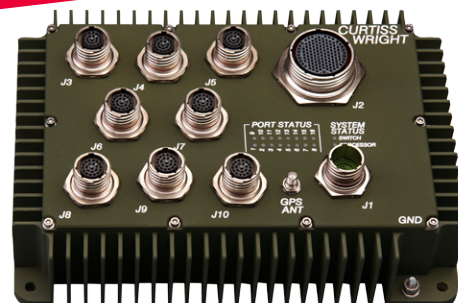# DIGITAL BEACHHEAD™
DBH-670

Overview

Curtiss-Wright Controls Defense Solutions' Digital Beachhead is a Size, Weight, Power, and Cost (SWaP-C) optimized solution designed to provide the essential foundations for modern vehicle digital architectures including:

- Vehicle Gigabit Ethernet Switching
- Vehicle Management Framework for Vetronics Interface & Logistics
- VICTORY Data Bus Management and Shared Services
- CBM+/HUMS with interface to the US Army's Common Logistics Operating Environment (CLOE)

The Digital Beachhead™ combines a powerful Gigabit Ethernet switch with a power-efficient ARM™ based vetronics computer. With a powerful set of pre-integrated software applications and interfaces, the Digital Beachhead provides the foundation services to implement a network-enabled vehicle architecture with a level of integration never before attained.

Designed specifically for the rugged military market, the Digital Beachhead prepares all levels of vehicles for network-enabled operations and is easily usable in any rugged military application. This cost effective approach provides platforms with an affordable entrance into digital architectures.

Figure 1: DBH-670 Digital Beachhead Hardware Block Diagram
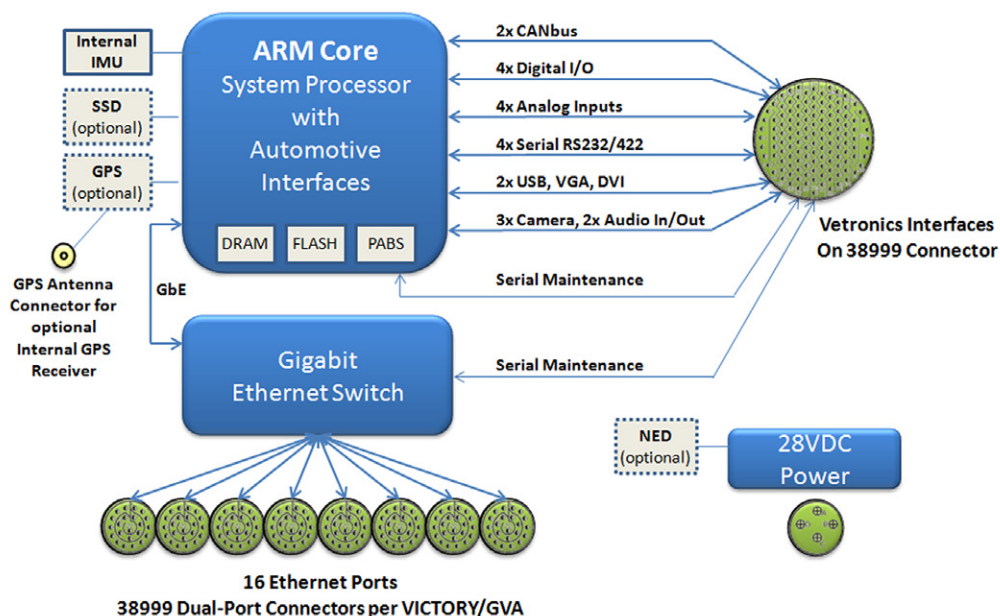
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Features

SWaP-C Optimized Network Switch and Vehicle Management Computer

- Extremely small footprint (10.5" x 7.5" x 3") and under 5 pounds weight
- 20 Watts typical power

16-port Gigabit Ethernet Switch

- Non-blocking architecture supports tri-speed operation (10/100/1000Mbps) with auto-negotiation and auto-MDIX
- Energy Efficient Ethernet (EEE) with built-in status LEDs and cable diagnostics
- Feature-rich networking support includes IPv4/v6 support, VLANs, IGMP multicast, QoS, MSTP/RSTP, link aggregation, port mirroring, and jumbo frames
- Powerful in-band (HTTP/Telnet/SNMP) and out-of-band (RS-232) switch configuration and management
- Hardware support for IEEE-1588 Precision Time Protocol with nanoseconds timing synchronization

Vehicle Management Computer with Flexible Vetronics Interfaces

- Vehicle Management Framework (VMF) provides a software interface for rules-based vehicle management and control, with interfaces to CBM+/HUMS and VICTORY
- Vehicle interfaces include multiple CANbus ports, audio and video (camera) interfaces, as well as analog and digital I/O interfaces
- Local display (VGA/DVI) and remote monitoring via web/HTTP services
- Optional pre-integrated CBM+ software for interoperability with US Army's Common Logistics Operating Environment (CLOE)

