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## **IDC Integrated Master Plan**

**Version 1.0**

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# **IDC Integrated Master Plan**

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### **Abstract**

This is the IDC Re-Engineering Phase 2 project Integrated Master Plan (IMP). The IMP presents the major accomplishments planned over time to re-engineer the IDC system. The IMP and the associate Integrated Master Schedule (IMS) are used for planning, scheduling, executing, and tracking the project technical work efforts.

## REVISIONS

<b>Version</b>	<b>Date</b>	<b>Author/Team</b>	<b>Revision Description</b>	<b>Authorized by</b>
V1.0	12/2014	IDC Re- engineering Project Team	Initial delivery	M. Harris

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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. The current IDC system meets mission requirements, but is difficult and expensive to maintain and enhance. The system and its uses have evolved considerably since its initial design. The primary goal of this project is to re-engineer the IDC system, resulting in a fully modeled software architecture and implementation supported by a modern software development environment. Sandia National Laboratories (SNL) has been contracted to begin this re-engineering effort.

The IDC Re-Engineering Phase 2 project will follow the IBM Rational Unified Process (RUP), an industry-standard software lifecycle development methodology that defines four major project phases: Inception, Elaboration, Construction, and Transition. RUP is described in section 4.1 Development Approach. While this plan addresses the complete lifecycle of IDC Re-Engineering Phase 2 project, only the first portion (through Inception) has received Authority to Proceed.

## **1.2. Project Assumptions and Ground Rules**

The following assumptions and ground rules are in effect for the duration of the IDC project:

Assumptions:

- The IDC project is heavily reliant on the US NDC Modernization project. For that reason, there are a number of constraints built into that relationship including the vetting of information with AFTAC.
- The IDC will continue to operate a primary processing system at the IDC facility throughout development and transition of the Phase 2 portion of the Re-Engineered IDC system.
- IDC will continue to perform system integration, maintenance, and operational support of the IDC re-engineered system, including sustainment and test systems.
- Security accreditation for the modernized IDC System will be accomplished by IDC.
- Hardware for the current and re-engineered IDC System will be procured and deployed by the IDC.
- Hardware and software for SNL development and testing will be procured by SNL.
  - RUP will be used for the complete lifecycle of the IDC project.

Ground Rules:

- The IDC Re-Engineering Phase 2 project is a collaborative effort between SNL and the IDC. IDC has allocated staff resources to sufficiently support this effort.
- The IDC mission must execute fully and effectively during transition to the re-engineered system.
- The re-engineered system must meet needs for the next ~20 years.

### 1.3. **Event and “Action Term” Dictionary**

Here are a few of the terms that will be used in this document.

**Phase:** A term defined in the Rational Unified Process (RUP), which is being used as a software development process on the IDC Re-Engineering Phase 2 project. The phases being used for the IDC Re-Engineering Phase 2 project are:

- **Inception** – The first phase of RUP where the main purpose is to achieve concurrence among all stakeholders on the lifecycle objectives for the project.
- **Elaboration** – The second phase of RUP where the main purpose is to baseline the architecture of the system and provide a stable basis for the bulk of the design and implementation effort in the next phase.
- **Construction** – The third phase of RUP where the main purpose is to complete the development of the system based upon the baseline architecture.
- **Transition** – The fourth and final phase of RUP where the main purpose is to ensure that software is ready for delivery and is delivered to its users.

**Iteration:** An iteration encompasses the development activities that lead to a product release, executable version of the product, together with any other peripheral elements necessary to use this release. Note: the Inception phase won’t have an executable version to release. A development iteration is in some sense one complete pass through all the disciplines: Requirements, Analysis & Design, Implementation, and Test, at least.

**Milestone:** A number of milestones have been defined for the IDC Re-Engineering Phase 2 project where items are required to be at a certain state. The milestones listed in this document are at the phase boundaries.

**Project Artifact:** An internal or external work product developed for the IDC Re-Engineering Phase 2 project.

**Deliverable:** An externally required Project Artifact for the IDC Re-Engineering Phase 2 project.

**Project Artifact State:** The state of the individual project artifact that is due internally and/or externally.

- **Identified**  
The project artifact has been identified and initialized in the system model and in Rational Team Concert.
- **Drafted**

The first draft of the project artifact has been completed. The outline should be very complete (although it may change) and many of the sections should have at least a description of the future contents. Much of the document structure is complete and a table of contents can be created (if applicable). There may be a number of open issues that have already been defined.

- Fully Described  
This state describes that a project artifact has a draft of the expected content for all sections of the product. There may be some outstanding questions or other issues to be resolved but no driving issues (architecturally significant or major) that still need to be resolved.
- Complete  
This state describes that a project artifact has all content complete. There are no outstanding questions or other issues to be resolved (with very few exceptions).
- Delivered  
The project artifact has been made available to its recipient and the appropriate stakeholder has acknowledged its receipt.
- Approved  
The appropriate stakeholder has accepted and approved the deliverable. Changes to the artifact follow the Change Request process.

## **1.4. Organizational Structure**

### **1.4.1. *Integrated Project Team Organization***

These are the roles defined by RUP and adopted by the IDC Re-Engineering Phase 2 project at SNL. Typically SNL staff will execute multiple roles.

