

MilCAN matters

The deterministic protocol for CAN

Issue 7

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25th MilCAN Meeting @ DRDC

Reaching the 25th successful MilCAN working group meeting is a milestone in itself with industry, academia and government agencies working together to create a robust open specification for the 'real' world of military vehicles control area networks.

It is also significant in that this cooperation spans international, this was illustrated by the location of the 25th meeting which was held at Suffield, Canada and hosted by the DRDC (Defence Research and Development Canada).

The DRDC representation has been instrumental in the development of the MilCAN specifications and holding the 25th meeting there seemed an appropriate way of recognising this support.

Despite the distances involved the meeting was well attended with a full agenda for the meeting.

Included within the agenda were three detailed presentations with the aim of informing and raising the debate on topics that needed to be covered during the meeting.

Safe MilCAN presented by Tim Murray of QinetiQ, High Availability MilCAN presented by Dr Elias Stipidis, University of Sussex, MilCAN Conformance presented by Dr Periklis Charchalakakis, University of Sussex.

These subjects provoked a good debate with the agreement that without a convincing cost benefit analysis Safe MilCAN should not be pursued. On conformance testing it was acknowledged

that lack of provision for equipment to support testing verification was restricting development work and actions were taken by members to address this.

The presentation on High Availability MilCAN acted as a basis for a workshop during the meeting to brainstorm the requirements and produce a definition of requirements.

As part of the meeting activities the current MILCAN A complete Rev 2 draft specification was reviewed and agreed on by the Technical group.

The publicity group reviewed feedback to date on promotional activities, there had been some successes but it had been difficult for member companies to involve their corporate marketing groups in incorporating MilCAN logos etc, work would continue on highlighting MilCAN activities through the trade press.

A most interesting tour of the site was conducted, such is the size of the location many different spheres of research and development can be undertaken and trailed at the same location without the need to move to different locations and all the logistics that entails.

And then there was the journey back home.....

The next meeting will be held back in Europe at Ultra Electronics in Cheltenham, UK 25 & 26 March 2008.

Andrew Watson
Deutsch Ltd.

MWG Members
at DRDC Suffield



**"...robust open
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*ESTABLISH, MAINTAIN AND
BROADEN THE USE OF
MILCAN AS THE DEFINITIVE
INTEGRATION STANDARD
FOR MILITARY LAND
VEHICLE SUBSYSTEM
COMMUNICATIONS*

“It was clearly illustrated how VSI as a concept and MilCAN as an open standard have grown and are contributing actively to equipment programmes such as FRES...”

MilCAN Certification Update

All MilCAN Conformance testing has been successfully completed using standard test equipment. However, delays over equipment loans from the MWG members have delayed the testing verification process. This matter has been addressed since the last MWG meeting by the members and it is safely expected that during Q1 of 2008 the facility at the VRC, University of Sussex, will be open.

During the past few months there were a number of events featuring MilCAN including DSEi and DVD, with the most noticeable one the VSI briefing day at Abbey Wood in October. MilCAN being the most excellent example of VSI, it was an important part of the day within the presentations and even more substantial during the highly successful technology demonstrators by SELEX Sensors and Airborne Systems, BAE Systems, Thales Optronics, Thales Air Defence, General Dynamics, Ultra Electronics, QinetiQ, and the University of Sussex. It was clearly illustrated how VSI as a concept and MilCAN as an open standard have grown and are contributing actively to equipment programmes such as FRES providing enhanced capabilities to the British Army.

www.vsi.org.uk

Elias Stipidis

Defence R&D Canada

Defence R&D Canada – Suffield hosted the recent MilCAN meeting. The Suffield site is one of seven research centres operated by DRDC, providing research and technology for the Canadian Forces.

DRDC Suffield was established in 1941 and is located 250 Km East of Calgary. The centre is located on the Canadian Forces Base Suffield – one of the largest army training ranges in the world at just under 2700 square Km. About 20 percent of the area is normally used by DRDC Suffield, with the remainder shared with the British Army Training Unit Suffield.

Employing 280 staff, DRDC Suffield is the lead Canadian laboratory in defence against chemical and biological threats, military robotics and military engineering.

Contributions to MilCAN and work on systems integration for combat vehicles is conducted as part of the military robotics theme.

Robert Chesney
DRDC Suffield

MilCAN Matters celebrates its fourth year in existence with its seventh issue.

