Discrete simulation examples

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Overview

- Types of discrete-event simulation software:
  - general purpose drag-and-drop
  - programming libraries
- Case 1: Airport logistic simulation
- Case 2: Supply chain simulation
- Case 3: Transport simulation
- Conclusions and outlook

Types of Simulation Software

General-purpose:

- Arena
- Simio
- Simul8
- Plant Simulation
- Enterprise Dynamics
- Extend
- Anylogic
- …

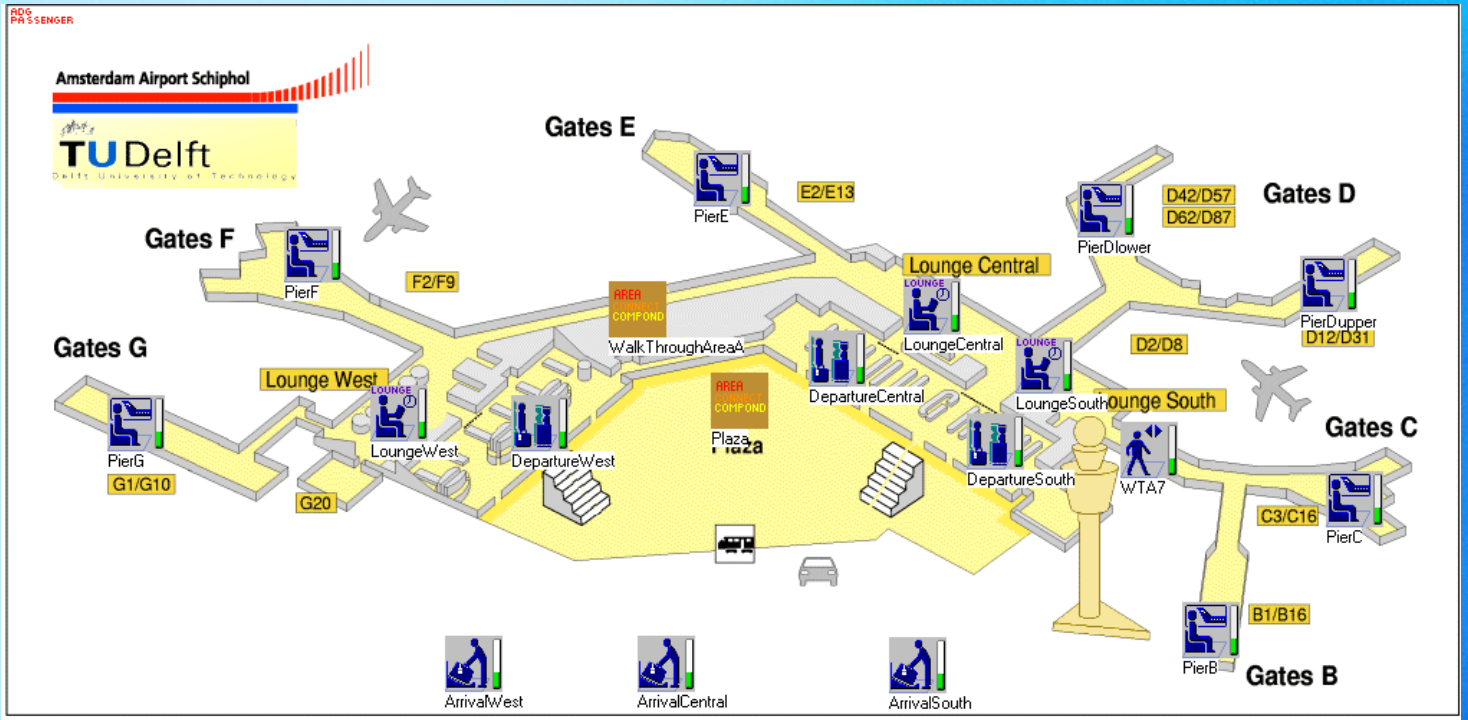
Developments:

- hierarchy
- libraries
- 3D animation
- input/output
- optimization
- extensions
- multi-formalism
- …

