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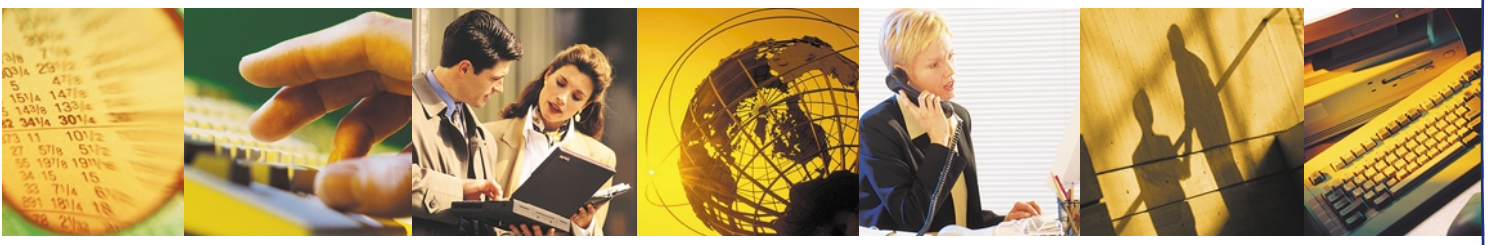
> Integrating Business Processes With Web Services



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> In the beginning

In the beginning there was an Internet of computers. People used it to collaborate and gather information via PCs using email and web servers. Henceforth, tens of millions of people could communicate with each other. And then there was the Internet of embedded computers. People conversed via games consoles, TVs, automobiles, mobile phones and PDAs. Hundreds of millions of people were hitherto 'connected'. Enter 'Web Services'. Now computers talk among themselves and just about anything else as diverse as thermostats, vending machines, milk cartons and clothes. Billions of things will interact autonomously. The next wave of the Internet is upon us.

The benefits of the Internet are clear; a pervasive network, driven from the edge, increasing productivity by facilitating communications, eventually between all human beings and perhaps all things. It's a revolution, which has already experienced several waves and shows no sign of abating. This 'new wave' likely reserves us the Internet's biggest benefit yet: to facilitate trade between enterprises, no matter how big or small, irrespective of geography, but this time without human intervention. The ability to create wealth and prosperity will proliferate by further levelling the playing field and expanding the geographic horizon of the supply chain. Businesses in remote locations will be able to publish their wares in industry directories available to the world's leading manufacturers and marketplaces for a relatively modest investment.

Much of this is already underway. The problem is, how can businesses trade with each other electronically without knowledge of their business processes or IT systems? For the fortunate few there is Electronic Data Interchange (EDI). For the rest, it's largely a manual process. But even the largest enterprises are looking to move away from EDI - what use is an electronic supply chain, if only a handful of your suppliers can afford to use it? To truly benefit from a modular electronic business framework, all suppliers need to be connected and it needs to be easy for new suppliers to participate, irrespective of their size or geography. This is why even the world's largest businesses are now turning towards Web Services. EDI is unlikely to disappear overnight though; the investments are high, so early deployments will likely erect bridges between the two technologies.

> The Advent of Web Services

What differentiates Web Services from EDI is its adherence to broadly available industry standards such as the Internet (HTTP, HTML, TCP/IP) and a subset of the Standard Generalized Markup Language (SGML) known as eXtensible Markup Language (XML). Less complex than SGML and more robust than HTML, XML is set to be the format of choice for transporting data around networks, including the Internet. XML lowers the cost of configuring new business relationships by providing a set of reusable core components. These core components, industry sensitive by nature, form the basis of 'smart business processes' able to integrate with existing systems.

> The Power of Business Process Integration

Web Services will enable a far greater level of integration for intra and inter-enterprise transactions. Procurement systems for example will embed business rules with a level of abstraction far more powerful than ever before:

"Purchase all widgets for sub-assembly X from approved suppliers, applying the best financial terms and shortest lead time".

A process that could take hours/days to complete manually can be concluded in a matter of minutes.

