State of the Art Passenger Information System for Trains

Customer: Trenitalia
System Integrator: Almaviva TSF SpA
Market: Railway
Application: Passenger Information System
Technology Partner: SADEL SpA
Location: Italy

Introduction

In the last few years all the train operator companies have made a big effort to increase passenger satisfaction, providing audio and video information about travel (train position, estimated arrival time, next stop announcements and connections), generic information, news and advertisements.

Thanks to the so-called Passenger Information Systems (PIS), train travel is easier and safer for occasional users and for elderly people, physically-challenged persons and people with hearing difficulties. PIS allows them in particular to prepare at leisure for the transfer to connecting trains or for arrival at their destination. This service is implemented with the following devices: internal LCD TFT graphic displays, internal and external LED or LCD display boards, coach audio amplifiers, coach control units, train control units, additional passenger entertainment devices.

These products, from the appearance and functionality point of view, look similar to common daily devices like LCD TV/monitors, car navigators, shops LED information displays. In truth, they must work on rolling-stock so they have to comply with very strict regulations (European Standard EN 50155and Trenitalia ST 306158Addendum for electronic equipment used on rail vehicles) related to working temperature, vibration, power supply, low power consumption, compact mechanical dimensions, lifetime, etc.

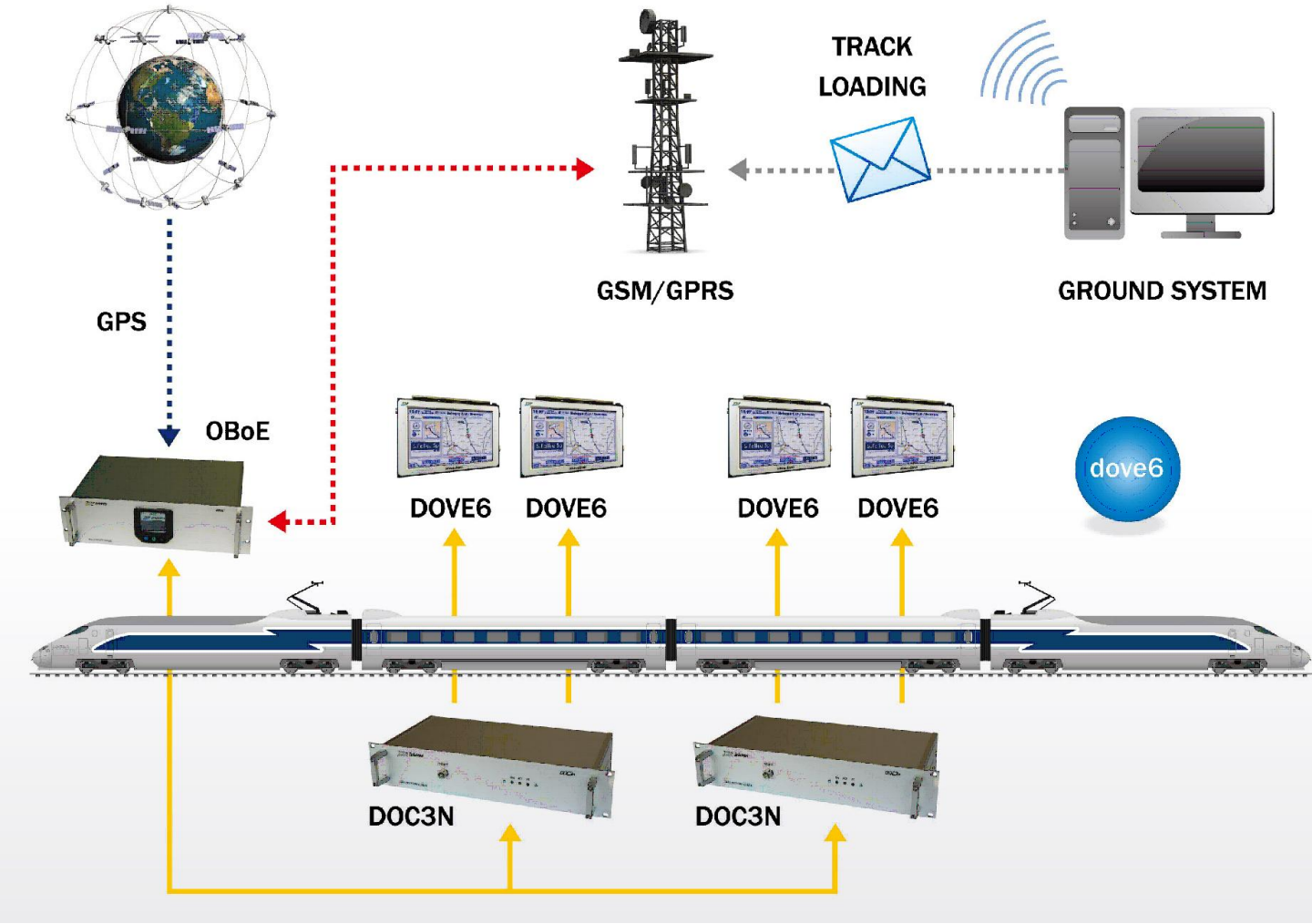
Solution

Our minimal suggested PIS architecture is composed of the following devices:

- **OBoE** (On Board Equipment): device placed in the driving cab of the train. OBoE allows communication with a ground system using GSM/GPRS and Wi-Fi modules. OBoE, thanks to the GPS receiver and the programmed train track, loaded before departure, provides audio and datainformation related to train journey, next stop announcements, advertisements, etc.
- **DOC3N** (DOC-TRAIN): device installed on each vehicle of the train. DOC3N creates the train communication network between OBoE and video data and digital audio peripherals to transfer information on all the coaches.

- **DOVE6** and **ECCOTI**: video interface for passengers and train staff based on LCD TFT 17 inches color technology. Up to 6 units can be mounted on each coach to provide information related to next stop, destination and connections.
- **SAX3N568**: 30W coach audio amplifier in compliance withUIC568 standard.

Additional passenger information could be added with other products like outdoor and indoor display boards, digital video surveillance system and seat audio and video entertainment devices connected to DOC3N.



System

DOC3N and DOVE6 devices are based on an Advantech EPIC single board computer (SBC) powered with an Intel® 373 Celeron® M ULV 1000MHz 512kB L2 Cacheprocessor with 5.5W power dissipation. The board is equipped with up to 1 GB DDR266 RAM and up to 8 GB of COMPACT FLASH or DOM storage devices for operating system and

application programs. High expansion flexibility is guaranteed with PC/104 (ISA) and PCI-104 (PCI) connectors, allowing expansion for GSM/GPRS and GPS cards or additional Ethernet ports.

Communication between DOC3N placed on different coaches and DOVE6 is implemented with power line modems to avoid additional installation, cable and connector costs. High speed modules are used for data transfer, while low speed modules are used for diagnostic and data backup purposes. The Power Supply subsystem is designed for 24 Volt train battery input with Supercap-UPS and digital control of device voltages.

Benefits

- Working Temperature from -25 to +80 °C to comply with EN-50155 T3
- Custom connectors with orientation peg and retention lock to avoid vibration problems on rolling stock
- BIOS customization for LVDS interface for 1280x768 resolution with 18 and 24 bit color depth
- SBC architecture with EPIC form factor
- PWM and ON/OFF control for LCD backlight
- Single +5 Volt supply voltage for SBC
- Royalty free Linux operating system
- Power Line Communication modules:
  - High Speed up to 200 Mbps
  - Low Speed up to 2.4 kbps