

Software Systems Architecture

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Introduction: Software Architecture

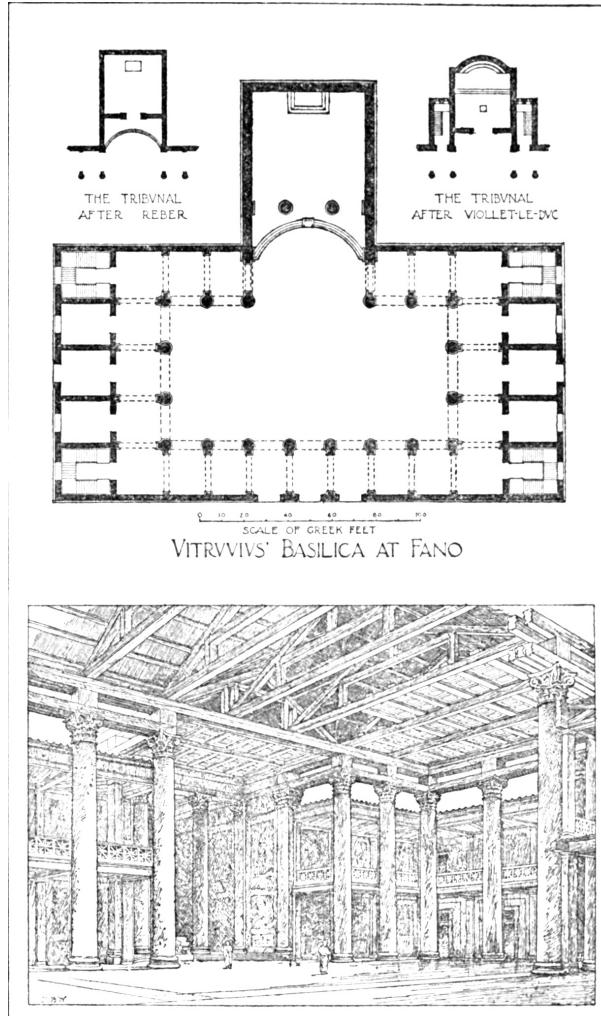
What is Software Architecture?

Why is it important?

What is Architecture (building, not software)?

What is an Architect (a building architect, not a software architect)?

Marcus Vitruvius Pollio (b. 80-70 BC)



Vitruvius: 3 Pillars of Architecture



Utility

STABILITY

Beauty

Field Trip!!!!!!

Let's look for those three pillars of architecture:

- Firmness (stability)
- Utility (usefulness)
- Beauty

Utility: Fit for the purpose

Interior of Notre Dame
Cathedral, Paris

Encourages visitors to
lift their eyes
heavenward



Firmness: Romanesque Architecture



Firmness: Building a Cathedral

Flying buttresses,
Reims (France)
Cathedral

Enabled
construction of:

- High thin walls
- Large windows



Unity of Design and Appearance (Frauenkirche, Munich)



Unity of Design and Appearance (II)

Aachen, Germany



Unity of Design and Appearance (III)

Denver Public Library, USA

Yes, this is ONE building!

Designed by a committee of architects!

- Could you guess?



