CASE STUDY

Smart IoT-Connected Rail Passenger Infotainment Solution by SADEL

Intel® Atom™ Processor E3825

Internet of Things

"We chose a single board computer powered by Intel® Atom™ processors because of their strong performance and industry reputation. We put our trust in Intel® technology as it is reliable."

Giuseppe Chili, Marketing Manager, SADEL

Founded in 1991, SADEL is an Italian leader in the railway industry, providing communication systems for all types of rolling stocks. It offers train manufacturers, train operators, and their staff integrated on-board solutions to facilitate effective remote operations management and smart passenger infotainment services. SADEL, together with AAEON and Intel, has designed and built an integrated infotainment system, including audio, video, and entertainment devices, that is continuously connected to the control room and connects trains to the Internet of Things (IoT). The system has already been adopted on high-speed and commuter trains in Italy.

Challenges

• **Difficult environment.** Communications equipment on trains must function properly in harsh conditions, such as environment temperatures ranging from -25°C to +85°C, according to the EU standard EN50155.

• **Railway regulations.** All products in a train must adhere to strict standards, relating to working vibration, power consumption, and lifetime.

• **Lengthy process.** Time to market in the railway industry can take years from concept to mass production, so product design requires a solid long term vision.

Solutions

• **Durable processing power.** SADEL chose Intel® Atom™ processors to power its solution because of their low energy consumption, impressive throughput, and because they can withstand extreme industrial temperatures.

• **Reliable technology.** The Intel® Atom™ SoC is soldered directly onto the printed circuit on the base of AAEON's computer board*, which eases implementation of a fanless heat sink and can boost reliability.

Impact

• **Passenger experience.** Modern integrated systems can make traveling a more pleasant experience by offering better passenger safety and relaxation thanks to a connection with the rest of the world.

• **Performance, cost, and energy.** The solution offers a powerful, energy-efficient system that delivers high-definition content while keeping support costs down and minimizing total cost of ownership.

• **True connectivity.** Thanks to hardware from Intel and AAEON, SADEL can help train manufacturers and operators to run IoT connected trains with geo-localized audio and video information, entertainment, travel information, and other news.

Italian railway speeds towards a smarter, more connected future with Intel® Atom™ processors

"We really like working with Intel and have a good, long-standing relationship. Intel provides us with everything we need to realize a solution for our customers. The brand is so well known, it makes it even easier to sell."

Gianclaudio Lolli, Sales Manager, AAEON

Building smarter railways

Our world is becoming ever more connected, and this doesn't stop when you travel. Around 40 percent of the world's population is Internet connected[1], and people expect to be able to connect from anywhere, on whatever device they have to hand. To keep up, train operators are deploying more and more consumer technologies in their carriages so that each passenger, whether traveling for business or pleasure, feels no interruption to their day and is comfortable to browse the Internet and be easily connected to vital information or entertainment to pass the time.

"We aim to help train operators deliver connectivity from when passengers first step into a coach," said Giuseppe Chili, marketing manager at SADEL. "With a smart Passenger Information System (PIS), travelers can enjoy live updates, be it weather or news, and a range of online games or films via WiFi or wired Ethernet. Being able to offer commuter passengers uninterrupted connectivity so they can continue to work on emails or remotely access business content online is a particular advantage. Especially with the rise in smart cities, it is crucial for transport to be part of this ongoing flow of data."

The benefits of creating IoT-connected trains are various, but there are challenges too: This industry has a lot of government rules to maintain security and quality, and deploying complex technologies into every coach of a fleet takes time. Technology providers can work hard for three years only to have to wait for another two while coaches become available. SADEL works closely with each railway company to ensure all regulations are met, certificates approved, and tests passed.

There are also lots of different providers vying for a part in railway communications systems, which makes many deployments very complex. "Too many parties use one device for one function, when rail companies need an end-to-end fully integrated system that is easy to install, like our PIS," said Chili.

Passenger satisfaction is paramount

Now, more than ever, operators and passengers alike expect train punctuality, comfort, and up-to-date journey information to be delivered as standard. Train operators are making an effort to increase passenger satisfaction by providing useful travel information - from estimated arrival time to next stop and connections announcements - generic information, and entertainment.

ODM supplier, AAEON, and SADEL have worked together for many years, and are now delivering smart travel solutions designed to help train companies really focus on their customers. "More and more people are traveling, but unfortunately it is not always such a pleasant experience," said Chili. "Fortunately, a modern PIS helps make traveling a better, more connected experience, with passengers' comfort, safety, and interest in mind." A smart PIS makes train travel easier and safer, especially for elderly, less mobile, or disabled people, by alerting passengers to prepare at their leisure to disembark or transfer to a connecting train. Automatic audio announcements and real-time information on LCD screens also allow train staff to truly focus on traveler needs and ticket control.

