goto; conference aarhus

ARCHITECTING IN THE GAPS

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INTERNATIONAL SOFTWARE DEVELOPMENT CONFERENCE

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About Me

- Software architect & development manager at UBS Investment Bank
  - working on equity swaps systems in Equity Derivatives
- Software architect for ~10 years
- Author of "*Software Systems Architecture*" book with Nick Rozanski
  - new 2nd Edition published in October 2011
- IASA and BCS Fellow, IET member, CEng

Agenda

- Difficulties with Practicing Software Architecture
- Architecture is in the Gaps
- Exploring the Metaphor
- System Qualities and Boundaries

Difficulties with Practicing Software Architecture

Identifying Software Architecture

- *software architecture = {elements, form, rationale}*
  - Perry and Wolf (1992)
- *The software architecture of a system is the set of structures needed to reason about the system, which comprise software elements, relations among them, and properties of both*
  - Bass, Clements and Kazman (2011)
- *The set of design decisions which, if made incorrectly, will cause your project to be cancelled*
  - Eoin Woods

Yet, it's still hard to be clear where architecture starts and stops

Key Characteristics of Architecture Work

- Design centric activity
  - designing something is key
- Stakeholder focus
  - wide community with conflicting needs
- System-wide concerns
  - architectural design decisions affect system-wide qualities
- Balancing of concerns
  - no right answer
- Leadership
  - responsibility for the work of others as well as your own

Identifying Software Architecture

- Software architecture is difficult to tie down
  - we know what design is
  - we know what implementation is
  - we sort of know architecture when we see it
- But does this matter?
  - yes and no
  - life can be harder when we're not quite sure
- *If you don't know where you are going, you will probably end up somewhere else*
  - Lawrence J. Peter (of "The Peter Principle" fame)

Difficulties in Practice

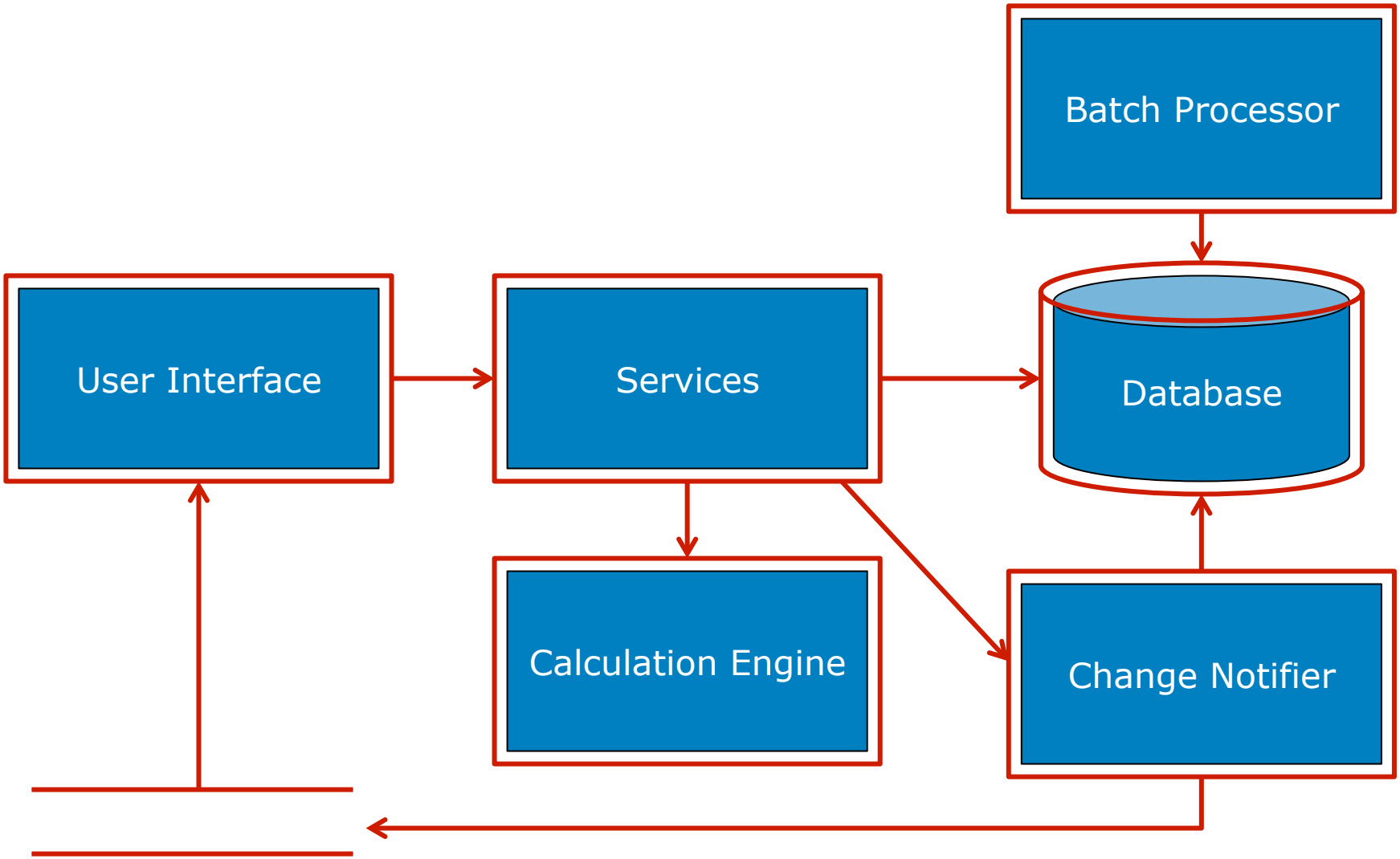
- Justifying Software Architecture
  - do we really need it? what does it offer?
  - don't we just do this stuff all the time?
- Knowing How Much Is Enough
  - how much of your time is "architecture" ?
  - when can we get started on the "real" work?
- Where to Focus
  - what do you need to do that others won't do?
- How to Work with Others
  - how do you cooperate with implementation teams?
  - how do you get people to listen to you?!

