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SAND2013-9319P

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Inception Iteration 2 Program Management Review

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9 October 2013

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Program Management Review

- This is a Program Management Review for the US NDC Modernization project, Inception Phase, Iteration 2
- The PMR provides an opportunity to review the objectives, cost, schedule, and performance status of the US NDC Modernization effort
- Detailed issues are discussed during weekly project and technical meetings of the AFTAC-SNL team and monthly status reports to the contract office

Outline

- Statement of Work Review
- Financial Status
- Schedule Status
- Deliverable Status
- Risks
- Elaboration Phase Plans

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STATEMENT OF WORK REVIEW

Statement of Work

- Scope: specify and design a new US NDC architecture using Rational Unified Process (RUP)

- RUP Phases
  - **Inception – scope the system**
  - Elaboration – architecture/analysis
  - Construction – software development
  - Transition – deploy the system

The current SNL project

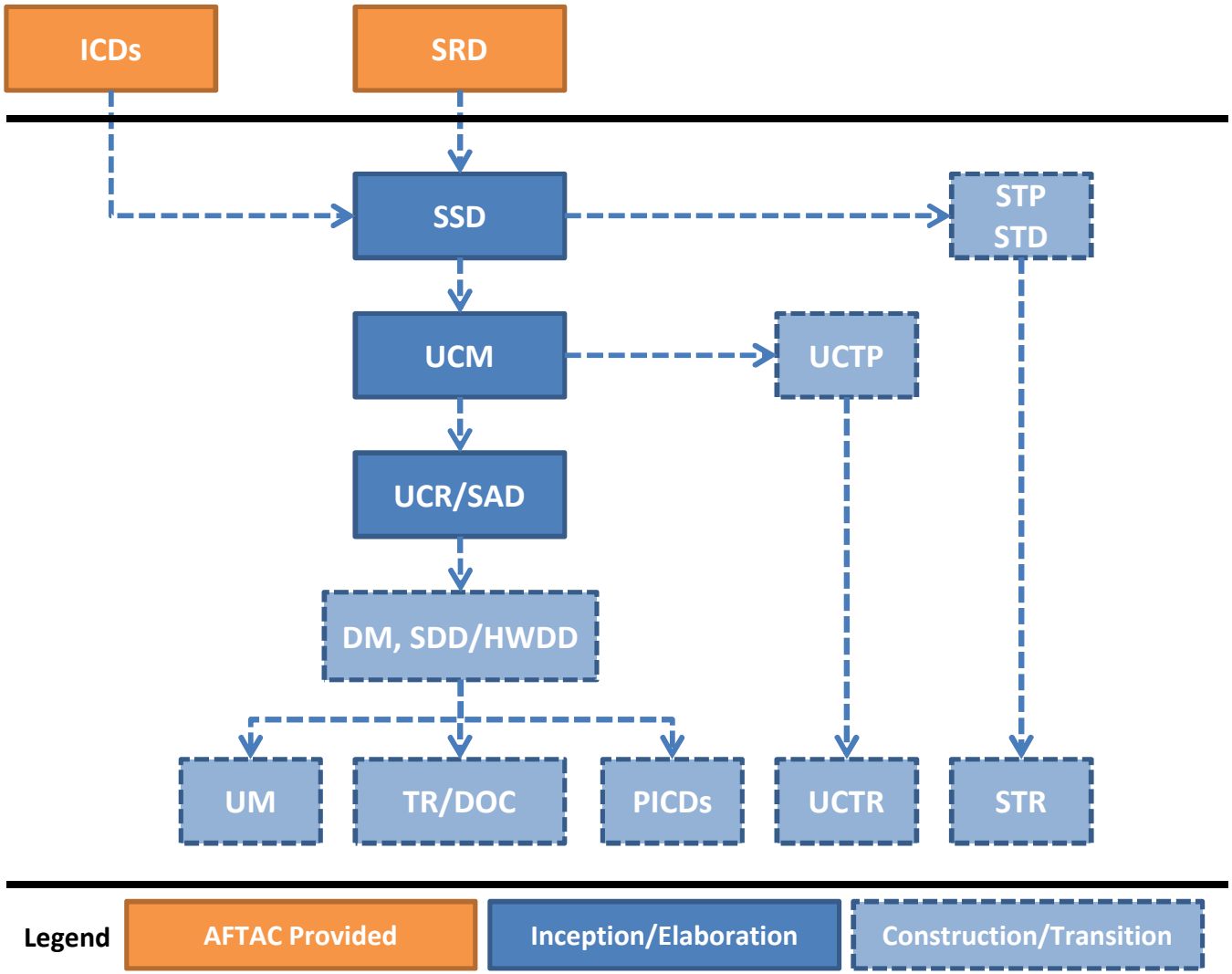
Future work being specified

- 6-Month Iterations

	12	FY13		FY14		FY15		FY16-TBD
Phase	Inception			Elaboration				Construction-Transition
Iteration	Plan	I1	I2	E1	E2	E3	E4	TBD

We Are Here

System Design Products



DM = Design Model
HWDD = Hardware Design Document
ICDs* = Interface Control Documents
PICDs = Product ICDs
SAD = System Architecture Document
SRD* = System Requirements Document
SSD = System Specification Document
STD = System Test Description
STR = System Test Results
STP = System Test Plan
TR/DOC = Training/Documentation
UCM = Use Case Model
UCR = Use Case Realizations
UCTP = Use Case Test Plan
UCTR = Use Case Test Results
UM = User's Manual

US NDC Modernization Team

AFTAC	
POC	Lead
	Program Manager
	Chief Scientist
	Chief Engineer for Modernization (primary POC)
	Chief Engineer for Current System
	Interactive
	Detection
	Interactive
	Association & Location
	Modeling & Event ID
	Reporting & Mapping
	Test Manager
	Tuning

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Mark Harris	SNL Lead
Shack Burns	Lead Architect
Christopher J. Young	Geophysicist/Domain Expert
Dorthe B. Carr	Software Architecture
David Clifford	Software Architecture
Benjamin R. Hamlet	Software Architecture
Michael M. Hess	Software Architecture
Jennifer E. Lewis	Software Architecture
Randy Lober	Software Architecture
Ryan Prescott	Software Architecture
Sean Stroud	Software Architecture

