PHILIPS

Building Product Populations with Koala2

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Introduction


I’m going on a holiday
And I’m taking with me…

In 1998…

In 2004…

If I were a rich man …

GPS + GSM

GSM + DigCam

PDA + GPS

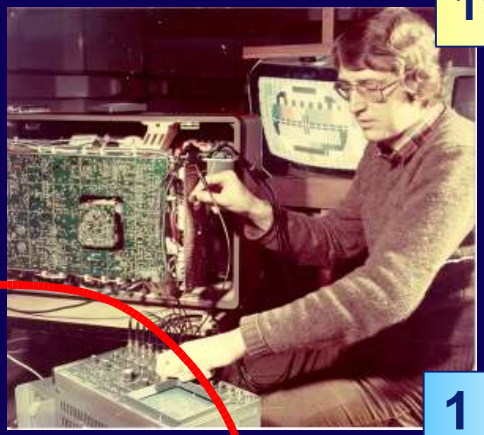
CD-RW, DVD, Card, TV

PDA + GSM + DigCam

My own field

1965

1979



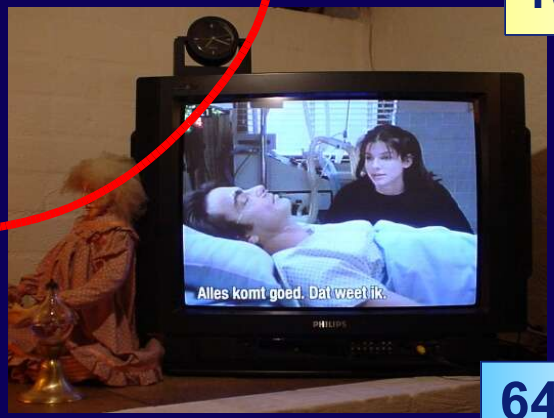
1 kB

Moore's Law

2000

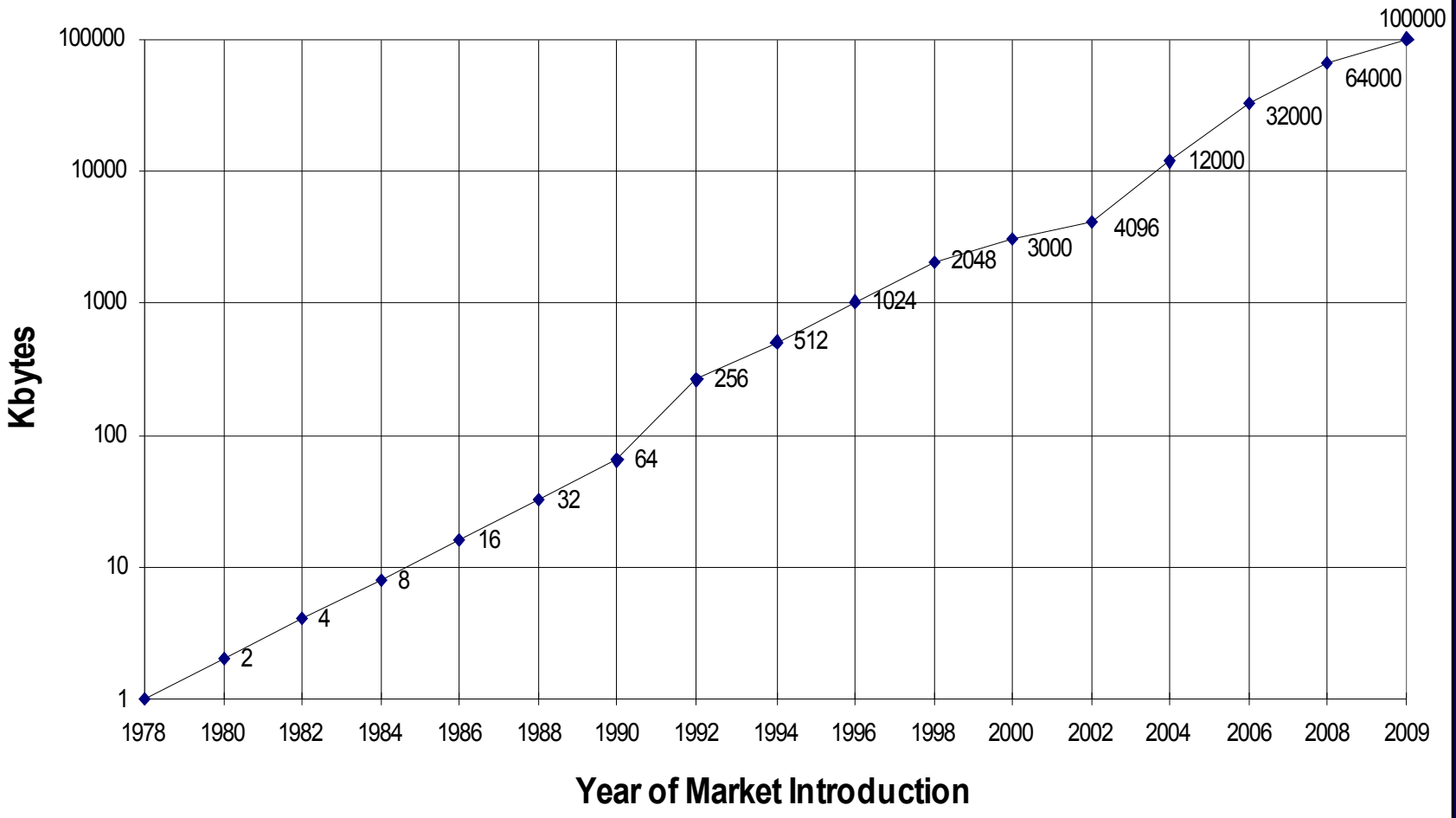
2 MB

1990

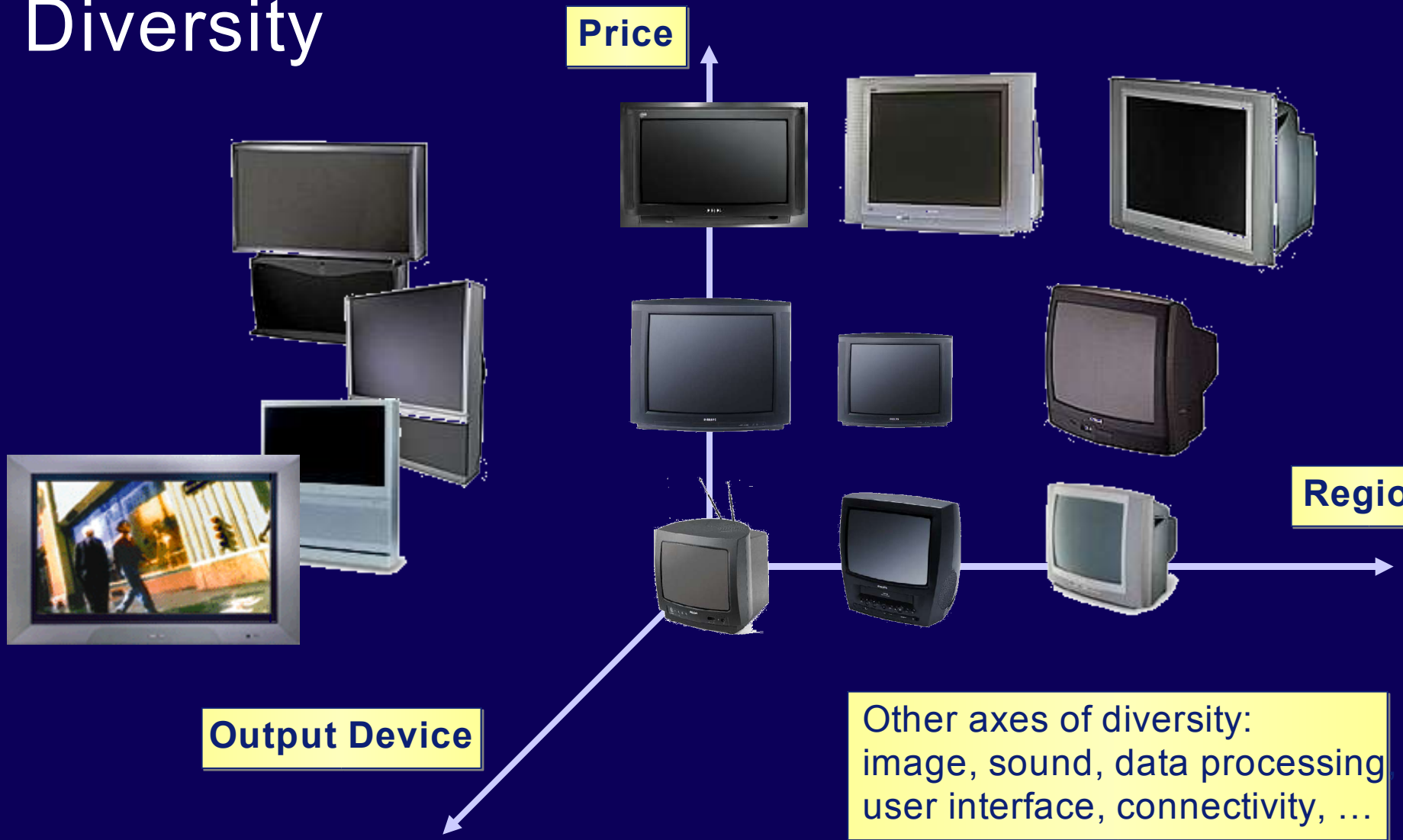


64 kB

