



3. Definition Phase

Solution Life Cycle

Phases	Vision	Definition	Construction	Deployment	Support & Retirement
Results	Problem Assessment	System Requirements	Detailed Design	Deployed Solution	Production Services
	Solution Recommendation	Preliminary Design	Accepted Solution		

A summary of SLC recommendations for use during the Definition Phase is contained within the following matrix.

Phase Area	SLC Recommendations
OBJECTIVE	Establish and document the requirements and designs necessary to develop, test, and deploy the solution that will provide the benefits as outlined in the Business Case.
ENTRY CRITERIA	<ul style="list-style-type: none"> • First iteration of the Solution Acquisition Plan has been developed and approved. • The Business Case has been developed and approved. • The Task Order has been awarded. • The IPT has been formed. • The Work Breakdown Structure has been approved and baselined. • High Level Requirements are developed and approved. • SLC Security Checklist - Vision Phase has been completed and approved. • Security Assignment Letters are approved.



Phase Area	SLC Recommendations
<p style="text-align: center;">PROCESS AND OUTPUTS</p> <p>* Sample is provided in Appendix A</p>	<p><u>Solution Acquisition Planning</u></p> <ul style="list-style-type: none"> • Updated Business Case • Approved and Baselined Solution Acquisition Plan • Approved and Baselined Work Breakdown Structure • Updated Business Performance Model * <p><u>Solution Acquisition Project Management (ongoing)</u></p> <p><u>Requirements Development and Management</u></p> <ul style="list-style-type: none"> • Lower Level Requirements Document • RDM Plan • Traceability Matrix <p><u>Preliminary Design</u></p> <ul style="list-style-type: none"> • Preliminary Design Document* <p><u>Transition to Support</u></p> <ul style="list-style-type: none"> • TTS Plan <p><u>System Security</u></p> <ul style="list-style-type: none"> • SLC Security Definition Phase Checklist <p><u>Quality Assurance</u></p> <ul style="list-style-type: none"> • Updated Quality Assurance Plan • Memorandum of Records (MOR) <p><u>Configuration Management</u></p> <ul style="list-style-type: none"> • Final Configuration Management Plan • Configuration Item Index • Configuration Item Library • Development Environment established



Phase Area	SLC Recommendations
<p style="text-align: center;">ROLES AND RESPONSIBILITIES</p>	<p>The following roles will participate in this phase, and are defined in the Definition Roles and Responsibilities section:</p> <ul style="list-style-type: none"> Chief Information Officer eCommerce Application Development (CIO ECAD) CIO IT Management CIO IT Services Configuration Management (CM) Lead Decision Support Group (DSG) Executive Sponsor Executive Steering Committee Integrated Product Team (IPT) Investment Review Board (IRB) Integrated Technical Representative (ITR) Project Manager Quality Assurance (QA) Manager Requirements Development and Management (RDM) Lead Subject Matter Experts (SMEs) System Manager System Security Officer Technical Architecture Lead Transition to Support (TTS) Lead



Phase Area	SLC Recommendations
<p style="text-align: center;">EXIT CRITERIA</p>	<p>The following are critical exit criteria for this phase:</p> <ul style="list-style-type: none"> • Solution Acquisition Plan has been updated. • Lower Level Requirements Document has been developed, approved, and baselined. • Requirements Traceability Matrix is documented and baselined. • Preliminary Design Document has been developed and approved. • SLC Security Checklist - Definition Phase has been completed and approved. • Quality Assurance Plan has been approved. • CM Plan has completed, approved, and baselined. • Configuration Item Index has been created. • Development Environment has been established. • Critical Infrastructure Protection Program's Mission Essential Infrastructure Evaluation Survey is completed. • General Support System (GSS) & Major Application (MA) Inventory Submission Form are completed. • TTS Plan has been reviewed and approved. • The WBS has been updated. <p>The following are recommended exit criteria for this phase:</p> <ul style="list-style-type: none"> • Business Case, if updated, has been approved. • Business Performance Model, if updated, has been approved. • Task Order, if needed for Construction and Deployment, has been awarded. • The QA MOR has been updated, if necessary, and approved. • Risks and Issues are tracked. • Configuration Item Library System has been created. • RDM Plan has been completed, approved, and baselined. • ECM Tool User IDs created.
<p style="text-align: center;">JOB AIDS</p>	<ul style="list-style-type: none"> • Solution Acquisition Plan Template • Configuration Management Plan Template • Configuration Item Index Template • CM File Repository Directory Structure Template • Requirements Traceability Matrix • RDM Plan Template • SLC Security Definition Phase Checklist • Department of Education Critical Infrastructure Protection Program Mission Essential Infrastructure Evaluation Survey • Department of Education General Support Systems and Major Applications Inventory Procedures document • Enterprise Change Management Process Guide



