The New Royal Adelaide Hospital Testing Journey

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Agenda

• Project Overview
• Project Structure
• Test Approach and Phases
• Test Statistics
• Lessons Learnt
• Q&A
Project Overview

• Major Milestones
  • **2006 June** – SA Government proposed to build a new hospital to replace the existing Royal Adelaide Hospital
  • **2011 September** – Construction early works and ground works commenced
  • **2015 August** – Commenced commissioning of the hospital’s ICT systems and mechanical services on site
  • **2016 October** – Certificate of Occupancy
  • **2017 March** – Technical Completion
  • **2017 June** – Commercial Acceptance
  • **2017 September** – Official opening ceremony and patient move undertaken.
Project Overview

• Quick Video Overview
  • Video
Project Overview

• **Interesting Facts and Figures**
  • 2,200 staff on site at the peak of the project
  • 100,000m³ of concrete in the structure
  • 25,000 tonnes of structural steel
  • 40km of partitioning
  • Estimated 300,000 crane lifts to assemble the structure
  • Each level of the hospital is the size of two football ovals
  • Hospital itself is the same length as 28 Adelaide Metro buses
  • The design and construction cost of the new RAH was $1.85 billion.
  • The total project cost was $2.3 billion.
Project Overview

• Extremely Complex Integration
• More than 200 integration touch points
Project Structure

- Managed by a **Public Private Partnership (PPP)**
- **The PPP consists of:**
  - Celsus
  - Hansen Yuncken
  - CPB Contractors (Formerly Leighton Contractors)
  - Spotless
  - DXC Technology (Formerly HPE)
- The Public Private Partnership (PPP) contract is to design, finance, construct and manage non clinical services of the facility till 2046
Project Structure

• Multiple Vendors Involved in delivering Software and Hardware solutions
• The major vendors were:
  • **DXC Technologies (Formerly HPE)**
    • Integration Engine
    • IMATIS – Mobile CISCO Handheld device
  • **Honeywell**
    • Building Security systems
  • **Visionstream**
    • ICT Network
    • Wireless Location Services
    • PABX
  • **Schneider Electric**
    • Building Management Systems
  • **Citadel (Formerly Service Point)**
    • Audio Visual Systems
    • Wayfinding Kiosks
Project Structure

• Other Partners Involved in delivering Software and Hardware solutions

• **Spotless:**
  • Helpdesk System
  • Meals Management System
  • Automated Guided Vehicles

• **SA Health**
  • Integration works with the Facility Management Systems
  • Modifications to EPASS to align with nRAH systems
  • Integrated Bedside Terminals
Test Approach

- **Test Approach**
  - Master Test Strategy created and accepted by all
  - Master Test Plan(s) for Integrated testing
  - Risk based approach due to volume
  - Two distinct components
    - Vendor’s own testing
    - Integrated collaborative testing
  - Dependant on physical construction
  - Collaborative approach – all parties to be equal in contribution
Test Phases

• **Stand Alone Testing Phase**
  • All Vendors performed and managed own Standalone Testing
  • Tested all standalone functionality within own systems
  • Tested non-functional components of their own systems
  • Each Vendor determined own approach
  • Each Vendor produced a Test Record for standalone testing

• **System Integration Testing Phase**
  • Vendors tested together
  • All touch points tested individually
  • Individual Test Records created
Test Phases

• **End to End Testing (E2E) Phase**
  • Joint Master Test Plan Created
  • Consisted of Both Functional and Non-Functional testing
  • Blackbox Testing
  • Execution was a joint effort by all Vendors and other Partners (Sa Health and Spotless)
  • Performed multiple times in different environments
  • A Test Record has been created for each of the phases
  • More than 200 unique E2E events
Test Phases

• E2E - Functional
  • Integrated Test Environment (ITE)
    • Testing in an off site environment
    • Scaled down version of the production configuration
    • One combined Test Record was created and once approved the configuration was implemented in the Production(PROD) environment

• Production – Sample Hospital
  • Specific physical areas selected to align with construction
  • All ICT components had to present in the Sample Hospital
  • Concept enabled testing to progress without a completed facility
  • Allowed for early detection of Integration issues.
Test Phases

• E2E – Functional continued.
  • **Production** – Entire Hospital
    • Risk Based
    • Subset (20%) of all locations selected – approx. 6000 locations
    • Some life threatening systems tested on more than 20% - up to 100%
    • Selected set of E2E Tests only - location specific
Test Phases

• E2E – Non-Functional.
  • Experts(Innodev) were brought in to assist in the execution of the Non-Functional Testing
  • No consolidated load generator – customised scripts

• Performance Testing
  • Risk Based Approach
  • Peak Load generated for applicable system
  • Daily Average Load on all other systems
  • E2E Test Executed numerous Times and individual transaction times captured to determine proper metrics
  • Each transaction time had to be within time frame to pass.
  • Some transaction times measured by log file comparison and some measured by Stopwatch
Test Phases

• **E2E – Non-Functional** continued.
  
  • **Application Failover Testing**
    
    • Pass criteria was no transactional loss during failover
    • Peak Load or appropriate load generated for applicable system(s)
    • All systems with a High Availability requirement tested
    • All in scope systems was failed over, individually, under load, from the Primary to the Secondary and back to the Primary
    • The Primary Data Centre was failed over to the Secondary and back to the Primary
    • The Whole Network was failed over to the Secondary and back to the Primary
    • After each failover event log files were interrogated to determine a pass / fail
Test Phases

• Independent Certifier (IC) Test Phase.
  • Could only commence when all works and testing completed
  • IC granted Technical Completion
  • Each test witnessed by the IC and the State/Spotless

• IC Schedule 10 – Individual System Test Phase
  • Validation of all Contractual standalone requirements
  • Each requirement had a test case
  • Each requirement signed off individually by the IC

• IC Schedule 10 – E2E Test Phase
  • Full E2E suite of tests had to be executed
  • Each E2E test case had to be signed off by the IC
  • Test Records for the E2E-Non Functional testing was signed off by the IC.
Test Statistics

• These number excludes Vendor Stand Alone- and Independent Certifier testing
• More than 1100 Test cases
• More than 6000 Tests Executed
• More than 500 Defects raised
Lessons Learnt

• Developers / Manager does not always makes good Testers
• Clear and precise expected results in Test Cases
• Different Test Maturity levels in different organizations
• Ensure proper functional and non-functional requirements are defined
• Do not try to blend IT with Construction
• Ensure Entry and Exit criteria is met before progressing to next phase
• Lack of a proper non-production test environment
• Encourage proper communication when performing integrated testing
• For Specialist Testing you need Specialist resources
• Automate Regression suites
Questions