Web services represent a significant technology change that will alter industry power dynamics and shift the landscape for users. These effects will take time to unfold, but those perceptive enough to align themselves along the new developmental axes will be best positioned for the future. If you want to understand the forces shaping the evolution of information technology, the Web-services world is a good place to start.

Web services are software building blocks that interact using Internet standards such as extensible markup language (XML) and simple object access protocol (SOAP). They can be exposed to other Web services within an enterprise or trading network, to remote service providers or customer sites, or directly to end-users.

Last month we put Web services in historical context, describing an “evolutionary revolution” in software development rooted in component software, application integration and other trends. Now we turn to the future. The branches of the Web-services tree are as long and tangled as its roots, making it important to understand both.

Web services are one of at least three related Internet transformations now underway, including broadband (see Release 1.0, July/August 2001 and February 1999) and peer-to-peer (P2P) (see Release 1.0, November and December 2000). All are unfinished. Now is the time to consider their implications... and how to shape them.

As always, vendors are fighting over protocols and positioning their offerings to capture mindshare. These surface skirmishes mask
deeper questions. Will the balance of power in information technology shift from product creators to service providers? Who will control the crucial mappings between services? Will users gain greater choice and freedom, or will they find themselves tied to providers who control their very identity?

Web-services deployment is following three paths. **Bottom-up**, individual developers are adding XML-based interfaces to applications. They are doing so to solve real-world integration problems, or to expand the market for their products by making it easier for others to connect to them. **Top-down**, major vendors are developing standards and releasing platforms that implement them (see the boxes in the last month on pages 5 and 9). **Inside-out**, managed networks are linking together companies in dynamic business webs (see page 13).

Future developments will depend on how four key challenges are addressed: semantic gaps between applications, identity management, Web-services networks and business models. Below, we first consider how Web services will spread beyond tools and development platforms. We then examine each of the four challenges, and trace how the story will likely unfold.

**Beyond Platforms**

**Where are the services?**

It’s natural that the first wave of vendors in a new space create infrastructure or focus on familiar problems such as internal application integration. Developers need tools before they can do anything else. And while the possibilities for dynamic connections between unrelated parties are exciting, there’s a huge trust barrier to overcome.

Many of the businesses that have experimented with Web services have been more comfortable using the approach inside the firewall.

Yet there’s more to Web services than that. The whole idea of loosely coupled systems is that companies and applications won’t be locked into pre-defined relationships. The first personal computers were home-assembled kits, but the PC industry as we know it began
when companies such as Apple and Commodore started selling complete boxes to non-technical users. Similarly, mechanisms to let companies build Web services are important, but so are pre-packaged services that can be invoked remotely. It may be that Levi Strauss and the pickaxe vendors were the surest beneficiaries of the California gold rush, but some prospectors did strike gold.

Microsoft has announced plans for standalone Web services that it will charge for under its My Services (née Hailstorm) initiative (see page 8). The first deliverable, .Net Alerts Service, will let consumers opt-in to receive automated alerts from Websites such as eBay, E-Trade and Expedia. Many sites already offer alerts triggered by events such as stock price moves, either built internally or using alerting service providers such as Envoy, Adebra or Par3. The appeal of Web services for alerting is that the alerts can be deployed and customized more easily, and can tie into a central repository of user information and preferences.

Microsoft is not alone. TIAN, described below, builds applications that can be called as Web services. Userland is working on a desktop hub to orchestrate services. Groove Networks this month announced a $51 million investment from Microsoft, based on synergies between its collaboration platform and Microsoft’s .Net component environment. More examples are bound to follow. Standalone Web services will serve a function similar to infomediaries such as MySimon and Epinions, only they will add value without sending users to a separate Website.

**TIAN: on-demand relevancy**

TIAN offers a suite of applications to Websites, enterprises and service providers based on its technology for understanding and responding to the context of a user’s session. Founder and CEO Christian Gheorghe started an early customer relationship management company in 1991 that analyzed data for companies such as AT&T, TCI and Time Warner. Recognizing that the Internet would transform customer relationships, he sold his first company to Experian and started TIAN to provide analytics and optimization in realtime.

TIAN’s secret sauce is its relevancy engine. Collaborative filtering and personalization services (see Release 1.0, September 1998 and November 1996) rely on data from previous transactions. By contrast, TIAN’s offering links information to context in any situation. Instead of using one approach, the company employs 19 different algorithms to provide the best response in a particular case.
TIAN uses a distributed architecture, with context inferred, relevancy calculated and intelligence re-injected at several places in the network. Customers can establish data collection points at an origin server, regional aggregation point, edge server or potentially at an end-user device such as a smart mobile phone. If you analyze relevance only at a Website’s origin server, says Gheorghe, “you don’t necessarily capture the need state of the user. You need the whole picture across the infrastructure to be able to react and improve the quality of experience.” If information is coming from a caching server operated by a content-delivery network such as Akamai (see RELEASE 1.0, DECEMBER 1999), for example, the data on that server is what needs to be analyzed.

In effect, TIAN does the same thing as the distributed denial of service protection companies we covered earlier this year (see RELEASE 1.0, FEBRUARY 2001). It sifts through data collected in many places, trying to recognize patterns. When it finds them, it dynamically repackages existing templates with relevant content.

