AnyLogic – a New Generation Professional Simulation Tool

Yuri G. Karpov

XJTek
St.Petersburg Polytechnical University

Russia

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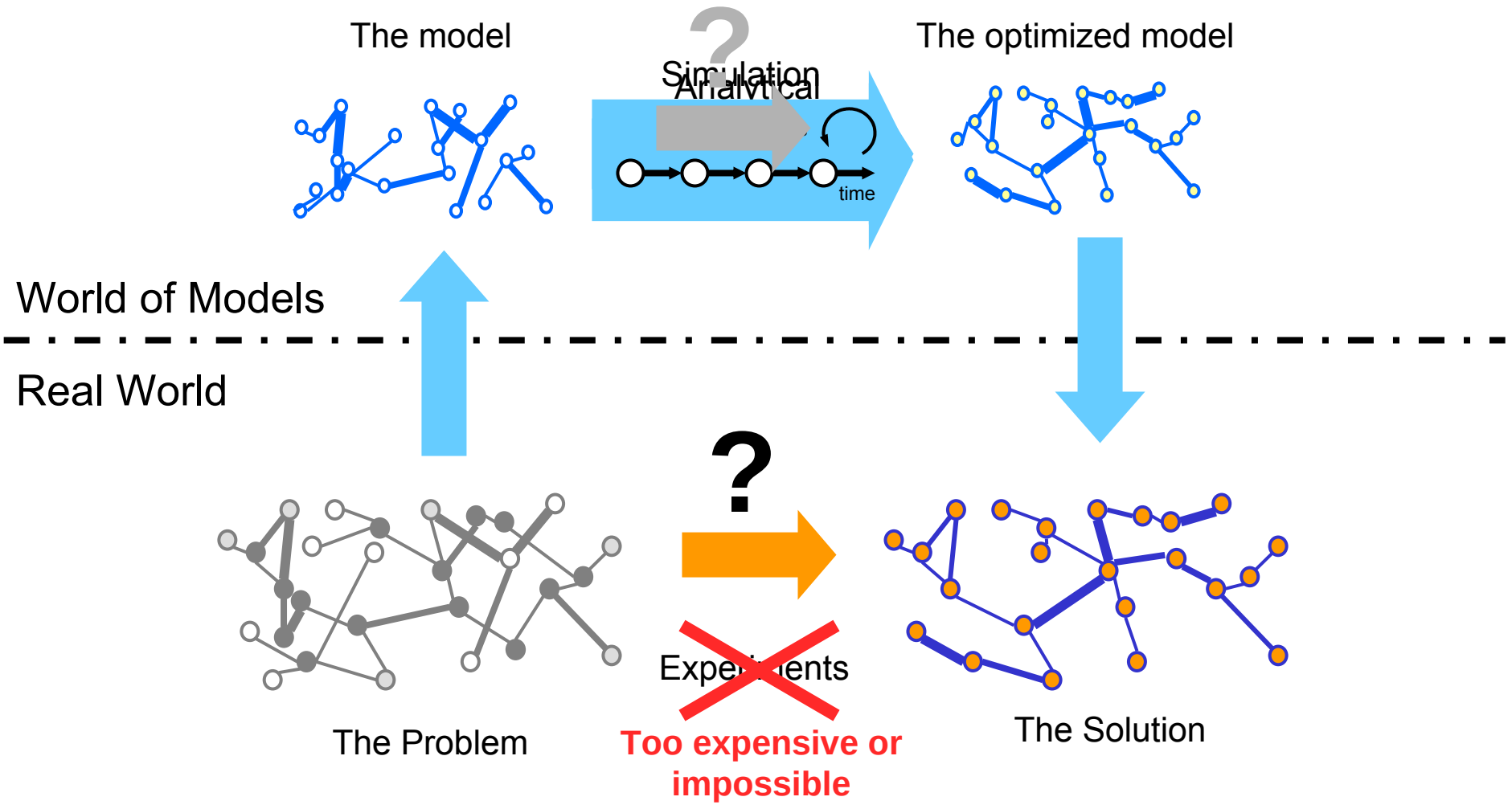
Modeling


