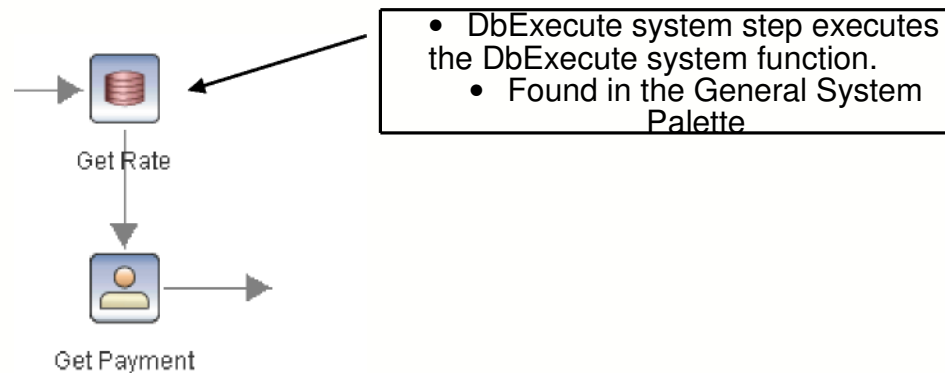# Databases and Components

Workflow Designer

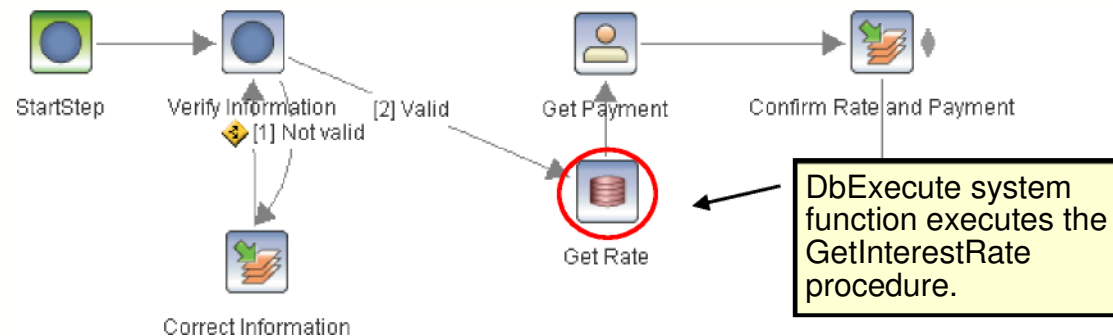IBM FileNet Business Process Manager

DbExecute system function

- Executes a stored procedure in a database
    - Specify the external database, the name of the stored procedure, and parameters.
    - Database and stored procedure must exist and the connection be configured.

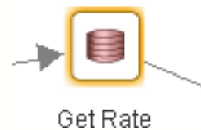| |
|---|
| • DbExecute system step executes the DbExecute system function. |
| • Found in the General System Palette |

Get Rate

Get Payment

Example: Using DbExecute

- Use case scenario

  - When a new loan is being prepared, the current interest rate is retrieved from the database.

- Solution example

  - A stored procedure named "GetInterestRate" was defined in a LoanDB database.

  - Data field interest_rate is set by the stored procedure executed at the Get Rate step.

StartStep → Verify Information [2] Valid → Get Payment → Confirm Rate and Payment

[1] Not valid

Correct Information

Get Rate

DbExecute system function executes the GetInterestRate procedure.

DbExecute step parameters

- Database connection alias is configured by the system administrator for the Process Engine.
- Stored procedure name is determined by the database programmer.
- Parameters are assigned in the workflow definition.

Get Rate

Must previously configure database connection in the PE

Must match order and data type of parameters with those in the stored procedure

Step Name

Get Rate

Database Connection Alias: LoanInfoDB

Procedure Name: GetInterestRate

Parameters

#	
1	loan_amount
2	loan_term
3	large_loan
4	interest_rate

Parameter data types

- Data type used in a Process Designer field must match parameter data type in the stored procedure.
  – Depends on database type
  – Parameter cannot be an array.
  – Parameter can be a single element of an array.