During the Suffield meeting the MWG decided that there was a need to improve the outward understanding of the MilCAN protocol. In order to enhance the understanding of the detailed protocol a guidelines document was proposed.

The guidelines document would mirror the MilCAN specification, paragraph by paragraph, providing explanation and guidance on each specification clause. The timetable for producing this document is not confirmed but the aim is to have the first draft available for review at the next meeting. Other measures aimed at improving the use and understanding of MilCAN were discussed, including:

- >Making available UML for parts of the specification
- >Making available an existing source code for a MilCAN stack

The second item, MilCAN source code, is dependent on the MilCAN group sanctioning the quality of the code and finding a suitable Open Source Licence.

The next MilCAN meeting will be held at Ultra Electronics, Cheltenham, UK on 26th & 27th March 2008.

Bob Connor
VSI Technical Leader
QinetiQ Ltd

DRDC Suffield Site



MilCAN

Based on the standard CANbus specification ISO11898, MilCAN provides a level of determinism for applications where guaranteed delivery of messages is required. This enhancement of the ISO11898 standard, changes the original Event Triggered architecture to a Time Triggered architecture, where messages are sent on the bus in a pre-determined order, based on the value of a sync counter that is broadcast from a master node. This changes the broadcast nature of CANbus, to one of controlled messaging, giving the system designer an assurance of message validity.

MilCAN goes on to support a Multi-Master implementation whereby a number of potential master nodes execute an election process to determine who will run the time-base. Whilst this function provides an element of redundancy and robustness, the election process itself has not been formally verified and therefore there is no verification data.

The underlying CANbus protocol has a failure mode called the babbling idiot, whereby a faulty node can gain high priority access to the bus. This fault is not common but it is not possible to mitigate the failure without radically changing the protocol itself. A babbling idiot would potentially jeopardise the sync frame broadcast and hence the determinism of the message delivery schedule of the system.

MilCAN on its own is not really suitable for applications that have safety integrity requirements. Such applications would require additional system checks and interlocks as well as verification evidence to mitigate the issues described above as well as the 'buy-in' of the certification body concerned.

That said, MilCAN has been successfully used in applications such as Turret Motion Control, Utility Management and Navigation Systems where the system designer has provided the necessary consideration of the protocol shortfalls.

MilCAN is best suited to applications that are not safety related where the robustness of orderly messaging as opposed to broadcast messaging is required.

Time Triggered Protocol

Just like MilCAN, TTP uses a pre-determined time schedule to guarantee delivery of messages. It uses a concept of global time, and therefore doesn't have a master node, which is inherently a more reliable approach.

TTP has a Bus Guardian to protect against a babbling idiot, ensuring that a node only has access to the physical bus at the

appropriate time.

TTP has been developed for high-integrity, real-time applications, where significant error detection and fault-tolerance must be provided. In addition, it has dual redundant bus structure built into the protocol.

Safety and integrity have been designed in from the outset, with consideration of issues such as certification at the forefront of the validation process. To illustrate this, the core algorithms of TTP have been formally verified by independent bodies and multi-million fault injections have been carried out to validate the protocol functionality. TTP has been adopted by many safety related industries due to its safety approach and has the evidence required by certification agencies.

There is a significant development overhead involved in implementing TTP. The system architecture and message timing both need up front work and are best done in modeling tools

MilCAN or TTP?

Recently in the Military and Aerospace Electronics 2007 conference and exhibition the keynote speaker, Steve Mallon, Chairman of Intellect's Aerospace & Land Systems Council, put an important question forward "Can land systems match the complexity of air platforms—and remain affordable?". This certainly raised a lot of further questions especially on the through life capability requirements and associated platform life cycle costs; very important Vehicle Systems Integration consideration. It is therefore important to identify early during the design process the sub-system operational requirements and future upgrades such that during technology insertion a deterministic or safety critical Vetronics architecture network can be selected. These considerations are well detailed in the latest issue of the VSI standards and guidelines document (www.vsi.org.uk) alongside the VSI Metrics that provide a measure of assessing compliance.

Hence, whilst TTP offers major advantages over MilCAN, they are only really beneficial in safety related or high integrity applications, where formal verification may be required.

Both MilCAN and TTP have their place, and indeed can happily complement each other in land platform applications.

Tony White
Ultra Electronics Electrics

“MilCAN is best suited to applications that are not safety related where the robustness of orderly messaging as opposed to broadcast messaging is required”

“Both MilCAN and TTP have their place, and indeed can happily complement each other in land platform applications”

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