



MicroTCA Application Guide

Version 1.0

August 11, 2010

Guide created by David Pursley of Kontron

*with input from
Eike Waltz of Elma Electronics
and Mark Leibowitz of BAE Systems*

AdvancedMC is a trademark of PICMG.

AdvancedTCA and MicroTCA are registered trademarks of PICMG.

Revision History

- v1.0, 8/11/2010:
Initial release by MTCA.3 committee. Includes information on MTCA.0, MTCA.1, MTCA.3 specifications. Also includes preliminary information on MTCA.2 and MTCA.4.

WHILE THE INFORMATION IN THIS PUBLICATION IS BELIEVED TO BE ACCURATE, PICMG® MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARD TO THIS MATERIAL INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF TITLE OR OWNERSHIP, IMPLIED WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR USE.

Scope

This guide is intended for system architects who are responsible for evaluating and selecting the architecture and form factor for specific project requirements. As such, the goal of this document is to help those architects to narrow down their search space when considering the MicroTCA family of specifications.

This document gives a high level overview of the types of applications and requirements that would drive a project toward one MicroTCA specification or another. This document does not explicitly compare MicroTCA against other form factors. Instead, it is designed for the architect who wants to leverage the advantages of MicroTCA but is unsure which variation or designation of a MicroTCA product class to use.

Please note that this guide is derived from information in the PICMG® MTCA.0, MTCA.1, and MTCA.3 specifications and working group documents. For guidelines on the design of MicroTCA™ compliant modules and systems, refer to the full specifications and/or working group documents.

Related specifications

MicroTCA has its foundations in ATCA (Advanced Telecommunications Computing Architecture), in which AdvancedMC's (Advanced Mezzanine Cards) are mezzanine cards. Essentially, the MicroTCA base specification defines a system where AdvancedMC's can be used outside of an ATCA carrier. This enables the potential to create a system with many of ATCA's advantages in a smaller and more energy-efficient package.

A number of more rugged and more specialized MicroTCA implementations have also been defined. With each of these derivative specifications, the goal is to reuse the exact same AMC printed circuit boards and as much of the MicroTCA base specification infrastructure as possible.

The current list of MicroTCA-related specifications is listed in Table 1. Visually, the relationship of these specifications is shown in Figure 1.

PICMG Specification	Name	Description
PICMG 3.0	AdvancedTCA Base Specification	The PICMG 3.0 “core” specification specifies board, backplane and shelf mechanicals; power distribution and the connectivity required for system management.
AMC.0	AdvancedMC Mezzanine Module	Defines a mezzanine building block approach for the addition of crucial functionality to a PICMG 3.0 carrier card available from a number of third party suppliers.
MTCA.0	MicroTCA	Defines a system architecture that uses AdvancedMC Mezzanine Modules plugged directly into a backplane without modifications.
MTCA.1	Air Cooled Rugged MicroTCA	Defines ruggedized version of MicroTCA for exterior and mobile communications applications.
MTCA.2 *	Hardened Air Cooled MicroTCA	Defines ruggedized version of MicroTCA for rugged industrial and military applications with forced air flow over the modules.
MTCA.3	Hardened Conduction Cooled MicroTCA	Defines ruggedized version of MicroTCA for rugged industrial and military applications with no air flow over the modules.
MTCA.4	xTCA for Physics	Develops additional features and options for AdvancedTCA and MicroTCA for use in particle physics research including data collection and accelerator control systems.

Table 1: The MicroTCA family of specifications includes five MTCA.x specifications and two supporting specifications.

* The MicroTCA.2 standardization effort has not begun, except to identify the potential need for such a standard.

