If at first an idea is not absurd, then there is no hope for it.

Albert Einstein

ActorWeb

Towards a deeper understanding of system architectures

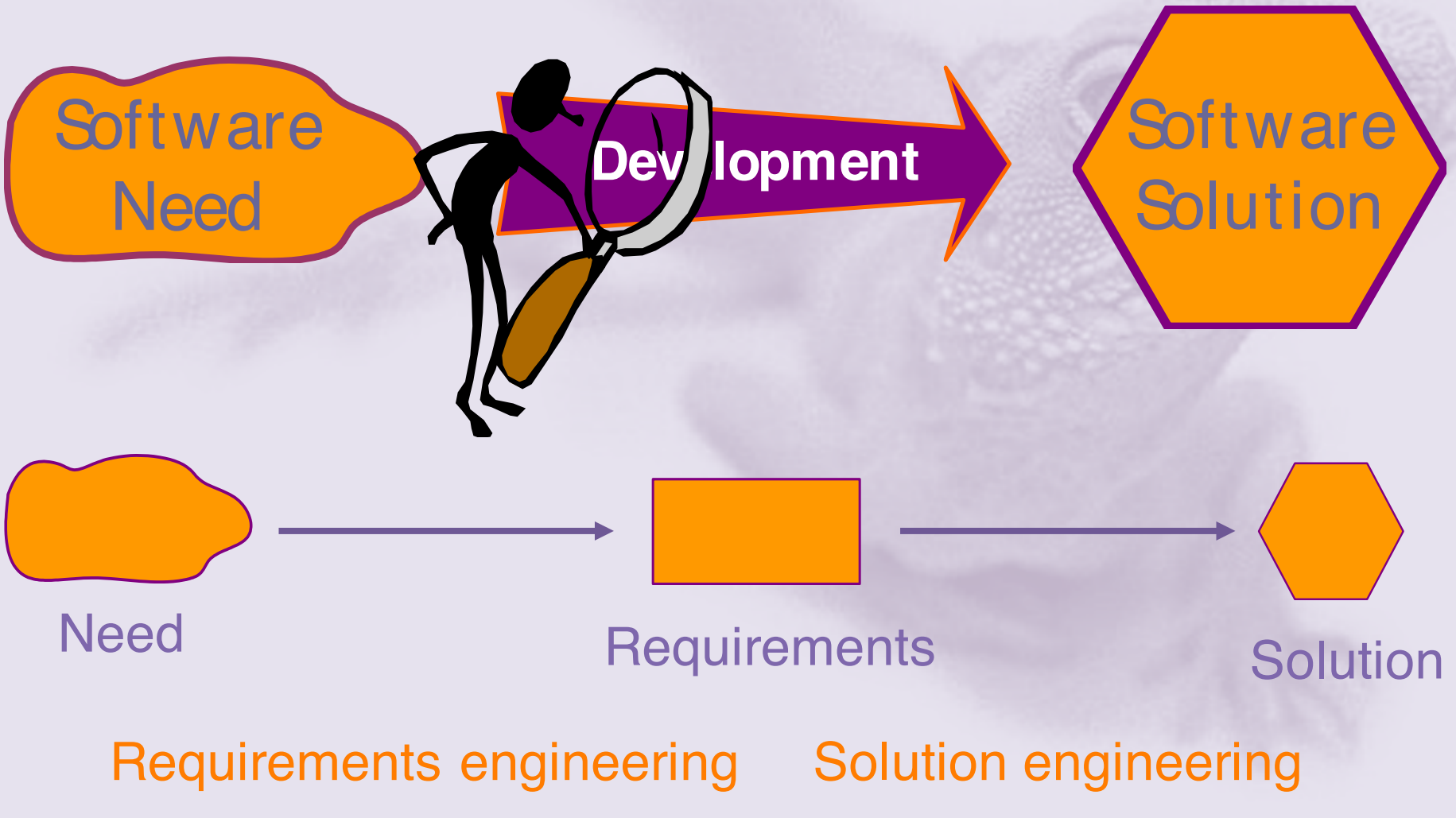
Erik Proper
University of Nijmegen
(Ordina Institute)

