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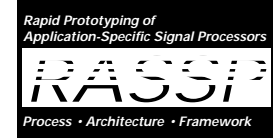
Workshop on Electronic Design Processes

Process Technology Toolkit to Support Electronic Design

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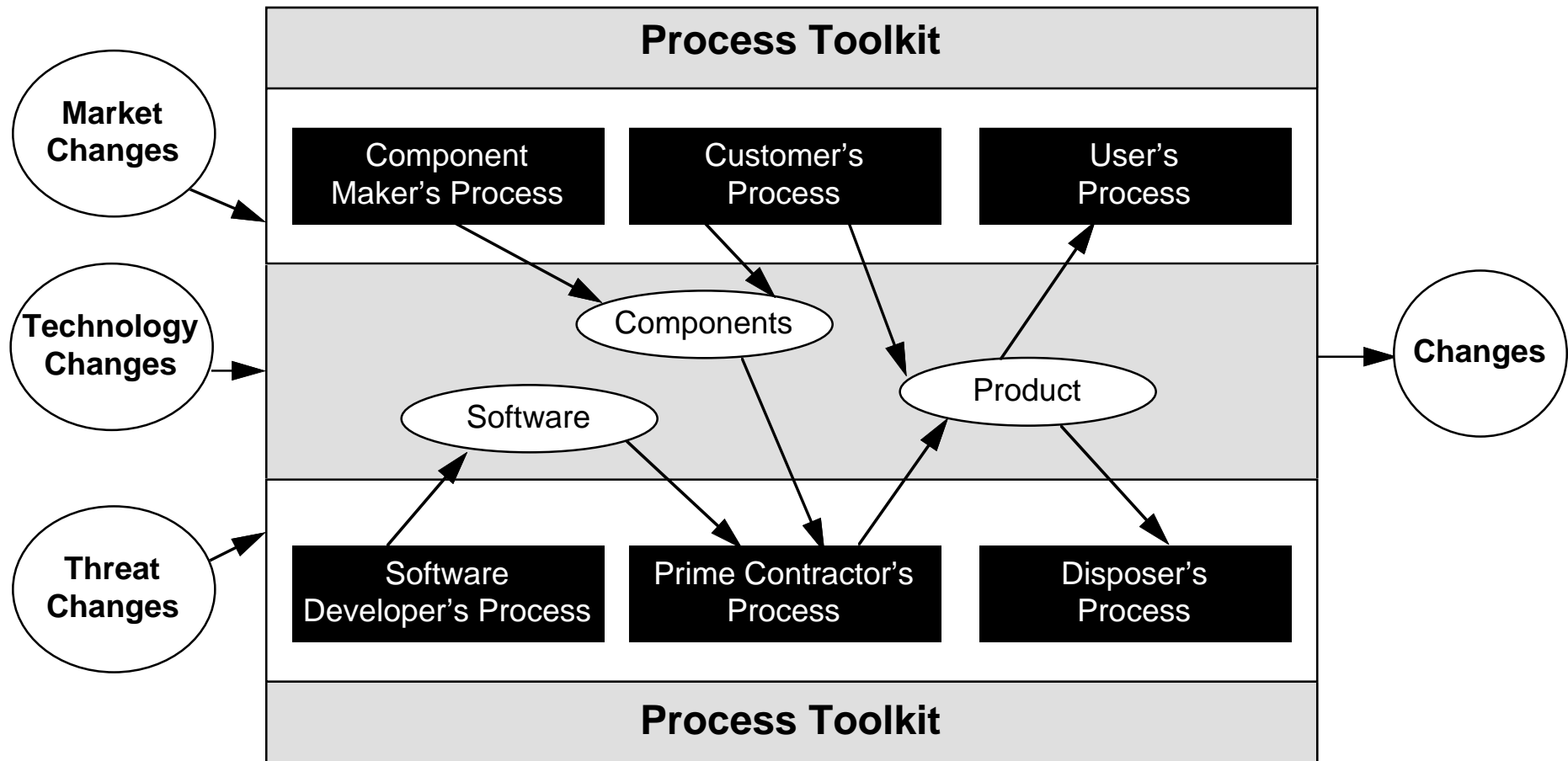
April 24-26, 1996

Agenda



- **Background**
- **Process Modeling: Rapid Prototyping of Application-Specific Signal Processors (RASSP) program**
- **Extended RASSP/Business Process Reengineering (BPR) Strategy**
- **Application to Affordable Multi-Missile Manufacturing (AM3)**
- **Process Toolkit Concept**

