Acquisition Research Program:
Creating Synergy for Informed Change

Ontology-based Software Reuse Repository

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Topics

- Background
- Research Goals
- Repository Tool
  - Guided Search
  - Repository Framework
  - Visualization
- Use Case Demonstration

Background

- Need for improvements
  - Software repository capabilities often sighted as inhibitor to software reuse
  - Robust search and discovery methods needed
- SHARE Repository
  - Enables reuse of combat systems software and related assets
  - Est. August 2006 by PEO IWS
  - NPS researchers tasked to consider areas of improvement for the repository

Research Goal

- Improved software repository capabilities
- Areas of improvement:
  - Organization of repository contents
    - Robust metadata
    - Include all relevant artifact types
    - Ontologies to capture context for repository contents
  - Search and discovery methods
    - Guided search
    - Multiple Views

Guided Search

- Smart navigation of repository contents vs. typical search and return
- Point and click interface
- User context incorporated into search process
- Results are continuously reprioritized based on user actions

Repository Framework

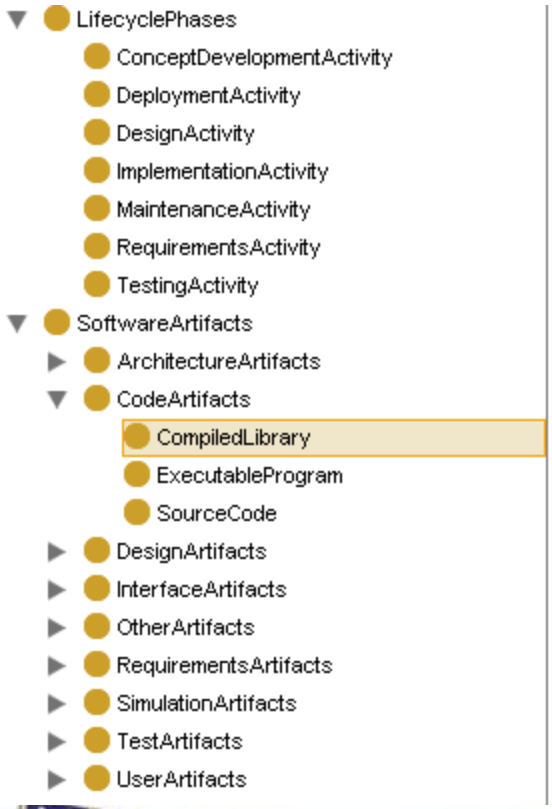
- Component Specification - a description or model of the items in the repository
  - "Typical" Metadata - information about an asset/artifact
  - Software Behavior Description – a searchable representation of the software asset's behavior
- Ontology – a contextual model of the repository items describing their relationships to aid in associating artifacts with user needs

