OMX

OPERATING MODES

The intention of this technical note is to provide users
a comprehensive overview on the OMX3200 and the various
operating modes that are available for processing traffic.

OMX3200 Overview

The OMX3200 is a multi-terabit traffic flow visibility platform supporting advanced packet processing and metadata generation for up to 32x100GbE or 64x10GbE interfaces in a compact 1RU modular chassis. The OMX can also support WAN protocol translation on 100G OTN, 10G OTN and 10G SONET/SDH interfaces. Intended for passive monitoring applications, the OMX typically resides directly off a network tap or router span port within the visibility architecture.

The OMX3200 passes processed traffic and/or enriched IPFIX metadata to downstream tools for deeper analysis.

The modular chassis of the OMX3200 has four independent card slots that can support hot swappable DP800 modules. Each module comes equipped with eight QSFP28 interfaces for input/output signaling and can be software configured to operate in a specific operating mode based on the signal types the user intends to monitor. The DP800 operating mode defines the specific input/output interfaces on that module and the specific processing functions that are available. The DP800 modes are licensed using specific RTU keys. The available DP800 operating modes include:

- 100GbE (with or without IPFIX)
- 10G IPFIX mode (10G ingress with 100G egress and 10G IPFIX)
- 10G mode: 10G (100GbE or 10GbE egress)
- OTU4-100GbE
- OTU4 MUX
- SONET/SDH

Various packet steering functions are available on a per mode basis including 5-tuple/VLAN filtering and traffic aggregation. More information regarding which features are available within each operating mode is listed within this document.

The OMX3200 supports up to 4 x DP800 hot-swappable modules per 1RU device.
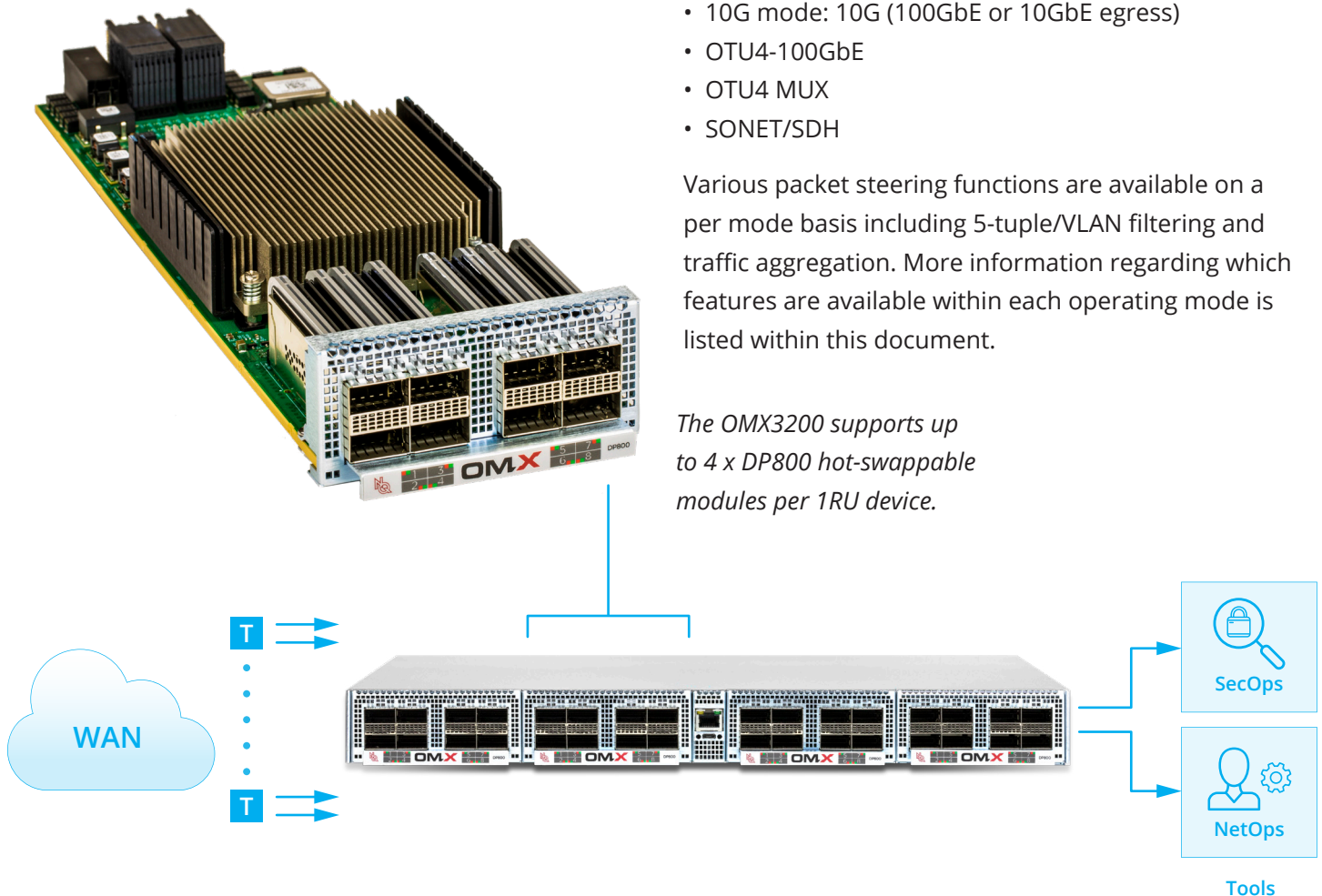
Advanced Packet Processing