Code Size Evolution of High End TV Software

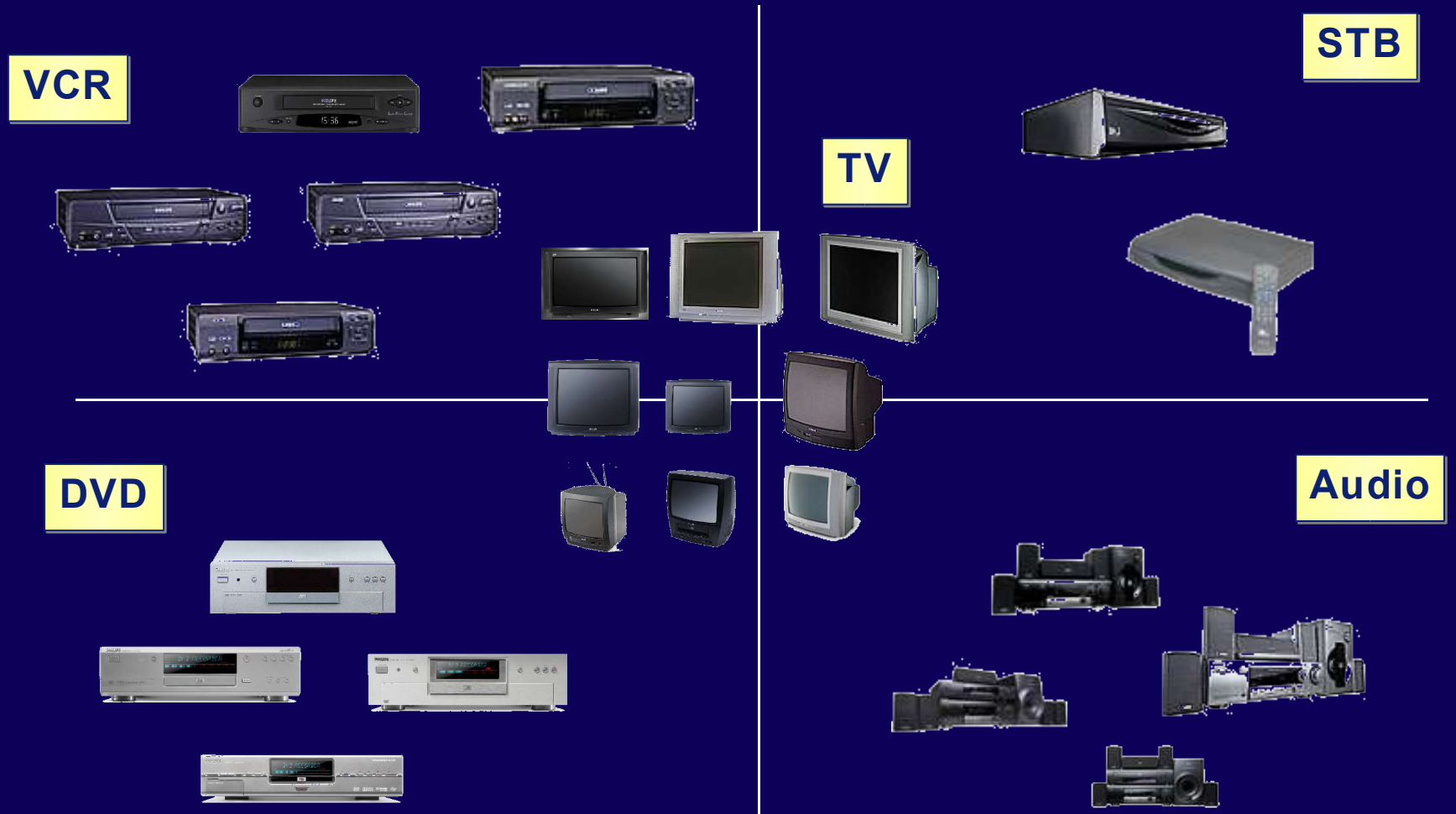


Diversity



Other axes of diversity:
image, sound, data processing
user interface, connectivity, …

Family of Families…



Composition…

Teletext

EPG

UIMS

Video Processing

Output Driver

Tuner

Audio Processing

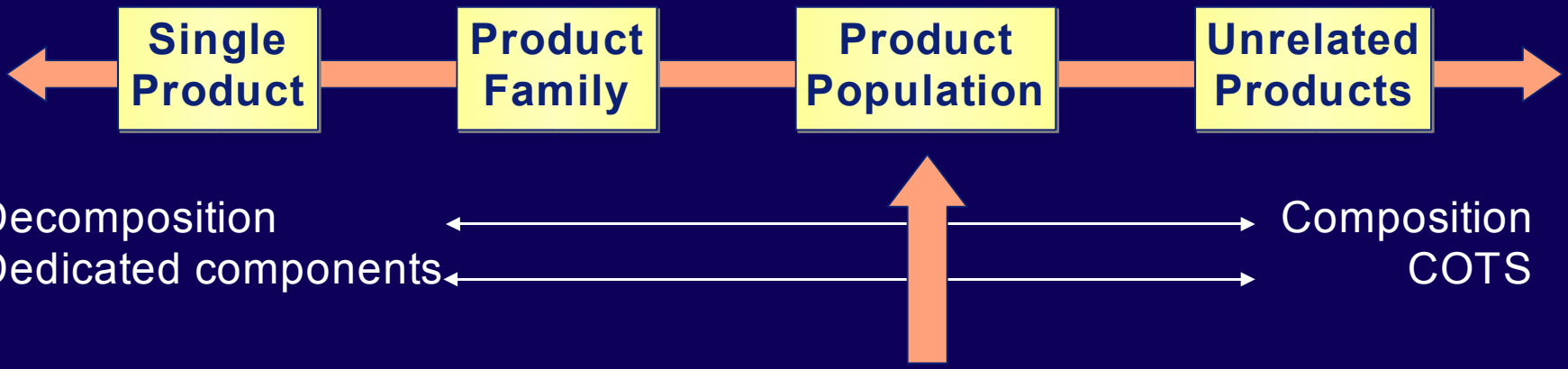
Amplifier

Hard disk

VCR

DVD

A product population is:
- a set of products with many commonalities,
- but also with many differences,
- developed by different suborganizations,
- each with its own time-line / lifecycle.