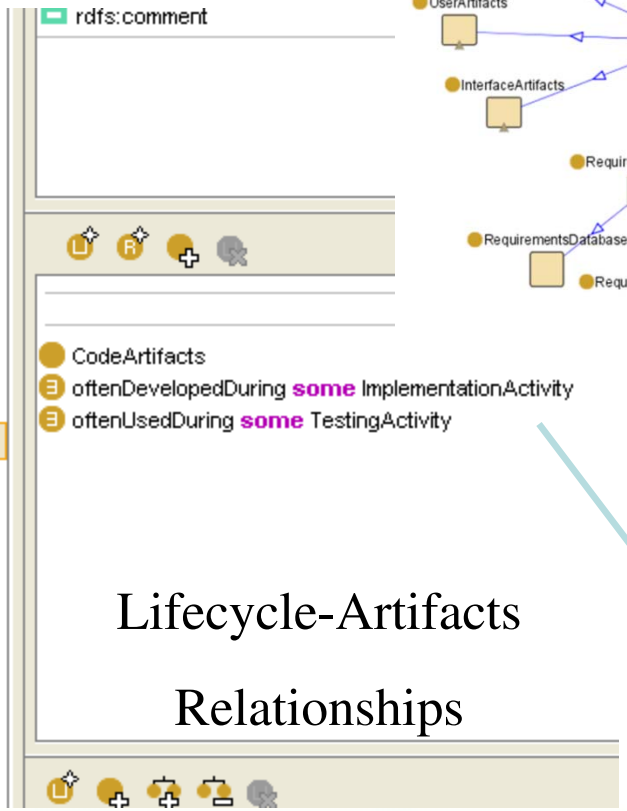
Repository Framework - Ontologies

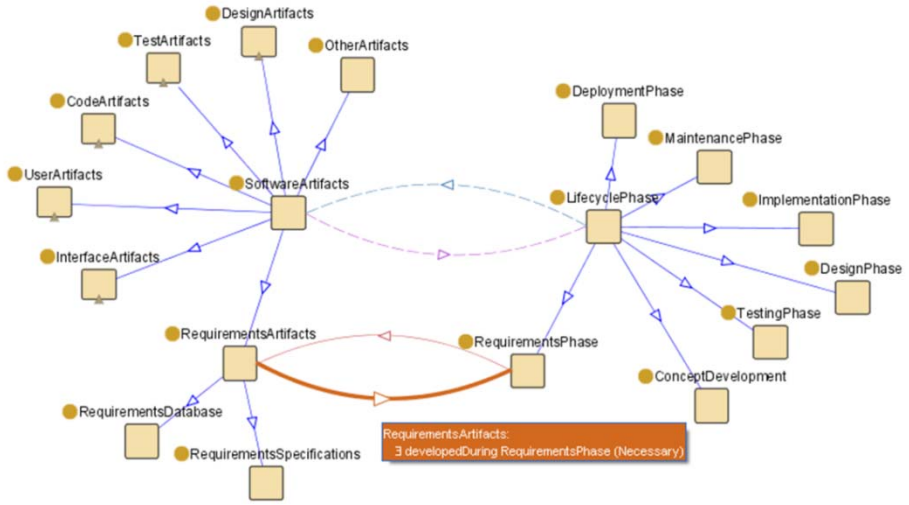
- Multiple sources of context for repository artifacts
  - Artifact's place in the Software Engineering Lifecycle
  - System Architectures (Aegis, SSDS, etc.)
  - Surface Navy Open Architecture reference architecture
- OWL-DL (Description logic) representations included in previous reports

Lifecycle-Artifact Ontology

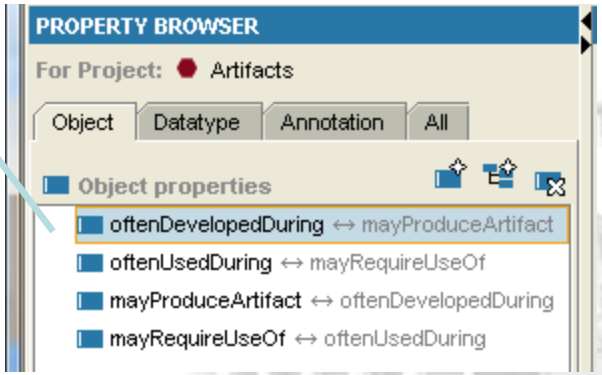
- Links artifact types to development activities





