The Workflow Management Coalition Specification

Workflow Management Application Programming Interface (Interface 2&3) Specification

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0. Change History

Version 1.0
- Intitial version

Version 1.1
- Consistent handling of output parameters as pointers
- Added attributes for WMTProcessDefinition
- Editorial enhancements

Version 1.2
- Added Abstract Object Model
- Added OLE Binding
- Added OMG IDL Binding

Version 2.0 (Beta)
- Added Process Definition functions
- Added States
- Added references to Audit Data
- Added Conformance Specification

Version 2.0 (Beta)
- Added Application Interface Definition
- Added Application Interface functions

Version 2.0e (Beta)
- Added Conformance Profile for WFToolAgent

1. Purpose

The purpose of this document is to specify standard workflow management Application Programming Interfaces (API) which can be supported by WFM products. These API calls provide for a consistent method of access to WFM functions in cross-product WFM Engines. The API set is named Workflow Application Programming Interfaces (WAPI).

This document defines the API specifications of the Workflow Management Coalition for building workflow-enabled applications (Interface 1,2 and 3 in the Workflow Reference Model).

This document is directly associated to the documents:

- Workflow Management Coalition Glossary
- Workflow Management Coalition Interface 2 WAPI Naming Conventions

The three documents constitute the complete specification.

2. Audience

The intended audience of this document includes all participants in the workflow industry. Comments should be addressed to the Workflow Management Coalition.

3. Overview

The support of these interfaces in WFM products allow the implementation of front-end applications which need to access WFM Engine functions (Workflow services). Such implementations might be written by WFM exploiters or ISVs. Implementation of these API calls are also intended to allow the workflow applications to be adjusted to operate with different WFM Engines using this common API interface.

These API calls should allow a WFM exploiter to have a single end user interface and functions set regardless of the number of WFM products existing in an installation. WAPI calls may be implemented in a number of languages. The first Coalition specification will be for the 'C' language. The API operates as CALLS. No assumption is may regarding the underlying implementation of the CALLS in a particular WFM product implementation. The WAPI calls are for use at run-time. That is, when processes are executing or are to be executed. They would normally be used by workflow applications (e.g. worklist handlers, cooperating applications) but may also be used by a WFM Engine when it wishes to interact with another WFM product within the context of the API functions.

Through its set of functions, the WAPI provides a set of workflow services that a Workflow Enactment Service provides. The WAPI does not assume any specific user interface, but rather it specifically assumes that the user interface of the workflow enabled application, that uses these services, provides its own user interface, that depends solely on the application development environment facilities where it is implemented.

The WFM Engine functions can broadly be classified in the following areas:

- **WAPI Connection Functions**
- **WAPI Workflow Definition Functions**
- **WAPI Process Control Functions**
- **WAPI Activity Control Functions**
- **WAPI Process Status Functions**
- **WAPI Activity Status Functions**
- **WAPI Worklist Functions**
- **WAPI Administration Functions**

3.1 Application Interface Definition

Introducing a Workflow Management System always implies that at least the existing IT environment has to be integrated, or better "*workflow enabled*". Additionally, this interface grants a certain degree of protection on the already installed software systems.
The W*f*MC's interface to invoke applications does not define a direct application control mechanism. Today, the customers and the vendors are confronted with several different operating systems and application communication mechanisms. Therefore, Workflow Management Systems need an interface to specific application drivers. With the definition of these drivers to invoke and control applications, the Coalition offers an interface which enables a standardized protocol between workflow products and any other software systems.

Currently, a variety of Workflow Management Tools support specialized mechanisms to integrate applications and to exchange information. While all these mechanisms are mostly individually implemented for specific customer requirements, system integration companies and third party vendors have to re-implement these mechanisms, if they intend to use another Workflow Management tool at the same site. Consequently, their interest in supporting the generation of such an interface is, indeed, very high, as it would definitely improve their daily work. It might appear very simple to "*workflow enable*" common applications, nevertheless, workflow environments typically include a series of different specialized applications, which run in heterogeneous environments.
Workflow Management Systems as well as integration platforms are required by the market and require a generalized and standardized application interface.

3.1.1 Purpose & Background

The "Invoking Applications Interface" defines an interface mechanism between Workflow Management Systems and any other application, but it, however, differentiates itself from the other Coalition interface definitions. Invoking an application is not a workflow specific functionality, but a Workflow System would not make much sense without this functionality.
Therefore, this interface addresses workflow system vendors as well as any third party software vendor. Based on different communication technologies the so-called "*Tool Agents*" can handle the application control and information exchange. These *Tool Agents* represent at least one specific invocation technology. E.g. while one *Tool Agent* supports DDE commands, others can communicate based on protocols like OLE or CORBA or any other concept.
The technology to interact between a *Tool Agent* and a corresponding application depends on the underlying architecture and on application - specific interfaces, which have to be managed under control of the *Tool Agent* itself. The suggested interface defines the way a *Tool Agent* can be used by a workflow application, e.g. a worklist handler or the workflow engine. Finally, the purpose of *Tool Agents* can be compared with the purpose of standardized software components.

3.2 Design Philosophy

There are a number of design assumptions and constraints that provide a framework or philosophy for the definition of this specification.

3.3 Design Assumptions

Incremental Set of Functions. It is assumed that as the WFM technology evolves, likewise the specifications defined in this document will evolve and will have additions in subsequent versions of this document.

- Strings are defined with buffer sizes allocated in bytes. Strings are assumed to be zero terminated.
- The workflow engine may have security restrictions that may cause an error to be returned to a user for some of the API calls.
- The specific calls to change state have to be supported by all vendors. The generic state changes are reserved for vendor specific states. In the future, it is expected that a common set of states will evolve.
- Each process definition must have a unique ID within an administrative scope.
- Each process instance must have a unique ID within an administrative scope.
- Each activity instance must have a unique ID within a process instance.
- Each work item must have a unique ID within a process instance.
- Process Instance ID is unique to the workflow engines from which it is available. It is the responsibility of the workflow engine to ensure a unique identifier within this scope.

3.4 Design Objectives

Ease of Implementation. The API specification must be easy to implement by a wide range of vendors. This also implies that the specification will be able to be implemented by multiple vendors in a reasonably short period of time.

3.5 Defined Terms and Abbreviations

The terms used in this document are defined in the WFM Coalition Glossary.

3.6 Reference Documents

The following documents are associated with this document and should be used as a reference.

- WFM Coalition Reference Model
- WFM Coalition Glossary
- WFM Coalition WAPI Naming Conventions

3.7 Conformance

A vendor can not claim conformance to this or any other WfMC specification unless specifically authorized to make that claim by the WfMC. The WfMC grants this permission only upon the verification of the particular vendor's implementation of the published specification, according to the conformance requirements and applicable test procedures defined by the WfMC.

3.8 WAPI Naming Conventions

The Working group has proposed a set of standards for handling the naming conventions of the different implementation of the Workflow API. These naming conventions standards are described in the document

Workflow Management Coalition Interface 2 WAPI Naming Conventions (Document Number WFMC-TC-1013).

4. WAPI Data Types

This section describes the WAPI data types. These data types are used in the WAPI calls as input and output parameters.

4.1 Basic WAPI Data Types

This subsection contains definitions of the basic Workflow Management types that are operating system or platform dependent.

```
typedef char                    WMTInt8;
typedef short                   WMTInt16;
typedef long                    WMTInt32;
typedef unsigned char           WMTUInt8;
typedef unsigned short          WMTUInt16;
typedef unsigned long           WMTUInt32;

typedef WMTInt8                 WMTText;
typedef WMTText                 *WMTPText;
typedef WMTInt8                 *WMTPInt8;
typedef WMTInt16                *WMTPInt16;
typedef WMTInt32                *WMTPInt32;

typedef WMTInt8                 WMTBoolean;
typedef WMTUInt8                *WMTPointer;
typedef WMTText                 *WMTPPrivate;

#define WMNULL                  ((WMTPointer)0)
#define WMFalse                 0
#define WMTrue                  (!WMFalse)
```

4.2 Other WAPI Data Types

This subsection contains definitions of the Workflow Management types that are specific to the structures and objects defined in this specification.

Strings in this specification, are assumed to be zero terminated. The maximum string length for names, keywords and identifiers in this specification is 63 characters hosted in a 64 byte text array. The following macro definition specifies this typical size:

```
#define NAME_STRING_SIZE        64
```

All strings in this specification are defined as text arrays, such as:

```
WMTText         user_identification[NAME_STRING_SIZE];
```

Given this, in the example above the string can include up to a maximum of 63 real characters.

In some other cases, the fixed size structures for data reference and unique ids are also defined through the following macro definitions:

```
#define UNIQUE_ID_SIZE          64
```

All WAPI function calls have a uniform error return datatype:

```
typedef struct
{
       WMTInt16       main_code;
       WMTInt16       sub_code;
} WMTErrRetType;
```

This data type is shared among all API calls. All other data types are shown along with the WAPI description for each individual call.

This error return datatype is a Int32 word that has two Int16 elements for error returns. The main_code element contains the main error return code, while the sub_code element contains a code that further specifies the nature of the error. For example, the main_code error code `WM_INVALID_PROCESS_INSTANCE` (see Error Return Codes below), would include in its sub_code set of codes a further, more detailed reason why the process instance is invalid.

This specification assumes that the Coalition will specify a subset of the main_code codes, leaving for vendor specific implementation the remaining main_code codes and the set of sub_code codes to provide extensibility and specialization of error codes.

```
typedef struct
{
       WMTText user_identification[NAME_STRING_SIZE];
                                          // The identification of the workflow
                                              participant on  whose behalf the Workflow
                                              Application will be  operating.  The
                                              value specified may represent a human, a
                                              device, etc.  This identification is
                                              normally used for security checking,
                                              accounting, etc.

       WMTText password[NAME_STRING_SIZE];
       WMTText engine_name[NAME_STRING_SIZE];
                                          // The identification of the WFM Engine to
                                              whom the subsequent API calls are to be
                                              directed.  This information would not be
                                              required for some WFM products in the
                                              normal case.  However, it is required for
                                              those Workflow Applications which
                                              interact with multiple WFM Engines.  This
                                              would be a symbolic  name which is
                                              resolved through a lookup facility.
       WMTText scope[NAME_STRING_SIZE];
                                          // Identification of scope for the
                                              application.  If scope is not relevant,
                                              then this field would be empty and
                                              ignored.

}WMTConnectInfo;

typedef  WMTConnectInfo *WMTPConnectInfo;

typedef struct
{
       WMTUInt32              session_id;    // locally unique ID for the session
       WMTPPrivate            pprivate;     // pointer to a private structure containing
                                              vendor specific information.
}WMTSessionHandle;

typedef WMTSessionHandle *WMTPSessionHandle;
```

```
typedef struct
{
       WMTInt32       filter_type;          // Includes basic types and  SQL String
       WMTInt32       filter_length;        // Length (in bytes) of value
       WMTText        attribute_name [NAME_STRING_SIZE]
       WMTUInt32      comparison;           // one of: <, >, =, !=, <=, <=
       WMTPText       filter_string;
}WMTFilter;

typedef  WMTFilter *WMTPFilter;

// The first 255 filter types will be reserved.  These will be used for filtering on
    attributes of process control data and process relevant data. The specific code values
    for these codes are included in the WFM Coalition Interface 2 WAPI Naming Conventions
    specification document.

// In this specification there are two types of filters.  One type is useful for
    comparisons with and between attribute values. In this case, the filter_string
    includes the attribute value that the attribute is compared against.  The second type
    is a more general mechanism in which the filter_string represents the whole argument
    (typically a full SQL argument). If filter_type is a  SQL string, the filter_string
    will point to a SQL clause with the syntax of a WHERE clause in the SQL 92 standard
    language specification.


typedef struct
{
       WMTUInt32      query_handle;
}WMTQueryHandle;

typedef WMTQueryHandle *WMTPQueryHandle;

typedef struct
{
       WMTText        wf_participant[NAME_STRING_SIZE];
}WMTWflParticipant;

typedef WMTWflParticipant *WMTPWflParticipant;

typedef struct
{
       WMTText proc_def_id[UNIQUE_ID_SIZE];
}WMTProcDefID;

typedef WMTProcDefID *WMTPProcDefID;

typedef struct
{
       WMTText activity_id[NAME_STRING_SIZE];
}WMTActivityID;

typedef WMTActivityID *WMTPActivityID;

typedef struct
{
       WMTText proc_def_state[NAME_STRING_SIZE];
} WMTProcDefState;

typedef WMTProcDefState *WMTPProcDefState;   // pointer to a 63-byte string

typedef struct
{
     //  This is the minimum list of elements at this time. Future versions to provide
       extensibility for this structure.

       WMTText               process_name[NAME_STRING_SIZE];
       WMTProcDefID          proc_def_id;
       WMTProcDefState       state;
} WMTProcDef;

typedef WMTProcDef *WMTPProcDef;
```

```
typedef struct
{
       WMTText proc_inst_id[UNIQUE_ID_SIZE];
}WMTProcInstID;

typedef WMTProcInstID *WMTPProcInstID;

typedef struct
{
       WMTText proc_inst_state[NAME_STRING_SIZE];
} WMTProcInstState;

typedef WMTProcInstState *WMTPProcInstState; // pointer to a 63-byte string

typedef struct
{
     //  This is the minimum list of elements at this time. Future versions to provide
        extensibility for this structure.

        WMTText               process_name[NAME_STRING_SIZE];
        WMTProcInstID         proc_inst_id;
        WMTProcDefID          proc_def_id;
        WMTProcInstState      state;
        WMTInt32              priority;
        WMTWflParticipant     proc_participants[20];
                                    //up to 20 63 character long participant identifiers
} WMTProcInst;

typedef WMTProcInst *WMTPProcInst;

typedef struct
{
       WMTText activity_inst_id[UNIQUE_ID_SIZE];
}WMTActivityInstID;

typedef WMTActivityInstID *WMTPActivityInstID;

typedef struct
{
       WMTText activity_inst_state[NAME_STRING_SIZE];
} WMTActivityInstState;

typedef WMTActivityInstState *WMTPActivityInstState;

typedef struct
{
    // This is the minimum list of elements at this time. Future  versions to provide
        extensibility for this structure.

        WMTText               activity_name[NAME_STRING_SIZE];
        WMTActivityInstID     activity_inst_id;
        WMTProcInstID         proc_inst_id;
        WMTActivityInstState  state;
        WMTInt32              priority;
        WMTWflParticipant     activity_participants[10];
                                    //up to 10 63 character long participant identifiers
} WMTActivityInst;

typedef WMTActivityInst *WMTPActivityInst;
```

```
typedef struct
{
       WMTText        work_item_id[UNIQUE_ID_SIZE];
}WMTWorkItemID;

typedef WMTWorkItemID *WMTPWorkItemID;

typedef struct
{
    // This is the minimum list of elements at this time. Future  versions to provide
       extensibility for this structure.

       WMTText               workitem_name[NAME_STRING_SIZE];
       WMTWorkItemID         workitem_id;
       WMTActivityInstID     activity_inst_id;
       WMTProcInstID         proc_inst_id;
       WMTInt32              priority;
       WMTWflParticipant     participant;
} WMTWorkItem;

typedef WMTWorkItem *WMTPWorkItem;

typedef struct
{
       WMTText        attribute_name[NAME_STRING_SIZE];
       WMTInt32       attribute_type;              // type of the attribute
       WMTInt32       attribute_length;            // length of the attribute value
       WMTPText       pattribute_value;            // pointer to the attribute value
} WMTAttribute;

typedef WMTAttribute *WMTPAttribute;

typedef struct
{
       WMTInt32       attribute_number;
       WMTPAttribute  pattribute;
       WMTNextAttr    *WMTAttributeList
} WMTAttributeList;

typedef WMTAttributeList *WMTPAttributeList;
```

4.3 Attributes

This specification does not make any assumption about the binding that workflow applications will make of retrieved attributes and their values. It is up to the specific application to manage this binding. The API manages attributes as a set of four elements:

```
WMTText        attribute_name[NAME_STRING_SIZE];
WMTInt32       attribute_type;              // type of the attribute
WMTInt32       attribute_length;            // length of the attribute value
WMTPText       pattribute_value;            // pointer to the attribute value
```

All API calls in this specification that deal with attributes, take each individual element as separate parameter for the call.

The following type definitions are used for attribute name:

```
typedef WMTText WMTAttrName[NAME_STRING_SIZE];
typedef WMTAttrName *WMTPAttrName;
```

These attributes are of the kind called *Process Control* and *Process Relevant Data.* Some attributes of process instances, activity instances and work items could be: priority, state, start_time, description, instance_name, workflow_participant.

5. WAPI Error Return Codes

This section describes the minimal set of WAPI error return codes. These error codes correspond to the main_code element of the WMTErrRetType datatype defined above. The specific code values for these codes are included in the *WFM Coalition WAPI Naming Conventions* specification document.

The minimal set of main_code error return codes are:

WM_SUCCESS
Indicates that the API call completed successfully.

WM_CONNECT_FAILED
Indicates that the **WMConnect** call failed.

WM_INVALID_PROCESS_DEFINITION
Indicates that the process definition ID that was passed as parameter to an API call was not valid, or it was not recognized by the servicing workflow engine.

WM_INVALID_ACTIVITY_NAME
Indicates that the activity name that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_PROCESS_INSTANCE
Indicates that the process instance ID that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_ACTIVITY_INSTANCE
Indicates that the process instance ID that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_WORKITEM
Indicates that the work item ID that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_ATTRIBUTE
Indicates that the attribute that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_ATTRIBUTE_ASSIGNMENT_FAILED
Indicates that the workflow engine was not able to complete the attribute assignment requested.

WM_INVALID_STATE
Indicates that a state was not valid, or was not recognized by the servicing workflow engine.

WM_TRANSITION_NOT_ALLOWED
Indicates that the state transition requested was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_SESSION_HANDLE
Indicates that the session ID that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_QUERY_HANDLE
Indicates that the query handle ID that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_SOURCE_USER

Indicates that the participant “source user” that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_TARGET_USER
Indicates that the participant “target user” that was passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_INVALID_FILTER
Indicates that the filter structure or values that were passed as parameter to an API call was not valid, or was not recognized by the servicing workflow engine.

WM_LOCKED
Reserved for situations in which the servicing workflow engine implements “locking” of workflow entities (process definitions, process instances, activities, work items, etc.) to indicate that the entity is locked at the moment in which its access is requested.

WM_NOT_LOCKED
Reserved for situations in which the servicing workflow engine implements “locking” of workflow entities (process definitions, process instances, activities, work items, etc.) to indicate that the entity is **not** locked at the moment in which its access is requested.

WM_NO_MORE_DATA
Indicates that a **fetch** query call has reached the end of the list of valid entities to be returned. This error return code is used to implement queries of lists of workflow entities, it indicates that all the entities of the list that matched the selection criterion have already been returned.

WM_INSUFFICIENT_BUFFER_SIZE
Indicates that the buffer size that was passed to an API call is insufficient to hold the data that it is supposed to receive.

```
WM_APPLICATION_BUSY
        Indicates that the corresponding application is currently busy and cannot
        return a status of work progress.

WM_INVALID_APPLICATION
        Indicates that an invalid application has been requested by the calling
        interface.

WM_INVALID_WORK_ITEM
        Indicates that an invalid work item has been referenced to by the calling
        interface.

WM_APPLICATION_NOT_STARTED
        Indicates that the requested application did not start up successfully.

WM_APPLICATION_NOT_DEFINED
        Indicates that the application is not installed or configured.

WM_APPLICATION_NOT STOPPED
        Indicates that the corresponding application did not stop orderly.
```

6. WAPI Descriptions

This section describes the WAPI calls. They are grouped as follows:

- **WAPI Connection Functions**
- **WAPI Process Control Functions**
- **WAPI Activity Control Functions**
- **WAPI Process Status Functions**
- **WAPI Activity Status Functions**
- **WAPI Worklist Functions**
- **WAPI Administration Functions**
- **WAPI Application Invocation Functions**

The specification of the WAPI calls that follows includes a specification of parameters with indications of the direction of data passing:

in	for parameters with data being passed to the API from the calling application
out	for parameters with data being passed from the API to the calling application.

It should be noted, that in the "C" language interface, parameters that are specified as *out* require a pointer to be passed from the calling application to the API. The API in turn will return the appropriate data in the space pointed to by the pointer. The specification of these *in* and *out* parameters is provided to clarify the specific purpose of these parameters in the calls.

6.1 WAPI Connection Functions

Connected/Connectedless Overview

The Coalition **WMConnect /WMDisconnect** API commands are intended to bound a set of related work by the application using them. When issued, the **WMConnect** returns a handle whose value is used on all other Coalition API calls. The handle value is unique and relates API calls which are issued between a **WMConnect /WMDisconnect** pair instance. The **WMConnect** command allows information to be supplied once and to remain valid until a **WMDisconnect** occurs.

Information supplied during the **WMConnect** (see the ConnectInfo structure in the **WMConnect** call) includes identification information relating to who/what is requesting services from the WFM Engine for use by an authentication service. The structure of the session handle that is returned by the **WMConnect** call is a pointer to a structure that contains a session ID and another structure pointer containing vendor specific information. (See the Session Handle structure in the **WMConnect** call.)

For those workflow servers that establish a connection, the session ID and the pointer to the vendor specific information would be returned by the workflow engine. For those workflow servers that do not establish a connection, the session ID would be set to 0, and a pointer to the connection information that was passed in by the user will be stored in the private structure contained in the session handle structure.

Operation between the API and the Engine

The construction of the Coalition API calls are intended to have little impact on the operational structure of how a WFM product supports them. The API calls are considered to be protocol neutral in that once the API boundary is crossed, different types of mechanisms may be employed to deliver the request to the WFM engine. A particular WFM product's method of interacting between the API calls and the WFM Engine functions may be RPC, conversational, messaging (connectedless) or others.

If a messaging mechanism is used by a WFM product, the receipt of a **WMConnect** may result in the determination of what messaging queue is to be used for interaction between its API support and the WFM engine functions, plus establishing control information to link that queue to subsequent API calls which use a particular handle. If the WFM engine is remote, it may also send a setup type of message to the engine.

If a conversational mechanism is used by a WFM product, and the WFM engine is remote, the receipt of a **WMConnect** may result in the establishment of a communications session between the code supporting the API calls and the WFM engine.

If a data base is being used, one of the results of the **WMConnect** may be the establishment of a connection to the appropriate data store facility.

A particular WFM product may choose to accept the **WMConnect** command, return a handle, and ignore the fact that it occurred.

The above are examples of possible operations performed by different WFM products in support of a **WMConnect** command. Obviously, more are possible.

In some cases, a product will be required to connect a single workstation to multiple WFM engines. It is possible that multiple **WMConnect** commands are active concurrently and the subsequent API commands be directed to the correct WFM engine. The **WMConnect** command may be used to designate a particular engine. The handle returned from the **WMConnect** command may be used on subsequent API calls to link those which relate to a engine.

The results of a **WMDisconnect** command is may vary, again depending upon a particular WFM product implementation. Its purpose is to indicate that the application issuing the preceding API calls will no longer be accessing the WFM engine functions within the previous context. In some products, upon receipt of a **WMDisconnect** command, communications and other resource types may be released.

Application Operation when using the API calls

The operational structure of an application as it relates to the use of the Coalition API calls is affected by the way the API calls are constructed. The current construction of the Coalition API calls result in the code segment of the application making the API call to run in blocked mode. That is, the application will issue an API command and 'wait' for a response from what it perceives as the WFM engine. When making the API call, the application code segment gives up control to the API and does not regain control until the API command is satisfied.

Much of the time, the API commands will be issued due to a workflow participant's direction via the application's End User Interface (EUI). Most of the current API commands are not such that a workflow participant would be interested in making the request, doing something else, and then sometime later (via a process/queue/whatever) viewing the real response to the request. With the request types supported by the API set, it would normally be the case that a workflow participant would want to see the response to the request as soon as possible.

The API calls could be constructed in such a way to allow the application code segment making the API call to run in unblocked mode. That is, to make the API call 'immediate return' rather than waiting for the actual response to the requested action. If this were done, the Coalition would need to define additional functions to support connectedless mode of operation (in some manner, get the asynchronous response when it did arrive and get it to the workflow participant).

The **WMConnect** / **WMDisconnect** API commands themselves have nothing to do with the ability of an application to run connected or connectedless as they are now defined.

Synchronous vs Asynchronous Calls

Most API calls in the WAPI call set are synchronous calls. In particular all the query related API calls are synchronous. Other calls may have some asynchronous behavior in that the call itself will return synchronously to the caller program, but the work specified by the call may be executed by the Workflow Engine at a later time, letting the application proceed. This set of API calls will not include any Call-Back mechanism to synchronize asynchronous calls.

6.1.1 WMConnect

NAME

WMConnect - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMConnect** command informs the WFM Engine that other commands will be originating from this source.

```
WMTErrRetType WMConnect (
                  in  WMTPConnectInfo pconnect_info,
                  out WMTPSessionHandle psession_handle)
```

Argument	Description
pconnect_info	Pointer to structure containing the information required to create a connection.
psession_handle	Pointer to a structure containing information which can be passed to the WFM Engine on all subsequent API calls which would identify interactions within the **WMConnect** / **WMDisconnect** bounds, that define a participant's session interaction with the Engine. These handles are opaque so that in connectedless environments the handles include participants identities and passwords rather than session identification. There will be a special value for a handle to indicate failure of the function.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_CONNECT_FAILED
```

WMDisconnectNAME

WMDisconnect - Disconnect from the WFM Engine for this series of interactions

DESCRIPTION

The **WMDisconnect** command tells the WFM Engine that no more API calls will be issued from this source using the named handle. The WFM Engine could discard state data being held or take other closure actions.

```
WMTErrRetType WMDisconnect (
                  in WMTPSessionHandle psession_handle)
```

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
```

6.2 WAPI Process Control Functions

Process Control Functions can be defined as those which change the operational state of one or more process instances. These API calls are intended for use by the WFM end user application. However, some of the API calls, or parameters within some of the API calls, may affect multiple users and would normally be restricted to the use of a process administrator.

6.2.1 WMOpenProcessDefinitionsList

NAME

WMOpenProcessDefinitionsList - Specifies and opens the query to produce a list of all process definitions that meet the selection criterion of the filter.

