

An OASIS White Paper

T-Mobile International ebXML B2B Gateway Solution

**Adoption of the ebXML Messaging Service and ebXML
Collaboration Protocol Profiles and Agreements OASIS Standards**

By Pim van der Eijk
For OASIS

OASIS (Organization for the Advancement of Structured Information Standards) is a not-for-profit, international consortium that drives the development, convergence, and adoption of e-business standards. Members themselves set the OASIS technical agenda, using a lightweight, open process expressly designed to promote industry consensus and unite disparate efforts. The consortium produces open standards for Web services, security, e-business, and standardization efforts in the public sector and for specific industries. OASIS was founded in 1993. More information can be found on the OASIS web site at <http://www.oasis-open.org/>. OASIS also hosts the ebXML XML.org web site, <http://ebxml.xml.org/>, which serves as the official international community gathering place and information resource for the suite of ebXML standards.

The ebXML Messaging Service (ebMS) OASIS Standard enables the transport, routing and packaging of e-business transactions. The ebXML Collaboration Protocol Profiles and Agreements (CPPA) OASIS Standard describes how trading partners engage in electronic business collaborations through the exchange of electronic messages. Both technical specifications are part of the ebXML modular suite of specifications. The OASIS Technical Committees working on ebMS and CPPA were originally formed in 2001. The ebXML Messaging Service specification, version 2.0 and the ebXML Collaboration Protocol Profiles and Agreements specification, version 2.0, became OASIS Standards in 2002. Along with two other specifications of the ebXML framework, both documents were approved by the International Standards Organisation as ISO/TS 15000-2 and ISO/TS 15000-1 in March 2004. Both Technical Committees are working on version 3.0 of their specifications.

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Executive Summary

T-Mobile was founded in Germany July 1993 to provide mobile telephony services in Germany. Since then, the company has developed into an integrated and coordinated global brand, and one of the leading international mobile communications carriers. T-Mobile operates in key markets in Europe, including Austria, Czech Republic, Germany, the Netherlands, and the United Kingdom, as well as in the United States. By the end of 2006, T-Mobile International employed over 54,000 people serving more than 106.4 million customers in the twelve T-Mobile markets. T-Mobile International accounted for around 32 billion euros revenue in fiscal 2006 and is a fast growing strategic business unit of Deutsche Telekom, the international communications company.

As a leading mobile communications company, T-Mobile works closely with suppliers, distributors, wholesalers and other strategic business partners, and its corporate customers. Business collaborations such as ordering and billing involve massive exchange of information, increasingly in electronic formats. In early 2003, the T-Mobile CRM department found that business partners of T-Mobile started requesting a more capable and standards-based B2B interface that would work for all business domains, replacing the various non-standard machine-to-machine interfaces that had been developed over the years.

The EAI and Architecture team at T-Mobile's corporate IT Department worked with T-Mobile business units to select a B2B standard, based on an analysis of the requirements of existing electronic communication systems and some of the anticipated new applications that were being planned. These requirements included the ability to exchange business data in any format (XML, EDI, PDF), without pre-defined limitations in message size in a reliable and secure fashion among T-Mobile and its business partners, using an open standard implemented in commercial off-the-shelf products. The framework that was found to best meet these requirements was ebXML, in particular the ebXML Message Service and the ebXML Collaboration Protocol Profile and Agreements technical specifications developed at OASIS, the international open standards consortium.

To validate the decision to use ebXML and to select a commercial product to support its implementation in the company, T-Mobile issued a Request for Information to multiple vendors. T-Mobile selected Axway (previously Cyclone Commerce) for a proof-of-concept to test both ebXML functionality (including reliable messaging and packaging) and scalability of the gateway to large numbers of business partners and large volumes. These tests were completed successfully in spring 2004. As of December 2006, T-Mobile International has been operating a production ebXML-based B2B gateway using this solution for over two years. The number of business partners connected to the gateway is expected to double in 2007, as the system will be used to serve more of the geographies in which T-Mobile operates.

In retrospect, the overall experience with ebXML at T-Mobile has been very positive. If the decision would have to be made today, T-Mobile would again select ebXML. One of the key benefits is that while ebXML is a powerful technology, it is at the same time minimally intrusive to existing applications. This means that existing systems and exchanges can be made to benefit from a reliable and secure ebXML infrastructure easily, with limited or no changes to back-end enterprise applications.