The model
?
Simulation
Analytical
time
The optimized model
World of Models
Real World
?
Experiments
The Problem
Too expensive or impossible
The Solution

Analytical vs Simulation Modeling

Analytical (e.g. Excel-based)

- **Static, mostly deterministic model**
- \+ Helps to find some solutions
- \+ Easy to implement
- \- Hard to capture time, dynamics
- \- Hard to capture complex causal dependencies
- \- Hard to model time-related constraints
- \- Cannot play the model in time

Simulation

- **Executable simulation model**
- \+ Naturally captures causal dependencies and timed constraints of any complexity
- \+ Easily captures stochastic nature of the problem
- \+ Can play the model behavior in detail
- \+ Enables to measure virtually anything
- \- Takes more time and skills to develop

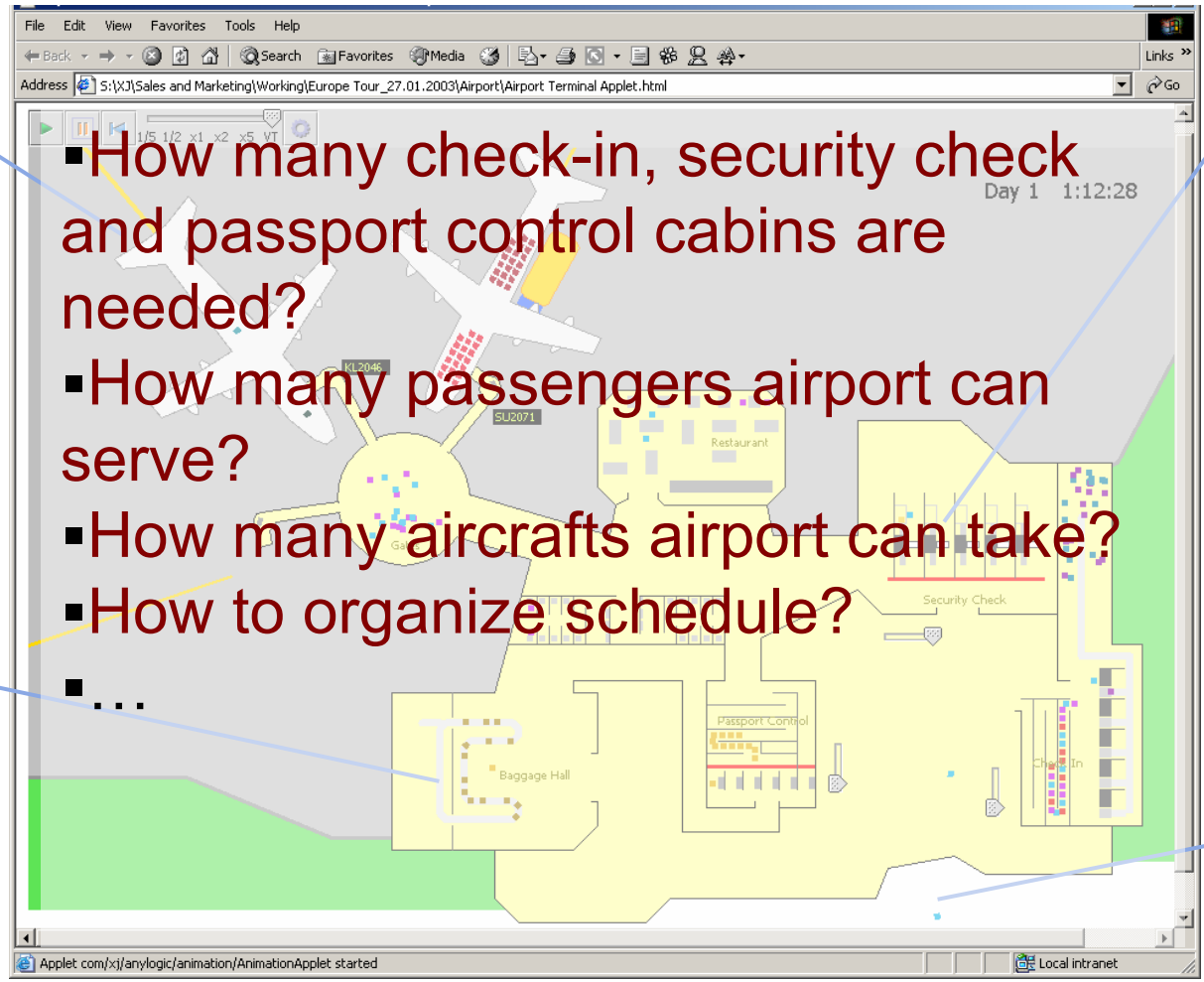
FOR SYSTEMS WITH DYNAMIC BEHAVIOR:

- \- **May miss a good solution or even give incorrect one**
- \+ **Gives better, more informed solutions**

An Example: Airport Terminal

Aircrafts appear with appropriate frequency

Baggage is taken by passengers after passport control



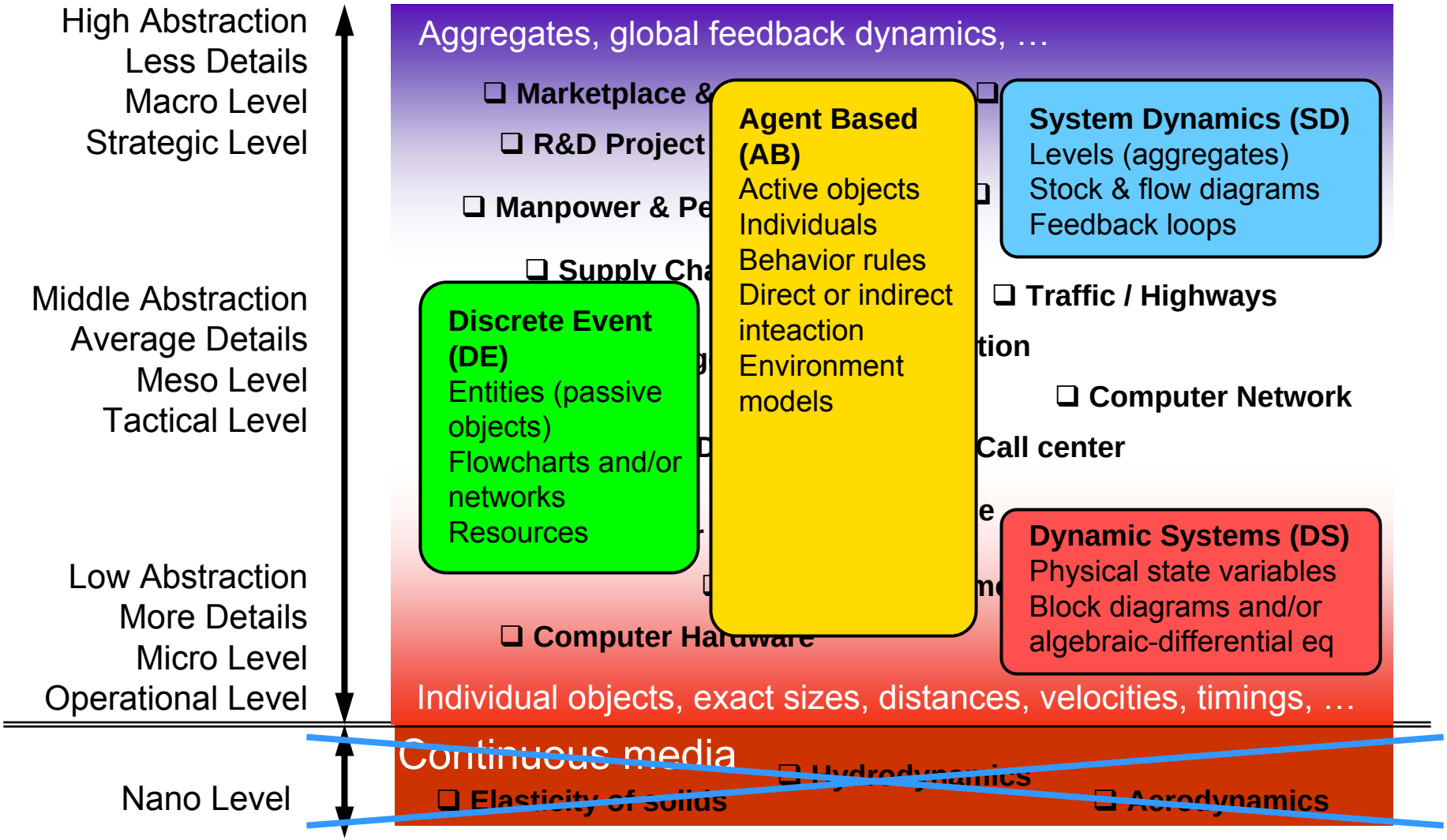
- How many check-in, security check and passport control cabins are needed?
- How many passengers airport can serve?
- How many aircrafts airport can take?
- How to organize schedule?
- …