DESCRIPTION

This command may also be used by a manager or process administrator to get a list of process definitions so they may view which processes are startable by particular persons. This command directs the WFM Engine to open the query to provide a list of process definitions which are available to a particular workflow participant, some of which may be startable by the participant. It is assumed that not all processes in an organization may be started by all workflow participants. One of the uses of this API is to allow a workflow participant to view which processes he/she can start with the expectation that the next action by the workflow participant would be to pick one to be started.

This command will return a query handle for a list of process definitions that match the specified value for the attribute. The command will also return, optionally, the total *count* of definitions available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1. If `pproc_def_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL process definitions.

(**Note**: This API does not change the state of process or activity instances per the definition above of Process Control Functions. It is included in this section because it might normally lead to the execution of other API calls which would cause operational state changes.)

```
WMTErrRetType WMOpenProcessDefinitionsList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPFilter pproc_def_filter,
                    in  WMTBoolean count_flag,
                    out WMTPQueryHandle pquery_handle,
                    out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_def_filter	Filter associated with the process definition.
count_flag	Boolean flag that indicates if the total count of definitions should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of process definitions that fulfill the filter condition.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_FILTER
```

REQUIREMENTS

No requirements are assumed to exist with regard to the type of process model.

No requirements are assumed to exist with regard to how workflow participant's are identified within the WFM Engine.

RATIONALE FOR API

This command and the corresponding fetch calls allows a workflow participant to retrieve the process definition ids which a workflow participant is authorized to start. They might be used in conjunction with the WMCreateProcessInstance and WMStartProcess API calls to start a particular named process.

6.2.2 WMFetchProcessDefinition

NAME

WMFetchProcessDefinition - Returns the next process definition from the set of process definitions that met the selection criterion stated in the WMOpenProcessDefinitionsList call.

DESCRIPTION

This command directs the WFM Engine to provide one process definition from the list of process definitions which are available to a particular workflow participant, some of which may be startable by the participant. It is assumed that not all processes in an organization may be started by all workflow participants. One of the uses of this API is to allow a workflow participant to view which processes he/she can start with the expectation that the next action by the workflow participant would be to pick one to be started. This fetch function, as well as all other fetch functions in this API, will return subsequent items after every call, one at a time. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`. The sort order in which the items are returned is specific of the workflow engine servicing the call, no specific order should be assumed.

```
WMTErrRetType WMFetchProcessDefinition (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPProcDef pproc_def_buf_ptr)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the WMOpenProcessDefinitionsList query command.
pproc_def_buf_ptr	Pointer to a buffer area provided by the client application where the process definition structure will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.2.3 WMCloseProcessDefinitionsList

NAME

WMCloseProcessDefinitionsList - Closes the query of process definitions.

DESCRIPTION

```
WMTErrRetType WMCloseProcessDefinitionsList(
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the WMOpenProcessDefinitionsList query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.2.4 WMOpenProcessDefinitionStatesList

NAME

WMOpenProcessDefinitionStatesList - Specifies and opens the query to produce the list of states of the process definition that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of states for a process definition. The command will also return, optionally, the total *count* of definitions available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available states of the process definition that match the filter criterion, in order to offer this list to the application user. For example, process definitions can be in states such as *disabled* (thus disallowing temporarily the creation of new process definitions), or *enabled* (thus allowing again the creation of new process definitions based on the named definition). If `pproc_def_state_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL states available for the definition.

```
WMTErrRetType WMOpenProcessDefinitionStatesList (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID pproc_def_id,
                  in  WMTPFilter pproc_def_state_filter,
                  in  WMTBoolean count_flag,
                  out WMTPQueryHandle pquery_handle,
                  out WMTUInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_def_id	Pointer to a structure containing the unique process definition ID.
pproc_def_state_filter	Filter associated with the process definition state.
count_flag	Boolean flag that indicates if the total count of process definition states should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of states for this process definition.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
```

6.2.5 WMFetchProcessDefinitionState

NAME

WMFetchProcessDefinitionState - Returns the next process definition state, from the list of states of the process definition that match the filter criterion.

DESCRIPTION

This command returns a process definition state. This fetch function will return subsequent process definition states after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`.

```
WMTErrRetType WMFetchProcessDefinitionState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPProcDefState pproc_def_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessDefinitionStatesList** query command.
pproc_def_state	Pointer to a buffer area provided by the client application where the state name will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.2.6 WMCloseProcessDefinitionStatesList

NAME

WMCloseProcessDefinitionStatesList - Closes the query for process definition states.

DESCRIPTION

```
WMTErrRetType WMCloseProcessDefinitionStatesList (
                  in   WMTPSessionHandle psession_handle,
                  in   WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessDefinitionStatesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.2.7 WMChangeProcessDefinitionState

NAME

WMChangeProcessDefinitionState - Changes the state of the named process definition.

DESCRIPTION

This command is defined to allow a process definition to be changed temporarily to a specific state such as *disabled* (thus disallowing temporarily the creation of new process definitions), or *enabled* (thus allowing again the creation of new process definitions based on the named definition).

```
WMTErrRetType WMChangeProcessDefinitionState (
                  in   WMTPSessionHandle psession_handle,
                  in   WMTPProcDefID pproc_def_id,
                  in   WMTPProcDefState pproc_def_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_def_id	Pointer to a structure containing a unique process definition ID.
pproc_def_state	Pointer to a structure that contains the name of the state to change the process definition to.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_STATE
WM_TRANSITION_NOT_ALLOWED
```

REQUIREMENTS

Each process definition must have a unique ID within an administrative scope.

RATIONALE FOR API

This API allows the possible intervention of a process administrator in a running process. This might be for the purpose of changing the process definition and having all subsequently created definitions reflect the new definition.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process Definition State
Event Code:	WMChangedProcessDefinitionState

6.2.8 WMCreateProcessInstance

NAME

WMCreateProcessInstance - Create an instance of a previously defined process.

DESCRIPTION

An operational instance of the named process definition will be created by a WFM Engine as the result of this command. A call to WMStartProcess would then start the process.

To assign attributes to the process instance, you will make multiple calls to WMAssignProcessInstanceAttribute.

The process instance ID returned by this call is valid and reliable until WMStartProcess is called, at which time it may be reassigned to a new value.

```
WMTErrRetType WMCreateProcessInstance (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID  pproc_def_id,
                  in  WMTPText pproc_inst_name,
                  out WMTPProcInstID pproc_inst_id)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_def_id	Pointer to a structure containing a unique process definition ID.
pproc_inst_name	Pointer to the name for the process instance created by this call.
pproc_inst_id	Pointer to a structure containing the process instance ID created by this call.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
```

REQUIREMENTS

No requirements exist with regard to process model type.

RATIONALE FOR API

This API allows a workflow participant to create an instance of a process. It is anticipated that vendor's implementations will be of at least 2 types: one in which the creation of a process instance and the starting of the same are a single functionality and another in which this functionality is separate. The calls in this API definition are thus separated to accommodate both types of implementation. Vendors that provide the single functionality will implement the creation and start of a process through the creation of a temporary (possibly local) `proc_inst_id` through WMCreateProcessInstance, assign attributes to it and then call WMStartProcess.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Create / Start Process Instance
Event Code:	WMCreatedProcessInstance

6.2.9 WMStartProcess

NAME

WMStartProcess - Start the named process.

DESCRIPTION

The **WMStartProcess** command directs the WFM Engine to begin executing a process, for which an instance has been created. When a process is started through this command, the first activity(s) of the process will be started. The process instance ID returned by this call will be valid for the life of the process instance.

Note: The programmer needs to maintain the association between the new process instance ID and the session in order to identify which session they need to connect to for future calls.

```
WMTErrRetType WMStartProcess (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID  pproc_inst_id,
                    out WMTPProcInstID pnew_proc_inst_id)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the process instance ID returned by the WMCreateProcessInstance call.
pnew_proc_inst_id	Pointer to a structure containing the process instance ID created by this call. This ID will be valid for the life of the process instance.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_ATTRIBUTE
```

REQUIREMENTS

The process instance to be started has a unique id within an administrative scope.
No requirements exist with regard to process model type.

RATIONALE FOR API

This API allows a workflow participant to start a created process instance. It is anticipated that vendor's implementations will be of at least 2 types: one in which the creation of a process instance and the starting of the same are a single functionality and another in which this functionality is separate. The calls in this API definition are thus separated to accommodate both types of implementation. Vendors that provide the single functionality will implement the creation and start of a process through the creation of a temporary (possibly local) `proc_inst_id` through WMCreateProcessInstance, assign attributes to it and then call WMStartProcess.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Create / Start Process Instance
Event Code:	WMStartedProcessInstance

6.2.10 WMTerminateProcessInstance

NAME

WMTerminateProcessInstance - Terminate a process instance.

DESCRIPTION

This command provides the capability of gracefully terminating a process without aborting the process instance. Return from this call does not imply that the process instance has terminated, for example, the process instance could be stopped when currently running activities are complete. The exact behavior of currently running activities is system dependent.

```
WMTErrRetType WMTerminateProcessInstance (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	A pointer to a structure that indicates the process instance that you want to terminate.

ERROR RETURN VALUE

The error return value for this function will include one or more of the following error codes (see Error Return Codes section):

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
```

REQUIREMENTS

None

RATIONALE FOR API

To allow a process instances to be terminated.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process Instance State
Event Code:	WMTerminatedProcessInstance

6.2.11 WMOpenProcessInstanceStatesList

NAME

WMOpenProcessInstanceStatesList - Specifies and opens the query to produce the list of states of the process instance that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of states for a process instance. The command will also return, optionally, the total *count* of states available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1. The meaning of states is dependent upon the particular WFM Engine implementation. For example, the process instance can have states such as *suspended* or *in-progress*.

One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available states of the process instance that match the filter criterion, in order to offer this list to the application user. If `pproc_inst_state_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL states available for the process instance.

```
WMTErrRetType WMOpenProcessInstanceStatesList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPFilter pproc_inst_state_filter,
                    in  WMTBoolean count_flag,
                    out WMTPQueryHandle pquery_handle,
                    out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pproc_inst_state_filter	Filter associated with the process instance state.
count_flag	Boolean flag that indicates if the total count of process instance states should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of states for this process instance.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
```

6.2.12 WMFetchProcessInstanceState

NAME

WMFetchProcessInstanceState - Returns the next process instance state from the list of states of the process instance that match the filter criterion.

DESCRIPTION

This command returns a process instance state. This fetch function will return subsequent process instance states after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`.

```
WMTErrRetType WMFetchProcessInstanceState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPProcInstState pproc_inst_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessInstanceStatesList** query command.
pproc_inst_state	Pointer to a buffer area provided by the client application where the state name will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.2.13 WMCloseProcessInstanceStatesList

NAME

WMCloseProcessInstanceStatesList - Closes the query for process instance states.

DESCRIPTION

```
WMTErrRetType WMCloseProcessInstanceStatesList (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessInstanceStatesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.2.14 WMChangeProcessInstanceState

NAME

WMChangeProcessInstanceState - Changes the state of the named process instance.

DESCRIPTION

This command is defined to allow a process instance to be changed temporarily to a specific state such as *suspended*.

Execution of this command will cause the single process instance that is named to be transitioned to a new state. In this case, the meaning of all states is dependent upon the particular WFM Engine implementation. This command will set the state attribute of the process instance to a state such as *suspended* or *running*.

```
WMTErrRetType WMChangeProcessInstanceState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id,
                  in  WMTPProcInstState pproc_inst_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing a unique process instance ID.
pproc_inst_state	Pointer to a structure that contains the name of the process state that you want to change the instance to.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_STATE
WM_TRANSITION_NOT_ALLOWED
```

REQUIREMENTS

Each process instance must have a unique ID within an administrative scope.

RATIONALE FOR API

This API allows the possible intervention of a workflow participant in a running process.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process Instance State
Event Code:	WMChangedProcessInstanceState

6.2.15 WMOpenProcessInstanceAttributesList

NAME

WMOpenProcessInstanceAttributesList - Specifies and opens the query to produce the list of attributes that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of attributes for a process instance. The command will also return, optionally, the total *count* of attributes available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available attributes that can be assigned to the process instance, in order to offer this list to the application user. Attribute values can be obtained as well provided that a buffer of enough size is passed in the fetch call. Individual attribute values can also be retrieved with the **WMGetProcessInstanceAttributeValue** call. If `pproc_inst_attr_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL attributes available for the process instance.

```
WMTErrRetType WMOpenProcessInstanceAttributesList (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id,
                  in  WMTPFilter pproc_inst_attr_filter,
                  in  WMTBoolean count_flag,
                  out WMTPQueryHandle pquery_handle,
                  out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pproc_inst_attr_filter	Filter associated with the process instance attributes.
count_flag	Boolean flag that indicates if the total count of process instance attributes should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of attributes for this process instance.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
```

6.2.16 WMFetchProcessInstanceAttribute

NAME

WMFetchProcessInstanceAttribute - Returns the next process instance attribute from the list of attributes that match the filter criterion.

DESCRIPTION

This command returns a process instance attribute. This fetch function will return subsequent process instance attributes after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`. The fetch function will return the attribute value as well in a buffer specified in the call. If `buffer_size` is NULL then the attribute value will not be returned. If `buffer_size` is not large enough to hold the attribute value then the function will return as much of the attribute value as can be fit in the buffer. The proper length of the attribute value is available in the `attribute_length` field. The application can compare the `attribute_length` with the `buffer_size` to determine if the full value was returned.

```
WMTErrRetType WMFetchProcessInstanceAttribute (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPQueryHandle pquery_handle,
                    out WMTPAttrName pattribute_name,
                    out WMTPInt32 pattribute_type,
                    out WMTPInt32 pattribute_length,
                    out WMTPText pattribute_value,
                    in  WMTInt32 buffer_size)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessInstanceAttributesList** query command.
pattribute_name	Pointer to the name of the attribute.
pattribute_type	Pointer to the type of the attribute.
pattribute_length	Pointer to the length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.
buffer_size	Size of the buffer.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.2.17 WMCloseProcessInstanceAttributesList

NAME

WMCloseProcessInstanceAttributesList - Closes the query for process instance attributes.

DESCRIPTION

```
WMTErrRetType WMCloseProcessInstanceAttributesList (
                in WMTPSessionHandle psession_handle,
                in WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessInstanceAttributesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.2.18 WMGetProcessInstanceAttributeValue

NAME

WMGetProcessInstanceAttributeValue - Returns the value, type and length of a process instance attribute specified by the `proc_inst_id` and `attribute_name` parameters.

DESCRIPTION

This command will return the value of a process instance attribute in the buffer specified in the call.

```
WMTErrRetType WMGetProcessInstanceAttributeValue (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPAttrName pattribute_name,
                    out WMTPInt32 pattribute_type,
                    out WMTPInt32 pattribute_length,
                    out WMTPText pattribute_value,
                    in  WMTInt32 buffer_size)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pattribute_name	Pointer to the name of the attribute.
pattribute_type	Pointer to the type of the attribute.
pattribute_length	Pointer to the length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.
buffer_size	Size of the buffer to be filled.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_ATTRIBUTE
WM_INSUFFICIENT_BUFFER_SIZE
```

6.2.19 WMAssignProcessInstanceAttribute

NAME

WMAssignProcessInstanceAttribute - Assign the proper attribute to process instance(s)

DESCRIPTION

This command tells the WFM Engine to assign an attribute, change an attribute or to change the value of an attribute of a process instance.

This command changes the value of an attribute of a process instance. Attributes of process instances are of the kind called *Process Control and Process Relevant Data*. These attributes are specified as quadruplets of *name, type, length* and *value.*

```
WMTErrRetType WMAssignProcessInstanceAttribute (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPAttrName pattribute_name,
                    in  WMTInt32 attribute_type,
                    in  WMTInt32 attribute_length,
                    in  WMTPText pattribute_value)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the process instance ID that indicates the process for which the attribute will be assigned.
pattribute_name	Pointer to the name of the attribute.
attribute_type	Type of the attribute.
attribute_length	Length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_ATTRIBUTE
WM_ATTRIBUTE_ASSIGNMENT_FAILED
```

REQUIREMENTS

None

RATIONALE FOR API

For various business reasons, certain pieces of work are required to be handled with particular attributes (e.g. priority) relative to other pieces of like work. This command allows attributes to be set on those pieces of work. In some cases, these attributes are determined by the WFM product based upon data values existing during process execution. The setting of these attributes through the use of this API is provided to cover the cases where applications set them upon requests from users.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process Instance Attributes
Event Code:	WMAssignProcessInstanceAttributes

6.3 WAPI Activity Control Functions

Activity Control Functions can be defined as those which change the operational state of one or more activity instances. These API calls are intended for use by the WFM end user. However, some of the API calls, or parameters within some of the API calls, may affect multiple users and would normally be restricted to the use of a process administrator.

6.3.1 WMOpenActivityInstanceStatesList

NAME

WMOpenActivityInstanceStatesList - Specifies and opens the query to produce the list of states of the activity instance that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of states for an activity instance. The command will also return, optionally, the total *count* of states available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available states of the activity instance that match the filter criterion, in order to offer this list to the application user. If `pact_inst_state_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL states available for the activity instance.

```
WMTErrRetType WMOpenActivityInstanceStatesList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPActivityInstID pactivity_inst_id,
                    in  WMTPFilter pact_inst_state_filter,
                    in  WMTBoolean count_flag,
                    out WMTPQueryHandle pquery_handle,
                    out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing a unique process instance ID.
pactivity_inst_id	Pointer to a structure containing the unique activity instance ID.
pact_inst_state_filter	Filter associated with the activity instance state.
count_flag	Boolean flag that indicates if the total count of activity instance states should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of states for this activity instance.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_ACTIVITY_INSTANCE
```

6.3.2 WMFetchActivityInstanceState

NAME

WMFetchActivityInstanceState - Returns the next activity instance state, from the list of states of the activity instance that match the filter criterion.

DESCRIPTION

This command returns an activity state. This fetch function will return subsequent activity states after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`.

```
WMTErrRetType WMFetchActivityInstanceState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPActivityInstState pactivity_inst_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenActivityInstanceStatesList** query command.
pactivity_inst_state	Pointer to a buffer area provided by the client application where the state name will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.3.3 WMCloseActivityInstanceStatesList

NAME

WMCloseActivityInstanceStatesList - Closes the query for activity instance states.

DESCRIPTION

```
WMTErrRetType WMCloseActivityInstanceStatesList (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenActivityInstanceStatesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.3.4 WMChangeActivityInstanceState

NAME

WMChangeActivityInstanceState - Changes the state of the named activity instance.

DESCRIPTION

This command directs a WFM Engine to change the state of a single activity instance within a process instance. This allows the state of one activity instance to be changed, without impacting others in the process instance.

For example, this command will be used to change the state of an activity instance to *suspended*. This command can be used afterwards to change the state of the activity instance back to *running*. The implementation documentation will provide the names and semantics of the supported activity states for a particular implementation.

```
WMTErrRetType WMChangeActivityInstanceState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id,
                  in  WMTPActivityInstID pactivity_inst_id,
                  in  WMTPActivityInstState pactivity_inst_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing a unique process instance ID.
pactivity_inst_id	Pointer to structure containing the activity instance ID of the activity whose state to change.
pactivity_inst_state	Pointer to a structure that contains the name of the activity instance state that you want to change to.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_ACTIVITY_INSTANCE
WM_INVALID_STATE
WM_TRANSITION_NOT_ALLOWED
```

REQUIREMENTS

Each process instance must have a unique ID within an administrative scope.
Each activity instance must have a unique ID within a process instance.

RATIONALE FOR API

A workflow participant may wish to modify the state attributes associated with a particular activity instance.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Activity Instance State
Event Code:	WMChangedActivityInstanceState

6.3.5 WMOpenActivityInstanceAttributesList

NAME

WMOpenActivityInstanceAttributesList - Specifies and opens the query to produce the list of activity attributes that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of attributes for an activity instance. The command will also return, optionally, the total *count* of attributes available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available attributes that can be assigned to the activity instance, in order to offer this list to the application user. Attribute values can be obtained as well provided that a buffer of enough size is passed in the fetch call. Individual attribute values can also be retrieved with the **WMGetActivityInstanceAttributeValue** call. If `pact_inst_attr_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL attributes available for the activity instance.

```
WMTErrRetType WMOpenActivityInstanceAttributesList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPActivityInstID pactivity_inst_id,
                    in  WMTPFilter pact_inst_attr_filter,
                    in  WMTBoolean count_flag,
                    out WMTPQueryHandle pquery_handle,
                    out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pactivity_inst_id	Pointer to a structure containing the unique activity instance ID.
pact_inst_attr_filter	Filter associated with the activity instance attributes.
count_flag	Boolean flag that indicates if the total count of activity instance attributes should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of attributes for this activity instance.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_ACTIVITY_INSTANCE
```

6.3.6 WMFetchActivityInstanceAttribute

NAME

WMFetchActivityInstanceAttribute - Returns the next activity instance attribute from the list of activity attributes that match the filter criterion.

DESCRIPTION

This command returns a activity instance attribute. This fetch function will return subsequent activity instance attributes after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`. The fetch function will return the attribute value as well in a buffer specified in the call. If `buffer_size` is NULL then the attribute value will not be returned. If `buffer_size` is not large enough to hold the attribute value then the function will return as much of the attribute value as can be fit in the buffer. The proper length of the attribute value is available in the `attribute_length` field. The application can compare the `attribute_length` with the `buffer_size` to determine if the full value was returned.

```
WMTErrRetType WMFetchActivityInstanceAttribute (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPAttrName pattribute_name,
                  out WMTPInt32 pattribute_type,
                  out WMTPInt32 pattribute_length,
                  out WMTPText pattribute_value,
                  in  WMTInt32 buffer_size)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenActivityInstanceAttributesList** query command.
pattribute_name	Pointer to the name of the attribute.
pattribute_type	Pointer to the type of the attribute.
pattribute_length	Pointer to the length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.
buffer_size	Size of the buffer.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.3.7 WMCloseActivityInstanceAttributesList

NAME

WMCloseActivityInstanceAttributesList - Closes the query for activity instance attributes.

DESCRIPTION

```
WMTErrRetType WMCloseActivityInstanceAttributesList (
                in  WMTPSessionHandle psession_handle,
                in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenActivityInstanceAttributesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.3.8 WMGetActivityInstanceAttributeValue

NAME

WMGetActivityInstanceAttributeValue - Returns the value, type and length of an activity instance attribute specified by the `pproc_inst_id, pactivity_inst_id` and `attribute_name` parameters.

DESCRIPTION

This command will return the value of an activity instance attribute in the buffer specified in the call.

```
WMTErrRetType WMGetActivityInstanceAttributeValue (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPActivityInstID pactivity_inst_id,
                    in  WMTPAttrName pattribute_name,
                    out WMTPInt32 pattribute_type,
                    out WMTPInt32 pattribute_length,
                    out WMTPText pattribute_value,
                    in  WMTInt32 buffer_size)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pactivity_inst_id	Pointer to a structure containing the unique activity instance ID.
pattribute_name	Pointer to the name of the attribute.
pattribute_type	Pointer to the type of the attribute.
pattribute_length	Pointer to the length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.
buffer_size	Size of the buffer to be filled.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_ATTRIBUTE
WM_INSUFFICIENT_BUFFER_SIZE
```

6.3.9 WMAssignActivityInstanceAttribute

NAME

WMAssignActivityInstanceAttribute - Assign an attribute to an activity instance.

DESCRIPTION

This command tells the WFM Engine to assign an attribute, to change an attribute or to change the value of an attribute of the activity instance within a named process definition.

This command changes the value of the attributes of a activity instance. These attributes of activity instances are of the kind called *Process Control and Process Relevant Data*. These attributes are specified as quadruplets of *name*, *type*, *length* and *value*.

```
WMTErrRetType WMAssignActivityInstanceAttribute (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID pproc_def_id,
                  in  WMTPActivityInstID pactivity_inst_id,
                  in  WMTPAttrName pattribute_name,
                  in  WMTInt32 attribute_type,
                  in  WMTInt32 attribute_length,
                  in  WMTPText pattribute_value)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pactivity_inst_id	Pointer to a structure containing the activity instance identification for which the attribute will be assigned.
pattribute_name	Pointer to the name of the attribute.
attribute_type	Type of the attribute.
attribute_length	Length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_ACTIVITY_INSTANCE
WM_INVALID_ATTRIBUTE
WM_ATTRIBUTE_ASSIGNMENT_FAILED
```

REQUIREMENTS

None

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Assign Activity Instance Attributes
Event Code:	WMAssignedActivityInstanceAttributes

6.4 WAPI Process Status Functions

The process status functions are intended to provide a view of the work done, work to be done, work associated with a workflow participant or group of workflow participants, etc. The status queries may be requested by a normal workflow participant or may be requested by a manager or process administrator who wishes to view the progress of work within his/her domain.

The status API calls are structured such that they provide views ranging from a view of global work to a view of work within a single process instance. These views are as follows:

1	All the process instances associated with a process definition.	**WM(Open+Fetch+Close)ProcessInstancesList**
2	A view of a single process instance.	**WMGetProcessInstance**

In addition, various filters (parameters) are provided with the calls such that the information returned may be tailored.

The API functions associated with these API calls are described in this section.

6.4.1 WMOpenProcessInstancesList

NAME

WMOpenProcessInstancesList - Specifies and opens the query to produce a list of process instances that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of process instances that match the specified value for the *attribute.* The command will also return, optionally, the total *count* of instances available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

This command will be used to set up a wide variety of queries of process instances. For example, this command will be used to set up the query for a list of *completed* or *suspended* process instances. If `pproc_inst_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL accessible process instances.

```
WMTErrRetType WMOpenProcessInstancesList (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPFilter pproc_inst_filter,
                  in  WMTBoolean count_flag,
                  out WMTPQueryHandle pquery_handle,
                  out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_filter	Pointer to a structure containing the information for this request.
count_flag	Boolean flag that indicates if the total count of process instances should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of process instances that fulfill the filter condition.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_FILTER
```

REQUIREMENTS

None

RATIONALE FOR API

The requester of the information needs to know what work of a particular type is in process or needs to know what work has completed.

6.4.2 WMFetchProcessInstance

NAME

WMFetchProcessInstance - Returns the next process instance from the list of process instances that met the selection criterion stated in the corresponding WMOpenProcessInstancesList call.

