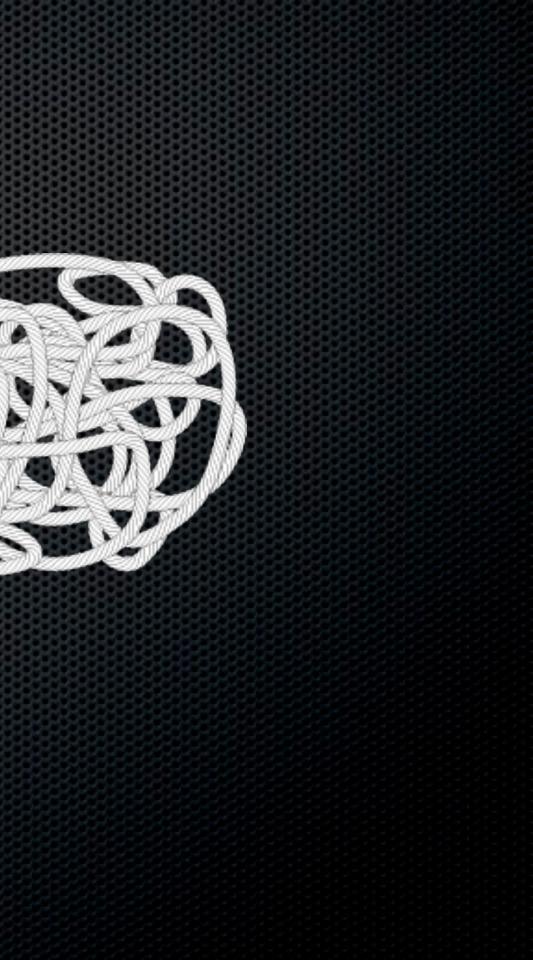
Where's my Architecture?

Chris Chedgey Structure101



Discovering/defining architecture

- Real architecture
- Existing codebase structure
- Well-structured containment
- Creating well-structured containment
- Levelization
- Making it real •



+ Examples

About Structure101 Inc.

Structure101

- Since 2000/2007
- Team in Ireland, France, India, Spain, Canada, ...
- Web+channel sales

"Structure101 shaved months of calendar time and man years of effort off the project" Bill Jackson, Netflix



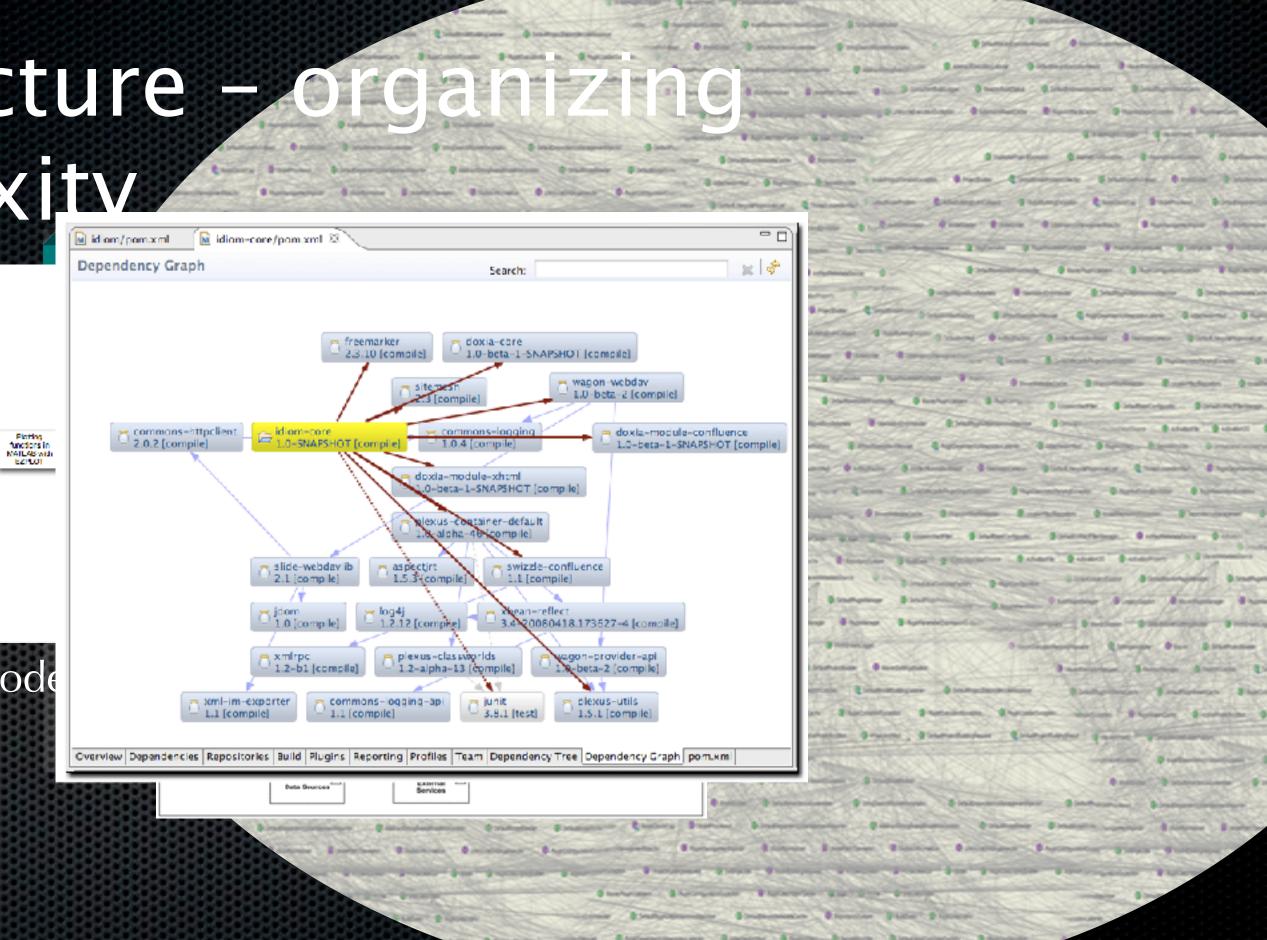
Why Structure?

"Well-structured software is delivered in half the time, at half the cost, with 8x less bugs" US Air Force study.

