

Testing the Heathrow Terminal 5 Baggage Handling System- Before it is built

T5

**Roger Derksen
Huub van der Wouden**

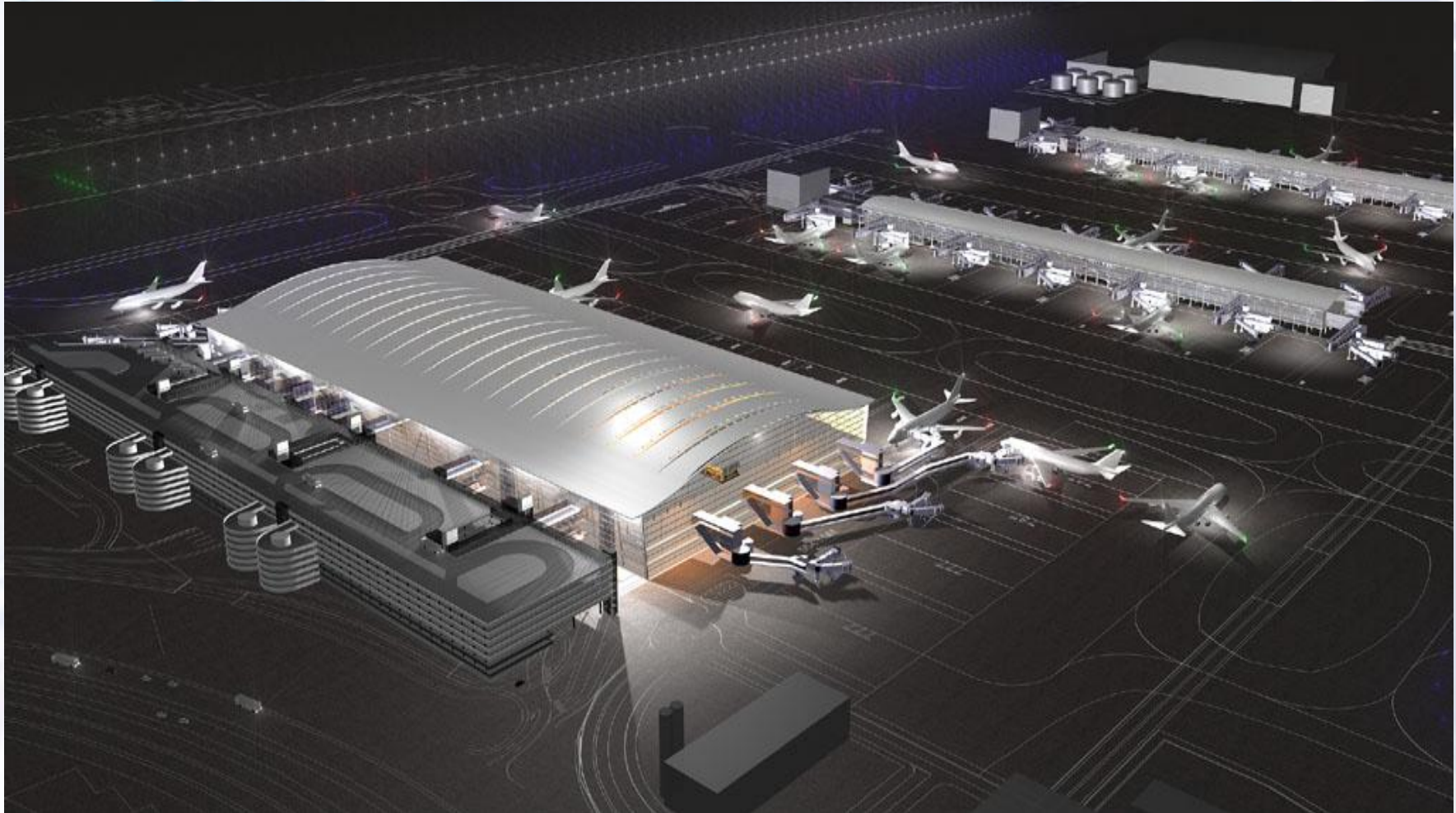
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Outline

