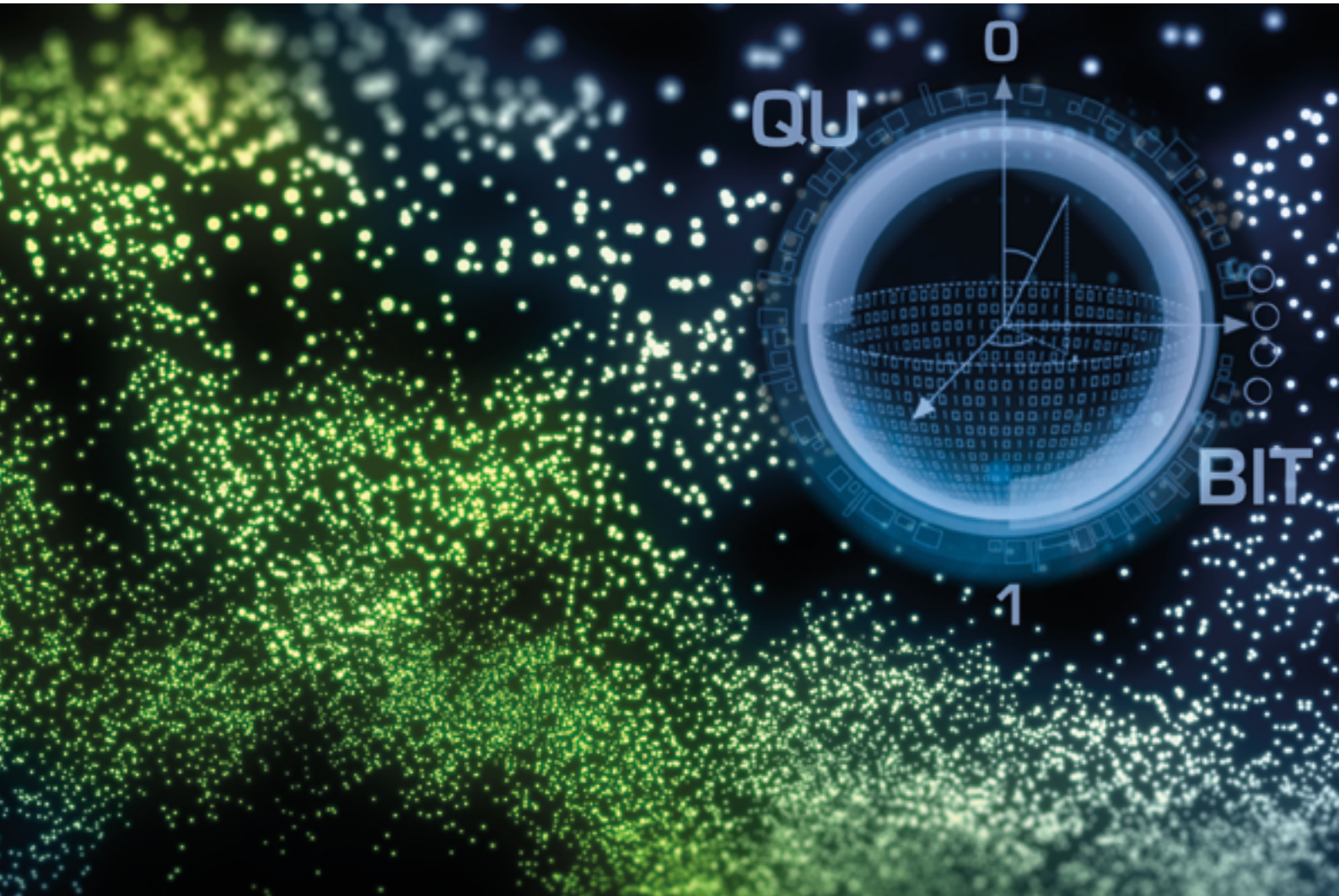# powerBridge
Computer

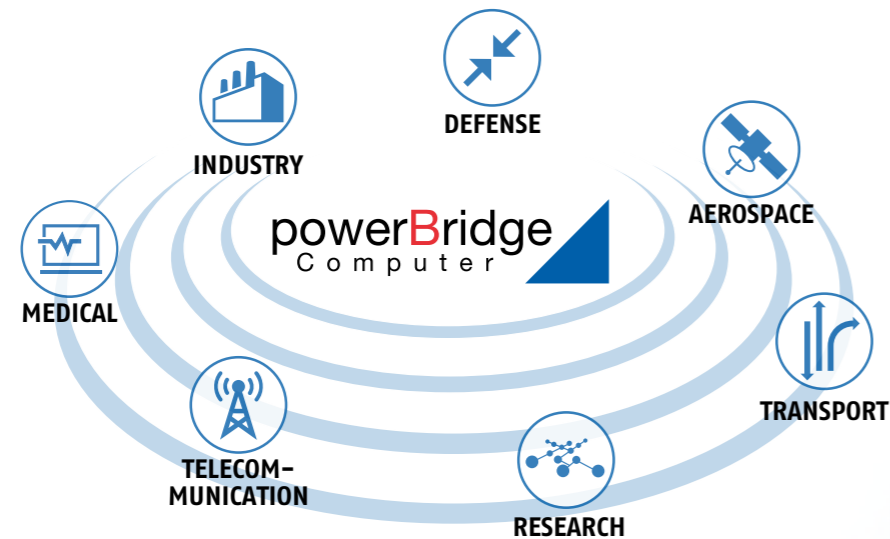# Computer Solutions for
Challenging Applications

About Us

powerBridge Computer provides computer systems and boards from leading manufacturers since 1993. We design and integrate industrial computer systems, communication systems