We Need a Good Metaphor

- When creating XP Kent Beck realised the need for a unifying idea to guide design work
  - the "metaphor" in Extreme Programming
- Somehow we need a metaphor to guide people's thinking about software architecture
  - something simple
  - something that can be visualised

Architecture is in the Gaps

Software Architecture is found at Boundaries



Software Architecture is at the Boundaries

- Architecture organises, links, unifies and constrains
  - shared ideas, shared interfaces, shared concepts, …
  - Software architecture itself isn't the end, it's the means
- Software architecture allows others to work effectively and collaborate
  - even when they are unaware of this
  - provides the structure in which others can place their work
  - allows cooperation by providing unifying ideas
- Software architecture aims to achieve cross-element systemic qualities ("quality properties")
  - qualities rely on structures, connectors and constraints

Examples of Architecture at Boundaries

- Technical: middleware and EAI
  - architecture as software
- Organisational: cross-team ("domain") architect
  - architecture as coordination
- Conceptual: reference models for domains
  - architecture as a unifying metaphor
- Design: system components and connectors
  - architecture as context
- Qualities at Boundaries: security or availability
  - qualities are only achieved by unifying across components

Exploring the Metaphor

(or "so what?")

Where the Metaphor Can Help

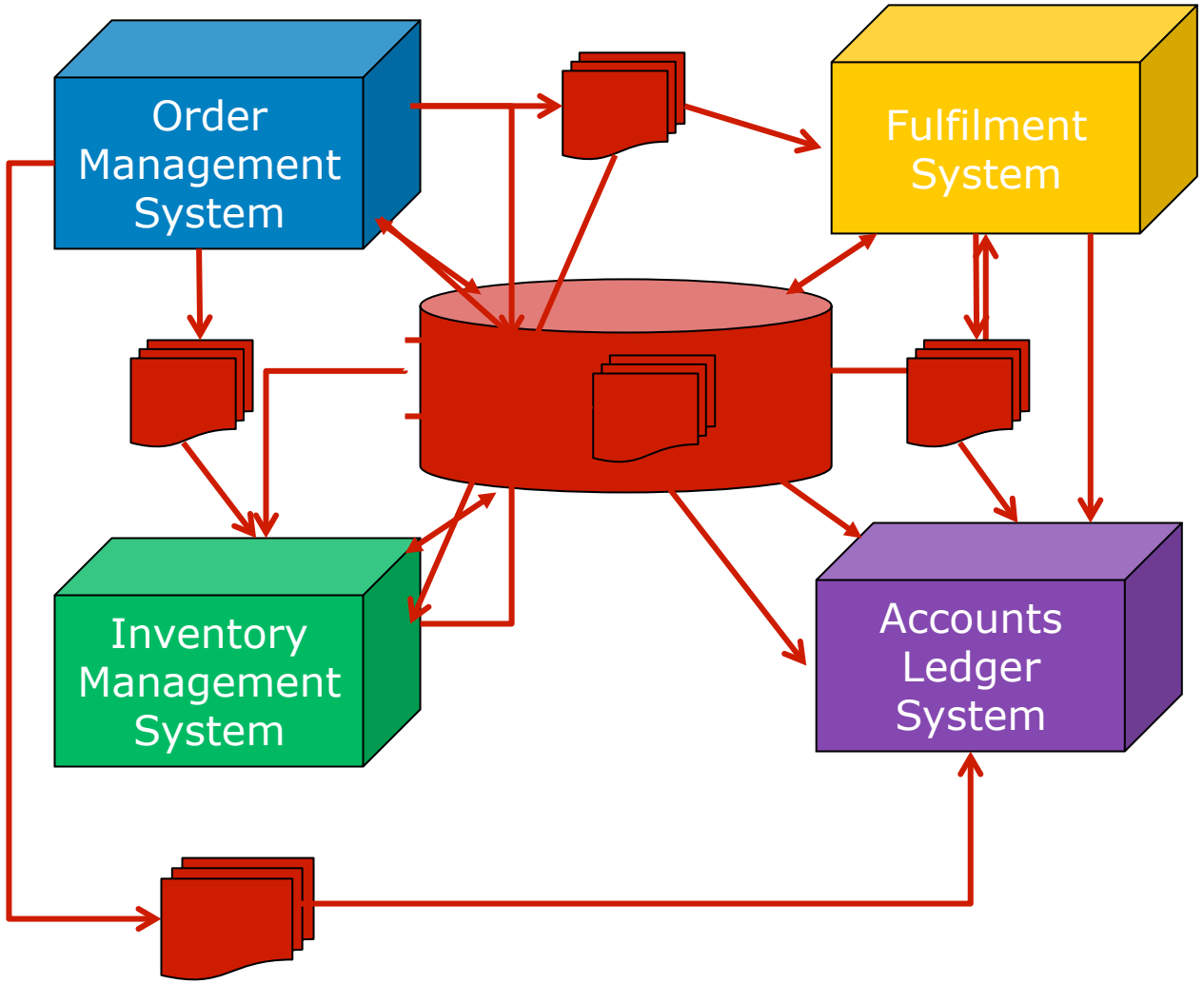
- Identify where architecture is needed
  - in the gaps where no one else is looking
- Define architecture's specific contribution
  - thinking about boundaries that no one else is looking at
- Distinguish the architecture work
  - the boundaries, not the pieces
- Collaborate effectively
  - inside the boxes, someone else is probably there already
- Focusing on structure not function
  - a set of boundaries provides design context and limits
  - enables qualities

Do you need to do any architecture?

- Do you have a number of independent things cooperating?
- Do you already have a unifying mechanism and structure to combine them?
- No?
- You have “gaps” between the pieces …

… you could do with some “architecture”

