



Ansaldo STS

A Hitachi Group Company



Intelligent Mobility

Andrew Barr
CEO and General Manager, Ansaldo STS

Ansaldo STS is a global rail technology company

International technology leader in railway signaling and integrated transport systems for mass transit, and passenger and freight rail operations.



High Speed Lines



Main and Suburban Lines



Freight Lines



Conventional Metros



Driverless Metros



Tramways and Light Rails

Ansaldo STS' international footprint

Americas:

Pittsburgh, Batesburg,
Honolulu, Kansas City, Los
Angeles, Rockville, Toronto,
Kingston, Lima, Fortaleza

Europe, North Africa & Middle East:

Genoa, Naples, Turin, Potenza, Paris,
Riom, Copenhagen, London, Madrid,
Munich, Stockholm, Thessaloniki, Ankara,
Tunis, Oran, Rabat, Abu Dhabi, Riyadh

Beijing, Taipei, New Delhi, Kolkata,
Bangalore, Kuala Lumpur, Gaborone,
Karratha, Perth, Brisbane, Newcastle

Key Data

Employees	3,933
Revenue (@ Dec 2015)	€ 1,383.8 M

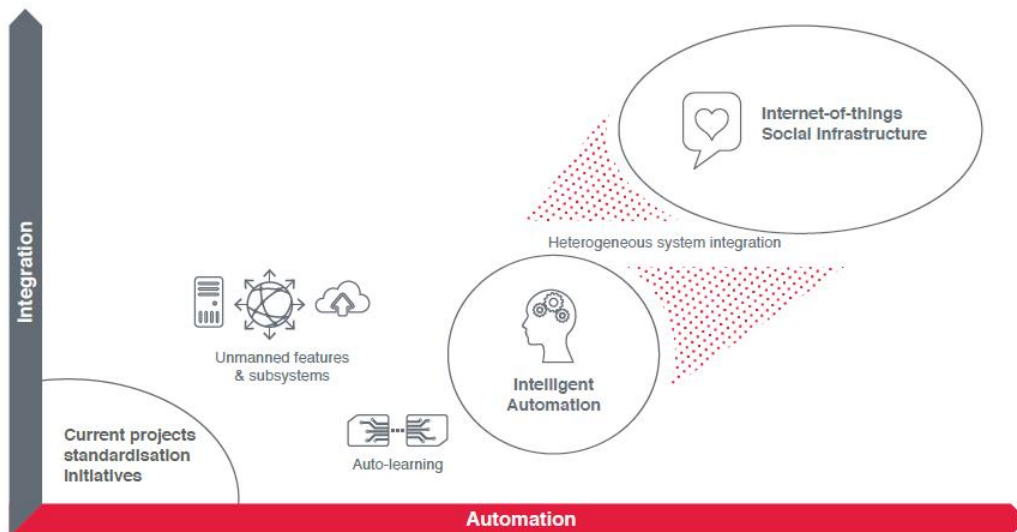
“As the rail market continues to grow, so does the potential for new technology enabled applications within the infrastructure”

Source: Frost & Sullivan



Global industry trends in transportation automation

Key driver in Ansaldo STS' innovation road map



Innovations in Rail Automation

Satellite localization and multi-bearer telecommunications for train control systems



Satellite Localization System features:

- ERTMS / ETCS compatibility
- Local positioning satellite systems - GPS, Glonass, Galileo
- SIL-4 compliant
- Augmentation network for increased accuracy

Multi-Bearer Telecom capability, including:

- TETRA
- Cellular, 2G/3G/4G
- Satellite
- Intelligent routing

Benefits:

- **Reduces capital expenditure**
 - Minimises need for wayside equipment
→ reduces cost of infrastructure in remote areas or areas of low traffic density
- **Lowers operational expenditure**
 - Uses existing telecommunications networks
 - Less maintenance costs (equipment and crew) as a result
- **SIL 4**
 - Safety level in low traffic/remote areas not compromised

Freight: under deployment in Australia

Roy Hill Iron Ore

- 350km Heavy Haul freight line in remote area
- Commissioning scheduled in 2017



Passenger: field testing underway in Europe

Sardinia 3InSat pilot

- 50km regional low-density passenger line
- Phase 1: Satellite only - 700km with Satcom
- Phase 2: ERTMS + LDS - 3,000km with TETRA, 1,200km with 2G/3G, 300km with Satcom



Innovations in Rail Automation

Moving block, automation and driverless for passenger applications

Integration

Automation

Automatic Train Operation (ATO) for Mass Transit applications

Driverless and unattended metros with track-circuit based and/or CBTC signalling for complete Train Protection (automatic braking) and Train Control functionalities (start/stop, dwell, recovery, banking, etc.)