VICTORY Architecture Features

- Support for VICTORY Data Bus and Platform Services, including centralized distribution of time, position, speed, heading, and orientation
- External GPS (DAGR compatible) and Inertial Navigation interfaces
- Optional internal GPS receiver (Polaris Link or GB-GRAM) saves valuable vehicle space
- Can chain one GPS to multiple DBH units
- GPS interfaces support 1 PPS input for time accuracy
- VICTORY and GVA compliant MIL-STD-38999 pinouts

Designed for Rugged Military Applications and Environments

- -40°C to +71°C natural convection design also supports cold-plate to +90°C
- 28V DC power compliant to MIL-STD-1275D
- Optional Nuclear Event Detector (NED)
- Qualified to MIL-STD-810 and MIL-STD-461

Applications

- Intra-vehicle networks
- Vehicle modernization
- VICTORY Architecture compliance
- Vehicle management (Vetronics)
- Vehicle Usage & Health Management (HUMS)
- CBM+/CLOE interface
- Network interconnects and expansion
- Shared processing and peripheral communications

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Network Switch

The Digital Beachhead includes a 16-port Gigabit Ethernet switch. Built around a non-blocking core fabric, the switch supports a wide range of network features, including:

- Full support for IPv4 and IPv6 networks
- Tri-speed operation (10Base-T, 100Base-TX, and 1000Base-T) with auto-negotiation and auto-MDIX for trouble-free interconnects
- Diagnostic/status LEDs to display link status
- Energy Efficient Ethernet per 802.3az
- Port, MAC, and protocol-based VLANs per 802.1Q with MVRP
- Spanning Tree support (STP, RSTP, MSTP)
- Multicast support, including IGMP and MLD snooping
- Multiple traffic classes via QoS with flexible scheduling algorithms and traffic shaping
- Support for jumbo frames up to 9KB
- Link aggregation, Port mirroring
- Static routing is also supported for IP routing to attached WAN/radio ports

The network switch also includes full support for hardware-based Precision Time Protocol (IEEE-1588), enabling network nodes to synchronize time with nanoseconds accuracy. Time synchronization to internal or external GPS receiver is supported.

The Digital Beachhead network switch is compliant with the US Army's VICTORY Architecture as a Infrastructure Switch and Network Time Source. Network ports are provided on MIL-STD-38999 connectors compliant to both VICTORY and GVA (UK Def-Stan 23-09) pinouts for dual Ethernet.

Vetronics Computer

The Digital Beachhead includes a powerful and energy efficient ARM processor connected to a wide variety of popular vetronics interfaces. Combined with an easy-to-use web enabled interface, the Digital Beachhead provides the vehicle integrator with a powerful set of vehicle management services focused on monitoring and managing the overall health of the vehicle.

Standard vetronics hardware interfaces include:

- 2 independent CANbus interfaces
- 3 camera inputs supporting RS-170 video, typically used for backup camera or other utility video functions
- 2 analog audio inputs and 2 analog audio outputs
- 4 configurable analog inputs capable of differential, 2-wire, 3-wire and 4-wire sensing operation up to 10V
- 4 configurable digital inputs/outputs capable of operation up to 28V

Audio Bridging

The Digital Beachhead provides an audio bridging function to integrate analog intercom systems into the vehicle's digital architecture, as well as providing alert tone outputs.

User Interfaces

Although capable of headless operation, user interfaces to the Digital Beachhead are available through networked web services or locally attached display (VGA or DVI) and USB ports for keyboard/mouse or touch-screen interfaces.

Health Usage and Monitoring System (HUMS)

To provide off-device or off-vehicle health management, the Digital Beachhead can interface with a wide range of HUMS systems.

For US Army systems, the Digital Beachhead can be supplied with pre-integrated CBM+ software for interoperability with the US Army's CLOE environment for gathering and logging of critical vehicle data. No additional hardware is needed.

Local Storage

The Digital Beachhead has 2GB of on-board FLASH storage for user data, including health logging. On-board FLASH storage can be increased up to 30GB, and an additional 2.5" SSD can be added to increase this storage for longer or more detailed mission logs. A FIPS-140-2 or NSA certified encrypted SSD can also be supplied.

VICTORY Services

The Digital Beachhead provides essential VICTORY services to a vehicle or platform. Compliant to the current US VICTORY specifications, the Digital Beachhead provides centralized network services to realize a truly network-centric architecture whereby common network services are available to all connected and authorized equipment.