and boards according to the requirements of our customers.
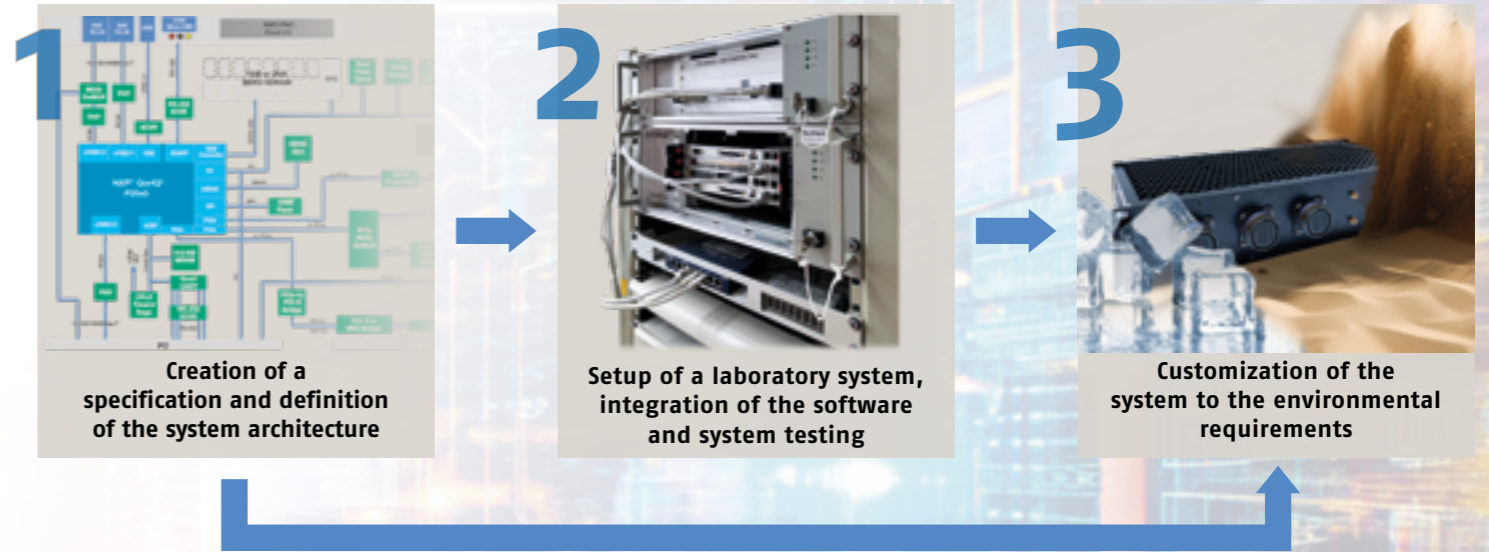
We deliver standard systems or individual computers. Our systems can be fully integrated with communication modules, analogue and digital interfaces, FPGA solutions, as well as drivers, operating systems and management software.