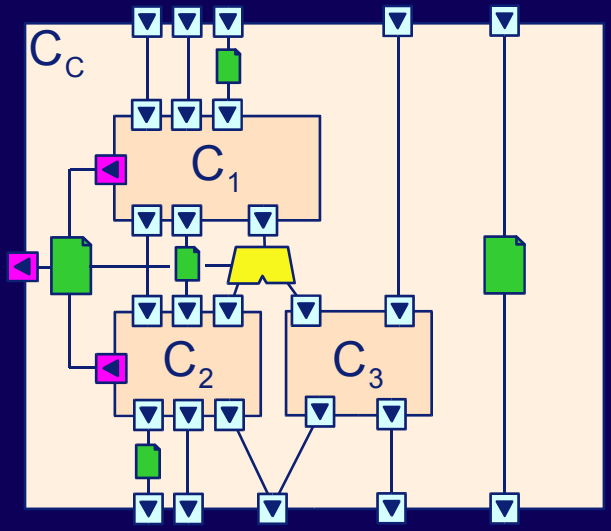
Example Product Line


BUILD-A-BEAR WORKSHOP

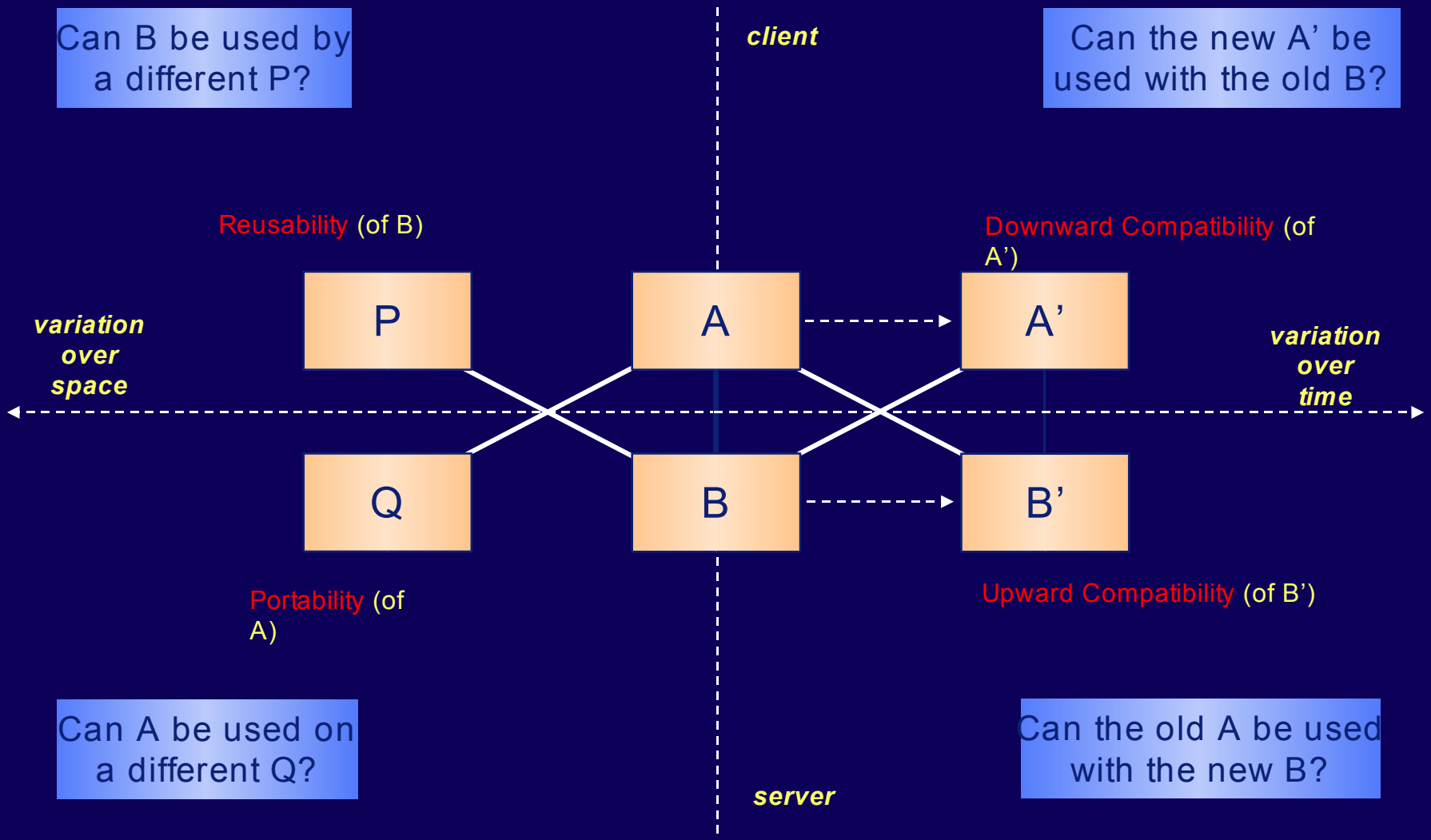
Enter Software Components...

Koala is…

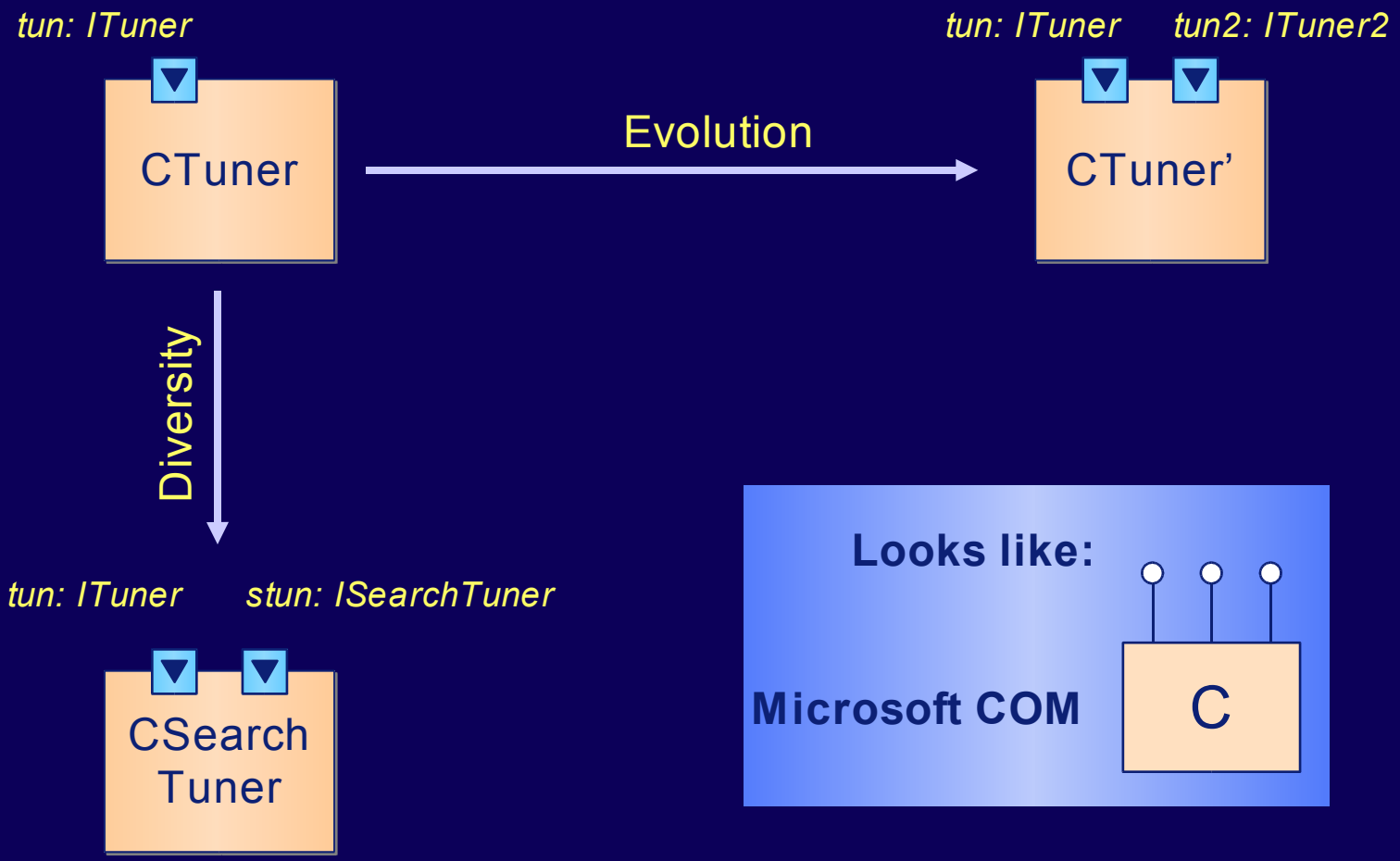
- a component Model
- with an ADL
- to build populations of
- resource constrained products



