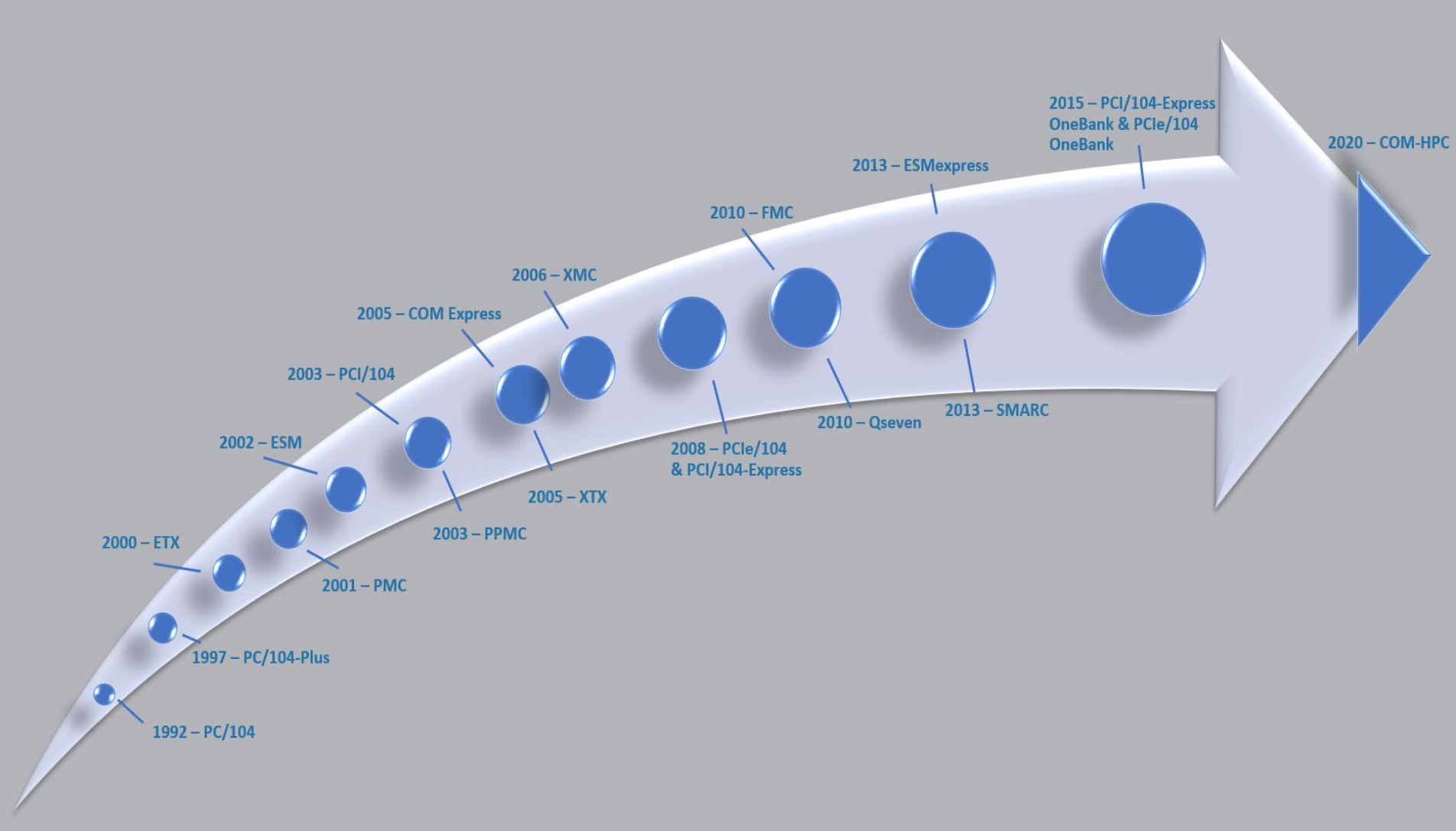# Module standards
in comparison

Technical possibilities and limits of the different plug-on boards

Hendrik Thiel, HEITEC AG

- **Historical Review**

- **Technical Comparison**

- **Market View**
  - Distribution by Architecture
  - Distibution by Availability