In TIAN’s case, these patterns are things such as whether a person is a browser, a shopper, an information seeker, or someone in search of self-help... and whether that situation changes. A salesperson looking for pricing information on a wireless device likely has one need state (closing business), while the same person using a laptop to review new product features has a different state (information seeking). What that person considers relevant may differ in each situation. Personalization...
engines and identity services such as Hailstorm don’t capture this level of context because they don’t operate on a user-session basis.

TIAN has built all of its applications as Web services so they can be deployed on top of existing infrastructures. Customers can feed requests at runtime using standard messaging such as SOAP and get back recommendations as to what the request means about the user and which content is most relevant. TIAN’s applications act as a shared grid of services that the infrastructure can leverage. “This is a place where self-describing objects can go to get intelligent,” says Gheorghe.

A Question of Semantics

The ontology problem
Web services need more than common syntax to express application or business logic. Two partners may both have a concept of a customer record, but use completely different data elements. A user calling resources related to bonds may be thinking about fixed-income securities or a baseball slugger. An eBay auction might be wrapped as a set of standards-based SOAP messages, but not made available on other sites because eBay can’t generate revenue from the seller. This could be called the ontology problem, because it’s similar to the artificial-intelligence challenge of creating ontologies, or structured representations of knowledge and concepts.

The official story that vendors such as IBM, HP, Ariba and Microsoft are pushing is that the solution is a new set of protocols for orchestration, directories and so forth. Yet standards alone merely push the problem to higher levels. Remember the NASA Mars lander that crashed because thrust instructions were sent in English measurements to a system designed for metric units? There wasn’t a failure to communicate; there was a failure to recognize conflicting assumptions. Such assumptions are dangerous when they are evident only to someone outside the relevant conversation.

The Universal Description, Discovery and Integration (UDDI) and Web Services Description Language (WSDL) standards provide mechanisms to describe services in directories, but that doesn’t help much if the same service or interface can be described in multiple ways. (On this point, see Clay Shirky’s article listed in the resources section.) Moreover, using standards to enforce interface and semantic conventions cuts against the grain of the freedom and flexibility that Web services promise (see box, page 18).
Alpiri: distributed ontologies for Web services
The startup most directly focused on Web-services ontologies is Alpiri, founded by R.V. Guha and Rob McCool. Guha was lead architect for Cyc, a high-profile artificial intelligence effort to represent common human knowledge. He was the primary creator of the World Wide Web Consortium (W3C)'s resource description format (RDF) standard for metadata (see release 1.0, May 1998), and spent time at Netscape and Epinions. McCool helped develop NCSA httpd, the first widely used Web server, which became the foundation for Apache. He was one of the creators of the common gateway interface (CGI) scripting mechanism, and is also a Netscape veteran.

Alpiri creates semantic knowledgebases that map requests to services the way the domain name system (DNS) maps requests to Websites. Instead of translating one-to-one between the schemas and naming systems, Alpiri links each to a core vocabulary of concepts and relationships. If you know there is a kind of object called a music album, that albums are created by groups, and that groups have things like bios, tour dates and discographies, you can build rich linkages without matching the ID numbers different retailers use for each album. “You and I don’t reference things by pointing to neurons in our head; we give descriptions,” explains Guha.

Guha and McCool looked for a concrete application to demonstrate the utility of this system (and Web services generally). They decided to kill two birds with one stone: the limitations of search engines, and the poor state of online advertising. The idea was that visitors to portals and search engines should be able to pull back more than just a keyword-based list of Web pages in response to their search queries. They call it realtime advertising.

With a small team in a mostly empty Silicon Valley office vacated by another startup, Alpiri created prototypes with information related to sports and music. When a user enters a request, it is automatically turned into a structured query that in realtime pulls back related eBay auction items, albums and so forth related to the request.

Portals have offered related links and ad banners for years. However, these connections are hard coded, making it difficult to add new data feeds. “It’s like making a building to survive an earthquake. If it’s too rigid, it’s a nightmare,” explains Guha. Moreover, simple keyword linkages ignore context. When a user types in “Sting,” should the system return information about the musician or the movie...or bees? In addition to these semantic issues, Alpiri had to tackle caching and other performance challenges to build a general-purpose platform that worked at Internet scale.
Alpiri has held discussions with major search engines, e-commerce sites and others, but hasn’t yet finalized its business model. Guha believes the real revolution in Web services lies not in the protocols, but in the interaction model that now becomes possible. “All the SOAP/XML stuff is a different syntax for something that could be done in 1982,” he says. What’s new is that, “We are taking data exchange from batch mode to interactive mode.” Just as time-sharing replacing batch-processing mainframes was essential for the emergence of the PC and its user interface, he believes, interactive Web services will be the catalysts for the next stage of Internet evolution.

Identity Services

He who controls the names controls the universe!
Identity is a crucial element of pretty much any vision for the future of the Net (see RELEASE 1.0, FEBRUARY 1998). Without identity, every service is one-size-fits all. Security can’t be assured unless there is some way to authenticate the person requesting a service. And many resources that could support richer transactions or information offerings – your credit card number (and balance), your address book, your favorite restaurant – simply can’t be invoked without an identity mechanism.

The problem with identity is that it’s both radically centralized and infinitely distributed. There is only one you, and you’re in only one place at a time. But in any given situation, you could be connecting to the network from an arbitrary number of points, on an arbitrary number of devices, through an arbitrary array of services.