How do companies construct new business relationships enabling this level of integration? Figure 1 describes how a new business relationship may be configured between two companies A and B. STEP 1. Company A consults an Industry Registry of Web Services and selects one that fits its needs. Think of this registry as containing process models, vocabularies and profiles that describe how future partners or customers may interface with Company A. If it doesn't exist, it can alternatively write its own. STEP 2. Company A integrates the Web Service into its local systems. STEP 3. Company A then subscribes to the Industry Web Services Registry, advertising its presence on the network. STEP 4. At this point, Company

B discovers Company A and enquires about how to negotiate with it (STEP 5), perhaps automatically, based on its ability to conform to those rules. This may or may not, involve human decision-making. STEP 6. Once the agreement on how both companies interact is in place, they possess a template to perform regular business transactions automatically.

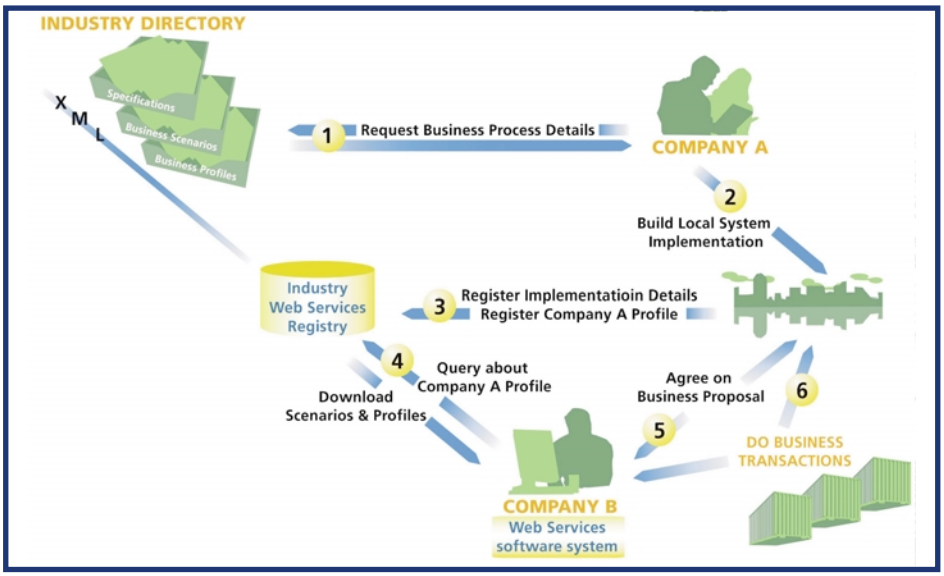

Figure 1. Web Services Business Process Integration Between Two Companies

Basic Web Services are simple, typically stateless, requests for simple data sets. Interaction focuses on a server-specific interface. These types of services are frequently demonstrated with examples such as the classic 'request for a stock quote'. But as seen in Figure 1, Web Services will be used to process more complex transactions, such as the processing of a purchase order. In figure 2, the purchase order document format describes the basic message parameters for interaction between two companies. Interrogating this data structure will determine Company B's 'fitness' to trade with Company A and vice versa. By exchanging XML documents in this way, integrating disparate business processes across heterogeneous systems within and without the enterprise is defined in a vendor neutral format. The existing IT landscape can be exploited and augmented with a minimum level of disruption.