SNL-AFTAC Collaboration

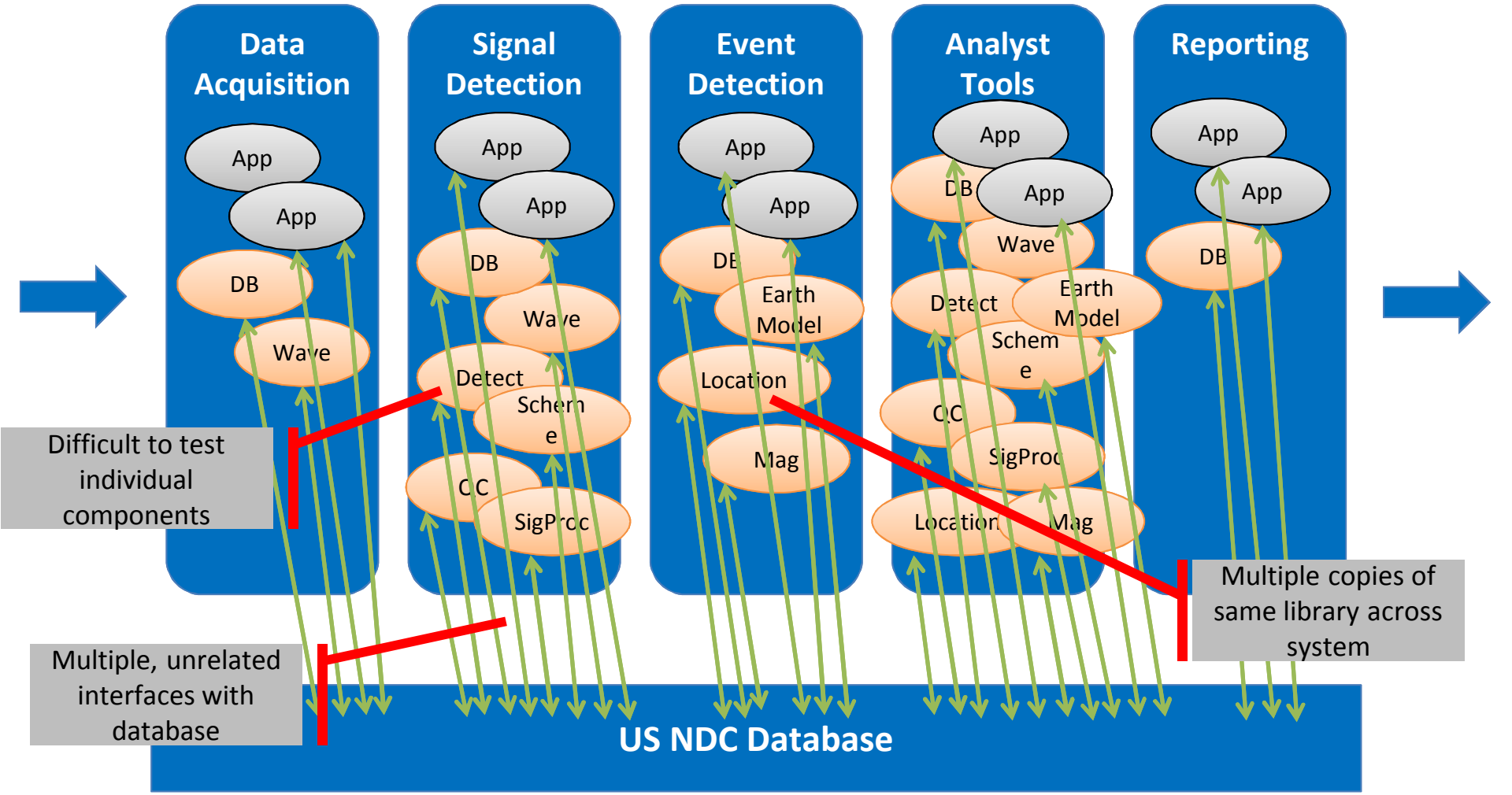
- Weekly Coordination Conf Calls
- Weekly Technical Conf Calls
- Collaboration through SNL SharePoint sites and remote login
- Team Meetings

4/9-10/2013	SNL at AFTAC	Iteration I1 Review
6/25-27/2012	SNL at AFTAC	SSD/UC Collaboration
7/16-17/2012	SNL at AFTAC	SRP/Modernization
7/29-2/2013	AFTAC at SNL	SSD/UC Collaboration
8/13-15/2013	SNL at AFTAC	UC Discussions
8/19-22/2013	SNL at AFTAC	UC Discussions
9/24-26/2013	SNL at AFTAC	SSD Review

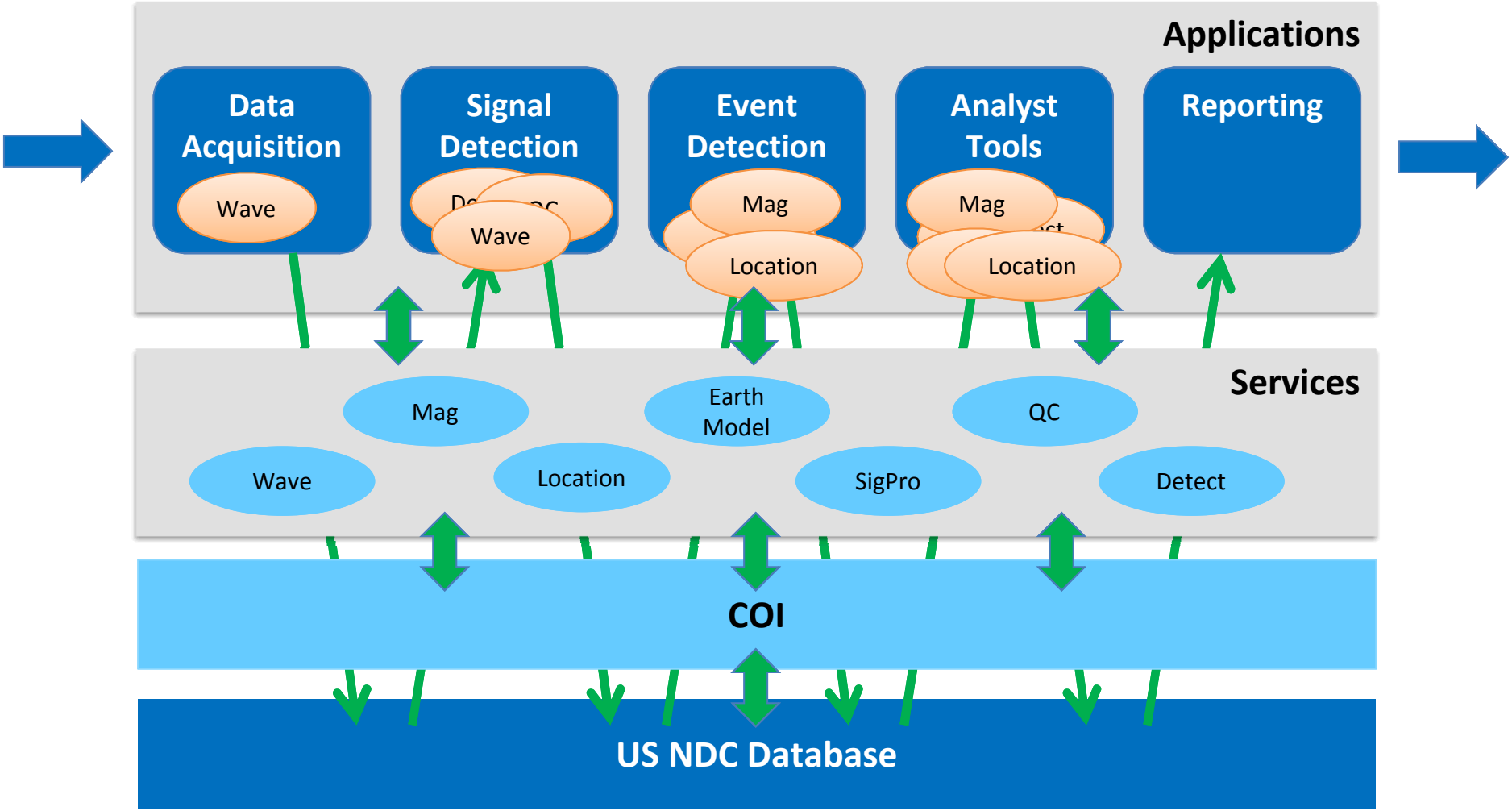
- External Collaboration Meetings

5/8-10/2013	IDC Reengineering
7/18/2013	NEIC Software Engineer Visit SNL
9/9-12/2013	IDC Modernization
9/18/2013	GNEMRD (Casey) Visit SNL