- Project Manager – This role plans, manages and allocates resources, shapes priorities, coordinates interactions with stakeholders and users, and keeps the project team focused. The Project Manager also establishes a set of practices that ensure the integrity and quality of project work products
- System Analyst - This role leads and coordinates requirements elicitation by outlining the system's functionality and delimiting the system
- Requirements Specifier – This role specifies and maintains the detailed system requirements
- Change Control Manager – This role defines and oversees the change control process
- Configuration Manager – This role manages the overall Configuration Management (CM) infrastructure and environment for the product development team
- Software Architect - This role leads the development of the system's software architecture, which includes promoting and creating support for the key technical decisions that constrain the overall design and implementation for the project
- Designer – This role leads the design of a part of the system, within the constraints of the requirements, architecture, and development process for the project

- Implementer – This role develops software components and performs developer testing for integration into larger subsystems, in accordance with the project's adopted standards.
- User-Interface Developer – This role coordinates the design of the user interface. This includes gathering usability requirements and prototyping candidate user-interface designs to meet those requirements
- Integrator – This role leads the planning and execution of implementation element integration to produce builds
- Test Manager – This role leads the overall test effort. This includes quality and test advocacy, resource planning and management, and resolution of issues that impede the test effort
- Test Analyst - This role identifies and defines the required tests, monitors detailed testing progress and results in each test cycle and evaluates the overall quality. The role also represents stakeholders who do not have direct or regular representation on the project.

The primary IDC stakeholders for the IDC Re-Engineering Phase 2 project are provided in Table 1:

**Table 1 – External Interfaces**

Organization	Name	Phone/email/pager
Department of State	Tim Evans	Phone: (202) 586-0324 Email: Timothy.Evans@nnsa.doe.gov
IDC	Randy Bell	Email: randy.bell@ctbto.org
IDC	Elena Tomuta	Email: elena.tomuta@ctbto.org

#### 1.4.2. *Team Meetings*

This section discusses the formal meetings on the project. The intent is to document the primary means of communication among the team.

**Table 2 - Team Meetings**

Meeting Name	Frequency Expected	Type of Communication	People/Roles expected to attend/communicate
PMR (Project Status Reviews)	Semi-annually (at iteration boundary)	In-person (conference call-ins if needed)  Nominal location is at IDC	Project Manager, Software Architect, level-1 manager and, other team members as needed for the agenda  PM personnel from IDC

Meeting Name	Frequency Expected	Type of Communication	People/Roles expected to attend/communicate
Iteration Reviews (includes all technical review)	Semi-annually (at iteration boundary)	In-person (conference call-ins if needed)  Nominal location is at the IDC	Project Manager and other team members as needed for agenda  Project personnel from the IDC
End of Phase Review	Near the completion of the last iteration of the phase.	In-person or conference calls  Nominal location is at IDC	Project Manager, Software Architect, level-1 manager and, other team members as needed for the agenda  Project personnel from the IDC
Project Coordination Call with IDC	Varies – coordinated through email	Conference call	Project Manager, Lead Software Architect from SNL; PM personnel from IDC

## 2. INTEGRATED MASTER SCHEDULE (IMS)

Figure 1 contains the top-level IDC Re-Engineering Phase 2 schedule as of the date of this version of this IMP/IMS. The contents of the full schedule are located in the IDC Integrated Master Schedule document.

