

System-Level Design Using Y-Charts

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In cooperation with



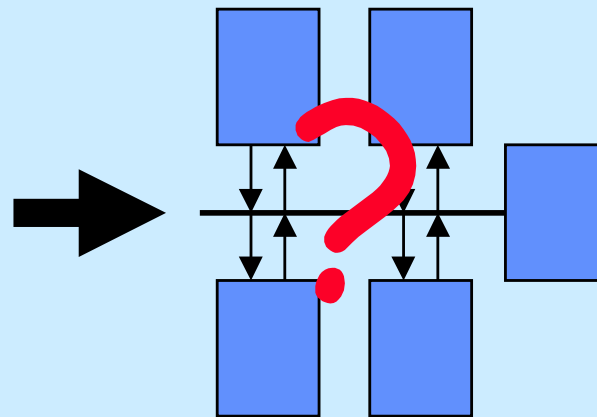
Bart Kienhuis, February 19 1999

Design problem

Application

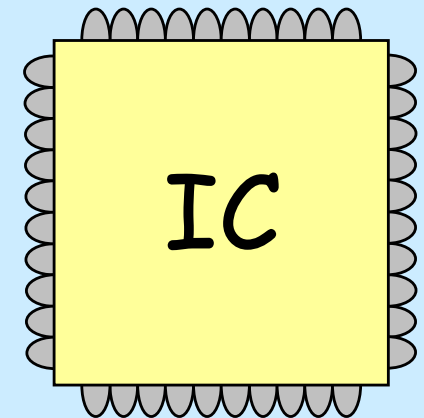


Architecture

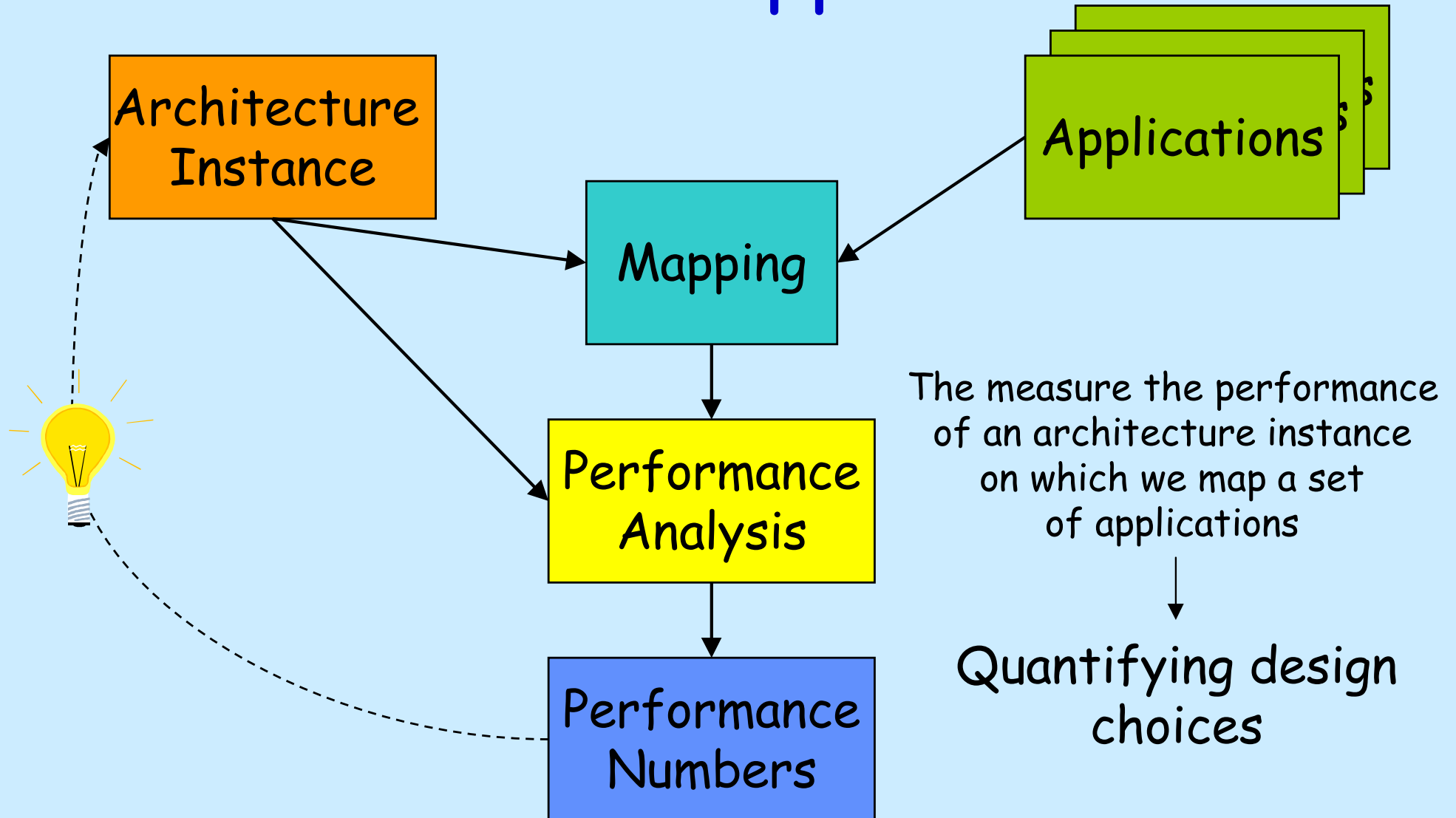


