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The business of web services

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Abstract

Web services integrate businesses. Today most computing applications run in corporate silos; tomorrow web services will join up business applications, allowing them to seamlessly interoperate. Web services are not the next big thing – but they will allow the last three big things to happen.

Think of the revolution that the web has delivered to human users. Right now an equivalent revolution is happening – web services are delivering content directly to computer applications. Our business environment is being transformed: no longer the barriers of supplying your information to external organisations, but rather applications can now access your information in real time. Transaction costs plummet and the dynamics of the information economy shifts in to overdrive. Will it feel like someone has hit the fast-forward button? They say that an Internet year is the equivalent of three months; in the future will we transact business at a speed where a web services year is equivalent to three seconds? Are we ready or, as usual, will we only really recognise a technical revolution after it is actually over?

Our business models need to be transformed. The first users of electricity had it delivered to them in a packaged battery form; only when an electrical distribution network was built did it really revolutionise the way we live. Currently, our information users receive data in packaged form; web service infrastructure provides the equivalent on-demand distribution network that promises to revolutionise the way we do business.

Our Vision is that 'Ordnance Survey and its partners will be the content provider of choice for location-based information in the new information economy'. This paper describes the Ordnance Survey web services strategy contributing to that vision, the results of our collaborative web services pathfinder project, and suggests alternative delivery models on how we can satisfy the needs of our customers.

e-Government perspective

Government delivers services to the public. Increasingly the public is accessing those services through an electronic medium. e-Government is about building a national legal and technical infrastructure to enable a knowledge-based economy. It is an opportunity to change the way government works by building services that match the needs of the citizen. The challenge is to transform government from a set of internal silos based on traditional production and distribution models to a customer-centric service model. We have an aspirational target that all government services will be online by 2005.

Interoperability is the key. The e-Government Interoperability Framework defines the technical policies and specifications governing information flows across government and the public sector. It defines the essential prerequisites for joined-up and web-enabled government. Future versions of e-GIF will mandate standards for web-based services together with best practice guidance on their use.

Ordnance Survey works closely with the Office of the Deputy Prime Minister and the Office of the e-Envoy. There is increasing recognition that many e-Government transactions have a spatial element and those e-services are enriched through integration with the seamless spatial database managed by Ordnance

Survey. Ordnance Survey data are made available for central government use under the terms of the UK Pan-government agreement. The purpose of the agreement is to improve efficiency through the better use of geographical information and to work towards the 2005 e-delivery target.

Increasingly, customers also need to link and integrate different data and products. Ordnance Survey is leading the initiative to define the Digital National Framework™ – a set of principles and standards allowing external organisations to integrate their datasets and reference the national base data in an intelligent and meaningful way.

Web services definition

Web services are about infrastructure – infrastructure for business – building on the current infrastructures we already have, such as the Internet, and extending it with a set of additional standards to allow computers to talk directly to each other. Traditional web applications rely on a human user to interpret the information and respond; web services allow computers to interpret the information and respond. My business application can now talk directly to your business application – no human intervention required.

A quiet revolution is happening. You may not have noticed it, but increasingly distributed applications are being implemented using this technology – often behind the same user interface with which you are already familiar. Industry vendors are repurposing their monolithic applications into more reusable components accessible as web services. Behind the scenes the stage is being redesigned – the actors may be the same, but they are now working off a new script.

A web service is a software component whose services are visible and accessible to other software applications. You can publish descriptions of web services; based on these descriptions web services can find other web services and they can call or bind to other web services. Technologists refer to this as the publish-find-bind model, and it is central to what is known as a service-oriented architecture.

Imagine a group of teenagers, each with their own mobile phone. All manner of techniques are used by the teenager to get their mobile number widely known or published; other teenagers find the number by either asking directly or maybe asking a friend: binding is a simple matter of making the call. This is the model of a service-oriented architecture – web services interoperate in a loosely-coupled manner. The power of the model is that web services may call other web services, and web services may be recombined or replaced at run-time – adapting to changing demands.

The real pay-off is now that you have a set of invocable web services, you can control or choreograph the sequence or flow of execution through the services. Business processes may now comprise a sequence of web services – and are therefore much easier to adapt to changing business needs. Traditionally, business logic is deeply embedded in applications and is expensive to modify. Decoupling the business logic and separating it from the underlying application infrastructure allows businesses to adapt in a more agile way.