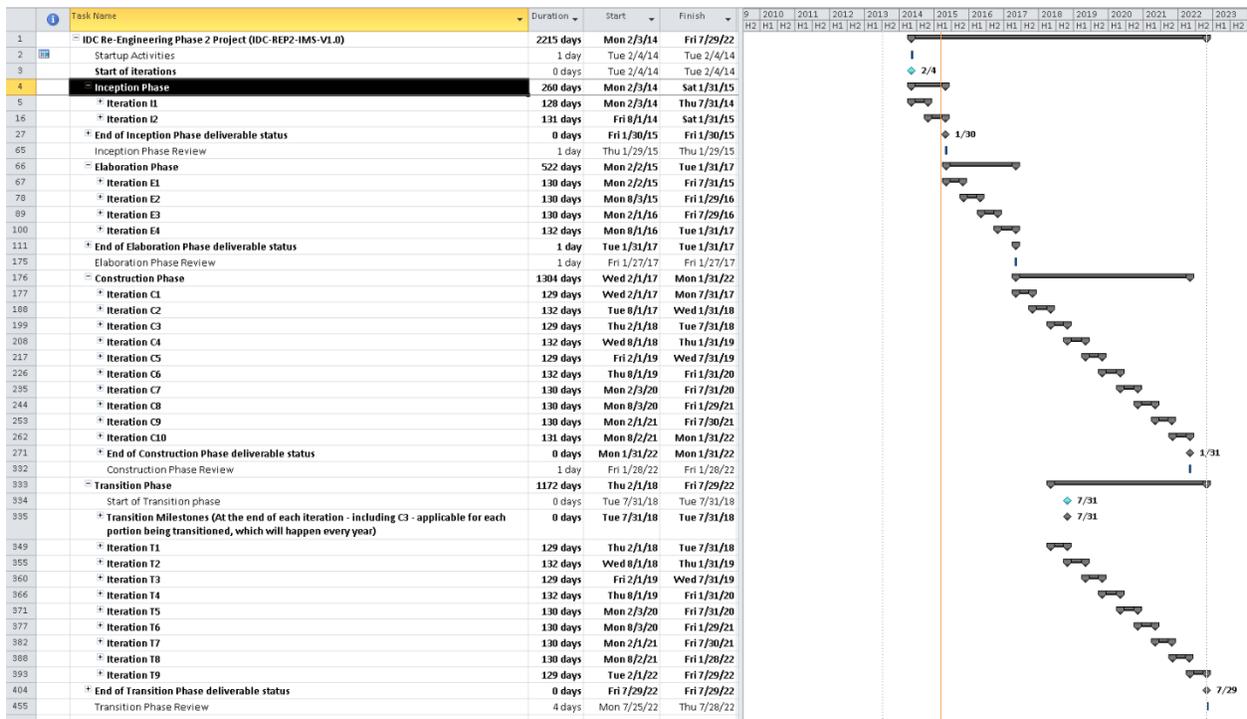


Figure 1. High-Level IDC Re-Engineering Phase 2 Schedule

### 3. IMP (EVENTS, ACCOMPLISHMENTS AND CRITERIA)

The major milestones, and this section, are currently defined according to the phase boundaries (according to RUP). RUP defines major accomplishments that need to be complete by each phase of the project. The IDC Re-Engineering Phase 2 project will use these as the primary goals that need to be accomplished or the Accomplishment Criteria (AC). The details of how the IDC Re-Engineering Phase 2 project measures whether those goals are met will be through the Evaluation Criteria (EC) that are established.

The milestones and the AC/EC status are planned into each phase boundary:

- Inception Phase Milestone – the end of Inception phase
- Elaboration Phase Milestone – the end of the Elaboration phase
- Pre-Transition Construction Milestone – before the beginning of each Transition phase iteration
- Construction Phase Milestone – the end of Construction phase
- Transition Phase Milestone – the end of Transition phase.

#### 3.1. Overall AC/EC Structure

Here is the list of Accomplishment Criteria (the goals) for the IDC Re-Engineering Phase 2 Project including Evaluation Criteria (the criteria used in measuring the status of each goal):

- AC: Requirements, key features, and main constraints are documented and baselined.
  - EC: Project Scope is in the \_\_\_ state
  - EC: Glossary is in the \_\_\_ state
  - EC: System Specification Document (based on the SRD) is in the \_\_\_ state.
  - EC: Use Cases are \_\_\_% in the Delivered state
  - EC: User-Interface Storyboards are \_\_\_% in the Delivered state
  
- AC: Risks have been sufficiently identified and mitigated.
  - EC: Risk List is in the \_\_\_ state
  
- AC: Project plan is an executable, measurable and sufficient plan for the completion of this project.
  - EC: Integrated Master Plan/Integrated Master Schedule are in the \_\_\_ state
  - EC: Cost estimates for the next phase are complete and reviewed with stakeholders.
  - EC: Tasks are planned for the upcoming iterations.
  
- AC: Development environment is defined and ready for use.
  - EC: The tools necessary for work in (phase) are installed and ready for use (before they are needed).
  
- AC: Architecture is complete and maintained throughout the life of the project.
  - EC: The SAD is in the \_\_\_ state.
  - EC: Use-Case Realizations (UCR) are \_\_\_% in the Delivered state
  - EC: Data Model is \_\_\_% in the Delivered state
  - EC: User-Interface Prototypes are \_\_\_% in the Delivered state
  - EC: Demonstrate the state of the system
  
- AC: Implementation is proceeding and will complete in time.
  - EC: Subsystem \_\_\_\_\_ is \_\_\_ % Complete
  - EC: Implementation Model is in the \_\_\_ state.
  - EC: Demonstrate the state of the system
  
- AC: Test plans and processes are in place and adequately test the functional and non-functional requirements.
  - EC: Test Plan is in the \_\_\_ state.
  - EC: Test Case Descriptions are \_\_\_% in the Delivered state.
  
- AC: Deployment is understood and all the plans are in place for a successful delivery to the stakeholder site.
  - EC: Deployment Plan is in the \_\_\_ state.
  - EC: User Manuals are in the \_\_\_ state.
  - EC: User Training Material is in the \_\_\_ state.

### 3.2. Inception Phase Milestone

The Inception Phase is completed at the end of iteration I2 (end of January 2015).

The high-level goals for the Inception Phase are included below:

- Stakeholder concurrence on scope definition
- Agreement that the right set of requirements have been captured and that there is a shared understanding of these requirements.
- Agreement that cost/schedule estimates, priorities, risks, and development process are appropriate.

Table 3 describes the detailed accomplishment criteria (AC) and evaluation criteria (EC) of the Inception Phase. The project may be aborted or considerably replanned if it fails to reach this milestone.

**Table 3 – Accomplishment/Evaluation Criteria for Inception Phase**

Accomplishment Criteria	Essential Artifacts	State at milestone	Notes
AC: Requirements, key features, and main constraints are documented and baselined.	Project Scope	EC: Project Scope is in the Delivered state	
	Glossary	EC: Glossary is in the Completed state	
	System Specification Document	EC: System Specification Document (based on the SRD) is in the Delivered state.	Any change to the SSD after this point will need to go through a Change Request (CR) and will need to be evaluated for cost/schedule impacts.
	Use-Case Model (Actors, Use Cases)	EC: Use Cases are 20% complete	100% of architecturally significant use cases are in the Delivered state  100% of use cases are in the Drafted
AC: Risks have been sufficiently identified and mitigated.	Risk List	EC: Risk List 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	
	Resource Plans	EC: Cost estimates for the next phases are complete and reviewed with stakeholders.	
	Iteration Plans	EC: Tasks are planned for the upcoming iterations.	Iteration plan for first Elaboration iteration completed and reviewed.  General outline of all work during the Elaboration phase is defined.  All plans for the upcoming iterations are in RTC.
AC: Development environment is defined and ready for use.	Development Infrastructure	EC: The tools and documentation necessary for work in Elaboration are installed and ready for use.	RTC installed, configured and being used.  RSA installed, configured and being used for use-case work and ready for use-case realization work.  The Configuration Management environment (within RSA) is set up and being used.
AC: Architecture is complete and maintained throughout the life of the project.	Prototypes	EC: Demonstrate the state of the system	Current state of the architectural prototype is demonstrated to stakeholders.

