NOT „MAKE OR BUY" BUT „BUY AND MAKE"

WHY BETTER DESIGN WITH A SOM INSTEAD OF AN ONBOARD CPU

Holger Wußmann, Kontron Electronics on behalf of Telerex

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THE MAGIC TRIANGLE OF PROJECT-/PRODUCTMANAGEMENT

Budget/Cost — Little money

Few staff — Resources

Risk — Low risk

Quality

Defined feature set — Scope

Time/Schedule — Short time

Quality — Defined level of quality

MAIN GAOLS FOR A „GOOD" DEVELOPER OR PRODUCT MANAGER

- Reduce effort (time and money)
- Reduce risk
- Reduce complexity
- Be fast
- Be flexible an prepared for future requirements (New Displays, Connectivity, IoT, ...)
- Be focused on your USP, your companies know how

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LOOKING LIKE TWINS:
SOM+BASEBOARD VERSUS SINGLE BOARD COMPUTER
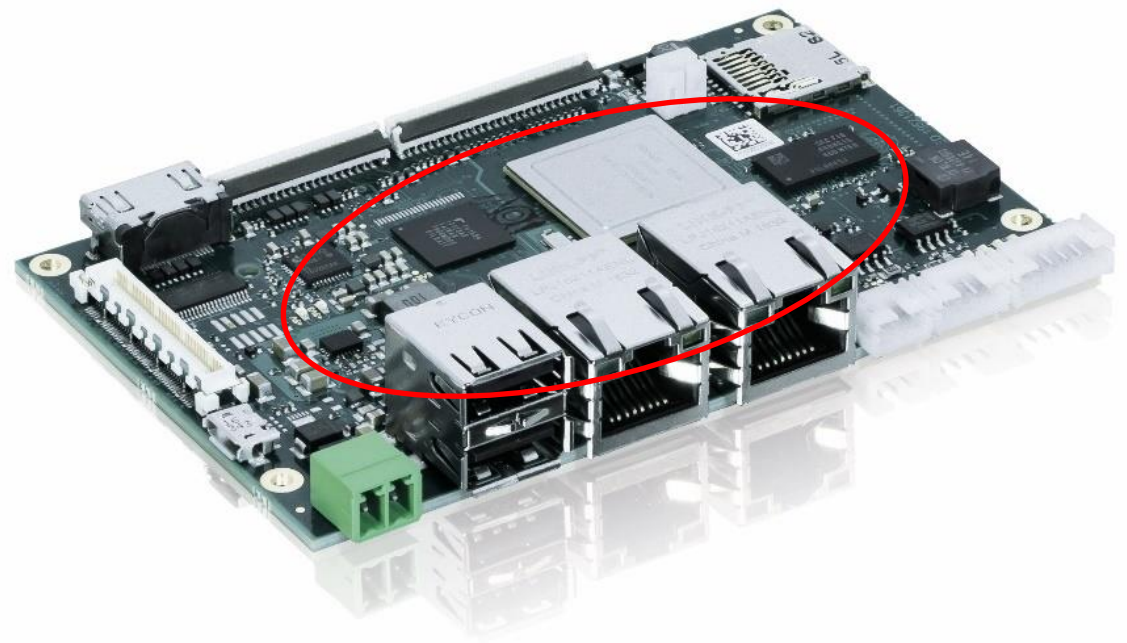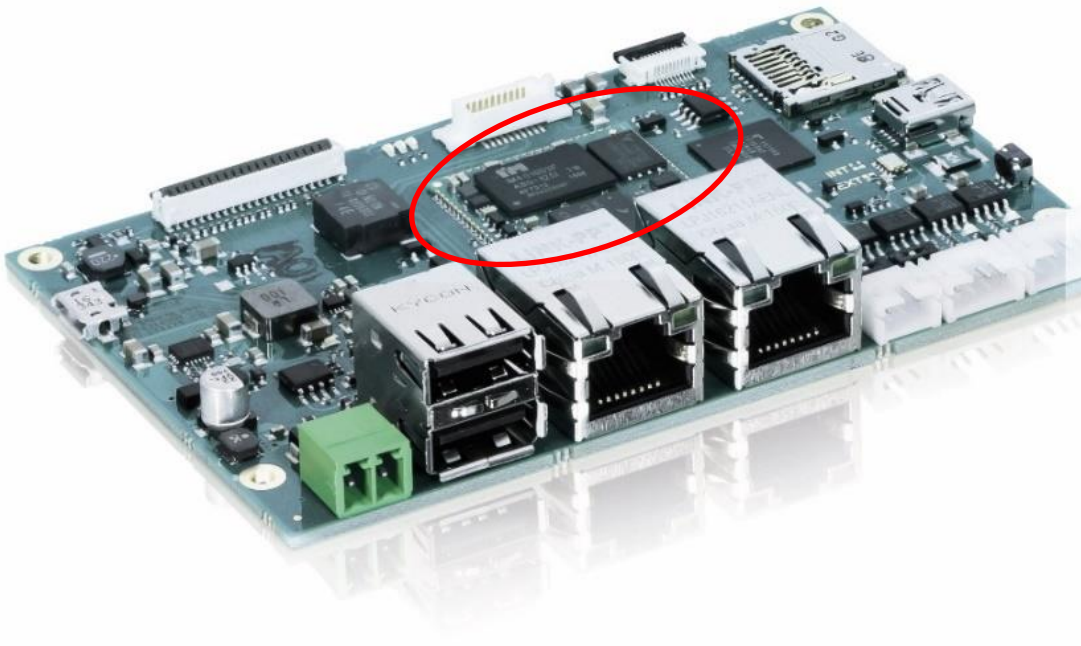
A SOM IN A NUTSHELL
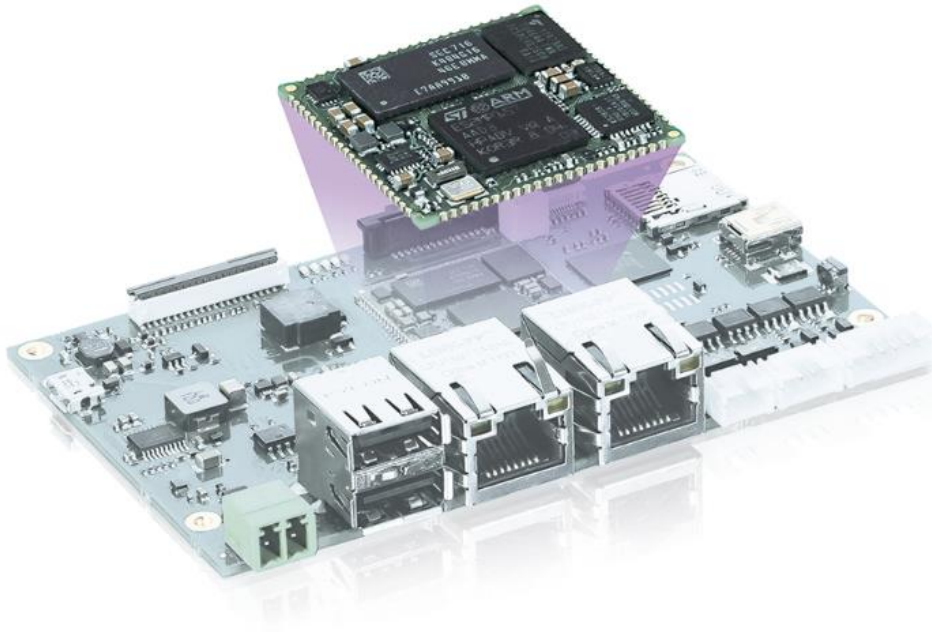
- ▶ Complete Core Hardware and Software
- ▶ µP, GPU, Memory, Power supply, communication interfaces, GPIO
- ▶ Ready to use Software
  (SDK, Bootloader, OS, BSP, Drivers…)
- ▶ Independant of application
- ▶ Usable for the development of almost any product
- ▶ Combination of standardized SOM and application specific carrier board is a perfect platform for various embedded products

WHY DO WE HAVE SOMS NOWADAYS?

