NIU3E – Nano Interface Unit

Rugged Embedded Multifunction I/O System with 10 GB Fiber Optic & 1 GB Copper Ethernet Switch

The NIU3E is a small, rugged, low-power, self-contained multifunction I/O processing system preconfigured with 24-CH programmable Discrete I/O, 8-CH ARINC 429/575, 4-CH CANBus and 2-CH MIL-STD-1553 functions and incorporates an Ethernet switch module that offers four (4) 10GBase-SR multimode fiber optic ports and sixteen (16) 10/100/1000Base-T Ethernet ports. The NIU3E can also be configured with one smart Configurable Open Systems Architecture™ (COSA®) function module. The NIU3E boasts a Dual or Quad Core ARM A53 processor for customer application and I/O and communications management. The NIU3E is configured with two 10/100/1000Base-T (GbE) Ethernet ports and an RS-232 port for maintenance / diagnostic or configuration interface. Ideally suited for rugged Mil-Aero applications, the NIU3E delivers off-the-shelf solutions that accelerate deployment of SWaP-optimized systems in air, land and sea applications.

The NIU3E rugged multifunction I/O and communications processing platform provides scalable system level solutions enabling networks including on-board vehicle, marine and aircraft platforms, to field and expand digital network architectures for network-centric operations.

Features

Preconfigured Onboard I/O Function
- 24-CH Discrete I/O (Enhanced Mode Optional)
- 8-CH ARINC 429/575
- 4-CH CANBus; CAN A/B 2.0, CAN-FD, ARINC-825
- 2-CH MIL-STD-1553

Supports One NAI smart I/O function modules
- 70+ modules to choose from Customer-configurable COSA® architecture

Minimized SWaP Footprint
- 7.2" X 6.6" X 3.0" (est.) (incl. connectors)
- ~6 lbs. (2.72 kg)
- 28 VDC @ ~0.85 A (est.) + Module Power (5-25 W typ. operating, depending on configuration & application)

Xilinx Zynq UltraScale+ SoC with Dual or Quad Core ARM A53
- 8 GB DDR4 RAM
- 32 GB SATA Flash

Supports ES2 Managed Switch Module
- 16x 10/100/1000Base-T (GbE)
- 4x 10GBase-SR Fiber
- 1x GbE and 1x RS-232 for maintenance

Connectivity
- 2x USB 2.0
- 1x RS-232 debug

Power Supply Hold-up (Optional)
50+ milliseconds of Holdup time

Certifiable
- DO-178C & DO-245 DAL A (Contact Factory)

Cybersecurity & Anti-Tamper
- FIPS-140-3 Level 3 (Contact Factory)

Continuous Background BIT

Operating System Support
- Xilinx PetaLinux
- Wind River VxWorks 7.x
- DDC-I Deos

Rugged applications*
- MIL-STD-810
- MIL-STD-461
- MIL-STD-704
- Operating temp: -40˚C to +71˚C
- Conduction-cooled & Convection/Air-cooled options (contact factory)

*Designed to meet. Characterizations pending. EMI/EMC requires shielded cables and proper grounding practices.