You probably carry some forms of identity verification with you, such as driver’s licenses and credit cards. However, it wouldn’t make sense to load up all your identity-related data on a personal smart card. What if it were lost or stolen? How could you trust that any place you inserted it was secure? And it wouldn’t be easy to come up with a universal standard so that the information could flow from wherever you were to whatever services needed pieces of it.

Putting identity databases in the network addresses these concerns, but creates new problems. If all the data is in one place, that becomes a huge security and reliability risk. A central identity repository would also give whoever owned it tremendous power. In the physical world, credit-rating services and government agencies that keep files on individuals have rules that (in theory) control who has access and how information is managed.
Web services bring these issues to the forefront. A world in which businesses and end-users invoke services from multiple sources requires powerful identity mechanisms. For a company to call a service from an outside provider, there must be some way to authenticate that provider and exchange information about both parties’ preferences and characteristics. For consumer services, the number of relationships is greater, while the commercial value and duration of each relationship may be lower, making a universal solution even more essential.

**My Hailstorm Services**

Microsoft was the first large technology vendor to grasp the strategic importance of identity services. (We’re not counting companies such as VeriSign that built their whole business on identity.) Microsoft acquired Firefly (see Release 1.0, February 1998) three years ago, and has made Firefly’s reworked Passport authentication technology the centerpiece of its network-based authentication efforts.

In March, Microsoft announced Hailstorm (see Release 1.0, May 2001), since renamed .Net My Services – a duller but less threatening moniker. My Services includes containers for various aspects of user identity (address, notification preferences, favorite Websites, credit-card numbers, etc.) that can be called as Web services. It delivers the three primary components of a digital identity system – data storage, authentication and authorization – underneath a starter kit of applications.

“Hailstorm is a digital safe-deposit box,” says Microsoft’s Charles Fitzgerald. “The basic premise is, ‘what are the set of things that deliver a consistent, personalized experience across different technologies?’” The examples he and others at Microsoft list seem simple – viewing your calendar on whatever screen happens to be in front of you, or automatically pulling in the Seattle Mariners’ schedule by clicking on a Website. If My Services succeeds, it will be for two reasons: the same infrastructure can span any content or device, and users can opt in or out of anything at any time.

My Services takes Passport to a new level. “What Microsoft realizes is that the value of a name or namespace is a function of the data exchange enabled by that namespace,” observes R.V. Guha of Alpiri (see page 6). “And the best way to increase that data exchange is by creating a platform around user data.”

The payoff that may make Microsoft’s investment worthwhile comes from the sheer scope of the opportunity. Microsoft has said it intends to charge users for the identity-based services it delivers. With hundreds of millions of potential users, the num-
bers add up quickly even at $2 to $5 per month. As Fitzgerald notes, this is part of a larger effort to reinvent Microsoft for the coming service-oriented world (see page 19). “We want to align the business model with the value proposition,” he explains. “You’re the only person in the world who cares about your stuff.”

**Give me liberty, or give me. . . a magic carpet?**

Other than a limited alerting service (see page 3), My Services is still just an announcement. But it has already provoked a strong response from other technology vendors concerned that Microsoft will strengthen its control over customers. In particular, Sun and AOL have argued that My Services is a closed platform, and that Microsoft is looking to lock in users by gaining centralized control over their personal data. Microsoft’s response is that it will allow Passport to be “federated” with other identity systems through the non-proprietary Kerberos standard. For example, a bank or an online merchant could maintain its own data stores, with Passport serving as the authentication layer.

AOL is working on its own universal authentication technology, code-named Magic Carpet, but hasn’t yet announced details. Late last month, a group of companies organized by Sun announced the formation of the Liberty Alliance, which plans to define specifications for federating identity-based services.

Contrary to some reports, Liberty is not an alternative technology to My Services. Its members have committed to developing an open mechanism for sharing identity-related data, not to any particular mechanism or system. Sun and Microsoft are bitter competitors, but some Liberty Alliance members are also Passport partners who may federate their data repositories with those that Microsoft manages.

“The goal here is not competition; the goal is interoperability,” says Jeff Veis, Sun’s project lead for the Liberty Alliance. Sun intends to be just one of many charter members, and doesn’t plan to run its own identity repository. By leveraging existing systems, the group hopes to move quickly. It intends to define a core specification by the end of the year, and to have trial implementations in the first half of 2002.

**Physical education**

The most interesting aspect of the Liberty announcement is the presence of companies such as Bank of America, Dun & Bradstreet and VeriSign that already manage and make available large databases of personal information. In fact, the group has
more than 30 members, including Nokia, Fidelity, United Airlines, GM, Cisco, Sony, RealNetworks and Intuit. All eyes today are on the technology infrastructure providers, but they provide only the plumbing.

The real-world scenarios can be complicated. If I use my Nokia phone tied into the OnStar wireless navigation system in my GM car to connect to my Passport account so that I can check the balance of my Bank of America savings account, who controls the data and who gets paid? “The challenge of an open federated approach is that it has to be as seamless as if one company were running it,” notes Veis. The Liberty Alliance has established working groups to address four aspects of this problem: technology, business, policy and marketing. The group’s goal is a system as universal and transparent as the Internet’s DNS.

In the physical world, clearinghouses such as credit rating agencies and credit-card processing networks knit together identity-based information, usually in exchange for a small share of each transaction. The question is whether users will view online identity as a similar invisible utility, or as a convenience they directly pay a primary provider – Microsoft, AOL, a bank, a local phone company – to deliver.

