Carving up stuff for fun and profit

Topconf Linz 2016

Stefan Tilkov
@stilkov
innoQ

“Stuff”?

Building blocks

lambdas

components

functions

services

containers

dynamic libraries

VMs

units

objects

libraries

images

classes

procedures

shared objects

modules

microservices

Commonalities

boundary

environment

implementation

dependencies

interface

How big shall each individual piece be?

Just make things the *right* size

My favorite programmer’s story

Task: Read a file of text, determine the *n* most frequently used words, and print out a sorted list of those words along with their frequencies.

Donald Knuth

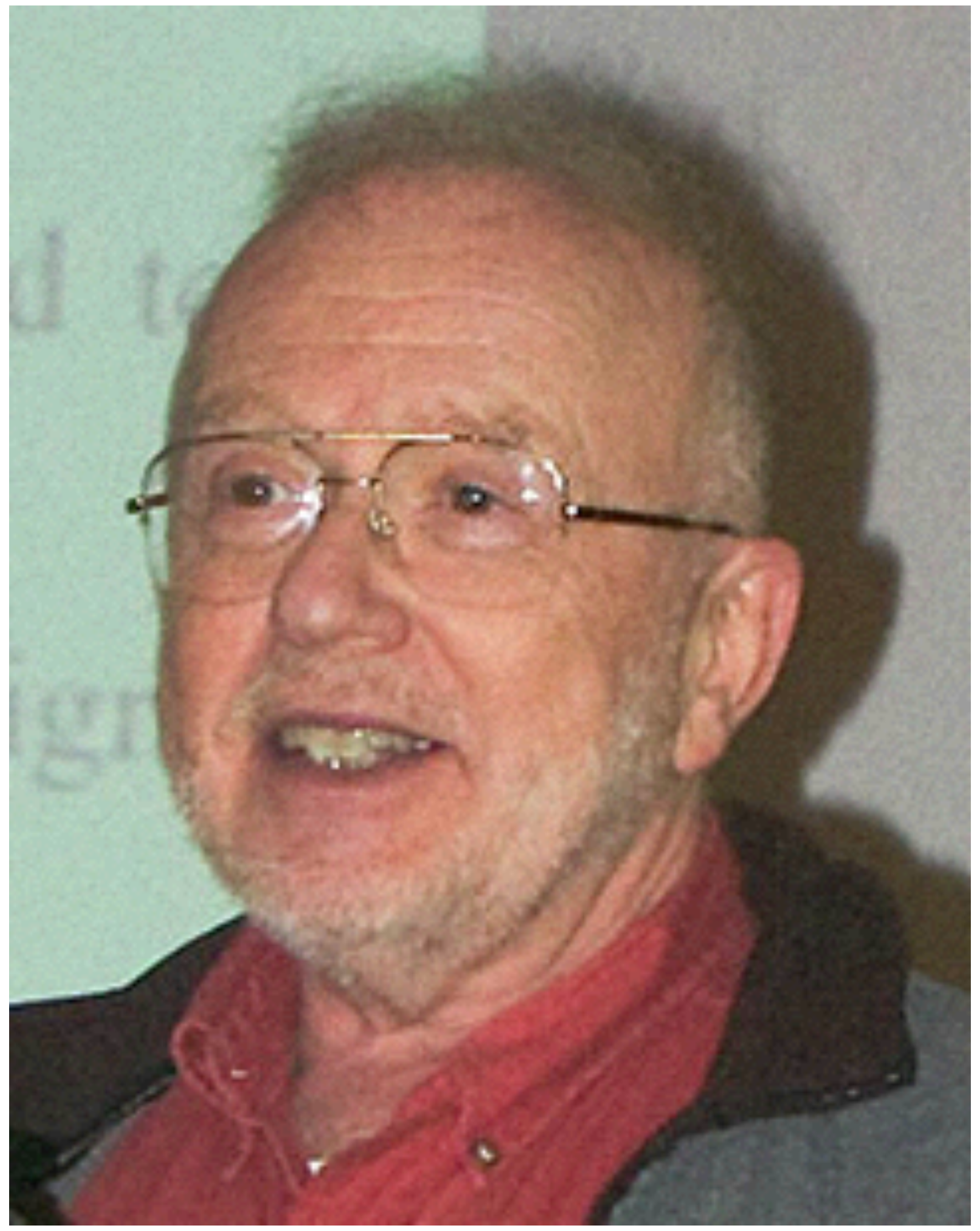
10-page literal
Pascal program,
including innovative
new data structure

Doug McIlroy

```
tr -cs A-Za-z '\n' |
tr A-Z a-z |
sort |
uniq -c |
sort -rn |
sed ${1}q
```

