In this issue...




Vol.21- June 2013


# View

the Newsletter of AIM GmbH

Right on Target

**AIM -** avionics testing for the future - Today

New developments - by Marco Motz

## Rolling Out New System Solutions!

**AIM have successfully provided many Data Control and Acquisition Systems, all of which benefit from our powerful PBA.pro Databus Analyser and its System integration tool capabilities.**

AIM Data Acquisition and Test Systems provide control, monitoring, recording, data visualisation and analysis capabilities. Our delivered systems, to date have included STANAG3910/ EFEX, ARINC429, AFDX, PANAVIA Serial Link, Fibre Channel, Serial EIA422 Databuses, Timecode and Discrete-I/O signals including DC Power switching, where required.

Typical Data Control and Acquisition System are either Desktop or Rack mounted and generally comprise of a Notebook based Workstation Host PC, with PBA.pro™ framework for remote control of a Data Acquisition Subsystem via Gigabit Ethernet link.

A typical Data Control and Acquisition System in a Compact rack case.

Application specific and script based PBA.pro™ panels, provide the HMI (Human Machine Interface) for System Setup, Parameter Displays and automatic Test sequences.

AIM Data Acquisition Subsystems can provide the required power sources, Signal Conditioning & Switching, incorporating customer specific signals and interface electronics to the UUT, via custom designed routing modules.

The Systems, with our intelligent AIM Interface Modules and further 3rd Party cards for IRIG-B Time Code and Discrete-I/O signals, provide all Databus and Signal control, monitoring, parameter acquisition, recording and time stamping functions are implemented within the Desktop or CompactPCI chassis.

Working with the customer, using design review meetings and Specifications, AIM can provide a customer specific solution.

**Contact us at AIM for further information on our systems capabilities to date, or if you have an upcoming requirement, no matter how big or small.**

**Welcome to the informative spring edition of our AIM View newsletter. With the introduction of our new family of Ethernet based products, which are packed with new and exciting innovations, we once again set a new course for your current and future avionics databus testing needs.**

With the introduction of the latest ANET Ethernet products our customers can take full advantage of designing networked solutions for avionics testing with the seamless integration of 'in the box' customer Applications. Even the 'Engine' of the standard PBA.pro™ Test & Analysis Software (Linux version) can be used 'embedded' into the ANET to support Applications such as the AIM BusPad-1553 iOS Application Study which can run on the iPad for MIL-STD-1553 databus monitoring and control via remote interfaces - **another first from AIM!**

On the subject of PBA.pro™ we have several new 'Apps' available for free download. Just log in and enter the download area to get the most out of your PBA.pro™ investment.

Our website now features a new page called - Technical and Application Notes. This page will be frequently updated with the latest technology and Applications from the AIM experts! Watch this space: www.aim-online.com/notes.aspx

1989 - 2013 - 24 YEARS AVIONICS TESTING

Wherever you are based in the world, you can rest assured that AIM continues to be committed to supporting all of your test projects regardless of size and complexity. This has been our mission since 1989. We are truly in it for the 'long haul'.

We wish to thank our large installed, world-wide customer base for your continued support to make us the number one trusted source for all your Avionics Databus Testing needs!

Yours truly

**Douglas Ullah**

**Director of Sales & Marketing**

# Start your (PBA.pro™) Engine!

## by Joachim Schuler


**With the new PBA.pro™ Engine the AIM Software Application flagship PBA.pro™ has entered a new era of Applications offering all the same functionality, but without a GUI whilst maintaining the abundance of powerful and conceptually rich features.**

The PBA.pro™ Engine inherits the power and flexibility from the standard PBA.pro™, whereby the core functionality remains the same, but with the GUI elements removed from all the PBA.pro™ components. This saves system resources for a lightweight version specifically for embedded type platforms.

Using the PBA.pro™ Engine in conjunction with the new family of Ethernet products (ANET1553-x and ANET429-x) enables the execution of the PBA.pro™ Engine right in the box.

The PBA.pro™ Engine runs on the embedded Application Support Processor (ASP) which can execute PBA.pro™ project files, perform scripting, or even fully remotely controlled by any other Application!