Each “Check” has appropriate throughput

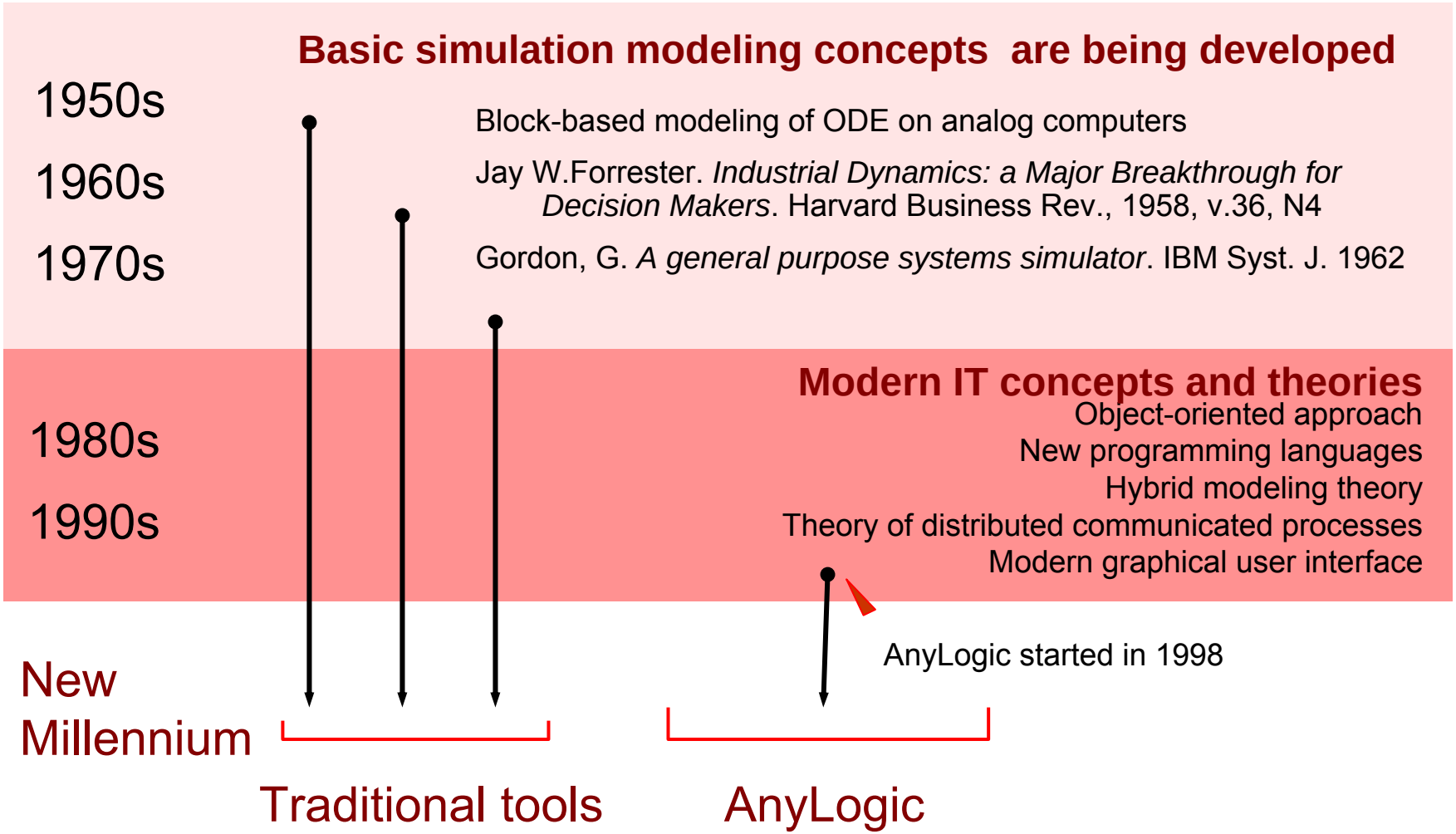
Passengers appear with variable frequency