Definition Phase Objective

The objective of this phase is to establish and document the requirements and preliminary design necessary to develop, test, and deploy the solution that will provide the benefits outlined in the Business Case.

In this phase, further groundwork for the development of the solution (i.e., requirements, design) will be laid. The Business Case and the Solution Acquisition Plan were established in the Vision Phase of the life cycle. In the Definition Phase, the goal is to determine or define what is required to build the solution based on the Business Case and the Solution Acquisition Plan. This will be accomplished by identifying and documenting the requirements and preliminary design for which the solution will be implemented, tested, and accepted. The RDM Plan and Requirements baseline will become the basis upon which the team defines the products, architecture, and scope of the work to be performed in future phases. As requirements are completed, each requirement is traced back to the Business Performance Model and corresponding performance factors by which the organization will measure the solution's success. The Business Performance Model may need to be updated and resubmitted for approval. Throughout the Definition phase, work is being done to identify further details to update the Business Case, the Solution Acquisition Plan and the WBS.

The following topics and processes will be addressed in this phase of the life cycle:

- Entry Criteria;
- Process and Outputs;
- Roles and Responsibilities;
- Exit Criteria; and
- Job Aids.

Definition Phase Entry Criteria

Before work in the Definition Phase can begin, the exit criteria from the Vision Phase must be completed. To review, these are:

- First iteration of the Solution Acquisition Plan has been developed and approved.
- The Business Case has been developed and approved.
- The Task Order has been awarded.
- The IPT has been formed.
- The Work Breakdown Structure has been approved and baselined.
- High Level Requirements are developed and approved.
- SLC Security Checklist - Vision Phase has been completed and approved.
- Security Assignment Letters are approved.

Definition Phase Process and Outputs

The following discusses the major processes and outputs to be completed during the Definition Phase. Solution Acquisition Planning is initiated in the Vision Phase. Many of the products developed in the



Vision Phase will be updated, re-approved, and baselined. Solution Acquisition Project Management has begun, and status reporting, risks and issues tracking will occur as discussed in the Vision Phase.

Requirements Development and Management

The first step in the Definition Phase is to gather requirements necessary for developing the proposed solution. A complete and thorough requirements gathering and analysis activity should be conducted to produce a Requirements Document. Reference the *RDM Process Guide* to help with this activity. Requirements serve as the basis for:

- Developing a design;
- Making implementation decisions;
- Planning and executing tests; and
- Accepting the delivered system or solution.

There are many different methods for gathering requirements and it is likely that multiple techniques will be used during any project in order to get the complete picture or understanding of the solution. *See the RDM Process Guide*. The following matrix provides a sample of the more commonly used requirements gathering methods, along with a brief description of the activities associated with that method.

