aReady – your cyber secure building block

Embedded Conference Finland 2024

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Agenda

1. **congatec in brief**

2. **Module overview**
   - Looking back the rearview mirror
   - COM-HPC
   - COM Express
   - SMARC

3. **Quick introduction on cybersecurity regulations**

4. **aReady**
   - Enabler for cyber security
   - aReady.VT, aReady.IOT, aReady.COM – which one to pick?

5. **Q&A**

congatec: Fact Sheet

12 congatec sites

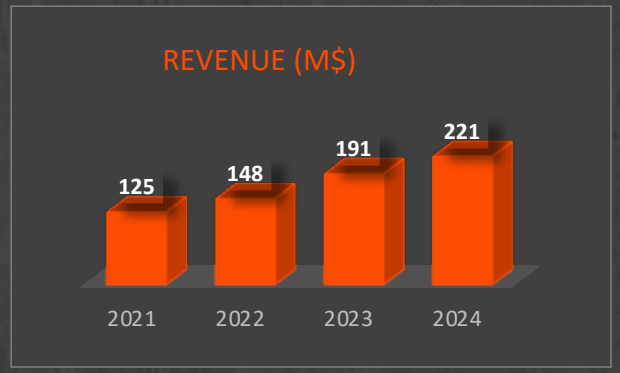
~370 Employees
1/3 in R&D and Tech Support

Founded 2004
Acquired by DBAG 2020

Headquarters
Deggendorf, Germany

Focused Specialist & Market leader

- Srongest COM Roadmap in the industry
- Best COM design-in support
- Highest design quality
- 700,000+ COMs shipped in 2023



Major Markets

- Automation
- Medical
- Entertainment
- Transportation
- Test & Measurement
- Robotics
- And most others …

>40 Sales Partner

>20 Solution Partner

Global & Fabless operations model

Multi-site, multi-continent scalable manufacturing to reduce risk, provide scale, and meet your requirements.
Romania, Taiwan, Thailand, Malaysia, Mexico (2024)

Strong Ecosystem and Innovation

- Strategic relationships with Intel, NXP, AMD, TI
- Innovator and thought leader
  - New standards driven by congatec (SGET, PICMG)

Global Ecosystem Partners

congatec

PICMG®

SGeT

Standardization

intel partner Titanium

AMD EMBEDDED SOLUTIONS Partner Program ELITE

NXP GOLD PARTNER

Texas Instruments

Processor Partners

rexroth A Bosch Company

American Megatrends

Microsoft

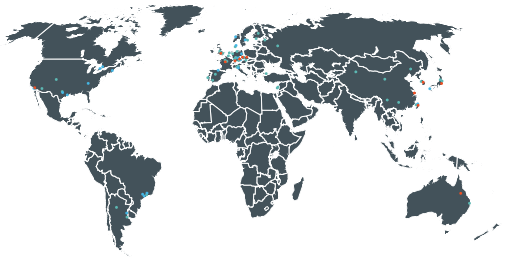
OSADL Open Source Automation Development Lab eG

REAL-TIME SYSTEMS

WNDRVR

yocto PROJECT

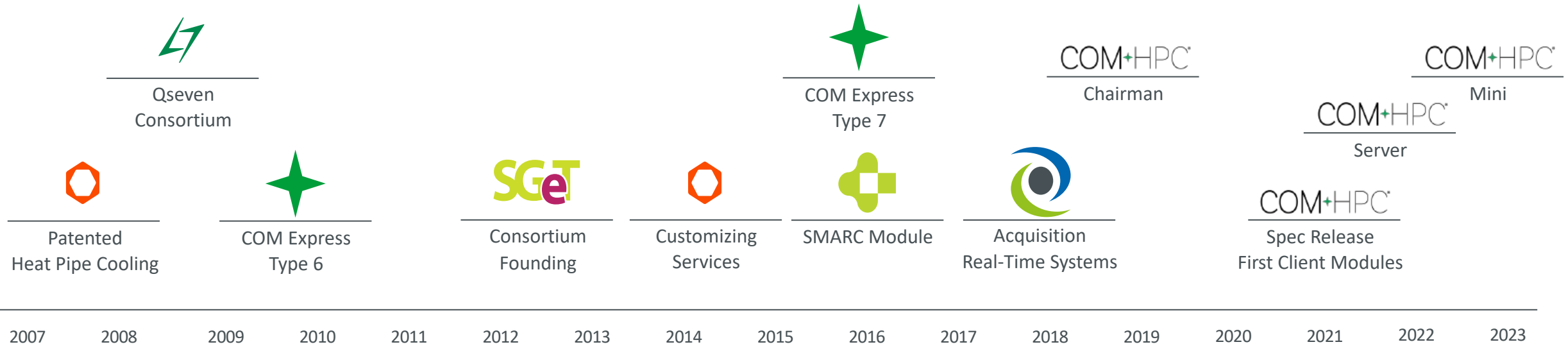
Software Partners



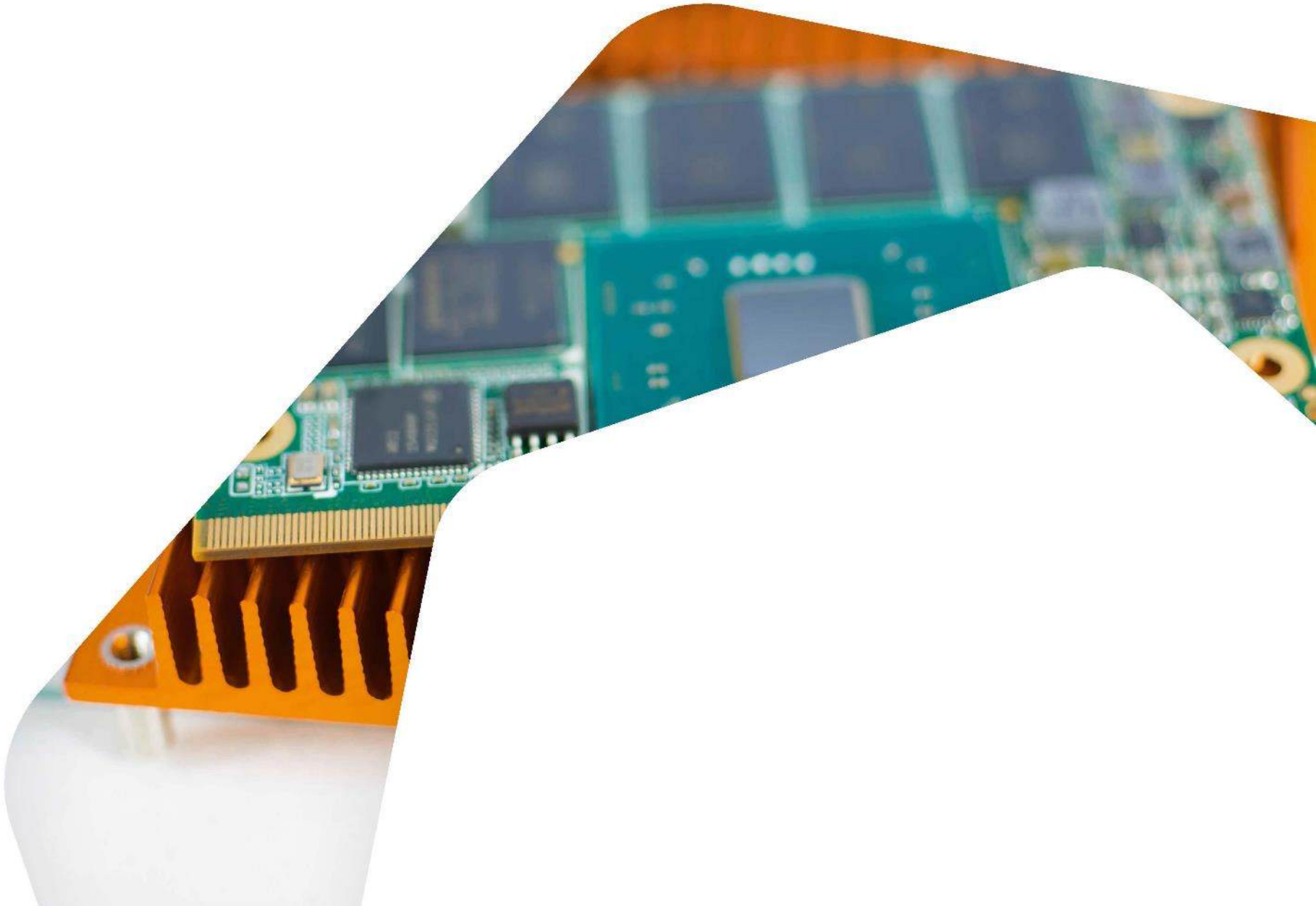
Sales & Solution Partners

Technology Leader

congatec has been Driving Industry Standards since 2005



Module overview

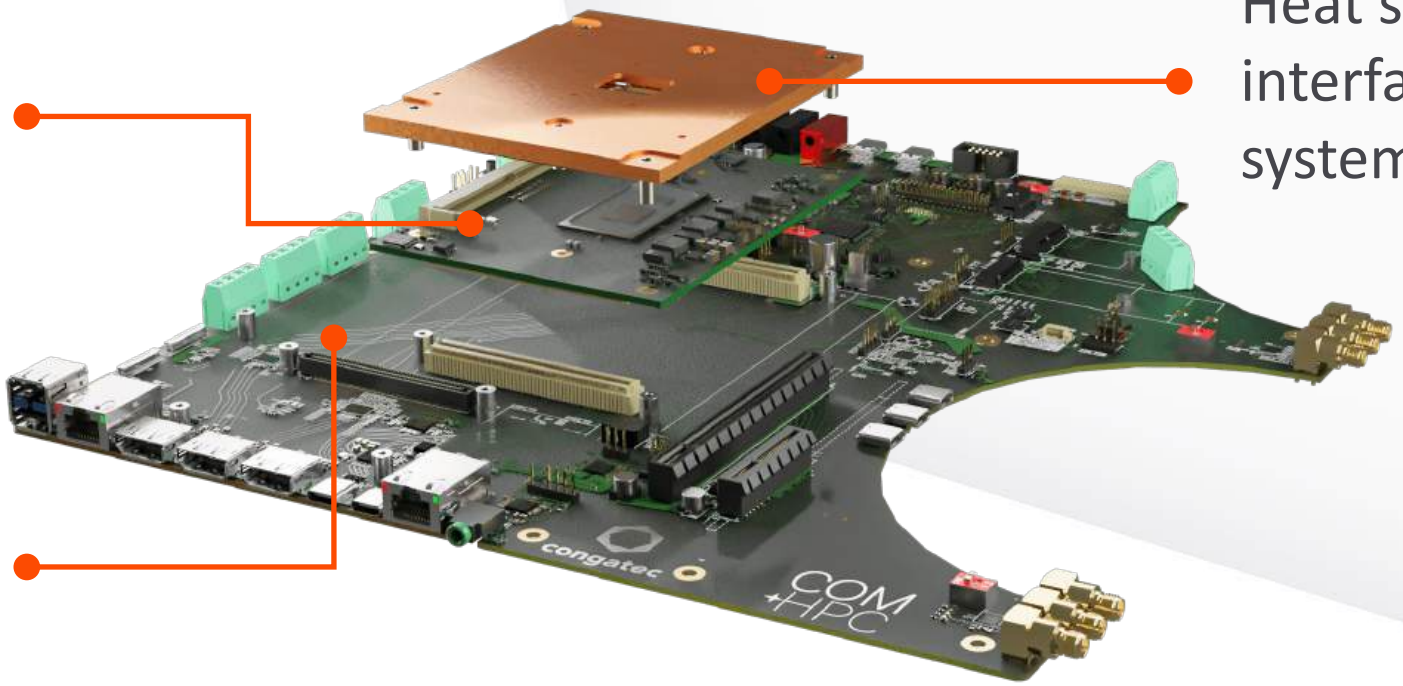


The modules – concept

Compact, powerful and extremely modular platforms

CPU module with standard PC core functions

Carrier board with customer specific functions & size



Heat spreader to interface to the system cooling

Computer-On-Module Concept

Separates standard and customized | Logical alternative to a chip-down design

The modules – benefits

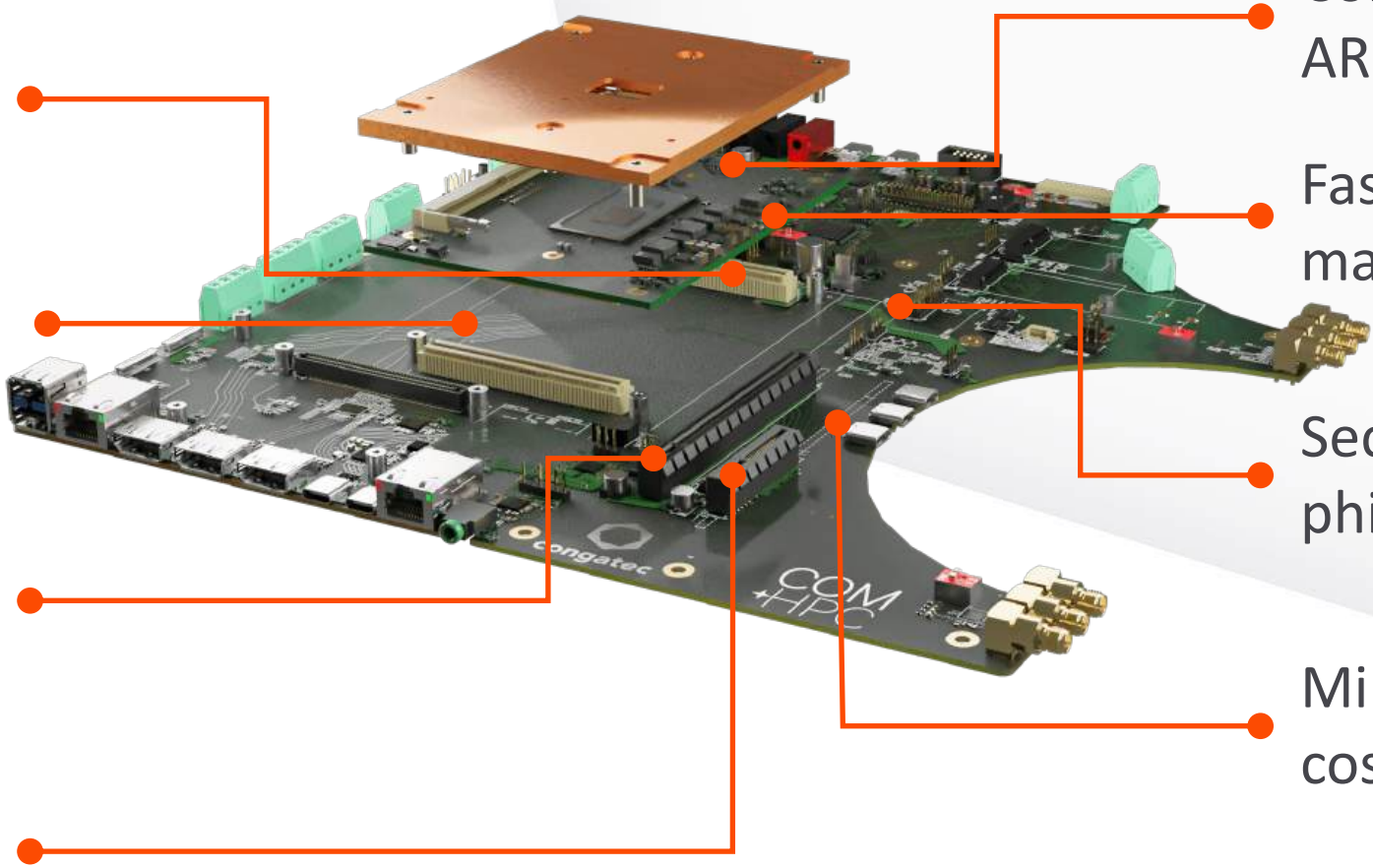
The advantages of open standard Computer-On-Modules

Faster
time to market

Reduced
development cost

Scalable
product range

Allows focus on
system features



Combine x86 &
ARM designs

Faster reaction to
market trends

Second source
philosophy

Minimize inventory
cost

Evolution of Open Computer-on-Module Standards

Compact, powerful and extremely modular platforms

Moore's Law for Computer-on-Modules

The number of transistors that fit on a specific Computer-on-Module form factor doubles approximately every 2 years.