Dr. Drang, http://www.leancrew.com/all-this/2011/12/more-shell-less-egg/

Information Hiding



"[I]t is almost always incorrect to begin the decomposition of a system into modules on the basis of a flowchart. We propose instead that one begins with a list of difficult design decisions or design decisions which are likely to change. ***Each module is then designed to hide such a decision from the others."***

David L. Parnas, 1971

http://www.cs.umd.edu/class/spring2003/cmsc838p/Design/criteria.pdf

Separation of concerns

“Let me try to explain to you, what to my taste is characteristic for all intelligent thinking. It is, that one is willing to study in depth an aspect of one's subject matter in isolation for the sake of its own consistency, all the time knowing that one is occupying oneself only with one of the aspects. […] ***It is what I sometimes have called "the separation of concerns", which, even if not perfectly possible, is yet the only available technique for effective ordering of one's thoughts, that I know of. This is what I mean by "focussing one's attention upon some aspect": it does not mean ignoring the other aspects, it is just doing justice to the fact that from this aspect's point of view, the other is irrelevant.*** *It is being one- and multiple-track minded simultaneously.”*

Edsger W. Dijkstra, 1974

http://www.cs.utexas.edu/users/EWD/ewd04xx/EWD447.PDF

Separate separate things

Join things that belong together

Single Responsibility Principle

“A class [or module] should only have one reason to change. […] The SRP is one of the simplest of the principles, and one of the hardest to get right. Finding and separating those responsibilities from one another is much of what software design is really about.”

“There is a corrolary here. An axis of change is only an axis of change if the changes actually occur.”

Robert C. Martin, 1995/2003

http://www.butunclebob.com/ArticleS.UncleBob.PrinciplesOfOod

High Cohesion

Loose Coupling

Vocabulary

adhesive: able to stick fast to a surface or object; sticky:

cohesive: characterized by or causing cohesion

cohesion: the action or fact of forming a united whole;
in physics: the sticking together of particles of the same substance

inherent: existing in something as a permanent, essential, or characteristic attribute

http://vanderburg.org/blog/Software/Development/cohesion.rdoc

Cohesion in OO: Object Calisthenics

1. One level of indentation per method
2. Don’t use the ELSE keyword
3. Wrap all primitives and strings
4. First class collections
5. One dot per line
6. Don’t abbreviate
7. Keep all entities small
8. No classes with more than two instance variables.
9. No getters/setters/properties
10. No static methods other than factory methods

Jeff Bay, 2008 – http://www.cs.helsinki.fi/u/luontola/tdd-2009/ext/ObjectCalisthenics.pdf

Indicators of *strong* cohesion

simple to understand

difficult to split

simple to explain

one stakeholder

(re-)used as a whole

one reason to change

Indicators of *weak* cohesion

hard to understand

obviously divisible

difficult to explain

multiple stakeholders

partially re-used

many reasons to change

Forces for separation

Different environments (scale, performance, security, ...)