Table 4 describes the detailed description of the Inception Phase deliverable plan.

**Table 4 – Deliverable Plan for Inception Phase**

WBS	Milestone	Date	Deliverables (include quantities, locations, special handling instructions, if applicable)
	ATP	Feb 2014	
02.12.08.13	Inception: End of Iteration I-1	Jul 2014	Iteration Reviews (at the end of every iteration) to provide stakeholders insight into progress and gain agreement on the scope of the next iteration
02.12.08.10	Inception: End of Iteration I-2	Jan 2015	Risk assessment to identify focus of early architectural definition
02.12.08.11			Refined Cost Estimate based on SSD, Use Case Model and architecturally significant use cases
02.12.02.04			System Specification Document (SSD) based on the stakeholder provided System Requirements Document (SRD) and external interface ICDs
02.12.02.07			Use Case Model (draft) using the Unified Modeling Language
02.12.02.07			Architecturally significant use case descriptions
02.12.08.07 02.12.08.08			Integrated Master Plan (IMP) and Integrated Master Schedule (IMS), which define the project scope and cover the full RUP lifecycle
02.12.02.05			Final System Requirements Document (SRD) reviews to assist the stakeholder with vetting their document
02.12..04			Demonstration of architectural prototype
02.12.09			Supporting Environment established for the Elaboration phase
02.12.08.13			Iteration Review
02.12..08.14			End of Inception Phase

### 3.3. Elaboration Phase Milestone

The Elaboration Phase is planned to proceed through the end of iteration E4 (end of January 2017). The high-level goals for the Elaboration Phase are included below:

- The architecture, requirements and plans are stable enough, and the risks sufficiently mitigated to be able to predictably determine the cost and schedule for the completion of the development.
- All architecturally significant risks are addressed
- A baselined architecture is established
- An evolutionary prototype of production-quality components is produced, as well as possibly one or more exploratory, throw-away prototypes to mitigate specific risks such as:
  - design/requirements trade-offs
  - component reuse
  - product feasibility or demonstrations to investors, stakeholders, and end-users.
- The baselined architecture is demonstrated that will support the requirements of the system at a reasonable cost and in a reasonable time.
- The key approaches to be used in test and evaluation are proven.
- A supporting environment is established.

Table 5 describes the detailed accomplishment criteria (AC) and evaluation criteria (EC) of the Elaboration Phase.

**Table 5 – Accomplishment/Evaluation Criteria for Elaboration Phase**

Accomplishment Criteria	Essential Artifacts	State at milestone (EC status)	Notes
AC: Requirements, key features, and main constraints are documented and baselined.	Project Scope	EC: Project Scope is in the Approved state.	Project Scope is refined, based on new information obtained during the phase, establishing a solid understanding of the most critical use cases that drive the architectural and planning decisions.
	Glossary	EC: Glossary is in the Approved state	

	System Specification Document (SSD)	EC: System Specification Document (based on the SRD) is in the Approved state.	Any change to the SSD after this point will need to go through a Change Request (CR) and will need to be evaluated for cost/schedule impacts.  Ensure the SSD captures all the non-functional requirements.
	ICDs	EC: ICDs are in the Delivered state	For the most part the system is to be consistent with all previously defined ICDs. This section is only here to accommodate any new ICDs that need to be documented.
	Use-Case Model (Actors, Use Cases)	EC: Use Cases are 80% complete	100% of architecturally significant use cases are in the Approved state.  80% of use cases are in the Delivered state.  100% of actors are in the Delivered state
	User-Interface Storyboards	EC: User-Interface storyboards are 100% in the Delivered state.	Some large subset (~75%) will be in the Approved state.
AC: Risks have been sufficiently identified and mitigated.	Risk List	EC: Risk List is in the Delivered state	Refined, based on new information obtained during the phase.

<p>AC: Project plan is an executable, measurable and sufficient plan for the completion of this project.</p>	<p>Integrated Master Plan/ Integrated Master Schedule (IMP/IMS)</p>	<p>EC: IMP/IMS are in the Approved state</p>	<p>Refined, based on new information obtained during the phase.</p>
	<p>Resource Plans</p>	<p>EC: Cost estimates for the next phases are complete and reviewed with stakeholders.</p>	
	<p>Iteration Plans</p>	<p>EC: Tasks are planned for the upcoming iterations.</p>	<p>Iteration plan for first Construction iteration completed and reviewed.</p> <p>General outline of all work during the Construction and Transition phases.</p> <p>All plans for the upcoming iterations are in RTC.</p>

<p>AC: Development environment is defined and ready for use.</p>	<p>Development Infrastructure</p>	<p>EC: The tools necessary for work in Construction phase are installed and ready for use.</p>	<p>RTC installed, configured and being used.</p> <p>RSA installed, configured and being used for use case, use-case realization design work.</p> <p>The Configuration Management environment (for code) is being used. Code is being generated and compiled into a build.</p> <p>Building and releasing versions of code is established.</p>
<p>AC: Architecture is complete and maintained throughout the life of the project.</p>	<p>Software Architecture Document</p>	<p>EC: The SAD is in the Delivered state.</p>	

