



Are You Being Served?

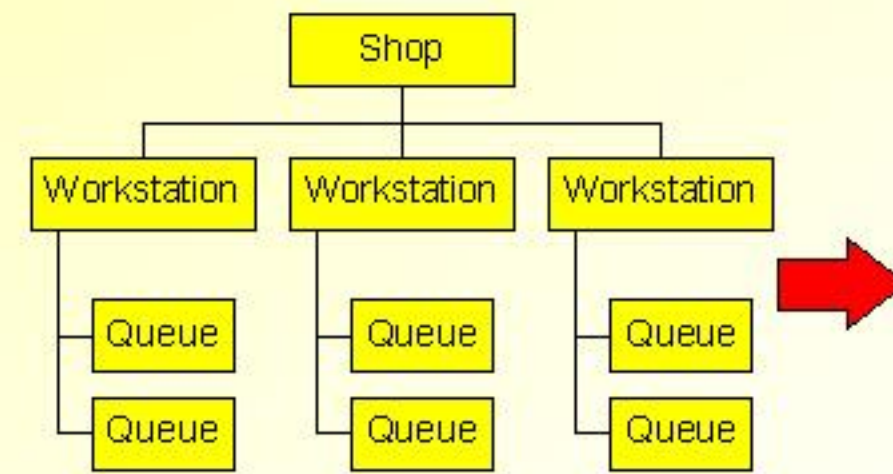
- **Servers** are the basis for most simulation models. They coordinate the interaction of **queues** and **resources**.
- They are standalone production control units. However, they assume a **push production control**.
- New factories use **pull production control**. Pull production control requires greater system integration.
- A **manufacturing process** is an alternative to a server, but it requires greater modeling infrastructure.

BUILDING BETTER MODELS

Simulation of Production Control

Production Control Framework

- A **production control framework** provides the necessary infrastructure to use manufacturing processes.
- It partitions production control into a three-tier hierarchy. Hierarchy based on time horizon of decisions.



Framework

Results

- Implemented the PCF using **Arena**. Each tier is represented by a module in a special template.
- Modular, parametric representation of production control increased model adaptability by **95%**.



Implementation

BETTER FACTORIES

Supply Chain Simulation Using Arena and Excel

Issues

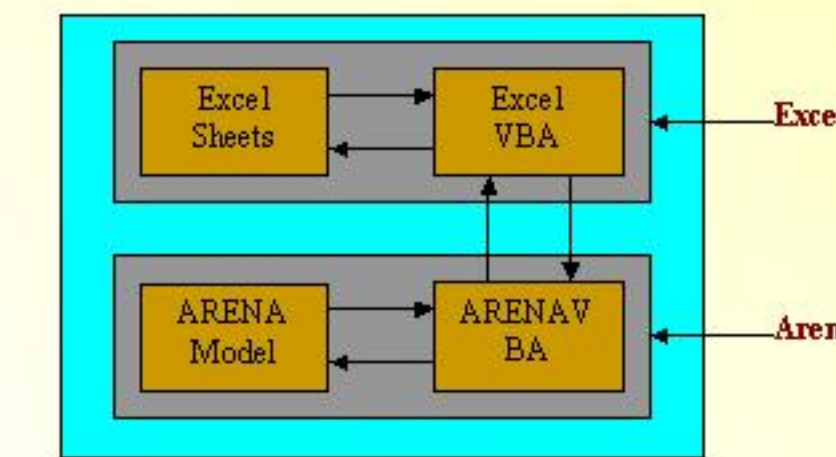
- Supply Chains are dynamic, stochastic, and complex systems
- Simulation softwares are not custom made for supply chain simulation
- Lot of effort involved in building supply chain models

Approach

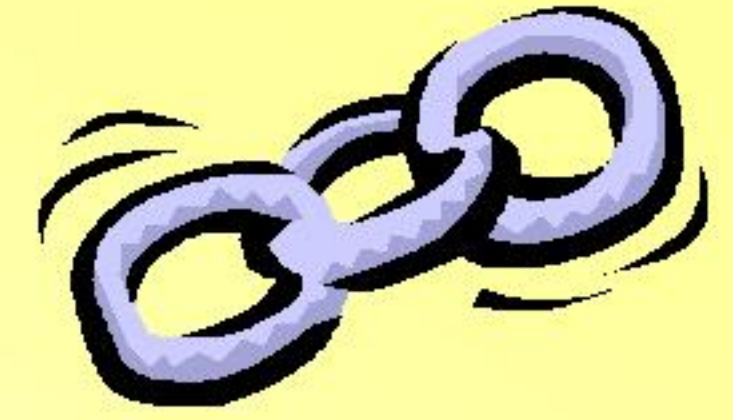
- Build modules that can be put together to construct supply chain models
- Standardization through Supply Chain Operations Reference model proposed by the Supply Chain Council