	DbExecute Parameter Types		
Process Designer	SQL Server	DB2	Oracle
Boolean	number	bit	number
Float	float	float	number
Integer	int	int	number
String	varchar	varchar	varchar
Time	timestamp	datetime	date

Required administrative task

- Define and verify a database connection for Process Engine.
    - Work with your system and database administrators on the business requirements.
    - Connection is configured in VWService properties using Process Configuration Console.
    - Connection is dependent on the type of database that holds the stored procedure.
    - Database can be other than the Process Engine workflow database.

Considerations in using DbExecute

- Null returned from a stored procedure

    If String data type, results in an empty string.

    - If Boolean, float, integer, or time, the item fails with a workflow exception.

- If stored procedure does not return within timeout limit, item fails with a workflow exception.

    - Default timeout limit is one hour.

    - Limit is set by the workflow administrator or system installer in Process Engine properties.

- Work with your database administrator or programmer to design appropriate business exception handling routines.

Component Integrator

- Is an IBM FileNet BPM service that connects the Process Engine with an external system
- Makes use of

  - Component Managers
  - Service adapters: Java and JMS
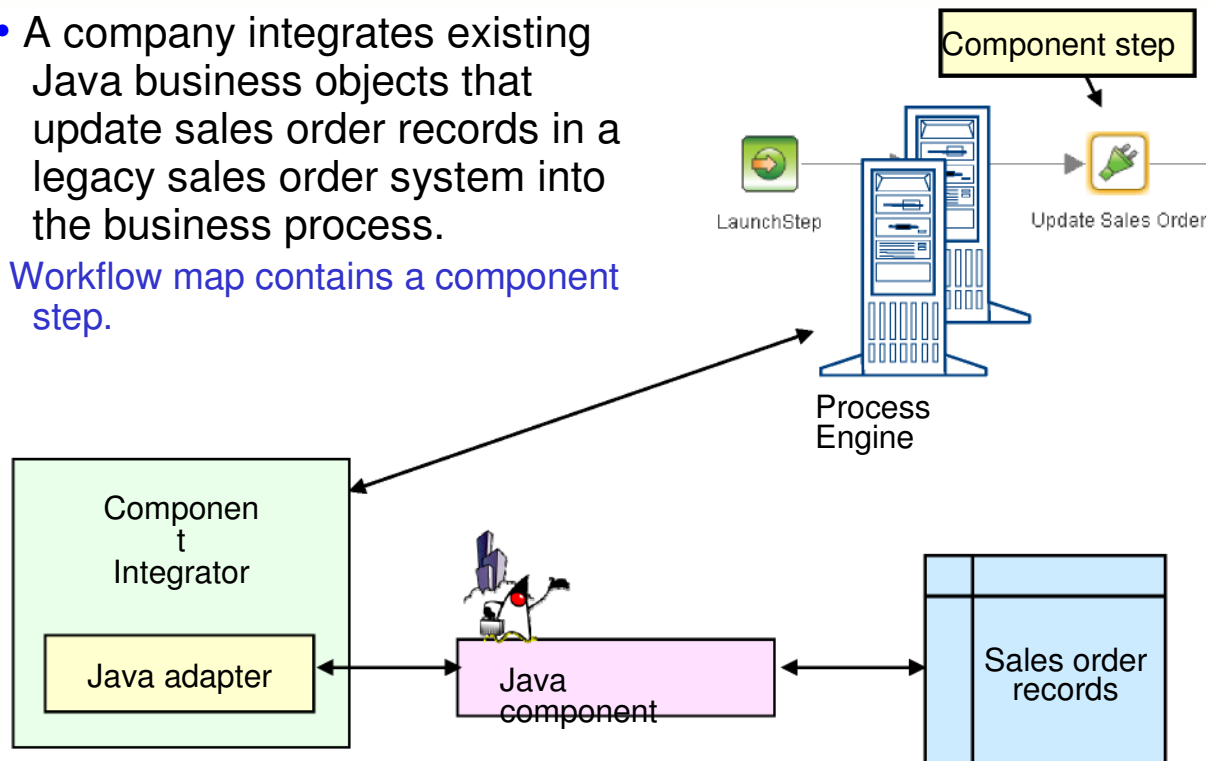   - Component queues on the Process Engine