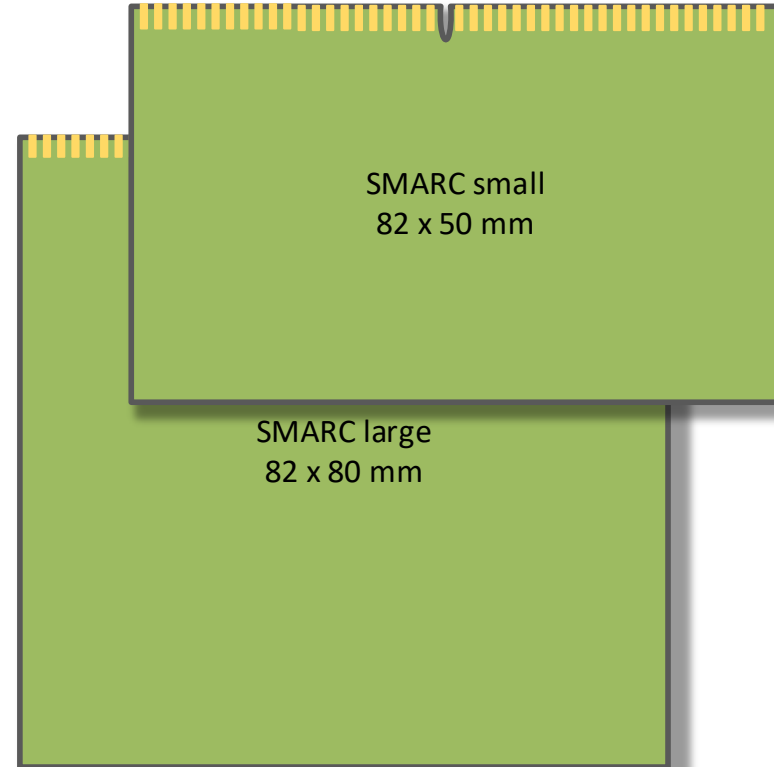- **Summary and Conclusions**

Historical Review

2015 – PCI/104-Express OneBank & PCIe/104 OneBank

2020 – COM-HPC

2013 – ESMexpress

2010 – FMC

2006 – XMC

2005 – COM Express

2003 – PCI/104

2002 – ESM

2000 – ETX

2008 – PCIe/104 & PCI/104-Express

2010 – Qseven

2013 – SMARC

2005 – XTX

2003 – PPMC

2001 – PMC

1997 – PC/104-Plus

1992 – PC/104

Technical Comparison

Technical Features

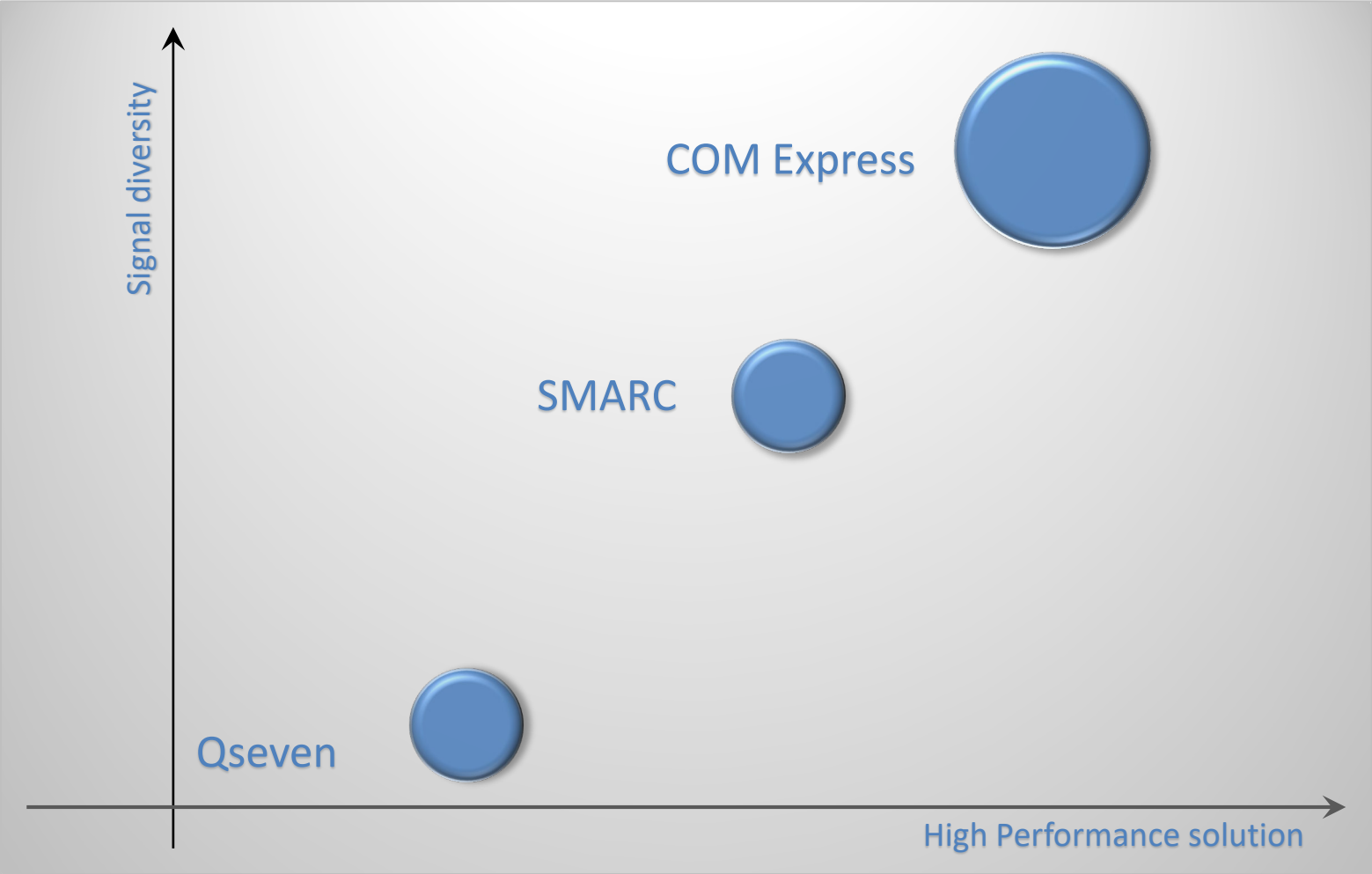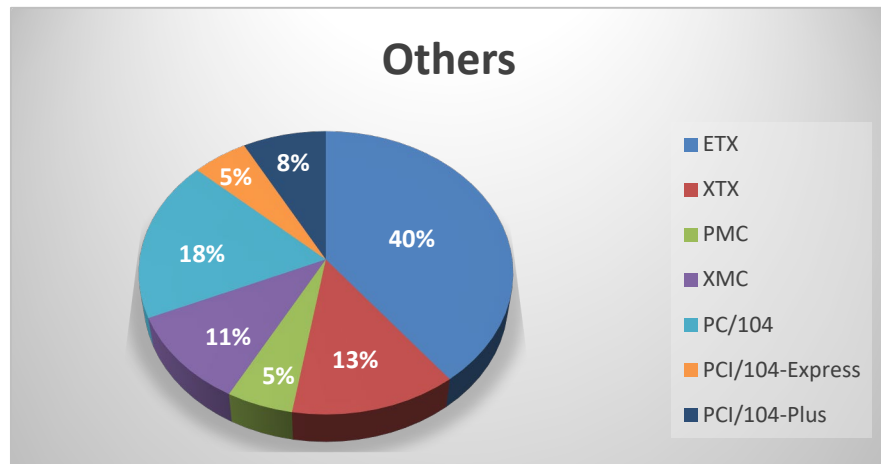|	Qseven		SMARC		COM Express		
	normal	µQseven	small	large	Type 6	Type 7	Type 10
Released	Qseven 2.1 2016		SMARC 2.0 2016		Init. 2005 Rev 3.0 2017	Init. 2005 Rev 3.0 2017	Init. 2005 Rev 3.0 2017
Architecture	X86 / ARM		X86 / ARM		x86	x86	x86
Connectivity							
PCIe up to Gen3	4 lanes	4 lanes	4 lanes	4 lanes	24 lanes	32 lanes	4 lanes
USB	8x USB 2.0 3x USB 3.0	8x USB 2.0 3x USB 3.0	6x USB 2.0 2x USB 3.1	6x USB 2.0 2x USB 3.1	4 USB 2.0 4 USB 3.0	4 USB 3.0	6 USB 2.0 2 USB 3.0
Pin count	230	230	314	314	2x 220	2x 220	1x 220
Max. Power consumption	< 12W	< 12W	< 15W	< 15W	116W	116W	58W
Application	Less complex designs like Edge Devices, Thin Clients		Complex visualisation solutions, IoT Gateways.		Mid level application; transportation, robotics, industrial control and HMIs	Micro Server / Server Application	Low power applications like mobile/handheld devices, controllers for outdoor applications