Edward Smit
Escador

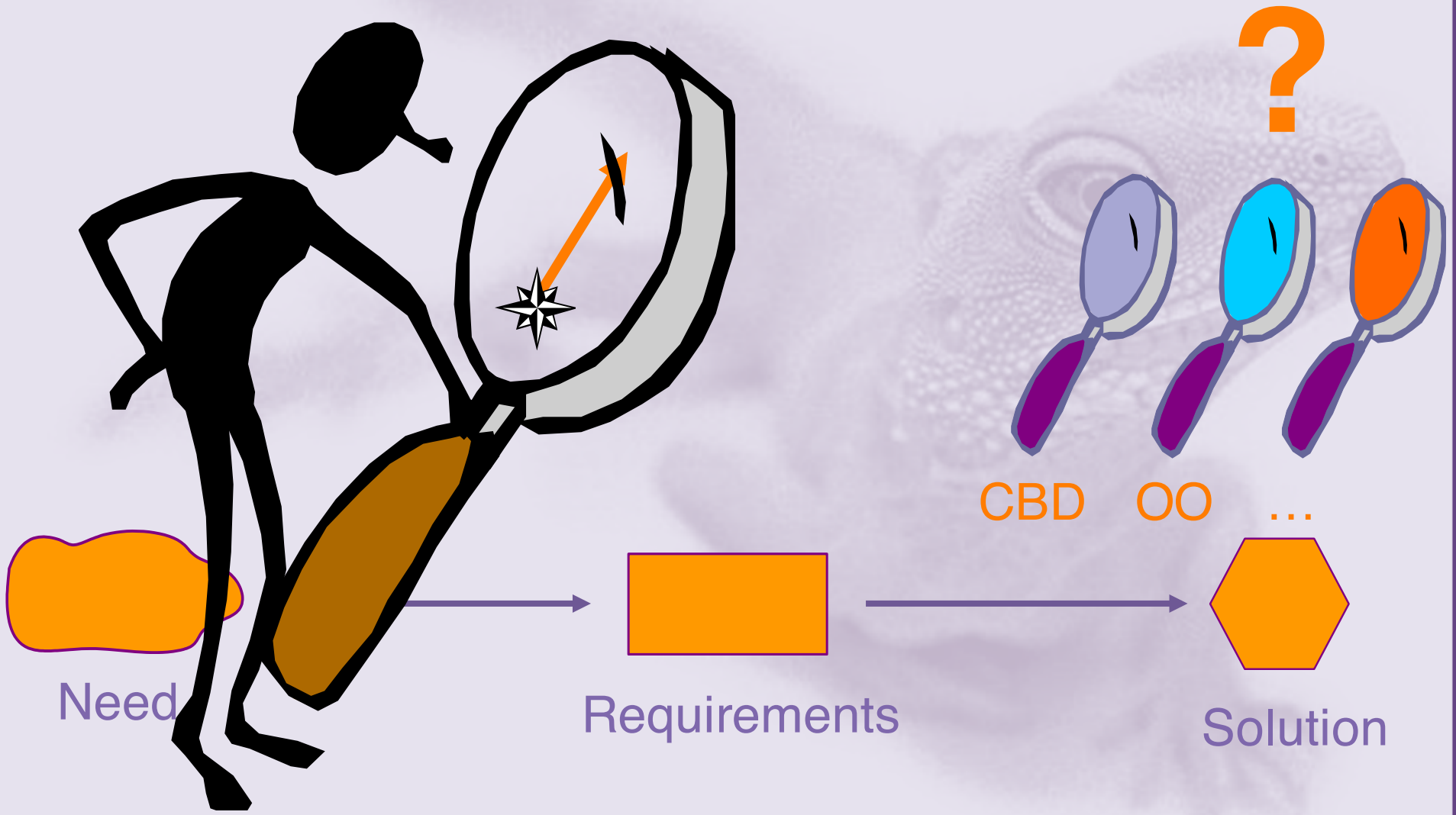
Agenda

- ActorWeb (EP)
  - Motivation
  - Way of thinking
- Cases (ES)
  - Nedap
  - Philips Analytical
- Research program (EP)
  - Challenges
  - Status

System development
- From need to solution -

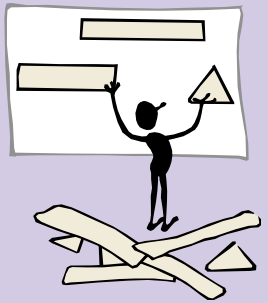


Motivation
- Understanding Needs -



Motivation
- Complexity of domains -

Project Domain



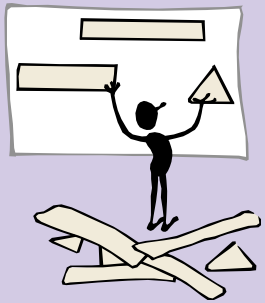
- That what performs the:
  - Change
  - Development
- Project/program

Target Domain

- The subject of the:
  - Change
  - Development
- Design/System

Motivation
- Complexity of domains -

Project Domain



- Parallel projects
- Mixed teams
- Mixed approaches
- …

Target Domain

- Evolution
- Legacy
- Multi-platform
- …

From need to solution

- Understanding the essential need

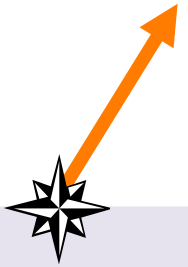
Requirements engineering

- Evolution of the need

Solution engineering

- Complexity of solution space:
  - Target domain
  - Project domain

Way of thinking - Postulate I



"The system to be developed should be considered in conjunction with its context"

Obvious! Really? What?

