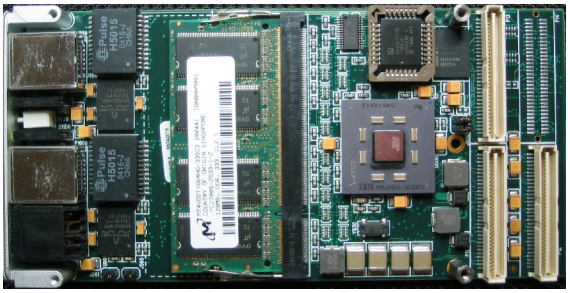
From the first US supplier of AFDX interfaces, the GXP1000 extends the capabilities envelope and provides Arinc 664 support including Boeing 787's EDE protocol. Starting with the Airbus A380 program dating back to 2002, a firmware approach utilizing intelligent Ethernet products has proven effective in reaching levels of functionality unattainable with other products. Powerful APIs for data acquisition, data generation and error injection are easily mastered. For maximum capability with minimum effort our Goebelyzer and Gtools productivity products offer unparalleled capability and features. Whether your application requires emulation of multiple end systems, or complex protocol processing and error injection, we have shown the highest performance and the greatest level of functionality. Our products are used in high-level systems simulation, as well as LRU design, verification and manufacturing test.

AFDX/Arinc 664 features:

- First supplier of Arinc 664 with EDE protocol (required for Boeing 787)
- Embedded PowerPc with dual 10/100/1000 RJ-45 interfaces
- PCI-X or PMC form factor adaptable to PCI PCIe cPCI PXI VME VXI
- On-board intelligence processes Arinc 664 protocols including redundancy, integrity, EDE management and error detection.
- On-board intelligence processes application layer protocols including frame counters, application layer CRCs, and data element function generators
- 4000 VLs and Ports configured via API
- Error checking flags or discards invalid frames under application control
- Error injection allows changing frame data including length, checksum and CRC
- Timing of transmit/receive data to 1.2 nanosecond resolution
- Achieves network loading of 100% on multiple 100 Mbit networks
- Drivers for Windows, IRIX, Linux, VxWorks and HP/UX.

Goebelyzer - Gtools features:

- Decode based on ICD definitions, including Arinc 429 and 661 decodes.
- Powerful plotting, triggering, filtering and sorting.
- Import NTAR, export CSV, XML, TEXT.
- Data pass through modification
- Network latency measurements
- Gtools productivity tools, including data loader, scripting, control panel, FIDO.



Commercial hardware

The GXP1000 is the second generation of AFDX available from the Goebel Company. It is but one of a commercial line of intelligent Ethernet controllers. Intelligent controllers offer future availability and upgrades unattainable with custom parts. Existing upgrade parts with Gigabit Fiber and faster processors are available from multiple manufacturers if required.

PMC form factor

The GXP1000 is a PMC card, more accurately PMCx, since it uses a PCI-x bus interface with 8 times the bandwidth of PCI. The PMC form factor provides a flexible platform that can be deployed in a variety of environments. We have delivered systems for PCI, PCI-x, VME and VXI

Drivers

We have delivered drivers for Linux, IRIX, HP/UX, VxWorks and Windows.

AFDX proven software

The key component of the GXP1000 is the firmware resident in it's 16 MB flash memory. This firmware has proven it's robust capability and performance starting with the Airbus A380 program in 2002. Advanced features of on-board data generation form the basis for a new paradigm of test capabilities.

AFDX performance

The firmware effectively exploits the capabilities of the processor PMC, and is capable of driving multiple 100 Mbit networks at 100% of theoretical bandwidth at all packet sizes. A single GXP1000 is typically all that is required in complex simulation environments where multiple end systems are emulated to stimulate the LRUs under test.

AFDX protocol

The GXP1000 faithfully follows the AFDX and Arinc 664 specifications. This includes:

- 4000 Vls and Ports
- Packet sizes of 1 to 8k bytes
- Fragmented packet support
- EDE protocol with timing precision as per spec of 100 microseconds or less
- Fragmented packets including EDE across fragmented packets
- BAG time of .5 to 128 milliseconds
- Jitter as per spec of less than .5 milliseconds
- Redundancy and integrity management
- Unique network ID and crossed network detection

AFDX networks are divided into logical connections termed virtual links. Virtual links are controlled in the bandwidth allocated to them. Specifying how often a packet can be transmitted controls the bandwidth. This is the bandwidth allocation gap or BAG time in milliseconds. BAG times are the minimal time between packets on a given VL, subject to a maximum jitter constraint. The GXP1000 rigorously enforces these constraints on BAG times and jitter.

Arinc 664 EDE protocol

The EDE protocol provides additional assurance of reliable data transmission. This functionality is available on the V6 version of the Rockwell Collins end system chip. The GXP1000 has been used in checkout of prototype versions of this chip.

Refer to the "Interoperability Specification for the 787 End System" for details of this protocol. The Goebel Company is a signatory to the PIA for this specification.

AFDX redundancy

Sending data on redundant networks enhances reliability in AFDX networks. The GXP1000

controls the sending of packets on one network or redundant networks as directed by the application. Redundant transmissions are kept within allowable jitter.

Upon reception redundant packets are filtered out to produce the original transmit stream of packets. Alternately all packets from both interfaces are available for reception.

