

THE UNIVERSITY OF HONG KONG

IMPACT CASE HISTORY**ebXML Message Gateway Hermes and B2B Connector Provide a Secure and Reliable Platform for E-Business****1. Summary**

The 'ebXML Message Gateway Hermes and B2B Connector' project led by Professor David W L Cheung and his team at the Center for E-Commerce Infrastructure Development of The University of Hong Kong demonstrates how excellence in research at the University can be developed into a platform technology that is successfully transferred to the business/industry sector, as evidenced by the support of four grants from the Innovation and Technology Fund for the project and installation of the technology in the HKSAR Government as well as public and private enterprises, not only in Hong Kong but also in other countries.



Through the engagement process that includes pilot projects with local and overseas enterprises, licensing to companies and open source distribution, the ebXML system has achieved global impact and penetration with recorded downloads from more than 85 countries. The technology has become the most popular open-source ebXML gateway in the world with proven quality and acceptance in many production systems.

2. Underpinning Research

Before the establishment of the Center for E-commerce Infrastructure Development (CECID) in the Faculty of Engineering, Professor Cheung had already spent effort in following the development of the XML technology in the Internet world. XML is a markup language that facilitates the exchange of complex information between computers. Before the existence of the XML technology, computer software in most cases exchanged information in very simple format. As the Internet becomes a super-efficient medium for exchanging information, it was discovered that there was a need to have a structural way to facilitate the encoding of complex information for exchange purpose. This triggered the development of XML as a markup language for this purpose. Professor Cheung has established his research in two directions: (1) To

develop techniques to use XML to define standards for exchange of information on the Internet. Besides academic result, he has developed guidelines for defining information exchange standards, which has been adopted by the Hong Kong Government in its service. The guideline has also been acquired by other bodies, including the Macao government. (2) To develop software to support the exchange of standardized information between parties (computers) in a secure manner. In this direction, he has led his team to develop a B2B ebXML based message exchange gateway called Hermes and transferred the technology to society in various ways.

In the area of electronic commerce, a family of XML based standards known as ebXML was sponsored by OASIS and UN/CEFACT. The mission of ebXML is to provide an open XML-based infrastructure to conduct electronic business by trading partners. In 2002, CECID, under the leadership of Professor Cheung, received a grant from the Innovation and Technology Fund (ITF) for the implementation of the ebXML infrastructure. As a deliverable of the project, a software named Hermes was released as an open source software.

The key functionality of Hermes is to support reliable and secure exchange of electronic documents between companies on the Internet. In simple terms, once Hermes is installed between two trading partners, it logically converts the unsecure and unreliable exchange on the Internet into a secure and reliable one as if it is carried out on a leased line.

Subsequently, in 2003 and 2007, two further ITF grants were awarded for the extension of the ebXML infrastructure based on Hermes. One was on process integration and the other was on its application to logistics. After successfully conducting a number of pilot projects with local and overseas enterprises, the business value and robustness of Hermes was confirmed. Following the feedback collected from users in the field, CECID subsequently developed a network device with Hermes as the core engine to support easy and fast installation of the gateway. The device, called B2B Connector, has been licensed to many companies. The B2B Connector can be configured to run within an hour. It demonstrates an impressive plug-and-play feature, which is highly appreciated by small enterprises from different industries.

3. References to the Research

Key peer-reviewed publications:

1. W.K. Sung, F.C.H. Tong, K.H. Yeung, **David W. Cheung**, C.J. Tan and William Song, Pervasive Multimedia Markup Language (PMML): an XML-based Multimedia Content Specification for Pervasive Access. Proc. *Tenth International World Wide Web Conference (WWW10)*, Hong Kong, May, 2001.
2. **David W. Cheung**, E. Lo, C.Y. Ng and T. Lee, Web Services Oriented Data

Processing and Integration. Proc. *The Twelfth International World Wide Web Conference (WWW 2003)*, Budapest, Hungary, May, 2003.

3. W. Lian, **David W. Cheung**, Nikos Mamoulis, and S.M. Yiu, An Efficient and Scalable Algorithm for Clustering XML Documents by Structure. Special Issue on Mining and Searching the Web, *IEEE Transaction on Knowledge and Data Engineering*, IEEE Computer Society, V16, N1, pp. 82-96, January 2004.
4. W. Lian, N. Mamoulis, **David W. Cheung**, and S.M. Yiu, Indexing Useful Structural Patterns for XML Query Processing. *IEEE Transaction on Knowledge and Data Engineering*, IEEE Computer Society, V17, N17, July 2005.
5. Eric Lo, **David W. Cheung**, C. Y. Ng and Thomas Lee, WSIPL: An XML Scripting Language for Integrating Web Service Data and Applications. *Web Intelligence and Agent Systems*, IOS Press, V4, N1, pp. 25-41, 2006.
6. **David W. Cheung**, Thomas Lee, Patrick Yee, Webformer: a Rapid Application Development Toolkit for Writing Ajax Web Form Applications. Proc. *The 4th International Conference on Distributed Computing and Internet Technology (ICDCIT 2007)*, Bangalore, India, Dec 2007.
7. Thomas Lee, C.T. Hon, **David W. Cheung**, XML Schema Design and Management for e-Government Data Interoperability, *The Electronic Journal of e-Government*, V7 I4, 381-390, 2009.
8. Jian Gong, **David W. Cheung**, Nikos Mamoulis, and Ben Kao, XML Data Integration using Fragment Join, Proc. *14th International Conference on Database Systems for Advanced Applications (DASFAA 2009)*, Brisbane, Australia, April 2009.
9. Thomas Y Lee, and **David W. Cheung**, Formal Models and Algorithms for XML Data Interoperability, *Journal of Computing Science and Engineering*, KIISE, V4, N4, 313-349, 2010.
10. Thomas Y.T. Lee and **David W. Cheung**, XML Schema Computations: Schema Compatibility Testing and Subschema Extractions, Proc. *The 19th Int'l Conf. on Information and Knowledge Management (CIKM 2010)*, Toronto, Canada, October, 2010.