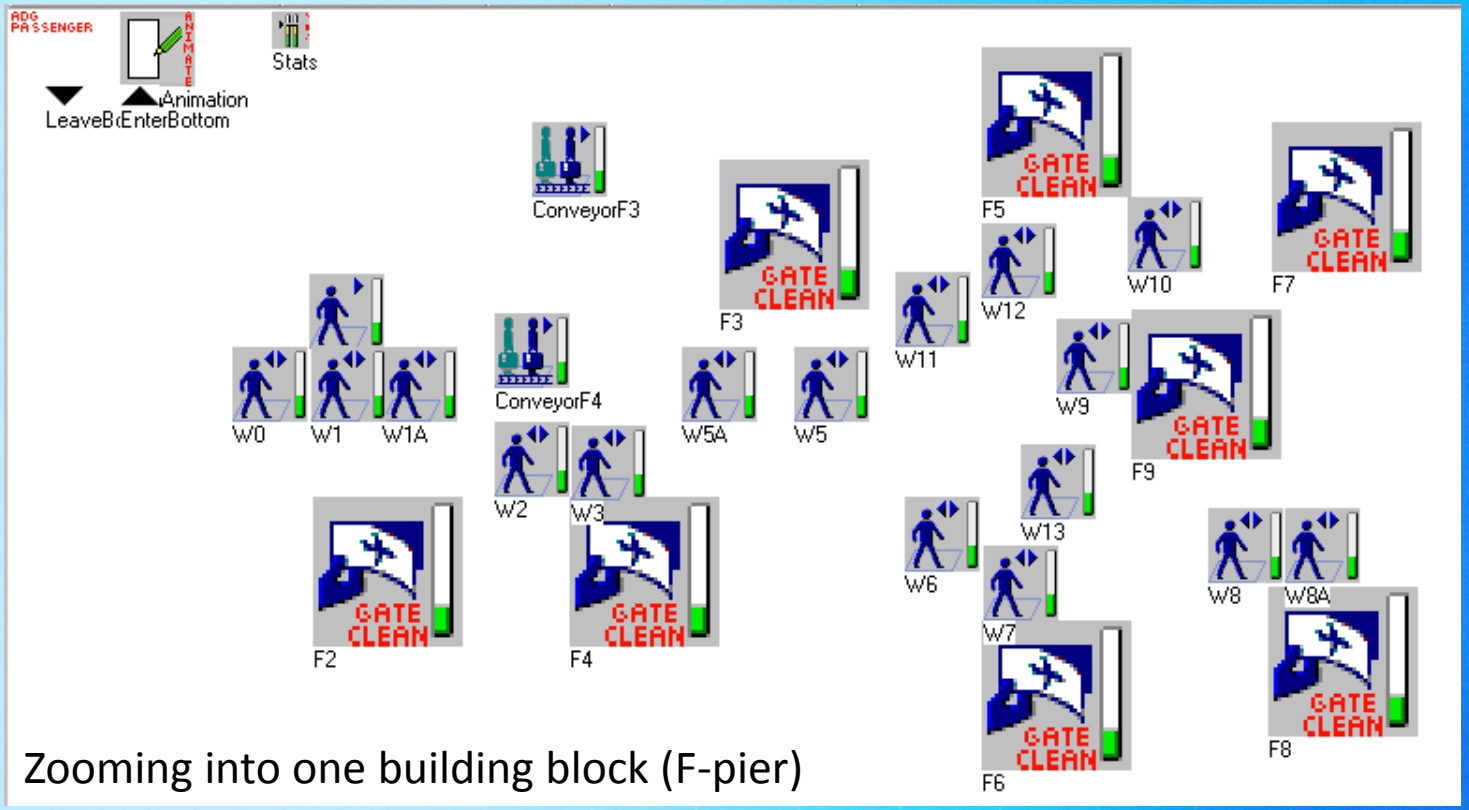
Example case: Airport logistics

- Observations:
  - one-shot models for each type of problem
  - long time to develop each model
  - model coding is quite complex
- Challenge: how to conceptualize and use building blocks
  - existing languages, formalizing concepts
  - new languages and concepts
- Question: can generic problems at airports be tackled in a generic way?
- Goal: one set of simulation libraries for airport logistics, design, and development

