# RECS®|Box microserver architecture

**R**esource **E**fficient **C**omputing and **S**torage

## RECS®|Box

Modular high-density microserver architecture
with integrated management

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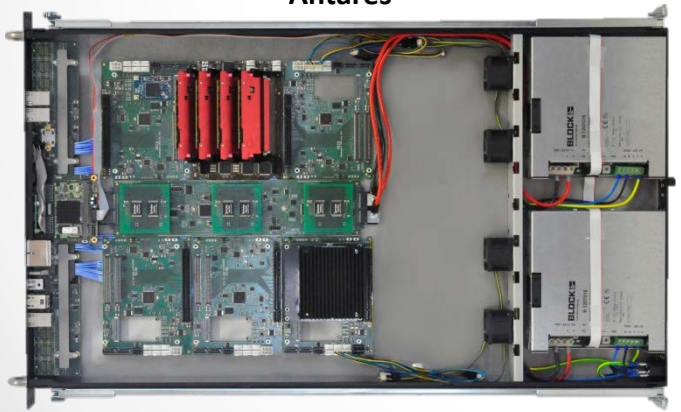
# RECS® | Box Microservers

- Arbitrary combinations of x86, ARM, GPU and FPGA compute modules
- Two base models
  - Arneb: Up to 72 compute modules
  - Antares: Up to 24 compute modules

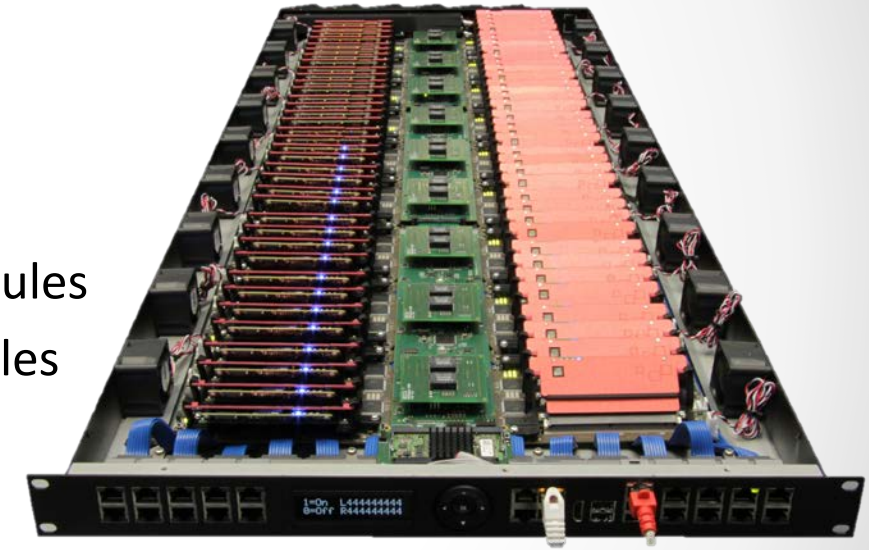
**Antares**



**Arneb**

# Arneb

- 19“ 1 U case, 102 cm long
- External power supply
- 18 Baseboards
  - = up to 72 ARM/FPGA compute modules
  - = up to 18 x86/FPGA compute modules
- Side cooling



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# Antares

- 19“ 1 U case, 79 cm long
- Integrated 300 W redundant power supply (1 + 1)
- 6 Baseboards
  = up to 24 ARM/FPGA compute modules
  = up to 6 x86/FPGA compute modules
- PCIe accelerator possible (GPGPU / Xeon PHI)
- Front-to-rear cooling

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# Common features (Arneb & Antares)

- Automatic load-dependend dynamic power supply
- Integrated KVM switch
  - HDMI
  - 4x USB
- LCD status display
- Integrated monitoring and control
  - WebGUI
  - External APIs
- 4x 1 Gbit/s management network (internally switched)
- Dedicated 1/10 Gbit/s compute network

# COM Express Baseboard

- Compatible with COM Express Type 6 and Type 2
- Modules range from Atom single cores to i7/Xeon quad core
- mSATA connector
- PEG connector
  (PCI Express for Graphics, PCIe 16x)
  - E.g. for GPGPU or
    FPGA-based HW accelerators