Previously created PBA.pro™ projects, database files, or even scripts are compatible with the PBA.pro™ Engine without major modifications. The standard PBA.pro™ can be used to interactively prepare these files for the later use with the PBA.pro™ Engine. All files can be dynamically loaded to and executed by the PBA.pro Engine on-the-fly.

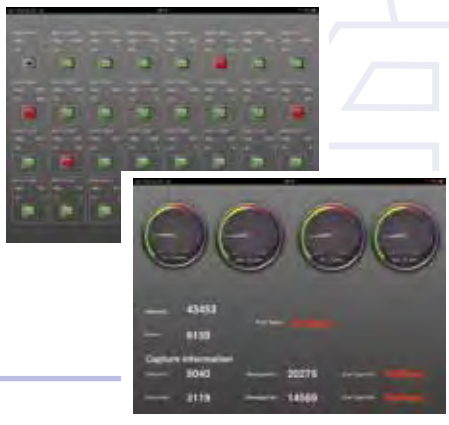
This new and revolutionary approach opens up a wide range of new Applications and use cases.

Controlling the AIM ANET with an embedded PBA.pro™ Engine via its Remote Control using Standard TCP/IP Socket connections makes it a very comfortable interface. The AIM ANET boxes can even be setup and configured for an autonomous operation performing fully automated test, simulation and monitoring tasks in a real time environment (LINUX). Incredibly this runs on the Application Support Processor (ASP) with no need for any external host PC's or additional controlling hardware!

AIM has already created the iPad 'App' study BusPad-1553 for the control of a PBA.pro™ Engine hosted in an AIM ANET1553. This 'App' provides MIL-STD-1553 snapshot monitoring, Chronological MIL-STD-1553 Message Display, Remote Terminal/ Sub Address Activity and Ad-hoc Message Data Views.

It demonstrates the unique capabilities of the AIM ANET boxes using an Ethernet connection which can be hardwired or even Wireless using an USB stick mounted on the ANET box.

**BusPad-1553- iPad 'App' for MIL-STD-1553 Snapshot Monitoring**




**ANET1553 Interface with PBA.pro Engine and optional USB WLAN Stick**



The most elegant and 'top gear' approach is to combine standard PBA.pro™ capabilities with a device hosting the PBA.pro™ Engine, like the ANET.

The powerful and industry standard PBA.pro™ GUI provides an easy to use front end interface and the PBA.pro™ Engine executes real time Applications on Interface level with the aid of PBA.pro™ Scripts right at the data bus front-end minimising latencies and offering real time performance.

In summary the optional migration of the PBA.pro™ Engine to the new AIM ANET boxes combines outstanding functionality, flexibility not seen in the industry. Our clients have in their hands - a new integrated product feature which is unrivalled both - for embedded and avionics testing world!

**PBA.pro Engine Remote Control via Standard Wireless LAN connection**

# Latest PBA.pro™ 'App' etisers on the web

## by Andreas Küchlin

**As introduced in the last AIM View, our website offers an accessories section to download PBA.pro™ add-ons and 'Apps' – free of charge!**

You can visit www.aim-online.com and log into the download area to have direct access to all current PBA.pro Accessories. With the latest release PBA.pro™ V02.48, some accessories have been updated and some new and exciting 'Apps' added:

***• Recording display***

This 'App' is created by a Python script and is used to control the recording acquisition on multiple streams. For this purpose the following general functionality is provided:

- *Selection of recording files and session name*
- *Display activity status of each stream by LED indication*
- *Display online recording information regarding the recorded files*
- *Enable/ disable recording for individual streams*
- *Overall recording status, elapsed time,available recording space*
- *Optional pre- and post- recording comment fields*
- *Recording control to manually start/ stop the recording*
- *A recording annotation file will be generated for each recording set*

***• Replay display***

Similar to the recording display, this 'App' is created by a python script, but offers a display to easily configure and control the replay units of multiple streams. For this purpose the following general functionality is provided:

- *Configuration of the ARINC429 channel and AFDX/ ARINC664P7 ports which are to be used for the replay (no need to configure the MIL-STD-1553 boards)*
- *Configuration of the replay files for each port/ channel/ stream*
- *Control of the replay for each port/ channel/ stream*
  - *Independently from each other*
  - *Synchronised to another port/ channel/ stream*

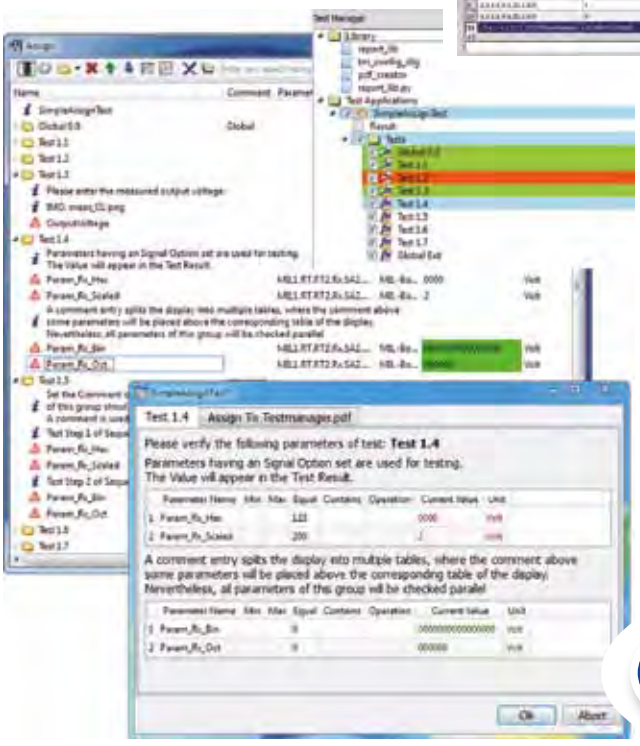
***• 'Assign To Test App'***

The idea of the 'Assign to Test App' is to derive a complete PBA.pro Test Manager project from an existing PBA.pro™ parameter assign without any effort and knowledge of scripting.

The PBA.pro™ assign display is typically used for receive-parameter values and modifies controllable send-parameters. It can also evaluate received parameter values. As a powerful option the PBA.pro Test Manager provides functionality to execute script tests, collect results and to summarise them in a report file. The 'Assign to Test App' annexes the PBA.pro™ assign with the PBA.pro Test Manager to transfer an already existing PBA.pro™ assign project to a test Application with multiple test steps.

The evaluation of test results is realised by assign parameters for which signals, based on conditions, are defined. All of these so called 'Alarmed Parameters' will be checked and evaluated during the test against their conditions. Special assign comments can be used to add extra functionality. For example, an assign comment can be used to pop up a message box to display information for the user, performing the test.

In summary the PBA.pro 'Assign to Test App' provides a comfortable, flexible and alternative way to create a test Application without any line of scripting!



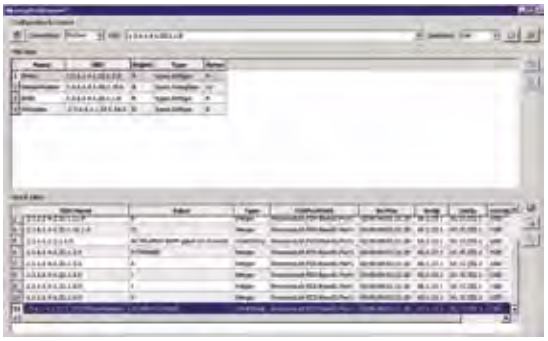

***• SNMP (Simple Network Management Protocol) Browser***

The 'snmpProBrowser App' is an easy to use graphical user interface tool that combines the features of the PBA.pro AFDX/ ARINC664P7 component with the Python SNMP v1 library. With this graphical interface the need of scripting to use SNMP in conjunction with the PBA.pro™ is eliminated.

The snmpProBrowser acts as SNMP Management console to interactively send SNMP 'Get', 'Set', 'GetNext' and 'Walk' request messages to SNMP Agents in an AFDX network. The received response messages are evaluated and printed chronologically in a result table overview.

