



IBM Cúram Social Program Management

# Cúram Workflow Overview Guide

Version 6.0.4

**Note**

Before using this information and the product it supports, read the information in Notices at the back of this guide.

This edition applies to version 6.0.4 of IBM Cúram Social Program Management and all subsequent releases and modifications unless otherwise indicated in new editions.

Licensed Materials - Property of IBM

Copyright IBM Corporation 2012. All rights reserved.

US Government Users Restricted Rights - Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

© Copyright 2011 Cúram Software Limited

# Table of Contents

|   |    |
|---|----|
| Chapter 1 Introduction .....                                      | 1  |
| 1.1 Purpose .....   | 1  |
| 1.2 Audience .....  | 1  |
| 1.3 Prerequisites .....   | 1  |
| 1.4 Chapters in this Guide .....                                  | 1  |
| Chapter 2 Cúram Workflow Management System .....                  | 3  |
| 2.1 Introduction .....  | 3  |
| 2.2 When should I use the Cúram Workflow Management System? ..... | 4  |
| 2.3 The Workflow Process Definition Tool (PDT) .....              | 5  |
| 2.3.1 Workflow Data Objects .....                                 | 5  |
| 2.3.2 Method References Library .....                             | 6  |
| 2.4 Workflow Engine .....   | 6  |
| 2.5 Inbox and Task Management .....                               | 6  |
| 2.6 Workflow Administration .....                                 | 7  |
| Chapter 3 Workflow Process Definitions .....                      | 8  |
| 3.1 Introduction .....  | 8  |
| 3.2 Activities .....  | 8  |
| 3.2.1 Start Process and End Process Activities .....              | 9  |
| 3.2.2 Automatic Activities .....                                  | 9  |
| 3.2.3 Manual Activities .....                                     | 9  |
| 3.2.4 Event Wait Activities .....                                 | 10 |
| 3.2.5 Route Activities .....                                      | 10 |
| 3.2.6 Subflow Activities .....                                    | 10 |
| 3.2.7 Loop Activities .....                                       | 11 |
| 3.2.8 Decision Activities .....                                   | 11 |
| 3.2.9 Parallel Activities .....                                   | 11 |
| 3.3 Transitions .....   | 12 |
| 3.4 Workflow Data Objects .....                                   | 12 |
| 3.4.1 Context Workflow Data Objects .....                         | 13 |
| 3.5 Activity Notifications .....                                  | 13 |
| 3.6 Workflow Process Definition Design .....                      | 13 |
| 3.6.1 Considerations for Business Process Analysis .....          | 13 |
| 3.6.2 Select and Analyze the Business Process for Workflow .....  | 14 |
| 3.6.3 Identify Workflow Participants .....                        | 16 |
| 3.6.4 Design Workflow .....                                       | 16 |

|  |    |
|--|----|
| 3.6.5 Determine What Starts Workflow Process Instance .....  | 20 |
| 3.6.6 Additional Considerations .....                        | 20 |
| Chapter 4 Workflow Engine and Process Enactment .....        | 21 |
| 4.1 Workflow Engine .....                                    | 21 |
| 4.2 Process Enactment .....                                  | 22 |
| 4.2.1 Enactment from Code .....                              | 22 |
| 4.2.2 Enactment by Raising Events .....                      | 22 |
| 4.2.3 Enactment as a Subflow .....                           | 23 |
| 4.2.4 Enactment via Web Services .....                       | 23 |
| Chapter 5 Inbox and Task Management .....                    | 24 |
| 5.1 Introduction .....                                       | 24 |
| 5.2 Tasks .....  | 24 |
| 5.3 My Tasks .....   | 24 |
| 5.3.1 My Open Tasks .....                                    | 25 |
| 5.3.2 My Deferred Tasks .....                                | 25 |
| 5.4 Available Task Search .....                              | 25 |
| 5.5 Inbox Actions .....                                      | 26 |
| 5.6 Working on a Task .....                                  | 26 |
| 5.6.1 Task Home Page .....                                   | 26 |
| 5.6.2 Task History and Comments .....                        | 27 |
| 5.6.3 Task Assignments .....                                 | 27 |
| 5.6.4 Task Graphical View .....                              | 27 |
| 5.6.5 Task Actions .....                                     | 28 |
| 5.7 Task Queries .....                                       | 29 |
| 5.8 Task Search .....  | 30 |
| 5.9 My Notifications .....                                   | 30 |
| 5.10 My Work Queues .....                                    | 30 |
| 5.10.1 User Subscribed Work Queues .....                     | 30 |
| 5.10.2 Other Subscribed Work Queues .....                    | 31 |
| 5.11 Task Preferences .....                                  | 31 |
| 5.11.1 Preferred Queue and Preferred Organization Unit ..... | 31 |
| 5.11.2 Task Redirection .....                                | 31 |
| 5.11.3 Task Allocation Blocking .....                        | 31 |
| Chapter 6 Workflow Administration .....                      | 33 |
| 6.1 Introduction .....                                       | 33 |
| 6.2 Process Instances .....                                  | 33 |
| 6.2.1 Process Instance Search .....                          | 33 |
| 6.2.2 Viewing Process Instances .....                        | 34 |
| 6.2.3 Process Instance Errors .....                          | 35 |
| 6.3 Workflow Events .....                                    | 35 |
| 6.4 Work Allocation .....                                    | 36 |
| 6.4.1 Allocation Targets .....                               | 36 |
| 6.4.2 Work Queues .....                                      | 37 |
| Chapter 7 Glossary .....                                     | 38 |
| 7.1 Workflow .....   | 38 |
| 7.2 Business Process .....                                   | 38 |

|  |    |
|--|----|
| 7.3 Cúram Workflow Management System (PDT) ..... | 38 |
| 7.4 Process Definition Tool (PDT) .....          | 38 |
| 7.5 Workflow Engine .....                        | 39 |
| 7.6 Inbox .....                                  | 39 |
| 7.7 Workflow Administration .....                | 39 |
| 7.8 Process Definition .....                     | 39 |
| 7.9 Activity .....                               | 39 |
| 7.10 Transition .....                            | 39 |
| 7.11 Workflow Data Object .....                  | 40 |
| 7.12 Start and End Process Activity .....        | 40 |
| 7.13 Automatic Activity .....                    | 40 |
| 7.14 Manual Activity .....                       | 40 |
| 7.15 Event Wait Activity .....                   | 40 |
| 7.16 Route Activity .....                        | 40 |
| 7.17 Subflow Activity .....                      | 41 |
| 7.18 Loop Begin and Loop End Activities .....    | 41 |
| 7.19 Parallel Activity .....                     | 41 |
| 7.20 Process Instance .....                      | 41 |
| 7.21 Activity Instance .....                     | 41 |
| 7.22 Transition Instance .....                   | 41 |
| 7.23 Tasks .....                                 | 41 |
| 7.24 Notification .....                          | 42 |
| 7.25 Work Allocation .....                       | 42 |
| 7.26 Allocation Target .....                     | 42 |
| 7.27 Work Queues .....                           | 42 |
| 7.28 Events .....                                | 42 |
| 7.29 Organizational Objects .....                | 42 |
| Notices .....                                    | 44 |



# Chapter 1

## Introduction

### 1.1 Purpose

The purpose of this guide is to provide an overview of the Cúram workflow functionality. By reading this guide, readers will have a basic understanding of workflow concepts and specifically how these concepts are realized in the Cúram application. Readers will also have an understanding of the components of the Workflow Management System (WMS), including Process Definitions, the Workflow Process Definition Tool (PDT), the Workflow Engine, the Inbox, and Workflow Administration.

In order to best understand these concepts, the guide should be read in full.

### 1.2 Audience

This guide is intended for developers and business analysts who are responsible for the design and development of workflow processes.

### 1.3 Prerequisites

It is assumed that the reader is familiar with the basic concepts of workflow. A glossary of workflow terms is also provided to aid the reader and this should be referred to for the definition of terms not understood by the reader (see Glossary for more details).

### 1.4 Chapters in this Guide

The following list describes the chapters within this guide:

#### **Cúram Workflow Management System**

This chapter provides an overview of the components of the Cúram

Workflow Management System (WMS), namely Process Definitions and the Workflow Process Definition Tool (PDT), the Workflow Engine, the Inbox, and the Workflow Administration application. A brief overview of workflow and the benefits and costs of using workflow is also described in this chapter.

### **Workflow Processes Definitions**

This chapter describes a workflow process definition, its activity types, transitions, and notifications. It also describes how a business process may be analyzed and how a workflow process definition may be designed using the results of such an analysis.

### **Workflow Engine and Process Enactment**

This chapter describes the workflow engine and the various ways a workflow process may be enacted in the Cúram WMS.

### **Inbox and Task Management**

This chapter describes the Inbox and the functionality available in the Cúram WMS to allow users of the system to manage their workload. The various task management functions also available are also described in this chapter.

### **Workflow Administration**

This chapter provides an overview of Workflow Administration which includes the maintenance of workflow process instances and the definition and maintenance of events, work queues and allocation targets.