Technique	Activity Description	Examples
EXISTING DOCUMENTATION REVIEW	Review documents that may be relevant to the project at hand, using more than one source if possible.	Modernization Blueprint, Architectural Standards, and Business Plans.
WORK PATTERN OBSERVATION	Observe currently established work practices and trends.	Day to day work processes and SMEs.
INTERVIEW SESSIONS	Interview managers and staff to determine their requirements.	Meet with Channel GMs / staff or Business Partners.
JOINT APPLICATION DEVELOPMENT (JAD)	Formal technique that brings functional and technical people together to develop requirements and plan the design. Intense workshop sessions are conducted in which end users and developers collaborate to produce the desired materials.	Special initiative is requested and requirements must be gathered in 3 weeks or less.
ANALYZE HELP DESK TROUBLE CALLS	Generate metrics based on Help Desk trouble calls in order to identify trends	Graph indicating type and number of calls per month.



Technique	Activity Description	Examples
CALLS	and opportunities for improvement.	
PROTOTYPING	A demonstrable representation that assists in clarifying requirements.	<ul style="list-style-type: none"> • Screen Mock-up; • User Interface Prototype; • System Concept Prototype.

The Requirements Document should include documentation of the requirement types identified in the following matrix. A *sample Requirements Document* is included for reference in Appendix A.

Category	Description	Sample Requirement Types
BUSINESS	Document the reason for the project initiative. These should tie to the Modernization Blueprint.	<ul style="list-style-type: none"> • Achieving a competitive advantage; • Meeting regulatory needs; • Reducing cost.
SYSTEM	Describe the features or qualities the system must possess to accommodate the business and functional requirements. Identify the components of the system infrastructure and their associated performance and quality dimensions.	<ul style="list-style-type: none"> • Architecture; • Communications; • Security; • Performance capacity; • Data storage and retrieval; • Reliability and maintainability.
FUNCTIONAL	Describe day-to-day business activities within which the solution must operate and perform, in order to accomplish its mission, including people and processes.	<ul style="list-style-type: none"> • Describe system workflow; • Incorporate business rules; • Address quality definitions; • Identify reporting needs.
TECHNOLOGY	Constraints on the IPT development team related to the use of specific technologies. Must adhere to the FSA Technology Architecture Policies and Standards.	<ul style="list-style-type: none"> • Accommodate the current technology infrastructure; • Implement using a cost-effective technology;
DEPLOYMENT	Requirements that surface later during the life cycle and impact the delivered solution. Ensure that the deployment requirements trace back to a valid business requirement.	<ul style="list-style-type: none"> • Maintenance support; • Data conversion; • Deployment; • Training.



Category	Description	Sample Requirement Types
DESIGN	Specifies how a particular requirement will be met, rather than just what action a solution or system must perform.	<ul style="list-style-type: none"> • Design features; • Development environment; • Operating system.

In developing and documenting the requirements, FSA advocates the use of the standard tool to assist in the tracking of requirements and verification that the solution meets the requirements. This will aid in resolving Software Investigation Requests (SIR), as original requirements can be quickly tracked. For more information on standard tools, refer to the *FSA CIO Information Technology Handbook*.

Within the RDM Plan, a requirements traceability matrix is recommended to define the relationships between requirements, documents, design, and implementation of a solution. Requirement traceability facilitates the ability to describe and follow the life of a requirement in both forward and backward directions. It is also recommended the traceability matrix be saved electronically separate from the RDM Plan. *For an example of a Requirement Traceability Matrix, see the RDM Process Guide.*

Figure 3 illustrates how critical it is to be able to trace requirements through the Solution Life Cycle. A development effort begins on the left-hand side of the V-model with analysis and design activities. The Business Case drives the overall requirements, which then drive the design and development activities. Once construction is complete, the product moves through the verification, validation, and testing activities on the right hand side of the V. During the earlier stages of testing, the focus is on individual components. As testing progresses, the focus is on functionality and the achievement of the Business Case. But all throughout, each task (indicated by a ‘T’ on Figure 3) or task package (indicated by a ‘TP’) ensures that the overall Business Case objectives and subsequent requirements are achieved. A requirements traceability matrix can effectively be used to map the requirements to Business Case objectives (on the front end) and to the preliminary design (on the back end).