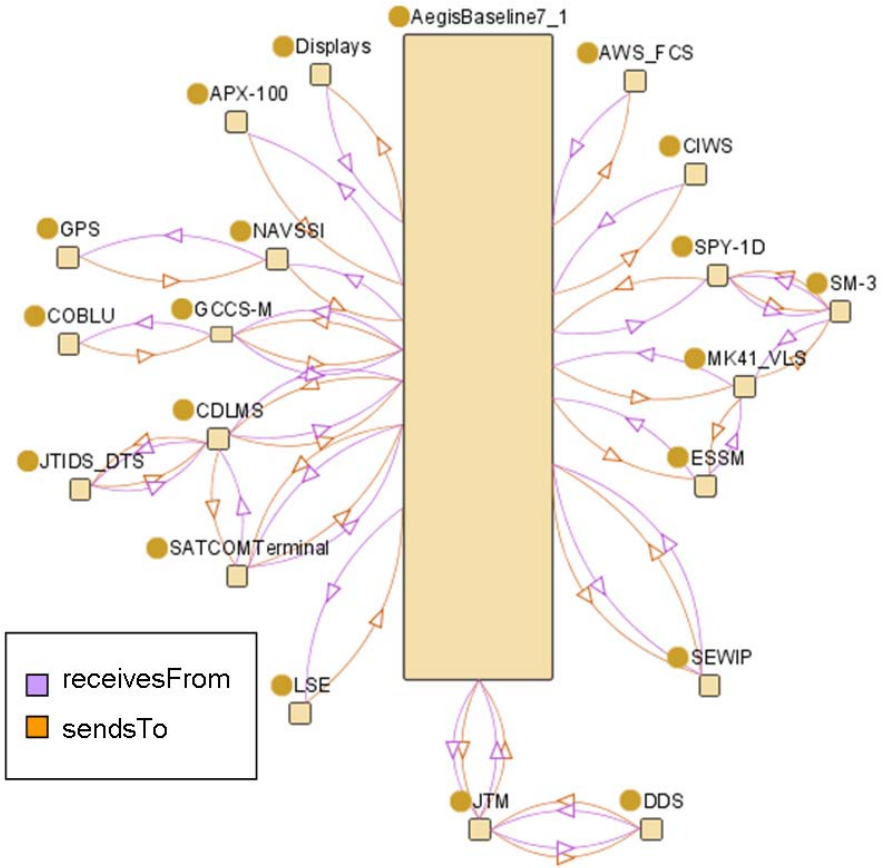


Lifecycle-Artifacts Relationships



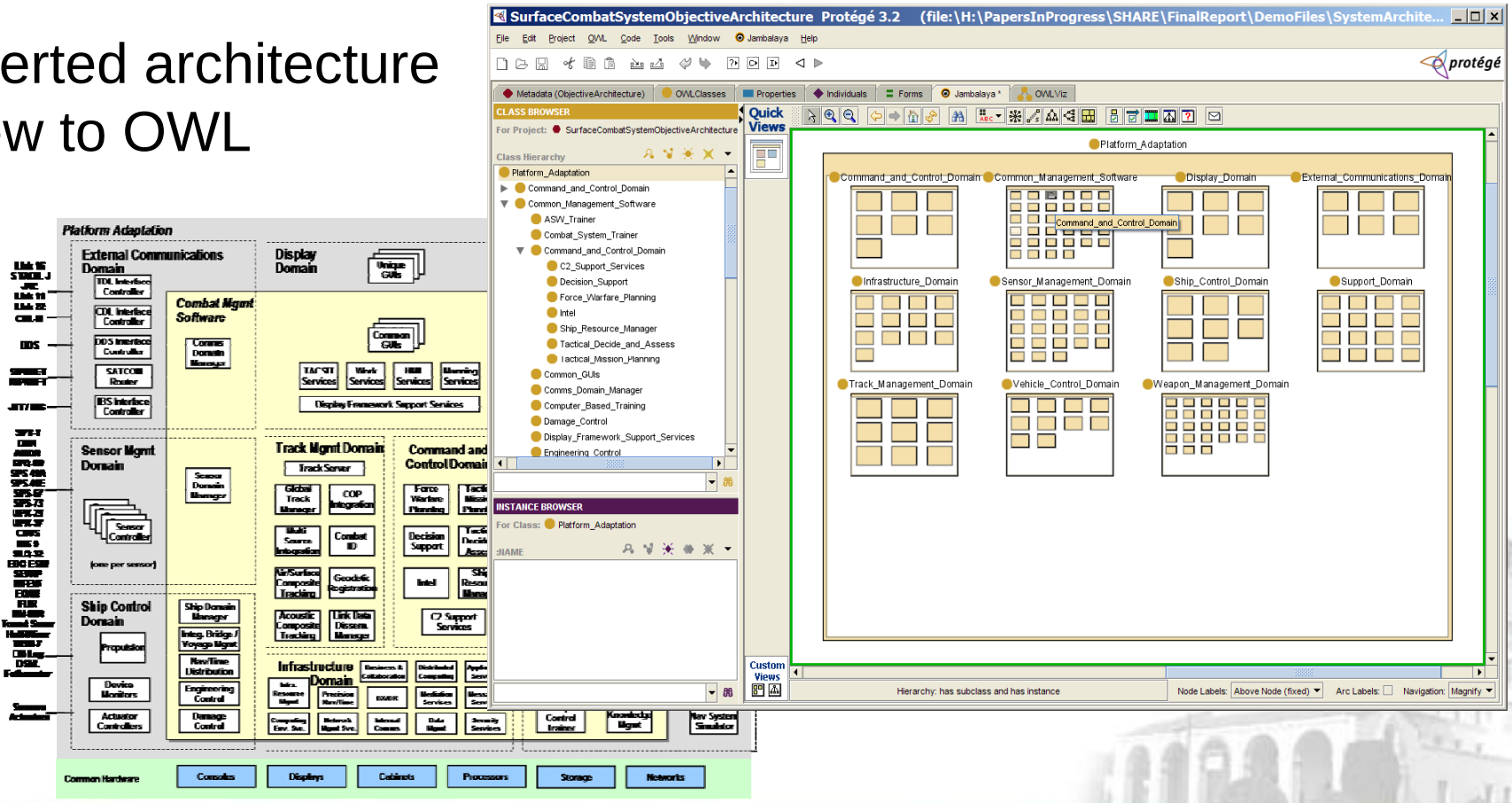
System Architecture

- Captures
  - System-subsystem relationships
  - Interfaces
  - Any other desired architectural relationships
- Example from Aegis SV-1 available in RDA CHENG Naval Architecture Repository System (NARS)