SMARC / Qseven - Board Sizes & Connector Types

µQseven
70 x 40 mm

Qseven
70 x 70 mm

SMARC small
82 x 50 mm

SMARC large
82 x 80 mm

COM Express - Board Sizes & Connector Types

COM Express (mini)
84 x 55 mm

COM Express (compact)
95 x 95 mm

COM Express (basic)
125 x 95 mm

COM Express (extended)
155 x 110 mm

Qualitative Comparison
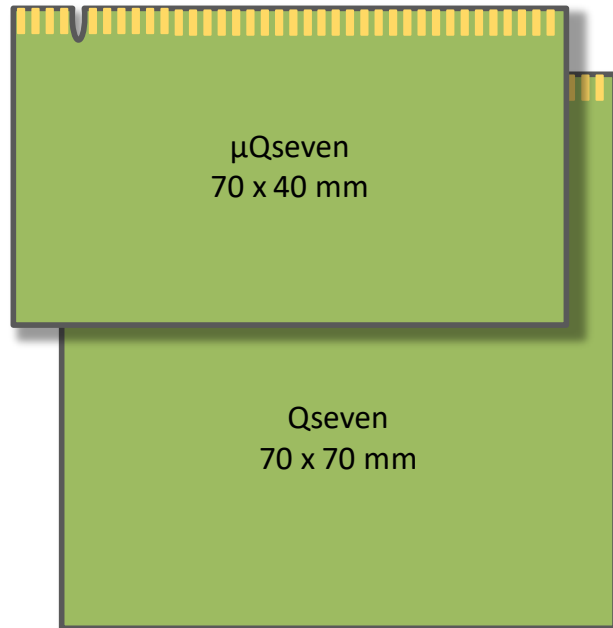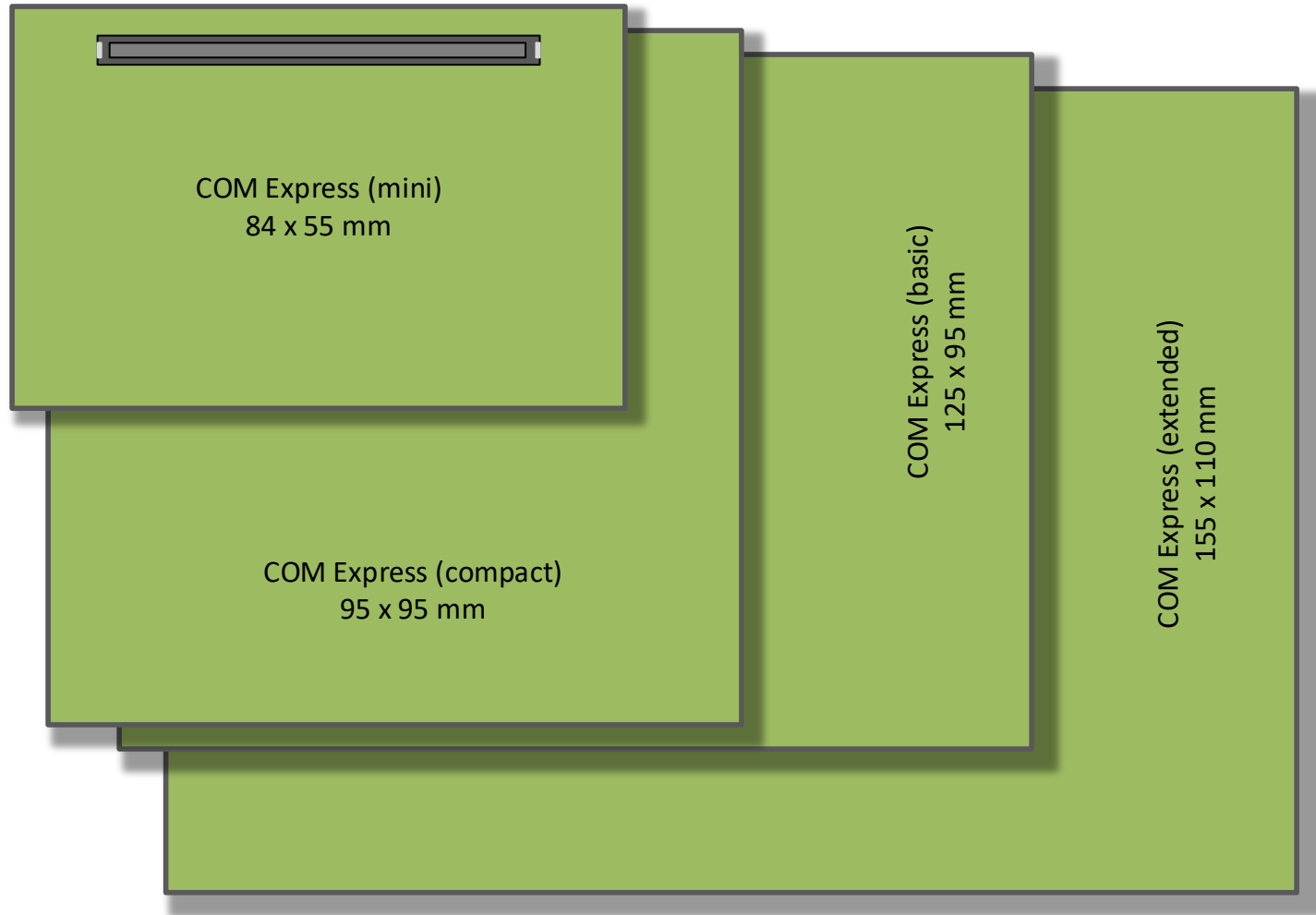
	Qseven	SMARC	COM Express
Bandwidth	+	+	++
Signal variety	o	+	++
Pin count	o	+	++
Performance	o	+	++
Ruggedness	++	++	++
Max. Power cons.	o	o	+
Mod. size	o	+	-

Rating:	very bad	bad	mediocre	good	very good
	--	-	o	+	++

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Market View

By Availability
By Architecture

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Market Overview

- COM Express
- Qseven
- SMARC
- Others (ETX,XTX, PMC, XMC, PC/104)