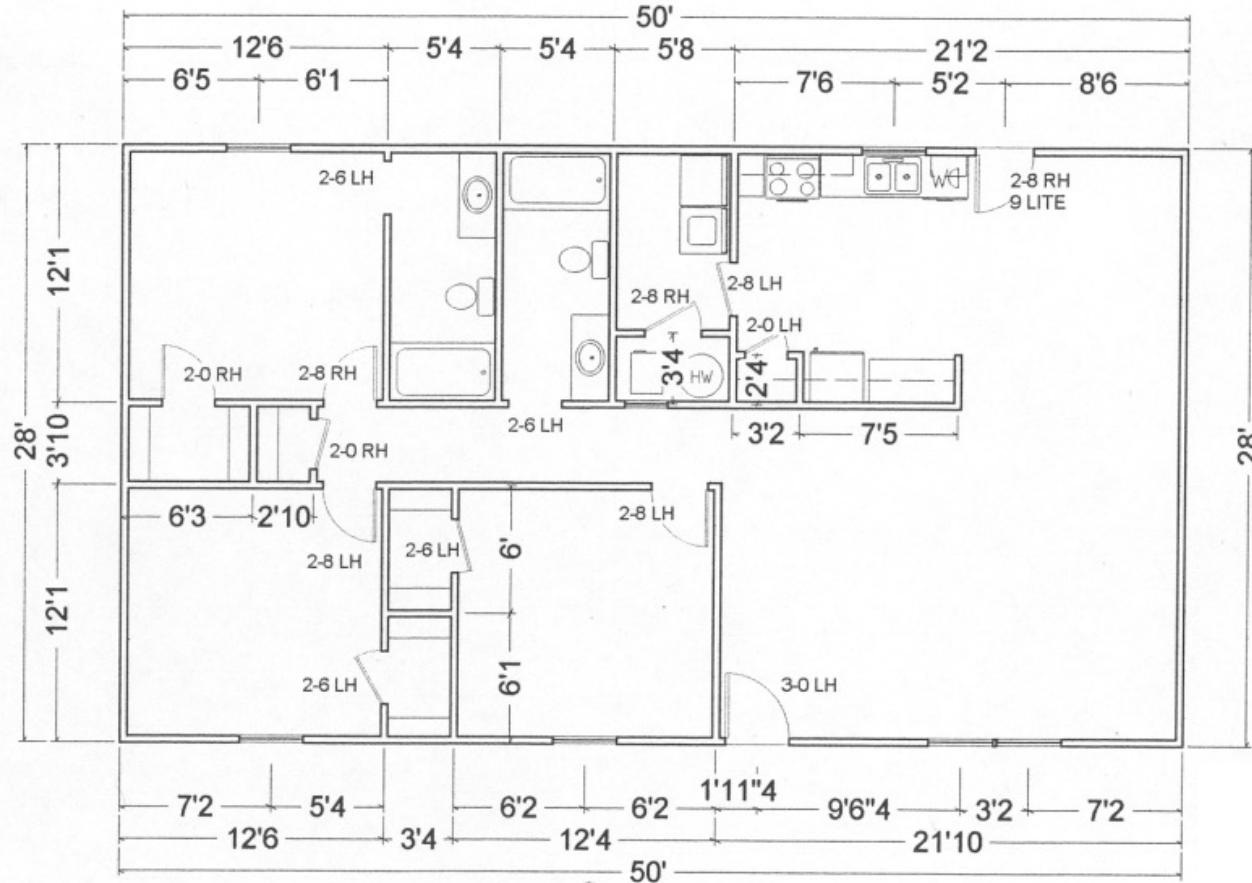
Path for Evolution

Chartres Cathedral, France

Architectural drift!



Partitioning



Also:

- Interfac
- Construction directions

What is Software Architecture?

Well, we know what Building Architecture is:

- The Structure of the Building
- The Overall Partitioning – Rooms and Such
- Guidelines for Construction
- Some notion of the use of the building

It is similar in Software Architecture

- The gross structure of the software
- The overall partitioning – Subsystems and Such
- Guidelines for construction, e.g., technologies to be used
- The highest-level mapping of the problem space to the solution space
- Some notion of the use of the software

... more

A model of the finished system

- Related to mapping of the problem space to solution space

A vision

- Of how the system should work
- Of how it should be implemented

A guide for implementation

- (see above)

Why Software Architecture?

The bits don't care!

Why is software architecture important?

(one reason)

Think back on the cathedrals:

- How did architecture affect the end-user experience?

Software architecture:

- How can software architecture affect the end-user experience?
- Give examples...

Why Architecture?

Every system has an architecture

- But some are better than others
- A systematic architecture makes life much easier for future as well as present developers

Architecture helps:

People understand the system

- Programmers, managers, **and users**

Divide up the work

Accomplish quality requirements

- Important: more on this later

Maintenance and enhancements

Guide product families

Architectural Knowledge

In system maintenance & enhancement, how much effort is devoted to discovery?