Run

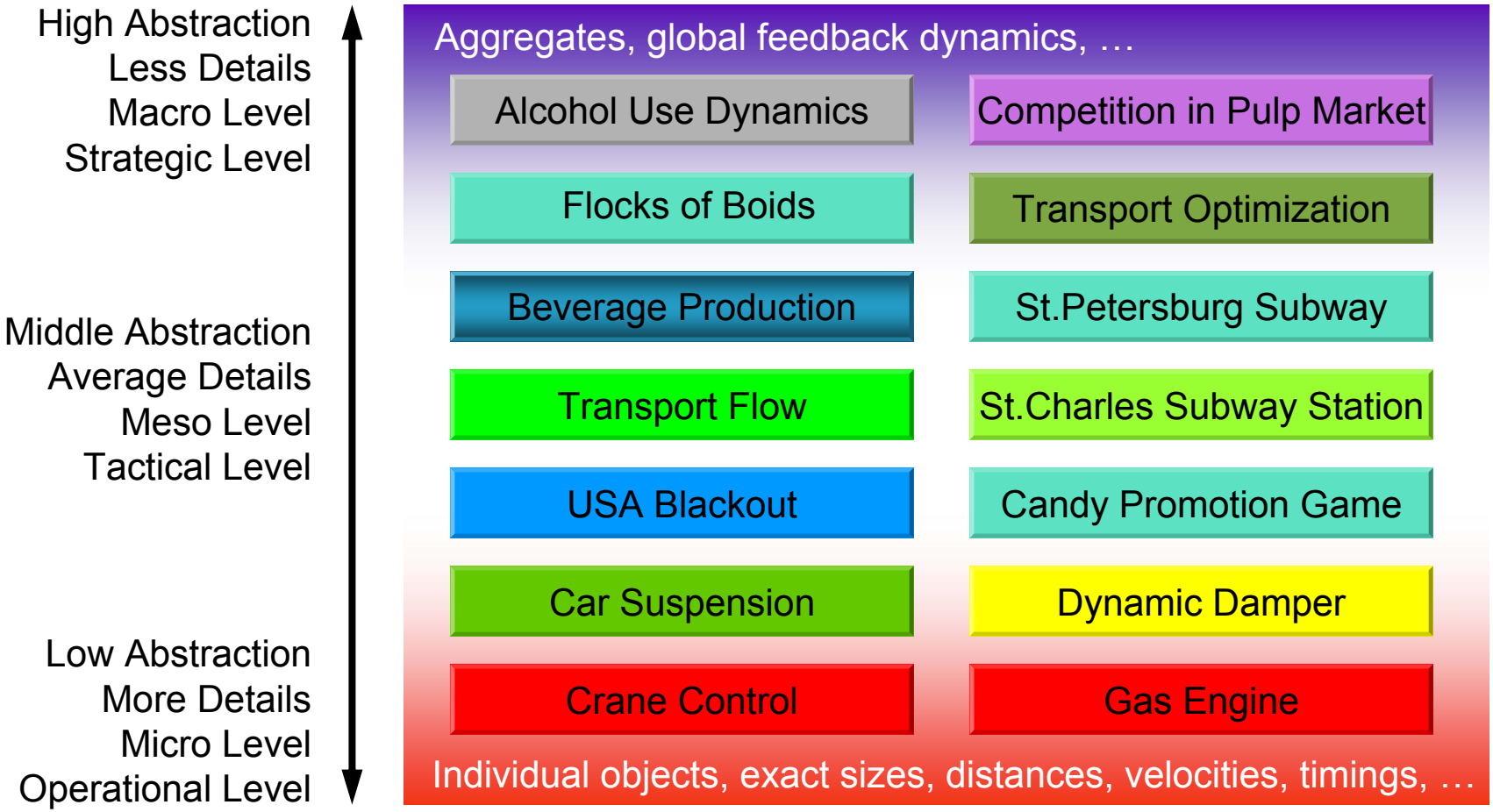
Abstraction Levels and Approaches



