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

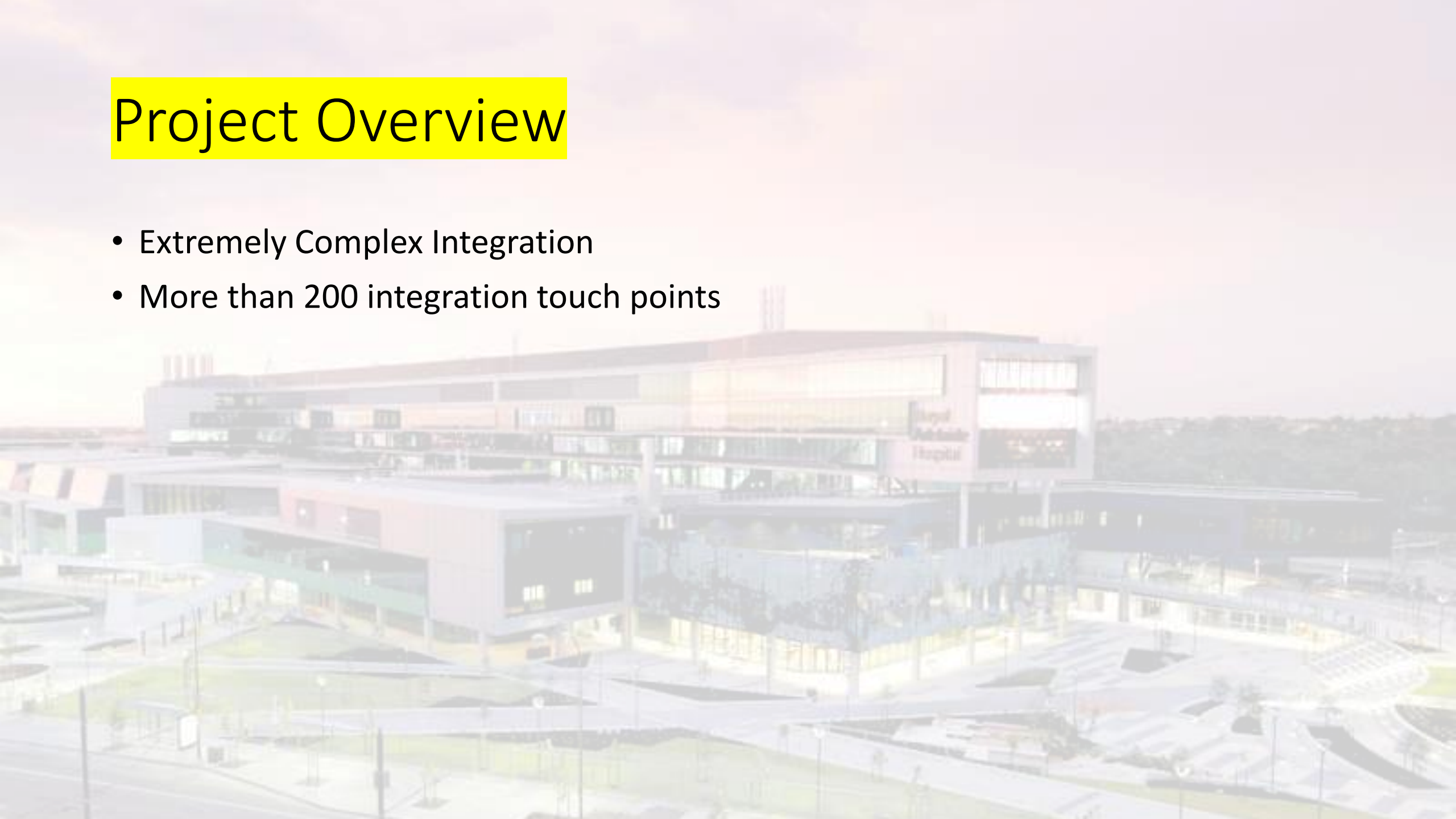
- Quick Video Overview
  - Video

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 of 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