Process Technology



Process technology impacts the entire product life-cycle

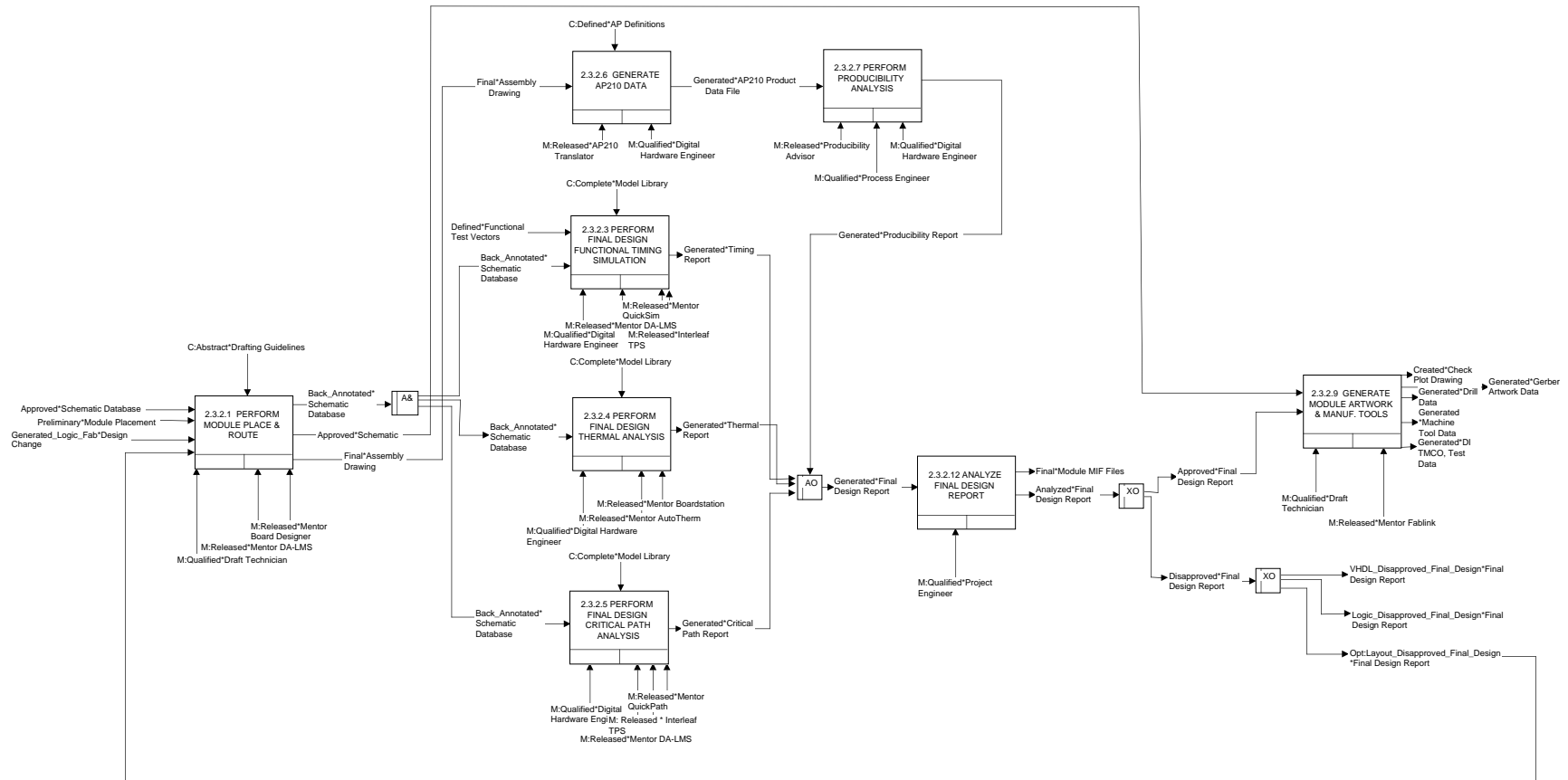
The Problem

- **“Typical process has 95-99% non-value-added work.”**
— Tom Davenport in Process Innovation
- **No one is responsible for the process**
- **Redundant ad-hoc work processes**

