



AI Powered Medical Imaging

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AI Medical Imaging product design with Computer-on-Modules



- **Computer module concept – AI supports**
- **Efficiency and performance of various GPU and NPU designs**
- **Deep learning vs. inference for medical applications**
- **TOPS comparison and use cases**
- **New AI-supported medical imaging diagnostics**
- **aReady. Software optimization for medical applications**

What changes are currently taking place in medical imaging devices through the integration of AI architectures?



AI has been driving research in the life sciences for decades

Recent advances have made AI more accessible

- to improve the quality of patient care
- accelerate diagnosis, research, and decision-making
- increase operational efficiency

Source:

<https://www.intel.com/content/www/us/en/learn/ai-in-healthcare.html>

¹“How AI Is Rapidly Changing Healthcare,” Technically Speaking: An Intel Podcast (S2 E2), May 1, 2024, [youtube.com/watch?v=83Jv20EC7Rk](https://www.youtube.com/watch?v=83Jv20EC7Rk).

²Rick Halton, “How AI Is Transforming Life Sciences,” December 18, 2023, sapiosciences.com/blog/how-ai-is-transforming-life-sciences/.

³IDC Resource Map Document: IDC Business Value of AI Survey, sponsored by Microsoft, IDC #US51331223, November 2023.

⁴Pedro Pereira, “Patient-Centered AI Redefines Continuum of Care,” insight.tech, April 4, 2024, insight.tech/health/patient-centered-ai-redefines-continuum-of-care#main-content.

