

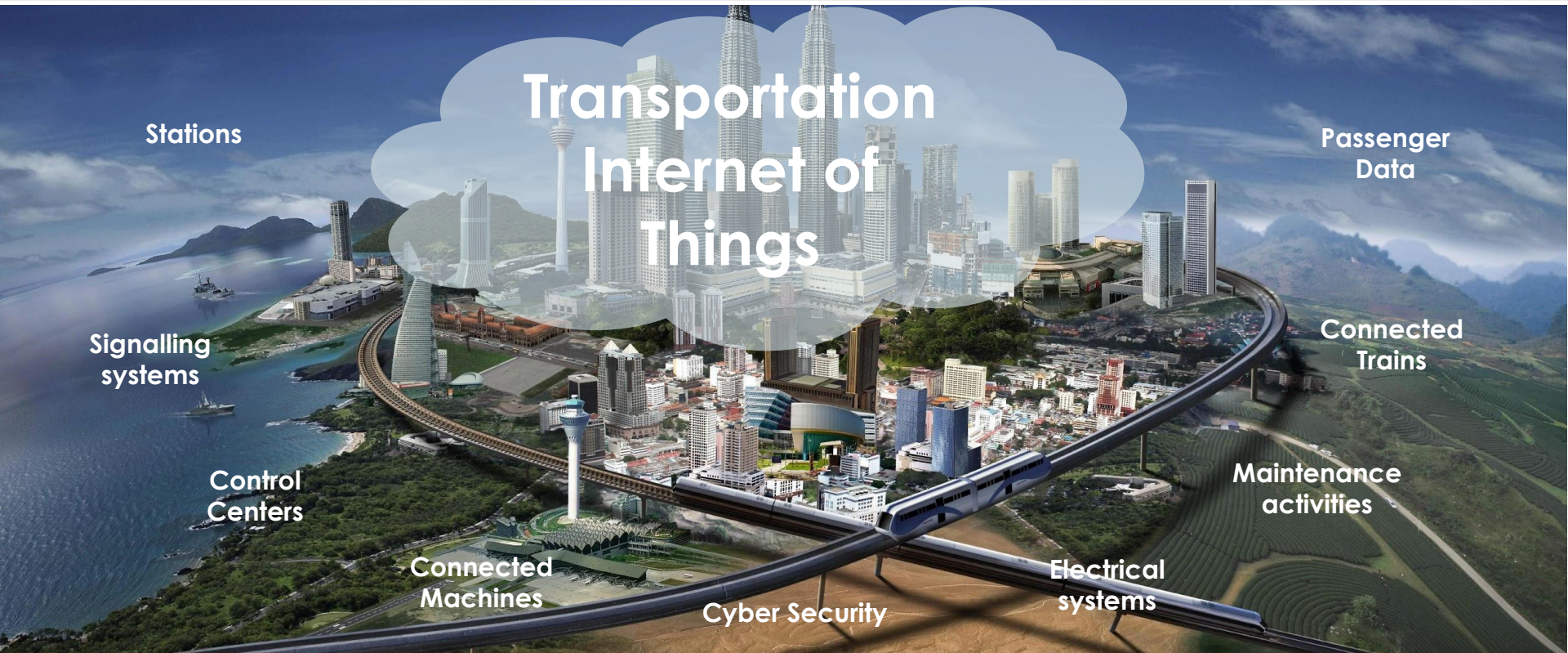
IoT and predictive maintenance in Railways

Predictive Maintenance & Operational Support
John Raymond, Head of Digital Services

Feb 2018



Globally – estimated 50B devices connected by 2020



Transportation Internet of Things

Stations

Passenger Data

Signalling systems

Connected Trains

Control Centers

Maintenance activities

Connected Machines

Cyber Security

Electrical systems

Data storage, communications, AI and mobility – driving the revolution

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Typical Challenges Facing Railways Today



We are looking for a **holistic maintenance strategy**: remote, predictive and prescriptive.



What is the Train Occupancy and Platform Crowding per station?



It would be interesting to undertake an analysis of **large-scale operational data-sets** to see if it can **identify trends** or patterns which could be used to improve the decision support and provide prescriptive advice.



We need support from a **Global Strategic Technical Centre**.