Multi-Application Systems

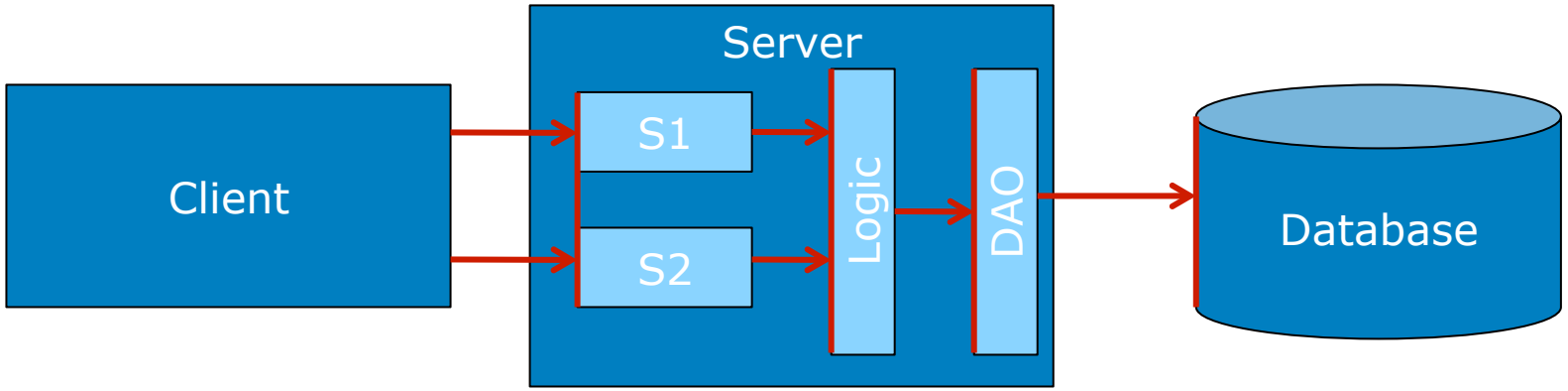


Application integration is all boundaries and gaps!

Where do you focus architecture effort?

- More design problems than you have time to solve
- Many can be (should be) solved by individual teams