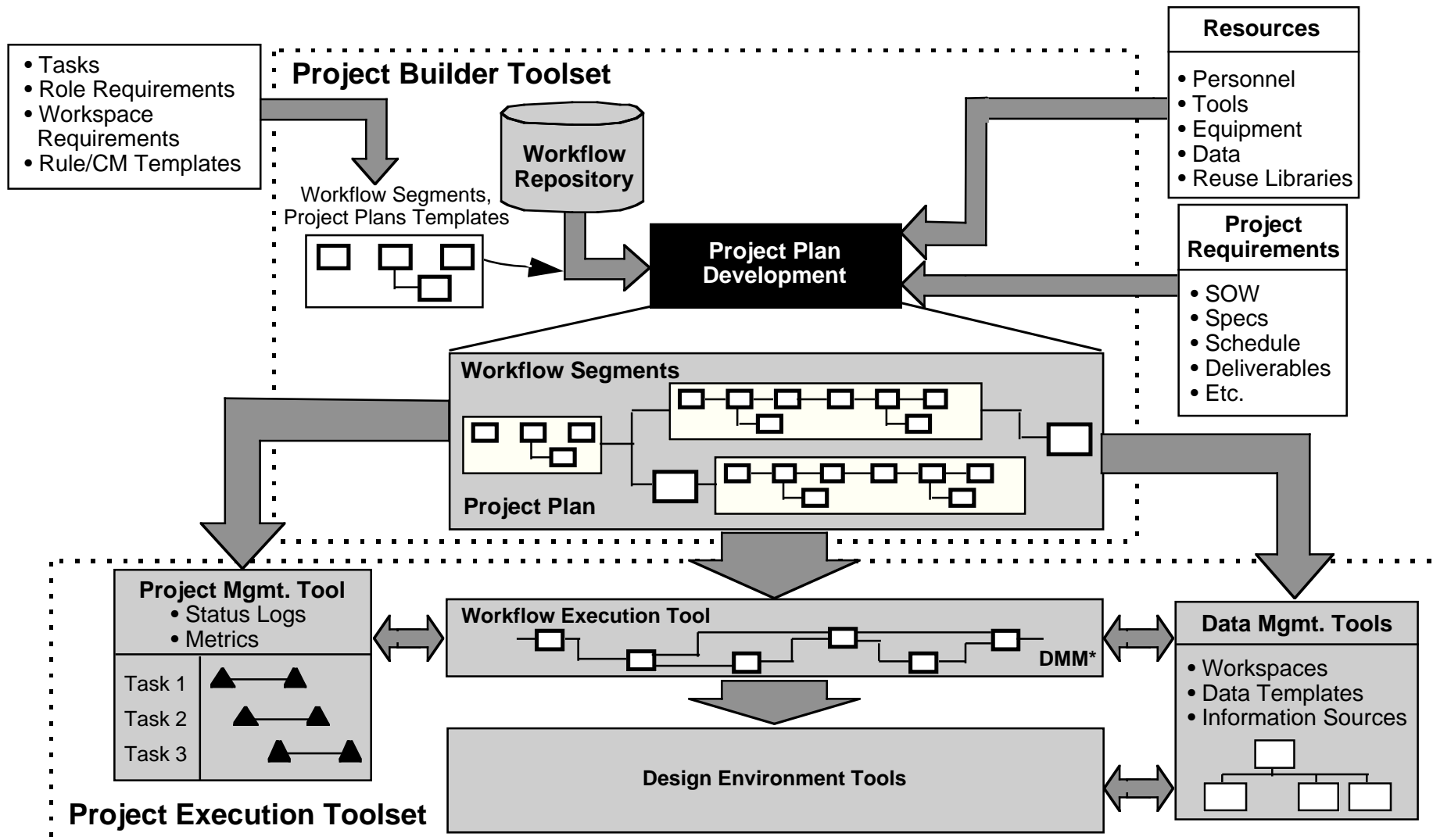
Result is loss of productivity and agility of an organization

- **Efficient processes are critical for DoD and industry**
- **Process is the key to achieving cost- and cycle-time reduction goals**

