Merseyrail, Liverpool St, York, and Newcastle. Scaleable IECC was cost-effective for the very large or small. It was CENELEC compliant with IP communications. The use of Message-broker and JAVA software was highlighted. The modular architecture can be adaptedfor different types of interlocking with protocol conversions, data mapping, and with non-vital reminders, ARS, TORR, MCB control etc. It is compatible with SSI, Smartlock, and Westlock, together with all types of relay interlocking.

Regarding ARS, Liverpool Street IECC was achieving 97% route setting by ARS. The aim of route setting was to give two consecutive green aspects to the driver. It was now possible to include conflict resolution, alternative routes, timetable management, and deal with terminating, dividing and joining trains. ARS was now compliant with Network Rail standard NR/L3/SIG/10210. Trials at York gave a 50% reduction in delays.

Ian gave examples of current workload associated with the Network Rail National Control Centres Project. The complex re-arrangement of the Great Western mainline control centres following the Reading Area remodelling, culminating in the Didcot ROC, was detailed, as was the progressive development of the Edinburgh ROC from the original PSB,recently adding on the Cowlairs (Glasgow Queen Street) area. The Ely-Norwich Modular Signalling Project included a workstation in Cambridge PSB. In the latter, the ARS manages the strike-ins for the numerous MCB- OD crossings. A vintage Mechanical Signal Box at Harrogate now has a workstation covering the sections formerly controlled by Horsforth and Rigton SBs.

Moving to the future, Ian pointed out that IECC was 25 years old. The upper limit of workstation capacity was considered to be 400-500 SEUs.

The industry now had more IT-literate users and a flexible workstation is being considered, with a flexible allocation of areas of control – there is no software limit to the area of control. Developments include Train Graphs, Platform Docking, Possession Management, ERTMS TSR updates, and links with other supplier's equipment. The industry should be working towards the "joined-up" railway with Network Rail/ TOCS integrated control.

Customers, with Twitter and smart phones could now be included in the dissemination of real time train information. Customers should be Connected and Informed by systems that are Reliable, Available, Affordable and Adaptive. Analysis of threats and opportunities is key to progress.

The discussion which followed included questions by Richard Parker, Quentin Macdonald, Ian Moore, Alan Beevors, and Brent Conlan. The vote of thanks to the speaker was given by Grace Nodes, and the members and guests responded in the customary way.

IRSE SWISS SECTION

SWISS SECTION

Report by George Raymond

ETCS ROLLOUT

Siemens' Rollout of ETCS L1 Limited Supervision on SBB

Siemens opened the doors of their Wallisellen site on 22 November to show the IRSE Swiss Section the rollout of ETCS Level 1 Limited Supervision on Swiss Federal Railways (SBB). Thomas Habermacher and Thomas Oberholzer explained how innovations in products but also in the industrial processes underlying the five-year rollout, are drastically cutting conversion costs.

ETCS: Full and Limited Supervision

In Switzerland, implementation of ETCS, with its interoperable air gap between balise and vehicle, is fulfilling two main objectives:

- Allow vehicles with ETCS Baseline 3 equipment to access the entire Swiss standard-gauge network;
- Help fulfil a 2006 agreement to equip the Rotterdam-Genoa Corridor with ETCS by 2015.

Switzerland is implementing two ETCS variants, Full and Limited Supervision:

Full Supervision	Limited Supervision
Implemented as ETCS Level 2 in Switzerland; can also be implemented as Level 1	Variant of ETCS Level 1 being implemented in Switzerland
Continuous supervision	Supervision only where needed
Full data on line profile	Simplified data on line profile
Cab signalling	Lineside signalling
Look-ahead functions	No look-ahead functions
Always SIL4	Ranges from SIL1 to SIL4
Standard ETCS vehicle components	Standard ETCS vehicle components

Limited Supervision was not originally part of ETCS, but was proposed by Switzerland and then integrated within the European standard. Easier, faster and cheaper to install than Full Supervision, Limited Supervision (LS) requires no changes to interlockings or driving rules and in Switzerland maintains the same safety level as the legacy solutions it replaces without a SIL4 implementation. Switzerland plans to use LS as a flexible stepping stone in a later migration to ETCS Level 2.

In Switzerland, ETCS L1 LS is replacing two legacy systems – the Signum magnet and ZUB:

	Signum magnet	ZUB
Application	All line signals	All high-risk line signals on SBB (and all signals on the smaller BLS and SOB networks).
Function	Communicates either stop, warning or proceed to the train in line with the adjacent signal's aspect.	Supervises a train's speed after it passes a distant signal to ensure that the train slows properly or stops at the next signal. An inductive loop extending some 200-300 metres upstream of the signal prevents unauthorised departures and improves performance by informing the train immediately of a less-restrictive aspect.
Component replacement during ETCS L1 LS rollout	Two balises replace the Signum magnet.	Two balises and EuroLoop, a leaky-feeder cable, which replaces the ZUB inductive loop.

