

FREMA: e-Learning Framework Reference Model for Assessment

www.frema.ecs.soton.ac.uk

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Learning Technologies
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Project Expertise

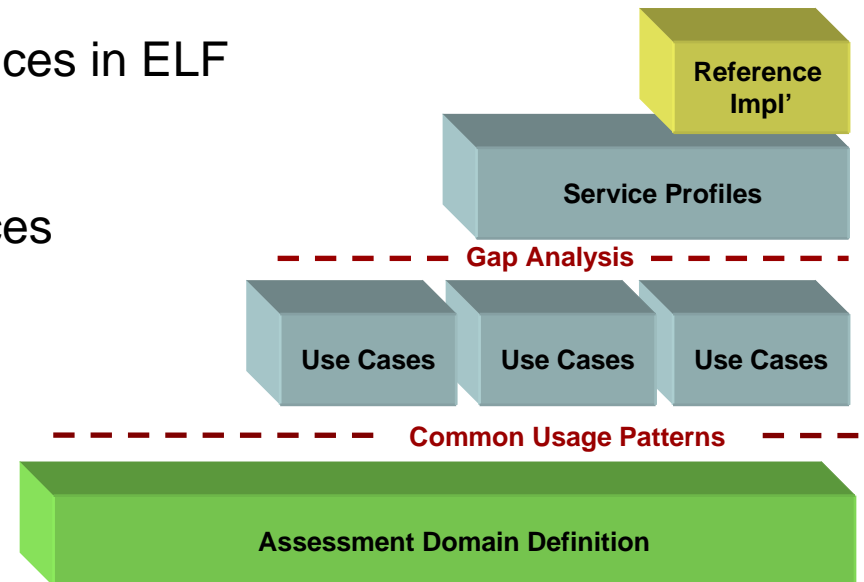
- **Hugh Davis:** University Director of Education, University of Southampton
- **Niall Sclater:** VLE Programme Director, OU
- **Robert Sherratt:** Head of Development for e-Services Integration at the University of Hull
- **Steve Jeyes:** e-Learning Manager Edexcel
- **Rowin Young:** CETIS Assessment SIG co-ordinator
- **Lester Gilbert:** Lecturer, General Manager (Learning Design)
- **Gary Wills:** Examinations Officer
- **David Millard:** Lecturer, Technical Manager (Knowledge Representation)
- **Yvonne Howard:** Project Manager, Software engineer
- **Iain Tulloch:** Domain researcher
- **Pasha Jam:** Researcher
- **Swapna Chennupati:** Researcher
- **Joe Price:** Graphic Design
- **Christopher Bailey:** Developer

Background

- What is FREMA?
 - JISC funded Project between Southampton, Strathclyde and Hull
 - Part of the e-Framework effort
 - Aim to produce a Reference Model of the e-Learning Assessment Domain
 - To aid interoperability and aid in the creation of Assessment Services for the e-Framework
- What is a Reference Model for Assessment?
 - Assessment is a broad and complex domain
 - Not enough to describe and define a set of services
 - Need a proper audit trail of decision making
 - Start by defining the domain
 - Work up through use cases to services (and example implementations)

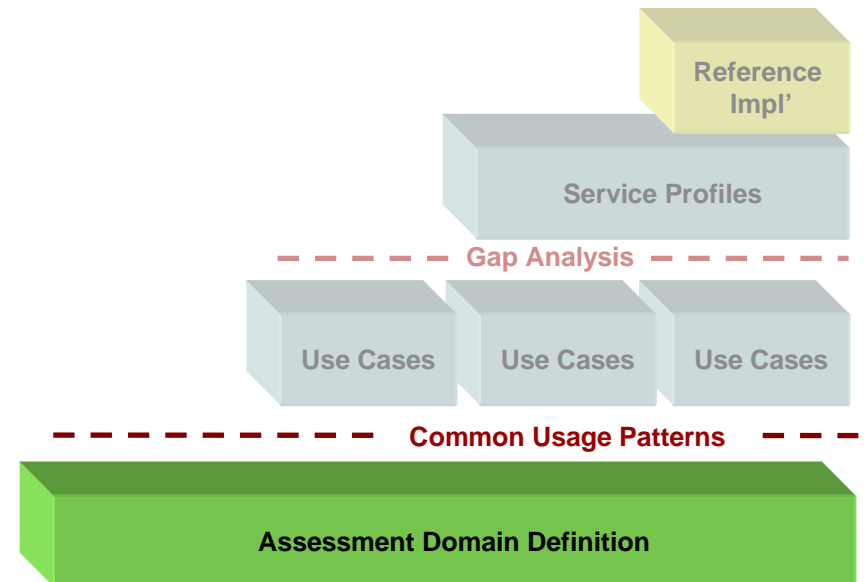
Anatomy of FREMA Reference Model

- Domain Definition
 - Overview of the domain, and how projects and standards fit within it
- Identifying Common Usage Patterns
 - Scoping the FREMA Project
- Developing Use Cases
 - Formal descriptions of usage patterns
- Gap Analysis
 - Mapping of Use Cases to the Services in ELF
- Service Profiles
 - Formal descriptions of those services
- Example Implementation
 - Of key/core services
 - Examples
 - Validation
 - Resource



Domain Definition – Engaging the Community

- An evolving, cross-referenced, searchable web site of resources in the assessment domain
- Gathered and Validated through engagement with the community
- A number of workshops, interviews and questionnaires
 - Institutions: York, Kingston, Loughborough, Strathclyde, SQA, Edexcel, Heriot-Watt, Glasgow Caledonian, Warwick, University of Technology Sydney
- Conference:
 - 9th CAA 2005 Loughborough
 - E-Learn 2005
 - Educa Online Berlin joint workshop
- CETIS Assessment SIG:
 - Southampton April 2005
 - Glasgow July 2005
 - Edinburgh November 2005
 - Glasgow March 2006



Interconnected Website

- Schema of resources and relationships between them (ontology)
- Used to generate dynamic pages for each resource
- Searching/Navigating/Analysis
 - User Defined Smart Search
 - Dynamic Gap Analysis
 - Concept maps
 - Secondary data (like how much info we have on a resource)

FREMA: Projects - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://www.frema.ecs.soton.ac.uk/db/index.php?table=organisations&type=project>

THE FREMA REFERENCE MODEL

FREMA REFERENCE MODEL >> PROJECTS

Projects

- [APIS](#)
- [ASAP](#)
- [ASSIS](#)
- [Bodington](#)
- [COLA](#)
- [e3an](#)
- [Freedom2Learn](#)
- [FREMA](#)
- [HELM](#)
- [ISIS](#)
- [Item Bank](#)
- [Searching - KD](#)
- [Item Bank](#)
- [Searching - SC](#)
- [JELFAD](#)
- [JORUM](#)
- [LAMS](#)
- [MakingTracks](#)
- [Maths Item](#)
- [Banking Project](#)
- [PAINTS](#)
- [PASS-IT](#)