VICTORY is the result of many years of network-centric design concepts applied to a deployable platform, and provides an architecture that supports network enabled services such as:

- VICTORY compliant subsystems (e.g. shot detection, RWS, 360 Situational Awareness)
- Smart and thin client displays
- Shared processing units for mission computing
- Network Attached Storage (NAS)
- Off-platform radio links
- Laptop and depot connection
- Expansion switches

GPS and Inertial Navigation Services

The Digital Beachhead supports direct connection to an external GPS receiver to provide real-time GPS data. An optional internal GPS (GB-GRAM or Polaris Link) is also supported. An internal Inertial Measurement Unit (IMU) is included as standard, along with support for an external IMU.

Using VICTORY services, these devices provide centralized time, position, speed, heading and orientation data that can be distributed to network devices, eliminating equipment duplication and lowering overall platform costs and complexity.

VICTORY Compliant Ethernet Switch

The Digital Beachhead's Ethernet network switch is also VICTORY compliant as an Infrastructure Switch and Network Time Source via PTP (IEEE-1588).

Additional VICTORY Capabilities

As the VICTORY specification is still evolving, the Digital Beachhead can extend support for new services with software updates. Examples of these future capabilities include:

- Additional VICTORY services, such as CBM+, Network Attached Storage (NAS), Mission Recording, etc.

MIL SPEC Compliance

The Digital Beachhead has been designed specifically for the defense industry. Power is compliant to 28VDC under MIL-STD-1275D, and supports normal, generator, and cranking modes, including spike and transient conditions.

All connections are via MIL-STD-38999 rugged connectors. Ethernet connections are compliant with VICTORY and GVA specifications for dual-Ethernet ports. Power is also compliant to VICTORY and GVA specifications.

Extended temperature operation is supported, with no pre-warming or startup requirements over the working -40°C to +71°C operational range. Natural convection design ensures reliable operation without forced air or fans. In cold-plate mounting conditions, the Digital Beachhead operates with cold-plate temperatures up to 90°C.

The Digital Beachhead chassis is designed to meet the most rugged conditions, including MIL-STD-810F for environmental and MIL-STD-461E for EMI/EMC compliance.

Low Power Operation

The Digital Beachhead is designed for low power operation. Ethernet ports are power optimized per Energy Efficient Ethernet, and unused ports are automatically powered down. The system processor is a power-efficient ARM processor, which has been configured to reduce power for unused system processing blocks.

Table 1: Physical & Rugged Qualifications

Feature	Description
Power	+28VDC nominal, per MIL-STD-1275D under normal, generator-only, and cranking conditions, including spike and transients ◆ Max: 33 watts ◆ Typical: 20 watts
Size	10.5" x 7.5" x 3.0" (266mm x 190mm x 76mm)
Weight	5.0 lb (2.3 kg) (preliminary)

Environmental – Thermal	◆ Operational:
	  - Natural Convection: -40°C to +71°C
	  - Cold Plate Mounted: -40°C to +90°C
	◆ Non-Operational:
	  - -55°C to +125°C

Humidity	0 to 100% condensing per MIL-STD-810F method 507.4
Shock	40g peak per MIL-STD-810F method 516.5
Vibration	10g peak sinusoidal, $0.1g^2$/Hz random, over 15Hz to 2KHz per MIL-STD-810F method 514.5
Salt & Fog	per MIL-STD-810F method 509.4
Sand & Dust	per MIL-STD-810F method 510.4
Temperature Shock	per MIL-STD-810F method 503.4
Explosive Atmosphere	per MIL-STD-810F method 511.4
Rain	per MIL-STD-810F method 506.4 for Drip
Steam & Water Jet	per IP66
Leakage (immersion)	per IP67 MIL-STD-810F method 812.4
Altitude	◆ Operating: -500ft to +12,000ft ◆ Non-operating per MIL-STD-810F method 500.4: -500ft to +50,000ft

