

IBM Cúram Social Program Management
Version 7.0.0

Cúram Evidence Developers Guide



Note

Before using this information and the product it supports, read the information in “Notices” on page 37

Edition

This edition applies to IBM Cúram Social Program Management v7.0.0 and to all subsequent releases unless otherwise indicated in new editions.

Licensed Materials - Property of IBM.

© **Copyright IBM Corporation 2012, 2016.**

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

© Cúram Software Limited. 2011. All rights reserved.

Contents

Figures	v
--------------------------	----------

Tables	vii
-------------------------	------------

Developing with Evidence 1

Introduction	1
Purpose	1
Prerequisites	1
Audience	1
Server / Client Evidence Components	1
Server Side Artifacts	1
Standard Evidence Interface	1
Evidence Interface	5
Participant Evidence Interface	6
Accessing Non-modeled Functions	8
Client Side Artifacts	8
Developing an Evidence Solution	9
Administration	9
Evidence Metadata	9
Product Evidence Link	9
Common Evidence Maintenance Operations	9
Create Evidence	9
Modify Evidence	12
Read Evidence	15
List Evidence	18
(deprecated) Evidence Dashboard and	
EvidenceFlow	19
Validations	19
More On Validations	20
Evidence Attribution	21
Re-attribution.	22
Evidence Relationship	22
Registering Evidence Implementations	23
Evidence Registrar Module	23
Legacy Evidence Registrar	24
Custom Hooks	24
Evidence Controller Hook	24

Evidence Controller Hook Registrar & Manager	24
Customization of Multiple Participant Evidence	25
Multiple Participant Evidence Extension	
Points	25
Multiple Participant Evidence Customization	26
Participant Evidence Integration	31
Overview	31
Integration of Participant Data as Evidence	32
Administration	32
AdminICEvidenceLink	32
ProductEvidenceLink	32
Integrating new Participant entities as Evidence	32
Implementing the ParticipantEvidenceInterface	32
Register entity in a Registrar Module	33
Applying Participant Evidence to all Cases	33
Modifications required to existing business processes	33
Sequence Diagrams for Participant evidence	34
Create Participant Evidence Sequence Diagram	34
Specific Processing For Participant Data when Creating Evidence	34
Modify Participant Evidence Sequence Diagram	34
Implementing Conditional Verifications	34
Conditional Verification	34
Rule Artifacts supplied by Verification framework	35
Rule Sets	35
Rule Classes	35
Verification Determinator	35
Verification Determinator Result	35
Verification Determinator Params	36
New Propagator	36

Notices 37

Privacy Policy considerations	38
Trademarks	39

Figures

1.	Sequence Diagram for Creating Evidence	9	5.	Participant Evidence Sequence	34
2.	Sequence Diagram for Modifying Evidence	13	6.	Evidence Sequence Diagram	34
3.	Sequence Diagram for Viewing Evidence	16	7.	Modify participant	34
4.	Sequence Diagram for Listing Evidence	18			

Tables

1. Evidence Relationship Link Entity 23

Developing with Evidence

Custom evidence solutions can be developed with Cúram Evidence. All of the evidence server-side infrastructure artifacts are available in the `curam.core.sl.infrastructure.impl` package. The evidence metadata entity contains metadata about each evidence type. This entity must be populated before evidence maintenance can proceed. Evidence maintenance functions are available in the administration application.

Introduction

Purpose

The purpose of this document is to provide assistance to developers intending to implement evidence solutions using Cúram's Evidence solution. It outlines common pieces of evidence maintenance functionality and describes how a developer can design / implement such functionality.

Prerequisites

The readers should be familiar with the evidence capturing aspect of case management as well as its use in determining eligibility and entitlement on a case. They should also have read "The Evidence Pattern" in the Designing Cúram Evidence Solutions guide.

Audience

This document is targeted at a technical audience, both developers and architects, intending to implement evidence solutions using Cúram's Evidence framework.

Server / Client Evidence Components

Server Side Artifacts

All of the Evidence server side infrastructure artifacts are shipped in the `"curam.core.sl.infrastructure.impl"` package. The key elements found here include the Evidence Controller / Evidence Controller Hook (see section 3.8) classes and the Evidence Interfaces. The Interfaces form part of the Interface Hierarchy. The Participant Evidence Interface and Evidence Interface both extend the parent Interface, Standard Evidence Interface. These Evidence Interfaces will be the artifacts of most interest to designers / developers as each evidence entity will need to implement this interface.

Standard Evidence Interface

The Standard Evidence Interface defines the following methods, which are common to both inheriting interfaces. The interface and its associated methods are shown with the appropriate Javadoc comments.

```
/*
 * Copyright 2005-2006,2011 Curam Software Ltd.
 * All rights reserved.
 *
 * This software is the confidential and proprietary information
 * of Curam Software, Ltd. ("Confidential Information"). You
 * shall not disclose such Confidential Information and shall use
 * it only in accordance with the terms of the license agreement
```

```

    * you entered into with Curam Software.
    */
package curam.core.sl.infrastructure.impl;

import curam.core.sl.infrastructure.entity.struct
    .AttributedDateDetails;
import curam.core.sl.infrastructure.struct.EIEvidenceKey;
import curam.core.sl.infrastructure.struct.EIEvidenceKeyList;
import
    curam.core.sl.infrastructure.struct.EIFieldsForListDisplayDtIs;
import curam.core.sl.infrastructure.struct.ValidateMode;
import curam.core.struct.CaseKey;
import curam.util.exception.AppException;
import curam.util.exception.InformationalException;
import curam.util.type.Date;

/**
 * This interface is a key component of the Curam
 * Evidence Solution. Implementations hoping to manage evidence
 * via the Evidence Solution must ensure that the
 * evidence entities contained within the solution implement the
 * Evidence Interface. By doing this, the evidence is utilizing
 * the Evidence Controller pattern whereby a lot of the common
 * business functions for maintaining evidence are contained
 * within the out-of-the-box evidence infrastructure.
 *
 * This interface is the super interface that will be
 * extended by other evidence interfaces that wish to provide
 * custom functionality for that type of evidence. The methods
 * defined on this evidence are common to any interface that
 * extends it.
 */
public interface StandardEvidenceInterface {

    // _____
    /**
     * Method for calculating case attribution dates. The
     * calculation of evidence attribution is an integral part of a
     * evidence solution as it determines the period of
     * time for which a piece of evidence is effective. The
     * implementation of this function will contain the logic that
     * derives the appropriate effective period for the evidence of
     * a particular type.
     *
     * @param caseKey
     *         Contains a case identifier
     * @param evKey
     *         Contains the evidenceID / evidenceType pairing of
     *         the evidence to be attributed
     *
     * @return Case attribution details
     */
    AttributedDateDetails calcAttributionDatesForCase(
        CaseKey caseKey, EIEvidenceKey evKey)
        throws AppException, InformationalException;

    // _____
    /**
     * Retrieves a summary of evidence details which are used to
     * populate the 'Details' column on the following evidence
     * pages:
     *
     * - All evidence workspace pages
     * - Apply changes page
     * - Apply user changes page
     * - Approve page
     * - Reject page

```

```

*
* @param key
*         Contains an evidenceID / evidenceType pairing
*
* @return A summary of the evidence details to be displayed
*/
EIFieldsForListDisplayDtls getDetailsForListDisplay(
    EIEvidenceKey key)
    throws AppException, InformationalException;

// _____
/**
 * Method to get the business end date for this evidence
 * record.
 *
 * @param key
 *         Contains an evidenceID / evidenceType pairing
 *
 * @return The end date for this evidence
 */
Date getEndDate(EIEvidenceKey evKey) throws AppException,
    InformationalException;

// _____
/**
 * Method to get the business start date for this evidence
 * record.
 *
 * @param key
 *         Contains an evidenceID / evidenceType pairing
 *
 * @return The start date for this evidence
 */
Date getStartDate(EIEvidenceKey evKey) throws AppException,
    InformationalException;

// _____
/**
 * Method for inserting case evidence.
 *
 * @param dtls
 *         Custom evidence details to be inserted
 * @param parentKey
 *         Contains the evidence type of the evidence being
 *         inserted
 *
 * @return Contains the evidenceID / evidenceType of the
 *         evidence inserted
 */
EIEvidenceKey insertEvidence(
    Object dtls, EIEvidenceKey parentKey)
    throws AppException, InformationalException;

// _____
/**
 * Method for inserting case evidence on modification. An
 * insert on modification takes place when the record being
 * modified is 'Active'.
 *
 * @param dtls
 *         Evidence details to be inserted
 * @param origKey
 *         Contains the evidenceID / evidenceType pairing of
 *         the evidence being modified
 * @param parentKey
 *         Contains the evidence type of the evidence to be
 *         inserted

```

```

*
* @return Contains the evidenceID / evidenceType of the
*         evidence inserted
*/
EIEvidenceKey insertEvidenceOnModify(Object dtls,
    EIEvidenceKey origKey, EIEvidenceKey parentKey)
    throws AppException, InformationalException;

// -----
/**
 * Method for modifying case evidence. This function is called
 * when 'In Edit' evidence is being modified in place.
 *
 * @param key
 *         Contains the evidenceID / evidenceType pairing of
 *         the evidence to be modified
 * @param dtls
 *         Modified evidence details
 */
void modifyEvidence(EIEvidenceKey key, Object dtls)
    throws AppException, InformationalException;

// -----
/**
 * Method for retrieving all child evidence for a specified
 * parent
 *
 * @param key
 *         Contains a parent evidenceID / evidenceType pairing
 *
 * @return List of all child evidence (evidenceID /
 *         evidenceType pairings) for the specified parent
 */
EIEvidenceKeyList readAllByParentID(EIEvidenceKey key)
    throws AppException, InformationalException;

// -----
/**
 * Method for reading case evidence.
 *
 * @param key
 *         Contains the evidenceID / evidenceType pairing of
 *         the evidence to be read
 *
 * @return Custom evidence details
 */
Object readEvidence(EIEvidenceKey key)
    throws AppException, InformationalException;

// -----
/**
 * Method for retrieving the list of evidence to be used in
 * the validation procedure. This is based on the evidenceID /
 * evidenceType pairing passed into this function.
 *
 * If the input evidence key was that of parent evidence, then
 * this function should return the parent and its associated
 * 'Active' and 'In Edit' child evidence records, if they
 * exist.
 *
 * @param evKey
 *         Contains the evidenceID / evidenceType pairing of
 *         the evidence being "acted upon".
 *
 * @return List of evidenceID / evidenceType pairings to be
 *         used in the validation procedure
 */