RASSP Process Modeling



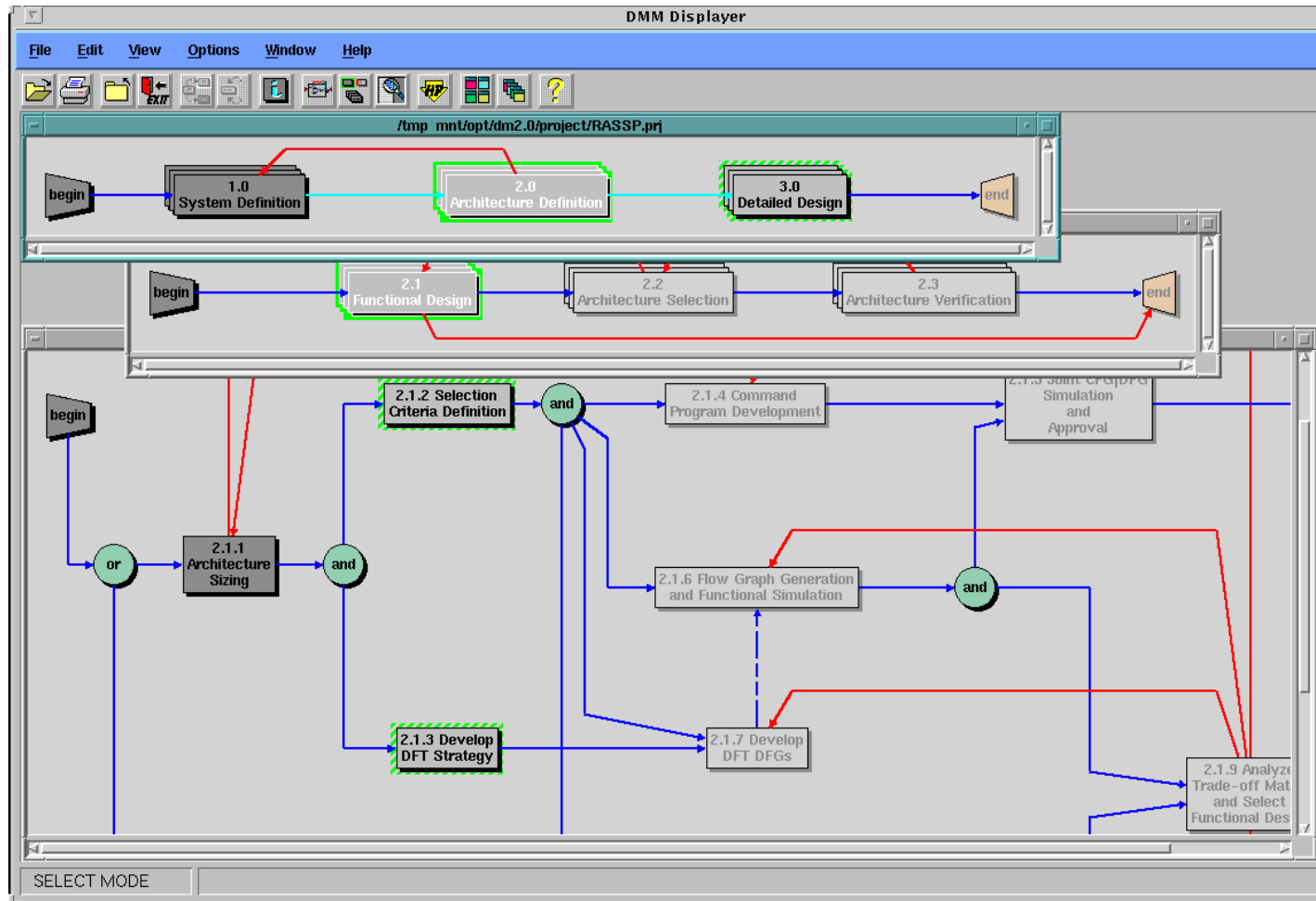
Project Plan Implementation with Workflow



Project plan provides realtime overview of project

*DMM = Design Methodology Manager

Workflow Implementation in DMM



RASSP Process Modeling Language (PML)

- **Developed a Neutral Process Language to exchange Integrated Definition (IDEF) 3x models**
- **Developed a repository to store IDEF3x process models**
- **PML was extended to support Precedence relationships between tasks**
- **Developed an interface to take process models from “top-down flowcharts” to process repository**
- **These efforts highlighted deficiencies in current technologies and the need for a comprehensive process toolkit**

Extended RASSP/BPR Strategy

- **Project scope, objectives, and vision**
- **Model and analyze the “as-is” process**
- **Simulate the “as-is” process**
- **Validate the “as-is” model and simulation**
- **Process and technological innovation**
- **Model and simulate the “to-be” process**
- **Cost/benefit analysis**
- **Implementation proposal**
- **Scheduling/workflow implementation**
- **Continuous improvement**

Modeling/Simulation Demonstration

- Simulation model generation
- “What-if” analysis

Modeling

- **If you don't model the process you**
 - Cannot fully understand it
 - Cannot make sure that users agree and view the process exactly as you do
 - Cannot optimize/improve the process
 - Cannot completely extract the TRUE requirements
-
- **Definition of a model:**
 - “M” models “A” if “M” answers questions about “A”
 - Ex: CAD model of a part

Change Levers/Enablers

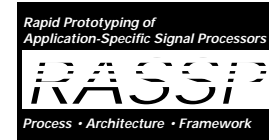
- **Organizational**
- **Cultural**
- **Information technology**
- **Measurements and incentives**
- **Skills**

Workflow Templates

Design Phase	Templates	Build 1A	UYS-2A	Final	
		Segments	Steps	Segments	Steps
System Definition	Requirements Analysis				20
	Functional Design				25
	System Partitioning				20
Architecture Def'n	Command Program Dev't				20
	Functional Design	2	14	2	14
	Architecture Selection	2	13	2	13
	Architecture Verification	2	16	2	16
	Hierarchical Simulation				20
	Primitive Development				20
Detailed Design	Module Design	2	24	2	24
	FPGA Design	1	10	1	10
	ASIC Design		18		18
	Backplane Design		14		14
	Chassis Design				20
	Cable Design				20
Concurrent Design	Parallel Tasks - Same data		1		TBD
	Multiple tool/data -Same task		1		TBD
Enhanced Concurrent Design	Process Iteration				TBD
	Multiple Engineers per Task				TBD
	Dynamic Workflow Creation				TBD
	Data Driven Precedence				TBD
Utility Workflows	Project			1	15
	Segment			1	15
	Process Step			1	5
	Design Reviews			1	5
	Reuse Element Generation	1	7	1	26
	Enterprise Maintenance			1	30
Total	27	10	95	15	370 ++