To exchange and request information with/ from an SNMP Agent, the snmpBrowser offers comfortable dialogs to:

- *Setup, save and restore connections*
- *Setup, save and restore MIB entries*
- *Display the available MIB entries in a tabular list*
- *Send SNMP requests ('Get', 'Set', 'GetNext' and 'Walk') by simple button click*
- *Automatically evaluate and list all responses of the SNMP Agent in a chronological tabular list*



**Special Note about 'Apps':**

*To run the 'Apps' customers will require the base PBA.pro-FD (Framework and Designer) software plus the relevant PBA.pro™ resource component. The PBA.pro-TSM (Test and Script Manager) is mandatory for the 'Apps' to run since they are script based. For some of the 'Apps' they may also require the use of the PBA.pro-DBM option. Contact us at sales@aim-online.com for more information.*

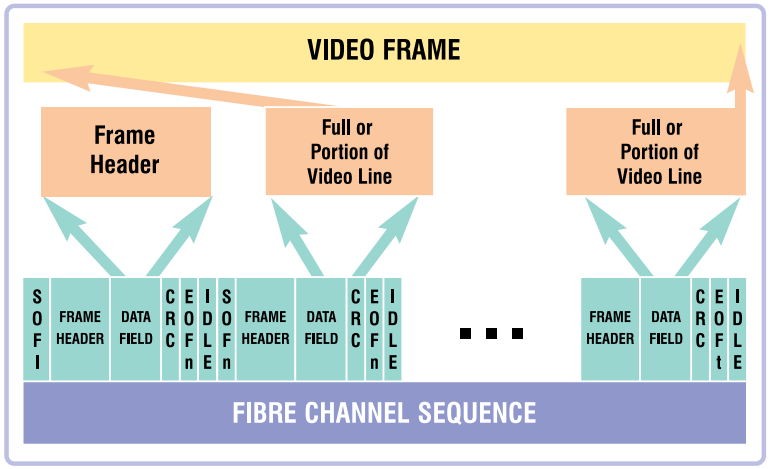
# Picture this - APE-FC-2 and ARINC818

## by Joachim Schuler and Marco Maier

### ARINC818 at a Glance:

**The ARINC818 Specification defines a digital video link that is used for uncompressed video data transmission.** This Specification enables Avionics Display manufacturers to choose the video format that best suits their Application. Video formats can differ in their Frame Rates, resolution, pixel density, and interlacing techniques which drive the required data rates. Different classes of video transmission are defined, which vary from simple asynchronous to pixel synchronous video transmission which require corresponding display capabilities.

On ARINC818 the large contiguous video frame data are mapped onto a Fibre Channel connection. Each picture equates to one ADVB (Avionics Digital Video Bus) Container, which is transmitted within one Fibre Channel Sequence. For example, a XGA resolution video has a picture size of 1024x768 pixel, which means one line has 1024pixel, and the picture has 768lines. Each pixel needs three bytes for colour information, so one line has an overall size of 3072bytes. This exceeds the maximum payload size of a single FC frame, hence it is split into two frames with each 1536bytes, carrying half a line each. The complete picture data will be sent within 1536 FC frames, called the Object2, with an additional ADVB header frame, called the Object0. These frames are all packed with one FC Sequence. Each full picture is therefore a single FC Sequence as shown above.




Receiving picture information is quite similar. All necessary information for 're-assembly' of the picture data is contained within the leading Object0 frame, and within the FC Header of each Object2 frame. The receiver has to check each incoming frame for its position within the picture (based on a Sequence number) and of course for errors during the transmission. Placing now all the FC payload data of the Object2 frames of one Sequence in proper ordering will re-assemble the picture.

Beside the known APE-FC-2 Fibre Channel Layer 2 capabilities, which provide a comprehensive set of test and analysis possibilities, the APE-FC-2 offers full-function ARINC818 analyser capabilities now. These allow the user to handle ARINC818 traffic over Fibre Channel with a max. of 1GFC currently. That would basically allow the periodic transmission of 1024x768 pixel resolution with 24-Bit colour depth and 40Hz refresh rate. With the new successor hardware APS-FC-2, available for later in 2013, data rates up to 4GFC will be possible, with S/W compatibility to the APE-FC-2.