Table 2: Hardware Specifications

Feature	Description
Ethernet Switching Fabric	Carrier Grade L2 Gigabit Ethernet Switch ◆ Fully non-blocking wire-speed performance with all ports and all frame sizes ◆ 4Mb integrated shared packet memory
Ethernet Management / Control Processor	Embedded MIPS processor ◆ 64MB DDR2 DRAM ◆ 32MB Flash
External Ethernet Ports	16 ports tri-speed 1000Base-T supporting 10Base-T, 100Base-TX, and 1000Base-T copper interfaces
Ethernet Port Specifications	◆ 10Base-T interfaces per IEEE 802.3 ◆ 100Base-TX interfaces per IEEE 802.3u ◆ 1000Base-T interfaces per IEEE 802.3ab ◆ Auto-MDI/MDIX crossover ◆ Max 100m segment length
Ethernet Maintenance Port	RS-232 Serial Port
System Processor	Dual-Core ARM Cortex-A9 Processor ◆ 800MHz core speed ◆ 1GB DDR3 DRAM ◆ 4GB Flash (2GB reserved for system)
Vetronics Interfaces	◆ 2x CANbus interfaces, per ISO-11898 - Up to 1Mbps interface speeds ◆ 4x Analog interfaces supporting differential, 2-wire, 3-wire, and 4-wire configurations ◆ 4x Digital I/O interfaces ◆ 1x RS-422 Interface for external GPS, including 1PPS input and output for downstream GPS ◆ 1x RS-422 Interface for external IMU ◆ 1x RS-232 Auxiliary Interface
Internal Sensors	Internal 3-axis Inertial Measurement Unit (IMU)
Optional Internal Expansion	◆ Internal GPS Receiver: Rockwell Polaris Link or GB-GRAM ◆ Internal SSD: 2.5" SATA-II @ 3.0 Gbps ◆ System Processor: DRAM expansion to 2GB ◆ System Processor: Flash expansion to 32GB
Indicators	LEDs for: ◆ Switch status ◆ Processor status ◆ Each Ethernet port has a link status LED LEDs are normally powered OFF, and can be turned on for status and diagnostics via hardware or software
Security Features	◆ ARM High Assurance Boot (HAB) architecture ◆ Optional internal FIPS-140-2 certified encrypted SSD ◆ NSA certified internal SSD available upon request

Table 3: Ethernet Software Specifications

Feature	Description
Ethernet Performance	• Fully non-blocking wire-speed performance with all ports and all frame sizes - 4Mb integrated shared packet memory • Energy Efficient Ethernet (EEE) with ActiPHY

Layer-2 Switch	• Support for IPv4 and IPv6 switching
	• Automatic switch learning and aging with up to 8,192 MAC addresses.
	• Support for jumbo frames up to 9,600 bytes
	• QoS Support with 8 traffic classes
	• VLANs
	  - 4,096 VLANs per 802.1Q
	  - VLAN broadcast, 802.1Q VLAN tagging & double-tagging
	• Multicast
	  - 8K L2 multicast groups, 8K IPv4/v6 multicast groups
	  - IGMPv2/v3, MLDv1/v2 snooping for forwarding of multicast traffic
	  - GMRP for multicast registration propagation
	• Link Aggregation (802.3ad) for increased bandwidth and load sharing
	• Port Mirroring
	• Rapid and Multiple Spanning Tree protocol (802.1w, 802.1s)
	• IEEE 802.3x flow control and back-pressure support

Layer-3 Switch	IPv4 Unicast Static Routing
Other	• IEEE-1588 Precision Time Protocol (PTP) with support for 1-step and 2-step clock sync • DHCP Server, DHCP Client
Management	• Port based security per 802.1X • RADIUS accounting, TACACS+ authentication • Web access security via HTTPS and SSHv2 • Web and CLI user login security • SNMP v1/v2/v3, Syslog, RMON

Table 4: Ordering Information

Product Number	Description
DBH-670-112000	Digital Beachhead, Switch Only Configuration • Managed Ethernet switch with 16-ports 10/100/1000Base-T ports, SNMP/CLI/Web management, IEEE-1588/PTP support • Natural convection chassis, -40° to +71°C, MIL-STD-1275 power
DBH-670-112210	Digital Beachhead, Worldwide Distribution • Managed Ethernet switch with 16-ports 10/100/1000Base-T ports, SNMP/CLI/Web management, IEEE-1588/PTP support, • Applications software: Vehicle Management Framework, 16GB user flash • Natural convection chassis, -40° to +71°C, MIL-STD-1275 power
DBH-670-112110	Digital Beachhead, US Army (VICTORY, CBM+) • Managed Ethernet switch with 16-ports 10/100/1000Base-T ports, SNMP/CLI/Web management, IEEE-1588/PTP support • Applications software: VICTORY services, CBM+, internal IMU, 16GB user flash • Natural convection chassis, -40° to +71°C, MIL-STD-1275 power • US ITAR CONTROLLED, due to VICTORY and CBM+ software
CBL-DBH-SET1	38999 breakout cable set (10) for DBH-670 Digital Beachhead • Includes J1 power cable breakout to spade lugs, J2 utility breakout to industry standard connectors, J3-J10 Ethernet breakouts to RJ45s • 2 meter length • Lab use only

Warranty

This product has a one year warranty.

Contact Information

To find your appropriate sales representative:

Website: www.cwcdefense.com/sales

Email: defensesales@curtisswright.com

Technical Support

For technical support:

Website: www.cwcdefense.com/support

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