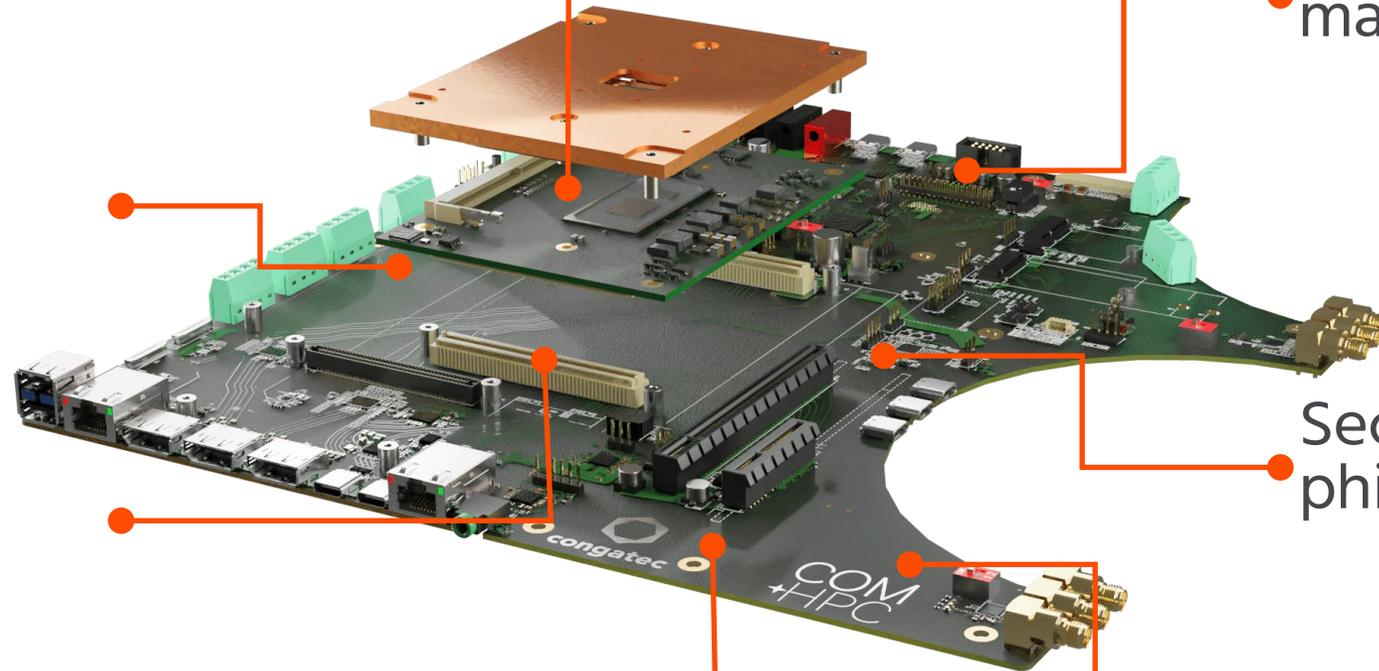
Computer-on-Modules – benefits

Faster time to market

Reduced development cost

Scalable product range

Allows focus on system features



Faster reaction to market trends

Second source philosophy

Minimize inventory cost

Computer-on-Module concept for Medical Imaging

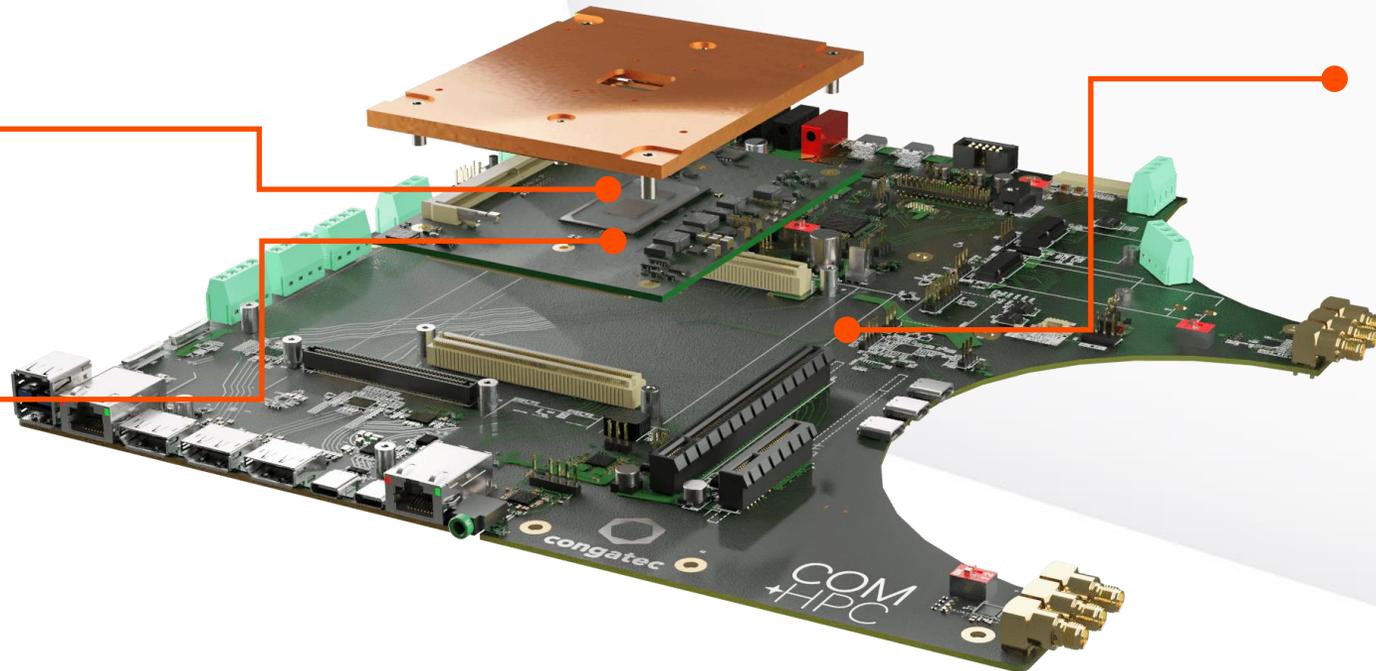


Compact, powerful, and extremely modular platforms

Processor module with standard PC functions (CPU, GPU, NPU)

Combines x86 & ARM designs

Carrier board with customer specific functions & sizes
Flexible GPU connections (onboard soldered, plugged)



-  Endoscopy
-  Ultrasonic
-  Xray
-  Computed Tomography
-  Magnetic Resonance Imaging (MRI)
-  Positron Emission Tomography (PET)

GPU / NPU

– GPU (Graphic Processor Unit)