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# COM Express Modules available

| CPU Type | RAM | Onboard Network |
|---|---|---|
| Intel Xeon E3-1505M v5; max. 4 x 2.8 / 3.7; 45 W TDP | max. 32 GB DDR4 ECC 2133 MT/s | 1 GbE[1] |
| Intel Core i7 6th generation; max. 4 x 2.8 / 3.5 GHz; 45 W TDP | max. 32 GB DDR4 2133 MT/s | 1 GbE[1] |
| Intel Core i5 6th generation; max. 4 x 1.9 / 2.7 GHz; 25 W TDP | max. 32 GB DDR4 2133 MT/s | 1 GbE[1] |
| AMD Embedded R; 4 x 2.1 / 3.4 GHz; 35 W TDP | max. 32GB DDR4 ECC 2400 MT/s | 1 GbE[1] |
| Xilinx Zynq XC7Z30/35/45; FPGA + Dual-core ARM | max. 16 GB | 1 GbE[1] |

[1] Additionally a 1 GbE or 10 GbE compute network is available on the baseboard

# RECS®|Box FPGA module

- Combination of FPGAs and embedded CPUs
  - Based on Xilinx Zynq XC7Z30/35/45
  - Dual ARM Cortex™-A9 MPCore
  - Tightly integrated Programmable Logic
    - Used to extend Processing System
- COM Express compatible

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# ARM Baseboard

- Integrates up to 4 ARM modules based on Apalis standard
- Modules available, e.g., from Toradex (NVIDIA TK1, NXP iMX6)
- Two own developments
  - Samsung Exynos 5250
  - Xilinx Zynq XC7Z30
- 2 integrated Gbit Ethernet Switches
  for compute network and management network

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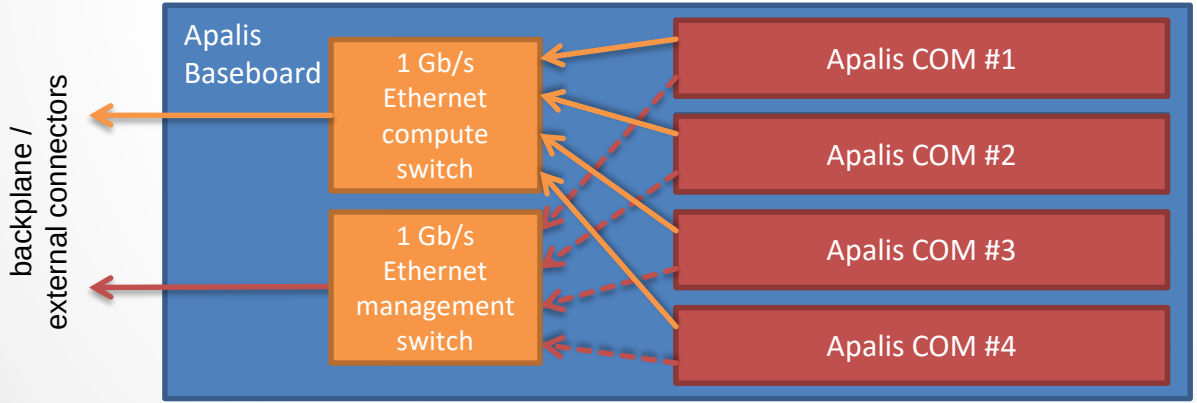
# ARM Baseboard networking

- Two separate 1 GBit networks
  - 1 Gb/s compute network (supported by all Apalis modules)
  - 1 Gb/s management (only for modules with second network interface)
    - christmann Exynos COM, christmann Xilinx 7000 SoC

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# Apalis Modules available

| Manufacturer | CPU | CPU Spec | GPU | RAM | Onboard Network |
|---|---|---|---|---|---|
| Toradex | NVIDIA® Tegra™ K1 | ARM Cortex™-A15<br>4 x 2.2 GHz | NVIDIA® Kepler™ GPU | 2 GB DDR3L | 1 GbE |
| Toradex | NXP®/Freescale<br>i.MX 6Quad | ARM Cortex™-A9<br>4 x 0.8 GHz | Vivante GC2000 | 2 GB DDR3 | 1 GbE |
| Toradex | NVIDIA® Tegra™ 3 | ARM Cortex™-A9<br>4 x 1.4 Ghz | Integrated ULP NVIDIA GPU | 2 GB DDR3L | 1 GbE |
| Christmann | Samsung Exynos 5250 | ARM Cortex™-A15<br>2 x 1.7 Ghz | ARM Mali-T604MP4; 533 MHz | 4 GB DDR3 | 2 x 1 GbE |
| Christmann | Xilinx Zynq FPGA +<br>ARM Cortex™-A9 | FPGA + Dual-core ARM | n/a | Max. 16 GB | 2 x 1 GbE |