Surface Combat System Top Level Objective Architecture

Converted architecture view to OWL



Visualization

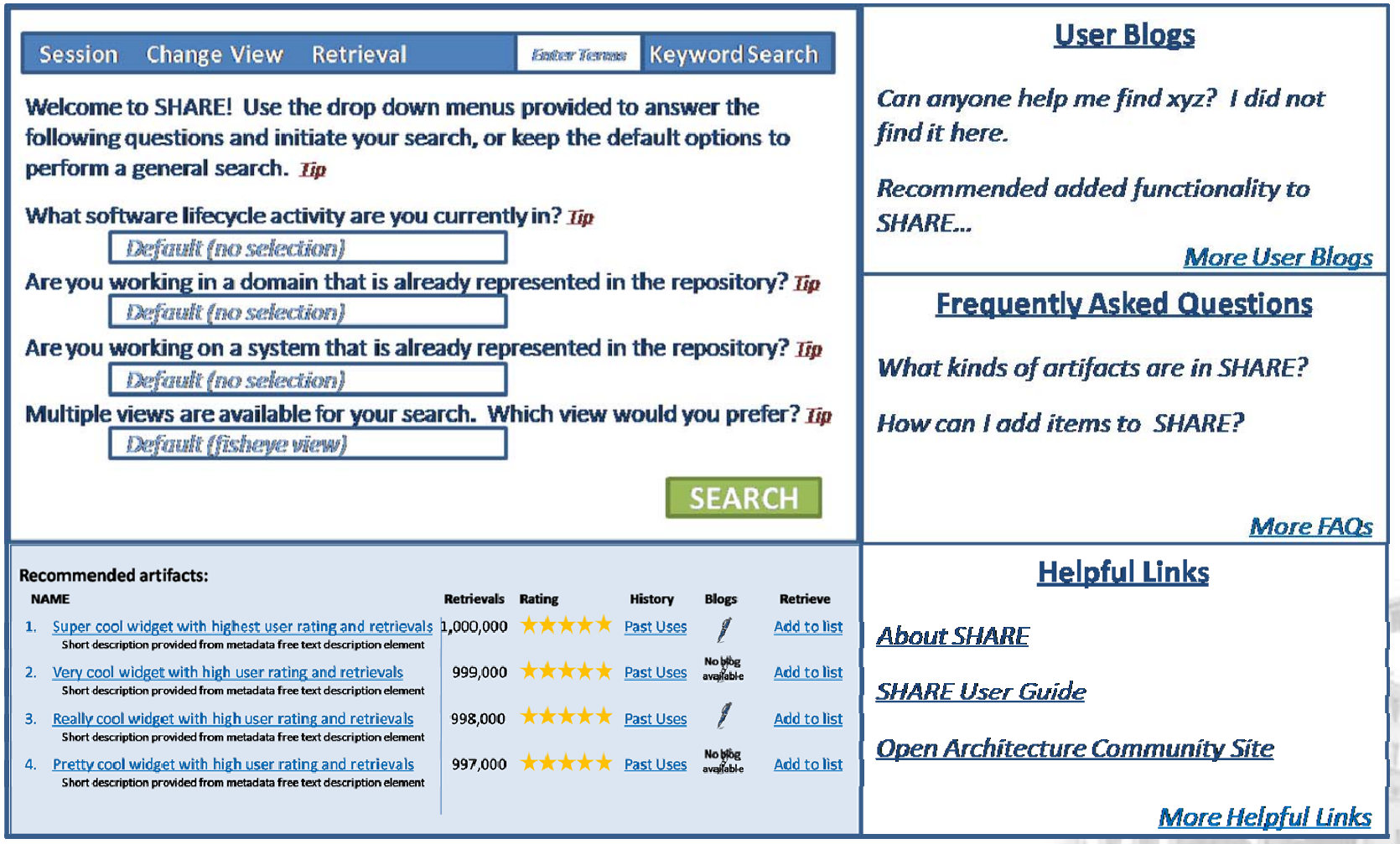
- Multiple visualization tools allow users to explore contents in a comfortable setting.
- Different types of views suggested:
  - Fisheye Graph (Use Case shows)
  - DoDAF Views
  - UML Representations

