Systems Architecture

Directorate of Line Upgrades

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• System complexity
• Drive to Standardisation
• What we actually need

• Architecture on the SSR Upgrade programme
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  – The Rail Architecture frameworK (TRAK)
  – Intelligent client architecting
  – Problems
  – Next steps

• Questions
Business Context

- 4 million journeys/day,
- 1 billion journeys/year
- 20 million customers
- 800 km of track
- 5000 signals
- 13 depots
- 402 escalators
- 600 trains
- 276 stations
Nature of our environment

- Increasing Capacity
- Enhanced Flexibility
- Managing Obsolescence

- Electro/mechanical/relays
- Basic Automatic Train Protection
- Automatic Train Operation
- Train Management Systems for asset management & comms link to control room. Enhanced electronics & SCADA
- Enhanced signalling functionality based on solid state technology
- DC Cam-shaft controllers & motors replaced by AC drives
- Enhanced Service Control
- Partial Automatic Train Regulation
- Air Conditioned Train Cars
- Auto turnaround
- Tunnel Cooling
- Mobile Phone and TV services above and below ground
- Integrated Train Identification and Comms Systems
- Integrated ticketing and payment systems
- Integrated Signals and Comm Systems
- Integrated Real Time Information
- Mobile Phone and TV services below ground
- Full Automation.
- Demand based service management.
- Auto Dwell Management.
- Full Automatic Train Regulation
- Decision Support
- E-ATO


1900-60
- Increasing Capacity

1960-80
- Enhanced Flexibility

1992-96
- Managing Obsolescence

2007
- Electro/mechanical/relays
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2012
- Enhanced Flexibility

2025
- Managing Obsolescence
System Complexity 2
The Need for Standardisation
What we need

Diversity is expensive
.. pragmatic is better

Share the feast

Its in the contract

What is Architecture?
Systems Architecture on the SUP

- Phase 1: Roll-out of Eight Car S-Stock Trains
  2007 - 2013

- Phase 2: Roll-out of Seven Car S-Stock Trains
  2011 - 2005

- Phase 3: Automatic Train Control
  2010 – 2018

Architecture Descriptions
Transition to modelling

Visio 200

INTERNATIONAL
STANDARD

Systems and software
Recommended practi
description of softwa
systems

Ingenierie des logiciels et des syst
e description architecturale des s
logiciels
TRAK meta-model
TRAK view map {incomplete}

See Solution Views

7th July 2009
TRAK - in EA Tool
Intelligent client architecting mitigates risk

Model with intelligence

Impose basis for evaluation

<table>
<thead>
<tr>
<th>«indicative design object»</th>
<th>Automatic Train Control</th>
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</thead>
<tbody>
<tr>
<td>allocatedFrom</td>
<td></td>
</tr>
<tr>
<td>«requirement» SRS-SSC-3256 Nice cheese, Grommit</td>
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<tr>
<td>«requirement» SRS-SSC-4356 Destroy all Aliens</td>
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<tr>
<td>«requirement» SRS-SSC-1176 Make my day, punk</td>
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<tr>
<td>«requirement» SRS-SSC-6454 Haunting of Molly Hartley</td>
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</table>

Get what you want

“I want it all... and I want it now!”

Requirements in context

<table>
<thead>
<tr>
<th>«physical»</th>
<th>Alien Signalling System</th>
</tr>
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<tbody>
<tr>
<td>allocatedFrom</td>
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<tr>
<td>«requirement» SRS-SSC-3256 Kill Bill</td>
<td></td>
</tr>
</tbody>
</table>

7th July 2009
Thinking *inside* the box

- Know where the solution boundary lies
- Know where the interfaces are
- Requirements mapped to IDOs
Problems (unsurprisingly)

1. Run that by me again

2. Unforgivable

3. ‘But we preferred the old pictures’

4. system vs view decomposition OMG!

5. Lack of relevant examples to rail domain
Next steps

• Modelling tool
• Repositories and exchange methods
• Support SSR tender and contract assessments
• Do more promotion
• Strategy for TRAK
• London Underground network-level architecting
• Ontology
Question time

• Q1. If standardising systems architecture is a business no-brainer, how are we to go about achieving this in rail?

• Q2. What does your business do today, and where does it need to get to, in systems architecting?

• Q3. What rail engineering products do you think of as being systems architecture views?

• Q4. What activities can architecting displace, if any?