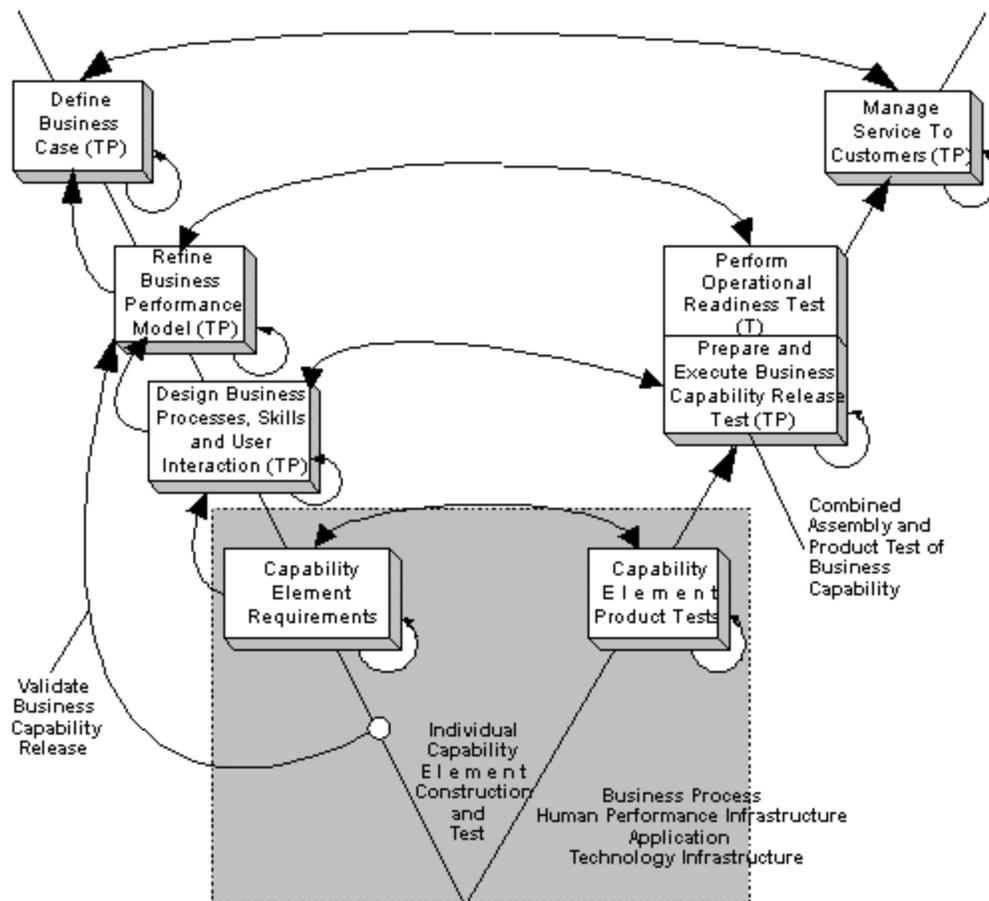


Figure 3 Requirements Traceability Diagram

One technique to facilitate review of requirements is a System Requirements Review (SRR). This is an interim review and/or committal point that provides an opportunity for the Executive Sponsor and IPT to agree upon and approve the solution requirements. During the review, all requirements documented in the Requirements Document are reviewed by both the Executive Sponsor and IPT, to ensure that everyone agrees on what the solution must accomplish. Sign-off must be obtained from the Executive Sponsor before moving into design mode, so the requirements can be baselined. After that, any new or modified requirements will require modification of the Requirements Document and approval by the Executive Sponsor prior to solution design modification.

Preliminary Design

Once the requirements have been agreed to by the Executive Sponsor and the IPT, the next step is to create the Preliminary Design, which will provide an abstract model of the solution. The Preliminary Design of the solution is often depicted visually through the use of graphic models, process flows, and block diagrams.

A sample Preliminary Design Document is included for reference in Appendix A. The project identifies specific work products to be developed in the WBS. The Preliminary Design Document typically includes the following documents.