Background and context

T-Mobile International

T-Mobile Germany was founded in July 1993 to provide mobile telephony services in Germany. T-Mobile International is headquartered in Bonn, Germany and was established in December 1999. Since then, it has developed into one of the leading international mobile communications carriers. T-Mobile concentrates on key markets in Europe including Germany and the United Kingdom (the leading European markets), as well as the United States. The company was the first to operate a trans-Atlantic mobile network based on GSM (Global System for Mobile Communications), the world's most successful digital wireless standard and still is the only one.

T-Mobile International has evolved from a collection of individual country mobile operators into an integrated global brand. In this evolution, it has adopted a single set of purchasing requirements, one technology architecture, one marketing and communications strategy, and one set of customer service standards. As the competitive landscape of the mobile communications market becomes increasingly international, it considers being "One Company" to be an indispensable prerequisite for the Group's future success.

T-Mobile continues to invest in high quality multimedia networks and in research and development to deliver innovative products and services to its customers, such as mobile Internet and mobile television. The company has set itself an ambitious goal to become the most highly regarded service company, by adhering to three strategic principles: customer centricity, superior network experience and operational excellence. T-Mobile subsidiaries and affiliates were among the first operators worldwide to use future-oriented technologies like GPRS, EDGE, UMTS, and HSDPA. T-Mobile also serves travelers with some 20,000 W-LAN hot spot locations in Europe and the United States, and has done innovative trials in mobile television broadcasting in 2006.

By the end of 2006, T-Mobile employed over 54,000 people serving more than 106.4 million customers in the twelve T-Mobile markets. The main markets for the company included Austria (3.2 million subscribers), Czech Republic (more than 5 million subscribers), Germany (31.4 million subscribers, market leader at 37% market share), the Netherlands (2.6 million subscribers), the United Kingdom (16.9 million subscribers), and the United States (more than 25 million subscribers).

T-Mobile International is one of the three strategic business units of Deutsche Telekom, the other two being T-Com (Broadband and Fixed Network) and T-Systems International (national and multinational corporate customers). Headquartered in Bonn, Germany, Deutsche Telekom is an international company present in about 50 countries around the globe. Deutsche Telekom employed approximately 244,000 employees worldwide and generated 61.3 billion euros revenues in the 2006 financial year, of which around 47 percent were generated outside of Germany. T-Mobile International accounted for 32 billion euros revenue in fiscal 2006. T-Mobile USA is bringing in a large share: the American subsidiary passed the ten million mark at the beginning of 2003 and the 25 million mark in the fourth quarter 2006.



T-Mobile Campus in Bonn, Germany

B2B communication at T-Mobile

As any large mobile communications company, T-Mobile works closely with its strategic business partners, including suppliers, distributors, wholesalers, and corporate customers and exchanges vast quantities of information with them, increasingly in electronic format. Some large corporate customers have thousands of subscriptions, and many of them want their billing information in electronic format. Electronic billing allows corporate customer organizations to cross-charge the costs of employee subscriptions internally to the right cost centres in an automated fashion, thus avoiding potentially substantial internal administration costs.

In some markets, companies that do not own a licensed frequency spectrum resell T-Mobile wireless services under their own brand name, using the T-Mobile network. Mobile virtual network operators have continued to enter the market over the years, consequently involving very high data communication volumes with the host network operator.

A third example of B2B communication is the ordering of mobile telephones, data cards, PDAs and accessories, some T-Mobile branded, from hardware partners.

Over the years, various interfaces have been built at T-Mobile to support machine-to-machine communication with some of these partners using diverse technologies like FTP, FTAM and email. However, none of these interfaces used a standard B2B communications protocol and each connection was a standalone system and handled as separate project. In early 2003, business partners of T-Mobile started requesting a more capable and a standard interface that would not be specific to a single type of communication (such as ordering or billing), but would work for all business domains.

The T-Mobile CRM department also found that having a business-to-business communications interface was becoming a competitive issue. Electronic billing can generate substantial savings for corporate customers, so these customers are increasingly demanding electronic billing services. Additionally, corporate customers were requesting a standardized gateway for sending provisioning orders to T-Mobile, to replace an error-prone legacy web interface.