Use Case Demonstration

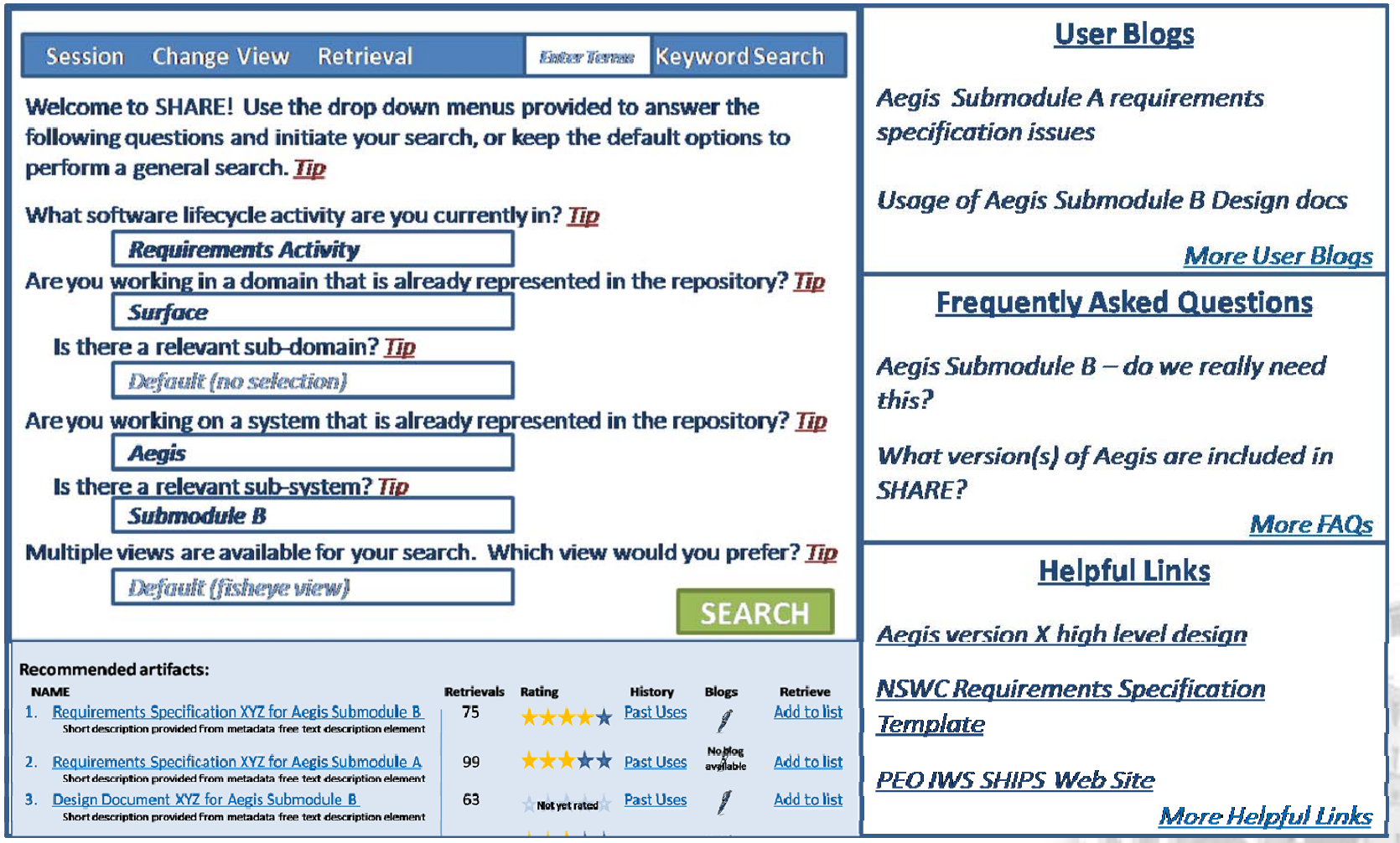
Overall Description

- Replacement for a subsystem of Aegis, generically termed “Submodule B”.
- SHARE repository consulted to find artifacts that will help in the development of the new subsystem ***requirements.***
- Potentially, there are existing system requirements that can be reused.
- There may also be additional artifacts to be discovered that may be helpful.

Home Screen

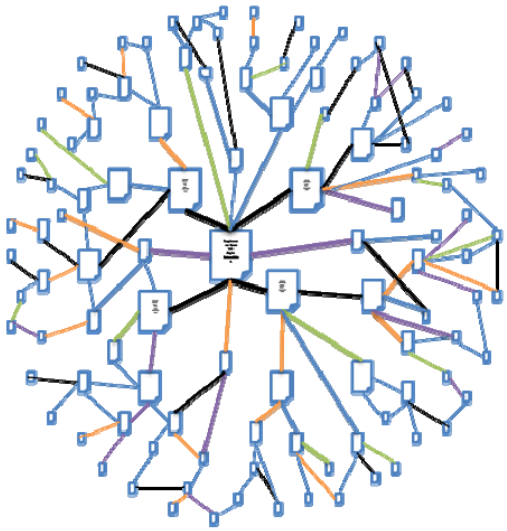

Session
Change View
Retrieval
Enter Terms
Keyword Search
Welcome to SHARE! Use the drop down menus provided to answer the following questions and initiate your search, or keep the default options to perform a general search. Tip
What software lifecycle activity are you currently in? Tip
Default (no selection)
Are you working in a domain that is already represented in the repository? Tip
Default (no selection)
Are you working on a system that is already represented in the repository? Tip
Default (no selection)
Multiple views are available for your search. Which view would you prefer? Tip
Default (fisheye view)
SEARCH
Recommended artifacts:
NAME
Retrievals
Rating
History
Blogs
Retrieve
1. Super cool widget with highest user rating and retrievals
Short description provided from metadata free text description element
1,000,000
Past Uses
Add to list
2. Very cool widget with high user rating and retrievals
Short description provided from metadata free text description element
999,000
Past Uses
No blog available
Add to list
3. Really cool widget with high user rating and retrievals
Short description provided from metadata free text description element
998,000
Past Uses
Add to list
4. Pretty cool widget with high user rating and retrievals
Short description provided from metadata free text description element
997,000
Past Uses
No blog available
Add to list
User Blogs
Can anyone help me find xyz? I did not find it here.
Recommended added functionality to SHARE...
More User Blogs
Frequently Asked Questions
What kinds of artifacts are in SHARE?
How can I add items to SHARE?
More FAQs
Helpful Links
About SHARE
SHARE User Guide
Open Architecture Community Site
More Helpful Links