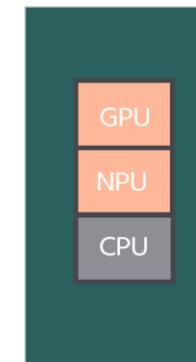
Dedicated GPUs usually offer higher throughput and process the most images per second. They were originally designed for graphics. Examples:

- Best performance for large tasks
- Intel Arc: Good combination of performance and speed (cost efficiency)
- Ideal for energy- and cost-saving applications (energy efficiency)



– NPU (Neural Processor Unit)

- While GPUs handle heavy AI tasks, NPUs are ideal for low-latency tasks and lighter AI with maximum cost savings
- The trend at the edge is toward integrated NPUs, with medium AI performance, AI software optimization, and good cost advantages



AI balance for performance / efficiency

GPU (Graphics Processing Unit)

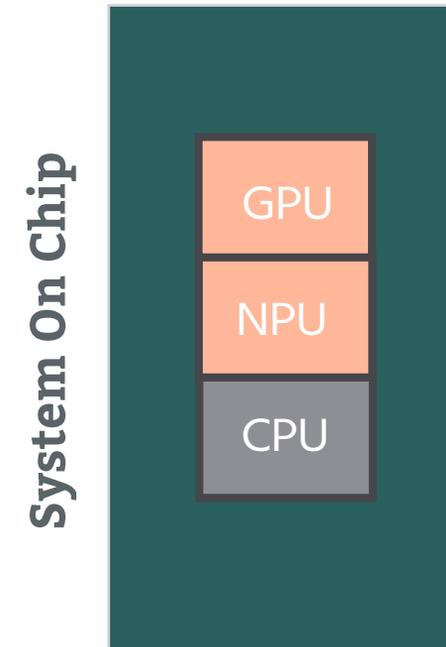
- Maximizes parallelism for graphics-heavy and generic AI applications
- High throughput, accelerates calculations

NPU (Neural Processing Unit)

- Optimized for AI algorithms with low power consumption (units can be switched off)
- For pattern recognition (speech, image/video changes)
- Inspired by neural network structure (matrix order)
- Energy-efficient optimized to work with low precision (e.g. INT8)

CPU (Central Processing Unit)

- Focus on versatility and sequential processes
- Optimized for control and decision logic, operating system
- Low latency



TOPS Comparison

TOPS – Tera Operations per Second

- GPU TOPS vs NPU TOPS
- FP32 vs. INT8 (Types of operations with varying degrees of precision)
- "Trainings" GPU TOPS to Inference GPU TOPS
- Total TOPS (CPU+NPU+GPU) vs (Single) TOPS (NPU)

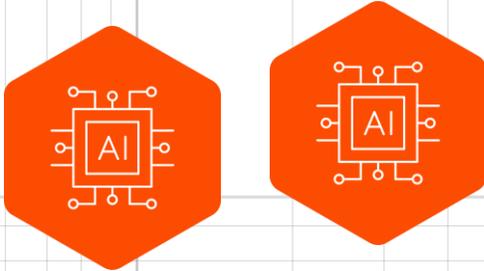
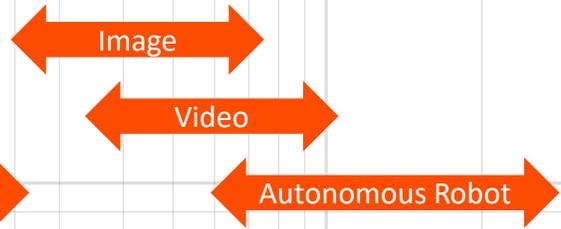
Consider better according to

- relevance depending on application
- Not only performance, but also energy consumption
- Search for independent benchmarks
- Check specifications and conditions
- Use experience from community and specialist forums
- Check manufacturer specifications very carefully

TOPS Positioning

Watt

100



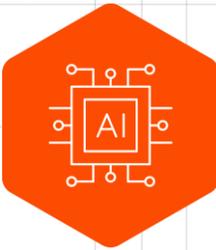
Future Generations
COM Express, COM-HPC & SMARC Modules

>100 TOPS
Next Gen

99 TOPS
Intel® Core™
Gen15



34 TOPS
Intel® Core
Gen14



<10 TOPS



1

10

100

1000

TOPs

Deep Learning vs Inference in Medical Imaging

Characteristic	Deep Learning (Training)	Inference (KI-Inferenz)
Purpose	Develop and train model	Apply model
Data	Large, annotated datasets	Individual, new data
computational effort	Very high	Low to moderate
Hardware	High-performance GPUs/TPUs	CPUs, integrated NPUs/GPUs
Application in Medical Imaging	Training a model for tumor detection	Real-time analysis of an ultrasound/endoscopy image

What are the benefits of inference in medical imaging?