- HALF
- A good architecture can help a lot
 - Structure
 - Implementation conventions

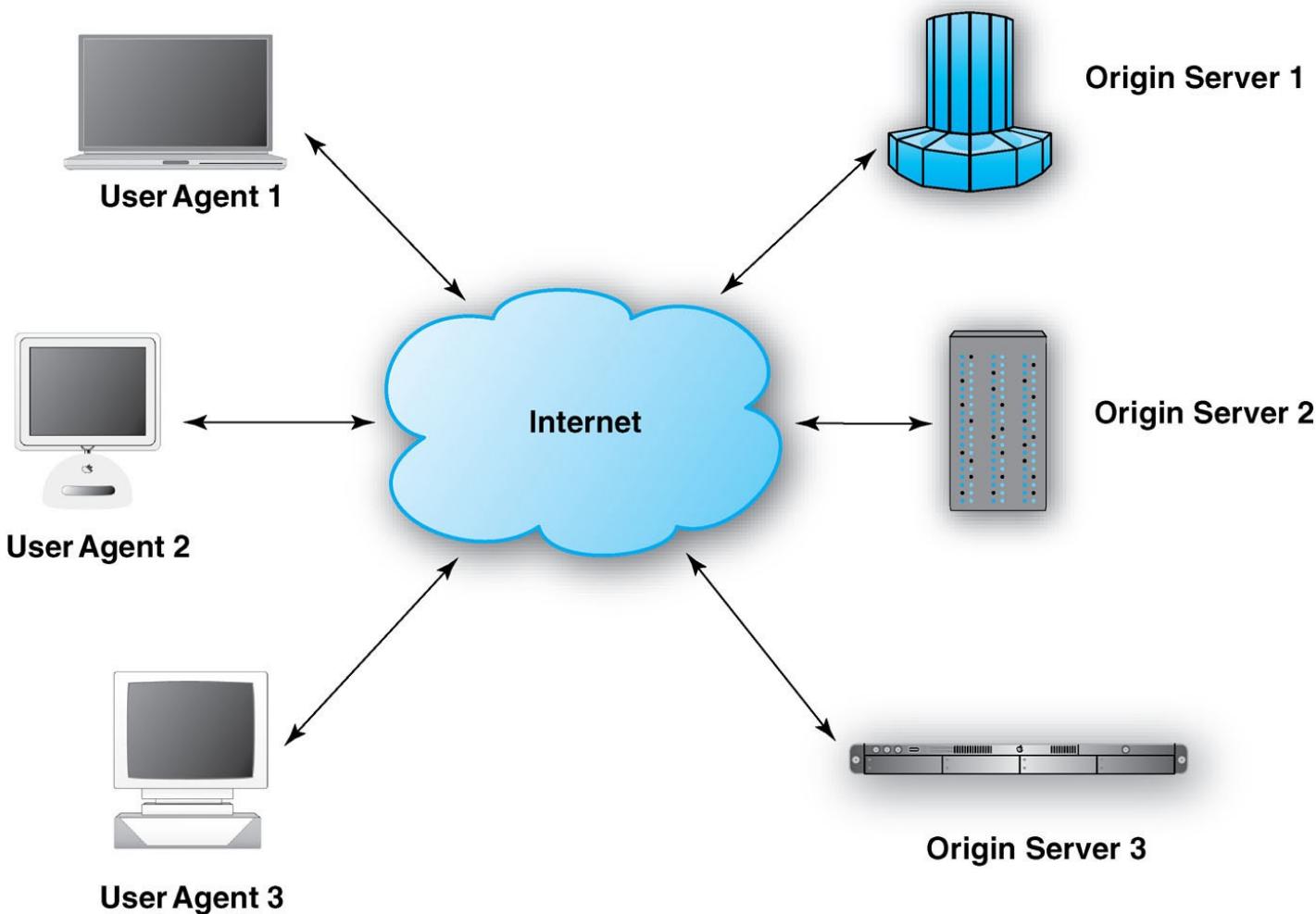
The Power of Big Ideas: The Architecture of the Web

Suppose you want to build the World Wide Web ...