Independent Deployment

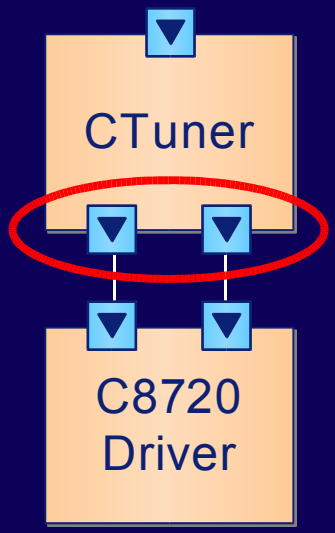


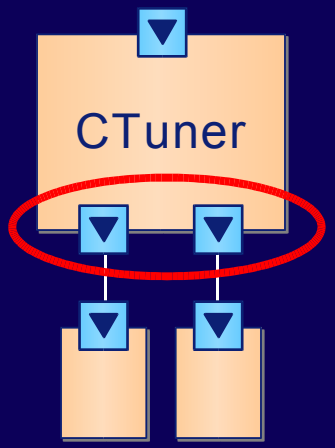
Provides Interfaces

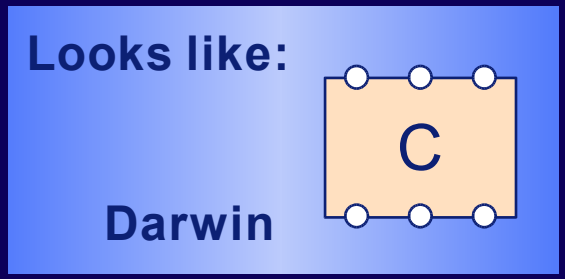


Requires Interfaces

All context dependencies are made explicit…
…and are bindable by a third party



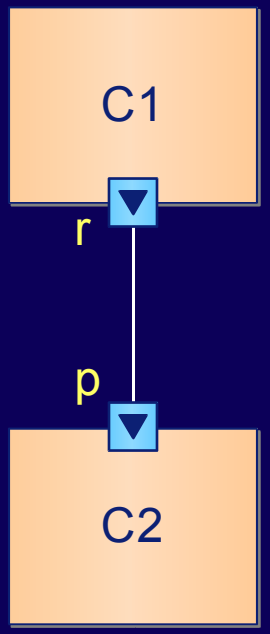




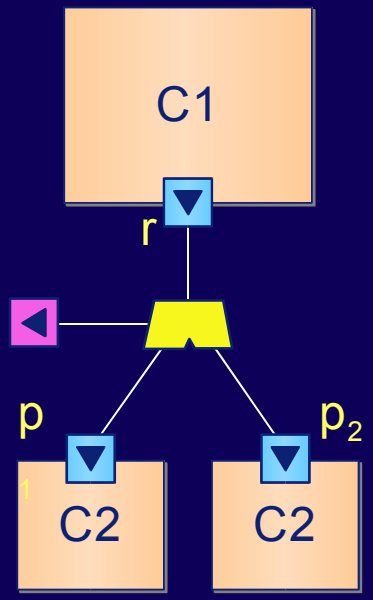
…so they can be bound differently in another product

Connectors

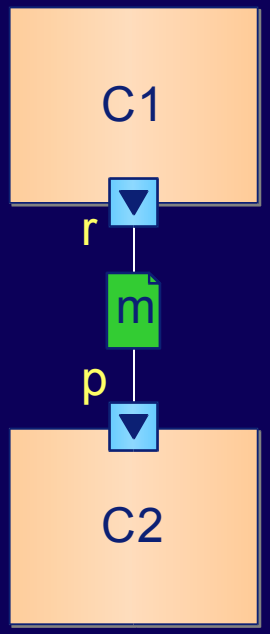
Direct



Switch



Glue Module

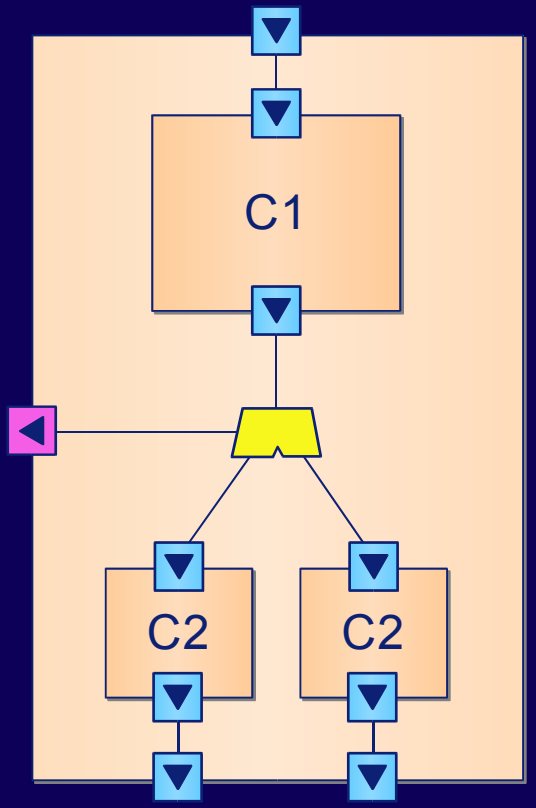


Looks like Hardware!

Looks like Visual Basic

Compound Components

Composition
is recursive…

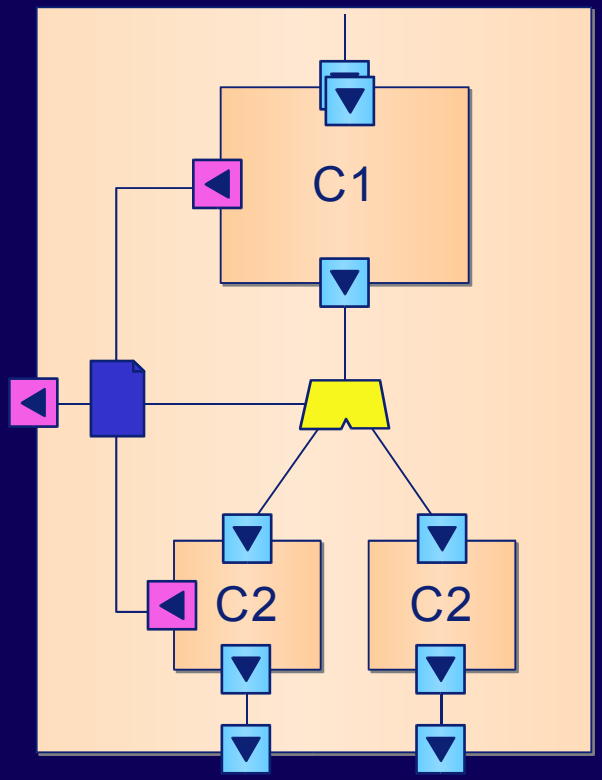


Component instances are encapsulated.