Benefits:

- **Lower operational expenditure**
 - drivers and on board personnel not required
 - system runs at optimum specification (reduction of energy consumption, components wearing, spare parts, maintenance, etc)
 - Metro operators can vary service with no staffing impact

- **Improved performance**

- High level of performance, availability and reliability
- Train turnover time at terminals can be extremely short

- **Safety optimised**

- obstacle detection systems remove risk of human error

In Service Driverless Metro

Denmark	Copenhagen City Ring M3 Copenhagen M1/M2
Italy	Brescia Milan Line 4 Milan Line 5 Rome Line C
Greece	Thessaloniki
Peru	Lima Line 2
Saudi Arabia	Riyadh Line 3 Riyadh University PNU
Taiwan	Taipei Circular Line
UK	Glasgow Metro
USA	Honolulu

Innovations in Rail Automation

Moving block, automation and driverless for freight applications

Automated Train Management

Ansaldo STS' automated train management technology is enabling the development of the world's first fully-autonomous heavy haul, long distance railway system.

Three Levels of Automation:

- Driver Advice Mode (with Driver)
- Cruise Control Mode (with Driver)
- Driverless ATO Mode

Automatic Train Operation / Automatic Train Protection for operational efficiency expansion

Ansaldo STS has deployed extensive signalling, train control and communications system upgrades to support iron ore mining capacity enhancement projects in a typical heavy haul environment (230 wagons and 2.3km long trains) in the Pilbara region of Western Australia.

More than 250 locos have been fitted with ATP and ATO.



Innovations in Rail Automation

Innovations in Freight and Passenger Rail automation

Integration

Automation

Ansaldo STS has the ability to provide services far beyond the traditional Train Management System (TMS) train dispatching capabilities.

Key Capabilities:

- Advanced database architecture that has the capability to capture years of train characteristic data
- Advanced data analytics
- Advanced predictive modeling

Key Outcomes:

- Helping increase rail performance through the provision of significantly improved and consistent train ETAs
- Increased network productivity
- Enhanced customer reporting and confidence
- Reduced delays throughout network



Innovations in Rail Automation

Mobile safety management systems for Hi-Rail and trackside

Integration

Automation

Integrated Electronic Train Order for Hi-Rail

The safety of Hi-Rail vehicles is assured as they are fully equipped with a Driver Machine Interface (DMI) which allows them to receive route settings directly from the train controller in the form of a Movement Authority.

Handheld Possession Management System

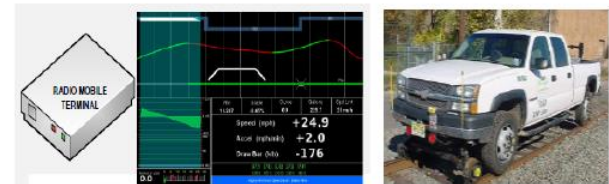
The safety of trackside crews can now be assured after they leave the Hi-Rail vehicle. This is achieved through the Handheld Possession Management tablet which they carry with them outside the vehicle.

Crews can request a possession directly via the tablet. The request is received by the VSS, and once approved by the train controller, possession is granted.

