

IDC RE-ENGINEERING REPORT

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IDC Re-Engineering Phase 3 Development Plan

Version 1.0

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Abstract

Sandia National Laboratories has prepared a project development plan that proposes how the parties interested in the IDC Re-Engineering system will coordinate its development, testing and transition to operations.

REVISIONS

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1. INTRODUCTION

1.1. Project Description

The International Data Centre (IDC) operates the IDC seismic, hydro-acoustic, and infrasound (SHI) processing software in support of the nuclear test treaty monitoring mission of the Comprehensive Nuclear Test Ban Treaty Organization (CTBTO). The IDC system collects and analyzes data from networks of seismic, infrasonic, and hydroacoustic sensors to detect and identify explosions within the Earth or at low altitudes in the atmosphere.

A project is underway to re-engineer the IDC system, improving capability, reliability, maintainability, and extensibility needed for full operations in the future. An effort to define requirements and architectural design is complete. The next phase is to develop, validate, and deploy the re-engineered IDC system.

1.2. Project Assumptions and Ground Rules

The following assumptions and ground rules proposed for the duration of the IDC project:

- The IDC will continue to operate a primary processing system at the IDC facility throughout development and deployment of the re-engineered IDC system.
- The IDC will perform system integration, maintenance, and operational support of the IDC Re-Engineered system.
- There will be side-by-side acceptance testing of the re-engineered system with the current primary processing system.
- Security accreditation for the modernized IDC System will be accomplished by the IDC.
- Hardware for the testbeds and operational pipelines of the re-engineered IDC System will be procured and deployed by the IDC.
- Hardware and software for development and testing will be procured by the development organizations.
- The re-engineered system must meet needs for the next ~20 years.

The US Air Force Technical Applications Center (AFTAC) has begun a modernization project for the US National Data Center (NDC) system that can be leveraged to realize substantial cost savings on the IDC Re-Engineering effort. AFTAC has selected Sandia National Laboratories (SNL) as the primary developer for the USNDC Modernization project. The remainder of this document assumes that SNL is the primary developer of the IDC Re-Engineered system and will leverage the US NDC Modernization effort.

With these extra considerations, the following ground rules are also proposed for the duration of the project:

- The software development project will be executed using the Scaled Agile Framework (SAFe)¹.
- All interactions between SNL and member-state NDCs in support of the IDC Re-Engineering effort will be managed and coordinated by the IDC.

1.3. Iterations and Program Increment Definition

One of the core principles of the SAFe framework is that large development teams must work to a known and dependable cadence.² It proscribes building and executing work based on the following timeboxes:

Iteration: Per the Scaled Agile Framework, “an iteration is a fixed timebox wherein teams build an incremental element of business or product functionality. During this short period, the team executes the Stories in their iteration backlog, integrates the output with that of other teams and prepares and participates in a System Demo.”³ For the IDC Re-Engineering development effort, SNL will use two-week iterations.

Program Increment: Per the Scaled Agile Framework, “a [program increment] is a cadence-based interval for building and validating a full system increment, demonstrating value and getting fast feedback.”⁴ Program increments (PIs) aggregate the work of multiple iterations from multiple teams and provide a forcing function for full system integration and validation. For the IDC Re-Engineering development effort, SNL will use PIs lasting thirteen weeks, consisting of six iterations and a week for project management meetings.

¹ [“Scaled Agile Framework”](#), Retrieved 2017-01-24.

² [“Principle #7 – Apply Cadence”](#), Retrieved on 2017-01-24.

³ [“Iterations – Scaled Agile Framework”](#). Retrieved 2017-01-23.

⁴ [“Program Increment – Scaled Agile Framework”](#). Retrieved 2017-01-23.

2. TIMELINE AND MILESTONES

Since SNL began working on the IDC Re-Engineering effort in 2014, it has followed the Rational Unified Process (RUP). RUP specifies four lifecycle phases for large software efforts. The first two phases, inception and elaboration, focus on the elicitation of requirements and the design of the system as captured in a variety of artifacts, including use cases, use case realizations, and storyboards. IDC Re-Engineering Elaboration Phase is scheduled to end in January, 2017.

The development phase of the re-engineered system is expected to last five years.