A new era begins

x86/DOS/Windows conquer industrial applications

ModulAT
- AT/ISA96 bus
- 120 pins

9.54 MHz Intel CPU 80C88

Pentium III
Cracks 1 GHz limit

VIA Eden

Foundation of ETX-IG
Open specifications

ETX/XTX
- ISA/PCI bus
- 400 pins

Intel Pentium 4

COM Express
- Pure serial PCIe bus
- 440 pins a quantum leap
- Basic & Compact dominate

Basic

Compact

Intel Pentium M
The COMe milestone processor

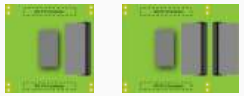
COM Express
Becomes PICMG standard

Server-on-Modules
Introduction of COM Express Type 7

COM-HPC

COM-HPC/Server
- Up to 64 x PCIe Gen 6
- 800 pins
- Headless
- 8 DIMM memory

Intel Xeon



COM-HPC/Client
- Up to PCIe Gen 6
- 800 pins
- Video/audio interfaces
- Up to 4 SODIMM memory

Performance

1993 2001 2005 2020 2024

The modules – open standards

SMARC

COM Express

Mini | Compact | Basic

Type 10 | 6 | 7

COM-HPC

Mini | Client

Size Mini | A | B | C

COM-HPC

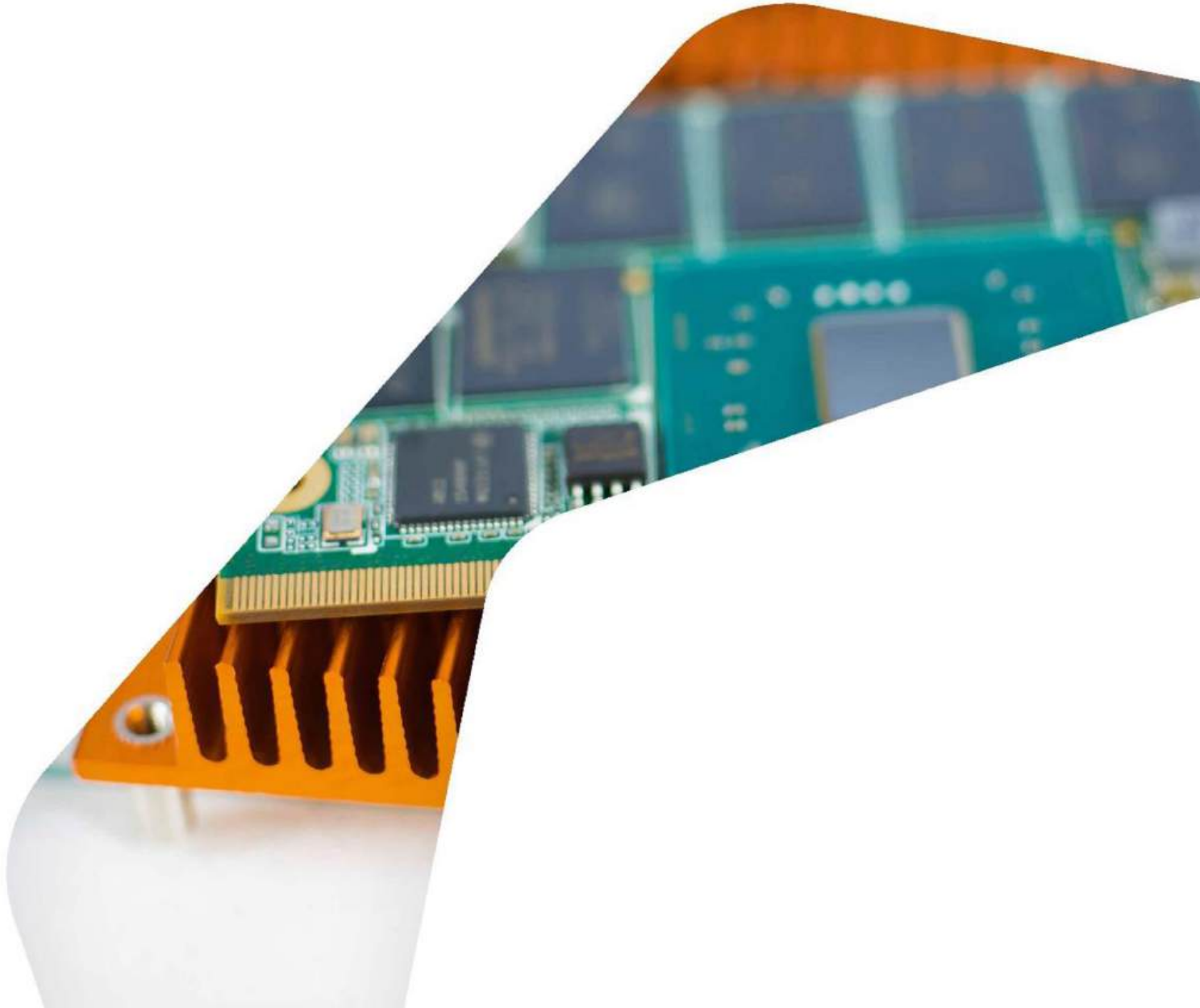
Server

Size D | E

COM-HPC

The game changer

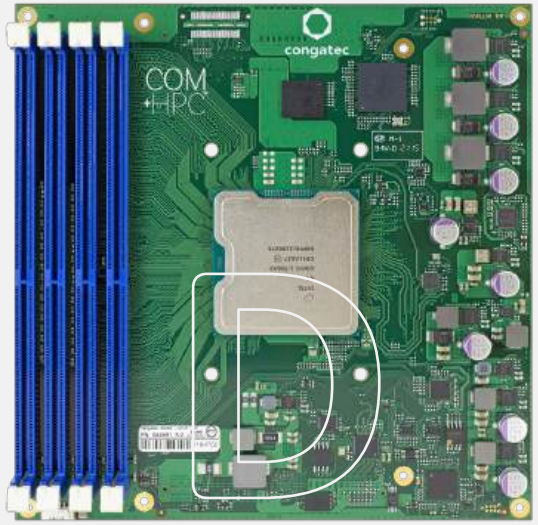
The ultimate choice for future-oriented digitization projects requiring highest bandwidth and performance



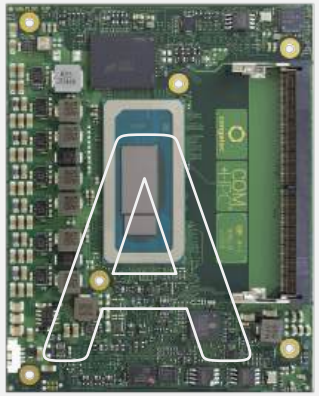
COM-HPC – sizes

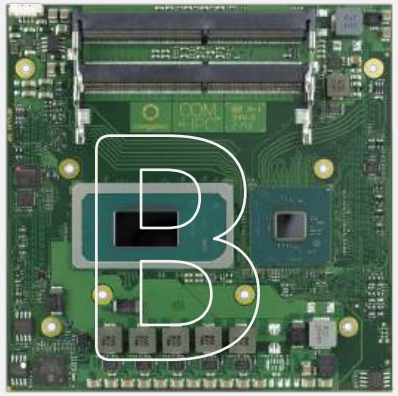
COM-HPC®

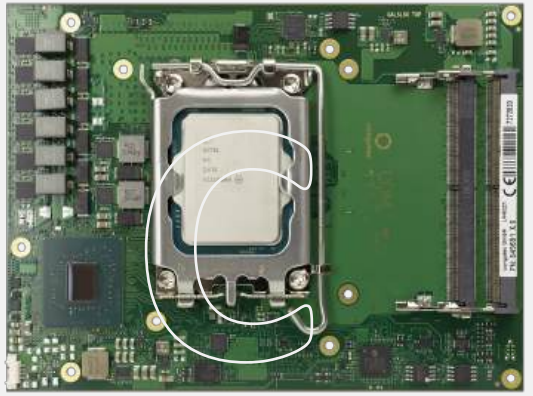
Server



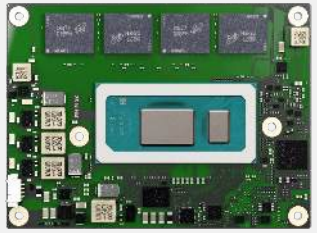
Client







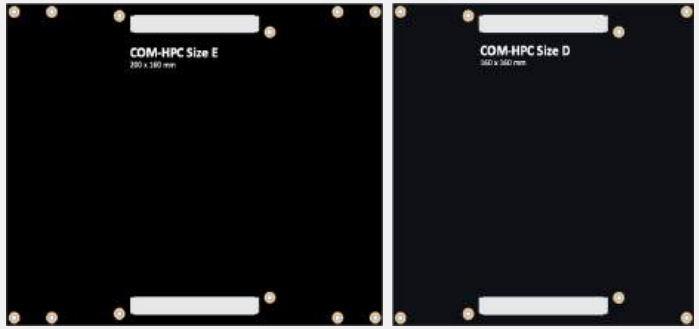
Mini



COM-HPC – types

COM-HPC Server

- 65x PCIe
- 2x USB 4.0
- 2x USB 3.1
- 4x USB 2.0
- 2x SATA
- 12x GPIO
- 2x UART
- eSPI, 2x SPI
- SMB, 2x I2C, IPMB
- 1x NBaseT (max. 10 Gb)
- 8x 25GBE KR
- Power 12V DC



COM-HPC Client

- 49x PCIe
- 4x USB 4.0
- 4x USB 2.0
- 2x SATA
- 12x GPIO, 2x UART
- eSPI, 2x SPI
- SMB, 2x I2C, IPMB
- 2x SoundWire, I2S
- 2x NBaseT (max. 10 Gb)
- 3x DDI
- eDP
- Power 8-20V DC
- 2x 25GBE KR

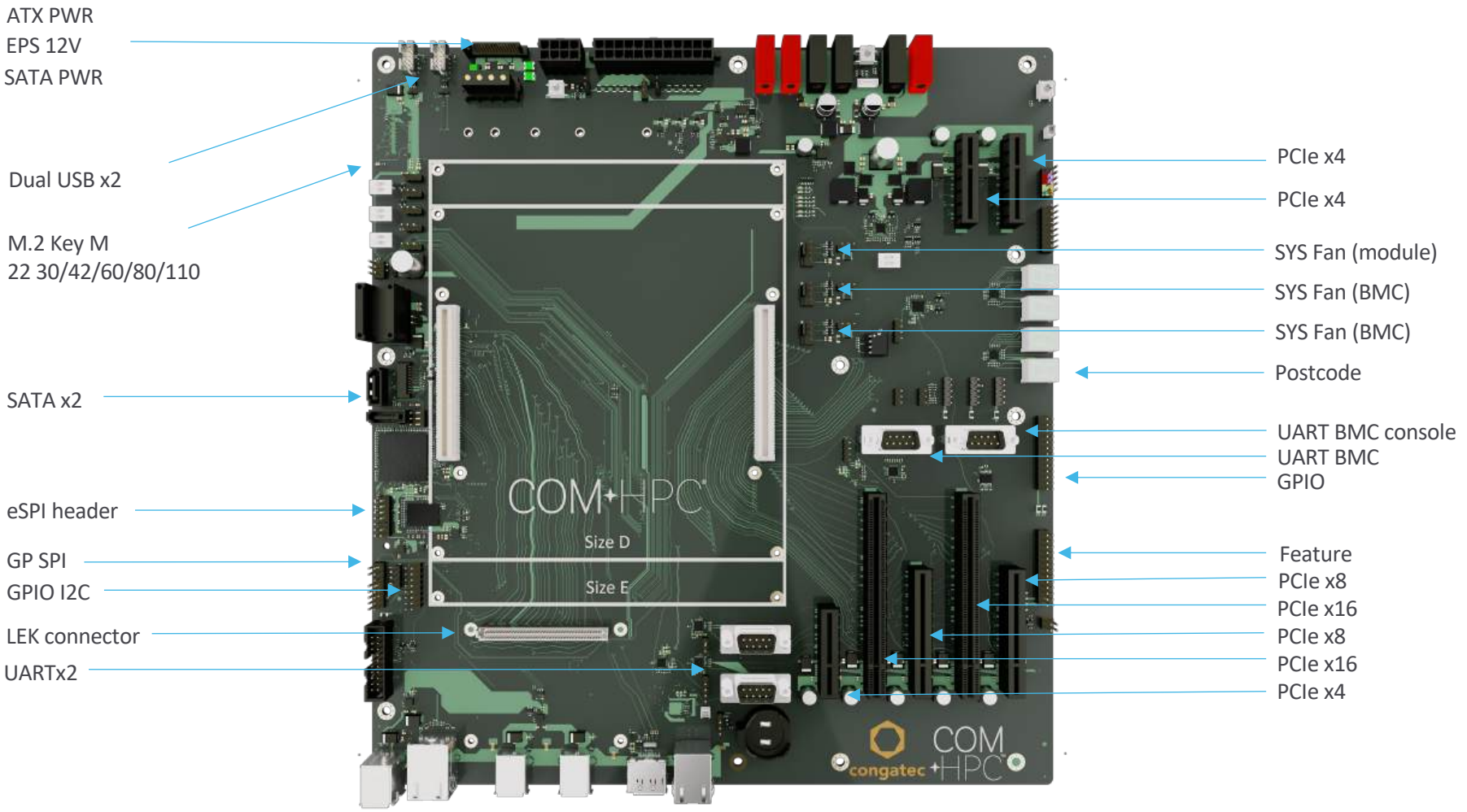
COM-HPC Mini

- 16x PCIe* with Target Support
- 4x USB4**
- 4x USB 3.2x1** / 2x USB 3.2 x2**
- 8x USB 2.0
- 2x SATA*
- 12x GPIO, 2x UART, 1x CAN
- eSPI, 2x SPI, SMB, 2x I2C
- 2x MIPI-CSI on flatfoil connector
- HDA/I2S, 2x SoundWire
- FuSa
- 2x NBaseT, 2x NBaseT Serdes*
- 2x DDI**, 1x eDP
- Power 8-20V DC

* Sharing with PCIe Lanes (16 in total)
** Sharing SuperSpeed Lanes (8 in total)

COM-HPC Server: Reference Carrier

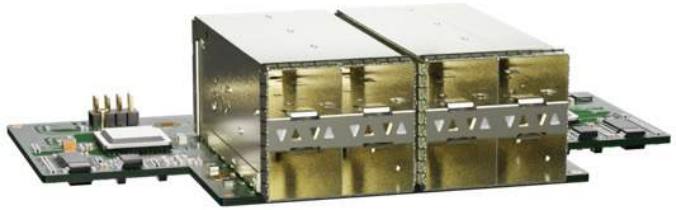
conga-HPC/Eval-Server Evaluation Carrier Board