### **Glossary**

This chapter provides a glossary of workflow terms.



# Chapter 2

## Cúram Workflow Management System

### 2.1 Introduction

The Cúram Workflow Management System (WMS) serves two main functions. The first is to support the automation of business processes. The second is to facilitate the routing of work among individuals and departments. The main components of this system are Workflow Process Definitions, the Workflow Engine, the Inbox and Task Management, and the Workflow Administration application (which includes the Process Definition Tool, PDT). Each one of these plays a role in one or both of these functions.

The automation of a business process starts with the design of a workflow for a business process. Key decisions have to be made in order for a business process to be mapped to a workflow process definition. For example there is an expectation that there will be manual steps involved in the business process or the business process may require configuration over the lifetime of the process. The Workflow PDT is used to create the workflow process definition based on this design. Using the PDT, a workflow developer defines the workflow activities, the transitions between these activities, and the information that passes through the workflow process.

Some of the activity types available in a process definition are as follows: Manual, Automatic, Loop, Event Wait, Route, Notification and Subflow. The PDT can be used to depict the sequence of a workflow process using the above activity types. The above activities are automatically preceded with a Start Process activity and conclude with an End Process activity type by the system, followed by any transitions or looping activities in between the workflow processes.

The Workflow Engine performs the runtime execution of the workflow process definition (i.e. process enactment). As a result of enactment, a workflow process instance is created. These workflow process instances can be monitored and controlled using the Workflow Administration functions

provided in the Cúram WMS.

The routing of work among individuals and departments also starts with the workflow process definition. Certain activity types represent work that needs to be completed by an individual or department; for these activities, the workflow process definition includes a strategy for assigning this work. The Workflow Engine evaluates the allocation strategy to determine who should complete this work, creates tasks for this work, and assigns the tasks to the appropriate users, organizational objects (e.g. organization units, positions or jobs) or work queues. The Inbox provides a user with information about the tasks that they need to action. An example of such task management actions include *View Task*, *Forward Task*, add *Add Comment* to a task.

## 2.2 When should I use the Cúram Workflow Management System?

The Cúram WMS offers the following features:

- Allocation - It can handle complex allocation logic for assigning work to users.
- Consistency - It provides process automation which can improve consistency of outcomes.
- Flexibility - It provides software control over processes which enables re-design in line with changing business needs.
- Traceability - It provides a visual representation of when actions were taken, by whom and what stage a given process is at.
- Customizability - Customers can re-sequence workflows provided by the application to suit their process needs.

However, using Cúram workflow does not come for free. There are trade offs to be considered when deciding to use workflow to complete a business process. The following points must be taken into account:

- Performance - There is state maintenance overhead in enacting workflow processes.
- Atomicity - Workflows are not atomic as each step can execute within its own transaction. This makes failure in later transactions difficult to recover from.

Since workflow is specifically about the automation of business processes, the following guidelines should be considered when deciding when to use the Cúram WMS to automate specific business processes:

- Don't do any design until you have the requirements. Documented business process requirements are a pre-requisite for considering when to apply workflow.

- A workflow should be considered when a business process requires human interaction.
- A workflow should not be used if a process can be automated end-to-end with no human interaction because using workflow in this scenario provides no benefit. It does not add any consistency, customizability or traceability above straight API calls and such the process contains no steps that require allocation. Therefore, unless there is a flexibility requirement to be able to re-sequence the steps at runtime, workflow should not be considered for such scenarios.
- When presented with sequences of automatable steps in a business process, consider providing APIs for each step and composing those API calls into a single method (which can then be called from the workflow)

## 2.3 The Workflow Process Definition Tool (PDT)

The Workflow PDT is used to create workflow process definitions. The PDT also contains a library for the business methods (both Business Process Object (BPO) and entity methods) which are available for use by the workflow process definitions.

The main function of the PDT is to create workflow process definitions by defining the activities in a workflow and the transitions between them. There are various activity types to choose from when creating a process definition, each one of which performs a different function. What occurs between the activities in a workflow depends on their transitions, the conditions for these transitions, and the data that is passed between them. For further details on workflow process definitions see Chapter 3, *Workflow Process Definitions*.

The PDT comes equipped with a visualization tool which allows the workflow developer to view a version of the workflow process definition.

The PDT will also validate workflow process definitions before the workflow developer releases them. It will check the process definition against a series of validations and report any errors for the workflow process on the whole, for activities, or for transitions. These validations assist a developer in producing a valid and well formed workflow.

### 2.3.1 Workflow Data Objects

Workflow Data Objects (WDOs) are the set of variables that transport data between activities in a workflow process. WDOs are mapped to activities in order to define the parameters for business processes which are called by the activity. For example, if information regarding a case and its owner is needed to perform an activity, a WDO can be mapped to that activity. This WDO would include two attributes: one for the case identifier and the other for the case owner.

WDOs must be added to a workflow process definition so that they can be

mapped to the activities. Templates can be created for WDOs that are used in a number of workflow process definitions, e.g., a template can be created for the case identifier. This eliminates the need to manually add the same WDOs to every workflow process definition.

### 2.3.2 Method References Library

The Method References Library contains references to all the BPO and entity methods from the application codebase which are available for use by the PDT when creating workflow process definitions. For example, a business method that is required to be executed by an automatic activity in a workflow process first needs to be added to this library before it may be selected for use in the PDT. The same rule applies to those methods used as allocation functions or deadline handler functions in a process definition.

## 2.4 Workflow Engine

The Workflow Engine manages the process instance lifecycle, executing activity instances and evaluating transition rules. During the process instance lifecycle, the Workflow Engine will continue to respond to events, such as the completion of a task, which tell it to resume the execution of a process instance. The Workflow Engine creates tasks instructing users on the work that needs to be completed manually, and evaluates the allocation strategy to determine which users should be assigned these tasks. The Workflow Engine also creates notifications for users to inform them of the progress or status of a workflow process instance.

The Workflow Engine manages each process instance until the end process activity for that instance is reached. The execution of this activity indicates the completion of the process instance. If the workflow process instance fails, the workflow engine will record information about the failure. A workflow administrator can then use this information to retry the workflow process instance from the failure point.

For further details on the Workflow Engine see Chapter 4, *Workflow Engine and Process Enactment*.

## 2.5 Inbox and Task Management

Tasks are used to assign and track the manual work of users in the application. The Workflow Engine creates tasks to complete manual activities and assigns these tasks to users based on an allocation strategy. Task deadline strategies can also be created to ensure that the task is actioned by a user and completed by that user in a timely fashion. These deadline strategies can be defined to deal with any tasks that exceed defined deadlines.

All the users in the application manage their task loads from the Inbox. The Inbox provides views to allow users to see the tasks they are currently working on (*My Tasks*) and tasks that are available to them to work on (*Available*

*Tasks*). Notifications (pieces of information that may be of interest to a user or set of users) are also presented to the user via their Inbox. Users may also create and run task queries to better filter the tasks that are available to them to work on. Users may also subscribe to work queues and retrieve tasks to work on from work queues in the Inbox.

The Task Management system also provides functions to allow users to manage individual tasks. Example of such functions include forwarding a task, reallocating a task and changing the amount of time worked on a task. Chapter 5, *Inbox and Task Management* provides more details on the Inbox and Task Management area of the Cúram Workflow Management System.

## 2.6 Workflow Administration

The Workflow Engine creates new process instances each time a workflow process definition is enacted in the application. The Workflow Administration functionality enables an administrator to monitor and control these process instances. An administrator may search for process instances based on details of the process definition used to create that instance, the tasks related to a process instance or by the events that the activity instances contained within the process instance are waiting on.

The details of a process instance may also be viewed. The details include a graphical view of the process instance which displays all of the activities in the associated process definition as well as highlighting those that have actually been executed (i.e. the path through the process). Details of the data used in that process instance as well as the data for each activity instance within the process instance is also available here for examination by an administrator.

The state of a process instance may also be managed as functions available to suspend a process instance, resume a process instance or indeed abort a process instance. Errors may also occur during the lifecycle of a process instance and these are also displayed here. An administrator may view the details of the error and based on this information may retry or discard the associated error.

Manual and decision activities both have allocation strategies which determine the users who will be assigned to the tasks created by the Workflow Engine for these activity types. Workflow allocation targets are one type of allocation strategy that can be used for this purpose and the creation and maintenance of these targets are managed here. Events are raised by application functions and the Workflow Engine uses them to transition workflows which are waiting on those events. These are also created and maintained by the available Workflow Administration functions.

Further details on the available administration functions are available in Chapter 6, *Workflow Administration*.

# Chapter 3

## Workflow Process Definitions

### 3.1 Introduction

A workflow process is enacted at runtime based on a workflow process definition. A workflow process definition describes the flow of a business process in terms understood by the Cúram Workflow Engine. It defines the activities in the workflow and the transitions between them. It also defines the data that is passed into and out of an activity during the execution of a workflow process instance.