	Design Model (and all constituent artifacts)	EC: Use-Case Realizations (UCR) are 50% Complete	<p>100% of UCR are Approved for the architecturally significant use cases.</p> <p>50% of UCR are in the Delivered state.</p> <p>Components have been identified and the make/buy/reuse decisions sufficiently understood to determine the construction phase cost and schedule with confidence.</p>
	Data Model	EC: Data Model is 50% Complete	Major data model elements (e.g. important entities, relationships, tables) defined and reviewed.
	Prototype	EC: Demonstrate the state of the system	Current state of the architectural prototype is demonstrated to stakeholder.
	User-Interface Prototypes	EC: User-Interface prototypes are 50% in the Delivered state.	
AC: Implementation is proceeding and will complete in time.	Implementation Model (and all constituent artifacts, including Implementation Elements)	EC: Implementation Model is in the Drafted state.	Initial structure created and major components prototyped.
	Unit tests		A draft of the various mechanisms and key software elements that facilitate unit tests.

AC: Test plans and processes are in place and adequately test the functional and non-functional requirements.	Test Plan	EC: The Test Plan is in the Drafted state.	
	Test Suite	EC: The Test Case Descriptions are 20% Complete	100% of test case descriptions for the architecturally significant use cases are in the Completed state.  20% of the test case descriptions are in the Completed state for remaining use cases.
AC: Deployment is understood and all the plans are in place for a successful delivery to the stakeholder site.	Deployment Plan	EC: Deployment Plan is in the Fully Described state.	Initial version developed and reviewed.
	User Support Material	EC: User Manuals are in the Drafted state.	User Manuals and other training materials.  Preliminary draft, based on use cases.

Table 6 describes the detailed description of the Elaboration Phase deliverable plan with the WBS elements.

**Table 6 – Deliverable Plan for Elaboration Phase**

WBS	Milestone	Date	Deliverables (include quantities, locations, special handling instructions, if applicable)
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02.12.08.13	Elaboration: End of Iteration E-1	7/2015	Iteration Review to provide stakeholders insight into progress and gain agreement on the scope of the next iteration
02.12.08.13	Elaboration: End of Iteration E-2	1/2016	Iteration Review to provide stakeholders insight into progress and gain agreement on the scope of the next iteration
02.12.08.13	Elaboration: End of Iteration E-3	7/2016	Iteration Review to provide stakeholders insight into progress and gain agreement on the scope of the next iteration
02.12.02.05	Elaboration: End of Iteration E-4	1/2017	System Specification Document
02.12.08.07 02.12.08.08			Integrated Management Plan/Integrated Management Schedule
02.12.02.07			Use-Case Descriptions and User Interface Storyboards traced to SRD/SSD requirements
02.12.02.07			Architecturally significant use case realizations
02.12.03.06			System Architecture Document
02.12.02.07			Identification of architecturally significant algorithms
02.12.09.03			SNL Testbed configured
02.12.03.08			Demonstration of executable architecture with simulated data
02.12.08.11			Refined Cost Estimate from the baseline architecture
02.12.08.05			Construction Phase Plan
02.12.05.01			System Test Plan and System Test Case Descriptions
02.12.08.13			Iteration Review to provide stakeholders insight into progress and gain agreement on the scope of the next iteration
02.12.08.14			End of Elaboration Phase

### 3.4. Pre-Transition Construction Milestone

The Pre-Transition Construction milestone is planned for each year beginning at the completion of C2 (beginning February 2018). These milestones are shown in blue arrows in Figure 2. The figure is an initial plan of how a solution will be iteratively developed during the Construction iterations and be iteratively deployed during the overlapping Transition iterations. The IDC Re-Engineering Phase 2 team will need to prioritize the portions (with coordination with the US NDC counterparts) that must be delivered and this must be well coordinated with the IDC stakeholders.

Iterations	C1	C2	C3/T1	C4/T2
Implementation tasks	Build the C1 capability	Build the C2 capability	Build the C3 capability	Build the C4 capability
Deployment tasks			Prepare to deploy the C1-C2 capability Conduct an SVT for the portion to be deployed (C1-C2)	Prepare to deploy the C3 capability Conduct an SVT for the portion to be deployed (C3) Transition the C1-C2 or in a subsequent iteration (stakeholder may conduct AT)

**Figure 2. Pre-Transition Construction Plan**

Table 7 describes the detailed accomplishment criteria (AC) and evaluation criteria (EC) of each year of the Construction/Transition Phase. The EC status applies to only those items that are required to be complete in that year:

- Complete a System Verification Test (SVT) with the stakeholders for the portion of the system being transitioned
- All the deployment documents (deployment plan and user training materials) are complete for the portion of the system being transitioned.

**Table 7 – Accomplishment/Evaluation Criteria for Construction/Transition Phase**

Accomplishment Criteria	Essential Artifacts	State at milestone (EC status)	Notes
AC: Development environment is defined and ready for use.	Development Infrastructure	EC: The tools necessary for work in Transition phase are installed and ready for use.	Refined, based on new information obtained during the phase.