- Provides benefits

  - Provides customization convenience for application integrators

  - Extends business functionality without full application development

  Uses existing Java business objects and components
  - Integrates with Java Message Service

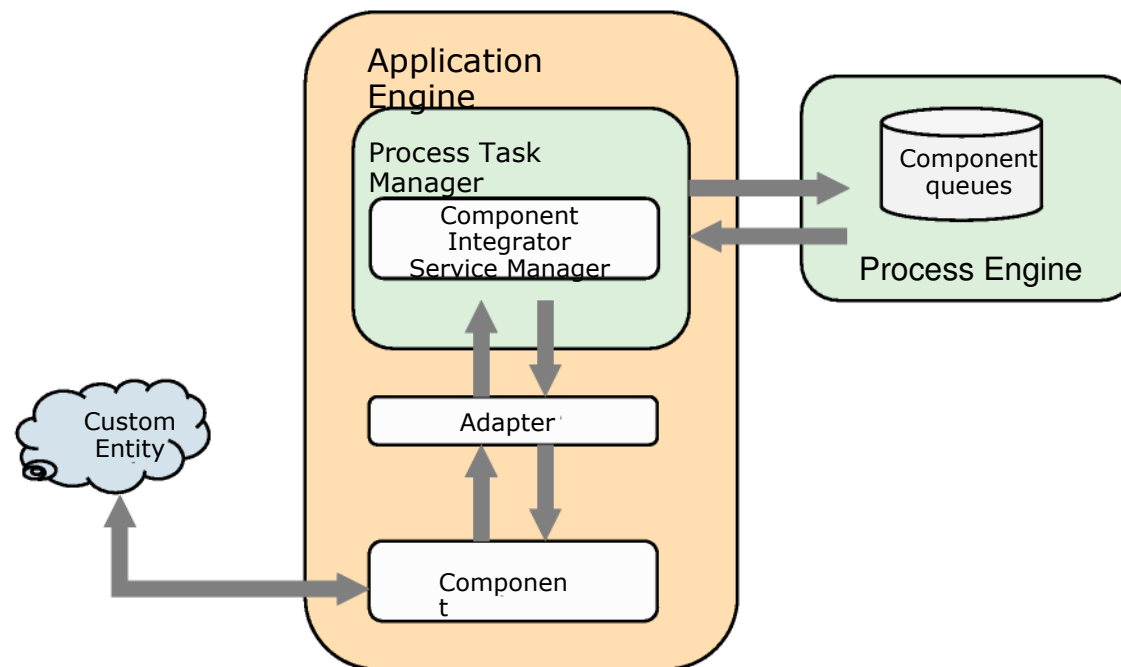Component

Example use case

- A company integrates existing Java business objects that update sales order records in a legacy sales order system into the business process.

  - Workflow map contains a component step.