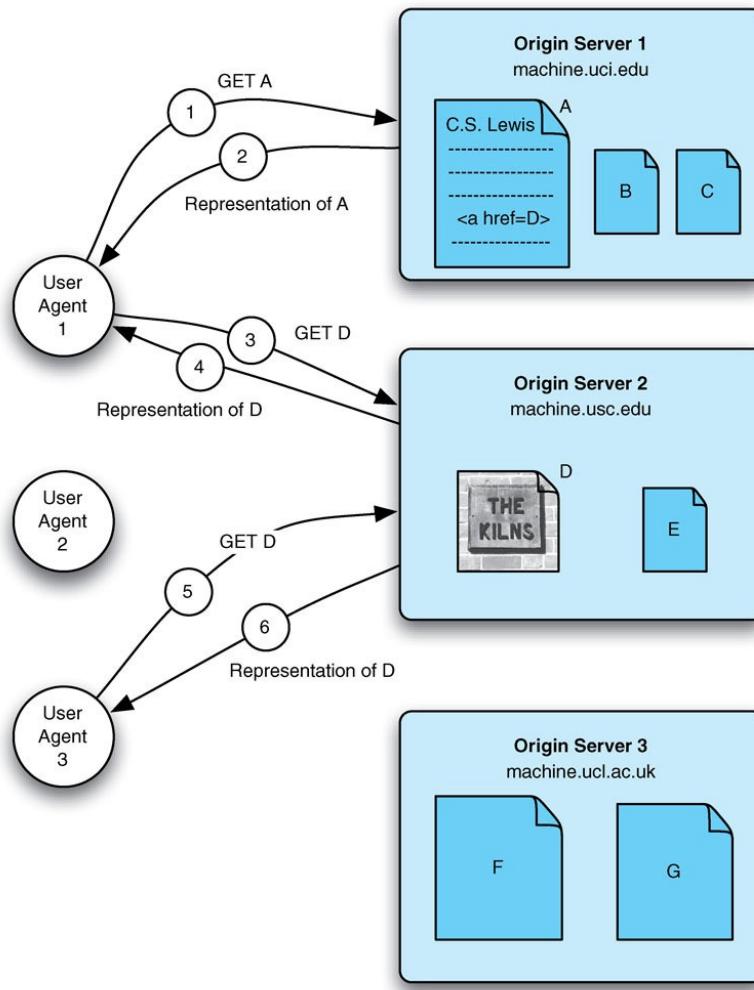
Where do you start?

For that matter, what *IS* the Web?