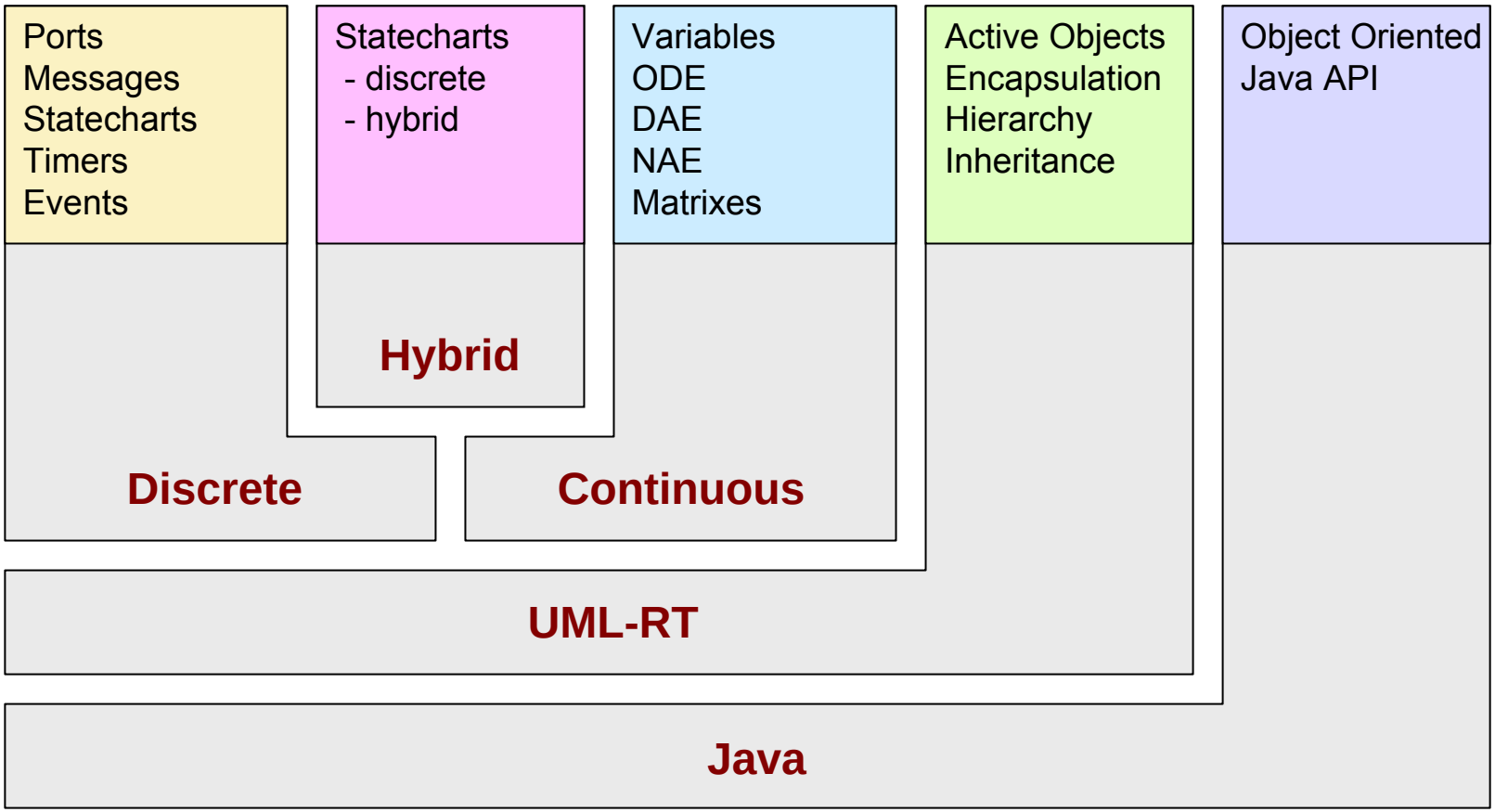
AnyLogic
A New Technology Simulation Tool