```

```

    EIEvidenceKeyList selectForValidation(EIEvidenceKey evKey)
        throws AppException, InformationalException;

    // _____
    /**
     * Method for validating evidences based on the validate mode
     * setting.
     *
     * @param evKey
     *      The evidenceID / evidenceType pairing of the
     *      evidence being "acted upon"
     * @param evKeyList
     *      The evidence hierarchy structure for the evKey
     *      parameter. If the evKey identified the parent
     *      evidence, the evKeyList may contain this parent and
     *      its relevant children for validation purposes
     *
     * @param mode
     *      The validation mode (insert, modify,
     *      validateChanges, applyChanges)
     */
    void validate(EIEvidenceKey evKey, EIEvidenceKeyList evKeyList,
        ValidateMode mode)
        throws AppException, InformationalException;
}

```

Evidence Interface

The Evidence Interface and its associated methods are shown with the appropriate Javadoc comments.

```

/*
 * Copyright 2005-2007 Curam Software Ltd.
 * All rights reserved.
 *
 * This software is the confidential and proprietary
 * information of Curam Software, Ltd. ("Confidential
 * Information"). You shall not disclose such Confidential
 * Information and shall use it only in accordance with the
 * terms of the license agreement you entered into with
 * Curam Software.
 */

package curam.core.sl.infrastructure.impl;

import curam.core.sl.infrastructure.struct
    .AttributedDateDetails;
import curam.core.struct.CaseHeaderKey;
import curam.util.exception.AppException;
import curam.util.exception.InformationalException;

/**
 * This interface extends the StandardEvidenceInterface,
 * therefore any class that implements EvidenceInterface
 * must provide its own implementations of the methods
 * defined in the standard interface. Any methods specific
 * to "classic" (i.e. not participant) evidence are to be
 * defined in this interface.
 */
public interface EvidenceInterface
    extends StandardEvidenceInterface {

    // _____
    /**
     * Transfers evidence from one case to another.
     *
     * @param details
     *      Contains the evidenceID / evidenceType pairings of

```

```

        *           the evidence to be transferred and the transferred
        * @param fromCaseKey
        *           The case from which the evidence is being
        *           transferred
        * @param toCaseKey
        *           The case to which the evidence is being
        *           transferred
        */
void transferEvidence(EvidenceTransferDetails details,
    CaseHeaderKey fromCaseKey, CaseHeaderKey toCaseKey)
    throws AppException, InformationalException;
}

```

Participant Evidence Interface

The Participant Evidence Interface and its associated methods are shown with the appropriate Javadoc comments.

```

/*
 * Copyright 2007 Curam Software Ltd.
 * All rights reserved.
 *
 * This software is the confidential and proprietary information
 * of Curam Software, Ltd. ("Confidential Information"). You
 * shall not disclose such Confidential Information and shall use
 * it only in accordance with the terms of the license agreement
 * you entered into with Curam Software.
 */
package curam.core.sl.infrastructure.impl;

import java.util.ArrayList;

import curam.core.sl.infrastructure.struct.EIEvidenceKey;
import curam.core.sl.infrastructure.struct.EIEvidenceKeyList;
import curam.core.sl.struct.ConcernRoleIDKey;
import curam.util.exception.AppException;
import curam.util.exception.InformationalException;

/**
 * This interface extends the StandardEvidenceInterface therefore
 * any class that implements ParticipantEvidenceInterface must
 * provide its own implementations of the methods defined in the
 * standard interface. Any methods specific to participant
 * evidence be defined in this interface.
 */
public interface ParticipantEvidenceInterface
    extends StandardEvidenceInterface {

    // _____
    /**
     * Method to check if the attributes that changed during a
     * modify require reassessment to be run when they are applied.
     *
     * @param attributesChanged
     *        - A list of Strings. Each represents the name of an
     *        attribute that changed
     *
     * @return true if Reassessment required
     */
    boolean checkForReassessment(ArrayList attributesChanged)
        throws AppException, InformationalException;

    // _____
    /**
     * Method for creating the snapshot record related to a
     * participant evidence record.
     *

```

```

    * @param key
    *     Contains an evidenceID / evidenceType pairing
    *
    * @return The uniqueID and the evidence type of the Snapshot
    *     record.
    */
    EIEvidenceKey createSnapshot(EIEvidenceKey key)
        throws AppException, InformationalException;

    // -----
    /**
    * Method to compare attributes on two records of the same
    * entity type. It then returns an ArrayList of strings with
    * the names of each attribute that was different between them.
    *
    * @param key
    *     - Contains an evidenceID / evidenceType pairing
    * @param dtls
    *     - a struct of the same type as the key containing
    *       the attributes to be compared against
    *
    * @return A list of Strings. Each represents an attribute name
    *         that differed.
    */
    ArrayList getChangedAttributeList(
        EIEvidenceKey key, Object dtls)
        throws AppException, InformationalException;

    // -----
    /**
    * Method to search for records on a participant entity by
    * concernRoleID and status.
    *
    * @param key
    *     - The unique concernRoleID of the participant.
    *
    * @return A list of EIEvidenceKey objects each containing an
    *         evidenceID/evidenceType pair.
    */
    EIEvidenceKeyList readAllByConcernRoleID(ConcernRoleIDKey key)
        throws AppException, InformationalException;

    // -----
    /**
    * Method removing participant evidence. This method is called
    * when participant evidence is being canceled
    *
    * @param key
    *     - Contains an evidenceID / evidenceType pairing
    * @param dtls
    *     - Modified evidence details
    */
    void removeEvidence(EIEvidenceKey key, Object dtls)
        throws AppException, InformationalException;
}

```

Adopting an interface approach enforces a pattern upon entity design and development as each entity must implement the same interface. This approach allows the Cúram Enterprise Framework to provide as much common functionality as possible so that custom implementations can concentrate more on business aspects of evidence maintenance, such as validations. Each evidence entity must implement the Evidence Interface to have access to the Evidence Controller class. This class implements the common business logic across all evidence entities and the custom business logic specific to each evidence entity.

Accessing Non-modeled Functions

When the Evidence Interfaces are implemented by evidence entities, the methods defined by these interfaces will be implemented by those entities. These methods will of course be non-modeled so will only exist on the evidence entity impl classes. In order to access the non-modeled functions, it's necessary to cast from the impl class. Examples of this can be seen in the entity program listings later in section 3.2 of this document. This casting mechanism will not work though unless the factory class is extending the impl class as opposed to the base class. The only way that this can be achieved, if no non-stereotyped functions are being added to the class, is to add a non-stereotyped dummy function. If this is not done, it will result in a runtime error when the casting is executed.

Client Side Artifacts

The client side infrastructure artifacts are located inside the `..\webclient\components\core\Evidence Infrastructure` directory. This folder primarily contains uim and vim client pages. The vim files will typically be included inside solution specific uim pages to manage generic evidence details whereas the uim pages contain complete out-of-the-box evidence maintenance functionality.

The key benefit of the .im files is that they can be changed in line with any enhancements made to the evidence maintenance solution without any impact on specific implementations, i.e. the upgrade is seamless.

Examples of infrastructural.vim files are as follows:

- Evidence_createHeader.vim
- Evidence_modifyHeader.vim
- Evidence_viewHeader.vim
- Evidence_viewHeaderForModal.vim

These artifacts manage the infrastructural attributes of evidence maintenance and should be included in create, modify and view evidence pages. This will be highlighted later when a sample implementation of the Evidence solution is discussed. Some further examples of vim files include:

- Evidence_typeWorkspace.vim
- Evidence_workspaceInEditHighLevelView.vim
- Evidence_workspaceActiveHighLevelView.vim

These artifacts are used to populate evidence workspaces. An evidence workspace is a central location for managing evidence. The above vim files will be included by workspace.uim pages.

Some examples of infrastructural uim pages which provide entire evidence maintenance functions are:

- Evidence_applyChanges1.uim
- Evidence_addNewEvidence.uim
- Evidence_dashboard.uim

Evidence_applyChanges1 lists all work-in-progress evidence, i.e. all new and updated evidence or evidence that is pending removal. The display and action bean on this page live on the Evidence facade which is part of the centralized evidence maintenance functionality.

Evidence_addNewEvidence lists all possible evidence types, filtered by category, and launches an appropriate create page for each.

Evidence_dashboard lists all evidence types on the given case broken into categories. It highlights which types have In Edit evidence recorded and which have verifications or issues outstanding.

Note: It is important to note that in some cases.vim files found in the client infrastructure package are actually included in infrastructure pages. For instance, Evidence_dashboardView.vim is included inside the Evidence_dashboard page and Evidence_flowView.vim is included inside the Evidence_flow page.

Developing an Evidence Solution

Administration

Evidence Metadata

The Evidence Metadata entity contains metadata information relating to each evidence type. This entity must be populated before evidence maintenance can proceed. A number of evidence page names, including the view and modify page names, are included in the metadata. These page names are retrieved at runtime via evidence infrastructure resolve scripts and via implementations of the Evidence Type interface on the server. The records on the Evidence Metadata entity are effective dated to facilitate pages changing over time, due to legislation for example.

Product Evidence Link

The Product Evidence Link entity links evidence to a product. In some circumstances, evidence may be stored at the Integrated Case level but only some of this evidence may apply to a given product on the Integrated Case. To know which evidence should be attributed to a given product, a lookup of this entity is performed as part of the attribution processing and only evidence linked to the product is attributed.

Common Evidence Maintenance Operations

In this section, some common evidence maintenance operations are outlined. This is done using sequence diagrams, client screenshots and server code snippets from the a sample product implementation. This product is used for demonstration purposes only.

Create Evidence

The development, both client and server, of a create evidence operation is outlined here.

Create Evidence Sequence Diagram:

Figure 1. Sequence Diagram for Creating Evidence

Client - Screen to Be Developed: The client page to be developed must include the evidence infrastructure page Evidence_createHeader.vim. This included.vim page facilitates the management of infrastructure attributes. For example, the Evidence Descriptor's receivedDate attribute is currently managed through this infrastructure page. If, at some point in the future, additional attributes which need to be managed through the create function were added to the Evidence Descriptor

entity, then these attributes could be mapped through this infrastructure page. Hence, this requires just a once-off infrastructure change rather than many changes to custom artifacts.

