

Advanced CAN (Controller Area Network) Tool

Federal Manufacturing & Technologies

D. J. Terry

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Published March 2000

Final Report/Project Accomplishments Summary

CRADA Number 96KCP1029

Approved for public release; distribution is unlimited.



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Date: 2-2-2000

Revision: 0

A. Parties

The project is a relationship between

Honeywell FM&T

Dearborn Group, Inc

2000 E 95th Street

27007 Hills Tech Court

PO Box 419159

Farmington Hills, MI 48331

Kansas City, MO 64141-6159

Tel: (248) 488-2080

B. Background

Sandia National Laboratories (SNL) made a decision in 1994 to use the Extended CAN (Controlled Area Network) protocol with a custom overlaid SGT protocol in the SGT Trailers. The Department of Energy's Kansas City Plant (KCP), operated by Honeywell Federal Manufacturing & Technologies (FM&T), supported the SGT project by manufacturing the STV (Sandia Test Vehicle), an SGT prototype. FM&T is currently manufacturing the subsequent SGT production trailers. Production at FM&T includes

both mechanical and electrical manufacturing needed to deliver a finished trailer. The tools to effectively develop the SGT software and electrical systems did not exist in 1994. FM&T designed and developed these tools which allowed the SGT software and electrical system to be designed and produced. These tools are also the foundation for the SGT production and maintenance testers.

After a thorough search in 1994, it was determined that a very limited choice of CAN testing and development tools was available commercially. The Dearborn Group in Michigan provided assistance with information about European companies that offered CAN interface cards that could be used with Windows applications. Two German suppliers of CAN interface cards and software were contacted. None of their products met all of the SGT requirements. In order to protect schedules, decisions were made to change or relax requirements where possible. The German suppliers were also asked to modify their existing products to meet the DOE requirements, but both were unwilling since both companies focus their attention on their major European customers such as Mercedes Benz, BMW, and Bosch. Using a combination of CAN cards from Germany along with creative software workarounds, a working solution was developed. With this approach we were able to "get by" without starting from scratch. A new design from scratch would have delayed the project a period of eighteen months.

C. Description

The CAN interface cards that are currently in use are PCMCIA based and use a microprocessor and CAN chip that are no longer in production. The long-term support of the SGT CAN interface is of concern due to this issue along with performance inadequacies and technical support. The CAN bus is at the heart of the SGT trailer. If the CAN bus in the SGT trailer cannot be maintained adequately, then the trailer itself cannot be maintained adequately.

These concerns led to the need for a CRADA to help develop a new product that would be called the "Gryphon" CAN tool. FM&T provided manufacturing expertise along with design criteria to ensure SGT compatibility and long-term support. FM&T also provided resources for software support. Dearborn provided software and hardware design expertise to implement the necessary requirements. Both partners worked around heavy internal workloads to support completion of the project.

This CRADA establishes a US source for an item that is very critical to support the SGT project. The Dearborn Group had the same goal to provide a US alternative to German suppliers. The Dearborn Group was also interested in developing a CAN product that has performance characteristics that place the Gryphon in a class by itself. This enhanced product not only meets and exceeds SGT requirements; it has opened up options that were not even considered before the project began. The cost of the product is also less than the European options.

D. Expected Economic Impact

The Dearborn Group is currently marketing the Gryphon product. This product provides

industry with the most powerful and versatile CAN product on the market. The Gryphon also expands testing capability and accessibility to in-vehicle networks that were not previously possible.

Gryphon is anticipated to play a major role in revenue generation during 2000 and beyond. Currently revenue income from Gryphon in 1999 was less than \$1M, and is forecast to be at approximately \$2M in 2000. This growth in sales directly affects the growth of Dearborn Group and the expansion plans in 2000 and over the next five years. The development of Gryphon described here has also led to the development of further multiplexed communication support as well as forming the base of a custom development for General Motors. The development of Gryphon has led to staffing increases, creating five positions at Dearborn Group.

Most importantly, the partnership formed on this CRADA development has led to the development of Gryphon being achieved faster than would have otherwise been possible, providing a low-cost USA source for CAN products.

E. Benefits to DOE

- Transfer of CAN technology to the DOE community.
- Critical support for DOE Transportation Safeguards Division (TSD) SGT and SST programs at Sandia, FM&T at Kansas City and Albuquerque, Pantex, Oak Ridge.
- More reliable domestic source.
- Product that exceeds SGT requirements.
- Powerful and flexible tool with expanded capability to support more extensive requirements if needed.
- Powerful tool to develop future application built around an in-vehicle network with distributed functions and intelligence.

The Dearborn partnership provided a tremendous savings when a custom proprietary distributed network did not need to be developed from scratch. Since resources were limited for both partners, a combined effort made it possible to complete the project. The taxpayer will benefit because a domestic supply has been established to ensure SGT reliability and security where cost has been minimized and performance maximized.