Business processes that have to be fully or partially automated will have workflow process definition requirements. Depending on the type of processing the workflow may contain various different types of activities. For example where manual steps are required a task needs to be generated to represent this piece of work, therefore the workflow process definition must contain a manual activity. Some business processes can be very complex and require a combination of different activity types that need to be executed in a specific sequence. The workflow process definition allows the designer to define the path between activities using transitions. The metadata associated with a process definition is described in more detail in the *Process Definition Metadata* chapter of the *Cúram Workflow Reference Guide*.

The main components of a process definition (activities, transitions, workflow data objects and notifications) are described in more detail in the following sections.

### 3.2 Activities

An activity in a workflow process definition defines a discrete piece of work that must be completed before a workflow process can progress. There are a number of different types of activities each of which is described below.

### 3.2.1 Start Process and End Process Activities

All workflow process definitions have a start and end activity which are automatically added by the PDT when a new workflow process definition is created. When a workflow is enacted, the transitions from the start activity are the first components to be evaluated. A workflow is completed when the transitions to the end activity are evaluated and the end process activity is executed. These activities are described in more detail in the *Base Activity* chapter of the *Cúram Workflow Reference Guide*.

Start activities must have at least one outgoing transition but no incoming transition. End activities must have at least one incoming transition but no outgoing transition.

### 3.2.2 Automatic Activities

Automatic activities are steps in a workflow that are executed without any human intervention. When a step in a business process needs to be executed by the system, the workflow that represents that business process requires an automatic activity.

An automatic activity invokes a method of any BPO or entity method. Its definition specifies the fully qualified name of the method to call, which parameters to pass to it, and what results to retrieve from it. Input mappings specify which workflow data should be passed as parameters to the business process. Output mappings are used to map data calculated, retrieved, and/or modified by the method back into the workflow data. It can then be used anywhere in the remainder of the process, e.g., the data can be used in the following activities or transitions.

The metadata associated with automatic activities is described in the *Automatic* chapter of the *Cúram Workflow Reference Guide*.

### 3.2.3 Manual Activities

When a business process requires manual steps, manual activities are required. The presence of a manual activity in a process definition ensures that a task is created by the Workflow Engine when that activity is executed. An allocation strategy is used to decide the appropriate user or group of users to assign the task to so that it may be actioned.

The task created describes the work to be performed and provides links to the pages in the application where the work can be carried out. A manual activity also specifies an event which will be used to signify that the work required for the manual activity has been completed. The Workflow Engine waits for this event to be raised. Once the event is raised, the activity is completed and the workflow proceeds to the next activity in the business process.

Time sensitive work requires a deadline handler to be set up. This can also

be done on a manual activity. A deadline handler specifies what should happen if the activity is not completed within a given amount of time.

The metadata associated with manual activities is described in the *Manual* chapter of the *Cúram Workflow Reference Guide*.

### 3.2.4 Event Wait Activities

When a business process is required to wait for any specified reason (i.e. some information is required before the next step of the process may proceed), then an event wait activity is required. An event wait activity is similar to a manual activity in that it specifies an event which the Workflow Engine waits for to signify that the activity has been completed. Event wait activities, however, do not create tasks for users. Once the specified event has been raised in the application, the Workflow Engine completes the event wait activity and proceeds to transition to the next activity in the process definition.

The metadata associated with event wait activities is described in the *Event Wait* chapter of the *Cúram Workflow Reference Guide*.

### 3.2.5 Route Activities

A route activity is an activity that performs no business functionality and its execution does not affect the application data nor the business process in any way. The primary purpose of the route activity is to assist in flow control. Route activities are often used as branch (split) and synchronization (join) points. They are also useful when the activities required by a business process do not naturally form a valid block structure that the workflow engine can execute.

Since all activity types can have notifications associated with them, route activities can be used to provide the effect of a pure notification that is not connected to any other functionality.

The metadata associated with route activities is described in the *Base Activity* chapter of the *Cúram Workflow Reference Guide*.

### 3.2.6 Subflow Activities

When designing a complex business process it may become too large to manage as one monolithic process definition. A sub-flow activity allows another process definition to be enacted as part of another process. To enact a process as a subflow, the subflow activity must identify the process that will be enacted by name. As with the other process enactment mechanisms, the latest released version of the process is the one that will be enacted.

Subflows can be enacted synchronously. This means that the branch of the parent workflow containing the subflow activity that started the subflow process waits for that subflow process to finish before continuing. Alternatively, a subflow may be enacted asynchronously. This means that once the



subflow activity starts the subflow process, the branch containing that subflow activity continues immediately with the outcome of the subflow process having no effect on the parent process.

The metadata associated with subflow activities is described in the *Subflow* chapter of the *Cúram Workflow Reference Guide*.

### 3.2.7 Loop Activities

Where a business requirement exists to carry out a piece of processing multiple times a loop activity may be used. The boundaries of a loop are defined by a Loop Begin and Loop End activity. The type of iteration and number of iterations depend on the loop type and conditions set for that loop. An example of loop types are *while* and *do/while*.

The Loop Begin activity is a control activity which specifies the loop type and the conditions under which the loop should reiterate or stop executing. The loop type indicates whether the conditions attached to the loop are evaluated up front (*while*) or after a full iteration of the loop (*do/while* or loop back). If the type is *while*, the conditions are checked before the first iteration of the loop. If they evaluate to `true`, then the loop doesn't have to go through an iteration. Otherwise, the loop will go through at least one iteration before the loop exit conditions are checked.

The metadata associated with loop activities is described in the *Loop Begin and Loop End* chapter of the *Cúram Workflow Reference Guide*.

### 3.2.8 Decision Activities

When a business process requires a user to make a decision on what should happen next (e.g. by answering a specific question ) the workflow process definition should contain a decision activity. A decision activity is an activity that asks a human user a question and allows the user to choose the answer from a list of presented options or alternatively enter a piece of free form text. It defines a task with one action which is a generic action that allows a user to answer a question. The format of the question with the answer options can either be multiple choice, which provides the user with options to select from, or else free form text, which provides the user with a text box to enter the answer in.

Decision activities contain an allocation strategy which defines the user or group of users assigned to the task of reaching a decision. Decision activities may also have a deadline strategy which defines what happens if an assigned user does not answer the question within a given time period.

The metadata associated with decision activities is described in the *Decision* chapter of the *Cúram Workflow Reference Guide*.

### 3.2.9 Parallel Activities

A parallel activity acts as a wrapper around certain activities. The effect of

using a parallel activity at runtime is that multiple instances of the wrapped activity are executed in parallel. To date, the only supported types of wrapped activity are *Manual* and *Decision* activities. Therefore, executing a parallel activity currently equates to the creation and allocation of multiple tasks in parallel.

A list workflow data object must be associated with a parallel activity. The number of items in this list workflow data object will determine the number of instances of the wrapped activity that will be created by the workflow engine.

The metadata associated with parallel activities is described in the *Parallel* chapter of the *Cúram Workflow Reference Guide*.

### 3.3 Transitions

To link the various types of activity together in a workflow process, transitions are used. Their primary function is to dictate the order in which activities are executed. There are three types of transitions in a process definition. They determine how branch points and synchronization points relate to each other. Branch points can be of type *XOR* (Choice) or *AND* (Parallel). Corresponding branch and synchronization points must be of the same type. A branch point of type *XOR* indicates that the first transition that can be followed will be. A branch point of type *AND* indicates that all transitions that can be followed will be.

Transitions can optionally have a condition to decide whether or not a given transition will be followed. A condition is a list of expressions that perform logical operations.

The metadata associated with transitions is described in the *Transitions* chapter of the *Cúram Workflow Reference Guide*.

### 3.4 Workflow Data Objects

Data is maintained and passed around in the workflow engine as workflow data objects and list workflow data objects. These are logical objects defined in the process definition that have a name and a list of attributes of various types to which data can be assigned. They are conceptually similar to objects in programming languages although their manifestation in the workflow system is of course quite different. Workflow data object values may be written at process enactment or from the output of various activity types.

Workflow data object instances and list workflow data object instances exist as soon as the process is enacted and exist until the process completes. As such they are available to be used in the activities and the transitions throughout the lifetime of that process instance. It is therefore the responsibility of the process designer to ensure that attributes of workflow data objects are populated before they are used. Attempts to use workflow data ob-

ject attributes before they are populated will result in failures at runtime.

### 3.4.1 Context Workflow Data Objects

Context workflow data objects are those that are not explicitly defined in the workflow process definition metadata but are made available by the PDT and workflow engine at various places during the execution of a process. Examples include the `Context_RuntimeInformation` WDO which is made available and maintained by the workflow engine, the `Context_Task` WDO which is made available for use in various mappings associated with a *Manual* activity and the `Context_Loop` WDO which is made available for use in some of the mappings associated with a *Loop* activity.

The metadata associated with workflow data objects and all of the available context workflow data objects is described in the *Workflow Data Objects* chapter of the *Cúram Workflow Reference Guide*.