- ▶ Rapidly increasing requirements for small, powerful embedded systems (due to progressive digitization)
- ▶ First integration by semiconductor manufacturer in the form of SOCs
- ▶ Second integration by electronics manufacturer in the form of SOMs
- ▶ High number of connections on small space
- ▶ Critical Timings
- ▶ High quantity
- ▶ High quality

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STRATEGIC ASPECTS

- Ready developed core module.
  - Shorter time to market
  - Less design risk due to well-tried solution
  - Long term available CPU module
  - Lifecylce management by manufacturer
- A CPU core optimized in every aspect
- Open X (Open Source, Open Hardware, Open Software)

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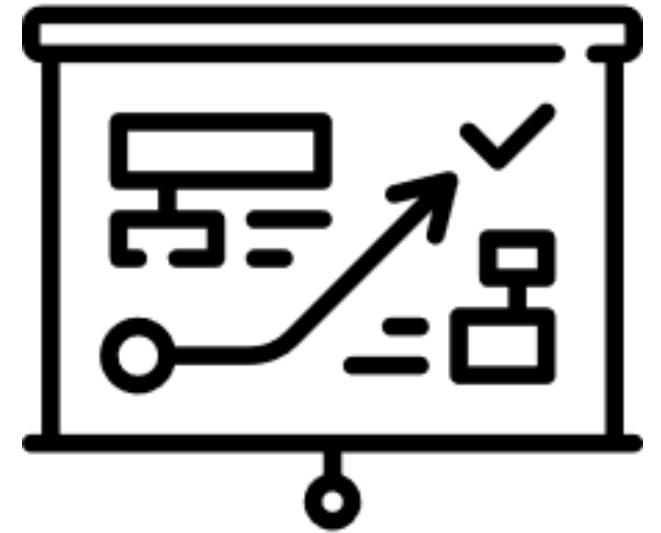
SCHEMATIC DESIGN ASPECTS

▶ Complex CPU Core is a ready developed module.

    ▶ Usable as easy as a microcontroller

    ▶ CPU Setup / Multiplexing

    ▶ Power supply (Power up/down sequencing)

    ▶ Memory design (DDR3/DDR4…)

▶ Baseboard is application optimized

    ▶ Exactly the required featureset, no overhead, design is BOM optimized

    ▶ In-house standard connectors

    ▶ It's your IP, it's your product
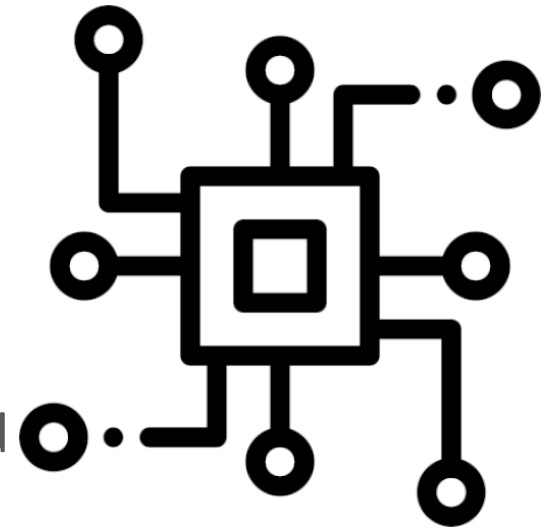
LAYOUT DESIGN ASPECTS

▸ You can use a ready developed module.