Multi-Functional
Multi-Standard

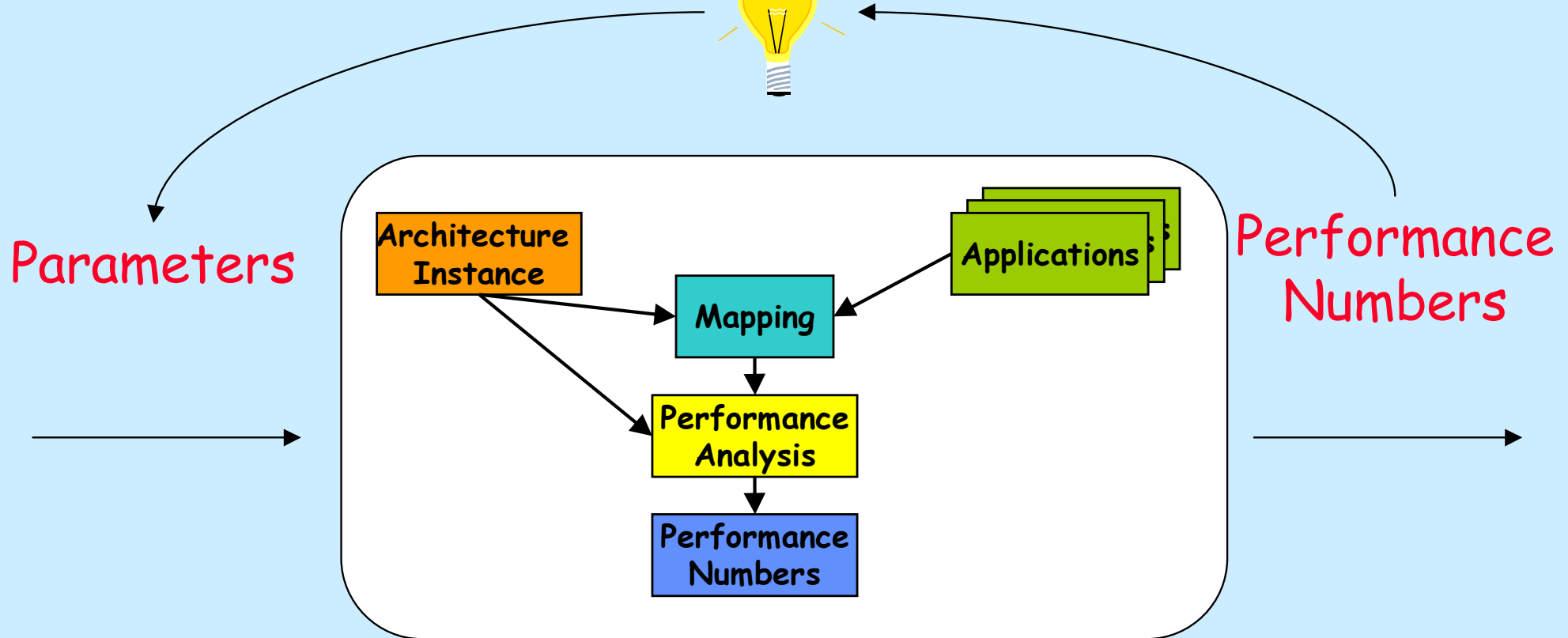
Integrated
Circuit



Y-chart Approach



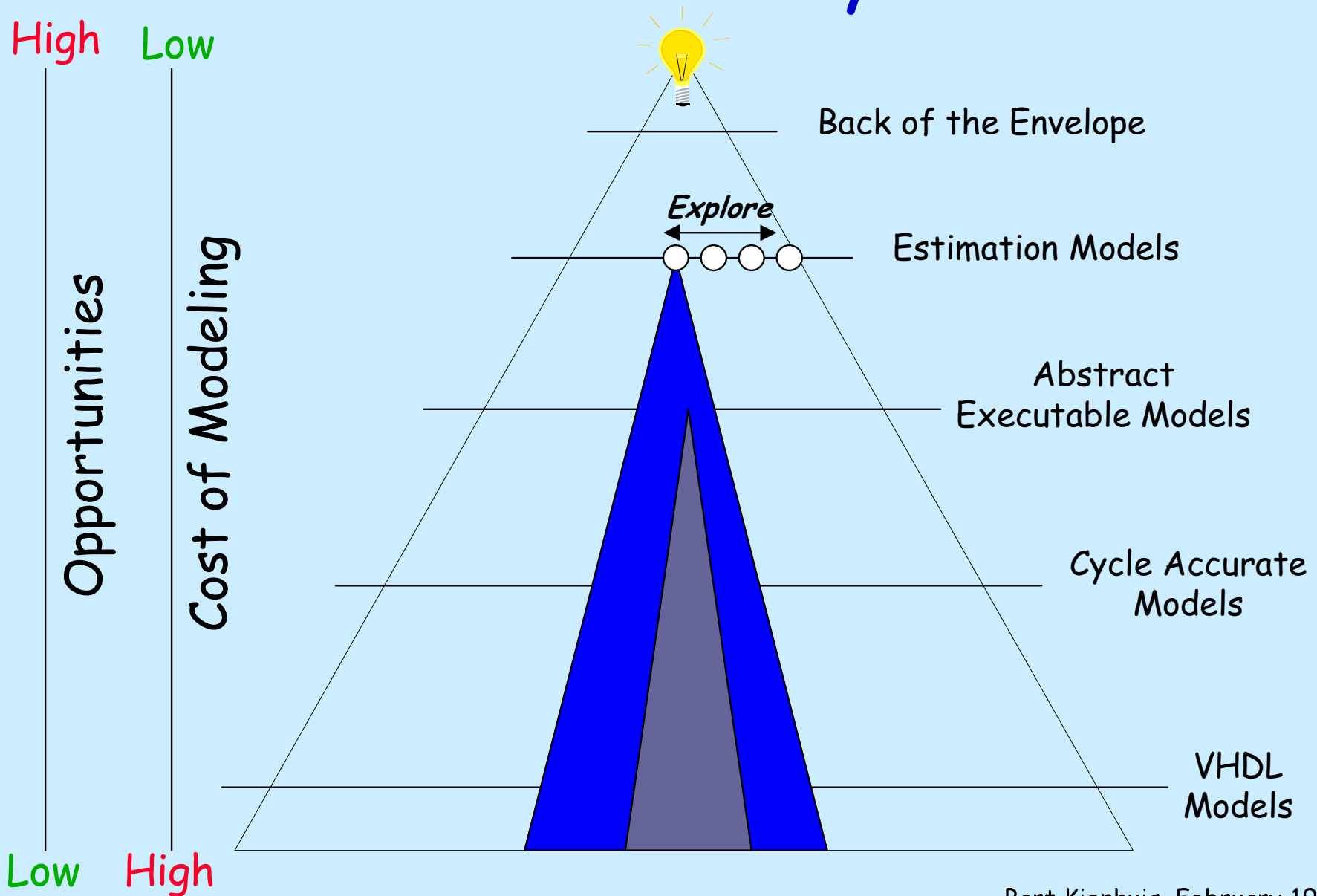