## 3.5 Activity Notifications

A notification is simply information that is sent to a user when a step in the process executes. Notifications manifest themselves as alerts in a user's *Inbox* or as emails. The users to which the notification must be sent are determined by the allocation strategy specified for the notification. The details that are displayed to the user in the alert or email are specified as part of the activity in the workflow process definition.

Notifications can be attached to any activity in a workflow process definition. The notification is created and sent using the specified delivery mechanism when the Workflow Engine executes the activity containing the notification.

The metadata associated with activity notifications is described in the *Activity Notifications* chapter of the *Cúram Workflow Reference Guide*.

## 3.6 Workflow Process Definition Design

Now that the main components of a workflow process definition have been outlined, the following sections give a brief overview of how a simple business process may be analyzed and converted into a workflow process definition and the main considerations that should be taken into account when doing this.

### 3.6.1 Considerations for Business Process Analysis

It is the role of a workflow designer to analyze a business process in order to determine and specify the workflow process contained within it.

When analyzing a business process, the following considerations should be

made:

**Identify the intrinsic steps to the business process**

These are the steps that are mandatory for the business process to succeed. If the workflow is to contain these steps, then additional considerations must be taken into account as described below.

**Consider data integrity and traceability**

Data passed through the workflow needs to be kept intact and there needs to be traceability for that data, i.e., the ability to determine how the data has changed as it has moved through the workflow. This may include the traceability of data through other integrated systems.

**Determine if there are alternative ways to complete intrinsic steps that fail**

It is very important to determine if there are alternative ways to complete any intrinsic steps that fail, either manual, or through some other automatic work around. If there is no way to complete an intrinsic step, should it fail, then it should not be included in the workflow.

**Determine the steps in the business process likely to be altered**

Steps likely to be altered in a business process are potential candidates for the workflow. The workflow is an easily configurable mechanism for handling activities. Whenever the steps in the business process need to be changed, the activities can be re-ordered or removed as necessary.

**Identify non divisible tasks**

There may be two or more steps in a business process which cannot be divided. For example, part of a business process might involve writing a person's social security number to one system and his or her salary details on different tables. These may be seen as two steps in the business process; however, they are non divisible tasks, i.e., one is invalid without the other. Non divisible tasks should not be in a workflow unless they can be combined into one activity.

**Determine if step involves a notification**

A notification may be added to any activity type in a workflow process definition. The notification will be delivered when the activity is executed by the workflow engine.

**Determine if step involves a piece of work to be carried out by a user**

A manual activity must be created for work that is carried out by a user.

**Identify Data Required**

This includes the type of data required and what it is used for.

Once these considerations have been taken into account, the workflow designer should be ready to design the workflow for the business process.

### 3.6.2 Select and Analyze the Business Process for Workflow

The first step in workflow design is to select and analyze the business pro-

cess by taking into account the considerations listed above, as well as any other additional considerations the organization defines for its workflow designers. An example of a business process that will be used to demonstrate how this might be done is the *Close Case* business process.

At a high level, the Close Case business process closes a case and the case's associated records, including its case reviews, case referrals, and open case events. A closure communication is printed for the service supplier(s) for any case referrals. A closure communication is also printed for the primary client on the case. The case identifier (caseID) of the case being closed is required data to perform this business process.

At a lower level, this business process starts off with a series of steps which include checking case security and validations, updating the case header status to closed, setting the case status end date to the current date. There are then three new records inserted: a case status record, a case closure record, and a case event record. All of these steps can be identified as intrinsic to the Close Case business process. Note, however, without any one of these steps, either the data integrity for the case is compromised or the traceability of the attempt to close the case would be incomplete. As all of these steps are required and would be difficult to implement should the workflow fail, these steps should therefore not be moved to the workflow process.

The next step in the Close Case business process example is the reassessment of the case. This identifies any over or under payments, and as such, is intrinsic to the business process, as the case should not be closed if any over or under payments are found. Thus, the step should not be included in the workflow.

If the reassessment results in an over or under payment, the case owner is notified of the over or under payment, provided the case owner is not the user who is closing the case. As this step involves a notification based on a condition, this step may be configurable as part of the close case workflow.

If reassessment does not result in an over or under payment, the close case process continues. The system checks if there are any active case reviews and cancels them while notifying the case reviewers. The system checks if there are case reactivation events on the case and closes these events. The system checks if there are any active case referrals, it cancels them, and generates a communication to the service supplier(s) impacted by the canceled referrals. The system also prints a closure communication for the primary client of the case. All of these steps can be part of the workflow, and where relevant, notifications can be defined.

Note that the communications for the service supplier(s) and the closure communication for the primary client need to be manually put in an envelope and sent to the communication recipients. This is an additional step that might need to be added to the close case business process and would require a manual activity.

The final step in the close case business process is to determine if the case owner needs to be notified that the case is closed. This is only done if the user closing the case is not the case owner. This step can also be put into the

workflow and the relevant notification defined.

In summary, there appears to be seven steps to be included in the workflow. A number of these steps will require notifications. Additionally, case and re-assessment data are required.

### 3.6.3 Identify Workflow Participants

Participants can play various roles in the completion of a workflow. For example, an activity can require that information is passed to a certain user. An important aspect of business process automation is the capability to manage the assignment of work to the resources required to perform the work. Manual activities can, for example, be assigned to users (or groups of users) that contribute to the execution of that activity. Decision activities can be assigned to the user(s) responsible for answering a particular question.

Identifying workflow participants is helpful in determining the users that may be the targets of activities and activity notifications. Also, it may be necessary to communicate with participants who are not users as part of the workflow. Identifying these participants is the first step in finding ways to communicate with them as part of the workflow.

The participants in the Close Case process are identified as follows:

- User closing the case
- Case owner responsible for the case (this can be the user closing the case) - this user is notified of any over or underpayments or else notified when the case is closed
- Case reviewer(s) - these users are notified when the scheduled reviews are canceled
- Service supplier(s) - communications are created for these participants when their referrals are canceled
- Primary client - a communication is created for this participant when the case is closed
- User who sends printed communications - this includes the communications for the service supplier(s) and the primary client

### 3.6.4 Design Workflow

The main steps to designing the workflow are to list its activities (including each activity's split and join type), to define all the transitions between the activities and their conditions, and to identify the workflow data object attributes required.

List Activities and Split/Join Types

Each step in a business process that is implemented in the workflow must be related to an activity. There may be additional activities required to validate the workflow. For example, route activities may be used to ensure a workflow is well-formed.

All activities in the workflow must have an activity type, as well as a split and join type. Activities which include notifications and manual activities must have at least one participant that is the target of the notification or manual activity task. It may also be helpful to identify any other participants who play a role in an activity.

The following are the activities required for the Close Case workflow:

| Activity Number | Activity Description   | Activity Type | Participants        | Join Type      | Split Type     |
|-----------------|--|---------------|---------------------|----------------|----------------|
| 1               | Start workflow   | Start         | Not applicable      | Not applicable | Choice XOR     |
| 2               | Notify case owner case not closed                                      | Route         | Case owner          | None           | None           |
| 3               | Check case review(s) and notify reviewer(s)                            | Automatic     | Case reviewer(s)    | None           | None           |
| 4               | Check case reactivation  | Automatic     | Not applicable      | None           | None           |
| 5               | Check case referrals and create communications for service supplier(s) | Automatic     | Service supplier(s) | None           | Choice XOR     |
| 6               | Route if user closing case is case owner                               | Route         | Not applicable      | None           | None           |
| 7               | Notify case owner if case is closed                                    | Route         | Case owner          | None           | None           |
| 8               | Create communication for primary client                                | Automatic     | Primary client      | Choice XOR     | None           |
| 9               | Mail service supplier(s) and primary client communications             | Manual        | Case owner          | None           | None           |
| 10              | End workflow   | End           | Not applicable      | Choice XOR     | Not applicable |

Table 3.1 Close Case Activities

Define Transitions and Their Conditions

All activities (except for the End Process activity) must have at least one outgoing transition. This is the transition from the activity to the next activity in the process. Activities with a split type of Parallel (*AND*) or Choice (*XOR*) will have multiple transitions.

The workflow designer must define the transitions for all activities in a workflow. The conditions for these transitions must also be defined, if applicable. The Workflow Engine uses these conditions to determine the route through a workflow process.