Server - Methods to Be Implemented: The SEGEvidenceMaintenance.createAssetEvidence facade operation calls the evidence service layer implementation.

```
// _____
/**
 * Creates an Asset evidence record.
 *
 * @param dtls Details of the new evidence record to be created.
 *
 * @return The details of the created record.
 */
public ReturnEvidenceDetails createAssetEvidence(
    AssetEvidenceDetails dtls)
    throws AppException, InformationalException {

    // set the informational manager for the transaction
    TransactionInfo.setInformationalManager();

    // Asset evidence manipulation object
    Asset evidenceObj = AssetFactory.newInstance();

    // return object
    ReturnEvidenceDetails createdEvidenceDetails =
        new ReturnEvidenceDetails();

    // create the Asset record and populate the return details
    createdEvidenceDetails =
        evidenceObj.createAssetEvidence(dtls);

    createdEvidenceDetails.warnings =
        EvidenceControllerFactory.newInstance().getWarnings();

    return createdEvidenceDetails;
}
```

These overloaded Asset.createAssetEvidence service layer operations call the Evidence Controller infrastructure function for inserting evidence.

```
// _____
/**
 * Creates an Asset record.
 *
 * @param dtls Contains Asset evidence record creation details.
 *
 * @return the new evidence ID and warnings.
 */
public ReturnEvidenceDetails createAssetEvidence(
    AssetEvidenceDetails dtls)
    throws AppException, InformationalException {

    return createAssetEvidence(dtls, null, null, false);
}

// _____
/**
 * Creates a Asset record.
 *
 * @param dtls Contains Asset evidence record creation details.
 *
 * @param sourceEvidenceDescriptorDtls If this function is called
 * during evidence sharing, this parameter will be non-null and
```

```

* it represents the header of the evidence record being shared
* (i.e. the source evidence record)
*
* @param targetCase If this function is called during evidence
* sharing, this parameter will be non-null and it represents the
* case the evidence is being shared with.
*
* @param sharingInd A flag to determine if the function is
* called in evidence sharing mode. If false, the function is
* being called as part of a regular create.
*
* @return the new evidence ID and warnings.
*/
public ReturnEvidenceDetails createAssetEvidence(
    AssetEvidenceDetails dtls,
    EvidenceDescriptorDtls sourceEvidenceDescriptorDtls,
    CaseHeaderDtls targetCase, boolean sharingInd)
    throws AppException, InformationalException {

    // validate the mandatory fields
    validateMandatoryDetails(dtls);

    EvidenceControllerInterface evidenceControllerObj =
        (EvidenceControllerInterface)
            EvidenceControllerFactory.newInstance();
    EvidenceDescriptorInsertDtls evidenceDescriptorInsertDtls =
        new EvidenceDescriptorInsertDtls();

    ReturnEvidenceDetails createdEvidence =
        new ReturnEvidenceDetails();

    if (sharingInd) {

        EvidenceDescriptorDtls sharedDescriptorDtls =
            evidenceControllerObj.shareEvidence(
                sourceEvidenceDescriptorDtls,
                targetCase);

        // Return the evidence ID and warnings
        createdEvidence.evidenceKey.evidenceID =
            sharedDescriptorDtls.relatedID;
        createdEvidence.evidenceKey.evType =
            sharedDescriptorDtls.evidenceType;

    } else {

        // As there is no participant associated with this evidence
        // we must retrieve the case participant to set the evidence
        // descriptor participant.
        CaseHeaderKey caseHeaderKey = new CaseHeaderKey();
        caseHeaderKey.caseID = dtls.caseIDKey.caseID;
        evidenceDescriptorInsertDtls.participantID =
            CaseHeaderFactory.newInstance().readCaseParticipantDetails(
                caseHeaderKey).concernRoleID;

        // Evidence descriptor details
        evidenceDescriptorInsertDtls.caseID = dtls.caseIDKey.caseID;
        evidenceDescriptorInsertDtls.evidenceType =
            CASEEVIDENCE.ASSET;
        evidenceDescriptorInsertDtls.receivedDate =
            dtls.descriptor.receivedDate;

        // Upon creation, the change reason should be Initial
        evidenceDescriptorInsertDtls.changeReason =
            EVIDENCECHANGEREASON.INITIAL;

        // Evidence Interface details

```

```

EIEvidenceInsertDtls eiEvidenceInsertDtls =
    new EIEvidenceInsertDtls();
eiEvidenceInsertDtls.descriptor.assign(
    evidenceDescriptorInsertDtls);
eiEvidenceInsertDtls.evidenceObject = dtls.dtls;

// Insert the evidence
EIEvidenceKey eiEvidenceKey =
    evidenceControllerObj.insertEvidence(eiEvidenceInsertDtls);

// Return the evidence ID and warnings
createdEvidence.evidenceKey.evidenceID =
    eiEvidenceKey.evidenceID;
createdEvidence.evidenceKey.evType =
    eiEvidenceKey.evidenceType;
createdEvidence.warnings =
    evidenceControllerObj.getWarnings();
}

return createdEvidence;
}

```

Modify Evidence

The development, both client and server, of a modify evidence operation is outlined here.

Modify Evidence Sequence Diagram:

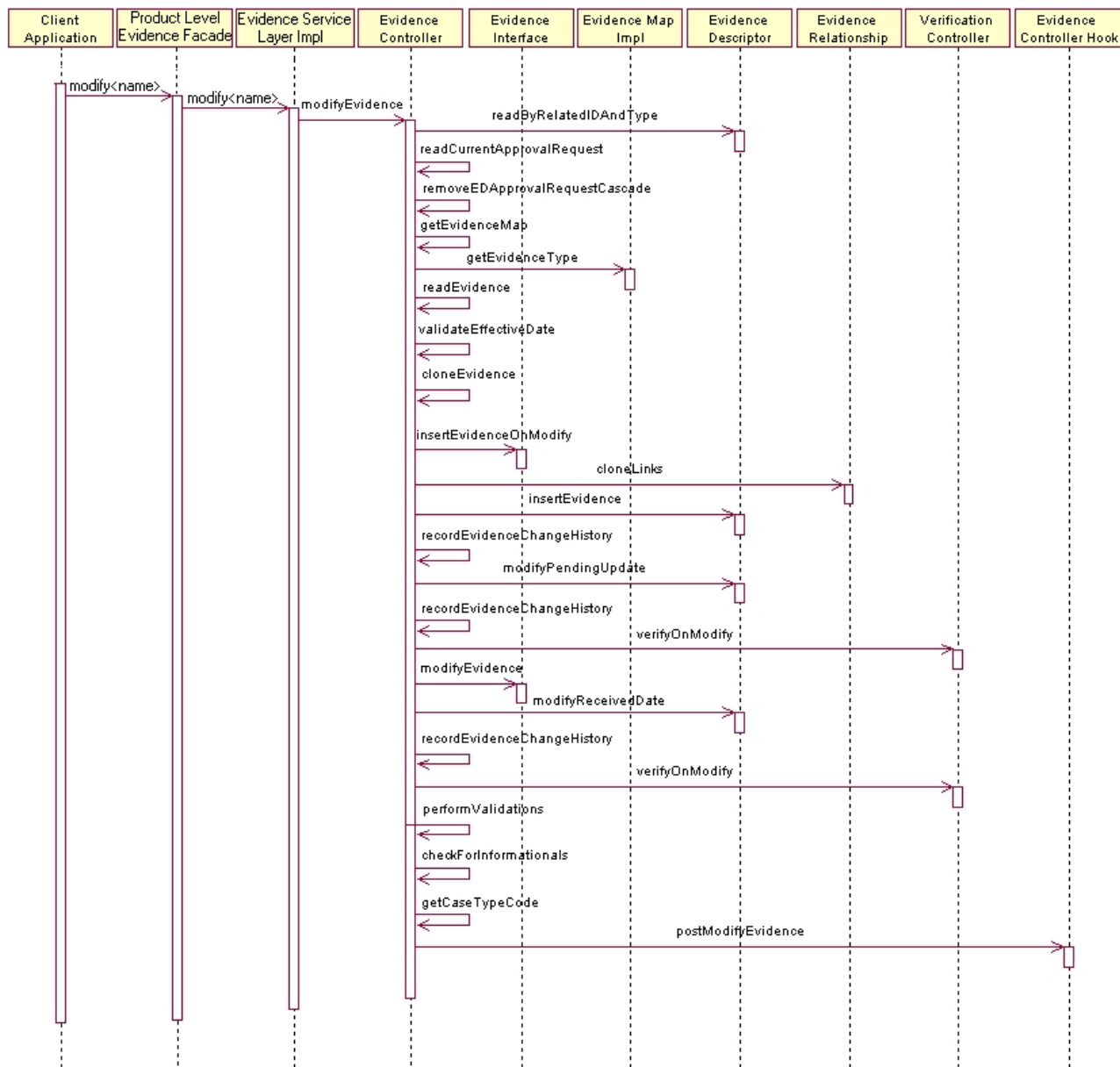


Figure 2. Sequence Diagram for Modifying Evidence

Client - Screen to Be Developed: The client page to be developed must include the evidence infrastructure page Evidence_modifyHeader1.vim. This included.vim page facilitates the viewing / modification of some infrastructure attributes. For example, received date can be viewed or modified via this.vim. Also, change reason and effective date of change can be set on the edited record. If, at some point in the future, additional attributes which need to be managed through the modify function were added to the Evidence Descriptor entity, then these attributes could be mapped through this infrastructure page. Hence, this requires just a once-off infrastructure change rather than many changes to custom artifacts.

The inclusion of Evidence_modifyHeader1.vim facilitates the following three types of evidence modification:

- Editing Evidence In Place

This refers to the modification of incorrect data on a piece of evidence which has not yet been activated. In this scenario, if the effective date is modified an error will be thrown informing the user that the date can only be modified when updating an active record.

- Evidence Correction

An evidence correction occurs when a piece of data on an active evidence record is modified resulting in the current active record being superseded. In this scenario, the effective date field must not be modified as this will result in a new record in the succession being created - see evidence succession.

- Evidence Succession

If the user modifies the effective date when updating a piece of active evidence, they are specifying a new record in the succession set, i.e. the new record will have the same successionID as the active record. Therefore, the active record will essentially be copied and made effective from the effective date specified by the user and the update applied to this record.

Note: Activation of newly created records in a succession will cause reattribution of records in that succession set.