Component types are not (necessarily) (see later).

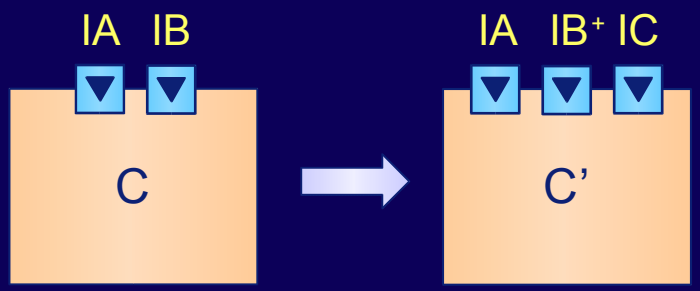
Diversity Interfaces and Switches

Diversity interfaces are *outgoing* interfaces which parameterize the component.



Partial evaluation is used to create resource efficient configurations.

Sub-typing and Evolution

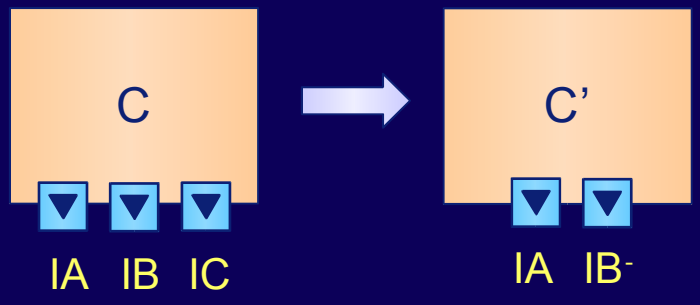


IB+ ⊆ IB

C' ⊆ C

Koala subtypes interfaces based on set inclusion of functions

Provide more...



IB- ⊇ IB

C' ⊆ C

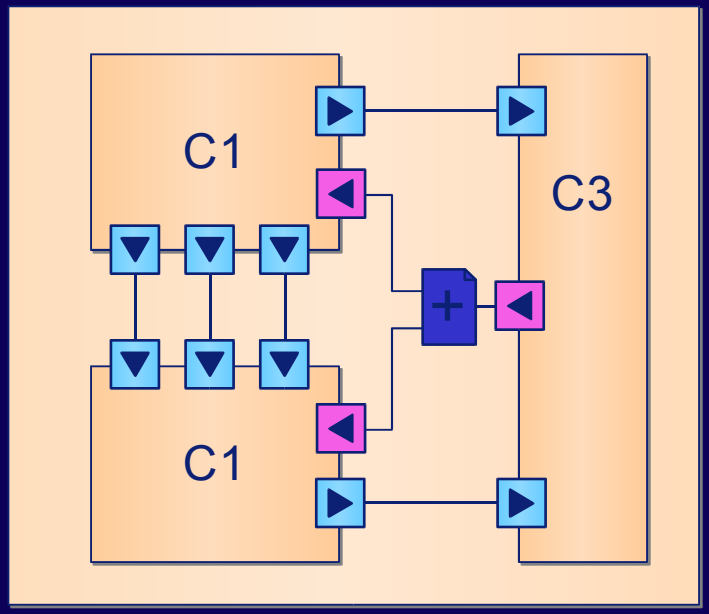
Koala reports an error if a non-existing interface is bound…!

Require less…???

Some Applications

Allocating Resources

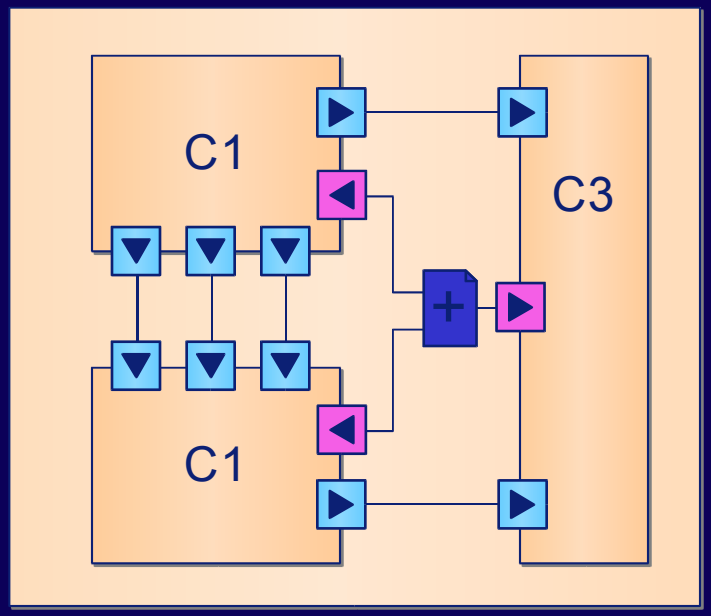
Components specify how many resources they require



This can be summed and provided to the component that delivers the resources at the product level