Frequency of change

Weight

Need for reuse

Crosscutting concerns

Technical dependencies

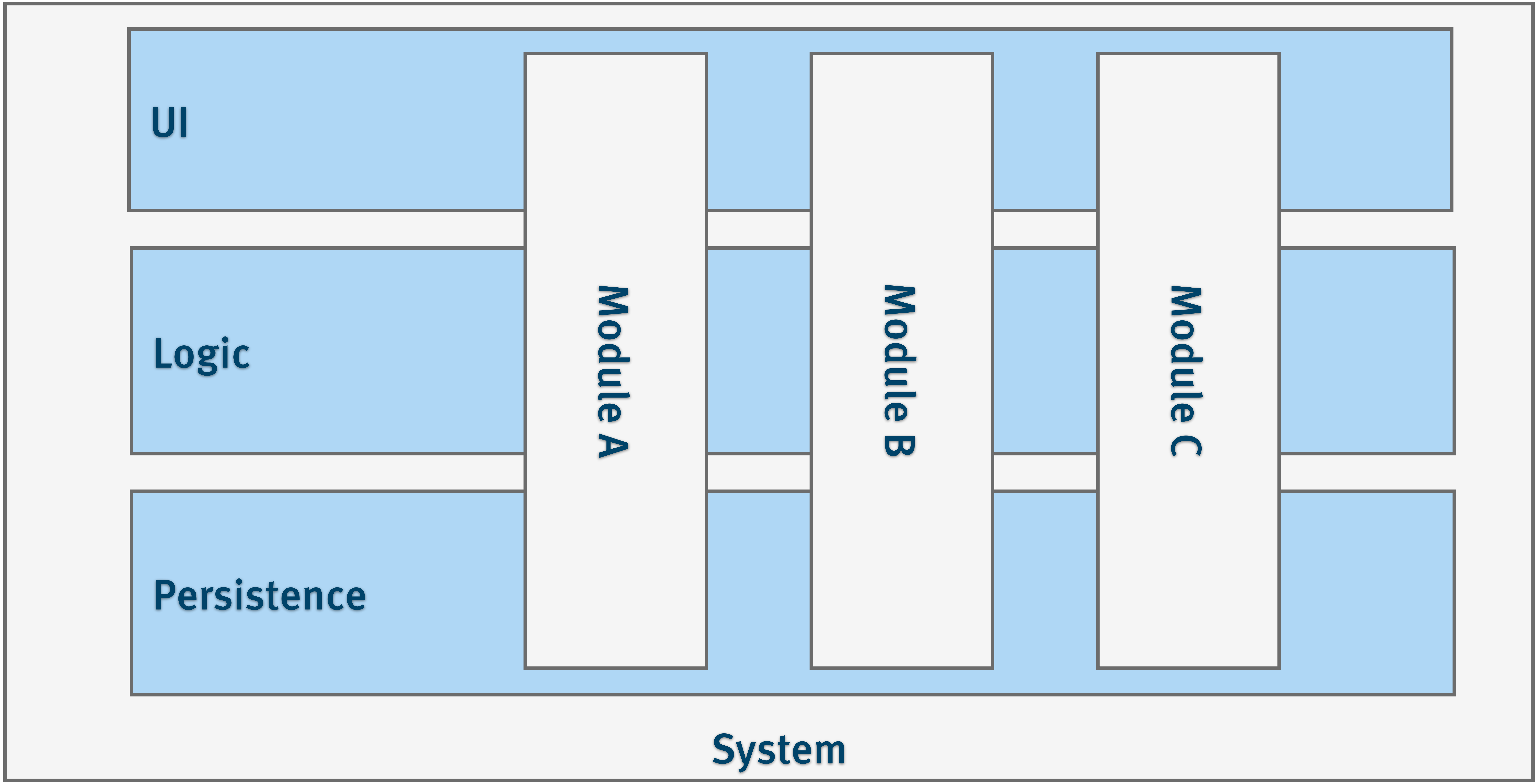
Domain dependencies

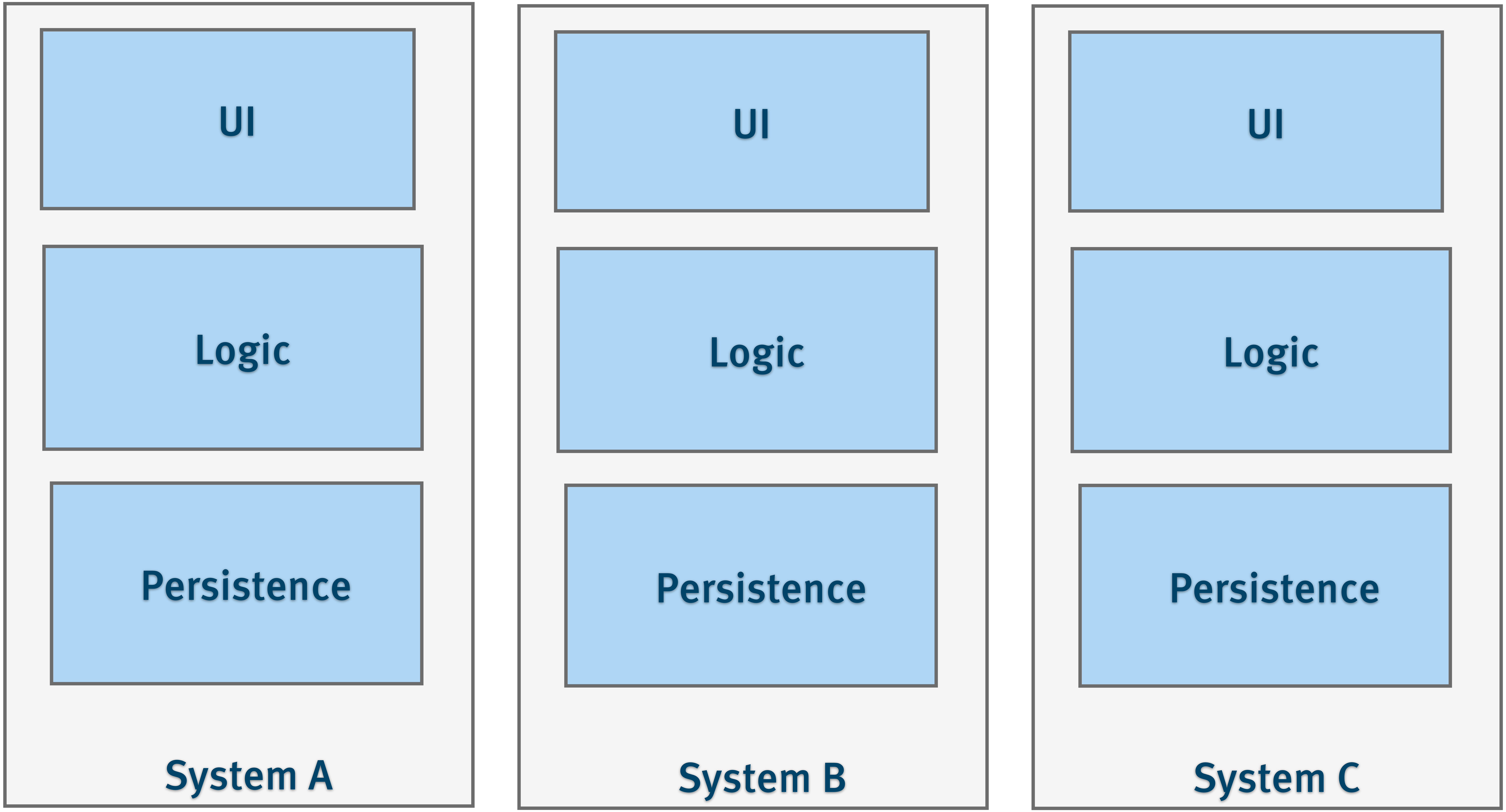
Parallel/isolated runtime

Implementation

Parallel/isolated development

Multiple Dimensions