Server - Methods to Be Implemented: The SEGEvidenceMaintenance.modifyAssetEvidence facade operation calls the evidence service layer implementation.

```
// _____
/**
 * Modifies an Asset evidence record.
 *
 * @param details The modified evidence details.
 *
 * @return The details of the modified evidence record.
 */
public ReturnEvidenceDetails modifyAssetEvidence(
    AssetEvidenceDetails dtls)
    throws AppException, InformationalException {

    // set the informational manager for the transaction
    TransactionInfo.setInformationalManager();

    // Asset evidence manipulation object
    Asset evidenceObj = AssetFactory.newInstance();

    // return object
    ReturnEvidenceDetails modifiedEvidenceDetails =
        new ReturnEvidenceDetails();

    // modify the Asset record and populate the return details
    modifiedEvidenceDetails =
        evidenceObj.modifyAssetEvidence(dtls);

    modifiedEvidenceDetails.warnings =
        EvidenceControllerFactory.newInstance().getWarnings();

    return modifiedEvidenceDetails;
}
```

The Asset.modifyAssetEvidence service layer operation calls the Evidence Controller infrastructure function for modifying evidence.

```
// _____
/**
 * Modifies an Asset record.
 *
 * @param dtls Contains Asset evidence record modification
```

```

*           details.
*
* @return The modified evidence ID and warnings.
*/
public ReturnEvidenceDetails modifyAssetEvidence
    (AssetEvidenceDetails details)
    throws AppException, InformationalException {

    // validate the mandatory fields
    validateMandatoryDetails(details);

    // EvidenceController business object
    EvidenceControllerInterface evidenceControllerObj =
        (EvidenceControllerInterface)
            EvidenceControllerFactory.newInstance();

    EIEvidenceKey eiEvidenceKey = new EIEvidenceKey();

    //
    // Call the EvidenceController to modify the evidence
    //

    eiEvidenceKey.evidenceID = details.dtls.evidenceID;
    eiEvidenceKey.evidenceType = CASEEVIDENCE.ASSET;

    // Create the evidence interface modification struct and assign
    // the details
    EIEvidenceModifyDtls eiEvidenceModifyDtls =
        new EIEvidenceModifyDtls();
    eiEvidenceModifyDtls.descriptor.receivedDate =
        details.descriptor.receivedDate;
    eiEvidenceModifyDtls.descriptor.versionNo =
        details.descriptor.versionNo;
    eiEvidenceModifyDtls.descriptor.effectiveFrom =
        details.descriptor.effectiveFrom;
    eiEvidenceModifyDtls.descriptor.changeReceivedDate =
        details.descriptor.changeReceivedDate;
    eiEvidenceModifyDtls.descriptor.changeReason =
        details.descriptor.changeReason;
    eiEvidenceModifyDtls.evidenceObject = details.dtls;

    evidenceControllerObj.modifyEvidence(
        eiEvidenceKey, eiEvidenceModifyDtls);

    //
    // Return details from the modify operation
    //

    ReturnEvidenceDetails returnEvidenceDetails =
        new ReturnEvidenceDetails();
    returnEvidenceDetails.evidenceKey.evidenceID =
        eiEvidenceKey.evidenceID;
    returnEvidenceDetails.evidenceKey.evType =
        eiEvidenceKey.evidenceType;
    returnEvidenceDetails.warnings =
        evidenceControllerObj.getWarnings();

    return returnEvidenceDetails;
}

```

Read Evidence

The development, both client and server, of a read evidence operation is outlined here.

View Evidence Sequence Diagram:

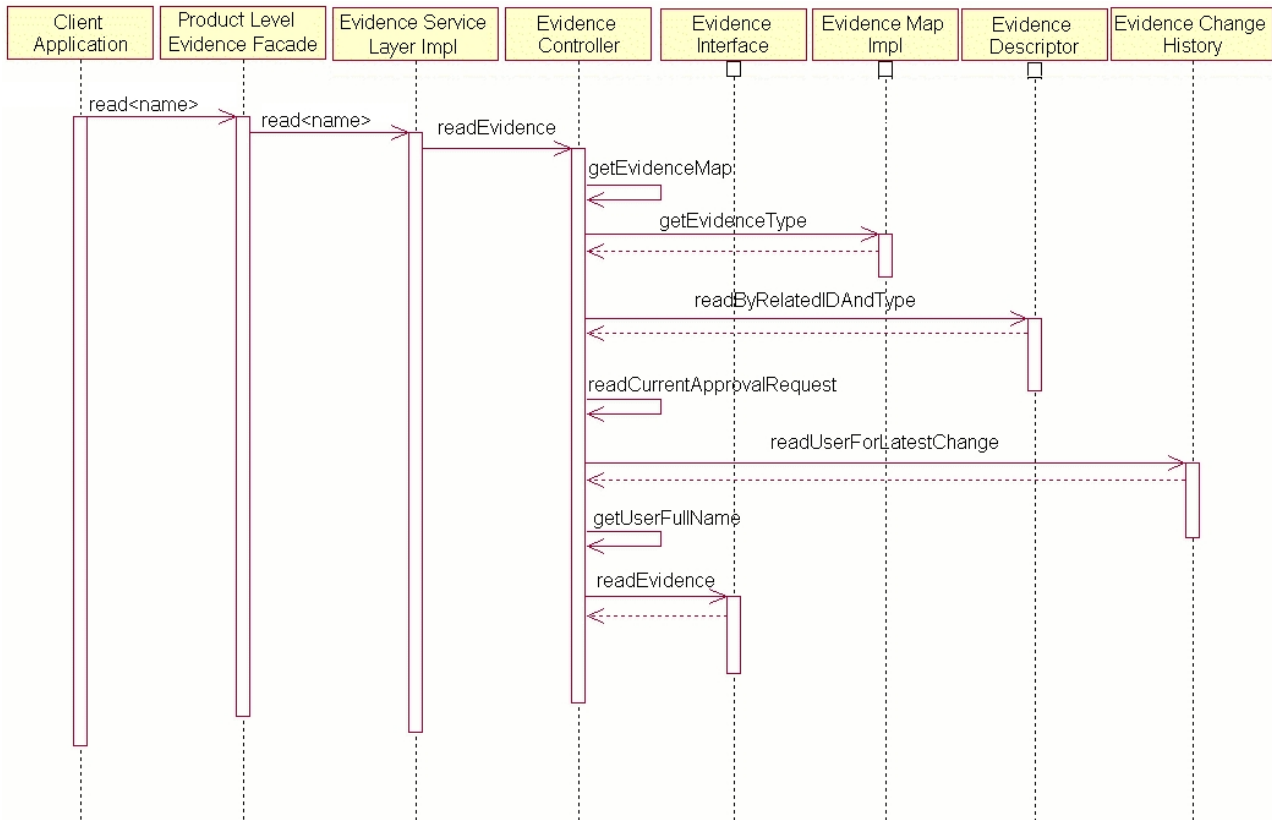


Figure 3. Sequence Diagram for Viewing Evidence

Client - Screen to Be Developed: The client page includes the evidence infrastructure page Evidence_viewHeaderForModal.vim. This included.vim facilitates the viewing of some infrastructure attributes.

Server - Methods to Be Implemented: The SEGEvidenceMaintenance.readAssetEvidence façade operation calls the evidence service layer implementation.

```

// _____
/**
 * Reads an Asset evidence record.
 *
 * @param key Identifies the evidence record to read.
 *
 * @return The details of the evidence record.
 */
public ReadAssetEvidenceDetails readAssetEvidence(
    EvidenceCaseKey key)
    throws AppException, InformationalException {

    // Asset evidence manipulation object
    Asset evidenceObj = AssetFactory.newInstance();

    // return object
    ReadAssetEvidenceDetails readEvidenceDetails =
        new ReadAssetEvidenceDetails();

    // read the Asset record and populate the return details
    readEvidenceDetails = evidenceObj.readAssetEvidence(key);
    
```



```

        return readEvidenceDetails;
    }

```

This service layer operation calls the Evidence Controller infrastructure function for reading evidence.

```

// _____
/**
 * Reads an Asset record.
 *
 * @param key contains ID of record to read.
 *
 * @return Asset evidence details read.
 */
public ReadAssetEvidenceDetails readAssetEvidence(
    EvidenceCaseKey key)
    throws AppException, InformationalException {

    // EvidenceController business object
    EvidenceControllerInterface evidenceControllerObj =
        (EvidenceControllerInterface)
            EvidenceControllerFactory.newInstance();

    EIEvidenceKey eiEvidenceKey = new EIEvidenceKey();
    eiEvidenceKey.evidenceID = key.evidenceKey.evidenceID;
    eiEvidenceKey.evidenceType = CASEEVIDENCE.ASSET;

    // Retrieve the evidence details
    EIEvidenceReadDtls eiEvidenceReadDtls =
        evidenceControllerObj.readEvidence(eiEvidenceKey);

    // Retrieve the evidence descriptor details
    EvidenceDescriptor evidenceDescriptorObj =
        EvidenceDescriptorFactory.newInstance();

    EvidenceDescriptorKey evidenceDescriptorKey =
        new EvidenceDescriptorKey();
    evidenceDescriptorKey.evidenceDescriptorID =
        eiEvidenceReadDtls.descriptor.evidenceDescriptorID;

    EvidenceDescriptorDtls evidenceDescriptorDtls =
        evidenceDescriptorObj.read(evidenceDescriptorKey);

    //
    // Return the evidence
    //

    ReadAssetEvidenceDetails readEvidenceDetails =
        new ReadAssetEvidenceDetails();
    readEvidenceDetails.descriptor
        .assign(evidenceDescriptorDtls);

    readEvidenceDetails.descriptor.approvalRequestStatus =
        eiEvidenceReadDtls.descriptor.approvalRequestStatus;
    readEvidenceDetails.descriptor.updatedBy =
        eiEvidenceReadDtls.descriptor.updatedBy;
    readEvidenceDetails.descriptor.updatedDateTime =
        eiEvidenceReadDtls.descriptor.updatedDateTime;

    // assign the evidence to the return object
    readEvidenceDetails.dtls.assign(
        (AssetDtls)(eiEvidenceReadDtls.evidenceObject));

    return readEvidenceDetails;
}

```

List Evidence

The development, both client and server, of a list evidence operation is outlined here. The list operation is used to populate an evidence workspace page.