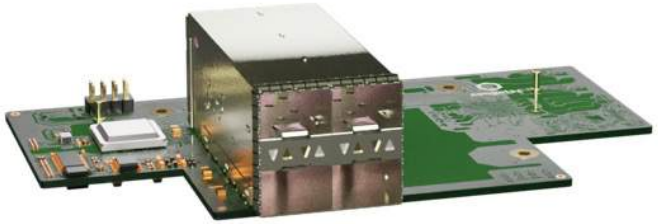
COM-HPC Server: conga-LEK‘s

Lan Enabling Kits – Mezzanine Cards for up to 100Gb Ethernet

PN065507
conga-HPC/LEK-8SFP28



PN065506
conga-HPC/LEK-C827-IM 8SFP+



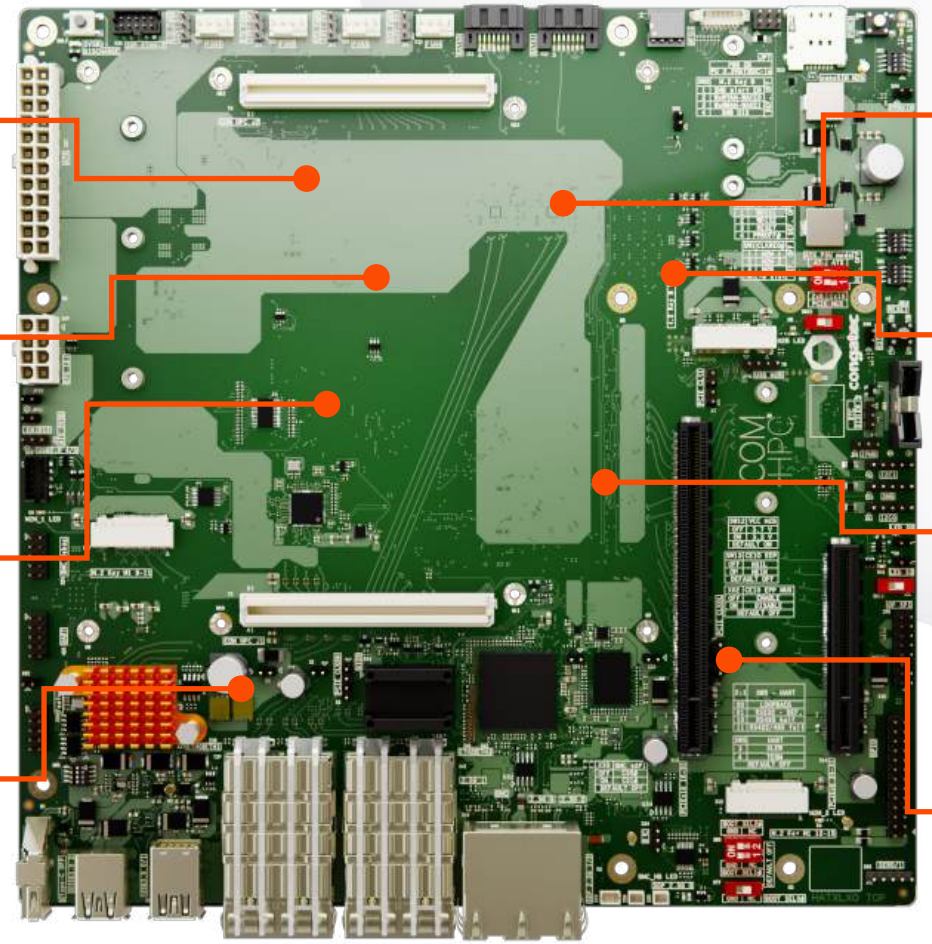
PN065505
conga-HPC/LEK-C827-IM 4SFP28

PN065508
conga-HPC/LEK-C827-IM 2QSFP28

PLUG LEK HERE

conga-HPC/uATX-Server

- Fully industrial application carrier for quick integration
- Designed with server application experts
- Massive Ethernet capability with 100GbE on 4x SFP28
- Scalability with conga-sILL and conga-sILH



- Highest feature-density on the market
- IPMI and 4x RJ45 connectors for 2.5GbE
- 2x PCIe connectors, 1x M.2 Key B, 2x M.2 Key M
- uATX form factor for integration in racks and common housings

conga-HPC/sILL: The COM-HPC Modules

- Perfect For Edge Computing and AI
- Maximum Throughput: Up to 100Gb Ethernet
- Flexible: 4-10 cores + 40-67W TDP
- Future Proof + Design Reuse
- Industrial Temperature Options
  + Industrial Use Condition

Intel® Ice Lake-D

conga-HPC/sILH: The COM-HPC Modules

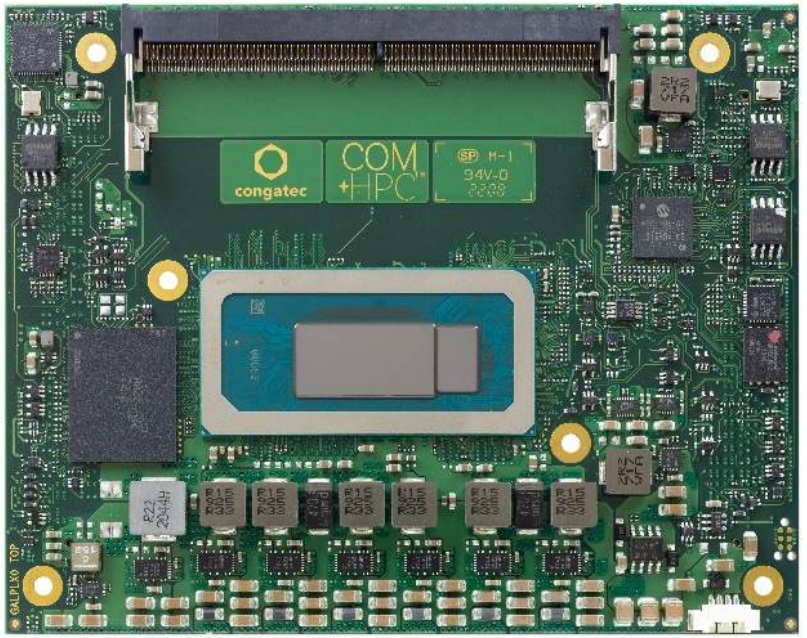
- Performance Champion – HPC, AI, 5G
- Maximum IO: 48x PCIe Lanes | 100Gb Ethernet
- Maximum Performance: Up to 125W | 22 cores
- Maximum Memory: Up to 512GB LRDIMM
- Extended Temperature (-40°C – 80°C)
  + Industrial Use Condition

Intel® Ice Lake-D

conga-HPC/cRLP: The COM-HPC Modules

COM-HPC Client Size A modules based on Intel 13th Gen

Format	COM HPC Client Type Size A (120*95mm)
Processor	13th Gen Intel® Core™ NEX mobile BGA Platform (U-, P-, H-series) | based on 15W, 28W, 45W TDP
Graphics	Up to Intel® Iris Xᵉ Graphics architecture with up to 96 EUs
Memory	2x DDR5 SO-DIMM sockets (up to 4800 MT/s) with max. 64 GB system capacity | optional onboard NVMe
Industrial Feature Set	3x DDI | eDP | HDA | 2x 2.5 GbE with TSN | x8 PCIe Gen5 (only on RPL-P H series | 2 x4 PCIe Gen4 | up to 8 PCIe Gen3 | 2x USB4 | 2x USB 3.2 Gen2x1 | 8x USB2.0 | up to 2x SATA | 2x UART | eSPI | 12x GPIO | SM Bus | I2C | GPSPI
Security	TPM | UEFI Secure Boot (optional) | Intel® Boot Guard (optional) | Intel® Platform Trust Technology
Operating Temp	Commercial temperature range 0°C to 60°C Industrial temperature range -40°C to 85°C
Intel Use Cond.	Embedded Broad Market Use Condition Industrial Use Condition with Ext. Temp



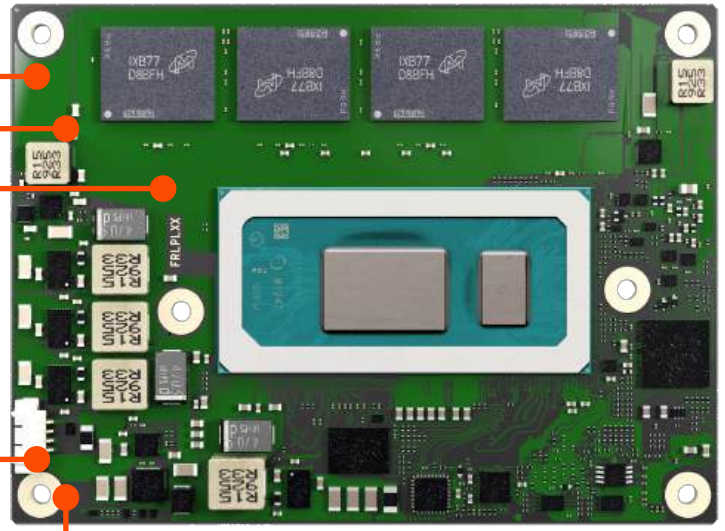
The Modules: COM-HPC Mini

COM-HPC®

congatec

The smallest high performance Computer-On-Module

- High Performance COM
- Small Size Mini 70x95mm
- 16x PCIe, USB4, 2x NBaseT
- Rich Video and Audio I/O
- High Speed 400 Pin Connector



conga-HPC/mRLP

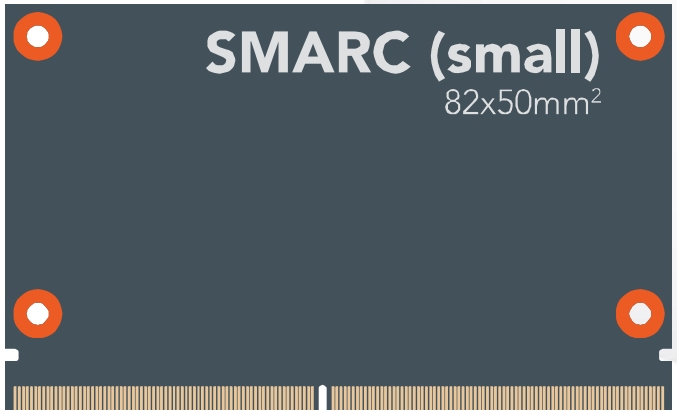
- 13th Generation Intel® Core™
- Intel® Xe graphics engine
- Rugged soldered processor
- Industrial temperature
- aReady

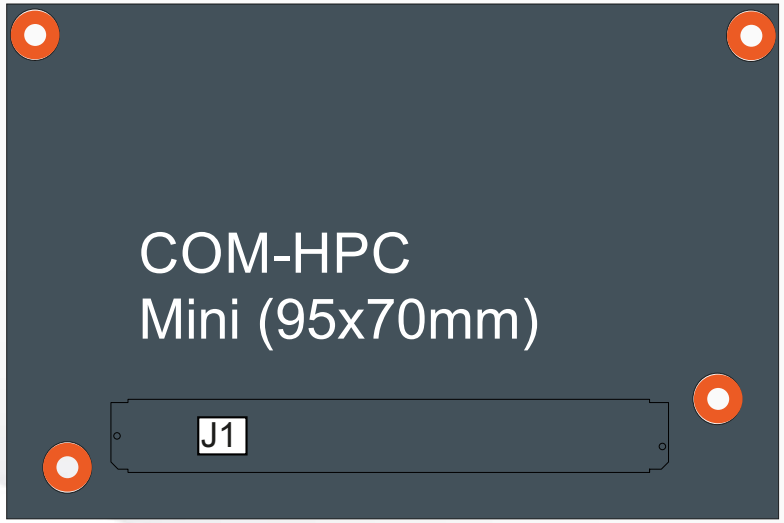
COM-HPC Mini

16x PCIe* with Target Support
4x USB4**
4x USB 3.2x1** / 2x USB 3.2 x2**
8x USB 2.0
2x SATA*
12x GPIO, 2x UART, 1x CAN
eSPI, 2x SPI, SMB, 2x I2C
2x MIPI-CSI on flatfoil connector
HDA/I2S, 2x SoundWire
FuSa
2x NBaseT, 2x NBaseT Serdes*
2x DDI**, 1x eDP
Power 8-20V DC

* Sharing with PCIe Lanes (16 in total)
** Sharing SuperSpeed Lanes (8 in total)

Size comparison





COM Express Mini

No USB4, only 4x PCIe
220 pins, max. 12W TDP

SMARC Module

Only 4 PCIe, No USB4
Power limitations
314 pins, max. 12W TDP

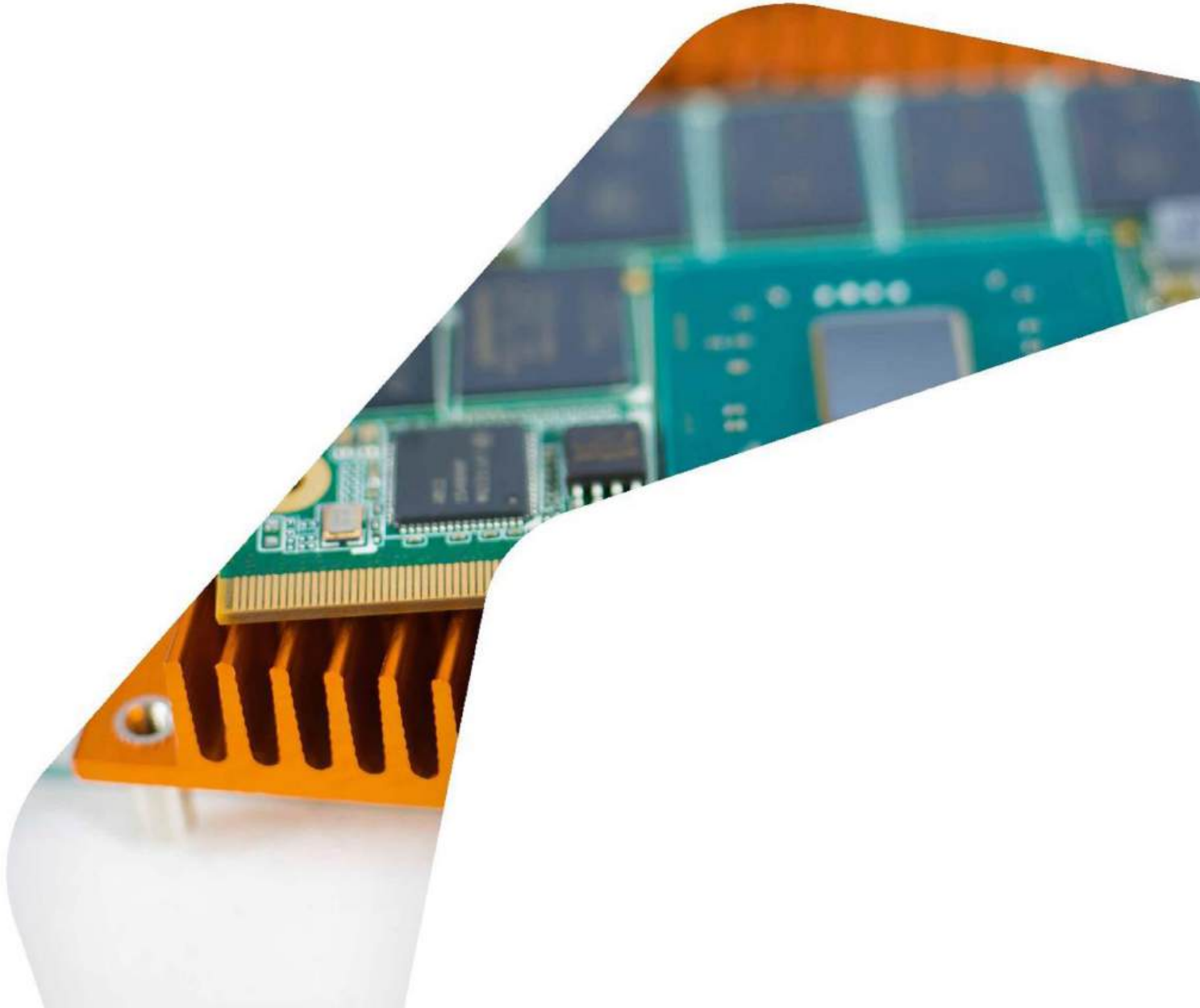
COM-HPC mini

16x PCIe Gen 5
USB4/TB support
400 pins, max. 28W TDP

COM Express

The most successful COM standard

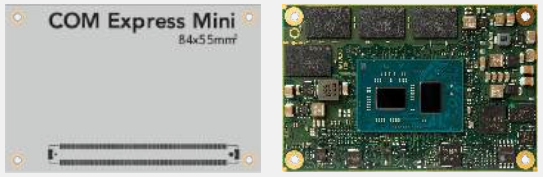
Simplify your designs with the most elaborated high-performance ecosystem



COM Express– types

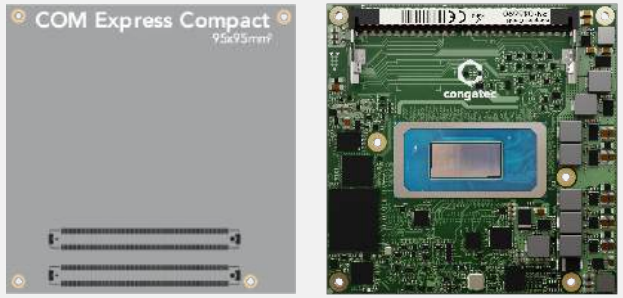
COMe Type 10

Gigabit Ethernet
LPC
4x PCIe
HDA
LVDS 1x24 / eDP
DDI
2x SATA
8x USB 2.0 / 2x USB 3.0
8x GPIO / SDIO
2x SER / CAN
SPI & I2C
Power



COM Express Type 6

Gigabit Ethernet	4x USB 3.0
LPC	
8x PCIe	
LVDS / eDP	PEG x16
HDA	
4x SATA	3x DDI
8x USB 2.0	
8x GPIO / SDIO	
2x SER / CAN	
SPI & I2C	
Power	Power