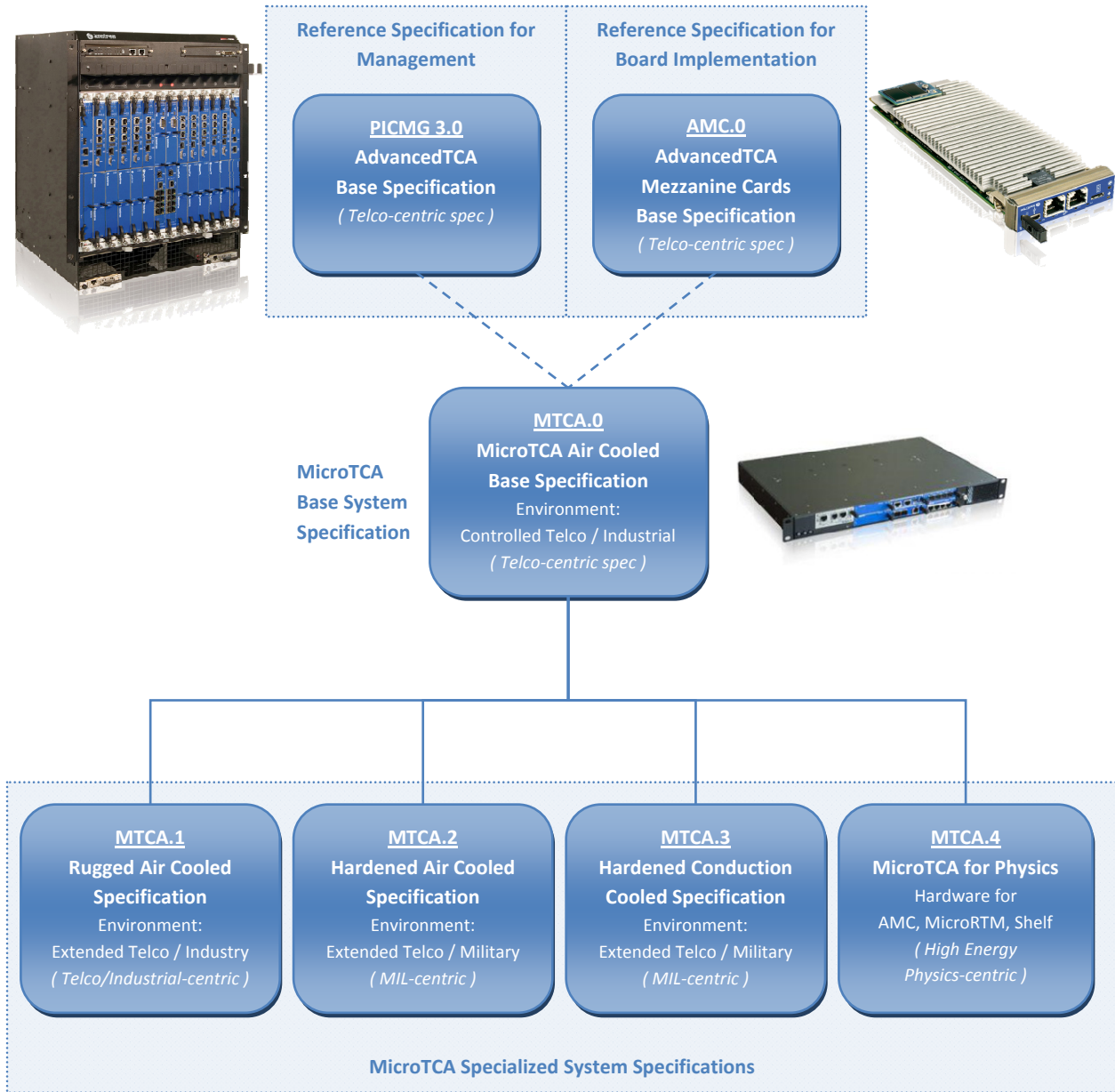


Figure 1: The MicroTCA family of specifications maximizes reuse from its ATCA and AMC parent specifications.

N.B.: MTCA.2, “Hardened Air-Cooled MicroTCA,” is intended for applications where the modules could be cooled by forced air, but the shock and vibration environment requires that they be more securely fastened to the subrack via wedge locks. The MTCA.2 standardization effort has not begun, except to identify the potential need for such a standard.

MicroTCA Family Decision tree

The decision tree shown in Figure 2 will help system architects choose which MicroTCA specification(s) are most relevant to the program at hand

For simplicity of the decision tree, some of the MicroTCA Product Classifications listed in the decision tree use the “x” suffix to indicate that the architect should choose from a set of classifications. Table 2 will help the architect choose the correct classification.

After using the decision tree, double-check the result by consulting Table 3 for a fuller list of environmental requirements for the classification. Of course, only a review of the full MTCA.x specification that contains the resulting product classification will guarantee that the classification meets all requirements of a given program.