- Built according to Apalis standard defined by Toradex
- Fully interchangeable with future versions built to the Apalis standard

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# RECS® | Box Exynos Compute Module

- Samsung Exynos 5250
  - ARM A15 Dual Core 1.7 GHz
  - MALI T604 GPU (supporting OpenCL)
  - Multi-format Video Hardware Codec
- 4 GByte DDR3 LP main memory (12.8 GByte/s)
- 16 GByte eMMC (200 MByte/s)
- 2x Gigabit Ethernet for compute and management network
- Measured peak performance (GPU): 43.3 GFLOPS@7.6 Watt - (5.7 GFLOPS/W)
- Operating System
  - Linux Kernel 3.x from Linaro
  - OpenCL Linux User Space Drivers for MALI GPGPU
  - Android 5.1.1

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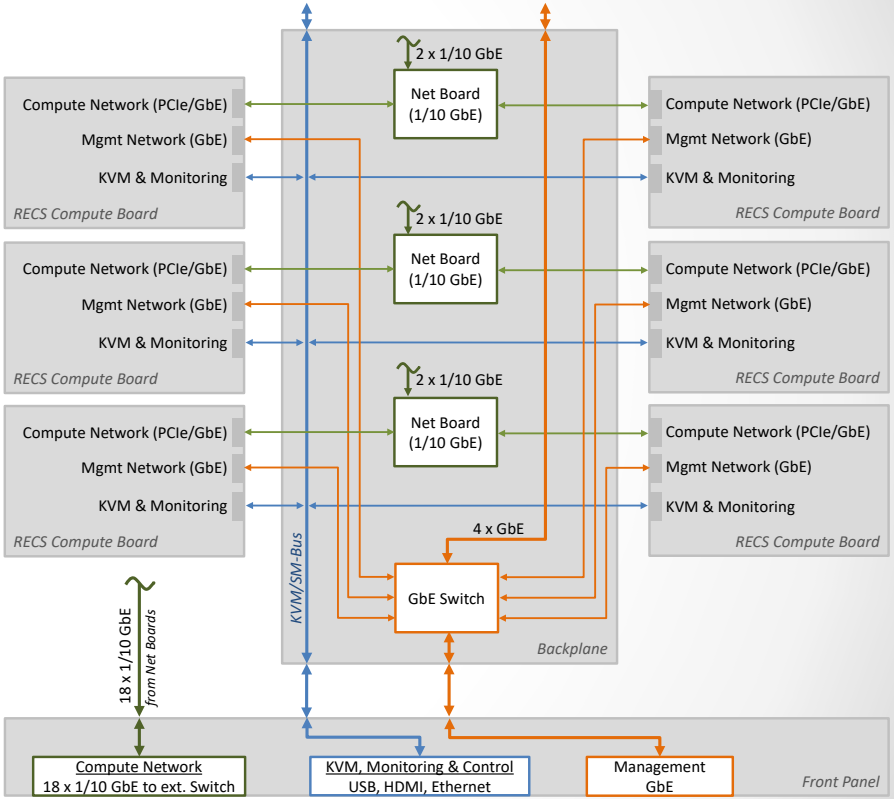
# RECS® | Box Communication Backplane

## Three Levels of Interconnect

- Data Communication
  - Externally switched
  - Interface realized by Net-Boards
    - 1/10 Gbit Ethernet Net-Boards available
    - 40 Gbit Ethernet; 10/40/56 Gbit Infiniband planned
- Management
  - Gigabit Ethernet, switched on the backplane
- Monitoring and Control
  - Distributed monitoring environment connected via dedicated system management bus
  - Externally accessed via Ethernet
  - Integrated KVM solution