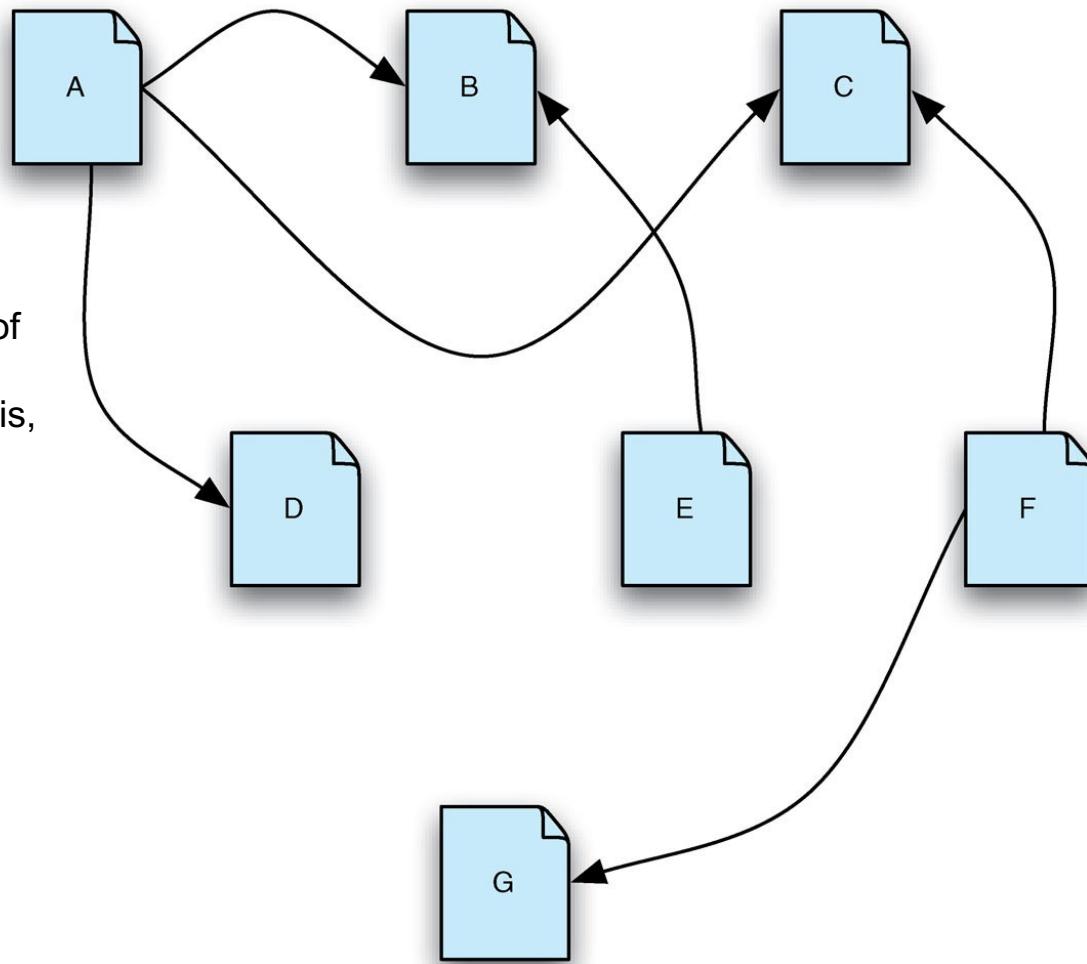
One View of the Web



Another view



Yet Another View of the Web



A user might view it as a set of linked information:

- a. A biography of C. S. Lewis, an author
- b. One of his books
- c. Description of where he lived
- d. Picture of his house
- e. Etc.

Another view of the Web!



Web Architecture

What do we learn (about the Web's architecture) from these pictures?

What is missing that is important?

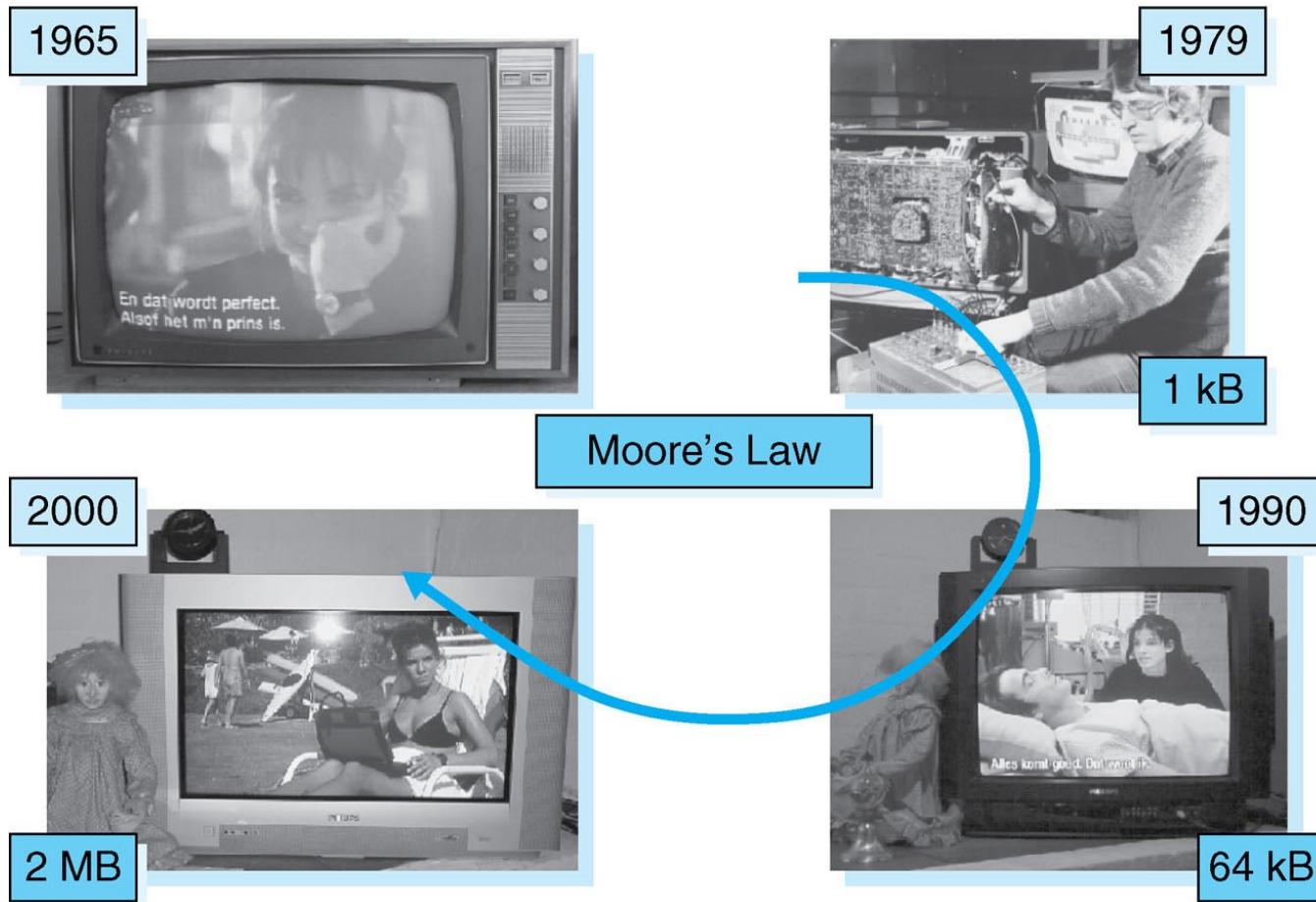
Why were the decisions about the architecture made?