- Some need wider context to understand and solve

Where do you focus architecture effort?



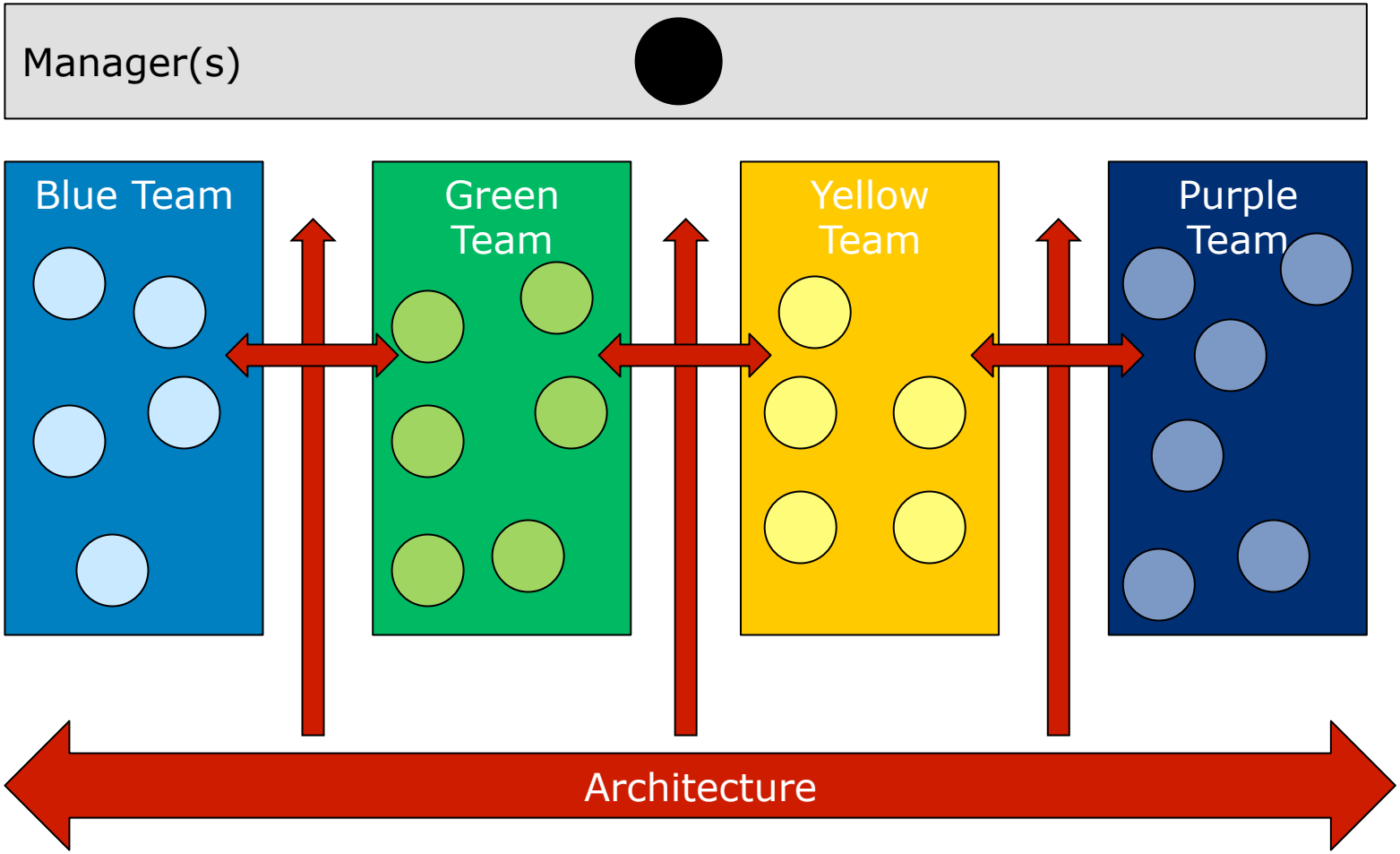
Focusing on the boundaries results in a focus on components, connectors, responsibilities and interactions … architecture!

