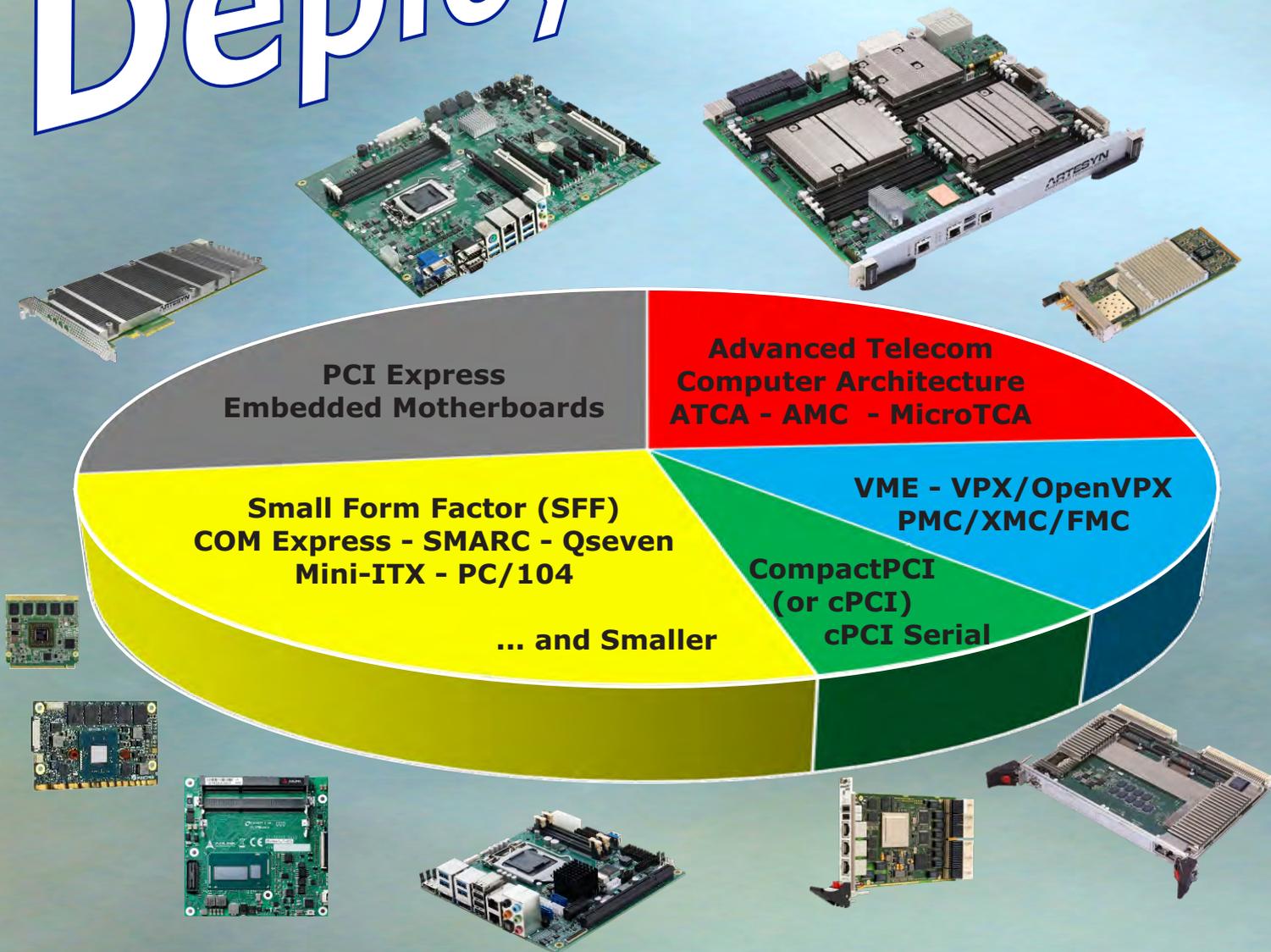


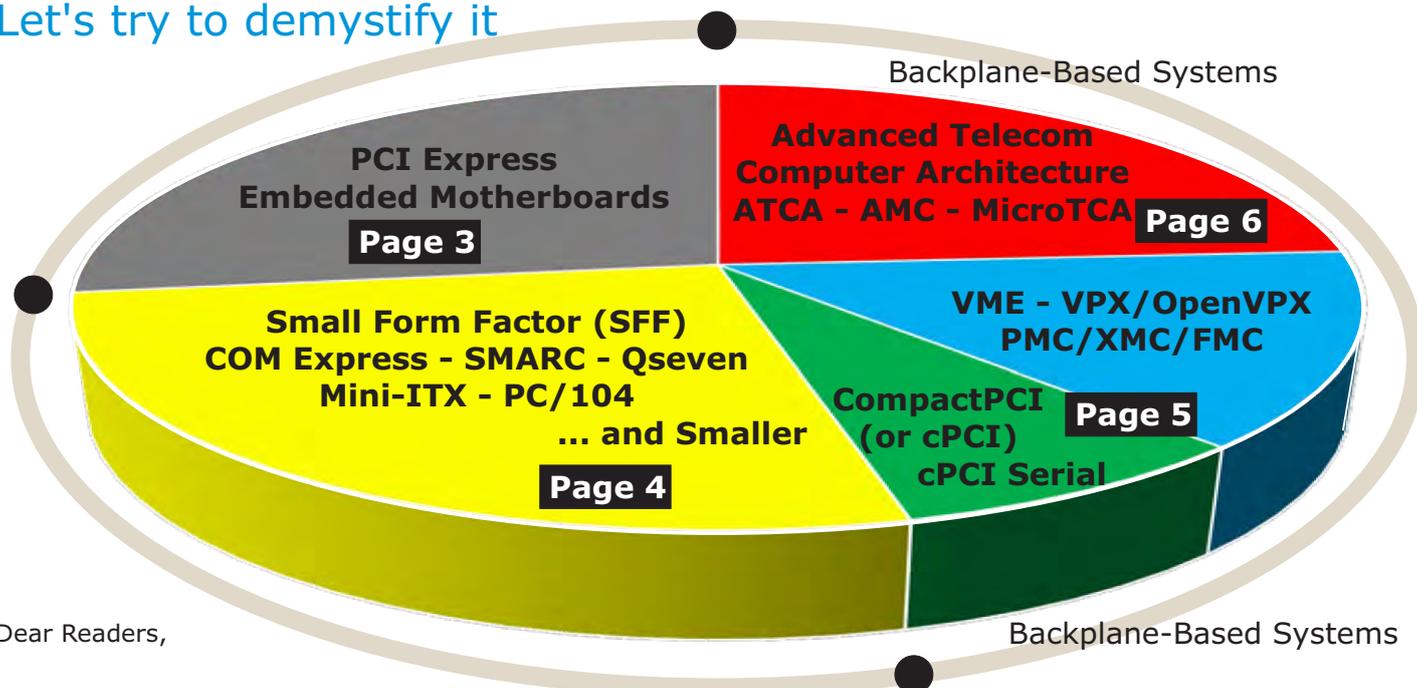
# Standard Architectures Deployment and Trends



**Standard Boards Market \$7B - Global**  
*excluding Systems & Integration Services*

# Special Edition Embedded Computer Boards

Who is making What and Who will « continue to » make What  
Let's try to demystify it



Dear Readers,

In this edition we are trying to give you an overview about the Embedded Board Market by Architecture/Format, which should help designers to make a choice for their next design.

We intend to publish a detailed update later in the year after specific interviews with vendor executives.

About the Standard Board Global Market 2015-2016

- Total: \$7Billions (excluding Systems and Integration Services)
- By Architecture/Format, see the pie above
- This is for the Merchant Market (meaning the Non-captive excluding the Captive, a factor 2 in some cases)

Methodology:

- Figure sources: analyst reports, press articles, congress, vendors, ... (conflicting info)
- Deployment and trends from the field, many customer inputs and meetings from our side
- We have explored in detail 60 Board Vendors websites (not always obvious)
- These 60 Vendors (list page 8) should represent about 90% of the Market (Total 200+)

Architecture Groups:

- We have put together on one page the architectures which are complementary and/or in competition for ease of comparison
- For each group we provide: vendor's product examples with links, associations/spec's with links, size comparison and more
- PAGE 3: PCIe and Embedded Motherboards, growing
- PAGE 4: SFF growing very fast - COMe is leading - SMARC & Qseven in competition, IoT to boost - Mini ITX a lot of functionality - PC/104 remain very strong in Mil/Aero
- PAGE 5: VME remains strong after 35 years and supported beyond 2025, smooth transition to companion VPX in some Defense applications - VPX growing fast now
- PAGE 5: cPCI drop in Telecom replaced by ATCA - cPCI Serial good position in Transportation and Industrial
- PAGE 6: ATCA 80% in Telecom, others include Military and Hi-end Control and Physics, **TOP Performances**
- Page 8: list of Associations and official specification sources with links, and the 60 selected vendors

About our background in short:

- 1980-2000: 20 years in Sales & Marketing/Executive Management for Embedded Systems (HW & SW)
- 2001-as of today 15 years: Marketing & Business Development **Services Worldwide** (many customer meetings)

**Your feedback is very important, please let us know**

Thank you.