Enterprise Environment - Capabilities

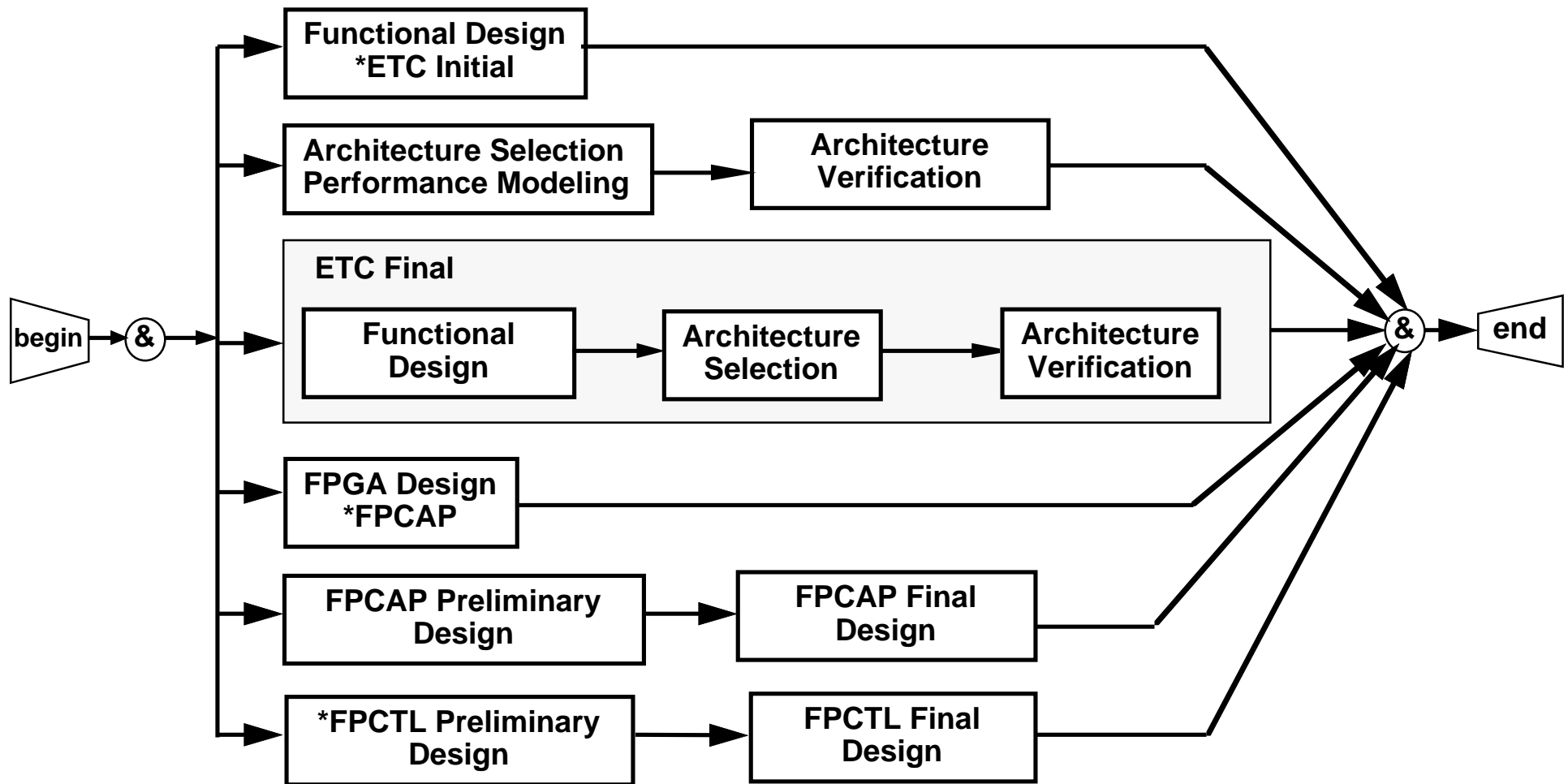
Design Methodology Manager (DMM)



Capability	Build		Example	Tools
	1A	Final		
Create and execute hierarchical workflows	Implemented	Same as Build1A	UYS-2 workflow contains functional-design workflow	DMM
Perform data-management functions	Implemented	Same as Build1A	Automated check-out and check-in of data items	DMM
Launch multiple tools per process step	Implemented	Same as Build1A	Launch RDD100 and JRS Tools for a task	DMM
Use multiple data items per Sstep	Implemented	Same as Build 1A	Multiple Excel files for the analysis step	DMM
Execute concurrent design workflows*	Basic concurrent workflows supported	All concurrent design workflows supported	Process iteration, dynamic workflow creation, multiple engrs/task, data-driven precedence	DMM
Create (or reuse) and execute project plans	Basic capability provided	Ability to combine segments and steps to develop plans	Construct advanced UYS-2A plan using library workflows	DMM / DM2.0