SADEL's end-to-end smart PIS - coordinated by its communications unit OB/Director* - is already working well for passengers in Italy, as Trenitalia's Frecciarossa high speed train fleet now has eight screens per coach, delivering a new, connected travel experience. It is ideal for train operators, like Trenitalia, SNCF, and Deutsche Bahn, that could benefit from carriages being always connected with operation control rooms as well as passengers.

Every train's faithful companion

A good PIS controls all devices and the flow of data for a better run railway. SADEL's PIS is driven by OB/Director, which runs on a modified Linux kernal and is based upon AAEONS's latest generation Single Board Computer* (SBC). This is specifically designed for in-vehicle solutions, and powered by Intel Atom processors E3825 and Intel Atom SoC. AAEON's SBC offers soldered components for sturdiness against shocks or vibrations, wide operable voltages, and compactness for easy installation. The high performance delivered by Intel® technology is important as it enables more PIS display screens to be powered by fewer devices, thereby reducing costs.

OB/Director allows real-time communication with the ground via wireless technologies, including GSM and LTE. Thanks to its GPS receiver, it continuously checks train position against the journey schedule, thus providing passengers and on-board staff with detailed, relevant travel information. It also enables remote maintenance, including wireless software upgrades and full PIS diagnostics.

It allows on-board staff to stay connected to passengers at all times. For example, a train's conductor can spread messages through the audio subsystem, monitor the video surveillance system to see exactly where and perhaps why an emergency lever was pulled, or send commands from his or her smartphone through the train's wireless network. Automatic audio and video announcements notify people on-board about any delays on the track, availability of the buffet car, or delayed arrival. This information can also be delivered to passengers' personal devices through a train line's dedicated app or web service.

IoT-connected On-Board Director

True connectivity via an IoT gateway and a full IP network enables better and more efficient maintenance of network appliances, such as train switches, WiFi access points, and end devices like LCD displays, audio control units, IP cameras, and emergency intercoms. "Together with ground operation room software, OB/Director constitutes a formidable tool to manage and control a whole fleet of trains at a country level," commented Chili. "It constantly collects data - people flow, temperature, and humidity - useful for planning, evaluating, and discovering valuable correlations thanks to data mining. It is a game changer in the railway market because it enables fully automated deployment of real-time updates, complete train management, and full passenger support."

"We are very proud of this solution because OB/Director has been installed on the entire Italian railway High Speed fleet and, as far as we are aware, there's currently no other solution like this on the market."

All this configures a real IoT environment, where the gateway can validate device interactions with the network and cloud provider to support an almost limitless range of new applications, from seat allocation and coach entertainment, to ticketing and real time monitoring of on board facilities.

Ready for a rough ride

Intel technology is durable enough to withstand chip junction temperatures from -40°C to +110°C, which makes OB/Director, like all other components of SADEL's PIS, fully compliant with international railway standards. All the application and system software is constantly updated on the go, so every train carries the latest software as soon as it is turned on. Full monitoring and some hardware diagnostics are also done remotely in real time.

"Reliability is paramount in railway applications. There are quite a few SBCs on the market, but it was challenging to find hardware that was certified for railway applications," said Chili. "AAEON's SBC, powered by Intel Atom E3825 processors, is compliant as well as durable and reliable. It solves a number of railway challenges. That is why it got a very warm reception from the market. Also, since the Intel Atom SoC is soldered directly onto the SBC, reliability is improved with no loss of performance, which means we have the flexibility to build more capability into the product and allow innovative use cases in the future without having to replace the hardware."

"Longevity is critical in this industry, and Intel is able to provide a life cycle we're happy with," said Gianclaudio Lolli, sales manager at AAEON. "These solutions are not cheap because they have to be so specifically tailored and need to be able to last. Intel technology is good for that. An additional benefit is that it scales well, so we could easily upscale processing power if a client wanted. Many of our customers are interested in using IoT technology to offer new or improved services."

There is huge potential to deploy IoT systems in the rail industry, to support both companies and passengers. For example, while over 3000 of the Trenitalia fleet are equipped with OB/Director, there are around 20,000 trains operating in Europe, so there is a fantastic opportunity to build more IoT-connected trains, with the help of SADEL, AAEON, and Intel.

Lessons Learned

Creating IoT-connected trains is part of SADEL's goal to increase the attractiveness of rail compared to other means of transportation. The future of the railway market is to make traveling by train as easy as by bus, as smooth as by car, as fast (door-to-door) as by plane, and as connected as on foot. The IoT plays a key role in this, and OB/Director is its faithful companion, effectively and securely linking all that happens inside a train coach with the world outside.

Find the solution that's right for your organization. View **success stories from your peers** and check out the **IT Center**, Intel's resource for the IT Industry.

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