RISSB
RAIL INDUSTRY SAFETY AND STANDARDS BOARD

FAST TRACK

THE NEWSLETTER OF THE HORIZONS PROGRAM I MAY 19

INSIDE THIS ISSUE – THE RAILWAY FOR THE NEXT GENERATION

Technology is advancing at the rate quicker than ever. Whilst it is impossible to predict what the future will look like 20 years from now, the editors have set out a vision of how the railway might look like for the next generation, through the daily stories of 4 young rail professionals in 2040.




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The Future of Stations

Zoe is a student and currently completing her internship at Hyperloop Australia in the town centre. Today is her last day of full-time work before university resumes next week.

Like every other morning Zoe leaves home at 7.30am and scoots to her home station and stores it at the mobility shed. The shed is monitored and entry to the shed is automatic via wireless verification with Zoe's personal device. Electric scooters and electric bicycles charging docks are also available at mobility shed, where power is supplied from the solar cells mounted on the roof of the shed.

A bike storage rack at Caringbah Station (NSW) that will form the basis of the future mobility shed (Source: St George & Sutherland Shire Leader)

A prototype gateless automatic fare collection system developed by ST Engineering, on display at the Singapore International Transport Congress and Exhibition in July 2018 (Source: The Strait Times)

When Zoe walked past the fare collection area onto the platform, fares were automatically deducted from her travel account on her RFID enabled smart wallet, and different cameras mounted at the station confirms Zoe's identity through facial recognition.

By 8.00am the sun was fully out and all photochromic glass panels at the platforms changes from transparent to translucent, providing shading to passengers.

Zoe boarded the 8.02am train and headed towards the town. Approximately 3 minutes into the journey there was an onboard announcement that the train which Zoe is on board needs to come to a stop due to a fault.

The Future of Network Incident Response

An incident has occurred on the network. The train which Zoe is travelling on has developed a fault. The continuous automated condition monitoring system onboard has identified a fault in the traction motor. The motor temperature has reached a critical level and smoke has been detected by sensors near the motor. The train automatically applies its brakes and smoothly comes to a stop, but it is now stranded between stations. Immediately, the fault is logged in the integrated fault management system (IFMS), which is viewable in real-time by all staff on their smart devices, as well as by Debbie in the Incident Control Centre who has been assigned as the person in charge of managing the incident.

The now stranded train performs a complete onboard system condition test and reports to the IFMS that indeed the traction motor has failed and the train is unable to move under its own power but all other systems report as operating normally and no smoke or heat is detected inside the train or around the traction motor. Debbie sees on the real-time train position system that there is another train 400m behind the stranded train. She issues a command to that train to proceed to the stranded train and automatically couple to the stranded train. Using onboard radar and laser distance measurement systems the operational train proceeds towards the stranded train and slowly and smoothly couples to the stranded train. Once coupled, the two trains communicate and act as a single consist. The operational train pushes the faulty train at line speed to the next station. Zoe and her fellow passengers are asked to exit the faulty train and to board the next available train which will arrive at the station in 3 minutes.

Debbie issues an instruction to the operational train to take the faulty train to the nearest maintenance depot. The maintenance staff at the depot are already aware of the faulty train via the IFMS and have retrieved a replacement traction motor and other parts in preparation for the arrival of the faulty train. The automated network control system determines the optimal route through the network which will not delay any other in-service trains. Once at the depot, the fault train is decoupled and repair works commence. The operational train returns automatically to the mainline to resume passenger service.

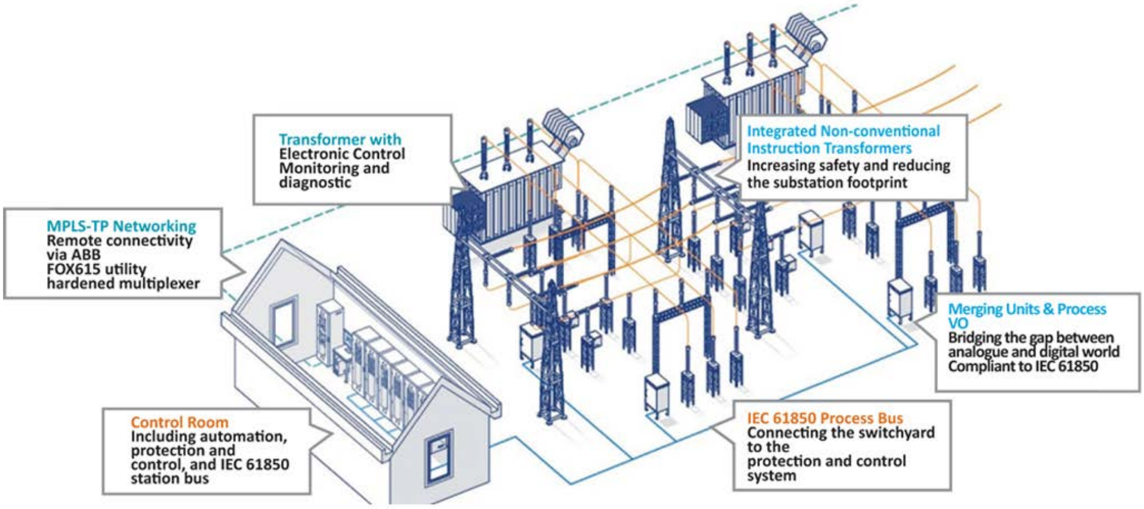
Later that day Debbie attended an IEEE tech talk, where she met Lachlan who told her about his work on condition monitoring at substations.