DESCRIPTION

This command returns a process instance. This fetch function will return subsequent process instances after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`.

```
WMTErrRetType WMFetchProcessInstance (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPProcInst pproc_inst_buf_ptr)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessInstancesList** query command.
pproc_inst_buf_ptr	Pointer to a buffer area provided by the client application where the set of process instances will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

REQUIREMENTS

None

6.4.3 WMCloseProcessInstancesList

NAME

WMCloseProcessInstancesList - Closes the query of process instances.

DESCRIPTION

This command will close the query of process instances that match the specified query *attribute*, specified in the **WMOpenProcessInstancesList** command. The *query handle* can no longer be used.

```
WMTErrRetType WMCloseProcessInstancesList (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenProcessInstancesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.4.4 WMGetProcessInstance

NAME

WMGetProcessInstance - Return a specific process instance record.

DESCRIPTION

The **WMGetProcessInstance** provides information about what work has been done within a process instance and what is the current work being done within the process instance.

```
WMTErrRetType WMGetProcessInstance (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    out WMTPProcInst pproc_inst)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to the process instance identification.
pproc_inst	Pointer to a structure containing the requested process instance information. Includes the state and other attributes of the process instance.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
```

REQUIREMENTS

None

6.5 WAPI Activity Status Functions

The process status functions are intended to provide a view of the work done, work to be done, work associated with a workflow participant or group of workflow participants, etc. The status queries may be requested by a normal workflow participant or may be requested by a manager or process administrator who wishes to view the progress of work within his/her domain.

The status API calls are structured such that they provide views ranging from a view of global work to a view of work within a single activity instance. These views are as follows:

1	All the activity instances associated to a process definition or instance	**WM(Open+Fetch+Close)ActivityInstancesList**
2	A view of a single activity within a process instance.	**WMGetActivityInstance**

In addition, various filters (parameters) are provided with the calls such that the information returned may be tailored.

The API functions associated with these API calls are described in this section.

6.5.1 WMOpenActivityInstancesList

NAME

WMOpenActivityInstancesList - Specifies and opens the query to produce a list of activity instances that match the criterion of the filter.

DESCRIPTION

This command will return a query handle for a list of activity instances that match the criterion of the filter. The command will also return, optionally, the total *count* of activity instances available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

This command will be used to set up a wide variety of queries of activity instances. For example, this command will be used to set up the query for a list of *completed* or *suspended* activity instances. If `pactivity_inst_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL accessible activity instances.

```
WMTErrRetType WMOpenActivityInstancesList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPFilter pactivity_inst_filter,
                    in  WMTBoolean count_flag,
                    out WMTPQueryHandle pquery_handle,
                    out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pactivity_inst_filter	Pointer to a structure containing the information for this request.
count_flag	Boolean flag that indicates if the total count of activity instances should be returned.
pquery_handle	Pointer to a structure containing a unique query information returned by this function.
pcount	Total number of activity instances that fulfill the filter condition.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_FILTER
```

REQUIREMENTS

None

RATIONALE FOR API

The requester of the information needs to know what work of a particular type is in process or needs to know what work has completed.

6.5.2 WMFetchActivityInstance

NAME

WMFetchActivityInstance - Returns the next activity instance from the list of activity instances that met the selection criterion in the corresponding WMOpenActivityInstancesList call.

DESCRIPTION

This command returns an activity instance. This fetch function will return subsequent activity instances after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`.

```
WMTErrRetType WMFetchActivityInstance (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPActivityInst pactivity_inst)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenActivityInstancesList** query command.
pactivity_inst	Pointer to a buffer area provided by the client application where the set of activity instances will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

REQUIREMENTS

None

6.5.3 WMCloseActivityInstancesList

NAME

WMCloseActivityInstancesList - Closes the query of activity instances.

DESCRIPTION

This command will close the query of activity instances that match the specified query *attribute*, specified in the **WMOpenActivityInstancesList** command. The *query handle* can no longer be used.

```
WMTErrRetType WMCloseActivityInstancesList (
                  in WMTPSessionHandle psession_handle,
                  in WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenActivityInstancesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

REQUIREMENTS

None

6.5.4 WMGetActivityInstance

NAME

WMGetActivityInstance - Returns the record of a specific activity instance.

DESCRIPTION

The **WMGetActivityInstance** command provides status about an activity within a process instance.

```
WMTErrRetType WMGetActivityInstance (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id,
                  in  WMTPActivityInstID pactivity_inst_id,
                  out WMTPActivityInst pactivity_inst )
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the process instance identification.
pactivity_inst_id	Pointer to a structure containing the identification of the activity instance.
pactivity_inst	Pointer to a structure containing the activity instance information.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_ACTIVITY_INSTANCE
```

REQUIREMENTS

None

6.6 WAPI Worklist Functions

The WAPI worklist API calls provide workflow participants access to information about work to which they have been assigned. As described by the WFM Coalition reference model, a process consists of a set of activities connected in such a way to control the sequencing of application invocation. An activity is associated with one or more applications to be invoked and also, during run time, is associated with the person(s) who has been assigned to do the work. Depending upon a WFM product's implementation, a workflow participant may be assigned one or more pieces of work at any one time. Each piece of work assigned to a workflow participant is called a 'work item' and the collection of all work items assigned to a workflow participant is called that workflow participant's 'worklist'.

(**Note**: To clarify the difference between an 'activity' and a 'work item' the following discussion is included. When a process is being defined (build time), an 'activity' is the construct used to define a piece of work to be done. It serves as a type of anchor point for further descriptions of that work to be done (i.e., the name of the application to be invoked, possibly a reference to skills needed to do the work, a symbolic name denoting the network address where the application is to be executed, etc.). During run time, when the activity is ready to be executed and one or more candidate persons are assigned to do the work, a work item is created and placed on that person(s) worklist. So, even though an activity and a work item both represent a piece of work, they come into existence at different points in time, there may be more than one work item for an activity and some operational characteristics may be different.)

A worklist then is defined as: the result of an implementation-defined query against the work item space. It is a list of work items and a work item is one element in a worklist.

The API calls in this section exist for the manipulation of work items and worklists.

6.6.1 WMOpenWorkList

NAME

WMOpenWorkList - Specifies and opens the query to produce the worklist that matches the criterion of the filter.

DESCRIPTION

This command provides the capability of returning a list of work items assigned to a specified workflow participant or a workgroup. The requester may be making the request on behalf of himself or may be a manager wanting to know what work has been assigned to a particular person or a workgroup.

A query handle will be returned for the list of work items that match the specified value for the attribute. The command will also return, optionally, the total *count* of work items available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1. If `pworklist_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL accessible work items.

```
WMTErrRetType WMOpenWorkList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPFilter pworklist_filter,
                    in  WMTBoolean count_flag,
                    out WMTPQueryHandle pquery_handle,
                    out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pworklist_filter	Pointer to a structure containing the filter information for this request.
count_flag	Boolean flag that indicates if the total count of work items should be returned.
pquery_handle	Pointer to a structure containing a unique query information returned by this function.
pcount	Total number of work items that fulfill the filter condition.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_FILTER
```

REQUIREMENTS

None

RATIONALE FOR API

A workflow participant must be able to determine what work has been assigned. A manager must be able to determine who has work and what work is to be done within a department.

6.6.2 WMFetchWorkItem

NAME

WMFetchWorkItem - Returns the next work item from the worklist that met the selection criterion in the corresponding WMOpenWorkList call.

DESCRIPTION

This command returns a work item. This fetch function will return subsequent work items after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`.

```
WMTErrRetType WMFetchWorkItem (
                  in   WMTPSessionHandle psession_handle,
                  in   WMTPQueryHandle pquery_handle,
                  out  WMTPWorkItem pwork_item)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenWorkList** query command.
pwork_item	Pointer to a buffer area provided by the client application where the set of work item will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.6.3 WMCloseWorkList

NAME

WMCloseWorkList - Closes the query of work items.

DESCRIPTION

This command will close the query of work items that match the specified query filter, specified in the **WMOpenWorkList** command. The *query handle* can no longer be used.

```
WMTErrRetType WMCloseWorkList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenWorkList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.6.4 WMGetWorkItem

NAME

WMGetWorkItem - Returns the record of a specific work item

DESCRIPTION

This command allows a workflow participant to designate which piece of work he wishes to do. The viewer may be selecting a work item from a list obtained by the **WMOpenWorkList** command.

This command operates on a single work item basis. This command execution need not imply that the work item is reserved or locked.

```
WMTErrRetType WMGetWorkItem (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id,
                  in  WMTPWorkItemID pwork_item_id,
                  out WMTPWorkItem pwork_item )
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pwork_item_id	Pointer to a structure containing the work item identification for this request.
pwork_item	Pointer to a structure containing the work item being returned by this function.

ERROR RETURN VALUE

The error return value for this function will include one or more of the following error codes (see Error Return Codes section):

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_WORKITEM
```

REQUIREMENTS

The application issuing the command must have sufficient identification information to select the work item desired.

RATIONALE FOR API

A workflow participant must be able to tell the WFM Engine which piece of work is to be selected.

AUDIT INFORMATION

The following audit information is directly related to this function and might be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Work Item State
Event Code:	WMSelectedWorkItem

In this paticular case it is left to the implementation to realize a state change of the Work Item when a WMGetWorkItem operation is invoked.

6.6.5 WMCompleteWorkItem

NAME

WMCompleteWorkItem - Tell the WFM Engine that this work item has been completed.

DESCRIPTION

This command allows a workflow participant to tell the WFM Engine that a work item has been completed.

To change a work item's attributes, multiple calls to WMAssignWorkItemAttribute.

```
WMTErrRetType WMCompleteWorkItem (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id,
                  in  WMTPWorkItemID pwork_item_id)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pwork_item_id	Pointer to a structure containing the work item identification for this request.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_WORKITEM
```

REQUIREMENTS

None

RATIONALE FOR API

WFM products implement various ways to determine when an activity is complete. The use of the API may range from just a successful/unsuccessful indication to placing values in the completion state which might cause the WFM Engine to select a future model navigation path from among many.

Typically, a work item will correspond to an activity instance. However the API should allow the existence of multiple work items per activity, executed one at a time. So completion of a work item does not necessarily mean that all work for an activity instance is completed. Completion of a work item could trigger the start of the next work item that corresponds to that activity instance. The Workflow Engine will determine the next work item based on the process definition.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Work Item State
Event Code:	WMCompletedWorkItem

6.6.6 WMOpenWorkitemStatesList

NAME

WMOpenWorkitemStatesList - Specifies and opens the query to produce the list of states of workitem that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of states for a workitem. The command will also return, optionally, the total *count* of definitions available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available states of the workitem that match the filter criterion, in order to offer this list to the application user. For example, workitems can be in states such as *disabled* (thus disallowing temporarily the creation of new process definitions), or *enabled* (thus allowing again the creation of new process definitions based on the named definition). If `pworkitem_state_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL states available for the definition.

```
WMTErrRetType WMOpenWorkitemStatesList (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID pworkitem_id,
                  in  WMTPFilter pworkitem_state_filter,
                  in  WMTBoolean count_flag,
                  out WMTPQueryHandle pquery_handle,
                  out WMTUInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pworkitem_id	Pointer to a structure containing the unique workitem ID.
pworkitem_state_filter	Filter associated with the workitem state.
count_flag	Boolean flag that indicates if the total count of process definition states should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of states for this process definition.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
```

6.6.7 WMFetchWorkitemState

NAME

WMFetchWorkitemState - Returns the next workitem state, from the list of states of the workitem that match the filter criterion.

DESCRIPTION

This command returns a workitem state. This fetch function will return subsequent workitem states after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`.

```
WMTErrRetType WMFetchWorkitemState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPQueryHandle pquery_handle,
                  out WMTPProcDefState pworkitem_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenWorkitemStatesList** query command.
pworkitem_state	Pointer to a buffer area provided by the client application where the state name will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.6.8 WMCloseWorkitemStatesList

NAME

WMCloseWorkitemStatesList - Closes the query for workitem states.

DESCRIPTION

```
WMTErrRetType WMCloseWorkitemStatesList (
                  in   WMTPSessionHandle psession_handle,
                  in   WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenWorkitemStatesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.6.9 WMChangeWorkitemState

NAME

WMChangeWorkitemState - Changes the state of the named workitem.

DESCRIPTION

This command is defined to allow a workitem to be changed temporarily to a specific state such as *notRunning*, or *running*. See Appendix G for a discussion of states.

```
WMTErrRetType WMChangeWorkitemState (
                  in   WMTPSessionHandle psession_handle,
                  in   WMTPProcDefID pworkitem_id,
                  in   WMTPProcDefState pworkitem_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pworitem_id	Pointer to a structure containing a unique workitem ID.
pworkitem_state	Pointer to a structure that contains the name of the state to change the workitem to.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_STATE
WM_TRANSITION_NOT_ALLOWED
```

REQUIREMENTS

Each workitem must have a unique ID within an administrative scope.

RATIONALE FOR API

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Work Item State
Event Code:	WMChangedWorkItemState

6.6.10 WMReassignWorkItem

NAME

WMReassignWorkItem

DESCRIPTION

This command allows a work item from one workflow participant's worklist to be reassigned to another workflow participant's worklist.

(**Note**: Possible future releases of the API specification may provide for an entire worklist to be reassigned in total.)

```
WMTErrRetType WMReassignWorkItem (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPWflParticipant psource_user,
                    in  WMTPWflParticipant ptarget_user,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPWorkItemID pwork_item_id)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
psource_user	The identification of a workflow participant from which work is to be reassigned.
ptarget_user	The identification of the workflow participant to whom work is to be assigned.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pwork_item_id	Pointer to a structure containing the work item identification being reassigned.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_WORKITEM
WM_INVALID_SOURCE_USER
WM_INVALID_TARGET_USER
```

REQUIREMENTS

The workflow participant making the reassignment request has the authority to do so.

RATIONALE FOR API

A workflow participant having work assigned may be away from work for various reasons and the work must be given to another workflow participant to get it accomplished. A WFM Engine may direct all work items to a single worklist (departmental worklist for example).

With the reassignment API, workflow participants in that department may reassign work to themselves after they finish a current work item and become available for more work. This creates a possible de facto people load balancing scheme.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Assign / Reassign Work Item
Event Code:	WMReassignedWorkItem

6.6.11 WMOpenWorkItemAttributesList

NAME

WMOpenWorkItemAttributesList - Specifies and opens the query to produce the list of work item attributes that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of attributes for a work item. The command will also return, optionally, the total *count* of attributes available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.

One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available attributes that can be assigned to the work item, in order to offer this list to the application user. Attribute values can be obtained as well provided that a buffer of enough size is passed in the fetch call. Individual attribute values can also be retrieved with the **WMGetWorkItemAttributeValue** call. If `pwork_item_attr_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL attributes available for the work item.

```
WMTErrRetType WMOpenWorkItemAttributesList (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPWorkItemID pwork_item_id,
                    in  WMTPFilter pwork_item_attr_filter,
                    in  WMTBoolean count_flag,
                    out WMTPQueryHandle pquery_handle,
                    out WMTPInt32 pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pwork_item_id	Pointer to a structure containing the unique work item ID.
pwork_item_attr_filter	Filter associated with the work item attributes.
count_flag	Boolean flag that indicates if the total count of work item attributes should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
Pcount	Total number of attributes for this work item.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_WORKITEM
```

6.6.12 WMFetchWorkItemAttribute

NAME

WMFetchWorkItemAttribute - Returns the next work item attribute from the list of work item attributes that match the filter criterion.

DESCRIPTION

This command returns a work item attribute. This fetch function will return subsequent work item attributes after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`. The fetch function will return the attribute value as well in a buffer specified in the call. If `buffer_size` is NULL then the attribute value will not be returned. If `buffer_size` is not large enough to hold the attribute value then the function will return as much of the attribute value as can be fit in the buffer. The proper length of the attribute value is available in the `attribute_length` field. The application can compare the `attribute_length` with the `buffer_size` to determine if the full value was returned.

```
WMTErrRetType WMFetchWorkItemAttribute (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPQueryHandle pquery_handle,
                    out WMTPAttrName pattribute_name,
                    out WMTPInt32 pattribute_type,
                    out WMTPInt32 pattribute_length,
                    out WMTPText pattribute_value,
                    in  WMTInt32 buffer_size)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenWorkItemAttributesList** query command.
pattribute_name	Pointer to the name of the attribute.
pattribute_type	Pointer to the type of the attribute.
pattribute_length	Pointer to the length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.
buffer_size	Size of the buffer.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

6.6.13 WMCloseWorkItemAttributesList

NAME

WMCloseWorkItemAttributesList - Closes the query for work item attributes.

DESCRIPTION

```
WMTErrRetType WMCloseWorkItemAttributesList (
                in  WMTPSessionHandle psession_handle,
                in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenWorkItemAttributesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

6.6.14 WMGetWorkItemAttributeValue

NAME

WMGetWorkItemAttributeValue - Returns the value, type and length of a work item attribute specified by the `pwork_item_id` parameter.

DESCRIPTION

This command will return the value of a work item attribute in the buffer specified in the call.

```
WMTErrRetType WMGetWorkItemAttributeValue (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPWorkItemID pwork_item_id,
                    in  WMTPAttrName pattribute_name,
                    out WMTPInt32 pattribute_type,
                    out WMTPInt32 pattribute_length,
                    out WMTPText pattribute_value,
                    in  WMTInt32 buffer_size)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pwork_item_id	Pointer to a structure containing the unique work item ID.
pattribute_name	Pointer to the name of the attribute.
pattribute_type	Pointer to the type of the attribute.
pattribute_length	Pointer to the length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.
buffer_size	Size of the buffer to be filled.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_ATTRIBUTE
WM_INSUFFICIENT_BUFFER_SIZE
```

6.6.15 WMAssignWorkItemAttribute

NAME

WMAssignWorkItemAttribute - Assign the proper attribute to a work item.

DESCRIPTION

This command tells the WFM Engine to assign an attribute, to change an attribute or to change the value of an attribute of a work item.

```
WMTErrRetType WMAssignWorkItemAttribute (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcInstID pproc_inst_id,
                    in  WMTPWorkItemID pwork_item_id,
                    in  WMTPAttrName pattribute_name,
                    in  WMTInt32 attribute_type,
                    in  WMTInt32 attribute_length,
                    in  WMTPText pattribute_value)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the unique process instance ID.
pwork_item_id	Pointer to a structure containing the work item ID for which an attribute will be added or changed.
pattribute_name	Pointer to the name of the attribute.
attribute_type	Type of the attribute.
attribute_length	Length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_WORKITEM
WM_INVALID_ATTRIBUTE
WM_ATTRIBUTE_ASSIGNMENT_FAILED
```

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Assign Work Item Attributes
Event Code:	WMAssignedWorkItemAttributes

6.7 WAPI Administration Functions

The set of administration functions provide the functionality needed to perform administration and maintenance functions of a workflow system. This set includes the minimal services contemplated for this client application interface. The set includes functions to change state of a set of process or activity instances, terminating and aborting process instances, and for assigning attributes to a set of process and activity instances.

6.7.1 WMChangeProcessInstancesState

NAME

WMChangeProcessInstancesState - Change the state of the instances of the named process definition that match the specified filter criterion.

DESCRIPTION

This command is defined to allow a set of process instances in the named process definition to move to a specific new state.

Execution of this command will cause a set of process instances of the named process definition change their state. If the filter pointer `pproc_inst_filter` is NULL, then the command is applied to all process instances. Specific state names and their semantics are dependent upon the particular WFM Engine implementation.

This call will be executed when a set of process instances of a process must have a new state, such as *suspended, disabled* or *enabled*. Specific state names and semantics must be included in implementation documentation.

Since this command operates on a set of process instances of a named process definition, it is expected to be issued by a person having the authority to do so. The scope of this operation may be different depending on the vendor's implementation.

```
WMTErrRetType WMChangeProcessInstancesState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID pproc_def_id,
                  in  WMTPFilter pproc_inst_filter,
                  in  WMTPProcInstState pproc_inst_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
Pproc_def_id	Pointer to a structure containing a unique process definition ID.
Pproc_inst_filter	Pointer to a structure containing the filter information for this request.
Pproc_inst_state	An ID that indicates the process state that you want to change to.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_FILTER
WM_INVALID_STATE
WM_TRANSITION_NOT_ALLOWED
```

REQUIREMENTS

Each process instance must have a unique ID within an administrative scope.
Each process definition must have a unique ID within an administrative scope.

RATIONALE FOR API

This API allows the possible intervention of a process administrator in a running process. This might be for the purpose of changing the process definition and having all subsequently created instances reflect the new definition. It provides the capability of halting running process instances while changes in roles, activities, etc. are put into effect. It allows instances to be stopped while problem determination can be done on a malfunctioning process.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process / Subprocess Instance State
Event Code:	WMChangedProcessInstanceState

6.7.2 WMChangeActivityInstancesState

NAME

WMChangeActivityInstancesState - Change the state of the activity instances of a particular name associated to a process definition that match the specified filter criterion.

DESCRIPTION

This command directs a WFM Engine to change the state of the named activity for a set of activity instances. It is assumed that a person who can change the state of the set of activity instances corresponding to a process definition has special authorization to do so. If the implementation supports a state such as *suspended*, and *resumed* or *in-progress*, then the functions for suspend and resume are implemented as state change calls. If the filter pointer `pact_inst_filter` is NULL, then the command is applied to all activity instances of the given activity definition.

```
WMTErrRetType WMChangeActivityInstancesState (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID pproc_def_id,
                  in  WMTPActivityID pactivity_def_id,
                  in  WMTPFilter pact_inst_filter,
                  in  WMTPActivityInstState pactivity_inst_state)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
Pproc_def_id	Pointer to a structure containing a unique process definition ID.
Pactivity_def_id	Pointer to the activity definition ID.
pact_inst_filter	Pointer to a structure containing the filter information for this request.
Pactivity_inst_state	An ID that indicates the activity instance state that you want to change to.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_ACTIVITY_NAME
WM_INVALID_FILTER
WM_INVALID_STATE
WM_TRANSITION_NOT_ALLOWED
```

REQUIREMENTS

Each process definition must have a unique ID within an administrative scope.
Each activity must have a unique ID within a process definition.

RATIONALE FOR API

A workflow participant may wish to modify the states of activity instances of a particular activity. Other situations might involve the malfunctioning of an application associated with an activity. A process containing the activity may be a frequently used one, and it might be issuing dumps each time it is invoked. The use of this API would allow the calling of the application to be stopped while remedial measures were taken.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Activity Instance State
Event Code:	WMChangedActivityInstanceState

6.7.3 WMTerminateProcessInstances

NAME

WMTerminateProcessInstances - Terminate the process instances of the named process definition that match the specified filter criterion.

DESCRIPTION

This command provides the capability of terminating a set of process instances associated with a process definition. Execution of this command will cause a set of process instances of the named process definition to be terminated. If the filter pointer `pproc_inst_filter` is NULL, then the command is applied to all process instances.

```
WMTErrRetType WMTerminateProcessInstances (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID pproc_def_id,
                  in  WMTPFilter pproc_inst_filter)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
Pproc_def_id	Pointer to a structure containing the process definition for which all process instances are to be terminated.
Pproc_inst_filter	Pointer to a structure containing the filter information for this request.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_FILTER
```

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process / Subprocess Instance State
Event Code:	WMTerminatedProcessInstance

6.7.4 WMAssignProcessInstancesAttribute

NAME

WMAssignProcessInstancesAttribute - Assign the proper attribute to a set of process instances within a process definition that match the specific filter criterion.

DESCRIPTION

This command tells the WFM Engine to assign an attribute, or to change an attribute or to change the values of an attribute of a set of process instances within a named process definition.

This command changes the value of the attribute of a process instance. These attributes of process instances are of the kind called *Process Control* or *Process Relevant* Data.

```
WMTErrRetType WMAssignProcessInstancesAttribute (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcDefID pproc_def_id,
                  in  WMTPFilter pproc_inst_filter,
                  in  WMTPAttrName pattribute_name,
                  in  WMTInt32 attribute_type,
                  in  WMTInt32 attribute_length,
                  in  WMTPText pattribute_value)
```

Argument Name	Description
Psession_handle	Pointer to a structure containing information about the context for this action.
pproc_def_id	Pointer to a structure containing the process definition ID for which the attribute of all process instances will be changed.
pproc_inst_filter	Pointer to a structure containing the filter information for this request.
Ppattribute_name	Pointer to the name of the attribute.
Attribute_type	Type of the attribute.
Attribute_length	Length of the attribute value.
Pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_FILTER
WM_INVALID_ATTRIBUTE
```

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type: Change Process Instance Attribute

6.7.5 Event Code: WMAssignedProcessInstanceAttributes

WMAssignActivityInstancesAttribute

NAME

WMAssignActivityInstancesAttribute - Assign the proper attribute to set of activity instances within a process definition that match the specific filter criterion.

DESCRIPTION

This command tells the WFM Engine to assign an attribute, or to change an attribute or to change the value of an attribute of a set of activity instances within a named process definition. These attributes of activity instances are of the kind called *Process Control* or *Process Relevant* Data. If `pact_inst_filter` is NULL, then the function is applied to ALL accessible activity instances of the given activity definition.

```
WMTErrRetType WMAssignActivityInstancesAttribute (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcDefID pproc_def_id,
                    in  WMTPActivityID pactivity_def_id,
                    in  WMTPFilter pact_inst_filter,
                    in  WMTPAttrName pattribute_name,
                    in  WMTInt32 attribute_type,
                    in  WMTInt32 attribute_length,
                    in  WMTPText pattribute_value)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_def_id	Pointer to a structure containing the process definition ID. In the case that the attribute will be changed for all activity instances that correspond to the process definition. This parameter will be NULL otherwise.
pactivity_def_id	Pointer to a structure containing the activity definition identification for which the attribute will be assigned.
pact_inst_filter	Pointer to a structure containing the filter information for this request.
pattribute_name	Pointer to the name of the attribute.
attribute_type	Type of the attribute.
attribute_length	Length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_ACTIVITY_NAME
WM_INVALID_FILTER
WM_INVALID_ATTRIBUTE
```

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Assign Activity Instance Attributes
Event Code:	WMAssignedActivityInstanceAttributes

6.7.6 WMAbortProcessInstances

NAME

WMAbortProcessInstances - Abort the set of process instances that correspond to the named process definition, that match the specific filter criterion, regardless of its state.

DESCRIPTION

This command allows a set of process instances of a process definition to be aborted. All current activities within these process instances will be stopped when possible. The instances will be terminated. If `pproc_inst_filter` is NULL, then the function will be applied to ALL accessible process instances.

