

High-level System Design Using Foresight

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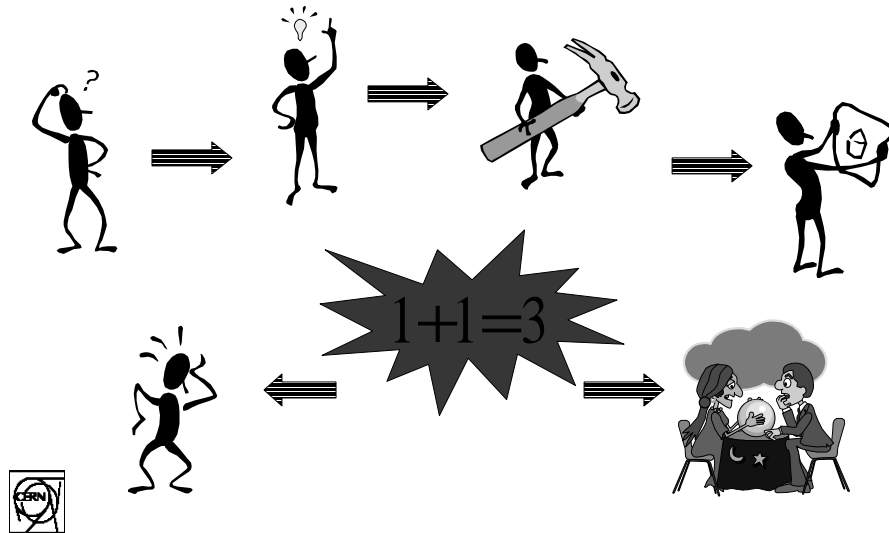


Outline

- ❖ Motivations
- ❖ Definitions
- ❖ Foresight: a Modelling and Simulation Tool
- ❖ A Simple Example
- ❖ ALICE



Motivations (1)

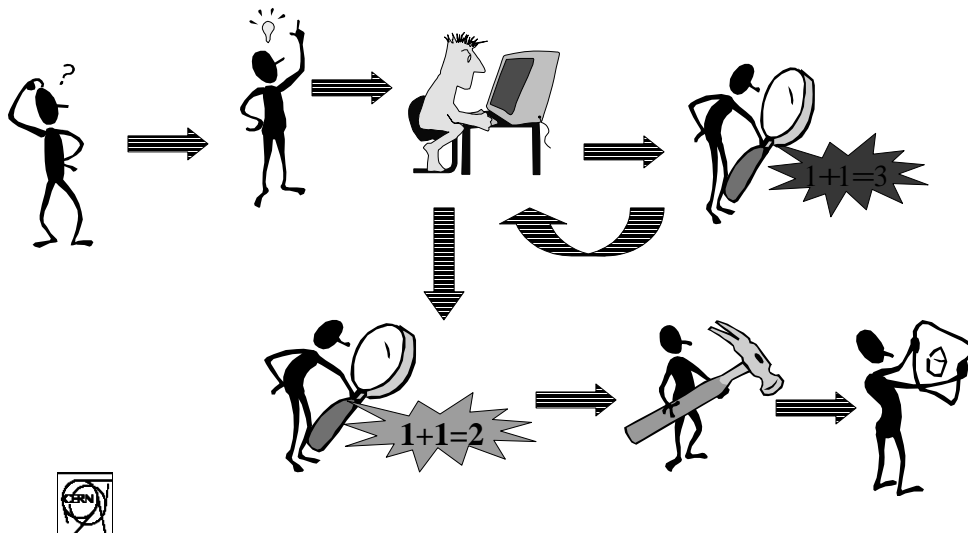


Motivations (2)

- ❖ High-level System Design
 - Functionality only - no hardware/software details
- ❖ Verification (before Hardware/Software Implementation)
 - Discover errors (input/output, performance, behavioural)
 - Confirm/Improve the design and the performances
 - Determine critical parameters
 - Evaluate the system under particular conditions
- ❖ Explore Other Architectures/Algorithms
 - Change sub-systems architecture and observe new behaviours
 - Change parameters



Motivations (3)



Definitions

❖ Specification

- Mathematical definition of system (unambiguous)
- Semantics of specification provides a model
- Behaviour of model = Behaviour of system

❖ Verification

- Model behaves correctly (simulation, model checking)

❖ Validation

- Model actually represents the desired system (discuss with designers)



Foresight (1)

❖ Foresight (Foresight Systems, Inc.)

- System level modelling and simulation tool

❖ Specification

- Data Flow Diagrams (event-driven processes, events, control flows)
- State Transition Diagrams
- Mini-Specs
- Hierarchical Specification (root = Data flow diagram)
- Real-time Parameters



Foresight (2)

❖ Analysis

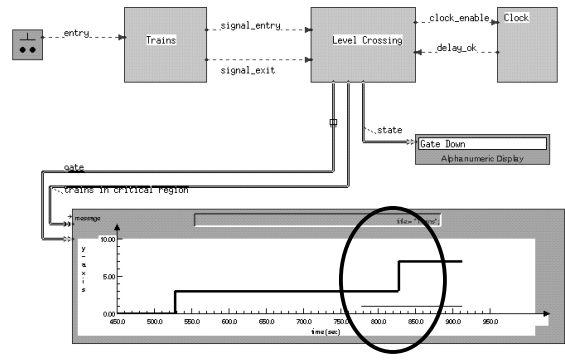
- Type checking, input/output checking, syntax errors