Business models

Essentially, the way we all conduct business has not changed over the last few centuries. New technologies lift constraints in the speed at which we do business by improving efficiencies. Technology has allowed us to do the same business at a faster rate. The medium may have changed but the message has remained the same.

Web services enable us not just to change the rate at which we conduct business but critically allows us to address the fundamental way we conduct business. We have to re-examine our essential purpose and nature of what we do as a business and capitalise on the opportunity that this technology affords us.

Our business models are based on what is viable. Cost of production and distribution must be lower than that we can recover from the sale. Not only are we limited by the constraints of the technology at our disposal but critically we are limited by our perception and ability to conceptualise new ways of doing things. This is the essential challenge of web services – we can use this technology to do new business, in new ways and expand our business offerings as an increasing range of possibilities now become viable. The birth of any new idea is painful; the birth of a new way of thinking is doubly painful.

Our business structures reflect the ways we conduct business. Deeply embedded in those structures is the assumed business model. Cultural and social constraints permeate through our organisational structures, and our ability to change and adapt as a business is limited by those constraints. Now, more than ever, is the time for organisations to understand their essential purpose. Internal constraints and barriers must be torn down, business and technical functions must align and our business models need to be transformed from product-centric to service-centric views driven by customers' needs.

We are all familiar with the supply-chain model – a comfortable view of the world based on the flow of goods from one organisation to another. Business relationships are relatively static, trading agreements span long periods of time, dynamics of the system are predetermined and predictable. We are taking twentieth-century industrial thinking and applying it to a twenty-first century post-industrial environment.

Web services offer us a radically different model – a value-network – a networked information economy of interoperating businesses freely trading information in a dynamic and responsive way. Trading relationships might only exist for a single commercial transaction, dynamics of the system are responsive and adaptive based on changing demand. Power shifts to the consumer of the service – consumers drive the demand on the system, suppliers are driven by that demand. A different economic dynamic comes into play – competition is now about driving transaction costs down and maximising the value that you can deliver to the consumer. Free-market economics are about delivering goods to the consumer, web services are about delivering information to the consumer – a key enabler of the information economy.

Roles within a business model

Within a value-network, businesses will play specific roles during a transaction. To understand the different roles in a single transaction, consider a traditional supply-chain situation.

Imagine for the moment we are in the pizza business: we rely on ingredients supplied via the supply chain. Flour is delivered to us by a flour mill, wheat is delivered to the flour mill by a primary producer such as a wheat farmer. Similar supply chains deliver us cheese, tomatoes and the other ingredients we need to make pizzas and sell them to our customer. Distinct roles emerge – producer, distributor, manufacturer and consumer. In a traditional supply chain the business roles are established and persist over a period of time.

Similar roles come into play in the information business: information is managed and updated by a maintainer, information is published by a publisher, subscribers receive information and add value, and consumers request the higher-level information. What makes a value-network different is that these roles and relationships may be transitory – and in fact may only last for the duration of the transaction. In one transaction my business may be publishing data and your business may be subscribing to that data. Simultaneously, in a separate transaction my business may be subscribing to different information that your business is publishing. In different transactions we may choose to adopt different roles – our trading relationship changes dynamically and is not necessarily the static, fixed relationship we had in the past.

This has a profound impact on the nature of how we will conduct business in the future. In the traditional model you may be prepared to invest time understanding my business offering and working with me to establish a long-term trading relationship. The cost of building that relationship could be spread over a large number of actual transactions. In a value-network, trading relationships are more transitory; you would not be prepared to invest time to understand what my business offering is – particularly for a single transaction. So, the costs of executing a transaction has to be minimised and the nature of the offering has to be totally transparent.

Web services strategy

Developing a strategy on the adoption of web services depends on the business model you want to support. Web services are a neutral enabling technology that you can apply to just about any business context. You could use web services to enable your current business model, but that would be missing the opportunity to transform your business and gain competitive advantage in the information economy.

An effective web services strategy should seek out the opportunities to reduce complexity in your existing infrastructure, increase your ability to adapt to changing demands, reduce supply barriers, expand your market base and allow you to compete in an open marketplace through collaboration with your partners.

Identify the key internal and external business interfaces you need to support and which external organisations you deal with. Priority is to support internal interfaces: understand which of those internal interfaces deliver business value and package your application functionality as a suite of web service components. Business processes may now be supported by invoking a sequence of services –effectively separating business logic from the underlying infrastructure. A period of time will be needed to stabilise your internal infrastructure before you embark on integration with other businesses.

