INVENTIVE

VCAD

Holonic Simulation of a Design System for Performance Analysis

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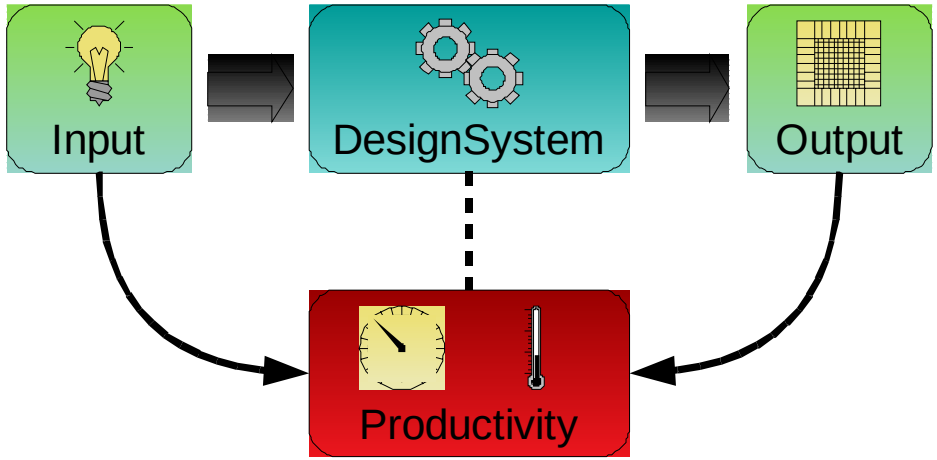
cadence

Overview

- The Problem
- Our Project
- Our Approach
- Simulation
  - Planning
  - Execution
  - Events
- Assessment
- Conclusions

The Problem



- Calculate Performance Indicators from Inputs and Outputs
- Current methods use a kind of black-box model for the Design System
- No reasons given for results, no justification of results
- No hints to improvements

Produktiv+

- government funded joint project of
  - AMD
  - Cadence Design Systems
  - Infinion
  - Robert Bosch

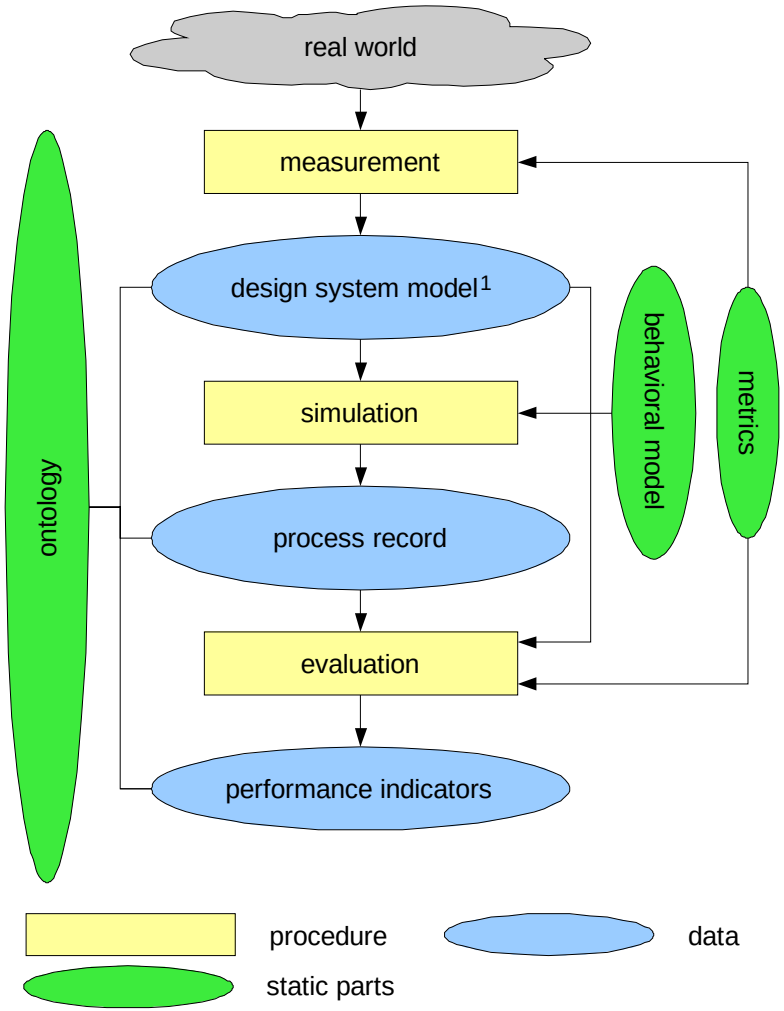
  + subcontractors

- Aims
  - Assessment of Productivity (and other KPIs) of Hardware Design Systems
  - Suggesting Improvements to Design Processes