AC: Test plans and processes are in place and adequately test the functional and non-functional requirements.	Test Plan	EC: Test Plan is in the Delivered state.	
	Test Suite	EC: Test Case Descriptions are Delivered.	
AC: Deployment is understood and all the plans are in place for a successful delivery to the stakeholder site.	Deployment Plan	EC: Deployment Plan is in the Delivered state.	Initial version developed, reviewed and baselined.
	User Support Material	EC: User Manuals are in the Delivered state.  EC: User Training Material is in the Delivered state.	User Manuals and other training materials.

### 3.5. Construction Phase Milestone

The Construction Phase is planned to proceed through the end of iteration C10 (end of January 2022). The high-level goals for the Construction Phase are included below:

- The product release is stable and mature enough to be deployed
- A System Verification Test is completed with the stakeholders
- All the deployment documents (deployment plan and user training materials) are complete.

Table 8 describes the detailed accomplishment criteria (AC) and evaluation criteria (EC) of the Construction Phase. Items highlighted in green have not changed state from the prior phase.

**Table 8 – Accomplishment/Evaluation Criteria for Construction Phase**

Accomplishment Criteria	Essential Artifacts	State at milestone (EC status)	Notes
AC: Requirements, key features, and main constraints are documented and baselined.	Project Scope	EC: Project Scope is in the Approved state.	Refined, based on new information obtained during the phase.

	Glossary	EC: Glossary is in the Approved state	Refined, based on new information obtained during the phase.
	System Specification Document	EC: System Specification Document (based on the SRD) is in the Approved state.	Any change to the SSD, after this point, can no longer be incorporated. A CR will have to be opened up.
	ICDs	EC: ICDs are in the Approved state	If any are changed or created.
	Use-Case Model (Actors, Use Cases)	EC: Use Cases are 100% in the Approved state.	
	User-Interface Storyboards	EC: User-Interface storyboards are 100% in the Approved state.	
AC: Risks have been sufficiently identified and mitigated.	Risk List	EC: Risk List is in the Approved state	Refined, based on new information obtained during the phase.  All risks have been mitigated at this point.
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 Approved state	Refined, based on new information obtained during the phase.
	Resource Plans	EC: Cost estimates for the next phase are complete and reviewed with stakeholders.	Refined, based on new information obtained during the phase.

	Iteration Plans	EC: Tasks are planned for the upcoming iteration.	Iteration plan for Transition iteration completed and reviewed.  Understanding of everything needed to be done during Transition phase. All plans through the end of project are in RTC.
AC: Development environment is defined and ready for use.	Development Infrastructure	EC: The tools necessary for work in Transition phase are installed and ready for use.	Refined, based on new information obtained during the phase.
AC: Architecture is complete and maintained throughout the life of the project.	Software Architecture Document	EC: The SAD is in the Approved state.	
	Design Model (and all constituent artifacts)	EC: Use-Case Realizations (UCR) are 100% Approved	100% of UCR are in the Approved state.
	Data Model	EC: Data Model is in the Delivered state.	
	User-Interface Prototypes	EC: User-Interface prototypes are 100% in the Approved state.	
AC: Implementation is proceeding and will complete in time.	Implementation Model (and all constituent artifacts, including Implementation Elements)	EC: Implementation Model is in the Delivered state.  EC: Each subsystem is 100% Complete.	Expanded from that created during the elaboration phase; all implementation elements created by the end of the construction phase.
	“The System” with a Prototype	EC: Demonstrate the state of the system	Current state of the implementation prototype is demonstrated to stakeholder.

AC: Test plans and processes are in place and adequately test the functional and non-functional requirements.	Test Plan	EC: Test Plan is in the Delivered state.	
	Test Suite	EC: Test Case Descriptions are 100% Approved.	100% of the test case descriptions are in the Approved state for all use cases.
AC: Deployment is understood and all the plans are in place for a successful delivery to the stakeholder site.	Deployment Plan	EC: Deployment Plan is in the Delivered state.	Initial version developed, reviewed and baselined.
	User Support Material	EC: User Manuals are in the Delivered state.  EC: User Training Material is in the Delivered state.	User Manuals and other training materials.

**3.6. Transition Phase Milestone**

The Transition Phase is planned to proceed through the end of iteration T9 (end of July 2022). The high-level goals for the Transition Phase are included below:

- Creating a final product release
- Finalizing end-user support material
- Executing final deployment plans
- Testing the final product at the users’ site
- Completing transition to maintenance and operations.

Table 9 describes the detailed accomplishment criteria (AC) and evaluation criteria (EC) of the Transition Phase. Item highlighted in green have not changed state from the prior phase.

**Table 9 – Accomplishment/Evaluation Criteria for Transition Phase**

Accomplishment Criteria	Essential Artifacts	State at milestone (EC status)	Notes
AC: Requirements, key features, and main constraints are documented and baselined.	Project Scope	EC: Project Scope is in the Approved state.	Final version delivered to stakeholder.
	Glossary	EC: Glossary is in the Approved state	Final version delivered to stakeholder.