Rail Infrastructure Manager challenges

Improve Safety

Increase Capacity

Improve Asset Availability

Reduce Cost

Passenger Experience

Vision for Big Data Analytics



CLOUD

- Scalable
- Easily upgradable
- Maintenance-free
- Lower ops costs



CYBER SECURE

- Highest standard of data protection
- On-going security



BIG DATA

- Network / Asset / Iot Data
- Operational Data
- Staff / Passenger Data
- Signalling Data
- Maintenance Data
- Ticketing Data



MACHINE LEARNING

- Prediction
- Artificial intelligence
- Algorithms
- Deep learning
- Data Science

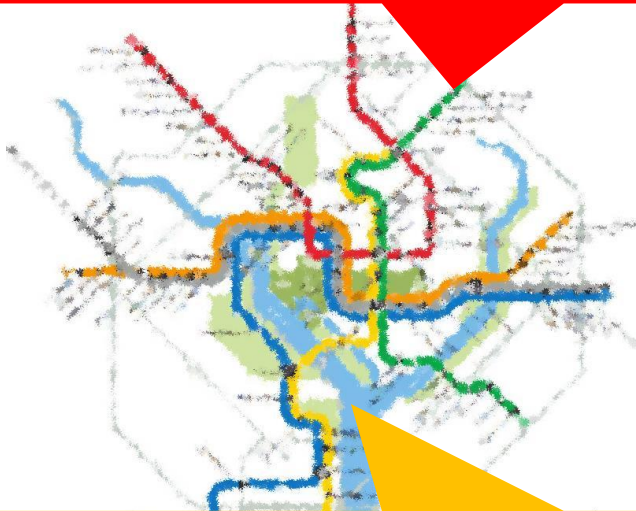


DIGITAL PRODUCTS

- Visualisations
- Data Manipulation
- Any device, any time, anywhere

Vision for Predictive Maintenance – Today vs. Tomorrow

Today: **ALARM:** Critical Point Machine Failure



Tomorrow: **ALERT:** Potential point machine failure in 10 days – suggest replacing worn motor -83% confidence

Yesterday: Remote Condition Monitoring

- Understand the asset state and asset health
- Understand where the problems are, but often when it is already too late (fault has already happened!)

Today & Tomorrow: Predictive Maintenance & Operational Support

- Visualize when an asset may fail and what mitigating actions to take
- Tactically mitigate response and strategically plan to optimise maintenance