Predicting Code Size

Components specify their code size



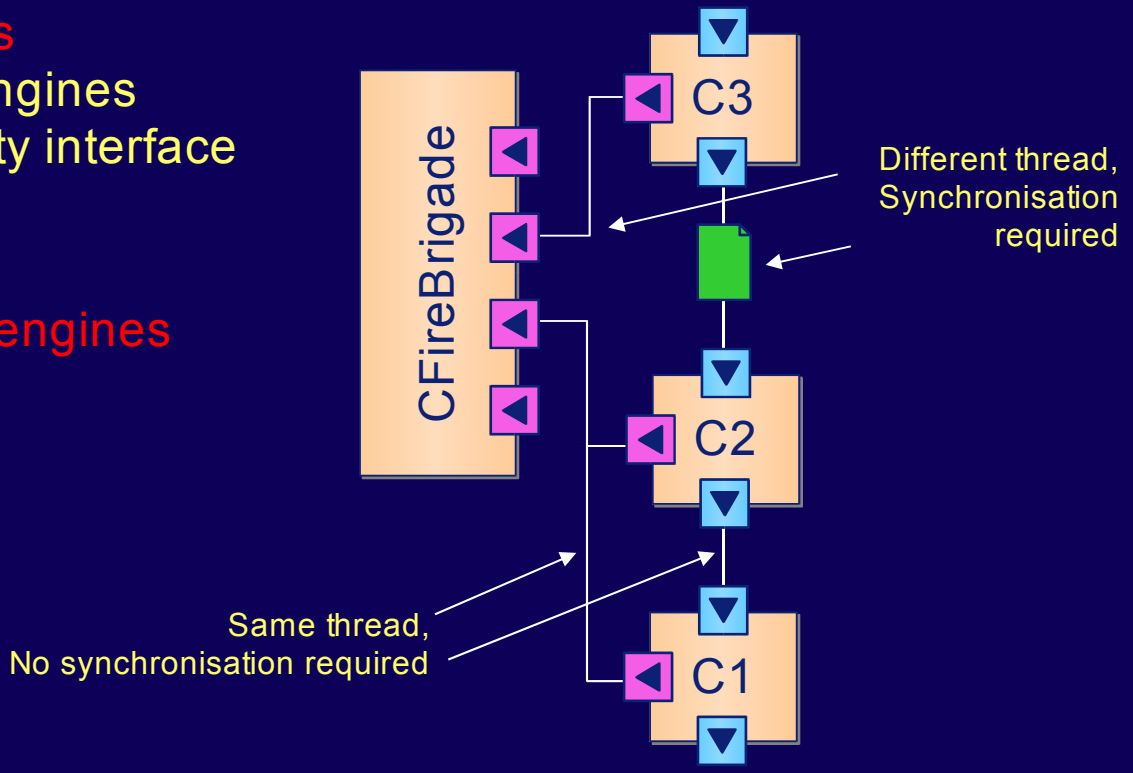
This can be summed at the product level

Multi Threading

Problem: many (>100) activities but few (<10) threads

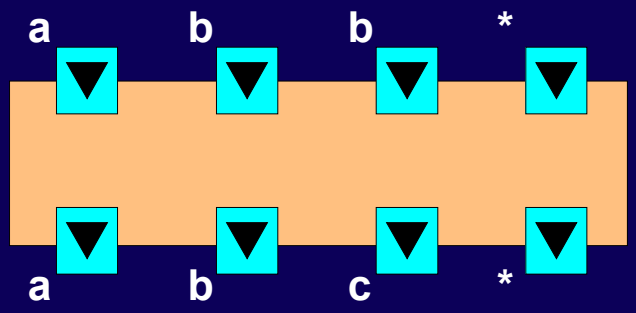
Step 1: use message pumps
created on virtual pump engines
required through a diversity interface

Step 2: bind these to pump engines
(a real dispatcher loop)