Different Priorities


UI
Logic
Persistence
Module A
Module B
Module C
System



UI

Logic

Persistence

System A

UI

Logic

Persistence

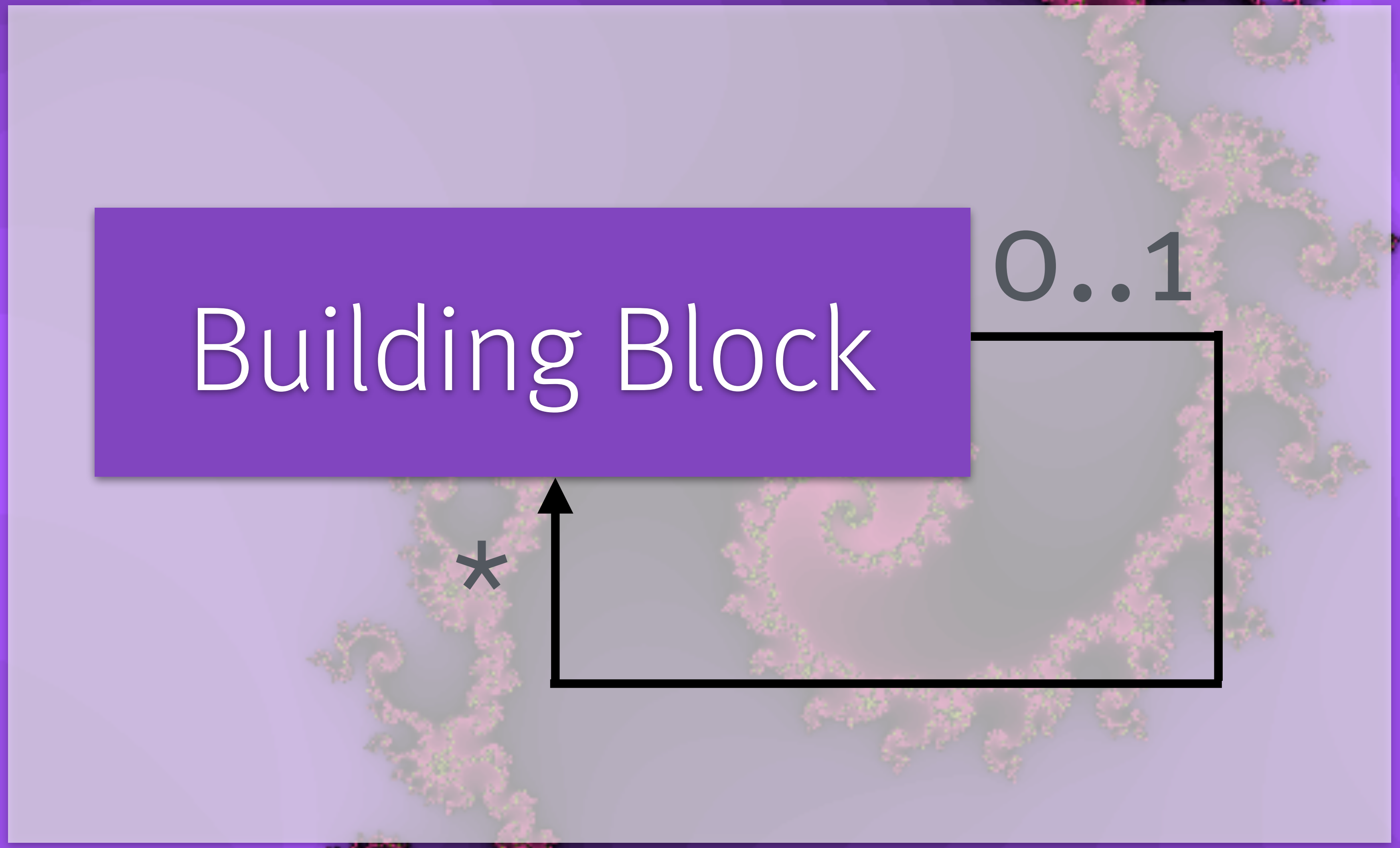
System B

UI

Logic

Persistence

System C

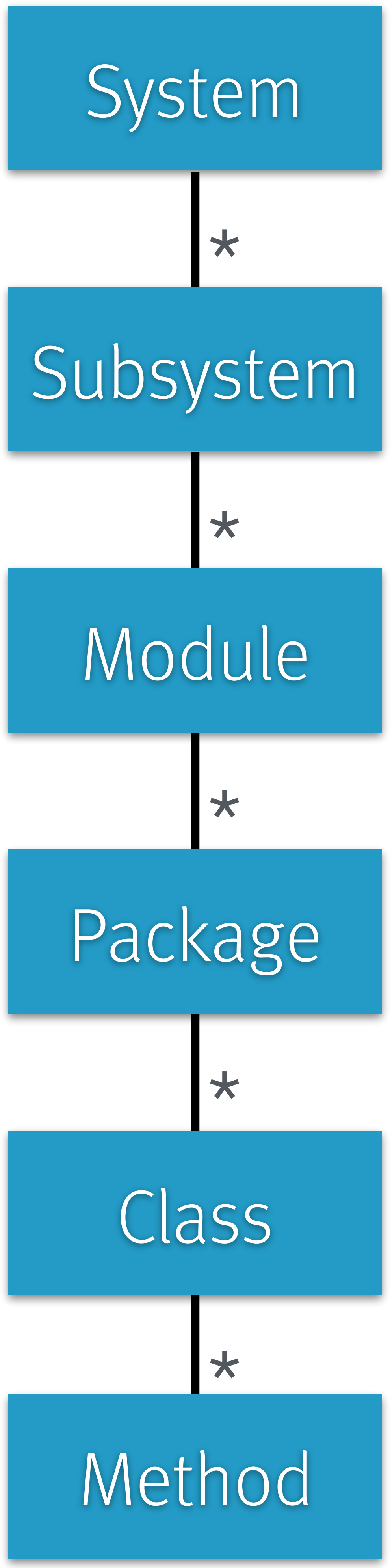


Building Block

0..1