- Real-time diagnoses during an ultrasound/endoscopy
- Supports radiologists in rapid analysis
- Improved precision and speed in detecting diseases

AI performance benchmark in medicine

The use cases for edge AI are diverse, making it difficult to find the right AI solution

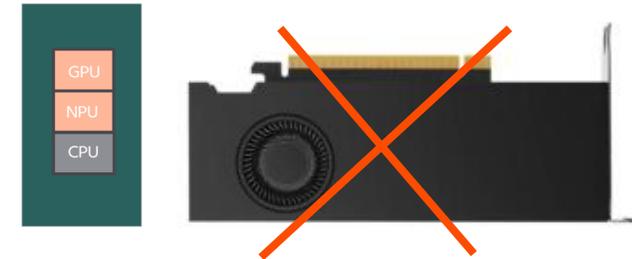
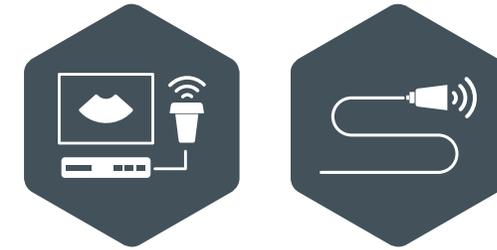
Medical Application	Criterion	Definition	Measurement	Scenario
Analysis of CT/MRI images	Throughput	Images per Second	Higher = Better	Processing large amounts of data
Realtime Ultrasound	Latency	Time between request and response	Lower = Better	Realtime-Analysis
Diagnosis on mobile devices	Efficiency	Energy and cost utilization	Higher = Better	Long-Term Operation

AI-supported Medical Imaging

More efficient diagnostics:

Strong shift in the medical imaging market from extended GPU cards to processors with integrated GPU + NPU (Neural processor units)

- AI-powered real-time analysis
- Delivers faster, more precise ultrasound results
- **Automates cross-sectional measurements and enhanced color markers**



Up to 20% increase in AI performance thanks to integrated iGPU & iNPU

Solution Brief



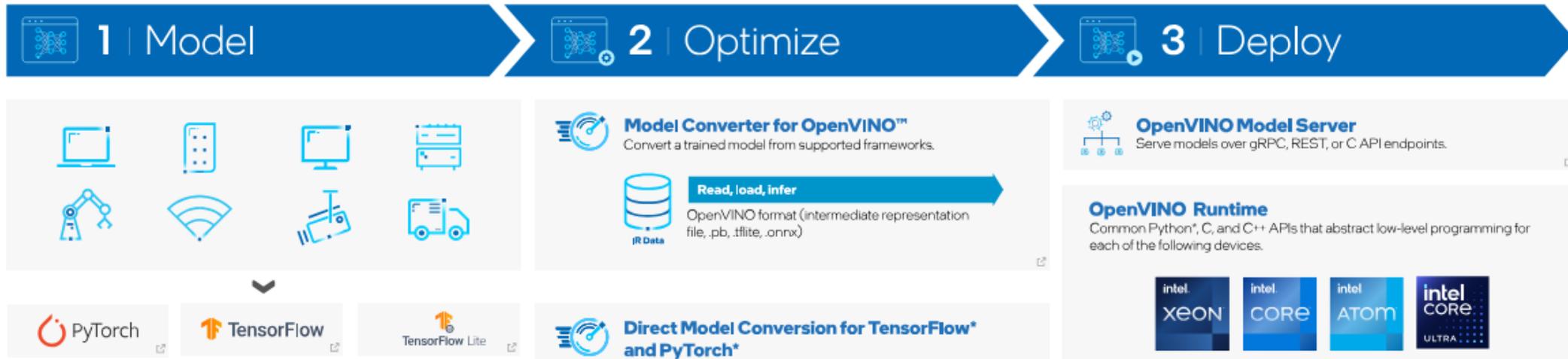
Health and Life Sciences Solution Architects / R&D Leads, Software Developers

congatec Adds AI to Ultrasound Systems with Intel®-Based Modules

conga-TC750 is based on COM Express standard and leverages heterogeneous computing capabilities of Intel® Core™ Ultra Processors (Series 2) to deliver a powerful, scalable, and field-upgradable module