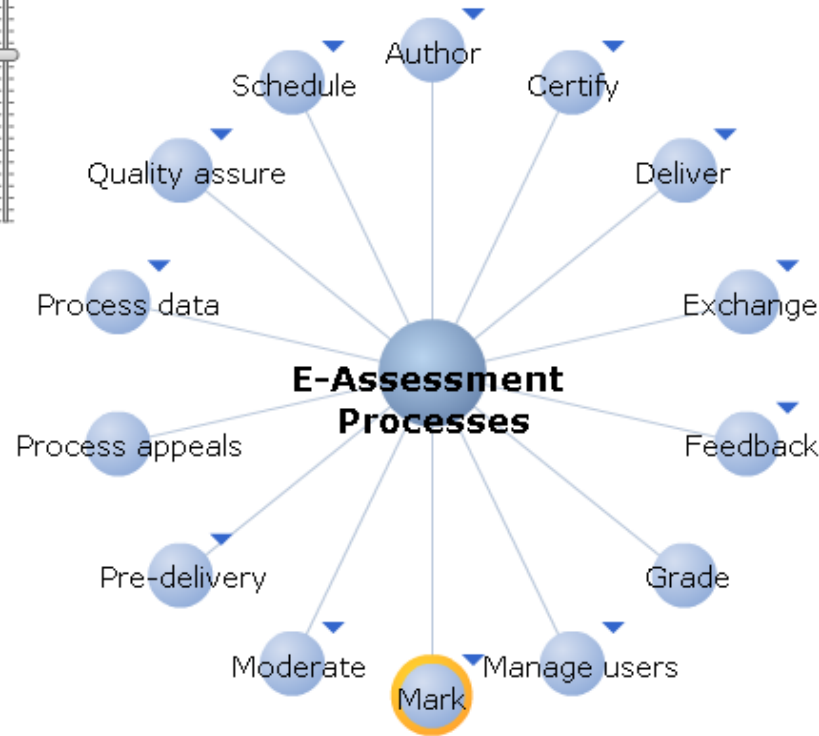
Help

To help you when viewing information in this site, two coloured bars (one green and one blue) are placed next to links. The left, green bar gives a visual indicator of the amount of descriptive text available for that concept, while the right-most, blue bar provides an indicator of how many related links are available from that concept.

THE FREMA REFERENCE MODEL

FREMA REFERENCE MODEL >> CONCEPT MAP (PROCESS)

Instructions



Organisations

- [APIS](#)
- [ASAP](#)
- [ASSIS](#)

Service Descriptions

- [Marking and Recording Results of a Java Assessment v \(1.0\)](#)
- [Detecting Plagiarism in Programming Assessments v \(1.0\)](#)
- [Rendering and Response Processing of QTI conformant questions v \(1.0\)](#)

Software

- [TOIA AMS v \(1.0\)](#)
- [Criterion](#)
- [CopyCatchGold](#)
- [Blackboard](#)

Home

Entities

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Standards

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Technical

Systems

Use Cases

FREMA: Projects - Microsoft Internet Explorer

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Back Forward Stop Refresh Home Search Favorites

Address http://www.frema.ecs.soton.ac.uk/db/index Go Google Search 588 blocked

THE FREMA REFERENCE MODEL

FREMA REFERENCE MODEL >> PROJECTS >> ASAP

ASAP

The **ASAP** (Automated System for Assessment of Programming) project developed a system which automatically assesses students programming submissions through a user agent such as a VLE (Virtual Learning Environment).

It internally invokes other existing services to generate questions and check for plagiarism. In particular, the project developed a new service to mark student submissions of Java programming assignments.

External links:

- ASAP Homepage
- ASAP CAA 2005 Paper
- ASAP Download Site
- ASAP uPortal
- AJM-Blackboard Evaluation click to visit this site
- AJM-WebCT Evaluation
- ASAP-Roboprof Document

Concepts:

- Processes
- Deliver
- Feedback
- Mark

Related items:

This project is involved in the following systems:

- ASAP System [more >]

This project produced the following software:

- AJM v(1.0) [more >]
- AJM Building Block v(1.0) [more >]

This project is involved in the following standards:

- IMS Content Packaging v(1.1) [more >]

Home

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Concepts

- Entities
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- Projects**
- Service Descriptions
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- Use Cases

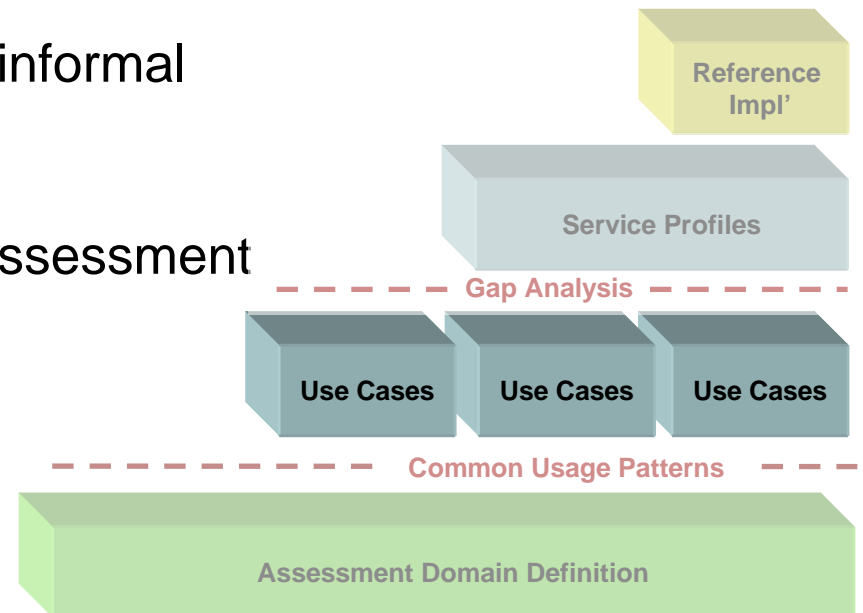
http://www.frema.ecs.soton.ac.uk/db/files/ASAP - uPortal Screenshots.doc Internet

Validating the Domain Definition

- We undertook a qualitative evaluation with domain experts to check that our concept map navigation tools were appropriate
- We also analysed the contents of peer reviewed published papers on assessment in the e-learning domain
 - To check coverage/validity of concepts
 - For this evaluation the forty five papers from the 9th International Conference on Computer Assisted Assessment were analysed.
- Reflection of database contents to original experts
- Other people are interested in using the FREMA database and concept map technology
 - Loughborough CAA conference in using similar to communicate with Assessment community perhaps
 - REAP project
 - LADiE extension bid

Use Cases

- FREMA has drawn a number of scenarios from its Domain Definition and has modelled them as use cases
- Scenarios are modelled as UML Use Case diagrams, with a number of actors taking part in high level Use Cases
- Use Cases are high level, and implementation independent
- They are structured, but relatively informal
- Scenarios
 - Summative, Peer & Artefact Assessment
 - Item Banking
 - External Examiner