In today's market, the availability and quality of such services are influencing a corporate customer's choice of communications service provider. The T-Mobile CRM department therefore started working with the T-Mobile IT department on the definition of a corporate B2B communication platform, based on open standards. The CRM's contact partner at the IT department was the EAI and architecture group, headed by Dr. Thomas Grimm. Dr. Grimm's team is responsible within T-Mobile corporate IT for all integration-related work, including Enterprise Application Integration, SOA related technologies and B2B partner communication.

ebXML

Development of the ebXML framework for electronic business was started in 1999, as a joint initiative of two standards organizations, **OASIS** and **UN/CEFACT**. OASIS is an international, not-for-profit consortium that drives the development, convergence and adoption of e-business standards. As of December 2006, OASIS has more than sixty technical committees creating standards in electronic business, Web services, security and other areas.

The United Nations, through its Centre for Trade Facilitation and Electronic Business (UN/CEFACT), supports activities dedicated to improving the ability of business, trade and administrative organizations, from developed, developing and transitional economies, to exchange products and relevant services effectively. It is well-known for various e-business standards, including UN/EDIFACT.

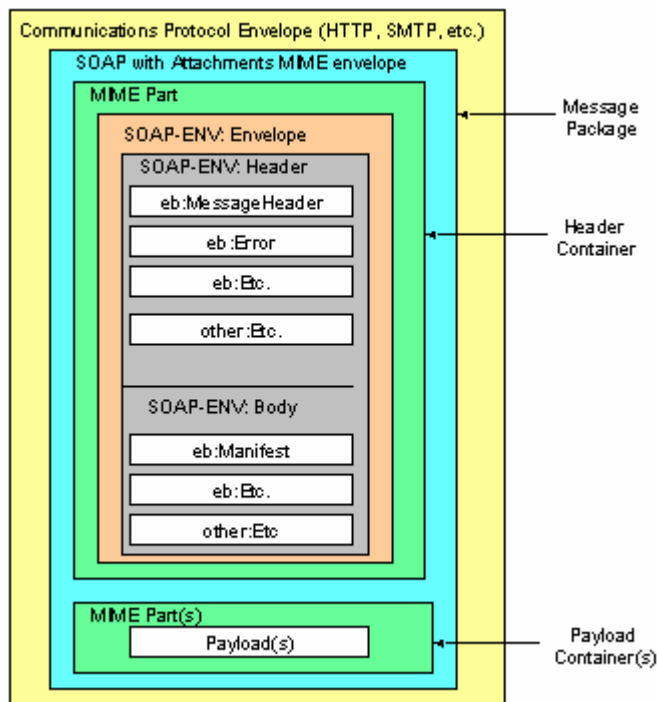
The original goal of ebXML was to develop a modular, yet complete electronic business framework to enable the development of a single global electronic marketplace. In 2006, the ebXML framework consists of:

- ❖ A series of technical infrastructure specifications, which continue to be developed and maintained within OASIS:
 - The ebXML **Collaboration Protocol Profiles and Agreements (CPPA)** specification, which defines an XML document type that can express formally how two trading partners agree to engage in electronic business collaborations through the exchange of electronic messages.
 - The **ebXML Messaging Service (ebMS)**, that provides facilities for secure and reliable transport, routing and packaging of e-business messages.
 - The ebXML Registry, encompassing a Registry Information Model and a set of Registry Services.
 - The ebXML Business Process specification, which provides a standards-based business process foundation and promotes the automation and predictable exchange of business collaboration definitions using XML.
- ❖ A specification for business information, developed by UN/CEFACT.
 - The ebXML Core Components specification definition.

An ebXML message consists of an ebXML header with business document header fields, defined in the ebXML standard. These header fields provide:

- ❖ an indication of the **sender** and intended **recipient** of the message;
- ❖ a message **identification** field;
- ❖ references to other messages, allowing **correlation** of requests and responses, errors and receipt acknowledgments, even if received asynchronously, hours, days or weeks after the referenced message was sent;
- ❖ fields indicating the **Service** and **Action** invoked by a message, linked to the underlying business collaboration and agreement; and
- ❖ an identification of the Collaboration Protocol Agreement (**CPAId**) context for the specific message exchange.

