SOFTWARE TECHNOLOGY FOR ADAPTABLE, RELIABLE SYSTEMS (STARS) PROGRAM

Technical Papers:
Defining Manually Enactable Processes Using the Process Definition Information Organizer Templates

Contract No. F19628–93–C–0129
Task IV02 – Megaprogramming Transition Support

Prepared for:
Electronic Systems Center
Air Force Materiel Command, USAF
Hanscom AFB, MA 01731–2116

Prepared by:
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This document consists of the presentation slides to be used as a tutorial at the 1995 SEPG Conference to be held in Boston, MA on May 22-25, 1995. This tutorial will cover planning for the definition of a project's processes, an approach for defining manually enactable processes, and an approach for evaluating process definition results.

Process, Process Definition Information Organizer Templates (PDIOT)
Preface

This document was developed by the Loral Federal Systems - Gaithersburg, located at 700 North Frederick Avenue, Gaithersburg, MD 20879. Questions or comments should be directed to Mr. William H. Ett at 301-240-6337 (Internet: ettb@lfs.loral.com).

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1995 SEPG Conference  
Boston, Massachusetts  
May 22-25, 1995

Tutorial:  
Defining Manually Enactable Processes  
Using the Process Definition  
Information Organizer Templates

Prepared by:  
William H. Ett, Loral Federal Systems  
Dick Phillips, SEI  
Jim Over, SEI  
Marc Kellner, SEI
Support for the preparation of materials for this tutorial was provided by the ARPA Software Technology for Adaptable, Reliable Systems (STARS) Program under the Loral STARS V02 Technology Transition task. Support was also provided by Dick Phillips, Jim Over and Marc Kellner of the SEI, through the collaboration of the SEI’s Process Definition Project with the STARS prime contractors and the STARS service demonstration projects. The authors would like to express their appreciation to John Foreman, STARS Program Manager, for his support of this tutorial.
Defining Manually Enactable Processes Using the Process Definition Information Organizer Templates

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Tutorial Contents

1 - Introduction
2 - Process Definition Concepts
3 - Planning the Project Process

Definition
4 - Process Context
5 - Process Layout Specification
6 - Process Design Specification
7 - Process Enactment Information Specification

Evaluation
8 - Evaluating Process Definition Results
Introduction

Who Should Be Here?

Professionals that:
- Define and reuse processes that need to be both understandable and enactable (or executable)
  - work, system, utility/service processes...
- Tailor organization processes to address the needs of their software development projects
- View processes as part of their transferrable knowledge base on how they expect to conduct business
What Will We Cover?

Planning for the definition of a project's processes
- Defining requirements for the project's process
- Defining the project's process architecture

An approach for defining manually enactable processes
- Laying out the process
- Describing methods, resources, and artifacts
- Describing the work actions of every enactable process
- Packaging the enactable process

An approach for evaluating process definition results

What Will You Walk Away With?

Techniques that can be applied to:
- Plan your process definition efforts
- Define manually enactable processes
- Evaluate your process definitions

A copy of:
- "Instructions for Process Definition Information Organizer Templates"
- Template skeleton
Agenda

08:00 AM Introduction
08:10 AM Concepts and Process Definition Planning
09:20 AM Process Context and Layout Specification
10:30 AM Break
10:40 AM Process Design & Enactment Specification
11:40 AM Process Definition Evaluation
11:55 AM Discussion
12:00 PM Adjourn

Contributors

SEI Software Process Definition Project
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Process Definition Concepts
Process Definition Concepts

Concepts

- Process Definition Elements
  - Activities, Artifacts, Agents
  - Methods and Entry/Exit Criteria
- Two Life Cycles Model for Process Definition
- Process Definition Activities
- Process Definition Products
Process Context

Why this process?

- What are the requirements for the process?
- What is the purpose of the process?

Activities and Agents

- What work is to be performed?
- What artifacts are to be employed and produced?

