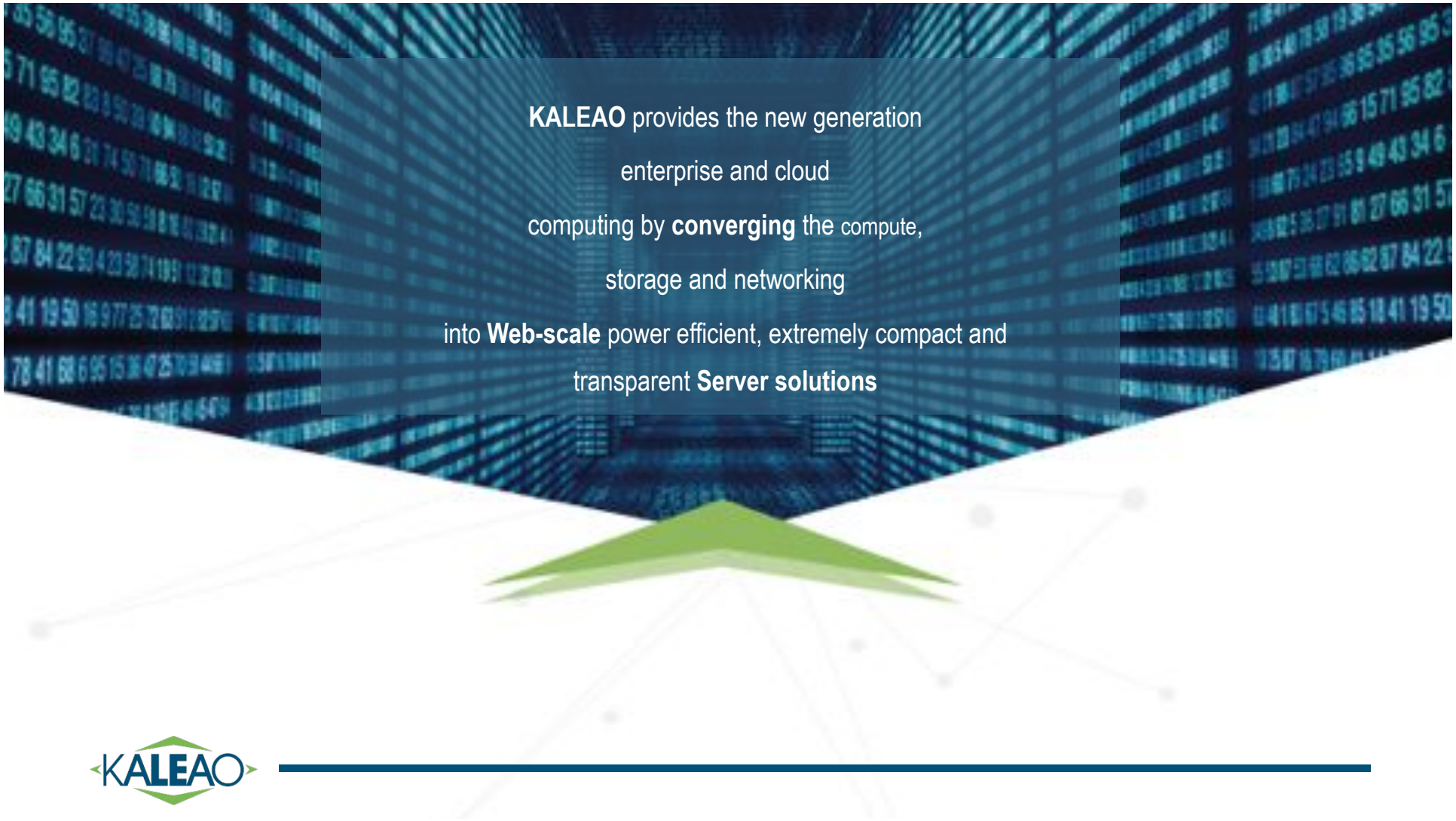
KALEAO Company & Solutions


KALEAO provides the new generation
enterprise and cloud
computing by **converging** the compute,
storage and networking
into **Web-scale** power efficient, extremely compact and
transparent **Server solutions**