```
WMTErrRetType WMAbortProcessInstances (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcDefID pproc_def_id,
                    in  WMTPFilter pproc_inst_filter)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_def_id	Pointer to a structure containing the process definition for who all processes instances is being aborted.
pproc_inst_filter	Pointer to a structure containing the filter information for this request.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_DEFINITION
WM_INVALID_FILTER
```

REQUIREMENTS

None

RATIONALE FOR API

This command is for use in catastrophic circumstances where nothing except clearing the process away can be done.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process Instance State
Event Code:	WMAbortedProcessInstance

6.7.7 WMAbortProcessInstance

NAME

WMAbortProcessInstance - Abort the process instance specified regardless of its state.

DESCRIPTION

This command allows a process instance to be aborted. All current activities within the process instance will be stopped when possible. The instance will be terminated.

```
WMTErrRetType WMAbortProcessInstance (
                  in  WMTPSessionHandle psession_handle,
                  in  WMTPProcInstID pproc_inst_id)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_inst_id	Pointer to a structure containing the process instance being aborted.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_PROCESS_INSTANCE
```

REQUIREMENTS

None

RATIONALE FOR API

This command is for use in catastrophic circumstances where nothing except clearing the process away can be done.

AUDIT INFORMATION

The following audit information is directly related to this function and would be recorded by an implementation of this specification that complies with the Audit Profile:

Audit Data Type:	Change Process / Subprocess Instance State
Event Code:	WMAbortedProcessInstance

6.8 WAPI Application Invocation Functions

The set of application interface functions provides services to *Tool-Agents*, to invoke and control applications associated with specific work items.

The Invoked Application Interface defines an API set, which is highly recommended to be used by Workflow System components (engine and client applications) to control specialized application drivers called Tool Agents. These Tool Agents finally start up and stop applications, pass workflow and application relevant information to and from the application and control the application's run level status. Therefore, the Invoked Application Interface WAPIs are only directed against a *Tool Agent*. Nevertheless, additional workflow information could be requested by an application via the *Tool Agent* using standard WAPI functions. As the Invoked Application Interface should handle bi-directional requests (requests to and from applications), it depends on the interfaces and architecture of applications how to interact with an *Tool Agent*.

This interface will allow the request and update of application data and more run-time relevant functionalities.

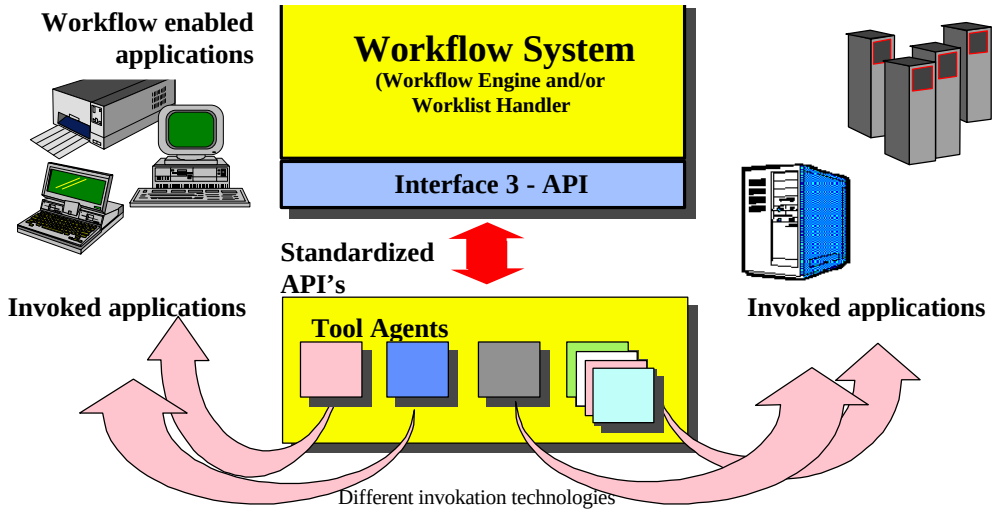


Fig. 1: The localization of the Invoking Application Interface.

The Workflow System itself has to know about the installed *Tool Agents*. The basic architecture of *Tool Agents* could be compared with a driver - interface, i.e. ODBC, etc..
Within this interface definition, no further communication mechanism between the *Tool Agents* and the Workflow System is necessary.

6.8.1 WMTAConnect() & WMTADisconnect()

DESCRIPTION

These commands create and terminate connections to Tool Agent interfaces. The commands are already defined in section "WAPI Connection Functions". Applications might require login procedures, therefore user authentication should be passed to a Tool Agent to provide single-login mechanisms.

Note: The value for engine_name in WMTConnectInfo represents the name of the Tool Agent implementation as defined in the process definition.

6.8.2 WMTAInvokeApplication()

NAME

WMTAInvokeApplication - Force a Tool Agent to start or activate a specific application.

DESCRIPTION

The workflow application or engine activates a specified application associated with a work item by calling this Tool Agent API. Applications could be already active (started) or have to be invoked (started) by the Tool Agent. Invoking an application always includes passing of additional options like application parameters and modes.

```
int WMTAInvokeApplication (
              in int tool_agent_handle,
              in string application_name,
              in WMTPProcInstID pproc_inst_id,
              in  WMTPWorkItemID pwork_item_id,
              in WMTPAttributeList pattribute_list,
              in int app_mode)
```

Argument Name	Description
tool_agent_handle	This handle represents one connection to a specific Tool Agent
application_name	This parameter represents the name of the executable file or component. The application name must be passed without the path name. (The Tool Agent implemetation and configuration has to handle the local configuration.)
pproc_inst_id	Process instance, to identify the relation between the application and a process instance. This ID allows the System to reference to a specific application handle of the Tool Agent.
pwork_item_id	Work Item associated with invoked application
pattribute_list	Pointer to a list of parameters and attributes which are required by the application. These parameters could be either application relevant, or dynamic, or workflow relevant data. (e.g. filename, record identifer, etc.)
app_mode	Represents a possible application mode like “CREATE”, “UPDATE”, “READ-ONLY”, ”PRINT”, etc..

ERROR RETURN VALUE

```
WM_SUCCESS
WM_APPLICATION_NOT_STARTED
WM_APPLICATION_NOT_DEFINED
WM_APPLICATION_BUSY
```

REQUIREMENTS

None

RATIONALE FOR API

This command invokes a specific application associated with a work item.A Tool Agent might control one or multiple applications, which have to be started or activated. Also, an application have to be started in a specific mode like “open” or “update”.

AUDIT INFORMATION

None

6.8.3 WMTARequestAppStatus()

NAME

WMTARequestAppStatus - allows the Workflow System to check for open applications and their status (running, pending, etc.).

DESCRIPTION

WMTARequestAppStatus() defines how the Workflow System has to check the status of an application and retrieves workflow relevant data from the application. To retrieve workflow relevant data from an invoked application, the workflow application or engine has to request the application status and information from a Tool Agent. Due to some asynchronous requirements of integrated applications, Tool Agents can request additional information by use of other WAPI interfaces.

```
int WMTARequestAppStatus (
              in WMTInt32 tool_agent_handle,
              in WMTPProcInstID proc_inst_id,
              in  WMTPWorkItemID pwork_item_id,
              out WMTInt32 app_status,
              out WMTPAttributeList WFRelevantData)
```

Argument Name	Description
tool_agent_handle	This handle represents one specific Tool Agent
Pproc_inst_id	Workflow relevant data belong to this process instance and should be updated after the application is finished.
Pwork_item_id	Work Item associated with invoked application.
app_status	Information about the invoked application. (I.e. “RUNNING”, “ACTIVE”, “WAITING”, “TERMINATED”, “FINISHED”, etc.)
WFRelevantData	A list or structure of workflow relevant data, which could be accessed by the Tool Agent mechanisms.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_APPLICATION_BUSY
WM_INVALID_TOOL_AGENT_HANDLE
WM_INVALID_WORKITEM
WM_INVALID_PROCESS_INSTANCE
```

REQUIREMENTS

None

RATIONALE FOR API

To check the status of an active work item this command might be used to control the status of an invoked application.

AUDIT INFORMATION

None

6.8.4 WMTATerminateApp()

NAME

WMTATerminateApp - Forces the Tool Agent to terminate an application.

DESCRIPTION

This API allows the Workflow System to stop an application, which relates to a specific process instance. Also, an application can be terminated by any other event. Therefore, WMTerminateApp is not mandatory within the application control APIs, but it allows the ToolAgent to free application relevant information.

```
int WMTATerminateApp (
                in WMTInt32 tool_agent_handle,
                in WMTPProcInstID pproc_inst_id,
                in  WMTPWorkItemID pwork_item_id)
```

Argument Name	Description
tool_agent_handle	This handle represents one specific Tool Agent
pproc_inst_id	Workflow relevant data belong to this process instance and should be updated after the application is finished.
pwork_item_id	Work Item associated with invoked application.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_APPLICATION_NOT STOPPED
WM_INVALID_PROCESS_INSTANCE
WM_INVALID_WORKITEM
WM_APPLICATION_BUSY
```

REQUIREMENTS

None

RATIONALE FOR API

This command is to close a connection to an application and to stop it. It might be used before system shutdown, or to terminate invoked applications to allow better control of system resources used by integrated applications.

AUDIT INFORMATION

None

7. Appendix A: Future Work

7.1 Additional API Areas

The WFM Coalition API specification work will address the following areas. It will be determined whether API calls should be created for these areas or whether they are the sole domain of particular WFM product implementations.

7.1.1 WFM Data API calls

The types of data that applications need to manipulate through this API specification are process control data, process relevant data, and application data. The current specification addresses the access to these data through the definition and manipulation of attributes of processes, activities and work items. It is currently believed that some additional new API calls or parameter additions to existing API calls will be required for complete data manipulation.

7.1.2 Ad hoc activities

In a future release of API specifications, the API working group will consider the functionality to allow applications to add activities to an instance of a process that are not part of its definition. These ad-hoc additions will be done on an instance basis.

7.1.3 Administration and Maintenance

The API working group believes that the functions in this area correspond to interface 5. Services should include functions for:

- Purging
- Backup
- Archiving
- Download and Upload instances (for remote users)

7.1.4 Names and Roles

The API working group believes that a Workflow Engine should also provide services for definition, assignment, mapping and maintenance of roles and names (identities). The working group also believes that these services should be provided through interface 5 as well.

7.2 Additional Issues

The WFM Coalition API specification work will be expanded to take care of the following issues for future releases.

7.2.1 Error reporting and control

All WAPI function calls have a uniform error return datatype. This data type is shared among all API calls. This specification assumes that the Coalition will specify a subset of the main error return codes, leaving for vendor specific implementation the remaining main error return codes and the set of subcode codes to provide extensibility and specialization of error codes. (See section WAPI Data Types, and WAPI Error Return Codes sections).

7.2.2 Synchpoint processing

Synchpoint processing deals with recoverability. The API working group believes that this area is extremely important to WFM exploiters. However, it is also believed that it would be one of the more

difficult areas to deal with in terms of member agreement. Work in this area is being deferred to the second release of the API specifications.

7.2.3 Security

The current version of the WFM API specification does not include any specific requirements or provisions for security mechanisms, except for the inclusion of user password in the **WMTConnectInfo** structure. Implementation of security mechanisms are left up to the specific implementations.

7.2.4 Locking

The current version of the WFM API specification does not include any specific requirements or provisions for locking mechanisms. Implementation of locking mechanisms are left up to the specific implementations.

7.2.5 Process Integrity

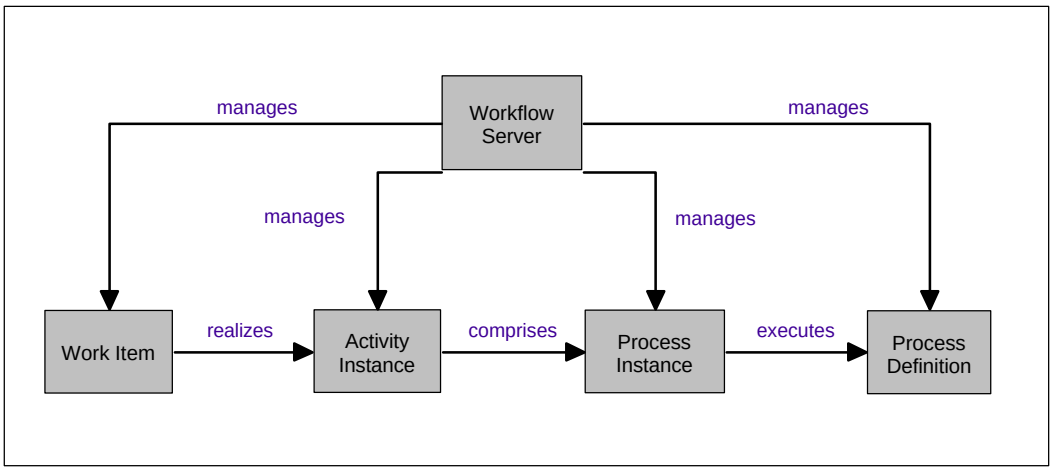
The current version of the WFM API specification does not include any specific requirements or provisions for mechanisms to guarantee process integrity. Implementation of process integrity mechanisms are left up to the specific implementations.

8. Appendix B: Object Bindings

This chapter describes the object bindings for the WAPI functions described in this document[1]. Bindings are defined for OLE and in terms of OMG IDL. Both bindings realize a common objet model that is described in the next section; the rest of the chapter describes the binding specifications.

8.1 Abstract Object Definition

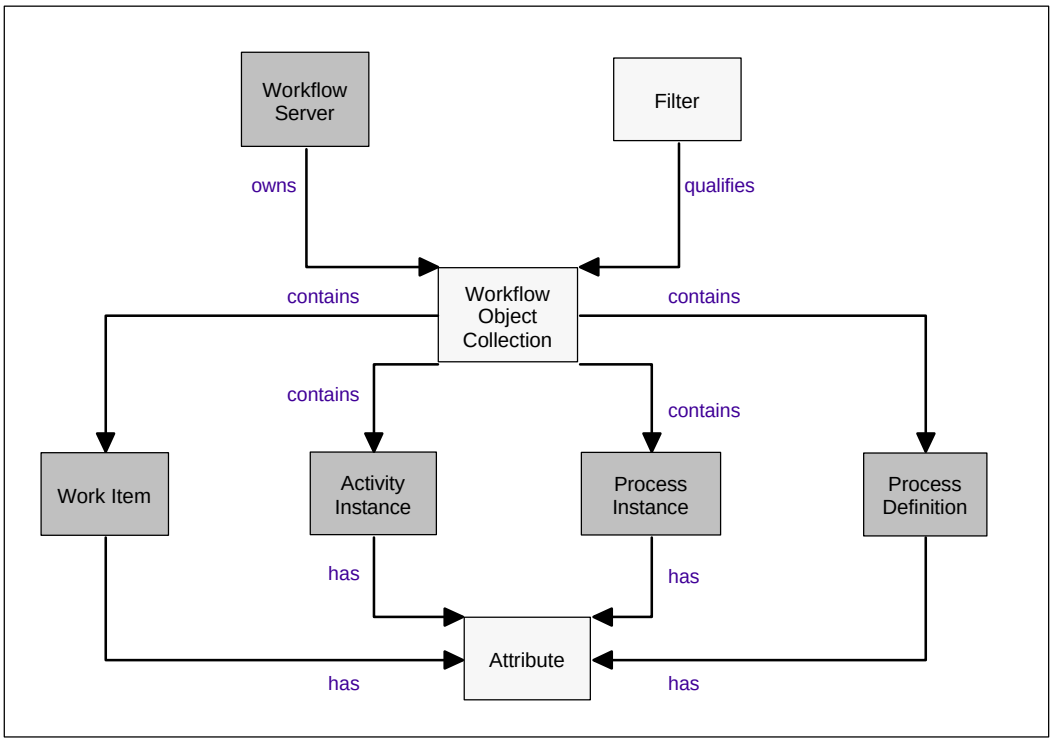
The following diagram shows the primary objects used in the definition of the Workflow Application Client interface.



The **WorkflowServer** provides the context for communication with the Workflow Enactment Service. It allows for filtered queries on objects owned by the specific Enactment Service. An executable workflow model itself is represented by the **ProcessDefinition** ; the Process Definition serves as a Factory for creating instances of the Workflow Model that are enacted by the Workflow Management System. To execute a specific process, a **ProcessInstance** of the ProcessDefinition is created. During execution of the ProcessInstance, the Enactment Service creates instances (**ActivityInstance**) of the Activity Definitions contained in the Process Definition. Assignment of an activity instance to a participant creates a **WorkItem**.

The next diagram shows the auxiliary constructs that are used to complete the Object Model.

[1] The new Process Definition functions are not covered here at the moment.



A set of standardized **Attribute**s is defined for each of the objects - attributes specific to a particular Enactment Service or user-defined attributes that determine the specifics of a Workflow object in a particular Workflow Model. Access to filtered lists of objects owned by the Enactment Service is managed via **Collection**-type interfaces; **Filter** objects support definition of selection criteria for those lists. Workflow Object Collections are realized as OLE-Collections in the OLE binding; in the OMG IDL binding an Iterator-type interface is defined for each of the fundamental Workflow Object interfaces.

8.1.1 Mapping WAPI to the OLE and IDL Bindings

The following table describes how the ingredients of the Common Object Model described above map to the WAPI constructs defined in this specification.

WAPI Element	OLE Object	IDL Interface
WMTSession	Server	ApplicationClientServer
WMTFilter	Filter	Filter
WMTQueryHandle	OLE-Collection	ProcessDefinitionsList ProcessInstancesList ActivityInstancesList WorkList AttributeList
WMTProcessDefinition	ProcessDefinition	ProcessDefinition
WMTProcessInstance	ProcessInstance	ProcessInstance
WMTActivityInstance	ActivityInstance	ActivityInstance
WMTWorkItem	WorkItem	WorkItem
WMTAttributeName WMTAttributeType WMTAttributeLength WMTAttributeValue	Attribute	Attribute
WMTEntity of type Process Activity	ActivityDefinition	

WMTEntity of type Transition Information	TransitionDefinition	
WMTEntity of type Application Definition	ApplicationDefinition	
WMTEntity of type Participant Definition	ParticipantDefinition	
WMTEntity of type Process Relevant Data	DataDefinition	

8.2 OLE Automation Binding

This appendix describes the OLE automation binding for the Workflow Management Coalition Interface 2 (WAPI2). It is based on:

- the WAPI specified in this document, and
- *Microsoft Visual Basic 4.0, Professional Features, Creating OLE Servers, Chapter 3, Standards and Guidelines*

This binding has two goals:

1. To accurately reflect the functionality specified by WAPI2.
2. To conform to the standards and guidelines for OLE automation interfaces.

Note that this version of the binding does not yet include the “entitiy” functions.

8.2.1 Expressing WAPI2 as an OLE Automation Interface

WAPI2 is defined in terms of data structures and functions. An OLE automation interface consists of object classes, each with properties and methods. The OLE automation binding for WAPI2 was derived using the following rules:

1. Define an OLE automation object class for each WAPI2 data structure. However, if a WAPI2 data structure consists of a single WMTText field, use the OLE automation String class.
2. Define a read-only OLE automation property for each field in each WAPI2 data structure, on the object class corresponding to the data structure.
3. For each WAPI2 function, define a method on the appropriate object class. Omit the session handle parameter from the methods (except for the Server methods).
4. Use OLE automation collections for each Open/Fetch/Close...List combination of functions, and for fields in data structures that hold multiple values (e.g. participants).
5. Errors are reported via exceptions.

8.2.1.1 Object Classes

The OLE automation binding defines an OLE automation object (class) for each WAPI2 data structure. For example, WAPI2 defines a process instance data structure as follows:

```
typedef struct
{
     //  This is the minimum list of elements at this time. Future versions to provide
        extensibility for this structure.

        WMTText               process_name[NAME_STRING_SIZE];
        WMTProcInstID         proc_inst_id;
        WMTProcDefID          proc_def_id;
        WMTProcInstState      state;
        WMTInt32              priority;
        WMTText               data_reference[DATA_REFERENCE_SIZE];
                                      // private element containing vendor specific
                                          information
        WMTWflParticipant     proc_participants[20];
                                      //up to 20 63 character long participant identifiers
} WMTProcInst;
```

The OLE automation binding defines a ProcessInstance object class with properites Name, ID, ProcessDefinitionID, State, Priority, DataReference, and Participants. This ProcessInstance object class defines Start and Terminate methods, corresponding to the WMStartProcess and WMTerminateProcessInstance WAPI2 functions.

The table below lists the object classes in the WAPI2 OLE automation binding, and the corresponding WAPI2 data structures. Note that there are exceptions to the rules stated above. There is no ConnectionInfo object class - the information is passed as separate parameters to the Connect method of the Server class. There is an Attribute object class - its properties are passed as separate parameters in the WAPI2 attribute functions.

OLE Automation Object	WAPI 2 Data Type
Server	WMTSessionHandle
	WMTConnectInfo
Filter	WMTFilter
Collection	WMTQueryHandle
ProcessDefinition	WMTProcDefID
ProcessInstance	WMTProcInst
ActivityInstance	WMTActivityInst
WorkItem	WMTWorkItem
Attribute	
String	WMTWflParticipant WMTProcDefState WMTProcInstState

The table below lists the entities in the Workflow Process Definition Language (WPDL), and the corresponding WAPI2 OLE automation binding objects.

OLE Automation Object	WPDL Entity
ProcessDefinition	Workflow Process Definition
ActivityDefinition	Workflow Process Activity
TransitionDefinition	Transition Information
ParticipantDefinition	Workflow Participant Definition
ApplicationDefinition	Workflow Application Definition
DataDefinition	Workflow Process Relevant Data

8.2.1.2 Object Hierarchy

The object classes in an OLE automation interface are organized into an object hierarchy. This is not an inheritance hierarchy based on “is a” relationships. Rather, it is a navigational hierarchy that “organizes the objects in a way that makes programming easier”. The top level objects in the hierarchy are “externally

creatable", which means that a program can obtain such objects directly. All other objects in the OLE automation interface are obtained indirectly, through the properties and methods of the top level objects. Here is the object hierarchy for the WAPI2 OLE automation interface:

Server
- Process Definitions
  - States
  - ActivityDefinitions
  - TransitionDefinitions
  - ParticipantDefinitions
  - ApplicationDefinitions
  - ProcessDataDefinitions
- Process Instances
  - Attributes
  - Participants
  - States
- Activity Instances
  - Attributes
  - Participants
  - States
- Work Items
  - Attributes
  - Participant
- ParticipantDefinitions
- ApplicationDefinitions

Filter

WAPI2 requires a program to first obtain a session handle, and then use it to get process, activity, and work item handles. In the OLE automation binding, Serverand Filter are the top level objects. The Server object class has methods for listing process definitions, process instances, activity instances, and work items.

8.2.1.3 Collections and Queries

WAPI2 supports several retrieval operations that return multiple values:

- a list of process definitions, process instances, activity instance, or work items,
- the states of a process definition, process instance, or activity instance
- the attributes of a process instance, activity instance, or work item

For each such retrieval operation, WAPI2 defines three functions:

- WMOpen...List
- WMFetch...
- WMClose...List

The open functions take a filter parameter. The fetch functions are used to iterate through the values retrieved.

OLE automation uses the Collection object class to navigate such one-to-many relationships in the object hierarchy. The Server object class has list methods which take a Filter object as a parameter and return a collection of ProcessDefinition, ProcessInstance, ActivityInstance, or WorkItem objects. The ProcessDefinition, ProcessInstance, and ActivityInstance object classes have a States property whose value is a collection of states. . The ProcessInstance, ActivityInstance, and WorkItem object classes have an Attributes property whose value is a collection of attributes. These properties have a Filter parameter.

The Collection object class has a Count property (the number of elements in the collection) and provides methods for iterating through its elements. For example, here is the VBA code to populate a list box with a user's work items:

```
Dim mySession As Session
Dim myWorkList As Filter
Dim myWorkItem As WorkItem

Set mySession = CreateObject("WAPI2.Session")
mySession.Connect(...)

