North Atlantic Industries
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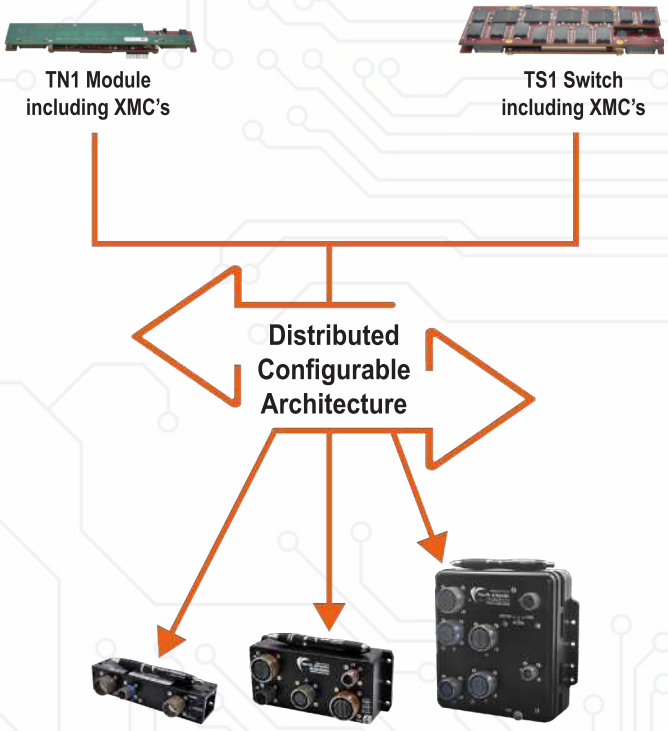
TIME SENSITIVE NETWORKING (TSN) from North Atlantic Industries

The enabling technology of the US Army Digital Backbone (DBB)

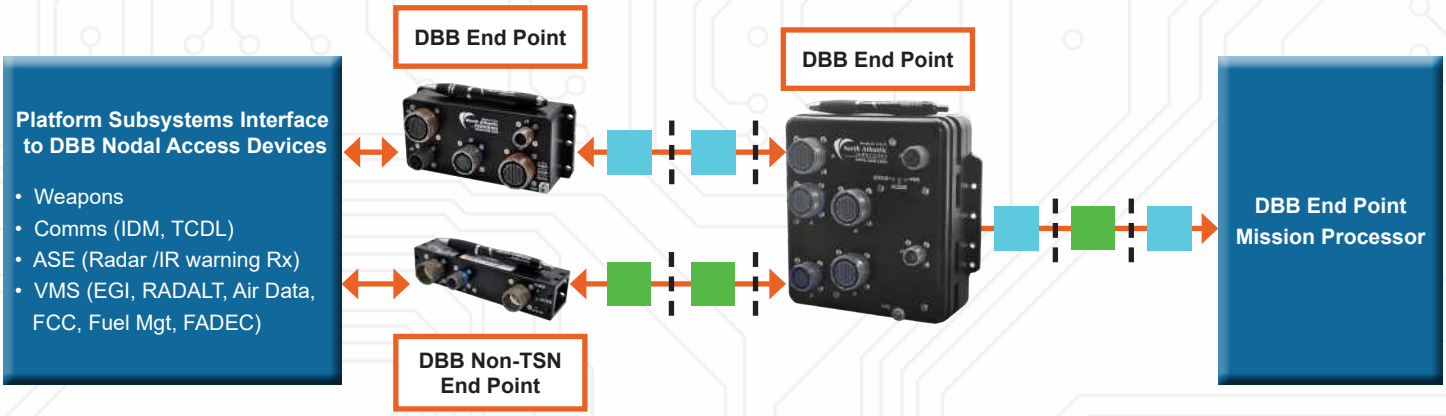
The Digital Backbone (DBB) of tomorrow's platforms requires determinism to support mission & safety critical, e.g. A-PNT operations, while simultaneously supporting legacy platform equipment. These capabilities are achieved through the application of IEEE 802.1AS-TSN and IEEE 802.1DP/DG Aerospace and Automotive TSN Profiles, respectively. A DBB with TSN support is required for Army Ground Vehicle Systems (GVS) and Aviation future platforms e.g., autonomous GVS, weapons, Unmanned Aerospace Systems (UAS), FVL and manned flight controls systems which are currently being procured by the military and commercial aerospace.



Achieving a deterministic Ethernet interface has been long desired and now enables the DBB to be certifiable up to DO-178C/254 DAL-A, enabling support for safety & mission critical functions to be managed over an Open Standards based DBB. Going forward, procurement of platform equipment will be standardized to the DBB specifications and will greatly reduce system architecture complexity and equipment integration costs.

NAI's DBB solutions support Nodal Access Units and DBB Switches all using an FPGA based MOSA aligned Network Accelerator Module developed with Army Aviation Combat Capability Development Command (CCDC)/Development Command (DEVCOM), NAI and DornerWorks. By using an FPGA based Network Accelerator Module supporting TSN, decouples the Network Stack and processing from the Real Time Operating System (RTOS), which enables portability of the Network Accelerator Module from one RTOS to another. The portability attribute is especially important when dealing expensive DO-178C/254 certifiable implementations. Additionally, using FPGA's to implement DBB/TSN Ethernet, enables easy adoption of new networking standards, that can be tailored to resolve interoperability issues with dissimilar devices, reduce obsolescence risk and compatibility between the traditional hard silicon based Network Interface Controller's (NIC's) used by Intel, NXP, Broadcom etc.

DBB Use Case Example Integration of legacy and TSN Subsystems onto DBB using Nodal Access Devices and DBB Switches



TSN Benefits

- End Points: Support up to Tri-Redundant architectures for Safety/Mission Critical Network implementations
- End Point and Switches Up to 10 Gbps and Fiber Optic interfaces
- IEEE 802.1AS-2020 TSN (most recent version)
- IEEE 802.1DP Aerospace TSN Profile (pending release)
- IEEE 802.1CB Frame Replication and Elimination for Reliability and Redundancy
- Mixed criticality traffic DO-178C/254 DAL-A to IEEE 802.3 DAL-E best effort traffic
- FPGA based implementation supporting configurability and adaptability to changing standards
- Portability of artifacts and configurations
- MOSA-aligned FPGA based network accelerator module

Time Sensitive Networking Advantages			
Deterministic	**TN1**	**TTE**	**Legacy Ethernet**
Low Latency	X	X	
Synchronized	X	X	
High Availability	X	X	
Sync Error Notifications	X	X	X
Priority Scheduling	X	X	
Supporting U.S. based IP	X		X

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100% Designed, Manufactured, Assembled and Tested in the U.S.A.

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