Component step

LaunchStep → Update Sales Order

Process Engine

Component Integrator

Java adapter ↔ Java component ↔ Sales order records

Component Integrator architecture overview

Application Engine

Process Task Manager

Component Integrator Service Manager

Component queues
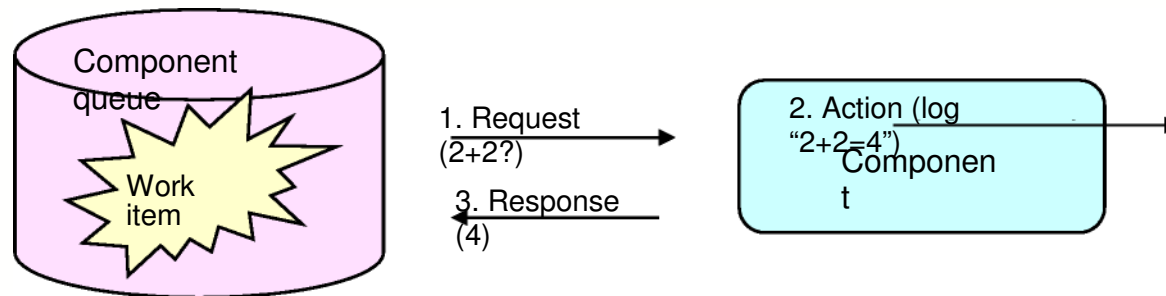
Process Engine

Custom Entity

Adapter

Component

Component Manager

- Service that provides link between Process Engine and external systems
    - Coordinates component interaction
    - Runs on the Application Engine
    - Delivers events from Process Engine to external entity
- Must configure the Process Engine server connection to Component Manager
    - Usually done at installation of IBM FileNet P8 software
- Must configure and start one or more Component Managers for the isolated region
    - Must be running to process component steps and Web Services system steps
    - Configuration depends on the requirements for component queues.

Done by the administrator using Process Task Manager

Component

- A component is a "work performer" application. Uses the Component Integrator to process workflow data Typically has no user interface
    - Typically performs automatic operations on work items
- A work item waits in a component queue for processing by a component.
    - The work item makes a request of a component.
    - The component can provide a response.
    - The component can perform other actions outside the region.

Component queue

Work item

1. Request (2+2?)

3. Response (4)

2. Action (log "2+2=4")

Component

Types of components

- Java
  - Component functionality is provided by a Java archive file.
- Classes contain methods (operations) to perform the work.
  - Data can move as follows:
- From the work item to the Java component

- From the Java component to the work item - Uses a configured Java component adapter

- JMS
  - Component functionality sends a message to a specified queue in a JNDI queue connection factory.

  - Data moves only from the work item to the JMS queue. - Uses a configured JMS component adapter

Component implementation

- Tasks necessary for integration of components in a workflow

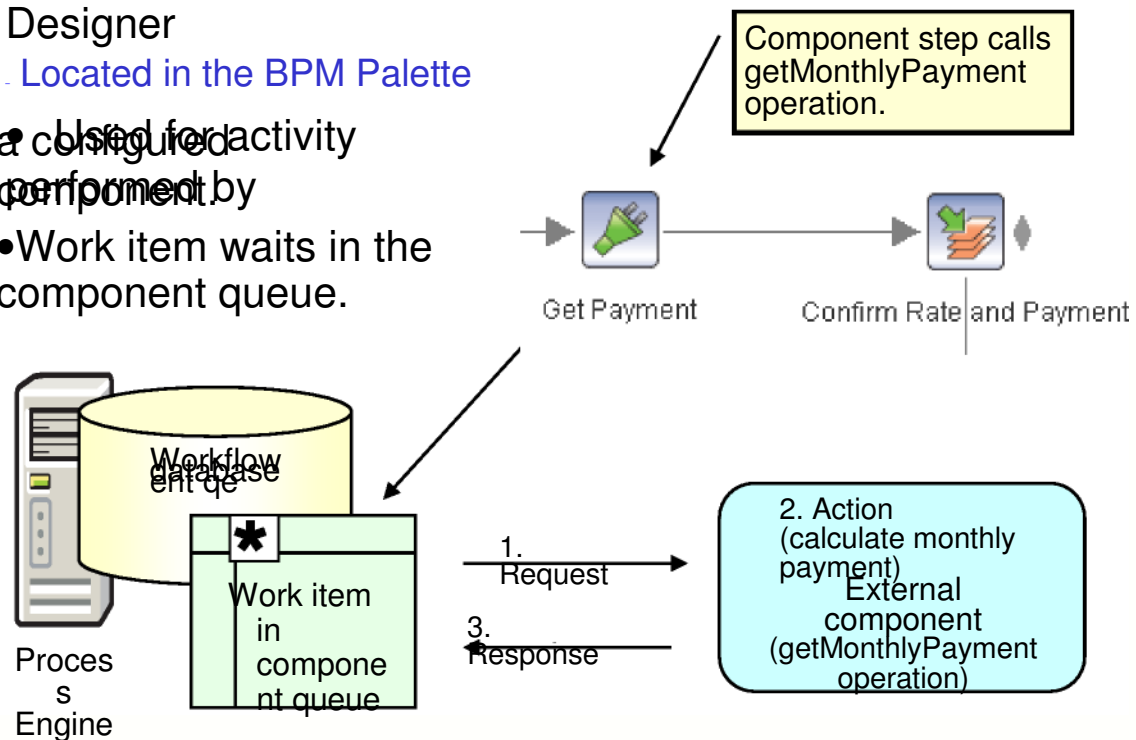| Task	Tool	Who
Develop custom component. Deploy software.	Standard developer tools	Application developer
Create and configure component queues.	Process Configuration Console	Workflow or system administrator
Specify location of Java class libraries (Java).	Process Task Manager	Workflow or system administrator
Start and administer Component Managers and components.	Process Task Manager	Workflow or system administrator
Use components in workflow definition steps.	Process Designer	Workflow designer