KALEAO

Trends

- The explosion of cloud, web and IoT
- Cloud workloads are increasing
- Requirements for more storage and compute
- Hyperscale technologies and methods penetrating enterprise data centers
- (The virtualization expansion and the software defined everything)
- Software network appliances and hyperconverged architectures make current hardware obsolete
- A growth in interest for ARM platforms

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Strategy

- Product leadership - continuing product innovation meeting customer needs
  - A tight and persistent marketing-development dialogue
  - A robust product roadmap based on innovative technologies
- Differentiation – KALEAO can implement a new, more efficient and more effective way of processing workloads
- Go to market – leverage SI and channels to reach max market coverage, starting from USA
- Cost effective fabless production model with retention of R&D and full control over HW design

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Team

- Strong team consisting of qualified professionals in the electronic and computer industry
- Management structure already defined and “up and running” covering the main organizational functions: R&D, operations, sales&marketing, finance and administration

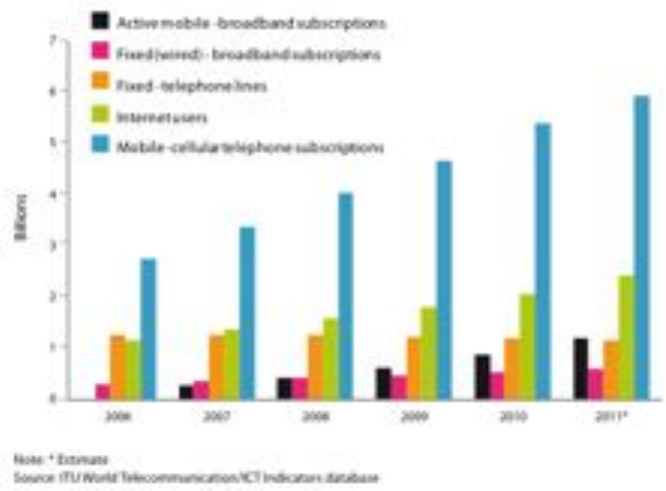
KALEAO
Unique Value Proposition

- **Delivering Innovation**
  - Innovative server platform architecture that leverages the mobile market ecosystem combined with next gen software for max value creation
- **Reduce TCO**
  - Highest compute and storage density
  - Low power consumption
  - High quality cost effective solution
- **Streamline operations**
  - KALEAO solutions enable assets rationalization, increased operational efficiency and optimized IT planning and growth

KALEAO :

Use mobiles tech into servers

- In 2015
  - > 6 Billions of mobile phones VS roughly 30 Millions of severs
- Leverage on economy of scale, energy efficiency, high density
- Build on ARM vendor ecosystem and a growing open source community



KALEAO – Global Footprint

Locations

- Cambridge UK – HQ
- Padova, IT
- Grenoble, FR
- Charlotte, US
- Heraklion, Crete, GR

KALEAO Web-scale Converged Solutions

- Automatic deployment and commissioning
- Infrastructure as a service (Iaas)
- Up to 192x 8 - way servers per 3U chassis
- Cloud level, scale out architecture
- Energy - efficient resource sharing design

- Compact converged processing/storage/network design
- Locality optimised mass storage NVMe SSD (optional)
- Optimised for performance-per-watt –per-metre^3
- Reduce capital and operational expenditure

- Transparent deployment of business services
- Maximize return on investments
- Customer focused operations and support
- Future scalability with strong technology roadmap

Space – Highest compute and storage density

Acquisition – Lowest cost per operation, per m^3

Operation – Lowest energy per compute operation

KALEAO
Unique selling points (1)

- True converged
  - Hardware level fusion of ARM based computing, flash storage and high bandwidth networking. Natively deployable as compute, storage or front end network server.
- Software defined hardware
  - KMAX introduces the idea of “physicalization” as the solution for the agility versus performance virtualization trade off. “Physicalized” resources are controlled by software but defined in hardware, maximizing performance and scalability, while keeping the agility of virtualization and the benefit of an hyperconverged solution

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Unique selling points (2)