A good set of boundaries places useful constraints on those working within them

Where does an architect fit with delivery teams?

- A manager?
- Working in one of the teams?
- Across all of the teams?

Where does an architect fit with delivery teams?



Dangers of the Metaphor

- All metaphors have the danger of over use
  - "don't be stupid"
  - architecture work is not just in the gaps
  - you can't just worry about the boundaries
- If you only own the boundaries, what do you own?
  - lack of tangible ownership
  - need people to understand and value this work
- Sometimes you need to "get off the fence"
  - into the detail within the boundaries
  - where you'll find more boundaries you couldn't see before!

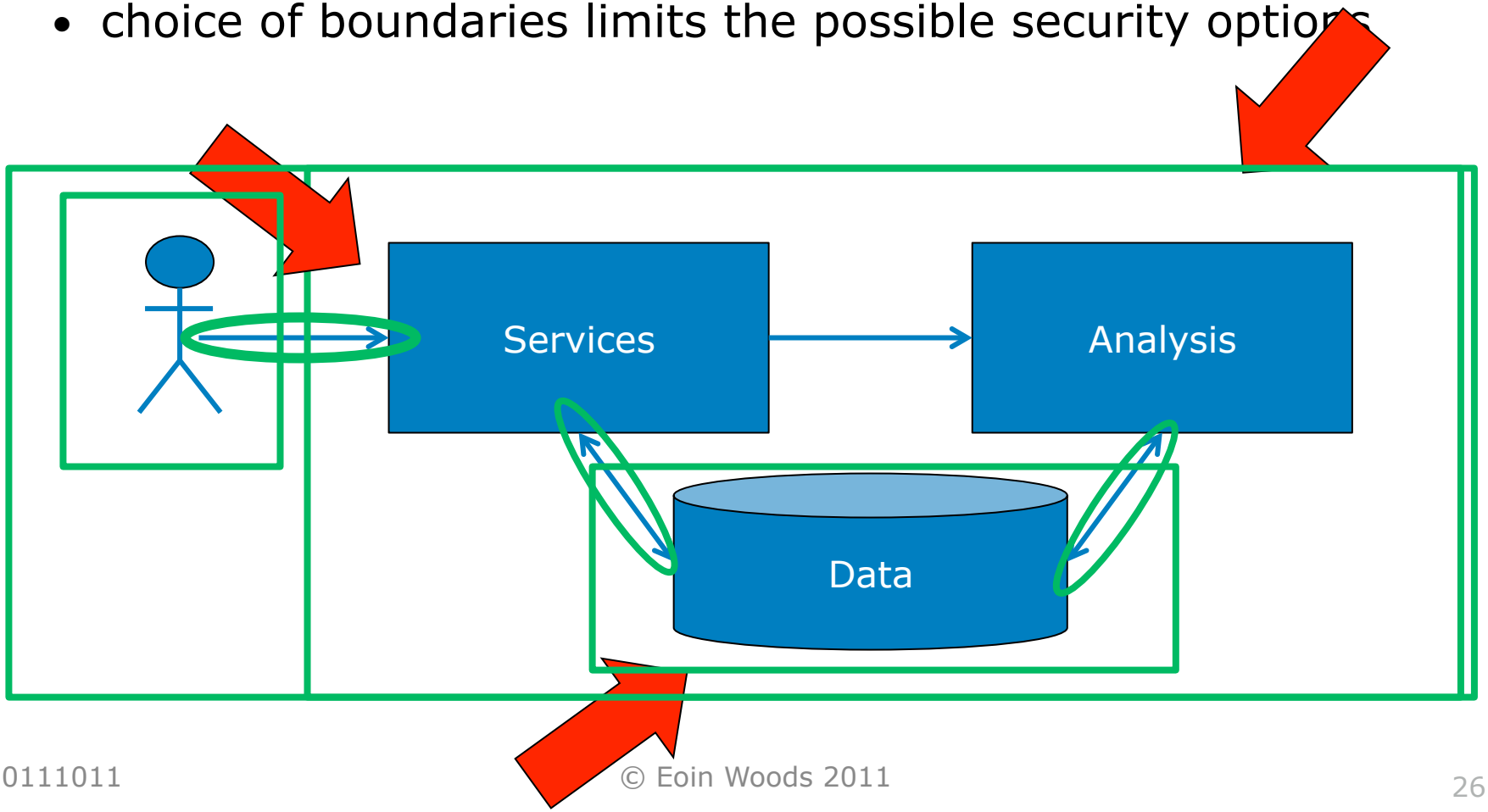
System Qualities and Boundaries