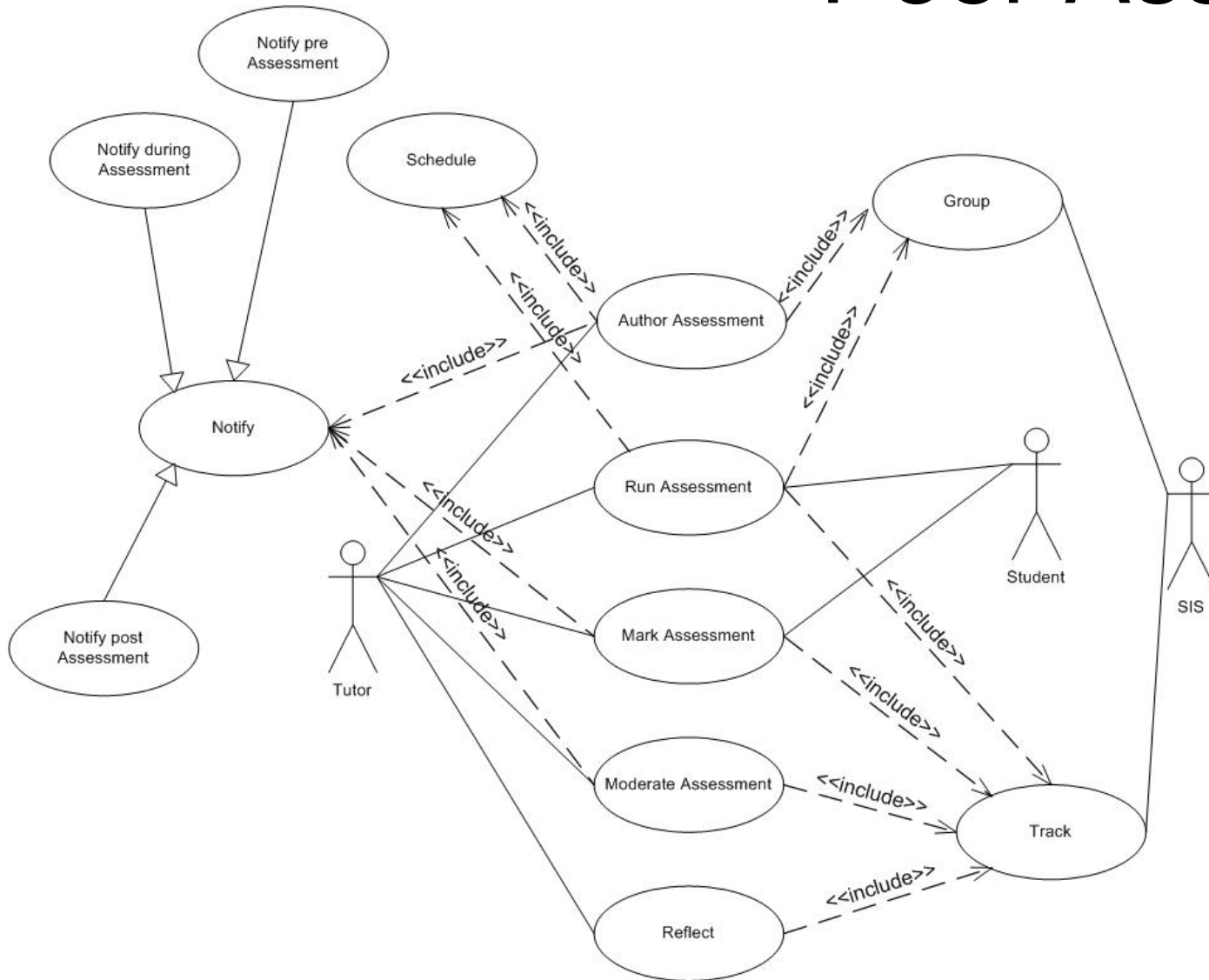


Use Cases - Provenance

The use cases were developed by eliciting practice from a number of members in the e-assessment community.

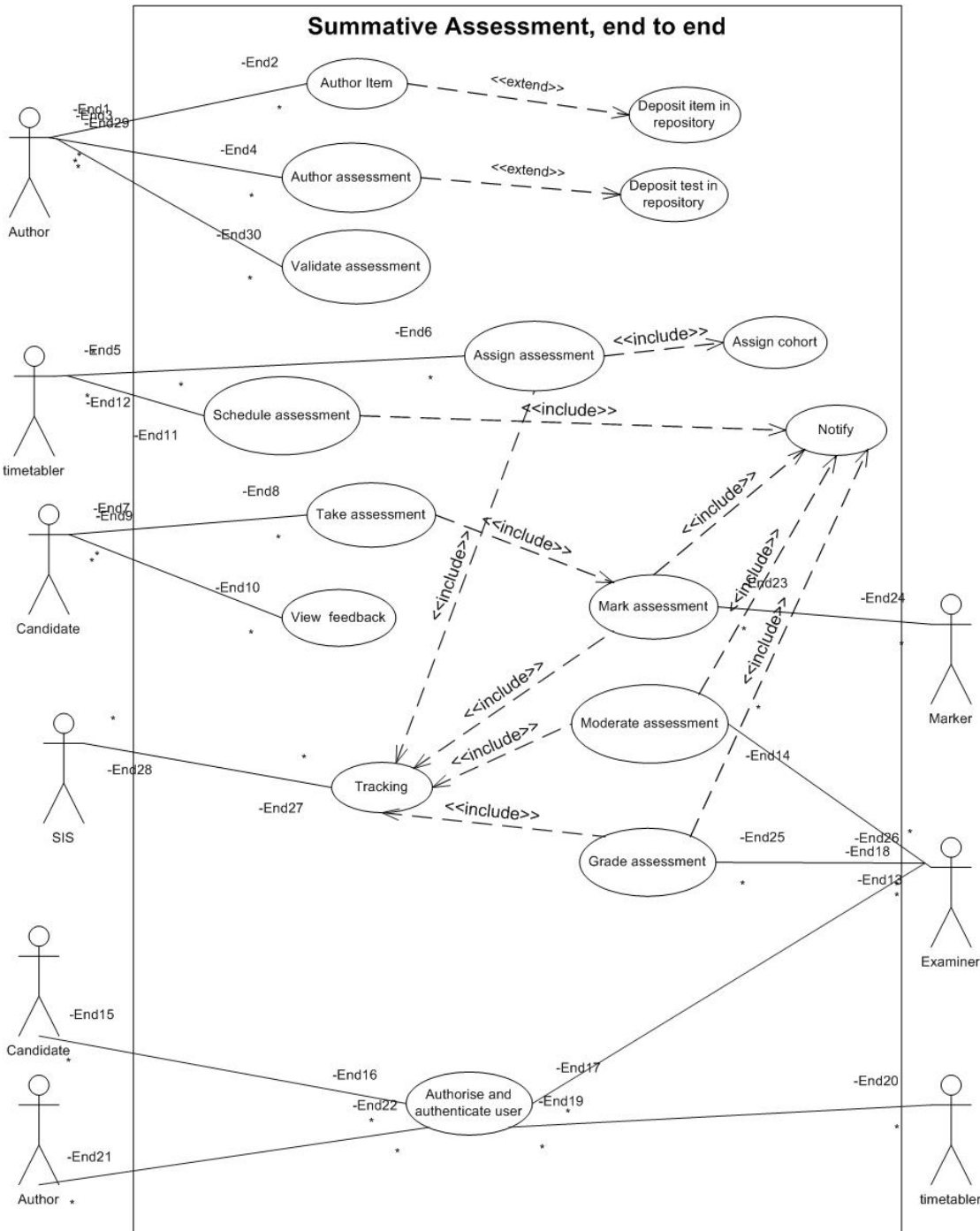
- **CETIS** (IBIS, Accessibility, Item Banking)
- **Qualification agencies:** SQA, Edexcel
- **Universities:** University of Hull, Spark University of Technology Sydney, Loughborough, University of Southampton, Kingston University.