*Concurrent design workflows defined in process capability section

Benchmark 3 Design Process



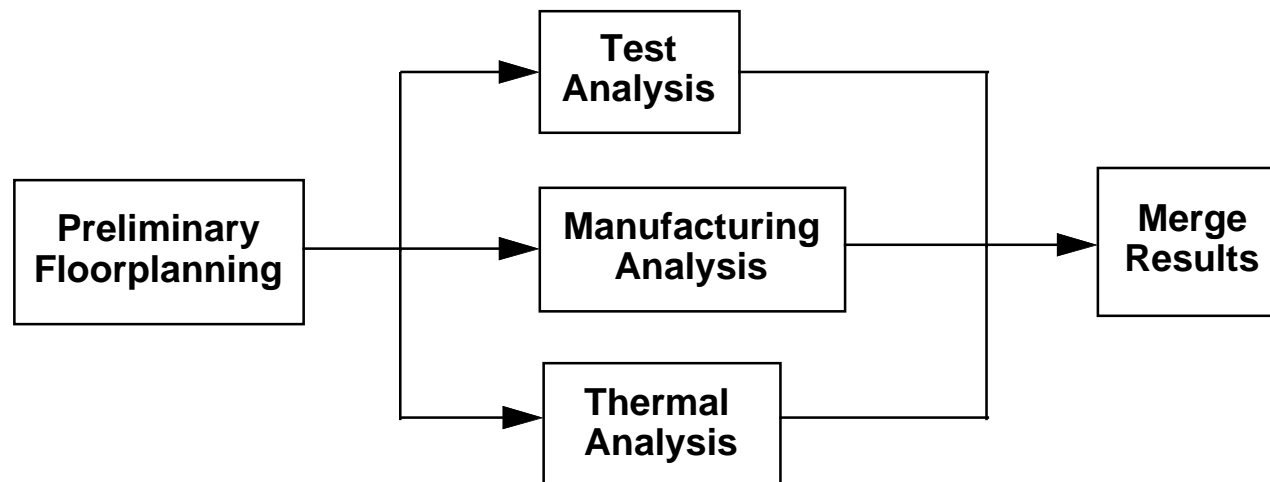
*ETC = Echo Tracker/Classifier

*FPCAP = Floating Point Commercial Arithmetic Processor

*FPCTL = Floating Point Controller

Concurrent Engineering

- **The RASSP workflows support concurrent engineering by allowing multiple design tasks to be performed simultaneously by different design engineers**
 - Engineers copy the design data from the shared workspace to their private workspace, perform the task, and make any necessary design changes
 - When completed, the project manager merges the design changes into one version and checks it back into the shared workspace
- **For Build 2, we are investigating the use of tools that will merge design changes together into one version**



Process Iteration

- **Two types of Process Iteration**
 - Reset
 - Repeat/Failback
- **Underlying issue of process iteration is data selection/versioning**
- **Process iteration is supported in Build 1A by the use of failback paths within the workflows**
 - Current version of data is always used
 - No support for obtaining earlier versions of data
- **Build 2 and subsequent versions of RASSP will support process iteration**
 - Failback paths in the workflows
 - Implementing the “Repeat” capability to support the RASSP spiral model
 - Data selection when “repeating” workflow tasks

Dynamic Workflow Creation

- **Dynamic workflow creation refers to situations where workflows need to be created/instantiated during execution of a project**
- **Two cases for dynamic workflow creation**
 - Reinvoke/design data pipelining
 - Multiple workflow instantiation
- **Reinvoke/design data pipelining supports the staged concurrency model of process execution, where dependent process steps receive interim results from the parent process**
- **Multiple workflow instantiations would be a project leader capability that addresses a situation where a new instantiation of a workflow is needed at some point during the execution of a project**
 - Each new instantiation would have its own unique set of business items
 - Would have the first task indicated as startable

Multiple Designers per Task

- **In designing large DSP systems, it will be very common to have multiple engineers working within the same workflow task (example: functional design of a module)**
 - Implies data sharing among the design team
- **Support for multiple designers per task is provided in Build 1A and on the Benchmark 3 program by declaring one person to be the owner of the task and data**
 - The task owner initiates the task and has the data checked out of metaphase into the owner's private work location
 - Other members of the design team copy their data to and from the owner's private work location

Critical Factors for Successful Business Process Engineering (BPE)



- Customer focus
- Top management commitment and involvement
- Clearly stated vision, goals, and objectives
- A proven methodology
- Focus on long term process management
- Focus on changing processes, not just fixing them
- Focus on critical/high payback processes
- Don't ignore the cultural/organizational impact

Guidelines

- **Stay focused on the customer**
- **Modeling methods and software are just tools**
- **Select methodology before selecting software**
- **Intelligently use tools to understand and solve the problem**
- **Don't over-analyze; your models will never be perfect**
- **Keep decision points closer to where the work is**
- **Reduce controls and constraints**

