

» StarVX «



Pre-Qualified HPEC Platforms

- » Compact 3U VPX Air and Conduction Cooled solutions
- » Turn-Key linux parallel x86 systems
- » Balanced I/O and CPU power
- » Up to 4GB/s board to board with TCP/IP sockets

Introduction

StarVX presents an optimal application-ready solution for radar and sonar systems that are expected to make a tremendous jump in a processing power and data I/O bandwidth.

StarVX was designed to help developers dramatically streamline the process from design to field deployment of next-generation radar and sonar and imagine applications. Based only on mainstream IT technology (TCP/IP, PCIe, Intel® CPUs, Linux), and co-developed with Intel and PLX, StarVX demonstrates the breakthrough technology that restores matched I/O and CPU performance ratios.

Based on the 3rd generation Intel® Core™ processors and the Kontron 3U VPX feature rich ecosystem, StarVX leverages Kontron's extensive computing platform design capabilities in small, air cooled or conduction-cooled platforms.

Performance

StarVX main asset lies in the unique balance offered between CPU computing power and I/O bandwidth. Leveraging hi-speed switched PCIe and 10GETH on the backplane, this architecture offers the necessary infrastructure for efficient implementation of the most demanding sensor processing applications. On the VX3044 CPU board, Quad Core Ivy Bridge enjoy sustained 16GB/s to/from the memory subsystem, while the board architecture provides up to 6GB/s sustained bandwidth on the data plane through TCP/IP (4GB/s on the PCIe backplane thanks to VXFabric™ and two 10GETH baseKR Links capable of 1GB/s sustained throughput) see VX3044 documentation for details.

	Sustained TCP bandwidth	CPU load TCP (load as a percentage of one multicore CPU)	Sustained raw bandwidth (1)
PCIe x8 gen3	4.4 GBytes/s	10% (quad core)	5.6 GBytes/s
PCIe x4 gen3	2.5 GBytes/s	6% (quad core)	2.8 GBytes/s
PCIe x4 gen2	1.3 GBytes/s	8% (dual core)	1.5 GBytes/s
PCIe x4 gen1 or x2 gen2	0.6 GBytes/s	5%	0.8 Gbytes/s

(1): Very light CPU load, transfer handled directly by switch DMA engine.

Software Baseline

StarVX software baseline is relying on Linux™. By default, x86_64 Fedora is proposed with numerous add-ons:

- » Diskless: seamless management of parallel boot from a single image using layered file systems and tools.
- » VXFabric: TCP/IP on PCIe backplanes



Hardware Baseline

StarVX hardware is based on 3U VPX technology from Kontron. StarVX building blocks are:

- » Computing blades: Core i7 single board computers up to quad core with 16GB DDR3
- » Co-Processing: FPGA boards (Virtex 6), GPGPU boards
- » Sensor Interface: FPGA boards (Virtex 6) with FMC slots, sFPDP up to 6 channels available, 10 GETH or 40 GETH input ports (on the 10 GETH switch Rear Transition Module)

Health Management

StarVX relies on VXControl™: Computer management board (CMB) provides extensive health status information, at the board and subrack level. Airflow temperature is controlled on each slot. Payload boards can be held in standby mode to accommodate low energy surveillance mode. Fine grained boot stage information is also available for each CPU (16 levels: from BIOS to user application defined levels).

Cooling

Air cooled versions of StarVX include single or dual fan tray option. Fans are managed under VXControl™ by the management board embedded in the subrack.

Third Party Tools

The Gedae compiler, from Gedae Inc. can automate the implementation of efficient complex applications for multiprocessor hardware. The Gedae compiler handles the complexity. Since the Gedae compiler is aware of the multi-processor and the multi-core and memory architecture of the target, it automatically customizes the software to that architecture. The Gedae language provides the compiler with information in a form that allows the compiler to automatically perform the most complex tasks, including threading the application, planning memory and implementing the distribution of the software.

Gedae has been proven effective solution on the most demanding systems in the world, fighter aircraft radars, and can be used as a general purpose development environment to program any compute intense digital system.

Base configuration and available results

A base configuration for StarVX has been defined :

- » One Air cooled enclosure with management board
- » Eight slot VPX backplane qualified for 10BaseKR and gen3 PCIe for 5HP boards
- » One GETH L2/L3 24+3 ports switch board
- » One gen2 PCIe 32 lanes switch board
- » Fedora 16 Linux distribution with VXFabric™/VXControl™ support packages.