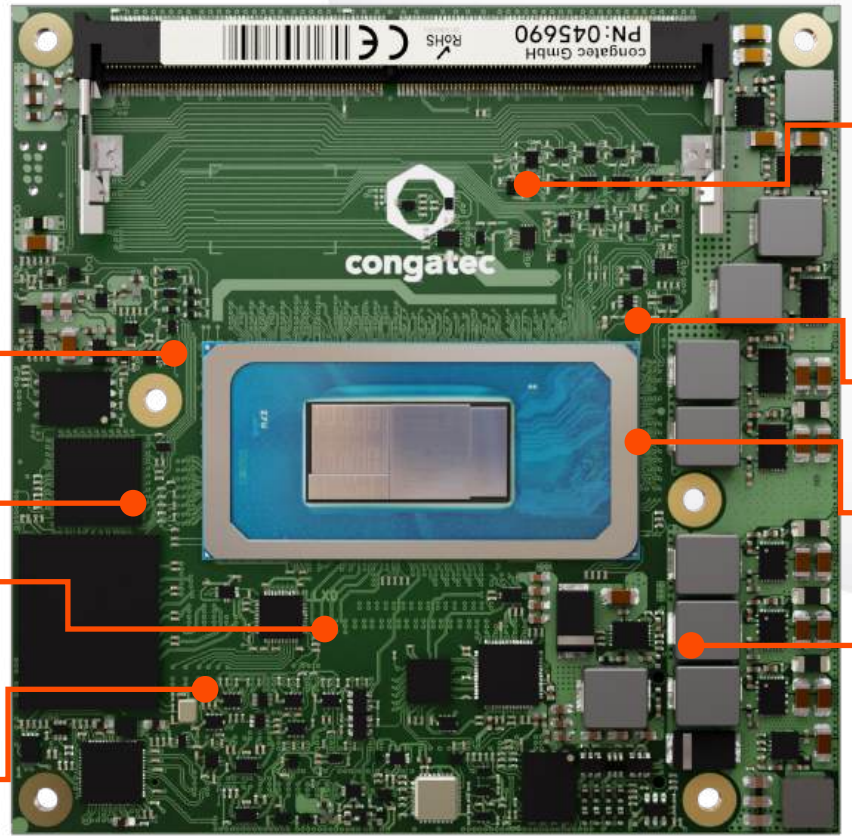
COM Express Type 7

Gigabit Ethernet	4x USB 3.0
LPC / eSPI	
32x PCIe	
2x SATA	4x 10GBaseKR
4x USB 2.0	
8x GPIO / SDIO	
2x SER / CAN	
SPI & I2C	
Power	Power

conga-TC700

VIRTUALIZATION READY

- Intel® Tile Architecture with incredible performance
- 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

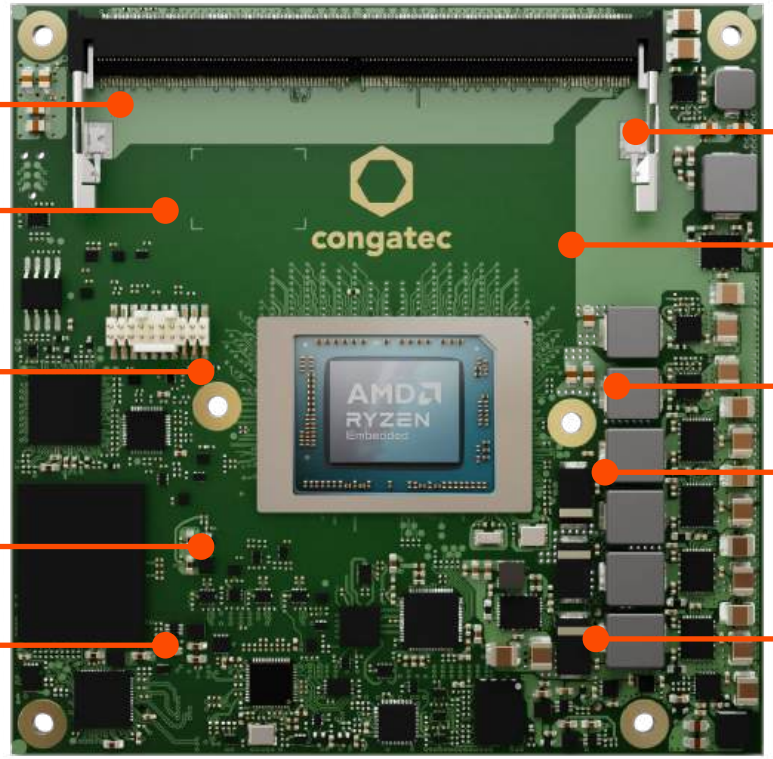
Compared to predecessor Platform.
Performance varies by use, configuration, and other factors. Learn more at intel.com/processorclaims. Results may vary

conga-TCR8

COMe Compact Module

VIRTUALIZATION READY

- XDNA NPU (16 TOPs) (39 TOPs for total SoC)
- Up to 8 Zen4 Cores (4nm) Up to 5.1GHz
- 10 Years availability Best Price / Performance
- TDP Range 15W to 54W
- Rich Multimedia: Up to 4 concurrent Displays



- RDNA3 graphics with up to 6 WGPs (12 CUs)
- Support for up to 128GB DDR5-5600 (with ECC)
- 6x PCIe Gen4 (8 Lanes) PEG x8 Gen4
- Onboard NVMe (option)
- Maximum interoparability for COMe application

AMD RYZEN EMBEDDED

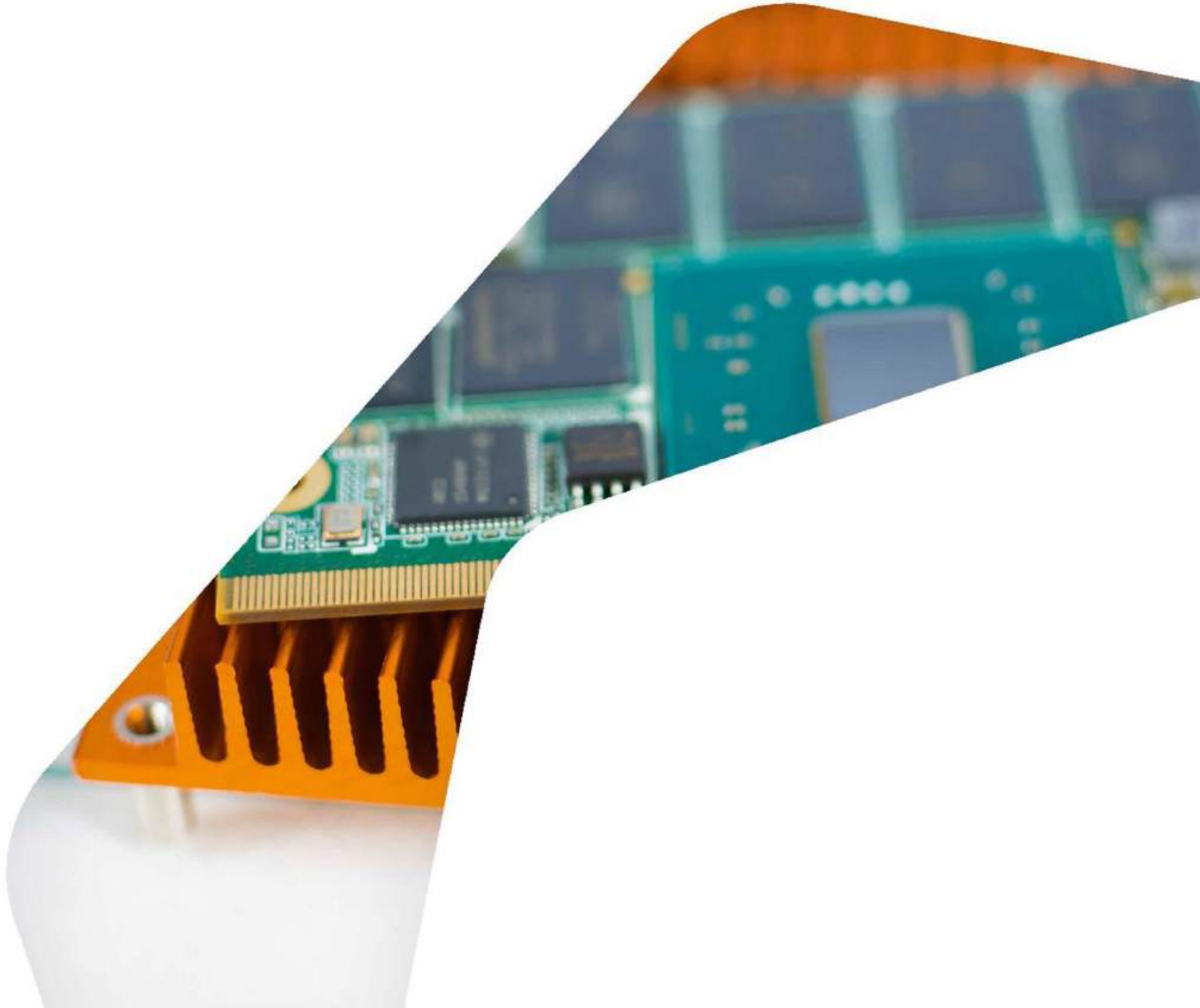
AMD EMBEDDED SOLUTIONS Partner Program ELITE

COM Express®

SMARC Module

The high-performance low-power standard

Ideal solution for size, weight, power and cost-optimized AI applications at the rugged edge

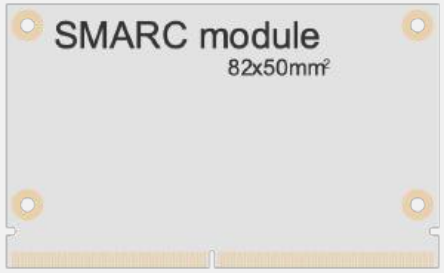


SMARC variants

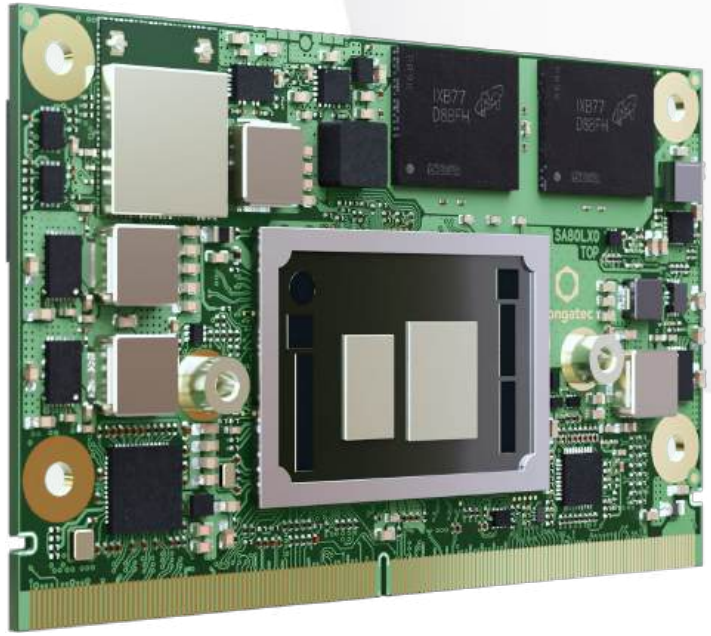
SMARC Module 2.2

- 4x Gigabit Ethernet1
- 4x PCIe1
- 4x MIPI CSI2
- HDA + 2x I2S
- 2x LVDS/eDP/MIPI DSI
- DP++/HDMI + DP++
- 1x SATA
- 6x USB 2.0 + 2x USB 3.0
- 14x GPIO + 1x SDIO
- 4x SER + 2x CAN
- eSPI + QSPI
- SPI & I2C
- Power

[1] 2x ETH & 4x PCIe or 4x ETH & 2x PCIe
[2] 2x Flatfoil Connector



x86



Arm variants

conga-SA8 SMARC Module

SMARC Module based on Intel Atom x7000RE processor series

Key Features

- **Up to 8 Atom cores full industrial**
  - Outstanding performance and parallel computing
  - Virtualization ready with RTS Real-Time Hypervisor
  - Extended temperature range -40°C to 85°C
  - AI Acceleration with Intel® Deep Learning Boost (VNNI)
- **Gen 12 UHD graphics**
  - up to 32EU w/ INT8 extension
  - 3 independent display pipes, up to 3x4Kp60 resolution
- **LPDDR5 4800 MT/s with in-band-ECC**
- **WiFi option available (Extended temp. / TSN)**
- **Extended longevity up to 10 years**

VIRTUALIZATION READY

intel partner Titanium

intel ATOM

SMARC module

SMARC 2.1
conga-SA8

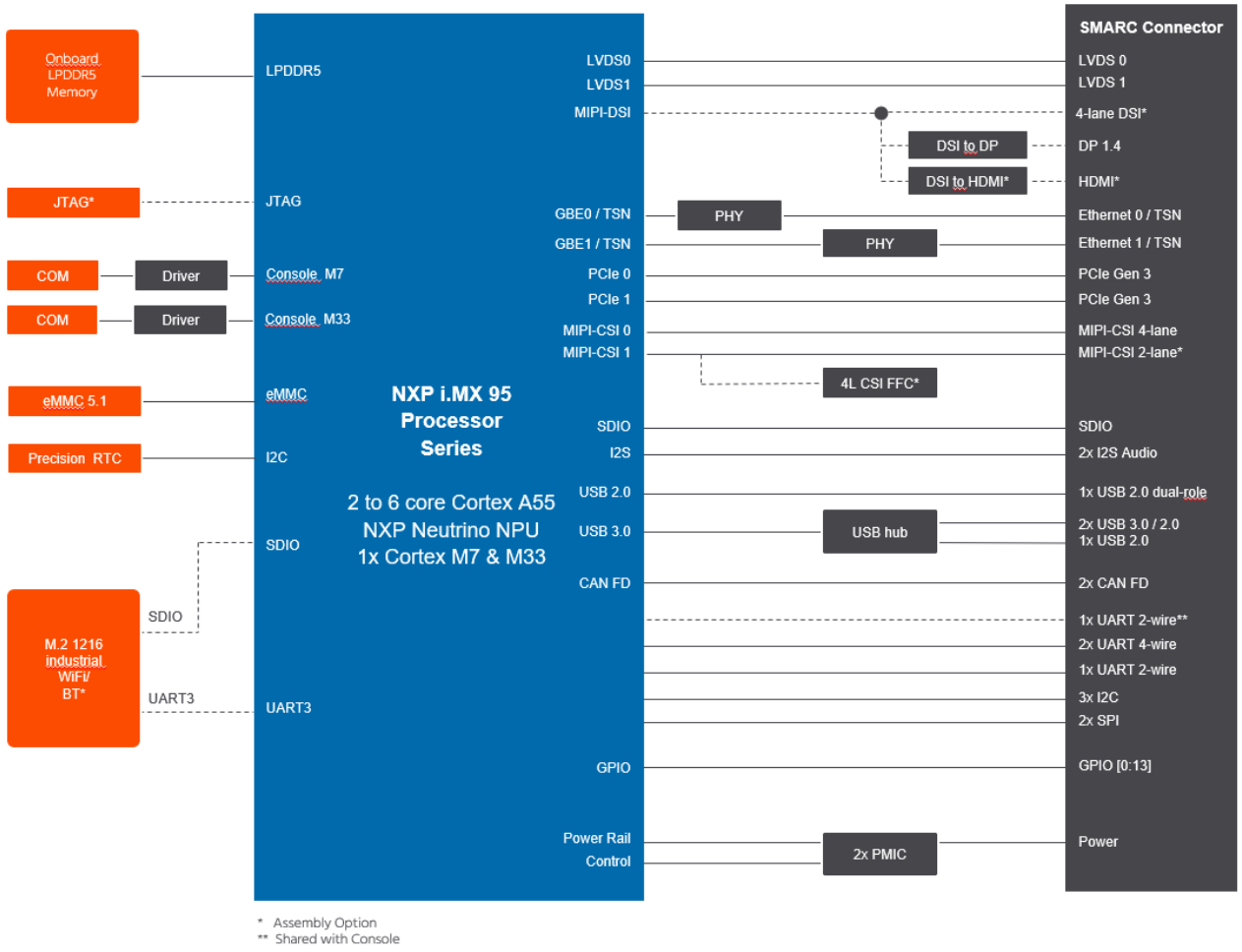
2x 2.5 GbE (TSN)
2x USB 3.2 Gen2
6x USB 2.0
SATA Gen 3.2
Up to 4x PCIe Gen3
3x I²C Bus
SPI
eMMC 5.1 (up to 256 GB)
pSLC mode (optional)
TPM 2.0
ACPI 5.0 compliant
WiFi 6E / BT (optional)