The battle is now joined. If federation mechanisms truly were open and secure, providers of identity-based services would compete on the basis of features, price and convenience, rather than on who controls the largest number of user records. “Our feeling is that there should be competition for the consumer’s trust,” says Veis.

Keep an eye on telecom
Microsoft’s original Hailstorm announcement led to an outpouring of interest among IT companies in identity services. Seeing the spectrum of possibilities as only My Services, Liberty Alliance and Magic Carpet, though, misses something big. Participants in other network industries such as telecommunications have been thinking about identity for their own reasons.

Earlier this year, we examined the ENUM standard for mapping Internet protocol addresses to telephone numbers (see RELEASE 1.0, APRIL 2001). The idea behind ENUM is that your communication address (phone, email or Web) should be the touchpoint for various other pieces of information about you. Neustar, the Lockheed spinoff that administers the North American Numbering Plan for telephone number assignment, has been actively promoting ENUM, as has VeriSign.
Millions of users have accounts with AOL or Passport, but billions around the globe have phone numbers. Recognizing this, VeriSign spent $1.2 billion in late September to acquire Illuminet, which makes software that telcos use to deliver advanced services. VeriSign hopes to use its position in Internet address management as a stepping stone to identity-based services involving telecommunications networks.

The telecom analogy to federated identity systems is local number portability (LNP). The US Telecommunications Act of 1996 mandated LNP to allow customers to keep their phone numbers when switching local phone companies. In essence, this is a database system that the phone network checks before completing a call.

LNP delivered an unexpected benefit following the terrorist attacks on September 11. When Verizon switches in New York near the World Trade Center were damaged, the carrier was quickly able to update the LNP databases to redirect traffic through alternate switches in New Jersey. ENUM would allow similar redirection for Internet-based communications. Neustar ceo Jeff Ganek sees this as a powerful argument for ENUM. “The dynamic routing and control capabilities of an ENUM-like service allow re-routing of messages from one facility to another in a comprehensive way that was very useful in a disaster,” he told a conference in Washington, DC this month.

**Governance and government**

Identity services raise important policy issues related to privacy, security, consumer protection and antitrust. Inevitably, such services will be subject to some combination of private governance mechanisms and oversight by actual governments. Already, national and international agencies are heavily involved in telecommunications addressing, and privacy regulations limit how financial-services institutions can make use of the identity data they manage. The Internet Corporation for Assigned Names and Numbers (ICANN) has gone through a rocky process to build a non-governmental governance structure for the DNS. [Disclosure: Esther Dyson was ICANN’s founding chairman and still serves on its membership advisory committee.]

So far, neither Microsoft nor the Liberty Alliance has said much about the governance aspects of their identity services. Private mechanisms similar to the standards processes of the Internet Engineering Task Force or the World Wide Web Consortium would be more efficient than direct government involvement. However, there’s a danger that the schism among technology providers will prevent a private governance effort from gaining the necessary support.
Banker, baker, thief? Mother or father? Good for $10, $10K or $10 million? Licensed practitioner or opinionated know-nothing? Curious amateur or apprentice terrorist? Grateful customer or secret shill? Earnest young student or perennial con artist? Cute 16-year-old or dirty old man? Registered employee or fired, disgruntled ex-employee off the payroll but still in the access database? Astute real-estate investor, or the mayor’s friend making illicit use of inside information?

There’s a lot of talk about identity these days, but it’s worth pointing out that what let the high-jackers board their planes on September 11 was not — as far as we know — use of fake IDs, but rather a lack of coordination at the back end, unifying what was known about the individuals and drawing conclusions from it.

Identity isn’t all or nothing. Law enforcement wants to put different facets of an identity together, so that individuals cannot evade responsibility for their acts or obligations. Marketers want to know what someone wants and will pay for, even if they don’t know the person’s name, while people in a chat room or on an expert ski slope (or an ICANN discussion list) simply care about someone’s credentials or role, with no interest in the “whole person.”

In short, identity is a complex concept, just like privacy. It means many things, and it’s a collection of information — which can be either centralized or decentralized.

Avoiding centralization

What does this mean for these new passport/ID/identity/wallet systems that are causing so much buzz right now?

One could imagine a totally “safe” world in which each individual’s every action and affiliation was closely monitored by not by a person but by a global data-mining system... but most people would prefer not to. That would potentially turn control over to another group of oppressors. Nor would it guarantee security.

Let’s focus on actual risks, rather than tracking everyone. In the end, security depends not just on identification, but on behavior. Is the person carrying a box-cutter? Is she interested only in flying a plane, not in taking off or landing it? Does he keep trying to get at certain restricted files? Does she work odd hours?

Here the issue is coordination. If a person never shows up at the school he paid a fee to and cited on his visa application, overstays his visa, and then shows up at baggage screening with a box-cutter, how can all those bits of information be correlated in real-time?

Perhaps the most important single rule is that there should not be a single “identity authority.” Let’s avoid concentration of power in either government or commercial hands.

There needs to be interoperability between identity mechanisms, but by default the centralization should reside with the user, with the user the focal point and the integrator of the disparate systems. It should be the user’s decision to “re-use” his credentials from one service to another. That reflects real life: People have different identities and roles from context to context; they behave differently and present different facets of themselves. That’s not pathological and should not be treated as such.