Why these decisions and not others?

Why did similar systems fail, but the Web succeeded?

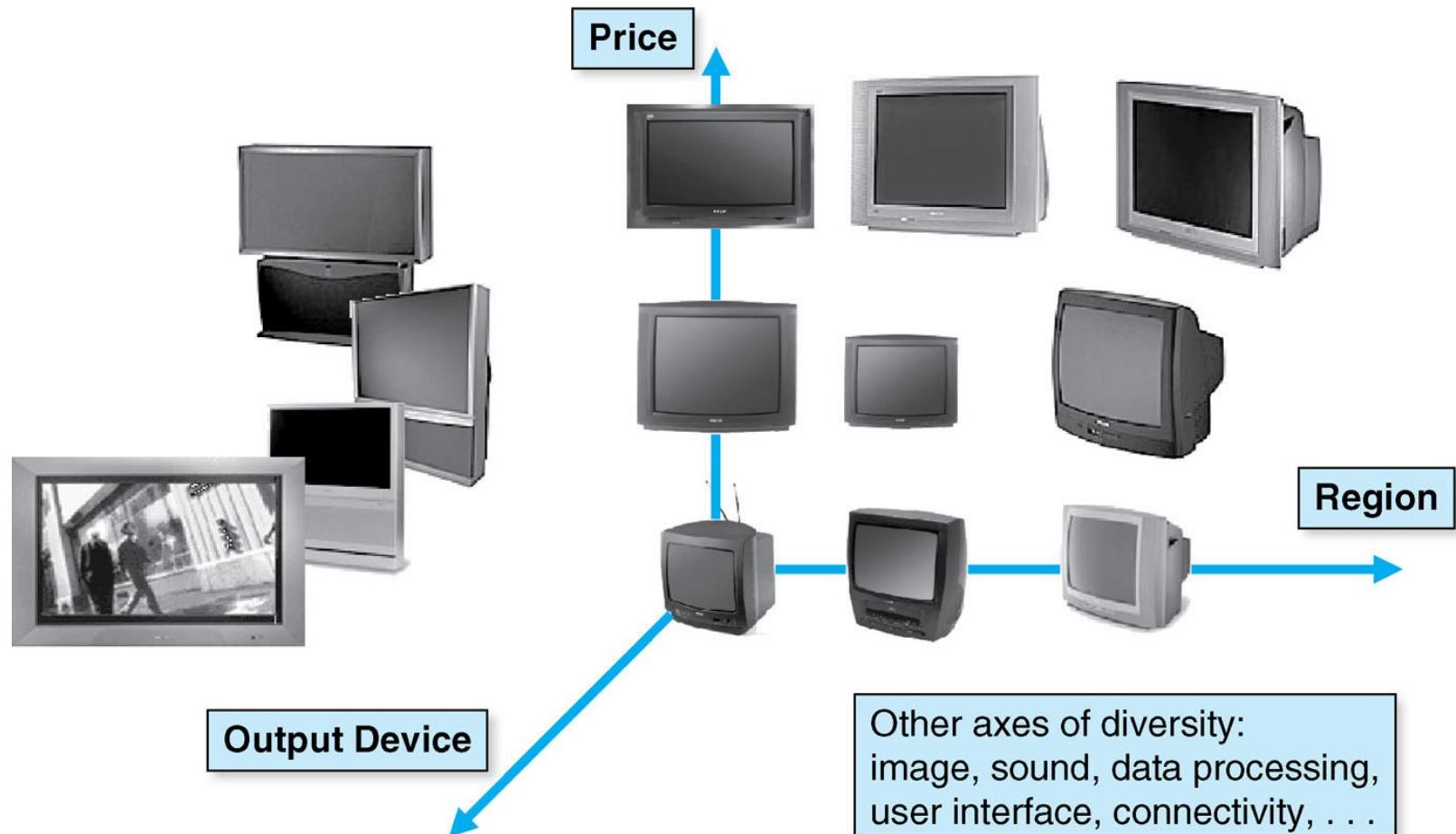
The power of Architecture: Enabling product lines (Phillips)