NXP i.MX 95 APPLICATIONS PROCESSOR Family

conga-SMX9 – NXP i.MX 95

SMARC Module for the Industrial Secure Connected Edge

- Heterogenous, multi-domain Arm® architecture combining low-power, real-time and secure high-performance processing
  - Up to 6x Arm® Cortex®-A55 | Cortex®-M7 | Cortex®-M7
  - Arm Mali GPU | OpenGL® ES 3.2 | Vulkan® 1.2 | OpenCL 3.0
  - NXP eIQ® Neutron neural processing unit (NPU) and a new image signal processor (ISP)
- eIQ® ML Software Development Environment with Machine Learning Tools supporting ML Inference Engines (TensorFlow Lite, DeepView RT, Glow…)
- NXP AI and Machine Learning Training Academy
- Rich IO
  - 2x GbE with real-time TSN and IEEE 1588 for precise, low latency control loops | optional NXP based Wifi/BT M.2 module
  - 3x USB 2.0 | 2x USB 3.0 | 2x PCIe Gen3 | 2x CAN FD
  - Native LVDS, MIPI-DSI or DP 1.4 (through bridge)
- Highest reliability for harsh environment applications | Industrial grade -40°C to 85°C
- Extended longevity up to 10+ years



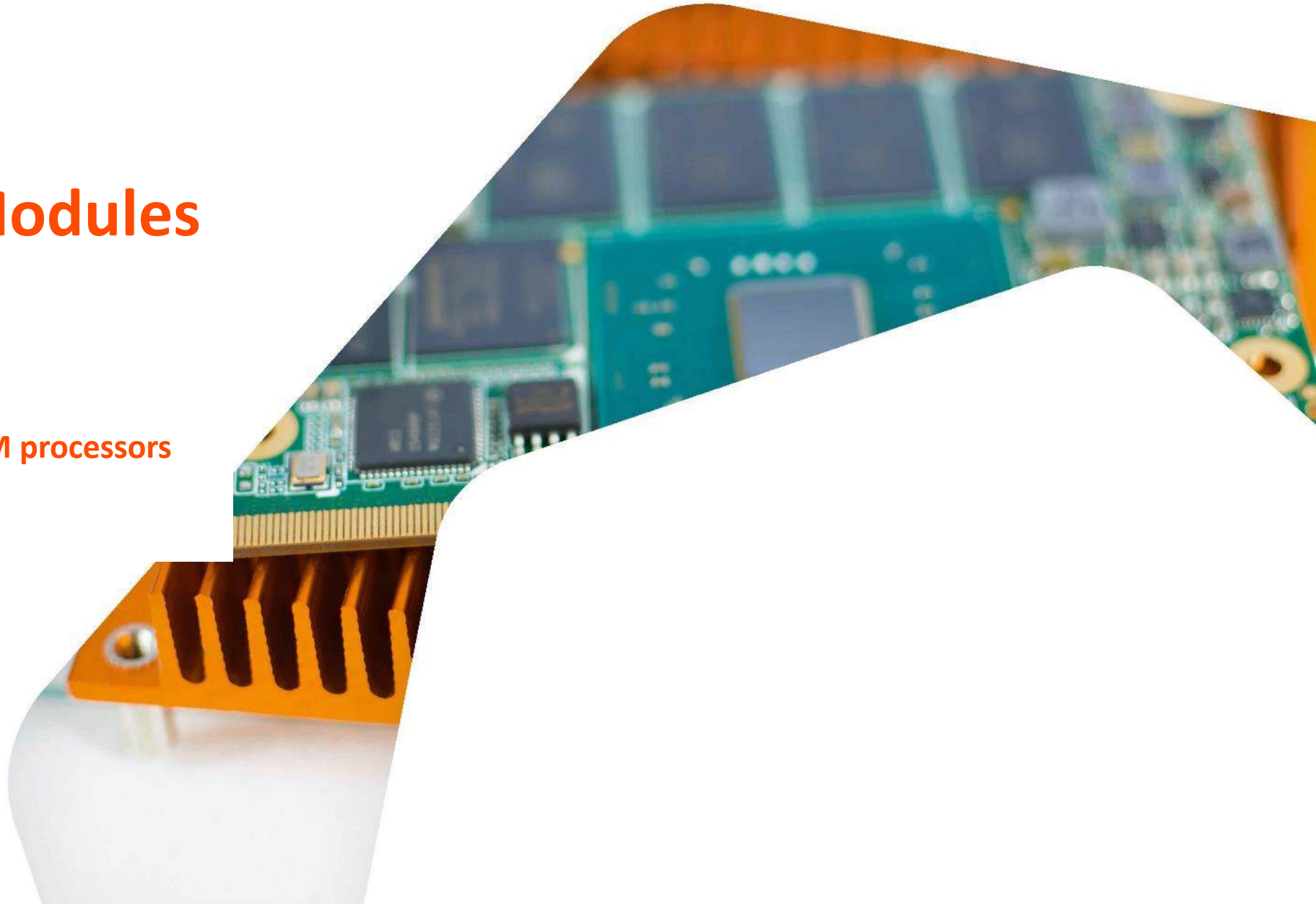
i.MX 8M Plus vs. i.MX 95: Comparison

Platform comparison based on congatec SMARC Modules

SMARC Module	conga-SMX8-Plus	conga-SMX9
Processor Series	NXP i.MX 8M Plus	NXP i.MX 95
Core	2-4 Arm Cortex-A53 / NPU 2.25 TOPS 1 Arm Cortex-M7	**2-6 Arm Cortex A55** / 1 Arm Cortex M33 / 1 Arm Cortex M7 / eIQ® Neutron NPU 1.0 TOPS
Graphics	Vivante® GC7000UL, 3D GPU, 16GFLOPS	ARM® Mali® 3D GPU, 50GFLOPS, 4K VPU
Memory	LPDDR4, inline ECC	LPDDR5, inline ECC
Display	LVDS, **HDMI 2.0a**, MIPI-DSI	LVDS, MIPI-DSI or DP **(HDMI only on demand!)**
Camera	2x 4-lane MIPI-CSI w/ISP, 375 Mp/s	Up to 2x 4-lane MIPI-CSI w/ISP, 500 Mp/s
Security	EdgeLock® Assurance	EdgeLock® Secure Enclave
PCI Express	1x x1 PCIe Gen 3, 4x USB3	2x x1 PCIe Gen 3, 3x USB3
Ethernet	2x GBE, 1x with TSN	2x GBE with TSN, optional 10GbE USGMII
T operation	-40° to 85°C	-40° to 85°C
SW support	Yocto / Android (congatec Git-Server)	Yocto / Android (congatec Git-Server)

TI based ARM Modules

SMARC Module based on TI ARM processors



conga-STDA4 – TI Jacinto™ 7 TDA4VM

SMARC Module driving the intelligent Edge

- Heterogenous Arm® architecture
  - 2x Arm® Cortex®-A72
  - 6x Arm® Cortex®-R5F | C7 DS | 2x C66 DSP
  - Matrix Multimedia Accelerator for Deep Learning
- 8 TOPS Deep Learning Starter Kit for Edge AI Applications supporting TensorFlow, ONNX Runtime, TVM, Docker, ROS…
- Rich IO
  - 2x GbE with real-time TSN
  - 3x USB 2.0 | 2x USB 3.0 | 4x PCIe Gen3 | 2x CAN FD
- Highest reliability for harsh environment applications | Industrial grade -40°C to 85°C
- Extended longevity up to 10+ years

SMARC module

Texas Instruments

SMARC 2.1
conga-STDA4

2x GbE with TSN
QSPI
eMMC
2x MIPI CSI2 4L / ISP
I2S 0-1
1x dual-role USB 2.0 | 2x USB 2.0 | 2x USB 3.0
4x PCIe Gen3
GPIO 0-14 / SDIO
LVDS 2x24 / DP / MIPI-DSI
SER 0-4
SPI / I²C / CAN FD
Power PMIC

Module services

Definition Phase

- Design-in training
- Design guides
- Reference schematics
- Support for COM selection
- Carrier board component selection

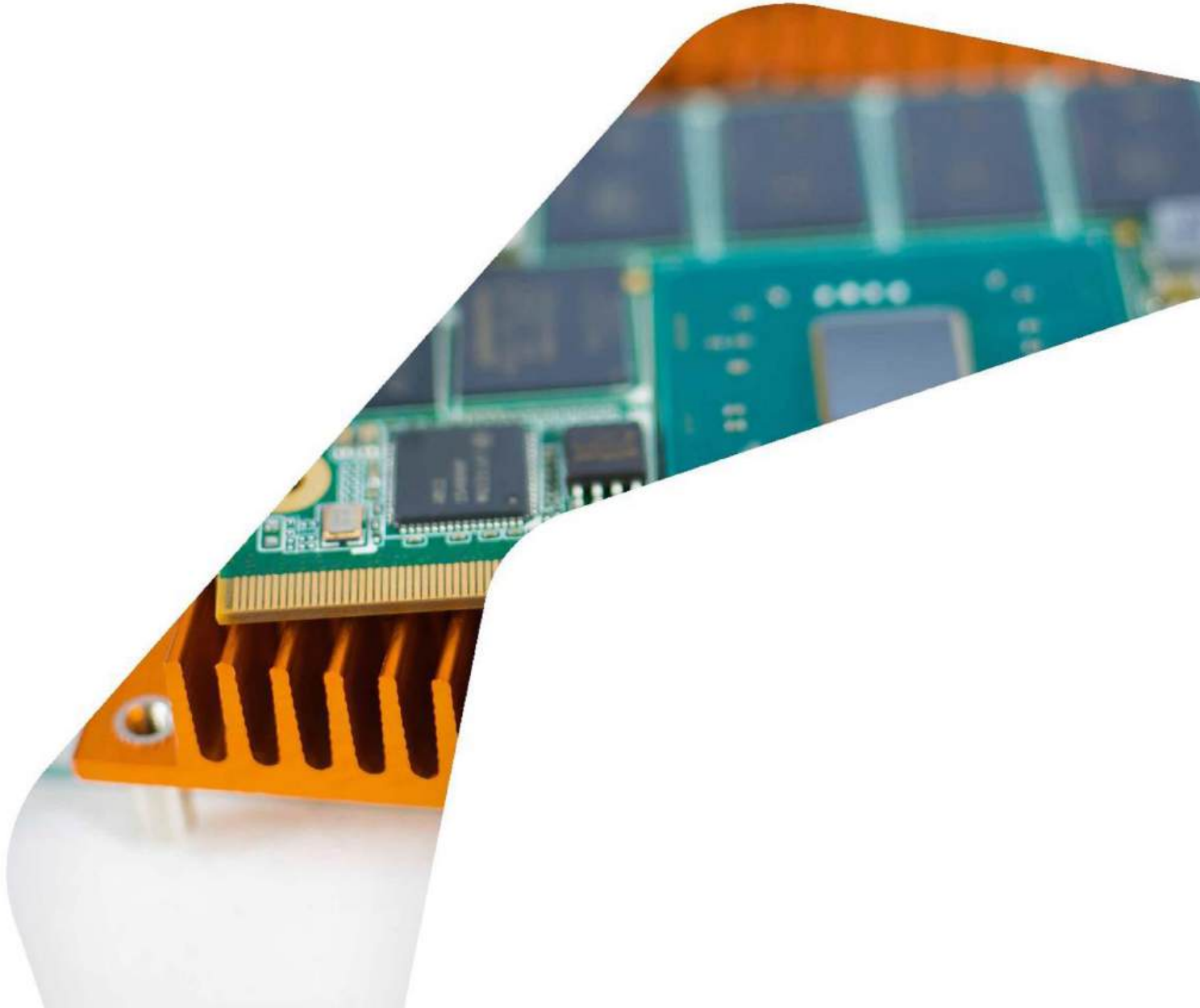
Design Phase

- Schematic review
- Signal integrity simulation
- Layout review
- Bring-up support & debugging
- BIOS customization

Validation Phase

- Pre-compliance measurement
- MTBF calculation
- Support for EMC measurement
- Thermal solutions & support
- Customized standard article handling

Cybersecurity Basics



Cybersecurity Basics

(Cyber) Security	≠	(Functional) Safety
Cybersecurity is the application of technologies, processes, and controls to protect systems, networks, programs, devices and data from cyber attacks.(1)		Functional Safety (FS) is the safeguard against hazards resulting from faulty and interrupted functionality.(2)

(1) https://www.itgovernance.co.uk/what-is-cybersecurity
(2) https://www.tuv.com/landingpage/en/functional-safety-meets-cybersecurity/main-navigation/functional-safety/

CIA-Triade

Confidentiality

Preserving authorized restrictions on information access and disclosure, including means for protecting personal privacy and proprietary information.(1)

Availability

Ensuring timely and reliable access to and use of information.(1)

Integrity

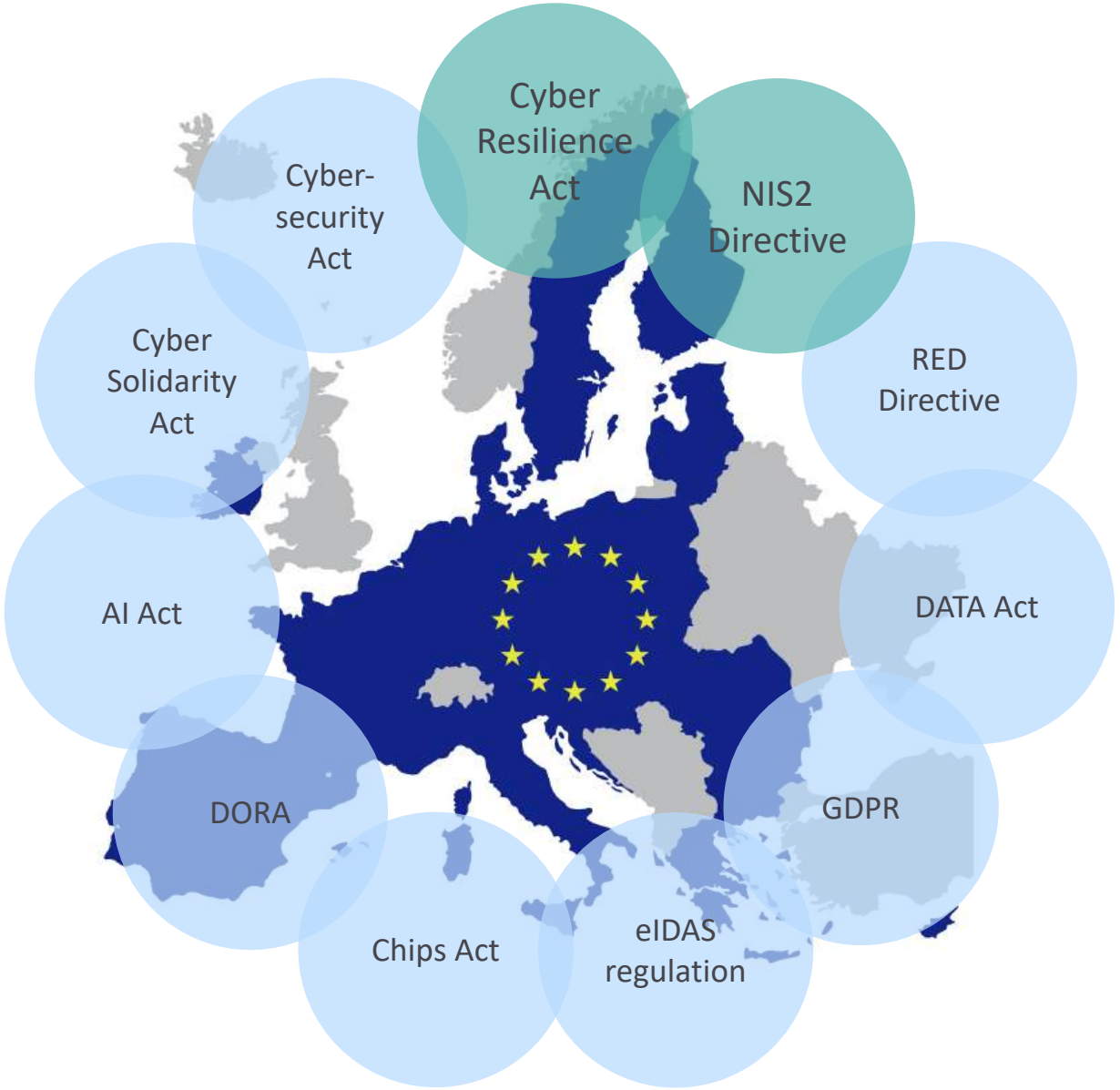
Guarding against improper information modification or destruction and ensuring information non-repudiation and authenticity.(1)

