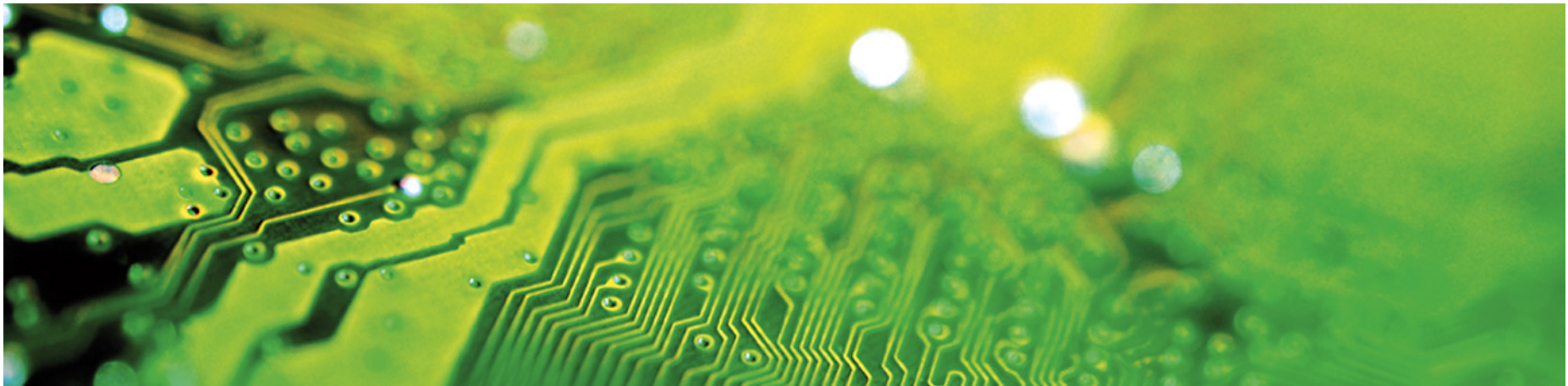


Intel® based Embedded Platforms for IoT

Harald Maier (Product Manager x86 @ TQ-Systems)