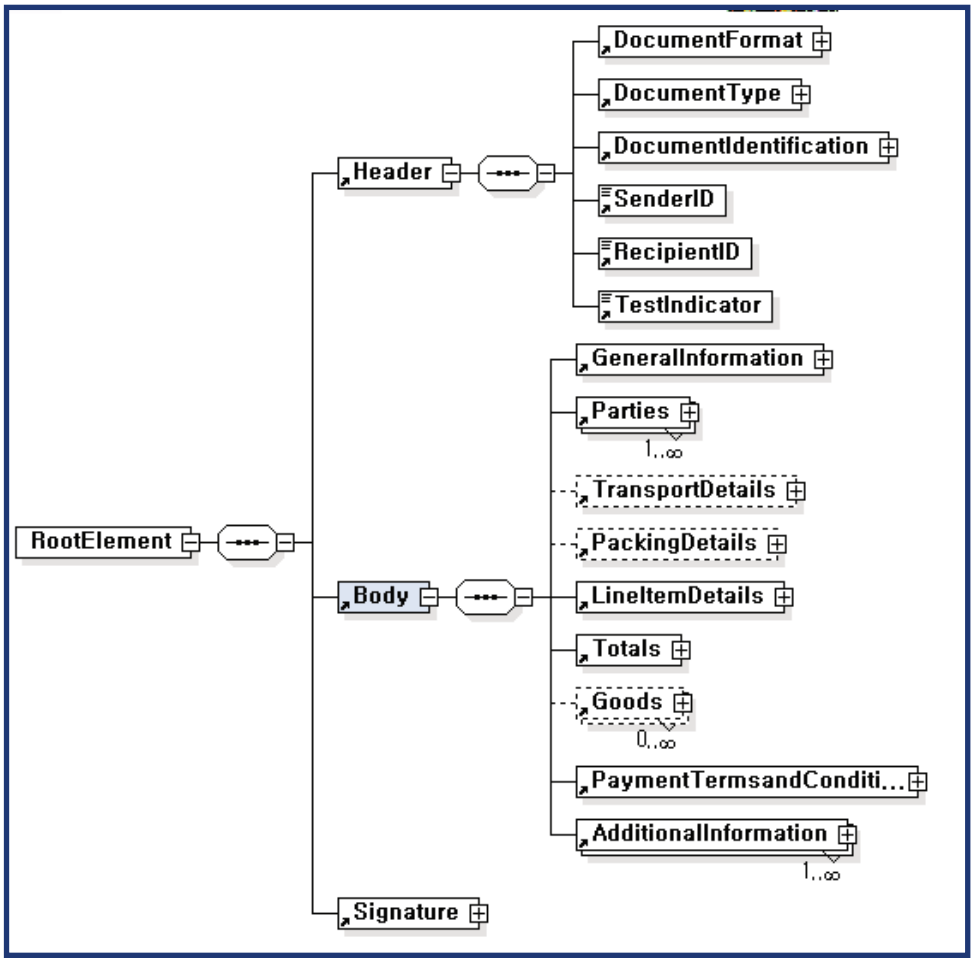

Figure 2. Sample Purchase Order Document Format

> Web Services
Architecture

The key enabling technologies that underpin the Web Services architecture are built upon an XML foundation. The first pillars of this architecture are already erected and have matured over the last 2 to 3 years, even though they continue to evolve:

- UDDI - The first pillar forms a business registry baptised 'the UDDI' (Universal Description, Discovery and Integration) - a white pages of general information, a yellow pages of geography and industry codes and a green pages of protocols supported by each business.

- WSDL - The second pillar describes services through a mark-up language known as 'WSDL' (Web Services Description Language) - which specifies a common XML framework for exchanging information between applications.
- SOAP - The third pillar defines the transport protocol named 'SOAP' (Simple Object Access Protocol), which delivers messages between applications over HTTP. The purpose of SOAP is to fulfil one of two functions:
  - Either to execute Remote Procedure Calls, invoking another application typically within the firewall (intra-enterprise) or
  - To deliver objects to remote locations through firewalls (inter-enterprise).