- London Heathrow T5 – Intro
- The baggage handling system
- Testing with emulation
- Low level emulation & testing
- High level emulation & testing
- Conclusions
- Question

London Heathrow T5 – Intro



T5 - Facts

**30 million passengers
a year**

**It will take approx.
37 million man-hours
to build T5**

70.000 bags a day

**One core building
One satellite building**

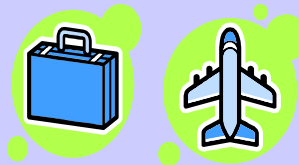
**Second satellite
due to open
In 2011**

The baggage handling system - functions



The baggage handling system - architecture

Service management



Flights, bags, services

Logistics management



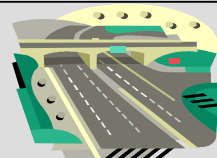
Routes, destinations

Transport Management



Transportation, flow control

Physical equipment



Raw conveyor,
Bagtrax, Cranes ...

Testing with emulation

- Emulation extensively used in previous projects
- Emulation models – intelligent stubs
- Automod® simulation software
- Low level emulation
- High level emulation

Low level emulation & testing

Low level emulation

- Replace physical equipment
- Interfaces with PLC
- Same electric in - & outputs

Service management



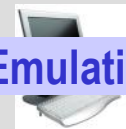
Logistics management



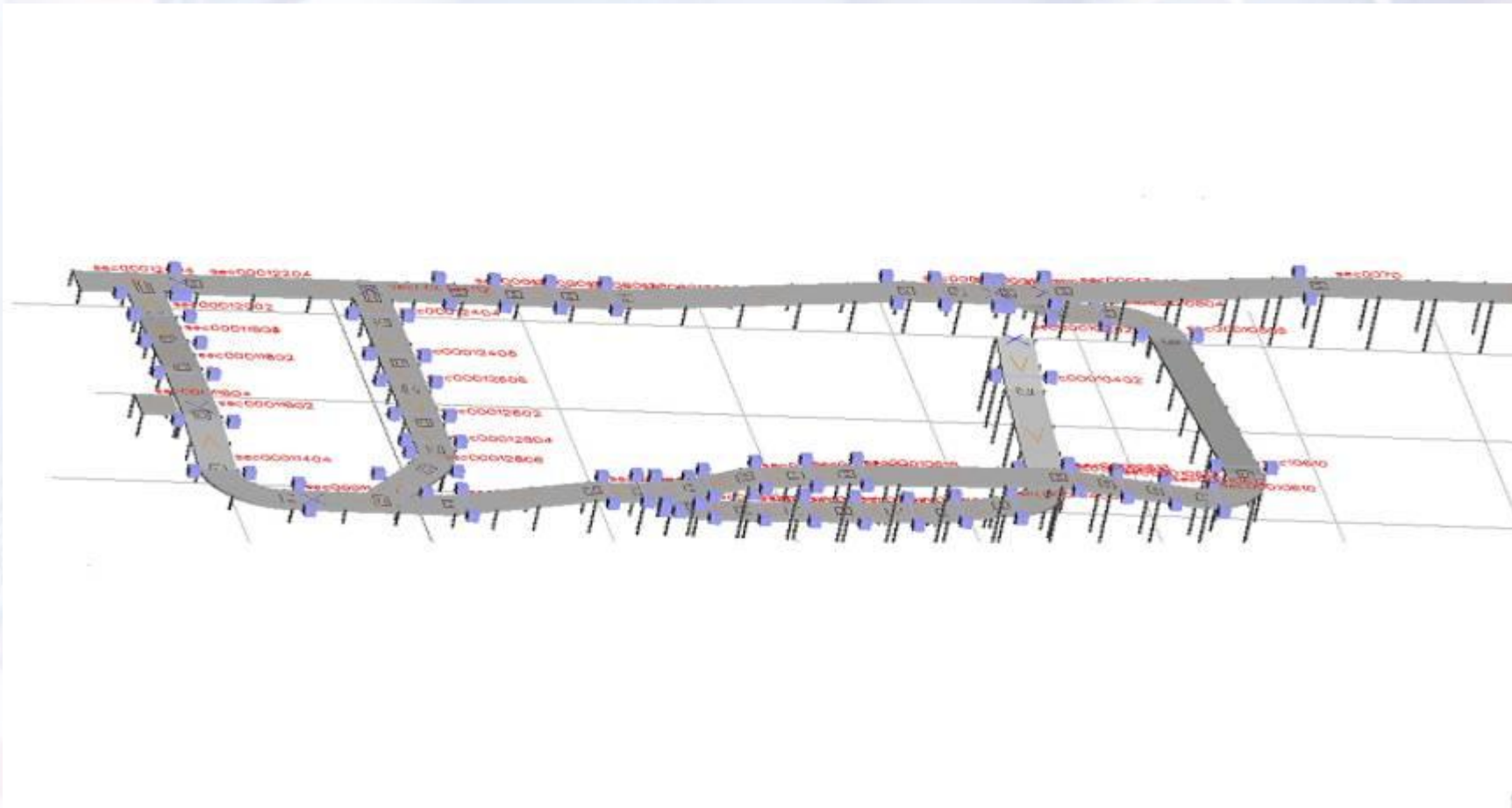
Transport Management



Emulation

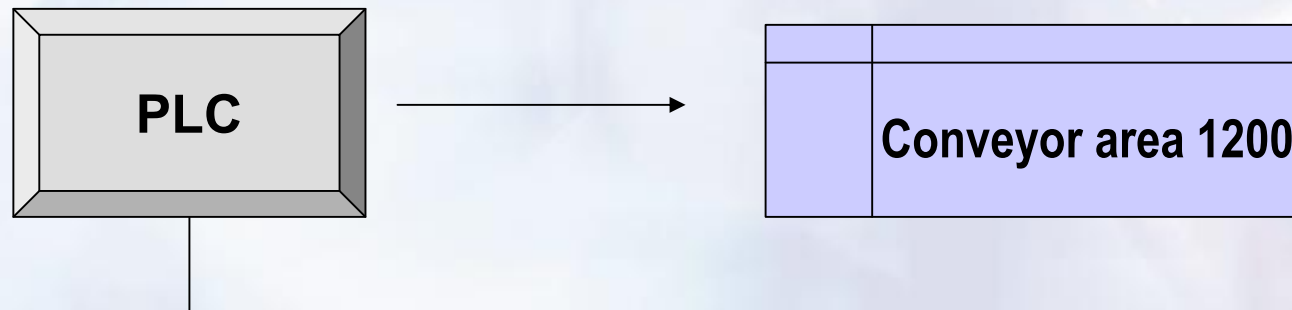


Low level emulation & testing