Our Aims

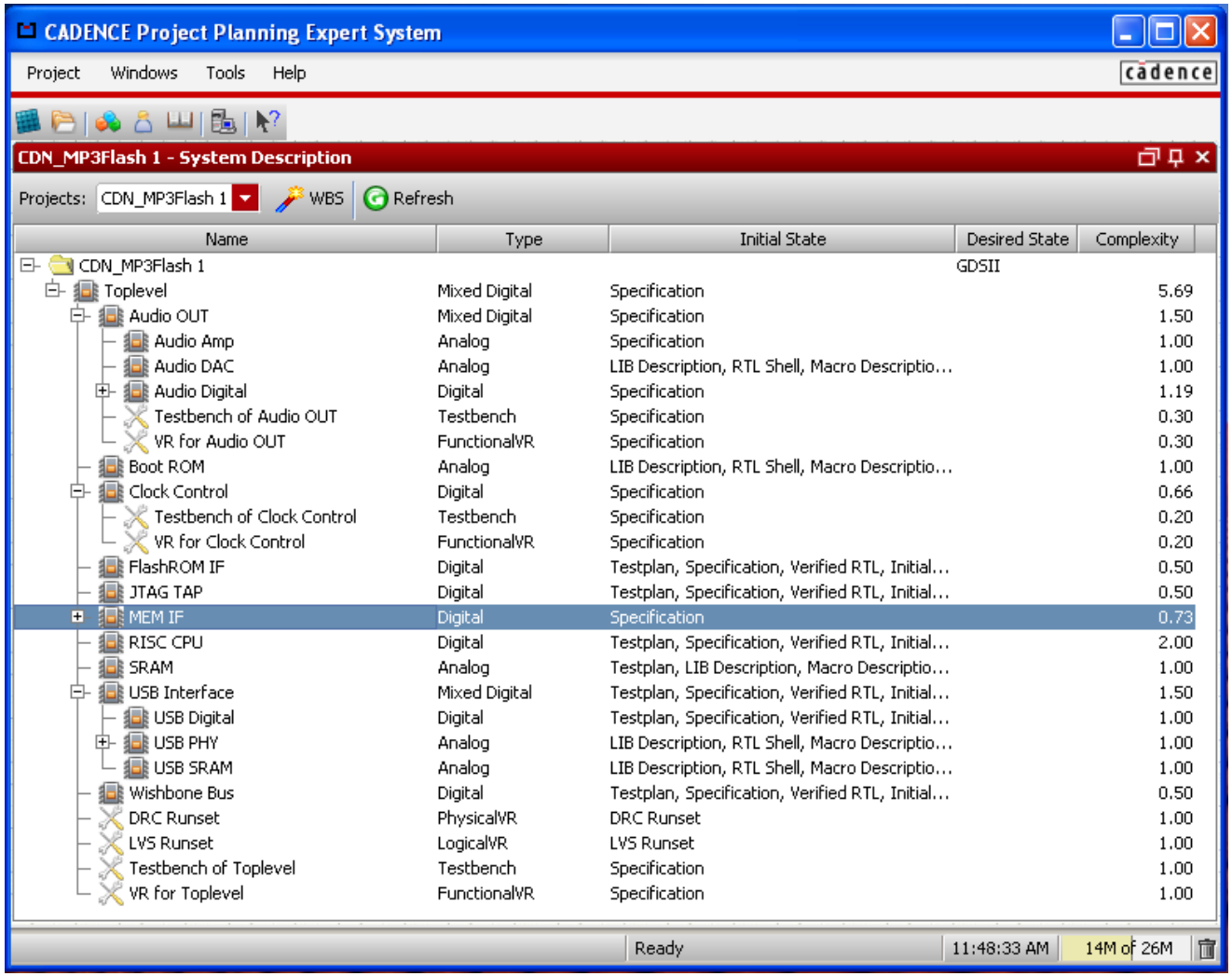
- More Detailed, Comprehensible Assessment of the Design Process
- Zoom-In on Design Steps, Design Phases and/or Parts of the Design
- Find Weak Spots
- Predict Effect of changes/improvements
- Help Planning and Predicting Future Projects