New congatec/Intel paper
AI Powered Medical Imaging

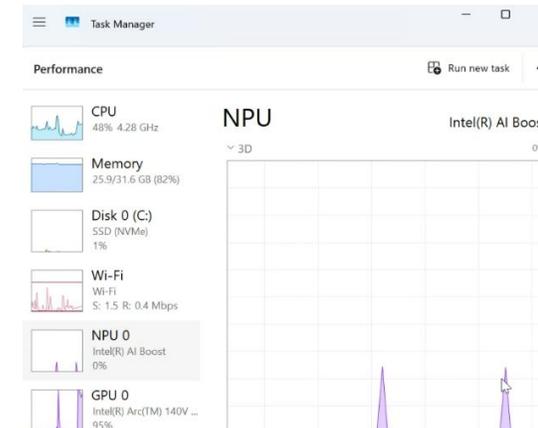
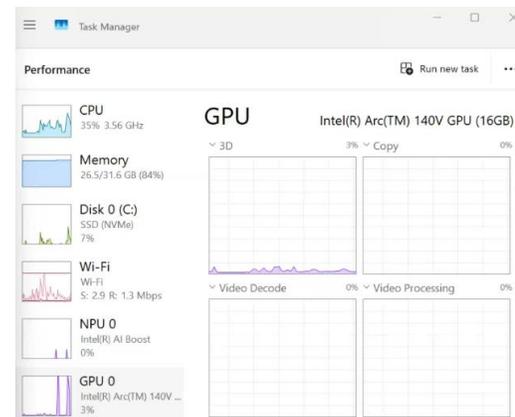
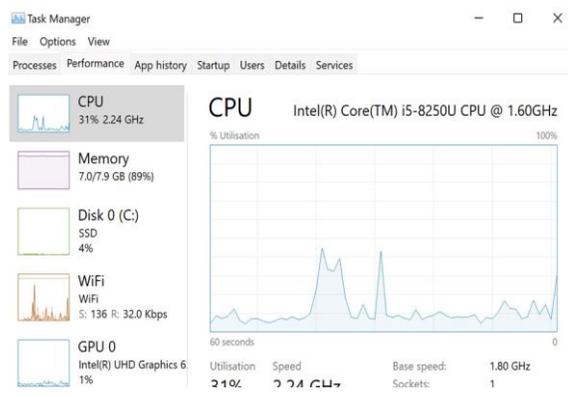
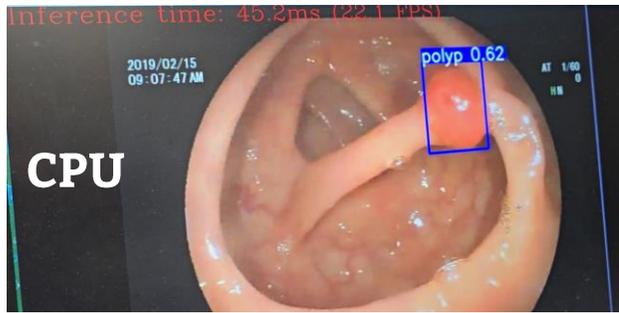
AI Software Tools



- Optimize AI models
- Run inference at the edge, faster, safer, and cost-efficient
- Enable real-time insights
- **Optimize workload of different AI models, on different Silicon (CPU/GPU/NPU), on onboard processor and/or external GPU cards**

Medical Imaging Demo congatec

The demo shows how choosing the right processing unit, CPU, GPU, or NPU, dramatically improves diagnostic speed, image fluidity, and system efficiency at the point of care.