Selected external grant funding:

1. Establishment of an ebXML software infrastructure in Hong Kong (ITS/101/01)
Funding Scheme: Innovation and Technology Support Programme (ITSP)
Principal Investigator: Professor Francis C M Lau
(Professor David W L Cheung was the PI and Professor Lau is the Project Coordinator. It was recorded in the system that Professor Lau was the PI.)

Period:	2002-2004
Amount Awarded:	HK\$9,539,000
2. A business process and information interoperability platform based on open standards (ITS/038/03)	
Funding Scheme:	ITSP
Principal Investigator:	Professor David W L Cheung
Period:	2003-2006
Amount Awarded:	HK\$13,996,087
3. Extending web 2.0 to deliver e-commerce services (ITS/070/06)	
Funding Scheme:	ITSP
Principal Investigator:	Professor David W L Cheung
Period:	2006-2007
Amount Awarded:	HK\$982,675
4. An eLogistics Appliance with data exchange and conversion technologies for infrastructure connectivity (ITP/018/07LP)	
Funding Scheme:	Platform Research Projects - General Award
Principal Investigator:	Professor David W L Cheung
Period:	2007-2008
Amount Awarded:	HK\$5,984,600

4. Details of the Impact or Benefit

The impact of Hermes and the B2B Connector in society is evident in its installations in many production systems. This platform technology has become the most popular ebXML messaging gateway in the world, with downloads from more than 85 countries. A few examples of its use are given below.

The Office of the Government Chief Information Officer (OGCIO) of the HKSAR Government has adopted Hermes as part of the Government Electronic Trading Services (GETS) system. GETS is a mission critical system. In 2007, the Government reviewed the technical architecture of GETS in order to meet the future needs of trade document processing. After in-depth evaluation, OGCIO decided to adopt ebXML as the message exchange standard and choose Hermes as the gateway software to handle all GETS document exchange between the Government and GETS service providers, which deliver front-end electronic services to the trading community. The enhanced GETS, supported by Hermes, was launched in January 2010. Hermes, as the core engine, has demonstrated its superior quality. The GETS gateway exchanges over 19 million trade documents per year on average. In addition, all the three service providers of GETS, Brio, Tradelink and Global eTrading Services, have used Hermes for their document submissions to GETS.

Another illustrative case is the e-commerce system implemented by MTR Corporation Limited (MTRC). MTRC's internal goods receiving system manages all the document exchange between MTRC and its business partners. It takes care of all office supplies procurement in MTRC. MTRC adopted Hermes as the gateway of its goods receiving system so that they could make use of the Internet to exchange sensitive business documents with their business partners. In 2005, MTRC switched to use the hardware container of Hermes, the B2B Connector. MTRC confirmed that both products perform robustly and fit the business needs of its goods receiving system very well.

Another example is from an IT executive search and staff search services company, which provides IT contract staff services to clients including the HKSAR Government. It has used the B2B Connector in the exchange of job requirement information and candidates' personal data over the Internet with their clients. The company has confirmed that the B2B Connector runs smoothly and robustly and seldom requires maintenance operations.

The impact of Hermes and B2B Connector goes beyond Hong Kong. For example, an IT company in New Zealand with business focus in the area of supply chain for the small to medium logistic/third party warehouse suppliers has used Hermes for more than 7 years in their business. Hermes provides a cost-effective and yet robust solution for small and medium suppliers to participate in the e-supply chain and gain all the advantages of using electronic document exchange that large multinationals have. The company confirmed the reliability of Hermes and acknowledged the good support provided by Professor Cheung's team at CECID.

Most recently, in 2011, the Hospital Authority has engaged Professor Cheung and his team to design and implement a secure communication module, based on Hermes, for the Electronic Health Record (eHR) Project. Among others, the eHR Project aims to develop a sharing platform for all public and private hospitals, clinics and other health service providers to securely share their electronic health record data of their patients. This lightweight, yet robust module implemented by Professor Cheung's team will be installed in up to 3,000 private clinics participating in the eHR programme to ensure the secure transfer of electronic health record data between those private clinics and the eHR sharing platform.

The technical quality of Hermes and B2B Connector has received local and regional recognition. It won the Certificate of Merit at the Hong Kong Computer Society's IT Excellence Awards in 2004, and then won the Asia-Pacific ICT Awards (APICTA) competition under the R&D category. In the Linux Business Award of 2005, Hermes was the Best Infrastructure Building and Communication Application.

The technology developed in this project has proven to be applicable to many business-to-business initiatives, and its quality and acceptance has been proven in many production systems.

5. References to the Corroboration of Impact or Benefit

- Statements of support from the following organizations are available for corroboration purpose:
 - Office of the Government Chief Information Officer (OGCIO) of the HKSAR Government
 - MTR Corporation Limited
 - InfoTech Services (Hong Kong) Ltd
 - B2B Fusion, New Zealand
 - Hospital Authority

- Awards received:
 - Certificate of Merit at the Hong Kong Computer Society's IT Excellence Awards in 2004
 - Asia-Pacific ICT Award (APICTA) under the R&D category
 - Best Infrastructure Building and Communication Application in the Linux Business Award of 2005