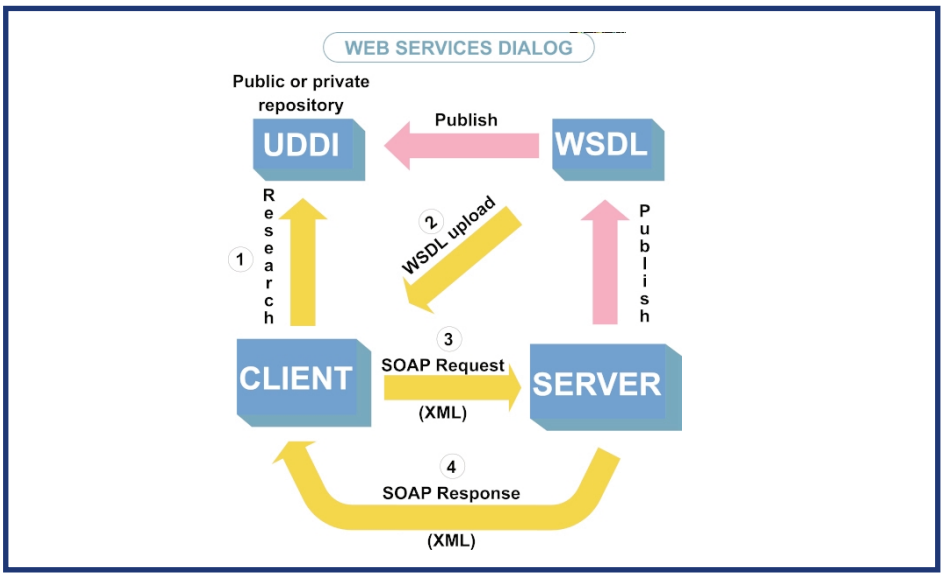

Figure 3. Web Services Dialogs between UDDI, WSDL & SOAP

- A fourth pillar currently being erected is 'ebXML' (Electronic Business XML) providing a business level framework defining trading partner profiles, business processes, messaging services and repository/registry standards that will enable businesses to discover each other and conduct business over the web.

With these standards in place, it is now possible to submit a request from a remote heterogeneous client to a database and receive a response in the form of an XML document. Access to the database is provided through a Web Services interface that sits in front of the database - see figure 4.

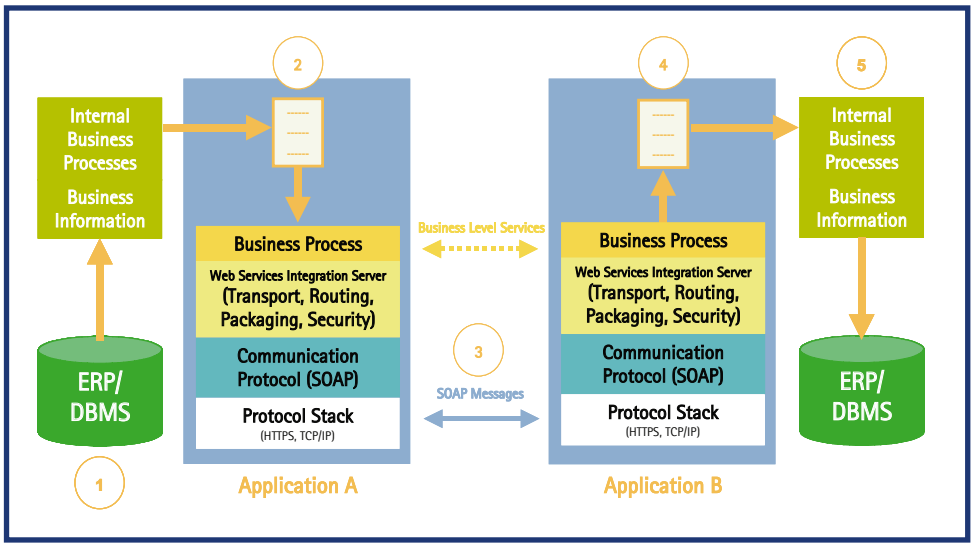

Figure 4. Remote Request to Heterogeneous ERP or Database System

In order to enable this, Web Services architectures will need to exhibit the following characteristics:

1. Orchestrate information and business logic in a distributed environment
2. Integrate data from heterogeneous database and operating system platforms
3. Provide scalable performance to meet unpredictable demand
4. Provide a secure and reliable connection

> Four J's Web Services Integration Server

Web Services Integration Server (WSIS) is a derivative Business Development Suite platform, targeted purely at the dedicated infrastructure needs of Web Services architects looking to integrate complex distributed business processes. WSIS is in its final stages of release which is scheduled for winter 2002/2003.

Orchestrating Information and Business Logic in a Distributed Environment

WSIS embeds Business Development Language (BDL), which processes, integrates and routes information flowing between disparate business processes emanating from distributed applications. BDL is a simple fourth generation language designed to manipulate database content and Web Services, capable of linking business logic between applications developed with different development tools - see figure 5.