Facts & Figures

- Over 30 years on the market
- Privately owned in second generation
- Over 3 decades of VMEbus experience
- Own laboratory and integration facilities
- PICMG member
- ISO 9001:2015 and 14001:2015 certified

INDUSTRY

DEFENSE

AEROSPACE

MEDICAL

powerBridge Computer

TRANSPORT

TELECOM-MUNICATION

RESEARCH

Development Process

1 **Creation of a specification and definition of the system architecture**

2 **Setup of a laboratory system, integration of the software and system testing**

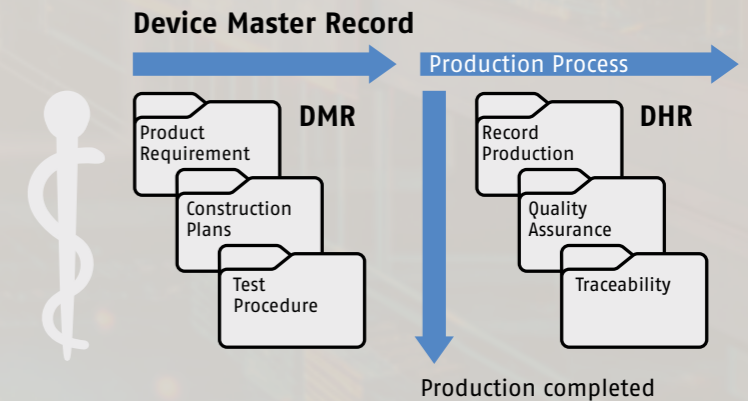**3** **Customization of the system to the environmental requirements**

Quality Management

The basis of our high quality are Device Master Records and Device History Records.

Device Master Records describe the complete manufacturing process. This allows the exact reproduction of products.

Device History Records track the production of each batch. They enable the identification of quality problems at any time in any individual device.

Device Master Record

Production Process

DMR

Product Requirement

Construction Plans

Test Procedure

DHR

Record Production

Quality Assurance

Traceability

Production completed

Customized Solutions

Where standard products are no longer sufficient or extreme environmental condi-
tions prevail, powerBridge Computer offers individual solutions. We develop specific
boards and backplanes and integrate them into the right chassis to handle any chal-
lenge. Our systems are working reliably for decades and are used successfully from
the deep sea to outer space.

Chassis for Challenging Environments

Using the right chassis is essential for the
function of a system under harsh environmen-
tal conditions. With our extensive know-how
we can realize technically complex chassis at
economical terms.

Customized Boards & Carrier Boards

Whether hybrid backplane, carrier board or cus-
tomized I/O board: We at powerBridge Computer
develop, in close consultation with you, your
specific board: from the technical specification
to series production – even for small quantities.
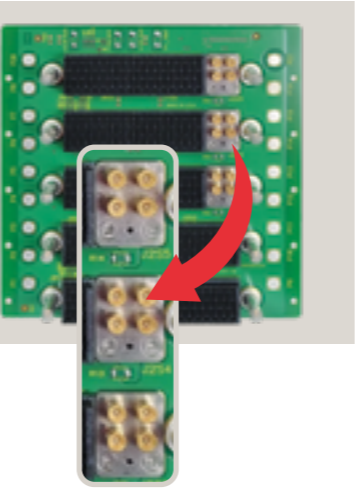
BSP –
Individual Board Support Package

You need an individual BSP for your board?
We develop it for you – whether it is Linux,
VxWorks, Windows or any other operating
system.

Commercial off-the-shelf Solutions

The long-term availability of your system is defined by the choice of components. With an intelligent selection of Commercial off-the-shelf products, most applications can be realized without customized components. Most important for a successful system integration is a deep knowledge of the existing product range and a close dialog with the engineers of the manufacturers.

With high real-time signal processing requirements MicroTCA systems enable powerful signal generation and control loops; for this reason MicroTCA is used in SDR, vision, or timing applications.

StarterKits

You want to get an easy start with a perfect development environment? We created StarterKits: These are different chassis variants, which are shipped fully functional with necessary components and an operating system – just plug in your payload boards and get started.

Chassis Designs

From a small box to a redundant 9U 19" chassis – depending on the requirement, a fitting COTS solution is available. Water-cooled, conduction-cooled or rugged systems are also available.

Modularity

Our systems are designed with modularity in mind, so specific requirements or applications can be accommodated, and a skilful grouping and selection of components allows a high degree of individualization. The mezzanines are expansion cards, allowing additional functions for their host CPUs or FPGAs. Mezzanines or RTMs allow the flexible adaptation of a system to different application profiles.
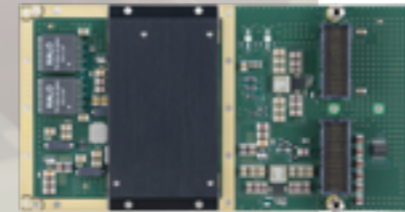
PMC (PCI Mezzanine Card)

PMC is a world wide standard for mezzanine cards, using PCI or PCI-X interfaces. PMC-modules offer a flexible option to add additional functions to a computer.
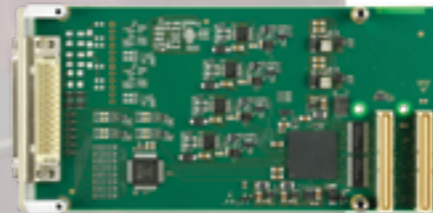
XMC (Switched Mezzanine Card)

XMC is an expansion of the PMC standard, offering high speed connections like PCI Express (PCIe). XMC-modules allow the integration of high performance I/O- and processing functions into a system.

