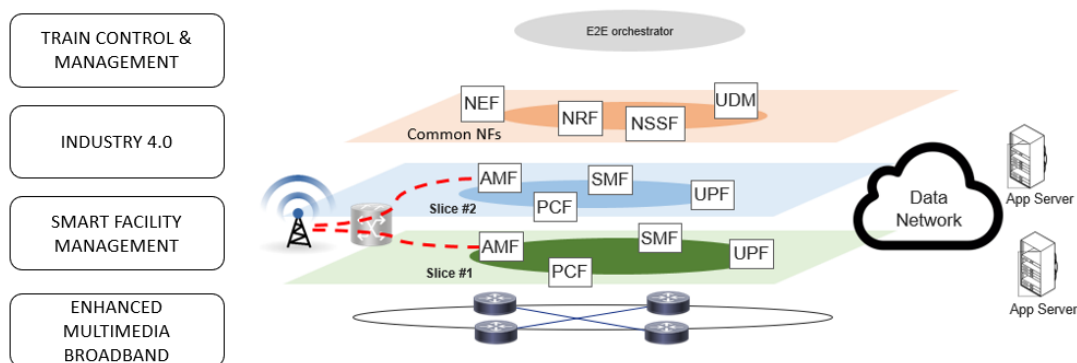


RELIANCE Use Cases

RELIANCE

RELIANCE is aiming to extend the 5G network architecture with new functionalities needed for multi-service and multi-domain management, with the related abstractions, interfaces, and mechanisms to support needed resilience, security, and scalability.

The architectural work of RELIANCE is driven by the diverse needs and requirements stemming from vertical industries (Industry 4.0, Smart Cities, Enhanced multimedia broadband & Transportation -train control & management-). The RELIANCE framework will be implemented and validated on selected use-cases through proof-of-concepts, aiming at demonstrating the envisioned benefits of the RELIANCE framework.



RELIANCE network slicing over multiple domains

RELIANCE Use Cases

- **RELIANCE progress on Train Control & Management**

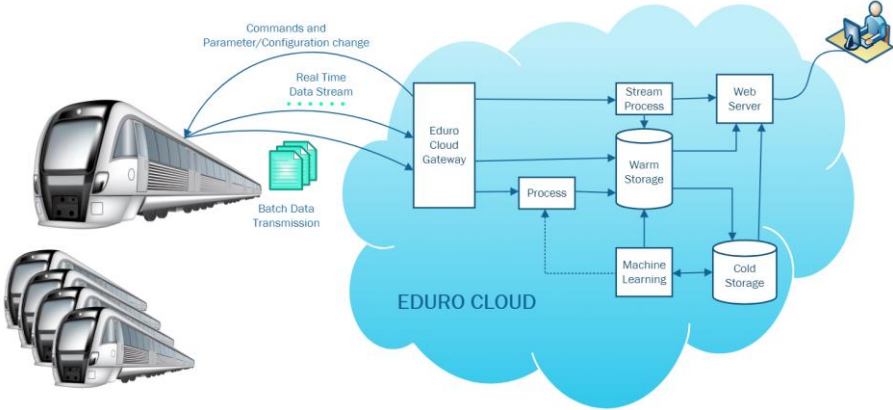
The BOMBARDIER MITRAC Train Control and Management System (TCMS) is a modular, scalable and open-standard control and communication platform in use in a large number of different products systems on all types of trains and applications all over the world (for example, High Speed Trains, Locomotives, Intercity Trains, and Metros). MITRAC TCMS takes care of the control of many of the functionalities in the vehicle like propulsion and brakes. It also handles the driver user interface and manages and controls the data flow on board between the different subsystems like converters, doors, HVAC etc. as well as between the train and wayside. The communication system on-board is built on an IP communication backbone, compliant with IEC 61375 “Train Communication Network” standard, allowing seamless on-board communication and wireless communication between train (on-board) and wayside (off-board).

It is essential for Bombardier to boost the investment in the emerging technologies like 5G technology, Cloud computing, SDN, and new Big Data methods, to exploit the value of the vast amount of data generated on the trains (GB/h). To fully deploy all possibilities also tight requirements in terms of latency, resilience, coverage, and bandwidth must be satisfied for the On board and Off board train communication infrastructure – in all different environments from crowded cities and tunnels to rural areas.

