The role of the architect in today’s turbulent world is discussed. There is a need for systems that improve security, safety, and that provide threat analysis and prevention, and intelligence. These systems are build in an era full of technological opportunities; from biometrics to intelligent vision/analysis et cetera. However we are faced with many challenges: how to cope with huge amounts of information, how to cope with or how to prevent false positives and false negatives. At the same time system builders have to deal with complicating factors: human factor, many open systems in stead of a few closed systems, and the dynamics of the environment (politics, terrorists, nature, ...).

What is the role of the architect, how to cope with the challenges and complications, what methods and tools are available?
Distribution

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draft
version: 0
The Architect in a Turbulent World

security and safety problems and needs
technological options
architect
complex systems of systems
security and safety solutions
human context

pirates
terrorists
turbulent world
(natural) disasters

terrorists
turbulent world
(natural) disasters
cyber crime
large scale fraud

architect
security and safety problems and needs
technological options

stakeholders
users
buyers
suppliers
legislation

fast evolving heterogeneous

terrorists
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fast evolving heterogeneous
The Role of the Architect in a Turbulent World

The Role of the Architect in a Turbulent World

from problem to solution
product creation process

structure of this presentation

the role and profile of the
architect in a turbulent world

1. exploring turbulence

2. from problem to solution
product creation process

3. fit technological options
to problem context

4. role and profile of the
architect in a turbulent world

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RATWcontent
The Role of the Architect in a Turbulent World

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RATWcontentTurbulence
Sources of Turbulence: Mega Events

- Technology: Enron, Parmalat, Nick Leeson, Barings Bank, Airbus crash, Habsheim
- Crime: Al Qaeda, Madrid, London, Malacca Strait, pirates, Russian n-fishing, Nigerian e-fishing, department store collapse, Seoul, ice rink collapse, Moscow, ice rink collapse
- Nature: Rita storm, New Orleans flooding, Tsunami, Xmas 2004, SARS, H5N1 bird flu, earthquake, Pakistan 2005, ice rink collapse, Moscow, ice rink collapse
- Technology: Enron, Parmalat, Nick Leeson, Barings Bank, Airbus crash, Habsheim
- Crime: Al Qaeda, Madrid, London, Malacca Strait, pirates, Russian n-fishing, Nigerian e-fishing, department store collapse, Seoul, ice rink collapse, Moscow, ice rink collapse
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Most Stakeholders Strive for Certainty

dealing with uncertainty

pull towards certainty

inventors
entrepreneurs

managers

quality assurance

purchasers
general public
government

employees

employees
government
Contradiction: Humans as Champions of Adaptability

Homo Sapiens
thousands of years of adaptation
sea, desert, polar, mountain,
dehydration, flood, fire, famine,
war, plague, diseases
technological systems
hundreds of years of dedication
From Problem to Solution; Product Creation Process

1. Exploring Turbulence
   - Problem
   - Technology
   - Solutions

2. From Problem to Solution
   - Problem
   - Technology
   - Solutions

3. Fit Technological Options to Problem Context
   - Problem
   - Technology
   - Knowledge
   - Solutions

4. Role and Profile of the Architect in a Turbulent World
   - Problem
   - Technology
   - Architect
   - Solutions

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RATWContentPCP
Product Creation: Phasing of Process Steps

1. Feasibility
2. Definition
3. System Design
4. Engineering
5. Integration & Test
6. Field Monitoring
7. Product Operational Lifecycle

-1 Strategy
The “CAFCR” model

What does Customer need in Product and Why?

- Customer objectives
- Application
- Functional
- Conceptual
- Realization

drives, justifies, needs
enables, supports
# Security as example through all views

<table>
<thead>
<tr>
<th><strong>C</strong>ustomer objectives</th>
<th><strong>A</strong>pplication</th>
<th><strong>F</strong>unctional</th>
<th><strong>C</strong>onceptual</th>
<th><strong>R</strong>ealization</th>
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<td>selection</td>
<td>functions for administration</td>
<td>cryptography</td>
<td>specific algorithms</td>
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<td>security zones</td>
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<td>storage</td>
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<td>administrators</td>
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</table>

desired characteristics, specifications & mechanisms

<table>
<thead>
<tr>
<th><strong>not trusted</strong></th>
<th><strong>social contacts</strong></th>
<th><strong>missing functionality</strong></th>
<th><strong>holes between concepts</strong></th>
<th><strong>bugs</strong></th>
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</thead>
<tbody>
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<td>wrong quantification</td>
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<td>buffer overflow</td>
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<td>blackmail</td>
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<td>non encrypted</td>
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<td>poor exception</td>
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<td>unworkable procedures</td>
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<td></td>
<td>handling</td>
</tr>
</tbody>
</table>

threats

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QNsecurityExample
Connecting Problem Space and Solution Space