F. Industry Area

The main industries that will benefit are the US Automotive and heavy truck industries. Other industrial areas that could benefit include agriculture, factory automation (SDS, DeviceNet), medical, and robotics. Use of the Linux operating system (a Windows or Windows CE-like operating system) in the Gryphon has helped to expand the use of this operating system in a non-traditional area.

G. Project Status

Project was completed with results that have exceeded expectations. There were some delays caused by redesign decisions and other project workload demands at FM&T and Dearborn. Most of the delays occurred during 1997 as the SGT went into production.

Point of Contact for Project Information

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- Company Size and Point of Contact

Dearborn Group

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MI 48331

Telephone: (248) 488 2080

Fax: (248) 488 2082

<http://www.dgtech.com>

President: Mark Zachos

Engineering Manager: Richard Price

Number of employees: 30

Revenue 1999: \$5M

- Project Examples

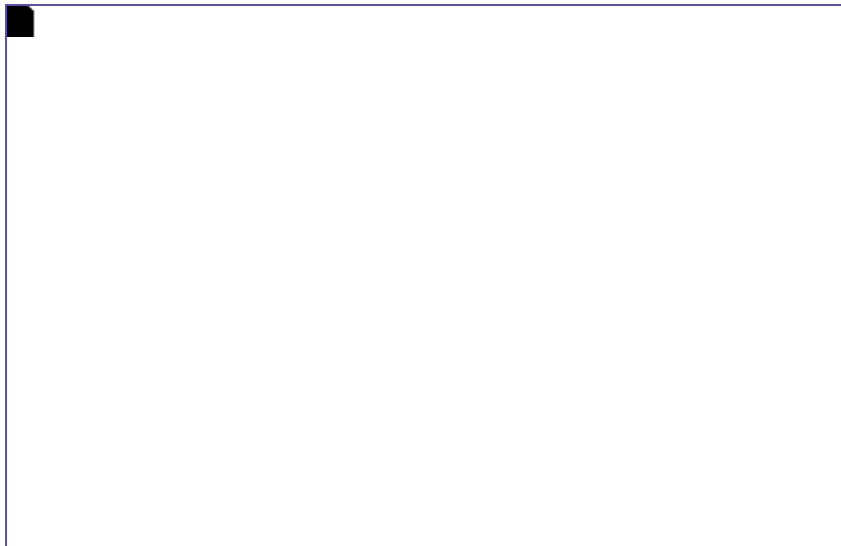
Front View of Gryphon

Shows LCD display, power indicator, Ethernet traffic indicator, memory access indicator, menu selection/display arrows, IR interface.



Rear View of Gyphon

Shows PCMCIA card socket, Ethernet connection, Serial connection, power connection, and Interface connections.



K. Technology Commercialization

Dearborn is marketing this CAN development tool as "Gryphon" and currently has GM and others interested in using Gryphon as a tool for engineering development, diagnostics, acceptance testing, and field troubleshooting for in-vehicle networks. There are other applications that are being explored to use the Gryphon (or variations of the Gryphon) as an interface between a vehicle and the operator, either locally or remotely. The following flyer is an example of Gryphon marketing.



Dearborn Group highlighted the Gryphon's flexibility in two vehicle demonstrations at the Cobo Center, for the 1999 SAE International Congress and Exposition. SAE show visitors were able to see the Gryphon work in conjunction with Lear Corporation's *TransGO* interior user concept and Dearborn Group's CarConnect™ technology to access functions on a Jaguar XK8 sports car, via a wireless connection.

The Gryphon was used as an in-vehicle network port to provide access to diagnostics and body electronics. With the Gryphon paired with "off-the-shelf" technology—a PC, cellular modem, and optional Global Positioning Satellite (GPS) system—users were able to interact easily and securely with some of today's automobiles.

Consumers could benefit from the Gryphon-based CarConnect™ system by having an intelligent gateway between a standard PC and a vehicle's electronic systems. The wireless cellular phone connection allowed remote interaction between consumers and functions already available on today's vehicles. Some demonstrated capabilities include the arming and disarming of car alarms, remote notification (via e-mail or pager) of break-in attempts, and the opening and closing of windows. Another feature of CarConnect™ is its easy-to-use automotive diagnostic software. This could allow automotive service centers to remotely access and diagnose a problem on the customer's car, using the Gryphon-based CarConnect™ technology.

This same technology has also been showcased at other technology shows, beginning with its participation in the Intel *Connected Car PC* demonstration, at Convergence '97. It was also seen in the ITS America show at Cobo in May 1998.

L. Release of Information

I have reviewed the attached Project Accomplishment Summary prepared by Honeywell FM&T and agree that the information about our CRADA may be released for external distribution.

Original signed by 14th March 2000

Name: Richard Price Date

Organization: Dearborn Group

Title: Automotive Manager