- **System Architecture Diagrams** - modular and layered graphical representation of the solution, accompanied by a written description that provides a more detailed explanation of the components, including descriptions of their respective functions and how they interrelate;
- **User Interface and Workflow** - screen diagrams and menus as well as storyboards that describe the look and feel of the recommended solution. The storyboards should indicate how information will flow through the system and how users will access that information;
- **Logical Data Models** - diagram of the data that is to be processed and stored by the system. This diagram and associated data dictionary describe the entities (data components), their attributes or fields, indexes, and foreign keys;
- **Report Content Descriptions** - includes a discussion of what tools, if any will be used to generate ad hoc and “canned” reports. Also describes:
 - Number and types of reports;
 - Frequency of report generation;
 - Sources for the information to be reported;
- **External System Interfaces** - describes how the recommended solution would interface with external systems. This should include for each external system:
 - *Frequency* that data will be exchanged;
 - *Manner* of the exchange (real-time, batch on-demand, or scheduled);
 - *Description* of the data to be exchanged; and
 - *Assignment* of the system of record (which systems will have the authority to create, update, or delete data elements);
- **Data Conversion and Migration Strategies** - describes how legacy data will be converted and migrated into the new system. Any data conversion and migration strategy must comply with the standards set forth in the Logical Data Model. The following information should be included for each legacy data set:
 - Location;
 - Data elements;
 - Volume of data to be converted;
 - Method to be utilized for the conversion (manual or automated data input, data transformation routine, or data load routine); and
 - Timing of the migration;
- **Interface Control** - defines one or more interfaces between two systems;
- **System Test Plans** - outlines the various kinds of testing that will be performed during the Construction Phase. It includes:
 - Overall testing approach;
 - Strategy for planning and executing each type of test;
 - Justification for not including a particular type of test; and
 - Test automation strategy, if applicable.

Refer to the System Integration and Testing Process Handbook for guidance for creating the System Test Plan.

- **System Test Description** - detailed plans needed for testing the solution. A detailed plan is required for each type of test outlined in the testing strategy. Test plans will not be fully developed until the detailed design is completed during the Construction Phase, but for now should include:
 - Test scenario description;



- Inputs and outputs;
- Expected results;
- Frequency of tests; and
- Test automation plan, if applicable.

Refer to the System Integration and Testing Process Handbook for guidance for creating the System Test Description.

One technique to facilitate review of a preliminary design is to hold a Preliminary Design Review (PDR). This formal review should cover the entire Preliminary Design Document from beginning to end. This comprehensive walkthrough gives the Executive Sponsor the opportunity to develop a common understanding of the requirements and to resolve any outstanding issues. The PDR gives the IPT team one last forum to ensure understanding of requirements, acceptance criteria, and assumptions. The PDR provides a high-level picture of the solution and allows IPT members and the Executive Sponsor to make major implementation decisions simply and cost-effectively. It also gives the team an opportunity to make an early reality check and to verify that the solution is consistent with the requirements.

The PDR is also the appropriate time for the discussion on how the solution will be developed and deployed (i.e., custom development, use of COTS software or ASP vendors, etc.). The completion of the Definition Phase is a decision point for the IPT and the Executive Sponsor with regards to the most effective means of providing the solution. Approval of the Preliminary Design Document, as well as this development and implementation decision, must be obtained from the Executive Sponsor, acknowledged by sign-off, before exiting this phase.

If additional funding or contractor support is needed to construct and deploy the solution, then the Business Case will need to be updated by the IPT and approved by the IRB and a new Statement of Objectives may need to be created in order to award a new Task Order for the Construction and Deployment Phases.

Transition to Support (TTS)

The Transition to Support plan is approved by the IPT project manager in conjunction with the sign-off of the project work plan by the Executive Sponsor. The TTS plan must be maintained throughout the Support & Retirement Phase of the project life cycle. The TTS lead is responsible for maintaining the TTS plan.