Who performs the activity (human agents and their roles)?
Activity States

Process: Prepare System Specification

Perform Problem Domain Analysis

Perform Solution Domain Analysis

Develop System Specification

Conduct System Specification Technical Review

Conduct System Specification Management Assessment

Ready

In-Work

Suspended

Completed

Methods and Resources

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>How supported</th>
<th>Resources and Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop System Specifications</td>
<td></td>
<td>Hardware, Software,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Materials, Cost/Schedule,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reviewer and Specifier employ / are constrained by

Methods, Tools, Procedures
**Entry/Exit Criteria**

**Conditions under which an activity:**
1) should begin:
   - Artifact states
   - Completion of predecessor activities
   - Resource availability

2) may be declared "complete."
   - Artifact states
   - Completion of other related activities
   - Returns from methods
   - Checklist completion
Artifacts

- Used or produced by a process
- Are activity inputs and outputs
- May have states and allowable state transitions

Artifact States
Two Life Cycle Concept for Process Definition

Business Drivers
- Determine Process Needs for Org
- Develop Organization Processes
- Deploy, Use and Measure
- Improve Processes
- Org Process Assets
- Project Process Assets
- Feedback/Req

Customer & Organization Drivers
- Determine Process Needs for Project
- Develop Project Processes
- Deploy, Use and Measure
- Improve Processes
- Org Process Assets
- Project Process Assets
- Feedback/Req

Organization Focus
- Organization processes as "Product Line"
  - Standard Business processes
  - Standard technical, service and utility processes
  - Process analysis and improvement
- Processes defined to:
  - Support the organization's business requirements
  - Ensure consistency and quality of products / work results
  - Address process assurance criteria required by customer set
Why the Two Life Cycles for Process?

Project Focus

- Project process concerns - Customer / Developer
  - Processes that demonstrate developers can deliver
  - Processes that address customer’s requirements
  - Processes that address customer’s quality concerns
  - Processes that also address organization requirements
  - Processes must reflect how work is to be performed
    - Different application domains
    - Different domain and technical maturity
    - Technology adoption and use

CMM V1.1 Mapping to Cleanroom

Exercise illustrated key differences of the “project process” and “organization processes”

- Organization processes developed to address process assurance criteria of the CMM
  - Software project management processes
  - Technical service processes
- Cleanroom Process - prepared specifically to support the technical management and development of software projects:
  - Life cycle specific way of doing business
    - Defect prevention
    - Statistical usage testing
A Process Development Process

Purpose
- to define a capable process that describes the specific means by which the product goals will be met

Input
Customer information
Customer requirements
Product description
Product specifications
Policy and Standards

Output
Process Definition
Process Models
Process Guides
Training

Process Development Activities

Product Requirements and Planning

Note 1. Requirements and planning for product and process may overlap

Note 2. Process Capability Evaluation and Transfer to Operations may overlap

Source: Over & Keller
Process Definition, Evaluation & Use

Planning
- Process Context
  - Planning of Process Layout identified in the "Process Definition Implementation Plan"

Definition
- Stage 1: Process Context
- Stage 2: Process Design
  - Process Enactment Information
- Stage 4: Evaluation, Process Testing through Manual Enactment, and PSS Preparation

Evaluation, Integration into Manual PSS

A Process Guide is produced for each process identified in the "Process Definition Implementation Plan".

Process Definition Products

- Customer/Organization Process Requirements
  - Process Layout Specification
  - Process Design Specification
  - Process Enactment Specification
  - Process Guide
  - Org/Project Repository Book
  - Process Execution Log
Defining a Manual Process Support System

Guides by Providing a Process Context for Work

Makes Visible Product and Service Quality Requirements

Identifies Work Dependencies and Collaboration Requirements

Supports Tracking of Work Performed & Products Produced

System developed to meet the process requirement of a project, so that the project may be "process-driven"

Note: Figure Depicts a Manual Process Support System for a Project
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★ 3 - Planning the Project Process

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Evaluation
8 - Evaluating Process Definition Results
Process Definition Planning

Concepts
- Analyzing the Requirements for the Project Process
- Preparing the Project Process Architecture
  - SCAI Project Example
- Preparing the Phased Definition Plan
- Using the Process Architecture to Support Process-Driven Project Planning

Focus
- Project Process Definition
- Approach applied on the Air Force STARS Demonstration Project

Project Process Requirements & Planning

![Diagram of Project Process Requirements and Planning]
Process Definition as a Project Activity

Project process definition is a vital part of an engineering project and must be planned

- Process Definition efforts may be organized as a project within a project

Examples:
  - process action teams
  - business process re-engineering

Successful process definition efforts:
  - are planned and tracked
  - follow a defined process as the basis for planning
  - are staffed, reviewed, approved, etc.