*

Hierarchy & Rule Example



System

*

Subsystem

*

Module

*

Package

*

Class

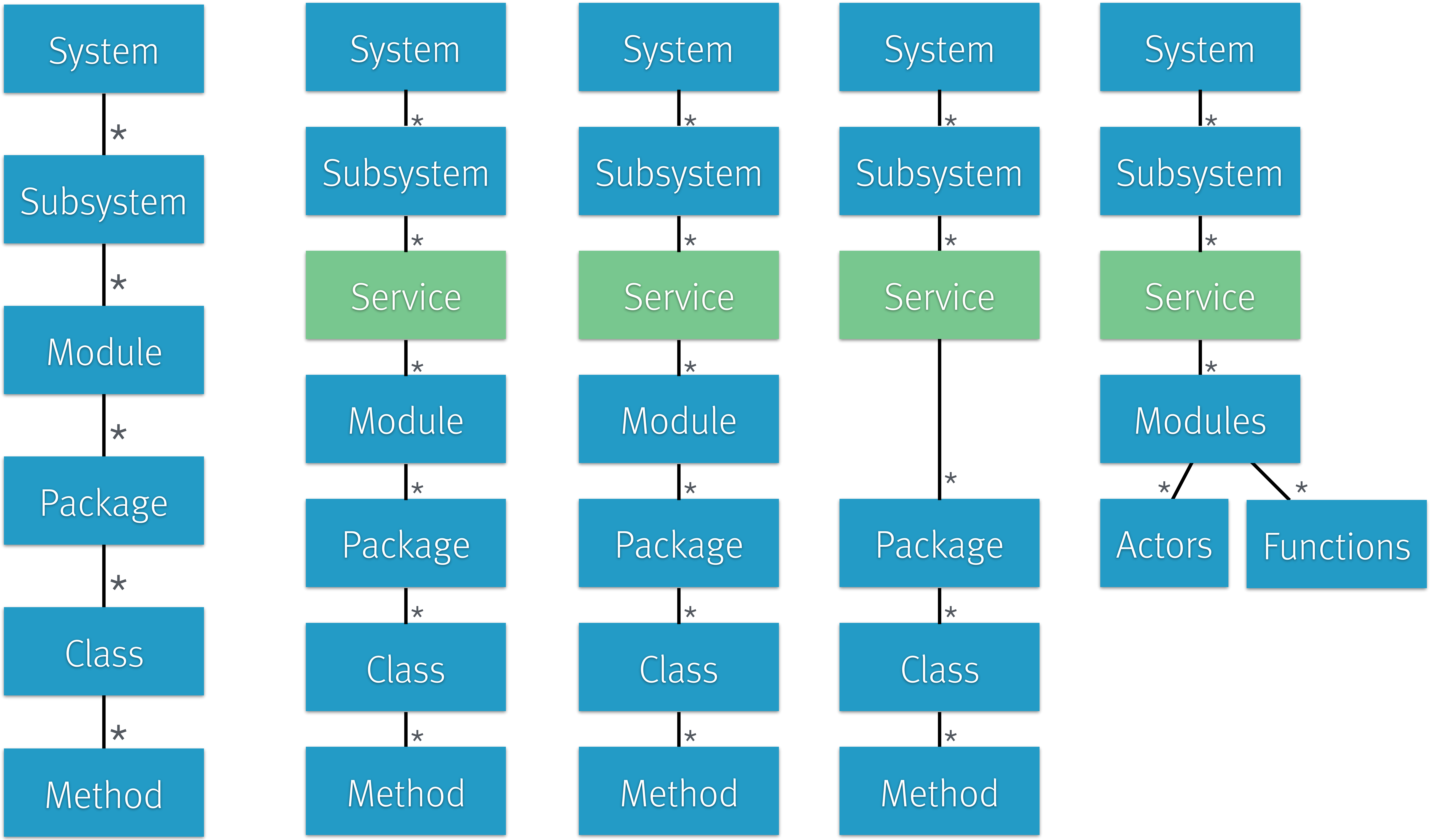
*

Method

- Systems only communicate via async interfaces
- Subsystems can use sync calls via facades
- Modules only depend on modules of lower layers