Prepare the system for component use

- Region data structures must exist before you can use components in a workflow.
- Administrative tasks required:

1. Create component queues.

2. Configure component queues using the appropriate adapter.

3. Define component queue operations.

4. Configure and start Component Managers.

Component step

- • Step type in Process Designer
  - Located in the BPM Palette

- Used for activity
• a configured
  performed by
  component.

- •Work item waits in the component queue.

Component step calls getMonthlyPayment operation.

Get Payment

Confirm Rate and Payment

Workflow
ent qe
database

Process
s
Engine

Work item
in
compone
nt queue

1.
Request

3.
Response

2. Action
(calculate monthly
payment)
External
component
(getMonthlyPayment
operation)

What is a queue operation?

- A queue property that specifies input and output parameters for a task (function)
  - Used to define parameters based on the requirements for data type and direction
  - Typically used for tasks processed by automated programs, such as component steps
- One or more operations can be defined for a queue and used in a workflow.
  - An operation is defined using the Process Designer Configuration view or Process Configuration Console.
  - An operation is assigned to a step using Process Designer.
- An operation definition includes
  - Operation name
  - Operation parameters

Operation parameters

- Operation parameter name does **not** have to match the workflow data field name.

- Operation parameter data type **must** match the expression data type.
- Data access assigned for a parameter controls the data flow to and from the operation.

Read Only:

Operation reads from the work item, when step is opened.

Write Only:

Operation writes to the work item, when step is completed.

Read/Write:

Both actions are allowed.

Use a component step in a workflow definition

1. Add a component step to a map.

2. Click Add to select a component and operation.

Get Payment

Step Name

Get Payment

Operations	▲ ▼ ☐ ✖
Name	Component
getMonthlyPayment	LoanInfoCalculation

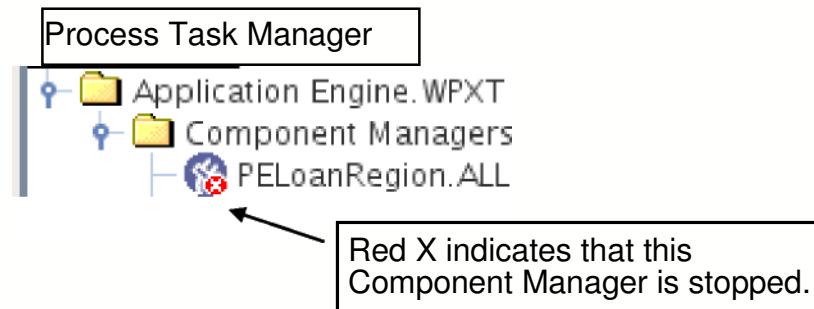| Operation Parameters			
Name	Type		Expression
LoanAmount	Float	▤	loan_amount
InterestRate	Float	▤	interest_rate
LoanTerm	Integer	▤	loan_term
MonthlyPayment	Float	✎	monthly_payment