This ebXML header information is expressed in a SOAP XML envelope with ebXML extensions. The ebXML envelop itself uses the Multipurpose Internet Mail Extensions (MIME) container structure, widely known as the mechanism used by email client software for sending email with (arbitrary) binary attachments. The SOAP envelope is stored as the first MIME part in this MIME container. The actual business documents (payload) are in the second (and possibly subsequent) MIME parts.



ebXML Message Structure

The ebXML messaging service also supports a reliable messaging protocol that uses receipt acknowledgement messages, a mechanism for resending unacknowledged messages and filtering duplicate messages. The resending logic, acknowledgment generation and duplicate elimination functionality is provided by the message service

handler. Applications can delegate the responsibility of reliable messaging to the ebXML messaging infrastructure. The ebXML Message Service uses various other specifications to secure messages. For instance, it can use the XML Digital Signature Recommendation to digitally sign messages. This allows a recipient to validate the origin of a particular message and its integrity.

The ebXML ***Collaboration Protocol Profiles and Agreements*** technical specification defines a standard XML language for business collaborations. In ebXML products, a Collaboration Protocol Agreement, or CPA, serves as a configuration document that controls the behavior of ebXML message service handlers. A CPA is an agreement that covers exchange between two business partners, and specifies which messages each organization has agreed to send to (or receive from) the other organization. It also associates each message type with a specific delivery channel. A delivery channel defines a set of technical properties, such as:

- ❖ the address (URL) to which particular messages are to be sent;
- ❖ whether or not reliable messaging is to be used;
 - if yes, number of retries and time interval to wait before resending a message;
- ❖ if Digital Signatures are to be used, the public key information (PKI) partners should have to validate the signature.

When sending a message to, or receiving one from, a business partner, a message handler can retrieve these parameters from a CPA and process the message as appropriate.

In March 2004, five ebXML OASIS Standards were published as five parts of the International Standard, ISO 15000. Since then, OASIS Technical Committees have continued work on updated versions of these specifications and on the ebXML Business Process, which was voted OASIS Standard by year-end 2006.

The T-Mobile ebXML Gateway

Selecting a B2B Protocol

While T-Mobile's customers were requesting a standard for B2B communication, they did not express a preference for a specific protocol. T-Mobile therefore evaluated a number of candidate protocols against a set of requirements gathered from an analysis of existing and anticipated future partner connections. The candidate protocols included:

- ❖ RosettaNet, a B2B framework developed in the electronics, semiconductor and IT industry.
- ❖ Applicability Statement 2 (AS2), a specification for Electronic Data Interchange (EDI) using the Internet HTTP protocol. AS2 is standardized by the Internet Engineering Task Force (IETF).
- ❖ **ebXML** (electronic business XML), a framework for electronic business.

Evaluation

T-Mobile's evaluation of open standards for B2B integration was carried out in 2003 and was based on a requirements analysis that included the following criteria:

- ❖ T-Mobile needed a protocol that does not require all business data to be in a single (XML or other) format, but is **payload-neutral** and can support whatever formats are used by (legacy or future) applications or agreed upon with business partners. Today, documents exchanged by T-Mobile with business partners can be in EDI, XML, PDF and other formats depending on context.
- ❖ T-Mobile also needed a protocol that can transport messages of **arbitrary size**. A simple provisioning order in XML or EDI is typically (much) less than 10 KB in size. A data file containing billing information for a large wholesale partner may be 500 MB or larger.
- ❖ T-Mobile also needed the ability to package **multiple payload parts** in a single message.
- ❖ T-Mobile required a protocol which supports bindings to public networks, such as the Internet, as a less expensive alternative to dedicated lines. In a B2B context using such public networks, it is not always possible to predict the availability of a network connection or partner system. A mechanism for **reliable messaging** is indispensable for high-volume, highly automated exchanges.
- ❖ T-Mobile's customers were asking for an **open standard**, supported by open standards organizations.

The conclusion of the evaluation was that ebXML best met T-Mobile's requirements.

At the messaging level, ebXML uses the Multipurpose Internet Mail Extensions (MIME) container structure, widely known as the mechanism used by email client tools for sending email with binary attachments. This allows data in any format or any size to be transmitted. The ebXML specifications also met the requirement of being open standards, being supported by OASIS, UN/CEFACT and the ISO.

Finally, while not as important from a technical point of view, the reference to the widely known acronym “XML” within the acronym ebXML turned out to be an important advantage in communicating with other parts of the T-Mobile business, where XML was gaining increased momentum.

Proof of Concept

The next phase after selecting the standard B2B protocol at T-Mobile was to validate the concept of implementing ebXML using commercially available, interoperable software products. This work began at the end of 2003. T-Mobile used information from the Drummond Group’s commercial ebXML interoperability certification service to establish a comprehensive list of vendors. A formal Request for Information was sent to all potential suppliers.