The following are the transitions for the above Close Case activities and their conditions:

| Transition Description  | From Activity Number | To Activity Number | Transition Condition               |
|---|----------------------|--------------------|------------------------------------|
| Over or underpayment exists   | 1                    | 2                  | If OverUnderPmtInd = true          |
| Non-closure notification sent   | 2                    | 10                 |                                    |
| No over or underpayment   | 1                    | 3                  | If OverUnderPmtInd = false         |
| Case review(s) closed and reviewer(s) notified                          | 3                    | 4                  |                                    |
| Case reactivation check complete  | 4                    | 5                  |                                    |
| Case referral(s) closed and case owner IS the user closing case         | 5                    | 6                  | If caseOwner = userClosingCase     |
| Case owner does not need to be notified                                 | 6                    | 8                  |                                    |
| Case referral(s) closed and case owner is NOT the user closing the case | 5                    | 7                  | If caseOwner not = userClosingCase |
| Closure notification sent to case owner                                 | 7                    | 8                  |                                    |
| Communication created for primary client                                | 8                    | 9                  |                                    |
| Service supplier and primary client communications mailed               | 9                    | 10                 |                                    |

Table 3.2 Close Case Transitions



## Graph Design

Once the workflow designer has identified a list of activities and their transitions, the designer should create a graphical view of the workflow. This allows the workflow designer to check the validity of the design before it goes to development. The workflow designer can choose his or her preferred tool, e.g., Microsoft® Visio, to create the graph.

## Identify Workflow Data Object Attributes

In order for a workflow to be enacted successfully (and to progress), the required data must be successfully passed into the workflow process at enactment time and between activities during the lifetime of the process instance. This data is defined as WDOs for the workflow process definition and must be mapped to the appropriate activities. The following are the workflow data object attributes that are required during the course of the Close Case workflow process:

| Data Item              | Purpose   |
|------------------------|---|
| caseID                 | Required throughout the workflow to identify the case being closed  |
| overUnderPmtInd        | This is used for the transition condition to determine if the case can be closed or if the case owner must be notified that reassessment has discovered an over or under payment            |
| caseOwner              | Username of the case owner - this is used for the transition condition to determine if a case closure notification should be sent to the case owner   |
| userClosingCase        | The name of the user who initiated the Close Case business process - this is used for the transition condition to determine if a case closure notification should be sent to the case owner |
| listOfCaseReviewers    | A list of user names of case reviewers for whom notifications must be sent regarding case reviews being canceled  |
| listOfServiceSuppliers | A list of concern role names of service suppliers for whom communications must be printed and mailed regarding referrals being canceled   |

Table 3.3 Close Case Workflow Data Object Attributes

### 3.6.5 Determine What Starts Workflow Process Instance

The workflow developer must determine what starts a workflow process instance for the new workflow. This is the stage in the business process where the workflow is enacted. When designing a workflow, this will usually be the step in the business process which comes just before the first main step that has been added to the workflow.

The first main step in the workflow is determining whether or not an over or underpayment has been found as part of reassessment, and if so, notifying the case owner that the case cannot be closed.

The step before this is the reassessment of the case itself. Since reassessment has not been added as an activity to the workflow, this is a likely candidate for where in the business process the workflow should be enacted from.

In the Close Case business process, an event can be added just after reassessment which enacts a process instance of the Close Case workflow. Alternatively, the source code can be updated to directly enact the Close Case workflow.

### 3.6.6 Additional Considerations

There are additional considerations to take into account when analyzing a business process and designing a workflow. They are listed as follows:

#### **Determine if steps can be broken down into smaller steps**

This may be an alternative workaround for steps that fail. It may also be a good way to break complex activities down into smaller, less complex activities. The less complex the activity, the easier it is to complete. If the workflow fails, it is easier to undo completed activities when these activities are smaller and more manageable.

#### **Identify source code changes to support workflow**

Existing BPO methods in the application may need to be refactored to allow them to be specified in a workflow process definition. This refactoring may include the breaking down of a specified method into smaller and more discrete steps, each with a predefined, well understood function that can easily be incorporated into a workflow.

# Chapter 4

## Workflow Engine and Process Enactment

### 4.1 Workflow Engine

The Cúram WMS includes a Workflow Engine which provides the runtime execution environment for a process instance. There are various mechanisms available to enact a workflow process and these are discussed in the next section. When a process is enacted, the Workflow Engine examines specified process to enact and uses the latest released version of that process definition to create the process instance to run.

Data required to enact the specified workflow is specified by the enactment mappings in a process definition. These are mappings from struct attributes in the application to workflow data object attributes that have been marked as required for enactment. When the process is enacted, the data in the specified struct attributes is mapped to the workflow data object attributes and persisted so that it is available for use elsewhere in the workflow.

The Workflow Engine manages the process instance lifecycle, executing activity instances and evaluating transition rules. During the process instance lifecycle, the Workflow Engine will continue to respond to events, such as the completion of a task, which tell it to resume the execution of a process instance. The Workflow Engine creates tasks instructing users on the work that needs to be completed manually, and evaluates the allocation strategies to determine which users should be assigned these tasks. The Workflow Engine also creates notifications for users to inform them of the progress or status of a workflow process instance.

The Workflow Engine manages each process instance until the end process activity for that instance is reached. The execution of this activity indicates the completion of the process instance. If the workflow process instance fails, the workflow engine will record information about the failure. A workflow administrator can then use this information to retry the workflow process instance from the failure point.

## 4.2 Process Enactment

Enacting a process definition creates an instance of that process. Most process definitions require a minimum set of initial data. All enactment mechanisms must have a way to set the input data for a given process at enactment time.

Currently there are four enactment mechanisms supported by the Cúram WMS. A brief summary of each is outlined in the following sections but a more detailed technical overview may be found in the *Process Enactment* chapter of the *Cúram Workflow Reference Guide*.

### 4.2.1 Enactment from Code

The most direct way of enacting a process is by identifying a location in the application from which a process instance must be started. Code must then be inserted at that point to call the enactment service API. This API allows the developer to specify the name of the process to start and to supply the enactment data required by the process.

While enacting a process in this way is simple and intuitive, it does have the draw back of being hard coded in the application logic. This being the case, alterations such as removing the enactment, changing the process to start or indeed even minor changes to the required enactment data will require code changes and redeployment of the application.

Further details on enacting processes from code may be found in the *Process Enactment* chapter of the *Cúram Workflow Reference Guide*.

### 4.2.2 Enactment by Raising Events

Events provide a mechanism for loosely-coupled parts of the application to communicate information about state changes in the system. When one module in the application raises an event, one or more other modules receive notification of that event having occurred provided they are registered as listeners for that event.

To make use of this functionality, some events have to be defined, some application code must raise these events, and some event handlers have to be defined and registered as listeners to such events. Developers must write and register event handlers (classes that perform some action when an event is raised) and optionally event filters (logic that determines whether or not to invoke the handler for a given event). The WMS has an event handler that is automatically registered to listen for events associated with workflows.

It is possible to start a process in response to an event being raised. This requires the setup of some configuration data (either through an administration interface or as pre-configured database entries). The configuration specifies the process/processes to start in response to a specific event being raised. Mappings of event data to the enactment data required by the process

can also be configured in this way.

Process enactment event configuration is stored on the database and a user interface is supplied to allow the manipulation of this data. As such process enactment created in this way can be enabled, disabled, changed and even removed at runtime. The main drawback of this approach is that since events have a finite amount of information, only process definitions that require such a small amount of enactment data can be enacted in this way.

A Process Enactment Event Handler is supplied with the application and is automatically registered to listen for events raised in the application. Where a process has been configured to be enacted from an event, the data from the event is mapped into the enactment data of the process, and the process is started.

Further details on enacting processes by raising events may be found in the *Process Enactment* chapter of the *Cúram Workflow Reference Guide*.

### 4.2.3 Enactment as a Subflow

To enact a process as a subflow, a subflow activity must be created in the parent process that identifies the process that will be enacted by name. As with the other process enactment mechanisms, the latest released version of the process is the one that will be enacted.

Subflows can be enacted *synchronously*. This means that the branch of the parent workflow containing the subflow activity that started the subflow process waits for that subflow process to finish before continuing.

Alternatively, a subflow may be enacted *asynchronously*. This means that once the subflow activity starts the subflow process, the branch containing that subflow activity continues immediately with the outcome of the subflow process having no effect on the parent process.

Further details on enacting a process as a subflow may be found in the *Subflow* chapter of the *Cúram Workflow Reference Guide*.

### 4.2.4 Enactment via Web Services

The workflow processes can be exposed as web services by setting metadata values. Once the web services application is deployed, the Web Service Definition Language (WSDL) and the service for such process definitions are available in the normal way for the application web services. The service name is the same as the name of the process that has been exposed.

Further details on enacting processes via web services may be found in the *Workflow Web Services* chapter of the *Cúram Workflow Reference Guide*.

# Chapter 5

## Inbox and Task Management

### 5.1 Introduction

The Inbox is used by the users of a Cúram application to manage their tasks. The following sections describe the various task lists available in the Inbox and the functions available to allow them to manipulate and process the tasks that have been assigned to them to completion.

### 5.2 Tasks

Tasks are used to assign and track the work of system users. The Workflow Engine creates tasks to complete the work specified for the manual and decision activity in the process definition that has been enacted. It assigns these tasks to users, organizational objects and/or work queues based on an allocation strategy. Tasks contain actions which are links to pages in the application to allow the user complete the work defined by the task. Task deadline strategies may also be specified to ensure that the task is actioned and completed by a user in a timely fashion. These deadline strategies can be defined to deal with any tasks that exceed defined deadlines.