Our Approach

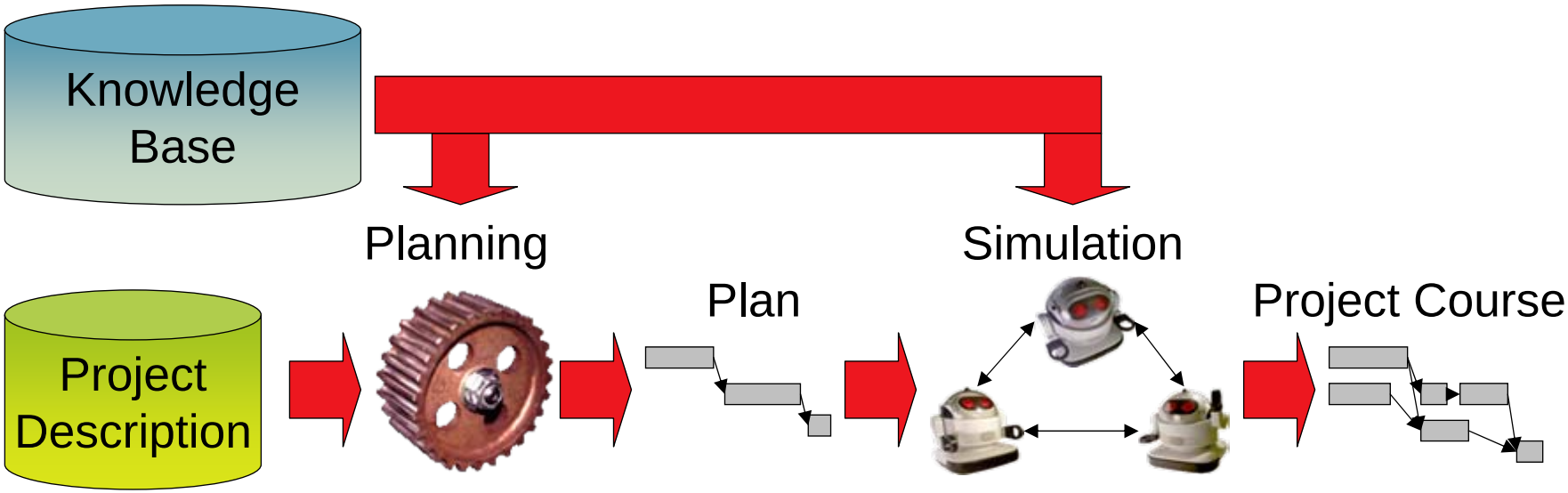


[1] the model contains the parameters in its instances

Demonstrator – System Description



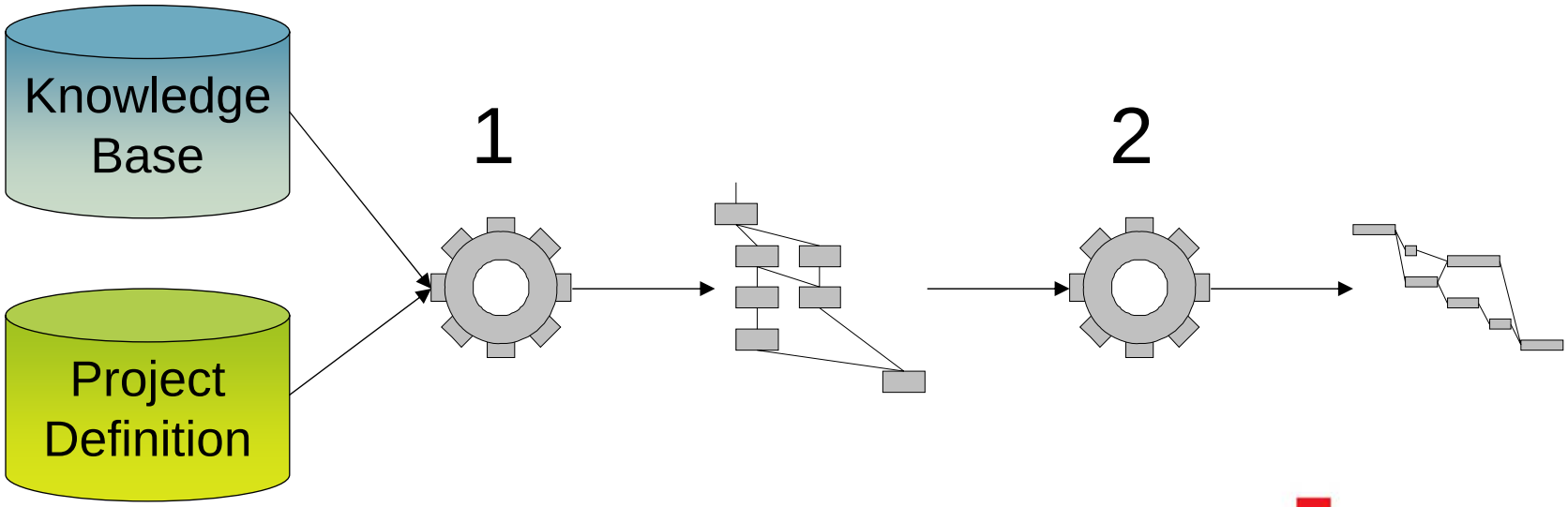