Daniel Dierickx, Acting Chief Editor & CEO e2mos [mgt@e2mos.com](mailto:mgt@e2mos.com) [www.e2mos.com](http://www.e2mos.com)

# PCIe (or PCIE or PCI Express)

PCI Express (Peripheral Component Interconnect Express)

## Market Presence

- Most popular board format
- All Servers from IBM, Lenovo, HP, Dell, SuperMicro, ... have PCIE slots
- Rackmount or Industrial PC's are equipped with many PCIE slots
- Very much used for HPC and HPeC (event [www.isc-hpc.com](http://www.isc-hpc.com))
- Many functions available from many suppliers
- Now also used in volume for Video Accelerators (see picture)



Artesyn SharpStreamer  
Video Transcoding Accelerator Card  
[Click Here](#)

## Creation

- PCIe in 2004 by Intel – Dell - HP - IBM
- First PCI in 1992 (6 revisions till 2004)

## Association/Consortium/Specifications/Resources

- PCI-SIG <https://pcisig.com>
- PCI-SIG was founded in 1992 - Today over **700 Members** <https://pcisig.com/membership/member-companies>

## Product Examples

- from Artesyn: Video Accelerator, High Density Video Streaming card (see picture) [Click Here](#)
- from Intel: SSD (flash card) [Click Here](#)
- from Nallatech: Hi-end FPGA card [Click Here](#)
- from Acromag: I/O card [Click Here](#)
- from Pentek: I/O card [Click Here](#)
- MaxCore System with 15 PCIE slots [Click Here](#)

## Embedded/Industrial Motherboards Industrial Mainboards

### Popular Formats

- ATX (Desktop PC-like)
- Mini-ITX ... growing very fast



Mini-ITX Embedded Board  
with 6th Gen Intel Core  
Adlink AmITX-SL-G-L45 [Click Here](#)



Industrial ATX Motherboard  
with 6th Gen Intel® Core™  
Adlink IMB-M43 [Click Here](#)

### History and More

- Wikipedia [Click Here](#)

### Processors

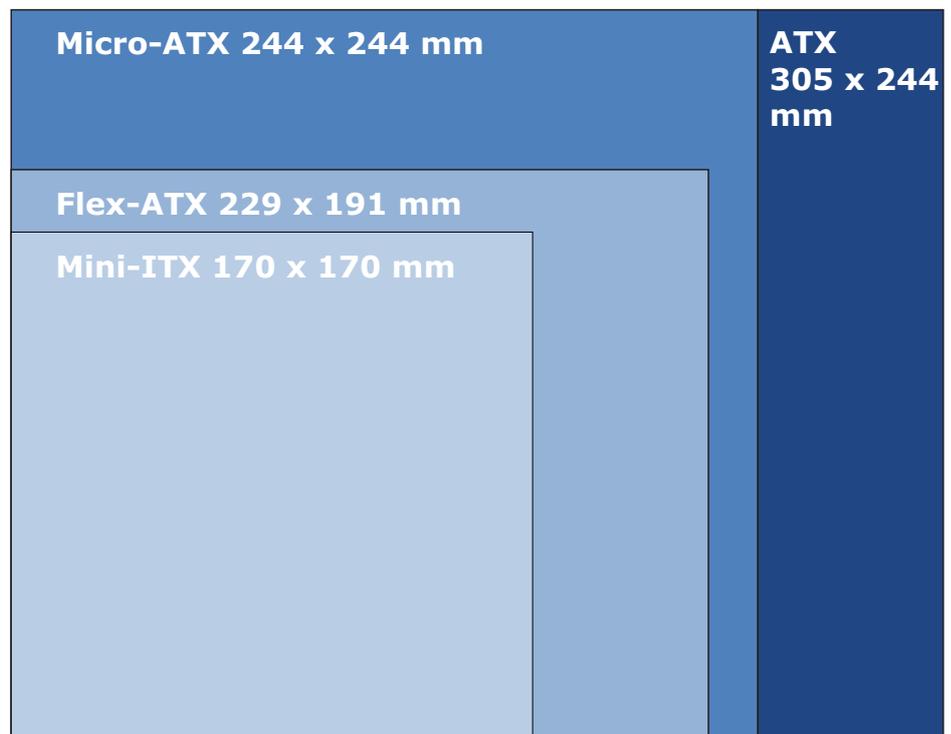
- Mainly Intel (many)
- AMD

### Supplier Examples

- Adlink [Click Here](#)
- Advantech [Click Here](#)
- Congatec [Click Here](#)
- Fujitsu [Click Here](#)
- iBASE [Click Here](#)
- Portwell [Click Here](#)
- Ricoh Industrial Solutions [Click Here](#)

### Huge Deployment

- Industrial PC
- Automation
- Medical
- Security/Surveillance
- Manufacturing
- T&M
- Digital Signage
- ... and more



# Small Form Factor Modules (SFF)

## COM Express SMARC Qseven

**VERY SMALL**  
Not a Standard  
30x30 mm

**Qseven**  
70x70mm  
**µQseven**  
70x40mm

**SMARC (large)**  
82x80mm  
**SMARC (small)**  
82x50mm

**COM Express**  
**Compact**  
95x95mm  
**Mini**  
84x55mm  
**Basic**  
125x95mm

COM Express - SMARC - Qseven Sizes Comparison  
Product Pictures and Press Release [ESW March 2016 \(p.3\)](#)