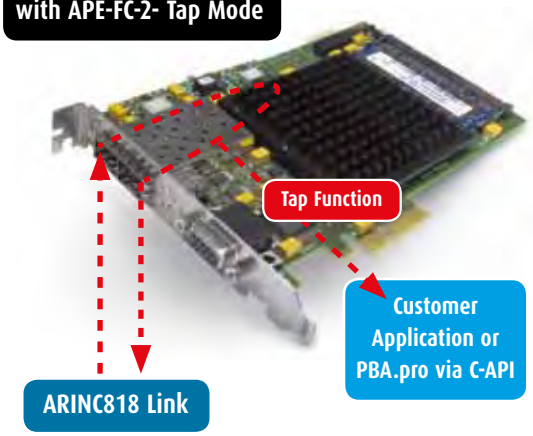
The Application Programming Interface (API) which is included in the board price, offers transmitter side functions to load single picture data or picture sequences and send them over Fibre Channel to drive ARINC818 capable devices/ display in real time. For example a single picture can be sent periodically with a S/W configurable refresh rate or simply acyclic (e.g. on application request). Same is also applicable for picture sequences which can be sent in a single shot or repetitive mode. In all modes it is possible to change or reload picture data during operation 'on-the-fly' while the board maintains picture data integrity and the configured refresh rates on the ARINC818 link accordingly.

Import of picture data e.g. in Windows BMP/ DIB format for transmission is also supported by the API which also does the translation into the corresponding ARINC818 Object0/ Object2 format, required for transmission over FC. Application notification provisions, like call backs, are also offered to provide maximum on flexibility for customer applications.

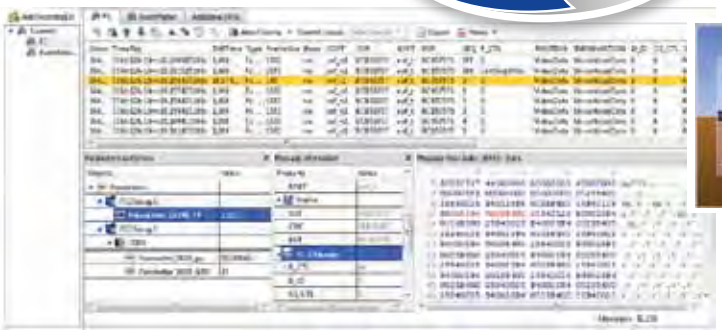
Different modes on receiver side of the APE-FC-2 API offer great flexibility for analysing incoming ARINC data on Upper Layer Protocol (ULP) level as well as on Layer 2 level. Different API helper functions support and simplify the programming effort e.g. by the translation of chronologically captured FC-2 frames with full timestamp and meta information which represent the ARINC818 Object0s and Object2s into one or more visible pictures e.g. in Windows BMP/ DIB format. Furthermore a receive mode for getting the latest received picture is also offered.

A unique feature of the APE-FC-2 interface is the Tap mode which allows to 'insert' the interface into an existing connection e.g. between a generator and a display in order to tap-out ARINC818 data for monitoring, analysis and display purposes.

**ARINC818 Test Scenario with APE-FC-2- Tap Mode**




Finally to mention, that the PBA.pro™ will also support the ARINC818 modes of the APE-FC-2 via the ARINC818 Upper Layer Protocol option for the PBA.pro-FC-2 resource component, taking advantage from all PBA.pro™ functions like Scripting, customised GUIs, etc. So the known scalability of the PBA.pro™ offers provisions for 'pure' ARINC818 based test, simulation and analysis solutions (including all FC Layer 2 capabilities) up to heterogeneous avionics data bus test systems with a seamless integrated ARINC818 functionality.



# First Ethernet based interfaces for MIL-STD-1553 now available – with more coming... by Frank Scherer

**With the successful introduction of USB based portable test products back in 2009, AIM have recently launched a new line of Ethernet based MIL-STD-1553 test and simulation products. The ANET1553-x can be controlled over an Ethernet LAN for analysing, simulating, monitoring and protocol testing of one or two dual redundant MIL-STD-1553A/B data buses.**

**The Hardware Advantage**

The key component of the ANET1553-x, in addition to the proven MIL-STD-1553 core comprising an FPGA and the Bus Interface Unit (BIU) processor, is the onboard Application Support Processor (ASP) based on a System-On-Chip (SOC) hardware solution running under an embedded LINUX Operating System.

