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Andrew Borchers
Lawrence Technological University, MCI

Mark Demski
MCI

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Andrew S. Borchers, DBA (borchers@ltu.edu)
Lawrence Technological University

Mark Demski
MCI

Abstract

As a response to strong competitive pressures, the automotive industry has actively employed Electronic Data Interchange (EDI) in communication between suppliers and carmakers. This paper reviews the recent development of ANX® a COIN (Community of Interest Network) intended to provide industry wide connectivity. The authors identify roadblocks to the success of the standard.

Introduction

Prior research has identified solid business benefits from Electronic Data Interchange (Mukhopadhyay, 1995). A key enabler in EDI, however, is communication standards. Such standards, particularly at the application layer, are often developed on an industry wide basis. This paper examines one such standard, ANX®, created in the automotive industry. The researchers focus on the business case for ANX® and its viability as a standard.

Automotive Industry Drivers

The automotive industry has been the scene of intense competitive pressures for several decades. A small number of vehicle manufacturers, including GM, Ford, DaimlerChrysler and a few Japanese firms dominate the industry, obtaining an increasing percentage of their content from thousands of supplier firms. In turn they deliver their product through thousands of independently owned dealers. The industry faces serious over capacity, an increasing inability to pass on cost increases to customers and a strong need to reduce costs. The increased use of suppliers has created a strong need for electronic communication between trading partners.

For several years EDI has been widely implemented in the industry as a way to communicate between the carmakers and their tiered supply chain. In the automotive industry Tier 1 suppliers sell parts directly to carmakers. In turn, Tier 2 suppliers sell parts to Tier 1 firms. Typically, carmakers require their Tier 1 suppliers to communicate business documents (such as purchase orders and invoices) and engineering data (such as CAD drawings) electronically. Tier 1 suppliers may, or may not, require Tier 2 and lower levels to communicate to them electronically.

The industry has established a comprehensive set of application level standards through the Automotive Industry Action Group (AIAG). AIAG standards facilitate easy transmission of business and engineering documents. Specialized committees have been established to further define standards for subsets of the industry, such as heavy truck makers.

The benefits of EDI in the automotive industry have been demonstrated by a longitudinal study conducted by Mukhopadhyay (1995). This research is an ex post facto study conducted at Chrysler over a nine year period. In this research Mukhopadhyay identified savings of $60 per vehicle in manufacturing and logistics costs from the use of EDI. Further, Chrysler saves an additional $40 per vehicle from electronic document transmission and preparation. Automotive Industry Action Group (1998) estimated savings from EDI at about $70 per vehicle support this research.

ANX® Overview

Historically, each of the major automakers established their own networks for connecting suppliers and their SNA based internal networks. This situation began to change in 1995 when AIAG established Transmission Control Protocol/Internet Protocol (TCP/IP) as the standard for transport of automotive trading partner data. With the shift to TCP/IP, the potential exists for a single, shared network throughout the industry to support transmission of data formatted according to AIAG standards.

In designing ANX®, AIAG considered, and rejected, several possible network solutions:

- Private point-to-point networks were found to be too expensive.
- Single vendor based Virtual Private Networks (VPN), while providing security and reliability, created the potential of monopolistic control by the vendor.
- The public Internet, while inexpensive, had security and reliability problems.

AIAG ended up creating a Community of Interest Network (COIN) that allowed each ANX® trading partner to select a communication vendor from an approved list. Administration of the network is vested in the AIAG organization. Appendix I shows the network architecture. The following entities participate in the architecture:

- **Automotive Network Exchange Operator (ANXO):** This company will have direct operational and management responsibilities over the ANX® service. They are under contract to the AIAG.
- **Trading Partner (TP):** These are the actual end users of the ANX® network. They compromise automotive component suppliers (Lear, Dana, Goodyear, Delphi)

or manufacturers (DaimlerChrysler, Ford, General Motors).