Simulation Overview



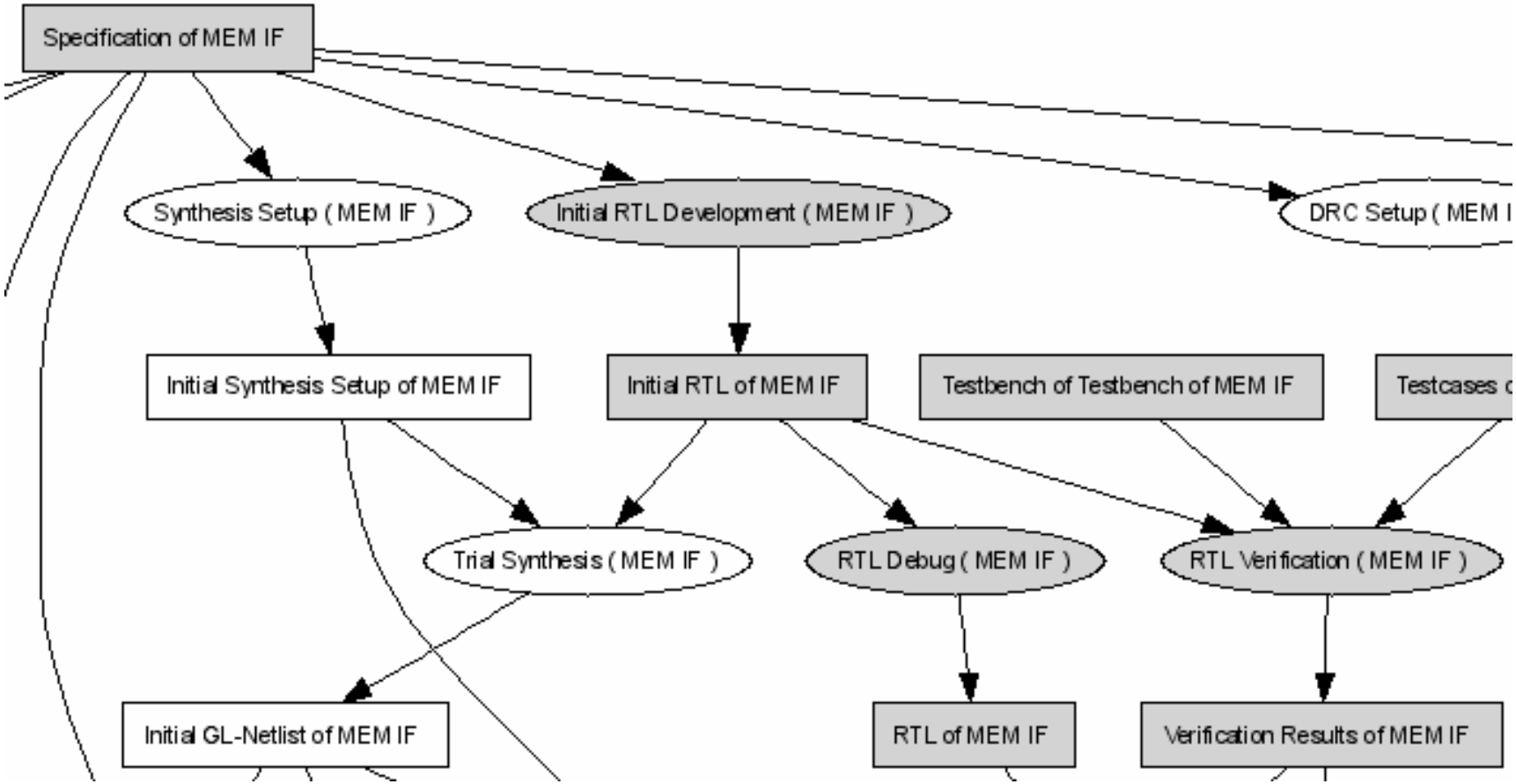
- Create a course-grain plan based on the knowledge and project description
- Simulate plan to test feasibility and find possible problems