Computer-on-Module conga-TC700 COM-Express



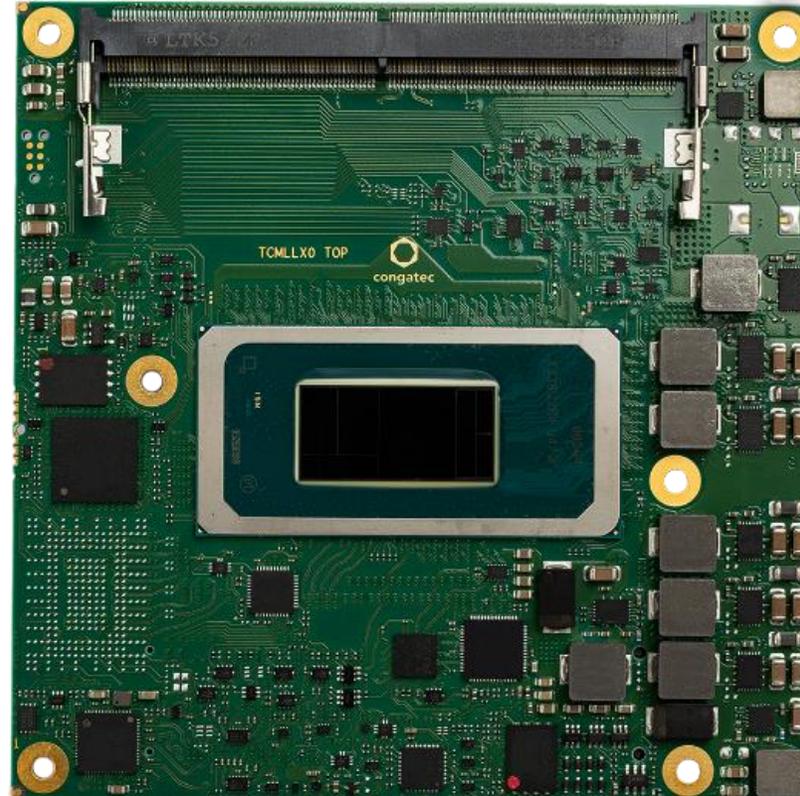
VIRTUALIZATION READY

Intel® Tile Architecture with incredible performance
34 TOPS

Intel® Arc™ Graphics 1.81x performance* | 128EU

PCI Express Gen 4

Best AI Performance/Watt with up to 2.56x*



CPU performance* 1.24x with up to 16 cores 22 threads on Intel 4 process

Intel® AI Boost Integrated AI Accelerator

USB4

Faster and more DDR5 96GB RAM 5600MT/s and in-band ECC



Intel® Core™ Gen14

Computer-on-Module conga-TC750 COM-Express



Drop-in upgrade to conga-TC700
with upgraded performance
99 TOPS

Multithreading CPU performance
+19% | New Lion Cove and Skymont
P- and E-Cores

Now with Core Ultra 9
Design scales from 15W up to 45W



Powerful integrated graphics with
graphics performance +20%
graphics cache upgrade +100%

The AI Era is here with up to 99 TOPS
total Edge AI performance enabled
by XMX Systolic Array GPU design