- Target domain:
  - Initial state
  - Organisation, business, technology, …
- Project domain:
  - Project team, project technology, …

Way of thinking - Postulate II

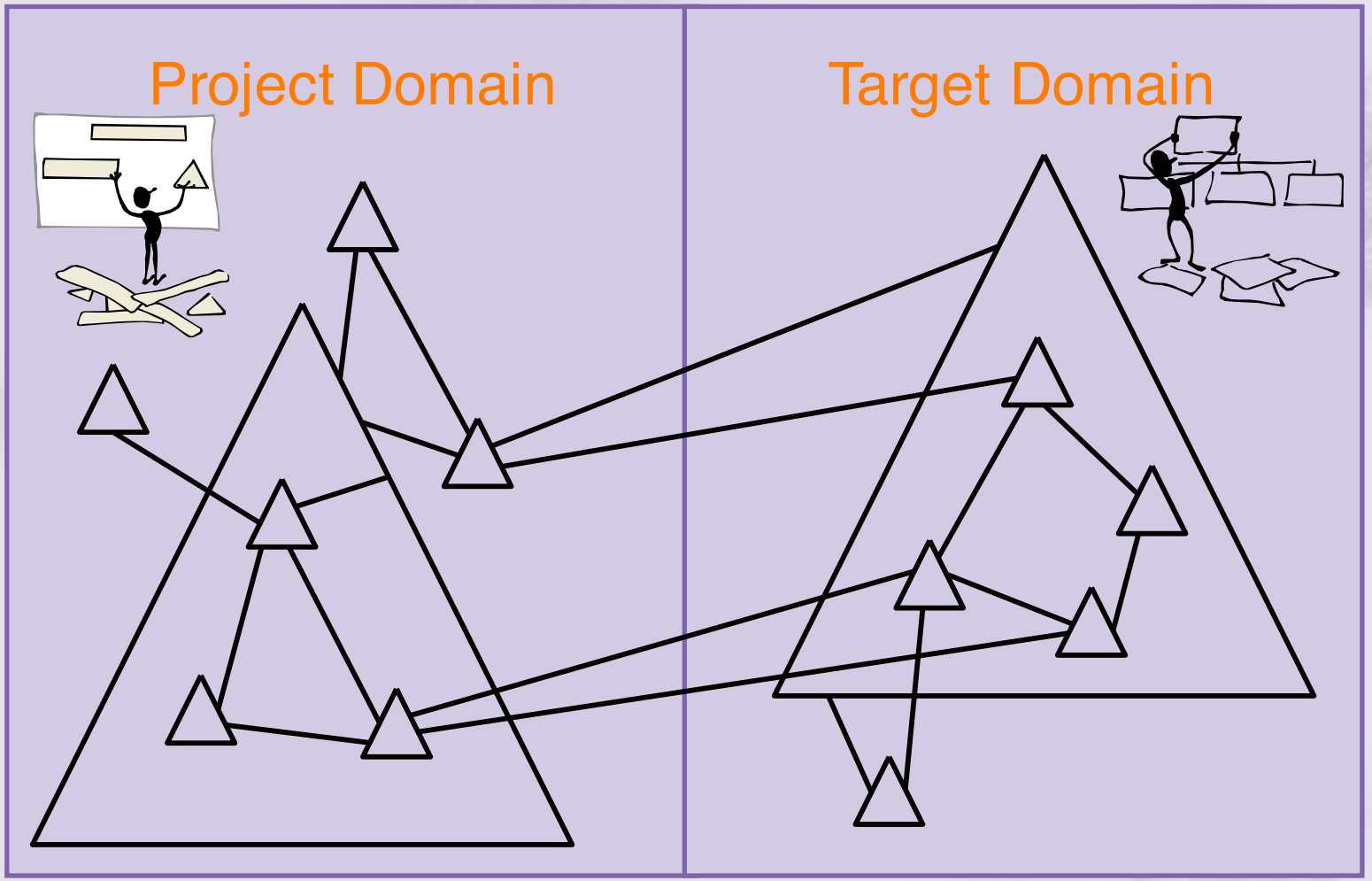
"Understanding the act of:

- Requirements engineering
- Solution engineering

requires a set of truly elementary (system) concepts"

- Observing needs: minimal distortion
- Insight: common terminology
- Physics: elementary set of particles & forces

A system …
an ecology of actors



Way of thinking - Postulate III

"The target and project domains should be viewed as a collection of communicating actors"

- Actors may be:
  - Human or automated
- Actors may have:
  - State, behaviour, ..