Benefits

- Reusable modules make building supply chain models easier
- Different structural and operational approaches can be simulated to choose the best alternative

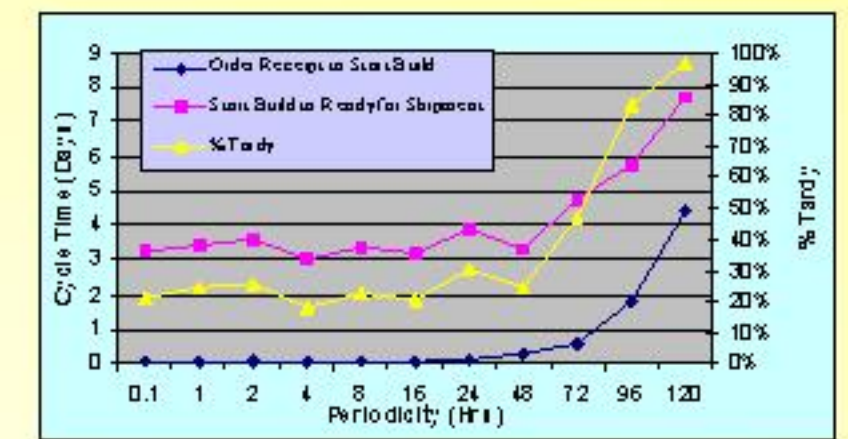


Arena – Excel Interaction



Rescheduling Frequency and Supply Chain Performance

- Effect of Sourcing, Production, and Delivery rescheduling frequencies
- Effect on Cycle Time and Percent Tardy performance



Sample Output

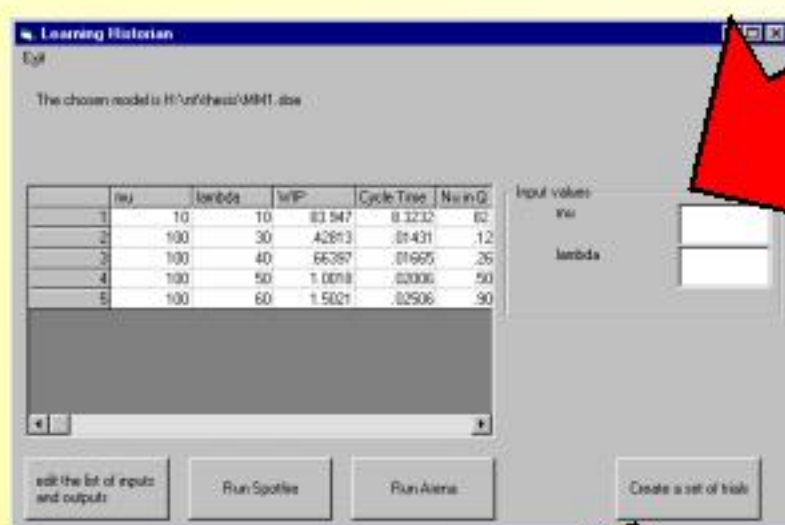
BETTER SUPPLY CHAINS

BETTER LEARNING

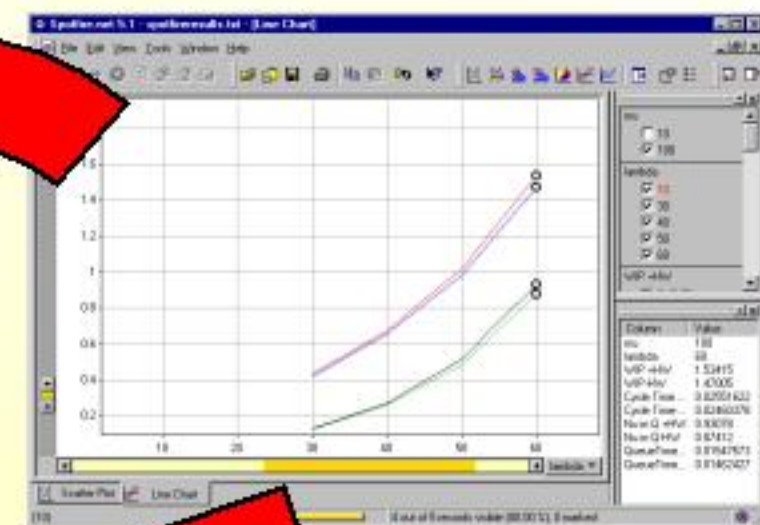
Learning Historian for Discrete Event Simulation

Facilitates learning by making it easier to run trials and visualizing results

- User selects input and output variables
- Enters parameters for multiple trials
- Displays table of results