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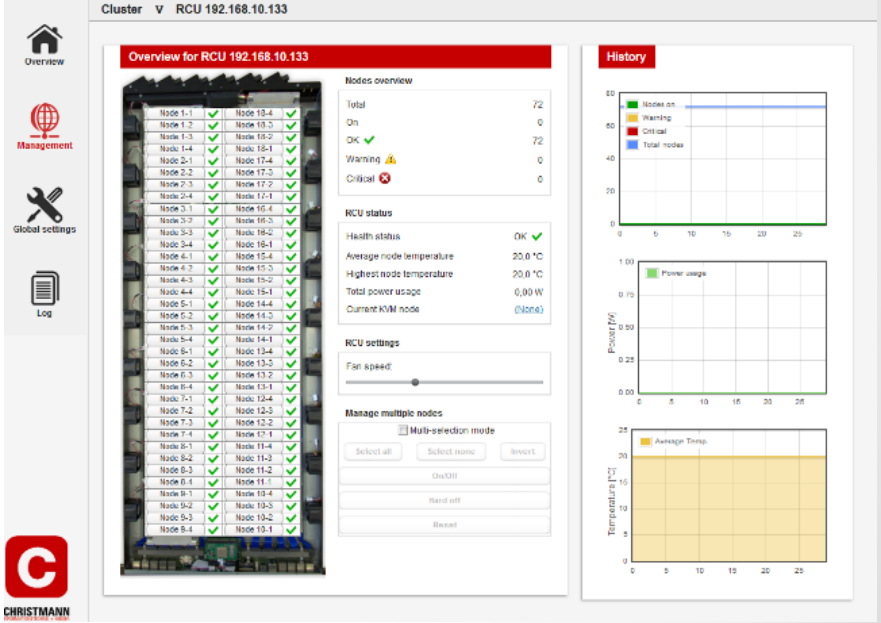
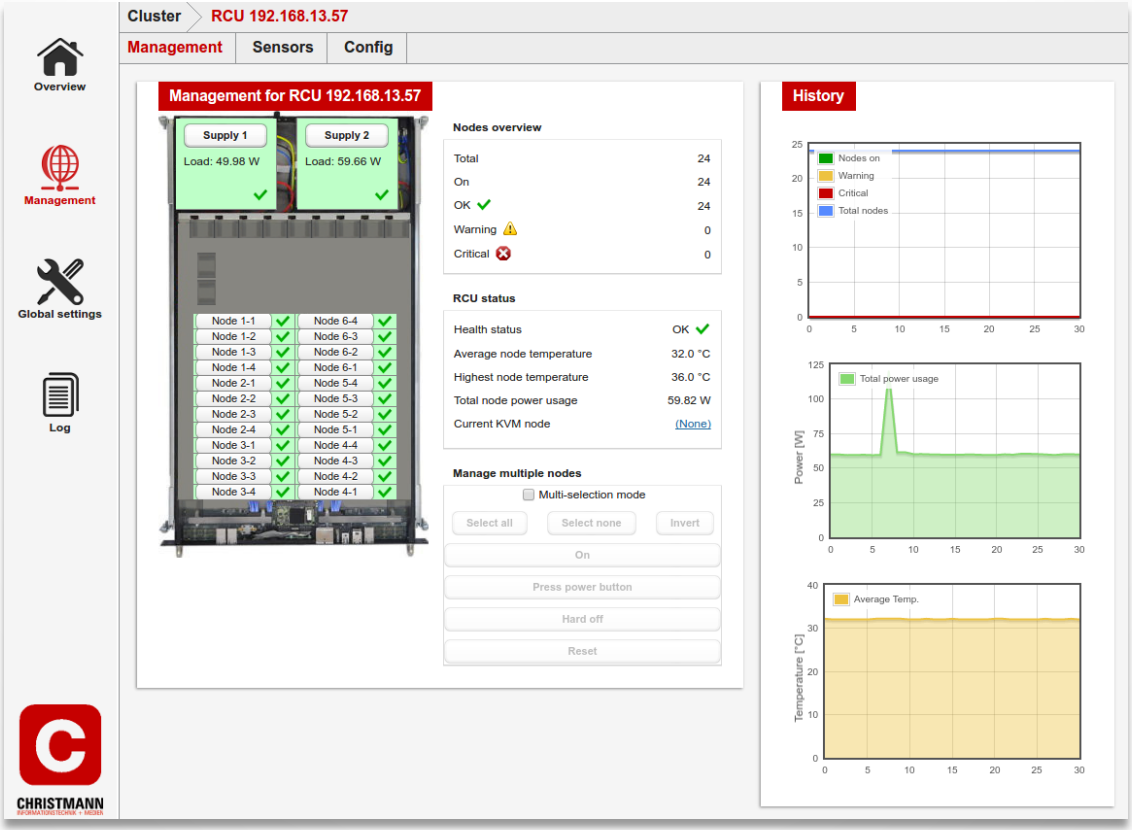
# Integrated management