Peer Assessment

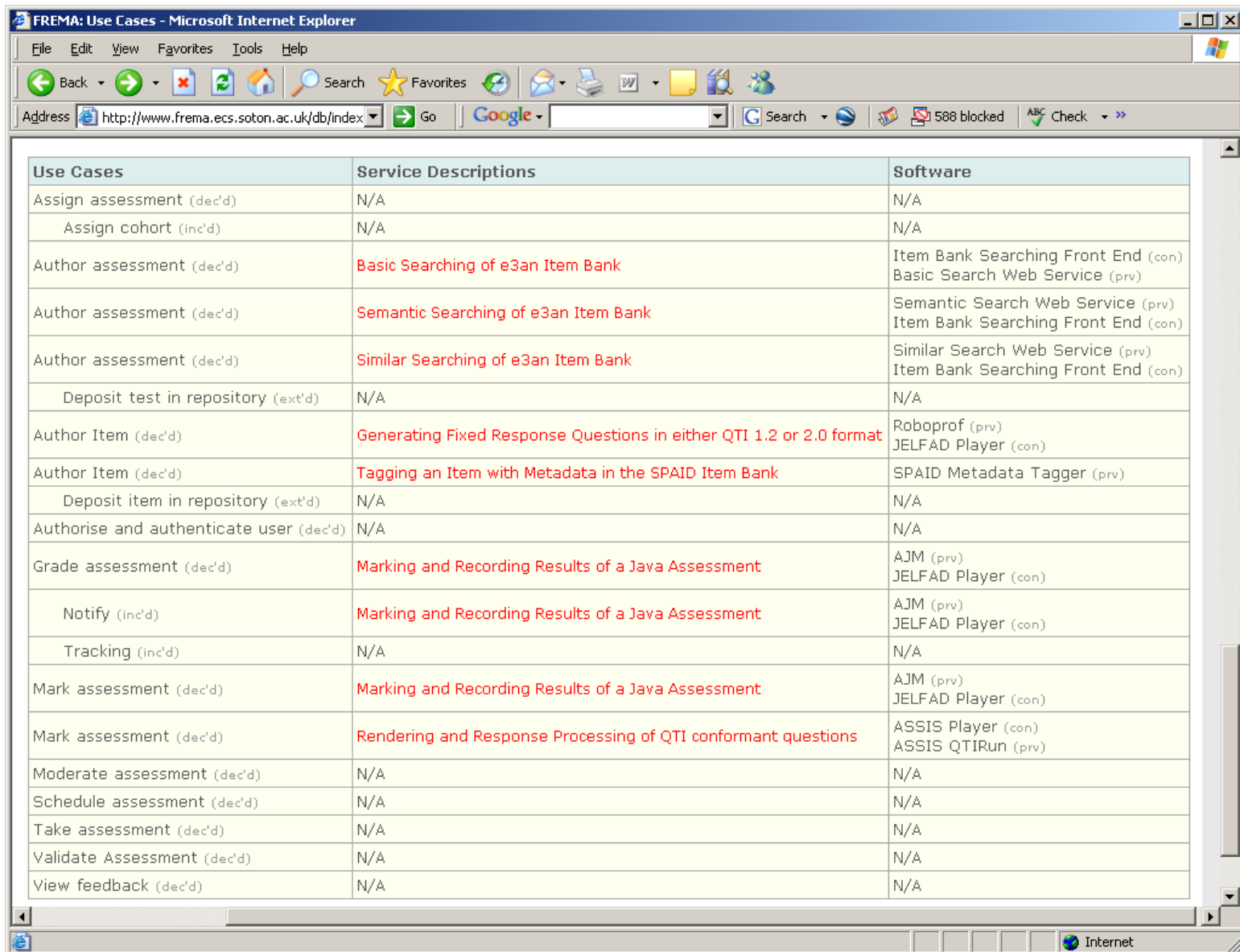


Summative Assessment

Summative Assessment, end to end



Analysis Tools: Gap Analysis



The screenshot shows a Microsoft Internet Explorer browser window with the title "FREMA: Use Cases - Microsoft Internet Explorer". The address bar displays "http://www.frema.ecs.soton.ac.uk/db/index". The main content area contains a table with three columns: "Use Cases", "Service Descriptions", and "Software".

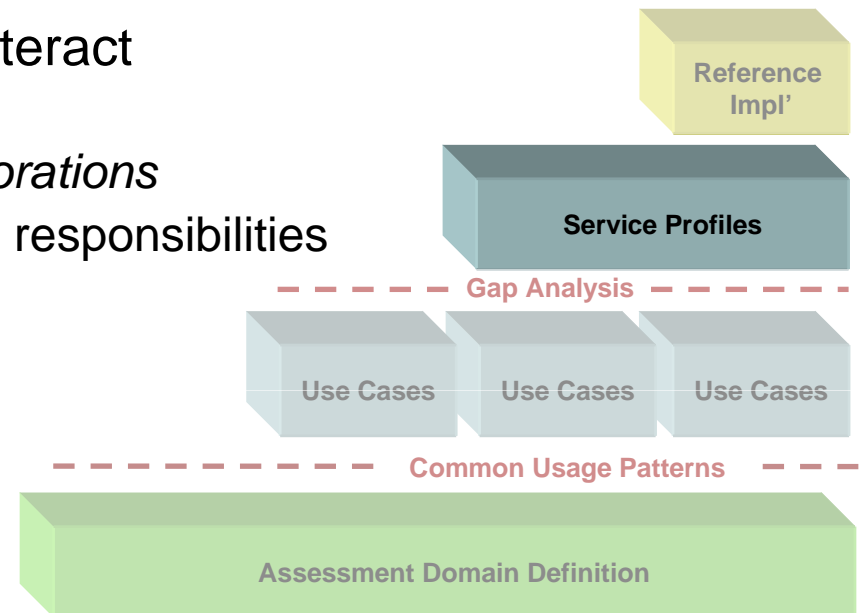
Use Cases	Service Descriptions	Software
Assign assessment (dec'd)	N/A	N/A
Assign cohort (inc'd)	N/A	N/A
Author assessment (dec'd)	Basic Searching of e3an Item Bank	Item Bank Searching Front End (con) Basic Search Web Service (prv)
Author assessment (dec'd)	Semantic Searching of e3an Item Bank	Semantic Search Web Service (prv) Item Bank Searching Front End (con)
Author assessment (dec'd)	Similar Searching of e3an Item Bank	Similar Search Web Service (prv) Item Bank Searching Front End (con)
Deposit test in repository (ext'd)	N/A	N/A
Author Item (dec'd)	Generating Fixed Response Questions in either QTI 1.2 or 2.0 format	Roboprof (prv) JELFAD Player (con)
Author Item (dec'd)	Tagging an Item with Metadata in the SPAID Item Bank	SPAID Metadata Tagger (prv)
Deposit item in repository (ext'd)	N/A	N/A
Authorise and authenticate user (dec'd)	N/A	N/A
Grade assessment (dec'd)	Marking and Recording Results of a Java Assessment	AJM (prv) JELFAD Player (con)
Notify (inc'd)	Marking and Recording Results of a Java Assessment	AJM (prv) JELFAD Player (con)
Tracking (inc'd)	N/A	N/A
Mark assessment (dec'd)	Marking and Recording Results of a Java Assessment	AJM (prv) JELFAD Player (con)
Mark assessment (dec'd)	Rendering and Response Processing of QTI conformant questions	ASSIS Player (con) ASSIS QTIRun (prv)
Moderate assessment (dec'd)	N/A	N/A
Schedule assessment (dec'd)	N/A	N/A
Take assessment (dec'd)	N/A	N/A
Validate Assessment (dec'd)	N/A	N/A
View feedback (dec'd)	N/A	N/A