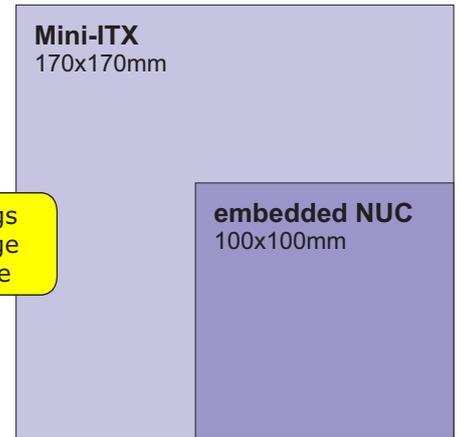
- also called Computer-On-Module (COM)
- choice of Processors Intel - AMD - ARM - ...
- standalone single board computers
- or **processor mezzanine plugged** on a base/carrier board that contains the **user's application specific I/O**
- SMARC (Smart Mobility ARChitecture) mainly ARM SoC
- **VERY SMALL** (not a standard) 30x30mm with ARM9, or 40x26mm with more functionality, produced by TQ Group
- COM Express is leading the race

## embedded NUC

- Industrial PC inspired by Intel® NUC systems (NUC: Next Unit of Computing)
- Specification published: Nov. 14, 2014)

## Mini-ITX

- Complete Embedded PC 170x170mm (see page 7)
- High runner and still growing fast



All drawings on this page same scale

## PC/104 and PC/104-Express

- Unique self-stacking bus and a lot of I/O Cards
- Ruggedized: Transportation - Military

Complete Description & Specifications - All Formats

The PC/104 Consortium chose PCI Express because of its full PC market adoption, performance, scalability, and growing silicon availability worldwide.

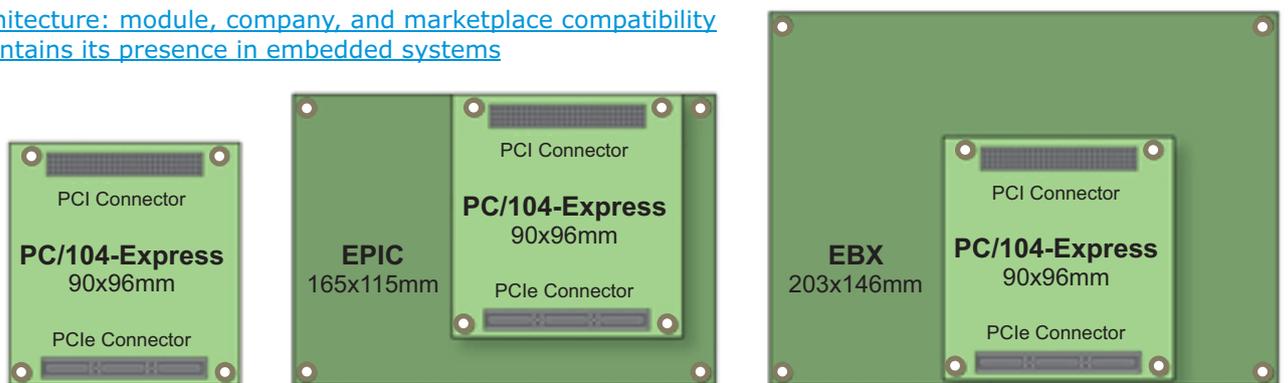
Category	Architecture	Associations / Specifications	Website
Small Form Format	COM Express	PICMG - USA	<a href="#">CLICK HERE</a>
Small Form Format	SMARC	SGET - Germany	<a href="#">CLICK HERE</a>
Small Form Format	Qseven	SGET - Germany	<a href="#">CLICK HERE</a>
Small Form Format	embedded NUC	SGET - Germany	<a href="#">CLICK HERE</a>
Small Form Format	embedded NUC	Intel Site	<a href="#">CLICK HERE</a>
Small Form Format	PC/104	PC/104 Consortium - USA	<a href="#">CLICK HERE</a>
Small Form Format	Mini-ITX	Intel Site	<a href="#">CLICK HERE</a>
Small Form Format	Non Standard 30x30mm	Vendor: TQ Group - Germany	<a href="#">CLICK HERE</a>

It provides a high-performance physical interface while retaining software compatibility with existing PCI™ infrastructure.

EPIC-Express™ and EBX-Express™ are the embodiments of PCIe/104 on the PC/104 Consortium's EPIC and EBX form factors.