Example case: Airport logistics

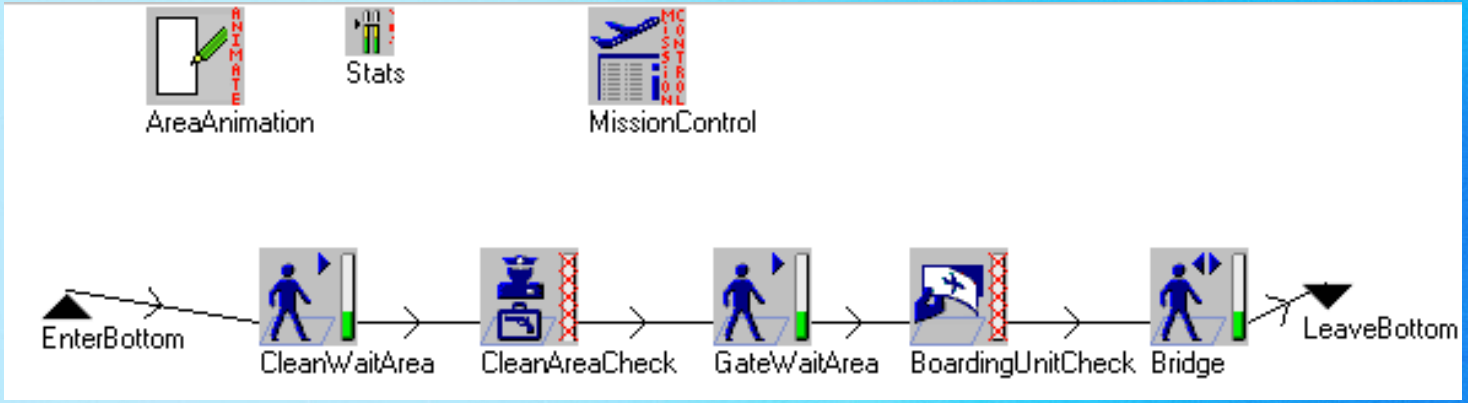


Example case: Airport logistics



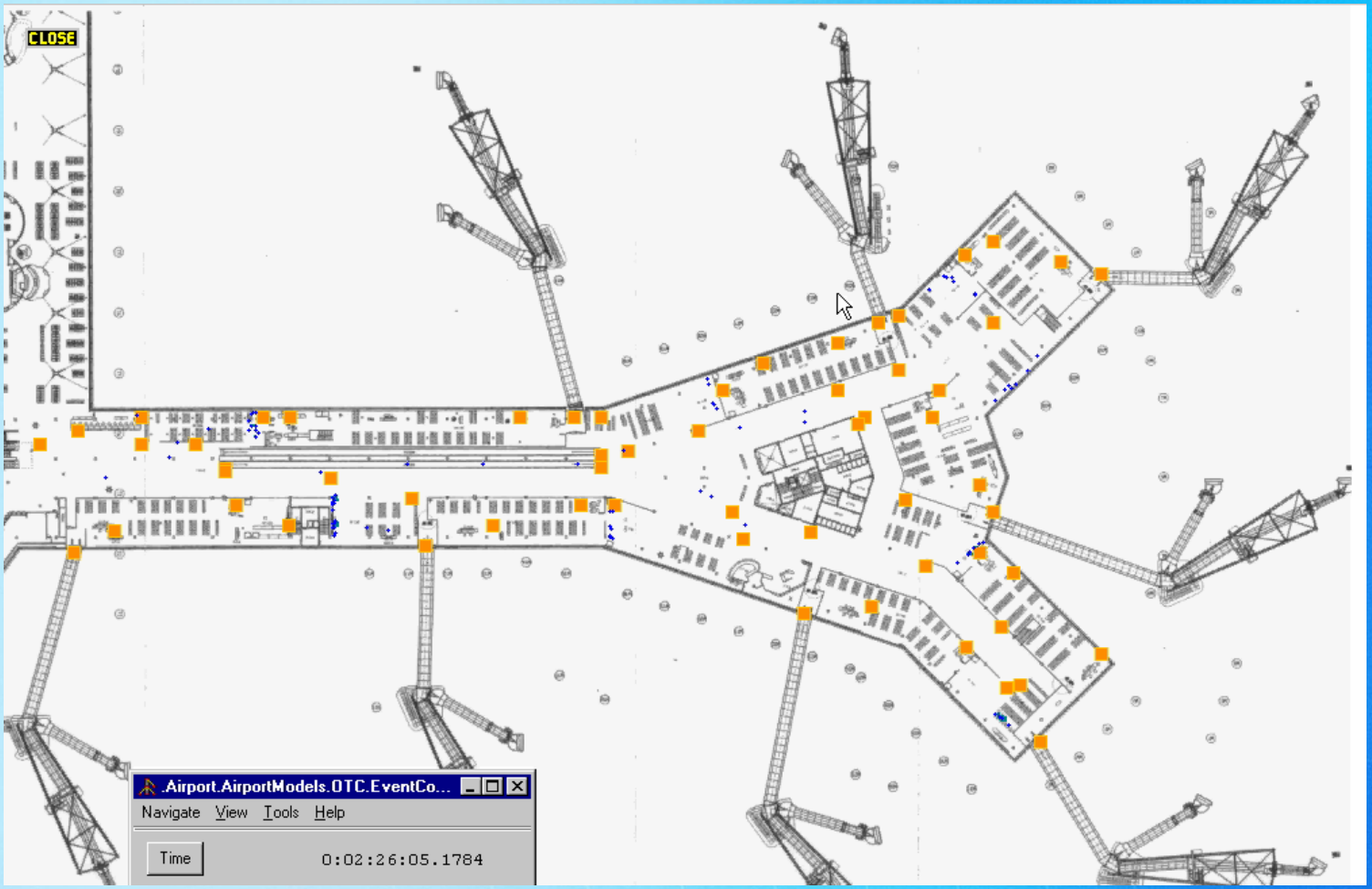
Zooming into one building block (F-pier)

Example case: Airport logistics



Zooming in further (building block gate F5)