System Security

As the system progresses through the Definition Phase, several security actions should occur. The system should be defined as a new system or major modification to an existing system. The system's sensitivity should be classified and the system's criticality should be defined. To define sensitivity, the system owner (and its data) should review the importance of confidentiality, integrity, and availability. These factors dictate the security controls necessary to protect the assets of the system. Similarly, a security review should occur which will identify threats to the system as well as intrinsic vulnerabilities. Finally, the system's controls should be reviewed for federal and departmental policy compliance. At a minimum, the system should be reviewed for compliance with OMB Memorandum A-130 Appendix III, the Privacy Act, GISRA (NIST Self-Assessment), Department of Education Policy, and FSA policy. A security guidance compliance matrix should be constructed to document the findings of the review.

Additionally, at the end of the Definition Phase, the SLC Security Definition Phase Checklist should be signed off by the System Security Officer (SSO). The checklist represents the completion of all security related activities for the Definition Phase. The activities include:

- System Roles and Responsibilities
- System Identification and Analysis
- Threat and Vulnerability Assessment
- Security Guidance Compliance Matrix
- Interconnected System(s)' Security Documentation
- Memorandum of Understanding (MOU)/Service Level Agreement (SLA) Draft
- C&A Project Plan
- System Rules of Behavior
- Constructed Clearance Requirement Matrix
- Approved Contractor Access Request Form

For more information regarding the SLC Security Definition Phase Checklist, see the System Security Process Guide.

Quality Assurance (QA)

Quality Assurance continues from the Vision Phase. The QA Plan is completed and approved and QA reviews are conducted to verify adherence to plan standards and processes. The organization FSA QA Team representative(s) evaluates activities and work products for compliance with applicable procedures, standards, and policies, as well as, completeness, consistency, appropriateness and applicability.



In addition, the FSA QA Team representative documents all noncompliance issues in a Memorandum of Record (MOR) document. There are 3 categories of findings:

- Major noncompliance – schedule risk, feature risk or incorrect metrics;
- Minor noncompliance – all others;
- Observation – potential improvement opportunity.

Configuration Management (CM)

The Configuration Management Plan is updated and finalized before the Construction Phase. The CM Lead works with the Project Manager to identify the critical work products that are placed under Configuration Management as Configuration Items. Such items include both code and non-code work products, for example, requirements, designs, testing documents, source code, technical architecture components and project plans. The Configuration Item Index and the Configuration Library System are created. Configuration Library Systems consist of tools and procedures used to store and access environments for the development and storage of Configuration Items.

Definition Phase Roles and Responsibilities

The following matrix is provided as a guide to the roles and responsibilities of the key personnel that are in the Definition Phase of the life cycle.

Title	Role	Responsibility
CIO ECAD	Liaison between the CIO and the Business Channels.	Participate in the development of and review the Requirements Document and Preliminary Design to ensure they meet the objectives defined in the Business Case and Business Performance Model. Conduct reviews to ensure compliance to the SLC Process Guide and FSA QA standards.
CIO IT MANAGEMENT	Liaison between the AWG and the IPT.	Review the content within the Requirements and Preliminary Design Documents to ensure they meet the Technical Architecture standards. Review any hardware, software, integration, and system architecture needs or procurement in support of the Architecture Working Group (AWG).
CIO IT SERVICES	Liaison between the VDC and the IPT.	Review the Requirements and Preliminary Design documents and work with IPT to identify needed VDC services. Notify the VDC of any planning changes identified during this phase.
CM LEAD	Manage project CM activities.	Update and finalize the Project CM plan. Create the Configuration Item Index and the Configuration Library System. Work with Project Manager to identify Configuration Items.
DSG	Business Case Analysis / Review.	Conduct “across the enterprise” analysis and review of all IT initiatives. Review Business Cases and submit to IRB for approval.