For Each myWorkItem In Session.ListWorkItems(myWorkList)
        ListBox.AddItem myWorkItem.Name
Next myWorkItem
```

The ProcessDefinition, ProcessInstance, ActivityInstance, and WorkItem classes each have collection-valued properties for their states, attributes, and participants. The elements of the state and participant collections are strings. The elements of the attribute collections are Attribute objects, which have two properties: Name and Value. The Value property is expressed as an OLE automation Variant, which provides methods for determining its data type and length.

8.2.1.4 Exceptions

OLE automation supports exceptions. OLE automation servers can report errors by raising an exception rather than returning an error code. This allows chaining calls to an OLE automation interface in a single expression. For example, the following expression

```
WorkItem.ProcessInstance.ProcessDefinition.Name
```

makes three calls to the OLE automation interface to return the name of the process definition for the process instance that contains the work item. These expressions commonly appear in programs or macros that call an OLE automation interface. Any one of the calls could encounter an error, which would be reported to the calling program through an exception.

The OLE automation binding for WAPI2 uses exceptions to report errors. The exception object carries a text description of the error with it. The Server object also has ErrorCode and ErrorSubCode properties. When a program calls the WAPI2 OLE automation interface, and the server encounters an error, it sets the Server properties to the error codes in the WMTErrRetType data structure, and raises an exception.

8.2.2 Attributes

Most workflow objects can have a collection of attributes, where each attribute has a name, data type, and value. The WAPI C binding provides functions for

- iterating through the attributes of an object: WMOpen…AttributesList, WMFetch…Attribute, WMClose…AttributesList, and
- getting and setting attribute values: WMGet…AttributeValue, WMAssign…AttributeValue.

In the OLE binding, each object has an Attributes property whose value is a collection of Attribute objects. The OLE collection object provides methods for iterating through the attributes of an object. An Attribute object has name, type and value properties corresponding to the `attribute_name`, `attribute_type`, `attribute_length`, and `attribute_value` parameters to the WMGet…AttributeValue function. The Attributes collection is indexed by attribute name. Getting the value of an attribute object has the same effect as calling WMGet…AttributeValue; setting the value of an attribute object has the same effect as calling WMAssign…AtributeValue. For example, the following expression

```
activity.Attributes("Size").Value
```

evaluates to the value of the “Size” attribute of an activity object (referenced by the activity variable), and

```
activity.Attributes(“Size”).Value = 15
```

updates the “Size” attribute of an activity object. The data type of the Value property is the OLE automation Variant type. This data type provides functions for determining the data type of its value, and converting its value to a basic data type.

8.2.3 Server

The Server object class corresponds to the WMTSessionHandle data type. Server objects are externally creatable. A program must successfully call the Connect method on a Server object before it can be used to access other objects.

8.2.3.1 Properties

A Server object has the following properties:

Name	Type	Description
Engine	String	**pconnect_info.**engine_name
ErrorCode	Integer	WMTErrRetType.main_code
ErrorSubCode	Integer	WMTErrRetType.sub_code
Scope	String	**pconnect_info.**scope

These properties are read-only. They are set when the OLE automation interface raises an exception.

8.2.3.2 Methods

A Server object has the following methods:

Signature	Description
Connect in String User in String Password	WMConnect
ProcessDefinition CreateProcessDefinition	WMCreateProcessDefinition
DeleteProcessDefinition in ProcessDefinition ProcDef	WMDeleteProcessDefinition
Disconnect	WMDisconnect
Collection ListProcessDefinitions in Filter ProcDefFilter	WMOpenProcessDefinitionsList
Collection ListProcessInstances in Filter ProcInstFilter	WMOpenProcessInstancesList
ProcessInstance GetProcessInstance in String ProcInstID	WMGetProcessInstance
Collection ListActivityInstances in Filter ActivityInstFilter	WMOpenActivityInstancesList
ActivityInstance GetActivityInstance in String ProcInstID in String ActivityInstID	WMGetActivityInstance
Collection ListWorkItems in Filter WorkItemFilter	WMOpenWorkItemsList
WorkItem GetWorkItem in String ProcInstID in String WorkItemID	WMGetWorkItem

ApplicationDefinition CreateApplicationDefinition in String Name	WMCreateEntity
DeleteApplicationDefinition	WMDeleteEntity
ParticipantDefinition CreateParticipantDefinition in Sting Name	WMCreateEntity
DeleteParticipantDefinition	WMDeleteEntity

8.2.3.3 Connect

This method is the binding for the **WMConnect** function. Note that the engine name and scope parameters to the WMConnect function are omitted here. This information is encoded in the parameters to the call to the OLE function (CreateObject or GetObject) which returns the server object.

```
Connect (
                in  String User,
                in  String Password)
```

Argument	Description (WMConnect Argument)
User	**pconnect_info.**user_identification
Password	**pconnect_info.**password

8.2.3.4 CreateProcessDefinition

This method is the binding for the **WMCreateProcessDefinition** function.

```
ProcessDefinition CreateProcessDefinition ()
```

Argument	Description (WMCreateProcessInstance Argument)
ProcessInstance	**pproc_def_id**

8.2.3.5 DeleteProcessDefinition

This method is the binding for the **WMDeleteDefinition** function.

```
DeleteProcessDefinition (
                in  ProcessDefinition ProcDef)
```

Argument	Description (WMDeleteProcessDefinition Argument)
ProcDef	**pproc_def_id**

8.2.3.6 WMDisconnect

This method is the binding for the **WMDisconnect** function.

```
Disconnect ()
```

8.2.3.7 ListProcessDefinitions

This method is the binding for the **WMOpenProcessDefinitionsList** function.

```
Collection ListProcessDefinitions (
                in  Filter ProcDefFilter)
```

Argument	Description (WMOpenProcessDefinitionsList Argument)
ProcDefFilter	pproc_def_filter
Collection	pquery_handle

8.2.3.8 ListProcessInstances

This method is the binding for the **WMOpenProcessInstancesList** function.

```
Collection ListProcessInstances (
                in  Filter ProcInstFilter)
```

Argument	Description (WMOpenProcessInstancesList Argument)
ProcInstFilter	pproc_inst_filter
Collection	pquery_handle

8.2.3.9 GetProcessInstance

This method is the binding for the **WMGetProcessInstance** function.

```
ProcessInstance GetProcessInstance (
                in  String ProcInstID)
```

Argument	Description (WMGetProcessInstance Argument)
ProcInstID	pproc_inst_id
ProcessInstance	pproc_inst

8.2.3.10 ListActivityInstances

This method is the binding for the **WMOpenActivityInstancesList** function.

```
Collection ListProcessInstances (
                in  Filter ActivityInstFilter)
```

Argument	Description (WMActivityInstancesList Argument)
ActivityInstFilter	pactivity_inst_filter
Collection	pquery_handle

8.2.3.11 GetActivityInstance

This method is the binding for the **WMGetActivityInstance** function.

```
ActivityInstance GetActivityInstance (
                in  String ProcInstID,
                in  String ActivityInstID)
```

Argument	Description (WMGetActivityInstance Argument)
ProcInstID	pproc_inst_id
ActivityInstID	pactivity_inst_id
ActivityInstance	pactivity_inst

8.2.3.12 ListWorkItems

This method is the binding for the **WMOpenWorkList** function.

```
Collection ListWorkItems (
                in  Filter WorkListFilter)
```

Argument	Description (WMOpenWorkList Argument)
WorkListFilter	pworklist_filter
Collection	pquery_handle

8.2.3.13 GetWorkItem

This method is the binding for the **WMGetWorkItem** function.

```
WorkItem GetWorkItem (
                in  String ProcInstID,
                in  String WorkItemID)
```

Argument	Description (WMGetWorkItem Argument)
ProcInstID	pproc_inst_id
WorkItemID	pwork_item_id
WorkItem	pwork_item

8.2.3.14 CreateApplicationDefinition

This method is the binding for the **WMCreateEntity** function, when used to create a workflow application definition outside of any process definition.

```
ApplicationDefinition CreateParticipantDefinition ()
```

Argument	Description (WMCreateEntity Argument)
Name	entity_name
ApplicationDefinition	Entity

8.2.3.15 DeleteApplicationDefinition

This method is the binding for the **WMDeleteEntity** function, when used to delete a workflow application definition that is not part of a process definition.

```
DeleteApplicationDefinition (
                in  ApplicationDefinition AppDef)
```

Argument	Description (WMDeleteEntity Argument)
AppDef	entity_id

8.2.3.16 CreateParticipantDefinition

This method is the binding for the **WMCreateEntity** function, when used to create a workflow participant definition outside of any process definition.

```
ParticipantDefinition CreateParticipantDefinition ()
```

Argument	Description (WMCreateEntity Argument)
Name	entity_name
ParticipantDefinition	Entity

8.2.3.17 DeleteParticipantDefinition

This method is the binding for the **WMDeleteEntity** function, when used to delete a workflow participant definition that is not part of a process definition.

```
DeleteParticipantDefinition (
                in  ParticipantDefinition PartDef)
```

Argument	Description (WMDeleteEntity Argument)
`PartDef`	`entity_id`

8.2.4 Filter

The filter object class corresponds to the WMTFilter data type. Filter objects are externally creatable.

8.2.4.1 Properties

Filter objects have the following properties:

Name	Type	Description
Type	Integer	WMTFilter.filter_type
Length	Integer	WMTFilter.filter_length
AttributeName	String	WMTFilter.attribute_name
Comparison	Integer	WMTFilter.comparison
FilterString	String	WMTFilter.filter_string

8.2.4.2 Methods

There are no methods for Filter objects.

8.2.5 Process Definition

The process definition class corresponds to the WMTProcDefID data type. Process definition objects are not externally creatable. They are returned by the Server object's ListProcessDefinitions method, and by the ProcessDefinition property of a ProcessInstance object.

8.2.5.1 Properites

A ProcessDefinition object has the following read-only properties:

Name	Type	Description
Activities	Collection	WPDL <Activity List>
Applications	Collection	WPDL <Workflow Application List>
Data	Collection	WPDL <Workflow Process Relevant Data List>
ID	String	WMTProcDefId.proc_def_id
Name	String	WPDL <process name>
Participants	Collection	WPDL <Workflow Participant List>
States	Collection	WMOpenProcessDefinitionStatesList
Transitions	Collection	WPDL <Transition Information List>

All of these properties, except name, are read-only. The States property takes a Filter parameter.

8.2.5.2 Methods

A ProcessDefinition object has the following methods:

Signature	Description

ProcessInstance CreateInstance	WMCreateProcessInstance
ChangeInstancesState in Filter InstanceFilter in String InstanceState	WMChangeProcessInstancesState
ChangeActivityInstancesState in String ActivityDefinitionID in Filter InstanceFilter in String InstanceState	WMChangeActivityInstancesState
TerminateInstances in Filter InstanceFilter	WMTerminateProcessInstances
AssignInstancesAttribute in Filter InstanceFilter in String Name in Variant Value	WMAssignProcessInstancesAttribute
AssignActivityInstancesAttribute in String ActivityInstanceID in Filter InstanceFilter in String Name in String Value	WMAssignActivityInstancesAttribute
AbortInstances in Filter InstanceFilter	WMAbortProcessInstances
ActivityDefinition AddActivity in String Name	WMAddEntity
ApplicationDefinition AddApplication in String Name	WMAddEntity
ParticipantDefinition AddParticipant in String Name	WMAddEntity
ProcessDataDefinition AddData in String Name	WMAddEntity
TransitionDefinition AddTransition in String Name	WMAddEntity

Note that the Server parameters to these methods is implicit. They use the server from which the process definition was obtained.

8.2.5.3 CreateInstance

This method is the binding for the **WMCreateProcessInstance** function.

```
ProcessInstance CreateInstance ()
```

Argument	**Description (WMCreateProcessInstance Argument)**
ProcessInstance	**pproc_inst_id**

8.2.5.4 ChangeInstancesState

This method is the binding for the **WMChangeProcessInstancesState** function.

```
ChangeInstancesState (
                in  Filter InstanceFilter,
                in  String InstanceState)
```

Argument	**Description (WMChangeProcessInstancesState Argument)**
InstanceFilter	**pproc_inst_filter**
InstanceState	**process_inst_state**

8.2.5.5 ChangeActivityInstancesState

This method is the binding for the **WMChangeActivityInstancesState** function.

```
ChangeActivityInstancesState (
                in  String ActivityDefID,
                in  Filter InstanceFilter,
                in  String InstanceState)
```

Argument	Description (WMChangeActivityInstancesState Argument)
ActivityDefID	pactivity_def_id
InstanceFilter	pact_inst_filter
InstanceState	activity_inst_state

8.2.5.6 TerminateInstances

This method is the binding for the **WMTerminateProcessInstances** function.

```
TerminateInstances (
                in  Filter InstanceFilter)
```

Argument	Description (WMTerminateProcessInstances Argument)
InstanceFilter	pproc_inst_filter

8.2.5.7 AssignInstancesAttribute

This method is the binding for the **WMAssignProcessInstancesAttribute** function.

```
AssignInstancesAttribute (
                in  Filter InstanceFilter,
                in  String Name,
                in  Variant Value)
```

Argument	Description (WMAssignProcessInstancesAttribute Argument)
InstanceFilter	pact_inst_filter
Name	attribute_name
Value	pattribute_value

8.2.5.8 AssignActivityInstancesAttribute

This method is the binding for the **WMAssignActivityInstancesAttribute** function.

```
AssignActivityInstancesAttribute (
                in  String ActivityDefID,
                in  Filter InstanceFilter,
                in  String Name,
                in  Variant Value)
```

Argument	Description (WMAssignActivityInstancesAttribute Argument)
ActivityDefID	pactivity_def_id
InstanceFilter	pact_inst_filter
Name	attribute_name
Value	pattribute_value

8.2.5.9 AbortInstances

This method is the binding for the **WMAbortProcessInstances** function.

```
AbortInstances (
                in  Filter InstanceFilter)
```

Argument	Description (WMAbortProcessInstances Argument)
InstanceFilter	pproc_inst_filter

8.2.5.10 AddActivity

This method is the binding for the **WMAddEntity** function, when used to add an activity definition to a process definition.

```
ActivityDefinition AddActivity (
                    in  String Name)
```

Argument	Description (WMAddEntity Argument)
Name	entity_name
ActivityDefinition	entity

8.2.5.11 AddApplication

This method is the binding for the **WMAddEntity** function, when used to add an application definition to a process definition.

```
ApplicationDefinition AddApplication (
                    in  String Name)
```

Argument	Description (WMAddEntity Argument)
Name	entity_name
ApplicationDefinition	entity

8.2.5.12 AddData

This method is the binding for the **WMAddEntity** function, when used to add process relevant data to a process definition.

```
ProcessDataDefinition AddData (
                    in  String Name)
```

Argument	Description (WMAddEntity Argument)
Name	entity_name
ProcessDataDefinition	entity

8.2.5.13 AddParticipant

This method is the binding for the **WMAddEntity** function, when used to add a participant to a process definition.

```
ParticipantDefinition AddParticipant (
                    in  String Name)
```

Argument	Description (WMAddEntity Argument)
Name	entity_name
ParticipantDefinition	entity

8.2.5.14 AddTransition

This method is the binding for the **WMAddEntity** function, when used to add transition information to a process definition.

```
TransitionDefinition AddTransition (
                  in  String Name)
```

Argument	Description (WMAddEntity Argument)
Name	entity_name
TransitionDefinition	entity

8.2.6 Process Instance

The ProcessInstance object class corresponds to the WMTProcessInst data type. Process instance objects are not externally creatable. They are returned by the Server object's ListProcessInstances method, and by the ProcessInstance property of an ActivityInstance or WorkItem object.

8.2.6.1 Properties

A ProcessInstance object has the following read-only properties:

Name	Type	Description
Attributes	Collection	WMOpenProcessInstanceAttributesList
DataReference	String	WMTProcessInst.data_reference
ID	String	WMTProcessInst.proc_inst_id
Name	String	WMTProcessInst.process_name
Participants	Collection	WMTProcessInst.proc_participants
Priority	Integer	WMTProcessInst.priority
ProcessDefinition	ProcessDefinition	WMGetProcessDefinition
ProcessDefinitionID	String	WMTProcessInst.proc_def_id
State	String	WMTProcessInst.state
States	Collection	WMOpenProcessInstanceStatesList

All of these properties are read-only, except for the State property. Updating this property has the same effect as calling the ChangeState method. The Attributes and States properties take a Filter parameter. The ProcessDefinition property is a convenience. It calls the GetProcessDefinition method on the session from which the process instance was obtained, passing the ProcessDefinitionID property value.

8.2.6.2 Methods

A ProcessInstance object has the following methods:

Signature	Description
ProcessInstance Start	WMStartProcess
Terminate	WMTerminateProcess
ChangeState in String State	WMChangeProcessInstanceState
AssignAttribute in String Name in Variant Value	WMAssignProcessInstanceAttribute
Abort	WMAbortProcessInstance

Note that the Server parameters to these methods is implicit. They use the server from which the process instance was obtained.

8.2.6.3 Start

This method is the binding for the **WMStartProcess** function.

```
ProcessInstance Start ()
```

Argument	Description (WMStartProcess Argument)
ProcessInstance	pnew_proc_inst_id

8.2.6.4 Terminate

This method is the binding for the **WMTerminateProcessInstance** function.

```
Terminate ()
```

8.2.6.5 ChangeState

This method is the binding for the **WMChangeProcessInstanceState** function.

```
ChangeState (
                in  String State)
```

Argument	Description (WMChangeProcessInstanceState Argument)
State	pproc_inst_state

8.2.6.6 AssignAttribute

This method is the binding for the **WMAssignProcessInstanceAttribute** function.

```
AssignAttribute (
                in  String Name,
                in  Variant Value)
```

Argument	Description (WMAssignProcessInstanceAttribute Argument)
Name	attribute_name
Value	pattribute_value

8.2.6.7 Abort

This method is the binding for the **WMAbortProcessInstance** function.

```
Abort ()
```

8.2.7 Activity Definition

The ActivityDefinition class corresponds to the Workflow Process Activity entity in WPDL. Activity definition objects are not externally creatable. They are returned in the Activities property of a ProcessDefinition object.

8.2.7.1 Properties

An ActivityDefinition object has the following properties:

Name	Type	Description
Attributes	Collection	WMOpenEntityAttributesList

ID	**String**	**WPDL <activity id>**
Implementation	**ApplicationDefti ntion ProcessDefintion**	**WPDL <implementation>**
Name	**String**	**WPDL <name>**

8.2.8 Activity Instance

The ActivityInstance class corresponds to the WMTActivityInst data type. Activity instance objects are not externally creatable. They are returned by the Server object's ListActivityInstances method, and by the ActivityInstance property of a WorkItem object.

8.2.8.1 Properties

An ActivityInstance object has the following properties:

Name	**Type**	**Description**
Attributes	Collection	WMOpenActivityInstanceAttributesList
DataReference	String	WMTActivityInst.data_reference
ID	String	WMTActivityInst.activity_inst_id
Name	String	WMTActivityInst.activity_name
Participants	Collection	WMTActivityInst.proc_participants
Priority	Integer	WMTActivityInstance.priority
ProcessInstance	ProcessInstance	WMGetProcessInstance
ProcessInstanceID	String	WMTActivityInstance.proc_inst_id
State	String	WMTActivityInstance.state
States	Collection	WMOpenActivityInstanceStatesList

All of these properties are read-only, except for the State property. Updating this property has the same effect as calling the ChangeState method. The Attributes and States properties take a Filter parameter. The ProcessInstance property is a convenience. It calls the GetProcessInstance method on the server from which the activity instance was obtained, passing the ProcessInstanceID property value.

8.2.8.2 Methods

An ActivityInstance object has the following methods:

Signature	**Description**
ChangeState in String State	WMChangeActivityInstanceState
AssignAttribute in String Name in Variant Value	WMAssignActivityInstanceAttribute

Note that the Server parameters to these methods is implicit. They use the server from which the activity instance was obtained.

8.2.8.3 ChangeState

This method is the binding for the **WMChangeActivityInstanceState** function.

```
ChangeState (
                in  String State)
```

Argument	Description (WMChangeActivityInstanceState Argument)
State	pactivity_inst_state

8.2.8.4 AssignAttribute

This method is the binding for the **WMAssignActivityInstanceAttribute** function.

```
AssignAttribute (
                in  String Name,
                in  Variant Value)
```

Argument	Description (WMAssignActivityInstanceAttribute Argument)
Name	attribute_name
Value	pattribute_value

8.2.9 WorkItem

The WorkItem class corresponds to the WMTWorkItem data type. Work item objects are not externally creatable. They are returned by the Server object's ListWorkItem method..

8.2.9.1 Properties

A WorkItem object has the following properties:

Name	Type	Description
ActivityInstance	ActivityInstance	WMGetActivityInstance
ActivityInstanceID	String	WMTWorkItem.activity_inst
Attributes	Collection	WMOpenWorkItemAttributesList
DataReference	String	WMTWorkItem.data_reference
ID	String	WMTWorkItem.workitem_id
Name	String	WMTWorkItem.workitem_name
Participant	String	WMTWorkItem.proc_participant
Priority	Integer	WMTWorkItemance.priority
ProcessInstance	ProcessInstance	WMGetProcessInstance
ProcessInstanceID	String	WMTWorkItemance.proc_inst_id

All of these properties are read-only. The Attributes property takes a Filter parameter. The ActivityInstance and ProcessInstance properties are a convenience. They call the GetProcessInstance and GetActivityInstance methods, respectiively, on the server from which the work item was obtained, passing the ProcessInstanceID or ActivityInstanceID property value.

8.2.9.2 Methods

A WorkItem object has the following methods:

Signature	Description
AssignAttribute in String Name in Variant Value	WMAssignWorkItemAttribute
Complete	WMCompleteWorkItem
Reassign in String SourceUser in String TargetUser	WMReassignWorkItem

Note that the Server parameters to these methods is implicit. They use the server from which the work item was obtained.

8.2.9.3 AssignAttribute

This method is the binding for the **WMAssignWorkItemAttribute** function.

```
AssignAttribute (
                in  String Name,
                in  Variant Value)
```

Argument	Description (WMAssignWorkItemAttribute Argument)
Name	attribute_name
Value	pattribute_value

8.2.9.4 Complete

This method is the binding for the **WMCompleteWorkItem** function.

```
Complete ()
```

8.2.9.5 Reassign

This method is the binding for the **WMRessignWorkItem** function.

```
Reassign (
                in  String SourceUser,
                in  String TargetUser)
```

Argument	Description (WMReassignWorkItem Argument)
SourceUser	psource_user
TargetUser	ptarget_user

8.2.10 Transition Definition

The TransitionDefinition class corresponds to the Transition Information entity in WPDL. Transition definition objects are not externally creatable. They are returned in the Transitions property of a ProcessDefinition object.

8.2.10.1 Properties

A TransitionDefinition object has the following properties:

Name	Type	Description
Attributes	Collection	WMOpenEntityAttributesList
From	ActivityDefinition	WPDL <trans from>
ID	String	WPDL <transition id>
Name	String	WPDL <name>
To	ActivityDefinition	WPDL <trans to>

8.2.11 Participant Definition

The ParticipantDefinition class corresponds to the Workflow Participant Definition entity in WPDL. Participant definition objects are not externally creatable. They are returned by the ListParticipantDefinitions method of a Server object, or in the Participants property of a ProcessDefinition object.

8.2.11.1 Properties

A ParticipantDefinition object has the following properties:

Name	Type	Description
Attributes	Collection	WMOpenEntityAttributesList
ID	String	WPDL <participant id>
Name	String	WPDL <name>
Type	Integer	WPDL <participant type>

8.2.12 Application Definition

The ApplicationDefinition class corresponds to the Workflow Application Definition entity in WPDL. Application definition objects are not externally creatable. They are returned by the ListApplicationDefinitions method of a Server object, or in the Applications property of a ProcessDefinition object.

8.2.12.1 Properties

An ApplicationDefinition object has the following properties:

Name	Type	Description
Attributes	Collection	WMOpenEntityAttributesList
ID	String	
Name	String	WPDL <tool name>

8.2.13 Process Data Definition

The ProcessDataDefinition class corresponds to the Workflow Process Relevant Data entity in WPDL. Process data definition objects are not externally creatable. They are returned in the Data property of a ProcessDefinition object.

8.2.13.1 Properties

A ProcessDataDefinition object has the following properties:

Name	Type	Description
Attributes	Collection	WMOpenEntityAttributesList
ID	String	WPDL <data id>
Name	String	WPDL <name>
Type	Integer	WPDL <data type>

8.2.14 Attribute

The Attribute object class corresponds the a single attribute of a workflow object. . Attribute objects are not externally creatable. They are returned in the Attributes property of a workflow object, which is a collection of attribute objects indexed by name.

8.2.14.1 Properties

An Attribute object has the following properties:

Name	Type	WMFetch...Attribute Parameter
DataType	Integer	attribute_type
Name	String	attribute_name

Value	Variant	pattribute_value

The name and data type properties are read-only Updating the value of an attribute has the same effect as calling WMAssign…AttributeValue on the object from which the attribute was obtained.

8.3 OMG IDL Binding

This chapter provides a detailed description of the Workflow Facility Client Application components in terms of OMG IDL. The specification is split into three modules, the first one providing generic interfaces and operations, the others defining the specific interfaces and functions for the Application Client Interface and the Process Definition Interface.

8.3.1 The Workflow Facility Base Module

The Workflow Facility Base module contains definitions common to all of the various interfaces described in the Workflow Reference Model.
The interfaces defined by this module are:

- *Attribute* interface, which provides access to attributes of various types of workflow objects.
- *AttributeList* interface, which provides operations to handle filtered lists of Attributes.
- *Filter* interface, which is used to define queries for workflow objects issued agaist the Workflow Enactment Service who owns these objects.
- *WorkflowObject* interface, which defines generic operations and attributes common to many workflow objects

The following abbreviated IDL summarizes the interfaces contained in the CfWFBase module.

```
module CfWorkflowFacilityBase {

        ... // data type and general exception definitions

        interface Filter {
            ... // query filter object definitions
        };

        interface Attribute {
            ... // workflow object attribute definitions
        };

        interface AttributeList {
            ... // workflow object attribute list definitions
        };

        interface WorkflowObject {
            ... // workflow object definitions
        };

};
```

The following sections describe the contents of the CfWFBase module in detail.

8.3.1.1 Data Types and General Exceptions

The following data types and exceptions are defined in the CfWFBase module and are used in various interfaces of the Workflow Facility.

```
// TYPE DEFINITIONS
typedef string                          WMTName;
typedef WMTName                         WMTState;
typedef sequence<WMTState>  WMTStates;
typedef string                          WMTId;
typedef integer                         WMTErrorCode

// EXCEPTION DEFINITIONS
exception     InvalidFilter (WMTErrorCode       badFilter);
exception     NoMoreData ();
exception     InvalidState();
exception     TransitionNotAllowed();
exception     AttributeAsignmentFailed();
exception     InvalidAttribute();
```

Each workflow object has a name and a state. WMTName and WMTState define the types to specifiy the corresponding attributes. In addition, the WMTName type is used to define any kind of name-like attribute, e.g., to specifiy named references to objects outside the scope of the Workflow Facility specification. WMTStates handles a list of states. The WMTId type is used for identification of persistent object references. The WMTErrorCode type is used to provide additional information with some Exceptions, e.g., the InvalidFilter exception uses the Error Code to indicate the specific problem with the Filter.
The InvalidFilter and NoMoreData exceptions are related to processing of filtered queries and query result lists. InvalidState and TransitionNotAllowed exceptions are raised by state-changing operations on workflow objects.

8.3.1.2 Filter Interface

The *Filter* interface is used to specify the filter criteria for a query against the set of objects of a specific type.