Achieving Qualities

- Security
  - threats appear at boundaries so we secure boundaries, connectors and information crossing boundaries
  - security options may require boundaries within a system
- Performance and Scalability
  - interactions across boundaries can destroy performance but partitioning is needed for scalability
- Availability
  - location of boundaries in software and deployment platform dictate possible availability & resilience
- Evolution
  - position and nature of boundaries constrains evolution

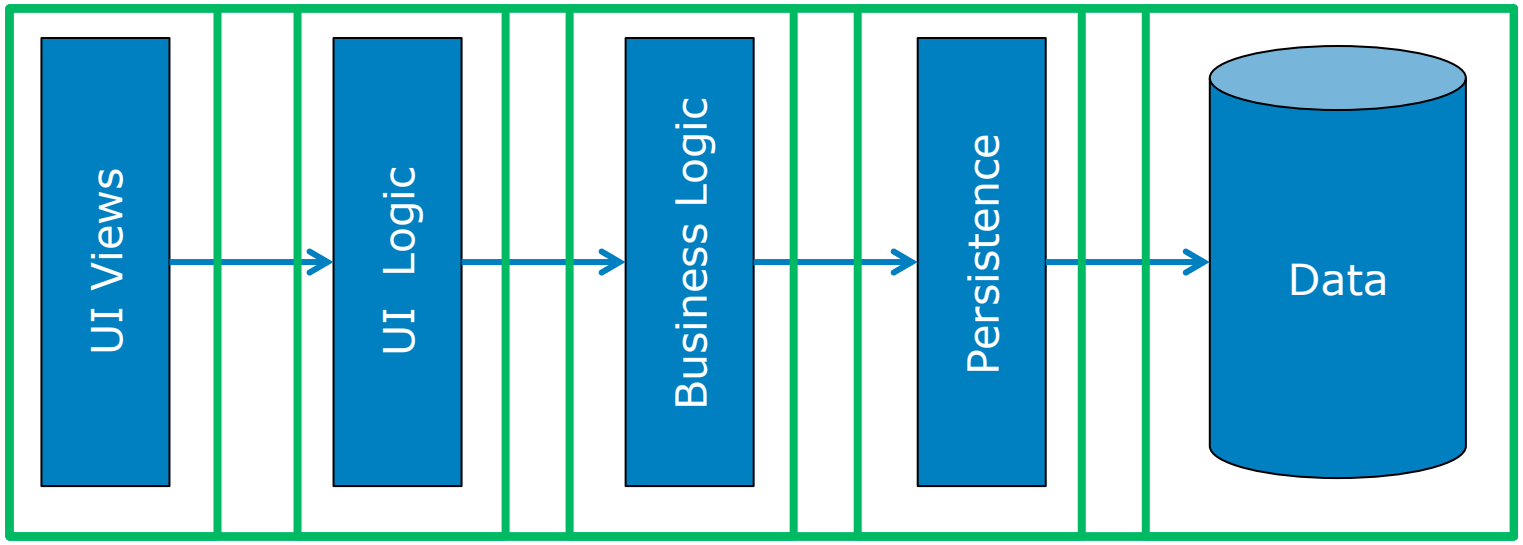
Security

- Threats appear at boundaries
- Boundaries and interactions need to be secured
  - choice of boundaries limits the possible security options



Performance and Scalability

- Where do you put the boundaries?