(1) https://www.nccoe.nist.gov/publication/1800-26/VolA/index.html

Important definitions

Standard	EU Directive	EU Regulation
Usually created by industry commitees Compliance is usually voluntary	A "directive" is a legislative act that sets out a goal that EU countries must achieve. It is up to the individual countries to devise their own laws.	A "regulation" is a binding legislative act. It must be applied in its entirety across the EU.
ISO, IEC, …	NIS2, RED, …	CRA, AI Act, Data Act, …

Cyber Security Regulations Overview

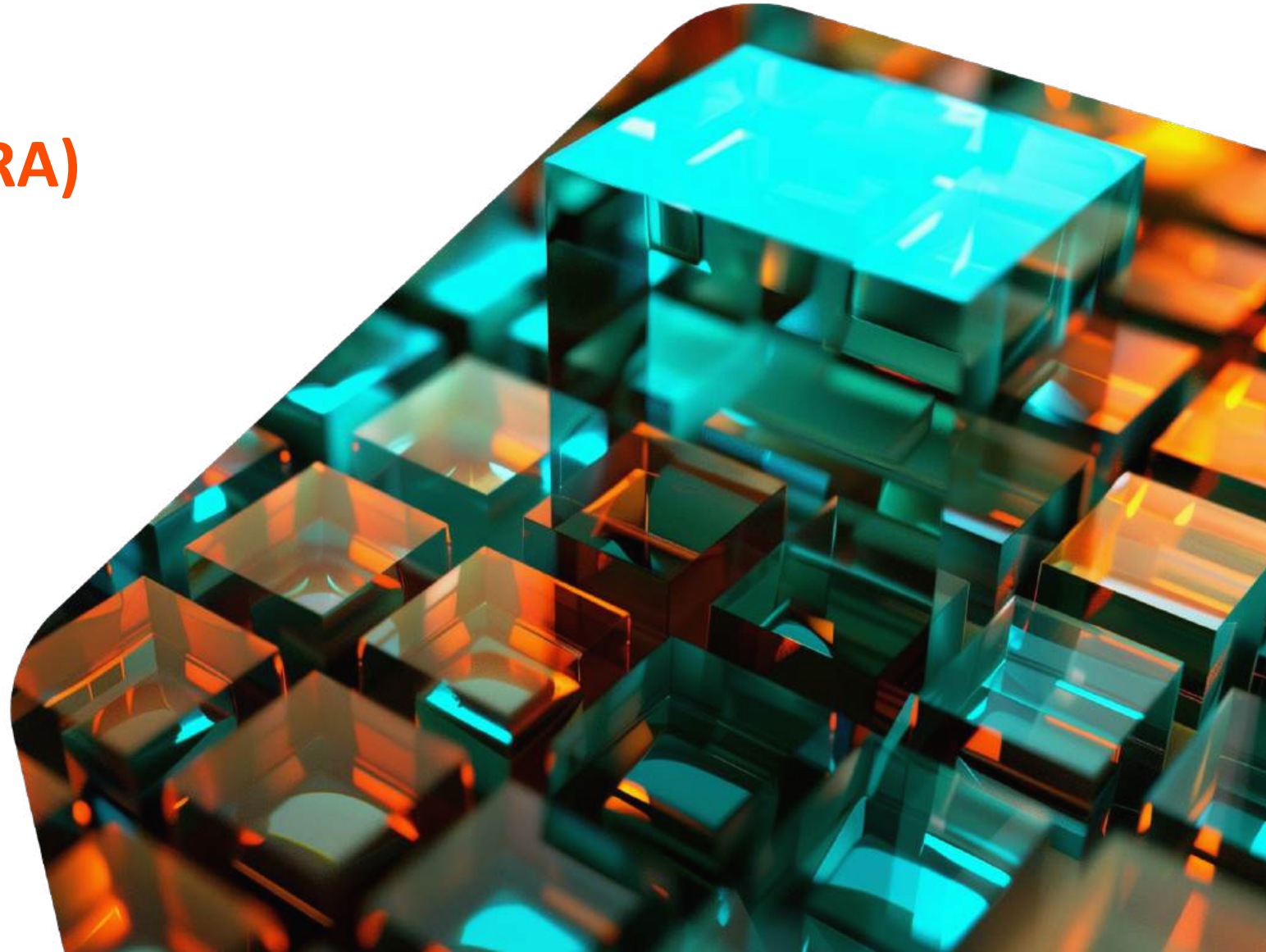


U.S. Cyber Trust Mark

UK PSTI

Product Security and Telecommunications Infrastructure (Product Security) regime

EU Cyber Resilient ACT (CRA)



Who is affected?

congatec

Manufacturers

Manufacturers must **design, develop, and produce** their products in accordance with the **essential cybersecurity requirements.**

Distributors

Distributors are required to **verify** that the **products** they supply in the market **comply** with the **CRA**.

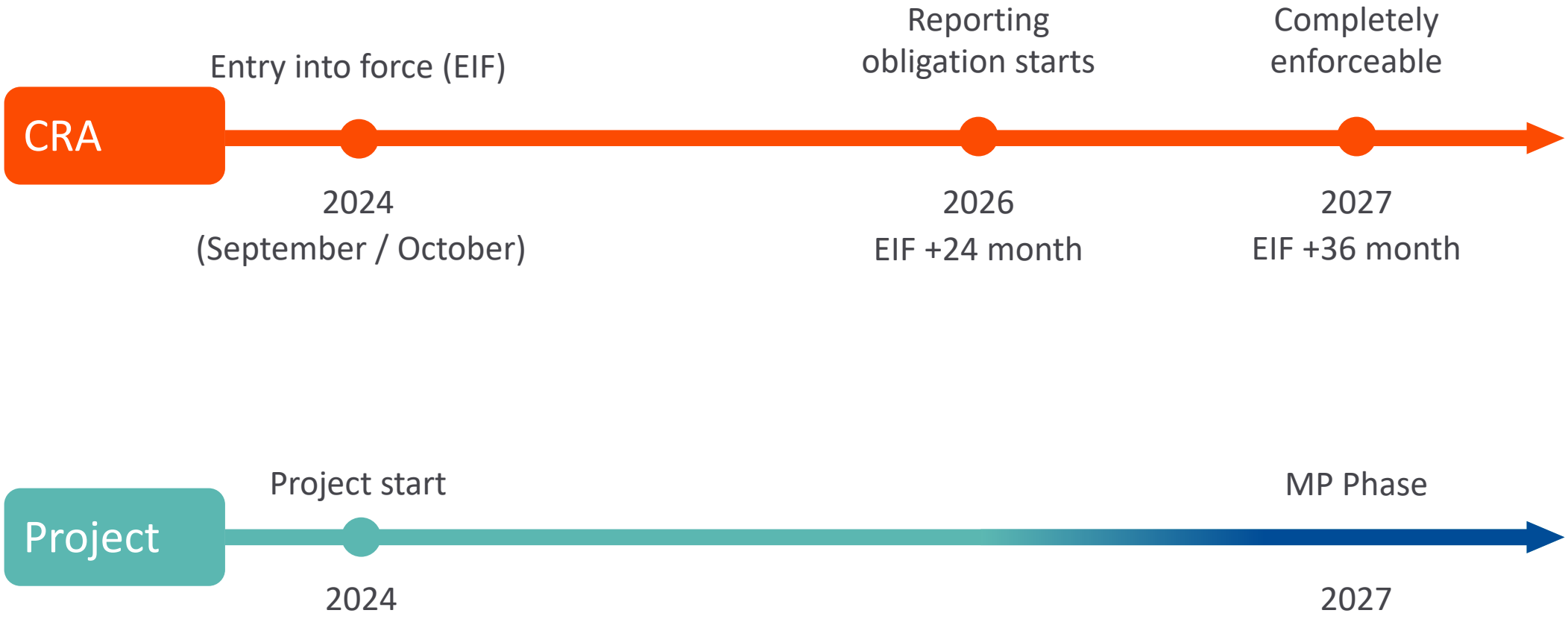
Importers

Importers must **ensure** that the **products** they place on the **EU market comply** with the **essential cybersecurity requirements**.

Key obligations for Manufacturers

Risk Assessment	• Assess the cybersecurity risks associated with the product • Include the risk assessment in the technical documentation
Security by design (and by default)	• Keep security in mind during: planning, design, development, production, delivery and maintenance • Secure by default and with limited attack surface
Conformity Assessment	• Self assessment • Third party assessment
Security Updates	• Provide security updates over the whole lifecyle • Provide mechanisms
Reporting	• Vulnerabilities must be reported to ENISA • Within 24h after becoming aware

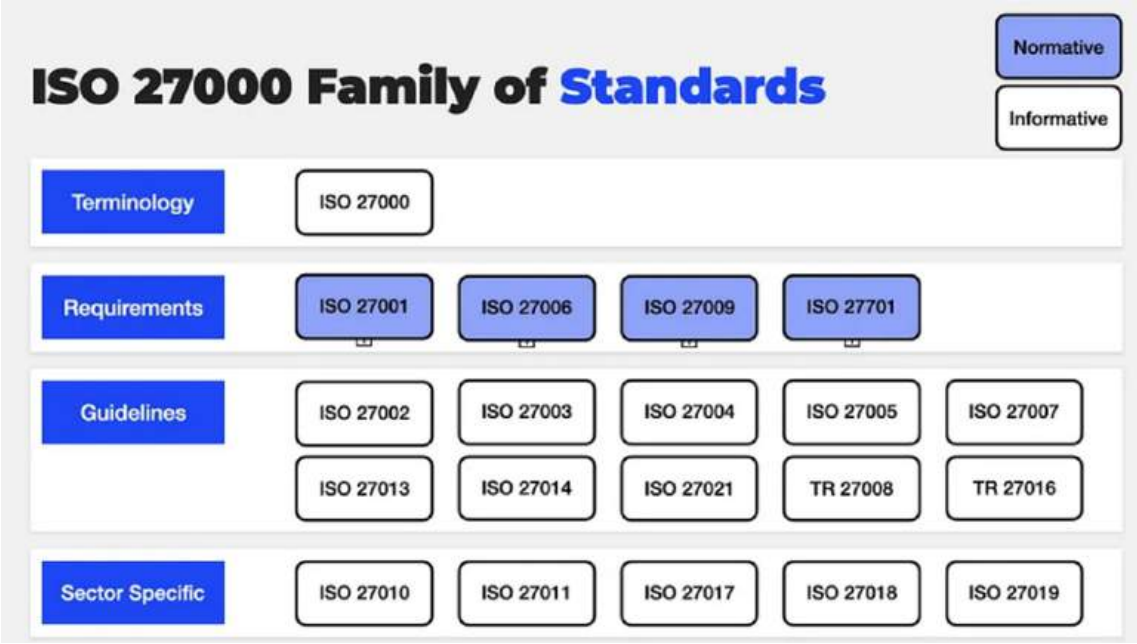
Timeline


CRA
Entry into force (EIF)
2024
(September / October)
Reporting
obligation starts
2026
EIF +24 month
Completely
enforceable
2027
EIF +36 month
Project
Project start
2024
MP Phase
2027

ISO 27001 & IEC 62443

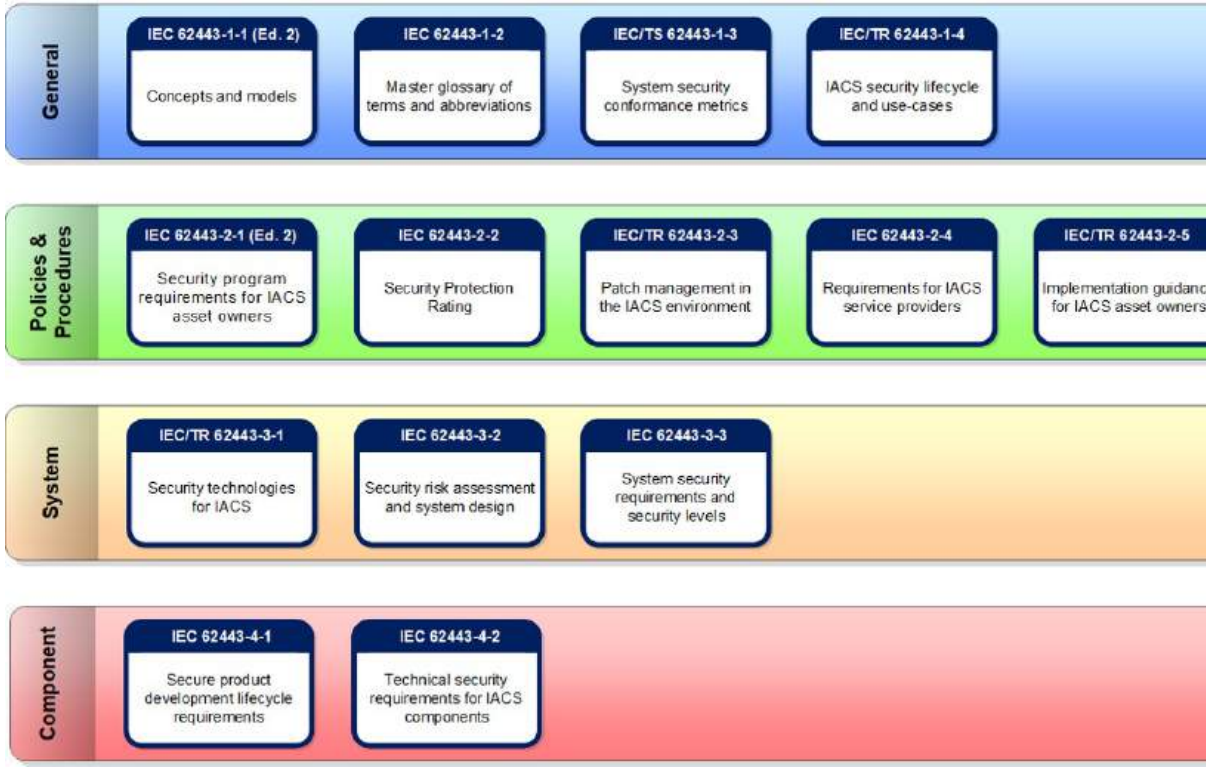
ISO 27001 (IT-Security)

Requirements for the Introduction, implementation, operation, monitoring, review, maintenance and improvement of formalized information security management systems



IEC 62443 (OT-Security)

Technical specification covering the terminology, concepts and Models for the security of industrial products defined



congatec – Security by Design

Cybersecurity in your application

Confidentiality	Integrity	Availability
Customer Application	**Customer Application**	**Customer Application**
Maintained Operating Systems	**Maintained Operating Systems**	**Maintained Operating Systems**
• **Virtualization / Separation** • **Key Management (TPM2.0)** • **…**	• Hardware „Root of Trust“ • Secure BIOS Updates • RTS Secure Boot Loader	• Reliable Hardware • Ruggedized Design • …