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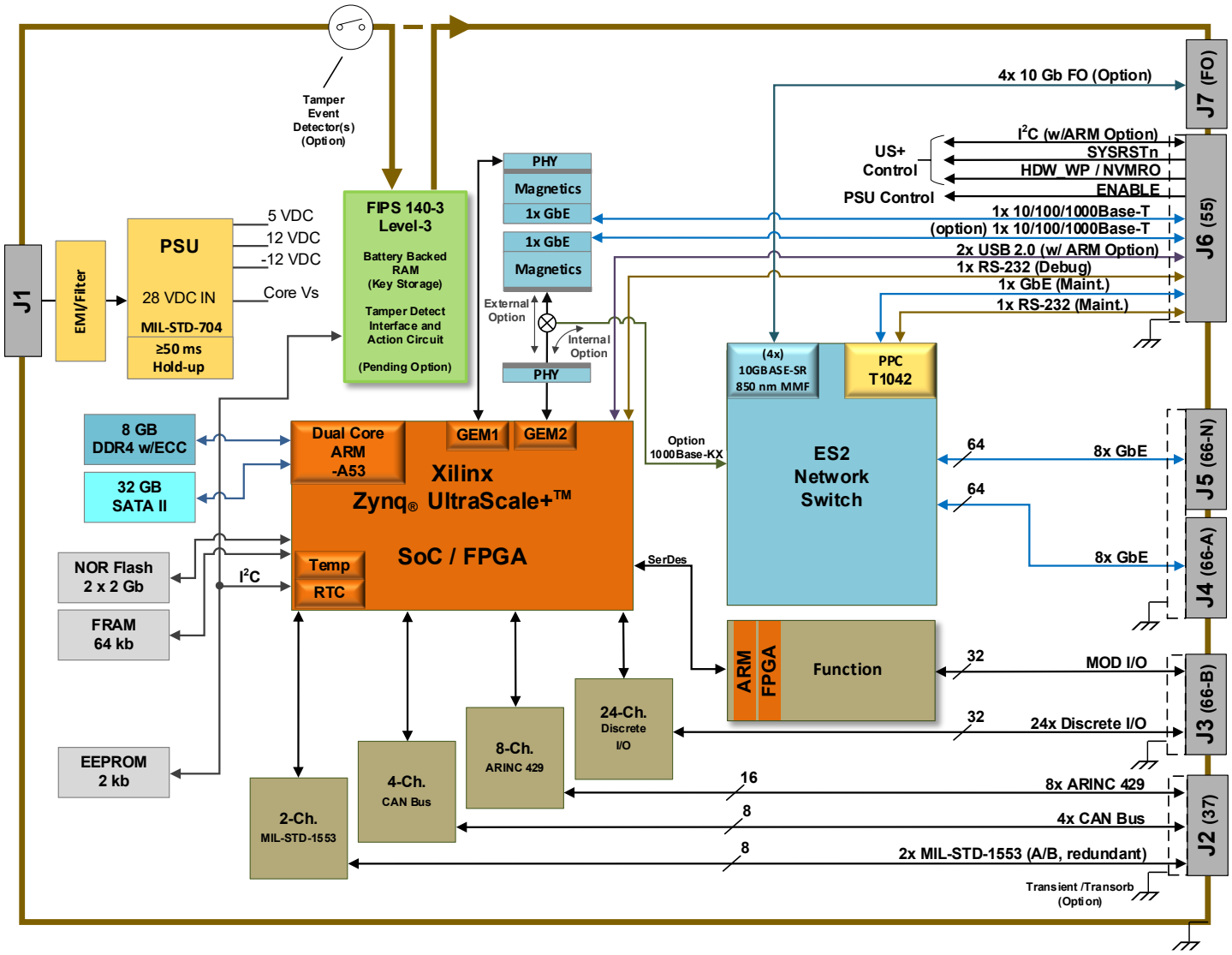
System Block Diagram



ES2 Managed Ethernet Switch Specifications

Module ID:	ES2: Multiport Managed Ethernet Switch Module (up to 16 ports)
Number/Type of Channels:	Up to 16; 10/100/1000Base-T Additionally: 1x 10/100/1000Base-T maintenance port interface 1x RS-232 maintenance/console port interface Fiber-Optic Channel, 4x 10 Gb
Compatibility Standards	Broadcom® BCM53454x • IEEE 802.3ab (1000Base-T Gig-E) • IEEE 802.3u (100Base-TX Fast Ethernet) • IEEE 802.3i (10Base-T Ethernet) • IEEE 802.3x (Flow control/full and half duplex)

