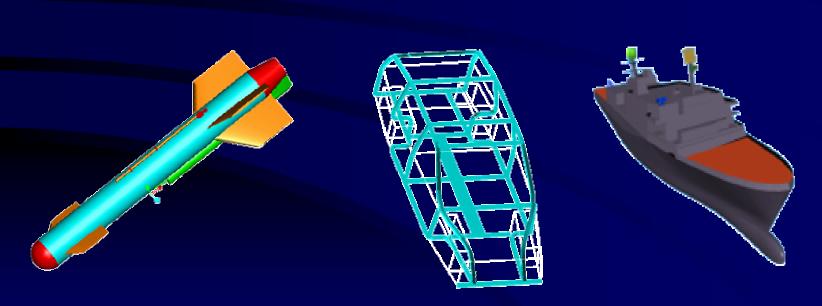# Activity Based Operation Modeling
and
Events Simulation

TechnoSoft the Company

TechnoSoft Inc., founded in 1992, is a leading provider of object-oriented Modeling software for Knowledge-Based Engineering.

The Adaptive Modeling Language, AML, is the foundation of many commercial and defense Knowledge-Based Engineering applications.

In partnership with major aerospace industry and US government research labs TechnoSoft has developed and deployed key engineering solutions for technology assessment and evaluation.

Activity Based Operation Modeling

Support the modeling of the operations and activities of the engineering processes at each level of the product life cycle: Design, Production, Deployment, and Maintenance.

Technology Assessment

Assess the impact of the technology variables on the product processes and related cost employing:
- Product Data Model (Geometry, Material, Process)
- Producibility Knowledge Base
- Process Data Base (Tooling and Equipment standards)
- Resources and material Manager

Process Modeling Methods and Elements

A unified object-oriented part model representing a common computational model enabling the direct exchange and link of part geometry/data and Process Elements.

Model the process operations sequence, resources, and material requirements facilitating assessment of technology variables impact on operation time, span time, and cost.

Provide a web-based collaborative environment supporting the real time interaction among the various participants

Facilitate the representing of the process various element for operations sequencing optimization accounting for resources constraints and interdependencies.

Process Domain Definition

Support the defining of custom domain-specific process element templates, called meta-processes or process catalogs. Basic elements are Operations, Resources, Material, and Components.

Labor categories, machines, facility resources, etc, can be defined based on the general element provided. Attributes and relationships can be dynamically added and defined.

The tailored elements can be used to build dynamic parametric process model. These meta-processes can then be saved to a file and used in future process models.

Benefits

- Support standard representation and documentation of processes activities and operations.

- Facilitate sharing of process knowledge among disciplines, as well as among partnering organizations and contractors.

- Facilitate technology assessment and cost feasibility early in the design stage.

- Trace cost variance with design releases.

- Account for cost at each level of the model hierarchy and across processes.

Framework Adoption

Provide the tool to supplier as stand alone applications or provide access via the internet.

Enable the supplier to characterize their production process via providing their production operation model and resources.

Enable the exchange of dynamic operation models without jeopardizing any of the supplier proprietary information.

Applications

Cost Estimation

Time and Schedule Estimation
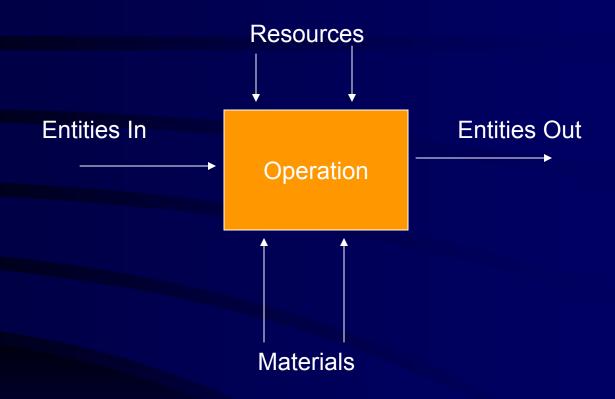
Resource Management
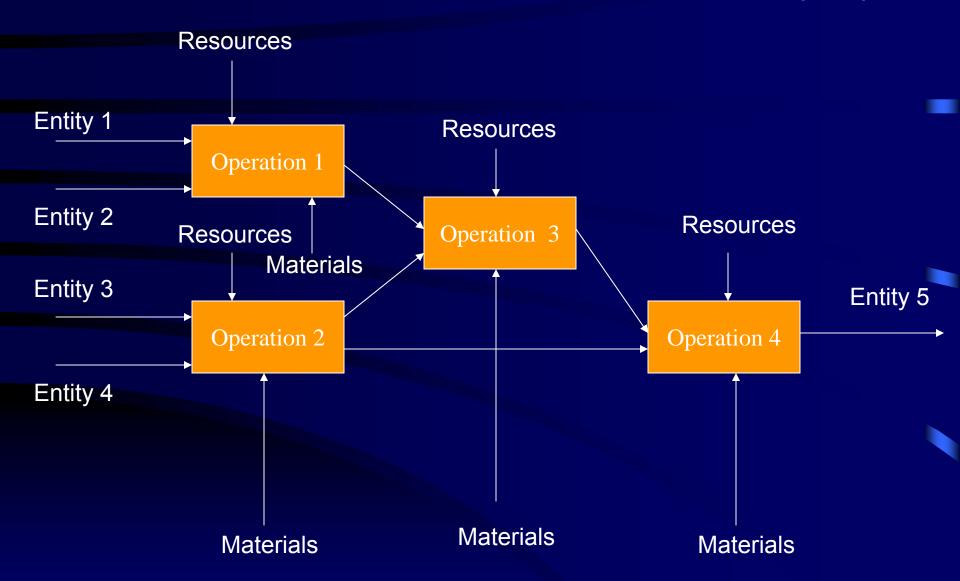
Stock Management