- When a codebase grows beyond a certain size, without a guiding architecture, developers start drowning in an expanding sea of source files
- This is a huge, pervasive driver of cost which impacts all development activities
- Discovering defining an architecture for an existing code base is a much lower cost and risk than struggling on... or starting over
- But this has required a new kind of tool \rightarrow **Structure101** •

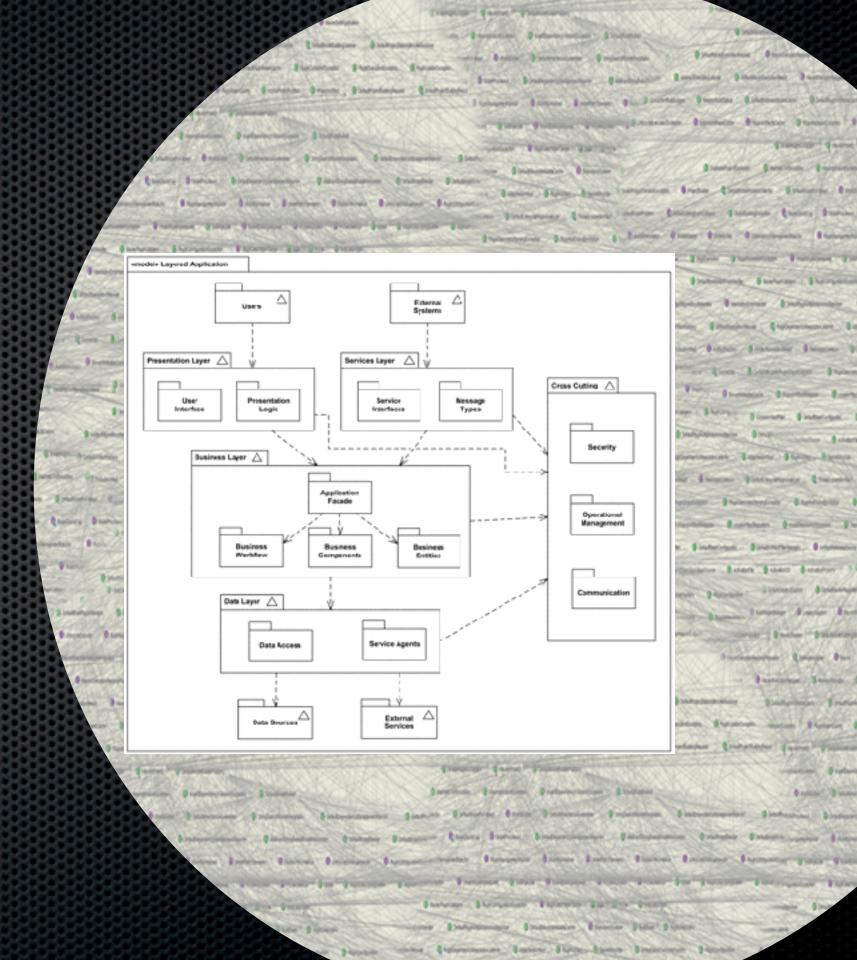
Architecture – oro complexity idiom/pom.xml

- Well organiz •
- Inter-contain •
- Real? •
 - Maps to code
 - Validated



Real Architecture

- Map/blueprint for developers
- Phased testing and release
- Divide work across organizations, teams, individuals
- Modularity: interfaces + info hiding
- Reuse or replace subsystems or layers
- Impact/regression control
- Help new developers
- •
- Agile Engineering



Controlling Architecture

- New project •
 - Define architecture that maps to the evolving codebase
 - Communicate, enforce, evolve •
- Existing codebase •
 - **Discover**/lefine architecture that maps to the evolving codebase
 - Communicate, enforce, evolve •

The structure of a codebase



What we have (raw material)

mentation 1. Imp

Not an "architecture"

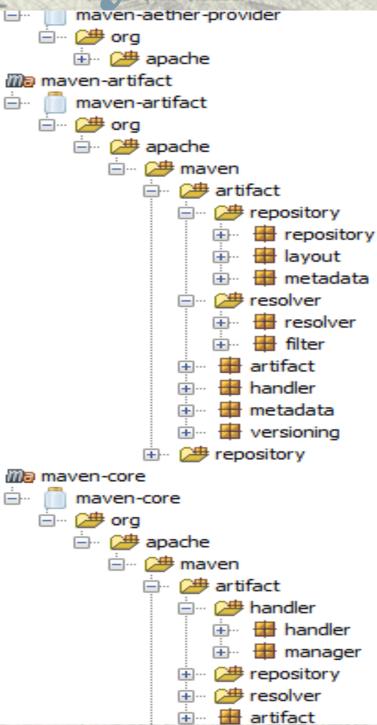
Thousands of source files

Countless interdependencies

What we have

calorganization

2



projects, ...

Packages, jars, Maven

Helps to find files

But is it an "architecture"?

What we have

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projects, ...

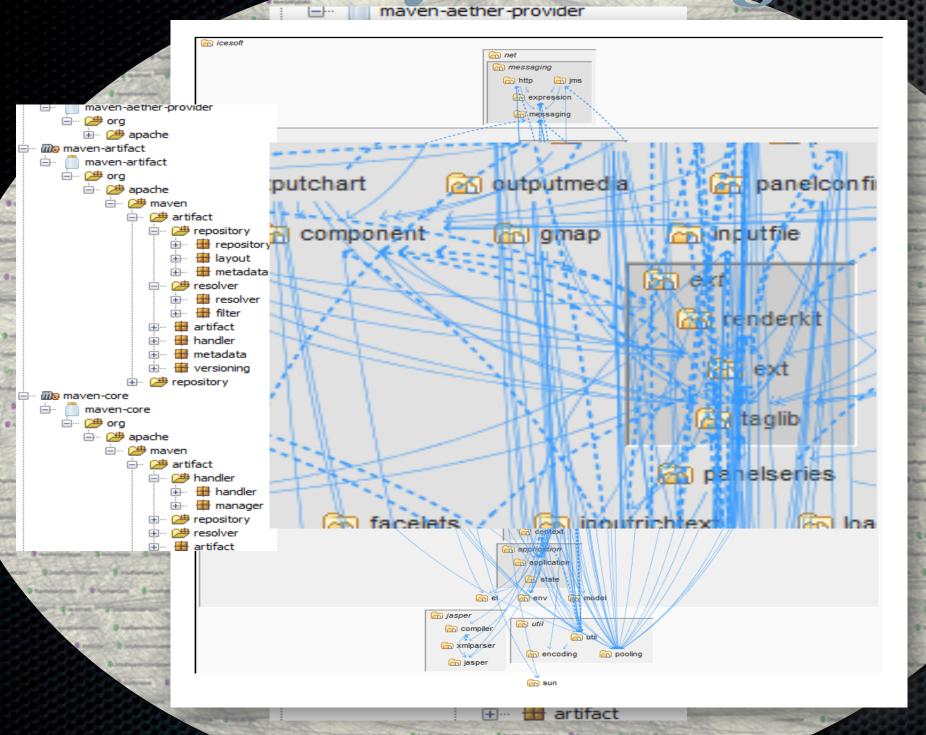
Packages, jars, Maven

Helps to find files

But is it an "architecture"?