ONE SOLUTION: to cover all asset types, regardless of OEM provider

Predictive Maintenance

Remote Condition Monitoring

Predictive Maintenance & Operational Support

Source

- Sensors
- Logger

Transit

- IP
- HTTP/S

Thales Predictive Maintenance

Insight

- State of Asset

Algorithm

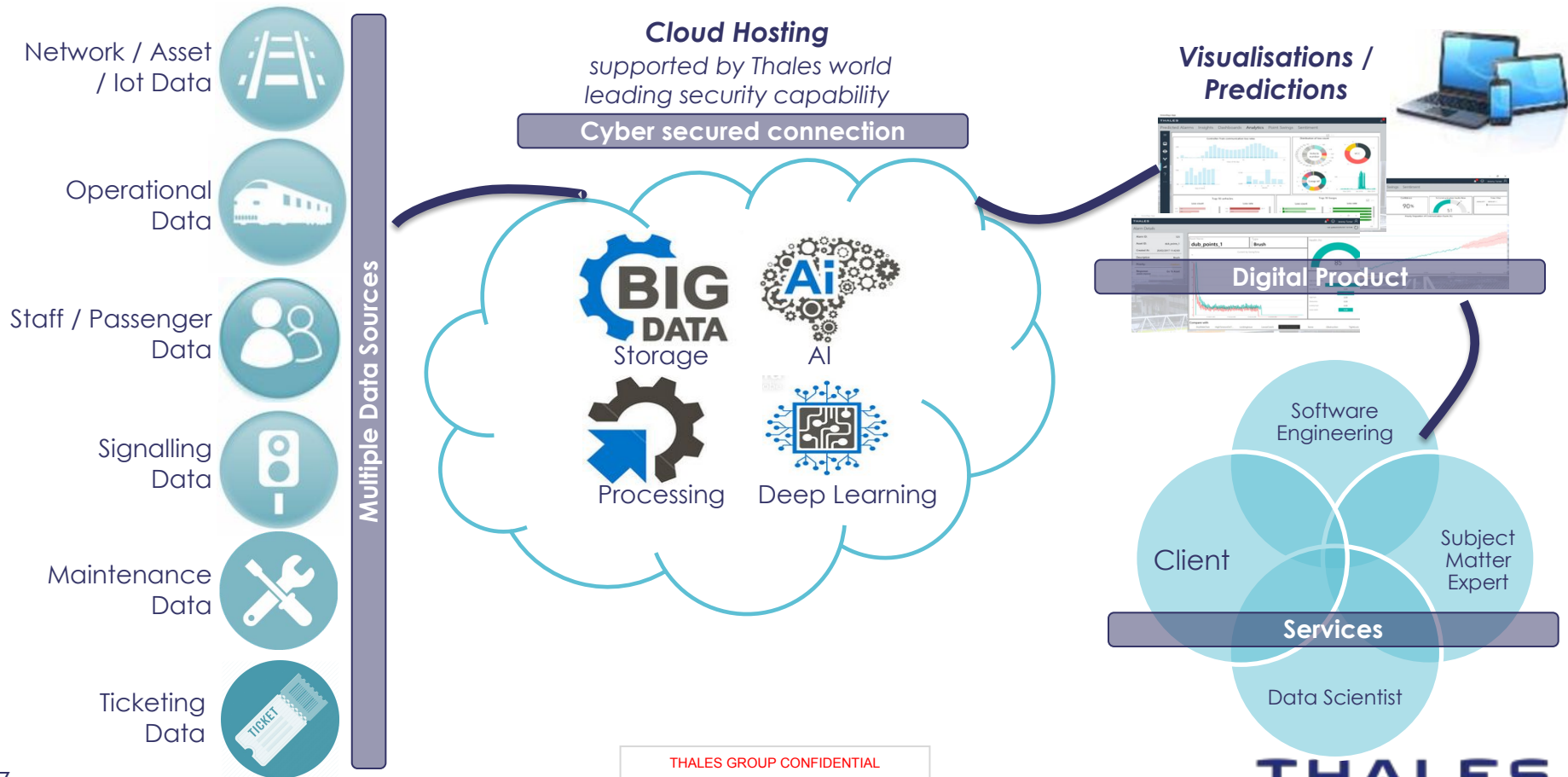
- Machine Learning

Future Prediction

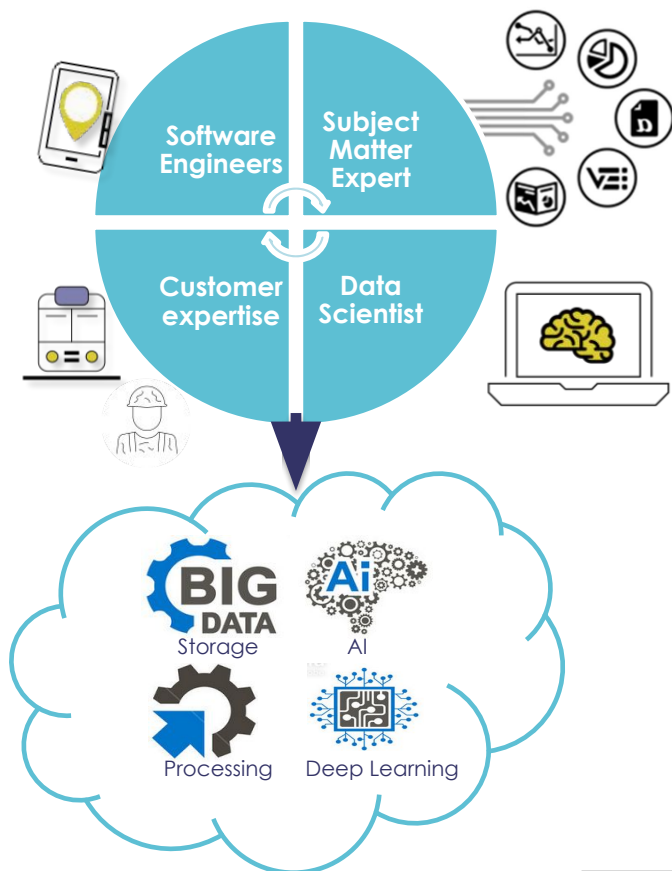
- Time to Failure

Increasing Benefit

Predictive Maintenance– How does it work?



A collaborative approach to development



Collaboration between Thales & customer

- **Data scientists** work with **subject matter experts** to understand asset performance
- **SW engineering** work with **data scientists** to incorporate clever algorithms
- **Subject matter/customers** work with **SW engineers** in agile way
- Customers own all their Data