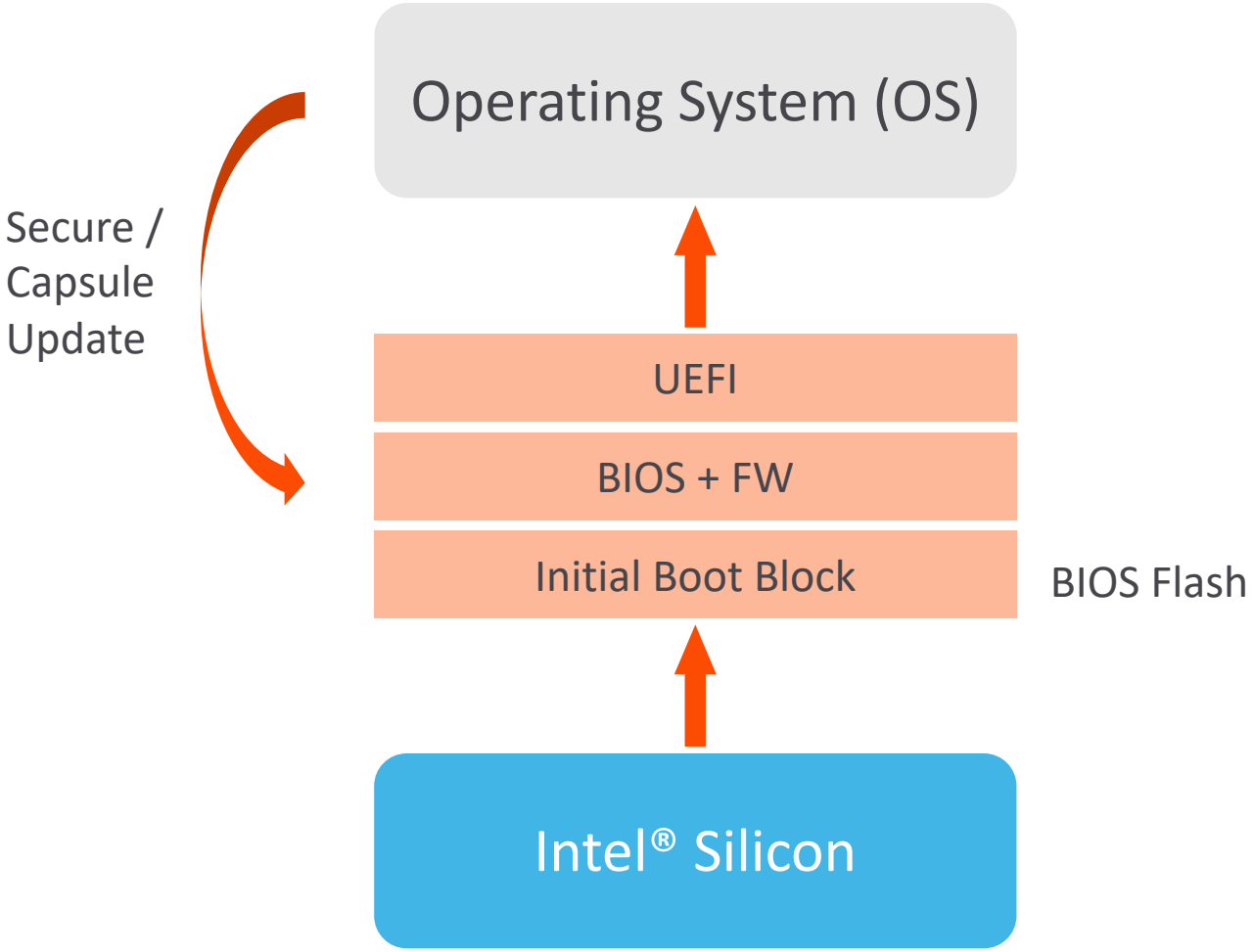
congatec modules provide a solid, future proof foundation

1st congatec products based on IEC 62443

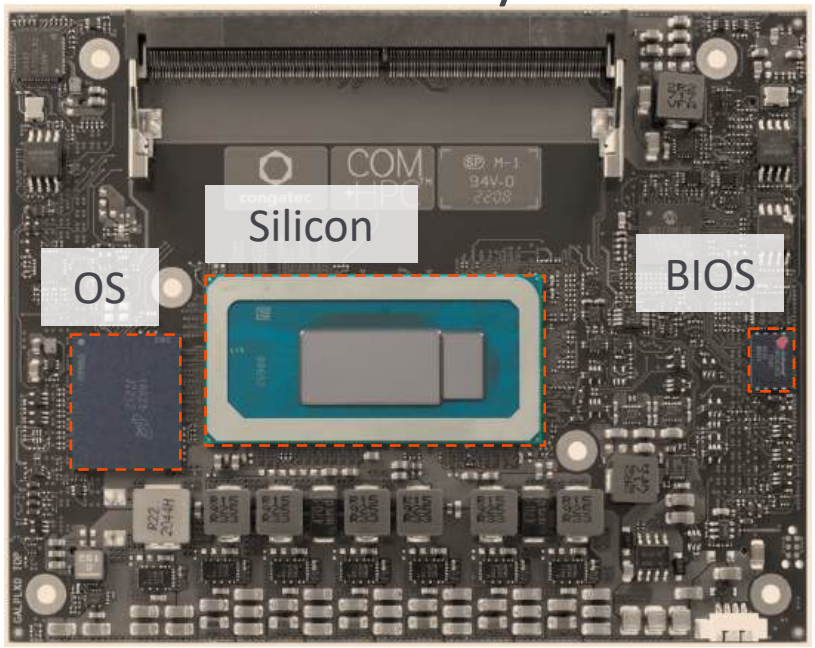
- **Secure boot loader**
- **Secure COM-HPC mini module**
  - conga-HPC/mRLP
- **Secure Hypervisor**
- **IOT building blocks**

congatec – Security by Design

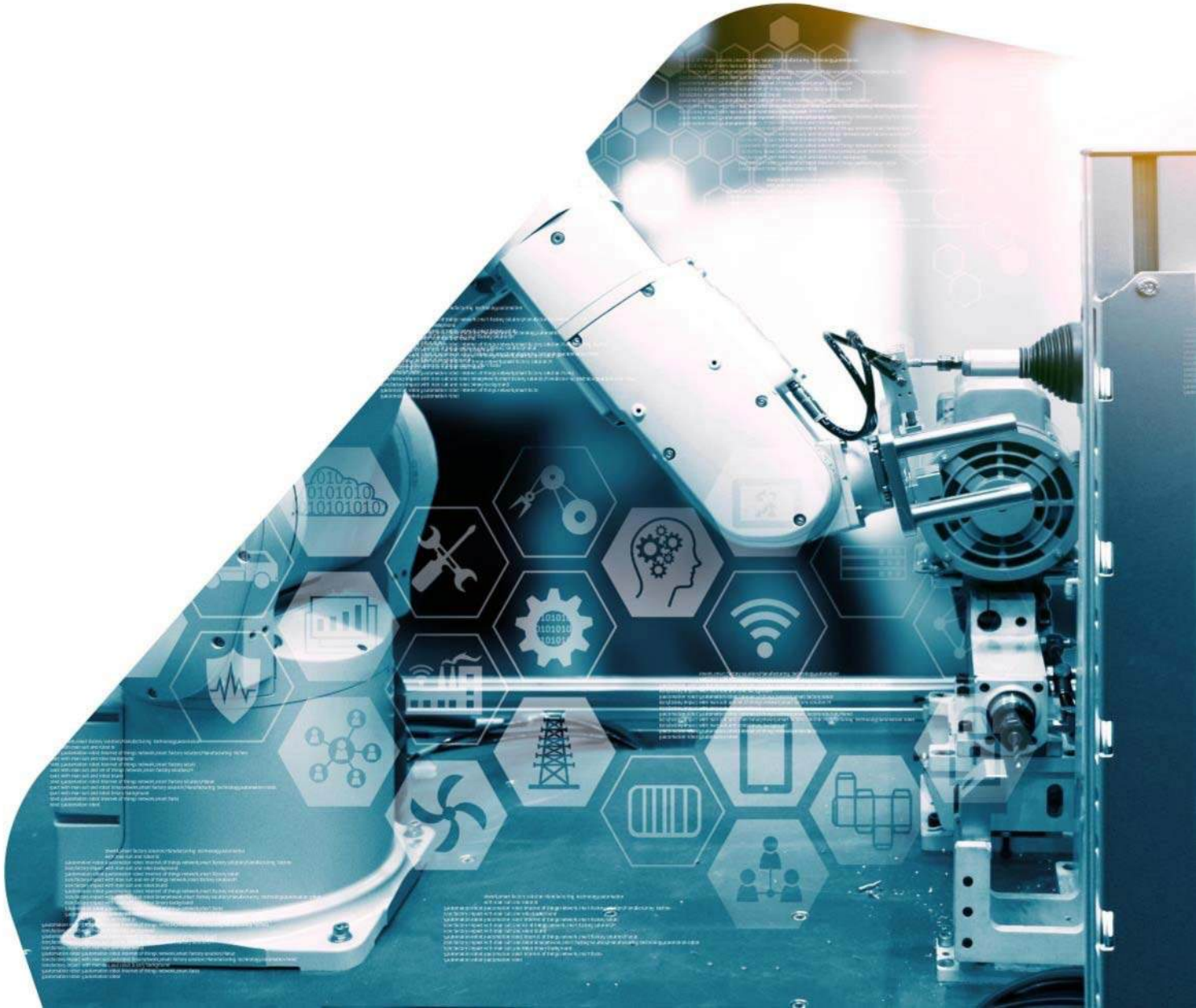
Defence in depth …



… starts at the very core



aReady – Application Ready



Why Application Ready?

Customer challenges these days

Complexity

- Increasing complexity
- More functions and tasks
- Broader variety of expertise/skills needed

Security

- Increasing cyberattacks (CRITIS)
- High level of security needed to avoid manipulation
- New technologies and security measures needed

Internet of Things

- Secure data transmission
- Management of large amounts of data (Big Data)
- Solutions need to collect, store and process the data efficiently and securely

Digitalization

- Adaptive Systems
- Connectivity
- Flexible and scalable systems needed

aReady. Categories

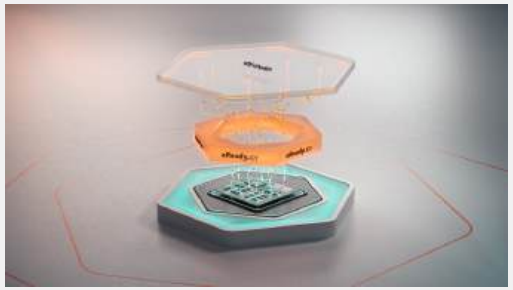
aReady. VT

Virtualization is a technology that enables the creation of virtual instances of computing resources, such as servers, storage, or networks, allowing multiple virtual environments to run independently on a single physical machine.

aReady. COM

COMs with ready-to-go software integration to simplify the customer implementation.

aReady.COMs are tailored to customer demands to create the perfect fitting heart of the customer application and interfaces.



aReady. IOT

Technologies that connect physical devices to the internet, enabling data exchange and automation. This includes hardware devices like conga-connect, as well as software platforms for data management, analysis, and control.

aReady.
VT

congatec

Virtualization Technology

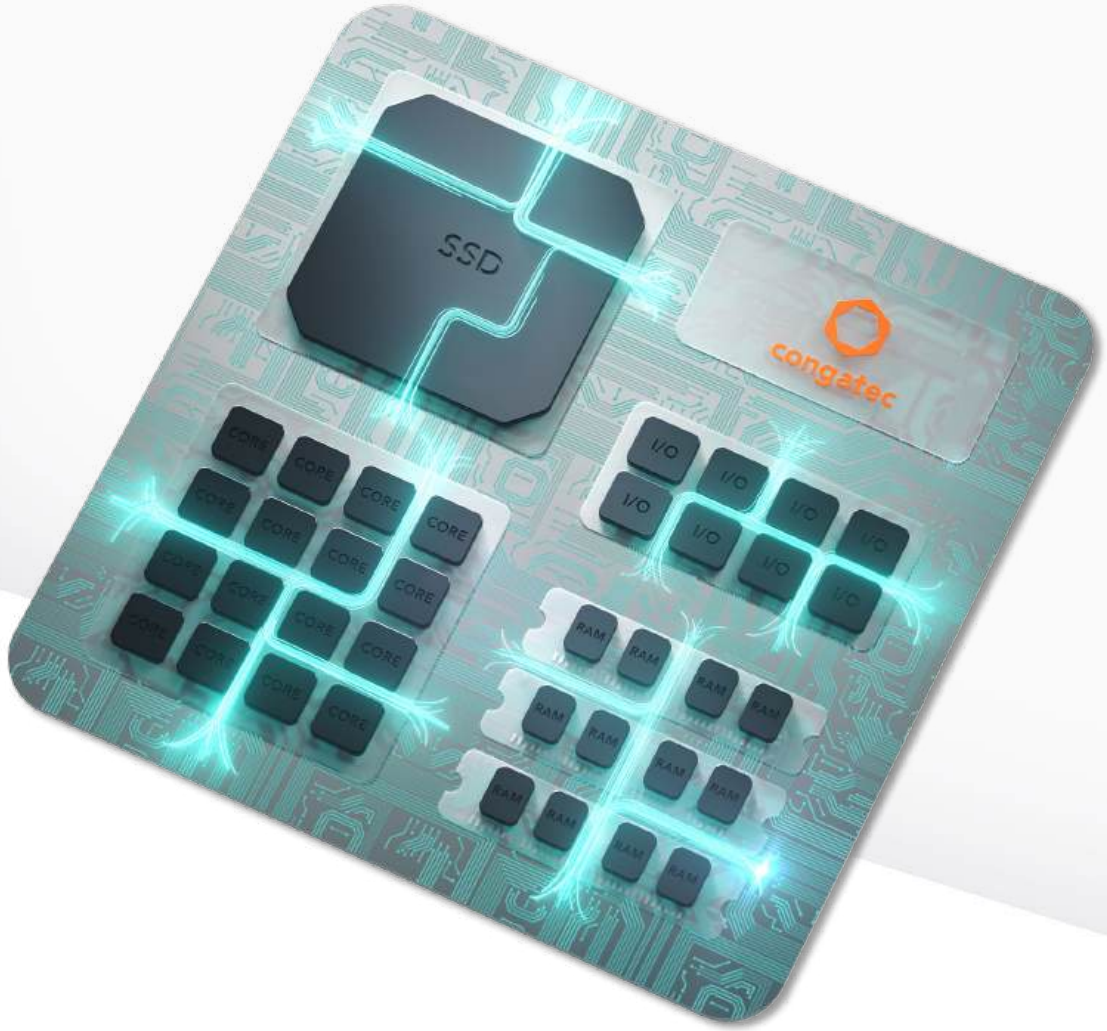
- Hypervisor-on-Modules

VIRTUALIZATION READY

  - Easier access to VT
  - Demonstrate software competence
- Real-Time capable Hypervisor
- Secure Bootloader

Coming Soon

- Secure Hypervisor (62443 Certified)