- ARM hyperconvergence
  - KALEAO is the only company that offers hyperconverged functionality on ARM platforms, combining the advantages of hyperconvergence with those of energy efficiency and high density
- Reap the mobile advantage
  - KALEAO is the only company that designs server solutions starting from mobile components, so customers can benefit from mobile economies of scale and low power consumption
- A full integration
  - Controling HW and SW design, KALEAO has the only solution that proposes a full intimate integration of compute, storage, network, virtualization and software in an ultra efficient plug and play appliance

KALEAO – Key facts

- Intellectual Property and know how
  - Relevant IP portfolio
  - Experienced worldwide engineering
  - Production, operations & quality management
- Product Portfolio
  - Comprehensive HW portfolio –boards, boxes, servers, cartridges and rack systems
  - Fully integrated appliances (HW + SW + services)
  - Software defined infrastructure - API based automation
- Customer Focused
  - Open software platform
  - Solutions for Cloud, Enterprise and IoT / M2M
  - Delivery, installation and support

KALEAO – Target Areas and Use Cases

- **Public and private cloud**
  - Cloud services management and provision
- **Web infrastructure**
  - Web Hosting and web organizations
  - E-Commerce and web dservices
  - Web 2.0 and Web 3.0
- **IT infrastructure**
  - Intranet, file storage, messaging and collaborations, application server, data management
  - Software development
- **Data analytics**
  - Data mining, business intelligence, analytics
- **CDN – content delivery networks**
  - Content and web pages storage, replication and delivery
- **IoT fabric**
  - Computation and storage enablement of IoT application and platforms
  - Combination of edge and data center computing into a single on-premise system
- **Smart storage**
  - Enterprise and cloud hyperscale storage management

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KALEAO – Target Customers

- **Hyperscale data centers**
  - Looking for low footprint low power consumption web scale ready solutions
- **Web and hosting companies, cloud services providers**
  - Looking for flexibility and agility plus saving capex, energy and space
- **IoT companies**
  - Looking for power aware effective data management solutions
- **Systems integrators**
  - Looking for extension of their offering and new ways to solve customer problems
- **OEM**
  - Looking for innovative ARM based next gen technologies to include in their server pr**oducts**
- **Large enterprises**
  - Looking for a cost aware but effective way to implement a web scale approach for their IT
- **Media companies**
  - Looking for reliable, performant and cost affordable streaming solutions

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Density, efficiency, performance and agility in an 64 bit ARM appliance

KALEAO KMAX

IT INFRASTRUCTURE PAIN POINTS

- Power consumption on the rise
  - Energy bills are an increasing operating cost in cloud and enterprise data centers
  - PUE improvements are flatting out (or topping the “1” limit) due to high costs to reach the next level of DC efficiency
  - Availability of power supply is a concern for many large data centers
- Inefficiency and waste
  - Servers are often underutilized but consuming resources also in idle mood
  - Silos still dominate many data center operations – system complexity everywhere
  - Space inefficiencies: DC expansion is often limited by high cost of building new DC space (especially with aggressive PUE targets)
- Virtualization: the trade off between performance and agility
  - Multiple layers in the stack push applications further away from the metal and too many layers of virtualisation kill performance
- Hyper converged: large scale converged resource complexity
  - Enterprises are looking to adopt web scale to increase efficiency and optimize infrastructure
  - Traditional hyper-converged systems bear many advantages but often are not an answer for web scale due to
    - Not guaranteed performance
    - Not predictable and manageable behaviour at very large scale
    - Hardware utilisation inefficiency and limited solution “openness”

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THE SOLUTION

- KMAX Appliance
- KMAX Server

KALEAO KMAX

- Effective true convergence
  - Natively deployable as compute, storage or front end network server
- Web scale hyper convergence
  - Seamlessly integrated virtualization and software to provide full hyperconverged functionality with “physicalization” of resources for max agility without sacrificing performance
  - Architecture designed to scale indefinitely
- High density
  - Extremely compact system design (up to 80% space reduction)
- Low power consumption
  - Extreme energy efficiency (up to 70% energy savings at IT equipment level)
- Smart computing
  - Max utilization of resources for computing output minimizing waste