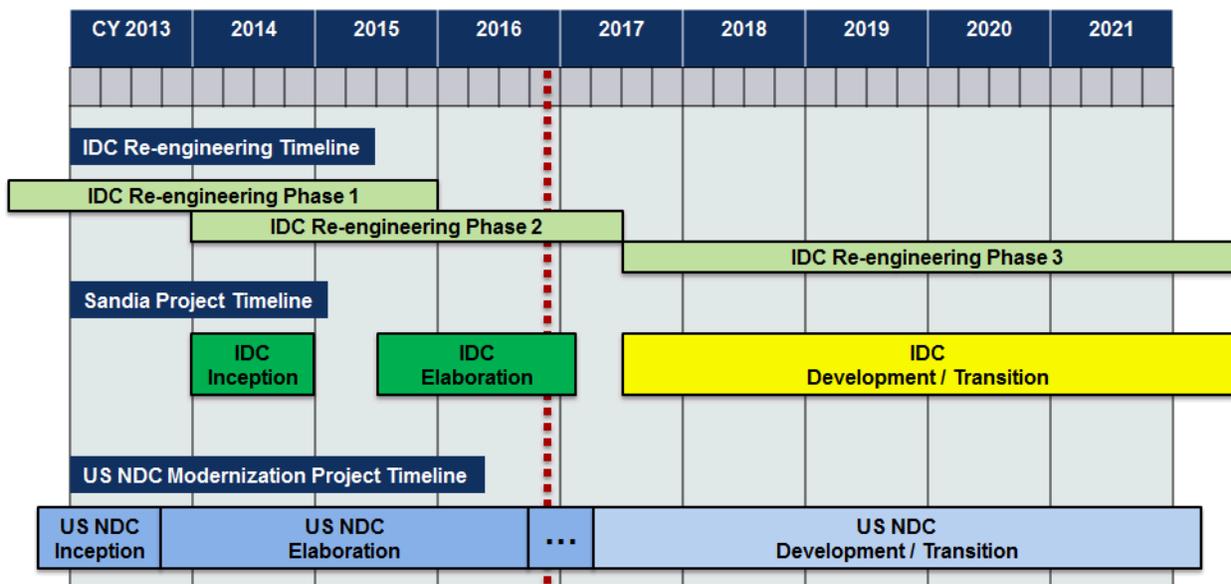


Figure 1 – Notional Timeline for the IDC Re-Engineering Phase 3

The following table lists the milestones for the IDC RP3 project.

| Milestones | |
|--|------|
| Project Start | Y1Q1 |
| Deploy System Architecture | Y2Q3 |
| Deploy Data Access and System Services | Y2Q3 |
| Deploy Automated Processing Architecture | Y3Q1 |
| Deploy Interactive Processing Architecture | Y3Q1 |
| Deploy Initial Data Acquisition | Y3Q1 |
| Deploy Initial Station Processing | Y3Q2 |
| Deploy Initial Analyst Workspace | Y3Q2 |
| Deploy Initial Auto Event Processing | Y3Q4 |
| Deploy Initial Product Distribution | Y4Q2 |
| Deploy Initial System Monitoring and Testing | Y4Q2 |
| IOC | Y5Q2 |
| FOC | Y5Q4 |

3. COLLABORATION

Figure 2 shows the interactions of several parties that are interested in the IDC Re-Engineering development effort. SNL is the primary developer of the IDC Re-Engineered system. The IDC has many roles including primary system integrator, end-user representative, and the maintainer of the operational system.