Initial Questions Answered



Fisheye Navigation – Initial return

Session | Change View | Retrieval | Enter Terms | Keyword Search



✓Functional similarity
Lifecycle phase relation
✓ usedDuring
✓ createdDuring
System/subsystem relation
✓ isPartOf
✓ interfacesWith
Reference Architecture relation
✓ isPartOf
✓ interfacesWith
Multiple relations

Recommended artifacts:

	NAME	Retrievals	Rating	History	Blogs	Retrieve
1.	Requirements Specification XYZ for Aegis Submodule B Short description provided from metadata free text description element	75	★★★★★	Past Uses		Add to list
2.	Requirements Specification XYZ for Aegis Submodule A Short description provided from metadata free text description element	99	★★★★★	Past Uses	No blog available	Add to list
3.	Design Document XYZ for Aegis Submodule B Short description provided from metadata free text description element	63	Not yet rated	Past Uses		Add to list
4.	Design Document XYZ for Aegis Submodule A Short description provided from metadata free text description element	80	★★★★★	Past Uses	No blog available	Add to list
5.	Requirements Specification ABC for LCS Submodule Q Short description provided from metadata free text description element	102	★★★★★	Past Uses		Add to list

User Blogs

Aegis Submodule A requirements specification issues

Usage of Aegis Submodule B Design docs

More User Blogs

Frequently Asked Questions

Aegis Submodule B – do we really need this?

What version(s) of Aegis are included in SHARE?

More FAQs

Helpful Links

Aegis version X high level design

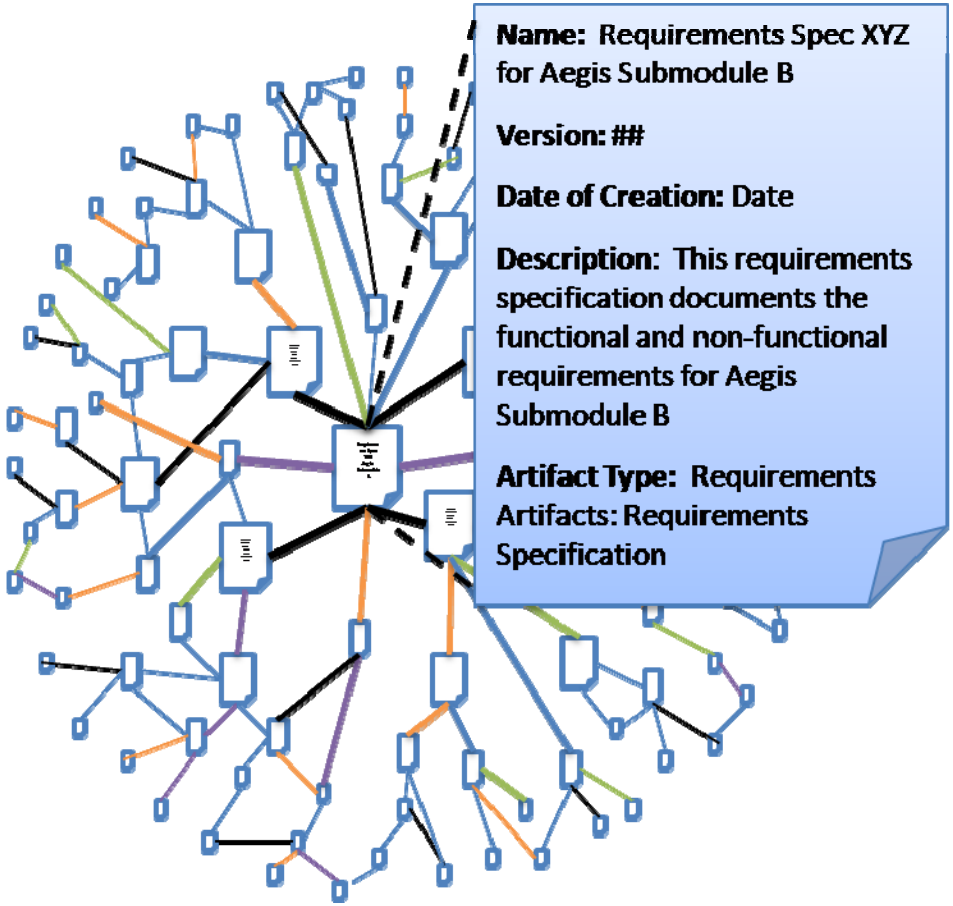
NSWC Requirements Specification Template

PEO IWS SHIPS Web Site

More Helpful Links

Artifact Details

Session Change View Retrieval | Enter Terms | Keyword Search



Name: Requirements Spec XYZ for Aegis Submodule B

Version: ##

Date of Creation: Date

Description: This requirements specification documents the functional and non-functional requirements for Aegis Submodule B