### Read the NEWS:

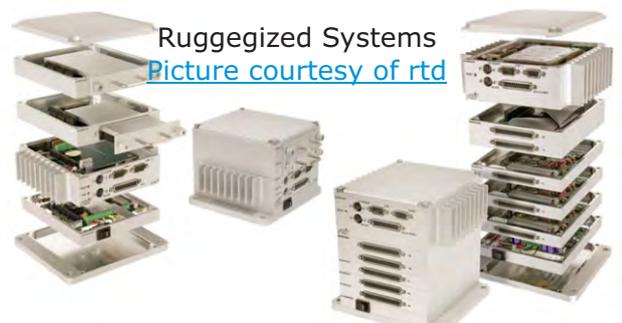
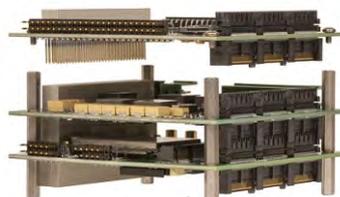
- [PC/104 architecture: module, company, and marketplace compatibility](#)
- [PC/104 maintains its presence in embedded systems](#)



PCI/104 Express - EPIC - EBX Sizes Comparison



PC/104 Express Board  
[Picture courtesy of Kontron](#)



Ruggedized Systems  
[Picture courtesy of rtd](#)

# 3U and 6U (Backplane-based Boards)

## VME/VXS (Serial) - CompactPCI & Serial - VPX/OpenVPX

Applications: Industrial - Transportation - Military/Naval/Aerospace

### Mezzanine Cards

#### PMC - PrPMC (Processor) - XMC (Switched) - FMC (FPGA)

The PMC (PCI Mezzanine Card) was first adopted for use in commercial and government electronics in 1994 as the IEEE standard 1386.1.

#### Associations - Complete Specifications - Product Examples

Backplane-based	CompactPCI	PICMG - USA	<a href="#">CLICK HERE</a>
Backplane-based	VME - VXS - PMC/XMC	VITA	<a href="#">CLICK HERE</a>
Backplane-based	VPX - Open VPX	VITA	<a href="#">CLICK HERE</a>
Backplane-based	VPX - Open VPX	Vendor: Mercury Systems - USA	<a href="#">CLICK HERE</a>
I/O Cards (for example)	PMC - XMX - FMC	Vendor: Curtiss-Wright - USA	<a href="#">CLICK HERE</a>

See page 8: Table with 60 Vendors of which 21x VME, 25x cPCI, 20x VPX, 21x PMC/XMX/FMC



[MVME8105](#)  
NXP® QorIQ® P5020  
VME64x SBC

#### Artesyn - VME beyond 2025

Artesyn, formerly Motorola the inventor of the VMEbus (1981), confirms «we can continue to offer an extensive portfolio of VME boards up to at least 2025» see [ESW March 2016](#)

VME is used in applications that are event-driven. These applications – controlling motors and actuators, moving gun turrets and missile launch frames into position – are control system applications. **VME's interrupt structure is the only architecture that can handle these kinds of applications in real time.**



[cPCI-A3515 Series](#)



cPCI-A3515 cPCI-A3515B cPCI-A3515D

#### Adlink - 3U cPCI Serial

ADLINK Launches 3U CompactPCI® Serial 4th/5th Generation Intel® Core™ Processor Blade with ECC memory  
First ADLINK processing blade supporting the CompactPCI Serial standard for high-speed data throughput



[VPX3G10](#)  
3U VPX Graphic Card (GPGPU) featuring the 384 core NVIDIA



[VPX6000](#)  
6U VPX Conduction-cooled Dual-CPU 4th Gen Intel Core i7

#### Adlink - VPX

**LEFT:** VPX3G10 3U VPX general-purpose computing on graphics processing unit (GPGPU) blade featuring the 384 core NVIDIA GeForce GT 745M GPU with high resolution and high performance graphics capabilities.

**RIGHT:** VPX6000 Dual-CPU 4th Gen Intel Core i7 processor 6U VPX blade (0.85" pitch) with Mobile Intel® QM87 Express Chipset in a rugged conduction cooled, VPX REDI (VITA 48) form factor.

#### Extreme Engineering - XMC/PrPMC

**LEFT:** XPedite6401  
NXP QorIQ LS1043A ARM Processor-Based Conduction-Cooled XMC/PrPMC Mezzanine Module

#### Vadatech - FPGA FMC per VITA 57

**RIGHT:** FMC219  
FMC High-speed Dual DAC 14-bit at 2.5 GSPS with Wide-band PLL on board



[Xpedite6401](#)



[FMC219](#)