- wait area
- security check
- clean wait area
- boarding control
- bridge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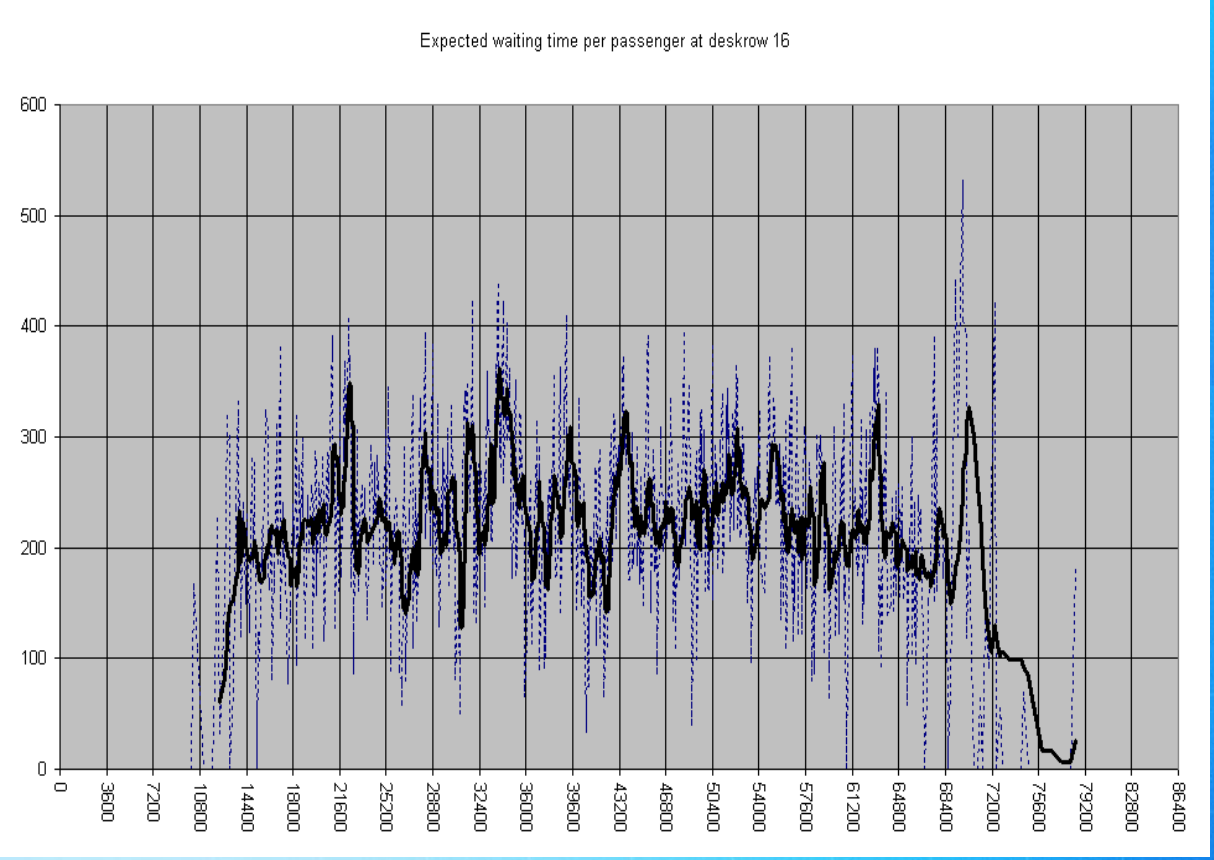
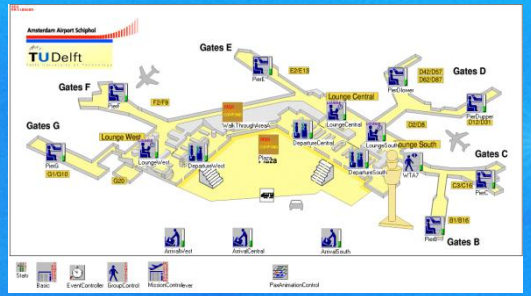
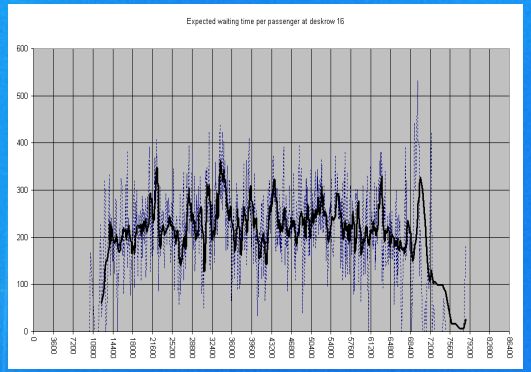
Example case: Airport logistics



Example case: Airport logistics

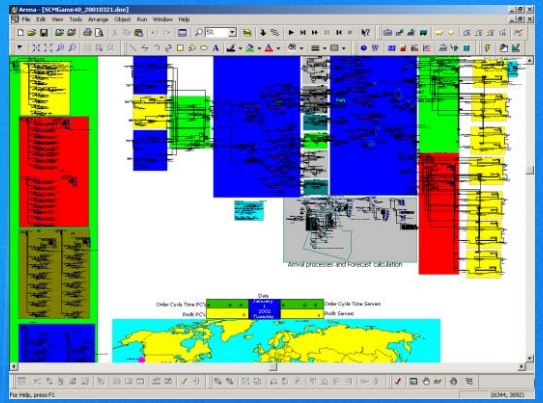
- Conclusions
  - one library for passenger terminal logistics at airports
  - infrastructure can be modeled quickly
  - hierarchy helps to reuse earlier efforts
  - models are still complex – a lot of the behavior is hidden
  - more focus on input, output, scenarios needed
  - extensible library is possible



