



Technology Corner: Building A Superstructure

By Frank Orchard, Chief Technology Officer, Optum, Inc.

The advent and acceptance of the Internet as a 7x24x365 business medium have opened the door to delivering the system-to-system connectivity needed to introduce a new era of cross-enterprise trade. In an effort to demystify the technological underpinnings of supply chain visibility and synchronization, I would like to briefly explain some of the thinking behind Optum's breakthrough "superstructure," TradeStream.

When Optum first set out to design TradeStream, our executive team established a number of core objectives for the project:

- **Ease of use:** like all good web-based applications, it would require no user manual.
- **Ease of integration:** it must connect easily with diverse systems inside and outside an organization's infrastructure – and in real time.
- **Fast implementation and ROI:** companies need solutions that are quick to implement and guarantee results.
- **Low cost to implement and maintain:** companies are eager for a "new use model," one that maximizes the utility of their current systems with little fuss.

From a technology perspective, the most daunting design task in meeting our goal was creating the desired ease of integration. Optum had years of experience to draw on from its efforts integrating warehouse and transportation management solutions with ERP systems. Yet, it was also clear from the outset that the World Wide Web would be an ideal data transport mechanism if our reliability and cost requirements could be met. Why? Simply put, the Internet is always available and at only a fraction of the cost of traditional EDI VANs or WANs. Additionally, the emergence of XML as a new, web-friendly data protocol made the Internet the logical solution for our key integration objectives.

What evolved from this early thinking was an exciting new concept – the "superstructure" – an application that could be layered on top of a company's IT infrastructure and across its trading partners. It's a vastly different approach than the typical "rip-and-replace" philosophy adhered to by some software vendors. The benefits are significant and two-fold. First, cost of integration decreases dramatically. Second, the superstructure provides an immediate mechanism to derive greater value from the business applications already in use – **a compelling argument for companies still trying to absorb their previous technology investments.**

Yet, to effectively deliver on the promise of this superstructure, connectivity was only one piece of the puzzle. We discovered quickly that TradeStream also must be bi-directional and binding. Data would have to flow freely in and out of the application, between and across enterprises, while also requiring the other business systems to



acknowledge they had received and processed transactions. Think of it as “closed loop” communications.

This challenge brought us to the first major, strategic design decision for the superstructure: the hub and spoke model. For TradeStream to monitor, manage and optimize events, activities and business processes across multiple organizations, it would need access to critical data from all partners in a company’s (we call this organization the “sponsor”) supply chain. In addition, this data would need to be collected over a wide geographic area (the “spokes”) into a central data repository (the “hub”), enabling TradeStream to act on it. Finally, the data would have to be collected in real time to provide rapid resolution to supply chain problems. All told, this model would be optimal only if a robust, but inexpensive, integration architecture could be built.

Leveraging XML

XML has several very attractive attributes. First, it is “firewall friendly.” This is critical, since most corporate firewalls accept XML in standard ports: port 80 for standard XML and port 443 for encrypted XML. This greatly reduces the cost and expense of firewall configuration.

Second, XML can be sent real-time over the Internet via HTTP technology. A server can perform an HTTP or HTTPS posting to deliver an XML document from a spoke to the TradeStream hub. We have found that a spoke **anywhere in North America** can deliver an XML document (an advanced shipping notice, for example) to the TradeStream hub **in less than 30 seconds**. With XML, our real-time objectives were realized.

Third, XML can be made very secure with inexpensive encryption and authentication techniques called digital certificates. Commonly called SSL security (secure sockets layer), digital certificates provide encryption of XML documents so that while they travel the public Internet they are virtually undecipherable. Digital certificates also provide authentication; a digital signature is applied to a transaction, and the hub will only receive it if the signature identifies an authentic TradeStream source. These security components are absolutely essential to give companies the confidence that their critical corporate data (revolving around customer orders) is safe traveling the public Internet.

Finally, XML is self-defining and easily extensible. Customer-specific data can be added readily to the standard XML data formats of TradeStream without any customization of the core product.