KALEAO KMAX

- Compute
  - 2GHz ARM Cortex-A57/A53
  - 192 8-way servers in 3U space
  - Less than 15 Watt per server
- Storage
  - Up to 173TB of flash storage
  - 96 GB/s total bandwidth
  - 30M of available IOPS per chassis
- Network
  - Port configurations up to 960Gbit/s
  - Dual Ethernet ports per server
  - Integrated 1.97 Tera-bit switching

green

ENERGY EFFICIENCY

HIGH DENSITY

CLOUD SCALABILITY

TRUE CONVERGENCE

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KMAX - technology

True convergence

- Native (board level) **convergence**: a hardware level fusion of ARM based computing, flash storage and high bandwidth networking. Based on ARM for maximum energy efficiency and density
- Highly scalable and supporting an advanced resource aggregation technology

Software defined hardware

- KALEAO KMAX introduces the idea of “physicalization” as the solution for the agility versus performance virtualization trade off
- “Physicalized” resources are controlled by software but defined in hardware
- “Physicalization” maximizes performance and scalability while keeping the agility of virtualization

Next generation hyperconverged software platform

- The Micro Visor technology enables a tiny Xen based Type 1 Hypervisor shim, providing the maximum amount of hardware resource for applications whilst consuming the least amount in management overhead
- Software definition of resources and full integration of virtualization, Open Stack and JuJu Charms for a complete range of orchestration, management and other services

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KMAX editions

KMAX server

"True" converged HW platform
IPMI v2.0
Limited virtualized resources
Custom tenant images deployment

KMAX appliance

"True" converged HW platform
IPMI v2.0
Unlimited "Physicalized" resources
Custom tenant images deployment
Advanced software defined network functions
Embedded open stack controller
On App Orchestration tools
User Interface

KALEAO can discuss other configurations of the product on case by case basis

KMAX server - features

- Based on 64-bit ARM for high density and low power consumption
- Effective “True” convergence. Natively deployable as compute, storage or front end network server
- Full hardware-level segregation and independence
- Enables bare-metal provisioning of platform software
- Open platform for systems integration

Compute

- 2GHz ARM Cortex-A57/A53
- 192 8-way servers in 3U space
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Storage

- Up to 173TB of flash storage
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Network

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KMAX appliance - features

- Software defined hardware via OnApp software control with KMAX HW acceleration. Enables booting and running server workloads with bare metal type performance, without sacrificing virtual machine flexibility
- Embedded OpenStack Controller, with industry standard APIs
- Intuitive single pane of glass UI designed for large scale infrastructure (compute, network, storage)
- Web scale architecture designed to scale indefinitely and equipped with multi rack orchestration functionality
- Ultra efficient platform that eliminates virtualization overhead. Fewer virtualization layers consume less HW resources, decreases boot time and increases storage speed. More resources for the applications
- FPGA accelerated virtual IO for storage and networking

KMAX appliance - features

- Dedicated or shared cores (limited or none virtualization CPU and memory oversubscription)
- Network and storage IO access latency better or equal to native OS installation on the same hardware
- Bare metal type IO storage performance for fast snapshot and image clone capability
- Memory borrowing across nodes for intensive workloads and distributed low-power server clusters
- Embedded SDN and SDS support without traditional VLAN limitations
- Fine grain CPU group isolation for over commitment ratio and pinging policy control to ensure VM has guaranteed resources and complete isolation
- Thin provisioning
- Local path optimization and workload placement
- Wide area disaster recovery support for data replication across clouds.

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KMAX configuration - capabilities

- Compute
  - Samsung Exynos 7420 CPU
  - 64/128 GB NV cash
- Storage
  - SSD sizes: 0.5/1/2/3.6 TB
  - Total flash memory for 3U: 24/48/96/173 TB
- Network
  - Different network bandwidth available
  - Per 3U chassis: from 80 to 960 Gbit/s