Validating the Use Cases

- Peer Review by reflection with original domain experts for,
 - Coverage, accuracy, completeness
- We undertook a qualitative evaluation with domain experts at the CETIS Assessment SIG in Glasgow to validate the use cases and their representation in the FREMA model for,
 - Appropriate granularity
 - Understandability
 - Clarity
 - Choice of representation
 - Description quality and level of detail

Service Profiles

- Service Profiles are high level descriptions of an atomic service
- Defines the granularity of a service
- Does not define a formal interface
 - But outlines the *responsibilities* of the service
- Does not define how the service interact
 - But does describe potential *collaborations* that would help the service fulfil its responsibilities



Service Responsibilities and Collaboration Cards

SRC: Take Assessment

Responsibilities:

Manage Assessment Session

- Choose Assessment
- Open Assessment
- Display Rubric
- Confirm Candidate has read Rubric
- Confirm Candidate has finished assessment
- Enforce assessment constraints (time, etc)
- Close assessment

Present Items according to assessment instructions

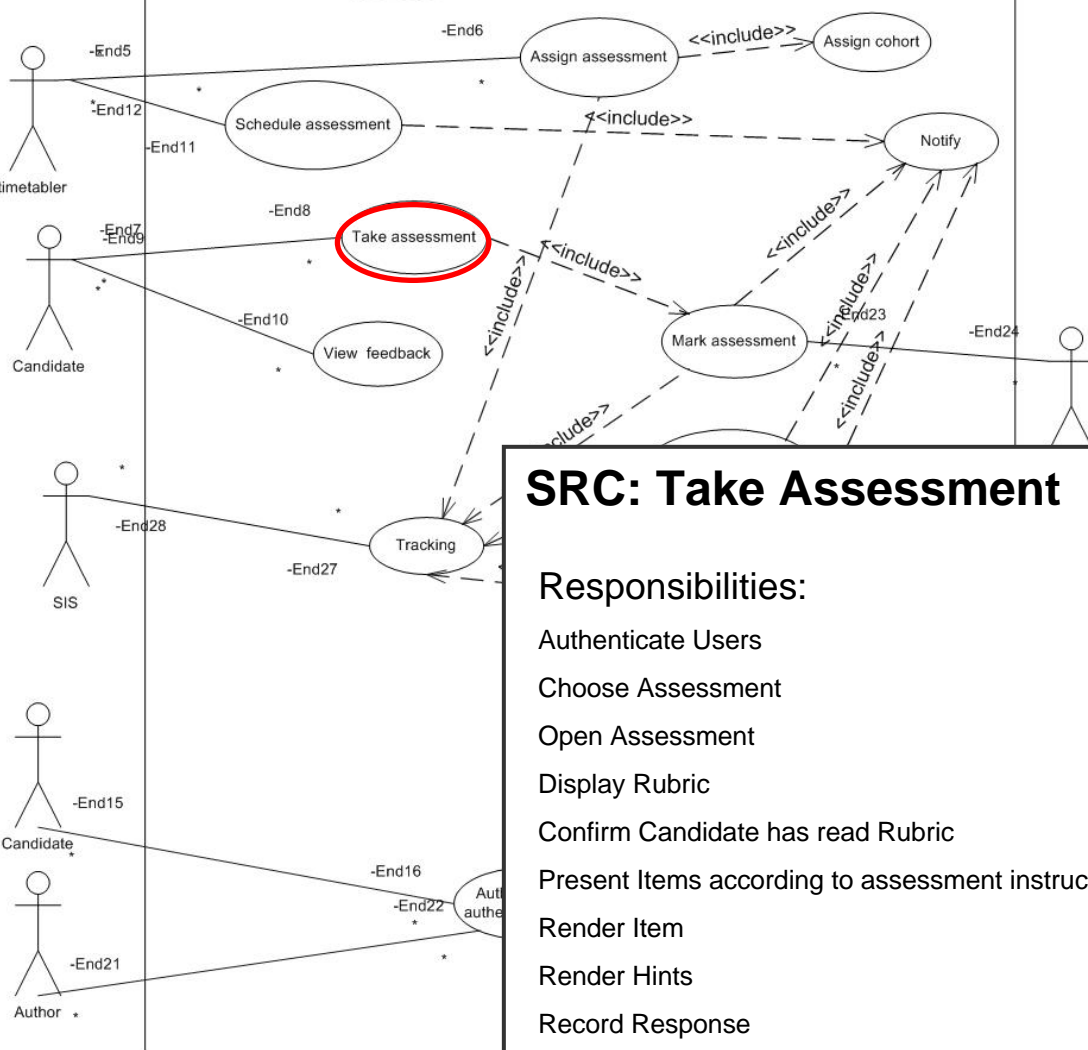
- Render Item
- Render Hints
- Record Response
- Process Response
- Enforce item constraints (no. retry's, etc)

Record usage data

Collaborations:

- Authenticate
- Schedule
- Track

Factoring a Service



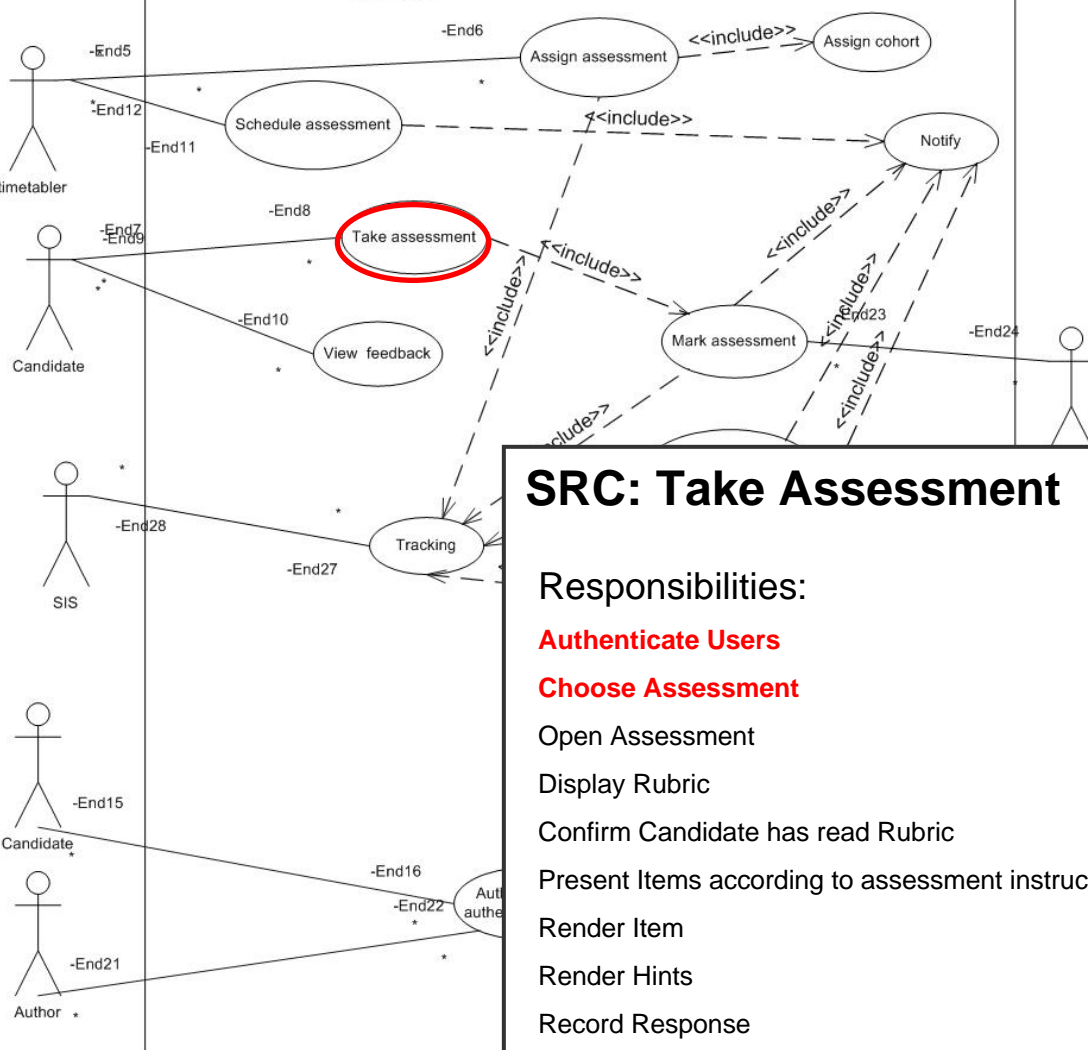
SRC: Take Assessment

Responsibilities:

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Collaborations:

Factoring a Service



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Present Items according to assessment instructions

Render Item

Render Hints

Record Response

Process Response

Confirm Candidate has finished assessment

Enforce assessment constraints (time limits, etc)

Record usage data

Enforce item constraints (no. retry's, etc)

Close assessment

Track Progress

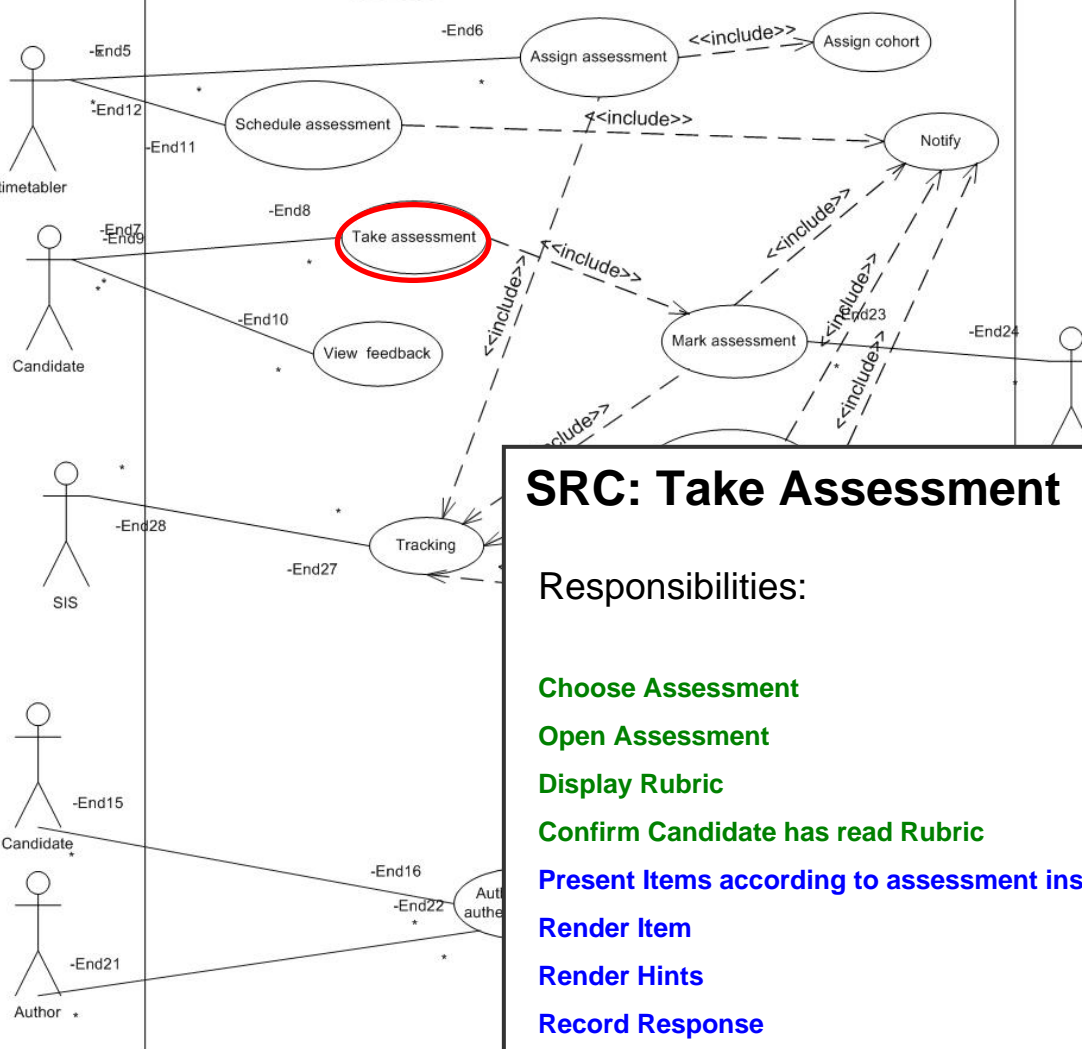
Collaborations:

Authenticate

Schedule

Track

Factoring a Service



SRC: Take Assessment

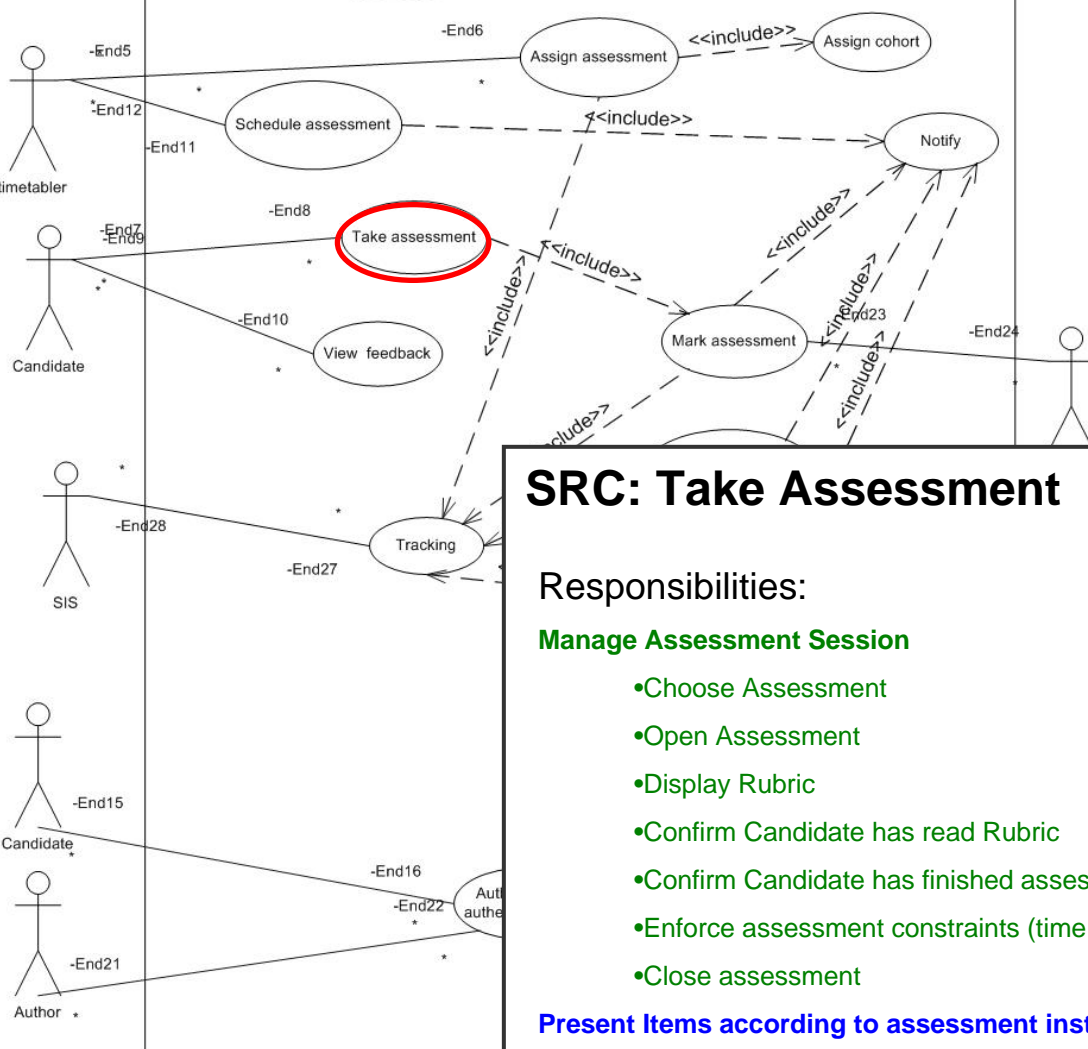
Responsibilities:

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Factoring a Service



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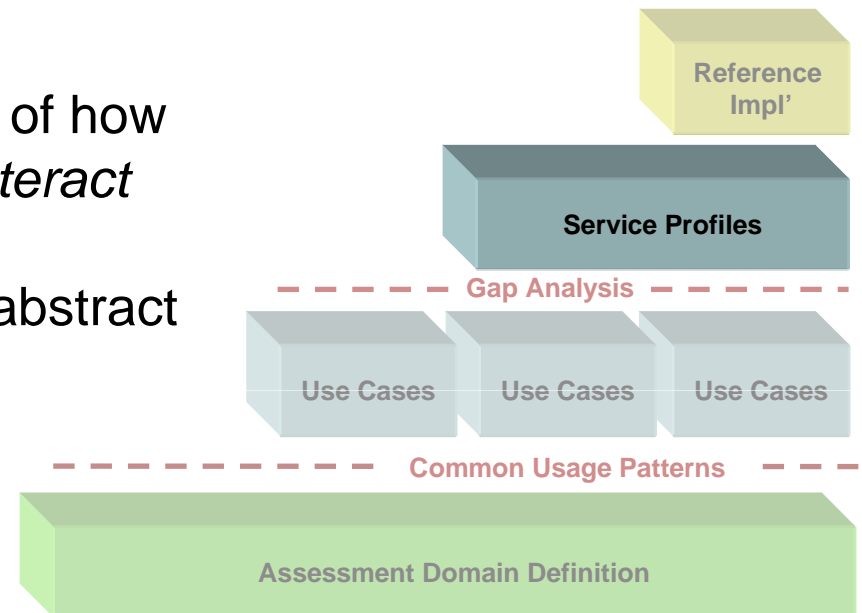
Record usage data

Collaborations:

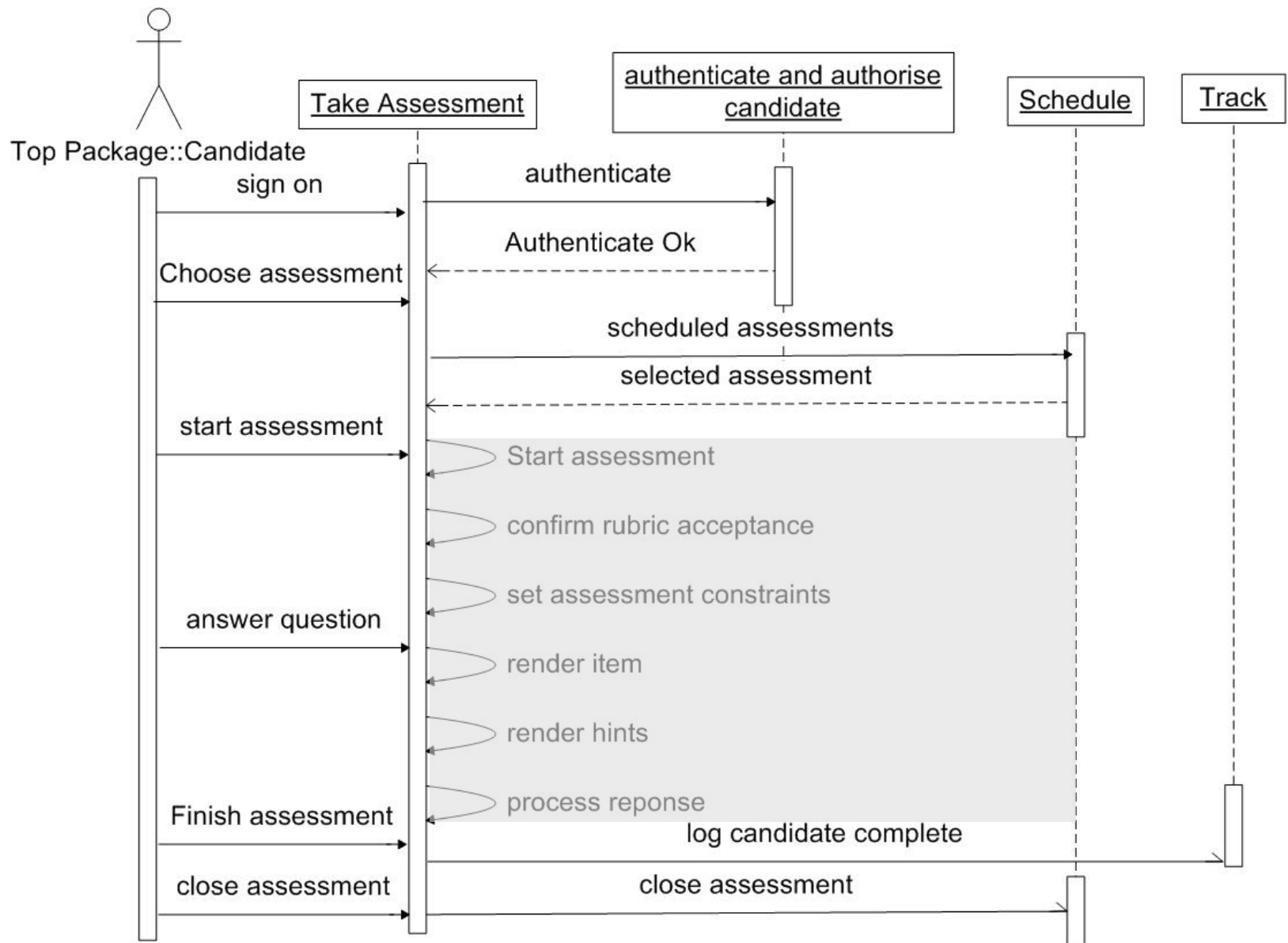
- Authenticate
- Schedule
- Track

Service Workflow

- Services that are otherwise independent may be orchestrated in a workflow to fulfil a particular use case
- This workflow definition applies to a number of service profiles, but is independent of the individual services
- The workflows are themselves a more coarse grained service profile
- But need an additional description of how the services within the workflow *interact*
- Interaction is defined in the same abstract way as Service Profiles

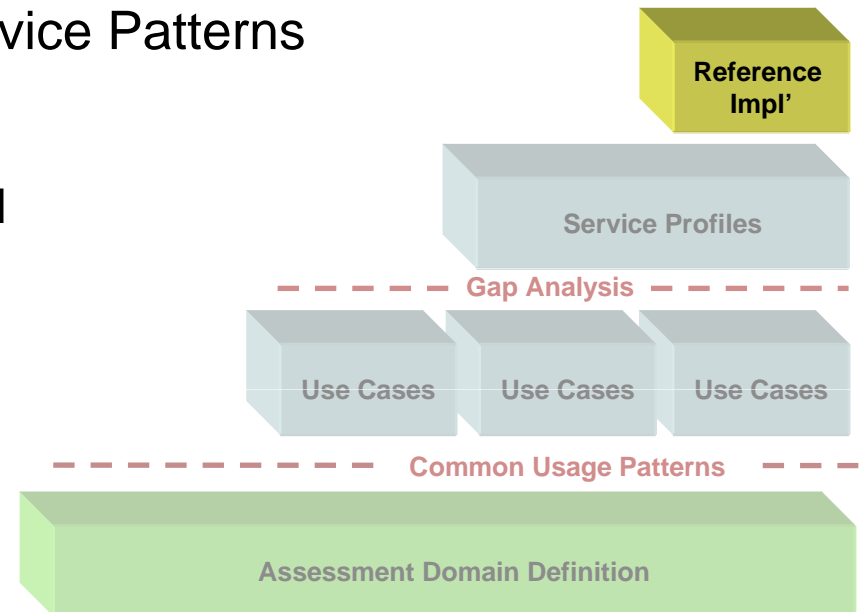


Service Interaction Diagram



Service Patterns

- Exemplar workflows
 - Described as patterns
 - How service interoperability can be achieved
 - Solutions to common interoperability problems
 - Behaviour intersect
 - Mimic
 - Semantic Web approach
- Reference implementations of Service Patterns
 - WS–Interaction diagrams
 - WSDL
 - Java Code to download and install
 - Running services to try



FREMA Core Services

- Assessment Services

- Assign
- Author item
- Author assessment
- Validate assessment
- Take assessment
- Mark assessment
- Moderate assessment
- Grade Assessment
- View Feedback

- Support Services

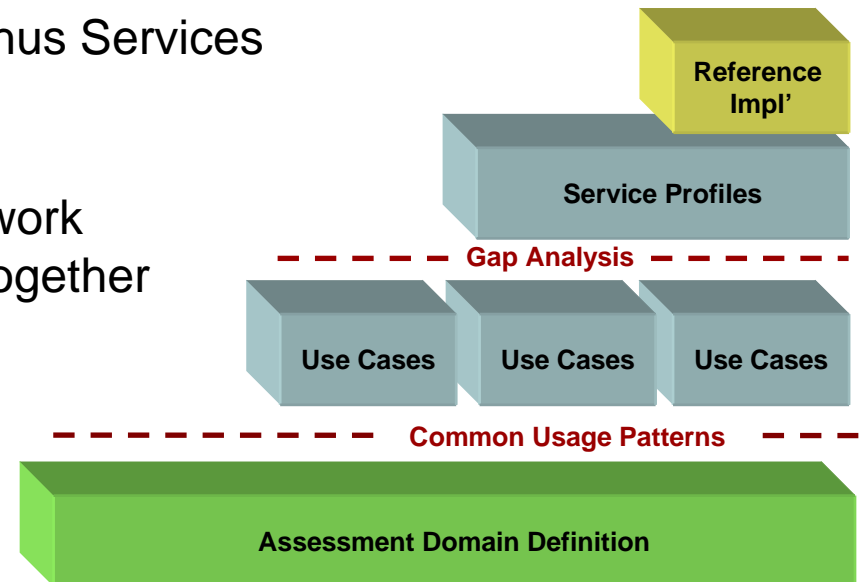
- Schedule
- Notify
- Track
- Authorise and Authenticate

Validating the Services

- Working with Kingston
 - starting now,
 - Peer review of services from Use Cases to SRC's and WS-Interaction diagrams
 - continuing into the extension bid,
 - Use the FREMA model to design a toolkit project
- Designed for an evolving view
 - Alternative services can be authored
 - New Use Cases may be added
 - Gap Analysis and other tools are dynamic
 - Opportunities for refactoring as new scenarios added

Using the FREMA Reference Model

- Use the Reference Implementation
 - Build on some or all of the developed services
- Use the Service Profiles
 - To develop your own services that will fit into the framework
- Use the Use Cases
 - To help understand usage patterns within the domain
 - Develop new Service Profiles and thus Services
- Use the Domain Definition
 - To develop a context for your own work
 - Understand how existing work fits together
 - Identify standards
 - Locate experts



Overview: Proposed Extension

Our Proposed Extension

- Provide for community curation, guardianship, and sustainability
 - To harden the website, add moderation, discussion forum, authoring facilities, and hand it over to the community
 - To support the debate over service refactoring
- To validate the reference model through real use
 - Assist one or more partners to develop toolkit demonstrations of assessment services
 - Engage in a validation activity with a commercial vendor (QuestionMark)
 - Coordinate with the eAssessment Roadmap project, and to link to the eAssessment Glossary
- Extend Service Workflows and Services Descriptions, other Use Cases and Scenarios
- Help JISC map assessment services to the e-Framework