Different requirements for different applications

Intel based Embedded solutions make it easier

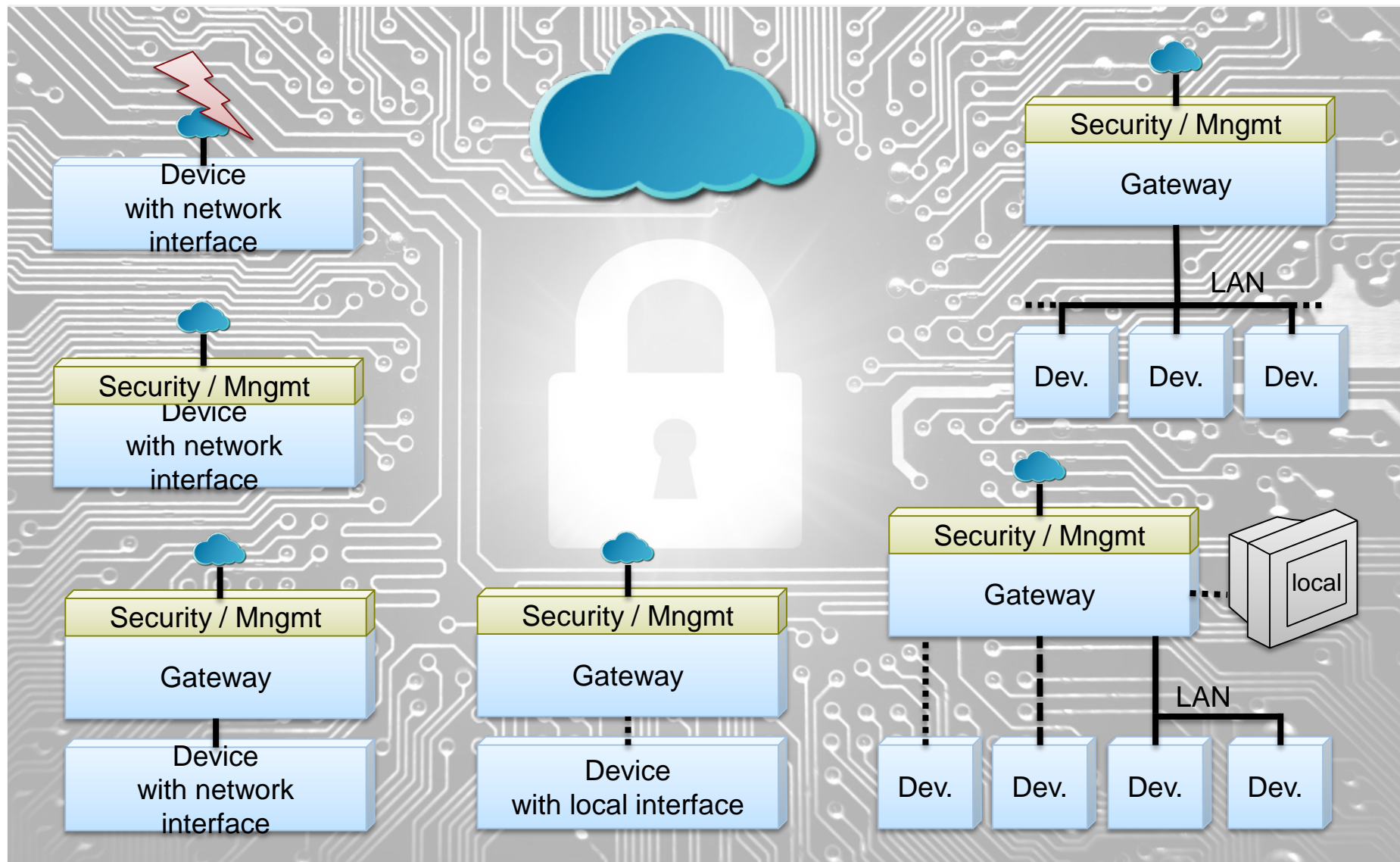


Agenda

- Overview: non-connected / directly connected / via gateway connected
- Talking about different requirements
- How can Intel® based solutions can help to make IoT life easier
- Intel® based Embedded Platforms for IoT from TQ

Different requirements for different applications

non-connected, directly connected, via gateway
connected



Different requirements for different applications

Connecting a device to the Internet



■ Main Show-Stoppers: Missing security and manageability

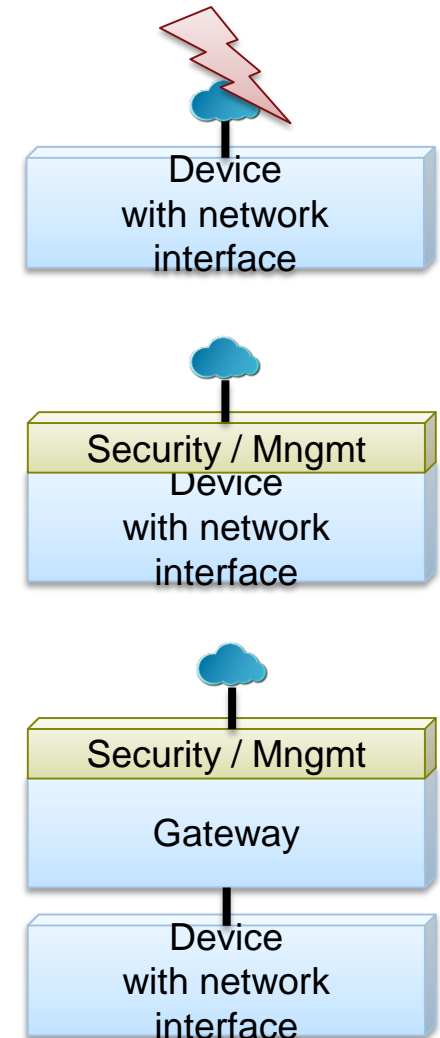
■ Security is a must have

- Secure your data
- Secure your device

■ Management is necessary

- to handle / update thousands of devices
- to see the status of each device

- Integrate security and manageability into the device
- Use a gateway to separate the connectivity to the internet from the original device
 - to keep device untouched / use pre-qualified gateway (regarding software, certifications,...)