What we have

organization 2



projects, ...

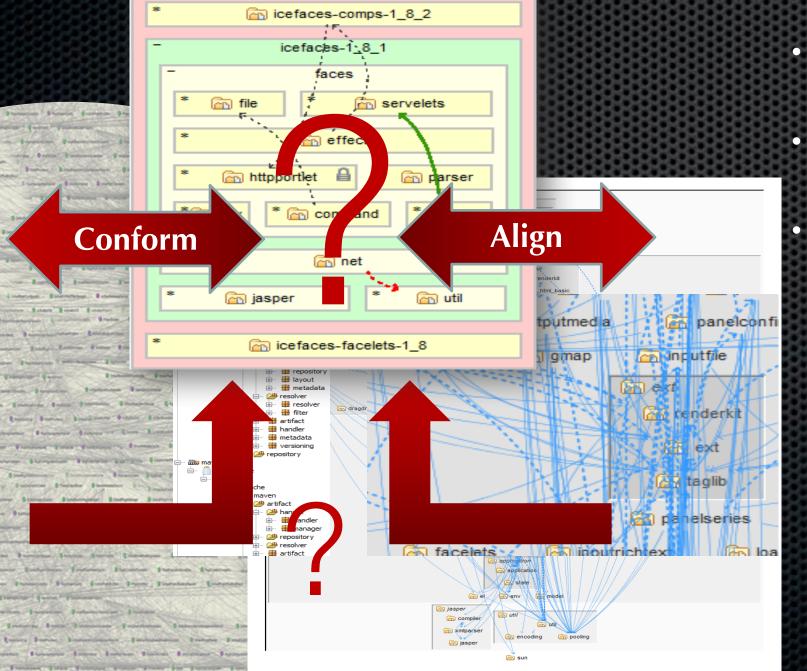
Not usually an "architecture"

Packages, jars, Maven

Helps to find files

But is it an "architecture"?

What do we need? 3. "Architecture"



James Darrent Darrent by the Darrent

Construction Designments Designed as April 2 (1981)

What is it?

How do we get it? How do we make it real?

"Well-structured containment"



Containment

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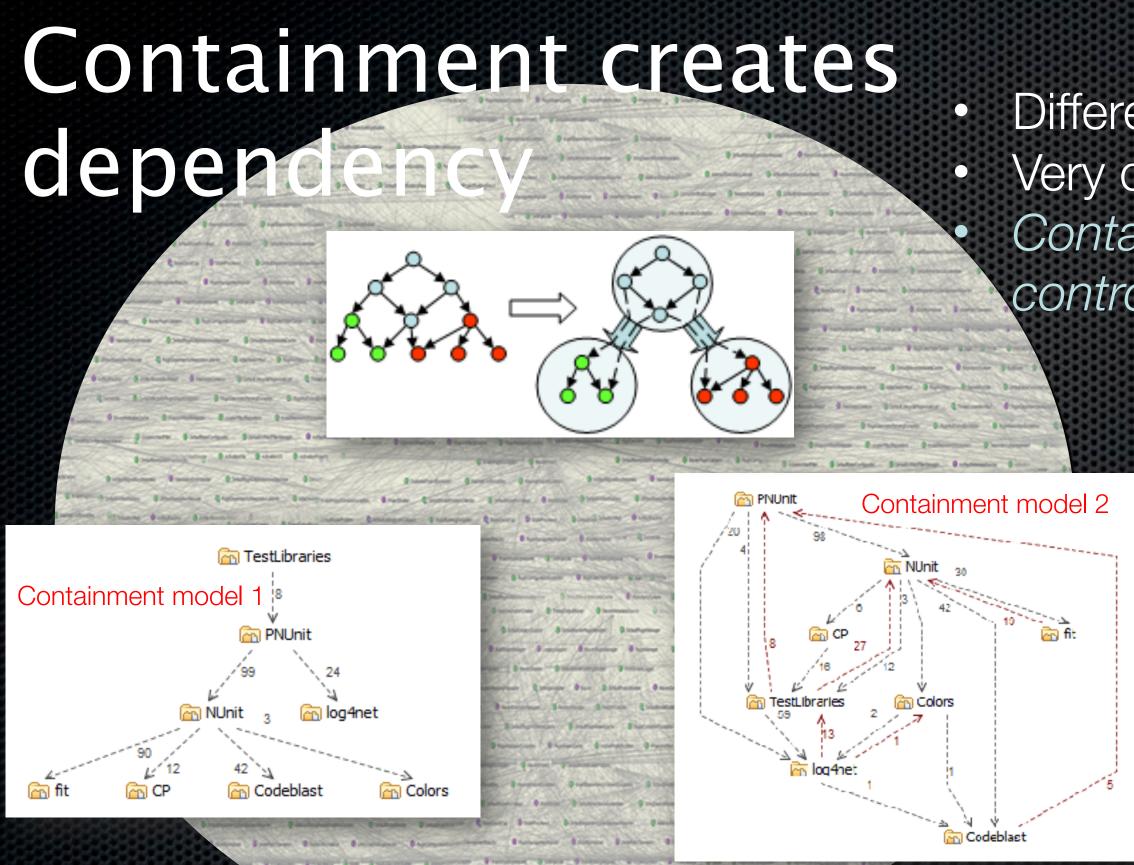
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Divide and conquer Code \rightarrow method \rightarrow class \rightarrow package \rightarrow subsystem \rightarrow "<u>Fat</u>" = too much in one place Grow and divide



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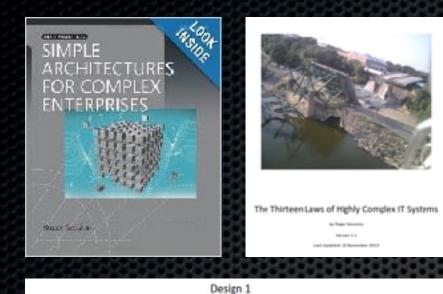
- Parallel States Antoniones, Barrier, Parallance Brancours, Parall

