TRX R6

Combined hardware and software solution running KlasOS Keel allows a range of applications to be supported on a single platform.

Supported applications include Passenger Wi-Fi, Infotainment and Passenger Information Systems, CCTV and TCMS access.

Open platform allowing the operator to add features over time.

Cellular Gateway With In-built Compute

Key Features

- Combined router/server with mutiple CPU options
- Dual-core Intel® Celeron® Processor G Series
- 6th Generation Intel® Core™ processors with dual-core i3, quad-core i5 and quad-core i7
- Support for six cellular modems (3G / 4G / 5G), Wi-Fi and Ethernet for connectivity
- Supports MVB, RS-422, RS-485 and GPS for telematics
- Integrated KlasOS Keel to supports third-party virtual machines
- Easily managed through integrated Keel CLI or SNMP via single IP address
- Firewall, captive portal and load balancing
- SDWAN tunnelling provides reliable connectivity over multiple WAN links with variable bandwidth
- Integrates with existing PKI infrastructure, secure data transfers using Keel private device keys

Trains   Autonomous   Fleet

KLAS

TRX R6

Diagrams

TRX® R6 Front

TRX® R6 Rear

KEELOS | BLACKROCK

Optimised Management & Virtualization

KLAS

RX R6

KlasOS Keel

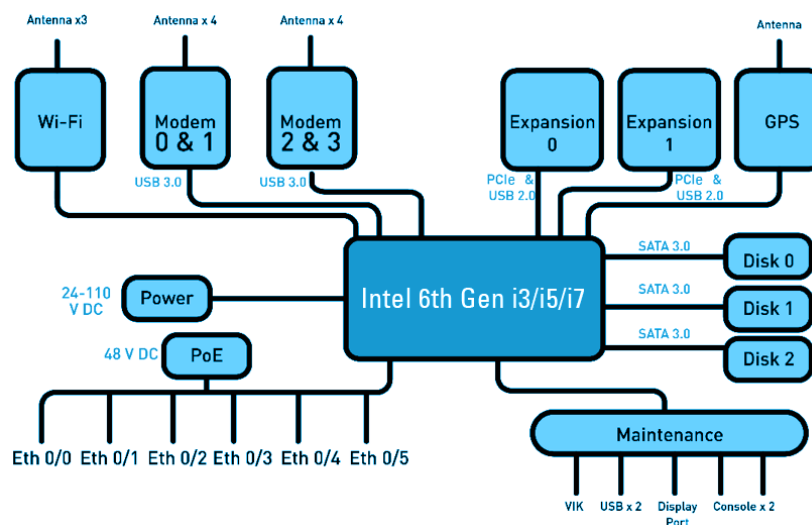**Cisco Technology**

KlasOS Keel

Connectivity
- 3G/4G/5G modems
- Wi-Fi Client and Access Point
- Software Defined WAN (SDWAN) tunnels isolate TCP and UDP connections from changes in WAN infrastructure

Virtualisation
- Integrated KVM hypervisor
- Existing legacy systems can be virtualised and deployed as a Guest OS
- Configurable resources such as CPU cores, RAM, Storage, Networking

Telematics
- RS-422 / RS-485 module and MVB module can be mapped to a Guest OS

Management
- Compatible with off-the-shelf tools such as Nagios
- SNMP v1/v2/v3
- SNMP and scripts can be combined to gather data
- Ansible/Vagrant for provisioning and deployment
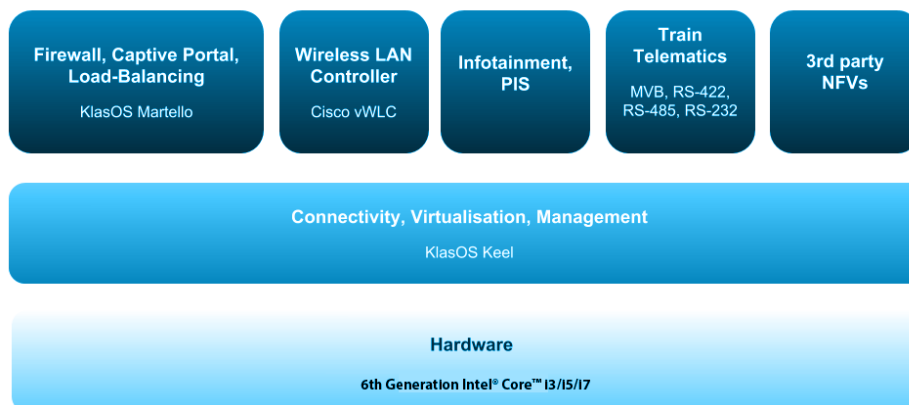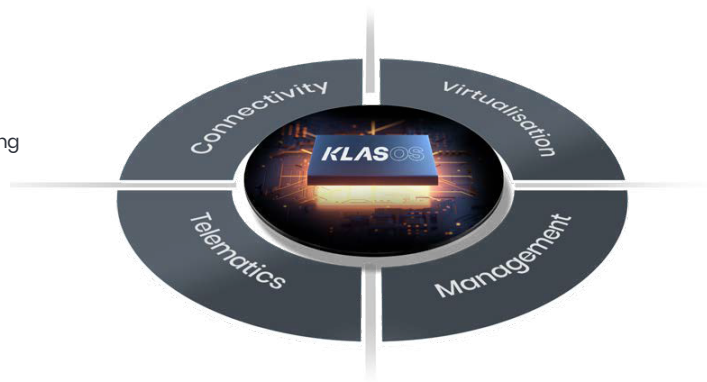
KlasOS Martello