Planning for Process Definition

- Survey Relevant Processes:
  - Org Processes, Policies, Stds
  - Customer Processes, Policies, Stds

- Identify Project Process Drivers:
  - Customer Requirements
  - Product Users & Maintainers
  - Product Quality
  - Cost & Schedule
  - Measurement Collection & Reporting
  - Product & Process Assurance Criteria

- Define Process Requirements & Prepare Project Development Strategy
  - Define approach to meet project goals

- Develop a Strawman Flow of Key Project Activities and Artifacts

- Prepare Manually-Enactable Process Definitions

- Prepare a Phased Process Definition Plan

- Project Process Support System Preparation

- Process-Driven Project Planning
Process Definition, Evaluation & Use

Survey Relevant Processes

Project process definition teams must identify what processes have been defined.

Potential Sources:
- Site SEPG
- SEI:
  - SEI Software Process Frameworks for levels 2 through 5 (ETVX description of each CMM V1.1 KPA)
- STARS ASSET:
  - Keeper of the SEI/STARS Process Assets
    - Cleanroom Process Guidebooks
    - Ada Process Model Guidebook
    - AT&T Quality Function Deployment Process
- Customer:
  - Standards and Product DIDs
Identify Project Process Drivers

- Product/system requirements
- Cost
- Schedule
- Customer processes, policies, and development standards
- Customer's definition of product quality
- Developer Process Assurance
- Organization processes, policies, practices, standards, methods, etc

Do you see any problems with the requirements we got from the customer?

Identify Project Process Drivers

I see a system deployed that is incredibly slow, and cannot be easily ported to your customer's other machines.

We forgot to tell the contractor what? Who's gonna want to use this new system...

- Operating environments
- How and where the target system will be used
- How the target system will be maintained and by whom
Defining Project Process Requirements

Requirements for the Project Process:

- How will we verify and validate the specified work products?
  - Verification - Is our work technically correct?
  - Validation - Is the system we built what the customer wanted?

- How will customer and contractor management assess work progress?

- How and when will status be reported to support project control?

- What measurements must be taken and what metrics must be computed? How will they be reported and when?
Verification and Validation Requirements: A Project Process Concern

It meets all of your requirements! It's what you specified.

It may be what I specified - but it isn't what I expected.

Verification:
"Did I do it the thing right?"
- technical correctness
- compliance with specifications

Validation:
"Did I do the right thing"
- producing what's needed
- compliance with expectations

RADC Quality Framework

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Factors</th>
<th>Efficiency</th>
<th>Integrity</th>
<th>Reliability</th>
<th>Survivability</th>
<th>Usability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
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<td>Operability</td>
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<td></td>
<td>X</td>
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<tr>
<td>Reconfigurability</td>
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<td></td>
<td></td>
<td>X</td>
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<tr>
<td>System Accessability</td>
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<td>X</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training</td>
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<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

This table illustrates a portion of the RADC quality framework factors and associated criteria. Factor/criteria paring is used to identify data collection forms and associated metrics for use in process instrumentation.
Prepare Project Development Strategy

Risk Factors:
- Problem domain understanding
- Technology maturity
- Precedence with respect to past systems
  - Unprecedented (first time out)
  - Precedented (instances have been built)

Development Approaches Selected to Manage Risk:
- Spiral framework
- Prototyping
- Incremental development
- Waterfall framework
Defining the Project Process Architecture

What is a "Project Process Architecture"
A framework of the process components required to satisfy a project's process requirements

The "Project Process Architecture" defines:
- The components of the project process and their relationships from a "black box" perspective:
  - Process components inputs and outputs
  - Process component black box behavior
- The interfaces between process components
Defining the Project Process Architecture

After the "Project Process Architecture" is defined, it becomes the basis for:

- **Process Definition Planning**
  - Understand what processes to reuse, tailor or develop
  - Basis for phasing the definition of project processes

- **Process Requirements Allocation**

- **Process Assurance Planning**
  - Understand which process components must address SEI CMM
    V1.1 or ISO-9000.2 criteria

---

Artifact flow for preparing an "Operations Model"
Process Component: "Operations Model Development"

Activity Flow: "Ada R/T Software Engineering Process" (1 of 3)
Process Architecture

Example from "Developing with Ada Life Cycle Methods" by Bruce E. Kerl. Bantam Professional Books