#### Note

Organizational objects and the relationships between them are collectively known as the Organization Structure. This is defined in the *Administration* section of the application. An organizational object may be associated with many users. For instance, an organizational unit would typically be used to represent an entire department, and may contain other sub-departments which in turn contain users. If a task is allocated to such an organizational object, the task is available to all of the users associated with that organisational object.

### 5.3 My Tasks

### 5.3.1 My Open Tasks

In order to action a task (i.e. invoke the available functions for a task), a user must first add that task to their *My Open Tasks* list. This can be done by using the *Add To My Tasks* function which may be specified from the *Available Tasks* search page results list or the *Task Home* page.

The *My Open Tasks* list therefore displays all of the tasks with a status of *Open*. Tasks that appear in this list no longer appear in the user's *Available Tasks* list and are also not available to any other user in the application.



#### Note

There is also a view of *My Open Tasks* from the application home pages.

### 5.3.2 My Deferred Tasks

Once a task is listed in the user's *My Open Tasks* list, it may be deferred until a later date. A deferred task is moved from the user's *My Open Tasks* list into the user's *Deferred Task* list. If a restart date is specified for the task, the task may be automatically returned to the user's *My Open Tasks* list on the specified date. This may be achieved by running a batch job (*RestartTask*) delivered as part of the application. The task may also be returned to the user's *My Open Tasks* list by using the *Restart Task* task management function provided.

## 5.4 Available Task Search

This page in the Inbox allows the user to search for tasks that are directly assigned to the user, assigned to the user's organizational objects (organisation units, positions or jobs) or assigned to any work queue that the user is subscribed to. The user can select one or more of the *assigned to* search criteria. The granularity of the filter specified for the available task search can also be further enhanced by selecting one or more task *priorities* (e.g.. High, Medium and Low) and/or one or more of the provided task *deadline* filters (i.e. Overdue, Due Today, Due This Week, Due This Month, Due After This Month).

Once the user has completed the Available Tasks search, the criteria used is saved and will be used on subsequent visits to the page by the user. The search criteria may also be updated at any time by revisiting the page and changing the criteria.



#### Note

There is also a view of *Available Tasks* from the application home pages.

## 5.5 Inbox Actions

There are a number of actions that a user can perform from their *Inbox*. These are mainly shortcut actions for retrieving tasks to work and may be accessed through the *Actions* menu in the title bar.

- *Get Next Task*: This action moves the *next* available task from the list of tasks available to the user, to the user's *My Open Tasks* list.
- *Get Next Task From Preferred Org Unit*: This action moves the *next* task from the user's preferred organization unit, to the user's *My Open Tasks* list. The user can specify their preferred organization unit in the Task Preferences section of the Inbox.
- *Get Next Task From Preferred Queue*: This action moves the *next* task from the user's preferred work queue, to the user's *My Open Tasks* list. The user can specify their preferred work queue in the Task Preferences section of the Inbox.
- *New Task*: This action allows the user to create a new manual task. A task subject must be provided and the task must be either added to the user's *My Open Tasks* list or assigned. A priority and a deadline for the task may also be specified. The newly created task may also be associated with a participant on the system and/or a specified case.



### Note

How the *next* task is determined is configurable but typically it is the highest priority task with the earliest assignment date. For information on changing the default Inbox customization see the *Inbox Configuration and Customization* chapter of the *Cúram Workflow Reference Guide*.

## 5.6 Working on a Task

This section outlines the functionality available to manage a task throughout the task life cycle.

### 5.6.1 Task Home Page

The task home page displays the details of a specific task. In addition, links are provided from the task home page to the pages in the application designed to allow the user to carry out the principal action(s) associated with the task. Tasks may also have supporting information links specified and if specified for the particular task, these allow the user to navigate to pages within the application containing supplemental information about the primary actions of the task. The task home page also provides access to the actions that allow the user to manage a task throughout the task life cycle.



### 5.6.2 Task History and Comments

The task history and comments page displays all of the events that have occurred during the life cycle of the task. For each event, the user name, the date and time that the life cycle event occurred and change information are recorded. A task history item is recorded for the following task life cycle events:

- Task Created
- Comment Added
- Time Worked Changed
- Priority Changed
- Deadline Changed
- Added to My Tasks
- Made Available
- Forwarded
- Allocation Failed
- Allocated To Default Queue
- Reallocated
- Deferred
- Restarted
- Deadline Expired
- Closed

### 5.6.3 Task Assignments

The task assignments page displays the current assignments for the task. A task can be assigned to a user, an organizational object or a work queue and the details displayed here include the name of the assigned to object and also its type.

### 5.6.4 Task Graphical View

This page displays a graphical view of the process instance associated with the task. Each activity in the process definition is displayed as well as the transitions between them. The currently executing activity is also highlighted. Details of activities that have already been executed are displayed in this view including the activity name, the date and time that the activity was executed and the status of any task associated with the execution of the

activity.

### 5.6.5 Task Actions

The following actions are available to the user in order to manage a task:

#### Add Comment

This function allows the user to add a comment to a task. A comment can be added for a task by the user at any time as this task action does not require the task to be part of the user's *My Tasks* list to be invoked. The task history is updated when a comment is added.

#### Add To My Tasks

On creation of a task, depending on the allocation strategy defined, a task is assigned to either a user, organization object or to a work queue. In order to action the task, a user must first add the task to their *My Open Tasks* list. This makes the task unavailable to other users. The task history is updated when this action is performed on a task.

#### Update Time Worked

This function allows a user to change the total time worked on a task. When this value is changed, a task history record is created which includes the total time before the change was made and the new total time.

#### Edit Priority

This function allows a user to change the priority of a task. When this value is changed, a task history record is created which includes the priority before the change was made and the new priority.

#### Edit Deadline

This function allows a user to edit the deadline date time of a task. When this value is changed, a task history record is created which includes the deadline before the change was made and the new deadline.

#### Make Available

This action makes the task available to the previous assignee(s) to work on. The previous assignee(s) can be a user, organizational object or work queue. When this action is performed, the user no longer sees the task in their *My Open Tasks* list. The task history is updated when this action is performed on a task.

#### Forward

This function allows a user to forward a task to a user, organization unit, position, job or work queue. The task history is updated when this action is performed on a task.

#### Reallocate

This function re-allocates a task by re-running the allocation strategy that originally allocated the task. Note since the allocation strategy is run again there is no guarantee that the task will be allocated to the same users, organizational objects or work queues as before (as the specified allocation targets may have been updated). The re-allocation of the task depends entirely on the logic of the allocation strategy. The task history is updated when this action is performed on a task.

#### Defer

Deferring a task effectively parks the task until a later date. When a task is deferred it moves from the user's *My Open Tasks* list to the *My Deferred Tasks* list. The task, however, is not made available to other users. The task can be scheduled for automatic restart. This means that the system will automatically revert the task status from deferred back to open on the date specified and the task will appear again in the user's *My Open Tasks* list. The task history is updated when this action is performed on a task.

#### Restart

This restarts a deferred Task and returns it to the user's *My Open Tasks* task list. This performs the same function as the automatic restart done by the system on the restart date via a batch job, but can be done at any time by the user. The task history is updated when this action is performed on a task.

#### Close

This closes manual tasks that were created by users in the Inbox. The action raises the specific event that such tasks are waiting on to indicate that they have been completed. Other tasks generated outside of the Inbox by the application are closed when the event those activities are waiting on are raised.

## 5.7 Task Queries

The *Task Query* functionality allows users to create, run and save task search related queries. Therefore, the same query may be executed over and over again.

The task query functionality allows the user to search for tasks based on a number of different criteria including tasks that are in the *My Open Tasks* list as well as tasks that are *Available* to the user. The result of a task query may be further filtered by specifying the task status, task priority, task deadline date time, task creation date and task restart date.

For example, each morning the working pattern for a specified user ensures that they search for tasks available to them whose deadline expires that week. Therefore it makes sense for the user to create a query which they can run when required without having to re-enter the search criteria each day. In this case the user creates a Task Query, they name the query *This Week's Tasks*, they select their user name in the *Assigned To* field and the *Due This Week* option in the *Task Deadline Due* field. They then click the save button and the query is saved.

## 5.8 Task Search

This search allows the user to search for any task in the system. The tasks are not required to be in the user's *My Open Tasks* list or be available to the user. Details of closed tasks may also be retrieved using this search.

## 5.9 My Notifications

During the execution of a workflow process, the workflow engine may create notifications. Notifications are used to inform a user that an event has occurred. However unlike tasks, there is no expectation that the user needs to do any work. Notifications may be delivered to the user via email or through alerts. Notifications that are delivered using the alert mechanism are displayed in the *My Notifications* page.

A notification will remain in this list until acknowledged by the user. The user may delete these notifications one by one or many at a time. It should be noted that alerts are physically deleted from the `Alert` database table when a user performs this action.



### Note

There is also a view of the users recent notifications from the application home pages.