Current US NDC



US NDC Transition



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FINANCIAL STATUS

Financial Status

- Slides that describe:
  - The funding received
  - The current spending according to the planned spending

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SCHEDULE STATUS

Inception Milestones

	Planned	Complete
Planning	**Aug 2012 – Sept 2012**	
SRD Reviews with AFTAC	9/30/2012	10/5/2012
Iteration I-1	**Oct 2012 – Mar 2013**	
Initial PM Info (Risk, Cost Estimate)	3/31/2013	2/27/2013
Initial SSD, UC List	3/31/2013	3/25/2013
Iteration Review	3/31/2013	4/10/2013
Initial Requirements Review	3/31/2013	4/9/2013
PMR	3/31/2013	4/10/2013
Iteration I-2	**Apr 2013 – Sept 2013**	
SOW Deliverables	9/30/2013	9/30/2013
Iteration Review	9/30/2013	10/9/2013
SSD Review	9/30/2013	9/26/2013
UC Review	9/30/2013	10/8/2013
PMR	9/30/2013	10/9/2013
Inception Phase Review	10/30/2013	10/9/2013

Elaboration Milestones

	Planned	Complete
Iteration E-1	**Oct 2013 – Mar 2014**	
Iteration E-2	**Apr 2014 – Sep 2014**	
Iteration E-3	**Oct 2014 – Mar 2015**	
Iteration E-4	**Apr 2015 – Sep 2015**	
Elaboration Phase Review	10/30/2015	

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DELIVERABLE STATUS

SOW Deliverables

- **Inception Phase Deliverables (FY12, FY13)**
  - **Iteration Reviews** (at the end of every iteration, tentatively every 6 months) to provide stakeholders insight into progress and gain agreement on the scope of the next iteration
  - **Project Scope Document** to clearly define the scope of the modernized system
  - **Integrated Master Plan (IMP)** and **Integrated Master Schedule (IMS)**, which define the project scope and cover the full RUP lifecycle
  - **System Requirements Document (SRD) reviews** to assist the customer with vetting their document
  - **System Specification Document (SSD)** based on the customer provided System Requirements Document (SRD) and external interface ICDs
  - **Risk assessment** to identify focus of early architectural definition
  - **Use Case Model** (draft) using the Unified Modeling Language
  - **Architecturally significant use case descriptions**
  - **Demonstration** of architectural prototype
  - Refined **Cost Estimate** based on SSD, Use Case Model and architecturally significant use cases
  - **Configuration Management Plan** (draft)
  - **Supporting Environment** established
  - **Inception Phase Review** to gain stakeholder concurrence on deliverables

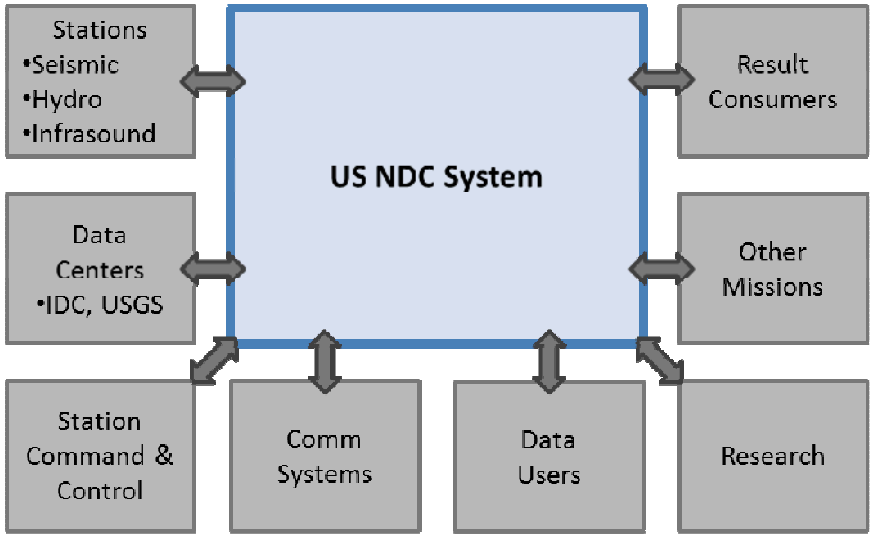
Inception Phase Artifacts

Inception Phase Deliverables	Current Artifact	Iteration Delivered
Iteration Review (Technical and PMR)	USNDC-Mod-PMR-I2.pptx	I1, I2
Project Scope Document	USNDC-Mod-SCOPE-V1.0.docx	I2
Integrated Master Plan (IMP)	USNDC-Mod-IMP-V1.0.docx	I2
Integrated Master Schedule (IMS)	USNDC-Mod-IMS-V1.0.mpp	I2
System Requirements Document (SRD) Reviews	N/A	I1, I2
System Specification Document (SSD)	USNDC-Mod-SSD-V1.1.docx	I2
System Specification Document (SSD)	USNDC-Mod-SSDM-V1.1.dpa	I1, I2
Risk List	USNDC-Mod-RISKS-V1.0.xlsm	I2
Risk Management Plan (RMP)	USNDC-Mod-RMP-V1.0.docx	I2
Use-Case Model	USNDC-Mod-UCM-V1.0.zip	I2
Use-Case Model Survey	USNDC-Mod-UCMS-V1.1.docx	I1, I2
Glossary	USNDC-Mod-GLOSSARY-V1.0.docx	I2
Architectural Prototype Demonstration	USNDC-Mod-SOA-V1.1.docx	I1, I2
Cost Estimates	Presented Iteration I1	I1
Configuration Management Plan	USNDC-Mod-CMP-V1.0.docx	I2
Inception Phase Review	Concurrent with Iteration Phase Review	I2

Deliverables are posted to project SharePoint sites.

Project Scope Document

- Statement of Need, Goals, Objectives
- Process for System Definition
- Discussion of Technical Scope
  - System Context
  - System Functions
  - Users
  - Subsystems
  - Security Levels
  - Scaling Expectations
- Project Assumptions and Constraints