FMC (FPGA Mezzanine Card)

FMC is a standard for mezzanine cards that is primarily used for the connection to FPGAs (Field Programmable Gate Arrays). FMC modules allow a flexible integration of different I/O functions by exchanging cards.

RTM
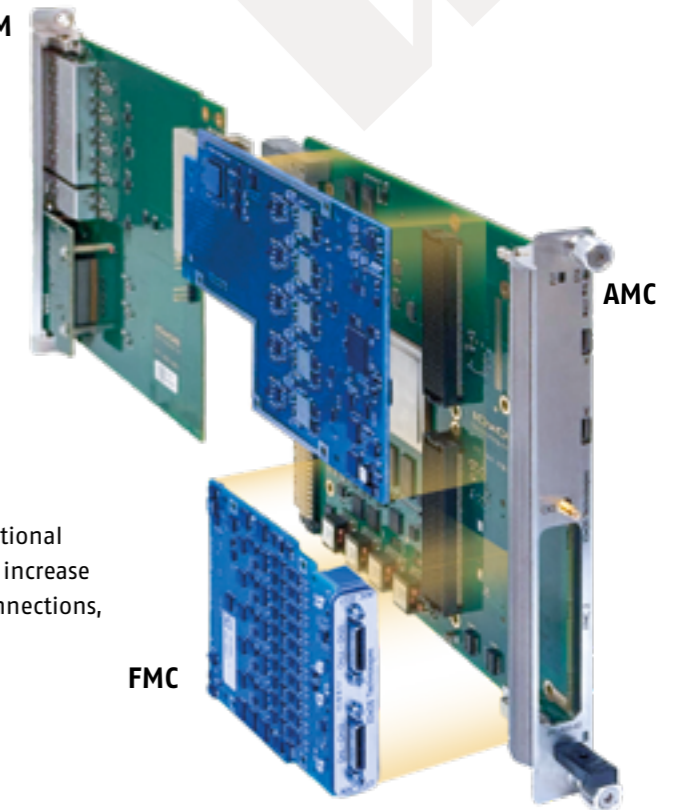
AMC

FMC

RTM (Rear Transmission Module)

The Rear Transmission Module (RTM) is used to access additional interfaces or functions on the back side of a system. RTMs increase the modularity of a system by providing additional I/O connections, power inputs, or other specialized interfaces.

Systems for Quantum Computing

Even a quantum computer requires a conventional computer system for control and monitoring. MicroTCA is ideally suited for this application. The requirements for reliability, redundancy and long-term availability are identical to those of accelerators and fusion reactors.