The data processing engines within OMX3200 support a common set of advanced packet processing features across each of the DP800 operating modes. In all modes, the engine is capable of operating at full line rate with deterministic latency, independent of the enabled processing functions. The advanced packet processing features include the following configurable options:

- MAC Address Bridging traffic (custom source/ destination MAC assigned per input interface and/or per SDH container/OTN tributary)
- MPLS Label Removal of up to 7 MPLS labels
- VLAN Tag Removal of up to 5 VLAN tags (option to removal all tags, retain all tags, retain outer tag, retain outer 2 tags, retain inner tag, retain inner 2 tags)
- IP de-tunneling of up to 2 identifiable IPv4/IPv6 tunnels (support for GTP, GRE, IP-in-IP, L2TP, PPTP)
- Insertion of custom VLAN tag into output traffic (custom tag assigned per input interface and/or per SDH container/OTN tributary)

These packet processing functions are intended to offload processing from the focused downstream analytics tools so that IPv4 and IPv6 traffic can be delivered in an optimal state for the tools to digest. The advanced packet processing feature is optional and requires RTU license RTU-32101 to be applied on an individual DP800 basis.
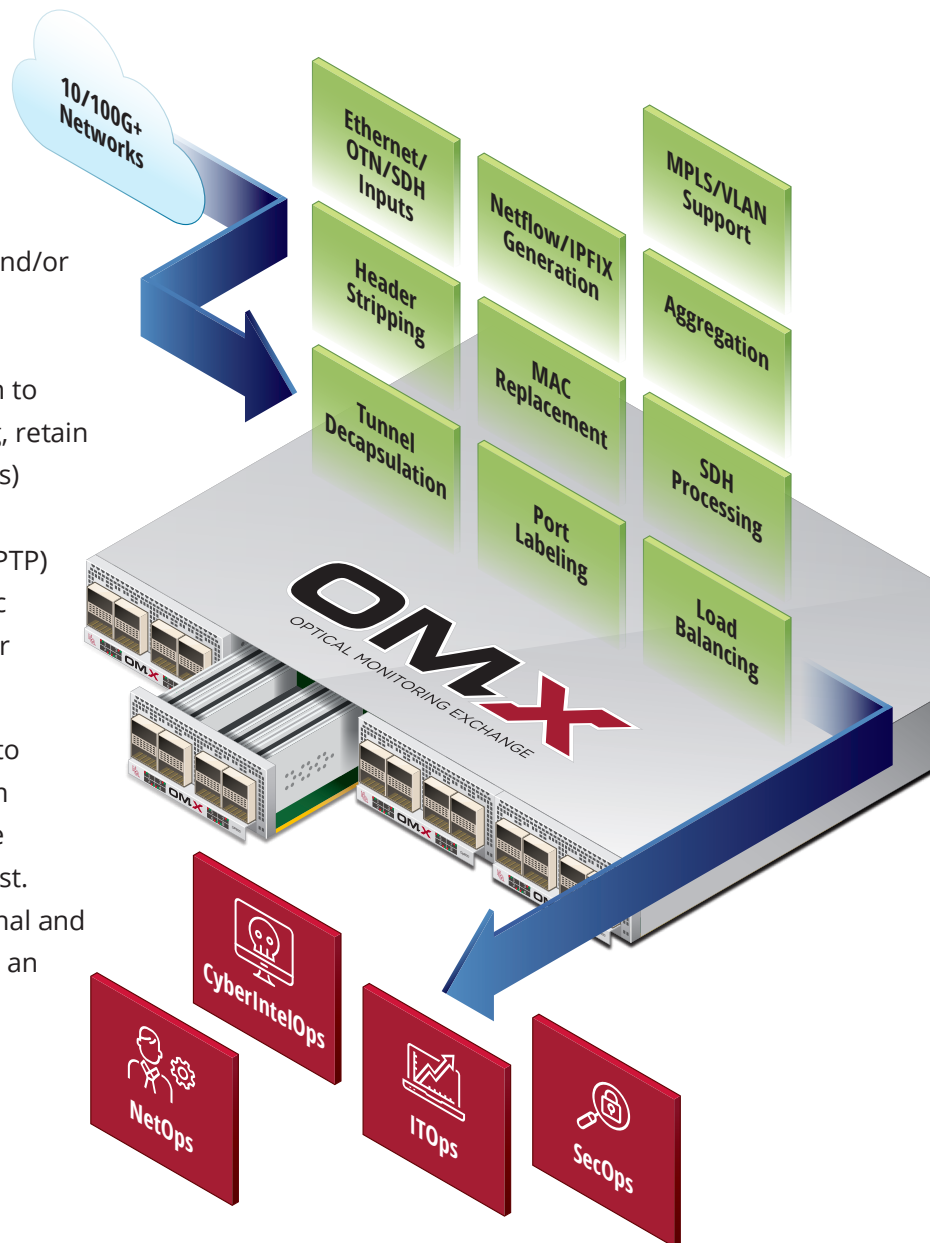
DP800 Modes of Operation

The OMX3200 supports six unique modes of operation. Each DP800 can be individually configured to run in an independent mode. Each DP800 slot requires an RTU to be configured for the desired mode.

DP800 Mode: 100GbE

The OMX3200 100GbE mode provides line-rate advanced packet processing for up to 800G of IP traffic on each DP800. By leveraging the OMX to eliminate multiple layers of network protocol encapsulations and removing traffic of no interest, the OMX greatly reduces the processing load on subsequent monitoring tools, effectively optimizing the entire visibility fabric.

RTU-32400 is required to operate a DP800 in the 100GbE mode. This mode supports up to 8 x 100GbE input/output ports on a single slot (32 x 100GbE per 1RU OMX device) by leveraging each port's traffic hairpin functionality, increasing density while reducing costly optical transceiver expenses.

DP800 Mode: 100GbE (with IPFIX)

As traffic rates continue to rapidly escalate, security teams are relying increasingly on analyzing network metadata to detect security threats and satisfy traffic intelligence requirements. The OMX scales existing flow analytics architectures to maintain visibility as links migrate to 100G.