Design Space Exploration



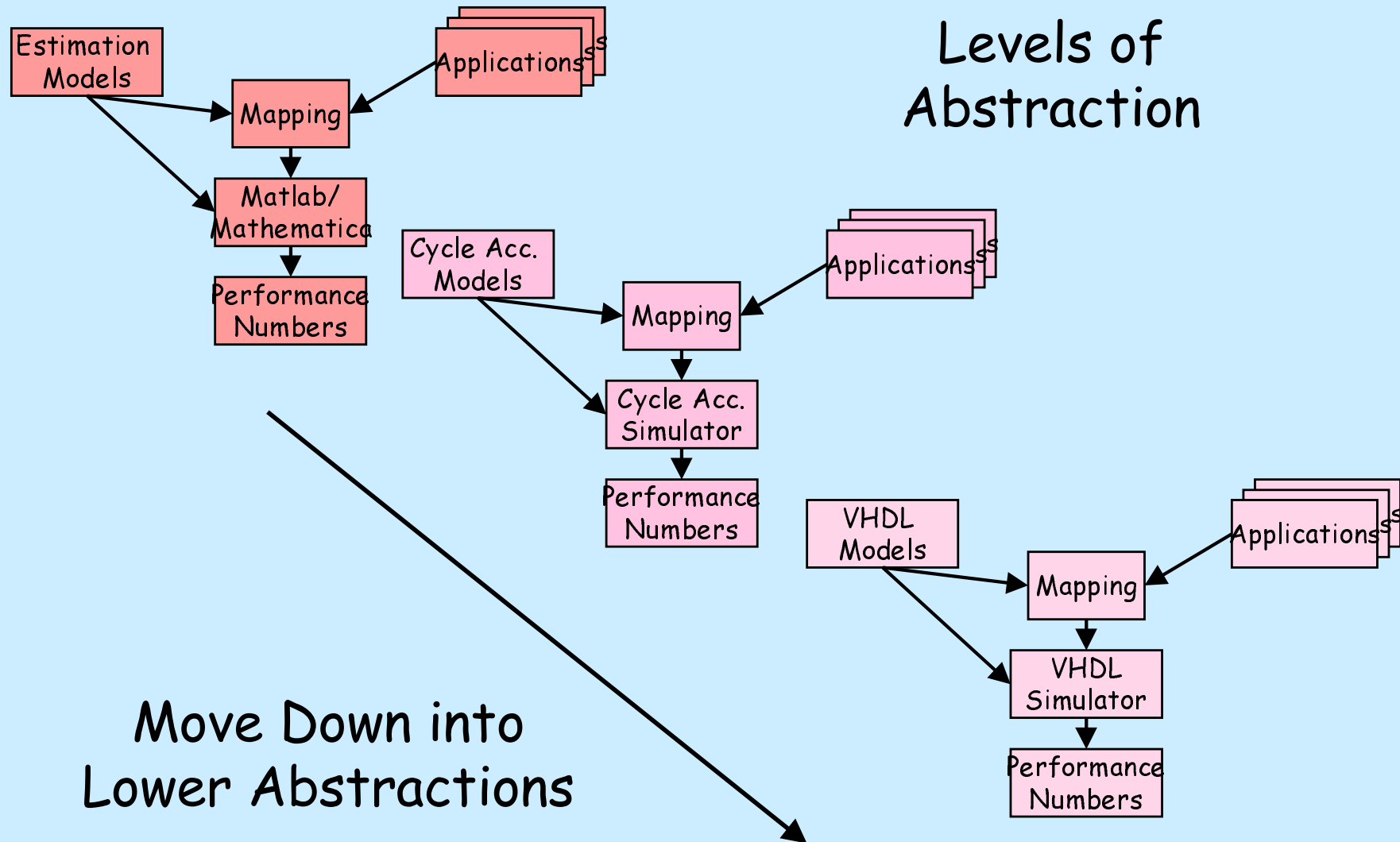
We use a Y-chart Environment
for doing Design Space Exploration