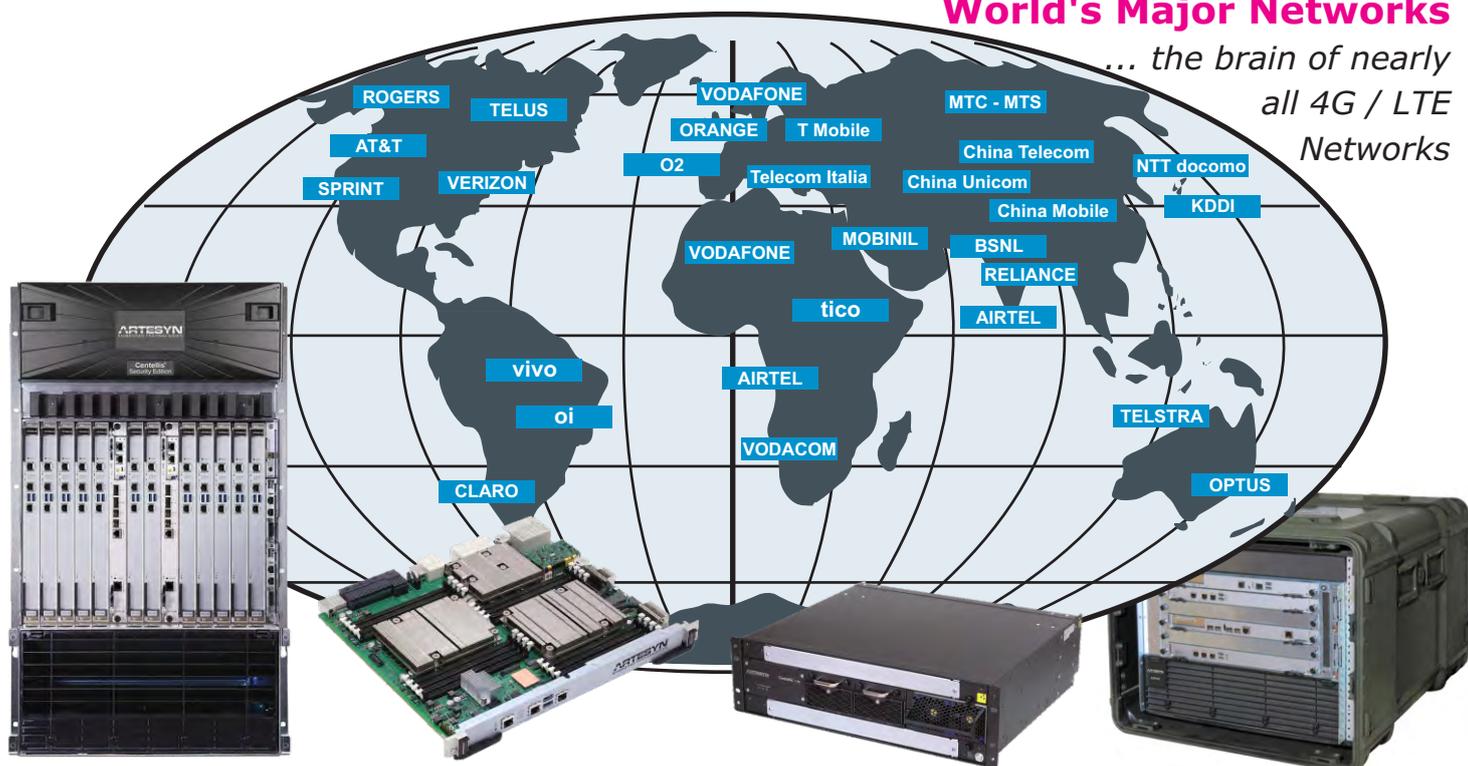
# Advanced Telecom Computing Architecture, (or AdvancedTCA or ATCA) ...now 100G

## What is ATCA

The Advanced Telecom Computing Architecture (AdvancedTCA®) specifications, denoted PICMG 3.X, are a series of **PICMG specifications**, designed to provide an **open, multi-vendor architecture targeted to requirements for the next generation of carrier grade communications equipment**. This series of specifications incorporates the latest trends in high speed interconnect technologies, next generation processors and improved reliability, manageability and serviceability. The original AdvancedTCA specification was released in January of 2003 and has been adopted by many of the top telecommunication equipment providers. It has expanded its reach into non-carrier grade environments where high processor and I/O density coupled with high system bandwidth are required. See all details here: <https://www.picmg.org/>

## ATCA is deployed in all the World's Major Networks

... the brain of nearly all 4G / LTE Networks



[NEW 14-Slot Chassis](#)  
600Watt per Blade  
100G

NEW Server Blade  
with Latest Intel Xeon  
[See the Video](#)

2 - 6 and 14-Slot  
[Systems](#)

[Military-Aerospace-Security](#)  
For Voice, Video, Data Processing,  
C4ISR, Combat Systems

## Features

The ONLY Standard Specifications for Large & Medium Telecom IT  
The ONLY One with Second Sources  
The ONLY ONE offering the « Make-or-Buy » option  
The MOST Flexible Computer Platform  
FULLY Modular and NO Single Point of Failure  
HA: High Availability « 99.999% five nines » In-service UPGRADE  
The BEST Platform to accommodate DSP Farms  
The MOST Trusted Platform for Security

See Artesyn [www.artesyn.com/computing/products/category/atca](http://www.artesyn.com/computing/products/category/atca) and page 8 **Vendors table: 13x ATCA and 19x AMC**

## Applications

Communications Large & Medium Networks  
Military - Aerospace - Deepsea - Security - Surveillance  
Large-scale Physics Experiments  
HPC (High Performance Embedded Computers)  
Semiconductor Manufacturing Equipment  
Hi-end Medical  
Signals Intelligence, ...