Direct Digital Synthesis – DDS

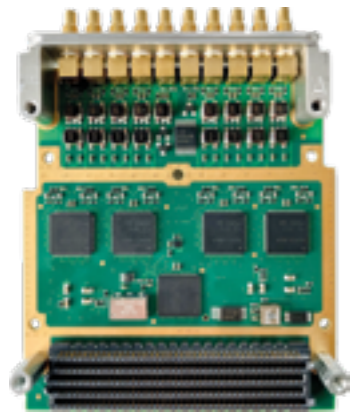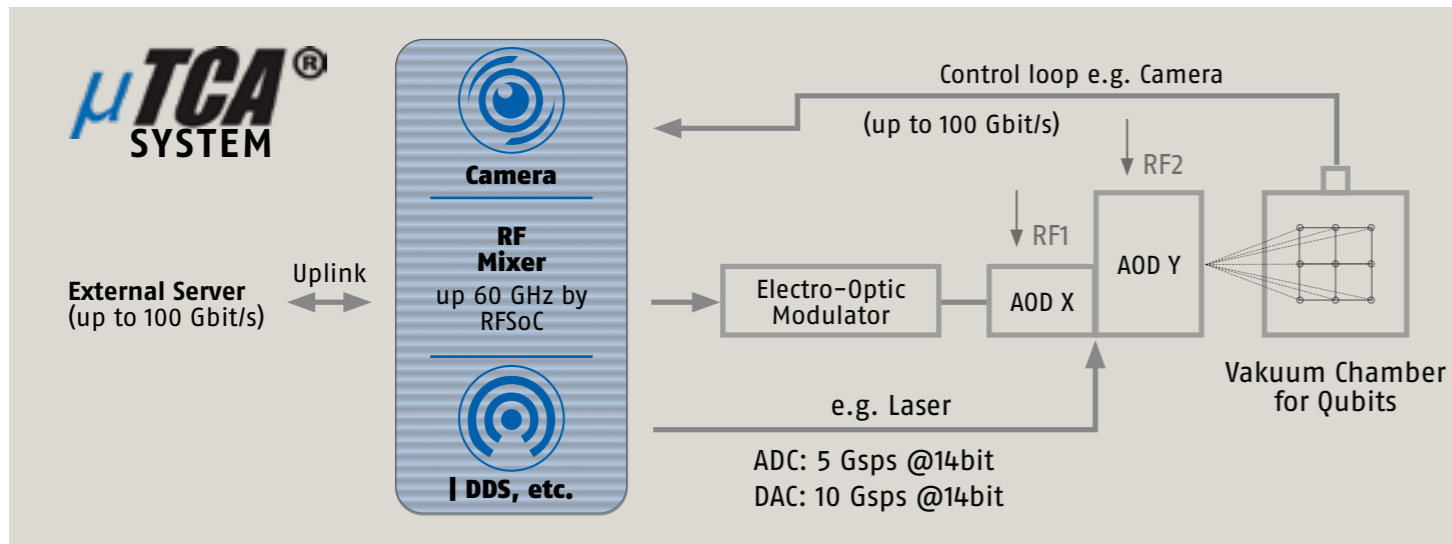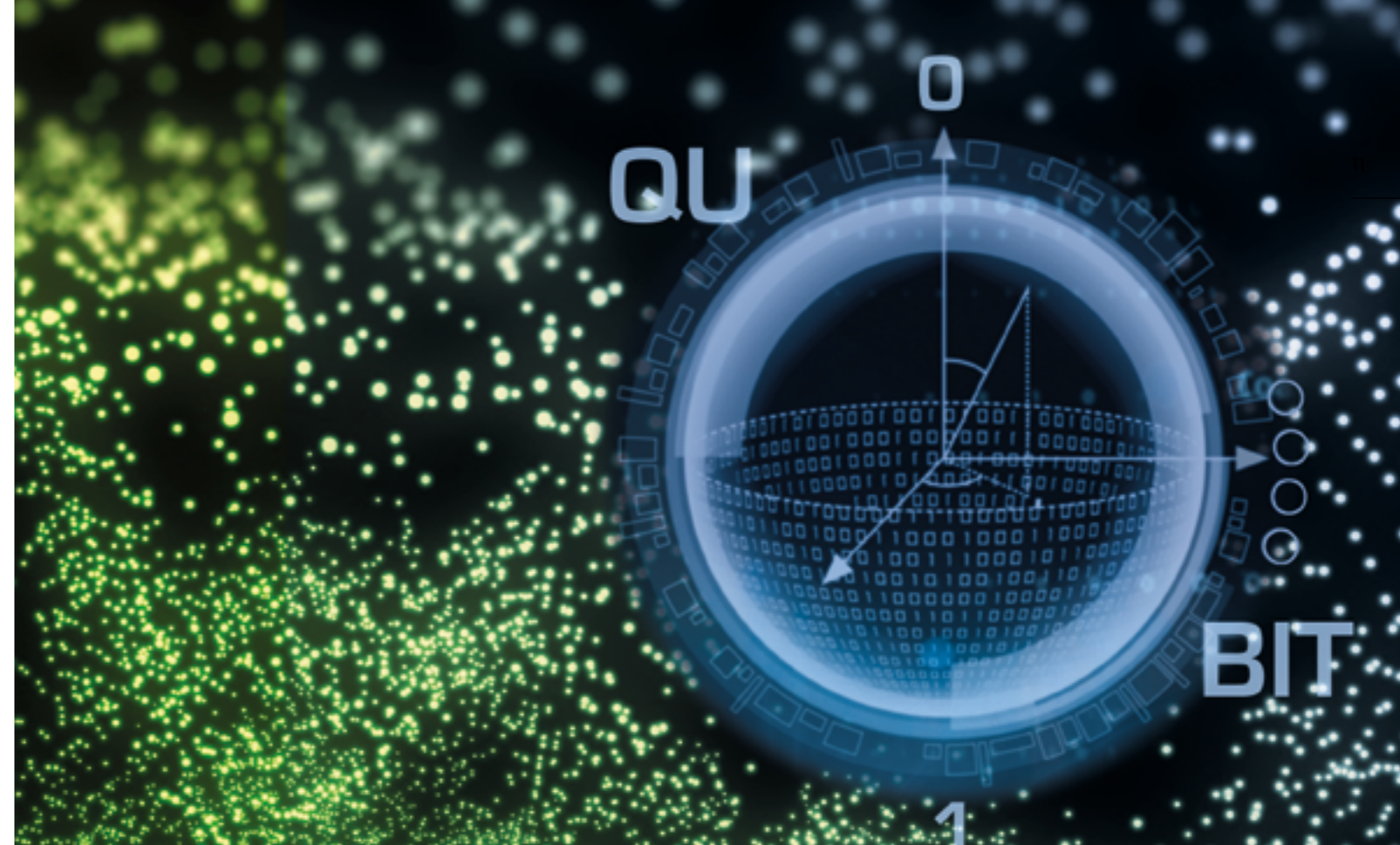DDS is a technique for precise signal generation that is used in quantum compu-ters for controlling and timing of Qubits. DDS allows a precise control over fre-quency, phase and amplitude of signals that are used to manipulate the Qubits.