The right tradeoffs

How can we reconcile the tensions and create the right trade-offs between efficiency and accuracy and responsibility on the one hand, and freedom and privacy on the other? Law enforcement should be able to integrate personal information upon showing appropriate cause... but what’s “appropriate cause”?

That will be a long argument we can’t resolve here, but we have already made a start as a society; let’s not now go too far in one direction. Already, anyone issuing a credential may require contractual obligations. Call it “light confidentiality”: We give you a credential and keep your identity or information private except under certain conditions.... Those conditions could include failure to fulfill an obligation, conflicts of interest (perhaps verified through some trusted third party), odd behavior (with fair warning) and of course government-issued warrants.

There are still many issues to work out. Juan may want to have a third party assert his creditworthiness, based on details kept confidential from anyone else. Or Alice may want her broker to certify that she doesn’t own any stock in WonderWidgets, without revealing what stocks she does own. How to deal with the fact that Alice may have several brokerage accounts? Or that, with no formal ties, Alice and Juan may be in cahoots? There’s no easy way to do so. It’s time to change the practice, perhaps, but we already have the laws to allow substantial discovery of the facts when there’s cause.
Web-Services Networks

Weaving the web of services

Integrating computer systems is always tougher than it looks, especially when you don’t control all the points involved. If a system you’re talking to doesn’t send back what you expect, or respond when you expect it, what do you do? Exception handling becomes so important and complex that it often overpowers the process of defining the normal rules for an interaction.

Rajiv Gupta, who led HP’s pioneering E-Speak Web services project (see RELEASE 1.0, JANUARY 2000), poses the problem directly: “A lot of people have focused on the functional aspects of Web services, but in running a business, it’s the non-functional aspects that sometimes are more important. Is it going to perform? Is it going to scale? Is it going to be enterprise-ready? All of that is what the cios need to see, and is sorely lacking today.”

There are many such questions that must be answered. How to ensure security when there’s no one in the middle controlling all the access points and validating all the transactions? How to model the subtle but essential meta-rules concerning application flow and timing? For example, the stock quote I request for you might be an essential precursor for a real-time trading application, or it might be the contents of a monthly portfolio update. There are proposed protocols such as Web services flow language and XLANG that address this area, but they are only a start.

If a consumer uses Web services to check the correct time by querying an atomic clock, and the request fails, the consumer will simply send it again. If the request involves a B2B situation where millions of dollars depend on accurate, reliable, non-repudiable transactions, that’s not good enough. Businesses are willing to pay to get the security, reliability, authentication and management capability they desire. This goes beyond standards and software tools. “If Web services are going to make it commercially, we need an infrastructure to allow that to happen,” says Flamenco Networks CEO Dave Spicer (see page 14).

Today, enterprise software platforms such as PeopleSoft and SAP are often the hubs that bring together partners offering specialized services, through portal interfaces, middleware or hosted offerings. Web services open up the interfaces between components, making it easier to tie together different kinds of systems. However, there must still be integration points responsible for performance and orchestration. Web-services networks fill this gap.
Grand Central: the middle of a decentralized world

Grand Central, which we covered in our report on peer-to-peer infrastructure (see RELEASE 1.0, DECEMBER 2000), was the first Web-services network to launch. Instead of selling software, Grand Central is a service provider. It hopes to be a universal utility for companies interested in integrating business processes across organizational boundaries. In effect, it’s outsourced middleware: as long as you can plug into the Grand Central network, it handles the plumbing such as queuing, policy management, access controls and metering.

Conceptually, it is the next generation of value-added networks (VANs), the point-to-point connections that are still the primary mechanism for cross-enterprise data connectivity. While startups such as TransactPlus and SlamDunk Networks use the Internet to offer VAN-like robust and secure messaging with significantly lower prices and provisioning times, they know nothing about the content or transactions they carry. Grand Central’s vision is broader. It sees its value in the management layers it adds on top, such as orchestrating disparate services and translating between protocols and connection methods.

Grand Central will charge customers based on the number of other companies they connect to over its secure messaging network. A single point-to-point connection is free, to encourage companies to try the service. Grand Central is banking on the network effects: every customer integrates with partners, who then become potential hubs themselves.

In effect, Grand Central is what Microsoft once called a megaservice – a huge data repository in the cloud. Grand Central’s directories will be the repositories for data and rules governing the business processes of its customers. If it can convince enough companies to sign up, this could be an extremely sticky and valuable asset.

Flamenco Networks: Web-services telephone jack

At Oracle, where Flamenco Networks ceo Dave Spicer was vp of development for the financial applications division, he participated in an industry consortium to develop standards for exchanging documents. “We agreed on what was going to be transferred, but we never agreed on how,” he recalls. After Oracle, he worked at B2B software vendors Clarus and Tradex, which also experienced the challenges of integrating business systems. Today, it’s clear that XML is the solution to the “how” problem for transferring information between applications.
But XML alone isn’t enough. . . which is where Spicer’s other experience, building networks at Bell Labs, factors in. “I saw an opportunity or need for a true network, not a hub-and-spoke approach which I saw from the software vendors,” he explains. Like Grand Central’s founders, Spicer saw the need for secure managed transactions as a key element for the success of Web services, and a network as the best solution to make those capabilities ubiquitous. (Grand Central’s reference points are consumer services such as CNet and Excite, in contrast to Flamenco’s B2B heritage.)