AGILE Development mentality

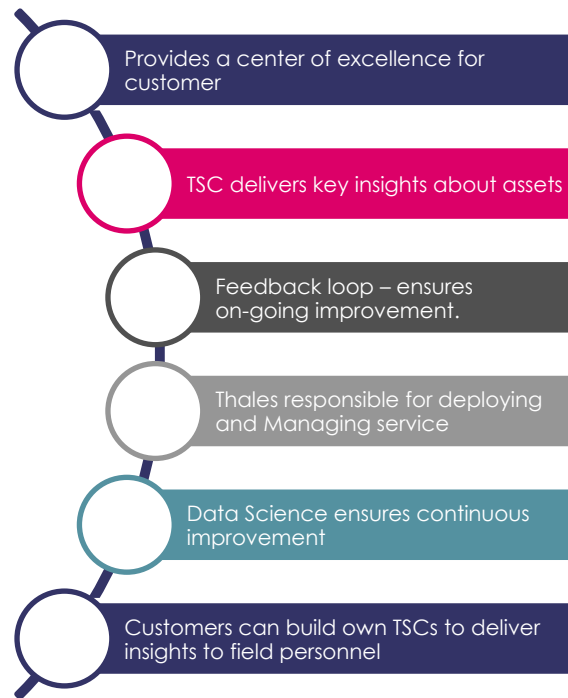
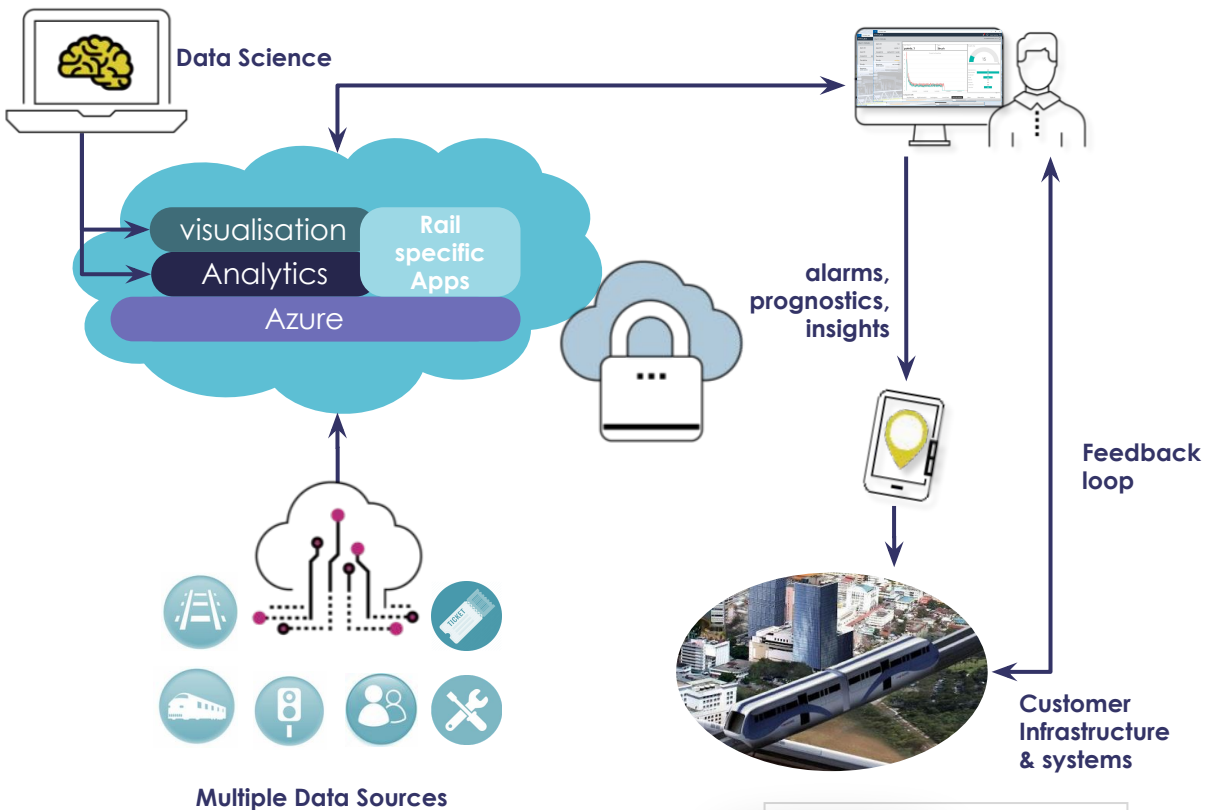
- 2 week sprints with customer feedback
- Continuous improvement, means that all customers benefit from new developments and knowledge.
- Visualisations that meet KPI's of each of customer.

Managed Service

Thales Managed Service

Thales or Customer Service Centre (TSC)

Managed Service - Benefits



Thales Expertise

Domain expertise on railways

- Thales has over 50 years experience in the rail industry, with 17,000km of tracks equipped with ETCS (European Train Control System)

Existing customer relationships / installed base

- Thales built and ran the worlds largest rail asset management system with 43000 assets, measuring performance in real time during the normal operation of the railway.