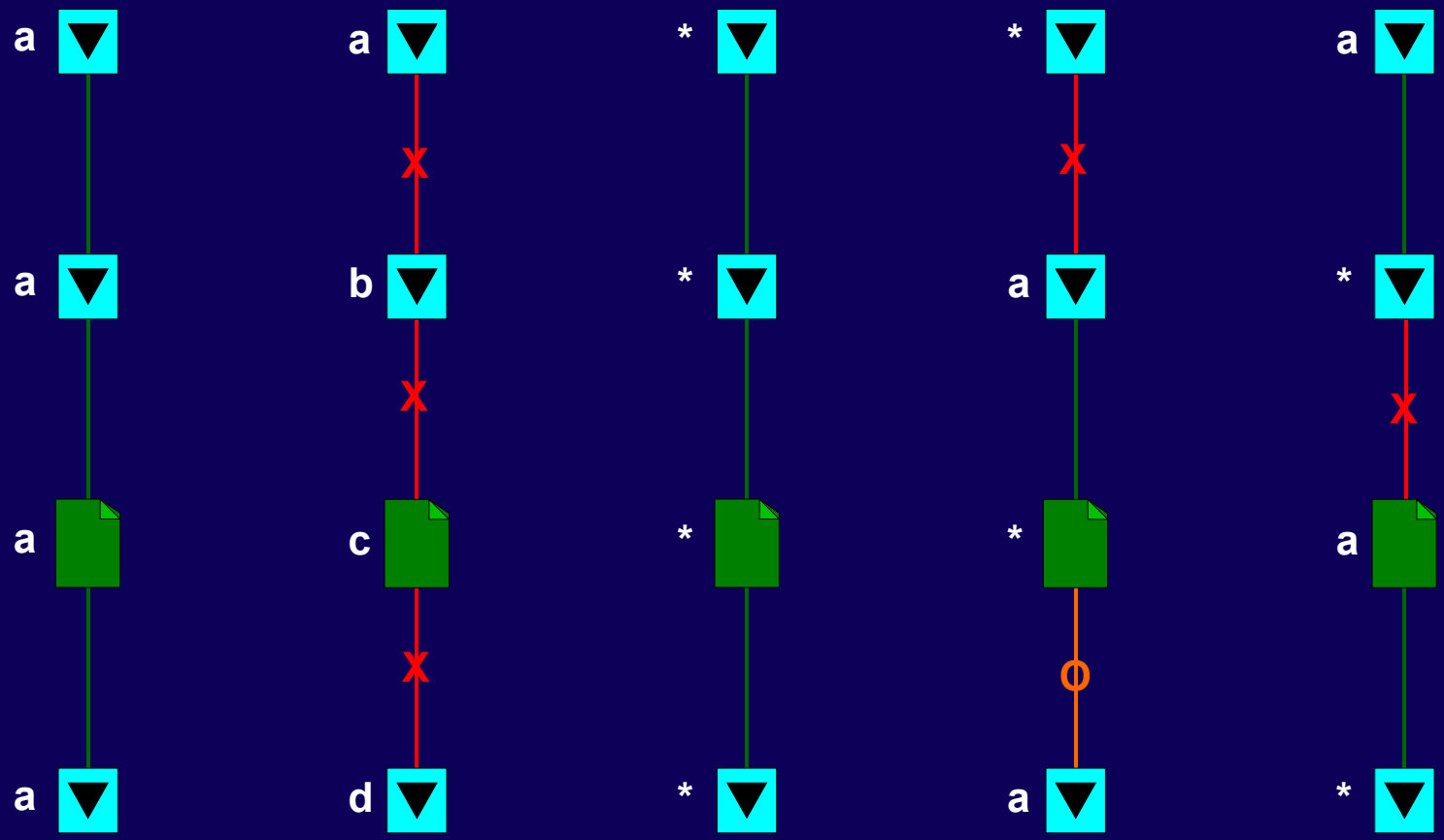


Threading Analysis

Attribute interfaces with
a symbolic thread label



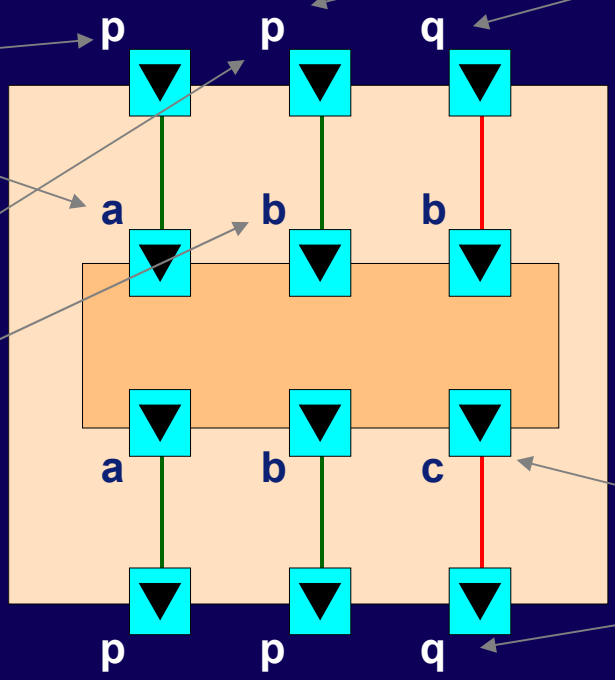
Threading Calculus



Unification

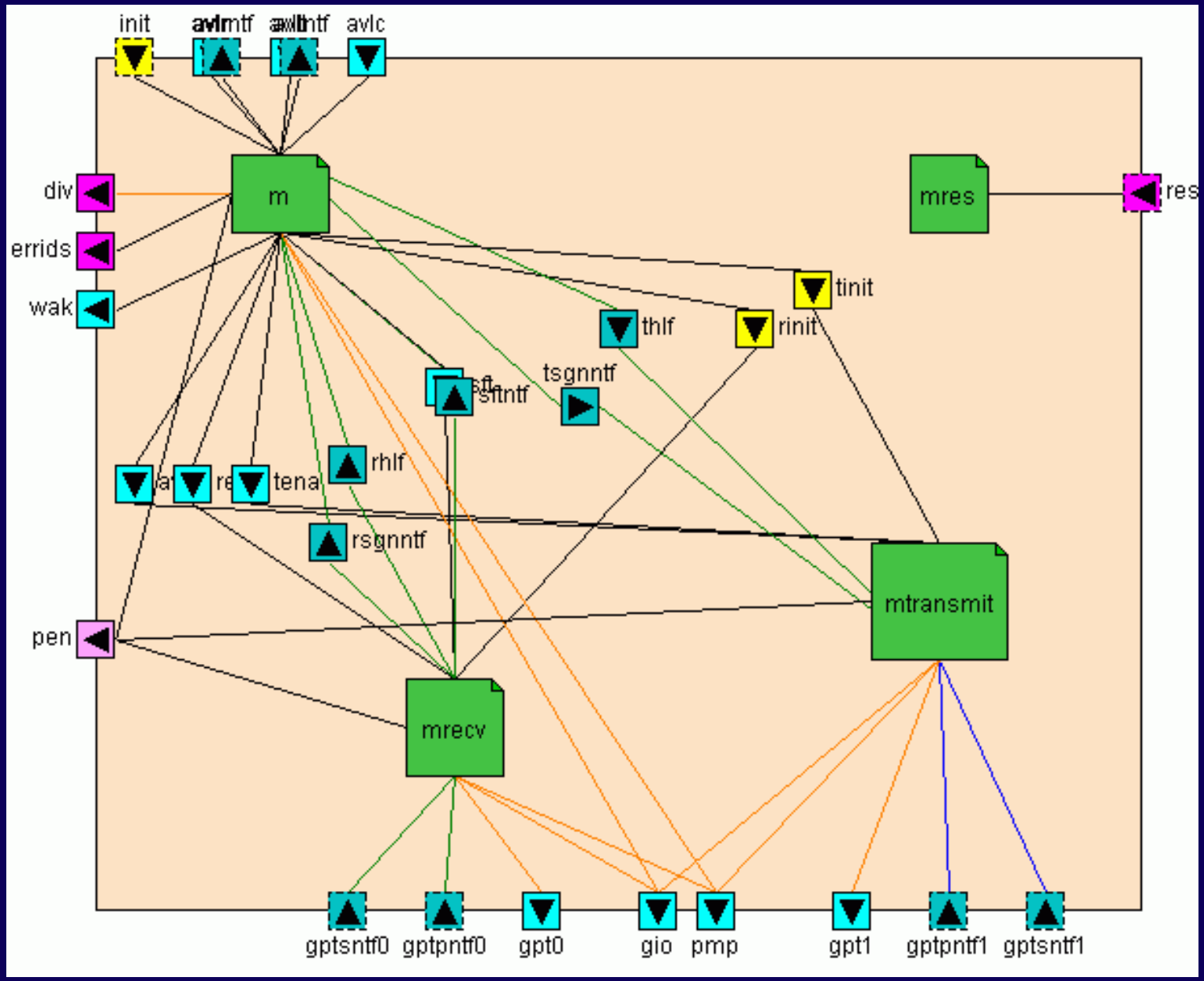
q must be same as p

Thread labels are unified



Prepared for call on different threads, but called on the same thread

C is a new thread, and cannot be equal to q


init
avlc
div
errids
wak
m
mres
res
tinit
thlf
rinit
tsgnntf
rhlf
tena
rsgnntf
mtransmit
pen
mrecv
gptsntf0
gptpntf0
gpt0
gio
pmp
gpt1
gptpntf1
gptsntf1