The SOC hardware has a built-in Ethernet interface, which is used for the implementation of the host connection via a Standard Ethernet RJ-45 connector. The SOC also has a USB interface for the user to connect external mass data storage devices or even a WLAN stick for wireless Ethernet operation!

With 128MB of BIU Memory (Global RAM), 256MB of ASP RAM and 1GB of ASP Flash memory, the ANET1553-x design offers enormous memory resources for the most demanding user cases and Applications.

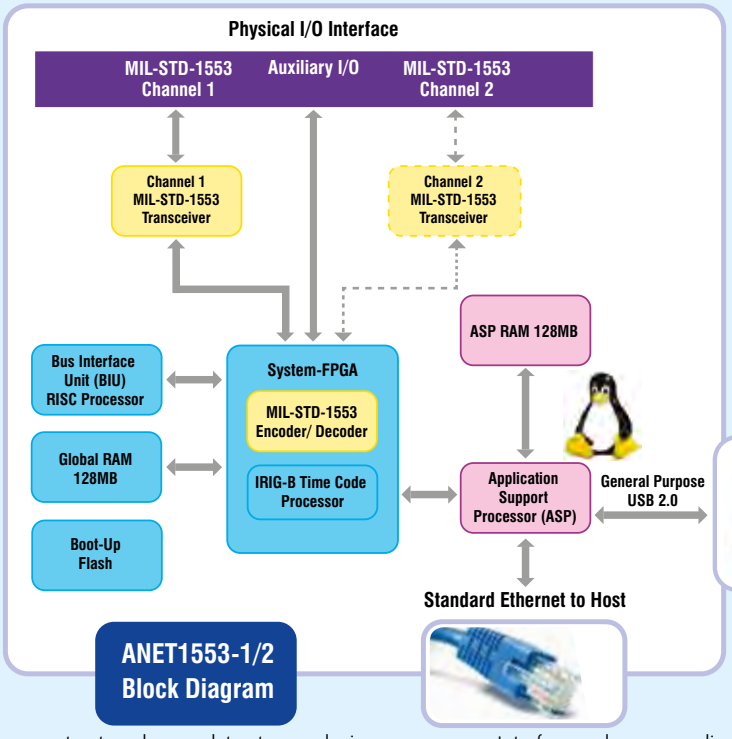
**The Software Advantage**

Today, the ANET1553-x uses the ASP to execute the AIM Network Sever (ANS) for all customer Applications and interfaces with the standard Application Programming Interface (API) common to all our MIL-STD-1553 interfaces. As part of the initialisation routine, the API needs to be given the IP address for the ANET1553-x simply by an additional parameter. From then, all API functions can be used just as if you are using a locally mounted PCI/PCIe/PXI interface board.

Software compatibility is consistent with existing API's for AIM's MIL-STD-1553 interfaces offering our clients an easy and graceful migration from existing Applications to those on the ANET1553-x platform.

Software support for the customer Application development is delivered with the ANET1553-x modules as are comprehensive Board Software Packages (BSP) for Windows and Linux Operating Systems.

AIM`s PBA.pro™ (for Windows & Linux) is fully supported for the ANET1553-x for all test, simulation and monitoring purposes. An onboard hosted Web based configuration utility allows the interactive configuration of the ANET1553-x via the internet browser of a connected host PC.




ANET1553-1/2 Block Diagram

**Advanced Applications - You take control**

The onboard LINUX Operation System offers a scalable and flexible platform for hosting various Applications onboard the ANET1553-x. Customer specific Application software development for the ASP is supported with the Standard Ethernet Interface and corresponding cross tool chain. Standard Linux debugging features like GDB are available to ease the development process. The method for developing Application software running on the ANET1553-x is essentially the support of the standard MIL-STD-1553 API for interfacing the required functionality from the onboard Application.