Input Interface



Output Interface

- Visualizes results
- Shows confidence intervals for multiple trials

- Backend runs trials
- Processes results

Eases Usability
Enhances Interactivity
Promotes Exploration
Increases Understanding

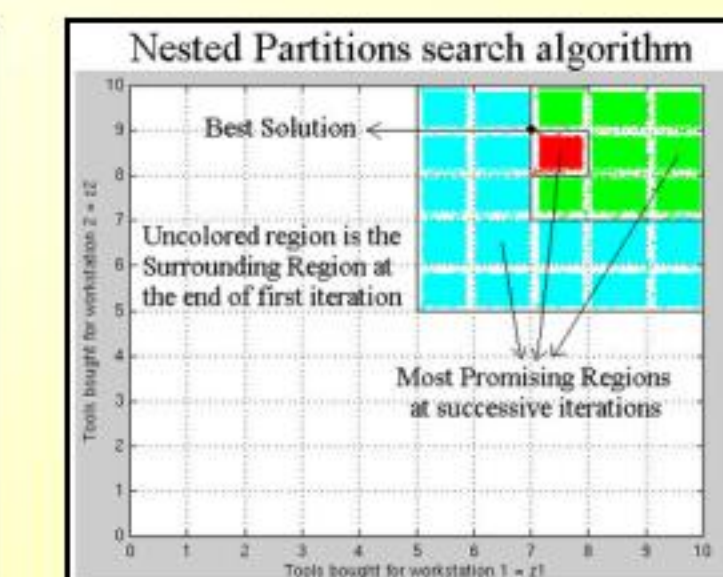
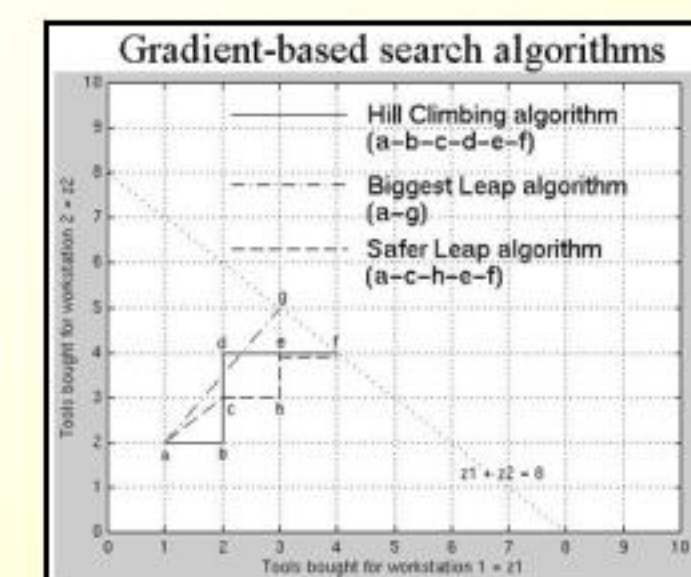
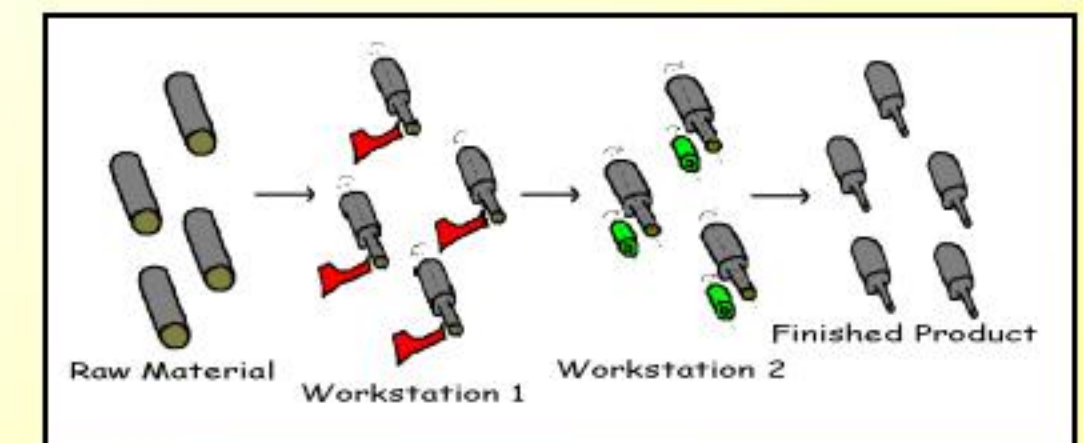


USING MODELS BETTER

BETTER SOLUTIONS

Simulation-based Stochastic Optimization

How many tools should be purchased for each workstation, to minimize the average cycle time?



Simulation provides a way to solve problems that cannot be solved analytically