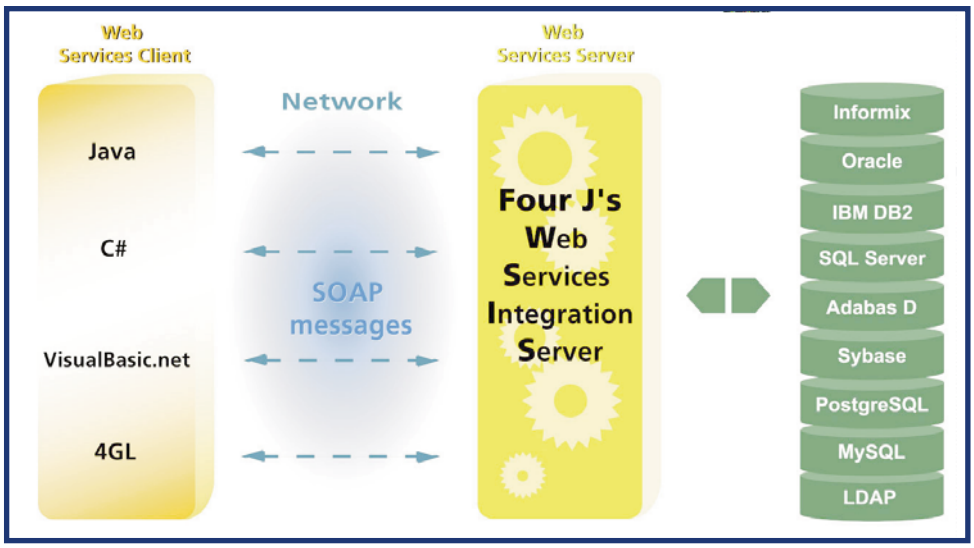

Figure 5. WSIS is Development Tool Agnostic

Its simple grammar makes it quick to learn and embedded commands hide the complexities of SOAP, UDDI or WSDL from the uninitiated developer.

Programs compile into a portable byte code that execute in Four J's Dynamic Virtual Machine (DVM) which forms the basis of WSIS. already proven and deployed in many Fortune 500 accounts. Its n-tier architecture enables the distribution of applications and databases through firewalls and across distributed networks.

The DVM has been ported to over 15 Unixâ platforms as well as Linuxâ and Windows NTâ, resulting in applications that need only be compiled once, saving valuable development, testing and deployment time.

Integrating Data from Heterogeneous Database and Operating System Platforms

Not only does WSIS expose Web Services in a straightforward way, by insulating the developer from Web Services 'spaghetti', it also enables simultaneous access to a broad range of databases - see figure 5. In BDL, database access forms an integral part of the language via SQL, so there is no need to concatenate 'SQL string wrappers', as is the case with Visual Basic and other development environments.

Provide Scalable Performance, Secure & Reliable Connections

A key element in scaling performance is efficient database access. Four J's Dynamic Virtual Machine achieves this with an Open Database Interface, providing native driver access to data. By removing the need for ODBC and JDBC layers often used by application servers and other development tools, performance is greatly enhanced and reliability is assured. These are two critical requirements for mission critical environments.

Over 1500 simultaneous users have been proven on a single server in a distributed banking application distributed across the African continent using Four J's Dynamic Virtual Machine. This is testimony to its efficient low bandwidth network protocol and Open Database Interface.

By enabling the application to reside behind the firewall and to sit physically distinct from the web server, hackers cannot intrude and violate the application. Using industry standard encryption methods and operating through firewalls, the Dynamic Virtual Machine dovetails into the existing security infrastructure.