L2 Features / Standard Management	• Transparent bridging • VLAN aware bridging • Rapid Spanning Tree Protocol • Multiple Spanning Tree Protocol • IGMP snooping – MAC based, filtering, Proxy reporting with snooping • MLD snooping (MAC based only supported) • Link Aggregation with LACP • 802.1x authentication (Port based) • Link Layer Discovery Protocol - LLDP (v1, v2)), LLDP MED • Ethernet OAM – 802.3ah • Q-in-Q VLAN tunneling and Provider bridging • Non-blocking, Gig-E, fully integrated switch fabric with packet buffer memory • Integrated MACs (IEEE 802.x compliant) with support for 9600-byte jumbo frames • High-performance, look-up engine with support for unicast MAC address entries • Automatic learning and aging tags • IPv4 and IPv6 traffic class support (including ARP, ICMP, ND, UDP) • Port segregating/partitioning options available (e.g., separate 8/8 ports for 2x independent networks) management • SNMP (v1, v2c, v3) agent and MIB support; configuration save / restore, CLI (Console, Telnet, SSH), pre-defined CLI commands • WebUI (HTTP and HTTPS / SSL), pre-defined web pages (As is basis), Clear configuration (As is basis) • Syslog – client (with reliable syslog delivery) and relay, email alerts with authentication support • TCP/IP stack for IPv4 and IPv6 (including ARP, ICMP, ND, UDP) • DHCP (client, server, relay) for IPv4 • Stateless DHCP service (Client) for IPv6 for specific options assignment • DHCPv6 relay with prefix delegation • RADIUS client, DNS client, TACACS+ client, SSH client, Telnet client (all clients with IPv4 and IPv6 support) • RMONv1 • IP authorized managers • Ethernet port control and management • Port mirroring
Quality of Service (QOS)	• ACLs (Access Control Lists) for traffic filtering, Redirect Filter Support in ACL, Out Filter Support in ACL • 802.1p, DiffServ, traffic prioritization queuing, policing, shaping • Rate limiting and storm control • Flow control
L3 Features	• IPv4 unicast - static routing, RIP v1/v2, OSPFv2 • IPv4 multicast – IGMP (v1/v2/v3) router, PIM-SSM • IPv4 – NAT (Network Address Translation) – unicast • IPv6 unicast - static routing, Neighbor Discovery, RIPv6, OSPFv3IPv6 multicast – MLD (v1/v2), PIM-SSM • Route redistribution between IPv4 routing protocols and static routes • Route maps for filtering route advertisements and route redistribution – IPv4 and IPv6 • Authentication support for OSPFv3 • Support for multiple IPv4 addresses per interface - OSPFv2
Security	• IKE (v1, v2) • IPSec • Stateful firewall • Denial-of-Service (DoS) attack

North Atlantic Industries

NIU3E
Nano Interface Unit

Select up to 1 independent functions for your application

Analog & Digital I/O

Function	Module	Description
A/D Converter	AD1	12 Ch. ±1.25 to ±10.0 VDC FSR; 256 kHz (max), 24-bit Sigma-Delta
	AD2	12 Ch. ±12.5 to ±100.0 VDC FSR; 256 kHz (max), 24-bit Sigma-Delta
	AD3	12 Ch. ±25 mA FSR; 24-bit 256 kHz (max), Sigma-Delta
	AD4	16 Ch. ±1.25 to ±10.0 VDC FSR or ±25 mA; 16-bit SAR, 8 Ch. x 2 A/D multiplexed, 400 kHZ (aggregate per A/D)
	AD5	16 Ch. ±6.25 to ±50.0 VDC FSR; 16-bit SAR, 8 Ch. x 2 A/D multiplexed, 400 kHZ (aggregate per A/D)
	AD6	16 Ch. ±12.5 to ±100.0 VDC FSR; 16-bit SAR, 8 Ch. x 2 A/D multiplexed, 400 kHZ (aggregate per A/D)
	ADE	16 Ch. ±10 VDC FSR; 200 kHz (max.), 16-bit SAR
	ADF	16 Ch. ±100 VDC FSR; 200 kHz (max.), 16-bit SAR
	ADG	16 Ch. ±25 mA FSR; 200 kHz (max.), 16-bit SAR
	ADH	8 Ch. ±100 VDC FSR; Individual SAR (ADF-type) 8 Ch. high-current capable with external shunt
I/O TTL/CMOS	TL1	24 Ch. 3.3V/5V tolerant, high-speed, programmable
	TL2	24 Ch. 3.3V/5V tolerant, high-speed, programmable, enhanced
	TL3 – TL8	24. Ch. 3.3V/5V tolerant, multiple strapping options
I/O Differential	DF1	16 Ch. RS-422/485 I/O transceiver
	DF2	16 Ch. RS-422/485 I/O transceiver, enhanced