ETCS Lineside Equipment Unit

Siemens developed and is producing the products for ETCS L1 LS at SBB mostly in Switzerland. A central component is the Lineside Equipment Unit (LEU). Siemens – and Thales, electronic interlockings it has supplied – are deploying ETCS in Switzerland in three variants:

	ETCS L1 LS		ETCS Level 2
With speed supervision?	**No**	**Yes**	**Yes**
Deployment	Replacement of existing Signum magnet at signals without ZUB	Replacement of existing Signum magnet and ZUB	Signalling system for the new Alpine tunnels on the Corridor lines
LEU solution	Siemens MiniLEU linked to signal	LEU linked to signal	(None: RBC transmits data via GSM-R to the train)
ETCS track equipment	Balises	Balises and EuroLoop	Balises

In ETCS L1 LS without speed supervision, to detect the Signum aspect at the signal without modifying the signalling system, Siemens' solution for Switzerland is the MiniLEU S11, which:

- is a low-cost solution for simple Signum magnet replacement;
- awakens to read the Signum relay contacts only when the balise detects an approaching ETCS vehicle antenna, thus minimising power needs;
- has solar panels on three sides and rechargeable batteries;
- can operate the entire year in shadow and up to three months in darkness, for example in snow;
- requires external power only in tunnels;
- reports faults – including low batteries – to vehicles for forwarding to the infrastructure operator.

Installation

A crew of two mount each balise on a non-metallic bar. This allows them to just loosen two rail fixation bolts instead of boring holes in the sleeper. The higher position may worsen the balise's exposure to ice blocks and hanging coupler hooks, but 3000 installations in Switzerland have yielded no problem reports.

At signals without ZUB, the crew affix the MiniLEU to the ground or a mast, wall or foundation, wire the components together and check that the balise correctly transmits the stop aspect. Installation takes two hours at most.

At signals also equipped with ZUB speed monitoring, Siemens installs its LEU S21, which unlike the MiniLEU can power the company's EuroLoop S21, a leaky feeder cable that, like the ZUB loop it replaces, typically runs 200-300 meters upstream from the signal.

An Industrial Rollout

Siemens has pledged to install ETCS L1 LS at ten SBB signals per day over five years without affecting operations. Some 15-20 Siemens installers are working on the rollout, which aims to convert 436 interlockings and 9300 signals, of which about 1500 are already done. (Thales is converting another 1700 signals linked to its own electronic interlockings.)

SBB had projected that under the traditional approach of engineering each signal individually, the full cost of the ETCS L1 LS rollout – for SBB and its suppliers – would have been CHF100 000 (€82 000) per signal. SBB's strategy was therefore to encourage supplier innovations to industrialise the rollout with the goal of cutting costs by 75%. With its budget of CHF300million (€245 million), the rollout project will nearly meet this goal.

Whereas SBB once would have done 80% of such work, and the supply industry 20%, this is now reversed. (The smaller BLS still do more work themselves.) SBB has had to learn to accept the presence of Siemens crews on their tracks. Siemens has taken over the whole installation task, including acceptance.

From January 2008 to November 2010, SBB organised a prototyping and development phase in which suppliers tested all processes and components, including the MiniLEU. This minimised risks for everyone. Siemens and Thales each converted two interlocking to ETCS L1 LS.

The tendering process began in November 2009. In September 2011, Siemens won the job of converting all SBB relay interlockings to ETCSL1 LS. Siemens and Thales will each convert their own electronic interlockings. SBB's initial ETCS rollout will be complete in December 2017. ETCS Level 2 will equip the new Alpine tunnels on the Corridor routes and L1 LS the rest of the SBB network.

To increase capacity, SBB will then migrate from L1 LS to Level 2 until 2060.

For Siemens, performing the rollout on a tight timescale and budget has required innovation not only in products, but also in the industrial rollout process, in the following areas:

Rollout process automation: The basis for data exchange between suppliers and SBB in all phases – including engineering, verification and service launch – is a formal workflow and automatic, electronic interfaces that minimise manual steps.

Fixed-duration work cycle: For each interlocking, no matter what its size, conversion is engineered, planned and conducted over 18 months in the same seven project steps.

Focus on logistics: To ensure that the change-over requires only one work session, all materials for a given signal arrive in a crate with everything the installers need. A number of such crates move together in a container, along with rolls of cable and a crate for documents.

Focus on quality: The requirement is to "get it right the first time" in a single work session at each signal, with no coming back.

Small set of standard solutions: In engineering the ETCS L1 LS rollout, Siemens was faced with five interlocking types, seven interface types, two signal-aspect generations and an endless variety of signal masts. To deal with this complexity, Siemens developed a small set of standard, modular solutions for the rollout, so SBB does not have to approve Siemens' solution for each site. This also cuts maintenance costs in the long term.

President's comments

In thanking Siemens Switzerland for hosting the event, IRSE Swiss Section President Markus Montigel observed that innovation in rollout processes, and not just in technology, makes for lower costs. He said that "*a wind of industrialisation is blowing through the railway*", moving it away from "*hand-knitting*". He also noted that among the event's 35 attendees, a record four were women.

Upcoming Swiss Section events include a May 2014 CENELEC seminar and a September 2014 visit to the new Gotthard tunnel.