Different containment Very different dependency *Containment is key to controlling dependency*

Dependency creates complexity

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Roger Sessions:



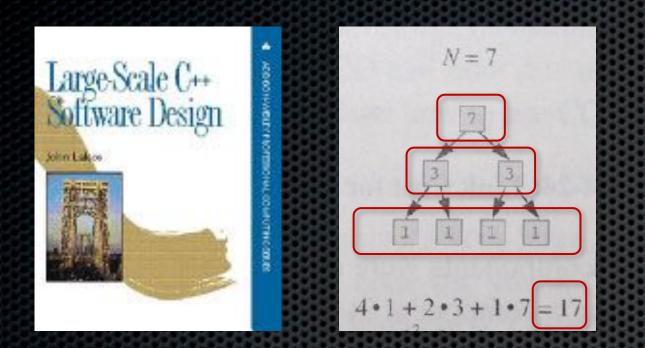
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Get Login Info	Login to User Account	Read User Acont Info
Get Bank Access Info	Create Rank Account S	Store Bank Access Info
Update Snk Access Info	Update Bank Account	Read Bank Access Info
Show Cash in Aconts	Get Accri Summaries	Create Bank Accit Info
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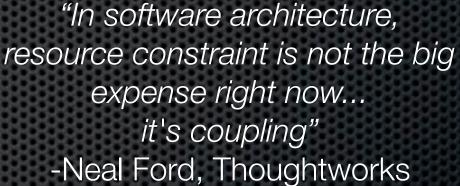
- Law 3. Complexity is driven by interdependencies.
- Law 10. Complexity is an undesirable architectural attribute of an IT system.
 - **Reliability:** Most IT failures are due to complexity.
 - Auditability: complex systems are extremely difficult to audit for regulatory compliance.
 - Security: complexity increases the chances of fraud and vandalism.
 - Alignment: complexity results in poor alignment between IT systems and business needs.
 - **Cloud:** complexity results in inefficient use of cloud resources.
 - *Maintainability*: complexity makes system maintenance much more difficult.
 - Agility: complexity makes change much more difficult.
 - Scalability: complex systems are hard to scale up when user demand exceeds expectations...

Dependency is cumulative

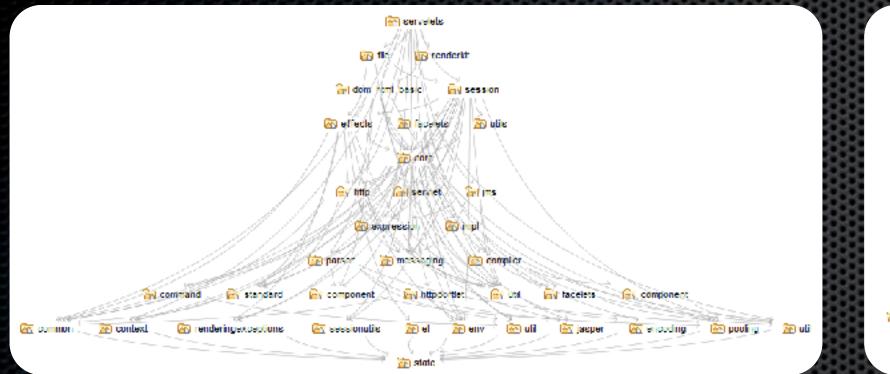


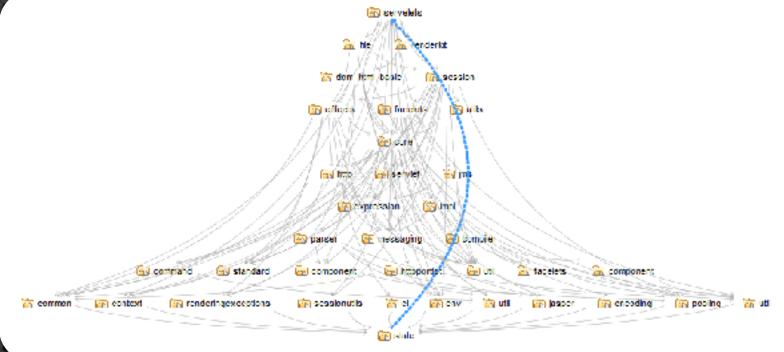
Cumulative Component Dependency (CCD) - John Lakos

"Law 8. Complexity increases exponentially" -Roger Sessions



Cycles explode dependency





• $CCD = (1*1) + (11*2) + (7*3) + \dots$

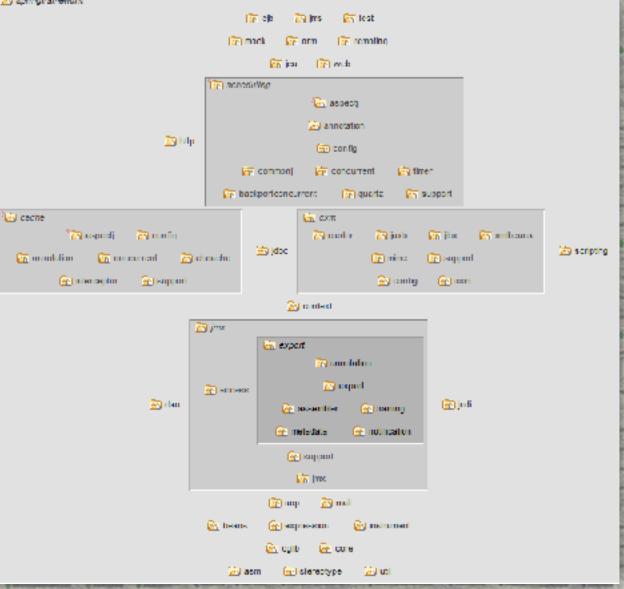
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• $CCD = 36^2$

"Cyclic dependencies have the greatest capacity to increase the overall cost of developing and maintaining a system" - John Lakos

 $\cdot = 1,296 !!!$

So "well-structured containment"