Interfaces to the US NDC System

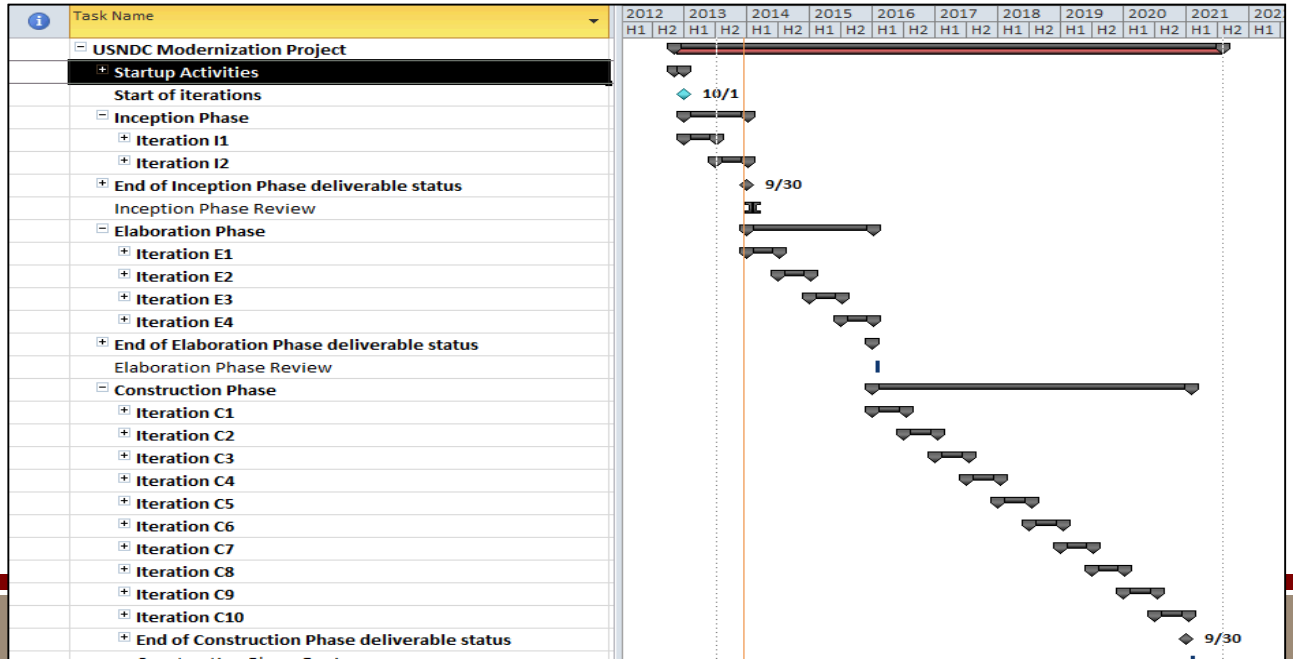
Integrated Master Plan (IMP)

- Follows DOD guidance: http://www.acq.osd.mil/se/docs/IMP_IMS_Guide_v9.pdf
- Includes:
  - Integrated Master Schedule (with a reference to the IMS)
  - IMP (Events, Accomplishments Criteria)
    - Accomplishment Criteria (AC) - high-level goals of the project
    - Evaluation Criteria (EC) to be complete at each milestone
    - Defines the state of each EC at each major milestones on the project
  - IMP Narratives
    - Discussion of RUP process
    - Construction phase planning options

AC: Risks have been sufficiently identified and mitigated.	Risk List	EC: Risk List is in the Completed state EC: Risk Management Plan is in the Completed state.	
AC: Project plan is an executable, measurable and sufficient plan for the completion of this project.	Integrated Master Plan/ Integrated Master Schedule (IMP/IMS)	EC: IMP/IMS are in the Completed state	

Integrated Master Schedule (IMS)

- High-level project schedule (in MS Project)
- Tightly coupled to the content of the IMP
  - Contains overall iteration plan and high-level tasks in each iteration
  - Contains the AC/EC status defined in the IMP
- Shows overlap of Construction tasks and Transition tasks
  - Shows the incremental deployment starting in Construction iteration 3



Risk Assessment

- Risk Management Plan defines the risk process
  - Risk Board identifies and evaluates risks & issues
    - Issue: Risk that is realized
  - Risk Owner executes mitigations, tracks status
  - Stakeholder reviews status, accepts resolution
  - Risk List spreadsheet with detailed information and history
  - Risk Item in RTC to associate mitigation and contingency tasks
- Risk Board defined initial Risk List for the project
- Risks will be discussed later (during this briefing)

Title	Iteration Created	Owner	Prob.	Impact	Exp	Risk Strategy	Date of Impact
If funding for future system construction (beginning FY16) is not approved or is less than adequate, then the system cannot be developed to meet all the requirements.	I1	mharris	4	5	20.0	Mitigate	10/1/2015
If the US NDC Modernization project doesn't meet the needs of the subsurface analysts for data presentation and responsiveness, then the US NDC Modernization system will not be accepted for operations.	I1	cjyoung	3	4	12.0	Mitigate	10/1/2017
If the components of the modernized system cannot be effectively integrated into the existing US NDC system, then the delivery of new features will be delayed.	I1	jfburns	2	3	6.0	Mitigate	10/1/2017