3. Operation parameters are automatically added, including type and access rights.

4. Assign an expression to each parameter.

Verify status of Component Managers

- A Component Manager must be created, configured, and running for a workflow to communicate with a component queue.
- Use Process Task Manager running on the Application Engine.
  - Select Application Engine.WPXT > Component Managers node.
  - Verify running status of each Component Manager and the components it manages.

Process Task Manager

Application Engine.WPXT
  Component Managers
    PELoanRegion.ALL

Red X indicates that this
Component Manager is stopped.

Access to a content repository

- Component Integrator infrastructure provides access to objects in a repository.
- Native IBM FileNet capability is named Content Extended Operations.

- Use to manipulate objects in an object store from within an executing workflow.

System-provided component: CE_Operations

- Is available as a native Java component queue

  - An initialized region includes a CE_Operations component queue configured with operations.

  - Administrator must complete configuration of the component queue in the region before it can be used.

- Provides access to Content Engine objects, properties, and actions.

- Is used in a component step to access a Content Engine object.

  - Select CE_Operations as the component.

  - Specify the operation.

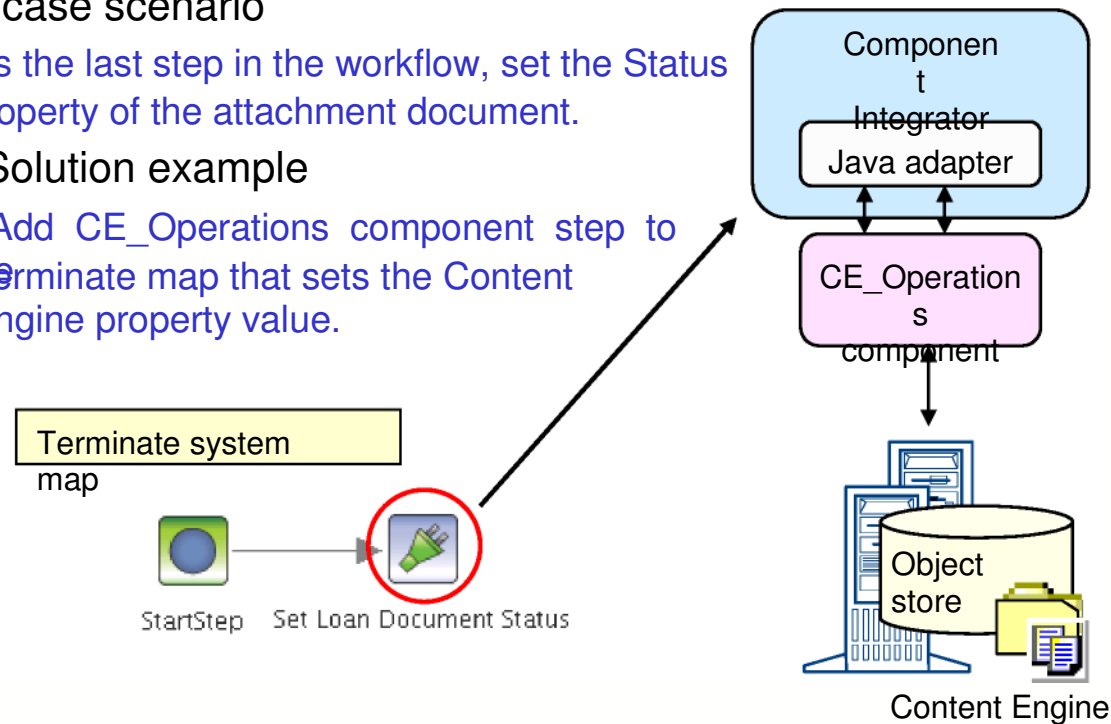 - Specify the expression for each operation parameter.