Customers can scale their designs
with additional performance without
a redesign



Intel® Core™ Gen15

congatec high-performance ecosystems



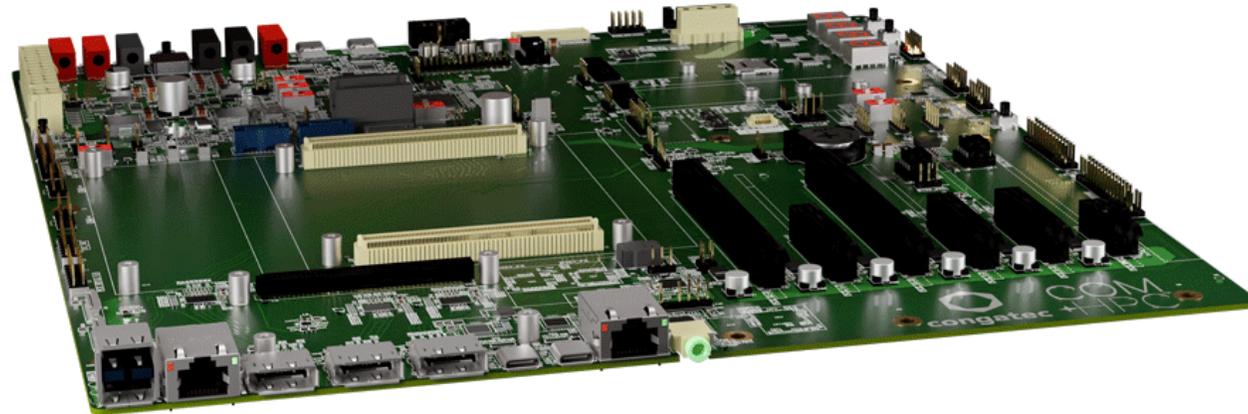
Cooling solutions



Modules & memory



Carrier boards



Module services & software

congatec high-performance cooling solutions



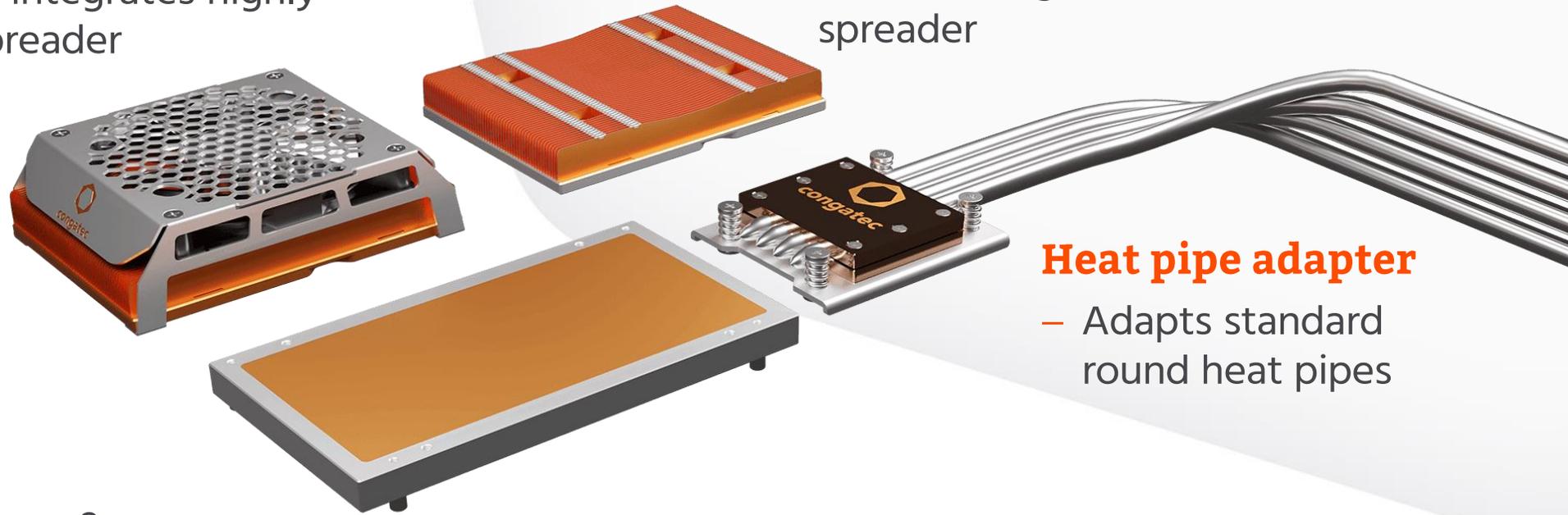
To fully exploit CPU performance & optimize MTBF

Active cooling solution (CSA)

- Adds cooling fins and integrates highly reliable fan to heat spreader

Passive cooling solution (CSP)

- Adds cooling fins to heat spreader



Heat spreader (HSP)

- Standardized dimensions & mounting
- High power versions utilize flat heat pipes or vapor chamber technology

Heat pipe adapter

- Adapts standard round heat pipes



Coolings

- Active Cooling Solution
- Heatspreader
- Heatpipe Adapter



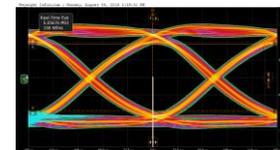
Evaluation Boards

- Reference boards
- Adapters



Services

- Design-In Training
- Reference Schematics
- Signal Integrity Simulation and Analysis
- Layout / Schematics Review
- Maintenance Packages