The advantages of DDS are high frequency accuracy and stability, fast switching and a wide frequency range.

µTCA® SYSTEM

External Server
(up to 100 Gbit/s)

Uplink

Camera

RF Mixer
up 60 GHz by RFSoC

| DDS, etc.

Control loop e.g. Camera
(up to 100 Gbit/s)

RF2

RF1

Electro-Optic Modulator

AOD X

AOD Y

e.g. Laser

ADC: 5 Gsps @14bit
DAC: 10 Gsps @14bit

Vakuum Chamber for Qubits

Selective Addressing of Multiple Qubits with Acousto-Optic Deflectors (AOD)

MicroTCA processes and generates high-frequency signals with a bandwidth of 6 GHz or more. This is realized by a multitude of powerful FPGA boards based on MPSoc or RFSoc. With, for example 8 DAC channels, relevant qubit gates can be stimulated.

With MicroTCA in just one single system, the high-frequency lasers are control-led, the machine system is monitored and the camera images are analyzed. The timing is almost without jitter (<10ps). The remote access is done via an uplink to the desktop server or directly at the MicroTCA system.

Image Processing

Your application requires 4K or 8K cameras with transfer rates up to 100GigE or 12G SDI capture cards? The application should interact with artificial intelligence? For this task FPGA-based systems are perfectly suited. Should the size be as small as possible? We realize your vision application, e.g. by using NVIDIA Jetson modules.

Small Vision System

Your vision application requires a compact and cost-efficient system? By using NVIDIA Jetson SOM modules, the development process is focused only on the customization of the carrier and not on the GPU. The carrier is custom-built to meet the requirements for I/O's, voltages, antennas and other. Depending on the specific industry, different limits of operating temperature or noise emission of the system are necessary – We will adapt the housing to your requirements.

MicroTCA Vision

By using intelligent FMC stacks, we can connect up to 4 x 10 GigE (optionally CoaXpress or 100 GigE) per FPGA. This enables the use of up to 24 cameras in a 2U 19" chassis. Each output supports PoE (Power over Ethernet) and is additionally equipped with an HDMI 2.0 output and HDMI capture input.
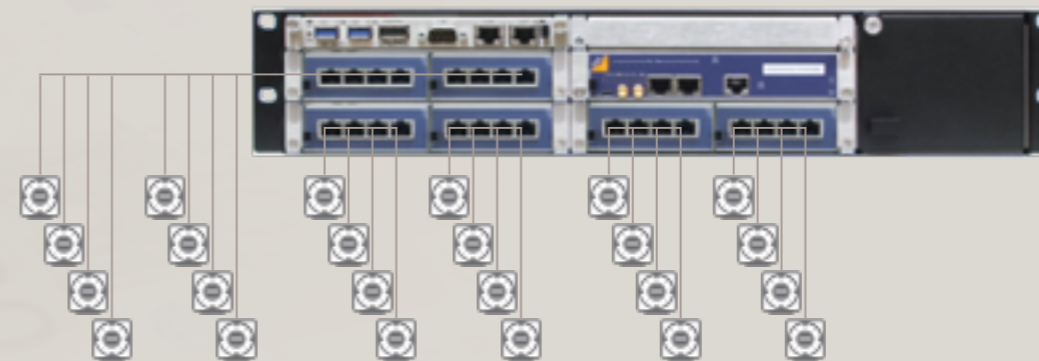
Software Defined Radio

Whether radio communication, beamforming, spatial multiplexing, cell phone control (CPC) or full-duplex communication – all those applications and more are possible with our systems. Due to the fastest FPGAs (Xilinx USC+) and high-performance AD converters, we support you with MPSoC or RFSoC on a MicroTCA basis. Our StarterKits allow a quick start.