Firewall
- Captive Portal
- Session-based load balancing

Third Party NFVs

Wireless LAN Controller
- Management
- CCTV
- Media hosting
- Routing

- Firewall
- Telematics

Integrated GPU
- Intel HD Graphics 530 integrated in KlasOS
- Ideal for Artificial Intelligence / Machine Learning workloads

Firewall, Captive Portal, Load-Balancing KlasOS Martello	Wireless LAN Controller Cisco vWLC	Infotainment, PIS	Train Telematics MVB, RS-422, RS-485, RS-232	3rd party NFVs

Connectivity, Virtualisation, Management
KlasOS Keel

Hardware
6th Generation Intel® Core™ I3/I5/I7

KEELOS | BLACKROCK
Optimised Management & Virtualization

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TRX R6

Specifications

Hardware Specifications

Server Features

- Processor options available:
    - Dual-Core Intel® Celeron® G3900E 2.4 GHz clock rate
    - Dual-Core 6th Gen Intel® i3-6102E 1.9 GHz clock rate
    - Quad-Core 6th Gen Intel® i5-6442EQ 1.9 GHz clock rate
    - Quad-Core 6th Gen Intel® i7-6822EQ 2.0 GHz clock rate
- Intel® Virtualization Technology (VT-x) with IPMI
- Up to 32 GB RAM
- Internal storage with capacity of 16 GB
- Dual removable 2.5" SATA Solid State Drive in sizes 256 GB - 4 TB

4G LTE Modems

- Sierra Wireless MC7430 / EM7430 LTE Cat-6
- Sierra Wireless MC7455 / EM7455 LTE Cat-6
- Sierra Wireless EM7511 LTE Cat-12
- Sierra Wireless EM7565 LTE Cat-12
- Telit LM 960 LTE Advanced Pro Cat-18

5G Modems

- Telit FN980M
- Quectel RG500Q-GL
- Thales MV31-W

GNSS

- Reception of GPS, GLONASS, QZSS, BeiDou
- High sensitivity acquisition and single-satellite timing
- Automatic holdover

Wi-Fi Interface

- IEEE802.11 ac/b/g/n modem with datarates of 1.3 Gb/s downlink
- 3x3 MIMO
- Supports 2.4 GHz and 5 GHz bands
- Enhanced wireless security supporting 64/128-bits WEP, WPA, WPA2, 802.1x
- Additional Wi-Fi interfaces supported via expansion slots

Ethernet

- 6 x Gigabit Ethernet in X-Code M12 or RJ-45 format
- Supports 10GbE in X-Code M12 format

Expansion Slots

- USB 2.0 and PCI Express signalling supports a range of devices per slot:
- DTE RS-422/RS-485 serial devices to control remote devices
- MVB
- General purpose IO with galvanically isolated outputs

Physical Specifications

- 9.8" W x 11" L x 3.05" H (250 mm x 279 mm x 76.5 mm)
- 9.9 lb / 4.5 kg

Electrical Specifications

- 24 - 110 VDC
- Power consumption
- 60 W including 6 modems, excluding PoE
- 160 W when all PoE ports are in use. 48 VDC input required

Software Specifications

Networking

- Software Defined WAN (SDWAN)
- Static Routing
- OSPF, RIP, BGP4
- Virtual Switch (vSwitch)
- NAT (PAT)
- 802.1q VLAN
- Access Control Lists (ACLs)
- DHCP Client/Server
- NTP Client and Master
- Integrates with existing PKI infrastructure

Virtualisation

- Integrated KVM Hypervisor
- vSwitch
- Virtio and e1000 NIC options
- USB and PCIe device passthrough
- Serial port passthrough
- Install Guest OS from ISO file or import from qcow2
- Read-only Guest OS option

Supported Interfaces

- Gigabit Ethernet
- 10GbE support
- Wi-Fi Client and Access Point
- 5G, 4G/LTE and 3G/UMTS modems
- SATA SSDs, VIK
- GPS, GPS relay over IP/serial
- Telematics via RS-485/422/232, MVB

Guest Networking Features

- Stateful Firewall
- QoS
- Captive Portal with rate limiting
- Netflow

Management

- SSH, Telnet, console
- Syslog
- SNMP v1/v2/v3

Compliance

- EN50155:2017 Railway Applications - Electronic equipment used on rolling stock (EN50155: Heat, Cold, Insulation, Vibration and Shock), EN60068-2-1, EN60068-2-2, EN60068-2-30
- EN61373:2017 Railway Applications - Rolling stock equipment Shock and Vibration
- EN50121-3-2:2017 Railway Applications - Electromagnetic Compatibility - Part 3-2 Rolling Stock - Apparatus
- EN45545-2:2015 Railway Applications - Fire Protection of Railway Vehicles - Part 2
- EN55032 Electromagnetic Compatibility of Multimedia Equipment
- RED Compliant
- IP 54 Ingress protection
- RoHS 2 Compliant
- FCC/CE

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