IETO & HPMS: under deployment in Australia

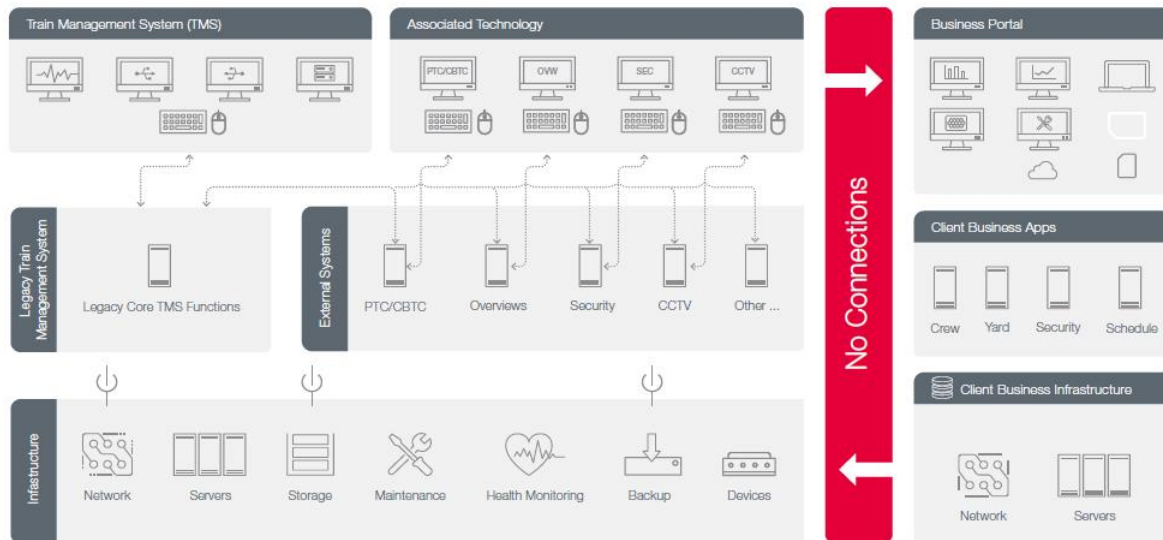
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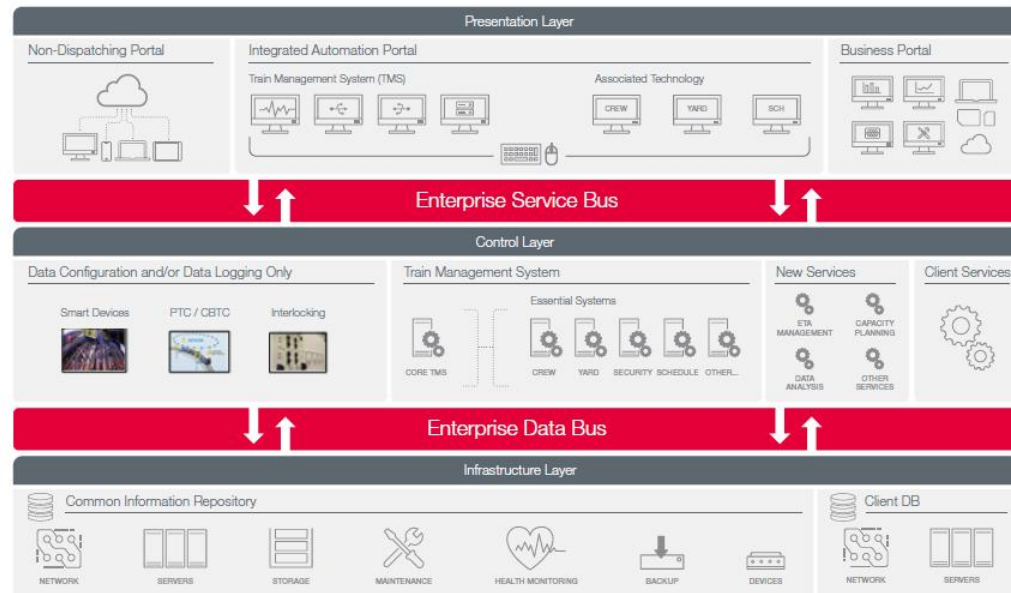
Integration roadmap

Evolution from traditional system architectures ...



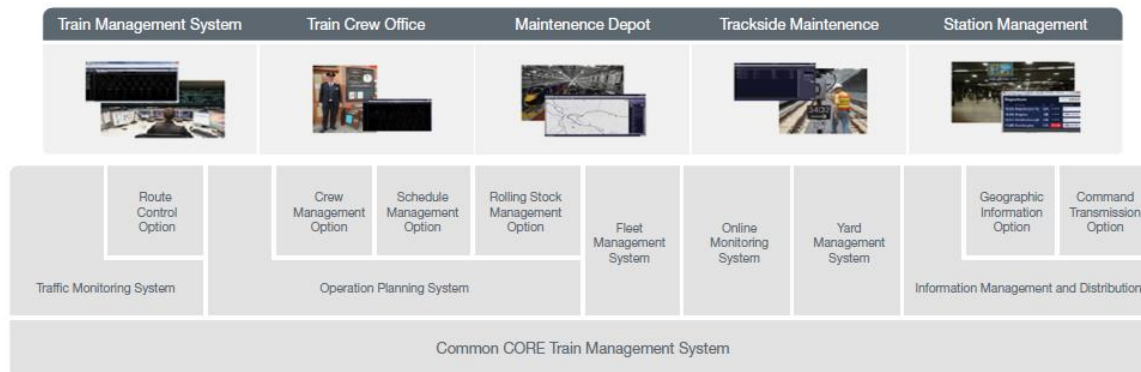
Integration roadmap

.... to new integration approach



Integration roadmap

Effective data sharing is the enabler for integrated planning.



From Autonomous Trains to Unmanned Systems Operations Centres



What we think we become - *Buddha*





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Thank you