- **Certified Service Provider (CSP):** This group includes telecommunications or IS companies that meet certain network performance and trouble reporting criteria set forth by the AIAG and ANXO.
- **Certified Exchange Point Operator (CEPO):** This company will manage the Asynchronous Transfer Mode (ATM) switch that will interconnect all of the Certified Service Providers.
- **IPSEC Function:** IPSEC is a highly secure data encryption algorithm that will keep the information in IP Packets scrambled as they leave the TP's location. At each TP's site there must be a separate piece of hardware to encrypt the data.
- **Certificate Authority Service Provider (CASP):** This company provides "electronic certificates" that will add another level of security. Certificates, based on an IP Address, guarantee that a TP is actually who they say they are.

The figure in Appendix I shows a line between ANX and the public Internet (labeled as "Note"). Such a connection is theoretically possible. However, it is not being permitted since public Internet traffic could "leak" onto the ANX® network.

Initial implementation of ANX® in September of 1997 included 30 trading partners and three CSPs. At first, no CASP was available. Since then a number of other entities have been connected, including a CASP. Interoperability problems have plagued the implementation, particularly between the ISPEC and CASP vendors.

ANX® Business Model

AIAG's basic business model can be characterized as "coop-etition". Fearing poor service and non-competitive pricing, AIAG opened up the CSP role to a number of vendors. These vendors interconnect at the CEPOs. AIAG effectively requires vendors to publicly release their rate structure. Hence, ANX® services will become commodities over time.

Potential CSPs faced a number of costly hurdles in order to provide ANX® services. These include:

- Strict packet loss metrics
- Specific billing formats
- Dedicated network management infrastructure
- Specific trouble ticket formats

These costs, in turn, are borne by trading partners. CSPs identified the potential for a three to four time increase in costs for trading partners over traditional networks.

ANX® funding is also a concern. In order for AIAG and ANXO to recover their costs, they need to charge trading partners fees. For a 64kbps connection, administrative fees are shown in Table 1. T1 connections are approximately four times as great. Note that Trading Partners also have to secure services from CSPs at a significant cost.

Although the cost for a large carmaker is relatively insignificant, these costs create serious challenges for Tier suppliers. Tier 1 suppliers will be forced comply by the carmakers. They, in turn, may well force Tier 2 and 3 suppliers to use the network. Further, because ANX® is not directly connected to the public Internet, many firms will find themselves with duplicate TCP/IP connections - one for the public Internet and the other for ANX®.

CSPs have difficult choices to make as well. Some have elected to stay out of the ANX® market. Others have taken partial steps, in some cases only setting up a single ANX® node for their customers to communicate with. Yet other CSPs have determined to create an entire network that is ANX® certified. One cost cutting approach, a dial-up version of ANX®, has not proven to meet reliability expectations.

One of the most serious challenges to ANX® is whether its business model can be sustained. Costs, as indicated above, are significant and, since they are people based, they are not likely to be reduced soon. While early adopters may sign up for these services, there will be reluctance from small Tier suppliers. There is some probability that ANX® will fail to provide the promised benefits.

Conclusions

The case of ANX® is instructive for the Information Systems discipline. While technology like EDI may offer significant business benefits, the creation of cost effective standards and industry wide infrastructure can be daunting and costly. Such standards must consider not only the needs of industry leaders (like the carmakers), but also consider the cost and benefits to smaller trading partners. While the automotive industry's move to TCP/IP is commendable, its insistence in creating a standalone, non-public Internet based network leads to more costs. Time will tell whether ANX® is successful or not.

Note

Automotive Network eXchange® and ANX® are registered in the U.S. Patent and Trademark Office as service marks by the Automotive Industry Action Group (AIAG)

References

AIAG Board of Directors. "The Business Case for ANX® Services". White Paper. July, 1998.

Mukhopadhyay, Tridas;Kekre, Sunder;K.S. "Business Value of Information Technology: A Study of Electronic Data Interchange." *MIS Quarterly.* (19:2) 1995, p. 137-156.

WWW.anx.org. World Wide Web. Visited February, 1999.

Table 1 - ANX® Fee Structure

	Payment Destination	Payment Frequency	Payment Amount
ANX® Registration Fee	AIAG	Annually	$400
ANX® Subscription Fee	ANXO	Annually	$1,300
ANX® Assessment Fee	ANXO	One-Time	$500

Appendix I