→ The Acquisition of Insight

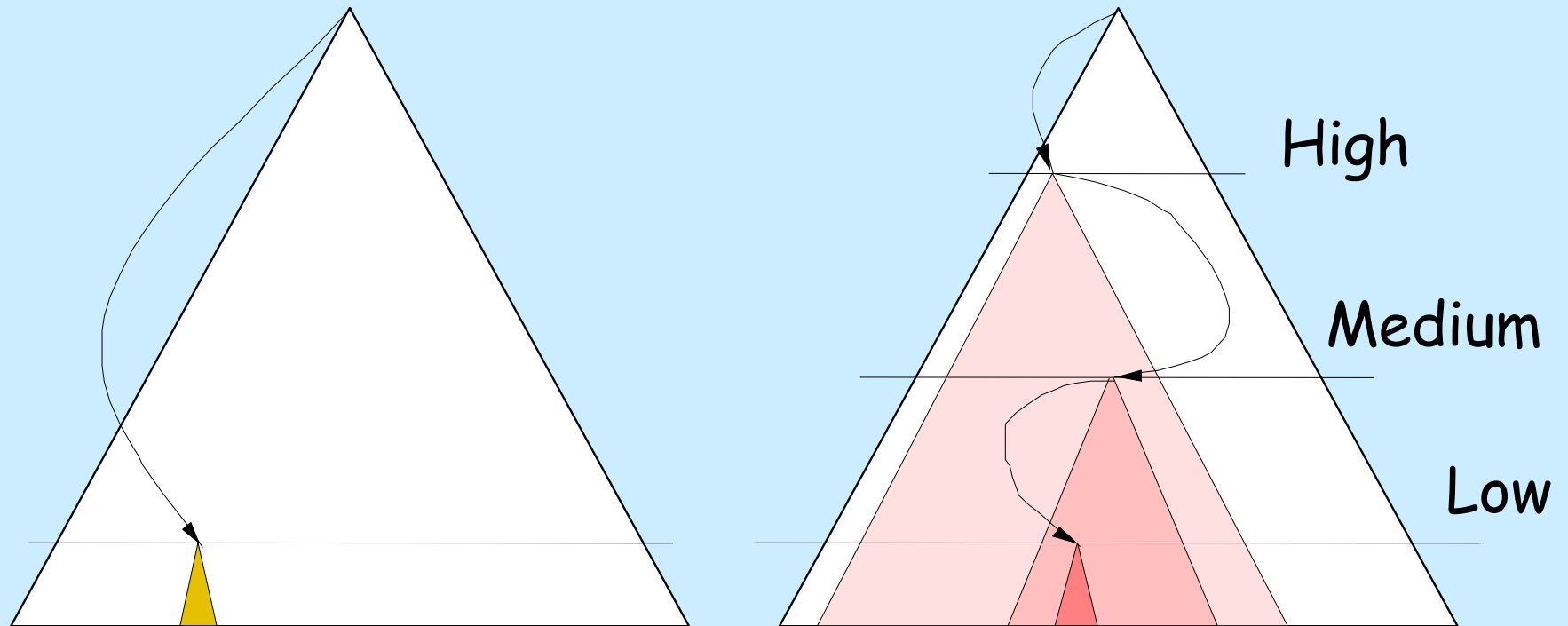
Abstraction Pyramid



Stack of Y-chart Environments



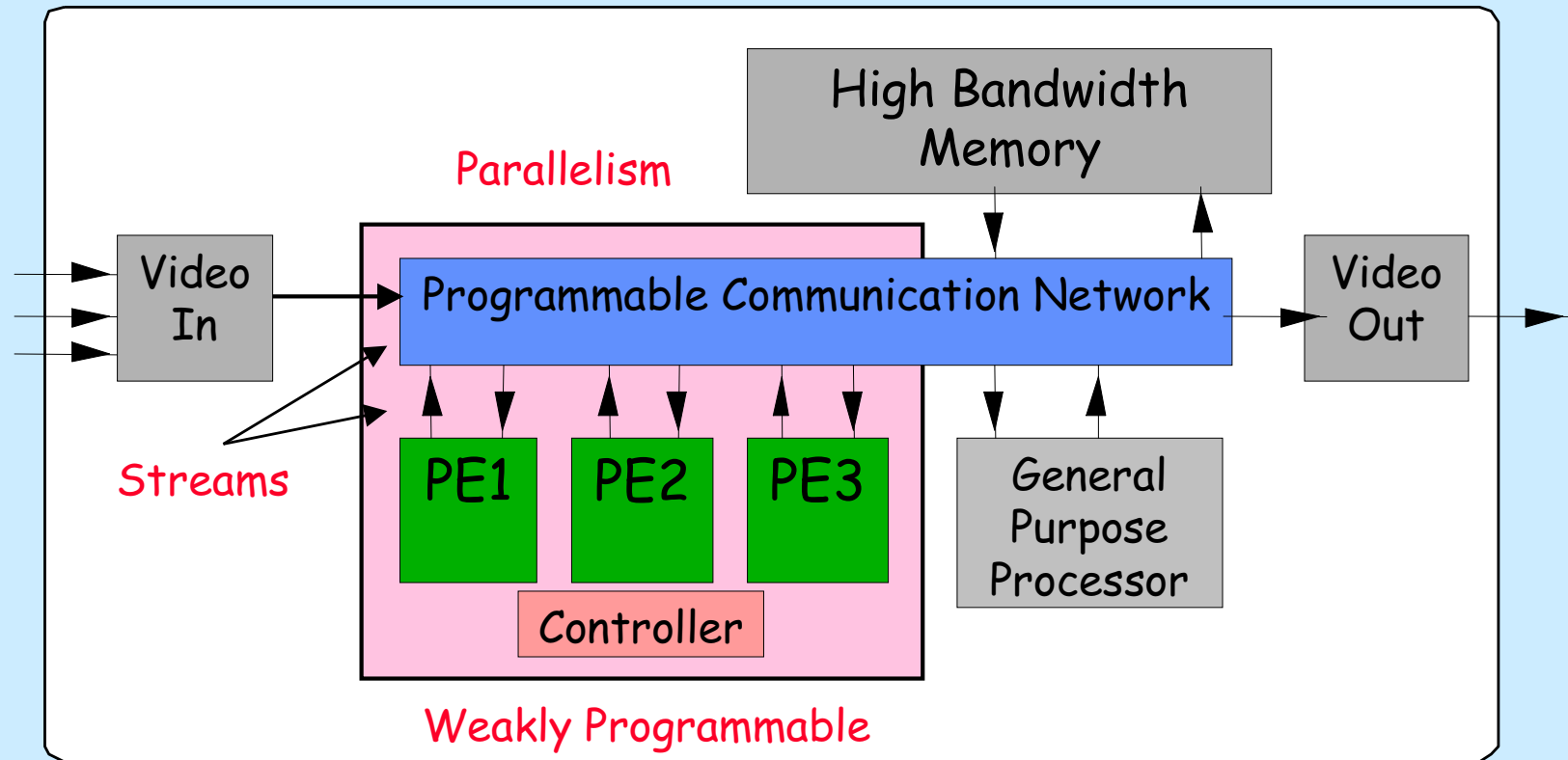
Stepwise refinement of the Design Space



Using a stack of Y-charts, we want to refine the Design Space of an Architecture in a stepwise manner