Flamenco and Grand Central use different architectures. Grand Central routes traffic across its own network through regional gateways. Its customers add special headers to their SOAP messages to send them through Grand Central’s infrastructure. Flamenco has a hybrid approach combining centralized and peer-to-peer configurations. Customers deploy proxy software in their own networks. The proxies communicate over Flamenco’s network to manage transaction flow, while the actual SOAP messages flow transparently across the Net. Flamenco provides a central management site customers use to establish, monitor and configure connections.

One consequence is that Flamenco doesn’t carry or store customer traffic. Where Grand Central charges partly based on usage, it charges a flat fee. There are other benefits, says coo James Davis: “Most companies would prefer not to send their mission-critical and business-confidential information to a third party if they don’t have to.” This reluctance to send data outside the firewall is especially true for internal Web services. The tradeoff is that customers must install Flamenco’s 200K Java proxies, and must send messages using a Web-services protocol. Grand Central’s more centralized architecture gives it greater ability to translate data in the network.

Spicer says the real value Flamenco adds lies in the management capabilities it gives its customers. For example, if a company wants to disallow another company from invoking a Web service it has published, it can use Flamenco’s management console to break the connection without having to change the service itself. Each transaction has a unique ID, which allows parties to track activity and verify transactions.

By using a network model and not requiring its customers to write any custom code, Flamenco hopes to lower the barrier for businesses to use Web services across corporate boundaries. “What we’ve done is provide a telephone jack that is exactly compatible with a standard Web-services plug, and yet it provides through the jack all of the robustness, security and reliability companies need,” says Davis.
The Business-Model Shuffle

There is striking agreement that the IT infrastructure of the future will be built on a foundation of Web services. Look more closely, though, and you’ll find many cracks and fissures in the façade. Just as Netscape, Microsoft and AOL bought into the Web at different times and in different ways, companies will approach Web services based on their existing interests and business models. As with the Web, those business models themselves will have to change to accommodate the new environment.

Commodity communications

The Internet spawned a revolution based on connectivity: Every person and machine could now be linked through a global web of networks. In other words, the Net commoditized communication between systems. Services such as Expedia, Amazon.com, Salesforce.com, eBay, Napster and Yahoo! could not easily have existed in the days of proprietary online services and value-added networks. The open Net freed providers of those services from the cost and complexity of exchanging information with their customers and partners, allowing them to focus entirely on the value of their offerings.
Proprietary online services such as Prodigy and networking vendors such as Novell struggled in the Internet era as their core business stopped being a source of added value. Established vendors such as AOL, Dell, IBM, Microsoft, Sun and Oracle were able to reassert themselves only through often-painful adaptation. IBM became a services company, AOL became a gateway to the Internet, and Oracle became the engine behind large Websites.

Web services commoditize a different type of communication: the dynamic, structured messages that flow within and between applications. This will have several consequences. In the near term, Web services will cause a boom in internal integration activity. With a lower cost, time and developer-expertise bar to connecting up systems, companies will suddenly find worthwhile projects that otherwise might not have even been considered (for example, the Southwest Airlines/Dollar Rent A Car system we described last month).

The Internet, and the massive IT deployments of the past seven years, gave companies a huge number of systems and applications that can talk to one another only imperfectly. The need for integration has never been greater, and for reasons we outlined last month, Web services offer a compelling solution.

Here’s the rub. If the Web-services model succeeds, it will make integration a commodity. Netscape created the commercial browser market. Hundreds of millions of browsers are now installed worldwide, making the browser perhaps the most successful user tool ever. However, Netscape itself is no longer around to celebrate. Thanks to network economics, helped along by Microsoft’s decision to give away Internet Explorer, the browser market generates almost no direct revenues. Only companies using browsers as a springboard to other revenue sources have survived.

Vendors depending on integration as the basis for their business face a similar challenge. “We are coming into an era where at last we have the terminology to talk about standardization of business processes. That means the additional value companies will create must be over and above that,” says HP’s Rajiv Gupta.

Those at risk include enterprise application integration (EAI) providers such as WebMethods, Vitria and Tibco, especially those at the messaging layer; electronic data interchange (EDI) companies such as Harbinger; application-server vendors such as BEA; and professional services organizations that manage integration projects whose costs can run to millions of dollars. Even when they see the importance of Web services, such companies often miss the full implications. “Their view of the
Programmers are also engaged in active debates about the best approach to Web services. Apache Software Foundation chairman Roy Fielding coined the term representational state transfer (REST) in his doctoral dissertation (see Resources) to explain the success of the Web’s software architecture. His argument was that, by offering only a small number of methods for communicating between systems (GET and POST), the Web forced developers to build applications with broad interoperability. Essentially, forcing developers to adhere to strict constraints in creating networked applications created more work initially but paid off in simpler interfaces that facilitated innovation.

Some technologists argue that a similar approach is necessary if Web services are to be as re-usable and interoperable as proponents hope. Others counter that Web services will only take off if developers build open interfaces to as many products and platforms as possible, and that will only happen if those developers have the freedom to choose the mechanism.