Function	Module	Description
D/A Converter	DA1	12 Ch. ±10 VDC or ± 25 mA / Ch.
	DA2	16 Ch. ±10 VDC @ 10 mA max. / Ch.
	DA3	4 Ch. ±40 VDC or ± 100 mA / Ch.
	DA4	4 Ch. ±20 to ± 80 VDC @ ±10 mA max. / Ch.
	DA5	2 Ch. 65 VDC @ ±2 A max., external applied VCC source
I/O Discrete	DT1	24 Ch. Discrete I/O, 0 - 60 VDC, 500 mA / Ch. max.
	DT2	16 Ch. Discrete switch, ±80 V, 625 mA / Ch. max., isolated
	DT3	4 Ch. Discrete-switch, 65 V, 2 A / Ch. as half-bridge configuration, ext. VCC or 2 Ch. ±65 V, 2 A / Ch. as full-bridge configuration, ext. VCC
	DT4	24 Ch. Discrete I/O, 0 - 60 VDC, 500 mA / Ch. max., enhanced operation
	DT5	16 Ch. Discrete switch, ±80 V, 625 mA / Ch., enhanced operation
	DT6	4 Ch. Discrete-switch, 65 V, 2 A / Ch. as half-bridge configuration, ext. VCC or 2 Ch. ±65 V, 2 A / Ch. as full-bridge configuration, ext. VCC (DT3-type enhanced operation TBD/pending)
I/O Relay		
	RY1	4 Ch. SPDT, 220 VDC/ 250 VAC, 2 A, 60 W/62.5 VA max., non-latching
	RY2	4 Ch. SPDT, 220 VDC/ 250 VAC, 2 A, 60 W/62.5 VA max., latching

Position, Timing, Measurement & Simulation

Function	Module	Description
AC Reference	AC1	1 Ch. 2-28 Vrms (LV) & 1 Ch. 28-115 Vrms (HV), programmable
	AC2	2 Ch. 2-28 Vrms (LV), 47 Hz -20 kHz (max. range),
	AC3	2 Ch. 28-115 Vrms (HV), 47 Hz - 2.5 kHz (max. range)
Thermocouple (Measure)	TC1	8 Ch. Thermocouple, J, K, T, E, N, B, R, S, and Low-voltage A/D
	TR1	8 Ch. RTD (RT1-type) or Thermocouple (TC1-type), programmable per Ch.
	RT1	8 Ch. RTD (2,3 or 4 wire), standard PT-type to 4 kohm
GPS	GP1	Multi-Ch. (satellite) GPS & IRIG Receiver or Source; 2x wide module, Javad TR2 high-performance GPS engine
	GP2	Multi-Ch. (satellite) GPS & IRIG Receiver or Source; 1x wide module, uBlox Neo GPS engine
IRIG	RG1	1 Ch. IRIG Receiver or Source, digital & analog w/ master timer
Strain Gauge	SG1	4 Ch. Strain Gauge, full-bridge measurement

Function	Module	Description
SYN/RSL-to-Dig	SD1	4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, 47 Hz - 1 Hz Freq
	SD2	4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, 1 kHz - 5 kHz Freq
	SD3	4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, 5 kHz - 10 kHz Freq
	SD4	4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc, 10 kHz - 20 kHz Freq
	SD5	4 Ch. 28-90 Vrms Input, 2-115 Vrms Exc, 47 Hz - 1 kHz Freq
L(R)VDT-to-Dig	LD1-5	4 Ch. 2-28 Vrms Input, 2-115 Vrms Exc (47 Hz - 20 kHz Freq. and 2-90 Vrms ranges, reference detailed specifications)
Dig-to-SYN/RSL Dig-to-L(R)VDT	DSx / DRx DLx	3, 2 or 1 Ch. @ 0.5 VA, 2.2 VA or 3.0 VA 2-90 Vrms / 2-115 Vexc @ 47 Hz – 20 kHz (Multi-range inputs/frequency; reference module detailed specifications)
Chip Detect	CD1	Six (6) chip detection and burn channels
Variable Reluctance	VR1	8 Channels, Differential Input