## AdvancedMC (or AMC) and MicroTCA (or μTCA)

**AMC** - AMC's are « Advanced Mezzanine Cards » to be used on ATCA Blades.

Some ATCA Blades have 1 or 2 AMC slots. AMC Carrier Blades are available with 3-4-7 slots [Kontron Parpro Vadatech](#)  
There many AMC's on the market (over 20 suppliers) and is the **perfect solution for customization**

**MicroTCA** - MicroTCA is a smaller chassis compared to ATCA (1-2-3-4U) and is using directly the AMC cards in that MicroTCA chassis

**Applications include:** Telecom Base Stations, Telecom Submarine Networks, Airborne Recovery of the Emergency Communication Network during Disasters, Military (very much USA), Physics Experiments (Worldwide), Transportation, and more  
Examples of AMC Vendors offering many options: [CommAgility](#) (DSP), [Prodrive](#) (Hi-end), [Vadatech](#) (over 300 AMC's)



# ADLINK Introduces Thin Mini-ITX Embedded Board, AmITX-BW-I, for Space-constrained Applications

*Flexible design offers rich I/O options and choice of processors to target digital signage boxes, vending machines, small POS systems, portable medical devices, infotainment, video, industrial automation and IoT*



Tapei, Taiwan – April 11, 2016 – ADLINK Technology, Inc., a leading global provider of cloud-based services, intelligent gateways, and embedded building blocks for edge devices that enable the Internet of Things (IoT), introduces the AmITX-BW-I, the company's first thin Mini-ITX embedded board. For flexible embedded application development, the AmITX-BW-I offers enhanced display features with Intel® Gen 8 LP HD Graphics in a low profile and scalable design.

The thin Mini-ITX form factor is the “premier standard for designing and assembling all-in-one PCs,” according to Intel. Measuring 170 mm square and less than 25 mm thick, the AmITX-BW-I fulfills requirements for applications in digital signage, infotainment, medical, and industrial automation that are running in limited-space environments. ADLINK's first thin Mini-ITX board also follows the Form, Fit, Function design principle to offer standardized pinout locations and is compatible with the Micro-ATX and regular ATX chassis.

“The AmITX-BW-I extends our Mini-ITX product range for high performance systems. With its enhanced graphics, compact size, and Windows 10 support, this new board offers embedded developers unsurpassed flexibility and cost-effectiveness in the long term,” said Henk van Bremen, senior director of the ADLINK Module Computing Product Segment.

With low-latency, high-resolution video imaging, the AmITX-BW-I features the Intel® Atom™ x5-E8000 processor and is designed for graphics-intensive applications such as infotainment, medical imaging, and industrial automation. Intel® Gen 8 LP HD Graphics supports three independent 4K displays and provides full hardware acceleration for encoding/decoding of HEVC H.265, H.264/263, SVC, AVS, VP8/9, and MPEG4. Video and 3D rendering is enhanced by DirectX 11.1, OpenGL 4.2, ES 3.0, and OpenCL 1.2.

The AmITX-BW-I supports high bandwidth connectivity with two single-lane PCIe bus interfaces. These deliver reliable Gigabit Ethernet for gaming, retail services, ATMs, slot machines, and kiosks. One Mini PCIe slot, one mSATA slot, and one SIM card slot are also available. A range of high-speed I/O, including two SATA 6 Gb/s ports, enables real-time data processing and sharing for medical imaging and diagnostics applications.

Board connectors include four rear USB 3.0, two front-panel USB 2.0, and two USB 2.0 onboard headers. The board also features four serial RS-232 ports, two serial RS-232/422/485 ports, a unique socketed SPI BIOS chip and SPI module, and a header for an optional TPM module.

The AmITX-BW-I embedded board is equipped with ADLINK's Smart Embedded Management Agent (SEMA) to provide detailed system data at the device level, including temperature, voltage, power consumption, and other key information. Access to system activities allows operators to identify inefficiencies and malfunctions in real-time, thus preventing failures and minimizing downtime. ADLINK's SEMA-equipped devices connect seamlessly to the SEMA Cloud to enable remote monitoring. All collected data, including sensor measurements and management commands, are accessible from any place, at any time through an encrypted connection.