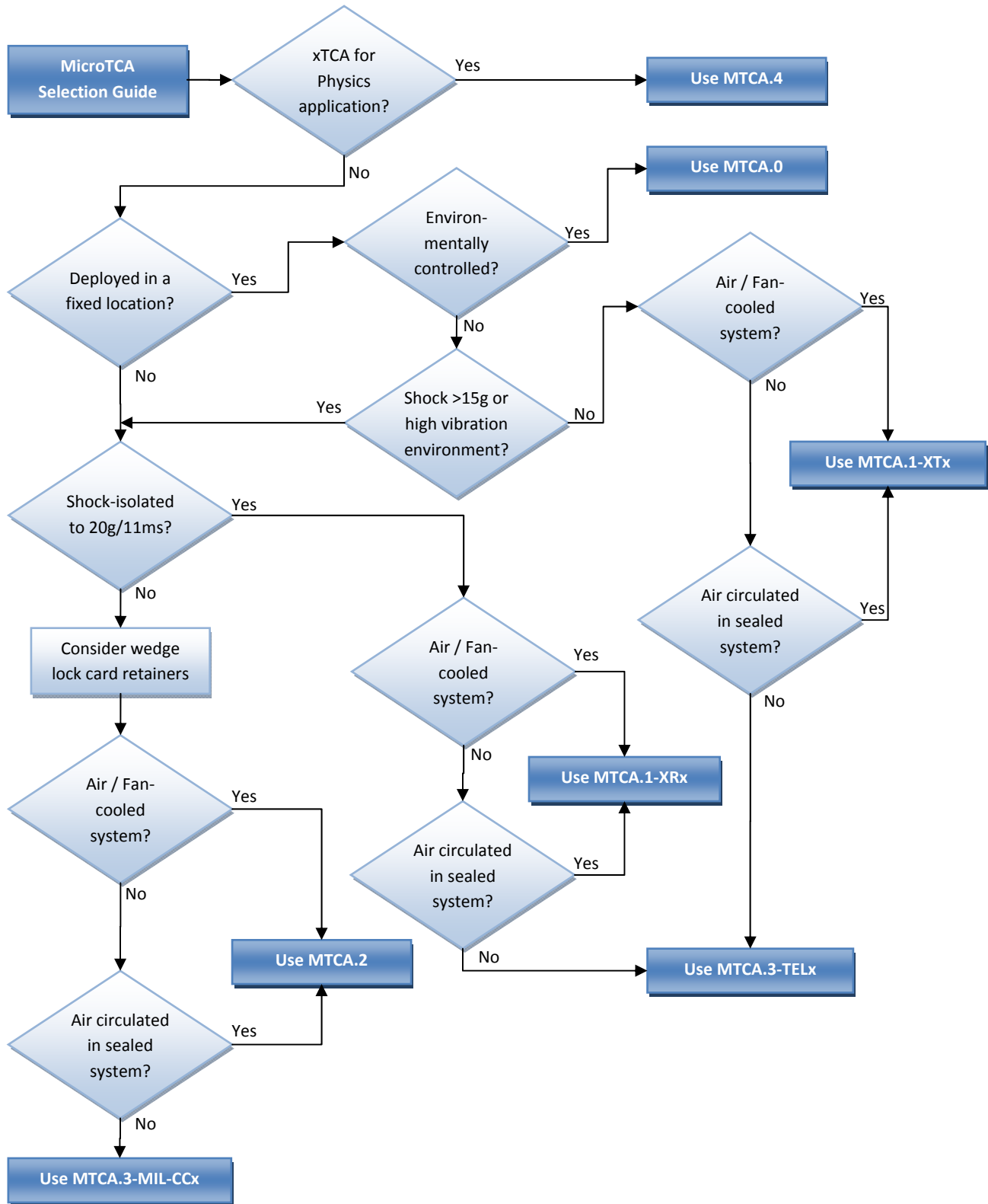


Figure 2: A decision diagram simplifies selecting which MicroTCA specification is most relevant to a given program.