Thales operates an open platform

- Allows customers and competitors to deliver additional insights on data, combining expertise to create the best solutions.

Testing and commissioning

- Asset visibility provided to field teams, increasing quality and accuracy of testing and commissioning phase

Cyber security expertise

- Recognised global leader in cyber security, implemented as standard across all our solutions.



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Appendices

www.thalesgroup.com

OPEN
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Challenges Eclipse solves

ELIMINATE IN SERVICE FAILURES

- Advance warning to prevent asset failure and service disruption
- Reduction in performance fines
- Creates improvements in capacity through greater asset availability
- Improved customer satisfaction through meeting timetable commitments
- Increasing company's competitiveness

REDUCE COST OF MAINTENANCE REGIME

- Enables customers to move from time based to condition based maintenance
- Reduction in over maintenance of assets
- Reduced maintenance windows allowing for more revenue generating service hours
- Forecast parts and labour requirements more accurately
- Reduce unplanned downtime in the field

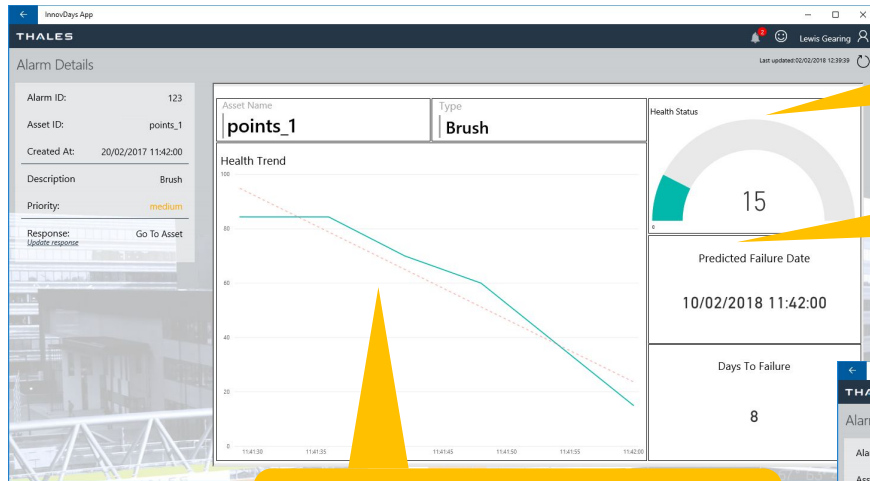
INCREASE WORKFORCE SAFETY & PRODUCTIVITY

- "Right fix, first time" allows increased workforce productivity – bringing correct parts, tools and expertise to site
- Reduces the time maintainers are in harms way on site
- Reduced asset fixing time increases maintainer and infrastructure availability
- Fewer dangerous emergency possessions due to reduced in service failures
- Fewer site visits for regular asset testing with condition based maintenance

Moving to ZERO unplanned maintenance

Eclipse Human Machine Interface (HMI)

Example of a brush failure on a points machine...

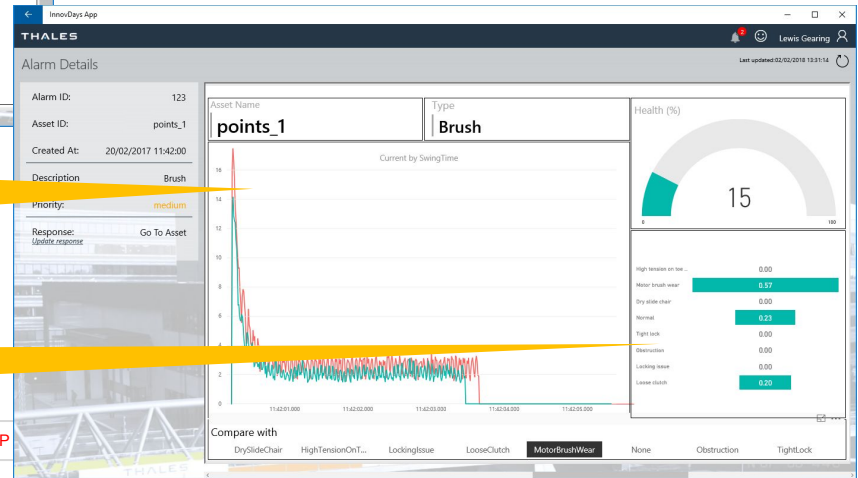


Health Assessment

Failure Prediction

Visualisation

Diagnosis



Example of CBTC non-communicating train...



Failure Prediction

Health Assessment

Visualisation

Diagnosis