Application to AM3

- **Developing “as-is” process models and simulations for**
 - Missile life-cycle
 - Seeker design
 - Guidance electronics
 - Factory
 - Procurement
- **Will use RASSP processes and infrastructure to develop “to-be” models and simulations**
- **Will use the Enterprise System to implement**

Benefits

- **Better understanding of processes**
- **Process improvements**
- **Process models versus process diagrams**
- **Better quantification of cycle times**
- **“What-if” analysis capability**
- **Well managed processes and information**
- **Status tracking**
- **Contribution to cycle-time and cost-reduction goals**

Why a Process Toolkit is Needed

- **Diverse process functions (capture, simulation, workflow, etc.)**
- **Diverse methodologies for performing these functions**
- **Many tools in the market to support these functions**
- **Tools become obsolete**
- **Some tools support one-way data exchange**
- **Data interchange done in proprietary formats**
- **Difficult to maintain and reuse process knowledge**

Existing Work in Process Interchange

- **RASSP PML**
- **MIT Process Interchange Format (PIF)**
- **SEE Interchange Definition Language (IDL)**
- **Workflow Management Coalition (WfMC) Standard Application Programming Interfaces (APIs)**
- **EXPRESS-P**
- **Commercial proprietary point solutions**

Challenge

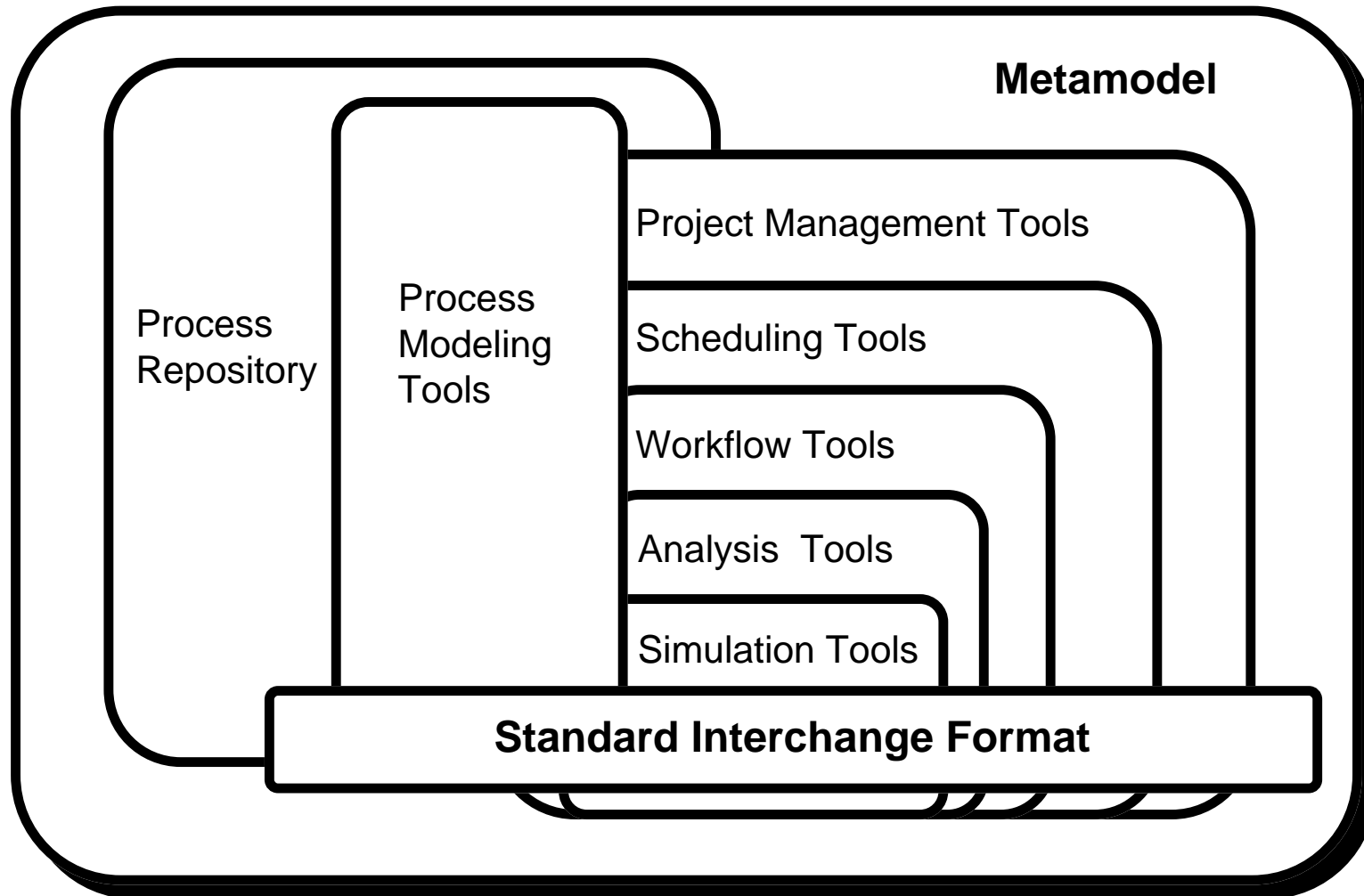


- **Develop and demonstrate a unified approach for process management**
 - Leverage existing research and standards
 - Demonstrate standard methodologies (such as RASSP) using commercial tools
 - Support all process-related aspects of BPR
 - Demonstrate useable capabilities using RASSP processes