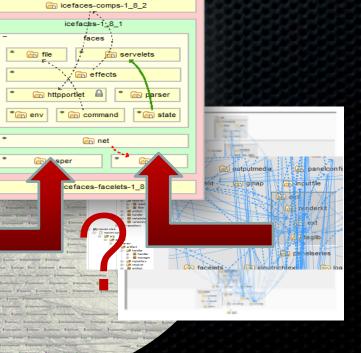


Oriente - Oliver

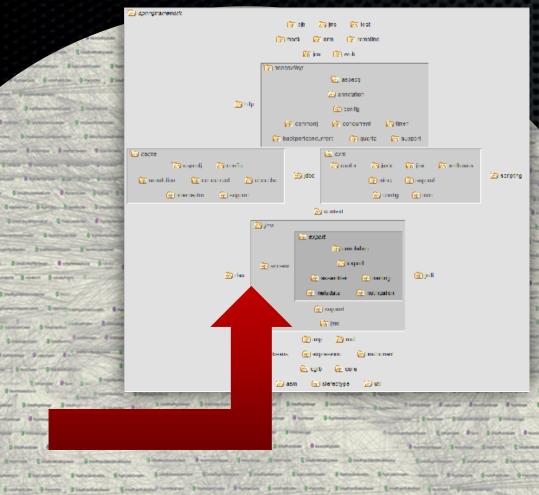
 No "tangled" containers No "fat" containers ... a foundation for "architecture" Modules/Rules Communication • Enforcement Controlled evolution

"Well-structured containment" HOW DO WE GET IT?





Using source files





Recursively group cohesive clusters of files Bust or isolate large file-level tangles

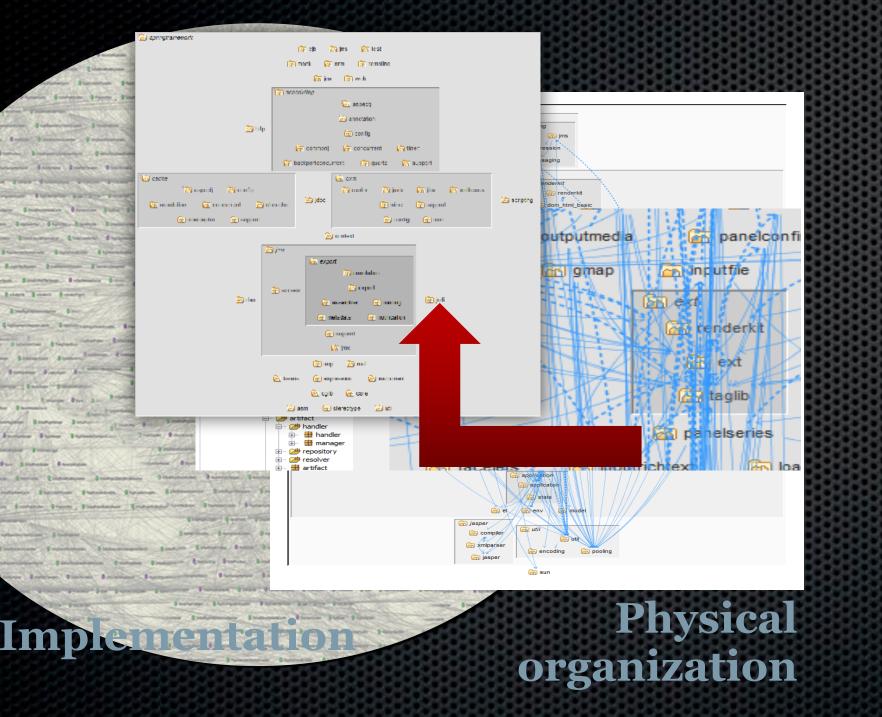
Can be partly automated

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Using physical organization



Restructure/refactor Disentangle

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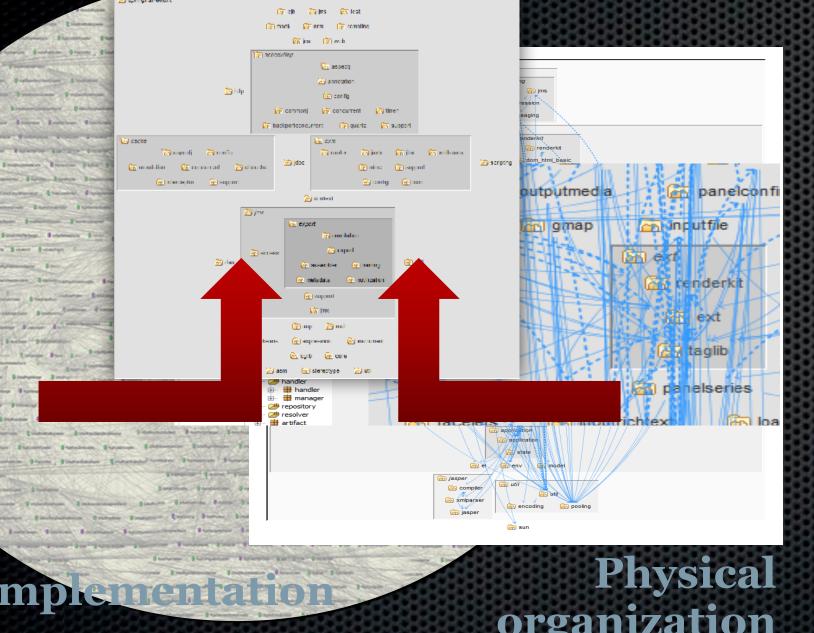
- Can be harder