## 5.10 My Work Queues

The *My Work Queues* section is divided into two lists; the first displays the work queues that the user is directly subscribed to and the second displays the work queues that the user's organizational objects are subscribed to.

### 5.10.1 User Subscribed Work Queues

This list displays the work queues that the user is currently subscribed to. From here the user can view the tasks assigned to a work queue. They may also add the next task assigned to a work queue to the *My Open Tasks* list. Users can also subscribe to another work queue or unsubscribe from a work queue from this page.

## 5.10.2 Other Subscribed Work Queues

The *Other Subscribed Work Queues* list displays a list of work queues to which the user's organization objects (organization units, positions or jobs) are currently subscribed. From here the user can view the tasks assigned to a work queue. They may also add the next task assigned to a work queue to their *My Open Tasks* list. However the user cannot subscribe or unsubscribe to or from a work queue as that is the function of an administrator or a supervisor user only when the type of work queue subscription is an organisational object.

## 5.11 Task Preferences

### 5.11.1 Preferred Queue and Preferred Organization Unit

The general settings area of the Inbox preferences functionality allows a user to set *Preferred Queue* and a *Preferred Organization Unit*. When the user sets a *Preferred Queue* it signifies the *Work Queue* whose tasks the user works on most often. Similarly when the user sets a *Preferred Organization Unit* it signifies the team whose tasks the user works on most often.

Once the user has specified a preferred queue or organization unit, they may then execute the *Get Next Task From Preferred Queue* and *Get Next Task From Preferred Organization Unit* shortcut Inbox actions.

### 5.11.2 Task Redirection

Task redirection enables the user to redirect tasks to another user or organizational object. This function is useful for situations such as annual leave. The user can specify the dates where the redirection start and ends. Task redirection must be set up to start at a future date, running either indefinitely or for a limited period. While the redirection period is active, no new tasks are assigned to the user. Instead, the tasks are assigned to the selected user or organization object. Any tasks in the user's *My Open Tasks* list remain in their *My Open Tasks* list.

Once a redirection period is active, all tasks currently assigned to the user may be removed from the user's inbox, and added to the assigned tasks list of the user or organizational object specified in the task redirection. This is done in a batch job named `ScanActiveTaskRedirections`.

The user may also view a list of active, pending and expired redirections on the task redirection page. Active or pending task redirections may be removed by the user at any time.

### 5.11.3 Task Allocation Blocking

In some scenarios, the user may want to stop tasks from being assigned to

them without wanting to specify another user to assign the tasks to. Task allocation blocking enables the user to ensure that no tasks are assigned to them from a specified time and date. Task allocation blocking, like task redirection, must be set up to start at a future date, and can run until a specified end time, or run indefinitely. No new task assignment records are created for the blocked user until the task allocation blocking period is cleared or expires.

Any task assignments that exist for the blocked user may be reallocated. This is done in a batch job named `ScanActiveTaskAllocation-BlockingPeriods`.

A list of current, pending and expired allocation blocks may be viewed on the Task Allocation Blocking page. Active or pending allocation blocks may be removed by the user at any time.

# Chapter 6

## Workflow Administration

### 6.1 Introduction

This chapter describes the Workflow Administration functions which enable an administrator to monitor and control process instances that are executed by the Workflow Engine. Administration functionality pertaining to allocation targets and events is also described here.

### 6.2 Process Instances

The Workflow Process Definition Tool (PDT) is used to define workflows. Once the workflows are defined, instances of these workflows will exist during runtime and therefore these workflow instances may require monitoring. Administration users are typically responsible for monitoring or maintaining workflow process instance. This includes searching for workflow process instances, viewing process instance information, and monitoring process instance errors.

#### 6.2.1 Process Instance Search

The Process Instance Search function allows an administrator to search for process instances. There are a number of different ways to perform such searches.

##### Search By Process Details

Various details about the workflow process may be used as search criteria when using this search. All of the following search criteria may be combined to find the required process instance(s):

- Process Enacted From - all process instances with a start date greater than the date specified.

- Process Enacted To - all process instances with a start date less than the date specified.
- Processes Completed From - all process instances with a end date greater than the date specified.
- Processes Completed To - all process instances with a end date less than the date specified.
- Process Name - all process instances with a name like the value entered.
- Process Status - all process instances with the specified status. The default status is *In Progress*.
- Process Instance ID - the process instance associated with this unique identifier.

### Search By Task Details

The details of the task associated with a specified process instance may be used as the search criteria here:

- Task ID - this search criteria returns all workflow process instances which reference a specific task identifier, including the workflow process instance the task was created from or is a part of.
- Tasks Reserved By User - this search criteria returns all workflow process instances which include tasks that are part of that user's *My Tasks* list.
- Tasks Associated With Case Reference - this search criteria retrieves all workflow process instances which include open tasks that are associated with the specified case.
- Tasks Associated with Participant - this search retrieves all workflow process instances which includes open tasks associated with the specified participant.

### Search By Event Details

The details of the event that activity instances associated with a process instance are waiting on may be used in this search:

- Event - this simple search will return all process instances with a status of *INPROGRESS* and *SUSPENDED* that contain activity instances waiting on the specified event.

## 6.2.2 Viewing Process Instances

This function may be used by the administrator to view the details and progress of a process instance. The administrator can view the values stored in the workflow data objects for the process instance. This view also shows the



activity instances that have been executed at that point in the process instance. In addition there is also a graphical view that shows the process definition structure. The graphical view highlights activities and transitions that have already been executed by the workflow engine. Some of the instance data for activities that have also been completed or are in progress may also be viewed using this functionality.

### Suspend Process Instance

This function allows the administrator to suspend a process instance that is in progress. The process instance must be resumed before any further activities will be executed.

### Resume Process Instance

This function is used to resume a suspended process instance.

### Abort Process Instance

This function is used to terminate a process instance that is in progress. Once aborted, a process instance cannot be resumed.

### Event Wait Override

All activities that wait for events to be raised have a failure mode where the event they are waiting on is raised before the activity is executed. To progress such process instances an administrator may override the event wait.

## 6.2.3 Process Instance Errors

The Workflow Engine records information regarding errors that occur during the lifetime of a workflow process instance. A workflow administrator can use this information for troubleshooting problems with the process instance. This includes re-trying or aborting failed workflow process instances. Re-trying a failed process instance instructs the Workflow Engine to re-enact the workflow process instance from where it failed. Alternatively, a workflow administrator can abort a process instance. This stops the process instance and its activities and closes any tasks associated with manual activities in the process instance. Depending on where the process was aborted, some manual steps may be required to complete before the process is actually aborted.

## 6.3 Workflow Events

Workflow events are also maintained as part of Workflow Administration. These events are sent by application functions and are used to transition activities in workflows which are waiting on those events or to enact workflow processes.

Manual, event wait, and decision activities will use events to progress a workflow process instance. The application raises an event when the action associated with the specified activity (task) is complete or when a particular event defined for an event wait activity has been completed. These events signal the Workflow Engine to complete the associated activity instance that is waiting on that event and to progress the workflow process instance by evaluating the next set of transitions and executing the next activity in the workflow.

The application may also use events to enact a workflow. When an action associated with an enactment event occurs in the application, the Workflow Engine processes this event and enacts a new instance of the specified workflow process defined in the process enactment event configuration data.

The process enactment event configuration data is created, maintained and manipulated using the workflow administration functionality. This configuration data specifies the process/processes to enact in response to a specific event being raised. Such process enactments may be enabled, disabled, changed and even removed at runtime using these administration functions. Mappings of event data to the enactment data required by the process may also be configured in this administration area of the application. For more details on enactment by raising events see Section 4.2.2, *Enactment by Raising Events*.

## 6.4 Work Allocation

When a task is created (or a notification being delivered) as a result of the execution of an activity, that task or notification must be routed to a specific user or group of users in order for it to be actioned. This process is called work allocation and a set of allocation rules will be associated with the activity for this purpose. Allocation strategies can be one of three types, functions, rules or allocation targets. Allocation targets are maintained using the Workflow Administration functionality and are described in the next section.

### 6.4.1 Allocation Targets

Allocation targets are logical grouping of users or work queues to which tasks and notifications can be assigned. This allows tasks and notifications to be assigned to a cross section of users in the organization in manner that can be customized by the workflow administrator.

Each allocation target acts as a container for one or more target items. These target items determine the users or work queues to whom the task or notification should be assigned. A target item can be any one of the following:

- Job - the task is assigned directly to the job. The notification is sent to any users assigned to the job via their position assignment.
- Organization unit - the task is assigned directly to the organization unit.

The notification is sent to any users assigned to the organization unit also via their position assignment.

- Position - the task is assigned directly to the position. The notification is sent to any users assigned to the position.
- Work Queue - tasks are assigned directly to the work queue. This enables users to subscribe to the work queue, view and work on any tasks that have been assigned to that work queue. Notifications are sent to any users who are subscribed to the work queue.
- User - the task is assigned or the notification is sent to the specified individual user.