List Evidence Sequence Diagram:

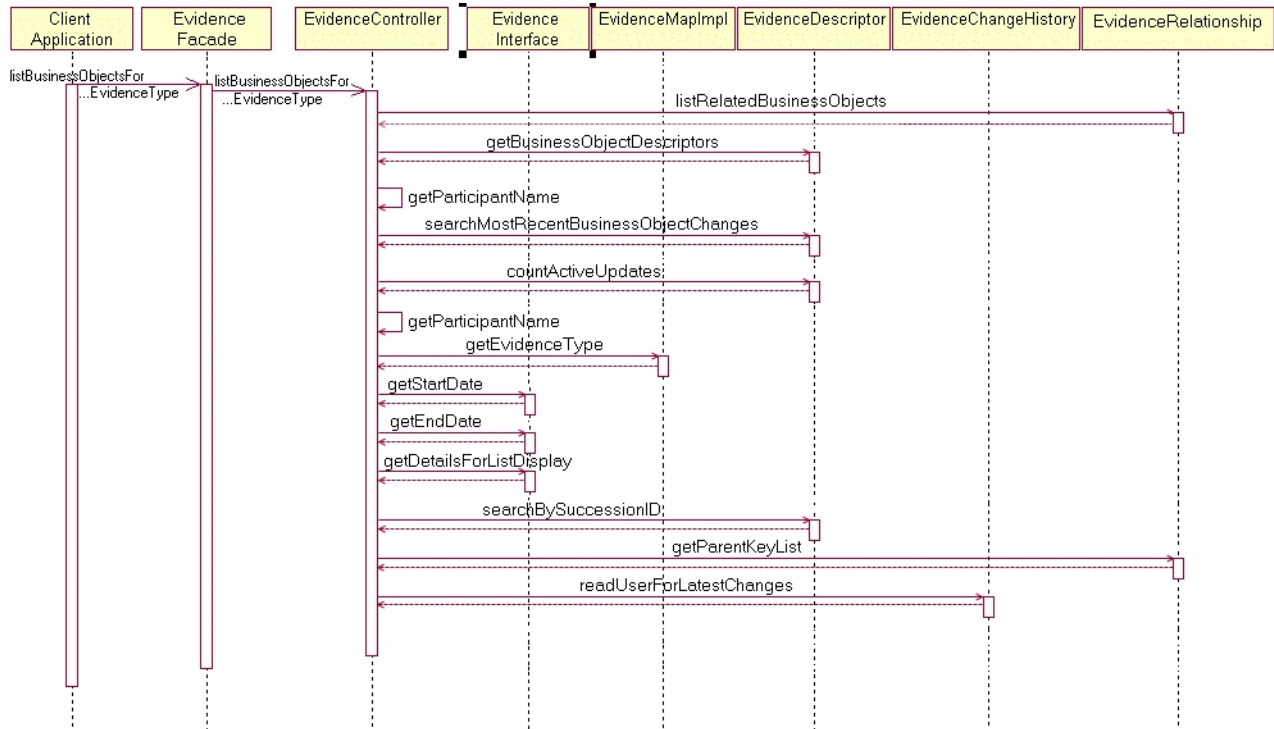


Figure 4. Sequence Diagram for Listing Evidence

Server - Methods to Be Developed: Much of the data displayed on the workspace page is retrieved via the Evidence Descriptor entity. The description and period are retrieved via Evidence Interface methods which must be implemented for each evidence type.

- *Asset.getDetailsForListDisplay entity operation*

The description, or summary details, is retrieved via the getDetailsForListDisplay Evidence Interface method which is implemented by the evidence entities. The implementation of the getDetailsForListDisplay method for the Asset is shown below. This interface function is also used to retrieve summary data when applying, approving, rejecting evidence as well as in evidence sharing, verifications and issues screens.

```

// _____
/**
 * Gets evidence details for the list display
 *
 * @param key Evidence key containing the evidenceID and
 * evidenceType
 *
 * @return Evidence details to be displayed on the list page
 */
public EFieldsForListDisplayDtls getDetailsForListDisplay(
    EEvidenceKey key)
    throws ApplicationException, InformationalException {

    // Return object
    EFieldsForListDisplayDtls eiFieldsForListDisplayDtls =
  
```

```

        new EIFieldsForListDisplayDtls();

// Asset entity key
final AssetKey assetKey = new AssetKey();
assetKey.evidenceID = key.evidenceID;

// Read the Asset entity to get display details
final AssetDtls assetDtls =
    AssetFactory.newInstance().read(assetKey);

// Set the start / end dates
eiFieldsForListDisplayDtls.startDate = assetDtls.startDate;
eiFieldsForListDisplayDtls.endDate = assetDtls.endDate;

LocalisableString summary = new LocalisableString(
    BIZOBJDESCRIPTIONS.BIZ_OBJ_DESC_ASSET);

summary.arg(
    CodeTable.getOneItem(SAMPLEASSETTYPE.TABlename,
        assetDtls.assetType));

// Format the amount for display
TabDetailFormatter formatterObj =
    TabDetailFormatterFactory.newInstance();
AmountDetail amount = new AmountDetail();
amount.amount = assetDtls.value;
summary.arg(formatterObj.formatCurrencyAmount(amount).amount);

eiFieldsForListDisplayDtls.summary =
    summary.toClientFormattedText();

return eiFieldsForListDisplayDtls;
}

```

(deprecated) Evidence Dashboard and EvidenceFlow



The Evidence Dashboard and **EvidenceFlow** are user interface constructs introduced to assist user navigation to all evidence on a case. No custom code is required in order to configure these for a custom case as these are infrastructural.

From these pages, a user can select a particular evidence type which should open the respective evidence workspace for that type of evidence. In the case of the Dashboard, this will open in a new tab, whereas the EvidenceFlow will redirect the bottom portion of the page.

The existence of 'In Edit' evidence records, outstanding verifications and outstanding issues are all highlighted graphically.

The list of evidence types on the case may be split into categories on these pages, by defining the category on the AdminICEvidenceLink table for Integrated Cases, or on the ProductEvidenceLink table for Product Deliveries.

Validations

The infrastructure facilitates the validation of work-in-progress changes. The validate page can be used either at a case level or on an individual evidence type.

The purpose of the case level validate page is to provide a means to test validations in advance of applying the changes. For some products, the full evidence set may be quite sizeable resulting in the apply changes listing containing

a considerable number of evidence changes of varying evidence types. In that scenario, the individual evidence type validate page may make it easier to associate a validation message with the correct evidence record. The validate page allows a user to pre-test the evidence changes. The user can see which validations will fail and fix them before applying the changes.

More On Validations

Two of the Evidence Interface functions which form part of the infrastructure support for evidence validation are `selectForValidations` and `validate`.

The `selectForValidations` function will typically be used to select all evidences which are related to or are dependant on the piece of evidence being validated. An example of this would be the modification of an amount on a parent evidence record. As part of the validation of the parent evidence, a check might need to be performed to ensure the sum of the child evidence records does not exceed the modified parent amount.

When a user applies changes to evidence records, the Evidence Controller calls out to the `selectForValidations` interface function on the entities for each evidence record. The logic within this method retrieves all related 'Active' and 'In Edit' evidences within the hierarchy for validation. For instance, if we are validating a child evidence record within a parent-child-grandchild relationship structure, both parent evidence and grandchild evidence are retrieved for the validation processing.

Once processing returns to the Evidence Controller, a filter is applied to the list of evidence. This filters the input list and leaves only 'Active' records, or 'In Edit' records as appropriate depending on whether the function must validate against work-in-progress or active only evidence. This filtered list is then passed to the `validate` function where custom validation is applied.

The program listing below shows a `selectForValidations` implementation used in the Asset demo.

```
// _____
/**
 * Selects all the records for validations
 *
 * @param evKey Contains an evidenceID / evidenceType pairing
 *
 * @return List of evidenceID / evidenceType pairings
 */
public EIEvidenceKeyList selectForValidation(
    EIEvidenceKey evKey)
    throws AppException, InformationalException {

    // Return object
    EIEvidenceKey eiEvidenceKey = new EIEvidenceKey();

    // Casting to impl due to calling non-modeled interface
    curam.seg.evidence.entity.intf.AssetOwnership
    assetOwnershipObj =
        (curam.seg.evidence.entity.impl.AssetOwnership)
        AssetOwnershipFactory.newInstance();

    eiEvidenceKey.evidenceID = evKey.evidenceID;
    eiEvidenceKey.evidenceType =
        CASEEVIDENCE.ASSET;

    EIEvidenceKeyList eiEvidenceKeyList =
        assetOwnershipObj.readAllByParentID(eiEvidenceKey);
```

```

        eiEvidenceKeyList.dtls.add(0, evKey);

    return eiEvidenceKeyList;
}

```

The code here, on the Asset parent entity, makes a call to the readAllByParentID interface method implementation on the child entity, Asset Ownership. The implementation of the readAllByParentID function on the Asset Ownership is shown in the program listing below.

```

// _____
/**
 * Read all Asset Ownership records
 *
 * @param key Contains the evidenceID and evidenceType
 *
 * @return A list of evidenceID and evidenceType pairs
 */
public EIEvidenceKeyList readAllByParentID(EIEvidenceKey key)
    throws AppException, InformationalException {

    // Return object
    EIEvidenceKeyList eiEvidenceKeyList = new EIEvidenceKeyList();

    // Create the link entity object
    EvidenceRelationship evidenceRelationshipObj =
        EvidenceRelationshipFactory.newInstance();

    // parent entity key
    ParentKey parentKey = new ParentKey();
    parentKey.parentID = key.evidenceID;
    parentKey.parentType = key.evidenceType;

    // Reads all relationship details for the specified parent
    ChildKeyList childKeyList =
        evidenceRelationshipObj.searchByParent(parentKey);

    // Iterate through the link details list
    for (int i = 0; i < childKeyList.dtls.size(); i++) {

        if (childKeyList.dtls.item(i).childType.equals(
            CASEEVIDENCE.ASSETOWNERSHIP)) {

            EIEvidenceKey listEvidenceKey = new EIEvidenceKey();

            listEvidenceKey.evidenceID =
                childKeyList.dtls.item(i).childID;
            listEvidenceKey.evidenceType =
                childKeyList.dtls.item(i).childType;

            eiEvidenceKeyList.dtls.addRef(listEvidenceKey);
        }
    }

    return eiEvidenceKeyList;
}

```

The function above retrieves all child evidence keys for the specified parent. The childID and childType pairings are returned to the calling mechanism.