Preserve familiar structures

Guided/manual reorganization

Draw on both implementation and existing physical organization

•

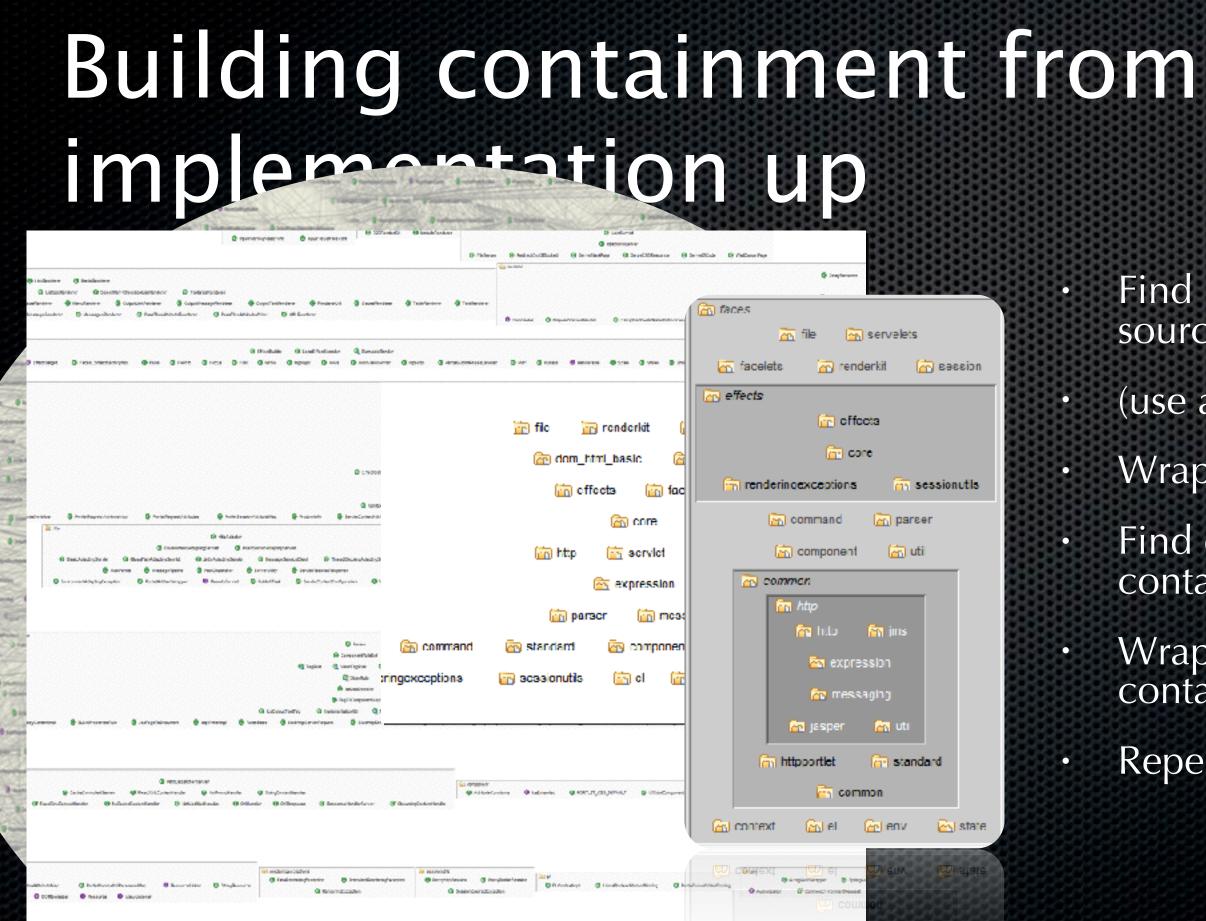


Use the physe where it is restructured

Build a new isn't

Use the physical organization where it is reasonably well-

Build a new structure where it



Find "cohesive clusters" of source files

(use automation)