For more information, please [CLICK HERE](#) or visit [www.adlinktech.com](http://www.adlinktech.com)

Daniel Dierickx  
CEO & co-Founder  
at e2mos  
Acting Chief Editor



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- Customer Meeting Setup
- Telemarketing
- Call Campaigns
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It is all based on:

- 30+ Years Customer Relationship and Market & Technology Expertise
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**Telecom COTS World**  
Broadband Broadcast IoT Convergence

**Embedded Systems World**

**ATCA World**

# Associations Consortiums and Specifications

Item	Category	Architecture	Associations / Specifications	Website
1	Small Form Format	COM Express	PICMG - USA	<a href="#">CLICK HERE</a>
2	Small Form Format	SMARC	SGET - Germany	<a href="#">CLICK HERE</a>
3	Small Form Format	Qseven	SGET - Germany	<a href="#">CLICK HERE</a>
4	Small Form Format	embedded NUC	SGET - Germany	<a href="#">CLICK HERE</a>
5	Small Form Format	embedded NUC	Intel Site	<a href="#">CLICK HERE</a>
6	Small Form Format	PC/104	PC/104 Consortium - USA	<a href="#">CLICK HERE</a>
7	Small Form Format	Mini-ITX	Intel Site	<a href="#">CLICK HERE</a>
8	Small Form Format	Non Standard 30x30mm	TQ Group - Germany	<a href="#">CLICK HERE</a>
9	Backplane-based	ATCA	PICMG - USA	<a href="#">CLICK HERE</a>
10	Backplane-based	AMC - MicroTCA	PICMG - USA	<a href="#">CLICK HERE</a>
11	Backplane-based	CompactPCI	PICMG - USA	<a href="#">CLICK HERE</a>
12	Backplane-based	VME - VXS - PMC/XMC	VITA	<a href="#">CLICK HERE</a>
13	Backplane-based	VPX - Open VPX	VITA	<a href="#">CLICK HERE</a>
14	Backplane-based	VPX - Open VPX	Mercury Systems - USA	<a href="#">CLICK HERE</a>

## Our Selection of 60 Board Vendors & their Architectures Offering

Item	Board Vendor / Format	PCIe	ATX Embedded	COM Express	SMARC	Qseven	embedded NUC	Mini-ITX	PC / 104	CompactPCI (cPCI)	VME - VXS	PMC - XMC - FMC	VPX - OpenVPX	ATCA	AMC
	<b>TOTAL by Format out of 60 Vendors</b>	<b>23</b>	<b>6</b>	<b>21</b>	<b>5</b>	<b>7</b>	<b>2</b>	<b>9</b>	<b>22</b>	<b>25</b>	<b>21</b>	<b>21</b>	<b>20</b>	<b>13</b>	<b>19</b>
1	AAEON			x	x	x			x						
2	Abaco (formerly GE IP)	x		x				x	x	x	x	x	x		
3	Acromag	I/O		x						x	x	x			
4	ADL Embedded Solutions								x						
5	Adlink	x	x	x	x	x		x	x	x			x	x	x
6	Advanced Micro Peripherals	x							x	x		x			
7	Advantech	x		x		x		x		x			x	x	x
8	AIM	x							x	x	x				
9	Aitech Defense Systems									x	x	x	x		
10	Annapolis Micro Systems	x											x		x
11	ARBOR Technology Co			x		x		x	x						
12	Artesyn (Originaly Motorola)	x									x			x	
13	Axiomtek	x	x	x				x	x						
14	BittWare	FPGA													
15	CES Creative Electronic Systems										x	x	x		
16	CommAgility	x											x		x
17	Concurrent Technologies									x	x	x	x		x
18	Congatec			x		x		x							
19	Curtiss-Wright	X							X	X	x	x	x		
20	Diamond Systems			x					x						
21	EKF System									X		X			
22	Elma									x	x	x	x		x
23	Eurotech			x					x	x	x				
24	Extreme Engineering Solutions			x						x	x	x	x		
25	Fastwell			x					x	x					
26	Fujitsu		x												
27	General Micro Systems									X	X		X		
28	iBASE	x	x	x	x			x	x						
29	ICOP Technology								x						
30	Intel	SSD					x								
31	Interface Concept									x	x	x	x		
32	Kontron		x	x	x			x	x	x	x	x	x	x	x
33	MEN			x						x	x	x			
34	Mercury Computer Systems										x	x	x	x	x
35	Nallatech	FPGA							FPGA		FPGA	FPGA		FPGA	FPGA
36	NAT	x								x	x	x			x
37	North Atlantic Industries									x	x		x		
38	Nutaq											x			x
39	OCZ (now a Toshiba company)	SSD													
40	PARPRO (incl. JumpGen Systems)	x												x	x
41	Pentek	I/O								x		x	x		x
42	Portwell			x	x	x			x						
43	Prodrive Technologies													x	x
44	Radisys			x										x	
45	Ricoh Industrial Solutions		x					x							
46	RTD								x						
47	SANBlaze									x				x	x
48	SECO			x		x	x								
49	SURF Communication Solutions	x													x
50	Telco Systems													x	
51	TEWS Technologies	x							x	x	x	x			x
52	Themis Computer										x	x	x		
53	TQ Group			x				x							
54	Vadatec	x								x		x	x	x	x
55	VersaLogic			x					x						
56	WIN Enterprises	X		X				X	X						
57	WinSystems								x						
58	WOLF Advanced Technology											x	x		X
59	XALYO Systems														
60	ZNYX									x				x	