This configuration has been used for numerous benchmark and application use case (SAR applications, ETH load balancing strategies, Direct addressing of computing nodes within starVX etc) in the course of the cooperation between Intel and Kontron. Contact your Kontron representative for details about the configurations used and benchmark results.



Building blocks current feature set

Beyond this base configuration, the following information can help designing other configurations from the existing StarVX components

- » Enclosure: Can house and manage up to 12 3U boards
- » PCIe switch: 256Gb/s capacity. Can route up to 8 payloads via x4 PCIe (Th.BW: 2GB/s) or up to 16 via x2 PCIe. Also offers a x4 PCIe front panel connection for rack extensions. Also offers a small L3 GETH Switch for small and compact configurations.
- » Backplanes: qualified backplanes include single and dual star centralized configurations.
- » FPGA boards: Virtex6 3U VPX FPGA boards offer FMC slots, compliant with VITA57 standard. Qualified configuration include sFPDP multi channel interface.
- » GPGPU boards: ATI Radeon™ E6460 or E6760 3U VPX boards can be part of the StarVX system to implement multi screen GPU or GPGPU computing requirements.

Evolutions of StarVX

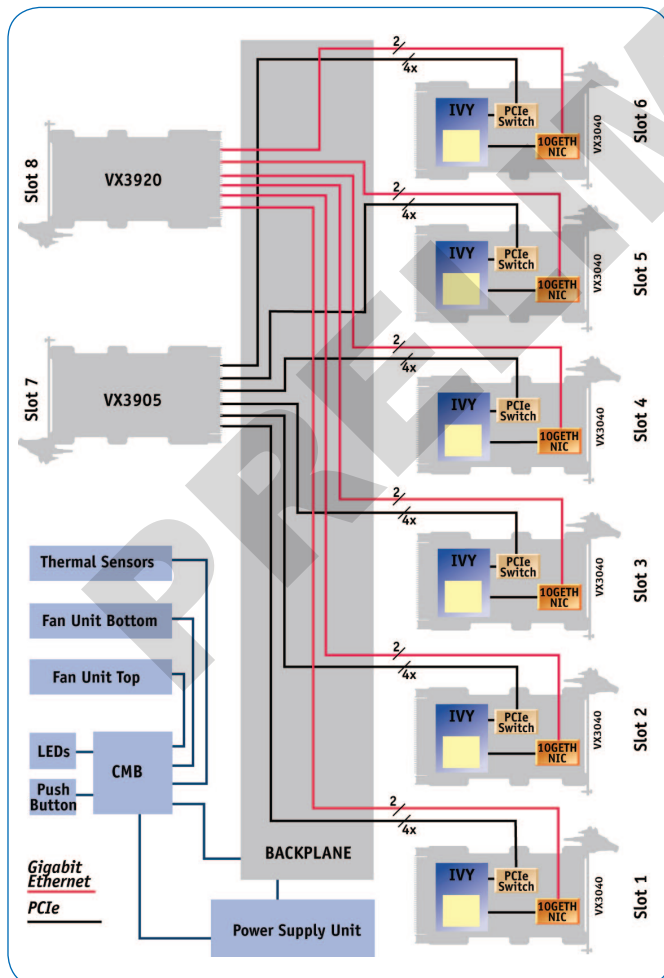
Currently being designed, or coming soon are the following additions to the StarVX building blocs:

Ethernet Switch : A 24 port 10GETH switch is being designed. It will offer 22x 10GBase-KR/1000Base-KX or up to 5 10GBase-KX4 (XAUI)/40GBase-KR4 to the backplane, allowing the use of 40GBASE QSFP+ Modules via a rear transition module

Sealed Enclosure: all boards are available in Conduction Cooled versions, allowing sealed StarVX configurations to be proposed in early 2014.

Tailored configurations

Using StarVX starts with a phase of requirement collection depending on the target application (data flow and bandwidth, latency, computing power, storage, size and weight constraints) which allow to build the most appropriate computer from a list of existing, pre validated computing elements.



Coming from the existing Kontron 3U ecosystem, each element is dedicated to a specific function: Computing, Switching, Storage, Cooling, Power Supply and has been qualified to operate under the target environment (Lab, Shelter, Vehicle)

Within weeks, a development version of the target computer is assembled and tested under stress (thanks to modular test tools) and delivered. This version is used early in the process for the application software integration phase.