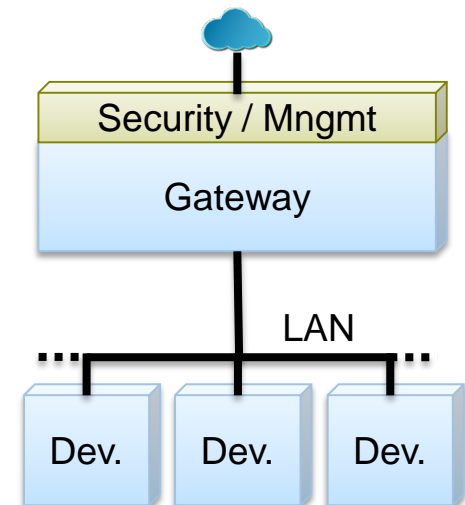
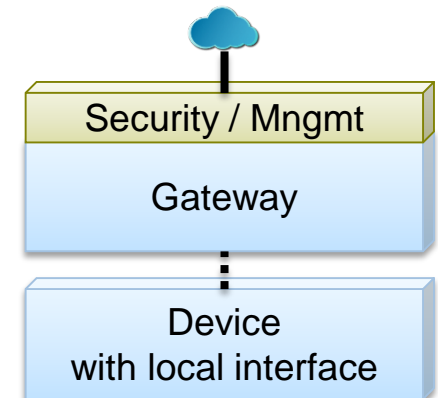
Different requirements for different applications

Connecting a device to the Internet



■ Additional jobs of a gateway:

- Upgrade a legacy device with an internet connection
- Translate protocols (hardware & software)
- Bridge a existing network to the internet
- Local analytics and filtering of data
 - »to reduce data traffic to the internet
 - »to recognize failures and sending alarms
- Enable redundant connectivity



Different requirements for different applications

Connecting a device to the Internet



■ Additional jobs of a gateway:

■ Consolidate data to be a common IoT instance

» representing a “thing” like a room with temperature, lightning, climate control,...

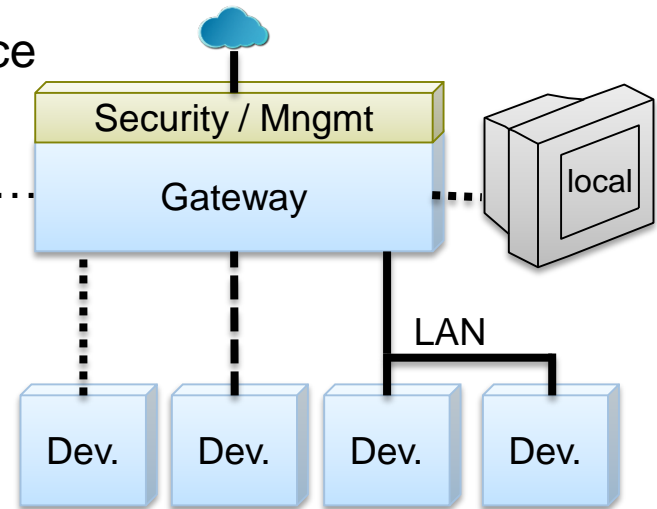
■ Local HMI

» enables local control and observation

■ Include additional data streams to the internet connection (audio, video,...)

