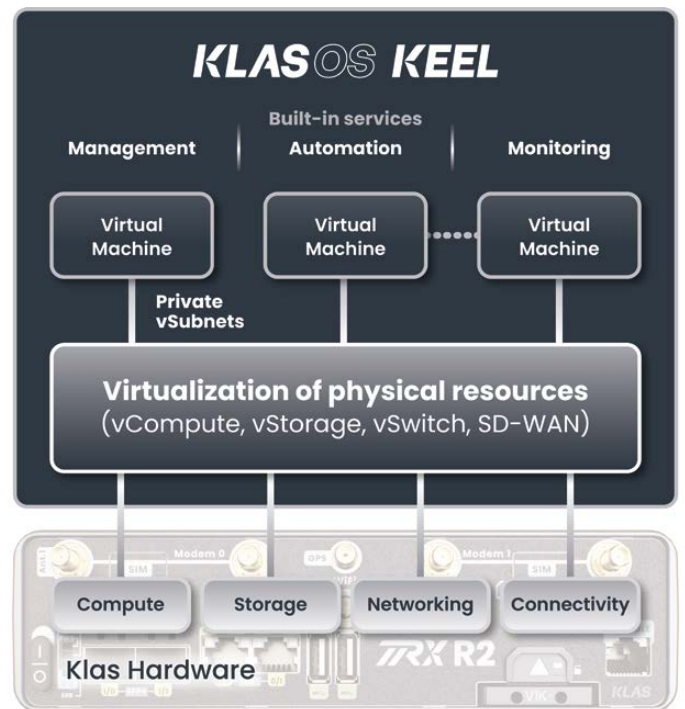# KEEL

THE INTELLIGENT EDGE OS

Keel is a lightweight Linux-based open source OS with integrated KVM-based hypervisor, routing and virtualized switching, firewall, and Software-Defined WAN (SD-WAN) capabilities, providing a secure virtualization environment on x86 compute platforms. Keel is NIAP Common Criteria certified and is listed as an NSA approved CSfC component.

KEY FEATURES

Keel is the default OS on Klas TRX R2 and TRX R6 modules. Separately, Keel KVM-based hypervisor is available for use on x.86 compute modules such as VoyagerVM and Voyager m-Series.

- Linux-based OS developed for low SWaP compute
- KVM open source hypervisor tailored for the edge
- Integrated IP networking route and switch capabilities
- SD-WAN with Auto-PACE support
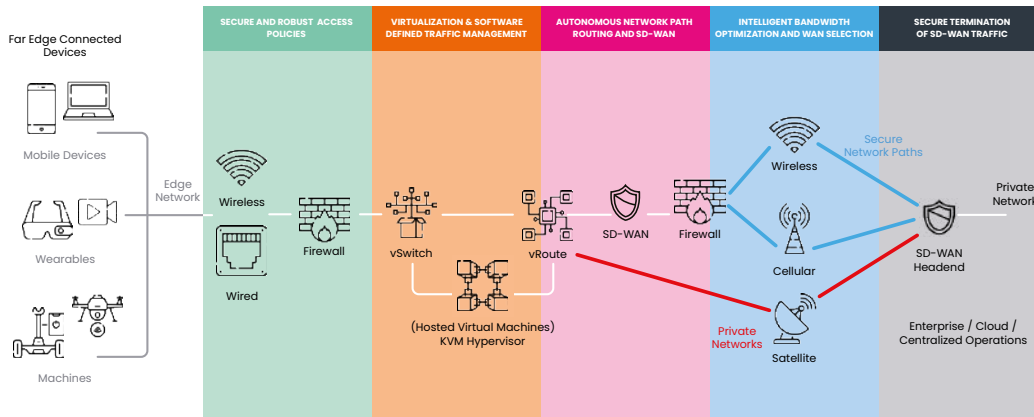- Firewall with advanced networking capabilities for secure routing

KLASOS **KEEL**

Built-in services

Management | Automation | Monitoring

Virtual Machine | Virtual Machine | Virtual Machine

Private vSubnets

Virtualization of physical resources
(vCompute, vStorage, vSwitch, SD-WAN)

Compute | Storage | Networking | Connectivity

Klas Hardware — TRX R2

Common Criteria

KLAS

Figure: A topology of Keel capabilities for end-to-end secure communications.