By applying an IPFIX metadata generation license (RTU-32200) to a DP800 operating in the 100GbE mode, the
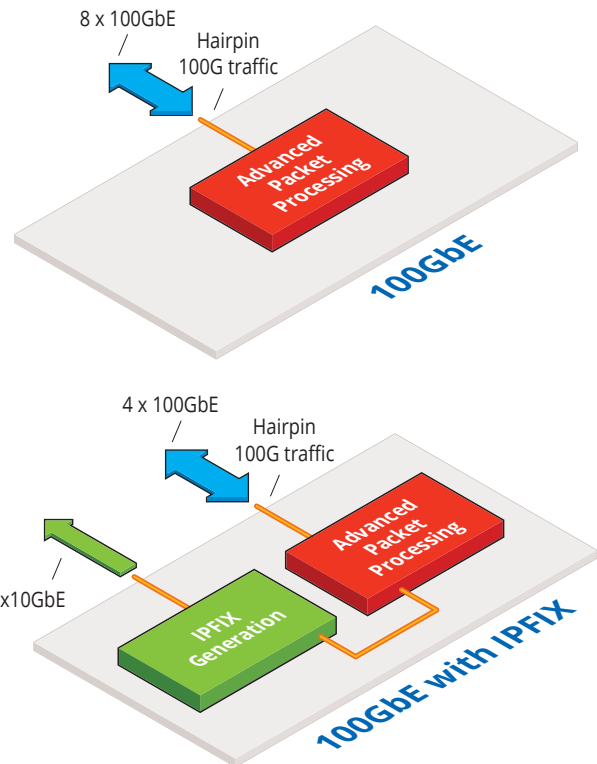
OMX will support unsampled flow metering on up to 4 x 100GbE interfaces per DP800. The IPFIX processing performance of each DP800 exceeds 200Gbps of unsampled metering while maintaining metadata on over 200 million active flows at any time. The OMX provides the option to generate flow metadata on selective flows via user-configurable filters and can also be provisioned to meter on inner or outer tunnels. Additionally, the OMX can hairpin processed packet payload data to downstream monitoring tools in parallel with flow metering function.

Each DP800 utilizes a dedicated 10GbE interface for exporting IPFIX records to destination collector clusters for detailed traffic analysis.

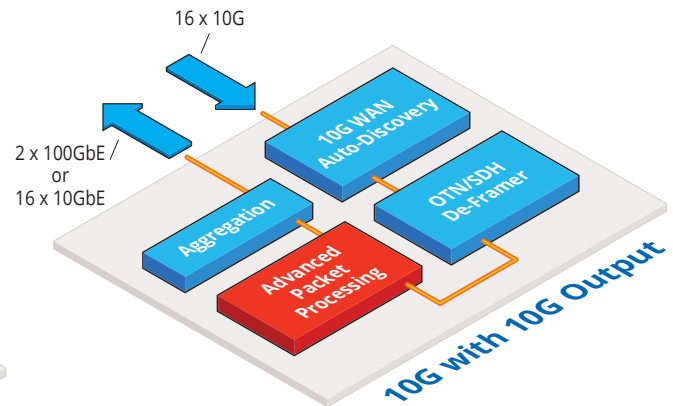| 100GigE Modes (with and without IPFIX)											
DP800 Config	RTU #	Notes	DP800 Port Count				OMX3200 Core SW (RTU-32000)	Additional RTUs			
			10G		100G			Advanced Packet Processing (RTU-32101)			Netflow/ IPFIX RTU-32200
			In	Out	In	Out	NQOS	Header Stripping	IP De-Tunneling	MAC Bridging	VLAN Insert	
100GbE	RTU-32400	100GbE Hairpin			8	8	✔	✔	✔	✔	✔	n/a
100GbE with IPFIX	RTU-32400	Includes IPFIX		Export	4	4	✔	✔	✔	✔	✔	✔

DP800 Mode: 10G (100GbE or 10GbE egress)

The OMX3200 supports a 10G mode that can operate with either 100GbE or 10GbE output ports. The intention of this mode is to provide monitoring access to 10GbE traffic streams whether the traffic is carried over native Ethernet or other WAN transport protocols like OTN or SDH. For 10GbE traffic carried over OTN or SDH, the OMX will remove the transport wrappers and process the IP packets carried within. With 100GbE egress enabled, traffic will be aggregated to 100GbE output ports. Each DP800 supports up to 16 x 10G input ports while operating in the 10G mode; each 10G input port can accept any of the following signal types:

- 10GbE
- OTU2 - carrying GFP, GFP-extended, WANPHY, STM64->VC-4-64c (GFP or POS)
- OTU2e/1e
- WANPHY
- STM64->VC-4-64c (GFP or POS)
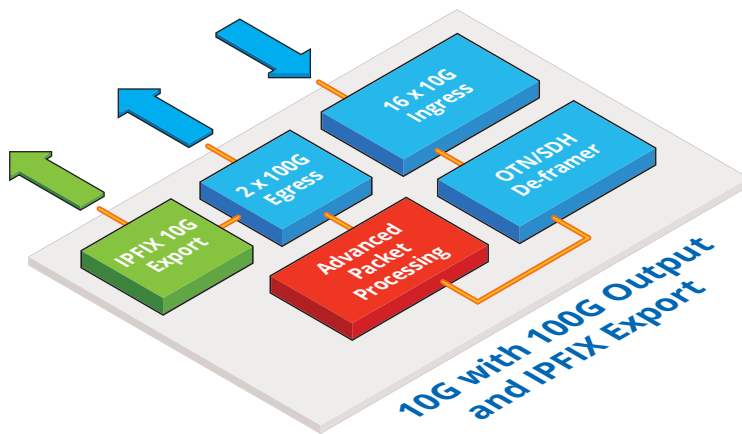
In addition to removing OTN and SDH wrappers, the OMX supports WAN auto-discovery. When WAN auto-discovery is enabled, the OMX can determine which of the signal types listed previously is present on the input port. It is important to note that RTU-32404 is required to run a DP800 in the 10G mode; advanced packet processing and WAN auto-discovery are optional features.

With 100GbE egress enabled, the traffic aggregation is fixed meaning traffic from a specific set of 8x10G input ports is aggregated to a specific 100GbE output port. Traffic from the other 8x10G input ports is aggregated to the other 100GbE output port. With 10GbE egress enabled, each 10G input port is assigned a dedicated 10GbE output port for steering traffic.


10G with 100G Output and IPFIX Export

10G with 10G Output

* Ingress support for 10GbE, OTU2-GFP, OTU2-WANPHY, OTU2-STM64 (GFP or POS), OTU2e/1e, WANPHY, STM64 (GFP or POS)

			10G Modes (with and without 100GigE Aggregation)											
			DP800 Port Count				OMX3200 Core SW (RTU-32000)			Additional RTUs				
DP800 Config	RTU #	Notes	10G		100G		NQOS	Aggregation / Switching	OTN Transponder	Advanced Packet Processing (RTU-32101)				Netflow/ IPFIX RTU-32200	WAN Auto Discovery RTU-32450
			In	Out	In	Out				Header Stripping	IP De-Tunneling	MAC Bridging	VLAN Insert		
10G (100GbE Egress)	RTU-32404	100G Egress	16			2	✔	**Fixed**	✔	✔	✔	✔	✔	✔	✔
10G (10GbE Egress)	RTU-32404	10G Egress	16	16			✔		✔	✔	✔	✔	✔		✔

DP800 Mode: OTU4-100GbE

The OMX3200 supports an OTU4-100GbE mode for performing a transponder function and removing the OTN wrappers so that monitoring tools can get access to the 100GbE traffic stream. After removing the OTN wrappers, the OMX can also perform advanced packet processing functions on the 100GbE traffic as required. RTU-32403 is required to operate a DP800 in the OTU4-100GbE mode; advanced packet processing is an optional feature.
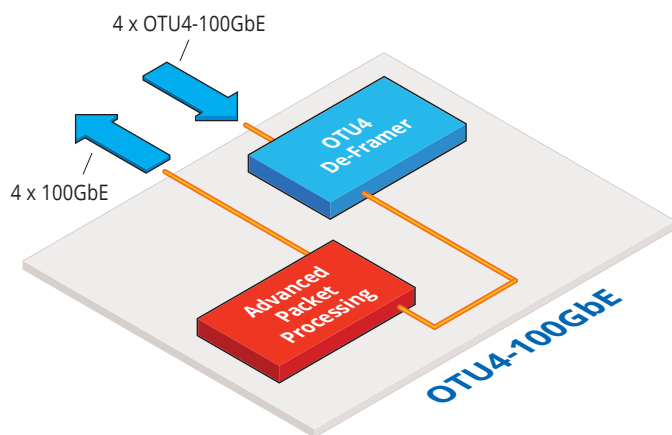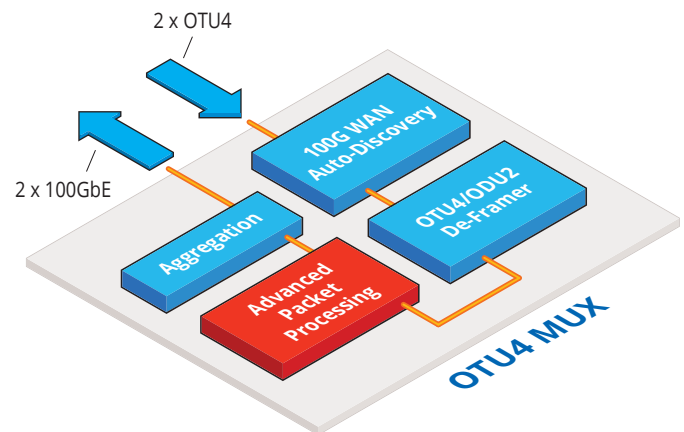