- Permanent monitoring of
  - Power consumption
  - Temperature
  - Fans
  - …
- Management of CPU modules (On/Off/Reset)
- KVM switching to single CPU modules
- Dynamic load management of power supplies
- Configurable redundancy for power supplies
- External APIs
  - REST (full featured)
  - IPMI
  - Nagios (temp. & power usage)
- OS monitoring integration
  - Modular, extensible through plugins



# Integrated management – server level

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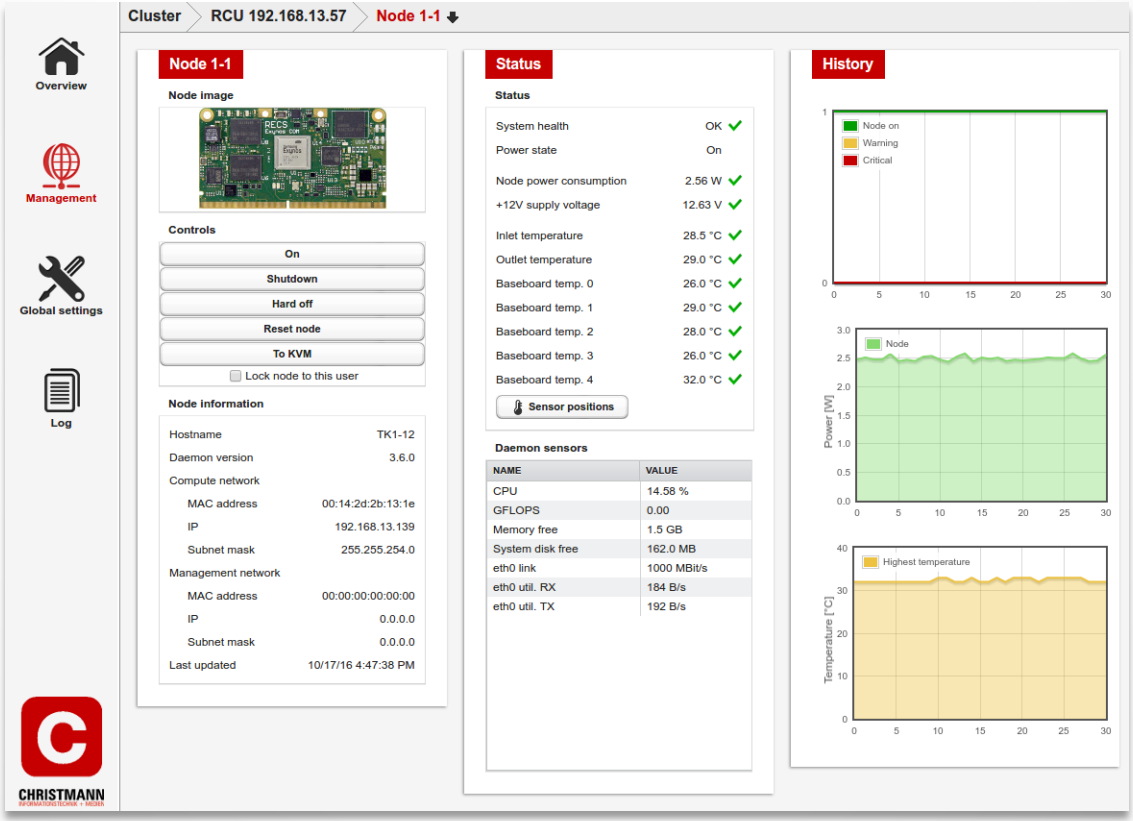
# Integrated management – node level

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## Want an offer? Questions?

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## More info at

http://christmann.info/embedded/

https://recswiki.christmann.info/

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