	System Specification Document (SSD)	EC: SSD (based on the SRD) is in the Approved state.	Final version delivered to stakeholder.
	ICDs	EC: ICDs are in the Approved state	Final versions delivered to stakeholder, if any changed/created.
	Use-Case Model (Actors, Use Cases)	EC: Use Cases are 100% complete	Final version delivered to stakeholder.
	User Interface Storyboards	EC: User-Interface storyboards are 100% in the Approved state.	
AC: Risks have been sufficiently identified and mitigated.	Risk List	EC: Risk List is in the Approved state	All risks have been mitigated at this point.  Final version delivered to stakeholder.
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 Approved state	Final version delivered to stakeholder.
AC: Development environment is defined and ready for use.	Development Infrastructure	EC: The tools necessary for work are transitioned over to the stakeholder.	Final version delivered to stakeholder.
		EC: The Configuration Management Plan is in the Approved state.	Final version delivered to stakeholder.
AC: Architecture is complete and maintained throughout the life of the project.	Software Architecture Document	EC: The SAD is in the Approved state.	Final version delivered to stakeholder.
	Design Model (and all constituent artifacts)	EC: Use-Case Realizations (UCR) are 100% Approved	Final version delivered to stakeholder.

	Data Model	EC: Data Model is 100% Approved.	Final version delivered to stakeholder.
	User-Interface Prototypes	EC: User-Interface prototypes are 100% in the Approved state.	Final version delivered to stakeholder.
AC: Implementation is proceeding and will complete in time.	Implementation Model (and all constituent artifacts, including Implementation Elements)	EC: Implementation Model is in the Approved state.	Final version delivered to stakeholder.
		EC: Each <u>subsystem</u> is 100% Approved.	Final version delivered to stakeholder.
AC: Test plans and processes are in place and adequately test the functional and non-functional requirements.	Test Plan	EC: Test Plan is in the Approved state.	Final version delivered to stakeholder.
	Test Suite	EC: Test Case Descriptions are 100% Complete	Final version delivered to stakeholder.
AC: Deployment is understood and all the plans are in place for a successful delivery to the stakeholder site.	Deployment Plan	EC: Deployment Plan is in the Approved state.	Final version delivered to stakeholder.
	User Support Material	EC: User Manuals are in the Approved state.  EC: User Training Material is in the Approved state.	Final version delivered to stakeholder.  User training is executed at the site.

## 4. IMP NARRATIVES

### 4.1. Development Approach

A development approach using phases and iterations will be used to develop the software for IDC Re-Engineering Phase 2 project based on IBM's Rational Unified Process (RUP). The IDC Re-Engineering Phase 2 development approach will be demonstration-based to provide early investigation and resolution of high-risk technical and performance issues. This will be achieved by partitioning the evolution of system functionality into iterations. Each iteration possesses all of the functionality of the previous iteration and will extend or evolve that functionality.

Iterations are limited duration project demarcations (6 months initially for the IDC Re-Engineering Phase 2 project). Iterations are grouped into phases, the length of which is determined by major project milestones. During each phase a well-defined set of objectives is met, artifacts are completed, and decisions are made to move or not move into the next phase. This approach guarantees a continuous and growing incremental capability soon after the project starts. It puts an emphasis on addressing high-risk areas first and on rapidly developing an initial version of the system. By developing an initial architecture early, the issues associated with the high-risk areas are identified and addressed much earlier in the development process than would be by using conventional methods.

#### 4.1.1. Phases

The four phases for IDC Re-Engineering Phase 2 software development are Inception, Elaboration, Construction, and Transition. Note that these four phases differ somewhat from the traditional waterfall phases used in historical software development: analysis, design, code, test, and install. As opposed to having project decision points at the end of the traditional phases, the transition from one phase to the next represents improved decision points for updates to the overall project scope and plan.

Figure 3 illustrates the development lifecycle for the project. The development cycles are defined in Table 10: IDC Re-Engineering Phase 2 Iterations.