- Packages must not have circular dependencies
- Classes within a package can collaborate closely
- Methods must not call beyond depth 2

Different modularization levels

Different rules & strategies



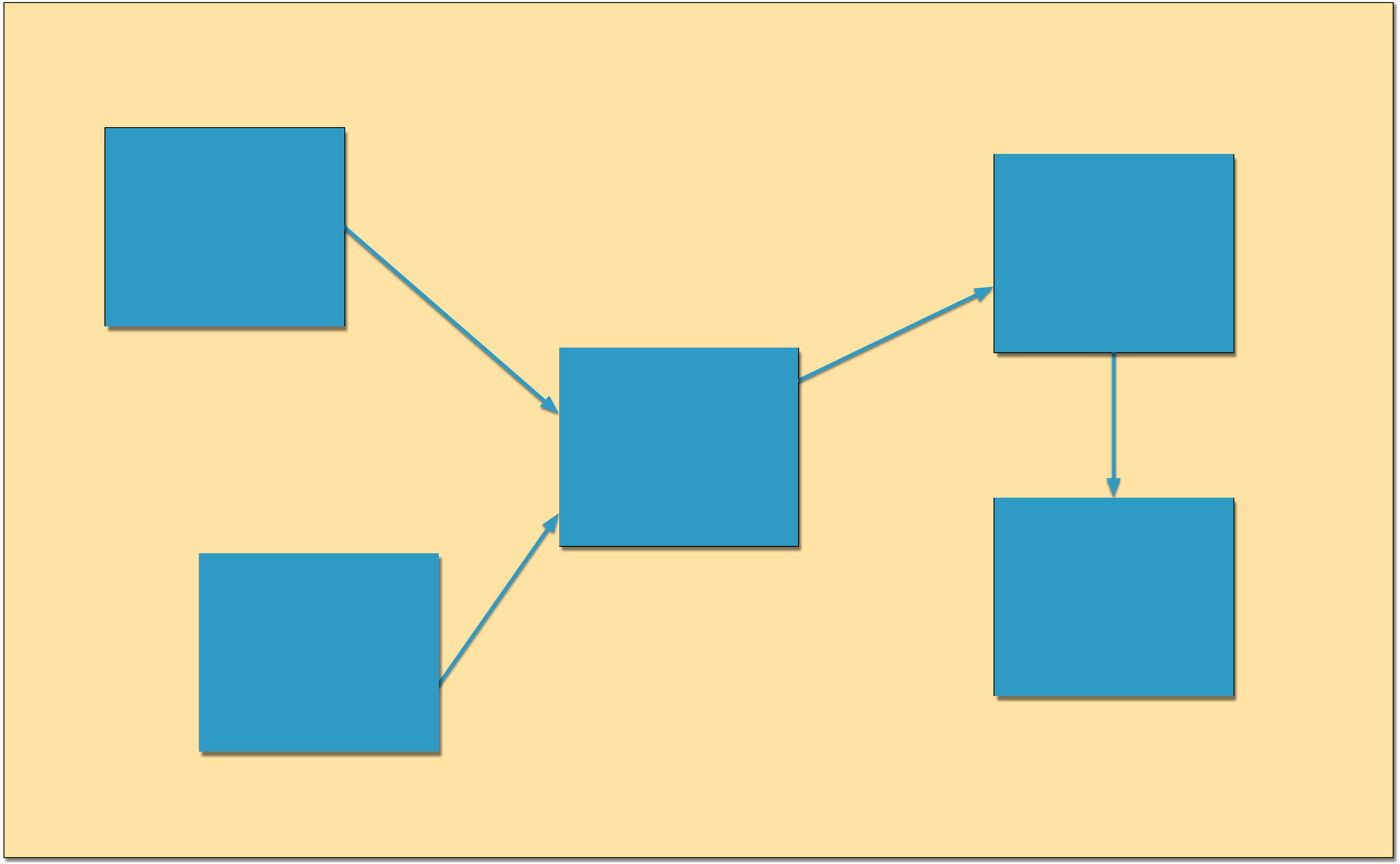
System
*
Subsystem
*
Module
*
Package
*
Class
*
Method