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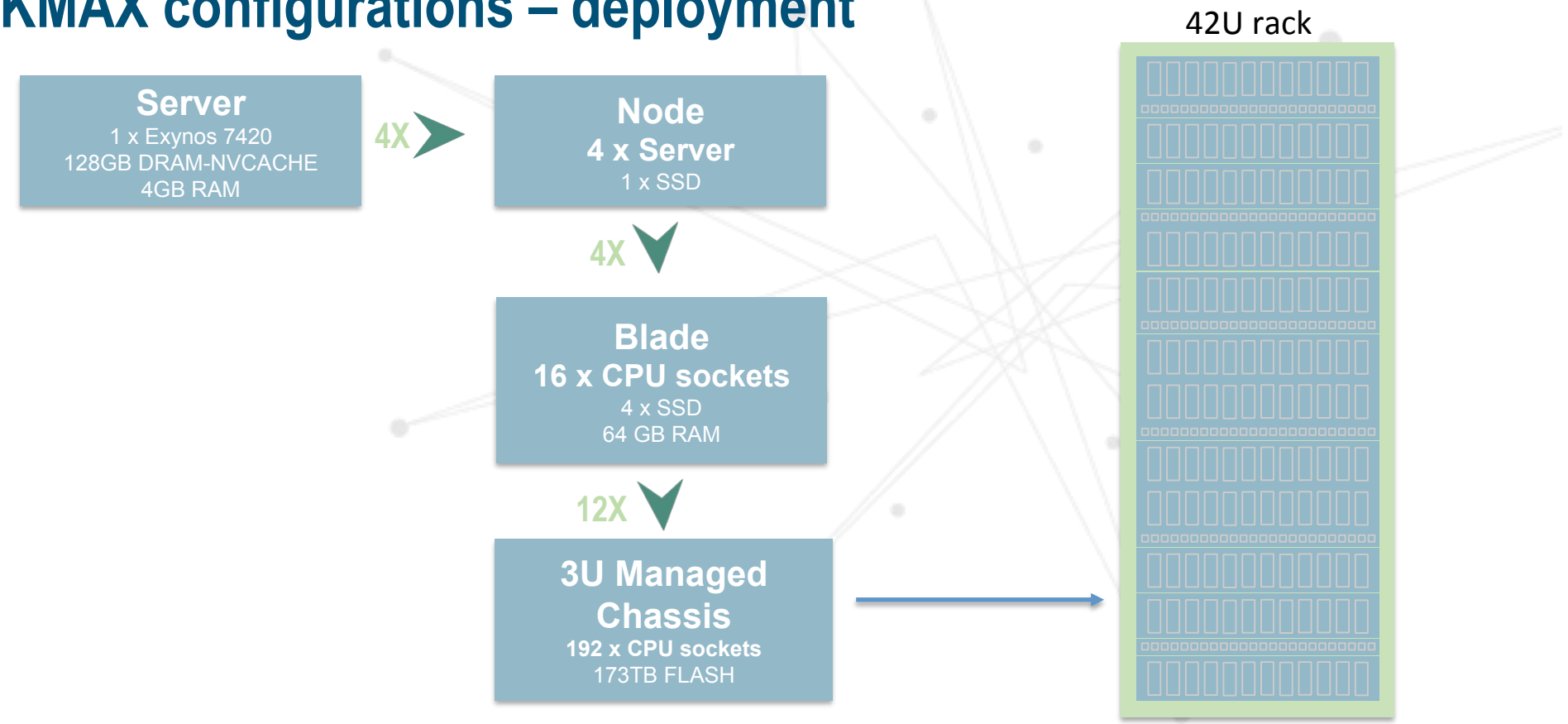
KMAX configurations – deployment



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KMAX – benefits

LOW POWER CONSUMPTION | SAVE SPACE | MORE PERFORMANCE | COMPATIBLE

- **Energy cost reduction**
  - Save between 50% to 60% on IT energy bills compared to x86 infrastructure
  - Save more than 70% on energy considering better low server utilization energy management
- **Space savings on server room space**
  - Save up to 85% compared to standard rack mounts
  - Save up to 70% compared to high density blades
  - Save up to 60% compared to hyperconverged solutions
- **More performance**
  - Can virtualize with no oversubscription
  - Independent of processor software defined storage and networking
  - “Physicalization” or resources eliminates latency and reduces determinately the virtualization overhead
- **Full compatibility** with all applications running on a Linux environments