AnyLogic: all abstraction levels and mix approaches

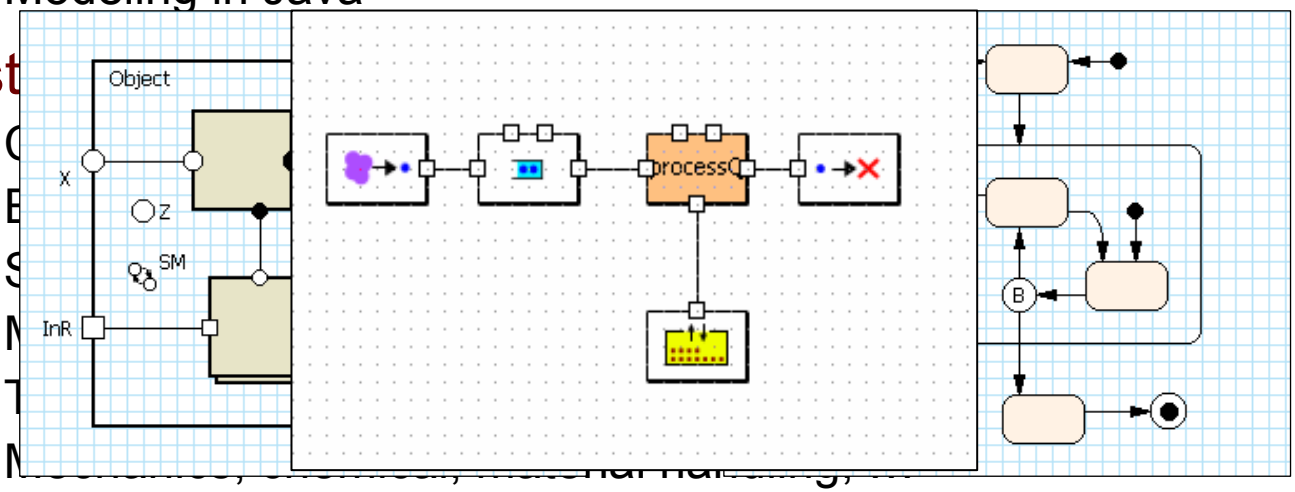


AnyLogic Modeling Framework



AnyLogic Professional Simulation Tool

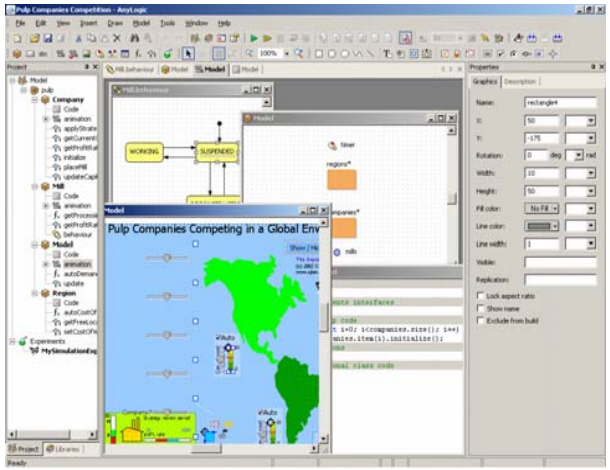
- Discrete, continuous and hybrid modeling
- Multiple modeling approaches:
  - UML-based OO modeling
  - Block-based flowchart modeling using predefined library blocks
  - Differential and algebraic equations
  - Modeling in Java
- A st
  - C
  - E
  - S
  - M
  - T
  - M
  - Education, military - and more…



AnyLogic - basics

- Java
- OO-approach, UML-RT
  - Active objects, messages, statecharts, timers, etc.,etc., etc.
- Hybrid dynamic system theory
  - Algebraic-differential equations, hybrid automata
- Theory of communicated sequential prosesses
- Best ideas of traditional simulation approaches
  - Visual specification, Flowcharts, Block diagrams, System Dynamics, …
- > 20 years of research
  - Research projects for HPLabs, Philips, Siemens, Samsung, IBM, AFRL, …
- > 10 years of SW product and simulation model development
  - SW products: COVERS, ModelVision, xjCharts, AnyStates, AnyLogic

Two Stages of Modeling in AnyLogic



Reducing complexity/flexibility

- Visual model development
  - Active objects, structure and behavior
  - Continuous / discrete
  - Predefined library objects
- Visual animation development
- Use all power of Java if needed

The ultimate goal is analysis, not model development!