ActorWeb - Uses

- Study:
  - Requirements engineering
  - Solution engineering

  (by gathering)
  - Patterns
  - Laws
  - Heuristics
  - …

  (using a common terminology)
- Inspiration:
  - Practice
  - Socio-technical Systems
  - Cybernetics
  - Biological Systems
  - Complex-Adaptive Systems
  - Agent-based Systems
  - Swarm Intelligence
  - …
- Specialise for specific approaches

"System Architecture Body of Knowledge"

ActorWeb - Uses

- Approach:
  - need
  - solution space

  (with an open mind)
- Choosing
  - appropriate development approaches

  (based on resulting understanding of)
  - essential need
  - possible solutions

“Unfolding the Solution Space”

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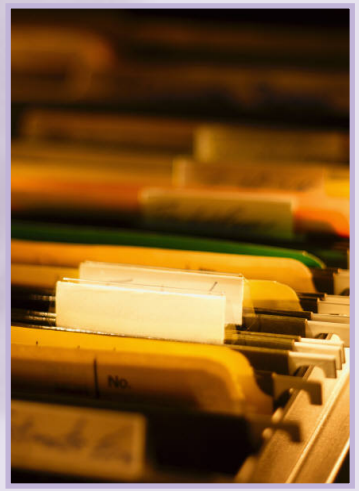
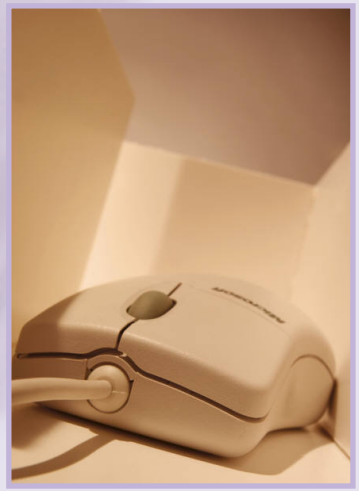
Background

- Nedap Groenlo B.V.
  - 640 employees, 100 mln USD
  - 19 countries (PoS), HQ in Groenlo
  - Department Security Control
- Security control product-line
  - Established 1978
  - Acknowledged player in the market



A security management system

- Situation:
  - Bespoke (serial line) networks
  - That connect ‘Accessor ’ ™ devices
  - Which can detect tokens, bar-codes, bio-metrics, etc…
  - And control doors and other means-of-access



The challenge …

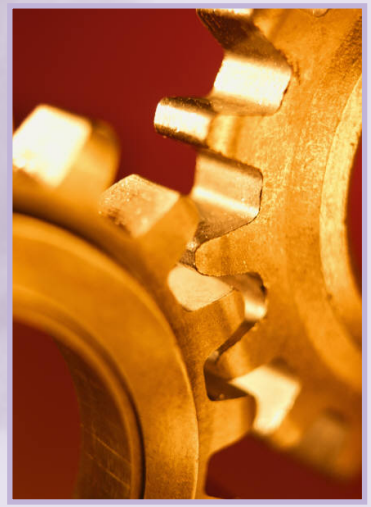
… is to meet these design-criteria:

- Open for multiple domains and locations
- Leveraging both experience and infrastructure of the Internet
- Challenging additional requirements:
  - Reliability and security
  - Robustness
  - Serviceability
  - Responsiveness and scalabi

The constraints …

… are founded in Nedap as a product-vendor:

- Solutions must be based on production-based design (minimal MLC, time-to-market, …)
- Solutions must capitalize on present and foreseeable organizational capabilities
- Solutions must embrace and extend standards where applicable



Issues to be resolved

- Structure issues:
  - What are the core responsibilities of the system?
  - What structures are stable and ubiquitous?
  - What are the key '-ilities' of the system?
- Implementation issues:
  - How to apply a/the fitting implementation architecture?
  - How do different architecture-styles (dynamic services, components) mix?
  - Integration with 3rd-party devices
  - What is Security and Manageability

ActorWeb and security management

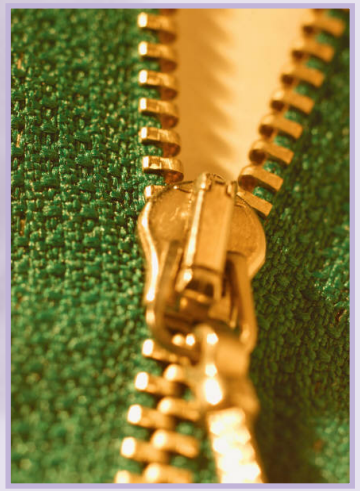
- What mind-frame fits these topics:
  - Product development
  - ‘Applicability’ over logical domains
  - Combining dynamics with robustness

Security as an organization in an organization

- Gaining and permitting access can be seen as an intricate, yet easy extendible network of roles. Each is:
  - Bound by simple contracts
  - Irrespective of the surrounding organization
  - Hierarchically bound in an overall structure, yet with great empowerment in time of crises
  - Decisions are based on a complex set of constraints