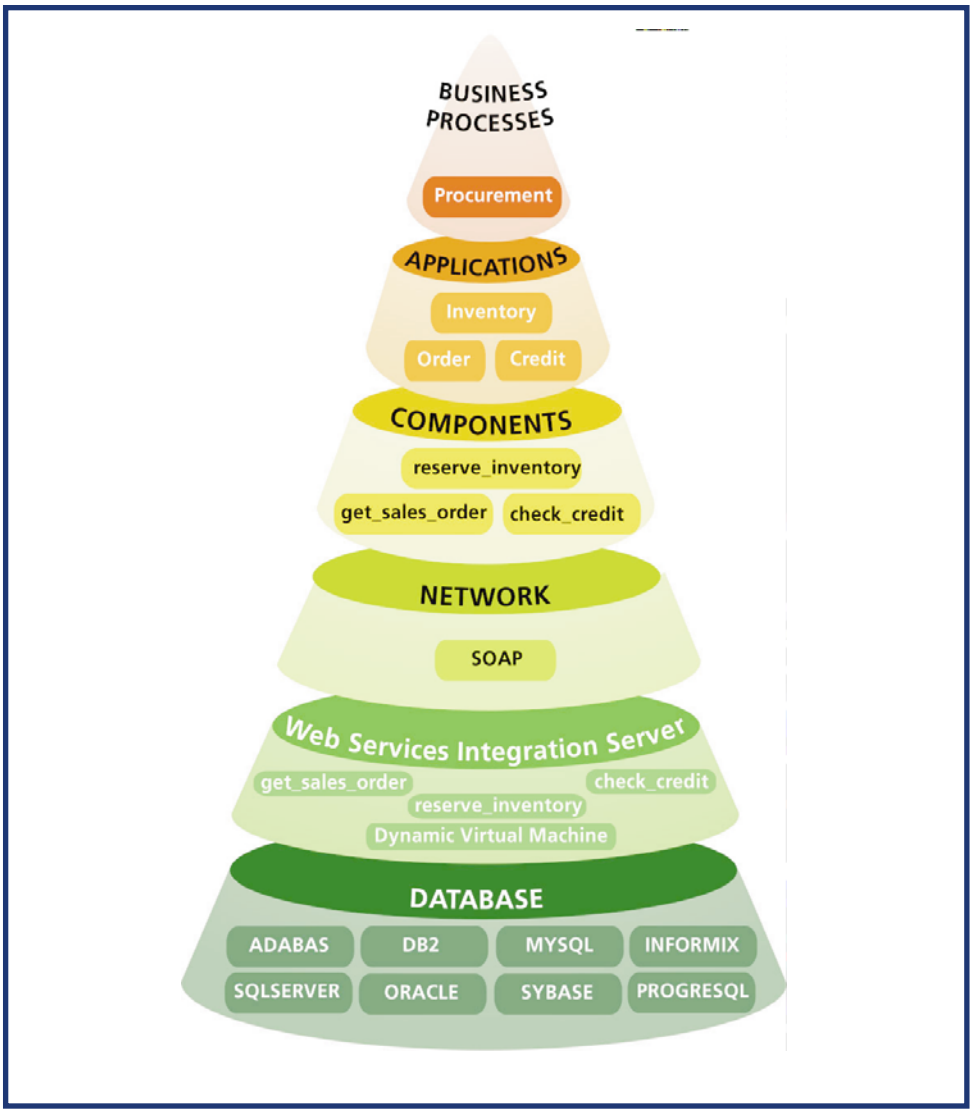

Figure 5. Integrating Business Processes Requires Native & Simultaneous Access to Industry Leading Databases

> Fact or Fiction?

Much of the work surrounding XML and Web Services has been ongoing for several years. XML grew out of SGML in 1996 and was validated by the WC3 Forum in 1998. Though still evolving, XML, UDDI, WSDL and SOAP have already clocked up several hundred thousand miles. Sponsored by OASIS (founded by IBM and Microsoft along with nearly 70 other industry leaders), they are accompanied by the United Nations/CEFACT organisation whose mandate covers worldwide policy and the technical development in the area of trade facilitation and electronic business. Headquartered in Geneva, UN/CEFACT developed the international UN/EDIFACT standard. Two thousand members of the Global Commerce Initiative (GCI) have signed up to deploy Web Services as the backbone of their new data exchange. Founded in 1999, the GCI represents retailers of all sizes across the globe involved in the complex supply chain for consumer goods.

Forrester Research sizes the e-business software market at $14.5B and Gartner Group estimates that 80% of integrated application environments will have evolved into integrated service environments focused on Web Services. The momentum exists to ensure that Web Services standards have a lasting impact on the way the world does business today and in the foreseeable future.

That's good news for Four J's ... and its customers. Four J's is proud to contribute to this movement and provide solutions today, built upon this rich heritage. Four J's believes wholeheartedly that Web Services are here for a long time to come.

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