Title	Role	Responsibility
EXECUTIVE SPONSOR	Solution Sponsor.	Review and approve Requirements Document and Preliminary Design Document. Also, review and approve any changes made to the Business Performance Model, Solution Acquisition Plan, Business Case and Task Order award.
EXECUTIVE STEERING COMMITTEE	Project Review and Recommendations.	Responsible for reviews and recommendations made throughout the delivery of the solution.
IPT	Solution Development and Delivery Team.	Requirements Documentation and Preliminary Design.
IRB	Approve Funding.	Review Business Cases to determine if they meet the FSA's priorities and make the funding determination.
ITR	Liaison between contractors and Business Channels.	Review the Requirements and Preliminary Design Documents to ensure they meet the objectives as stated in the Business Case and the Business Performance Model.
PROJECT MANAGER	Plan and manage the acquisition project	Manage the solution acquisition project. Oversee the development, review, and approval of all critical outputs, including requirements and preliminary design.
QA LEAD	Plan and manage QA activities.	Ensure that the project is performing all necessary QA activities as defined in the QA Plan. Implement QA process obtaining FSA team support from ECAD. Finalize QA Plan.
RDM LEAD	Develop and manage solution requirements.	Implement the RDM process to decompose high-level requirements to low level requirements. Complete and baseline RDM Plan. Develop and maintain Requirements Traceability Matrix.
SMEs - FSA, EXTERNAL, CONSULTANTS	Provide input to the Requirements and Preliminary Design.	Assist in the definition and development of the Requirements and Preliminary Design Documents by providing solution-related expertise.
SYSTEM MANAGER	Manage, review, and make recommendations.	Work with the Project Manager and System Security Officer to ensure security meets the FSA's security requirements. Assign SSO. Sign off on the SLC Definition Phase Checklist. Approve the TTS Plan.



Title	Role	Responsibility
SYSTEM SECURITY OFFICER	Review and make security recommendations.	Work with the Project Manager, System Manager, and others to ensure that the solution requirements and Preliminary Design meet the FSA's security requirements. Sign off on the SLC Definition Phase Checklist.
TECHNICAL ARCHITECTURE LEAD	Manage CR activity.	Examine requirements, submit and track a CR in the ECM Tool to create a suitable development environment.
TTS LEAD	Plan and manage TTS activities.	Develop the TTS Plan. Conduct review and obtain approval of the TTS Plan.

Definition Phase Exit Criteria

The next phase, Construction, is where the solution is developed and tested. Prior to that phase beginning, the following exit criteria for this phase must be met:

Critical:

- Solution Acquisition Plan has been updated.
- Requirements Document has been developed, approved, and baselined.
- Requirements Traceability Matrix has been baselined.
- Preliminary Design Document has been developed and approved.
- SLC Security Checklist - Definition Phase has been completed and approved.
- Quality Assurance Plan has been approved.
- CM Plan has been completed, approved, and baselined.
- Configuration Item Index has been created.
- Development environment has been established.
- Critical Infrastructure Protection Program's Mission Essential Infrastructure Evaluation Survey is completed.
- General Support System (GSS) & Major Application (MA) Inventory Submission Form are completed.
- TTS Plan has been reviewed and approved.
- The Work Breakdown Structure has been updated.



Recommended:

- Business Case, if updated, has been approved.
- Business Performance Model, if updated, has been approved.
- Task Order, if needed for Construction and Deployment, has been awarded.
- The QA MOR has been updated, if necessary, and approved.
- Risks and Issues are tracked.
- Configuration Library System has been created.
- ECM Tool User IDs have been created.
- Requirements Development and Management Plan has been completed, approved, and baselined.

Definition Phase Job Aids

The following job aids are available in the appropriate SLC Process Guides:

- Solution Acquisition Plan Template
- Configuration Management Plan Template
- Configuration Item Index Template
- CM File Repository Directory Structure Template
- Requirements Traceability Matrix
- RDM Plan Template
- SLC Security Definition Phase Checklist
- Department of Education Critical Infrastructure Protection Program Mission Essential Infrastructure Evaluation Survey
- Department of Education General Support Systems and Major Applications Inventory Procedures document
- Enterprise Change Management Process Guide