    ▸ Complex DDR3/DDR4 RAM design is done

        ▸ Length adjustments, Signal delay adjustments, RAM-Timing

        ▸ High frequency design needed, optional simulation needed

    ▸ Space needed for CPU core is defined right from the beginning

    ▸ EMC is already checked

        ▸ decoupling capacitors are placed (in right number and right position)

        ▸ Impedance controlled lines are designed

▸ Placement according to evironmental requirements
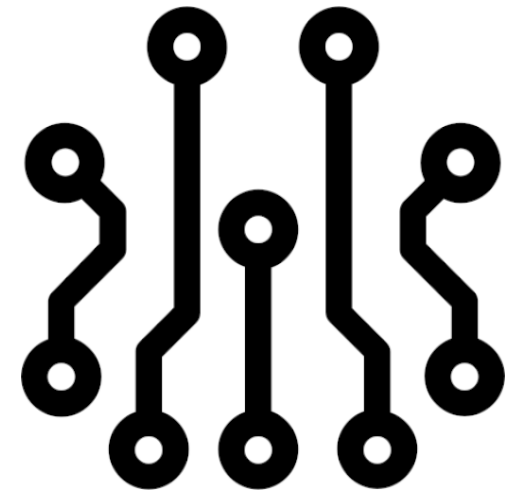
TECHNOLOGICAL ASPECTS

▶ Separation of normal and ultra-fine conductor structures
(on baseboard and SOM)

▶ Separation of very small parts (0201) and bigger parts with
thermal or mechanical requirements

  ▶ (production machines / pcb requirements)

▶ Mechanical decoupling of sensitive components from stressed
components
(BGAs separated from connectors and sockets)

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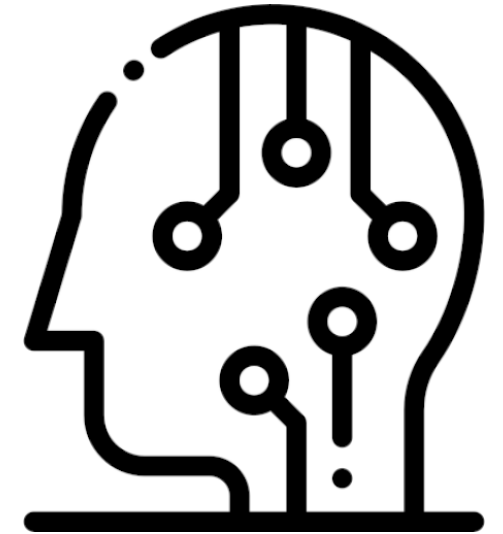
TESTING ASPECTS

▶ SOM can be tested individually

▶ SOM can be tested deeper and more intelligent
in terms of accessable testing points

▶ Significant less testpoints needed on baseboard (lower cost for adapter)

▶ SOM can come preconfigured (Bootloader, OS, application, MAC address)

▶ Testing by a robot (fewer human errors)

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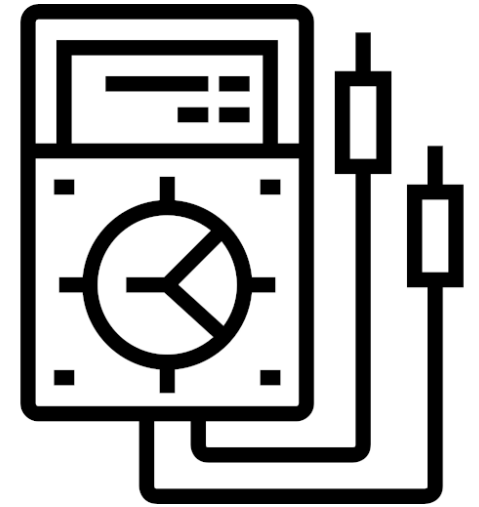
HMI ASPECTS

▶ Generic graphics interfaces on SOM

▶ Converter to individual display on baseboard

▶ Family adapter concept

▶ Drivers and adaption for mainstream and individual displays

▶ GUI via QT

▶ Optimized Browser for Webterminal functionality

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SOFTWARE ASPECTS

▶ Bootloader (Uboot)

▶ Linux BSP (Yocto based)

▶ Programming in C

▶ IEC 61131-3 PLC programming (CODESYS)