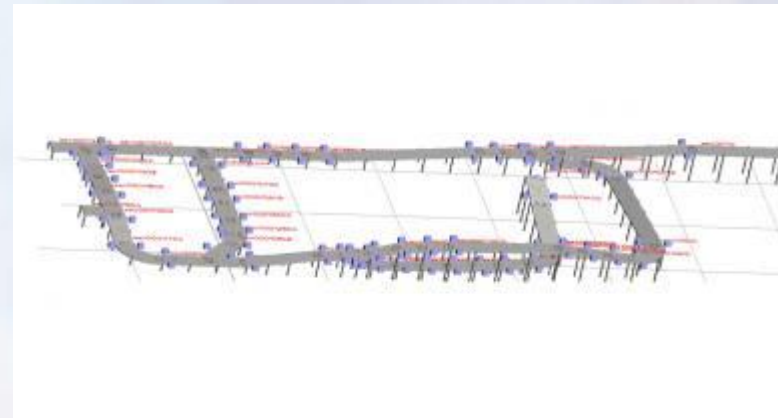


Low level emulation & testing

Testing using individual models

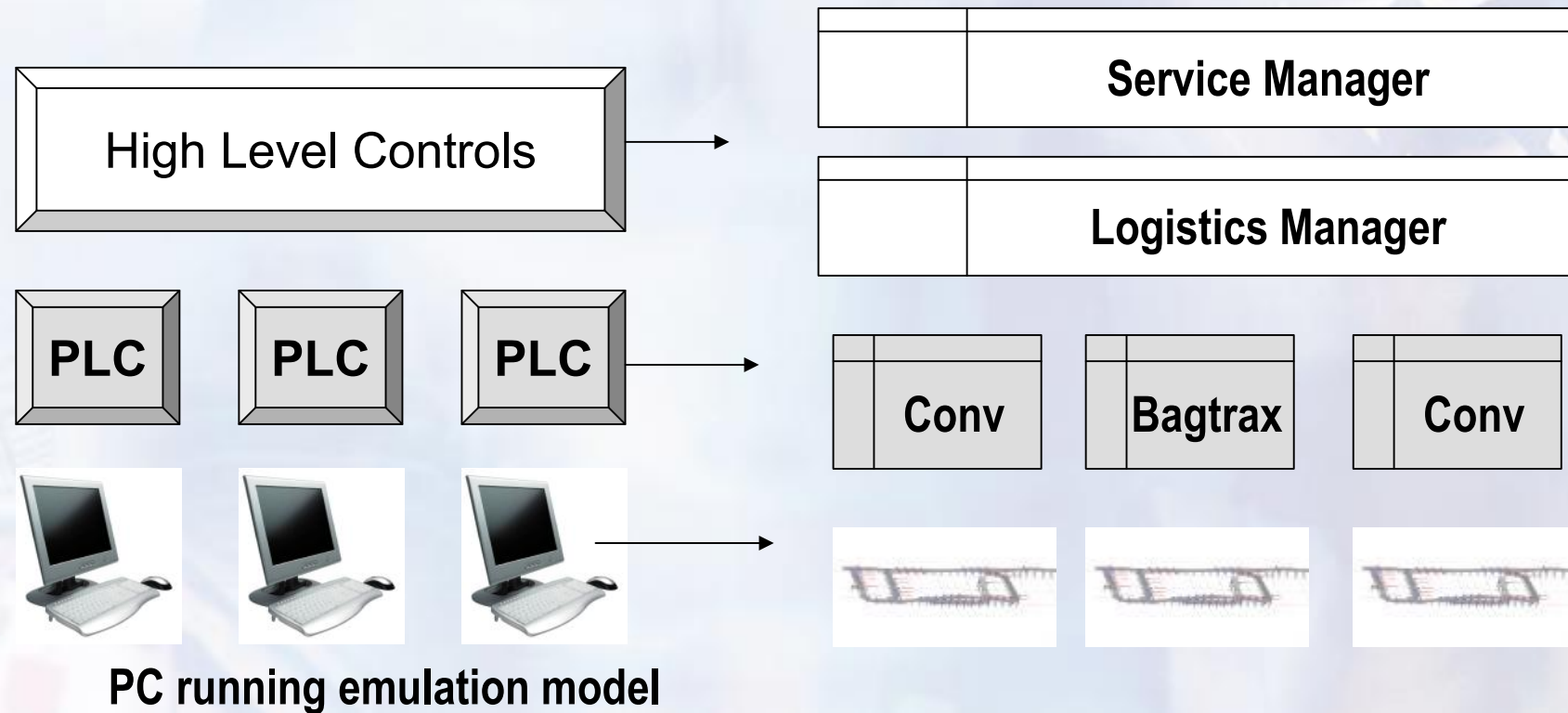


PC running emulation model



Low level emulation & testing

Testing using integrated models



Low level emulation & testing

Testing using integrated models

Example



**Unloading quay
(Transfer bag input)**



**Bagtrax®
High speed
transport**



**Build lateral
(Make up)**

High level emulation & testing

High level emulation

- Replace physical equipment and PLC controls
- One model for entire transport layer
- Realistic configuration
- Emulation of subsystems (incl. controls software)
- Demo