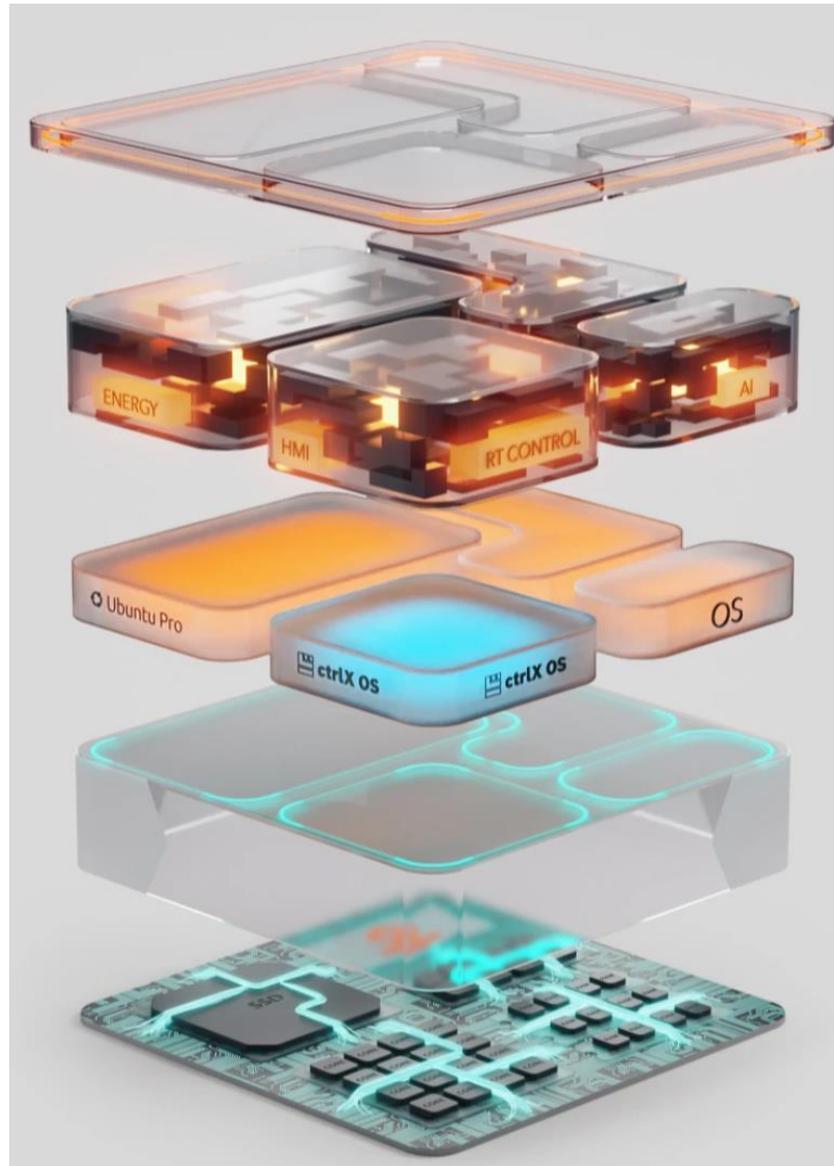
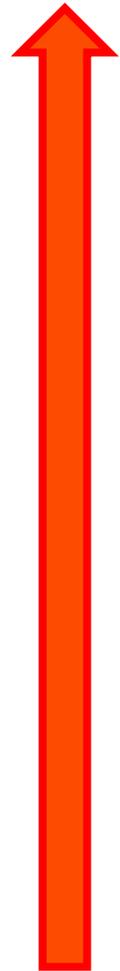
aReady

- Preinstalled Hypervisor
- Preinstalled Operating Systems: Ubuntu Pro, Bosch ctrlX
- IoT Suite



aReady. For medical Applications

aReady. simplifies the integration of AI, IoT connectivity, and security with high-performance embedded building blocks for faster application readiness.





Thank you for your attention

Dr. Zeljko Loncaric
MI Segment Manager Medical/Infrastructure

Summary

- AI transforms medical imaging with speed & precision
- CoMs provide scalable, flexible AI foundations
- aReady enables faster time-to-market

Goal

Smarter, more efficient medical devices



Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more information go to www.intel.com/benchmarks.

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