Evidence Attribution

Evidence attribution refers to the assignment of a period of time to a given piece of evidence during which that piece of evidence will be used for entitlement

calculations. The attribution period may range from a basic one to one mapping from the business start and end dates through to a more sophisticated algorithm considering any number of factors. This custom logic calculates the attribution period and the evidence controller takes care of synchronizing these with the specified effective dates – see example(s) below. It should also be noted that the attribution from and to dates can be null in which case the piece of evidence is assumed effective from the case start date to the expected end date.

One of the Evidence Interface functions is `calcAttributionDatesForCase` and the implementation of this function on an entity class is where the attribution from and to dates are determined for evidence on that entity.

Re-attribution

When evidence is modified as part of a succession and subsequently activated, re-attribution of the evidence records in the succession set occurs. A basic example of how this works is shown below:

Business Start Date: 3rd May 2006 (=attribution from date)

Business End Date: 30th July 2006 (=attribution to date)

A succession record is created effective from 5th June 2006. On activation of this record, the evidence is re-attributed and the following attribution records created:

3rd May 2006 to 4th June 2006

5th June 2006 to 30th July 2006

Re-attribution also occurs if evidence in a succession set is removed. For example, if the following three attribution records exist for records in the same succession set

3rd May 2006 to 4th June 2006

5th June 2006 to 30th July 2006

31st July 2006 to 29th Sept 2006

and the evidence record associated with the middle one is removed, applying changes will cause the following re-attribution

3rd May 2006 to 30th July 2006

31st July 2006 to 29th Sept 2006

The attribution record from 5th June 2006 to 30th July 2006 remains on the database but won't be picked up by eligibility processing as the associated evidence is removed, i.e. has a status of 'Canceled'.

Evidence Relationship

By default, the Evidence infrastructure facilitates the linking of parent-child evidence via the `EvidenceRelationship` link entity. The structure of the `EvidenceRelationship` link entity is as follows:

Table 1. Evidence Relationship Link Entity

Evidence Relationship
evidenceRelationshipID
parentID
parentType
childID
childType

This supports the relationship between any parent-child evidence and does away with the necessity for customers to model their own link entities for managing such relationships. When evidence is being inserted, the generic `EvidenceController.insertEvidence` function makes a call to the business process `EvidenceRelationship.createLink`. If a parent type has been specified, i.e. passed in from the client as part of the insert, then a record will be written to the `EvidenceRelationship` entity linking the child evidence to its parent. Also, a call is made to the business process `EvidenceRelationship.cloneLinks` directly after the call to the interface operation `insertEvidenceOnModify`. From `cloneLinks`, two further calls are made to `cloneLinksForParent` and `cloneLinksForChild`.

If customers are using their own link entities to manage relationships, they will need to override the Evidence Relationship business processes for creating and cloning links. The evidence type is available in the input keys of both these functions which means that responsibility can be delegated to the appropriate custom relationship processing based on the evidence type in the key.

Registering Evidence Implementations

The evidence maintenance pattern requires the set of evidence entities to be registered before they can be used. This is so that the controller can access these evidence entities at runtime.

The Core Cúram Framework does not know in advance which evidence entities will be used for the given evidence maintenance facility associated with a particular product implementation. The evidence types and their implementation must be paired at runtime.

Evidence Registrar Module

Google Guice dependency injection should be used in order to register the different evidence types and their implementations. This can be done by writing a new module class, or adding to a pre existing one. Once this is added to the `ModuleCalssName` table, then at runtime it will be loaded and the evidence types registered.

Google Guice dependency injection example:

```
/*
 * Copyright 2011 Cúram Software Ltd.
 * All rights reserved.
 *
 * This software is the confidential and proprietary information
 * of Cúram Software, Ltd. ("Confidential Information"). You
 * shall not disclose such Confidential Information and shall use
 * it only in accordance with the terms of the license agreement
 * you entered into with Cúram Software.
 */
```

```

package curam.seg.evidence.service.impl;

import curam.codetable.CASEEVIDENCE;
import com.google.inject.AbstractModule;
import curam.core.impl.FactoryMethodHelper;
import java.lang.reflect.Method;
import com.google.inject.multibindings.MapBinder;
import curam.core.impl.RegistrarImpl;
import curam.core.impl.Registrar.RegistrarType;

/**
 * A module class which provides registration for all of the
 * evidence hook implementations.
 */
public class SEGRegistrarModule extends AbstractModule {

    @Override
    public void configure() {

        // Register all hook implementations which implement the
        // interface EvidenceInterface.
        MapBinder<String, Method> evidenceInterfaceMapBinder =
            MapBinder.newMapBinder(binder(), String.class,
                Method.class, new RegistrarImpl(RegistrarType.EVIDENCE));

        evidenceInterfaceMapBinder
            .addBinding(CASEEVIDENCE.ASSET)
            .toInstance(FactoryMethodHelper.getNewInstanceMethod(
                curam.seg.evidence.entity.fact.AssetFactory.class));
    }
}

```

Legacy Evidence Registrar

The legacy mechanism for registration of evidence entities is still supported. i.e. using the Application Properties to specify the factories to populate a hashmap of the hook classes. The factory code will not change in order to maintain backward compatibility but all out of the box, legacy implementations have been deprecated.

Custom Hooks

As the Evidence Controller functionality is generic to all evidence solutions, the only way to facilitate an organization's unique requirements is by the provision of hooks where custom logic can be located in order to extend the core solution. Call outs to these hooks, or extension points, are made within the Evidence Controller maintenance functions.

Evidence Controller Hook

Evidence Controller Hook is the evidence infrastructure class which contains the extension points for the evidence maintenance pattern. An example of a hook in this class is `postRemoveEvidence`. A call is made to this function inside the Evidence Controller `removeEvidence` operation. Customers must override the hook with their custom version if they want to perform post remove evidence processing.

Evidence Controller Hook Registrar & Manager

Following on from the Evidence Registrar and the underlying Dependency Injection pattern, a similar approach has been taken for the registration of the Evidence Controller Hook class. An Evidence Controller Hook Registrar interface is shipped as part of the evidence infrastructure. As before, at runtime, the Evidence Controller invokes the Registrar's `register` method which performs the dependency

injection of the associated custom Evidence Controller Hook. This is the class which will have extended the out-of-the-box Evidence Controller Hook and overridden the methods being customized. This "injector" class is located through runtime configuration where the injector class itself is referred to as the "Evidence Controller Hook Registrar".

The dependency injection involves two steps. First, a custom Evidence Controller Hook Registrar, which implements the Evidence Controller Hook Registrar interface, must be located and the Registrar then invoked to register the customized hook class. For example, the product type and custom Evidence Controller Hook class pairing will be entered into a hashmap and then the class looked up via the product type when it's required. In order to locate the Evidence Controller Hook Registrar, its class name must be configured using the environment variable "curam.case.evidencecontrollerhook.registrars". Note: additional entries need to be added to this environment variable in a comma delimited format.

The implementation of the Registrar's register method must reference the customized Evidence Controller Hook class. Doing this in code, rather than as configuration, provides a compile time check that the referenced class exists. The existence of the Registrar, though, is only ascertained from the provided configuration, and may result in a runtime failure if the application is mis-configured.

The Evidence Controller Hook Manager class manages the static initialization of the Evidence Controller Hook mapping as well as the retrieval of the subclass of the Evidence Controller Hook. If no subclass is found, the out-of-the-box version of the Evidence Controller Hook class is returned.

Customization of Multiple Participant Evidence

This section describes the customization options for multiple participant evidence.

Multiple participant evidence is a feature that allows users to insert multiple records, modify multiple records or discard multiple records in a single action. This can save time and effort when caseworkers are managing multiple clients on a case, such as adding the same address for all family members in a single operation.

The following sections describe the customization options and extension points available to developers for multiple participant evidence.

Multiple Participant Evidence Extension Points

The following section describes the multiple participant evidence extension points.

A number of extension points have been provided to allow for customization. The following hook points have been provided.

- Pre create multiple participant evidence.
- Post create multiple participant evidence.
- Pre modify multiple participant evidence.
- Post modify multiple participant evidence.
- Pre discard multiple participant evidence.
- Post discard multiple participant evidence

Example Implementation

To enact custom functionality, do the following;

1. Create a new class in your custom package that implements the `curam.core.sl.infrastructure.impl.MultiEvidenceHook`.
2. Implement each method of the interface.

It is worth noting, the arguments supplied to the customization hook points are clones of the original. Modification of the values will not be reflected in the default flow.

```
class CustomMultiEvidenceHookImpl implements curam.core.sl.infrastructure.impl.MultiEvidenceHook
{
    /**
     * Include your custom processing in this function
     * and it will
     * be invoked before the multiple create operation.
     */
    public void preCreateMultiEvidence( final List<CaseParticipantRoleKey> participantList)throws
    {
        for (final CaseParticipantRoleKey item : participantList) {
            // Custom participant processing for pre create
            // multiple participant evidence
            ...
        }
    }
    // Implement all other interface methods, even if they do nothing.
    ...
}
```

Example Configuration

Once you have create a `MultiEvidenceHook` implementation you must configure it for use.

1. In your custom package create a new class that extends `com.google.guice.AbstractModule`.
2. Bind the custom implementation to interface using Guice binding.

```
public class HookModule extends AbstractModule {
    @Override public void configure()
    {
        // Bind custom multi evidence hook
        bind(MultiEvidenceHook.class).to(CustomMultiEvidenceHookImpl .class);
    }
}
```

Multiple Participant Evidence Customization

The following section describes how to configure custom filters.

Customization of the Multiple Participant Evidence feature provides the ability to configure custom filters. The multiple participant evidence maintenance filters provide control over the list of options presented to the user during multiple participant operations, namely;

1. The list of participants that are presented to the user during create operations.
2. The list of evidence that is presented to the user during modify operations.
3. The list of evidence presented to the user during a discard operations.

There are two types of filter, Global filter and Evidence type filters.

1. Global filters allow a general filter to be applied to all evidence, removing the need to apply for every evidence type, and also ensuring the filter is applied to newly created evidence types that support Multiple Participant Evidence.
2. Evidence type filters allow specific filters to be applied at the evidence type level giving a more fine grained control over how filters are applied.

Global Filters Configuration:

The following sections describe how to implement a global filter.

Global filters are applied to all evidence types. These filters can be used to provide general rules that are applied across all evidence types. This removes the need to replicate filtering rules across multiple types and removes the need to create new filters for each newly created evidence type.

Default Global Filters

When displaying a multiple participant create, update or discard page the list of items that is presented to the user is constructed from the case participants or case evidence. For more information on how these lists are constructed, refer to the Javadoc information of the `curam.evidence.impl.DynamicEvidenceMultiEvidenceOperations` class.