DP800 Mode: OTU4 MUX Mode

The OMX3200 supports an OTU4 MUX mode for performing a muxponder function and removing the OTN wrappers so that monitoring tools can get access to traffic streams multiplexed into OTU4 networks. For OTU4 traffic carrying ODU2 tributaries, the OMX will remove the transport wrappers and process the IP packets carried within. All of the traffic processed from

an OTU4 input port will be routed to a specific 100GbE output port. Each DP800 supports up to 2 x OTU4 input ports while operating in the OTU4 MUX mode; the DP800 can process 100% of the ODU2 tributaries carried within the OTU4. The DP800 can process any of the following traffic types carried within an ODU2 tributary:

- ODU2 carrying GFP, GFP-extended, WANPHY or STM64 (POS or GFP)
- ODU2e->10GbE

In addition to removing OTN and SDH wrappers, the OMX supports WAN auto-discovery. When WAN auto-discovery is enabled, the OMX can determine the entire OTU4 multiplexing structure including ODU3/2/2e/1/0 tributaries. The OMX will report overhead of each tributary including payload type. RTU-32401 is required to run a DP800 in the OTU4 MUX mode; advanced packet processing and WAN auto-discovery are optional features.


* Ingress support for OTU4 carrying ODU2-GFP, ODU2-WANPHY, ODU2e, ODU2-STM64 (GFP or POS)

DP800 Config	RTU #	DP800 Port Count				OMX3200 Core SW (RTU-32000)			Additional RTUs					
		10G		100G		NQOS	Aggregation/ Switching	OTN Processing	Advanced Packet Processing (RTU-32101)				Netflow/ IPFIX RTU-32200	WAN Auto Discovery RTU-32450
		In	Out	In	Out				Header Stripping	IP De-Tunneling	MAC Bridging	VLAN Insert		
OTU4/100GbE	RTU-32403			4	4	✔	**Fixed**	Transponder	✔	✔	✔	✔		*n/a*
OTU4 MUX	RTU-32401			2	2	✔	**Fixed**	Muxponder	✔	✔	✔	✔		✔

<p align="center">100G OTU4 Modes (with and without ODU2 Channelization)</p>

DP800 Mode: SONET/SDH

The OMX3200 supports a SONET/SDH mode for performing automated discovery and translation of standard OC-192/STM-64 signals. With no previous knowledge of the signal's provisioning, the OMX will discover the full channelization structure of the signal including overhead information and payload descriptions. The OMX can use the discovery information to remove the SDH wrappers, extract IP traffic and steer traffic of interest to downstream tools via the DP800 module's 100GbE output port. Each DP800 supports up to 8 x OC-192/STM-64 input ports while operating in the SONET/SDH mode; the DP800 can process 100% of the traffic without dropping any packets.