Therefore, it is not necessary to create new API functions for onboard Applications, since they can be simply be prototyped on a LINUX host using any AIM MIL-STD-1553 interface. This powerful and flexible software architecture with onboard customer Applications is only made possible with this new variant of ANET boxes.

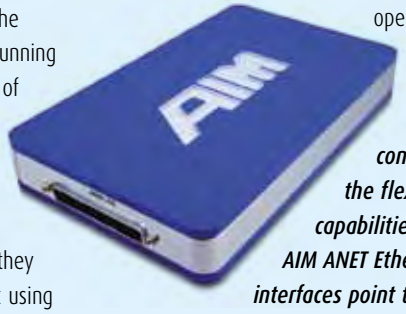
This new architecture can also host an 'embedded' PBA.pro™ which executes right on the ASP under control of the remote control interface over Ethernet and even web based Applications (see the feature 'Start your Engine' in this issue).

**Function and Features**

The ANET1553-1/2 provides an interface for one or two Dual Redundant MIL-STD-1553 buses with industry standard Twinax connectors. The physical bus interface provides software programmable bus coupling and variable output amplitude to the MIL-STD-1553A/B bus. The ANET1553-x can concurrently act as Bus Controller, Multiple Remote Terminals (31) and Chronological/ Mailbox Bus Monitor. Versions with reduced functionality (Single Function or Simulator Only) are available. All ANET1553-x modules have the capability to handle eight General Purpose Discrete I/O (GPIO) signals and also offer Trigger-I/O and synchronisation to external IRIG-B via an APU1553-x pin compatible D-Sub connector. A full range of MIL-STD-1553 protocol errors (AS4112/AS4111 compliant) can be injected/ detected. The ANET1553-x modules can electrically reconstruct and replay previously recorded MIL-STD-1553A/B record files physically to the MIL-STD-1553A/B bus with excellent timing accuracy.

**The latest Trick - ANET for ARINC429!**

Basically all of the above outlined capabilities and features (except the MIL-STD-1553 dedicated ones of course) are also applicable for the new Ethernet based ANET429-x for support of 4/8/16 ARINC429 channels! The common ANET core design with the BIU and FPGA section plus the Application Support Processor have been migrated and combined with an ARINC429 front-end for the implementation of the ANET429-x. Up to 16 fully S/W programmable channels (mode Tx/Rx, speed Hi/Lo) are supported with output connector compatibility to the corresponding APX/APE boards. Transmitters are with fixed output amplitude. The back end features like eight GPIO Discrete, Trigger-I/O and IRIG-B are also available. Application Programming Interface compatibility to the existing ARINC429 API is given and as a matter of course support of PBA.pro™ for a turnkey ARINC429 test, simulation and monitoring operation is available!



***The common core hardware concept and the flexible S/W capabilities of the new AIM ANET Ethernet based interfaces point to a new direction of portable interfaces for avionics data buses and fully addresses today's needs and more... 'Don't miss taking the ANET!'***

# AIM-USA-Refreshed LabVIEW VI's

## by Jim Cavera

**AIM is set to release a new generation of VI's in support of National Instruments' LabVIEW that will streamline integration of its avionics data bus interfaces. The new VI's feature an integrated design that combines several low level functions into fewer higher level ones, resulting in VI's that enable the user to quickly deploy a system that is based on the latest National Instruments' standards.**

LabVIEW is a graphical programming system developed and distributed by National Instruments and is arguably the most popular integrated environment for the development of test and instrumentation systems.

AIM has, for many years, fully supported the LabVIEW environment with our hardware API. In the past, though, that support has been a simple function mapping from our API to the LabVIEW virtual instrument (VI) structure. That is about to change. Over the next several months we will be releasing new VI suites with the following features:

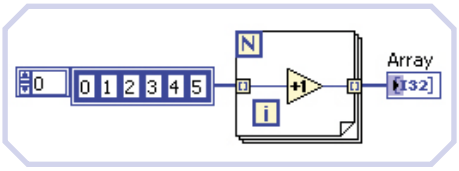
- *Support for native LabVIEW data types*
- *Support for native error handling*
- *Full documentation for each of the VI's and examples*
- *Support for true object-oriented software development*
- *Fully reentrant code designed for use with the LabVIEW Real-time and FPGA modules*
- *Support for National Instruments' Package Manager*
- *VI's for communicating between LabVIEW and PBA.pro™*
- *VI's for working with PBA.pro™ databases, recording files and projects*

LabVIEW was first released for the Macintosh in 1986, and since then has grown into a cross-platform language specifically geared toward test and instrumentation. Unlike more common programming languages (C, python, basic, etc.), LabVIEW is a data-driven, graphical language. Programs are not written so much as assembled from graphical elements, with 'wires' between those elements indicating data flow.