Set Loan Document Status

Examples of available operations

	Operation Description
checkin	Checks in attached document and sets property values.
createDocument	Creates document using specified class and property values and file in folder.
file	Files object in specified folder.
getContent	Retrieves content of the attachment.
getStringProperty	Returns a string value for the specified property of an attachment.
publish	Publishes the attachment using specified template.
sendMailAttachment	Sends mail with one or more attached documents.
setStringProperty	Sets a string value for the specified property of an attachment.

Use CE_Operations in a component step
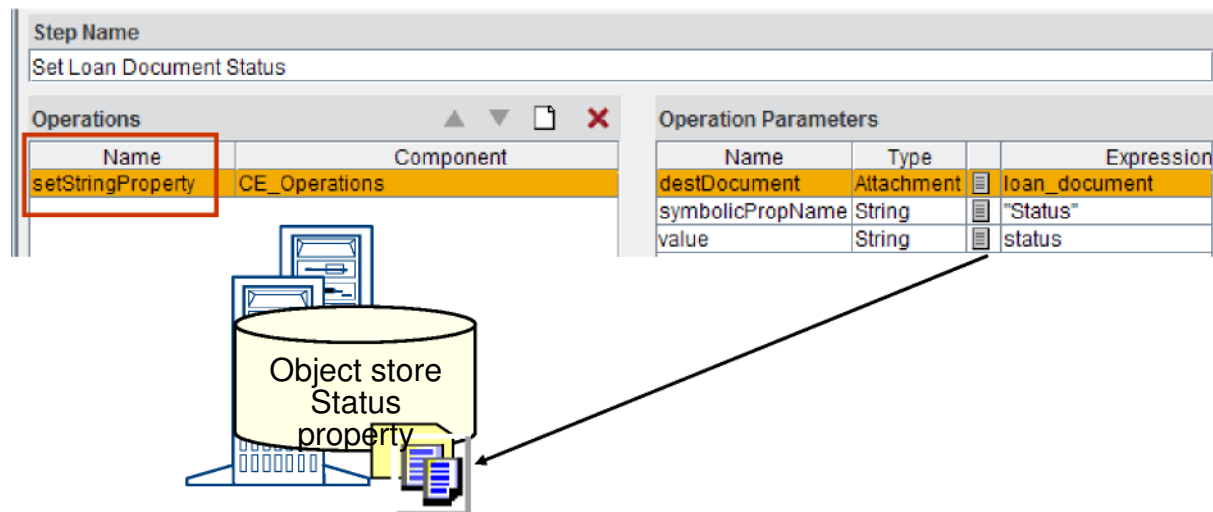
- Use case scenario
  - As the last step in the workflow, set the Status property of the attachment document.

  - •Solution example
    - Add CE_Operations component step to the terminate map that sets the Content Engine property value.

Componen t Integrator

Java adapter

CE_Operation s component

Terminate system
map

StartStep   Set Loan Document Status

Object store

Content Engine

Example: Set a string document property

- setStringProperty operation sets a String document property.

  - destDocument is the attachment.

  - symbolicPropName is the name of the property as specified in the object store.
  - value is the string value to be assigned to the property.

Step Name					
Set Loan Document Status					

Operations		▲ ▼ 🗋 ✖		Operation Parameters			
Name	**Component**			**Name**	**Type**		**Expression**
setStringProperty	CE_Operations			destDocument	Attachment	▤	loan_document
				symbolicPropName	String	▤	"Status"
				value	String	▤	status

Object store
Status
property

Content
Engine