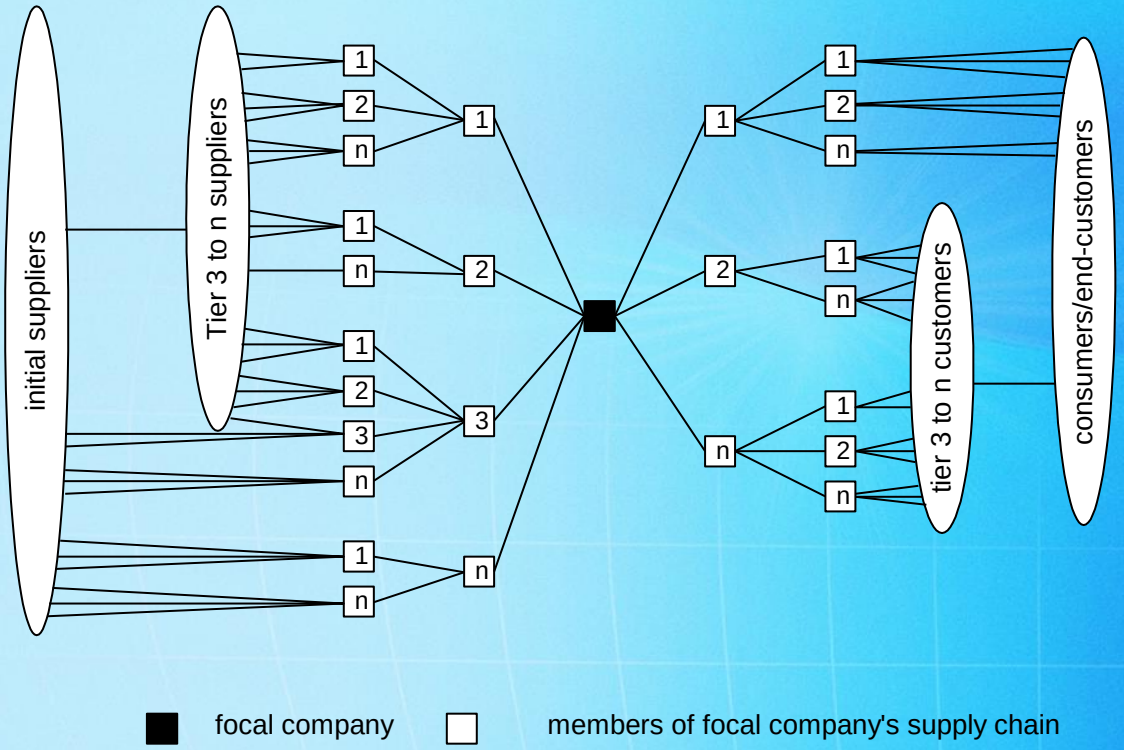


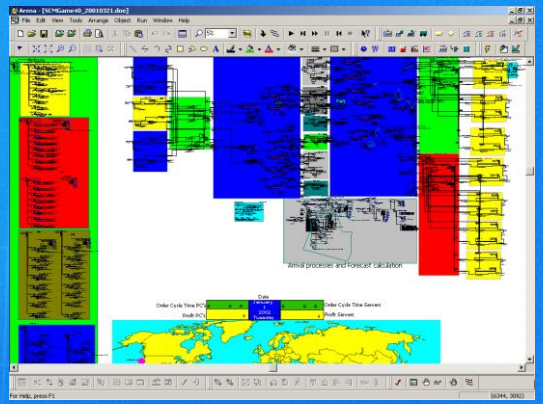
Example case: Supply chain

- Observations:
  - many changes in world-wide supply chains
  - time is an important factor
  - business relations are complex
- Challenge: how to create models for multiple scenarios that provide insight
  - compare alternatives
  - output is key
- Question: how can we parameterize models for multiple scenarios
- Goal: a flexible set of simulation models for demonstration and teaching