62%
16%
11%
11%

Others

- ETX
- XTX
- PMC
- XMC
- PC/104
- PCI/104-Express
- PCI/104-Plus

40%
13%
5%
11%
18%
5%
8%
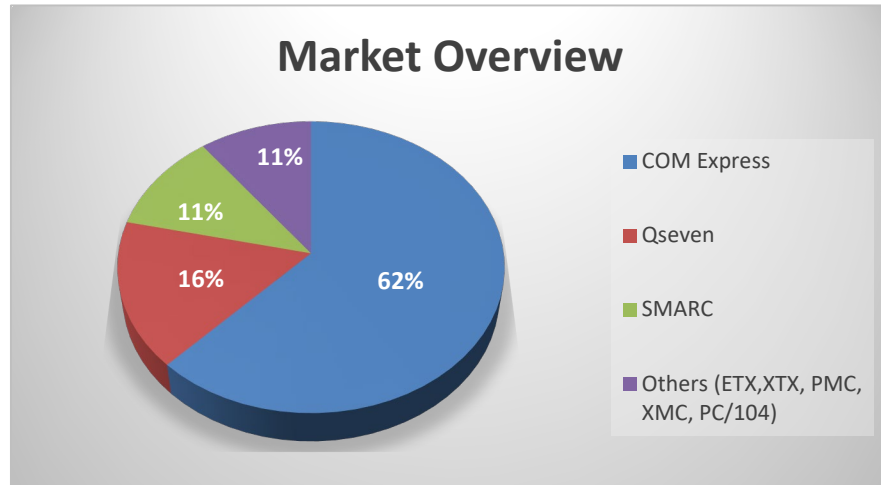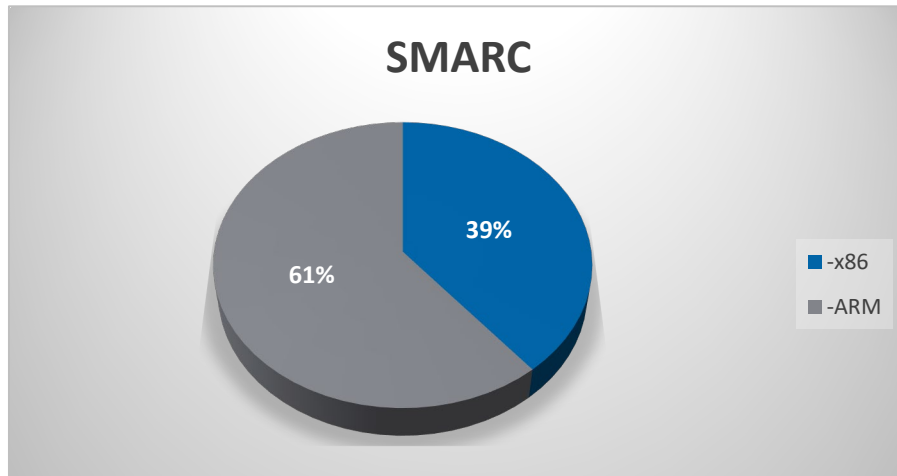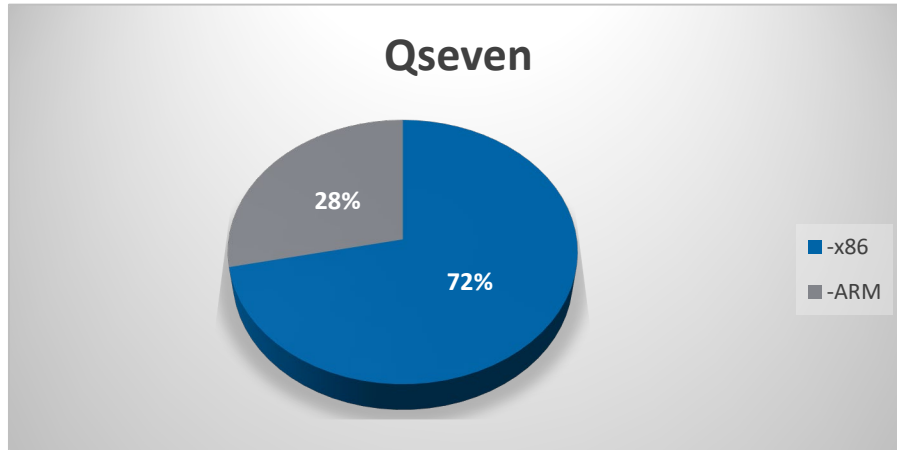
- ▪ Total market size of System on Modules across all market segments and processor architectures „guesstimated" over 3.5 billion USD by 2025.