» Needs additional interfaces

» Needs performance for data compression



Different requirements for different applications

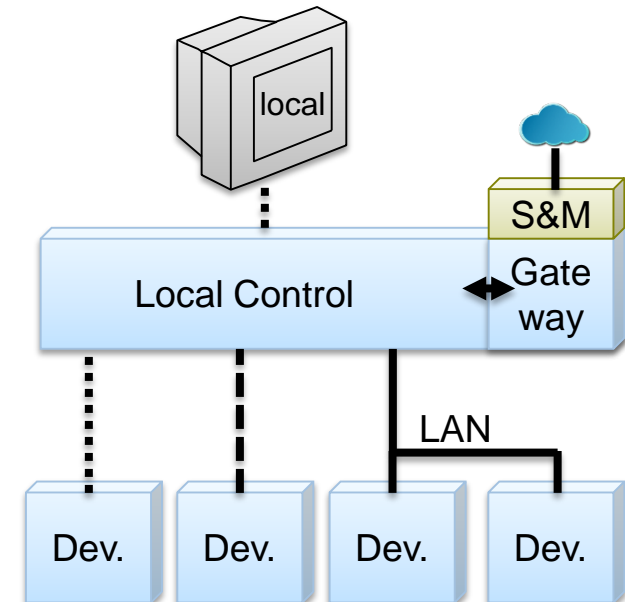
Connecting a device to the Internet



■ Virtual gateway:

- Virtualization on Multi Core CPU
- Hypervisor is running two completely independent Operating systems
- Local control is running on one or more Cores
 - » Completely independent from IoT connection
 - » No special IoT adaptation is necessary
- Running IoT gateway on separate core with dedicated interfaces connected to the internet
- Connection between local control / device and the virtual gateway is done by internal virtual network connection
 - » Can be implemented highly secure

■ Multi Core CPUs enable retrofit from non-connected control / device into a connected device without any hardware changes



Making IoT life easier

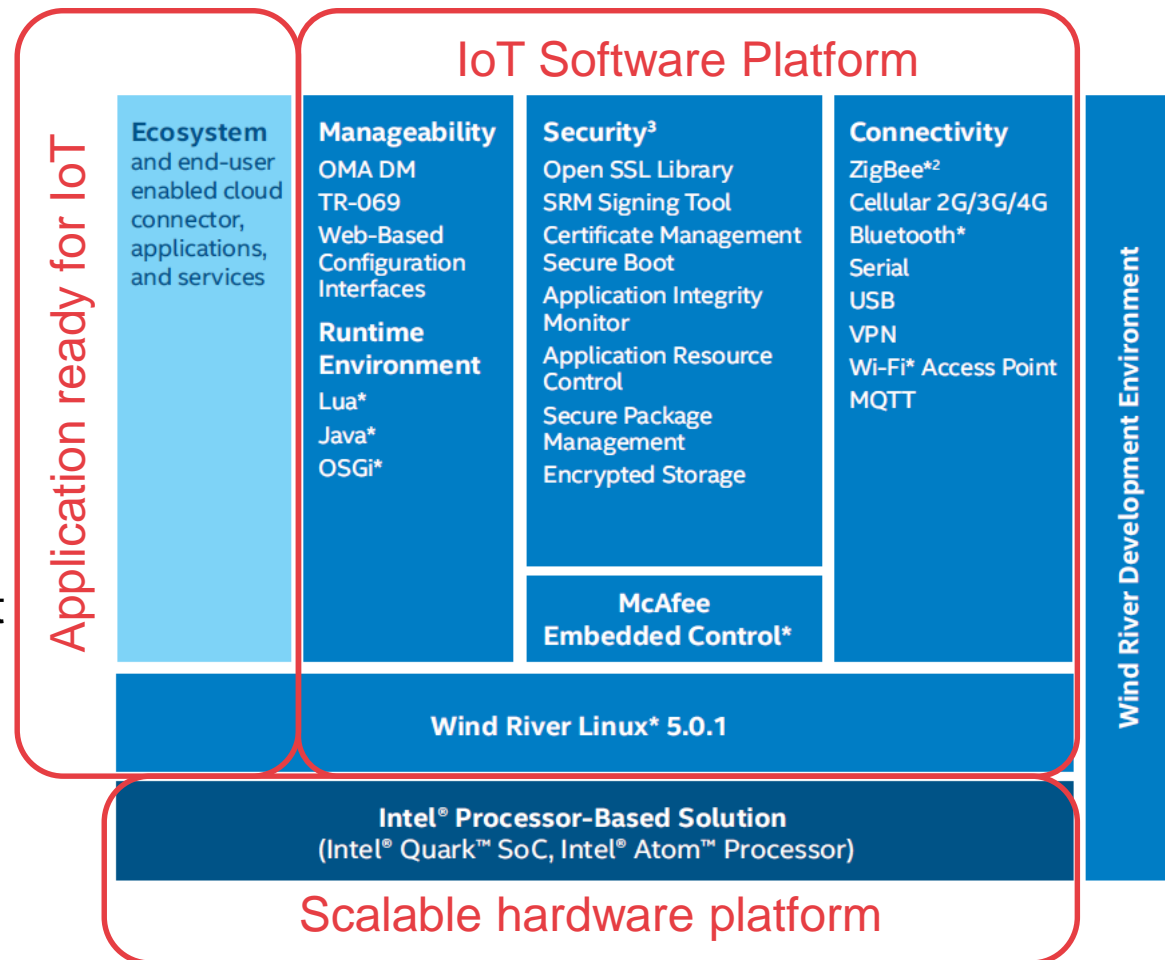
Optimized combination of hardware and software