The RELIANCE framework will represent a breakthrough in supporting these challenges by establishing end-to-end network slicing tailored to the data exchange requirements in train control management. By this it is possible to collect and analyze data in an intelligent way which will also open for a lot of new services to Bombardier customers as further defined below. Hand in hand with improved mobile connectivity there is also a need to explore future possibilities of internal train data communication architectures providing a scalable and efficient internal network on-board supporting and securing the exchange of data. The MITRAC platform is one of testbeds of RELIANCE project.

Architecture for collecting train data over 4G/5G and performing data analysis in cloud

- Supporting data streaming and Machine Learning
- Train on-board communication and train-wayside communication

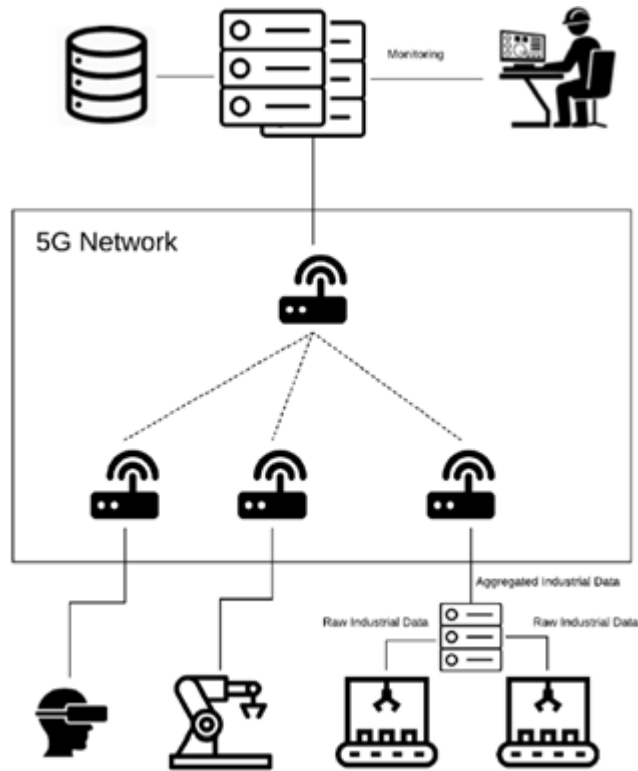


Train to/from wayside (ground) data communication

• **RELIANCE progress on Industry 4.0**

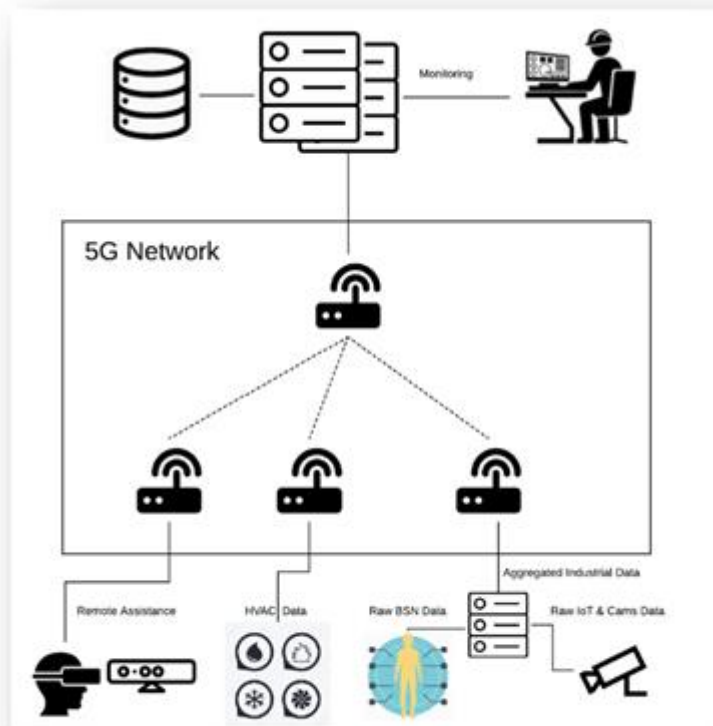
Current infrastructures are not able to provide the requirements in terms of communication (reliability, security and low latency, and QoS across different domains, with different SLAs) for specific tasks in Industrial Sensing Control & Maintenance and Collaborative Robotics.

RELIANCE project will provide enhanced services for Sensing Control & Maintenance and Collaborative Robotics. Specific R&D activities related to human-robot interaction, intuitive human-machine interfaces, and interaction between different robots and machines will be performed, exploring the opportunities and constraints to deploy new connected solutions in very different domains (IoT, Smart Cities, Industry 4.0...) in an integrated environment with pre-existing machines and workflows.