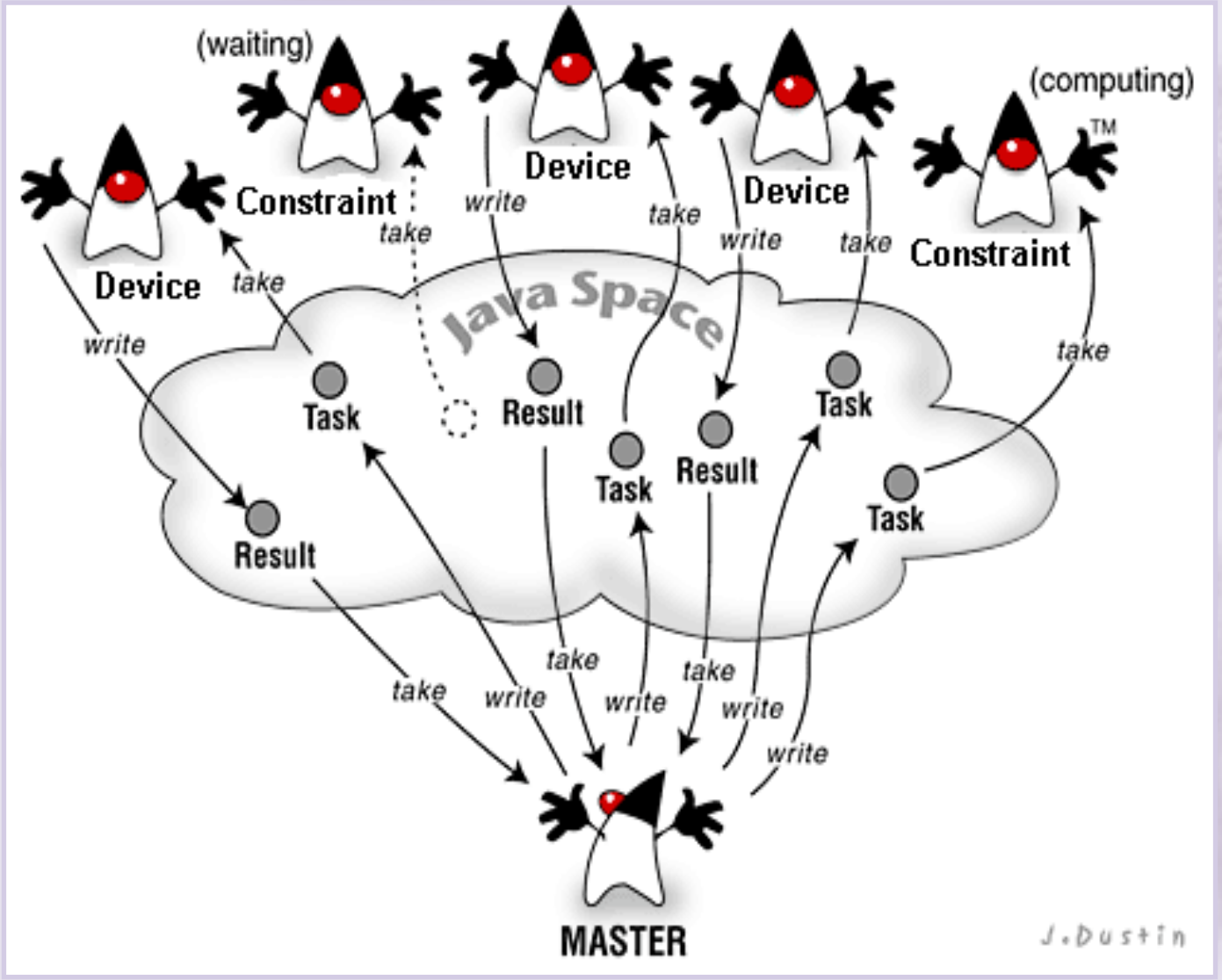
Implementation mind-frame

- The access-control system features:
  - A number of standard access-points
  - Each access-point is controlled by a dynamic (extendible, adaptable) set of constraints
  - Constraints can reside at access-points or other networks nodes