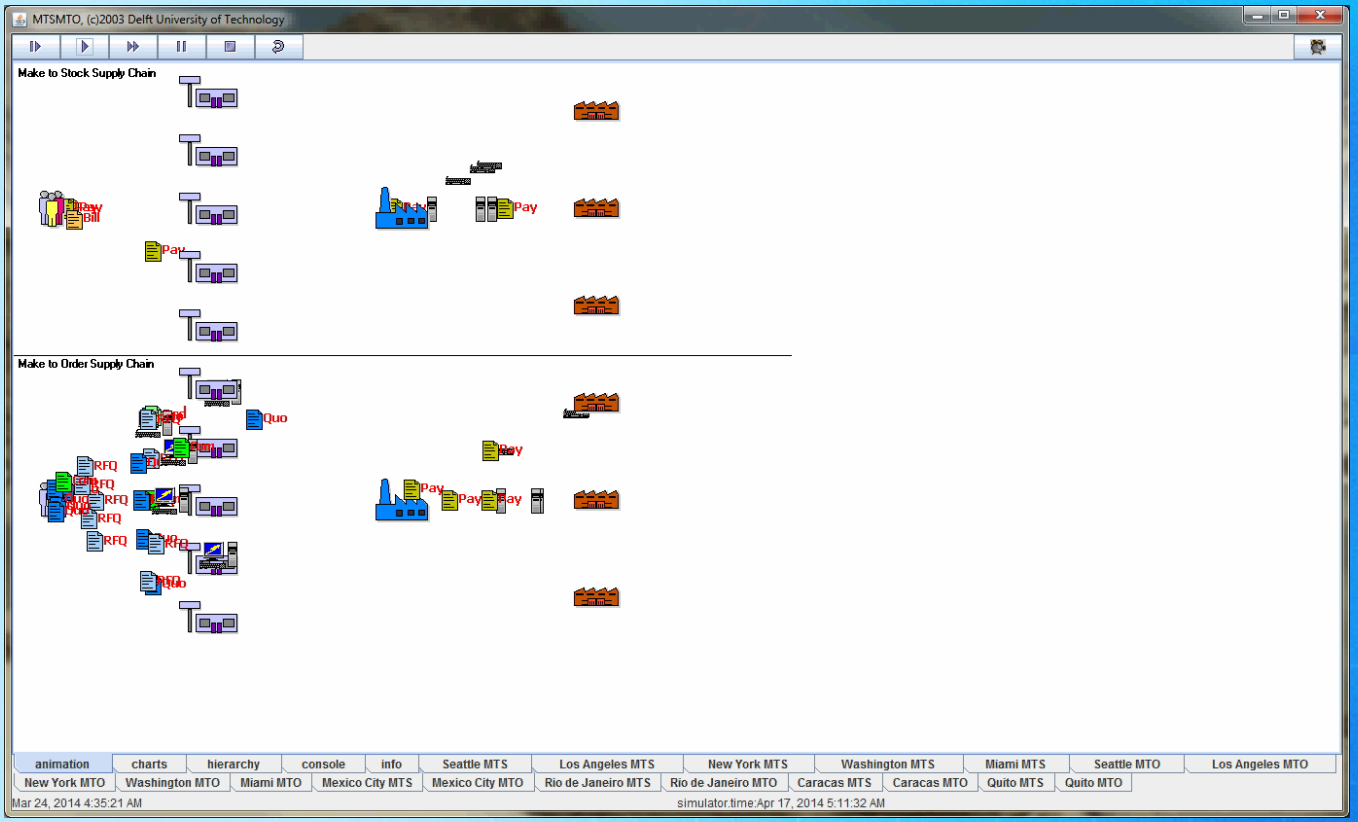


Example case: Supply chain

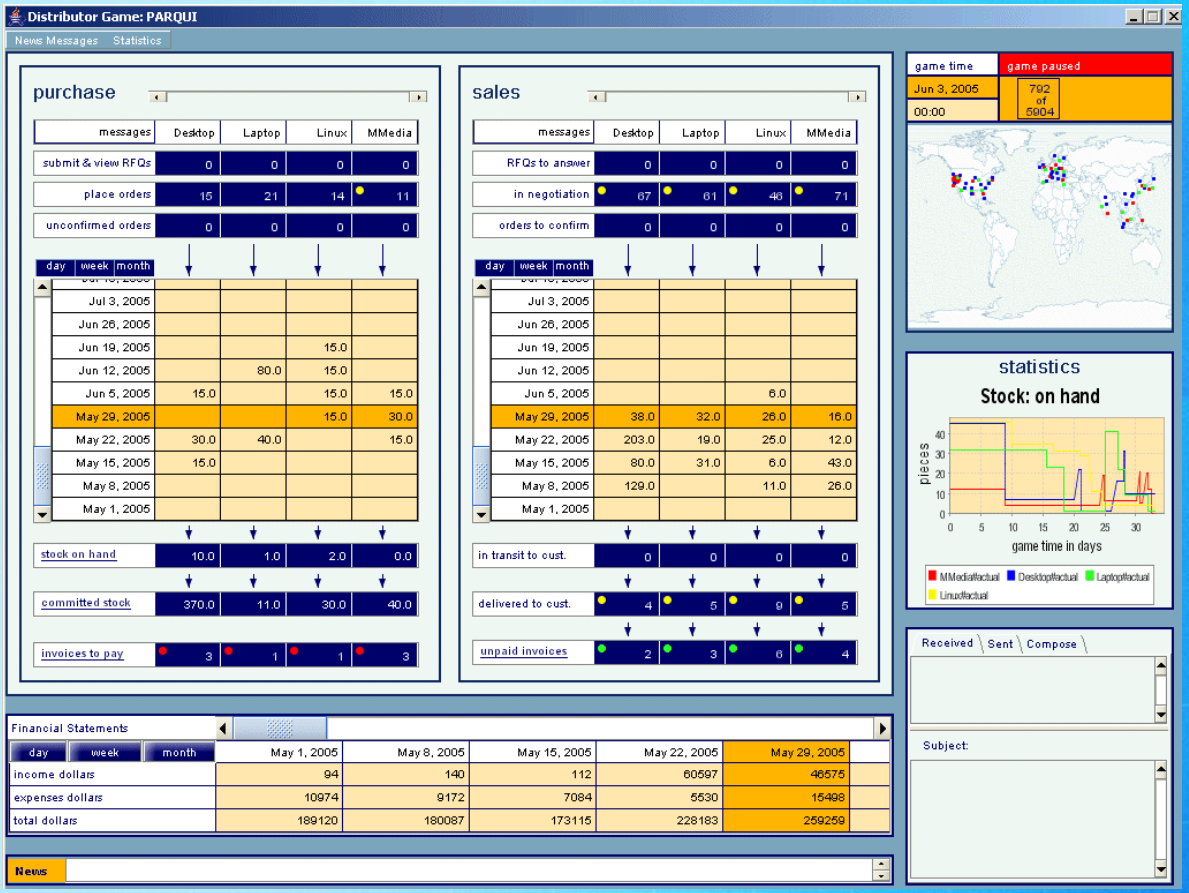




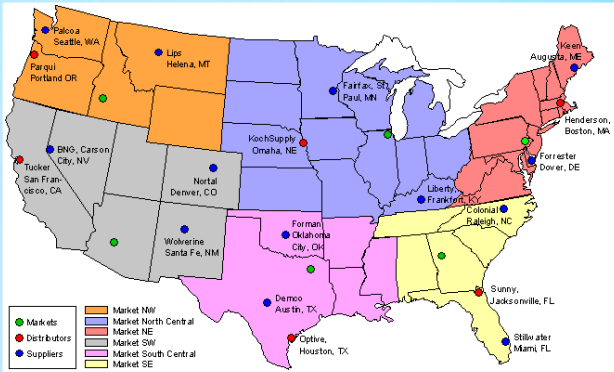
Example case: Supply chain

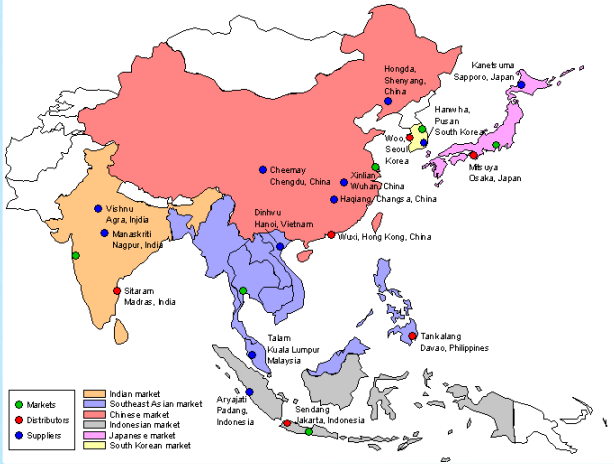


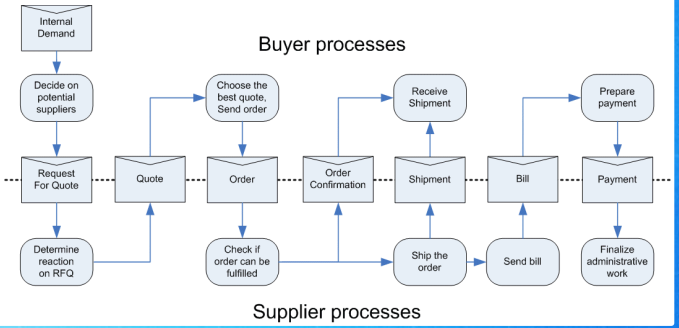
Extended to supply chain gaming



Extended to supply chain gaming

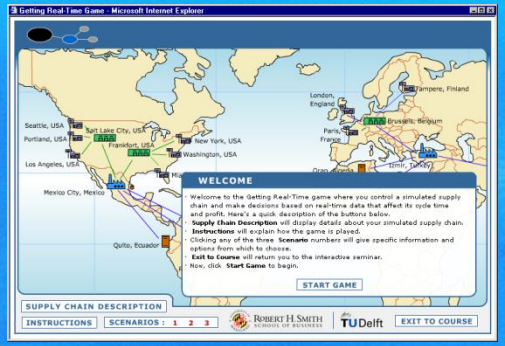


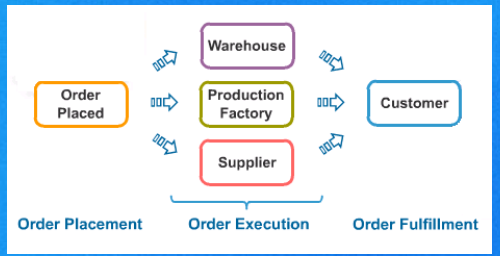




Example case: Supply chain

- Conclusions
  - flexible solutions for supply chain management
  - side-by-side comparison provides insight
  - focus on output