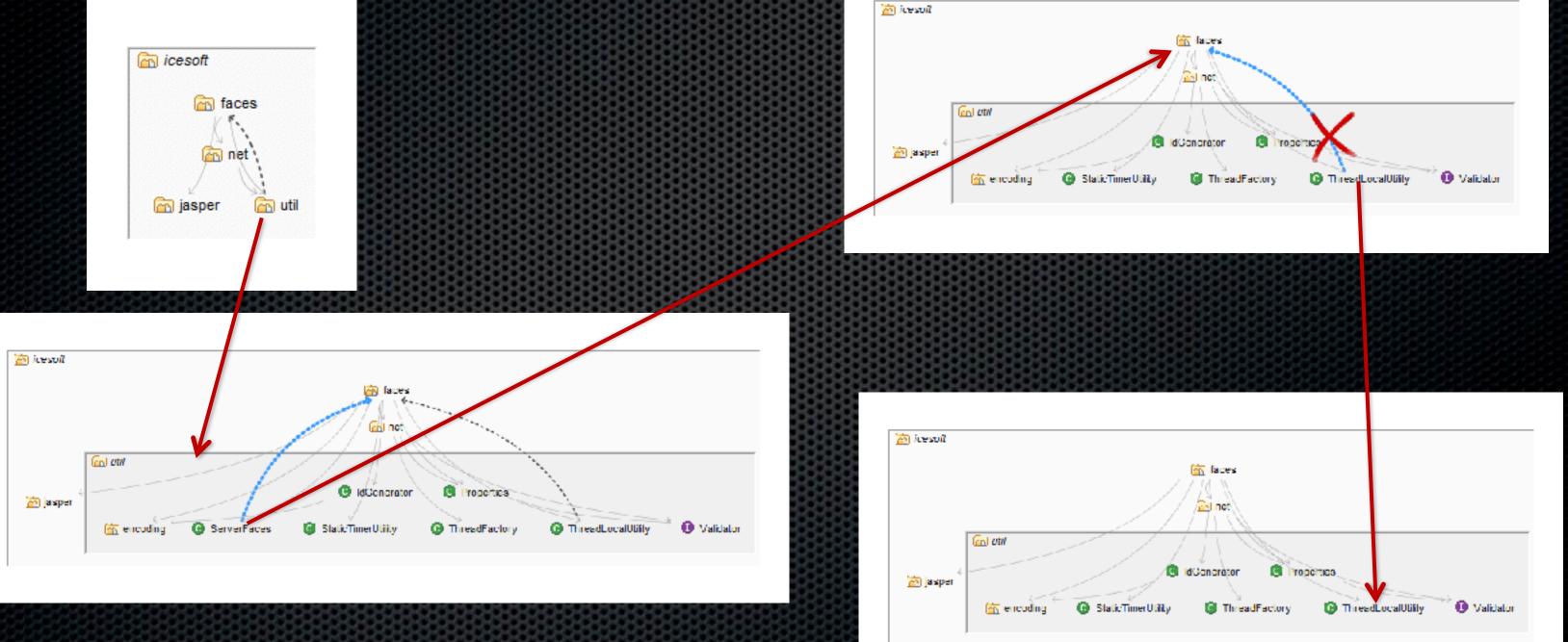
Wrap them into containers

Find cohesive clusters of containers

Wrap them into higher level containers

Repeat

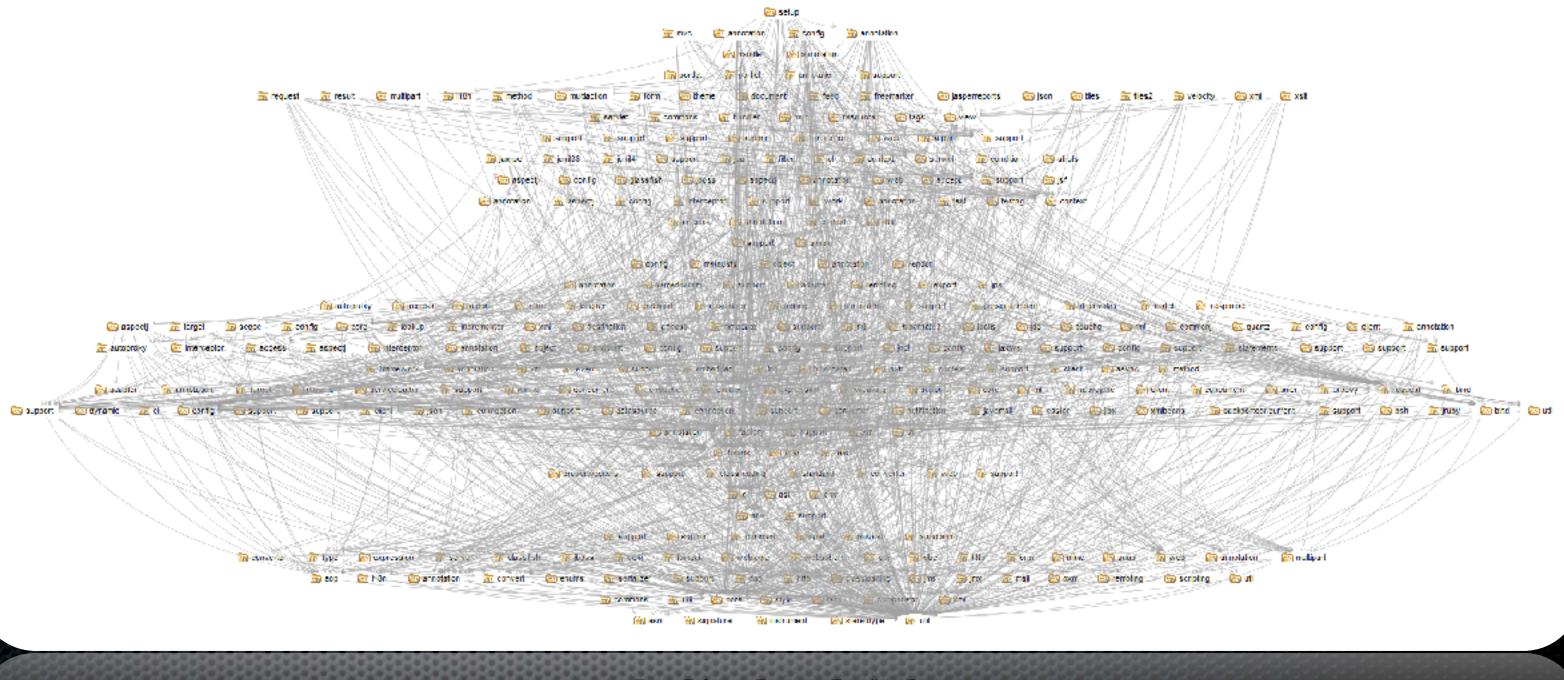
Restructuring physical organization





Key concept: Levelization

Levelization



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Levelization

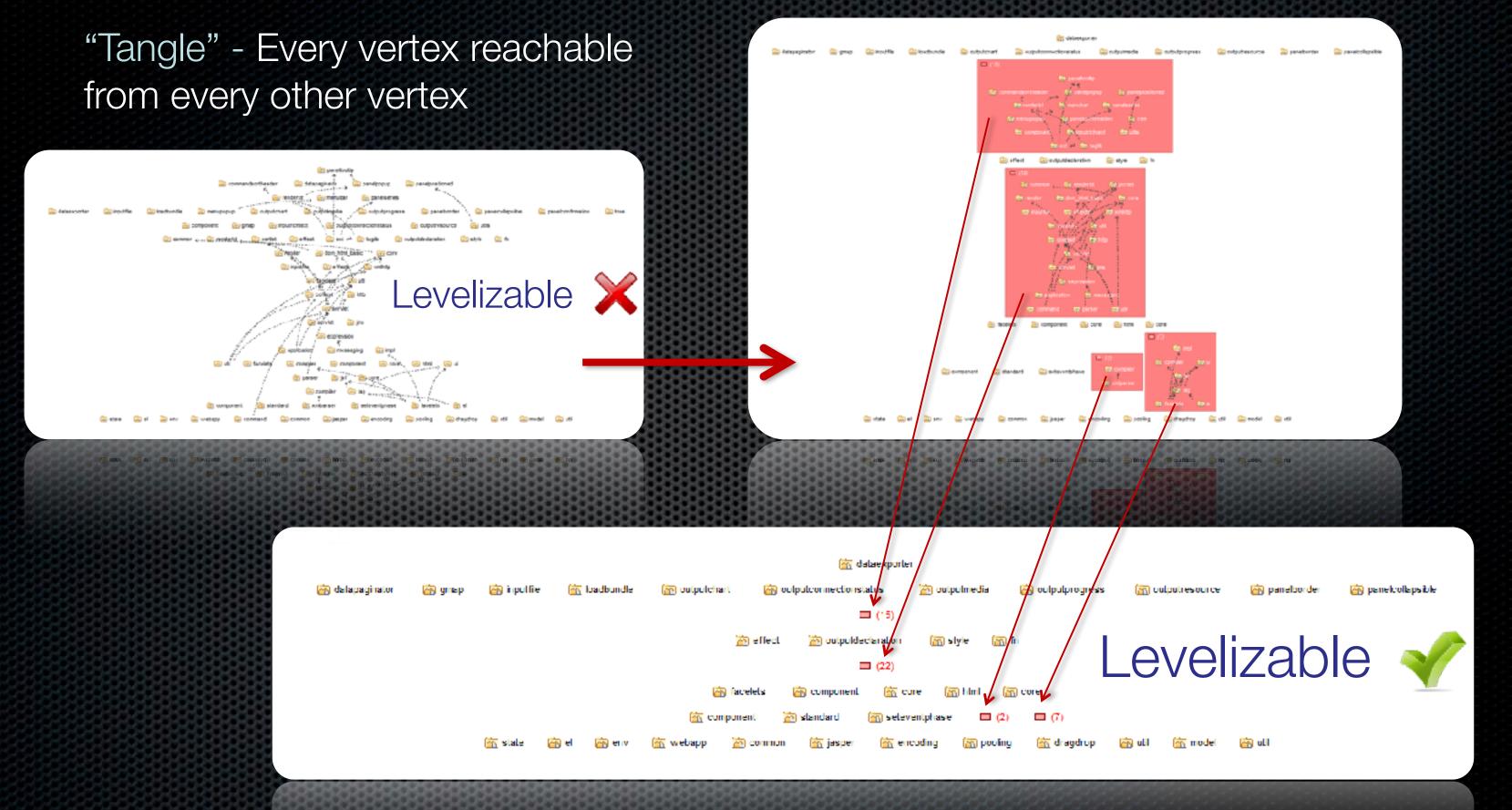
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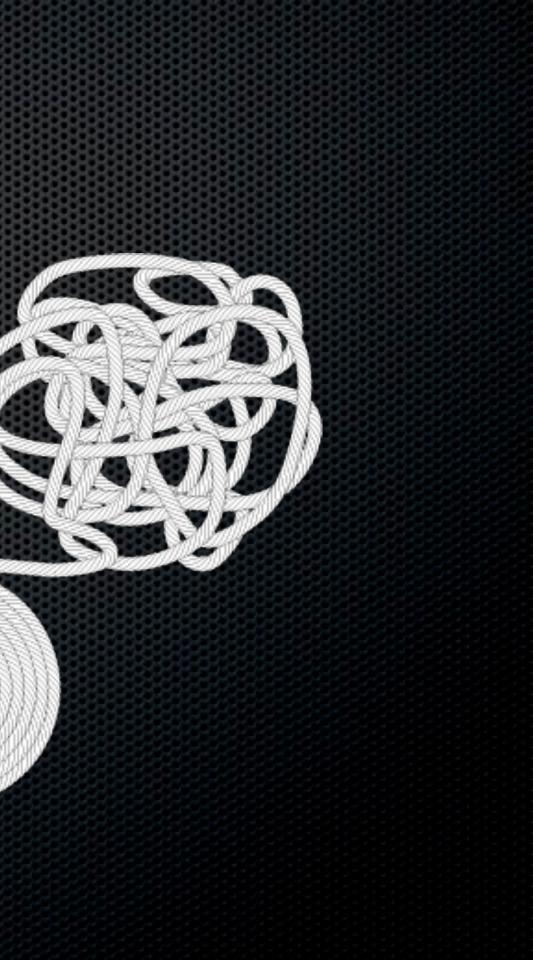
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Structure101