After the unfiltered list is constructed a global filter is applied for each operation type. For more information on how each default global filter works, refer to the Javadoc information of the `curam.core.sl.infrastructure.impl.MultiEvidenceFiltersImpl`.

Replacing Global Filters

If the default global filter is not suitable for your business scenario, it can be replaced with a custom version by configuring a new global filter.

The following sections present examples of how to implement a global filter;

- Global Filter for Multiple Create,
- Global Filter for Multiple Modify,
- Global Filter for Multiple Discard.

Global Filter for Multiple Create

The following example shows how a global create filter can be applied to all evidence types that use multiple participant evidence maintenance. The class must extend the `AbstractMultiEvidenceFiltersImpl` and implement the `evaluateParticipantForMultiCreate` operation.

The filter in this example has the following criteria.

1. Participant exists on the case for the given received date.
2. Participant is of type PRIMARY or MEMBER.
3. Participant is active.

```
public class CustomMultiEvidenceFiltersImpl extends AbstractMultiEvidenceFiltersImpl
{
    /**
     * Removes the given participant from the list presented during multiple participant crea
     * operation.
     * The participant will be removed if they are not active, current and have a participant
```

```

* type of PRIMARY OR MEMBER.
*
* @param participant
*     a case participant who is currently included in the multiple create list.
* @return
*     true if the participant should be excluded from the list.
*
*/
protected boolean excludeParticipantFromMultiCreate(final MultiParticipantDtls participant)
{
    return participant.recordStatus.equals(RECORDSTATUS.NORMAL) &&
        (participant.typeCode.equals(CASEPARTICIPANTROLETYPE.PRIMARY) ||
         participant.typeCode.equals(CASEPARTICIPANTROLETYPE.MEMBER)) && new
            DateRange(participant.startDate, participant.endDate).contains(getCurrentReceivedDate());
}
}

```

Global Filter for Multiple Modify

The following example shows how a global modify filter can be applied to all evidence types that use multiple participant evidence maintenance. The class must extend the `AbstractMultiEvidenceFiltersImpl` and implement the `evaluateParticipantForMultiModify` operation.

The filter in this example has the following criteria.

1. For the participant whose evidence the modify operation was initiated from, filter out all other evidence records belonging to this participant.
2. Filter evidence that does not exist on the case for the given received date.

```

/**
 * Custom class to redefine the global filter for the multiple participant maintenance
 * evidence lists.
 */
public class CustomMultiEvidenceFiltersImpl extends AbstractMultiEvidenceFiltersImpl
{
    /**
     * Return true if you want to filter this item from the list of evidence that can be
     * modified.
     *
     * @param evidence
     *     an evidence record that is currently included in the multiple participant update list.
     *
     * @return true if the evidence should be excluded from the multiple participant update
     * list.
     */
    protected boolean excludeEvidenceFromMultiModify(final MultiEvidenceDtls evidence) {
        // Do not exclude by default
        boolean shouldExclude = false;
        try {
            shouldExclude = evidence.participantID != getCurrentEvidenceDescriptorDtls().participantID
                && !new DateRange(evidence.startDate, evidence.endDate).contains(
                    getCurrentDynamicEvidenceObject().getReceivedDate());
        } catch (AppException e) {
            // Do not exclude
        } catch (InformationalException e) {
            // Do not exclude
        }
        return shouldExclude;
    }
}

```

Global Filter for Multiple Discard

The following example shows how a global discard filter can be applied to all evidence types that use multiple participant evidence maintenance. The class must extend the `AbstractMultiEvidenceFiltersImpl` and implement the `evaluateParticipantForMultiDiscard` operation.

The filter in this example has the following criteria.

1. For the participant whose evidence the discard operation was initiated from, filter out all other evidence records belonging to this participant.

```
/**
 * Custom class to redefine the global filter for the multiple participant maintenance
 * evidence lists.
 */
public class CustomMultiEvidenceFiltersImpl extends AbstractMultiEvidenceFiltersImpl implements MultiEvidenceFilters {

    /**
     * Return true if you want to filter this given item from the list of evidence that can
     * be discarded.
     *
     * @param evidence
     *      an evidence record that is currently included in the multiple participant update
     *      list.
     * @return true if the evidence should be excluded from the multiple participant update
     *      list.
     */
    protected boolean excludeEvidenceFromMultiDiscard(final MultiEvidenceDtls evidence) {
        boolean shouldFilter = false;
        try {
            shouldFilter = evidence.participantID != getCurrentEvidenceDescriptorDtls().participantID;
        } catch (AppException e) {
            // Do not filter
        } catch (InformationalException e) {
            // Do not filter
        }
        return shouldFilter;
    }
}
```

Global Filters Configuration

The following example shows how to configure your custom filter for use. In this example, the `CustomMultiEvidenceFiltersImpl` class is bound to the default `MultiEvidenceFiltersImpl` class which will result in the custom class overriding the default class.

1. In your custom package create a new class that extends `com.google.guice.AbstractModule`.
2. Bind the custom implementation to interface using Guice binding.

```
/**
 * Configure Filters for Multiple Participant Evidence Maintenance.
 */
public class FilterModule extends AbstractModule {
    @Override
    public void configure() {
        // Bind custom evidence filter
        bind(MultiEvidenceFiltersImpl.class).to(CustomMultiEvidenceFiltersImpl.class);
    }
}
```

Evidence Type Filters:

The following sections describe how to implement an evidence filter.

Evidence type filters provide the mechanism to customize specific evidence types for multiple participant update operations. A custom filter can be configured to be applied to 1 or more evidence types..

Note: An evidence type filter will **replace** the global filter. The type specific filter will receive the full set of records that can be legitimately displayed for the operation. E.g. all case participants including canceled ones or all evidence of the same type, regardless of whether it is canceled or end dated. While this gives the developer full control over how records will be filtered, it is likely they will need to re-apply some of the global rules..

Evidence type filters are configured by mapping the evidence type code of an evidence to a custom filter..

Multiple Participant Evidence Filter Implementation

A multiple participant evidence filter can be implemented by extending `curam.core.sl.infrastructure.impl.AbstractMultiEvidenceFiltersImpl` abstract class. Filter customization is done in two steps.

1. Implement a custom filter by extending the `AbstractMultiEvidenceFiltersImpl`.
2. Add a binding for the custom filter implementation using Guice binder.

Implementing New Multiple Participant Evidence Specific Filter

The following example demonstrates how to create an evidence type specific filter. The example excludes email addresses, from the multiple update list of an email address modify or discard operation, if they are not of the same type as the email address record selected for update..

1. Create a custom class that extends `AbstractMultiEvidenceFiltersImpl` and implements the exclude methods for modify and discard operations.

```
public class MyCustomEmailAddressMultiEvidenceFiltersImpl extends AbstractMultiEvidenceFiltersImpl {

    @Override protected boolean excludeEvidenceFromMultiModify(final MultiEvidenceDtls evidence) {
        return excludeEmailAddressEvidence(evidence);
    }

    @Override protected boolean excludeEvidenceFromMultiDiscard(final MultiEvidenceDtls evidence) {
        return excludeEmailAddressEvidence(evidence);
    }

    /**
     * Exclude evidence from email address multiple evidence update.
     */
    protected boolean excludeEmailAddressEvidence(final MultiEvidenceDtls evidence) {
        boolean shouldExclude = false;
        // Include by default.

        final EvidenceDescriptorKey evidenceDescriptorKey = new EvidenceDescriptorKey();
        evidenceDescriptorKey.evidenceDescriptorID = evidence.evidenceDescriptorID;
        try {
            // Re-apply the global filter rules because we have disabled them by
            // adding this type specific filter.
            boolean evidenceShouldBeConsidered = evidence.participantID != getCurrentEvidenceDescriptorID()
                && !new DateRange(evidence.startDate, evidence.endDate).contains(getCurrentDynamicDate());
            shouldExclude = !evidenceShouldBeConsidered;
        } catch (Exception e) {
            // Log the exception and return false to include the evidence.
            logger.error("Error while excluding evidence from email address multiple evidence update.", e);
        }
        return shouldExclude;
    }
}
```

```

        if (evidenceShouldBeConsidered) {
            boolean shouldExclude =
                ((String)readDynamicEvidenceObject(evidenceDescriptorKey).getAttributeValue(
                    getCurrentDynamicEvidenceObject().getAttributeValue(PDCEmailAddress.
                )
            }
        catch (AppException e) {
            // Default to include
        }catch (InformationalException e){
            // Default to include
        }
        return shouldExclude;
    }
}

```

2. Create a Guice Module to bind the implementation. If you are not familiar with the use of Guice Modules with Curam you can read more here. Use the evidence type code to bind the implementation using the standard Guice map binder strategy. In this case the evidence type code needed for the binding is PDC0000260, which maps to the 'Email Addresses' evidence type. The evidence type code value can be looked up on the EvidenceType code table.

```

public class EvidenceFilterModule extends AbstractModule {

    @Override public void configure() {
        final MapBinder<String, MultiEvidenceFilters>
        pdcMultiEvidenceFiltersMapBinder = MapBinder.newMapBinder(binder(), String.class,
        pdcMultiEvidenceFiltersMapBinder.addBinding("PDC0000260").to(
        MyCustomEmailAddressMultiEvidenceFiltersImpl.class);
    }
}

```

Participant Evidence Integration

Overview

Evidence is the term used for data in the calculation of eligibility and entitlement. Participant data is also regarded as evidence, a concern's date of birth for example, but in the past it wasn't always treated as classic evidence. It is obviously correct for a concern's date of birth to be maintained within the Participant Manager rather than being stored on a separate evidence entity, i.e. one that is interfaced to the Evidence API, but it must also be propagated across all cases belonging to the concern and any changes in such evidence must trigger reassessment.

- A modification applied to Participant data will automatically apply to all cases using this data
- Modifying such data will trigger reassessment of all cases using this data

The following Core Participant entities have been integrated with Evidence:

- Address
- AlternateID
- AlternateName
- BankAccount
- Citizenship
- ConcernRole
- ConcernRoleRelationship
- Education
- Employer
- Employment

- EmploymentWorkHour
- Foreign Residency
- Person
- ProspectEmployer
- ProspectPerson

Integration of Participant Data as Evidence

Participant Evidence Integration is available out of the box but, like evidence, it requires a certain amount of configuration. If the configuration is not carried out, then all newly integrated Participant evidence will not integrate with the Evidence API. It will, however, continue to function as it always has. Once configured, the Participant evidence will be linked to one or more cases via an Evidence Descriptor. As in the case of classic evidence, the Evidence Descriptor can be associated with either an Integrated Case or a Product Delivery.