▶ GUI via QT

▶ Optimized Browser for Webterminal functionality

▶ Individual Software

▶ Support for individual components / drivers

CODESYS

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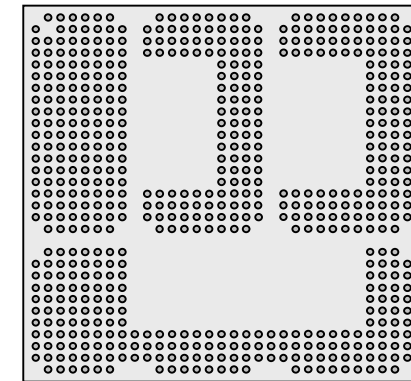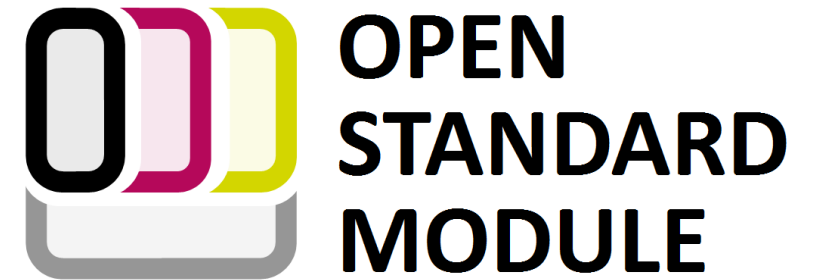VAN DER VALK HOTEL
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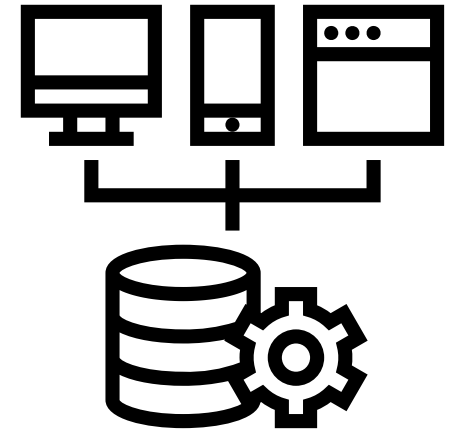
COST ASPECTS

▶ Separation of the (small) 8 to 10 layer SOM and the (larger) 4 to 6 layer baseboard (lower PCB cost)

▶ Separation of normal and ultra-fine conductor structures (lower PCB cost, higher availability of PCB manufacturers)

▶ SOM cost optimized

▶ Benefit from higher quantities

▶ Baseboard BOM optimized

▶ SOM product maintenance free of charge

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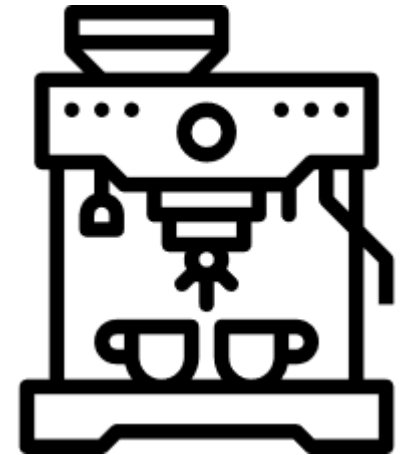
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STANDARDIZATION

▶ OSM Standardization procedure startet in SGET

▶ 4 form factors: zero, small, medium, large

   ▶ 30x13,5; 30x30; 30x48; 48x48 (mm)

▶ Predefined pining

   ▶ 147 pins, 267 pins, 395 pins, 593 pins (LGA)

▶ Broad range of manufacturers interested

**OPEN
STANDARD
MODULE**

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SUMMARY OF ASPECTS

▶ Designing a system based on a modern, complex CPU is not a simple thing.

▶ Concentrate on your USP:
The scope and the features of your product are your USP.
The features, the functionality, the interfaces are placed on the baseboard.

▶ You get the schematic and the BOM of reference board (Open source hardware).

▶ You get the Linux BSP (Open source software).

▶ You can get design support (Review of schematic and layout).

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UNLIMITED POSSIBILITIES

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#askTELEREX

#thankyouforlistening