KEEL FUNCTIONALITY

The following is a summary of supported functionality as part of Keel. For a detailed overview of functionality and links to public Knowledge Base articles, see **https://www.klasgroup.com/keel/**.

BASE

CATEGORY	DESCRIPTION
Firewall	Stateful Traffic Filter (NIAP approved)
Network and Routing	Layer 2 - Layer 3 IP switching and routing
Virtualization	KVM-based hypervisor
Cellular	Integrated LTE/5G modem controls
Wi-Fi	Access point and/or client mode configuration
GPS	Relay controls
Management and Monitoring	System based logging with SNMP support
Access Control / Security	Secured local and networked based access

ADD-ONS

SD-WAN	Intelligent traffic routing over WAN connections

KEEL VIRTUALIZATION

Keel supports an integrated KVM-based hypervisor. The Keel hypervisor supports sharing of the module's physical resources of compute, storage, networking, connectivity, and pass-through of serial periphery, e.g. USB, CAN, and MVB, to the hosted virtual machine.

In addition, Keel supports a secure web-based portal, allowing IT admins to control and access their virtual machines without the need to install software on local machines.

KLAS

KEEL SD-WAN

Unlike traditional static enterprise SD-WAN, Keel SD-WAN is designed specifically for managing IP traffic on fast moving vehicles that have access to multiple WAN paths with variable bandwidth speeds, e.g. trains connected over cellular, Wi-Fi, satellite, etc.

Simplifying secure and seamless connectivity over untrusted networks

- Keel's integrated SD-WAN provides a secure tunnel overlay on all available WAN interfaces, securely connecting edge and private networks without the need for third-party VPN software.
- With Keel, intelligently route WAN traffic automatically based on the bi-directional network performance, i.e. independent of modem signal strength.
- Maximize bandwidth availability by channel bonding all WAN interfaces as one network path. Equally, load balance WAN usage and manage expensive links, e.g. satellite.
- With seamless network path switching, define an up or holding time before the modem is used, minimizing data loss when traffic is switched between modems.
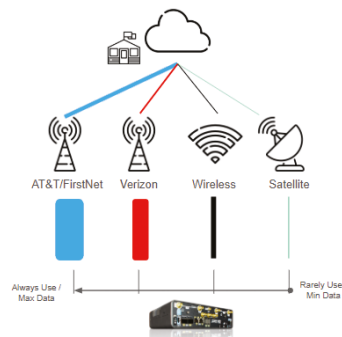
WAN BANDWIDTH AGGREGATION

- Channel bonding for maximun throughput
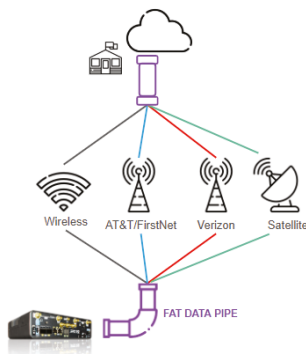
AUTOMATIC PRIORITIZATION OF WAN USAGE

- Weight paths to use for data transmission
- Load-balance data based on WAN performance

AUTO-PACE (PRIMARY, ALTERNATE, CONTINGENCY, AND EMERGENCY)

- Degraded performance and outage detection
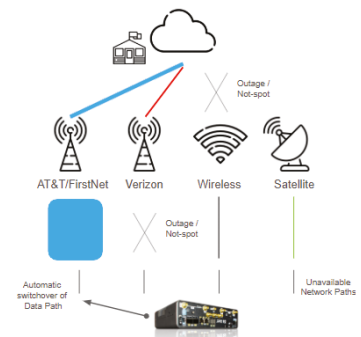- Traffic sent over next best performing WAN path

Figure: Keel SD-WAN for reliable and resilient connectivity when it matters most on the move.

MAINTENANCE AND SUPPORT

KlasKare is available for ongoing support and access to the latest Keel firmware, software updates, and Knowledge Base articles. For more details, see **https://www.klasgroup.com/wp-content/uploads/datasheets/KlasKare_datasheet.pdf**

ORDERING INFORMATION

Keel is a perpetual license on TRX R2 and TRX R6, with Keel SD-WAN available as an add-on license. With KlasKare, get access to future software releases. Keel Virtualization is available as a subscription-based license for use on x.86 edge compute platforms, e.g. VoyagerVM.

- **KlasOS Keel**: KLAS-KLASOS-KEEL-STD-1YR