Configuration Management Plan

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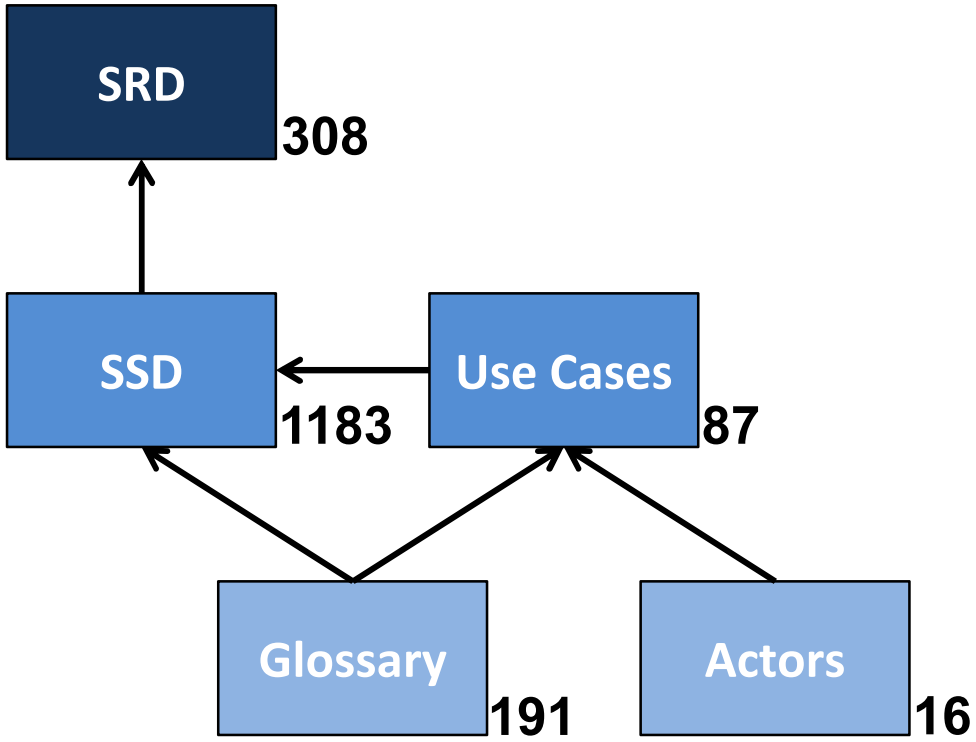
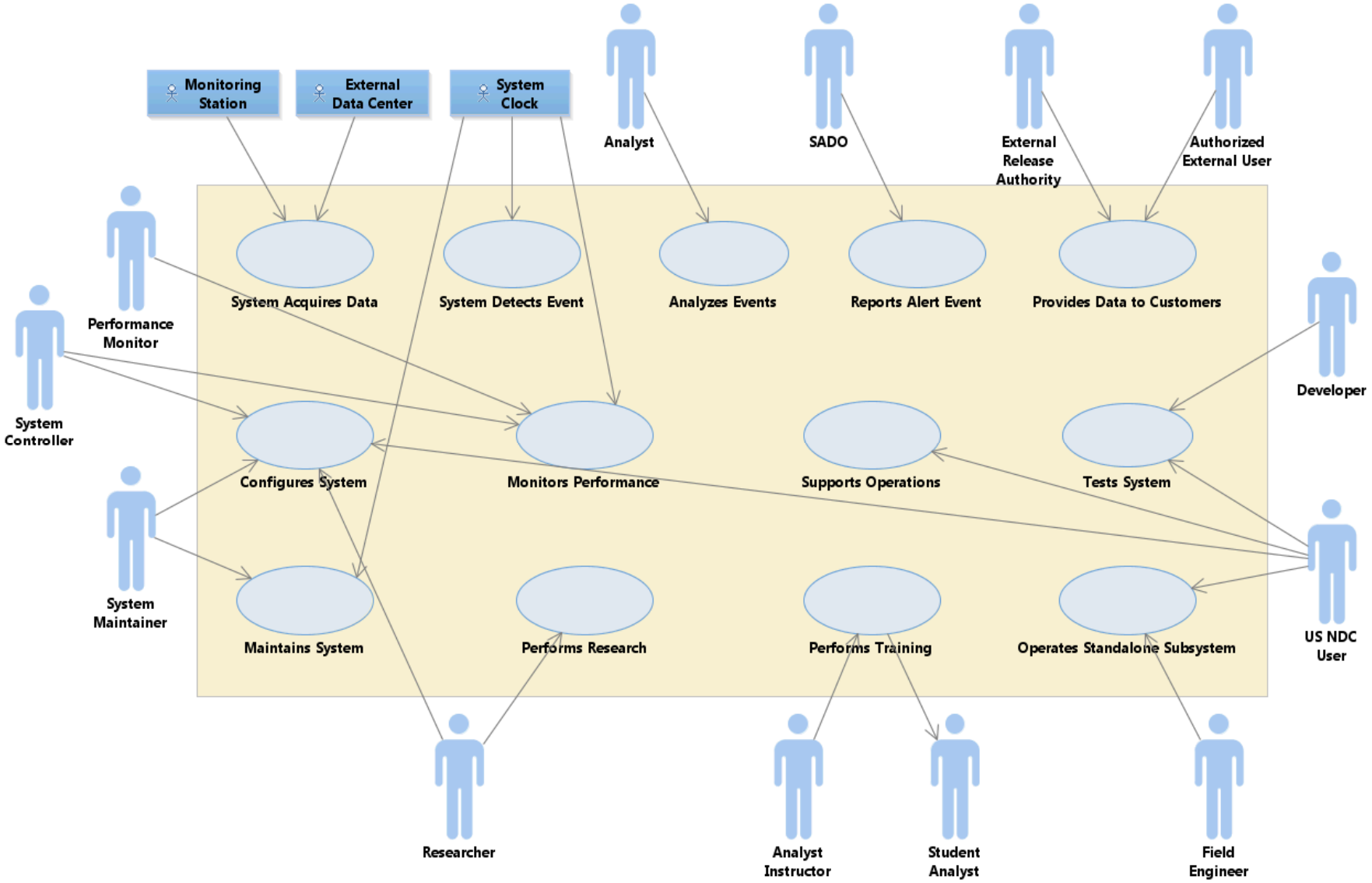
- Defines Configuration Management and Change Management processes
- Configuration Management
  - Discusses what will be controlled and how it is to be controlled
  - Processes using SharePoint and Jazz Source Control
  - Defines other concepts (e.g. builds and baselines)
- Change Management
  - Defines concepts, e.g. Change Control Board and Change Request (CR)
  - Defines the CR process
- The CR process will be used for delivered artifacts
  - SSD, UC, documents, etc.

Architecture Deliverables

- System Requirement Document (SRD) (AFTAC Provided)
- System Specification Document (SSD)
- Use Case Model
  - Use Case Descriptions
  - Actors
  - Use Case Models
- Glossary



Use Case Model



Use Case Example

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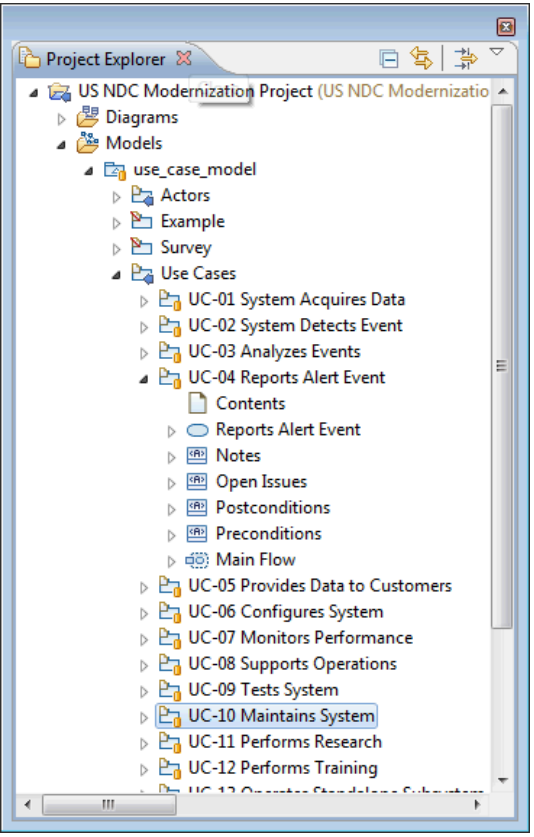
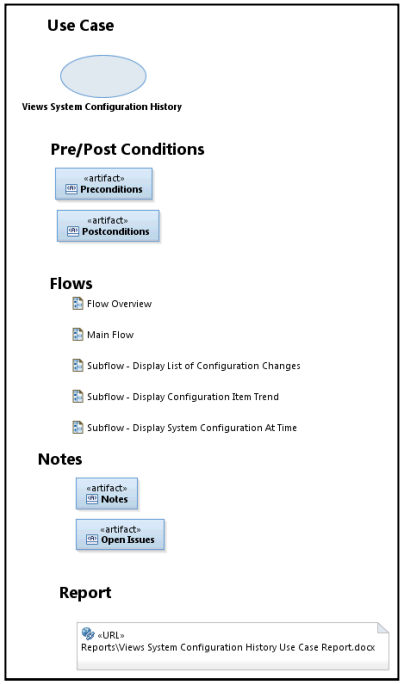
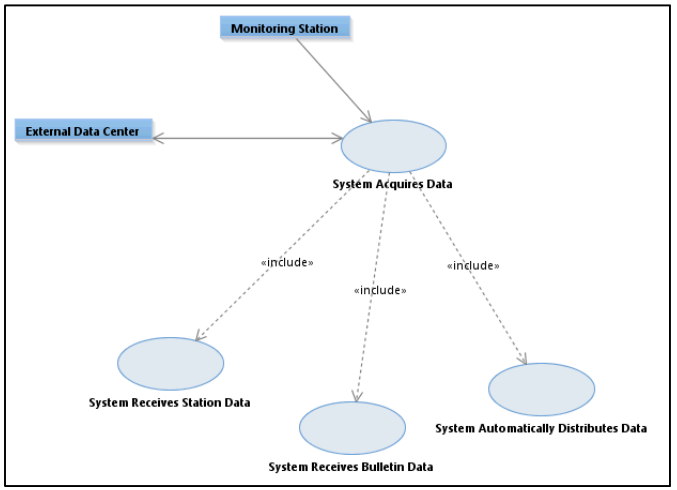
RSA Navigation