After evaluating responses to the RFI, one of the vendors, Cyclone Commerce (which subsequently merged with Axway), was invited for a proof-of-concept. Axway (and Cyclone Commerce prior to the merger) is an OASIS Sponsor member. Axway staff actively participates in the OASIS Technical Committees concerned with ebXML Collaboration Protocol Profiles and Agreements, ebXML Messaging, and ebXML Business Process. In addition to the project described in this document, Axway has other customers using its ebXML products and solutions in Asia, Europe and the United States in the automotive, telecom, trade/logistics and other industries, as well as in the public sector.

The T-Mobile ebXML proof-of-concept involved a number of tests, some of which focused on core ebXML functionality and others which simulated existing applications at T-Mobile, or applications under consideration including:

- ❖ Correct implementation of features dependent on ebXML message header fields, such as message **correlation** and conversations.
- ❖ Correct implementation of the **reliable messaging** protocol (where messages are to be stored and resent after a configurable interval, up to a certain number of times). The resending mechanism was enforced by manually disabling network connections while messages were being submitted.
- ❖ Ability to **package multiple payloads** in a single message. Some applications required sending usage data and authorization data in one single transaction.
- ❖ Various **load** and **connectivity** tests, involving combinations of message size and frequency, flow direction, document types, bandwidth requirements and number of partners:
 - One application required an outbound flow of 1500 messages per hour, with message size ranging from 100 bytes to 120 MB.
 - Another application focused on connecting a very large number of business partners. This test simulated a hypothetical point-of-sales integration solution involving 5600 T-Mobile outlets (**T-Punkten**). It involved an inbound flow of 7000 PDF documents per hour, with an average size of 150 KB.
 - Another inbound message flow involved 14 service providers, 10000 EDIFACT documents per hour, with an average document size of 2 KB.



T-Mobile Campus Inner Court

The tests were passed successfully, demonstrating both the ability of the ebXML standard to support large scale B2B exchanges and the scalable implementation of the ebXML standards embedded in the Cyclone Interchange product, currently available as the Axway **Synchrony Gateway: Interchange™**.

Production Deployment

Encouraged by the successful completion of the proof-of-concept, T-Mobile decided to implement a central Gateway that can be accessed by all T-Mobile divisions and subsidiaries in the different markets for communicating to external partners. The production system is based on the Axway Synchrony Gateway: Interchange™ product, an earlier version of which had already been used in the proof-of-concept. The gateway is used for B2B communication with business partners of T-Mobile and for communication with the other business units of Deutsche Telekom, T-Com and T-Systems (which, in the gateway product, are configured similarly to other external partners). The T-Mobile ebXML Gateway solution was acquired and tested in the first half of 2004, with first production deployments of business partners in the third quarter of 2004.

Results and Outlook

As of December 2006, the T-Mobile ebXML Gateway is in production with ten business partners, processing approximately one thousand ebXML B2B messages per hour. While most of the business partners that are currently connected to the Gateway are partners of T-Mobile Germany, the ebXML Gateway is deployed as a generic solution for T-Mobile International.

As an organization that has deployed ebXML Messaging and CPPA in production use for over two years, T-Mobile finds that their concerns today are less with the core ebXML message service functionality (which is stable, and interoperates well with its business partners) than with trading partner management. This includes issues such as sending certificate update notifications to trading partners in order to automatically update CPAs with new certificate information, and more generally the issues of configuration management of CPAs. Work has been ongoing in standards committees to provide additional support for these requirements.

In retrospect, the overall experience with ebXML at T-Mobile has been very positive. If the decision would have to be made today, the team at T-Mobile says they would again select ebXML. One of the benefits is that while ebXML is a powerful technology, it is non-intrusive at the same time. This means that existing systems and exchanges can be made to benefit from a reliable and secure ebXML infrastructure easily. As ebXML messages can transport data in any format, including legacy non-XML formats, existing applications can be made to leverage this reliable standards-based infrastructure with limited effort.

A planned focus on connecting more partners from other geographies explains why the uptake of the system is forecasted to accelerate, with an additional fifteen to twenty partners anticipated to be connected in 2007. To support this uptake, a Competence Center has been set up at T-Mobile to help internal users connect to the Gateway product and external partners deploy their own ebXML gateways to connect to T-Mobile.