SCAI Process Architecture Concept

Request/Response
## Phased Process Definition Plan

<table>
<thead>
<tr>
<th>Preparation Phase</th>
<th>Processes Required to Support Work Increments</th>
</tr>
</thead>
</table>
| SCAI Increment 1 (90 days prior to project start) | - Requirements Engineering Process (OBE)  
- System Specification Development Process  
- SAS Development Process  
- Requirements Model Development Process |
| SCAI Increment 2 (120 days prior SCAI release 1 development) | - System Object Specification Development Process  
- System Object Development Process  
- System Object Certification Process |
| SCAI Increment 3 (120 days prior to SCAI release 2 development) | - System Object Integration & Build Process  
- System Certification Process (Outside of AEP)  
... |

Example from the SCAI Project "Phased Process Definition Plan" for Application Engineering

---

## Process Driven Project Planning (1)
Process Driven Project Planning (1)
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Process Definition Products

Customer/Organization Process Requirements

- Process Layout Specification
- Process Design Specification
- Process Enactment Specification

- Process Guide
- Org/Project Repository Book
- Process Execution Log

Process Context & Requirements Definition

Purpose:
- Define process purpose and goals
- Define relationship to other processes
- Define requirements and measurable goals
- Define conditions under which the process will operate
- Provide a basis for process evaluation

Input:
- Phased process definition plan
- Customer information
- Customer requirements
- Product description
- Product specifications
- Policy and standards

Output:
- Process purpose and measurable goals
- Process requirements
- Process operating conditions
- Plan for definition and evaluation

Define Process Context and Requirements
# Process Context

## Process Guide

## Process Context Section

**Overview:**

**Process Purpose:**
- What will following this process accomplish?
- Does following this process satisfy its intended purpose?

**Process Goals:**
- Goals this process addresses

**Process Context:**
- Relationship of this process with others

---

**Process Context Section (Continued)**

**Process Requirements:**

**Required Inputs (Artifacts, messages, controls, etc.)**

**Process Work Results (Products and services)**
- Quality attributes of each work product and service

**Measurement requirements**
- Process measurements and metrics
- Product measurements and metrics

**Reporting Requirements**
- Normal reporting and exception reporting
Process Context:
Artifact Quality Attributes

<table>
<thead>
<tr>
<th>Product</th>
<th>User Product Quality Factor</th>
<th>Product Quality Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Catalog</td>
<td>Reliability</td>
<td>Accuracy</td>
</tr>
<tr>
<td>Software</td>
<td></td>
<td>Simplicity</td>
</tr>
<tr>
<td>Component</td>
<td>Usability</td>
<td>Operability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Training</td>
</tr>
<tr>
<td>Correctness</td>
<td></td>
<td>Completeness</td>
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<tr>
<td></td>
<td></td>
<td>Consistency</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Testability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traceability</td>
</tr>
</tbody>
</table>

Process Context

<table>
<thead>
<tr>
<th>Organization/Project Repository Book</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Context Section (Continued)</td>
</tr>
</tbody>
</table>

Process Operating Environment:

Process Audience:
- Who (roles) are the intended users of this process?
- What are their current responsibilities?

Process Usage:
- How will each audience use this process definition?

Benefits:
- What benefits will users realize after using the process?
Process Context

Organization/Project Repository Book

Process Context Section (Continued)

Process Audience and Experience:
- How new is what you are telling them?
- What vocabulary do they use?
- How do they think about this topic or the tasks involved?
- What do they need to know before using the process

Process Audience Motivation:
- How much effort are they willing to put into learning understanding what the process definition requires of them?

Next Step: Process Layout

- Complete process context for assigned process
- Identify and define artifacts
- Define agent roles
- Graphically depict process layout
- Verify that activity and artifact granularity is OK

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Process Layout Specification

Process Definition

Input
Customer:
- information
- requirements
Product:
- description
- specifications
Policy and Standards
Process:
- purpose and measurable goals
- requirements
- operating conditions
Phased process definition plan
Plan for definition and evaluation

Purpose
- create a process specification that:
  - is manually enactable
  - is precise and accurate
  - when followed, produces
  and expected and consistent
  results

Output
Process Guide
Supporting project references
Process Execution Log
Process operating conditions
Operational definition

Prepare Process Definition
Process Definition, Evaluation & Use

Planning

Process Context

Planning of a Process identified in the "Process Definition Implementation Plan"

Stage 1
Process Layout

Stage 2
Process Design

Stage 3
Process Enactment Information

Stage 4
Evaluation & Manual Process Enactment (Testing)