Artifact Type: Requirements Artifacts: Requirements Specification

✓Functional similarity

Lifecycle phase relation

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✓ createdDuring

System/subsystem relation

✓ isPartOf

✓ interfacesWith

Reference Architecture relation

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Multiple relations

Artifact Detail Page

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Artifact Type: Requirements Artifacts: Requirements Specification

Retrievals	Rating	History	Blogs	Retrieve
75	★★★★★	Past Uses		Add to list

Contribution Rationale: Submitter rationale for why it is included in the repository (free text)

Applicable Systems: Aegis: Submodule B

Objective Architecture Tags: Command and Control: Global Track Manager

Software Behavior Description: CSFL Function 1, CSFL Function 2

History:

Development Status: Complete

Pedigree:

Newer Version Of: Aegis Submodule B version XX

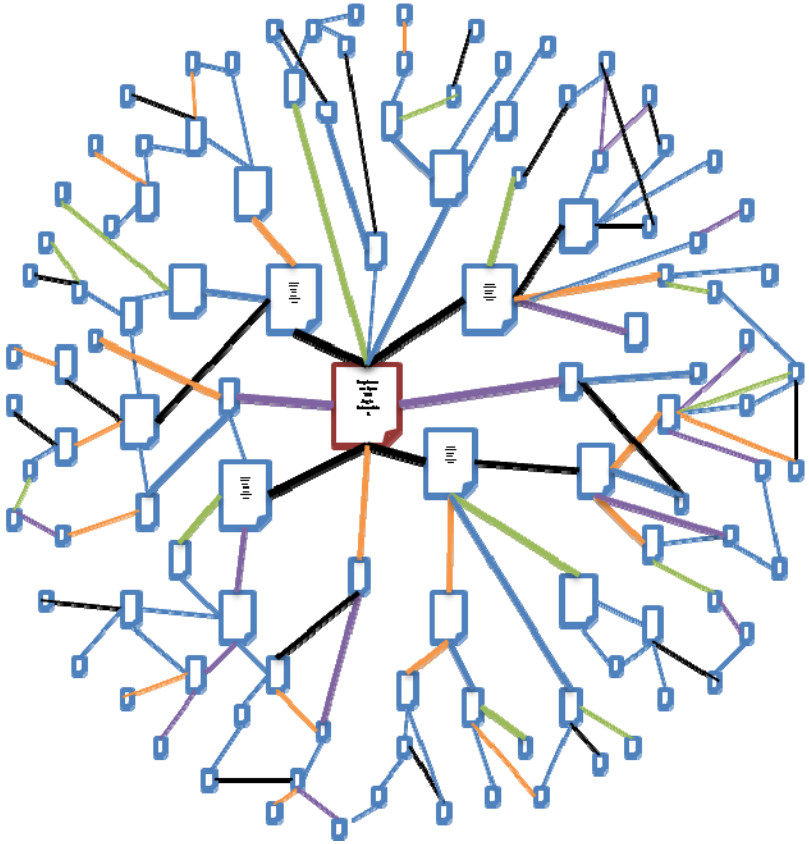
Interdependencies:

Interfaces With: Aegis Submodule A, Aegis Submodule C

Users who retrieved this item also retrieved:
List of applicable artifacts with hyperlinks to the relevant artifact detail page.