Communication

Function	Module	Description
ARINC	AR1	12 Ch. ARINC 429/575, TX or RX
	AR2	1 Ch. ARINC 568 (TX & RX) & 1 Ch. ARINC 579 (TX or RX)
MIL-STD-1553	FT1, FT2, FT3	1, 2 & 4 Ch. MIL-STD-1553, Dual Redundant, XFMR-Coupled
	FT4, FT5, FT6	1, 2 & 4 Ch. MIL-STD-1553, Dual Redundant, Direct-Coupled
	FTA, FTB, FTC	1, 2 & 4 Ch. MIL-STD-1553, Dual Redundant, XFMR-Coupled Assisted Mode Capable
	FTD, FTE, FTF	1, 2 & 4 Ch. MIL-STD-1553, Dual Redundant, Direct-Coupled Assisted Mode Capable
MIL-STD-1760	FTJ	1 Ch. MIL-STD-1553/1760, XFMR-Coupled
	FTK	2 Ch. MIL-STD-1553/1760 XFMR-Coupled

Function	Module	Description
CANBus	CB1	8 Ch. CAN bus, CAN 2.0 A/B Protocol
	CB2	8 Ch. CAN bus, J1939 Protocol
	CB3	8 Ch. CAN bus, CAN 2.0 A/B Protocol or J1939 Protocol, programmable
Ethernet	EM1	2-Port 10/100/1000Base-T Ethernet NIC, Intel 82850, PCIe I/F to processor (local or off-board host)
	ES2	16-Port 10/100/1000Base-T, managed switch, with L2/L3 Layer support 4x 10Gb Fiber Optic option, 2x wide module
Serial	SC1	4 Ch. Serial Communications, multi-mode RS-232/422/485/423 capable, ASYNC/SYNC (S/HDLC) non-isolated
	SC2	4 Ch. Serial Communications, multi-mode programmable, isolated
	SC3	8 Ch. Serial Communications RS-232/422/485 or GPIO, non-isolated
	SC7	4 Ch. Serial Communications, multi-mode, individual GNDs, non-isolated

Combination & Specialty

Function	Module	Description
Combination	CM5	2 Ch. MIL-STD-1553 & 8 Ch. ARINC 429/575
	CM8	2 Ch. MIL-STD-1553 & 12 Ch. Discrete I/O

Function	Module	Description
Flash	FM1	240 GB SSD, SATA II, MLC, -40° C to +85° C
	FM2	480 GB SSD, SATA II, MLC, -40° C to +85° C
	FM4	128 GB SSD, SATA II, SLC, -40° C to +85° C
	FM5	256 GB SSD, SATA II, SLC, -40° C to +85° C
	FM7	1 TB SSD, SATA II, TLC, 0° C to +70° C
	FM8	1 TB SSD, SATA II, TLC, -40° C to +85° C
	FM9	2 TB SSD, SATA II, TLC, -40° C to +85° C

Architected for Versatility

NAI's Configurable Open Systems Architecture™ (COSA®) offers a choice of over 70 smart I/O and communications options. Preexisting, fully-tested functions can be selected to quickly and easily meet system requirements. Individually dedicated I/O and communications processors allow mission computers to manage, monitor and control via single or dual Ethernet.

Product Lifecycle Management

From design-in to production, and beyond, NAI's product lifecycle management strategy ensures the long-term availability of COTS products through technology refresh, configuration management and obsolescence component purchase and storage.

Made in the USA
Certified Small Business

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