```
interface Filter {
          attribute long              filterType;
          attribute long              filterLength;
          attribute WMTName           attributeName;
          attribute integer           comparison;
          attribute string            filterString;
};
```

8.3.1.3 Attribute Interfaces

The Attribute interface is used to access attributes of workflow objects. Attribute data are accessed by value; the attributeValue is of type any and is further specified by attributeType**.**
There are basically three types of attributes of a workflow object that can be accessed via this interface:

- The standard attributes described in this document (e.g., Name)
- Vendor specific attributes associated with a particular object type (e.g., 'ProcessClass' attribute of a ProcessDefinition)
- User defined attributes associated with particular object instances (e.g., 'CustomerNumber' attribute of a particular ProcessInstance)

```
interface Attribute {
          attribute WMTName           attributeName;
          attribute string            attributeType;
          attribute long              attributeLength;
          attribute any             attributeValue;
};

typedef sequence<Attribute>           Attributes;
```

The AttributeList interface provides iterator operations for handling of a list of Attributes; the corresponding factory operation for this interface can be found in an workflow object interface. The

fetchAttribute operation gets the next Attribute from the list, the fetchAttributes operation gets the next howMany Attributes from the list; if the list is empty, the NoMoreData exception is raised.

```
interface AttributeList {
          Attribute     fetchAttribute()
                raises (NoMoreData);

          Attributes    fetchAttributes(long     howMany)
                raises (NoMoreData);
};
```

8.3.1.4 Workflow Object Interface

The Workflow Object interface defines the attributes and operations common to most workflow objects. Each WorkflowObject has a Name, a State and a set of Attributes associated with it.
A list of valid states for a particular WorkflowObject can be obtained using the listValidStates operation; the InvalidState exception is raised when a state change to an unknown state is requested. getState obtains the current State of a workflow object and setState changes the State; the TransitionNotAllowed exception is raised when the transition from the current state to the new state is not allowed.
OpenAttributesList is the factory operation for an AttributeList, allowing for a query for attributes; getAttributeValue supports access to attributes by name. The AssignAttribute(s) operations assign new values to Attributes. The InvalidAttribute exception is raised on requests for attributes not defined for the workflow object; tha AttributeAssignmentFailed exception is raised when the Attribute could not be modified, e.g., is read-only.

```
interface WorkflowObject {

          attribute WMTName          name;
          attribute WMTId            id;

          void listValidStates (
                        in Filter       filter,
                        in boolean      countFlag,
                        out WMTStates states,
                        out long        count);

          void changeState (in WMTState          newState)
                raises (TransitionNotAllowed, InvalidState);

          void getState ( out WMTState  currentState);

          void openAttributeList (
                        in  Filter              filter,
                        in  boolean     countFlag,
                        out AttributeList       attributes,
                        out long                count)
                raises (InvalidFilter);

          void getAttributeValue (
                        in  WMTName   name
                        out Attribute attribute)
                raises (InvalidAttribute);

          void assignAttribute ( in  Attribute   attribute)
                raises (InvalidAttribute, AttributeAssignmentFailed);

          void assignAttributes ( in  Attributes         attributes)
                raises (InvalidAttribute, AttributeAssignmentFailed);
};
```

8.3.2 Workflow Application Client Server Interface

The Workflow ApplicationClientServer interface handles the connection of a particular workflow user to an Enactment Service and provides access oto the workflow objects accessible through this Enactment Service. The connect operation initializes the ApplicationClientServer; the context of the connection is defined by the engineName and the scope. The ConnectFailed excpetion is raised when a connection could not be established. The disconnect operation serves as a destructor for the ApplicationClientServer.
Access to the workflow objects accessible through the connection is supported by providing factory methods for interfaces managing access to lists of workflow objects: the Open...sList operation take a filter as their first argument (see the CfWFBase module descritpion for details), the countFlag parameter indicates whether the number of elements in the query result should be returned. A NotConnected exception is raised when no connection was established. The query results are bound to a connection and are invalidated when the connection is terminated.
Operations are provided to get a ProcessInstance, ActivityInstance or WorkItem object via its identifier.

```
interface ApplicationClientServer {

          attribute CfWFBase :: WMTName engineName;
          attribute CfWFBase :: WMTName scope;

          void   connect(
                       in CfWFBase :: WMTName   userId,
                       in string                        password)
                 raises (ConnectFailed);

          void   disconnect()
                 raises (NotConnected);

          ProcessDefinitionList      openProcessDefinitionsList(
                       in  CfWFBase :: Filter      filter,
                       in  boolean             countFlag)
                 raises (InvalidFilter, NotConnected);

          ProcessInstanceList        openProcessInstancesList (
                       in  CfWFBase :: Filter   filter,
                       in  boolean             countFlag)
                 raises (InvalidFilter, NotConnected);

          ActivityInstanceList       openActivityInstancesList (
                       in  CfWFBase :: Filter   filter,
                       in  boolean             countFlag)
                 raises (InvalidFilter, NotConnected);

          WorkList openWorkList (
                       in CfWFBase :: Filter            filter,
                       in  boolean             countFlag)
                 raises (InvalidFilter, NotConnected);

          ProcessInstance getProcessInstance(
                       in CfWFBase :: WMTId             processInstanceId)
                 raises (InvalidId);

          ActivityInstance getActivityInstance(
                       in CfWFBase :: WMTId             processInstanceId,
                       in CfWFBase :: WMTId             activityInstanceId)
                 raises (InvalidId);

          Workitem getWorkitem(
                       in CfWFBase :: WMTId             processInstanceId,
                       in CfWFBase :: WMTId             workItemId)
                 raises (InvalidId);

};
```

8.3.2.1 Process Definition Interface

The Process Definition interface provides factory operation for Process Instances and supports Process Management operations on workflow objects related to the Process Definition: change of State and change of a specific Attribute's value for all members of a filtered set of Process Instances and Activity Instances. The ProcessDefinition interface inherits attributes and operations from WorkflowObject.

```
interface ProcessDefinition : CfWFBase :: WorkflowObject {

          ProcessInstance createProcessInstance (
                        in CfWFBase :: WMTName   instanceName)
                raises (NotConnected);

          void changeProcessInstancesState (
                        in  CfWFBase :: Filter   filter,
                        in  CfWFBase :: WMTState newState)
                raises (NotConnected, TransitionNotAllowed
                InvalidState);

          void abortProcessInstances (
                        in  CfWFBase :: Filter   filter)
                raises (NotConnected, TransitionNotAllowed);

          void terminateProcessInstances (
                        in  CfWFBase :: Filter   filter )
                raises (NotConnected, TransitionNotAllowed);

          void assignProcessInstancesAttribute (
                        in  CfWFBase :: Filter   filter,
                        in  CfWFBase :: Attribute        attribute)
                raises (NotConnected, InvalidFilter, InvalidAttribute,
                AttributeAssignmentFailed);

          void changeActivityInstancesState (
                        in  CfWFBase :: Filter   filter,
                        in  CfWFBase :: WMTState newState)
                raises (NotConnected, InvalidFilter, TransitionNotAllowed,
                InvalidState);

          void assignActivityInstancesAttribute (
                        in  CfWFBase :: Filter   filter,
                        in  CfWFBase :: Attribute        attribute)
                raises (NotConnected, InvalidFilter, InvalidAttribute,
                AttributeAssignmentFailed);
};
```

8.3.2.2 Process Instance Interface

The ProcessInstance interface provides operations to access and modify the state and the attributes of a Process Instance object.
State changes can be performed using the start, terminate or abort operations. Additional state transitions may be supported by an EnactmentService(see the WorkflowObject :: changeState() operation described above). The getParentProcessDefinition operation returns the ProcessDefinition object that was used to create the specific ProcessInstance. The listAssignedParticipants operation provides the list of workflow Participants associated to the Process Instance. The ProcessInstance interface inherits attributes and operations from WorkflowObject. All operations require an active connection to the Enactment Service.

```
interface ProcessInstance : CfWFBase :: WorkflowObject{

          attribute CfWFBase :: WMTDataRef              dataReference;
          attribute long                                priority;
```

```
        ProcessDefinition getParentProcessDefinition ();

        void start ()
              raises (NotConnected, TransitionNotAllowed);

        void terminate();
              raises (NotConnected, TransitionNotAllowed);

        void abort();
              raises (NotConnected, TransitionNotAllowed);

        CfWFBase :: WMTWflParticipants listAssignedParticipants ()
              raises (NotConnected);

};
```

8.3.2.3 Activity Instance Interface

The Activity Instance interface provides operations to access and modify the attributes and the state of an ActivityInstance object.
The getParentProcessInstance operation returns the ProcessInstance object that owns the specific ActivityInstance. The listAssignedParticipants operation provides the list of workflow Participants associated to the Activity Instance. The ActivityInstance interface inherits attributes and operations from WorkflowObject. All operations require an active connection to the Enactment Service.

```
interface ActivityInstance : CfWFBase :: WorkflowObject {

        attribute CfWFBase :: WMTDataRef              dataReference;
        attribute long                                priority;

        ProcessInstance getParentProcessInstance ();

        CfWFBase :: WMTWflParticipants listAssignedParticipants ()
              raises (NotConnected);
};
```

8.3.2.4 Work Item Interface

The WorkItem interface provides operations to access and modify the attributes and the state of a WorkItem object.
The get- and completeWorkitem operations change the State of a WorkItem. getAssignedParticipant returns the workflow participant currently assigned to the work item; reassignWorkItem assigns it to another participant.

```
interface WorkItem : CfWFBase :: WorkflowObject {

        attribute CfWFBase :: WMTDataRef              dataReference;
        attribute long                                priority;

        ProcessInstance  getParentProcessInstance ();

        ActivityInstance getParentActivityInstance ();

        void reassign (
                    in  CfWFBase::WMTWflParticipant    sourceUser,
                    in  CfWFBase::WMTWflParticipant    targetUser)
              raises (NotConnected, InvalidSourceUser, InvalidTargetUser);

        void get ()
              raises (NotConnected, TransitionNotAllowed);

        void complete()
```

```
                raises (NotConnected, TransitionNotAllowed);

          CfWFBase :: WMTWflParticipant getAssignedParticipant()
                raises (NotConnected);
};
```

8.3.2.5 Filtered List Processing

The following interfaces provide iterators for results returned from filtered list requests; see the section on Attributes for a description of the iterator functions.

```
typedef sequence<ProcessInstance>        ProcessInstances;
typedef sequence<Activitynstance>        ActivityInstances;
typedef sequence<WorkItem>               WorkItems;

interface ProcessDefinitionList {
          attribute long             count;

          ProcessDefinition fetchProcessDefinition()
                raises (NoMoreData);

          ProcessDefinitions fetchProcessDefinitions(
                      in  unsigned long               howMany)
                raises (NoMoreData);
};
interface ProcessInstanceList {
          attribute long             count;

          ProcessInstance fetchProcessInstance()
                raises (NoMoreData);

          ProcessInstances fetchProcessInstances(
                      in  unsigned long               howMany)
                raises (NoMoreData);
};
interface ActivityInstanceList {
          attribute long             count;

          ActivityInstance fetchActivityInstance()
                raises (NoMoreData);

          ActivityInstances fetchActivityInstances(
                      in  unsigned long               howMany);
                raises (NoMoreData);
};
interface WorkList {
          attribute long             count;

          WorkItem fetchWorkItem()
                raises (NoMoreData);

          WorkItem fetchWorkItems(
                      in  unsigned long               howMany);
                raises (NoMoreData);
};
```

8.3.3 The Process Definition Module

The Process Definition Module contains the interfaces used to create and modify Process Definitions to be executed by an Enactement Service.
The module defines the following interfaces:

- *ProcessModelServer* interface, which handles connection of a workflow participant with a particular Enactment Service and provides factory interfaces for access to filtered list of workflow definition objects owned by that Enactment Service.
- *ProcessModel* interface, which represents a workflow model; this interface serves as a factory for components of the process model, such as ActivityDefinitions and TransitionDefinitions.
- *ActivityDefinition* interface, which represents a node in a process model
- *TransitionDefinition* interface, which represents a connection between ActivityDefinitions
- *DataDefinition* interface, which defines the Process Relevant Data used by a particular process model
- *ApplicationDefinition* interface, which represents an application that can be used to support processing of an Activity during execution of a process model
- *ParticipantDefinition* interface, which represents a resource that might receive Work Items during execution of a process model

The following abbreviated IDL summarizes the interfaces contained in the CfWFBase module.

```
#include "CfWFBase.idl"

module CfWFProcessDefinition {

          ... // Data type and specific exception definitions

          interface ProcessModel;               // Forward declaration
          interface ApplicationDefinition;      // Forward declaration
          interface ParticipantDefinition;      // Forward declaration

          interface ProcessModelList {
                ... // Iterator for process model query result
          };

          interface ApplicationDefinitionList {
                ... // Iterator for application definition query result
          };

          interface ParticipantList {
                ... // Iterator for participant definition query result
          };

          interface ProcessDefinitionServer {
                ... // process definition server object definitions
          };

          interface ProcessModel : CfWFBase::WorkflowObject{
                ... // process model object definitions
          };

          interface ApplicationDefinition : CfWFBase::WorkflowObject {
                ... // application definition object definitions
          };

          interface ParticipantDefinition : CfWFBase::WorkflowObject {
                ... // participant definiton object definitions
          };

};
```

8.3.3.1 Data Types and Specific Exceptions

The following data types and exceptions are specific to the Process Definition Client module.

```
        // TYPE DEFINITIONS

        // SPECIFIC EXCEPTION DEFINITIONS
        exception                   NotConnected();
        exception                   ConnectFailed( CfWFBase::WMTErrorCode);
        exception                   InvalidId();
```

The exceptions defined here deal with poblems related to management of the connection to the Enactment Service.

8.3.3.2 Process Definition Server Interface

The Process Definition Server Interface handles the connection of a particular workflow user to an Enactment Service and provides access oto the workflow definition objects accessible through this Enactment Service.
The connect operation initializes the WorkflowEnactmentServer; the context of the connection is defined by the engineName and the scope. The ConnectFailed excpetion is raised when a connection could not be established. The disconnect operation serves as a destructor for the ApplicationClientServer.
Access to the workflow objects accessible through the connection is supported by providing factory methods for interfaces managing access to lists of workflow objects: the Open...sList operation take a filter as their first argument (see the CfWFBase module descritpion for details), the countFlag parameter indicates whether the number of elements in the query result should be returned. A NotConnected exception is raised when no connection was established. The query results are bound to a connection and are invalidated when the connection is terminated.

```
interface ProcessDefinitionServer {

        attribute CfWFBase :: WMTName engineName;
        attribute CfWFBase :: WMTName scope;

        void connect(
                in CfWFBase :: WMTName   userId,
                in string                password)
            raises (ConnectFailed);

        void disConnect()
            raises (NotConnected);

        ProcessModel createProcessModel(
                in  CfWFBase :: WMTName      processName)
            raises (NotConnected);

        ProcessModelList openProcessModelsList(
                in  CfWFBase :: Filter       filter,
                in  boolean              countFlag)
            raises (InvalidFilter, NotConnected);

        ApplicationDefinitionList openApplicationDefinitionsList (
                in  CfWFBase :: Filter   filter,
                in  boolean              countFlag)
            raises (InvalidFilter, NotConnected);

        ParticipantDefinitionList openParticipantDefinitionsList (
                in  CfWFBase :: Filter   filter,
                in  boolean              countFlag,
                out WMTActivityInstanceList      activityInstances,
                out long                 count)
            raises (InvalidFilter, NotConnected);

        ProcessModel getProcessModel(
                in CfWFBase :: WMTId             processModelId)
            raises (InvalidId);
```

```
        ApplicationDefinition getApplicationDefinition(
                in CfWFBase :: WMTId            applicationDefinitionId)
            raises (InvalidId);

        ParticipantDefinition getParticipantDefinition(
                in CfWFBase :: WMTId            participantDefinitionId)
            raises (InvalidId);
};
```

8.3.3.3 Process Model Interface

The Process Model interface provides factory operation for Activity Definitions, Transition Definitions and Data Definitions contained in a Process Model.
The ProcessDefinition interface inherits attributes and operations from WorkflowObject.

```
interface ProcessModel : CfWFBase :: WorkflowObject {

        ActivityDefinition addActivityDefinition(
                in CfWFBase :: WMTName   activityName)
            raises (NotConnected);

        void removeActivityDefinition(
                in CfWFBase :: WMTId            activityId)
            raises (NotConnected);

        DataDefinition addDataDefinition(
                in CfWFBase :: WMTName   dataName,
                in CfWFBase :: WMTType   dataType)
            raises (NotConnected);

        void removeDataDefinition(
                in CfWFBase :: WMTId            dataId)
            raises (NotConnected);

        TransitionDefinition addTransitionDefinition(
                in CfWFBase :: WMTName   transitionName,
                in CfWFBase :: WMTId            sourceActivityDefinitionId,
                in CfWFBase :: WMTId            targetActivityDefinitionId)
            raises (NotConnected, InvalidId);

        void removeTransitionDefinition(
                in CfWFBase :: WMTId            transitionId)
            raises (NotConnected);

};
```

8.3.3.4 Application Definition Interface

The ApplicationDefinition interface provides operations to access and modify the attributes of an Application Definition object. All operations require an active connection to the Enactment Service.

```
interface ApplicationDefinition : CfWFBase :: WorkflowObject{

        };
```

8.3.3.5 Participant Definition Interface

The ParticipantDefinition interface provides operations to access and modify the attributes of a Participant Definition object. All operations require an active connection to the Enactment Service.

```
interface ParticipantDefinition : CfWFBase :: WorkflowObject{
                attribute WMTParticipantType            type;

          };
```

8.3.3.6 Activity Definition Interface

The ActivityDefinition interface provides operations to access and modify the attributes of a Activity Definition object.
The getParentProcessModel operation returns the ProcessModel object that was used to create the specific ActivityDefinition. All operations require an active connection to the Enactment Service.

```
interface ActivityDefinition : CfWFBase :: WorkflowObject{

          attribute WMTImpementationType        implementationType;
          attribute CfWFBase :: WMTId   implementationId;

          ProcessModel getParentProcessModel ();

};
```

8.3.3.7 Transition Definition Interface

The TransitionDefinition interface provides operations to access and modify the attributes of a Transition Definition object.
The getParentProcessModel operation returns the ProcessModel object that was used to create the specific TransitionDefinition. All operations require an active connection to the Enactment Service.

```
interface TransitionDefinition  : CfWFBase :: WorkflowObject {

          attribute CfWFBase :: WMTId   sourceActivityId;
          attribute CfWFBase :: WMTId   targetActivityId;

          ProcessModel getParentProcessModel ();

};
```

8.3.3.8 Filtered List Processing

The following interfaces provide iterators for results returned from filtered list requests; see the section on Attributes for a description of the iterator functions.

```
typedef sequence<ProcessModel>                          ProcessModels;
typedef sequence<ActivityDefinition>     ActivityDefinitions;
typedef sequence<TransitionDefinition>   TransitionDefinitions;
typedef sequence<ApplicationDefinition>          ApplicationDefinitions;
typedef sequence<ParticipantDefinition>          ParticipantDefinitions;

interface ProcessModelsList {
          attribute     long                            count;

          ProcessModel fetch();
                raises (NoMoreData);

          ProcessModels fetchN(
                        in  unsigned long               howMany);
                raises (NoMoreData);
};
```

```
interface ActivityDefinitionsList {
          attribute     long                              count;

          ActivityDefinition fetch ();
                raises (NoMoreData);

          ActivityDefinition fetchN(
                      in  unsigned long                   howMany);
                raises (NoMoreData);
};

interface TransitionDefinitionsList {
          attribute     long                              count;

          TransitionDefinition fetch ();
                raises (NoMoreData);

          TransitionDefinitions fetchN(
                      in  unsigned long                   howMany);
                raises (NoMoreData);
};

interface ApplicatonDefinitionsList {
          attribute     long                              count;

          ApplicationDefinition fetch ();
                raises (NoMoreData);

          ApplicationDefinitons fetchN(
                      in  unsigned long                   howMany);
                raises (NoMoreData);
};

interface ParticipantDefinitionsList {
          attribute     long                              count;

          ParticipantDefinition fetch ();
                raises (NoMoreData);

          ParticipantDefinitions fetchN(
                      in  unsigned long                   howMany);
                raises (NoMoreData);
};
```

8.3.4 Relationship to WfMC Standards

The C-language description has been converted into an object oriented specification. Where possible, the syntax of C-functions has been preserved when converting to operations on objects. Here is a list of changes:

- The operations dealing with States and Attributes of workflow objects have been moved into the WorkflowObject class. The generic operations replace the object-type specific ones defined in the C-API.
- Processing of filtered lists is done in the same way as in the C-language specification, using an Iterator instead of WMTPQueryHandle. The Iterator might return more than one element at a time.
- The limits on the size of string type attributes have been removed. Same for limit on the number of Participants associated with an ActivityInstance or ProcessInstance.
- The Unique Id attributes of the various workflow entities are replaced by their object Id (not an explicit attribute).
- ReturnCodes have been replaced by exceptions.

9. Appendix D: Audit Data

The following describes the Audit Data related to the functions[2] defined in this specification. The WfMC Audit Data Specification identifies events related to workflow objects (in general changes of state or of attributes) and describes the format of Audit Data to be reported for these events. Events are in general triggered by an external interaction with the Enactment Service, e.g., via an operation define in this specification. An event can be a directly associated to the operation (e.g., WMStartProcessInstance triggers a WMProcessInstancesStarted event) or indirectly triggered by such an interaction, mediated by the Enactment Service (e.g., WMStartProcessInstance will cause state changes for the start activities of a process, resulting in WMActivityInstanceStateChanged events). An implementation of an Enactment Service complies with the WfMC Audit Data Specification if Audit Records are supported for all events identified in that document. For convenience of the reader we have included references to Audit-relevant events triggered by the functions described in this specification; for each operation the Audit Data Record and the directly associated event is stated. The following description provides pointers to the corresponding definitions in the WfMC Audit Data Specification; please refer to this document for details.

9.1 Auditing Process Definitions

The following table identifies the Audit Data for WAPI functions related to state changes Process Definitions. Operation refers to a aWAPI function defined in this specification, Event Set refers to a section in the WfMC Audit Data Specification and Event identifies the event reported in the Audit Data record.

Operation	Audit Data Record	Event
WMChangeProcessDefinitionState	Change Process Definition State	WMChangedProcessDefinitionState

9.2 Auditing Process Instances

The following table identifies the Audit Data for WAPI functions related to state changes and changes of attributes of activity instances. Operation refers to a aWAPI function defined in this specification, Event Set refers to a section in the WfMC Audit Data Specification and Event identifies the event reported in the Audit Data record.

Operation	Audit Data Record	Event
WMCreateProcessInstance	Create/Start Process/Subprocess Instance State	WMCreatedProcessInstance
WMStartProcessInstance	Create/Start Process/Subprocess Instance State	WMStartedProcessInstance
WMChangeProcessInstancesState	Change Process/Subprocess Instance State	WMChangedProcessInstanceState
WMChangeProcessInstanceState	Change Process/Subprocess Instance State	WMChangedProcessInstanceState
WMTerminateProcessInstances	Change Process/Subprocess Instance State	WMTerminatedProcessInstance
WMTerminateProcessInstance	Change	WMTerminatedProcessInstance

[2] The new Process Definition functions are not covered here at the moment.

	Process/Subprocess Instance State	
WMAbortProcessInstances	Change Process/Subprocess Instance State	WMAbortedProcessInstance
WMAbortProcessInstance	Change Process/Subprocess Instance State	WMAbortedProcessInstance
WMAssignProcessInstancesAttribute	Assign Process Instance Attributes	WMAssignedProcessInstanceAttributes
WMAssignProcessInstanceAttribute	Assign Process Instance Attributes	WMAssignedProcessInstanceAttributes

9.3 Auditing Activity Instances

The following table identifies the Audit Data for WAPI functions related to state changes and changes of attributes of activity instances. Operation refers to a aWAPI function defined in this specification, Event Set refers to a section in the WfMC Audit Data Specification and Event identifies the event reported in the Audit Data record.

Operation	Audit Data Record	Event
WMChangeActivityInstancesState	Change Activity Instance State	WMChangedActivityInstanceState
WMChangeActivityInstanceState	Change Activity Instance State	WMChangedActivityInstanceState
WMAssignActivityInstancesAttribute	Assign Activity Instance Attributes	WMAssignedActivityInstanceAttributes
WMAssignActivityInstanceAttribute	Assign Activity Instance Attributes	WMAssignedActivityInstanceAttributes

9.4 Auditing Workitems

The following table identifies the Audit Data for WAPI functions related to work items. Operation refers to a aWAPI function defined in this specification, Event Set refers to a section in the WfMC Audit Data Specification and Event identifies the event reported in the Audit Data record.

Operation	Audit Data Record	Event
WMAssignWorkitemAttribute	Assign Workitem Attributes	WMAssignedWorkitemAttributes
WMChangeWorkitemState	Change Workitem State	WMChangedWorkitemState
WMGetWorkitem	Change Workitem State	WMSelectedWorkitem (optional)
WMCompleteWorkitem	Change Workitem State	WMCompletedWorkitem
WMReassignWorkitem	Assign/Reassign Workitem	WMReassignedWorkitem

10. Appendix E: Conformance Profiles

This chapter deals with definition of criteria for a specific implementation of a Workflow Enactment Service to be conformant with the WAPI specification. Rather than requesting an implementation to support all of the functions specified above to conform with the WfMC standard, we define various levels of conformance. A set of Profiles is defined, each profile identifying a set of operations that address a specific usage scenario. An implementation of an Enactment Service might choose to comply with some, but not necessarily all of the Profiles.

10.1 Philosophy and Approach

The following conformance profiles are non-exclusive sets of functions from the WAPI2 specification. They strike a balance between the Vendor's desire to simplify the conformance process and the Customer's desire to have a straightforward and understandable conformance statement. The Conformance Profiles achieve this balance through the use of required WAPI Functions within optional profiles -- by definition, *any* profile is optional but its functionality is not. The philosophy behind their organization is as follows:

Their basic structure is easy to understand. The framework is understandable to customers and vendors who may not be intimately familiar with the specification and the history of its development.

They provide flexibility for vendors by avoiding an "all-or-nothing" conformance framework. The profiles mirror the general capabilities of today's workflow products. Vendors may choose to support any number of the profiles, but do not have to support them all -- we will measure conformance on a profile-by-profile basis. For example, a vendor could choose to provide only WorkList Handler support, and could earn a conformance certification just for that Profile.

Each Profile defines a set of functions that deliver business value to the customer in a predictable, meaningful way. Customers can evaluate products using these conformance profiles. Each profile provides a meaningful service between the vendor's product and the customer's client applications that use the profile. Customers want behavioral consistency across different implementations of this interface; that consistency is the result of the simple nature of these profiles.

10.2 Practice and Policy

A vendor can not claim conformance to this or any other WfMC specification unless specifically authorized to make that claim by the WfMC. WfMC grants this permission only upon the verification of the particular vendor's implementation of the published specification, according to applicable test procedures defined by WfMC.

When a vendor chooses to support a Conformance Profile, all WAPI Functions in that profile must actually "do something" in the vendor product representative of that WAPI Function's purpose. It is not acceptable to return a "WM_Unsupported" error message for a WAPI Function that is part of a supported profile.

Each vendor must produce documentation showing attribute mappings; i.e., which of their product's attributes are accessible using any of the attribute WAPI Functions in each supported profile.

Vendors may choose to support additional WAPI functions, along with vendor-specific API functions not prescribed in the Coalition specification. In such a case, WfMC encourages the vendor to document those function calls (and their associated attribute mappings) as an addendum to their documentation.

Each implementation must include program stubs for **all** unsupported WAPI functions. A call to any of these unsupported functions must return a "WM_Unsupported" error message.

10.3 The WAPI Conformance Profiles and Functions

For each Conformance Profile a function is defined that allows an application to check whether or not the specific Profile is supported by the implementation. Each implementation must include all **Is<xxx>ProfileSupported()** functions. These functions are in the following format:

> **WMIs<xxx>ProfileSupported() -** where <xxx> is the name of a particular Conformance Profile - API commands are intended to allow a user application to inquire whether a vendor's implementation of WM functions supports a certain Conformance Profile.

10.3.1 WMIsWorkListHandlerProfileSupported

NAME

WMIsWorkListHandlerProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsWorkListHandlerProfileSupported** informs the user application that this WFMC implementation fully supports all the WorkList Handler functions that comprise the Work List Handler Conformance Profile.

INTENDED USE

Implementation of this conformance profile provides external worklist handler functionality to a client application.

