Xilinx FPGAs Help NetQuest Deliver Advanced Packet Processing System for Telcos, Large Enterprises Making the 100G Network Transition

OMX3200: Xilinx's SerDes, Memory Technologies, and Technical Support Key to Win Against Network Processors and FPGA Competitors

AT A GLANCE:

NetQuest's OMX3200 leverages Xilinx Virtex Ultrascale+ FPGAs at the heart of its modular, high density packet processing platform with monitoring visibility across 100G Ethernet and OTN networks. The OMX3200's advanced algorithms remove transport protocols and generate flow level metadata, while filtering out unnecessary traffic. The platform enables SecOps, CyberIntelOps, ITOps, and NetOps professionals in telco carrier and large enterprise network environments to optimize IP packets for monitoring and downstream analysis by their preferred applications and tools. (See figure 1).

Customer: NetQuest Corporation

Industry: Communications

www.netquestcorp.com

CHALLENGE:
Real time, line-rate packet processing and optimization for monitoring high volume traffic over 100G Ethernet and OTN networks.

SOLUTION:
Xilinx Virtex Ultrascale+ VU13P FPGAs that support scalable, modular design for very high throughput.

RESULTS:
Enables processing up 3.2 Tbps with unique packet optimization and metadata generation functions that improve productivity of downstream inspection and security analysis tools.
**CHALLENGE:**

**100G Network Monitoring In Real Time at Line-Rate**

NetQuest is an established supplier of innovative network monitoring and access products that has made a strong name for itself in cyber surveillance applications over the past 20 years. Government agencies have traditionally used the company’s products to enable visibility into WAN, metro, and long-haul networks for security applications. Now, NetQuest is leveraging its experience and intellectual property developed while working in the government sector to build new products for the broader commercial service provider and enterprise network markets.

The increase in traffic that travels over today’s communication networks is growing rapidly due to the rise in popularity of mobile devices, IoT, and cloud computing. Transition from 10G/40G networks to 100G Ethernet and optical transport networks (OTN) is well under way with the move to next-generation 200G/400G/800G networks not far in the future. (See figure 2).

NetQuest recognized that this rapid network evolution to 100G and beyond is creating an opportunity with service provider and large enterprise customers who now need highly sophisticated IP packet monitoring and analysis capabilities at line-rate speeds in real time. “All of a sudden, they’re realizing x86-based analytics platforms cannot keep up with rising traffic rates; they need some hardware components to be able to keep up with some of the traditional packet processing and inspection type of activity they’re doing,” said Mike Seidler, director of product management at NetQuest Corporation.

In 2017, the company set about using its custom hardware approach to develop an optimized, multi-terabit platform, the OMX3200, to address these new opportunities with the most advanced IP packet processing available. Seidler continued, “For us, that fast transition to 100G networks has created an inflection point in the market. An opportunity to fill it with a product that is more cost effective and extremely dense. Instead of buying 3 or 4 boxes stacked up to handle 100G network monitoring applications, they can put in one of our 1RU OMX boxes.”

**SOLUTION:**

**28G SerDes, Technical Support, and FPGA Flexibility Outweigh Network Processors**

NetQuest possessed considerable FPGA engineering expertise having previously developed products based on Xilinx devices. However, with the OMX3200 project, the development team evaluated both network processors and competitive FPGA products. Ultimately, they selected the Virtex Ultrascale+ VU13P devices due to the availability of high performance SerDes (serializer/deserializer), their onboard memory, Xilinx technical support, and the amount of flexibility the FPGAs afforded for future OMX3200 updates and new feature releases.

The team explored many tradeoffs looking at Xilinx FPGAs versus network processor vendors and other FPGA vendors. “Xilinx gave us the capability to handle more traffic processing bandwidth in real time at line rates than other chips or FPGAs,” stated Seidler. “The Xilinx SerDes technology and the built-in memory were two very key decision criteria for us. We needed a high number of SerDes running at 28Gbps and the competition wasn’t ready with a solution that...
could handle our volume,” he continued. Additionally, while Seidler described the OMX3200 development team as “pretty self-sufficient,” when it needed technical support, he noted “we liked the way Xilinx documents their solutions better than the competition.”