Bringing It All Together

The final piece of the superstructure puzzle was integrating TradeStream with the back office systems used by the sponsor and its trading partners, such as order management and logistics applications such as WMS and TMS. With years of hands-on integration experience, we were aware that most commercial systems today have the ability to extract transactions when a specific event occurs, such as the generation of a sales orders



or shipment confirmations. Typically these systems (like Oracle, SAP, or PeopleSoft) can extract flat files, XML or EDI from behind the firewall. Some trading partners will have the ability to send this data to TradeStream as XML documents, others may need tools to assist in this effort at a low cost, and other have very low volumes and minimal technology behind the firewall.

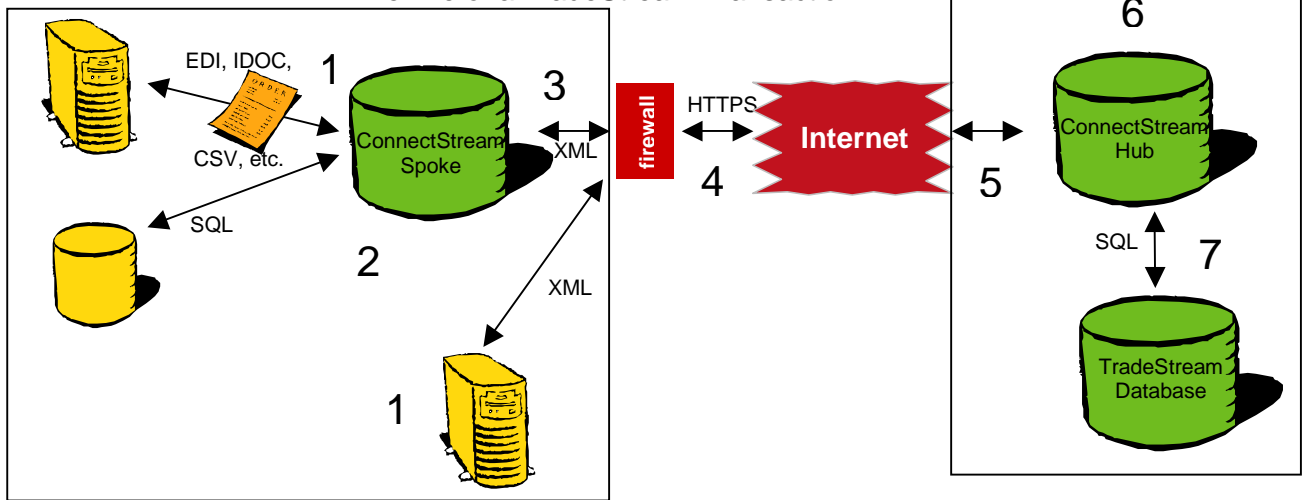
To meet these integration challenges we focused on creating the right adoption model for each trading partner. The Superstructure needs to offer a variety of integration solutions to meet the unique needs of each trading partner: a tight integration for high volume closely related trading partners, an open API for trading partners capable of sending XML to the hub, and web entry forms for lower volume trading partners with limited technology. For a tight integration the Superstructure offers a Spoke server, which can aid in the integration efforts by providing integration tools such as graphical mapping tools, a powerful 4GL to manipulate data, digital certificates for data security, and recovery functions in case connectivity is lost. It is also possible for trading partners to post XML directly to the TS hub via an open API, eliminating the need for any TS software at the trading partners site. Finally, it is possible for low volume trading partners to use web forms to enter data directly into the hub, requiring no integration at all! Again fine tuning the integration investment to the needs of each partner.

In an example of tight integration, TradeStream can accept a shipment confirmation from a second tier supplier at the hub. TradeStream will then evaluate this transaction for event management processing (potential alerts for a late shipment), then send an ASN XML BIO over the Internet in real-time to the local spoke of the sponsor's third-party logistics provider which translates the XML ASN into the **specific format** needed by that partner's WMS system so the goods can be received in a fully automated process. This is truly a superstructure with intelligence.

Where We've Been, Where We're Going

Since first rolling out TradeStream in late 1999, we have continually improved the product. For example, we have enhanced its core design to be "multi-threaded," so both spokes and hubs can process multiple transactions simultaneously. In addition, we have built server-based clusters at our hub, which are load balanced to provide unlimited scalability and fail over. At peak times, **TradeStream by Optum has processed over 500,000 XML documents in a single day for a single TradeStream Client**, demonstrating once and for all that Internet applications are scalable and, when designed correctly, industrial strength.

The Life of a TradeStream Transaction



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