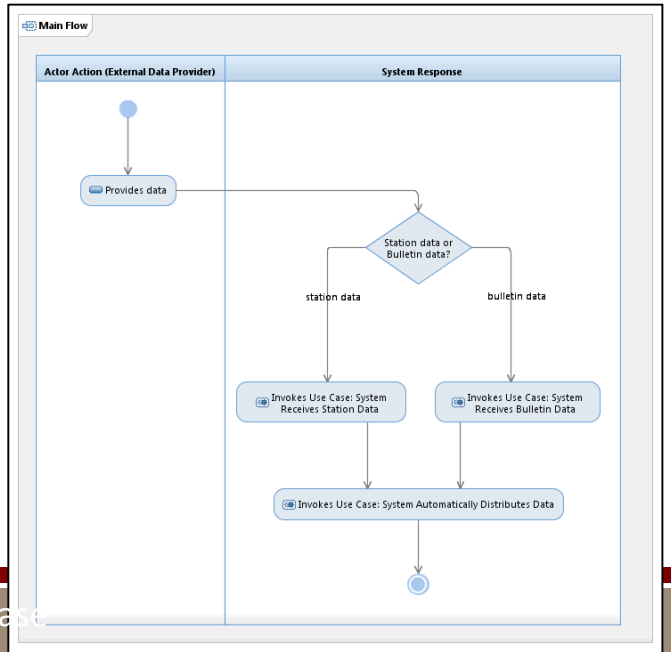
Contents Diagram



Use Case Diagram



Activity Flow Diagram



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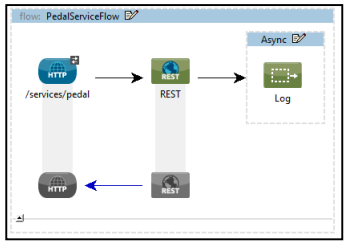
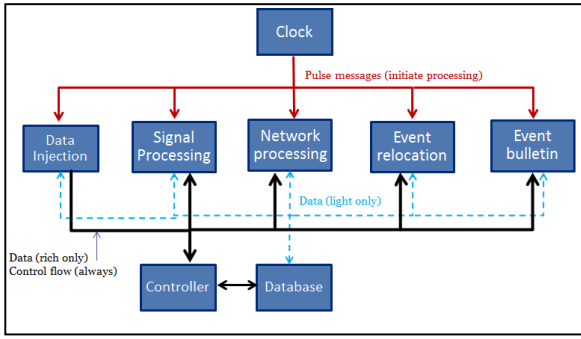
TECHNOLOGY STUDIES

Service Oriented Architecture

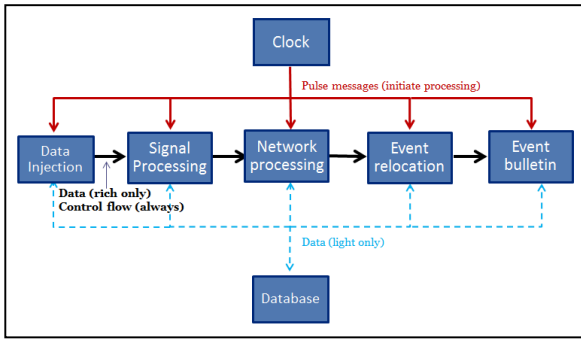
- Internal SNL study
- Proof-of-concept follow-on to Iteration 1 SOA study
- Deployed GNEM R&D software components into a basic pipeline configuration and measured performance
- SOA Framework:
  - Mule Enterprise Service Bus (MuleESB)
- Services:
  - WavePro, PEDAL, LocOO3D, plus additional services to operate pipeline
- Tested combinations of
  - control patterns (central vs. distributed)
  - communication interface standards (light vs. rich)
- Measured
  - Messaging Time, Messaging Size, and Processing Time
- Report detailing results is in preparation



MuleESB Interface



Central Control



Distributed Control

Database Performance Study

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- Internal SNL study
- Compared performance for storing binary data
  - Relational database
  - Filesystem
  - NoSQL database
- Performance Summary
  - Small binary objects: store as BLOBs in database
  - Medium-to-large binary objects: store on filesystem
  - Full report is available
- US NDC Recommendation
  - Define database needs and requirements (performance, hardware, access, size, replication, etc.) and choose the solution(s) that satisfy those needs

SeisComp3 Feature Comparison

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Strengths of SeisComp3

- Use of Spread (open source)
  - High performance messaging of meta data (picks) across independent processing components and modules
- Exporting and playback capability of event formations
  - Offline replay can be accelerated (100 to 10,000) normal speed
- Python scripting and environment management infrastructure
- Multi-layer configuration and defaulting settings
- Scalable to a single laptop for standalone operation

Weaknesses of SeisComp3

- Array processing
- Waveform correlation
- Analyst workflow support – no event or time interval lockout
- Convenient method to track and resolve unassociated arrivals
- Automatic merging of event hypotheses (conflict resolution)
- Interactive event comparison capability (dendograms)
- Event identification tool suites (discrimination, ECM)
- Multi-threaded implementation

- Conclusion: SeisComp3 is a good application for large event detection but is missing many features needed for detailed analysis and mission operations.
- Work involving SeisComp3 has transitioned to GNEMRD program.

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RISKS

Risk Definitions

Probability		
Likelihood	**Value**	**Likelihood Description**
5	Near certainty	Everything points to this becoming a problem
4	Very likely	High chance of this becoming a problem
3	Likely (50/50)	There is an even chance this may turn into a problem
2	Unlikely	Risks like this may turn into a problem once in a while
1	Improbable	Not much chance this will become a problem

Impact				
Level	**Value**	**Cost Criteria**	**Technical Criteria**	**Schedule Criteria**
5	Catastrophic	> 5M	Can't perform mission at all; Users cannot use a mission critical feature.	Slip > 1 year of baseline schedule
4	Critical	$2M<X<=$5M	Loss of mission capability for specific times or circumstances; users can't use the non-mission-critical feature.	6 months < slip <= 1 Year
3	Moderate	$500K<X<=$2M	Mission degraded below nominal with work-around available	2 months < slip <= 6 months
2	Marginal	$100K<X<=$500K	Mission performance margins reduced	Slip of up to 2 months
1	Negligible	Minimum to no impact	Minimum to no impact	Minimum to no impact

Risk Information

- Table of top 10 risks with iteration identified, probability, impact, exposure, risk strategy, date of impact, priority
- Matrix that shows all the risks within the axes of probability and impact
- Discussion of each risk along with mitigation plans