To streamline the project, NetQuest’s development team held biweekly program review calls with Xilinx Field Application Engineers and factory technical support that captured hot button items where they required more information and guidance. For example, topics addressed included board design and schematic reviews, GTY Transceiver operation, Xilinx IP capabilities and interfaces, and methodologies such as Partial Reconfiguration. The project progressed smoothly through several milestones from purchase of the Xilinx VCU118 evaluation board to creation of the first NetQuest OMX DP800 modules and eventual integration of the DP800 with the OMX’s CX3200 motherboard. NetQuest and Xilinx continue to partner on new feature requests with the VU13P by exploring additional uses of the Xilinx CMAC IP hard core and other solutions.

One of the attributes NetQuest’s team appreciated most about Xilinx FPGAs is their flexibility. The company has always been a big proponent of creating custom features to meet specific monitoring or packet processing requirements. While offering impressive capabilities for packet processing, the standard product chips couldn’t handle everything that the team needed to do. “We’re always looking for that ideal mix of the most advanced features and flexibility, which justifies the use of an FPGA. We have to make sure that our customers understand that FPGAs give us the flexibility to perform advanced traffic processing at a much greater throughput than competitive technologies, while also using significantly less power and space,” Seidler commented. (See figure 3).

RESULTS:
Modularity Drives Scale and Adoption

The OMX3200 integrates Xilinx FPGAs into a modular platform that is very unique for its 1RU form factor. The system can be configured with up to 4 modules, each with its own massive FPGA supporting 8 QSP28 100G ports for a total of 32 ports fully loaded. “Modularity allows us to really scale up. Many of our initial customer engagements appreciate that they can start with one module and add more as their need to process traffic and packets increases up to 3.2 Tbps on 100G interfaces,” said Seidler.

Packet optimization, protocol and tunnel stripping, is one key OMX3200 function at these massive line rates. GTP (GPRS Tunnel Protocol) tunnels are used heavily in the mobile market for IP packet routing. The OMX3200 strips the GTP tunnel, while simultaneously removing common VLAN tags and MPLS labels, to find the IP packet and then ships it to the downstream analysis tools. “We make it very simple for those inspection and security tools to do their job more productively,” said Seidler.
Another important OMX3200 function is flow level metadata generation where the system takes incoming packets in real time and creates very short records that summarize what type of traffic flows are happening on the network. By generating unsampled NetFlow or IPFIX records, users can reduce the network traffic to downstream tools by up to 99%, while still providing a complete view of the traffic profile running on their network. As more traffic overloads these tools, security operations teams are transitioning to using this metadata approach to do a first level threat analysis before deep packet inspection. (See figure 4).

**CONCLUSION:**

**FPGAs Help Future-proof the OMX3200**

“Xilinx FPGAs are a great fit for what NetQuest is doing with the OMX3200 now and over the next year,” said Seidler. The company completed its product development cycle in about 18 months, concluding the process via proof of concept validation testing with its first customer. Now that OMX3200 is generally available, the team is turning its attention towards the continued evolution of optical networks. They’ve identified “some very big opportunities in 2019” that are a good fit for the FPGA-based OMX3200 and started developing new features “we didn’t have full visibility into when we created the initial design.”

NetQuest’s future OMX3200 line card plans include support for CFP2 and QSFP-DD pluggable interfaces that enable 200G and 400G coherent network packet processing. Coherent technology allows the carriers to take the same lambda, same fiber, and increase the density by 10X or 20X. Seidler concluded, “We’re going to be able to take in coherent interfaces, which is very unique from a network monitoring access perspective.”

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**Figure 4: OMX3200 capabilities and packet processing flow**

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