External interfaces will relate to your customers, partners and perhaps contractors – the external organisations you do business with. Business-to-business integration requires close collaboration at both a business and technical level. Initially, small-scale pilot and technical trials are required to fully understand the technology; then a phased introduction is needed to integrate with external organisations.

At Ordnance Survey our web services strategy is following similar lines. Our road map focuses on internal interfaces to core functions such as the data maintenance infrastructure. Core functionality is exposed as a set of discrete web services, facilitating the integration of internal applications. Simultaneously, we have conducted small-scale pilots and a collaborative web services pathfinder project to understand how we can better interoperate with external organisations using standard web services interfaces.

Web services pathfinder

As we discussed earlier, interoperability is key and standards-based interfaces allow businesses to integrate. My standards-based component can only communicate with your standards-based component over a standardised interface.

Web services pathfinder was a collaborative project involving four external Open GIS Consortium members: EDINA® –at the Edinburgh University Data Library; IONIC® Software –OpenGIS®-compliant tools vendor with components for map and feature serving; Fraunhofer Institute from Germany – author of the web pricing and ordering service; and Ordnance Survey®, the national mapping agency of Great Britain.

The purpose of the pathfinder project was to prove the technical feasibility of publishing OS MasterMap® data via OpenGIS-compliant map and feature servers, and to evaluate transaction-based charging using the Web Pricing and Ordering Service. OpenGIS-compliant services were implemented using standards-based components serving OS MasterMap stored in an Oracle® 9i spatial database.

For demonstration purposes, a thin web client application was implemented by EDINA to access the web services. Equally, the same web services may be accessed by any other type of application, for example, a desktop GIS application. Use cases were implemented to allow the user to view an area of interest, perform an initial download of data, download changes and updates to that data, or subscribe to an automated update service.

Key findings of the work is that web services are technically feasible, collaboration with partners was facilitated by a common philosophy and underlying OpenGIS Reference Model, applications can be more rapidly developed using standards-based components, and we have now built the confidence and contained the business risk of using the technology.

Web services platform

As a result of the web services pathfinder project we have a demonstration proof-of-concept that has facilitated the discussion of the business concept. Central to the adoption of web services will be the implementation of a web services platform that can support our business requirements and deliver the scalability, availability and reliability of a fully operational system.

An effective web services platform will need to draw on the technical advances made in the mainstream IT industry, and combine it with the GI technologies emerging from standards bodies such as the Open GIS

Consortium. External organisations need to be able to interoperate through a standard set of interfaces and engage directly with Ordnance Survey data in a more integrated and meaningful way.

Transformation of our business to support the increasingly sophisticated needs of our partners and customer organisation is a long-haul undertaking. Business change supported by the right technical infrastructure will be needed to service those needs. We are continuing our consultative approach and adapting our business environment to meet the needs of our customers.

Opportunities for the future

Looking forward, we must predict the future needs of our customers and we are actively working on technical infrastructure to support those predicted demands. Web services are a key element of our strategy to better engage with the GI community. We are seeking organisations to participate in scaled trials of web services technology and join us in realising our vision of the future.

We have proven the technical feasibility of GI services, including mapping web services, feature web services and change-only update services for small volumes of data. Additional scaled trials are needed to resolve the remaining technical issues and to understand the business implications of delivering Ordnance Survey content directly to partner applications.

A centralised seamless database of large-scale data is core to our future business. Web services provide the publishing interface to allow external organisations to access those data. Ordnance Survey is collaborating with its partners, and through the use of web services will deliver on the vision to be the content provider of choice for location-based information in the new information economy.

Conclusion

Web service technology is maturing. Issues remain at a technical and business level. As a GI community we will need to collaborate closely to develop the next generation of business practice and resolve any remaining technical risk.

Now is the time to engage and realise the potential of the technology we have at our disposal. Web services now offer us the key to expand the GI market and enable a networked information economy. An expanded market is to our mutual advantage and a new era of cooperation and collaboration will allow us to build a shared economy in spatial-information resources.

Web services are a cornerstone to the way we will conduct business in the future. We need to jointly work towards that future, collaborating, sharing experience and building the next generation infrastructure to our mutual benefit.

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