The required configuration links the Participant evidence types to the Integrated Case(s) or Product(s) that will use them. Such data is stored on the AdminICEvidenceLink and ProductEvidenceLink respectively. Participant data that will be stored at the Integrated Case level needs to be configured on the AdminICEvidenceLink entity whereas Participant evidence that will be used by a Product needs to be configured on the ProductEvidenceLink entity.

Administration

AdminICEvidenceLink

Every integrated case type that wants to integrate the available 15 entities as evidence will need to insert an entry into the AdminICEvidenceLink table. This table must link evidenceMetadataID (from EvidenceMetadata table) and adminIntegratedCaseID (from AdminIntegratedCase table) for each participant entity required as evidence and for each integrated case type.

ProductEvidenceLink

Every product delivery case type that wants to integrate the available 15 entities as evidence will need to insert an entry into the ProductEvidenceLink table. This table must link evidenceMetadataID (from EvidenceMetadata table) and productID (from Product table) for each participant entity required as evidence and for each product type.

Integrating new Participant entities as Evidence

Integrating new, or existing, Participant entities with Evidence requires a number of steps. As mentioned above, meta-data needs to be configured for Integrated Case types and Product types. As well as this, other infrastructural support needs to be implemented by a developer in order for the integration to work.

Implementing the ParticipantEvidenceInterface

A Participant entity being integrated into the Evidence solution must implement the ParticipantEvidenceInterface. This means that the entity will need to implement the following functions:

- calcAttributionDatesForCase
- getDetailsForListDisplay
- getEndDate
- getStartDate
- insertEvidence

- insertEvidenceOnModify
- modifyEvidence
- readAllByParentID
- readEvidence
- selectForValidation
- validate
- checkForReassessment
- createSnapshot
- getChangedAttributeList
- readAllByConcernRoleID
- removeEvidence

Register entity in a Registrar Module

Participant entities being integrated to Evidence need to be registered via a Registrar Module as outlined in “Evidence Registrar Module” on page 23. The out of the box participant evidence types has been configured in CoreRegistrarModule. This binds the evidence type to its entity. These map bindings are loaded at runtime and are used by the Evidence Controller when looking up the appropriate evidence entity for a given type, i.e. the entity that has implemented the ParticipantEvidenceInterface.

Applying Participant Evidence to all Cases

A new hook class ApplyChangesForEvidence has been added.

The new ApplyChangesForEvidence class represents a hook which can be overridden by custom code. The

ApplyChangesForEvidence.isApplyChangesAutomatedForEvidence method is called from Evidence Controller to decide whether reassessment needs to be triggered when evidence is applied. The default implementation defaults to false and therefore the user will have to manually apply the changes on the associated cases. If the solutions wish to customize, the implementers should use ProductHookRegistrar.registerApplyChangesHooks method to add details of the hooks to use for applying changes. The static map attribute, applyChangesHookMap present in ProductHookManager class is used to store pairs of product type and the name of the class that implements the hook for that product type. The method ProductHookManager.getApplyChangesHook gets the implementation subclass of the ApplyChangesForEvidence class for the specified product type. The method EvidenceController.applyParticipantEvidence has been updated to obtain product delivery and product details for the case and then call ProductHookManager.getApplyChangesHook to obtain correct instance of the ApplyChangesForEvidence class for the given product.

Modifications required to existing business processes

In all places where there are existing calls to insert, modify, and less frequently, remove methods, the code needs to be updated to invoke the EvidenceController as well as the insert, modify and remove methods as appropriate. An example of how an insert works with Evidence is shown:

Before

```
// insert new citizenship entry
citizenshipObj.insert(citizenshipDtls);
```

After

```

//
// Call the EvidenceController object and insert evidence
// Evidence descriptor details
EvidenceDescriptorInsertDtls evidenceDescriptorInsertDtls =
    new EvidenceDescriptorInsertDtls();
evidenceDescriptorInsertDtls.participantID =
    details.concernRoleID;
evidenceDescriptorInsertDtls.evidenceType =
    CASEEVIDENCE.CITIZENSHIP;
evidenceDescriptorInsertDtls.receivedDate =
    Date.getCurrentDate();

// Evidence Interface details
EIEvidenceInsertDtls eiEvidenceInsertDtls =
    new EIEvidenceInsertDtls();
eiEvidenceInsertDtls.descriptor.assign(
    evidenceDescriptorInsertDtls);
eiEvidenceInsertDtls.descriptor.participantID =
    citizenshipDtls.concernRoleID;
eiEvidenceInsertDtls.evidenceObject =
    citizenshipDtls;

// EvidenceController business object
curam.core.sl.infrastructure.impl.EvidenceControllerInterface
evidenceControllerObj =
    (curam.core.sl.infrastructure.impl.EvidenceControllerInterface)
    curam.core.sl.infrastructure.fact.EvidenceControllerFactory
    .newInstance();

// Insert the evidence
EIEvidenceKey eiEvidenceKey =
    evidenceControllerObj.insertEvidence(eiEvidenceInsertDtls);

```

Sequence Diagrams for Participant evidence

The development, both client and server, of creating and modifying evidence operations are outlined here:

Create Participant Evidence Sequence Diagram

Figure 5. Participant Evidence Sequence

Specific Processing For Participant Data when Creating Evidence

Figure 6. Evidence Sequence Diagram

Modify Participant Evidence Sequence Diagram

Figure 7. Modify participant

Implementing Conditional Verifications

Conditional Verification

Conditional Verifications is a feature, wherein, the flexibility is provided to determine if verification is applicable for evidence through programmatic support as opposed to manually means. The programmatic support is encompassed through rule-class implementations and verification for a piece of evidence is determined based on a set of conditions. The Verification Engine will check the conditions specified, at the time of adding or modifying evidence but will create an

outstanding verification only when a condition that has been defined is met and not every time a verifiable data item is added or modified. The conditions can range from conditions against the value of the verifiable data item to more complex conditions where the values of a set of dependent evidences determine whether or not verification is required.

Rule Artifacts supplied by Verification framework

To facilitate integration between Verification framework and the rule implementations supplied by other components, the framework supplies core Rule Artifacts. These artifacts contain abstract rule classes that other components rule implementations must adhere to. This section identifies and details such low level Rule Artifacts which will be supplied as part of Verification framework.

Rule Sets

The rule set '*VerificationRuleSet*' is available as part of Verification framework. This rule set holds all the framework's artifacts such as the rule classes and the data container classes.

Rule Classes

The following rule classes are available as part of *VerificationRuleSet*. The purpose of these rule classes are explained in the corresponding sections.

- *VerificationDeterminator*
- *VerificationDeterminatorResult*
- *VerificationDeterminatorParams*

Verification Determinator

The business logic that determines whether conditional verification is required for particular evidence type goes in this rule class. Components creating rule implementations must adhere to the specification by directly/indirectly extending this class. The following attributes are available in this rule class.

S.No	Rule attribute name	Type	Purpose
1	<i>determine</i>	<u><i>"Verification Determinator Result"</i></u>	The implementation will contain the business logic that determines the output of conditional verification. A value of 'TRUE' indicates to the evidence framework that verifications are not applicable for the evidence, whereas 'FALSE' denotes that verifications need to be explicitly added.
2	<i>verificationDeterminatorParams</i>	<u><i>"Verification Determinator Params" on page 36</i></u>	This attribute is populated by the Conditional verifications framework and contains the values for all the input parameters for a particular instance.

Verification Determinator Result

This rule class is a data container whose purpose is to store the results of business logic in the *"Verification Determinator."* Currently this class has two attributes,

result - a boolean that states whether verification is required or not for a given evidence

reason - a codetable value from VerificationSkippedReason, which contains the values of reason for which the conditional verification is not applicable

It is the responsibility of the rule implementations to create/populate these attribute so that the verification framework, after examining the state of the attribute, can take appropriate business decisions.

Verification Determinator Params

While determining whether conditional verification is required or not, the framework will supply various input parameters to the rule implementation classes for various calculation purposes such as the evidence that is getting currently edited, the associated case identifier for the evidence etc. Please refer the following table for complete details of the input parameters.

S.No	Property Name	Data Type	Description
1	<i>verifiableDataItemName</i>	String	Represents the name of the 'Verifiable Data Item' such as 'Person Income', 'Date Of Birth' etc. The value comes from the code table 'VerifiableItemName'
2	<i>evidenceDescriptorID</i>	Number	The unique identifier of the evidence record in question
3	<i>caseID</i>	Number	The unique identifier of the case with which the evidence is associated

New Propagator

Verifications are applicable to active evidences as well as to evidences which are in 'in-edit' state. A new propagator –

ActiveInEditEvidenceRowRuleObjectPropagator is provided for this very purpose, which will propagate both these evidence type. It is recommended to use this new propagator to propagate the evidences to the rule data objects that are used in the conditional verification implementation classes.

Notices

This information was developed for products and services offered in the United States.

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, MD-NC119 Armonk, NY 10504-17

For license inquiries regarding double-byte character set (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. 19-21, Nihonbash

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 jurisdictions 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 typographical 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 websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you provide 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:

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.

The performance data and client examples cited are presented for illustrative purposes only. Actual performance results may vary depending on specific configurations and operating conditions.

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.

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 actual people or business enterprises 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.

Privacy Policy considerations

IBM Software products, including software as a service solutions, ("Software Offerings") may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings

can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering's use of cookies is set forth below.

Depending upon the configurations deployed, this Software Offering may use session cookies or other similar technologies that collect each user's name, user name, password, and/or other personally identifiable information for purposes of session management, authentication, enhanced user usability, single sign-on configuration and/or other usage tracking and/or functional purposes. These cookies or other similar technologies cannot be disabled.

If the configurations deployed for this Software Offering provide you as customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, see IBM's Privacy Policy at <http://www.ibm.com/privacy> and IBM's Online Privacy Statement at <http://www.ibm.com/privacy/details> the section entitled "Cookies, Web Beacons and Other Technologies" and the "IBM Software Products and Software-as-a-Service Privacy Statement" at <http://www.ibm.com/software/info/product-privacy>.

Trademarks

IBM, the IBM logo, and [ibm.com](http://www.ibm.com) are trademarks or registered trademarks 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/copytrade.shtml>.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Java[™] and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

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



Printed in USA