Service management



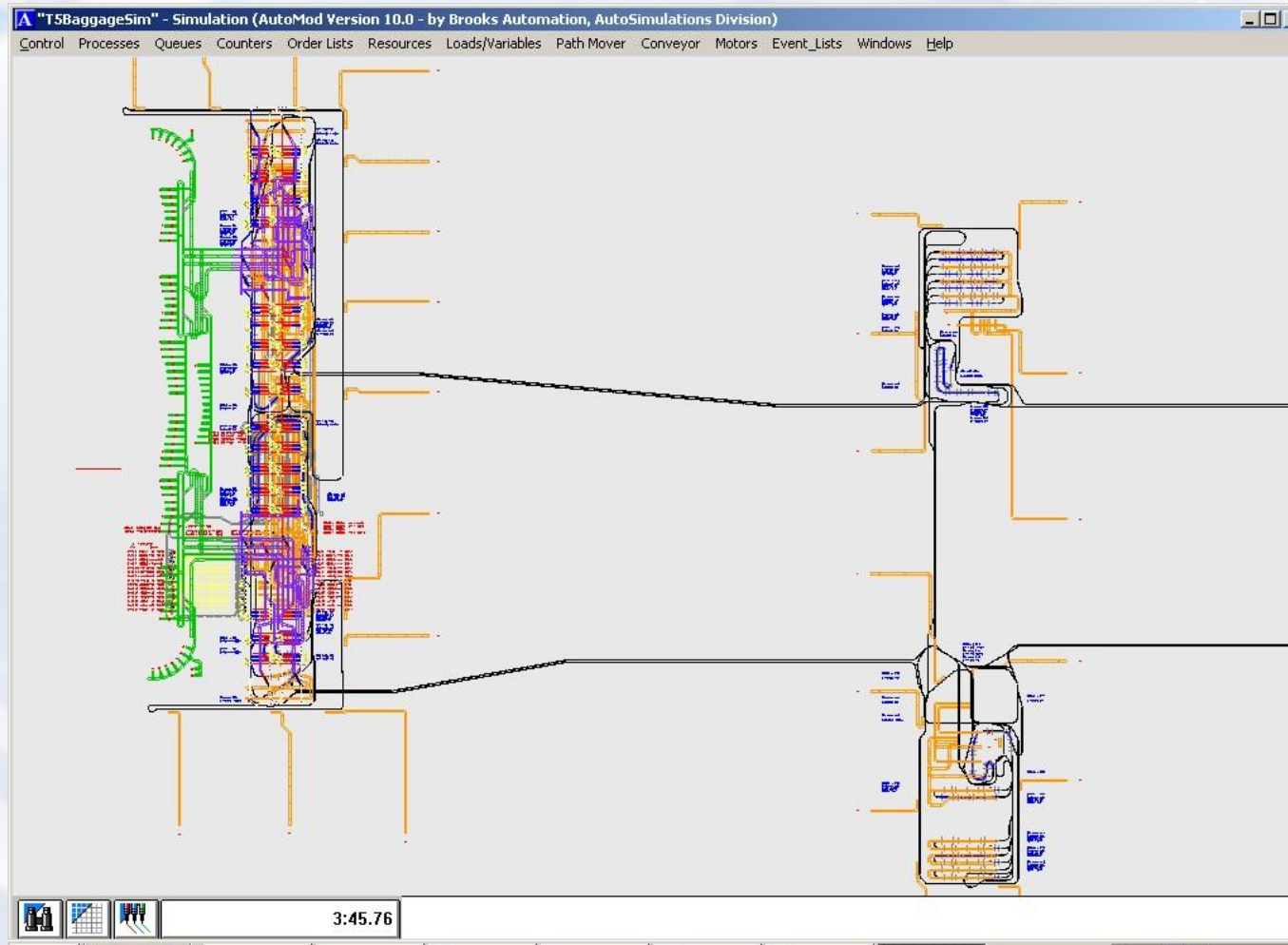
Logistics management



Emulation

High level emulation & testing

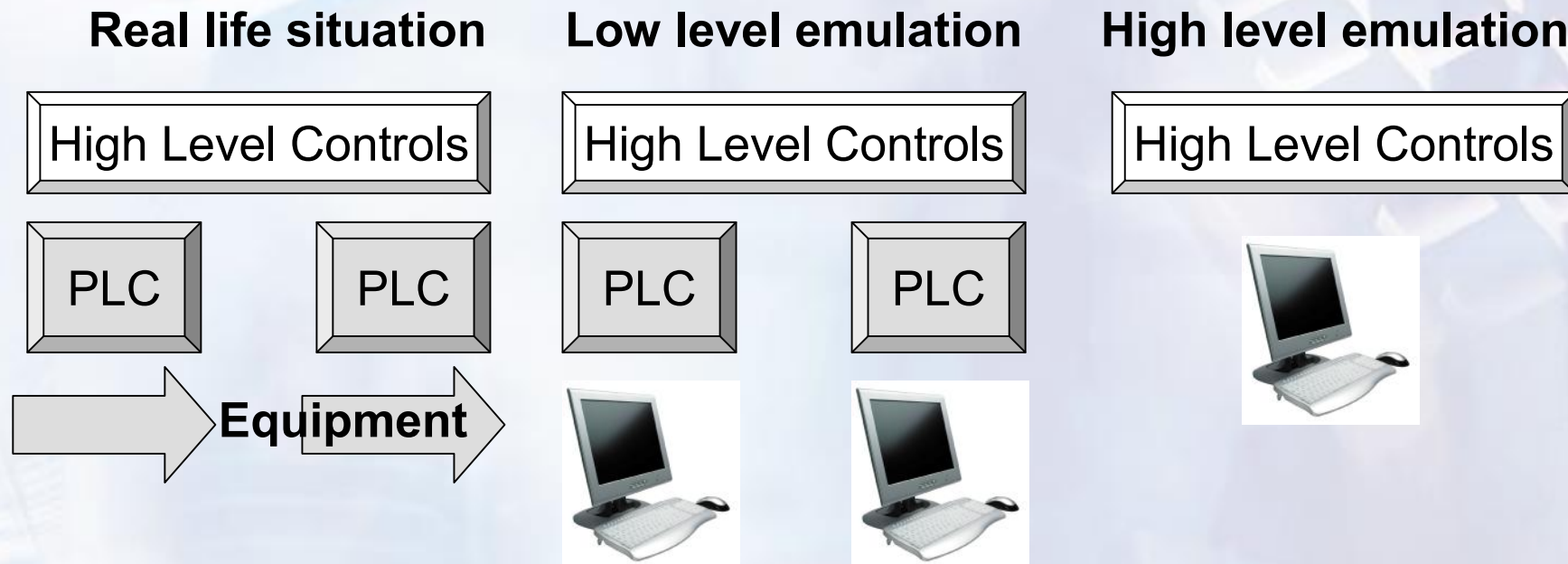
High level emulation





High level emulation & testing

High level emulation



Emulation & testing

- Emulation used at all levels of testing (depending on component)
- Horizontal (PLC $\Rightarrow$ PLC) and ...
- Vertical integration
- White box integration (interfaces)
- System testing (functional and non-functional)

Conclusion / lessons learned

- **Emulation: software with greater level of maturity - Many problems found before going to site**
- **Improved robustness of software**
- **Don't underestimate the effort spent on emulation**
- **Emulation development = software development**

Questions?

Also read the paper at www.transfer-solutions.com
“Testing the Heathrow Terminal 5 baggage handling system – before it is built”