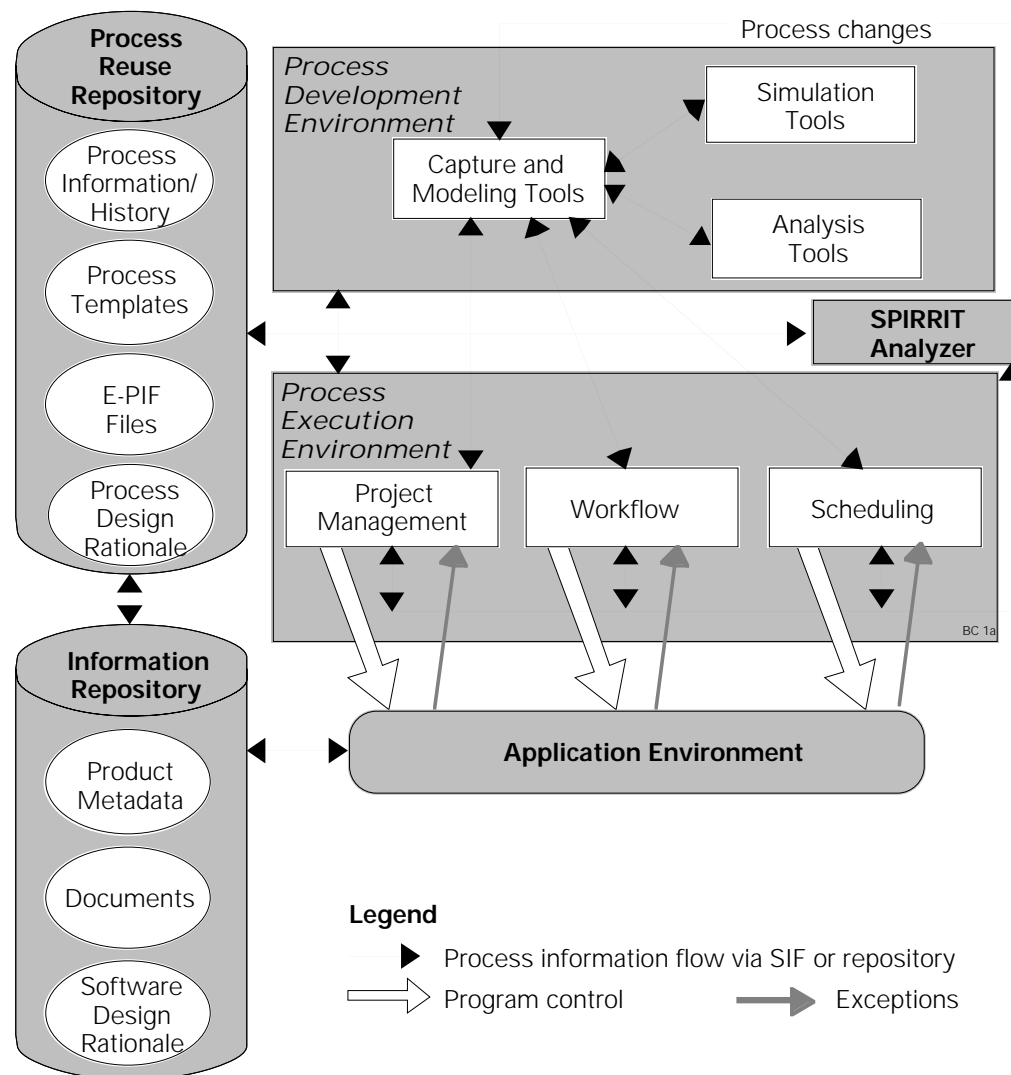
Scope

- **Process modeling**
- **Process analysis**
- **Process simulation**
- **Process execution (workflow)**
- **Process scheduling (finite capacity)**
- **Project management**
- **Process exceptions**

Process Technology Concept



Process Toolkit Architecture



Approach

- Evaluation and concept demo
- Leverage RASSP PML efforts
- Develop metamodel and interchange format
- Develop common API
- Develop interfaces to process technology tools
- Develop concepts to handle exceptions
- Develop process reuse repository
- Develop commercialization and standardization plans

Benefits



- **Process technology is benefiting RASSP and AM3 programs**
- **Toolkit will provide a cost-effective mechanism to implement design methodologies**
- **Results will benefit several ARPA (RASSP, AM3, Agile, etc.) and DoD (BPR, EI) programs**
- **Commercialization of the results through multiple vendors**