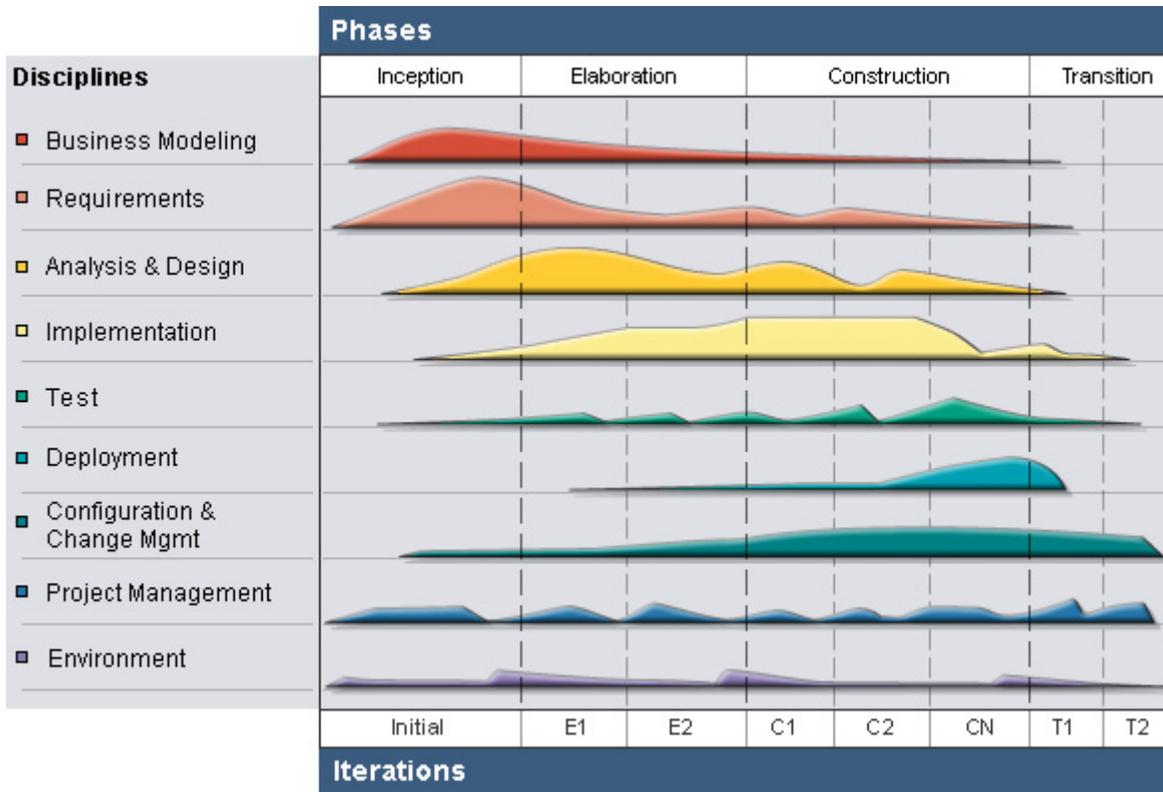


Figure 3. The RUP Development Lifecycle

#### **4.1.1.1. Inception Phase**

During the Inception Phase, the development team will analyze in detail what needs to be built and how to build it. The focus will be on requirements and the products and processes that are required to develop the system. The development team will work with stakeholders and users to understand the requirements. Interfaces to external systems will be identified and documented in the form of Interface Control Documents (ICD). Project planning and management activities will also be defined.

#### **4.1.1.2. Elaboration Phase**

As part of this phase, the architecture baseline will be developed. This is a critical phase in system development because the overall architecture and infrastructure designs are established. Selected COTS elements will undergo detailed evaluation and some major components will be integrated. Elaboration will end when the architectural design for IDC Re-Engineering Phase 2 project is stable, an executable architecture has been demonstrated, and the major risk elements have been addressed. Although requirements evolve across all phases and iterations, the requirements should be fairly stable by the end of the Elaboration Phase.

#### **4.1.1.3. Construction Phase**

During the Construction Phase, the architecture baseline will be completed and all remaining application features will be developed, integrated, and tested.

This phase is broken down into several iterations, designed to flesh out the architecture baseline and refine it into the final software and hardware products. During each iteration of the Construction Phase, the documents and other artifacts developed and updated during the Elaboration Phase are expanded, revised and ultimately stabilized.

#### **4.1.1.4. Transition Phase**

During the Transition Phase, the IDC project will be deployed to the operational sites. This phase includes delivery, installation, and final checkout of equipment and software, testing the new system against requirements defined in the System Specification Document, training of users and maintainers, and supporting the IDC in any acceptance and operational testing/certification that will be performed. At the conclusion of the Transition Phase, responsibility for system operation will transition to the users. Maintenance and enhancement of the system will remain with the IDC personnel.

#### **4.1.1.5. IDC Re-Engineering Phase 2 Construction and Transition**

The IDC Re-Engineering Phase 2 project is planned to incrementally deliver modernized components to the IDC System. Construction and Transition phases will substantially overlap.

#### 4.1.2. Iterations

The fundamental building block of the lifecycle is the “iteration” which is a composite set of activities with a specific purpose and a well-defined set of results. The actual inputs and outputs of an iteration vary throughout the lifecycle and the number of iterations varies depending on scale, risk, legacy, domain, etc. Iterations are six months long and are grouped into the four development phases previously described (Inception, Elaboration, Construction and Transition). This is done in order to manage the resolution of risk and to distribute the level of effort across the project lifecycle appropriately.

From a technical perspective, development occurs across iterations, in such a way that the system under development evolves incrementally. Each iteration concludes with an internal release of an executable product that is a subset of the complete system.

An iteration consists of the activities of planning, analysis, design, implementation, testing, in various proportions depending on where the iteration is located in the development cycle.

As shown in Table 10, seventeen iterations have been defined for IDC Re-Engineering Phase 2 project.

**Table 10: IDC Re-Engineering Phase 2 Iterations**

	Funded	Start	End	IDC Re-Engineering Phase 2 Project Phase
Iteration I1	Yes	Feb 2014	Jul 2014	Inception
Iteration I2	Yes	Aug 2014	Jan 2015	Inception
Iteration E1	No	Feb 2015	Jul 2015	Elaboration
Iteration E2	No	Aug 2015	Jan 2016	Elaboration
Iteration E3	No	Feb 2016	Jul 2016	Elaboration
Iteration E4	No	Aug 2016	Jan 2017	Elaboration
Iteration C1	No	Feb 2017	Jul 2017	Construction
Iteration C2	No	Aug 2017	Jan 2018	Construction
Iteration C3/T1	No	Feb 2018	Jul 2018	Construction/Transition
Iteration C4/T2	No	Aug 2018	Jan 2019	Construction/Transition
Iteration C5/T3	No	Feb 2019	Jul 2019	Construction/Transition
Iteration C6/T4	No	Aug 2019	Jan 2020	Construction/Transition
Iteration C7/T5	No	Feb 2020	Jul 2020	Construction/Transition
Iteration C8/T6	No	Aug 2020	Jan 2021	Construction/Transition
Iteration C9/T7	No	Feb 2021	Jul 2021	Construction/Transition
Iteration C10/T8	No	Aug 2021	Jan 2022	Construction/Transition

Iteration T9	No	Feb 2022	Jul 2022	Transition
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