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KMAX – benefits

REDUCE CAPEX | REDUCE TCO | INCREASE IT PRODUCTIVITY

- **Capital cost reduction**
  - Leverages mobile economies of scale to offer more computing per $
  - Allows “sweating” assets with infrastructure consolidation
  - Average 40% less IT CAPEX on bare metal comparison with standard x86
  - Average 70% less IT CAPEX compared with hyperconverged solutions
  - Average 50% less datacenter CAPEX
- **TCO reduction**
  - Average 50% less TCO compared with standard x86
  - Average 70% less TCO compared with hyperconverged
- **Increase IT productivity**
  - Better scalability, agility and performance
  - Eliminates IT management silos with centralized compute, storage and network management
- **Reduces the typical security concerns** of nowadays virtualized data centers

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KALEAO KMAX

Hardware platform specifications

- Server Configuration
  - 8x CPU per server, 16 servers per blade, 12 blades per 3U chassis → 192 x 8-way servers per 3U chassis
- Processor and memory
  - ARM Cortex-A57 ARMv8 64bit 2.1GHz quad-core
  - ARM Cortex-A53 ARMv8 64bit 1.5GHz quad-core
  - 4GB, 25GB/s DDR4 DRAM backed by up to 128GB of transcendental NV-cache
  - Total memory: Per blade: 64GB DDR4. Per Chassis 768 GB DDR4
- Storage
  - 1 optional 0.5TB/1.0TB/2.0TB 2.5” Enterprise NVMe SSD per node, up to 2TB per node, 8 TB per blade, 96TB per chassis
  - 2.5” enterprise class SSD using NVMe 4xlane PCIe technology with over 800K IOPS per drive
  - Total SSD bandwidth 96 GB/s, 30M IOPS per chassis
- Networking
  - Dual QSPF- 10Gbs/40Gbs network per blade offering up to 960Gbit/s for IO intensive apps
  - Interfaces: 2 x QSPF, at 10Gb or 40Gb, or RJ45
- Management
  - Independent 1Gb Ethernet supporting, web- based, Open-Stack and IPMI 2.0
- Platform resource API
  - Open- Stack: Nova Compute, Neutron Networking, Cinder Block Storage
- PaaS
  - Open- Stack compute, storage and networking software defined services
- Power Supply
  - External 48V DC, 60A Max.