A parallel divide has emerged between developers who favor SOAP and those who choose XML-RPC as the messaging format for Web services. XML-RPC, created by Userland’s CEO Dave Winer (see Release 1.0, July/August 1999), is seen as simpler to adopt and less controlled by large vendors. SOAP, which Winer later co-developed with Microsoft and Developmentor, is more sophisticated. It has the imprimatur of the World Wide Web Consortium and major industry players such as Microsoft, Sun and IBM. Winer, who stresses that he is agnostic and supports both in his own products, sees XML-RPC picking up steam among developers as SOAP languishes. However, the major commercial Web-services development platforms and networks use SOAP.

Established companies may find ways to succeed in the new world, but they will have to reinvent themselves. BEA, for example, is trying to become a deployment platform for Web services. Systems integrators may arbitrage the difference between the hype and reality of Web services to preserve their integration revenues, at least for a time. Eventually, Gupta sees companies competing on their “business templates” and implementation expertise. “The source of differentiation will be the processes: how I use this standard infrastructure to run my business more efficiently,” he predicts.

From products to services
The right business model isn’t always evident. Thomas Edison and his bankers fought over whether electricity generation facilities should be sold directly to businesses or built to serve many customers who paid based on usage. Alexander Graham Bell originally rented telephones and gave away calls. Some Americans watch free over-the-air broadcast television, while others pay for cable service.

In general, though, businesses based on digital goods are moving from product sales to service provision. It costs almost nothing to produce an additional copy of a digital offering, whether music files or productivity software. The user isn’t really paying for the bits delivered; he or she is paying some share of the R&D and marketing costs...
the vendor has incurred over a period of time. The service model is even more compelling for upgrades, because vendors must work even harder to convince users to pay for the added benefit. Also, small upgrades such as bug fixes, add-ons and security patches don’t lend themselves to a product model at all.

Not to mention the intellectual property problem with digital goods sold as products. The music industry in the years A.N. (after Napster) is discovering what the software industry already knew: piracy can be slowed, but not stopped. And if vendors’ efforts to reduce piracy cause too much inconvenience for legitimate users, the vendors will end up reducing their revenues rather than protecting them. A service model doesn’t make these issues go away, but it offers providers consistent revenue streams, constant communication with customers (good both to prevent piracy and as a marketing channel) and a framework for regular updates.

Sellers of digital goods aren’t the only ones who must adapt. “All the things that are currently accessed by humans as services are ripe to be delivered accessible by machines as services,” predicts O’Toole, pointing to industries such as financial services and travel. These are already service businesses, but usually vertically integrated and highly dependent on manual processes. As the services become standards-based network-accessible components, market dynamics will change.

**Microsoft and decentralization**

Microsoft is one of the companies seeking to shift some of its revenues toward services, by moving corporate customers of Office to a recurring fee model, promoting the Web-services concept and launching new offerings such as My Services.

Microsoft likes Web services because they power both smart clients and smart servers. As the 800-pound gorilla of software, Microsoft is widely associated with centralization. However, as David Bank chronicled in his book, *Breaking Windows* (see resources), that’s not how Microsoft sees itself. The company was born out of the PC revolution, which split hardware from software and broke IBM’s hammerlock on the industry by decentralizing computing to the desktop. Microsoft’s major foes today are Sun, IBM and Oracle, whose strength lies in central servers and services.

Microsoft sees itself benefiting from the commoditization of communications that the Internet and Web services represent, just as it did from the PC’s commoditization of hardware. “The same thing you saw in the computer industry, where value shifted from hardware to software, is happening on the Internet side. The people
who are survivors are mainly those who created deep software assets,” says Microsoft Web-services strategist Charles Fitzgerald.

Unlike the Web model, where heavy lifting happens at the server and the client is a dumb browser, Web services allow the client to process information, call services and assemble applications. Unlike pure P2P, though, there’s still a role for servers, which can also originate or respond to service requests, or can host enabling services such as identity repositories. This gives Microsoft many revenue-generating opportunities: in development tools, in e-business software, in operating systems, in desktop application software and in services such as Hailstorm. Says Fitzgerald, “We want to be the BASF of services – we don’t build the services, we make the services better.”

**Not so fast**

Not surprisingly, other vendors have a different perspective. Sun, IBM and HP, for example, all sell a combination of hardware, software and services. They preach best-of-breed bundles that take advantage of open interfaces and multi-platform support. For them, Web services are an opportunity to shift the balance of power away from Microsoft’s dominant software assets. As Rajiv Gupta of HP argues: “I think Microsoft has bet their farm on .Net. There are a lot of cios that say, ‘we don’t feel comfortable making a bet.’ Our point is that you don’t have to.”

“The Microsoft approach has traditionally been closed, proprietary, single-platform,” says Gina Centoni, director of product marketing for Sun’s open network environment Web-service effort. “We believe that the customer base is making a choice.” As we pointed out last month, Sun is in a tricky position with Web services. The networked application model is a realization of the ideas Sun has promoted for its entire existence, but the company is wary that Microsoft will use Web services to pull customers and developers from Java. Sun is initially applying Web services incrementally, to power enterprise portals and to deliver services to non-PC devices.

For an independent perspective, we turn back to Userland’s Dave Winer, a veteran of many software industry battles. In addition to being the driving force behind SOAP and XML-RPC, Winer has been one of the most active evangelists for the Web-services concept through informal dialogue and through his Scripting News Weblog. At the same time, he is one of the harshest critics of the way large vendors are implementing the model.
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For further reading:
David Bank, Breaking Windows: How Bill Gates Fumbled the Future of Microsoft (Free Press 2001)
http://www.xml.com/lpt/a/2001/10/03/webservices.html

Winer’s prediction: “What will happen in this space is that de facto standards will apply. Leaders in markets will see their scripting interfaces as a competitive advantage and will be incompatible with their competitors. The markets will shake out and whoever is left standing will be the one with the broadest support among developers. . . which is how these markets always work.”