Retrieved item highlighted

Session Change View Retrieval | Enter Terms | Keyword Search



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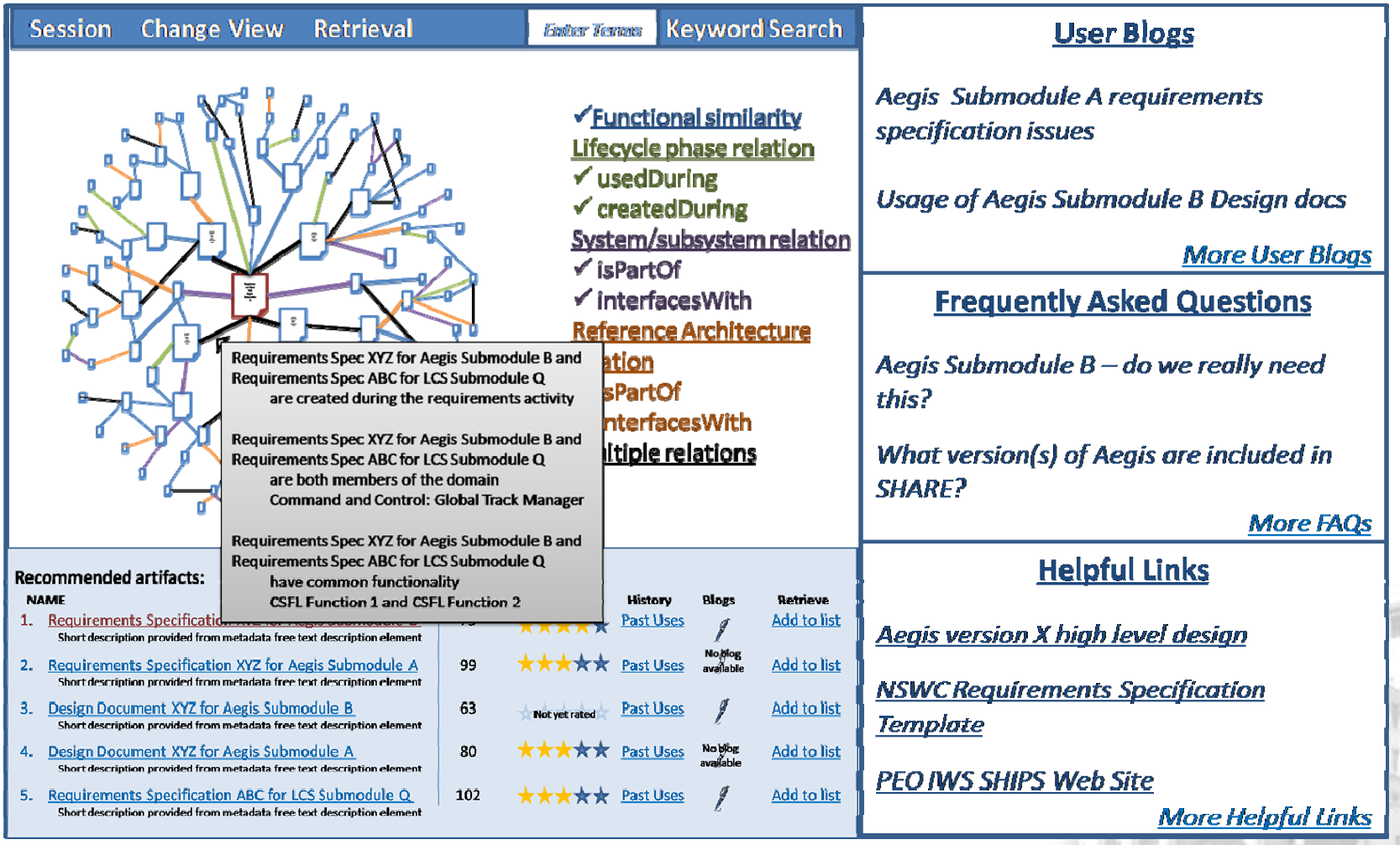
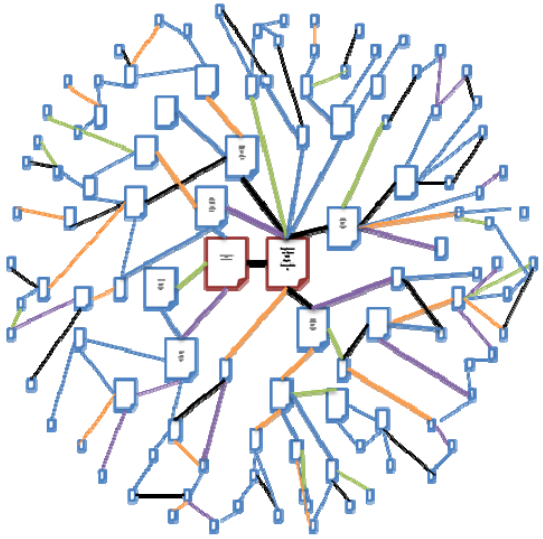
Relation Popup Window



Pane updates based on user action

Session Change View Retrieval | Enter Terms | Keyword Search



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5.	Requirements Specification 123 for SSDS Short description provided from metadata free text description element	55	★★★★★	Past Uses		Add to list

User Blogs

Aegis Submodule A requirements specification issues

LCS Submodule Q requirements

More User Blogs

Frequently Asked Questions

Aegis Submodule B – do we really need this?

How do I find details about the objective architecture developed for surface?

More FAQs

Helpful Links

PEO IWS SHIPS Web Site

NSWC Requirements Specification Template

Command and Control Best Practices

More Helpful Links

Retrieval List

ITEMS MARKED FOR RETRIEVAL: RETRIEVE

1. Requirements Spec XYZ for Aegis Submodule B

Version: ## **Date of Creation:** Date

Description: This requirements specification documents the functional and non-functional requirements for Aegis Submodule B

Artifact Type: Requirements Artifacts: Requirements Specification

See artifact details Blog about this item Delete

2. Requirements Spec ABC for LCS Submodule Q

Version: ## **Date of Creation:** Date

Description: This requirements specification documents the functional and non-functional requirements for LCS Submodule Q

Artifact Type: Requirements Artifacts: Requirements Specification

See artifact details Blog about this item Delete

3. Source Code for Some functionally similar Submodule

Version: ## **Date of Creation:** Date

Description: The code for cool Submodule Z is provided.

Artifact Type: Code Artifacts: Source Code

See artifact details Blog about this item Delete

RETRIEVE

Summary

- Ontology-based approach for organizing a software reuse repository
- Computer aided navigation techniques are enabled based on relationships in ontologies
- Demonstrated by Use Case scenario

Questions?

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