Modeling the Supply Chain using Anylogic Simulation and MILP optimization

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Semiconductor Supply Network

**Fabrication**
- Decision: How many wafers to start into which factory when
  - Variable TPT
  - Die: Good, faster; Slower, not good

**Assembly**
- Test 1
- Test 2
- Decision: How many of which die to put into which packages in which factory when
  - Variable TPT
  - Product: Good, faster; Slower, not good

**Finish**
- Decision: Configure, pack, ship, where & when
  - Variable demand (volume and time)
Planning Testbed Environment

Physical network simulation
• Discrete Simulation to play forward dynamics in time
• Metrics collected on performance of planning policies

Inventory Policies – could be:
• Heuristics
• Statistical
• Dynamic Models

MPS Planning

Planning systems simulation
• MILP solvers find best answer given the current state of the world
• Simulates actual production solvers

New Plan based on current state of world

New State of world based on execution of plan and inventory policy forward in time
End-to-End Simulation Poly Formalism Modeling

- KIB enables modeling to match the semantics between the models
  - Data transformations
  - Control flow
- Interoperability is one time development effort between the applications
Database Generated Models

- Worldwide physical facilities
- Products
- Lead times
- Capacities
- Valid product routings
- BOMs
Run Time Implementations

Local – everything in-process

- Anylogic Simulation
- Java
- MILP Optimizer
- KIB Logic

Good when models can run on local machine
- Easy to configure

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- Anylogic Simulation
- Java
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Good when models very complex (>Millions Constraints) or want to run many models in parallel

- Message Q
- Streams
- JDBC
- File Server
- DB Server
- Optimization Server

- JDBC
End-to-End Supply Chain Simulation

Enables what-if of end to end supply chain design and scenarios
End-to-End Supply Chain Simulation

Semiconductor manufacturing simulation from supplier to customer. Enables what-if of supply chain design and scenarios

• Use Cases
  – Test bed for planning and control strategies
  – Analysis on financials and service levels
  – Scenarios to procurement strategies
  – Inventory versus Service Level trade-off
  – Transportation trade-offs

• Poly-Formalism Approach
  – Heuristics for Inventory strategy
  – Optimization models for planning algorithms
  – Discrete event simulation for material flows