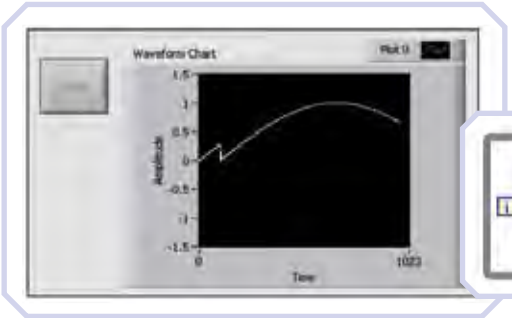
For instance, a traditional C program to increment every element in an array might look something like this:

```
int array[6] = {0, 1, 2, 3, 4, 5};
for (int i = 0; i < 6; i++) {
array[i] = array[i] + 1;
}
```

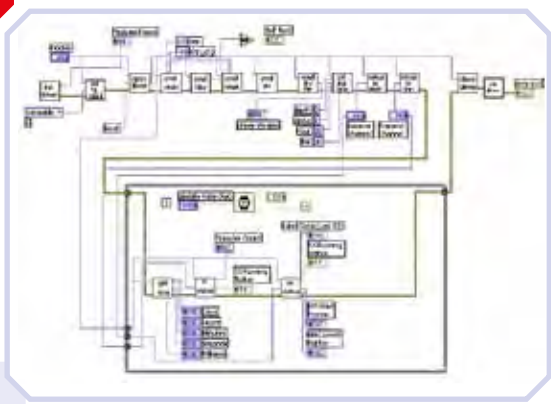
That same snippet of code, when implemented in LabVIEW, would look like this:



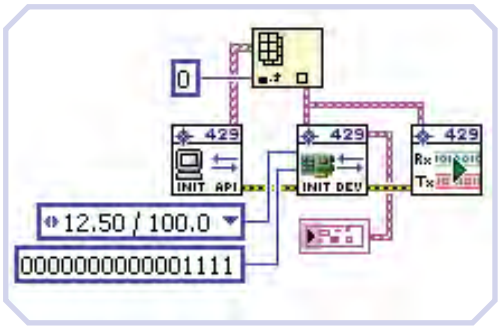

This may seem needlessly complex, and for such a simple example, perhaps it is. But the real power of LabVIEW can be seen when using it to create test systems. LabVIEW comes complete with a full set of controls and indicators, as well as functions for managing things like data recording, filtering, analysis, device control, etc. For instance, creating a simple oscilloscope, is almost as easy as incrementing an array:



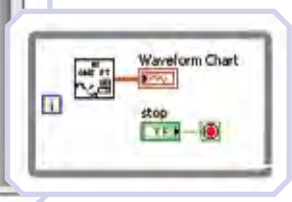

Our new LabVIEW API is similarly easy to use. Here is a diagram from our previously released API, showing the steps needed to create a simple ARINC429 bus monitor:



In the above diagram, all of the VI's shown must be selected and properly configured manually, with little indication as to the proper ordering or correct inputs. For a similar example from the new VI suite:




As you can see, the process of creating your system has been greatly simplified as well as redesigned to closely follow the LabVIEW coding guidelines. Data is passed by cluster, with easy to understand, enumerated types, and proper use of native error handling. Additionally, program flow is much more intuitive, with single VI's for initialization and start-up.




All of our current hardware will still support any systems that were developed using our previously released VI's. Our goal is to make the development of a test system as simple and straight-forward as possible, and our newest suite of LabVIEW VI's are an important step toward that goal.

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