When a task is assigned to an organizational object (i.e. job, organization unit or position) or work queue, the task is assigned directly to that organizational object or work queue and *not* to the individual users who are members of that organizational object or subscribed to that work queue. Therefore, once a user becomes a member of an organizational object or subscribes to a work queue, they will then be able to see all *existing* tasks assigned to that organizational object or work queue. Similarly when a user ceases to be a member of an organizational object or un subscribes from a work queue, they will no longer be able to see the tasks assigned to that organizational object or work queue.

### 6.4.2 Work Queues

A work queue is a subscription based list that can be assigned as a target item for an allocation target. They are maintained using the Workflow Administration functionality where an administrator can create, edit or remove work queues from the system.

Work Queues must have an assigned administrator. The administrator may subscribe users to the work queue if required. Otherwise, if the work queue definition specifies that users are allowed subscribe to the work queue, the users themselves can subscribe to the work queue. Work queues can also have a sensitivity level which restricts user access to the work queue by comparing the sensitivity specified for the work queue against the user's sensitivity.

Work queues can be defined for particular jobs or roles, for particular departments, or any other arrangement, e.g., the “Claim Approval Work Queue” and the “Claims Department Work Queue”. Tasks that are assigned to a work queue are visible to any user who subscribes to that work queue.

# Chapter 7

## Glossary

### 7.1 Workflow

Workflow is the automation of a business process either in whole or in part. During a workflow, information or tasks are passed from one participant to another for action, according to a set of procedural rules.

### 7.2 Business Process

A business process is a set of one or more linked procedures or activities which collectively realize a business objective or policy goal. This is normally contained within the context of an organisational structure defining functional roles and relationships.

### 7.3 Cúram Workflow Management System (PDT)

The Cúram WMS is a system of software that allows the definition and creation of workflow process definitions using a Process Definition Tool (PDT) and also manages the execution of these workflows through the use of the Workflow Engine. The Workflow Engine is able to interpret the process definitions, interact with workflow participants and, where required, invoke functions within the application. The system also contains an administration function for monitoring process instances and also an Inbox and Task Management area to manage the manual tasks that result from the execution of the workflow processes.

### 7.4 Process Definition Tool (PDT)

The PDT is a tool provided for creating and maintaining process definitions which can then be interpreted by the workflow engine. Creating a process definition involves using the PDT to describe the desired process behavior

in terms of activities and transitions.

## 7.5 Workflow Engine

The Workflow Engine provides the runtime execution environment for a process instance. It manages the data that is passed into and used in the process instance, executes and manages the various activities in the process and also manages the path taken through the process by evaluating the transitions between the activities that exist in the process.

## 7.6 Inbox

The Inbox is used by the users of the application to manage their tasks. It shows the tasks currently being worked on, tasks available to be worked on and the work queues which they are subscribed to.

## 7.7 Workflow Administration

The Cúram WMS provides workflow administration functions which enable an administrator to monitor and control process instances that are executed by the Workflow Engine. Administration functions to maintain events and allocation targets are also provided.

## 7.8 Process Definition

The representation of a business process in a form which supports automated manipulation, such as modelling, or enactment by a workflow management system. The process definition consists of a network of activities and their relationships, criteria to indicate the start and termination of the process, and information about the individual activities, such as participants, associated IT applications and data.

## 7.9 Activity

A description of a piece of work that forms one logical step within a workflow process definition. An activity may be a manual activity which does not support computer automation or automatic which involves the invocation of a function within the application. There are also other activity types supported in the Cúram WMS.

## 7.10 Transition

Transitions provide the links between activities. They are the primary flow control construct and dictate the order in which activities will be executed. Transitions are unidirectional and an activity can have multiple outgoing

and incoming transitions forming branch and synchronization points respectively.

### 7.11 Workflow Data Object

Data is maintained and passed around in the workflow engine as workflow data objects and list workflow data objects. These are logical objects defined in the process definition that have a name and a list of attributes of various types to which data can be assigned. Workflow data object values may be written at process enactment or from the output of the various activity types.

### 7.12 Start and End Process Activity

The start-process and end-process activities provide markers for the beginning and end of a workflow process. They are anchor points to which other activities can be attached using transitions thus creating a series of steps from the start to the end of the workflow process.

### 7.13 Automatic Activity

An automatic activity is a step in a workflow process that is wholly automated and under normal circumstances no human intervention is required for the completion of such a step. An automatic activity step invokes a method in the application to perform some processing required as part of the overall business process.

### 7.14 Manual Activity

A manual activity specifies where in the workflow business process human intervention is required. It also specifies the information the user will get when notified that they must perform a task and also the selection of the users to which the work will be assigned

### 7.15 Event Wait Activity

An event wait activity pauses the execution of a particular branch of a process instance until a particular event has been raised.

### 7.16 Route Activity

A route activity is an activity that performs no business functionality. The primary purpose of the route activity is to assist in flow control. Route activities are often used as branch (split) and synchronization (join) points. They can also be used to provide the effect of a pure notification that is not con-

nected to any other functionality.

## 7.17 Subflow Activity

When designing a complex business process it may become too large to manage as one monolithic process definition. A sub-flow activity allows another process definition to be enacted as part of another process.

## 7.18 Loop Begin and Loop End Activities

Many business processes are required to repeat until some condition is met. In the Cúram WMS, this is implemented using the loop-begin and loop-end activities. All activities that are between a loop-begin and its associated loop-end activity are repeated until the loop completes.

## 7.19 Parallel Activity

A parallel activity acts as a wrapper around certain activities. The effect of using a parallel activity at runtime is that multiple instances of the wrapped activity are executed in parallel. To date, the only supported types of wrapped activity are *Manual* and *Decision* activities.

## 7.20 Process Instance

A new workflow process instance is created for each enactment of a workflow process definition. It may be considered as the runtime data for an enacted workflow process definition.

## 7.21 Activity Instance

As each activity in the process definition is executed, an associated activity instance record is created and managed by the workflow engine. This record contains the runtime data for an activity instance in the enacted workflow.

## 7.22 Transition Instance

Each transition in the process definition that is evaluated and followed will result in an associated transition instance record being created and managed by the workflow engine. This record contains the runtime data for a workflow transition.

## 7.23 Tasks

Tasks are used to assign and track the work of system users. The Workflow

Engine creates tasks to complete the work specified for the manual, decision and parallel activities in a process definition that has been enacted. The tasks are assigned to users, organizational objects and/or work queues on the system based on an allocation strategy.

## 7.24 Notification

A notification is simply information that is sent to a user when a step in a process definition is executed. Notifications manifest themselves as alerts in the user's inbox or as emails. The users to which the notification must be sent are determined by the allocation strategy specified for the notification.

## 7.25 Work Allocation

When a task is created (or a notification being delivered) as a result of the execution of an activity, that task or notification must be routed to a specific user or group of users in order for it to be actioned. This process is called work allocation and a set of allocation rules will be associated with the activity for this purpose.

## 7.26 Allocation Target

An allocation target is a container for allocation target items. Tasks are targeted to all items added to an allocation target. For example, a task allocation target can contain a user target item and an organization unit target item. Tasks associated with this allocation target are directed to the selected user and all of the users in the selected organization unit.

## 7.27 Work Queues

A work queue is a subscription based list that can be assigned as a task allocation target. Tasks can therefore be assigned to work queues and users may subscribe to work queues in order to retrieve and action those tasks.

## 7.28 Events

Events provide a mechanism for loosely-coupled parts of the application to communicate information about state changes in the system. When one module in the application raises an event, one or more other modules receive notification of that event having occurred provided they are registered as listeners for that event. To make use of this functionality, some events have to be defined, some application code must raise these events, and some event handlers have to be defined and registered as listeners to such events.

## 7.29 Organizational Objects



Organization objects are groups of users that have the same *Job*, work in the same *Organization Unit* or have the same *Position*. Tasks may be assigned to an organizational object. When this scenario occurs, the tasks are available to all of the users who are a member of that organization object.

## Notices

This information was developed for products and services offered in the U.S.A. IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service. IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing

IBM Corporation

North Castle Drive

Armonk, NY 10504-1785

U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

Intellectual Property Licensing

Legal and Intellectual Property Law.

IBM Japan Ltd.

1623-14, Shimotsuruma, Yamato-shi

Kanagawa 242-8502 Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typograph-

ical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you. Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Corporation  
Dept F6, Bldg 1  
294 Route 100  
Somers NY 10589-3216  
U.S.A.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources.

IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products

should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

#### COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

© your company name) (year). Portions of this code are derived from IBM Corp. Sample Programs.

© Copyright IBM Corp. \_enter the year or years\_. All rights reserved.

If you are viewing this information softcopy, the photographs and color illustrations may not appear.

## Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trade-

marks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at <http://www.ibm.com/legal/us/en/copytrade.shtml>.

Microsoft Visio is a trademark of Microsoft Corporation in the United States, other countries, or both.

Other names may be trademarks of their respective owners. Other company, product, and service names may be trademarks or service marks of others.