- ▪ Industries such as defense, energy, healthcare and transportation are increasingly adopting modules.

- ▪ Three / in future four leading SoM with standardized interfaces
  - Qseven
  - SMARC
  - COM Express
  - *COM HPC*

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COM Express

Pie chart:
- COMe Basic 49%
- COMe Compact 38%
- COMe Mini 13%

Legend:
- COMe Basic
- COMe Compact
- COMe Mini
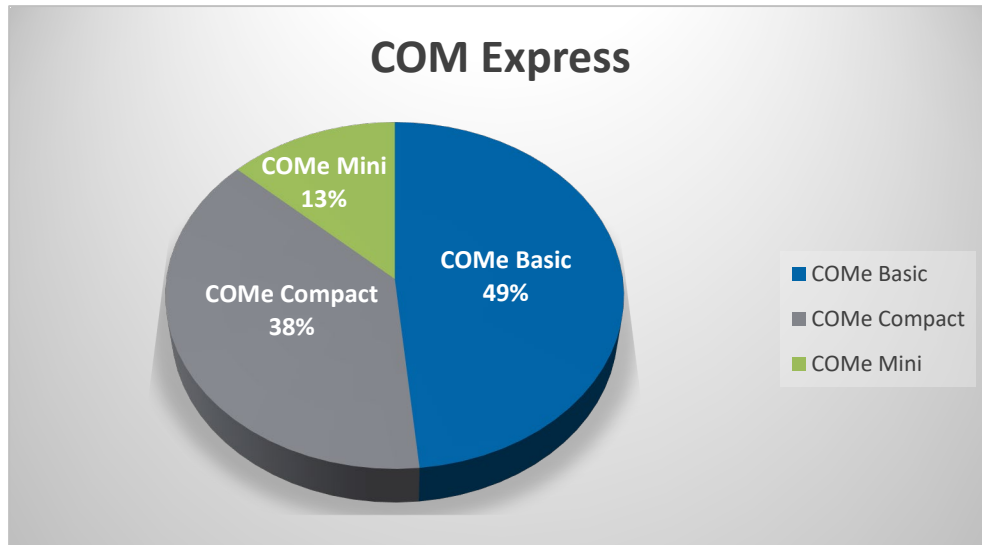
- COMe describes eight types (Type 1-7 and Type 10). Type 1, 3, 4 and 5 are obsolete and no longer relevant for new board designs.
  - Type 10 mainly using COMe Mini
  - Type 6 mainly using COMe Compact
  - Type 7 mainly using COMe Basic

- COMe Modules based on x86 architecture

- Actually three / in future four leading SoM with standardized interfaces
  - Qseven
  - SMARC
  - COM Express
  - *COM HPC*

Market View by Architecture – SMARC / Qseven

Qseven

28%

72%

- -x86
- -ARM

SMARC

39%

61%

- -x86
- -ARM

- The performance classification is also reflected in the availability of processor architectures at SMARC / Qseven

- ARM processors convince through efficiency, which is predestined for mobile devices or devices with lower performance requirements.

- x86 processors, which are produced by Intel or AMD, are suitable for more complex solutions with higher performance requirements and a realization of many interfaces, which are necessary for the ever advancing digital and virtualization

Summary and Conclusions

Summary and Conclusions

Application complexity →

Qseven	SMARC	COM Express	COM HPC
› 230 Pins	› 314 Pins	› Up to 440 Pins	› Up to 800 Pins
› Up to 12W	› Up to 15W	› Up to 116W	› Up to 300W
› 4 PCIe lanes	› 4 PCIe lanes	› Up to 32 PCIe lanes	› Up to 64 PCIe lanes
› 1x 1Gb Ethernet	› 2x 1Gb Ethernet	› Up to 5x 1Gb Ethernet	› Up to 8 x 25Gb Ethernet
› USB 3.0	› USB 3.0	› USB 3.1	

COM-HPC will not replace COMe.
It extends the server-on-module thought.