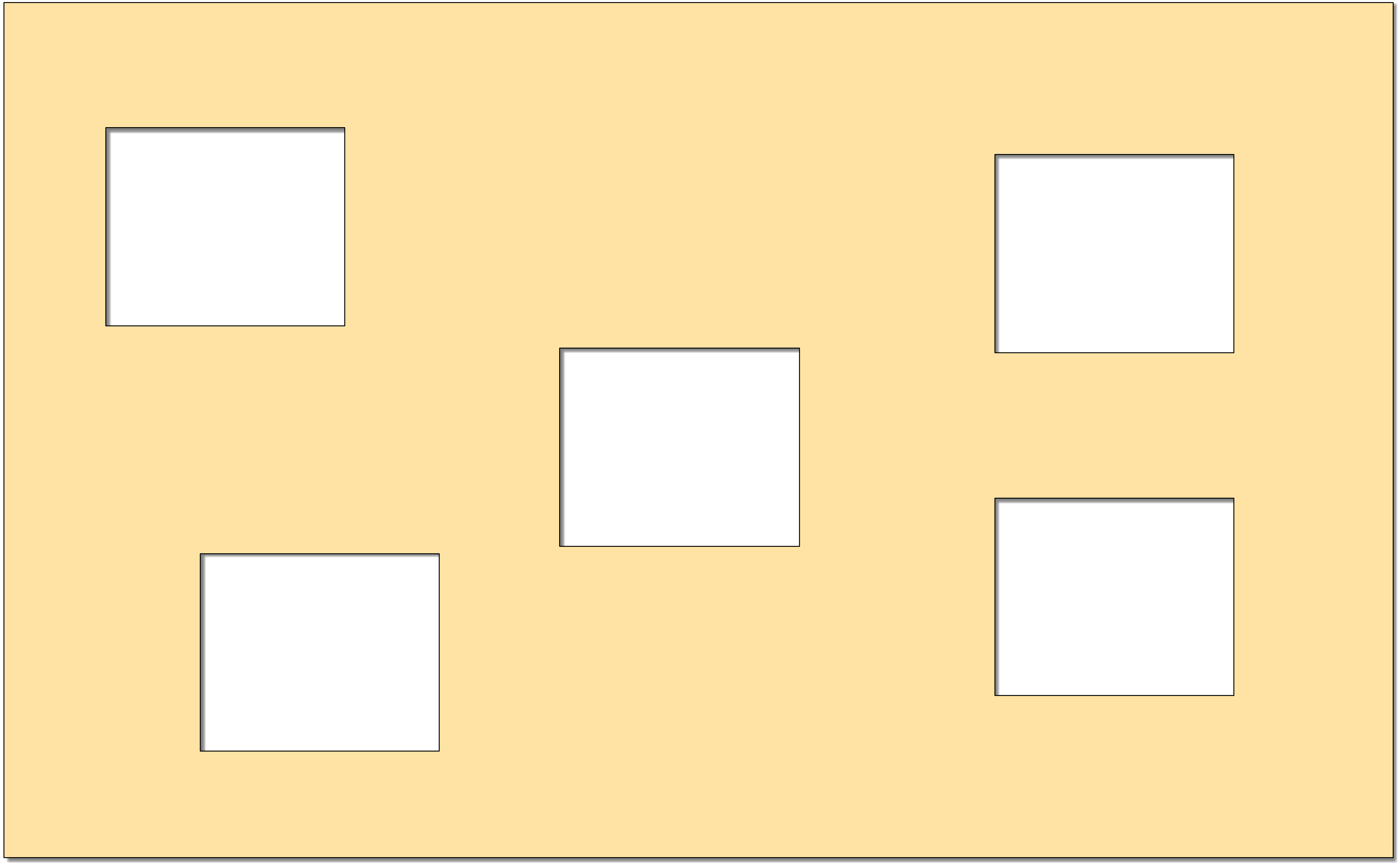
System
*
Subsystem
*
Service
*
Module
*
Package
*
Class
*
Method