Beamforming

Spatial Multiplexing
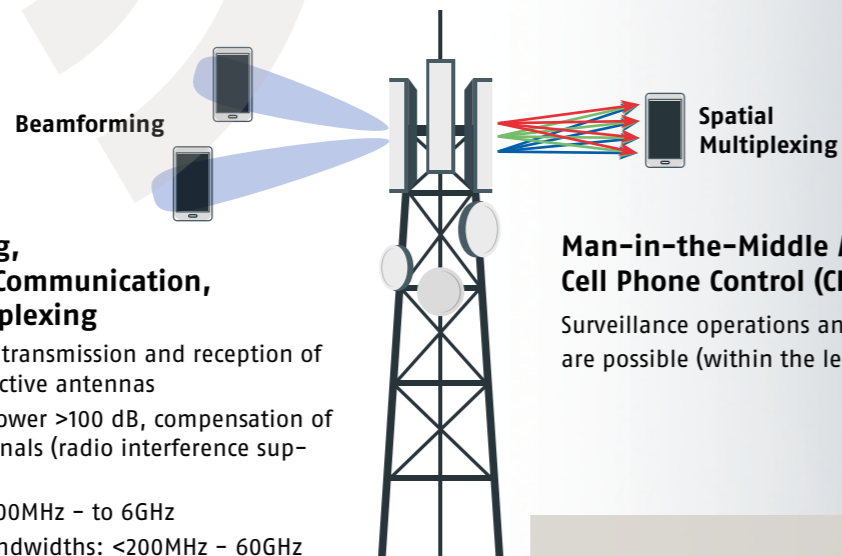
Beamforming, Full-Duplex Communication, Spatial Multiplexing

· Simultaneous transmission and reception of signals with active antennas

· TX/RX Signal Power >100 dB, compensation of interfering signals (radio interference suppression)

· Bandwidth: 200MHz – to 6GHz

· Additional Bandwidths: <200MHz – 60GHz bandwidth

Man-in-the-Middle / Cell Phone Control (CPC)

Surveillance operations and electronic warfare are possible (within the legal regulations).

Object Detection via Passive Signal Analysis / Passive Radar

FMode of operation:

· Receiving direct and reflected signals (E.g.: radio- or TV broadcasting)

· Differentiating the signals

· Calculating the size of and distance to objects

TV-Tower

**Target**

A

B

SDR

A – B = Length
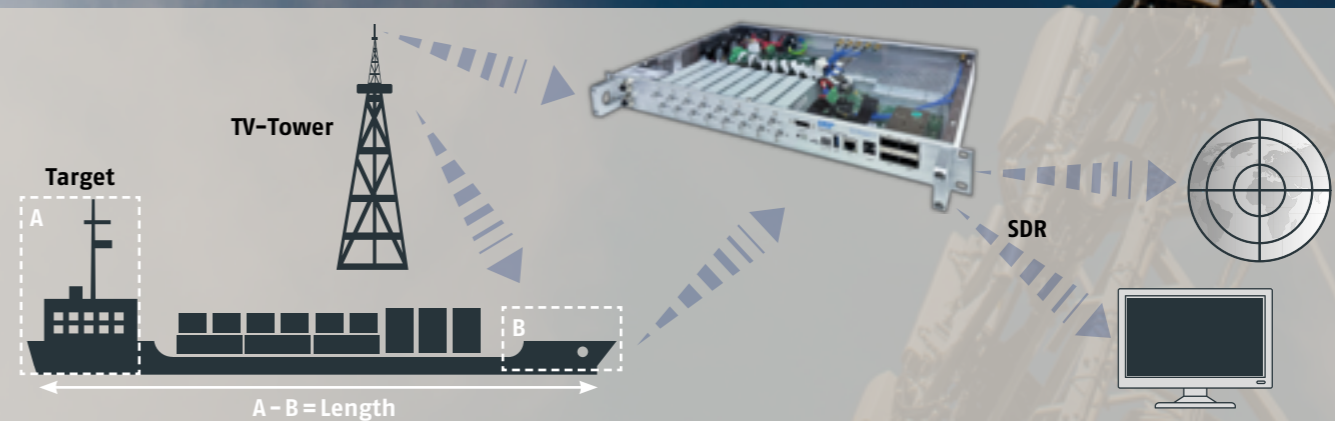
Medical

The strict requirements for medical technology, like IEC 60601-1-2:2014 or ISO 13485:201 are common for us. After understanding the customer requirement, we start with a conceptual design, followed by the realization and certification – from control computers, to vision applications on System-On-Modules (SOM)- basic up to high performance systems.