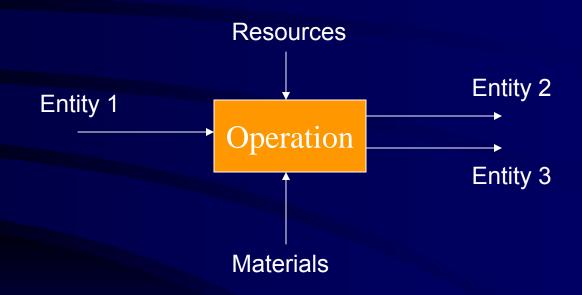Progress Tracking

Process Planning and Simulation

Process Visualization

Discrete Event Simulation

Process Elements Abstraction

Resources

Entities In → Operation → Entities Out

Materials

Process Elements Abstraction (cont)

Process Elements Abstraction (cont)

Process Elements Abstraction (cont)

Operations
Attributes
Duration
Start Time
End Time
Cost
Resources, Materials, Input & Output Components
Predecessors

Components
Subjects that the Operation act on, or add value to.
Attributes
Cost

Process Elements Abstraction (cont)

Resources
Finite resources such as labor, machinery, facilities, etc.
Attributes:
> Available Quantity
> Cost Rate

Material
Perishables such as fuel, stock, supplies, etc. *Attributes:*
> Available Quantity
> Cost Per Unit

Event
An event that is external to the physical operations and statistically related such as weather or damage
Attributes:
> Frequency
> Cause
> Effect

Cost Accumulation

Process Cost = $\sum$ (Activities Cost)

Activity Cost = $\sum$ (Resources Cost) + $\sum$(Materials Cost)

Resource Cost = (Resource Cost Rate) * (Activity Duration)

Material Cost = (Material Cost Per Unit) *

(Units Consumed by Activity)

Process Operations Schedule
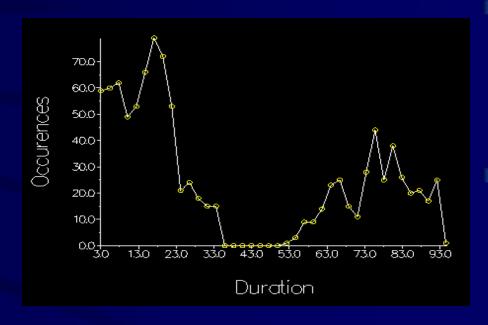
Process Span =   MAX (Activity End Time)

  – MIN (Activities Start Time)

Activities are scheduled based on the 'Predecessor' relationships between activities.

Scheduling will take into account Resources and Entities.
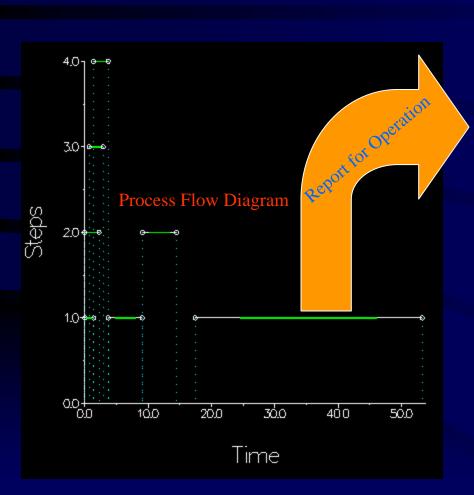
Post Processing

Gantt Chart

Random Variable Distribution

Reports

Process Flow Diagram

Report for Operation

Resource Report — Paint-Op-0001

Resource	Name	Qty
Start Time (Sec)	17.4518	
End Time (Sec)	53.2685	
1	Paint-Machine-0001	1.0000
2	Paint-Labor-2-0001	1.0000

Close