- **RELIANCE progress on Smart Faculty Management**

With buildings responsible for about half of all energy consumption and greenhouse gas emissions forward-looking companies and public entities are demanding new smart services. CONCATTEL's R&D activities for solutions for energy efficiency have resulted in different tools (as MeasureONE) that obtains data from the building to improve energy management and resources.



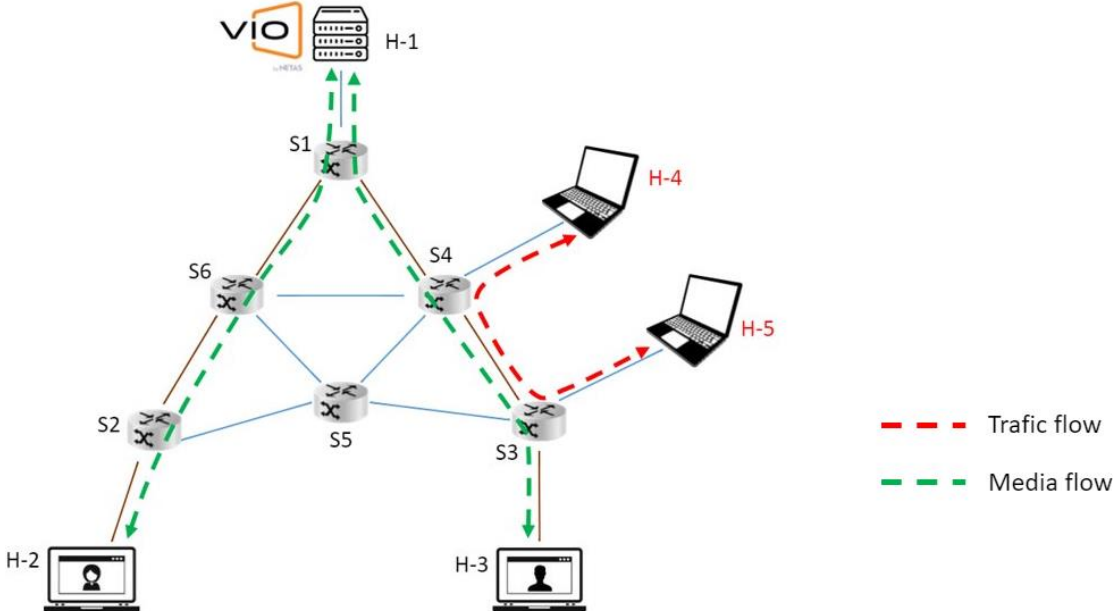
The CONCATTEL MeasureONE as mentioned previously is useful for monitoring energy consumption in a building and generate orders for remote maintenance. However, its application to a wider scope aligned with our “360 Solutions for Urban Transformation” portfolio cannot be achieved with the current infrastructures. The main drawback is the requirements in terms of security, low latency, bandwidth and scalability in a multi-domain context.

- **RELIANCE progress on Multiparty Video Communication**

RELIANCE partners conduct beyond the state-of-the art work on multimedia broadband use case, especially on multiparty video communication. In this manner, project partners target to propose novel methodologies to address sudden video quality fluctuations arise from instant congestions on the network. SDN methodology introduces great opportunities to solve the problem. As shown in the following figure, specific video streams can dynamically be directed to optimum routes whenever there is a congestion between video conference server and client. The proposed solution ensures guaranteed QoS values for video conference users even in case of variation on available bandwidth to increase QoE. In this scope, partners will focus on certain key performance indicators (KPIs);

- Satisfying service level requirements (such as bandwidth, latency, and coverage) of internal and external services
- Ease of deployment of in-house and third-party multimedia services
 - APIs developed for service configuration
 - APIs developed for charging third-parties based on provided service quality

As initial results, partners have designed high performance and content sensitive algorithm and developed traffic regulation manager to process the values, such as bit rate, resolution and delay in the communication between the spouses connected to the video conference service. Partners have also worked on meet service level requirements (bandwidth and latency) of digital services and designed the probes that track end-to-end performance data to provide the highest user experience.



RELIANCE

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RELIANCE is a EUREKA CELTIC-NEXT project and involves 10 organizations, from 3 different countries.

Partners

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Eduro AB	SE
Keyland Sistemas de Gestion S.L.	ES
NETAS Telecommunications A.S.	TR
RISE Research Institutes of Sweden AB	SE
Saint Patrich Technology S. L.	ES
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