A Process Guide is produced for each process identified in the "Process Definition Implementation Plan"

Evaluation, Process Testing through Manual Enactment, and PSS Preparation

Process Guide Integration into Manual PSS

Process Layout Objectives

Process Component to Define

Process Context

Process Requirements

Requirements for Defining the Process

Process Layout

Process Artifact Flow

Artifact Structure

Activity Flow & Activity Constraints

Agents and Resources Required

Activity and Artifact States
Describing the Artifacts of a Process

The important features of an artifact that should be described are:

<table>
<thead>
<tr>
<th>Relationships</th>
<th>Behavior</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• structure and content</td>
<td>• artifact state</td>
<td>• purpose</td>
</tr>
<tr>
<td>• derivation</td>
<td>• allowable state transitions</td>
<td>• description</td>
</tr>
<tr>
<td>• used or produced by activity</td>
<td></td>
<td>• requirements, goals, and measures</td>
</tr>
<tr>
<td>• used or produced by agent</td>
<td></td>
<td>• applicable specifications or standards</td>
</tr>
</tbody>
</table>
Artifact Structure

Describes the parts (components) of an artifact
- Artifact composition (part/subpart)
Artifact parts may themselves be artifacts

Example: Project Plan “X” is composed of:
- Overview section
- Work breakdown structure
- Size, effort, and cost estimates
- GANNT chart
- Methods/procedures

Artifact Structure

Artifact "A"
- Description
- Artifact States
- Structure

Artifact A1  Artifact A2  Artifact A3

Artifact "A1" is a subpart of Artifact "A."
Artifact Derivation

Describes *precedence order* based on the use of one artifact to *derive* another.

For example:
- Project estimates are based on the WBS
- Project schedule is derived from the project effort estimates and the WBS

Artifact Derivation

Artifact "A"
- Description
- Artifact States
- Structure

Artifact "B"

Derivation

Artifact "C"

Artifact "C" is derived from Artifact "A" and "B"

Artifact "A" is used to derive Artifact "C"
Artifacts Used and Produced

Activities have inputs and produce outputs

Examples of this relationship:

- Activity Develop Project Plan uses artifact SOW
- Activity Develop Project Plan produces Project Plan
- Artifact SOW is used by Develop Project Plan
- Artifact Project Plan is produced by Develop Project Plan

Artifact State

- Describes the phases (or states) of an artifact
- Transitioning from artifact state to artifact state describes the evolution of the artifact in the process

Example:

A project plan evolves from in-progress to drafted, and then to either approved or in-progress
Describing the Activities of a Process

The important features of an activity that should be described are:

<table>
<thead>
<tr>
<th>Relationships</th>
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<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• artifacts used and produced</td>
<td>• activity state</td>
<td>• purpose</td>
</tr>
<tr>
<td>• decomposition into sub-activities or procedures</td>
<td>• entry criteria</td>
<td>• description</td>
</tr>
<tr>
<td>• dependencies among activities</td>
<td>• exit criteria</td>
<td>• goals and measures</td>
</tr>
<tr>
<td>• activity control flow</td>
<td></td>
<td>• applicable polices</td>
</tr>
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<td>• performing agent</td>
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</tbody>
</table>

Activity Decomposition

Activities are decomposed into steps that are:
- Lower level sub-activities (tasks)
- Methods or procedures

Example:

1. Develop plan
   1.1 Develop WBS
   1.2 Develop estimates
      1.2.1 Estimate size
      1.2.2 Estimate effort
      1.2.3 Estimate resources
      1.2.4 Estimate schedule
      1.2.5 Estimate cost
   1.3 Develop overview

   ![Activity Decomposition Diagram]

   - develop plan
   - develop WBS
   - develop estimates
   - develop overview
   - est. size
   - est. effort
   - est. resources
   - est. schedule
   - est. cost
Activity Decomposition

Activity 1.2 has sub-activities 1.2.1, 1.2.2, and 1.2.3
Activity 1.2.1 is a sub-activity of 1.2

Separating "What" and "How"

An activity is described by specifying:
- "what" happens and "how" it is done
- The "how" component of an activity description should be defined in a method or procedure description separate from the activity description
Activity Dependencies

Activity dependencies arise from:
- Artifact state or use, as well as activity state
- Decomposition of activities
- Coupling of activities
- Activity constraint relationships

Activity Precedence

Activity 1.1 comes before Activity 1.2
Activity 1.2 comes after Activity 1.1
Activity Control

Activity 1.3 controls 1.3.1, 1.3.2 and 1.3.3.
Activity 1.3.1 is controlled by 1.3.