■ Intel® IoT platform (formerly called “Intel Moon Island”):

- Secure
- Scalable
- Interoperable

- Optimized by close partnership between Intel, Wind River and Intel Security (McAfee)
- $HW + SW = (Security)^2$
- Prepared for ready to use cloud based management with Wind River IDP



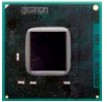
Different requirements for different applications

Scalability with Intel® processors



■ Simple Gateway applications with **Intel® Quark™ X1000 series**

- Single Core, 400 MHz, flexible with I2C, SPI, UART, USB and PCIe



■ Wide range of Gateway applications with **Intel® Atom™ E3800 series**

- Pin-compatible derivatives from Single Core up to Quad Core
- Highly flexible highspeed connectivity and extendibility
- Featuring also local control, analytics and observation (local HMI)
- Data compression capabilities for video streaming add-on
- Multi-Core architecture could cover also virtual gateway implementations



■ Workload consolidation with **Intel® Core™ series**

- Combining exhausting control, local analytics and observation with integrated gateway technology



Consistent SW Implementation thanks full x86 SW compatibility on all classes

Intel® based Embedded Solutions for IoT

TQ – Partner for OEM/ODM customers



■ IoT Building Blocks and Solutions from TQ

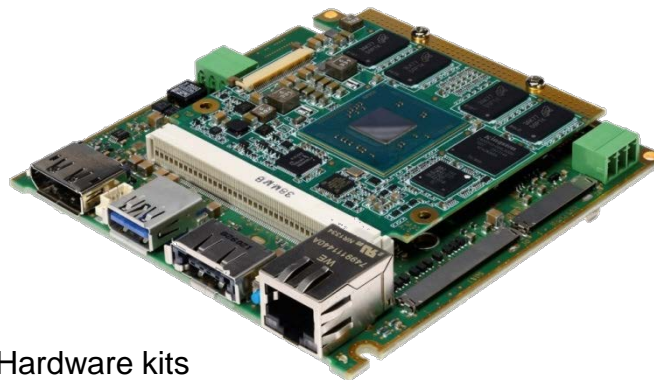
■ Based on Intel® Quark™, Intel® Atom™ and Intel® Core™ Processors

- » Hardware and Software IP Building Blocks for fully customized designs
- » Hardware Building Blocks for modular system designs
- » Ready to use solutions