Kontron provides expert level service to address all application design issues. This covers I/O and CPU bottlenecks, computation optimization, suggestion of 3rd party tools or heterogeneous computing (mix of different processor architecture, use of FPGA or GPGPU in the computing loop)

During that same period, the final computer is finalized to match the full scale application and the target environment. Test phase 1 qualifies the computer for temperature and vibration, test phase 2 is the final approval using the customer application code.

StarVX Components

Managed Enclosure

SR3U-xxx3U VPX 12 slot (5HP) with dual fan tray and health management board

Payload boards

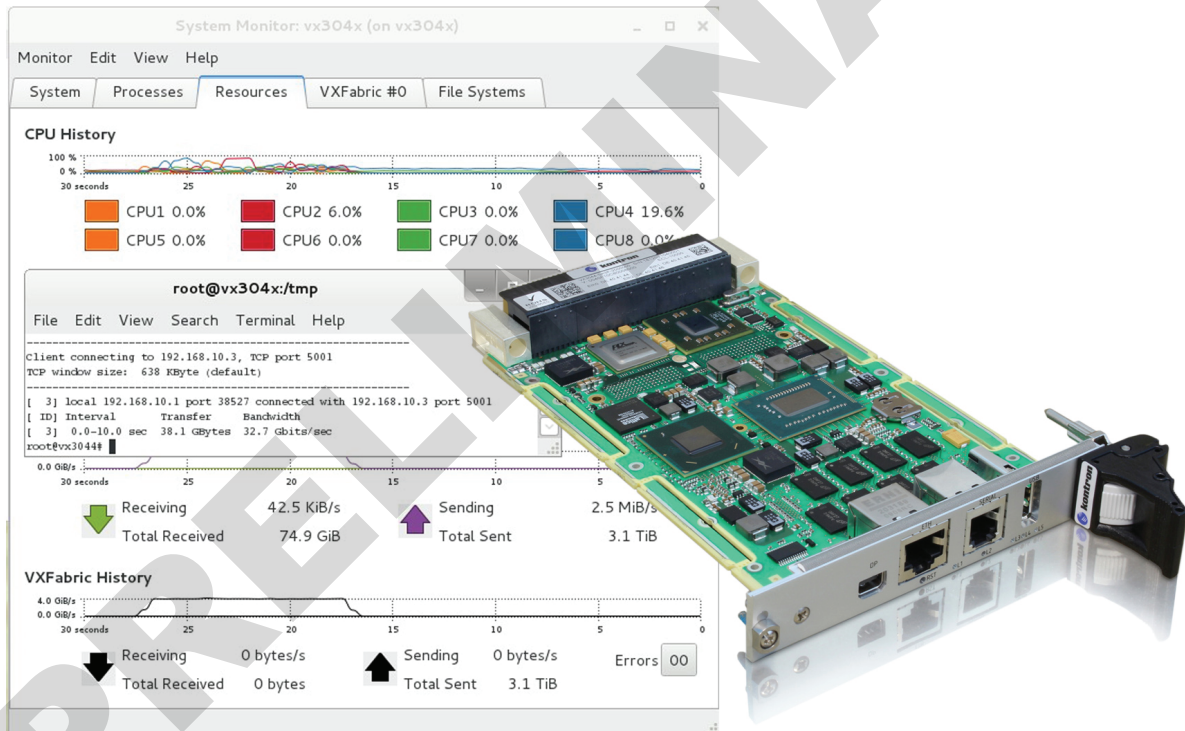
- » VX3044 Intel® Core™ i7 - 3612QE - Quad-Core™ 3U SBC with x8 PCIe gen3 and dual 10GETH
- » VX3836 Xilinx Virtex6™ FPGA board with VITA57 FMC support
- » VX3327 ATI Radeon™ E6460 or E6760 Silicon 3U VPX GPU/GPGPU boards

Switch boards

- » VX3905 PCIe switch (with GETH L3 switch capability)
- » VX3910 L2/L3 GETH switch

Software

- » Linux Fedora 16 with VXControl™ VXFabric™ and diskless support packages



VXFabric™ Performance using iperf between VX3044 CPUs and x8 PCIe gen3 Backplane

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