Complexity

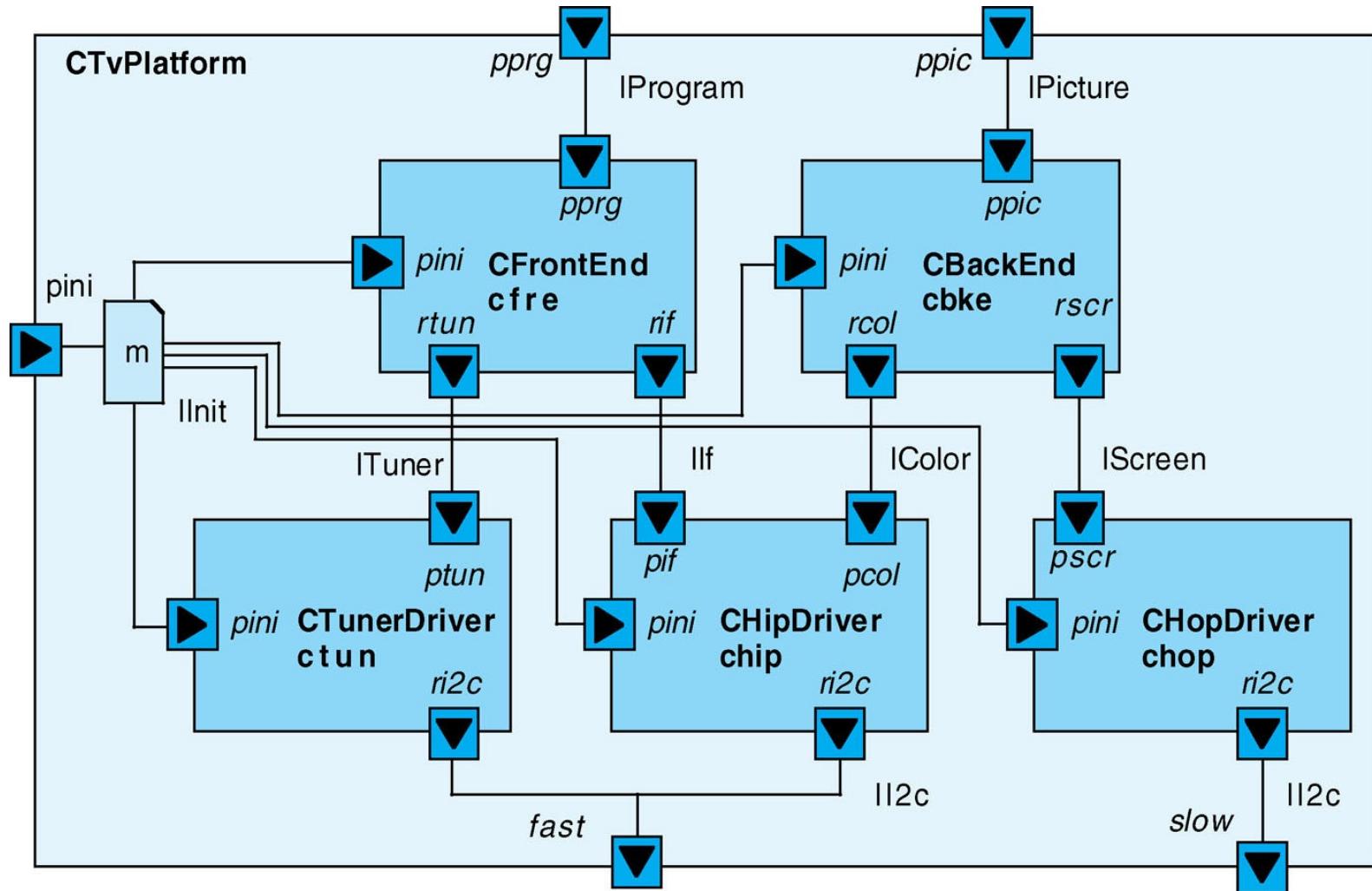


Phillips Product Families

A Television Product Family



TV Set Software Architecture



Possible products

Composition