```
WMTErrRetType WMIsWorkListHandlerProfileSupported()
```

Argument	Description
No Arguments	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

WORKLIST HANDLER CONFORMANCE PROFILE FUNCTIONS

The following functions comprise the Worklist Handler Conformance Profile:

WMConnect
WMDisconnect
WMOpenWorkList
WMFetchWorkItem
WMCloseWorkList
WMGetWorkItem
WMCompleteWorkItem
WMReassignWorkItem
WMOpenWorkItemAttributesList
WMFetchWorkItemAttribute
WMCloseWorkItemAttributesList
WMGetWorkItemAttributeValue
WMAssignWorkItemAttribute

RELATED AUDIT EVENTS

The following Audit events are related to the operations included in this profile and would be audited by an implementation that is compliant with the Audit Data Profile:

- All Audit Events related to state and attribute changes of Work Items, described by the Audit Data Types ‘Change WorkItem State’ and ‘Assign WorkItem Attributes’

10.3.2 WMIsProcessControlStatusProfileSupported

NAME

WMIsProcessControlStatusProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsProcessControlStatusProfileSupported** informs the user application that this WFMC implementation fully supports all the Process Control Status functions that comprise the Process Control Status Conformance Profile.

INTENDED USE

Implementation of this conformance profile allows a client application to select and manage process instances.

```
WMTErrRetType WMIsProcessControlStatusProfileSupported()
```

Argument	Description
No Arguments	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

PROCESS CONTROL STATUS CONFORMANCE PROFILE FUNCTIONS

The following functions comprise the Process Control Status Conformance Profile:

WMConnect
WMDisconnect
WMOpenProcessDefinitionsList
WMFetchProcessDefinition
WMCloseProcessDefinitionsList
WMCreateProcessInstance
WMStartProcess
WMTerminateProcessInstance
WMOpenProcessInstanceStatesList
WMFetchProcessInstanceState
WMCloseProcessInstanceStatesList
WMChangeProcessInstanceState
WMOpenProcessInstancesList
WMFetchProcessInstance
WMCloseProcessInstancesList
WMGetProcessInstance
WMOpenProcessInstanceAttributesList
WMFetchProcessInstanceAttribute
WMCloseProcessInstanceAttributesList
WMGetProcessInstanceAttributeValue
WMAssignProcessInstanceAttribute

RELATED AUDIT EVENTS

The following Audit events are related to the operations included in this profile and would be audited by an implementation that is compliant with the Audit Data Profile:

- All Audit Events related to state and attribute changes of Process Instances, described by the Audit Data Types ‘Change Process / Subprocess Instance State’ and ‘Assign Process / Subprocess Attributes’

10.3.3 WMIsProcessDefinitionProfileSupported

NAME

WMIsProcessDefintionProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsProcessDefintionProfileSupported** informs the user application that this WFMC implementation fully supports all the Process Defintion functions that comprise the Process Defintion Conformance Profile.

INTENDED USE

Implementation of this conformance profile enables a client application to display a list of available process definitions and their respective states.

```
WMTErrRetType WMIsProcessDefintionProfileSupported()
```

Argument	Description
`No Arguments`	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

PROCESS DEFINITION CONFORMANCE PROFILE FUNCTIONS

The following functions comprise the Process Defintion Conformance Profile:

WMConnect
WMDisconnect
WMOpenProcessDefinitionStatesList
WMFetchProcessDefinitionState
WMCloseProcessDefinitionStatesList
WMChangeProcessDefinitionState
WMOpenProcessDefinitionsList
WMFetchProcessDefinition
WMCloseProcessDefinitionsList

RELATED AUDIT EVENTS

The following Audit events are related to the operations included in this profile and would be audited by an implementation that is compliant with the Audit Data Profile:

- All Audit Events related to state changes of Process Definitions, described by the Audit Data Types ‘Change Process Definition State’

10.3.4 WMIsProcessAdminProfileSupported

NAME

WMIsProcessAdminProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsProcessAdminProfileSupported** informs the user application that this WFMC implementation fully supports all the Process Admin functions that comprise the Process Admin Conformance Profile.

INTENDED USE

Implementation of this conformance profile allows a client application to support global manipulation of process instances by an administrator. Contrast this set with the Process Control Status functions which work only on individual process instances.

```
WMTErrRetType WMIsProcessAdminProfileSupported()
```

Argument	Description
No Arguments	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

PROCESS ADMIN CONFORMANCE PROFILE FUNCTIONS

The following functions comprise the Process Admin Conformance Profile:

WMConnect
WMDisconnect
WMChangeProcessInstancesState
WMTerminateProcessInstances
WMAbortProcessInstances
WMAbortProcessInstance
WMAssignProcessInstancesAttribute
WMOpenProcessInstanceStatesList
WMFetchProcessInstanceState
WMCloseProcessInstanceStatesList
WMOpenProcessDefinitionsList
WMFetchProcessDefinition
WMCloseProcessDefinitionsList
WMOpenProcessInstancesList
WMFetchProcessInstance
WMCloseProcessInstancesList
WMOpenProcessInstanceAttributesList
WMFetchProcessInstanceAttribute
WMCloseProcessInstanceAttributesList

RELATED AUDIT EVENTS

The following Audit events are related to the operations included in this profile and would be audited by an implementation that is compliant with the Audit Data Profile:

- All Audit Events related to state changes of Process Instances, described by the Audit Data Types ‘Change Process / Subprocess Instance State’

10.3.5 WMIsActivityControlStatusProfileSupported

NAME

WMIsActivityControlStatusProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsActivityControlStatusProfileSupported** informs the user application that this WFMC implementation fully supports all the Activity Control Status functions that comprise the Activity Control Status Conformance Profile.

INTENDED USE

Implementation of this conformance profile allows a client application to select and manage activity instances.

```
WMTErrRetType WMIsActivityControlStatusProfileSupported()
```

Argument	Description
`No Arguments`	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

ACTIVITY CONTROL STATUS CONFORMANCE PROFILE FUNCTIONS

The following functions comprise the Activity Control Status Conformance Profile:

WMConnect
WMDisconnect
WMOpenActivityInstanceStatesList
WMFetchActivityInstanceState
WMCloseActivityInstanceStatesList
WMChangeActivityInstanceState
WMOpenActivityInstancesList
WMFetchActivityInstance
WMCloseActivityInstancesList
WMGetActivityInstance
WMOpenActivityInstanceAttributesList
WMFetchActivityInstanceAttribute
WMCloseActivityInstanceAttributesList
WMGetActivityInstanceAttributeValue
WMAssignActivityInstanceAttribute

RELATED AUDIT EVENTS

The following Audit events are related to the operations included in this profile and would be audited by an implementation that is compliant with the Audit Data Profile:

- All Audit Events related to state and attribute changes of Activity Instances, described by the Audit Data Types ‘Change Activity Instance State’ and ‘Assign Activity Instance Attributes’

10.3.6 WMIsActivityAdminProfileSupported

NAME

WMIsActivityAdminProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsActivityAdminProfileSupported** informs the user application that this WFMC implementation fully supports all the Activity Admin functions that comprise the Activity Admin Conformance Profile.

INTENDED USE

Implementation of this conformance profile allows a client application to support global manipulation of activity instances by an administrator. Contrast this set with the Activity Control Status functions which work only on individual activity instances.

```
WMTErrRetType WMIsActivityAdminProfileSupported()
```

Argument	Description
No Arguments	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

ACTIVITY ADMIN CONFORMANCE PROFILE FUNCTIONS

The following functions comprise the Activity Admin Conformance Profile:

WMConnect
WMDisconnect
WMChangeActivityInstancesState
WMAssignActivityInstancesAttribute
WMOpenProcessDefinitionsList
WMFetchProcessDefinition
WMCloseProcessDefinitionsList
WMOpenActivityInstanceStatesList
WMFetchActivityInstanceState
WMCloseActivityInstanceStatesList
WMOpenActivityInstanceAttributesList
WMFetchActivityInstanceAttribute
WMCloseActivityInstanceAttributesList

RELATED AUDIT EVENTS

The following Audit events are related to the operations included in this profile and would be audited by an implementation that is compliant with the Audit Data Profile:

- All Audit Events related to state and attribute changes of Activity Instances, described by the Audit Data Types ‘Change Activity Instance State’ and ‘Assign Activity Instance Attributes’

10.3.7 WMIsEntityHandlerProfileSupported

NAME

WMIsEntityHandlerProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsEntityHandlerProfileSupported** informs the user application that this WFMC implementation fully supports all the Entity Handler functions that comprise the Entity Handler Conformance Profile.

INTENDED USE

Implementation of this conformance profile provides entity handler functionality to a client application..

```
WMTErrRetType WMIsEntityHandlerProfileSupported()
```

Argument	Description
`No Arguments`	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

ENTITY HANDLER CONFORMANCE PROFILE FUNCTIONS

The following functions comprise the Entity Handler Conformance Profile:

WMConnect
WMDisconnect
WMOpenProcessDefinitionsList
WMFetchProcessDefinition
WMCloseProcessDefinitionsList
WMCreateEntity
WMAddEntity
WMOpenEntitiesList
WMOpenOwnedEntitiesList
WMFetchEntity
WMCloseEntitiesList
WMRemoveEntity
WMDeleteEntity

10.3.8 WMIsAuditRecordProfileSupported

NAME

WMIsAuditRecordProfileSupported - Connect to the WFM Engine for this series of interactions

DESCRIPTION

The **WMIsAuditRecordProfileSupported** informs the user application that this WFMC implementation fully supports all the Audit Record capabilities for all other implemented Conformance Profiles.

INTENDED USE

Implementation of this conformance profile provides audit record support for the other conformance profiles.

```
WMTErrRetType WMIsAuditRecordProfileSupported()
```

Argument	Description
No Arguments	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

AUDIT RECORD CONFORMANCE PROFILE FUNCTION

The following guidelines apply to the Audit Record Conformance Profile:

An implementation of any of the previous WAPI 2 Conformance Profiles may optionally include implementation of the Audit Record requirement for that Profile's functions. In order to be conformant with the Audit Record Specification for this interface, the vendor must implement Audit Records for each implemented Profile. For example, if a vendor has a conforming implementation of both the WorkList Handler and the Process Control and Status profiles, they must implement Audit Records for both profiles in order to achieve Audit Record Specification Conformance.

10.3.9 WMToolAgentProfileSupported

NAME

WMToolAgentProfileSupported – Connects and supports different Tool Agents to enable application invokation

DESCRIPTION

The **WMToolAgentProfileSupported** informs the user application that this WFMC implementation fully supports application invokation via the Tool Agent architecture model.

INTENDED USE

Implementation of this conformance profile provides an interface to integrate application control mechanisms for workflow integration reasons.

```
WMTErrRetType WMToolAgentProfileSupported()
```

Argument	Description
No Arguments	

ERROR RETURN VALUE

```
WM_TRUE  - If Conformance Profile is supported
WM_FALSE - If Conformance Profile is not supported.
```

TOOL AGENT CONFORMANCE PROFILE FUNCTION

The following guidelines apply to the Tool Agent Conformance Profile:

An implementation of any of the previous WAPI 2 Conformance Profiles may optionally include implementation of the Tool Agent requirement for that Profile's functions. In order to be conformant with the Tool Agent Specification for this interface, the vendor must implement Tool Agent interfaces, which enable application invokation via the implemented Profile.
The following functions comprise the Tool Agent Conformance Profile:

WMTAConnect
WMTADisconnect
WMTAInvokeApplication
WMTARequestAppStatus
WMTATerminateApp

11. Appendix F: Workflow Definition Functions

The following describes a new set of functions that deals with definition of workflow models.
The first section describes an abstract machinery for handling of building blocks of workflow models - abstract entities. Entity handling functions include creating and deleting entities as well as functions to get and set their attributes.
An entity can be whatever a specific vendor supports as building block for a workflow definition; however, a basic set of entity types that should always be supported (i.e., those corresponding to the Instances that can be accessed via the Application Client Interface) is defined in the documentation of Process Definition Interchange documentation (Interface-1) .
The middle piece of this chapter deals with connecting the abstract machinery of entities to the objects already introduced in this specification: entities are owned either by an Enactment Service or by a particular Process Definition; functions are described that enable editing of workflow objects in the context of an Enactment Service or a concrete Process Definition.
Due to the generic architecture of Workflow Definition Functions, implementations have to obey the semantical structure of the Process Definition Interchange Process Model as defined in the documentation of Interface-1, Process Definition Interchange Interface [Process Definition Interchange Process Model, WfMC TC-1016] .

A list of attributes of Process Model Entities is provided with the documentation of the Process Definition Interchange documents [Process Definition Attribute List, WfMC TC-1019].

11.1 Entity Handling functions

The following defines a set of generic functions which treat all objects maintained by an Enactment Service as Entities, ignoring their specific semantics in a Workflow context. All entities have an identifier, a name and a type and other, type specific attributes. The ID is unique within a scope and remains constant from session to session, and from client to client. The ID is used to allow entities to refer to each other in a persistent way.

11.1.1 Entity Data Types

```
typedef struct
{
       WMTEntityID           entity_id;
       WMTText               entity_type[NAME_STRING_SIZE];
       WMTText               entity_name[NAME_STRING_SIZE];
       void *                entity_private_data;
} WMTEntity;
```

11.1.2 WMCreateEntity

NAME

WMCreateEntity - Creates a new entity.

DESCRIPTION

This is how new entities are created that compose the workflow definition. The entity created is a workflow persistent entity. The structure for the new entity will be returned. The entity is scoped either by the context of an enactment service or by another entity.

```
WMTErrRetType WMCreateEntity (
       in  WMTPSessionHandle  psession_handle,
       in  WMTPEntity         scoping_entity,
       in  WMTName            entity_class,
       in  WMTName            entity_name,
       out WMTPEntity         entity)
```

Argument	Description
psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
scoping_entity	The entity that owns the new entity
entity_class	The vendor defined entity class that is to be created. Specifies what class of entity is to be created.
entity_name	The user defined name provided for this entity.
entity	Pointer to a buffer which will receive the entity structure.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SCOPE
WM_INVALID_CLASS
WM_READONLY_CLASS
```

11.1.3 WMOpenEntitiesList

NAME

WMOpenEntitiesList - Specifies and opens the query to produce a list of all entities (owned by a specific entity) that meet the selection criterion of the filter.

DESCRIPTION

This command directs the WFM Engine to open the query to provide a list of entities which are available to a particular workflow participant, some of which may be modifiable by the participant. A typical usage for this operation is to get a list of all entities of a specific entity_type within a certain process model.
This command will return a query handle for a list of entities that match the specified value for the attribute. The command will also return, optionally, the total *count* of entities available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1. If `pentity_def_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL entities in a given scope.

```
WMTErrRetType WMOpenEntitiesList (
       in  WMTPSessionHandle  psession_handle,
       in  WMTPEntity         scoping_entity,
       in  WMTPFilter         pentity_def_filter,
       in  WMTBoolean         count_flag,
       out WMTPQueryHandle    pquery_handle,
       out WMTPInt32          pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
scoping_entity	The entity that represents the scope of entities to be included in the query result
pentity_def_filter	Filter associated with the entities.
count_flag	Boolean flag that indicates if the total count of entities should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
Pcount	Total number of entities that fulfill the filter condition.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_FILTER
WM_INVALID_SCOPE
```

REQUIREMENTS

No requirements are assumed to exist with regard to the type of process model. No requirements are assumed to exist with regard to how workflow participant's are identified within the WFM Engine.

RATIONALE FOR API

This command and the corresponding fetch calls allows a workflow participant to retrieve the entities which a workflow participant is authorized to work on.

11.1.4 WMFetchEntity

NAME

WMFetchEntity - Returns the next entity from the set of entities that met the selection criterion stated in the WMOpenEntitiesList call.

DESCRIPTION

This command directs the WFM Engine to provide one entity from the list of entities which are available to a particular workflow participant, some of which may be modifiable by the participant. It is assumed that not all processes in an organization may be modified by all workflow participants. This fetch function, as well as all other fetch functions in this API, will return subsequent items after every call, one at a time. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`. The sort order in which the items are returned is specific of the workflow engine servicing the call, no specific order should be assumed.

```
WMTErrRetType WMFetchEntity (
        in  WMTPSessionHandle psession_handle,
        in  WMTPQueryHandle pquery_handle,
        out WMTPEntityID entity_id)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the WMOpenEntitiesList query command.
entity_id	Id of the next entity.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_ENTITY
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

11.1.5 WMCloseEntitiesList

NAME

WMCloseEntitiesList - Closes the query of entities.

DESCRIPTION

```
WMTErrRetType WMCloseProcessModelEntitiesList(
       in  WMTPSessionHandle psession_handle,
       in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the WMOpenEntitiesList query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

11.1.6 WMDeleteEntity

NAME

WMRemoveEntity - Deletes an entity.

DESCRIPTION

```
WMTErrRetType WMDeleteEntity (
       in  WMTPSessionHandle  psession_handle,
       in  WMTPEntity         scoping_entity,
       in  WMTPEntityID       entity_id)
```

Argument	Description
psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
scoping_entity	The entity that owns the entity to be deleted
entity_id	Pointer to the unique id of the entity being deleted.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SCOPE
```

11.2 Entity Attribute Manipulation

Every entity has attributes which contain specific information about the entity. These values are accessed via the WMGetEntityAttributeValue and WMSetEntityAttributeValue commands. Standard attributes will be defined for each standard entity type, and there will be other attributes that vendors will wish to implement specifically for their systems. In this way the entities are extensible by vendors.
Some attributes contain scalar values, and others contain a collection of values. The multi valued attributes are called “attribute lists” in this document. The values in an attribute list are accessed through the following functions: WMOpenEntityAttributeValueList, WMFetchEntityAttributeValue, WMCloseEntityAttributeValueList. The open command returns a query handle which is used to fetch subsequent values. Multi-valued attributes are updated though the use of WMClearEntityAttributeList and WMAddEntityAttributeValue.

11.2.1 WMOpenEntityAttributesList

NAME

WMOpenEntityAttributesList - Specifies and opens the query to produce the list of attributes for a specific entity that match the filter criterion.

DESCRIPTION

This command will return a query handle for a list of attributes for an entity. The command will also return, optionally, the total *count* of attributes available. If the count is requested and the implementation does not support it, the command will return a `pcount` value of -1.
One of the uses of this API, together with the corresponding fetch and close calls is to allow a workflow application to query the Workflow Engine for the available attributes that are defined for an entity, in order to offer this list to the application user.. If `pentity_attr_filter` is NULL, then the function, with the corresponding fetch calls will return the list of ALL attributes available for the entity.

```
WMTErrRetType WMOpenEntityAttributesList (
       in  WMTPSessionHandle psession_handle,
       in  WMTPEntity        scoping_entity,
       in  WMTEntity_Id      entity_id,
       in  WMTPFilter        pentity_attr_filter,
       in  WMTBoolean        count_flag,
       out WMTPQueryHandle   pquery_handle,
       out WMTPInt32         pcount)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
scoping_entity	The entity that scopes the entity
entity_id	
pentity_attr_filter	Filter associated with the entity attributes.
count_flag	Boolean flag that indicates if the total count of entity attributes should be returned.
pquery_handle	Pointer to a structure containing a unique query information.
pcount	Total number of attributes for this entity.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_ENTIY
```

11.2.2 WMFetchEntityAttribute

NAME

WMFetchEntityAttribute - Returns the next entity attribute from the list of attributes that match the filter criterion.

DESCRIPTION

This command returns an entity attribute. This fetch function will return subsequent entity attributes after every call. The fetch process is complete when the function returns the error `WM_NO_MORE_DATA`. The function will return attribute name and its type and length; valid types are all WMT data types defined below in this document plus

- expressions of the form ListOf(*Entity_Class*) where *Entity_Class* is a string, identifying an entity class supported by the Enactment Service
- expressions of the form ListOf(*Data_Type*) where *Data_Type* is one of the basic WMT types

Values of attributes of type List are handled using the WMT...EntityAttributeValuesList operations described below.

```
WMTErrRetType WMFetchEntityAttribute (
        in  WMTPSessionHandle psession_handle,
        in  WMTPQueryHandle pquery_handle,
        out WMTPAttrName pattribute_name,
        out WMTPInt32 pattribute_type,
        out WMTPInt32 pattribute_length,
        in  WMTInt32 buffer_size)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenEntityAttributesList** query command.
pattribute_name	Pointer to the name of the attribute.
pattribute_type	Pointer to the type of the attribute.
pattribute_length	Pointer to the length of the attribute value.
buffer_size	Size of the buffer.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
WM_NO_MORE_DATA
```

11.2.3 WMCloseEntityAttributesList

NAME

WMCloseEntityAttributesList - Closes the query for entity attributes.

DESCRIPTION

```
WMTErrRetType WMCloseEntityAttributesList (
       in  WMTPSessionHandle psession_handle,
       in  WMTPQueryHandle pquery_handle)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pquery_handle	Identification of the specific query handle returned by the **WMOpenEntityAttributesList** query command.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_INVALID_SESSION_HANDLE
WM_INVALID_QUERY_HANDLE
```

11.2.4 WMGetEntityAttributeValue

NAME

WMGetEntityAttribute - Retrieves an attribute from an entity.

DESCRIPTION

Returns the value of the attribute named. See WMOpenEntityAttributeValueList to get all of the elements of a multi-valued attribute. The value of the attribute named is copied into the attribute_value buffer specified. If the buffer is not large enough for the entire value, then only the part that fits will be placed in the buffer, but no error will result. The attribute_length will return the correct length of the attribute value, not necessarily the amount of data returned.

```
WMTErrRetType WMGetEntityAttributeValue (
       in  WMTPSessionHandle  psession_handle,
       in  WMTPEntity         scoping_entity,
       in  WMTPEntity         entity_handle,
       in  WMTPAttrName       attribute_name,
       out WMTInt32           attribute_type,
       out WMTInt32           attribute_length,
       out WMTPVoid           pattribute_value,
       in  WMTInt32           buffer_size)
```

Argument	Description
psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
entity_handle	Pointer to the entity structure from which the attribute is being retrieved.
attribute_name	The name of the attribute from which to retrieve the value.
attribute_type	Returns the type of the value that has been returned.
attribute_length	Returns the length of the value in the attribute
pattribute_value	A pointer to a buffer which will receive the value of the attribute.
buffer_size	The size of the buffer. This value used by the API to restrict writing of data to this length.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_NOT_SINGLE_VALUED
```

11.2.5 WMOpenEntityAttributeValueList

NAME

WMOpenEntityAttributeValueList - opens a multi-valued attribute on an entity for retrieving each of the values individually. The type of a value from the attribute is returned. A query handle is returned to fetch the individual values from. The count of items in the collection is optional.
If the name of a single valued attribute is given, an error will result.