The Future of Infrastructure Condition Monitoring

Lachlan is an electrical engineer working as a maintenance engineer as part of the systems integrity division of Sim City Metro. Sim City employs condition monitoring throughout its entire infrastructure network.

Lachlan is responsible for ensuring that the reliability, availability and maintainability targets are met for the traction substation to ensure that on time running targets for the network are achieved.

Each morning, Lachlan checks the condition assessment logs of the entire traction substations network. Each substation and sectioning hut has over 3000 data points with sampling rates ranging from the microsecond to every second. Communication between the analysers is through the established IEC 61850 protocol and is sent from the relay to a master data collection point. The measurements are than retrieved and processed through a series of algorithms to determine the appropriate maintenance and prioritize it based on analysed data, probability of failure and the required availability time to achieve on time running targets. This is a predictive form of maintenance instead of preventative and allows greater efficient use of resources with the limited pool available. It means that assets are only maintained and replaced when it needs to be extending the life of the assets whilst minimizing overhauls.



An infrastructure condition monitoring system concept architecture utilizing IEC 61850 protocol (Source: Electrical & Power Review)

A series of measurements on a rectifier transformer has caught the attention of Lachlan. Oil temperature, tank pressure and gas accumulation has all started to rise beyond the normal accepted region. The onboard dissolved gas analyser has also detected increased amount of carbon dioxide in the oil. The system has automatically classified it as a "major" and has adjusted the tap settings on the adjacent subsection to reduce the overall load on that rectifier transformer to prevent further damage. A maintenance job has "dropped" for the maintenance crew to perform a major overhaul on the rectifier transformer. As Lachlan is able to retrieve the historic data on the asset he has noticed that the asset is life expired and had received a major overhaul 6 months prior. As a result he has advised that a degree of polymerisation test (dp) be performed during the major overhaul and if the paper degradation is severe, than the asset be replaced.

At the IEEE event Lachlan and Debbie also met Harry, who has travelled 500 km to attend this event.

The Future of Regional Travel

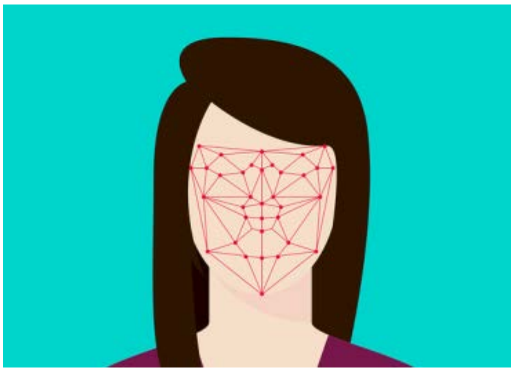
Harry lives in a regional area and doesn't usually have access to public transport, this week however he is required to attend a meeting in a major city.

Harry is staying with friends in an outer suburb, to prepare for his journey the following day he has downloaded an application to his phone. Upon starting the application he linked his credit details and using the phone camera with depth sensor uploads a hashed facial scan. Harry then enters his itinerary for the following day.

As Harry is 20km from the nearest railway station he will be collected by an autonomous shuttle bus service. This shuttle service route and passengers are dynamic and optimised for the most direct travel minimising traffic and delays. 10 minutes prior to Harry's collection a reminder is displayed on the application and he is asked to confirm that he is ready and to confirm his pickup. If Harry wasn't ready the shuttles route would be re-optimised without his pickup for the remaining passengers.

Upon the shuttle's arrival he is immediately identified by his facial profile and the bus doors open automatically. Similarly at the train station the entry gates operate automatically again using facial recognition and displays which platform to walk to. There is also an information board that upon approaching also displays personalised guidance based on his travel details activated only by standing in front of and glancing at the display.

The display on the back of the seat in front reminds him of which stop to deboard and the approximate time remaining until the train reaches that stop. Upon arrival, to assist in navigating through the station to the next platform navigation directions are projected on the floor in front of Harry and continue to track and update throughout the station.



Facial recognition technology is currently in use in many industries for security, healthcare and marketing purposes (Source: Pixabay)

Arriving at his destination Harry is sent a receipt for the journey and a one click option to book the shuttle for the return trip.

Thanks for reading

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