Metrolink Extension Programme

Systems Engineering Practices

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WSP | Parsons Brinckerhoff

INCOSE NW Group Meeting, 31st January 2017
Network Rail Office, Square One, Manchester
• Manchester Metrolink Tram Network
• Metrolink Extension Programme (Phase 3)
• System Level Engineering – SBS & Lifecycle
• Operational Readiness - Go-live Process
• Further Information

• Thales SE Approach & Toolset – Andy Jenkins

• Questions
Metrolink History

First ‘Second Generation’ tramway in the UK
Opened in 1992
Conversion of heavy rail link between Bury and Altrincham
Street running link through the city centre
Extended to Eccles in 2000
The Vision - Expanded Tram Network

- £1.4 billion investment between 2009 and 2016.
- 10 extensions to the network.
- 93 new and improved tram stops.
- Fleet of 104 new trams.
- Conversion to Line of Sight operation throughout.
- Trebles the size of the current network to 103km.
- Doubles passengers per year to 50m.

Transport for Greater Manchester
Metrolink Delivery Team

- LRV Supplier
- TMS Contractor
- DCM Contractor
- Operator

Organisations and Roles
Validation (What Has Been Produced Meets Requirements)

System Acceptance Tests

Transfer into Passenger Service

Development, Manufacture & Factory Test & Install or Construction

Scope Definition

Increasing Decomposition & Detail

Increasing Integration & Scale

Verification (Next Stage Satisfies the Intention of the Previous Stage)

Verification (Next Stage Satisfies the Intention of the Previous Stage)
Operational (Go-Live) Readiness Process
Go-live Readiness Tracker

| MRDL 200_5 | Fire & Evacuation Plan for Airport Stop issued | Document ref - PROC 00118 | MRDL George Barrow | Update 23/07 Several meetings held and document drafting commenced. MR/MAG interface. Update 07/08 Plan well progressed. Update 25/09 This has been incorporated into our main Procedure 0118 - Station Evacuations. – Complete. |
| MRDL 200_6 | Local Police liaison/emergency services plan approved | From: George Barrow (mailto:gbarrow@metrolink.co.uk) Sent: 09 October 2014 11:41 To: Daniel Churchman Cc: Dave Skirrow; Gary Scanlon; Alan Knott Subject: Airport Go-Live Update | MRDL George Barrow | Update 23/07 Discussions with Fire Brigade liaison officer underway. Confirmation that equipment requirements for applying emergency earths have been met for local brigade. Update 16/09 - Emergency services informed of current way forward. Update 25/09 MRDL have confirmed operational planned dates. Update 9/10/14 - Plan complete |
| MRDL 200_7 | Stop Appreciation Plan to include maps and training for CSRs | As per 200_6 ref | MRDL George Barrow | Update 04/09 Documentation being drafted. Update 16/09 - Information gathered, draft being finalised. Update 25/09 To be finalised before 13/10/2014. Update 09/10/14 - Training material complete, training on going |
| MRDL 200_8 | Approve Q&A customer services briefing documents from TfGM | Briefing docs in place | MRDL George Barrow | Update 23/07 Agreed activity can be removed. Day job. |
| MRDL 200_9 | Provide Customer Experience Officer resource for updating information e.g. Posters across system | Statement letter/email | MRDL George Barrow | Update 23/07 Agreed activity can be removed. Day job. |
| MRDL 200_10 | Operations staff (controllers) route appreciation training | Training complete, confirmation email from MRDL - As per 200_6 ref | MRDL George Barrow | Update 04/09 Documentation being drafted. Update 16/09 - Training completed and well progressed. Update 9/10/14 - Completed. |
| MRDL 200_11 | MRDL Change Control process substantially complete to support passenger service operation | Agility Ref No | MRDL George Barrow | Update 23/07 CC commenced. Stage 2 complete. Update 04/09 Stage 3 complete of total 5 stages. Stage 4 substantially complete. Update 9/10/14 - Process well advanced |
| MRDL 200_12 | MRDL to confirm management cover in place to provide first line response on passenger service commencement day (particularly if Sunday) | Email confirmation | MRDL George Barrow | Update 16/09 - MRDL committed to supporting this. Update 9/10/14 - Need details of opening. |

**PSRR Stage Gate - Summary Report**

| Meeting | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | Total |
| 02-Jul-14 | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% | 6% |
| 09-Jul-14 | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% |
| 23-Jul-14 | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% | 5.6% |
| 07-Aug-14 | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% | 11.1% |
| 21-Aug-14 | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% | 12.5% |
| 04-Sep-14 | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% | 15.2% |
| 18-Sep-14 | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% | 18.2% |
| 25-Sep-14 | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% | 24.9% |
| 02-Oct-14 | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% | 34.4% |
| 09-Oct-14 | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% | 53.2% |

**PSRR Flight Path**

- **Idealised PSRR**
- **PSRR Flight Path**
- **Total**
- **Overall**
- **Meeting**
- **0%**
- **6%**
- **12%**
- **18%**
- **24%**
- **30%**
- **36%**
- **42%**
- **48%**
- **54%**
- **60%**
- **66%**
- **72%**
- **78%**
- **84%**
- **90%**
- **96%**
- **100%**

- **Line Item Completion**

- **Meeting**
- **09-Oct-14**
- **02-Jul-14**
- **09-Jul-14**
- **23-Jul-14**
- **07-Aug-14**
- **21-Aug-14**
- **15-Sep-14**
- **11-Sep-14**
- **24-Sep-14**
- **18-Sep-14**
- **25-Sep-14**
- **02-Oct-14**
- **09-Oct-14**
- **16-Oct-14**
- **23-Oct-14**
- **30-Oct-14**
- **06-Nov-14**
- **13-Nov-14**
- **02-Oct-14**
- **09-Oct-14**
- **16-Oct-14**
- **23-Oct-14**
- **30-Oct-14**
- **06-Nov-14**
- **13-Nov-14**
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Relevant Papers
6. ‘Getting It Over The Line – Delivering a Light Rail System into Service’ at INCOSE UK Annual SE Conference (ASEC14) at RAF Cosford on 18 & 19 November 2014, Co-authors Adrian Cope, acpm ltd & Matthew Hack, TfGM.
INCOSE Guides


Technical Journal – Network

Current On-line Issue: http://network.wsp-pb.com/
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‘Challenges of Integrating the Whole System’ as part of 4 presentations on the Manchester Metrolink Extension Programme to the NETLIPSE 10th Anniversary Meeting ‘Challenges In Infrastructure’ at the Islington Doubletree Hilton, London 18-19th April 2016. Other presenters were Peter Cushing, Metrolink Director, Transport for Greater Manchester (TfGM), Steve Reynolds, Principal-in-Charge for the TfGM’s Delivery Partner for Metrolink (WSP|PB) & David Bray, Programme Director, Metrolink Extension Programme (MEP) (WSP|PB).
http://netlipse.eu/network-meetings/anniversary-network-meeting-london#WCXGsE1vhYd
Andy Jenkins
Any Questions...?