DESCRIPTION

```
WMTErrRetType WMOpenEntityAttributeValueList(
       in  WMTPSessionHandle psession_handle,
       in  WMTPEntity        scoping_entity,
       in  WMTPEntity        entity_handle,
       in  WMTPAttrName      attribute_name,
       out WMTInt32          attribute_type,
       out WMTPQueryHandle   query_handle,
       out WMTPInt32         pcount)
```

Argument	Description
psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
entity_handle	Pointer to the struct representing the entity.
attribute_name	The name of the multi-valued attribute to retrieve values from.
attribute_type	The collection of values as assumed to be of the same type since a collection is just a multi-valued attribute, so the collection_type is really the type of a single value in the collection.
query_handle	This query handle is used for WMFetchEntityCollectionValue and WMCloseEntityCollection
pcount	The number of values held in this attribute. This is optional. The value of negative one (-1) will indicate that the value is not supported.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_NOT_MULTI_VALUED
```

11.2.6 WMFetchEntityAttributeValue

NAME

WMFetchEntityAttributeValue - Retrieves an attribute from an entity.

DESCRIPTION

```
WMTErrRetType WMFetchEntityAttributeValue(
       in  WMTPSessionHandle  psession_handle,
       in  WMTPQueryHandle    pquery_handle,
       out WMTInt32   attribute_length,
       out WMTPVoid   pattribute_value,
       in  WMTInt32   buffer_size)
```

Argument	Description
psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
pquery_handle	Pointer to the query structure created with WMOpenEntityCollection
attribute_length	Returns the length of the value in the attribute
pattribute_value	A pointer to a buffer which will receive the value of the attribute.
buffer_size	The size of the buffer. This value used by the API to restrict writing of data to this length.

ERROR RETURN VALUE

WM_SUCCESS

11.2.7 WMCloseEntityAttributeValueList

NAME

WMCloseEntityAttributeValueList - Closes the query handle used to retrieve a collection (a multi-valued attribute).

DESCRIPTION

```
WMTErrRetType WMCloseEntityAttributeValueList(
    in  WMTPSessionHandle  psession_handle,
    in  WMTPQueryHandle    pquery_handle)
```

Argument	Description
psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
pquery_handle	Pointer to the query structure created with WMOpenEntityCollection

ERROR RETURN VALUE

WM_SUCCESS

11.2.8 WMAssignEntityAttributeValue

NAME

WMAssignEntityAttributeValue - Set an attribute of an entity.

DESCRIPTION

```
WMTErrRetType WMAssignEntityAttributeValue (
       in  WMTPSessionHandle  psession_handle,
       in  WMTPEntity     entity_handle,
       in  WMTPAttrName   attribute_name,
       in  WMTInt32       attribute_type,
       in  WMTInt32       attribute_length,
       in  WMTPText       pattribute_value)
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
entity_handle	Pointer to the entity structure from which the attribute is being retrieved.
Attribute_name	The name of the attribute to put the value into.
Attribute_type	The type of the value.
Attribute_length	The length of the value in the buffer.
Pattribute_value	A pointer to a buffer which contains the value of the attribute.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_NOT_SINGLE_VALUED
```

11.2.9 WMClearEntityAttributeList

NAME

WMClearEntityAttributeList - Deletes all of the values in a multi-valued attribute.

DESCRIPTION

```
WMTErrRetType WMClearEntityAttributeList(
       in  WMTPSessionHandle  psession_handle,
       in  WMTPEntity         entity_handle,
       in  WMTPAttrName       attribute_name
       )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
entity_handle	Pointer to the entity structure from which the attribute is being erased.
Attribute_name	The name of the attribute to be cleared out.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_NOT_MULTI_VALUED
```

11.2.10 WMAddEntityAttributeValue

NAME

WMAddEntityAttributeValue - Add a value to a multi-valued attribute of an entity.

DESCRIPTION

```
WMTErrRetType WMAddEntityAttributeValue(
       in  WMTPSessionHandle  psession_handle,
       in  WMTPEntity entity_handle,
       in  WMTPAttrName   attribute_name,
       in  WMTInt32   attribute_type,
       in  WMTInt32   attribute_length,
       in  WMTPVoid   pattribute_value
       )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
entity_handle	Pointer to the entity structure from which the attribute is being retrieved.
Attribute_name	The name of the collection (multi-valued attribute) to add the value into.
Attribute_type	The type of the value.
Attribute_length	The length of the value in the buffer.
Pattribute_value	A pointer to a buffer which contains the value of the attribute.

ERROR RETURN VALUE

```
WM_SUCCESS
WM_NOT_MULTI_VALUED
```

11.3 Process Modelling Functions

The following set of functions supports creation and modification of a workflow process model. A process model is made up from building blocks called process definition entities in this specification. Examples for process definition entities are Activity Definitions (the nodes of a process model, which become Activity Instances when the process model is executed) and Transitions (the connections between Activity Definitions). The generic entity handling functions defined above can be applied to modify the contents of a process model. A standard set of such entities, which is obtained from the WfMC Process Definition Specification document is described in the next section

11.3.1 WMOpenWorkflowDefinition

NAME

WMOpenWorkflowDefinition - Prepares for editing of workflow definition entities (i.e., on the Enactment Service scope level).

DESCRIPTION

This command tell the Enactment Service to prepare for editing of workflow definition entities it controls. This is the starting point for getting all of the entities that compose workflow definitions. This entity will form the scoping entity for most of the requests for further entities controled by the Enactment Service.

```
WMTErrRetType WMOpenWorkflowDefinition (
        in      WMTPSessionHandle       psession_handle,
        in      WMTText                 name(NAME_STRING_SIZE)
        in      WMTText                 scope(NAME_STRING_SIZE)
        out     WMTPEntity              workflow_definition_handle
        )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
Name	Identifier of the editing context
Scope	Scope of editing context
Workflow_definition_handle	Handle of the entity representing the workflow editing context. This entity will be used as scoping entity for subsequent editing on entities owned by the Enactment Service. The entity has type 'workflow definition', name taken from the second input parameter, and no additional attributes.

ERROR RETURN VALUE

WM_SUCCESS

11.3.2 WMCloseWorkflowDefinition

NAME

WMCloseWorkflowDefinition - Allows the system to free up any resources that are maintained to handle requests for entities within theEnactment Service.

DESCRIPTION

```
WMTErrRetType WMCloseWorkflowDefinition(
        in  WMTPSessionHandle  psession_handle,
        in  WMTPEntity         workflow_definition_handle
        )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
Workflow_definition_handle	Pointer to an entity structure which represents the contents of the Enactnemtn Service. It is assumed that all entities within the scope of this context become inaccessible once the workflow definition is closed.

ERROR RETURN VALUE

WM_SUCCESS

11.3.3 WMCreateProcessDefinition

NAME

WMCreateProcessDefinition - creates a new process definition

DESCRIPTION

Creates an entity for a new empty process definition within the system. The empty process definition can then have entities created within it.

```
WMTErrRetType WMCreateProcessDefinition(
        in  WMTPSessionHandle  psession_handle,
        out WMTPProcDefID  pproc_def_id
        )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
pproc_def_id	Pointer to the new process definition id for the process definition to create.

ERROR RETURN VALUE

WM_SUCCESS

11.3.4 WMDeleteProcessDefinition

NAME

WMDeleteProcessDefinition - deletes a process definition

DESCRIPTION

DELETES a process definition from the scope defined by the current session.

```
WMTErrRetType WMDeleteProcessDefinition(
        in  WMTPSessionHandle  psession_handle,
        in  WMTPProcDefID  pproc_def_id
        )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
pproc_def_id	Pointer to the process definition to be deleted

ERROR RETURN VALUE

WM_SUCCESS

11.3.5 WMOpenProcessDefinition

NAME

WMOpenProcessDefinition - Prepares for editing of a process model.

DESCRIPTION

This command tell the Enactment Service to prepare for editing of the specified process model. This is the starting point for getting all of the entities that compose the process definition itself. This entity will form the scoping entity for most of the requests for further entities within the process definition.

```
WMTErrRetType WMOpenProcessDefinition (
        in      WMTPSessionHandle       psession_handle,
        in      WMTPProcDefinition      proc_definition
        out     WMTPEntity              proc_model_handle
        )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
proc_definition	Process Definition to be edited
proc_model_handle	Handle of the entity representing the process model. This entity will be used as scoping entity for subsequent editing on the process definition

ERROR RETURN VALUE

WM_SUCCESS

11.3.6 WMCloseProcessDefinition

NAME

WMCloseProcessDefinition - Allows the system to free up any resources that are maintained to handle requests for entities within the process definition.

DESCRIPTION

```
WMTErrRetType WMCloseProcessDefinition(
        in  WMTPSessionHandle  psession_handle,
        in  WMTPEntity proc_model_handle
        )
```

Argument	Description
Psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
proc_model_handle	Pointer to an entity structure which represents the contents of the process definition. It is assumed that all entities within the scope of this process definition become inaccessible once the process definition is closed.

ERROR RETURN VALUE

WM_SUCCESS

11.4 Standard Process Modelling Entity Types

The following describes the standard entity types that should be supported by every Workflow Engine and their respective attributes (mandatory and optional); specific implementations may have additional types and additional attributes for each type. The types are ProcessDefinition, ActivityDefinition, Transition, Participant, Application and ProcessData. The entity types and their attributes are taken from the WfMC specification of the Process Definition Interface, which describes the Workflow Process Definition Language (WPDL); please refer to this document for further details. Some changes have been made to adjust the attribute names used by WPDL to those used in the Workflow Client Application Interface specification.

11.4.1 Additional Data Types

```
typedef struct
{
        WMTText         name[NAME_STRING_SIZE];
}WMTName;

typedef struct
{
        WMTText         date[NAME_STRING_SIZE];
}WMTDate;

typedef struct
{
        WMTInt32        duration;
}WMTDuration;

typedef struct
{
        WMTInt32        cost;
}WMTCost;

typedef struct
{
        WMTText         documentation[1024];
}WMTDocumentation;
```

```
typedef struct
{
       WMTText        expression[256];
}WMTCondExpression;   // Condition expresson. To be refined using expression grammmar

typedef struct
{
       WMTText        expression[256];
}WMTPartExpression;   // Participant expresson. To be refined using expression grammmar

typedef struct
{
       WMTText        expression[256];
}WMTApplicationSpec;  // Application identification. To be refined...
```

Attribute structure used by ProcessData entity type to define complex data structures; attribute value might hold ProcessDataID if type is COMPLEX, default value otherwise.

```
typedef struct
{
       WMTText        attribute_name[NAME_STRING_SIZE];
       WMTInt32       attribute_type;              // type of the attribute
       WMTInt32       attribute_length;            // length of the attribute value
       WMTPText       pattribute_value;            // pointer to the attribute value
}WMTAttribute;
```

11.4.1.1 WMAddTransition

NAME

WMAddTransition - Adds a transition definition to a process model.

DESCRIPTION

This command will return a transition definition entity owned by the process definition that is passed as second parameter, connecting the activity definition entities passed as third and fourth parameter.

```
WMTErrRetType WMAddTransition (
       in  WMTPSessionHandle  psession_handle,
       in  WMTPProcModelID    pproc_model_id,
       in  WMTPActDefID       psource_act_def_id,
       in  WMTPActDefID       ptarget_act_def_id,
       out WMTPEntity         entity_handle
       )
```

Argument	Description
psession_handle	Pointer to the structure with the session information created by a call to WMConnect.
pproc_model_id	Pointer to the process model owning the new transition
psource_act_def_id	Pointer to the source activity definition of the transition
ptarget_act_def_id	Pointer to the target activity definition of the transition
entity_handle	Pointer to a buffer which will receive the structure which represents a transition

ERROR RETURN VALUE

WM_SUCCESS

11.4.1.2 WMAddProcessDataAttribute

NAME

WMAddProcessDataAttribute - Adds an attribute to the list of attributes that define the data structure.

DESCRIPTION

```
WMTErrRetType WMAddProcessDataAttribute (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcModID pproc_model_id,
                    in  WMTPProcDataID pproc_data_id,
                    in  WMTPAttrName pattribute_name,
                    in  WMTInt32 attribute_type,
                    in  WMTInt32 attribute_length,
                    in  WMTPText pattribute_value)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_model_id	Pointer to a structure containing the process model entity ID.
pproc_data_id	Pointer to a structure containing the process data definition identification for which the attribute will be assigned.
pattribute_name	Pointer to the name of the attribute.
attribute_type	Type of the attribute.
attribute_length	Length of the attribute value.
pattribute_value	Pointer to a buffer area provided by the client application where the attribute value will be placed. Can be identifier of another process data entity.

ERROR RETURN VALUE

WM_SUCCESS

11.4.1.3 WMRemoveProcessDataAttribute

NAME

WMRemoveProcessDataAttribute - Removes an attribute from the list of attributes that define the data structure.

DESCRIPTION

```
WMTErrRetType WMRemoveProcessDataAttribute (
                    in  WMTPSessionHandle psession_handle,
                    in  WMTPProcModID pproc_model_id,
                    in  WMTPProcDataID pproc_data_id,
                    in  WMTPAttrName pattribute_name)
```

Argument Name	Description
psession_handle	Pointer to a structure containing information about the context for this action.
pproc_model_id	Pointer to a structure containing the process model entity ID.
pproc_data_id	Pointer to a structure containing the process data definition identification for which the attribute will be assigned.
pattribute_name	Pointer to the name of the attribute. Must be uique within the data structure.

ERROR RETURN VALUE

WM_SUCCESS

12. Appendix G: States

The following describes above a set of standard valid states for each of the major workflow objects defined in this document. States are organized into several levels of granularity, lower level states refining higher-level ones. An implementation of the Enactment Service might choose to support states on any level of granularity, omit states and add additional states to the list defined below. A state for a particular workflow object can be identified by its name only or by specifying its full name including its super-state parents using dot notation; for examples see the section on Process Instance states below.

12.1 Process Instance States

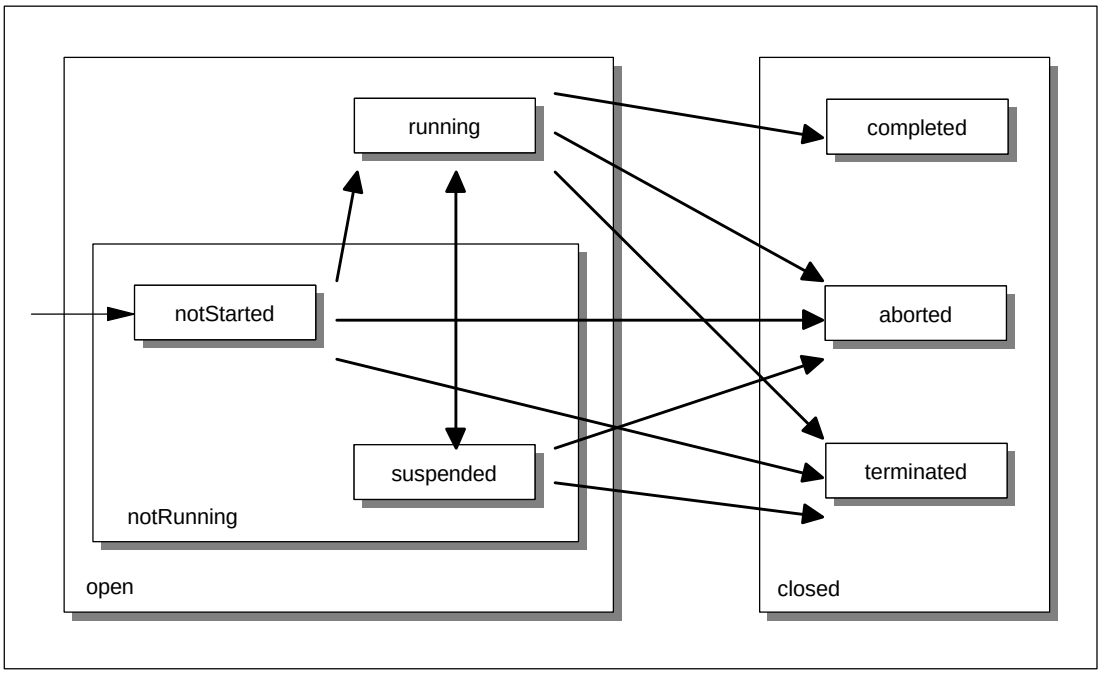
The top level of states for a Process Instance distinguishes two states, *open* and *closed*. The open state has two sub-states, *running* and *notRunning*; notRunning in turn has two sub-states, *notStarted* and *suspended.* The following list describes the states in detail:

- ***open*** - the Process Instance is being enacted
- ***open.running*** - the Process Instance is executing
- ***open.notRunning*** - the Process Instance is temporarily not executing
- ***open.notRunning.notStarted*** - the Process Instance has been created, but was not started yet
- ***open.notRunning.suspended*** - execution of the Process Instance was temporarily suspended
- ***closed*** - enactment of the Process Instance has been finished
- ***closed.aborted*** - enactment of the Process Instance has been aborted by a user (see the specification of WMAbortProcessInstance for a definition of abortion in contrast to termination)
- ***closed.terminated*** - enactment of the Process Instance has been terminated by a user (see the specification of WMTerminateProcessInstance for a definition of termination in contrast to abortion)
- ***closed.completed*** - enactment of the Process Instance has completed normally (i.e., was not forced by a user)

An implementation might decide to support refinement of states to a certain level only or omit certain states; valid sets of states include for example:

- *open* and *closed*
- *notRunning*, *running* and *closed*
- *notStarted*, *running*, *completed* and *terminated*
- ...

The following diagram shows the states and potential state-transitions; transitions are shown for the bottom-level states only, transitions between the higher-level states can be deduced from that easily; e.g., there is a transition from *open* to *closed* or from *notRunning* to *running*, but no transition backwards in both cases.



Here is a short discussion of the various state-transitions:

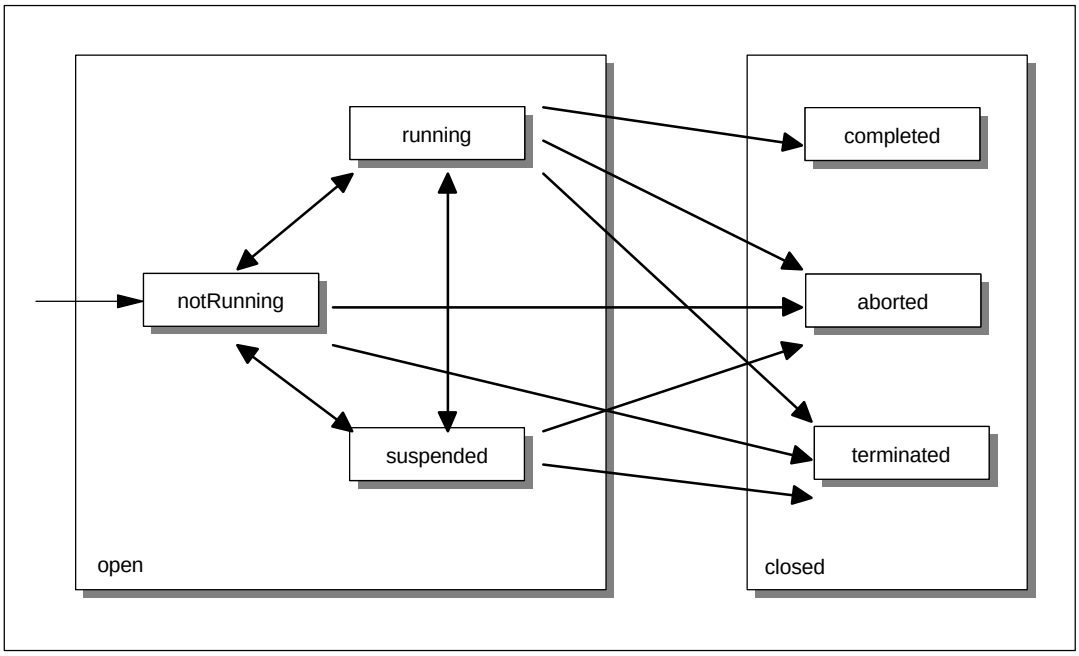
- When a Process Instance is created it will take its intial state, which is *open.notRunning.notStarted* (or just *open*, or *open.notRunning* depending on the level of granularity supported)
- Transitions can be made from *notRunning* states to the *running* state; transitions from the *running* to the *notRunning* super-state can be made to the *suspended* sub-state only.
- When enactment of a Process Instance is finished, its state will take one of the flavours of the *closed* state, depending on the way of ending enactment (normally *completed*, *terminated* or *aborted*). The *completed* state can only be reached from the *running* state since it represents normal completion of the Process Instance; the other *closed* sub-states are reached via the WMAbrtProcessInstance or WMTerminateProcessInstance operations.
- The *closed* state is a final state, i.e., there is no transition from a *closed* state to an *open* state.

12.2 Activity Instance States

The top level of states for an Activity Instance distinguishes two states, *open* and *closed*. The open state has three sub-states, *running, notRunning*; and *suspended.* The following list describes the states in detail:

- ***open*** - the Activity Instance is active
- ***open.running*** - the Activity Instance is executing
- ***open.notRunning*** - the Activity Instance is ready, but has not been started yet
- ***open..suspended*** - execution of the Activity Instance was temporarily suspended
- ***closed*** - enactment of the Activity Instance has been finished
- ***closed.aborted*** - enactment of the Activity Instance has been aborted, probably due to abortion of the owning Process Instance (see the specification of WMAbortProcessInstance for a definition of abortion in contrast to termination)
- ***closed.terminated*** - enactment of the Activity Instance has been terminated , probably due to termination of the owning process instance (see the specification of WMTerminateProcessInstance for a definition of termination in contrast to abortion)
- ***closed.completed*** - enactment of the Activity Instance has completed normally (i.e., was not forced by a user or by a state change of its owning Process Instance)

The following diagram shows the states and potential state-transitions; transitions are shown for the bottom-level states only, transitions between the higher-level states can be deduced from that easily.



Here is a short discussion of the various state-transitions:

- When an Activity Instance is created it will take its intial state, which is *open.notRunning*
- Transitions between the *notRunning* and the *suspended* states are in general initiated by the Enactment Service, triggered by a corresponding state change of the owning Process Instance; they could also be triggered via the WMChangeActivityInstanceState operation.
- Transitions between the *notRunning* and the *running* state might be initated by the Application Client user via the WMGetWorkitem operation, but this is up to the specific Enactment Service; otherwise the transition is either initiated by the Enactment Service or by the Application Client user via the WMChangeWorkitemState or WMChangeActivityState operation.
- Transitions between the r*unning* and the *suspended* state are in general initiated by the Enactment Service as a result of a corresponding state change of the owning Process Instance; an Enactment service might allow this transition to be performed as a result of the WMChangeWorkitemState or via the WMChangeActivityInstanceState operation also.
- When enactment of an Activity Instance is finished it's state will take one of the flavours of the *closed* state, depending on the way of ending enactment (normally *completed*, *terminated* or *aborted*). The *completed* state can only be reached from the *running* state since it represents normal completion of the Activity Instance.
- The *closed* state is a final state, i.e., there is no transition from a *closed* state to an *open* state.

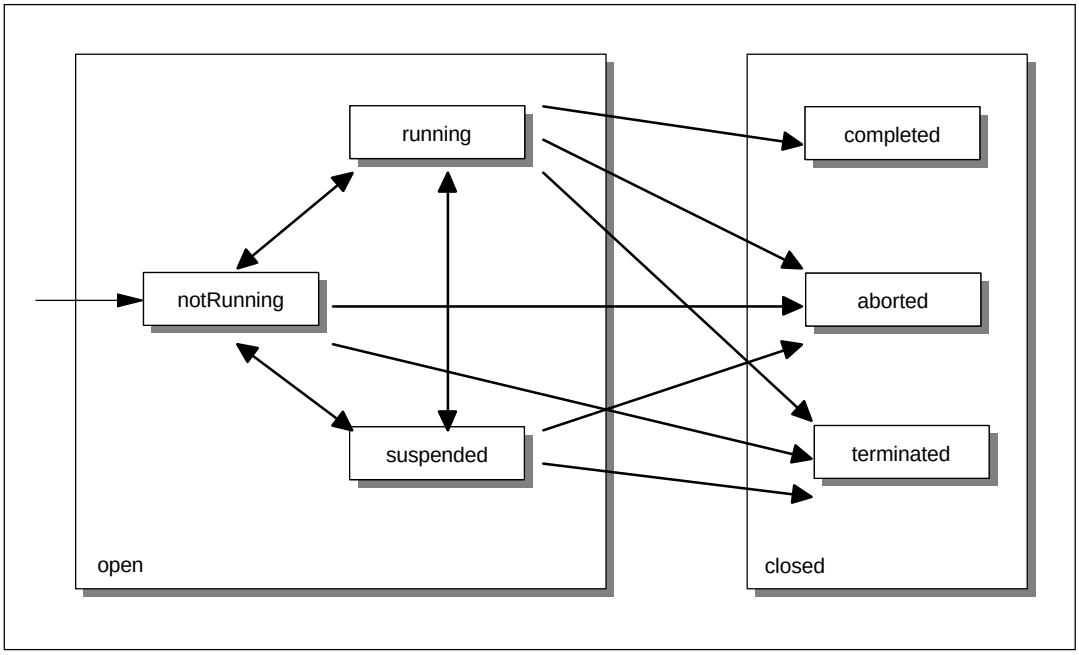
12.3 Workitem States

The top level of states for a Workitem distinguishes two states, *open* and *closed*. The open state has three sub-states, *running, notRunning*; and *suspended.* The following list describes the states in detail:

- ***open*** - the Workitem is active
- ***open.running*** - the Workitem is executing
- ***open.notRunning*** - the Workitem is assigned to a participant, but has not been started yet
- ***open..suspended*** - execution of the Workitem was temporarily suspended
- ***closed*** - enactment of the Workitem has been finished
- ***closed.aborted*** - enactment of the Workitem has been aborted, probably due to abortion of the owning Process Instance (see the specification of WMAbortProcessInstance for a definition of abortion in contrast to termination)

- ***closed.terminated*** - enactment of the Workitem has been terminated , probably due to termination of the owning process instance (see the specification of WMTerminateProcessInstance for a definition of termination in contrast to abortion)
- ***closed.completed*** - enactment of the Workitem has completed normally (i.e., was not forced by a user or by a state change of its owning Process Instance)

The following diagram shows the states and potential state-transitions; transitions are shown for the bottom-level states only, transitions between the higher-level states can be deduced from that easily.



Here is a short discussion of the various state-transitions:

- When an Workitem is created it will take its intial state, which is *open.notRunning*
- Transitions between the *notRunning* and the *suspended* state are in general initiated by the Enactment Service as a result of a corresponding state change of the owning Process Instance; an Enactment service might decide to allow this transition to be performed via the WMChangeWorkitemState operation also.
- Transitions between the *notRunning* and the *running* state might be initated by the Application Client user via the WMGetWorkitem operation, but this is up to the specific Enactment Service; otherwise the transition is either initiated by the Enactment Service or by the Application Client user via the WMChangeWorkitemState operation or as a result of a WMChangeActivityInstanceState on the associated Activity Instance.
- Transitions between the r*unning* and the *suspended* state are in general initiated by the Enactment Service as a result of a corresponding state change of the owning Process Instance; an Enactment service might decide to allow this transition to be performed via the WMChangeWorkitemState operation also.
- When enactment of an Workitem is finished it's state will take one of the flavours of the *closed* state, depending on the way of ending enactment (normally *completed*, *terminated* or *aborted*). The *completed* state can only be reached from the *running* state (via the WMCompleteWorkitem operation) since it represents normal completion of the Workitem.
- The *closed* state is a final state, i.e., there is no transition from a *closed* state to an *open* state.