■ Design and Manufacturing Made-in-Germany



CPU modules



Hardware kits



Devices

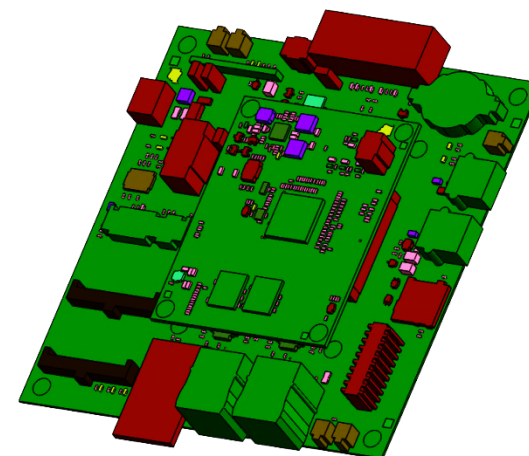
EVALx1000 with Intel® Quark™ X1000 series

Evaluation platform for customized designs



■ Key Features

- Intel® Quark™ X1000
optimized for IoT Gateway applications
- Ultra Low Power (max. 2.2W TDP)
- Tested with
Intel® IoT Gateway Software Stack (“Moon Island”)
- Available with
Intel® IoT Gateway Development License
- Modular Design for Rapid Prototyping (TQMx1000 + MBx1000)
 - Software development
 - Feature testing and specification
 - Feasibility analyses (3D,...)



*This platform is for reference only (and not for sale)
addressing full custom designs.*

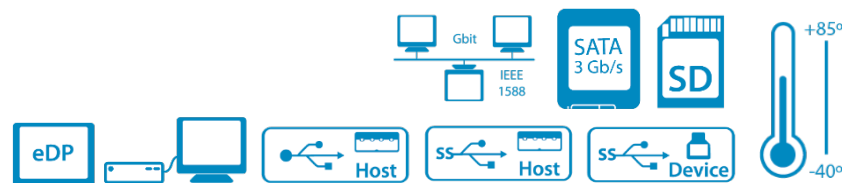
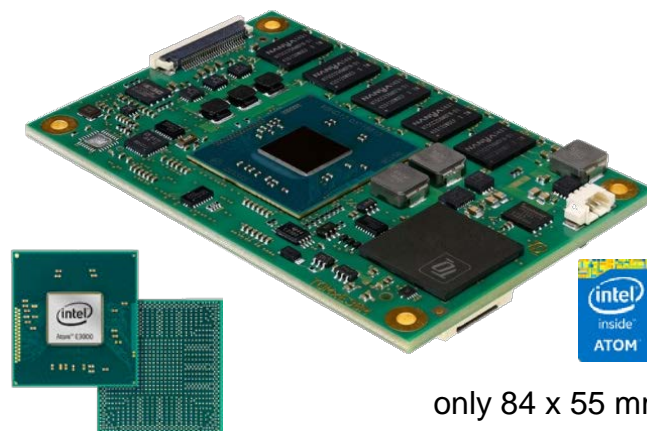
TQMxE38M with Intel® Atom™ E3800 series

Modular designs based on COM Express Mini Type 10



■ Key Features

- Intel® Atom™ E3800 ("Bay Trail-I")
 - » Single Core 1.46 GHz / 512 KB cache
up to Quad Core 1.91 GHz / 2 MB cache
- Up to 8 GB DDR3L with ECC support
- SD Card and USB 3.0 Device support
- High flexibility with eDP
- Optimized for Ultra Low Power
- Extended temperature range



■ General TQMx86 Features

- TPM 1.2/2.0, highly accurate industrial RTC, TQ board controller with flexiConfig
- UEFI BIOS with optimized Touch support, easyConfig and multiConfig
- Highly ruggedized design
- Customer specific added value like conformal coating

TQMx50UC with Intel® Core™ i3/i5/i7 5000U series

Modular designs based on COM Express Compact Type 6



■ Key Features

■ Intel® Core™ 5000U series ("Broadwell-U")