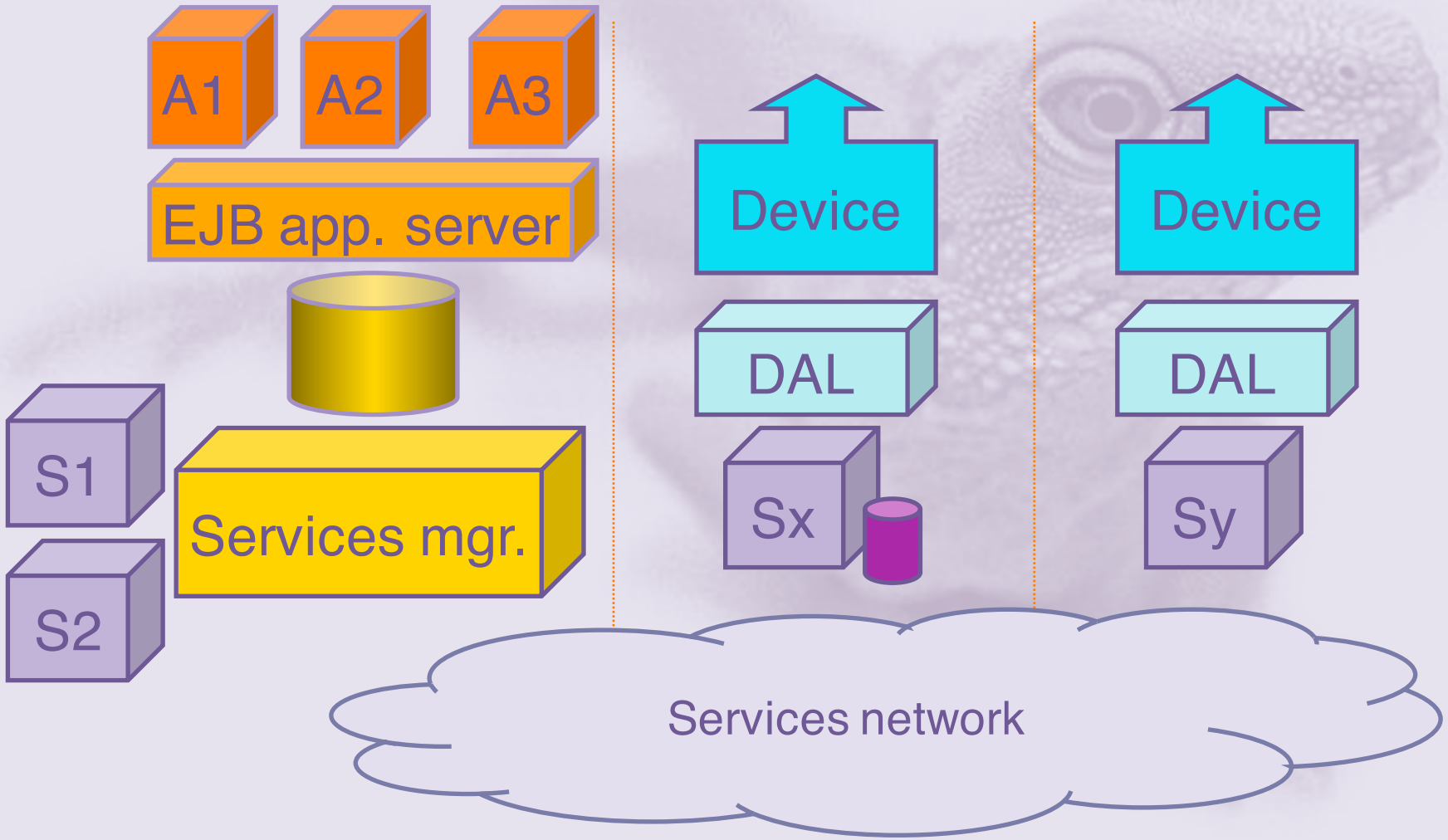


Actorweb

Space-based computing



Multiple architectural styles



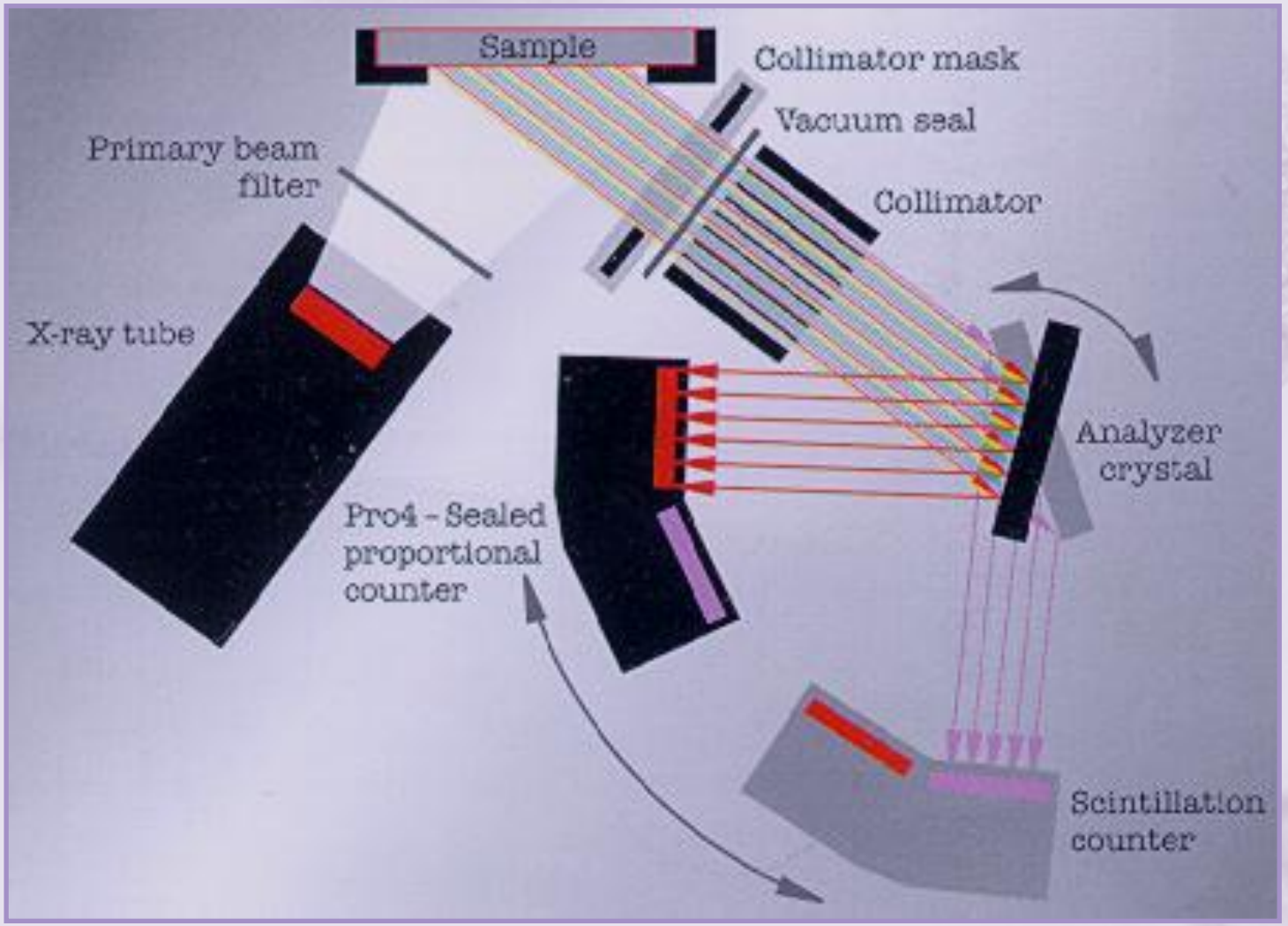
Results so far …

- Configurable constraints for advanced routing
  → e.g. Anti Pass Back, maximum persons per zone or parking control
- Multiple domains within the architecture
  → e.g. access control, mobile payment and time-management
- One programming model for evervone
  → unifying the existing expertise and development capabilities

A material analysis system

- Situation:
  - One of the advanced science branches of Philips
  - Distinguished market-leader in the xray-based material analysis branch
  - Clear technological legacy position (effort asymptote, forced move into component technology)

What is xray analysis



Different devices in different contexts

The challenge …

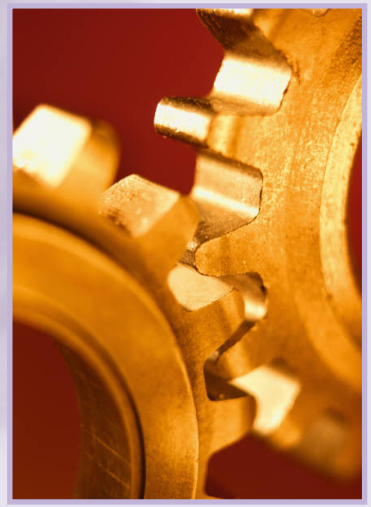
… is to meet these design-criteria:

- Enable penetration of adjoining markets
- Leveraging both experience and infrastructure of the Internet
- Challenging additional requirements:
  - Self- and remote-management
  - Serviceability
  - Versatility
  - Improve on quality and performance

The constraints …

… are founded in Analytical as a product - vendor with a scientific background:

- Solutions must be based on production - based design (minimal MLC, time-to-market, …)
- Complex domains and applications
- Analysis instruments have long life-cycles and specific maintenance characteristics



Issues to be resolved

- Structure issues:
  - What are the core responsibilities of the system?
  - What structures are stable and ubiquitous?
  - What are the key ‘-ilities’ of the system?
- Implementation issues:
  - How to apply a/the fitting implementation architecture?
  - How do different architecture-styles (dynamic services, components) mix?
  - How to ‘activate’ devices
  - What is self- and remote management