Simulation – Planning

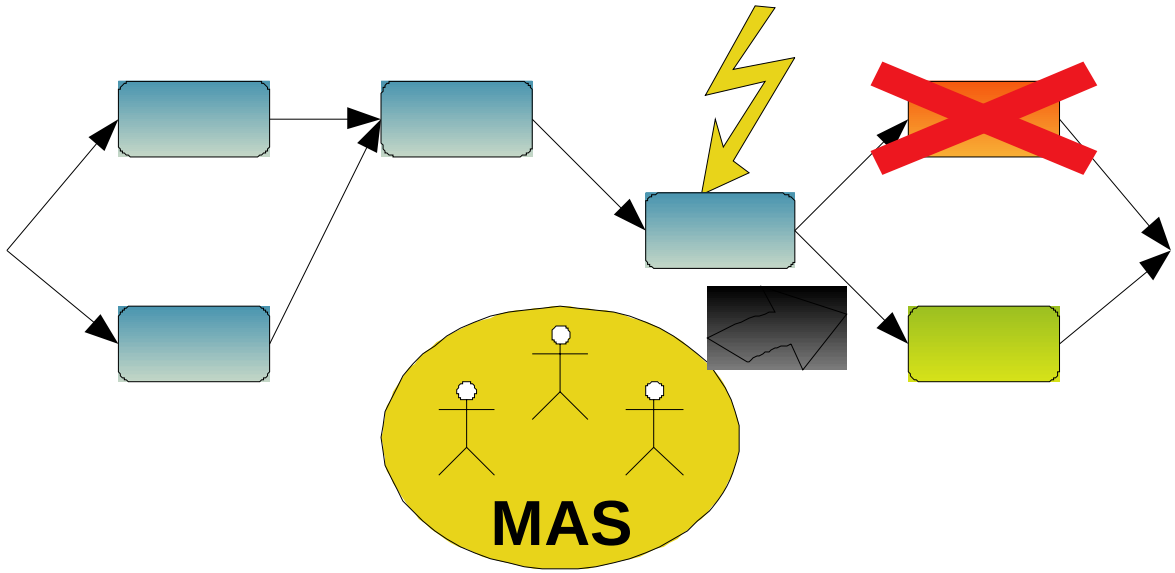
1. Generate a Work-Breakdown-Structure
2. Assign Resources and Schedule