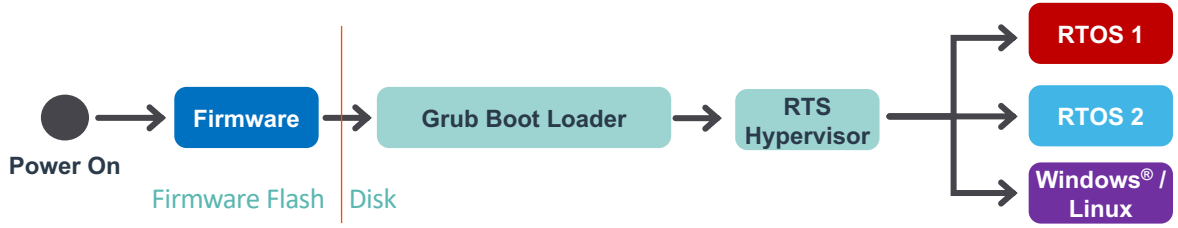


aReady. VT

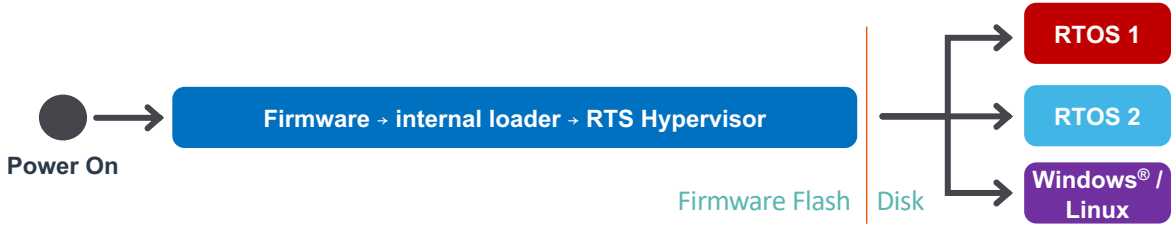
congatec

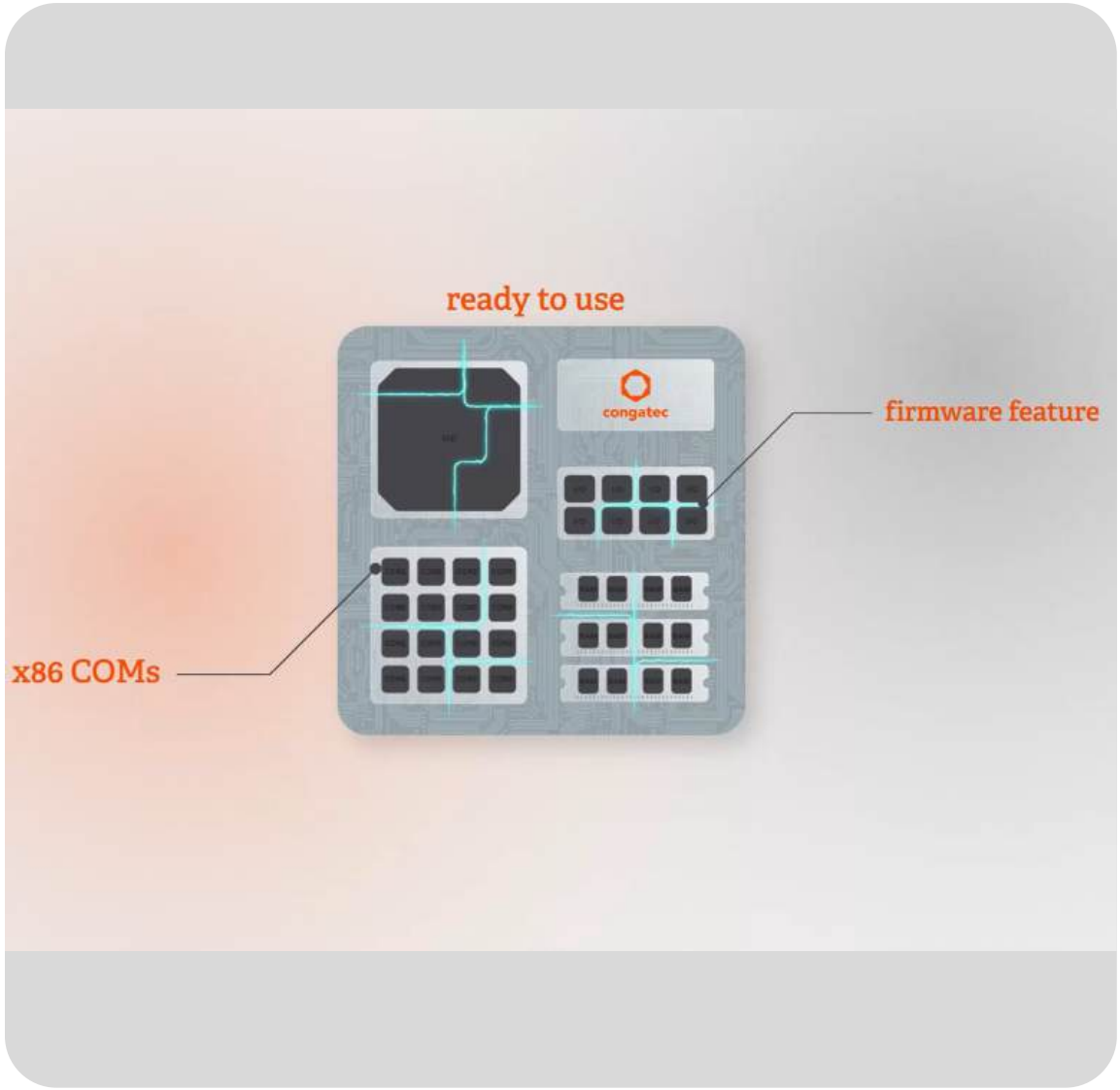
How does it work?

- RTS Hypervisor included in the firmware
- Inactive by default – customers can install and operate software normally
- Standard RTS Hypervisor on “any PC”:



- Hypervisor on Module:





What is a Hypervisor?

Multiple virtual machines on single host machines

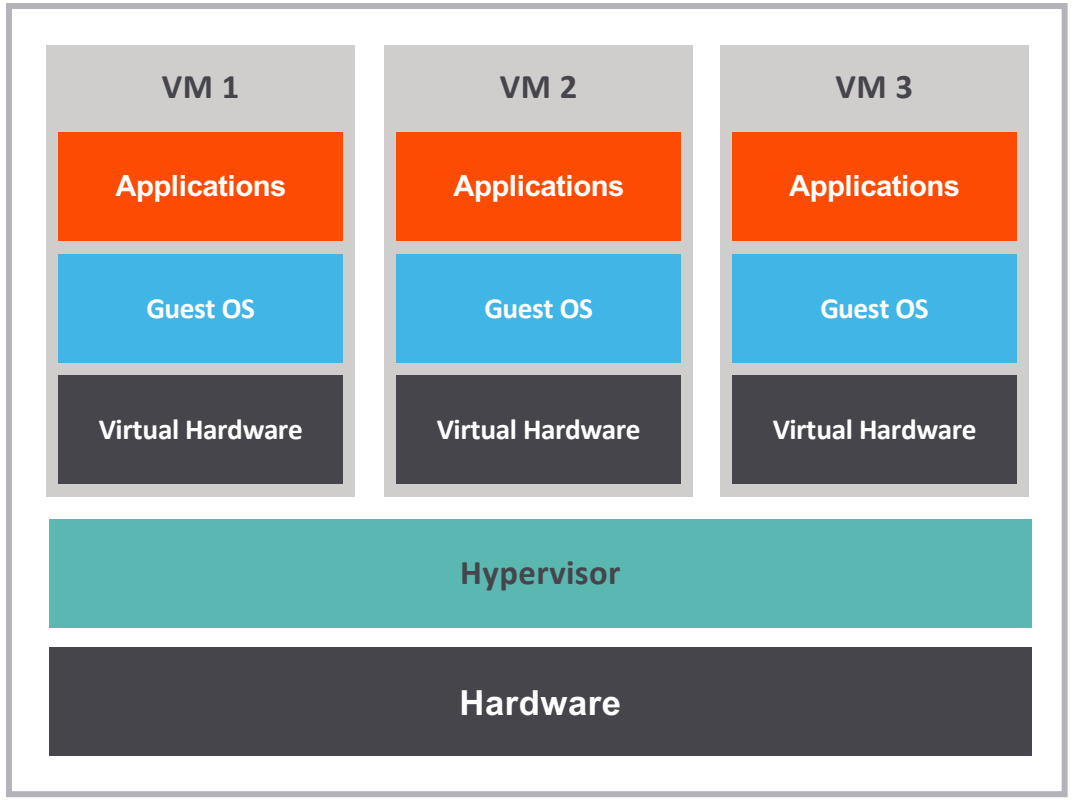
“Virtual Machine Monitor” (VMM)

Typical use cases

IT servers running in virtual machines

Different operating systems on one platform

Running Linux inside Windows or vice versa



Support of All Popular OSs

BlackBerry | QNX

Neutrino

Windows Embedded Gold Partner

Windows

WNDRVR

VxWorks

Real-Time LINUX

On Time REAL-TIME AND SYSTEM SOFTWARE

RTOS-32

tenAsys Embedded Virtualization Solutions

INtime

MICROWARE

OS-9

T-Kernel

aReady. IOT

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aReady.
IOT

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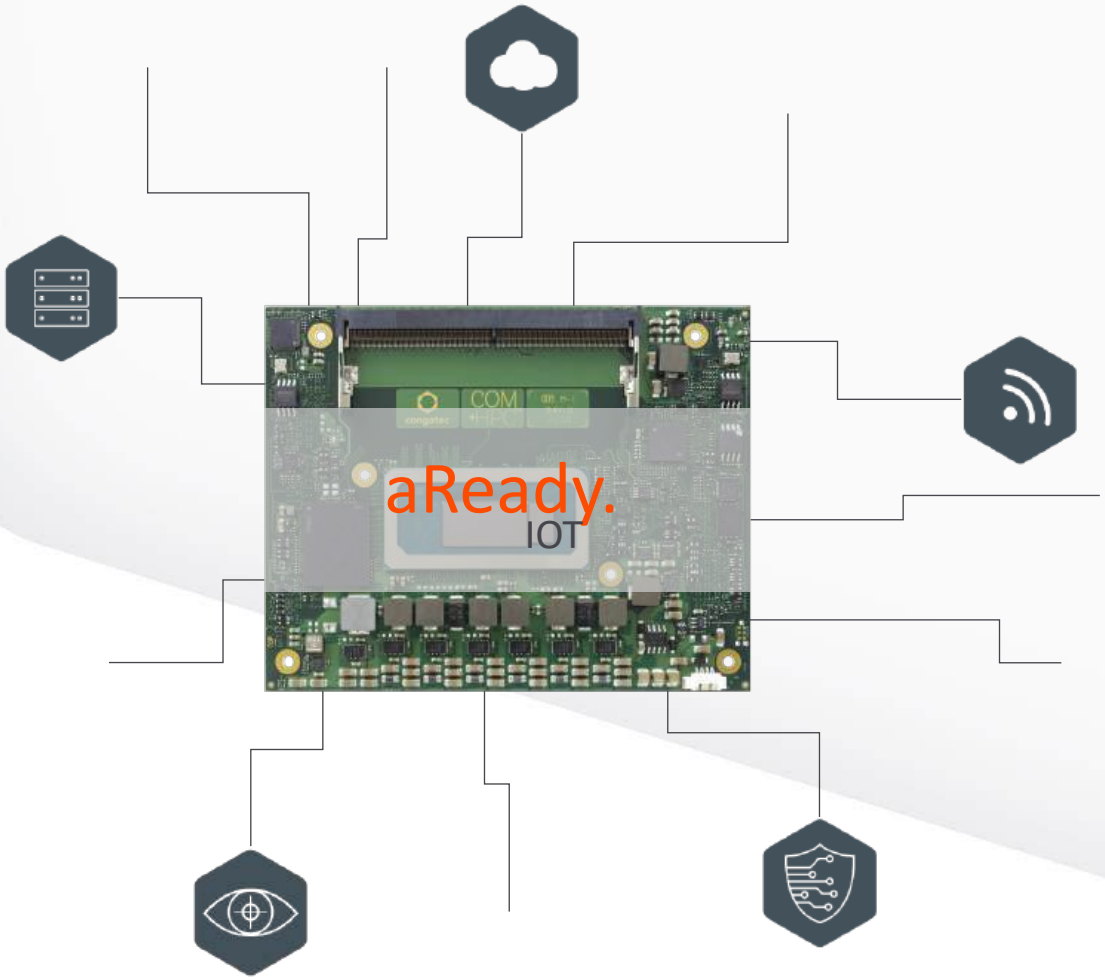
Make your devices available anywhere at anytime

Make your devices easily maintainable

Be always informed about your devices health and status

Re-act proactive to minimize system downtime



Services & Features

- System Integration Service
- Fleet Management
  - Device onboarding & provisioning
  - Software Updates (OTA)
- Monitoring & Diagnostics
  - Status Monitoring
  - Remote Diagnostics
  - Data Collection and Analytics
  - Predictive Maintenance
- Cloud Service

Don‘t just be ready – be application Ready!

aReady.
COM

Customer Application

Build your applications on aReady.COMs and become highly agile and responsive in a fast-paced technological landscape

Software

Pre-evaluated functional software building blocks significantly minimize design efforts and compatibility concerns for customer use cases.

Operating Systems

Every aReady.COM is designed with a ready-to-use approach thanks to pre-installed, pre-configured and licensed operating systems fitted to your needs. Of course with latest patches to protect your system from potential threats.

Virtualization

Hypervisor-on-Module, our innovative firmware feature, enables the consolidation of multiple applications on a single physical module to make full use of all resources.

Hardware

aReady.COM qualified congatec Computer-on-Modules come with soldered mass storage. Based on open standards they facilitate flexibel integration, enable easy upgrades to extend product lifecycles and improve Return-on-Investment.

aReady.COM

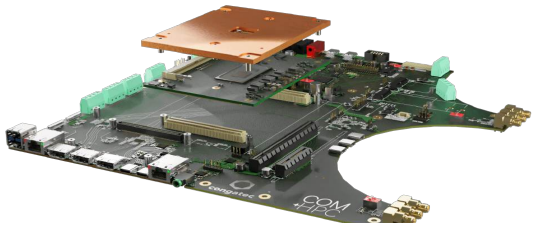
congatec

ctrlX OS and congatec

Pre-bundled solution

Model Connect (ctrlX) | Firewall (ctrlX) | VPN Client (ctrlX) | Customer app

ctrlX OS & congatec



ctrlX Store

Python (ctrlX) | ROS2 | SCADA | | WEBIQ SERVER

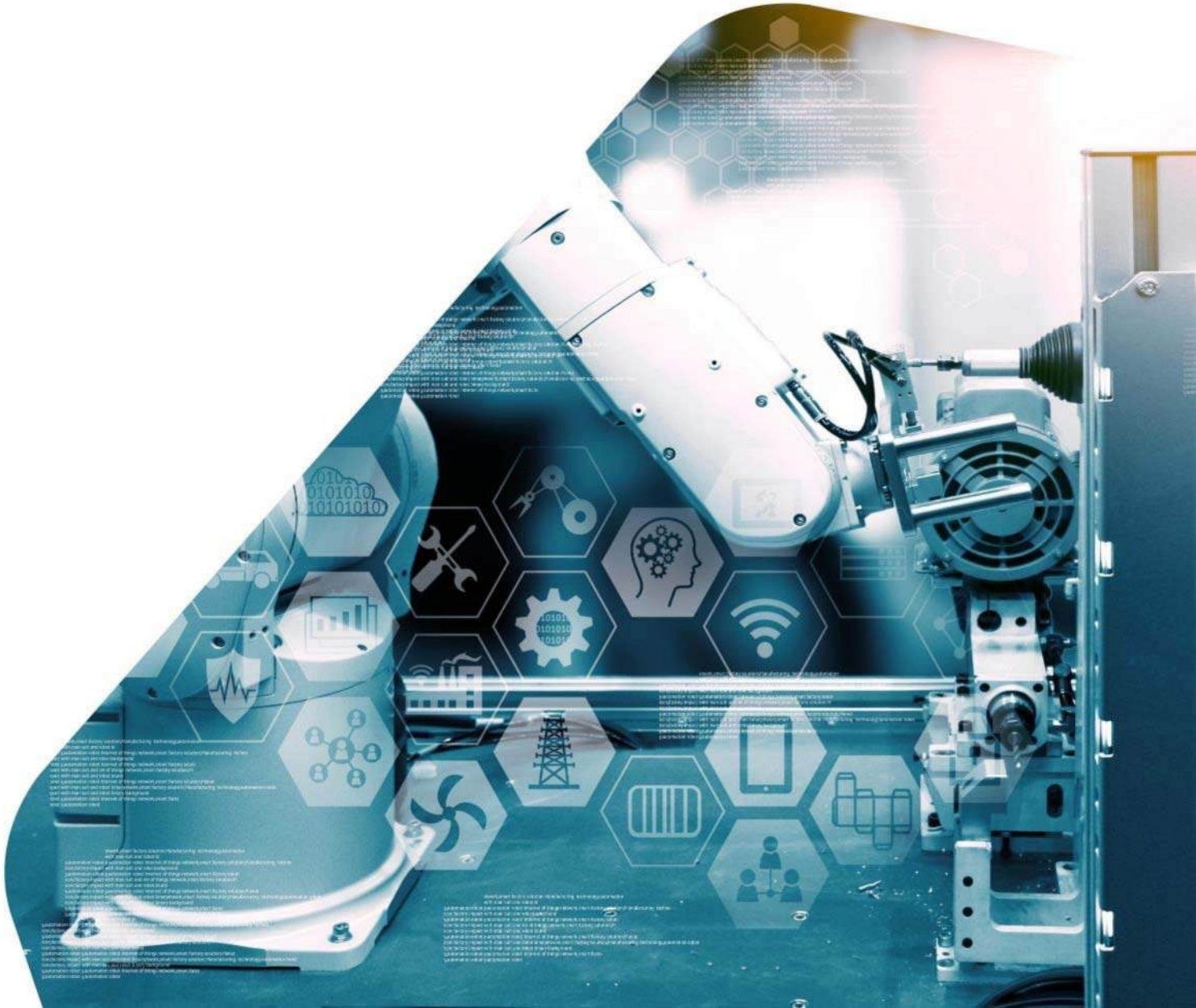
Node-RED (ctrlX) | VPN Client (ctrlX) | New apps | Firewall (ctrlX) | BOSCH

OPC UA Server (ctrlX) | Studio Selmo | congatec | VPN Client (ctrlX) | IIoT Cloud Monitor · Operate Analyze

BOSCH | Device Bridge BOSCH | FACTORY Orchestration Platform rexroth A Bosch Company | FANUC | VOICE CONTROL MGA

Reduce time-to-market through access to congatec hardware AND industrial applications

Q & A



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Questions?

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