Further Reading

T-Mobile International's web site can be found at <http://www.t-mobile.net/>. Key facts and figures in this white paper are taken from the T-Mobile corporate brochure, November 2006, and other public documents published on this web site. As of December 2006, the corporate brochure is available at http://www.t-mobile.net/MEDIA/9217_0.pdf. The web site of T-Mobile Germany is at <http://www.t-mobile.de/>. A document providing background information on T-Mobile Germany as of September 2006 is available (in German) from http://www.t-mobile.de/downloads/unternehmen/broschueren/unternehmensprofil_09_06.pdf.

The OASIS web site is at <http://www.oasis-open.org/>. The various technical committees and their public documents and email archives can be accessed from <http://www.oasis-open.org/committees/>. A list of OASIS Standards and other approved work is provided at <http://www.oasis-open.org/specs/>.

T-Mobile uses the ebXML Messaging and CPA capabilities of the B2B Gateway product of Axway, currently available in **Synchrony Gateway: Interchange™** (formerly Cyclone Interchange). Axway is a global provider of collaborative business solutions. Axway software and services are designed to help establish the connections that make companies easier to do business with: improving value chain efficiency, regulatory compliance and quality of service. Axway is a Sponsor member of OASIS and actively participates in the ebXML Technical Committees. Its ebXML products are Drummond-certified. Corporate information about Axway is available at <http://www.axway.com/company/>. Information about the company's products is available at <http://www.axway.com/products/>.

OASIS also hosts the ebXML XML.org web site, <http://ebxml.xml.org/>, which serves as the official international community gathering place and information resource for the suite of ebXML standards.

This document is the third OASIS case study describing a significant end-user implementation of ebXML. The previous two case studies are both about ebXML in healthcare:

- ❖ The "Connecting for Health" initiative for IT in healthcare in the United Kingdom is the world's largest civil IT project. It uses the ebXML Messaging standard in its Transaction Messaging Spine (TMS). This initiative is described in http://www.ebxml.org/case_studies/NHS-ebMSG-casestudy-041206.pdf. As of November 2006, 1.7 million bookings and 7,605,966 prescriptions had been made electronically using this system.
- ❖ The Norwegian e-Health Infrastructure is based on XML, ebXML and PKI. As of March 2006, it was in production with four applications, and had transported several million ebXML messages corresponding to transactions totaling more than 10 billion Norwegian Kroner (equivalent to 1.2 billion EURO, or 1.5 billion USD). This is described in <http://www.oasis-open.org/casestudies/Trygdeetaten-A4.pdf>.

The ebXML Messaging specification (ebMS) version 2 is available from OASIS or from the International Standards Organization (ISO):

- ❖ http://www.oasis-open.org/committees/ebxml-msg/documents/ebMS_v2_0.pdf

- ❖ <http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=39973>

The ebXML Configuration Protocol Profile and Agreement specification (CPPA) version 2.0 is available from OASIS or from ISO:

- ❖ <http://www.oasis-open.org/committees/ebxml-cppa/documents/ebcpp-2.0.pdf>
- ❖ <http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=39972>

The latest information and documents from the Technical Committee responsible for ongoing work on the ebXML messaging service specification are available at <http://www.oasis-open.org/committees/ebxml-msg/>. This includes (drafts of) future versions of the ebXML Messaging specification. The Technical Committee responsible for the ebXML Collaboration Protocols and Agreements specification has its home page at <http://www.oasis-open.org/committees/ebxml-cppa/>. It is also working on an updated version of the ebXML CPPA specification.

Interoperability of commercial ebXML Messaging software products is certified by the Drummond Group. Test results are available at <http://www.drummondgroup.com/html-v2/ebXML-companies.html>.

Editorial Contacts and Acknowledgments

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The source of the photographs of the T-Mobile campus used in this document is <http://www.t-mobile.de/unternehmen/pressefotos/>. The diagram of the ebXML Message structure is taken from the ebXML Messaging Service specification version 2.0 OASIS Standard.

This case study was supported by Axway, providers of Synchrony™, a platform made up of technology components, collaborative business solutions and services to address integration, collaboration and compliance initiatives, including the B2B Gateway product deployed at T-Mobile to provide the ebXML functionality described in this document. This support is provided in accordance to the OASIS Case Study policy (<http://www.oasis-open.org/casestudies/guidelines.php>).