In addition, the DP800 module provides an OC192/STM64 and four OC48/STM16 output ports for bypassing non-standard streams and an additional OC192/STM64 output port that can be used to
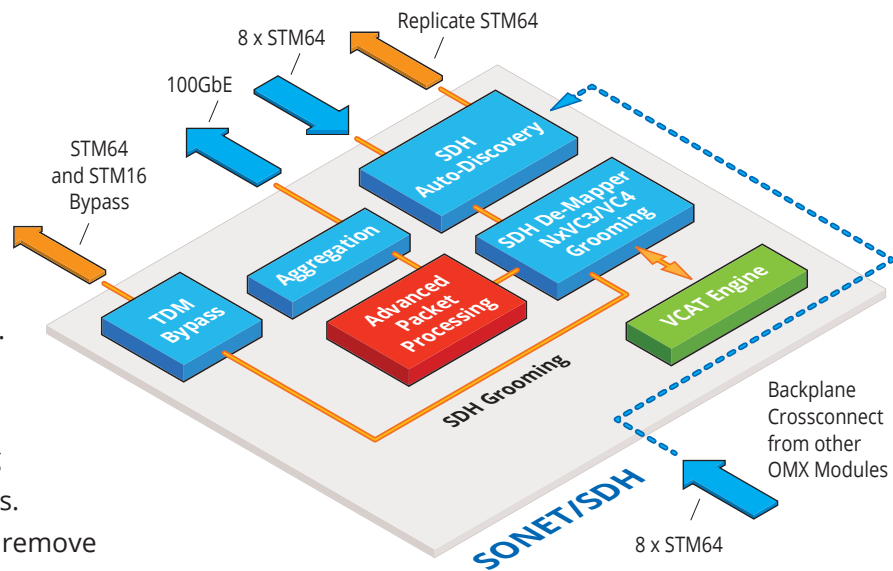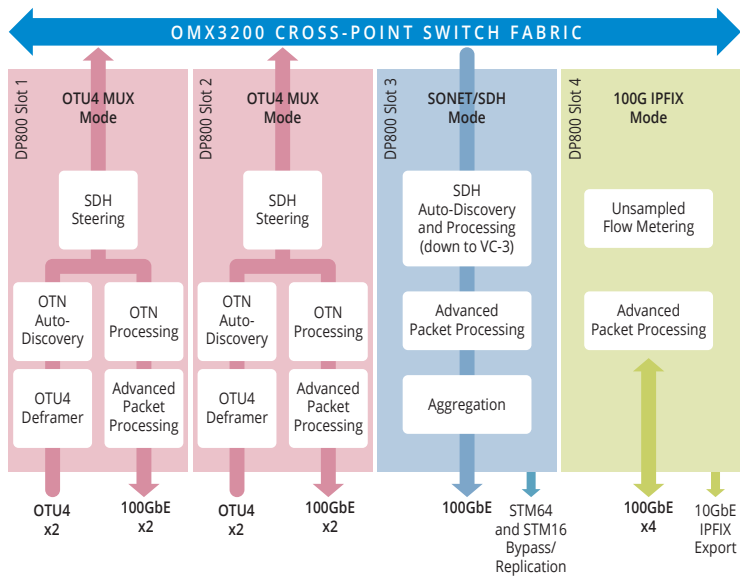

* Ingress ports accept STM64
** Module also accepts STM64 from OTU4 or OTU2 over backbone

replicate a duplicate copy of any of the input signals to an external tool.

In addition to processing native SDH STM-64 signals received via the physical QSFP interfaces, the OMX can leverage the DP800's channelized SONET/SDH processing features to handle STM-64 signals carried over OTN (OTU4 or OTU2). In this case, the OMX will remove the OTN wrappers on the DP800 on which the signal was received (i.e. a DP800 operating in the OTU4 MUX mode or 10G mode) and transport the embedded STM-64 over the OMX backplane so that all of the SDH processing can be performed on a DP800 slot provisioned for the SONET/SDH processing mode.

The application example to the left shows a single OMX using slots 1-3 to process 4 x OTU4 input signals carrying a mixture of Ethernet and channelized SDH traffic. In addition, there is still capacity available to use OMX slot 4 to ingest 4 x 100GbE signals for line-rate advanced packet processing and unsampled IPFIX flow metering.

N x 10G SONET/SDH Mode													
		DP800 Port Count				OMX3200 Core SW (RTU-32000)		Additional RTUs					
DP800 Config	RTU #	10G		100G		NQOS	Aggregation / Switching	Advanced Packet Processing (RTU-32101)				Netflow/ IPFIX RTU-32200	WAN Auto Discovery RTU-32450
		In	Out	In	Out			Header Stripping	IP De-Tunneling	MAC Bridging	VLAN Insert		
SONET/SDH	RTU-32402	8			1	✔	**Fixed**	✔	✔	✔	✔		✔

NetQuest Corporation

NetQuest has been a longstanding and trusted supplier of Cyber Surveillance Appliances to government agencies. With the introduction of the OMX3200, we have built upon our many years of network monitoring experience to offer an optimized network visibility solution ideal for cyber intelligence applications serving government, service providers and large enterprises.

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