Making it real

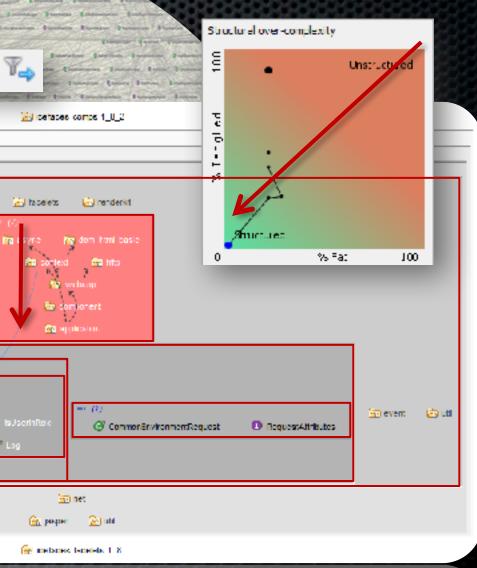


The Levelized Structure Map (LSM)

- Designed specifically for containment modelling
- *Expand/collapse* depth of scope •
- Auto-groups tangles, cohesive clusters, disconnected clusters •
- Filter items and dependencies to reduce no •
- Can be manipulated *interactively or automatically* to create well-structured • containment model
- Items are <u>always</u> levelized at every scope and • after every change

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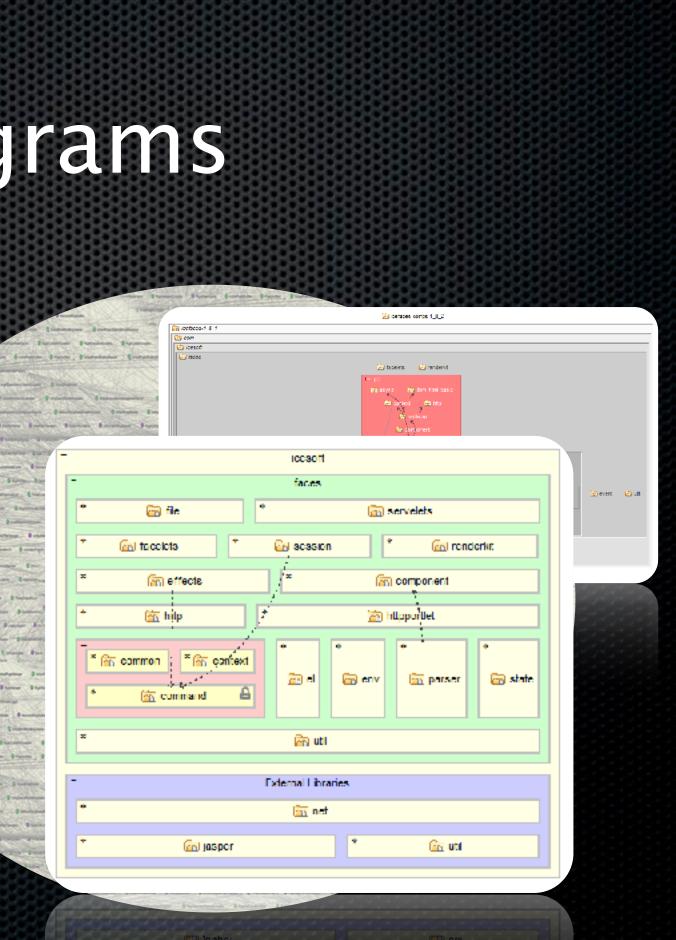




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The Architecture Diagrams

- Communicate important aspects of model with team
- Define rules for a containment model
- Cells *map* to code by patterns
- Dependencies *should* flow down
- Cell positioning expresses <u>many</u> rules, visually, intuitively
- Can have *many* diagrams
- <u>You</u> define layering and visibility not changed automatically
- Used to *check* code changes at edit and build times



Step 1: Discover and define your architecture

- Bootstrap step •
- Use LSM to create "well-structured containment model"
 - Get "Fat" and "Tangles" close to zero
- Use the <u>Architecture diagrams</u> to define dependency rules for your model
- Share your architecture

Step 2: Architecture-guided development

- Communicate •
 - Compile-time checking
 - Build-time checking
 - Reporting
- Evolve •
 - Update architecture when required
 - Adjust architecture ahead of development



Developer Plugin Code