Flotherm Analysis

For applications in critical thermal environ-ments, the heat dissipation gets simulated before building a prototype system. This gives us the ability to optimize the system for the en-vironmental conditions of your application.
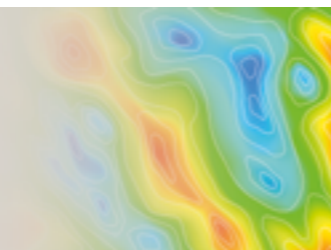
Factory Acceptance Test (FAT)

All systems run through the „Factory Acceptan-ce Test" in our quality inspection. This test is defined with the customers and allows them to use the system directly without any further technical quality inspections.
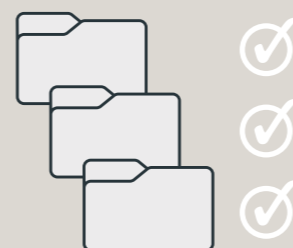
HPC – High Performance Computing

For high-performance applications, such as la-tency-free image processing or AI, we have sui-table HPC systems with the following features:
- Dual Socket
- Up to 6 NVIDIA double with GPUs
- Adapted to your requirements (sound level, dimensions etc.)

Small-Vision-System

By using modular solutions with NVIDIA Jet-son, the development process is focused on the customization of the carrier. The carrier is specifically designed for the required I/Os, vol-tages, antennas, and other requirements of the customer. Depending on the specific industry different limits for operating temperature or noise emission are necessary and can be speci-fied for the system – We will fully customize the housing to your requirements.
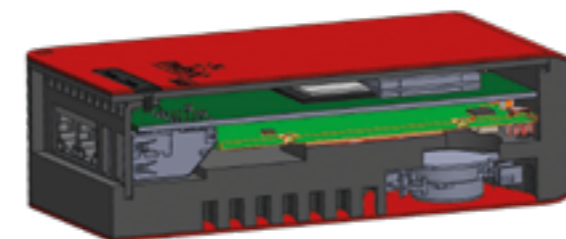
powerBridge Computer has the right hardware architecture for your requirements:
From VPX to CPCI and MicroTCA to proprietary systems, we independently provide
you with advice and let you benefit from our decades of experience.

MTCA

MicroTCA defines compact backplane-based computer systems based on AdvancedMC (AMC) modules. MicroTCA systems are used in industry, research, medical technology, transportation, defense, telecommunications, and networking. MicroTCA systems are always used when a lot of data (analog/digital) has to be processed in real time, e.g. by FPGAs. Examples for this are SDR systems, among others.

PXIe

PXIe stands for „PCIeXtension for Instrumentation" and is a modular computer system which is especially designed for measurement and automation technology. It is based on the PCI Express bus and offers a high bandwidth and fast data transfer rates. PXIe is a flexible and powerful platform for the development and integration of test and measurement systems.

COMExpress

COMExpress is a specification of the PICMG for x86-based Computer-on-Modules. These modules integrate the core functionality of a bootable PC such as CPU, graphics processor, main memory, and standard interfaces on one board, which is connected via two connectors to a specific carrier board.

CPCI / CPCI-S

CompactPCI is an American industrial bus system with single- or double-Europe card format and is normally used with passive backplanes. CompactPCI Serial is the further development of the CompactPCI standard. In contrast to CPCI, CPCI-S uses serial point-to-point connections and supports the PCIe bus.

HPC

High Performance Computing describes high performance systems, which represent what is technically possible. Usually these are equipped with PCIe slots and allow the use of the newest GPUs and CPUs. The preferred use of these systems are image and AI applications.

VMEbus

The **VMEbus** is a multiprocessor bus system. This means that several CPU Boards can be connected to each other or with several I/O boards. VMEbus systems have up to 20 slots. VME64 systems have a 64-bit bus width for data and addresses. All common processor types can be used on VMEbus cards. Today VMEbus systems can be found at countless applications in industry, research, medical technology, aerospace, and defense.

VPX (VITA 46)

The **VPX** standard (Virtual Path Cross-Connect) consists of a range of norms that define a bus system with computer boards in 3U and 6U sizes. The communication takes place via serial high-speed connections on passive or switched-fabric backplanes. VPX is mainly used for rugged high-performance applications, like mission computers in defense applications.

OpenVPX (VITA 65)

Based on VPX, **OpenVPX** standardize more stringent system architectures in 3U or 6U format. OpenVPX enables the compatibility of products from different manufacturers. More specifically it defines the architecture of the high-speed interfaces between payload, switches, backplanes, and chassis.

powerBridge
C o m p u t e r

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