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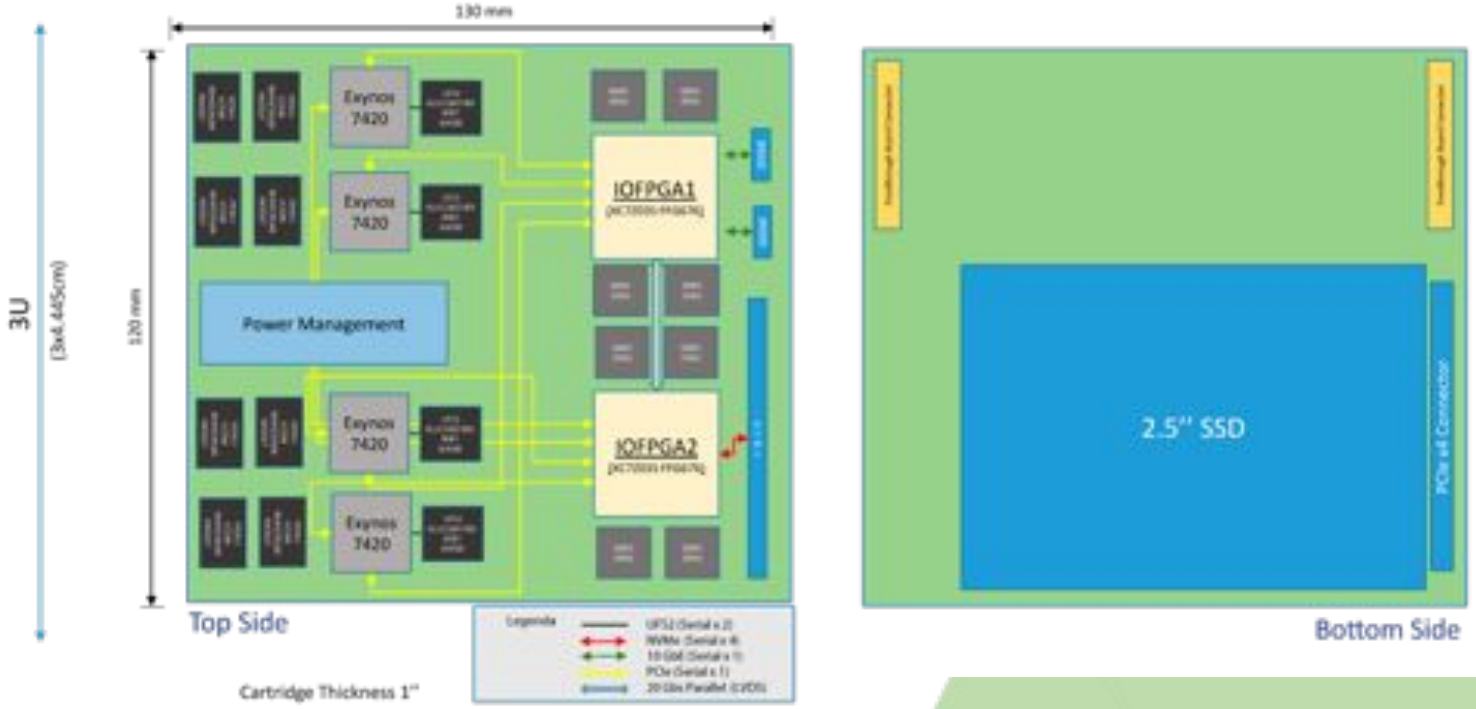
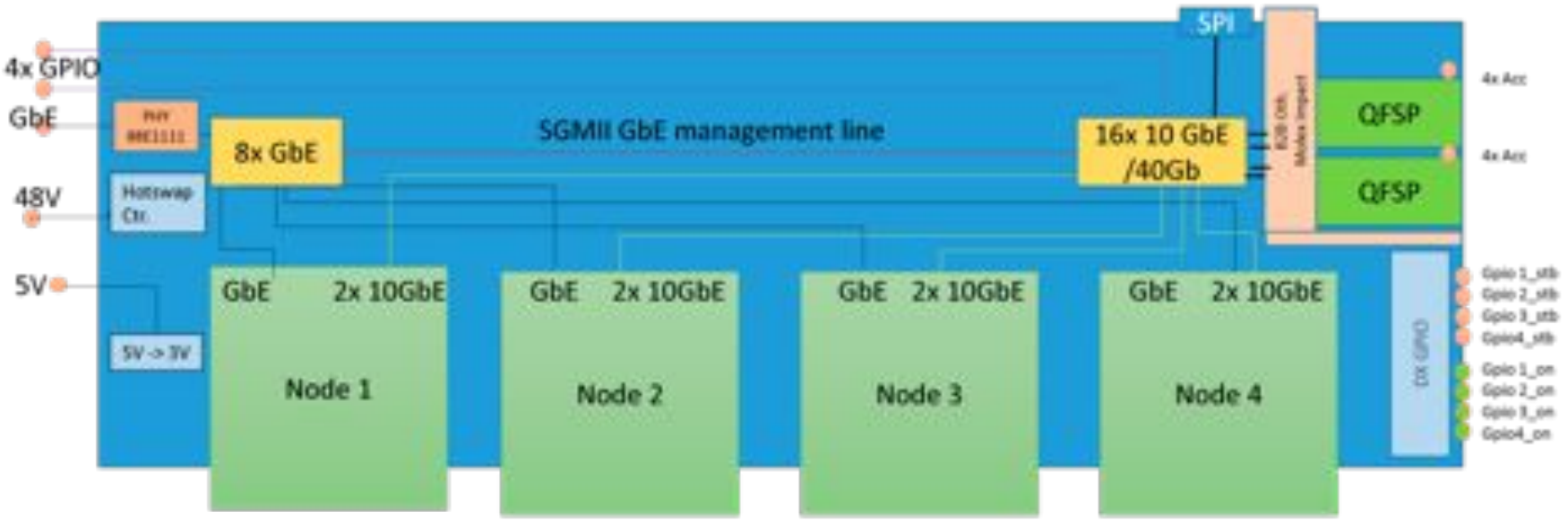
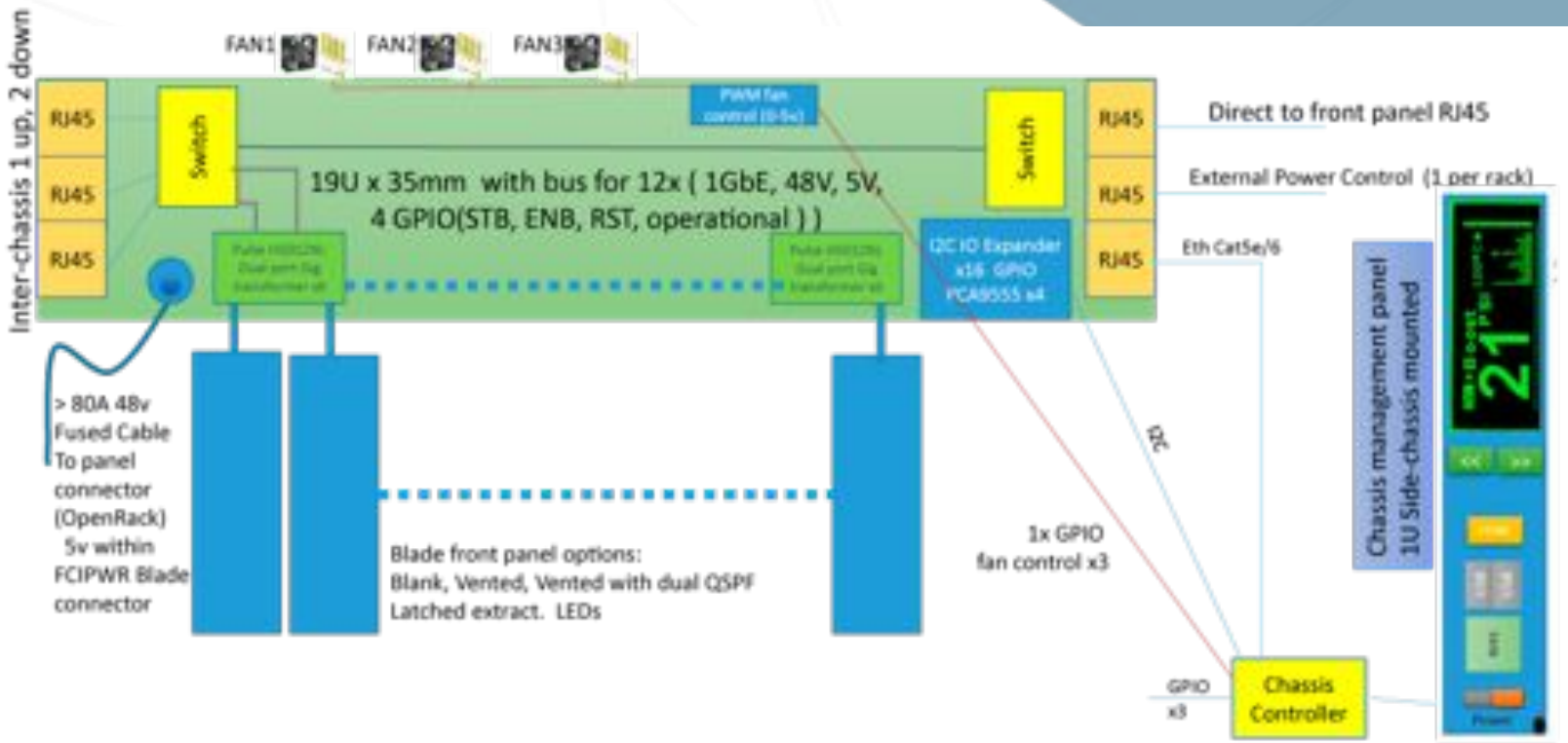
Node Architecture – 4 servers



Blade Feeder - Quad Compute Nodes



Backplane and management board



KALEAO - Partners

Fast growing company with strong financial backing . A team of people with longstanding experience in **high technology**, enterprise, cloud computing and server markets **innovative technology** and extensive **IP portfolio** that enable customers to create competitive advantage

Why KALEAO

KALEAO

THANK YOU

“The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark.”

Michelangelo (1475-1564)