❖ Simulation

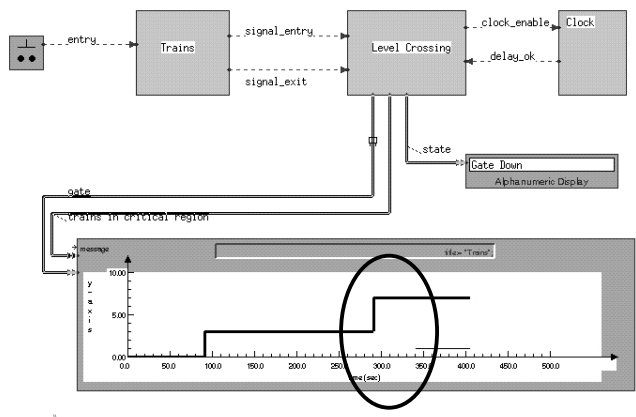
- Real-time execution of specification
- Stand-alone executable specification
- Animation of Diagrams
- Real-time constraint validation
- Debugging functions (breakpoints, monitors windows)
- Simulation is NOT formal verification !!!
- Works on Sun workstation



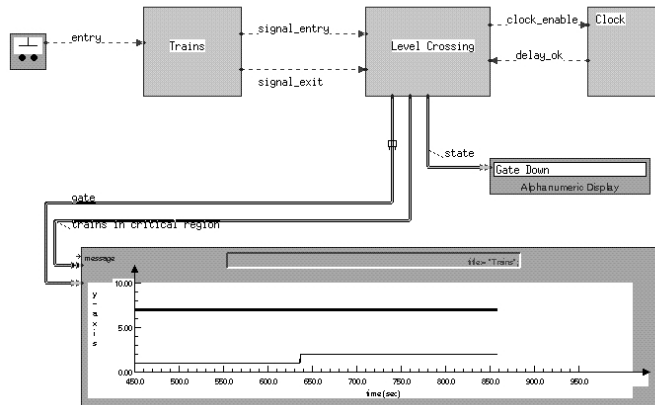
Simple Example: Error



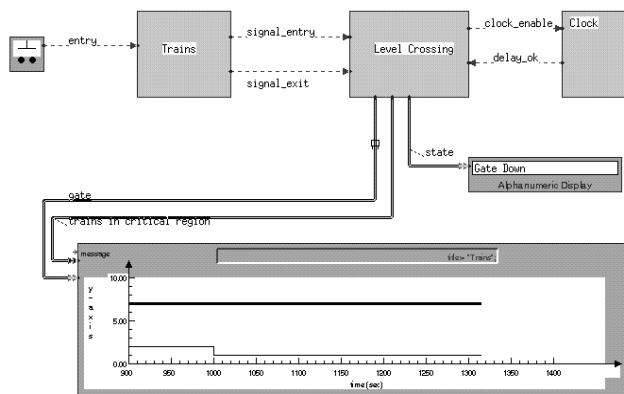
Simple Example: Correct



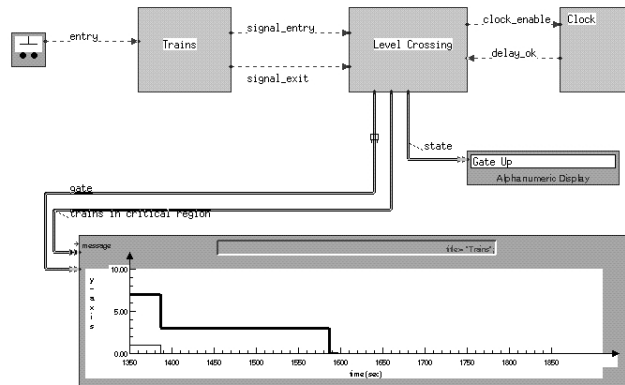
Simple Example



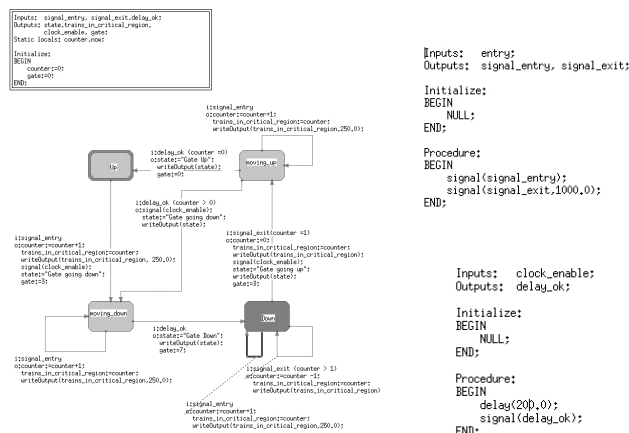
Simple Example



Simple Example



Simple Example



ALICE

❖ Model of whole ALICE DAQ System

- Trigger System (L0, L1, L2)
- Tracking Detectors
- DAQ (with DDL, RORC, FEDC, GDC, PDS, bandwidth, etc.)
- Parameters (finite buffers, etc.)

❖ Evaluation of Performances

- Whole system: maximal bandwidth / real bandwidth
- For each detector: buffer occupancy, bandwidth usage

❖ Alternative Algorithms

- GDC choice
- L2 trigger decision



ALICE: Overall System