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ELABORATION PHASE PLANS

Elaboration SOW Deliverables

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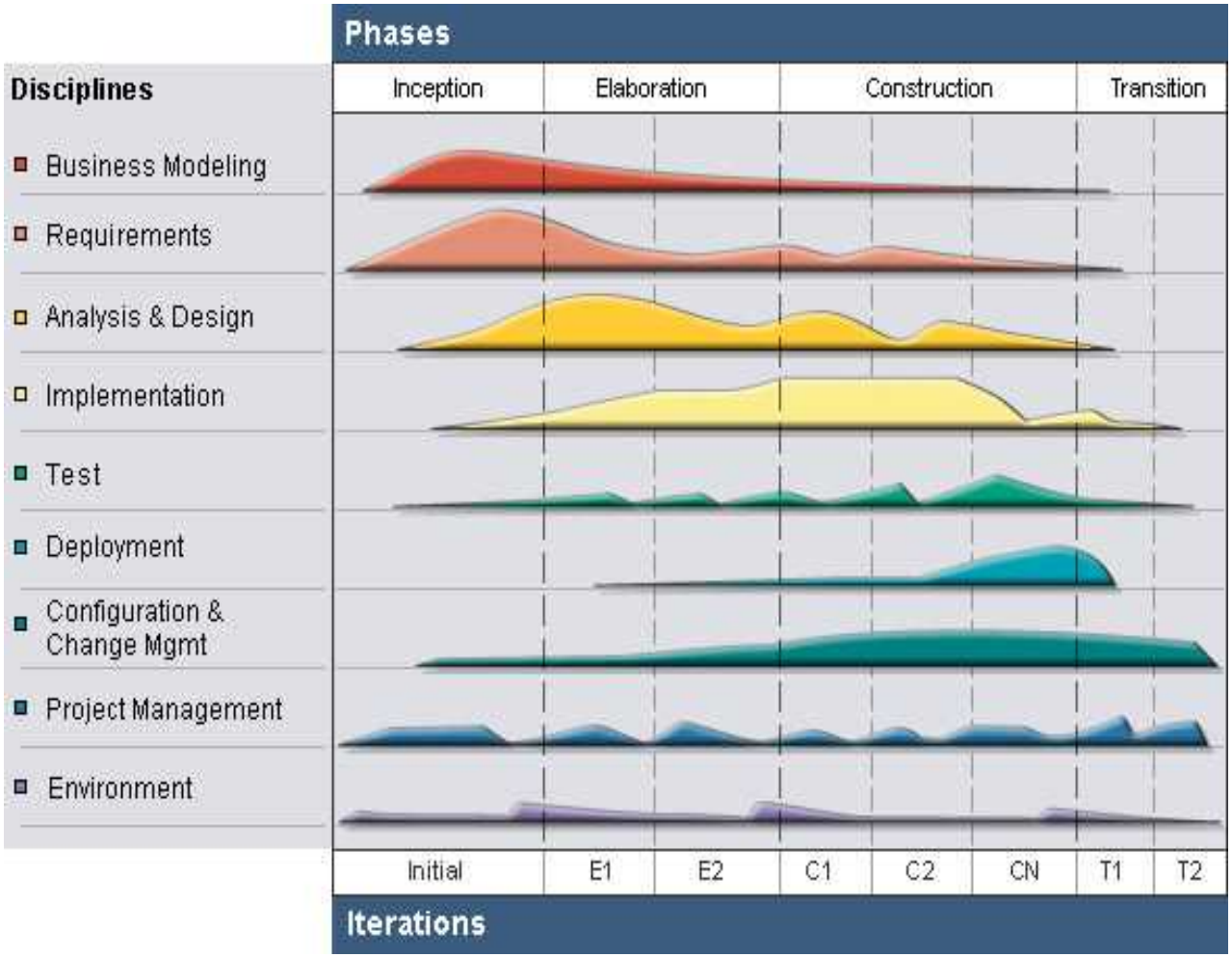
- **Focus is on architecture and infrastructure designs**

- **Iteration Reviews** to provide stakeholders insight into progress and gain agreement on the scope of the next iteration
- **System Specification Document** (updated)
- **IMP/IMS** (updated)
- **Use Case Descriptions** (baselined) and **User Interface Storyboards** traced to SRD/SSD requirements
- **Architecturally significant use case realizations (**baseline)
- **System Architecture Document**
- **Hardware Design Document**
- Identification of **architecturally significant algorithms**
- **SNL Testbed** configured
- Demonstration of **executable architecture** with simulated data
- Refined **Cost Estimate** from the baseline architecture
- **Construction Phase Plan** including migration plan for building, integrating, and deploying new architecture alongside existing system
- **System Test Plan** and **System Test Case Descriptions Information Assurance Plan/Security Design Document**
- **Elaboration Phase Review** to gain stakeholder concurrence on deliverables

RUP Effort by Discipline



Elaboration Phase Planned Effort

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RUP Discipline	Activity	Iteration (Weeks Effort)			
		E1	E2	E3	E4
		10/13-3/14	4/14-9/14	10/14-3/15	4/15-9/15
Requirements	System Specifications	5	5	5	5
	Use Case Descriptions	20	20	20	5
	User Interface Storyboards	40	40	20	20
Analysis & Design	Use Case Realizations	20	20	20	20
	System Architecture Document	40	20	10	10
Implementation	Executable Architecture Prototype	20	40	50	60
	User Interface Guidance	0	0	5	5
Test	Prototype Testing	0	0	5	10
Deployment	Demonstration	0	0	5	5
Configuration & Change Mgmt	CM Process	5	5	10	10
Project Management	Project Management	15	15	15	15
Environment	Design and Collaboration Tools	10	10	10	10
	Total	175	175	175	175