Activity Flow Relationships

Activity flow describes the static order of Activities

Sequence | Alternation | Iteration | Concurrency

A → B
A or C
A → B
A and C
Activity Flow Relationships

Activity flow also describes the relationships and constraints between activities.

- "Finish to Start": A must complete before B can begin.
- "Start to Start": A and B may both start together.
- "Start to Finish": B may not finish until predecessor A starts.
- "Finish to Finish": Completion of A is in part determined by the completion of B.

*Finish to Finish* Link Example
Activity Flow Relationships

"Finish to Finish" Link Example
Parallelism Considerations

Typical software developer's state:
- Many activities in progress
- Few activities completed
- Tendency toward activity completions "bunching up" at major checkpoints

Process definer:
- Eliminate unnecessary serial dependencies
- Seek opportunities to enable multiple activities to be performed asynchronously
- Synchronize at milestones as necessary

Layout Granularity Considerations

- Some granularity factors
  - Single Agent
  - Method intricacy
  - Practitioner expertise
  - Availability of subprocesses/methods
  - Characteristics of subprocesses/methods
  - Goals/purpose
  - Process/product state change logging points
  - Communication/navigation decision points
  - Project planning support requirements
## Process Layout

### Process Guide

### Process Layout Section

### Graphic Representation

- Artifact Goal State Map (artifact derivation flow)
  - Artifact structure
  - Artifact precedence

- Activity Network
  - Activity hierarchy
  - Activity precedence
  - Activity relation to artifacts (inputs/outputs)

### Textual Representation

For each activity of the process:

- Activity description

- Identification of supporting methods and states they may change

- Identification of required resources

- Identification of agents (roles) to perform/support the activity
Process Layout

<table>
<thead>
<tr>
<th>Organization/Project Repository Book</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artifacts and Goal States Section</td>
</tr>
<tr>
<td>Artifact Goal States</td>
</tr>
</tbody>
</table>

For each artifact, identify:

- Artifact state variables
- Allowable state transitions

Layout Example

Refer to "Process Definition Information Organizer Instructions" Manual
Next Step: Process Design

For the assigned process:
- Verify that activity and artifact granularity is OK
- Completely describe all artifacts
- Completely describe all roles and their skill and experience requirements
- Define all required method descriptions
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Process Design Specification
Process Design Information

Describing the Agents of a Process

The important features of an agent that should be described are:

<table>
<thead>
<tr>
<th>Relationships</th>
<th>Behavior</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>organizational structure</td>
<td>availability</td>
<td>role</td>
</tr>
<tr>
<td>activities performed</td>
<td></td>
<td>skills required</td>
</tr>
<tr>
<td>artifacts used and produced</td>
<td></td>
<td>training required</td>
</tr>
</tbody>
</table>
Roles

**Process definer:** lays out the process, defines it, and creates the Process Guide

**Practitioner:** follows or executes/enacts the process definition

- Executive, Manager, Team Leader, QA, Engineer, etc.

**Monitor:** tracks and evaluates status and progress, anticipates future state

- Executive, Manager, Team Leader, QA, Engineer, etc.

---

**Process Definition Products**

- **Customer/Organization Process Requirements**
  - Process Layout Specification
  - Process Design Specification
  - Process Enactment Specification

- Process Guide
- Org/Project Repository Book
- Process Execution Log
### Artifacts and Goal States Section

**Artifact Descriptive Information**
- Artifact Purpose and scope
- Artifact Goals
- Artifact hierarchical structure (layout)
- Reference to artifact specification (Artifact DID)
  - Artifact organization
  - Artifact contents
- Artifact constraints

Examples: Product standards, Drop dead dates, etc.
### Process Design

#### Organization/Project Repository Book

### Artifacts and Goal States Section

Artifact Owner and Constraints (Continued)

- Artifact constraints
- Access permissions
- How used/maintained
- Who uses/maintains

- Artifact metrics to compute and collect

### Methods Section

Method Descriptive Information

- Method objectives
- Inputs used
- Outputs produced

Infrastructure Requirements

- Agent requirements (requisite skills, method training)
- Organizational and management support required
- Process system support functions required
Process Design