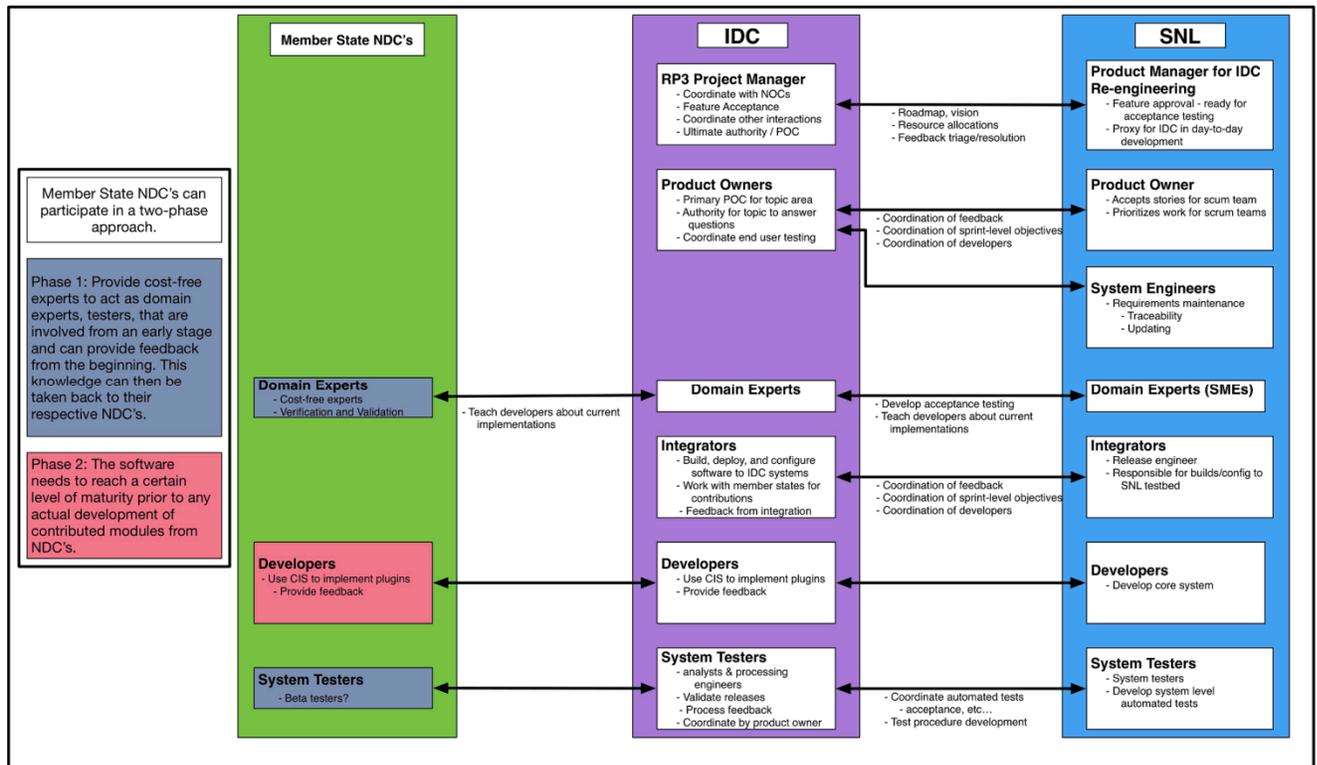


Figure 2 – IDC Re-Engineering Phase 3 Workflow and Interactions

The SAFe process framework proscribes a project role called the “product manager” embedded with the development teams whose primary responsibilities include understanding customer needs, validating solutions, communicating the program vision and developing the product roadmap. Because collaboration between SNL and the IDC is essential for ensuring that the developed system meets user needs, the SNL product manager will work closely with the IDC project manager to develop and continuously refine both the system vision and the near-term roadmap.

The IDC project manager and SNL product manager specify and plan work via a roadmap which covers approximately three program increments. Work on the roadmap is specified as features – units of work that can be completed within a

single program increment. In addition to being planned, the IDC project manager and SNL product manager work to prioritize the features using an economic framework.

Included in the definition of the feature is its “acceptance criteria.” These criteria provide the opportunity to define tests that must pass in order for the feature to be considered acceptable. As part of the feature definition, SNL system engineers will include traceability to the requirements, specifications, use cases and storyboards developed as part of the inception and elaboration phases of the project. In this way, SNL intends to use features to satisfy requirements.

When a feature has been deemed ready for implementation both because of its priority and its definition having sufficient detail, it is assigned to one of the SNL development team. The feature is then decomposed into smaller units of work, user stories, which the team should be able to complete in one iteration (2 weeks). The team’s “product owner” is responsible for the definition of the user stories as well as reviewing and approving the stories as the team completes them. Similar to how a product owner’s approval is required for user stories to be done, a product manager’s approval is necessary for features to be considered done.

In general, to be considered complete, the work associated with a user story or feature must meet several criteria before being considered complete: any code written to support the work must meet coding standards, it must be integrated and compile cleanly, and it must pass unit and feature level tests. At the feature level, any documentation and acceptance tests associated with the story or feature must be complete.

On a periodic basis, SNL will provide the in-process documentation and software, including source code, to the IDC. Integrators at the IDC will be responsible for building and configuring the re-engineered system from source as well as deploying the software to a testbed at the IDC. Validation will include executing the acceptance tests that SNL provided with the feature. Domain experts from member states may opt to contribute to these validation tests.

Feedback from member states as they validate the system will be coordinated by the IDC. Some of the feedback may result in change requests to the system. The IDC project manager will work with the SNL product manager to prioritize any change requests into the body of work.

3.1.1. *Member State Engagement*

Member state NDCs who wish to contribute to the re-engineering effort may do so in a number of ways: by supplying domain expertise, by validating the early releases of the system, and/or developing plugins for the system.

All member state engagement will be coordinated by the IDC.

3.1.2. *Collaborative Development*

The IDC Re-Engineered system has a requirement that the system must facilitate the update and replacement of algorithms. SNL has identified likely candidates for update and modeled these candidates as “plugins,” which are classes with a relatively high degree of isolation and adherence to specific interfaces.

To support collaborative development, SNL will continue to issue and refine the plugin interface specifications, also known as component interface specifications (CISs). The IDC should be able to incorporate code from third party developers, including member state NDCs, provided that the code follows the interface specifications. For further details, see the “IDC Re-Engineering Phase 2 Architecture Document.”

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