  - simulation libraries for programming languages (Java) used
  - programming libraries form the basis for further development such as games
  - serious games can be developed with a discrete simulation model as 'core'
  - this aligns well with decision making

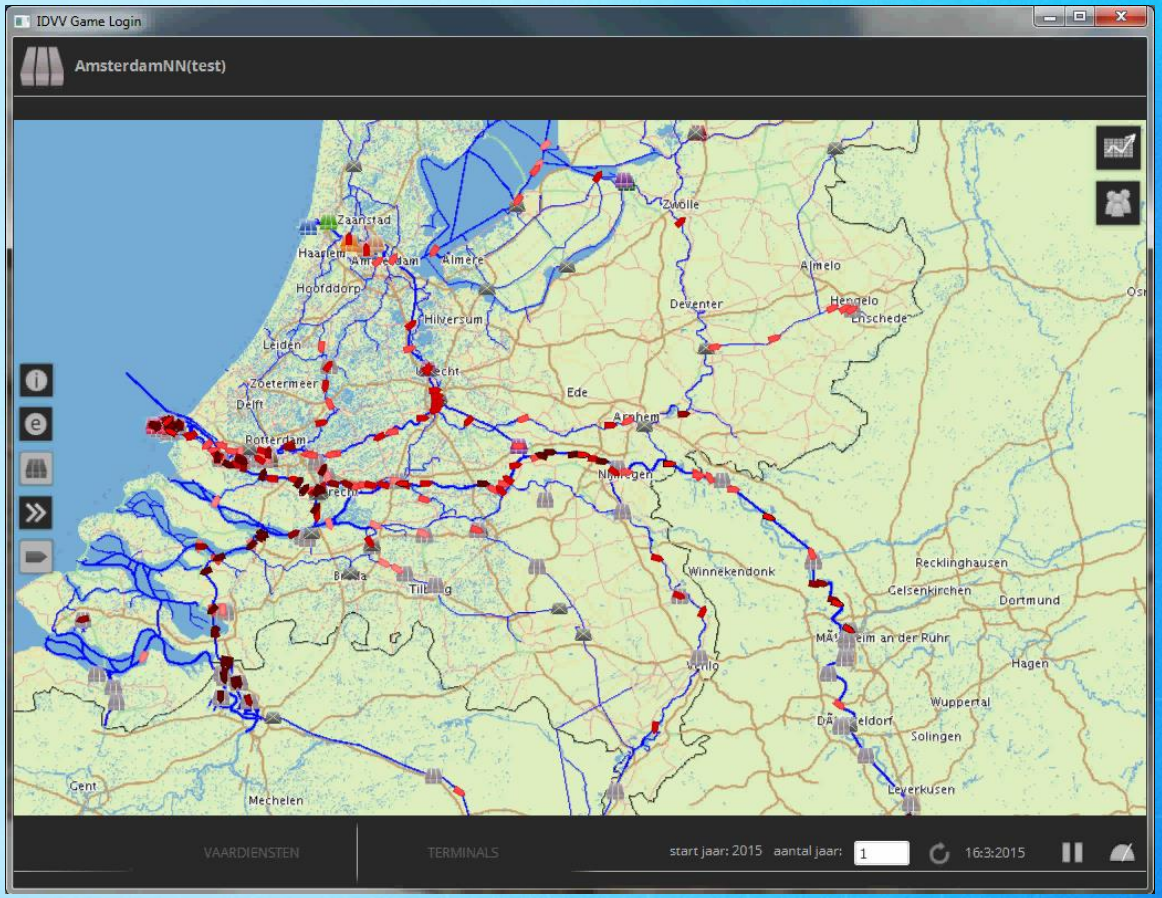




Example case: Barge transport

- Observations:
  - policy studies for long-term transport solutions are hard to carry out
  - need for data-based, fact-based models
- Challenge: models for long-term policy studies using micro-simulation
  - data-driven
  - usable in policy-making sessions
- Question: are micro-level models fast enough and usable in this setting?
- Goal: a micro-level model for barge transportation in The Netherlands that can be used in a policy setting

Example case: Barge transport



Example case: Barge transport

- Conclusions
  - micro-level simulations proved to be possible and effective for long-term decision making
  - discrete-event formalism created fast models
  - participants could use the model and were fully engaged

Thank you for your attention!

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