- Customer objectives
- Application
- Functional
- Conceptual
- Realisation

- social contacts
- open passwords
- blackmail
- burglary
- fraud
- unworkable procedures

- sensitive information
- selection classification
- functions for
- cryptography
- firewall
- security zones
- authentication
- strategy
- logging
- specific algorithms
- interfaces
- libraries
- servers
- protocols
- context
- understanding
- insight
- missing
- right decisions
- right questions
- not trusted
- fraud
- unworkable procedures
- process and design
- competence
- bug
- buffer overflow
- non encrypted
- storage
- poor exception handling
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QNsecurityExampleAnnotated
Example Questions

**Customer objectives**

**Application**

**Functional**

**Conceptual**

**Realisation**

Will biometrics improve authentication?

Is encryption guaranteeing information security?

What are the implementation related security hazards?

What are the process assumptions?

Does the technological solution fit in the human mindset?
Fit Technological Options to Problem Context

1. Exploring turbulence from problem to solution product creation process

2. Turbulent world problem architecture technology solutions

3. Role and profile of the architect in a turbulent world

4. Solutions fit technological options to problem context
Do the right things

Do the things right
"Guiding How" by providing rules for:

1. Functional Decomposition
2. Construction Decomposition
3. Allocation
4. Infrastructure
5. Choice of integrating concepts

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The Art of Architecting Anno 1990

Facts, Expectations and Intuition may be false
Integration requires a critical mindset that is alert for unknowns

Stakeholders

Expectations

Architecting

Architecture

Architect(s)

intuition, assumptions, beliefs, bias

problems, legacy
The Art of Architecting Anno 2006

Intuition
Expectations
Facts
Architecture(s)
Architecture
Architect(s)
Stakeholders
Note:
Facts, Expectations and Intuition might be false
or out of date or fluctuating

change
turbulence

Facts → Stakeholders

Analyse
Assess
Balance
Trade-off
Decide

Architecture(s)

Vision
Overview
Insight
Understanding

Architect(s)

Intuition

Architecture →

does it fit and satisfy today's and tomorrow's situation?

Note:
Facts, Expectations and Intuition might be false
or out of date or fluctuating
Architecting is much more than Decomposition

Decomposition is "easy"

Integration is difficult
Architecting: Preparing for Integration

Decomposition is "easy". Integration is much more difficult. Future extension.
Technical Decisions Require Detailed Know How

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RATWpyramid
The Role of the Architect in a Turbulent World
Organizational Problem: Disconnect

**What** does Customer need in Product and **Why**?

- **Customer objectives**
- **Application**
- **Functional**
- **Conceptual**
- **Realisation**

How can the product be realized

What are the critical decisions

- system requirements
- design decisions
- parts
- connections
- lines of code
- and growing every year...

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RATWdisconnect
Architect: Connecting Problem and Technical Solution

**Customer objectives**

**Application**

**Functional**

**Conceptual**

**Realisation**

**What** does Customer need in Product and **Why**?

**How** can the product be realized

**What** are the critical decisions

1. **Customer objectives**
2. **Application**
3. **Functional**
4. **Conceptual**
5. **Realisation**

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The Role of the Architect in a Turbulent World

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RATWbreadthAndDepth
Major Bottleneck: Mental Dynamic Range

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RATWmentalDynamicRange
Opposing, but Complementary Skills and Cultures

Based on: "Some Future Trends and Implications for Systems and Software Engineering Processes" by Barry Boehm, Systems Engineering, Spring 2006

- **Agility**: People thriving on chaos
  - System architects: create some order in chaos but fear dogmatic use of procedures and policies
- **Plan-Oriented**: People thriving on order
  - System engineers: create reliable, reproducible, maintainable, manageable systems introducing procedures and policies
System Roles: Company Culture Dependent

- system architect
- system designer
- system engineer
- system manager
- system tester

- high level of uncertainty
- need for certainty

- strategy
- feasibility
- definition
- system design
- engineering
- integration & test
- field monitoring
- product operational lifecycle
Recommendation 1: Team Work

1 team

- mutual respect
- complementary

few

- agility
- people

thriving
on chaos

many

- plan-oriented
- people

thriving
on order
Recommendation 2: Symbiose via Workshops

- **workshop(s)**
  - management
  - stakeholders
  - agility people
  - plan-oriented people

  *early in the project*
  *shared problem understanding*
  *shared solution exploration*