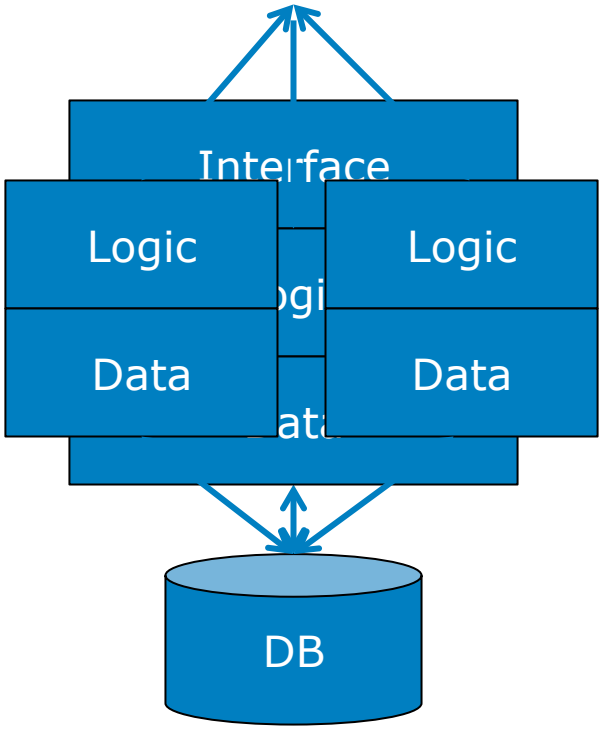


- Leads you to consider trade offs
  - each option affects P&S but also security, evolution, ...
  - each set of boundaries enables or limits deployment options

Availability

- Availability requires replication to allow for failure
- Replication requires layering and modularisation in order to enable it
  - modules (vertical partitions) to allow replication options
  - layers (horizontal partitions) to allow use of replication
- So availability also requires thoughtful placement of boundaries (partitioning)

Availability

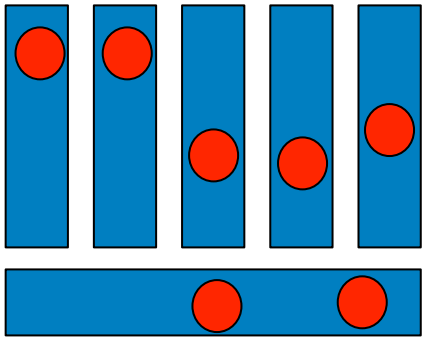


Each decision about boundaries affects the type and properties of the availability that the system can provide

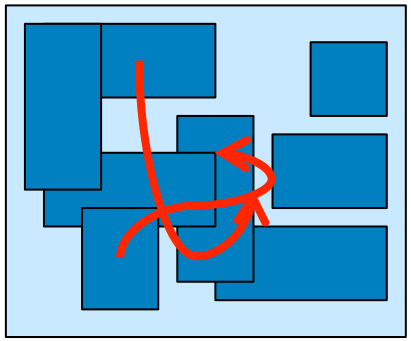
Evolution

- Evolution relies on well placed boundaries
  - layers
  - modules
  - encapsulated change
- Too many boundaries make change difficult
  - seemingly innocuous change involves many components
- Lack of solid boundaries makes change impossible
  - the big ball of mud that no one dares to change

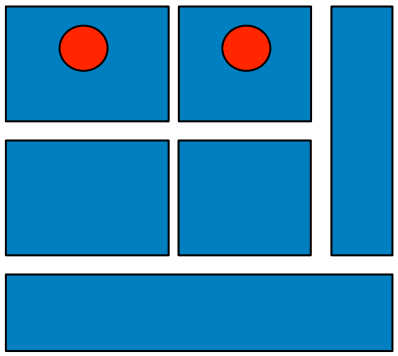
Evolution



Boundaries for the sake of boundaries



No thought given to boundaries



Boundaries with a Purpose

Achieving Qualities

- None of these qualities are achieved just by putting the boundaries in the right place
- Focusing on boundaries can guide architecture work
  - most quality properties heavily influenced by concerns at boundaries
  - someone else is working inside the components (hopefully!)
  - keeps the architecture work manageable

Summary

To Conclude

- Software architecture work can be difficult to define and justify
  - we know it when we see it
- Focusing on boundaries is a good metaphor for architecture work
  - boundaries lead you to fundamental structure, interfaces and interactions – the core of software architecture
  - boundary decisions have fundamental architectural impact
- Using this metaphor can help to define, justify and focus architecture work
  - and identify places that architecture work is missing
  - whoever does it

Questions and Comments?

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