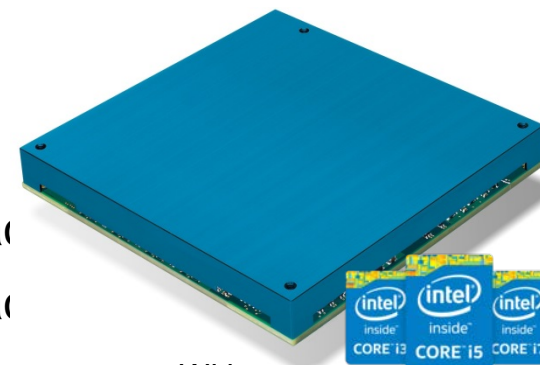
- » Intel® Core™ i3-5010U (2.1 GHz / 3 MB cache)
- » Intel® Core™ i5-5350U (up to 2.9 GHz / 3 MB cache)
- » Intel® Core™ i7-5650U (up to 3.2 GHz / 4 MB cache)

■ Up to 16 GB DDR3L-1600

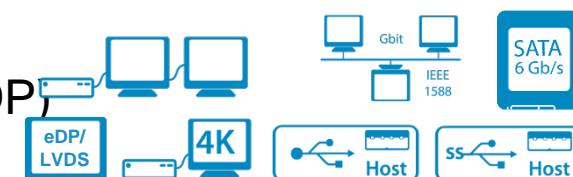
■ 3 independent display outputs up to 4K & MST Support

■ Intel® RealSense support

■ 14nm ⇒ best Performance-per-Watt ratio (15W TDP)



With
optimized cooling



■ General TQMx86 Features

■ TPM 1.2/2.0, highly accurate industrial RTC, TQ board controller with flexiConfig

■ UEFI BIOS with optimized Touch support, easyConfig and multiConfig

■ Highly ruggedized design

Customer specific added value like conformal coating

Ready to use Gateways

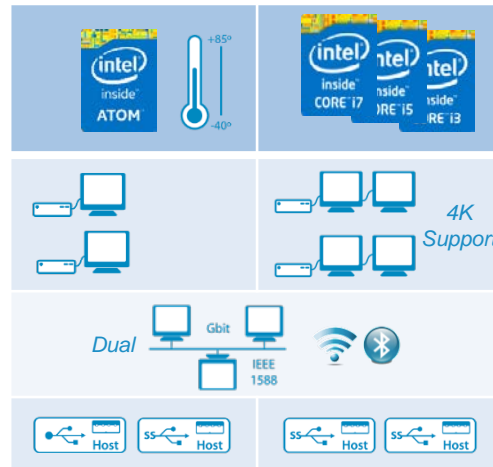
References / Product Preview



MBox-E38 with Intel® Atom™ E3800



- Up to Quad-Core 1.9 GHz with 2 MB Cache
- Up to 8 GB DDR3L-1333
- 2x Mini DisplayPort (DP++) with up to 2560x1600
- 2x Gigabit Ethernet
- 2x USB (3.0 + 2.0)
- WiFi Dual Band, AC + Bluetooth optional
- Mini PCIe (Full-Size / Half-Size) extension sockets
- mSATA Flash Disk
- -40°C ... +60°C (passive cooled)
- ~ 10 x 10 x 6 cm
- Intel® IoT Gateway Support



CBox-50U with Intel® Core™ 5000U



- Dual Core bis zu 3.2 GHz (Turbo) and 4 MB Cache
- Up to 16 GB DDR3L-1600
- 2x Mini DisplayPort (DP++) with up to 3840x2160 (UHD) + Multi Stream Transport (MST)
- 2x Gigabit Ethernet
- 2x USB 3.0
- WiFi Dual Band, AC + Bluetooth optional
- Mini PCIe (Full-Size / Half-Size) extension sockets
- mSATA Flash Disk
- 0°C ... +40°C (passive cooled)
- ~ 10 x 16 x 6 cm
- Intel® RealSense™ Support

TQ – your Partner for Intel® based components & solutions

Embedded Partnership



United by Technology . Embedded Partnership

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Technology in Quality