- Run the model
  - Interactive control of model execution
  - Support of debugging and calibration
- Rich set of experimental stuff
  - Sensitivity, optimization, stochastic, ...
- Integration, interoperability
  - DB and Spreadsheet interface
  - Interface with external hardware and SW

AnyLogic – State of the Art

- Dozens of companies use AL
  - IBM, Boeing, General Electric, General Motors, Mitsubishi, Siemens, Rockwell Collins, US Air Force Research Lab, INRIA, Intelligent Finance, SolutionWorx, Canadian Nat Railways, Sony, ARC Seibersdorf Reseach, Avitech Aviation Management Tech., …
- Universities all over the World
  - TU Vienna, Uni Maastricht, Uni Karlsrue, Asahikawa National College of Technology, Auburn Uni, Purdue Uni, Uni of Illinois, Uni Virinia, Australian Defence Force Academy, Uni-Erlangen, Frauhoffer Uni, Uni Uta, Ohio State Uni, …
- Russian Companies and Universities
  - Russian Aluminium, EuroSib, ImpexBank
  - State University of Management, Ulianovsk Uni, Ural Tech Uni, St.Petersburg Uni, St.Petersburg Banking Inst, …
- Partners
  - ATN(France), ARC(Austria), SMS, SimNexus, OptTec, StatFit,
- About dozen of distributors
  - ARC, Simulation Modeling Serices, ATN, Cosinus, Decisio Consulting, Pitotech (Taiwan), Evans & Peck (Australia), …
- Conferences
  - Winter Sim, IIE Annual Conf, System Dynamics Conf, Sim Sol, …

Thank You!

- Questions?

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