Organization/Project Repository Book

Methods Section (Continued)

Method Enactment Information
- How to achieve the objectives of the method
- How to report results

Agent Description Section

Agent role description
General experiences and skills required for the role
Types of resources the role requires

Design Example

Refer to Information Organizer Instructions
Next Step: Enactment Information Specification

- Add enactment work paradigm steps
- Draft "Process Guide"
- Refine granularity
- Refine detailed methods
- Complete "Process Guide"
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Process Enactment Information Specification
Process Definition, Evaluation & Use

Planning

Process Context

Planning of a Process Identified in the "Process Definition Implementation Plan"

Stage 1
Process Layout

Stage 2
Process Design

Stage 3
Process Enactment Information

Stage 4
Evaluation & Manual Process Enactment (Testing)

Evaluation, Process Testing through Manual Enactment, and PSS Preparation

A Process Guide is produced for each process identified in the "Process Definition Implementation Plan".

Process Enactment Specification

Objectives

Process Design

Entry Criteria Specification

Work Activities

Verification/Validation Activities

Specify Process Component's Work Actions

Measurement Recording Tasks

Process Status Logging Tasks

Status Communication Tasks

Reporting Method/Activity Completion

Process Enactment Specification

Exist Criteria Specification

Navigation Rules
Process Enactment Information

Concept of a Work Paradigm

Work Paradigm
- Common set of actions to be performed within each activity
- General case across an organization or project

Example: “ETVX” paradigm
- Test Entry criteria
- Perform Task
- Verify/validate results
- Test eXit criteria
Extended ETVX Process Description

- **Required Inputs**
- **Entry Criteria**
- **Log**
  - Communicate
  - Measure
- **Tasks**
  - Log
  - Communicate
  - Measure
- **Verify and Validate**
  - Log
  - Communicate
  - Measure
- **Exit Criteria**
  - Log
  - Communicate
  - Measure

- **Work Products/Results**

Describes what work is to be performed
Describes how work products/results will be verified and validated

Example Work Paradigm Actions

*Performing* main task and *logging* Artifact state information for future navigation decisions

*Verifying* results against internal criteria

*Validating* results according to recipient needs

*Recording* process and product metrics for future improvement or contractual needs

*Testing* Exit Criteria and *logging* Activity status

*Communicating* status to/from dependent work

*Navigating* to next defined activity based on current process/product state
Activity State and Allowed Transitions

Activity state can generally be described with these four states and the transitions:

- Ready
- Suspended
- In-work
- Completed

Activity Entry and Exit Criteria

*Entry criteria* define the conditions under which an activity is allowed to begin.

*Exit criteria* define the conditions under which an activity can be declared complete, and are generally based on:

- Completion of an activity or output
- Availability of an input or agent
- Satisfaction of evaluation criteria
- State of an activity, artifact, or agent
Concepts of Behavioral Adaptability

Exceptions to prescribed process definition stem from real-life events
Process definition must carry adequate information to accommodate these situations
Example of process navigation needs that require behavioral adaptability:
  - Iteration
  - Rework
  - Workahead

Mixed Initiative Considerations

Typical developer situation from following information-based, creative processes such as software development or product engineering:
  - Many activities in progress
  - Few completed
  - Parallelism the norm
To support "real life" process pragmatics:
  - Support/encourage workahead by means of permissive Entry Criteria
  - Enable management control through dependency network of rigid Exit Criteria
Optimal & Mandatory Entry Criteria

Entry criteria are either *optimal* or *mandatory*

*Optimal entry criteria* are those that *should* be met before the activity begins, but may be deferred to allow work-ahead

*Mandatory entry criteria* are those that *must* be met before the activity begins

*Deferred entry criteria* must be *satisfied before* the activity may be declared complete

*Note:* *exit criteria should always be mandatory*
Process Definition Products

Customer/Organization Process Requirements

- Process Layout Specification
- Process Design Specification
- Process Enactment Specification

Process Guide

Org/Project Repository Book

Process Execution Log

Enactment Information Example

Refer to “Process Definition Information Organizer Template” Instructions Manual
Next Steps

- Complete enactment information
- Complete detailed methods
- Complete all artifact DIDs
- Complete Process Guides
- Prepare Project References and Execution Logs
  - Revise as appropriate
- Evaluate all process definition products

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Evaluating Process Definition Results

Discussion