WBS Generation Example

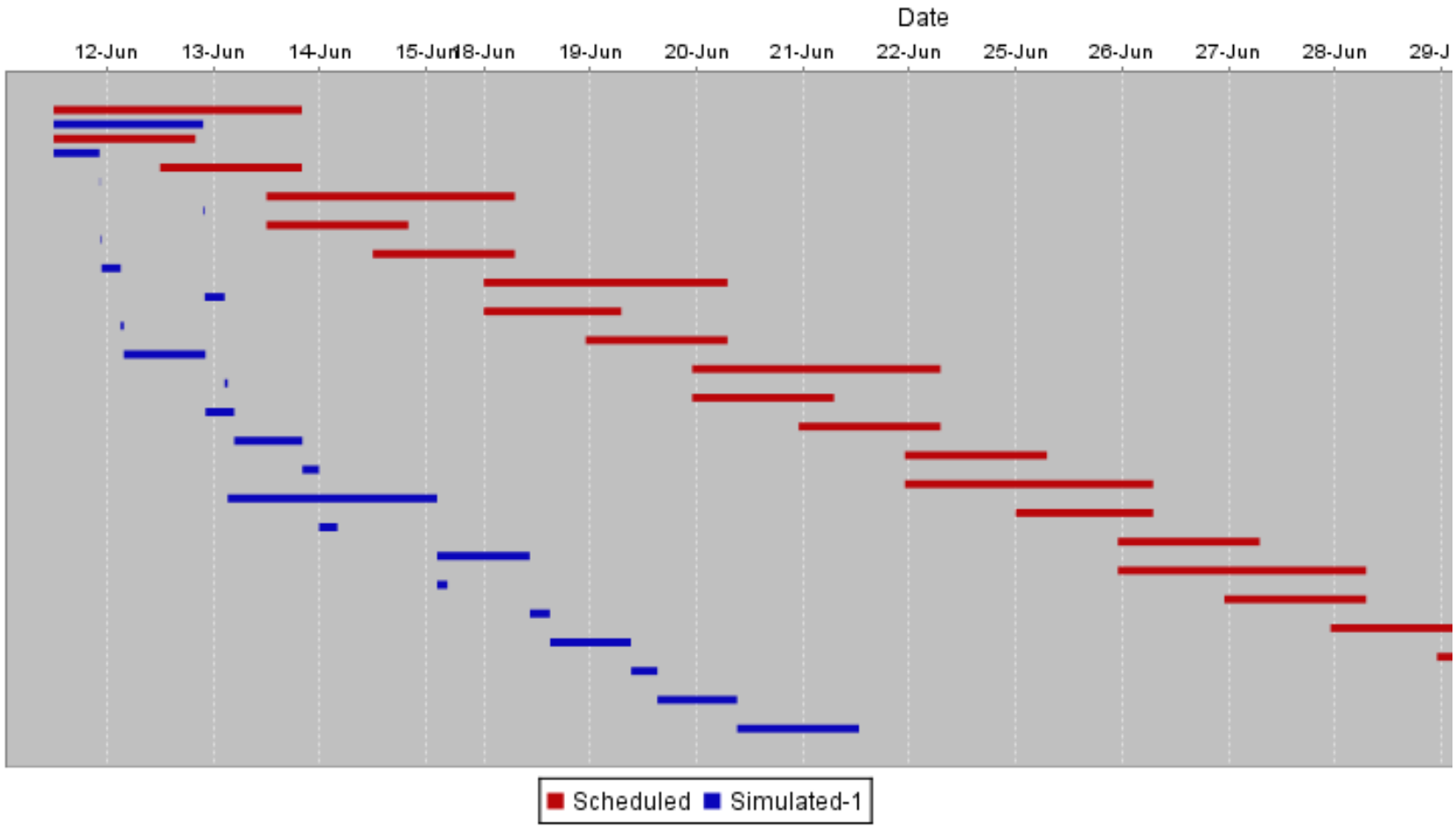


Simulation – Execution



- During execution of the plan, events and deviations can occur and may force the system to react
- Depending on the severity, the agents might have to reschedule, reassign, or even completely replan the remaining project

Demonstrator- Simulation Result



Events

- Events can disturb the normal course of the project
  - People getting unavailable (sickness, vacation, leaving)
  - Resources failures (hardware crashes, tool bugs…)
  - Specification Changes (very common!)
  - Changes in Complexity
- Activity lengths can vary even without larger events

- Add actual events for correct analysis of past project
- Add random events for analysis of future projects

Assessment

- Analyze acquired data extended by the result of the simulation
- Gain KPIs for every part of the design process and point to possible problems
- Detailed effort reports:
  - development
  - debugging
  - verification
  - communication
  - setup
  - wasted effort

Assessment – "What-If" Predictions

- Change parameters of the design system and re-simulate to estimate effects
- "How will my performance change, if I"
  - "… invest in new computing equipment?"
  - "… buy new Tools?"
  - "… send my employees to trainings?"
  - "… hire new employees?"
- "What if I change the design methodology?"
- "How will I perform when switching to a smaller technology?"

Assessment – Stability Analysis

- add typical random events to simulation
- randomly vary activity lengths using a beta distribution

- Run a whole set of simulations to estimate robustness
- Analyze outliers for possible weak spots

Conclusions & Future Work

- So far our approach can handle all requirements
- First test cases are promising
- A large set of analyses are possible, even predictions (precision unknown so far)

- Project not complete yet
- Important aspects of the design systems are not modeled yet, behavioral part still in the beginning
- Setup effort is still unknown

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