Example

High Performance DSP Architecture



**We developed a Y-chart environment for
*Stream-based Dataflow Architectures***

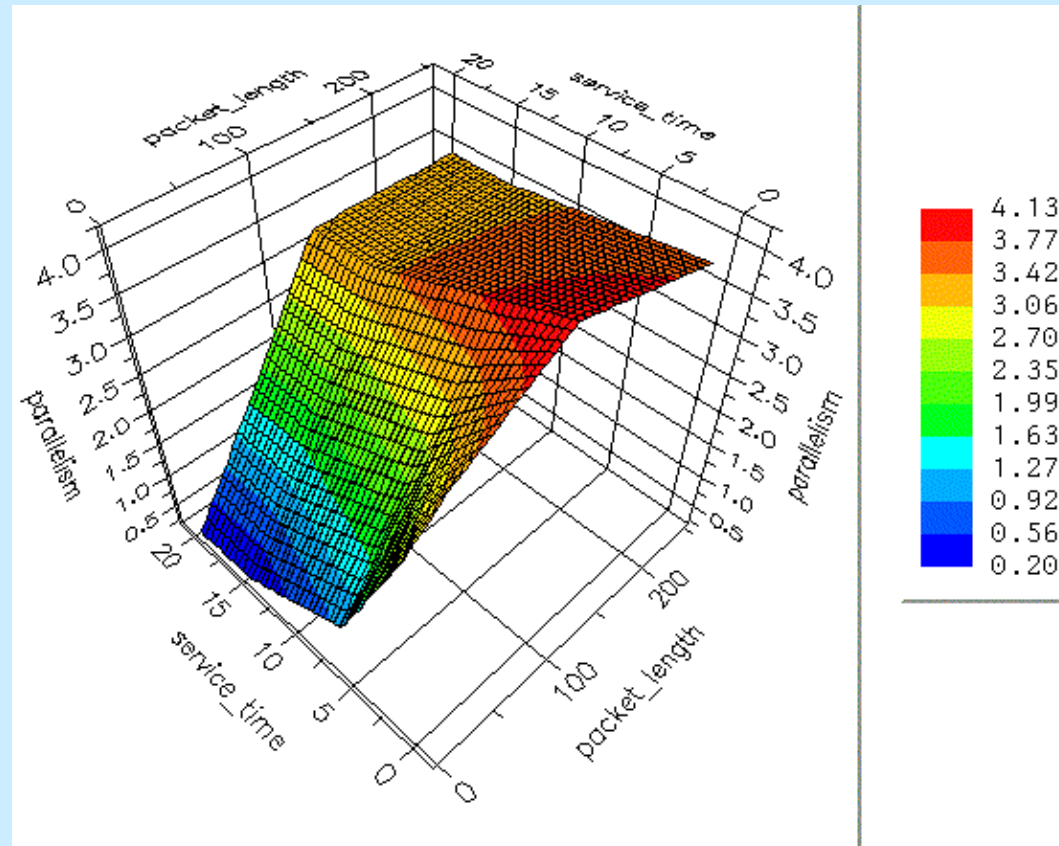
Realization of a Y-chart Environment

- We developed a retargetable architecture simulator for the Stream-based Dataflow Architecture, using only Kahn process networks.
- We developed a smart mapping approach based on the notion of Models of Computation and Models of Architectures.
- We were able to perform a design space exploration of the Stream-based Dataflow Architecture.

Y-charts and Ptolemy

- We like to show that the Ptolemy system is very useful for realizing Y-chart environments.
 - The Ptolemy system has well established computational models to express both Architectures as well as Applications.
 - The Ptolemy system has a well engineered software architecture.
- We will mainly focus on concurrency models like Kahn process networks and CSP.

Result of the Exploration



The result of simulating 25 different Architecture instances running a particular application in 16 minutes.