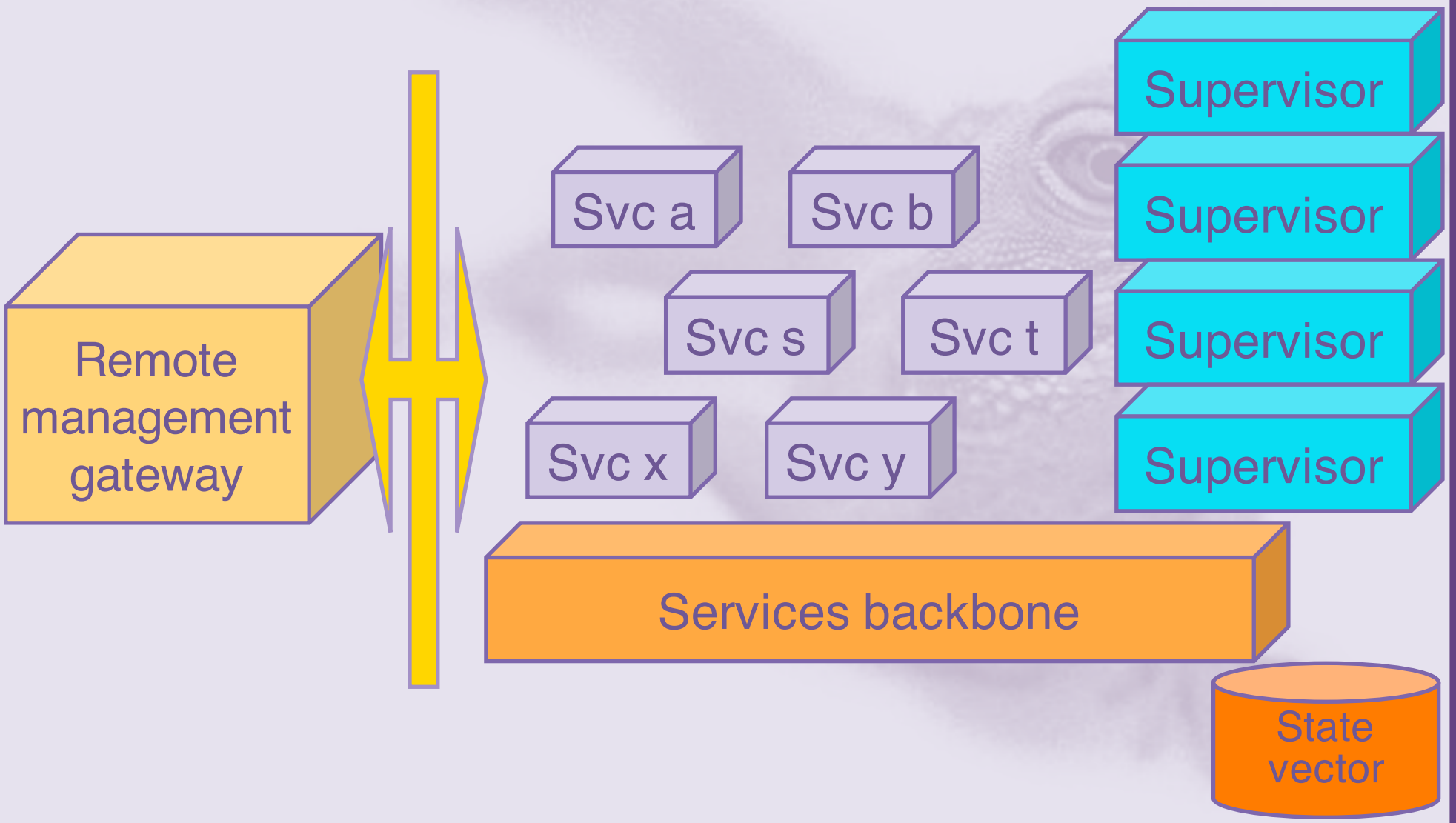
ActorWeb and xray analysis

- What mind-frame fits these topics:
  - Product development
  - Applicability over multiple analysis domains
  - Combining dynamics with robustness

Analysis can only succeed when well-organized

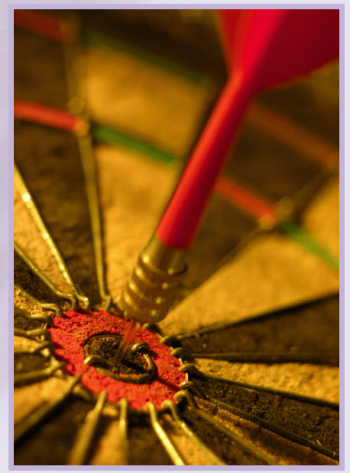
- Although theory still develops, it is primarily the combination of skills and assets that makes analysis difficult to do:
  - A dedicated number of intricate types of tests
  - Are based on re-using and re-fitting appliances and devices
  - Make complex application and interpretation possible in a predictable way

Multiple architectural styles



The results

- Based on the new architecture we can:
  - Use OSGI to remotely monitor and manage the instrument
  - Create and manage a dynamic network of devices and services in and across instrument(s)
  - Use extensible recipes to facilitate easy (re)configuration and usability



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Challenges

- Core concepts
- Additional concepts
  - Refined ways of thinking
  - Traditional approaches
- Gathering a body of knowledge
- Apply body of knowledge:
  - Requirements engineering
  - Solution engineering
  - Traditional approaches

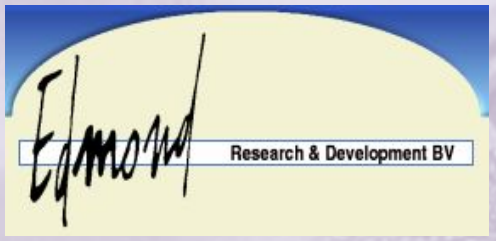
Status & next steps

- Lots of questions & challenges
- Gathering (E.Proper@acm.org)
  - Interested parties
  - Reactions
- Website: www.actorweb.org
- White-paper: being written

Status & next steps

- Program: *n*-projects
- Workshop by Mehmet Aksit
- Goal:
  - Gather interested parties
  - Identify projects

Interested people from:



You?

If at first an idea is not absurd, then there is no hope for it.

Albert Einstein

- Web-site: www.actorweb.org
- Contact person: e.proper@acm.org