AFDX integrity

AFDX networks maintain packet ordering between senders and receivers. This fact along with the addition of a sequence counter enables the detection of invalid packets. The GXP1000 handles the generation of sequence counters on transmission and the detection of invalid sequence numbers on reception.

Packets determined to be in error can be received by selecting to pass through error packets based on error types. This provides a powerful tool to debug errors in transmission.

On-board data generation

With our second generation GXP1000 product we have implemented a new paradigm of test functionality driven down to the on-board intelligence. This allows time critical protocols to execute on-board independent of host real-time capabilities. This paradigm of on-board test generation is available under application or scripting control. This capability has proven much easier for test generation compared to test programs or replay files, which require capture and editing before replay.

Data generation includes the ability to apply functions to individual data elements. For example a frame count, sine wave, square wave, or sawtooth wave can be applied to a data element within a packet. Application level CRCs can be applied to subsets of packet data. Frame counts are guaranteed to be accurate without host involvement. This capability has proven useful in low-level checkout where specific inputs are required at the LRU.

Network latency measurements

One test in validating an AFDX network is verifying the end-to-end packet latency. To perform this function the GXP1000 has software to measure the time difference between the same frame as seen on each port. Utilizing taps on two different points in the network, and connecting these taps to a GXP1000, the packet latency can be measured.

Goebelyzer

In support of analyzer requirements The Goebel Company has developed a multi-interface analyzer tool with advanced decoding capabilities. Data is displayed in engineering units based on ICD data definitions. We have ICD import tools from various CSV formats. Our decode capabilities are advanced to the point where our tools are employed to decode capture files from other analyzer vendors for import into post processing data bases. NTAR is the capture format for importing from other vendor capture files. Once imported, the same capabilities for export to text, CSV, XML, plots or PCAP formats are provided. Unlike some competing analyzers, data is displayed during capture. In addition, live displays of user specified data items can be generated via simple mouse clicks from ICD directories.

Goebelyzer – Arinc 429

On Boeing 787 there are large amounts of Arinc 429 data encapsulated in AFDX/Arinc 664 messages. Goebelyzer software provides decoding of Arinc 429 words into engineering units along with SSM and SDI bits. Our ability to decode 429 data is a popular feature, and even more so when encapsulated in Arinc 664 messages. This is a unique capability among AFDX/Arinc 664 vendors.

Goebelyzer – Arinc 661

Display data on the Arinc 664 network follows the Arinc 661 standard. Again the capability to decode Arinc 661 data is unique among Arinc 664 analyzer vendors. This capability is tied into our ICD translators to invoke 661 decoding. Any one concerned with looking at display data finds this an indispensable tool for data analysis.

Gtools

Our Gtools suite of productivity tools is a customer inspired collection of industry leading capabilities addressing a variety of user requirements. You will have a hard time finding the breadth of capabilities from any vendors especially in one low cost all inclusive package. Although our Gtools suite is an optional package, invariably all Goebelyzer orders specify Gtools due to the capabilities.

Gtools – AFDX scripting

One of the most powerful tools in the Gtools productivity suite is scripting. With simple scripts, one can generate AFDX traffic utilizing the advanced data generation and error injection capabilities of the API. Apply a sine wave to a data element or stop a frame counter for one frame, are examples of capabilities accomplished with simple script files. Now we are making these capabilities accessible with a mouse click in our AFDX control GUI. No other vendor provides the power of our data generation capabilities in any form, while we provide these capabilities via API, scripting, and next in GUI form.

Gtools – AFDX control panel

Our AFDX card can be configured and controlled from an extensive API, or from an AFDX control panel. With the control panel, Vls and Ports can be viewed for activity, errors, and bandwidth. AFDX control consists of VL and Port stop, start, redundancy, and integrity control for a companion simulation application. This eliminates the requirement for GUI control from the application. Current development is in progress to apply our industry leading suite of data generation and error injection capabilities to our AFDX control panel.

Gtools - Data Loader

As part of the Gtools suite of productivity enhancing tools, a data loader is provided for Arinc 615-A data loading compatible with Boeing 787 and Airbus AFDX Programs. Now there is no longer a need to procure separate tools for simulation, analysis and data loading.

Gtools – FIDO

FIDO stands for Flight Information Data Output which is a generic term used to describe the mechanism for accessing data inside the Smiths GPM. Goebelyzers with AFDX/A664 interface cards and Gtools package automatically include the FIDO tool. This tool provides a GUI for selection of GPM flight and debug data for viewing. Data elements are chosen by simple point a click from variable names listed in the FIDO XML data base. The data elements selected are built into a Goebelzer script to send the IDO messages required to retrieve the data. IDO message requests are made to the FIDO partition by executing the generated script. Goebelyzer software provides decoding, graphing and export of retrieved data. The FIDO tool is simply the easiest way by far to interrogate GPM FIDO data. In conjunction with Goebelyzer capabilities, FIDO data can be viewed in real-time, plotted or exported to CSV, or data bases. Users who need to look at FIDO data have no other reasonable alternative to view this data.

Gtools - Pass through modification

One of the unique features of the GXP1000 in conjunction with control panel software is the ability to modify network data passing from one LRU to another. For this feature the data is routed through the GXP1000 where a powerful filtering language is applied to select frames to modify. Once a frame is found, the appropriate data is modified and the modified frame passed to the target port. A small latency (less than 15 microseconds plus packet tx time) is introduced to the packet data. The modification can be applied to both networks using two cards, or the alternate network can be disabled. No other vendor offers a pass through data modification capability.

Proprietary Notice