Decision tree result	Possible classifications	When to use the classification
MTCA.1-XTx	MTCA.1-XT1	Operating temperature: -40 to +70C
	MTCA.1-XT1L	Operating temperature: -40 to +55C
MTCA.1-XRx	MTCA.1-XR1	Operating temperature: -5 to +55C Operating shock: 25g Operating vibration: 3g sinusoidal
	MTCA.1-XR2	Operating temperature: -5 to +55C Operating shock: 20g/11ms Operation vibration: 8g random (VITA 47 V2)
	MTCA.1-XR1/XT1	Operating temperature: -40 to +70C Operating shock: 25g Operating vibration: 3g sinusoidal
	MTCA.1-XR1/XT1L	Operating temperature: -40 to +55C Operating shock: 25g Operating vibration: 3g sinusoidal
	MTCA.1-XR2/XT1	Operating temperature: -40 to +70C Operating shock: 20g/11ms Operation vibration: 8g random (VITA 47 V2)
	MTCA.1-XR2/XT1L	Operating temperature: -40 to +55C Operating shock: 20g/11ms Operation vibration: 8g random (VITA 47 V2)
MTCA.3-TELx	MTCA.3-TEL-1	Operating shock: 15g Operating vibration: 1g sinusoidal
	MTCA.3-TEL-2	Operating shock: 25g Operating vibration: 8g random (VITA 47 V2)
MTCA.3-MIL-CCx	MTCA.3-MIL-CC2	Operating temperature: -40 to +55C (card edge)
	MTCA.3-MIL-CC3	Operating temperature: -40 to +70C (card edge)
	MTCA.3-MIL-CC4	Operating temperature: -40 to +85C (card edge)

**Table 2: Use this to determine the full MicroTCA Product Classification to use when the decision tree result ends with “x.”
A fuller list of environmental requirements for each Product Classification can be found in Table 3.**

Detailed specification comparison

A more detailed comparison of the environmental requirements for the various MicroTCA specifications is shown in Table 3.

N.B.: The following tables include references to MTCA.2, the specification for “Hardened Air Cooled” implementations. As mentioned previously, the MTCA.2 standardization effort has not begun, except to identify the potential need for such a standard. The values in this table corresponding to MTCA.2 are expectations of the worst case (most severe) environmental conditions MTCA.2 will address.

	Product Class		Product Class (Conduction-cooled)				
	Product Class (Air-cooled)	Product Class (Conduction-cooled)	MTCA.0	MTCA.1	MTCA.2	MTCA.3	MTCA.4
Operating Temperature	Basic		-5C / +55C	-5C / +55C			-5C / +55C
	XT1-L			-40C / +55C			
	XT1			-40C / +85C			
	(tbd)				up to -55C / +85C		
		TEL-1				-5C / +55C	
		TEL-2				-40C / +85C	
		MIL-CC2				-40C / +55C	
		MIL-CC3				-40C / +70C	
	MIL-CC4				-40C / +85C		
Non-Operating Temperature	Basic		-40C / +70C	-40C / +70C			-40C / +70C
	XT1-L			-40C / +70C			
	XT1			-40C / +70C			
	(tbd)				Up to -55C / +105C		
		TEL-1				-40C / +70C	
		TEL-2				-45C / +85C	
		MIL-CC2				-40C / +85C	
		MIL-CC3				-50C / +100C	
	MIL-CC4				-55C / +105C		
Operating Vibration	Basic		1g sinusoidal				1g sinusoidal
	XR1			3g sinusoidal			
	XR2			VITA 47-V2 8g random			
	(tbd)				VITA 47-V3 12g random		
		TEL-1				1g sinusoidal	
		TEL-2				VITA 47-V2 8g random	
		MIL-CC2				VITA 47-V3 12g random	
		MIL-CC3 MIL-CC4				VITA 47-V3 12g random	
Operating Shock	Basic		15g				15g
	XR1			25g			
	XR2			20g / 11ms			
	(tbd)				40g / 11ms		
		TEL-1				15g	
		TEL-2				25g	
		MIL-CC2					
		MIL-CC3 MIL-CC4				40g / 11ms	
Altitude	Basic	TEL-1 TEL-2	-60m / 4000m	-60m / 4000m		-60m / 4000m	-60m / 4000m
	(tbd)				-460m / 18300m		
		MIL-CC2 MIL-CC3 MIL-CC4				-460m / 18300m	

Table 3: MicroTCA specifications define characteristics for both rugged and benign environments.