Iteration E1 Tasks

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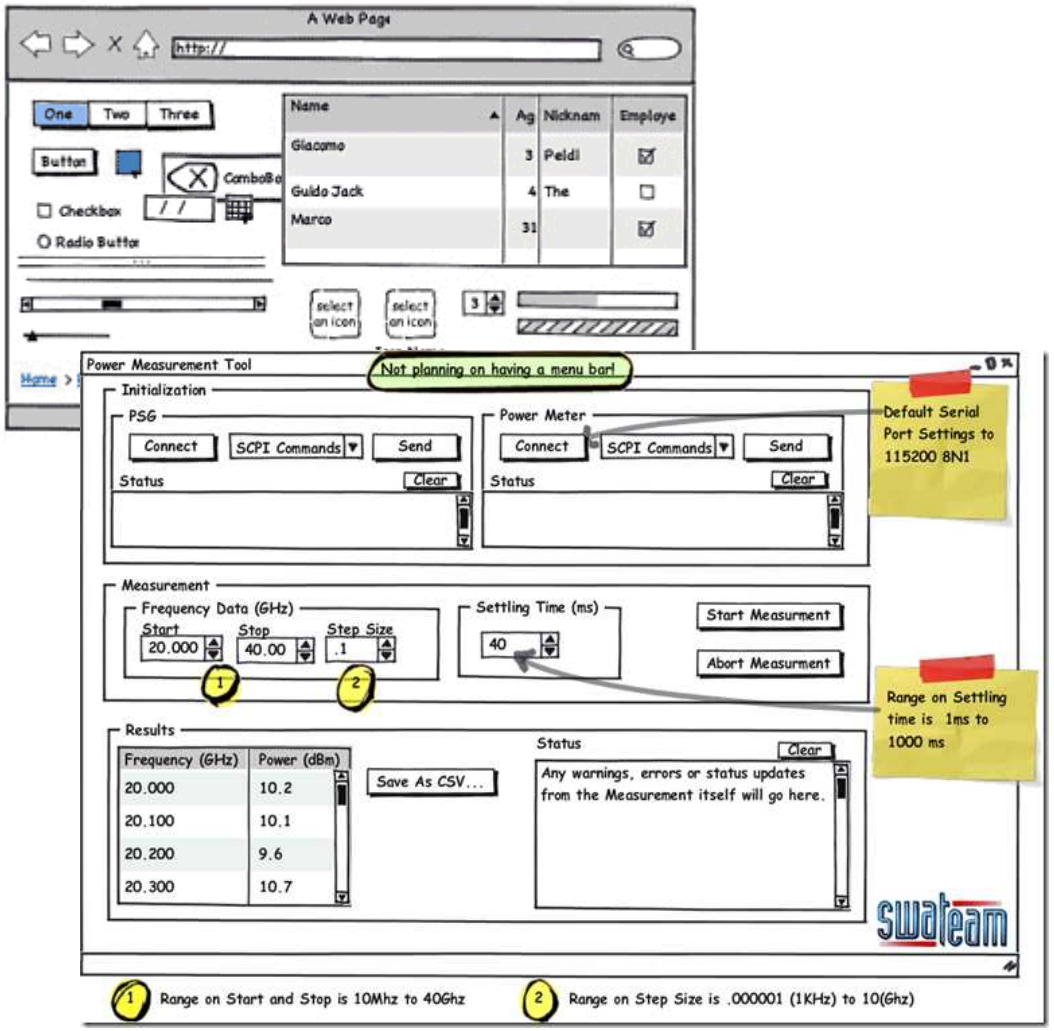
RUP Discipline	Activity	Iteration E1 Tasks
Requirements	System Specifications	Respond to CRs for new specs and changes
	Use Case Descriptions	Complete 20 UC models
	User Interface Storyboards	Complete 15 Storyboards
Analysis & Design	Use Case Realizations	Complete 10 UC Realization models
	System Architecture Document	Draft SAD
Implementation	Executable Architecture Prototype	Initial efforts in 3 areas
	User Interface Guidance	Draft UIG
Test	Prototype Testing	N/A
Deployment	Demonstration	N/A
Configuration & Change Mgmt	CM Process	Execute CM
Project Management	Project Management	Execute project (PM, RM, Cost Est)
Environment	Design and Collaboration Tools	Establish Storyboard and UCR processes, improve collaboration process

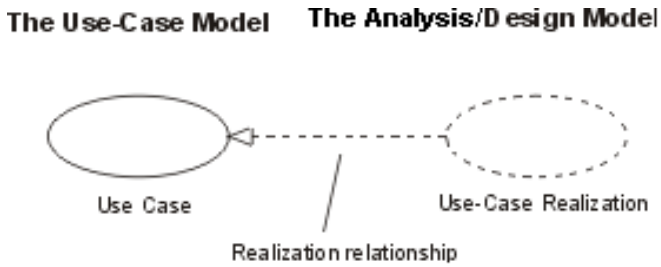
User Interface Storyboards

- Graphical description of system functionality presented to the user
- Clarify interaction of user and system described in Use Cases
- Guide User Interface and system design activities
- Not a prototype application

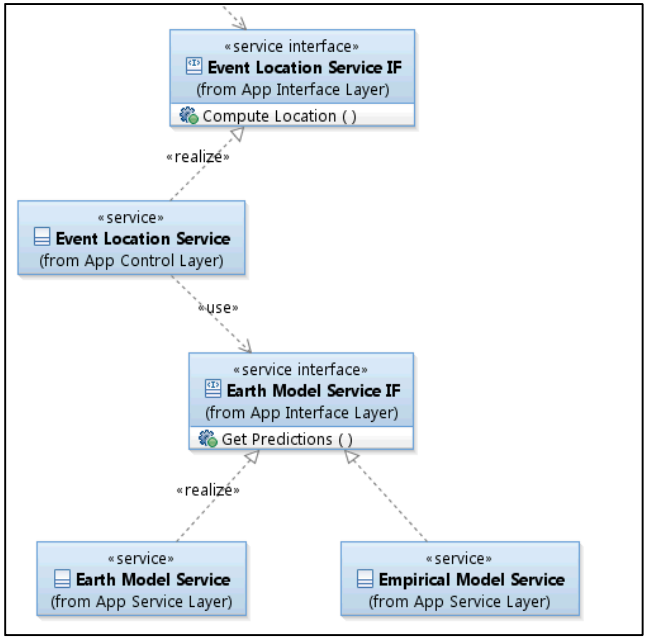


Use Case Realizations

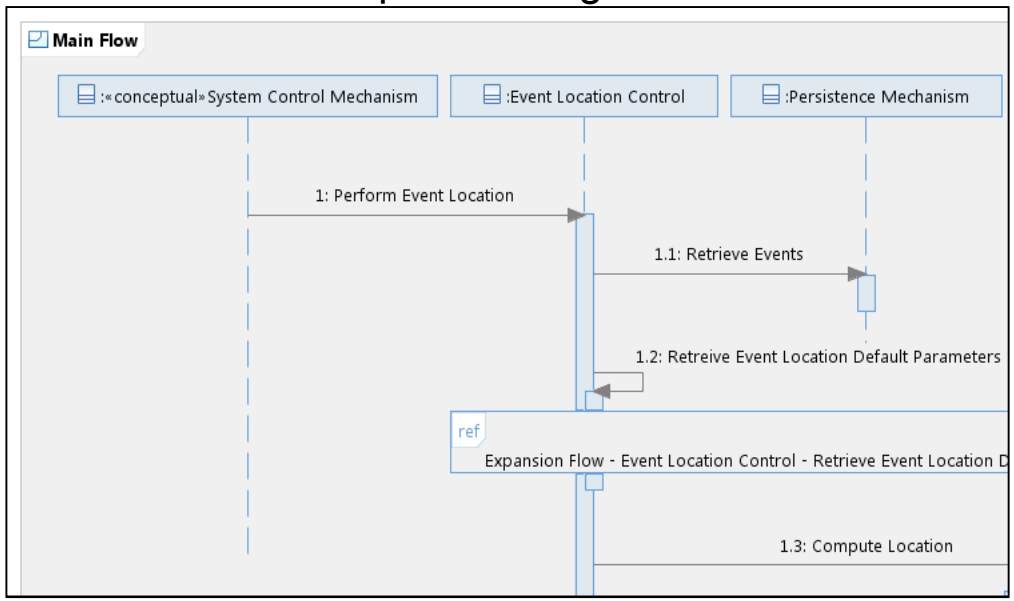
- Use Case Realizations map Use Cases to Architecture



Analysis Classes



Sequence Diagrams



Architecture Prototyping

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- Architectural prototyping reduces risk of broad design decisions by exploring feasibility of architecture concepts before construction
- Organizing teams to plan prototyping efforts
- Initial Prototyping Focus
  - Common Object Interface
  - Processing Control/Services Framework
  - User Interface Framework

Summary

- Cost, Schedule, Performance are on plan
- Inception Phase is complete
  - All Inception Phase deliverables are available for review and feedback
  - Awaiting approval by AFTAC
    - All artifacts are iterative
- Elaboration Phase Iteration E1 is beginning
  - Major activities are Use Cases, Storyboards, Realizations, Architecture, Prototyping