System
*
Subsystem
*
Service
*
Module
*
Package
*
Class
*
Method

System
*
Subsystem
*
Service
*
Package
*
Class
*
Method

System
*
Subsystem
*
Service
*
Modules
*
Actors
*
Functions





Environments

Language runtimes

Supervisors

Operating Systems

Container Hosts

Hardware

Application servers

Lessons learned

What works:

Being explicit about your meta-model

What doesn’t:

Mentioning the word “meta-model”

What works:

Separating macro and micro decisions

What doesn’t:

Over-regulating everything

What works:

Trusting your gut and making a good guess

What doesn’t:

Fleeing into technicalities

What works:

Use organization and its use cases as level 0 driver

What doesn’t:

Center around technical commonality

What works:

Prepare to be wrong on every level

What doesn't:

Aim for perfection and stubbornly stick to it

Finally, the only question you’re *really* here for:

Q. How big should your microservices be?

A: Super-small

Characteristics:

- As small as possible
- A few hundred lines of code or less
- Triggered by events
- Communicating asynchronously

As seen on:

- Any recent Fred George talk
- Serverless Architecture(*)
- AWS Lambda

(*) https://leanpub.com/serverless

A: Small

Characteristics:

- Small, self-hosted
- Communicating synchronously
- Cascaded/streaming
- Containerized

As seen on:

- Netflix
- Twitter
- Gilt

A: Medium-sized

Characteristics:

- Self-contained, autonomous
- Including UI + DB
- Possibly composed of smaller microservices

As seen on:

- Amazon
- Groupon
- Otto.de
- Self-contained systems (SCS)(*)

(*) https://scs-architecture.org

James Lewis

That's all I have, thanks for listening.

Thank you.

Questions?

Comments?

@stilkov

Stefan Tilkov

stefan.tilkov@innoq.com

Phone: +49 170 471 2625

innoQ

www.innoq.com

innoQ Deutschland GmbH

Krischerstr. 100
40789 Monheim am Rhein
Germany
Phone: +49 2173 3366-0

Ohlauer Straße 43
10999 Berlin
Germany
Phone: +49 2173 3366-0

Ludwigstr. 180E
63067 Offenbach
Germany
Phone: +49 2173 3366-0

Kreuzstraße 16
80331 München
Germany
Phone: +49 2173 3366-0

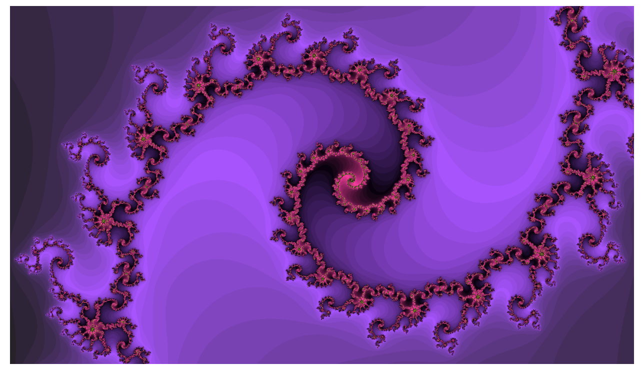
innoQ Schweiz GmbH

Gewerbestr. 11
CH-6330 Cham
Switzerland
Phone: +41 41 743 0116

Image Credit

David Mellor Kitchen Knives, https://flic.kr/p/pyW8xB

Alice Popkorn, https://flic.kr/p/5NsmsK



hairchaser, https://flic.kr/p/aqNWyV