Stay tuned
Thanks to the near-universal support of key standards, Web services as a general approach will be widely adopted. Now the fun begins. Developer mindshare matters a great deal. . . but so does customer demand. From e-business platforms to Web-services networks to standalone services to identity mechanisms, individuals and businesses will vote with their pocketbooks. Where we go from here will depend on what crosses the line between ideas and adoption. ■ R 1.0
Calendar of High-Tech Events

2001

OCTOBER 19-21  **NUPTURING THE CYBERCOMMONS 1981-2021** - Ann Arbor, MI. Computer Professionals for Social Responsibility looks at the history and future of the global cybercommons, including Internet governance, “openness,” virtual communities, election technology, etc. Contact Nathaniel Borenstein, nsb@cpsr.org. For CPSR contact information, call 1 (650) 322-3778, fax 1 (650) 322-4748. www.cpsr.org/conferences/annmtg01/

OCTOBER 19-21  **PPOP!TECH 2001** - Camden, ME. This year’s title is “Online, Everywhere, All the Time: How it Will Change Our Lives.” Speakers include Carl Yankowski, Nadine Strossen, John Naisbitt, and Bob Metcalfe. For more information, call 1 (207) 230-2425, or email info@poptech.org. www.poptech.org/home.cfm

OCTOBER 23-27  **WEBNET 2001** - Orlando, FL. A world conference on the WWW and Internet, sponsored by The WebNet Journal and organized by AACE. For information, email conf@aace.org, or call AACE at 1 (757) 623-7588. www.aace.org/conf/webnet

OCTOBER 31 - NOVEMBER 4  **ICEC 2001** - Vienna, Austria. The first International Center for Electronic Commerce conferences to be held in Europe. Special emphasis on EC firms and government bodies concerned with e-government. To register, contact Johanna Leithner, 43 (1) 515-14242, fax 43 (1) 5124-226, or email johanna.leithner@intropa-dmc.info.tuwien.ac.at/icec2001

NOVEMBER 4-6  **FM 1 NEW DEFINITIONS: VALUE COMMUNITY SPACE** - Heerlen/Maastricht, The Netherlands. Focuses on the impact of “digitization” and the themes of value, community and space. Register online at www.infonomics.nl/newdefinitions/. For more information, contact Kamini Aisola at k.aisola@kaiaconsult.com. www.infonomics.nl/newdefinitions/

NOVEMBER 5  **SECURITY AND PRIVACY IN DIGITAL RIGHTS MANAGEMENT** - Philadelphia, PA. One-day workshop as part of the Eighth ACM Conference on Computer and Communications Security. Contact ADM at 1 (212) 869-7440, fax 1 (212) 944-1318 or register at www.star-lab.com/sander/spdrm/.

NOVEMBER 5-9  **NEXT GENERATION NETWORKS 2001** - Boston, MA. The 15th annual conference organized by John McQuillan and Business Communications Review. Covers the alphabet soup of networking technologies, including broadband access, wireless and optical networking. www.ngn2001.com

NOVEMBER 16-18  **INTERNATIONAL CONFERENCE ON ONLINE LEARNING** - Orlando, FL. The 7th Sloan-C International Conference on Online Learning: “Emerging Standards of Excellence in Asynchronous Learning Networks.” For information about conference arrangements, contact J. Patrick Wagner, 1 (407) 207-4920, fax 1 (407) 207-4930, or email jwagner@mail.ucf.edu.
Calendar of High-Tech Events

DECEMBER 3-5  **PRIVACY BY DESIGN** - Montreal, Quebec Zero-Knowledge’s second annual Privacy by Design conference brings together business, technology, and policy leaders. Includes speakers from IBM, Oracle, Acxiom, HP and GM. privacy.zeroknowledge.com/privacybydesign2001/registration.asp

DECEMBER 5-7  **GLOBAL CITIZEN NETWORKS 2001** - Buenos Aires, Argentina The second World Congress of Citizen Networks gathers around the theme: “Renewing Communities in the Digital Era.” For additional information, contact the secretary of Global CN2001 at secretariado@globalcn2001.org. www.globalcn2001.org

DECEMBER 10-13  **STREAMING MEDIA EAST 2001** - New York, NY Touted as the world’s largest Internet audio and video event. For more information, go to www.streamingmedia.com/east or call (888) 301-8890 to register. www.streamingmedia.com/east

DECEMBER 10-13  **FALL INTERNET WORLD** - New York, NY The mother of all Internet trade shows makes its east coast stop, after a two-month postponement due to the events of September 11. To register, call 1 (800) 632-5537; fax, 1 (203) 559-2814. www.internetworld.com

2002

FEBRUARY 20-23  **TED 12** - Monterey, CA Richard Saul Wurman’s final year running his cross-cutting, mind-expanding event. He modestly promises, “simply the greatest design conference there ever was.” www.ted.com

MARCH 24-27  **PC FORUM** - Scottsdale, AZ EDventure Holdings’ premier conference, now in its 25th year. Look for a speaker list and more details soon on our Website at www.edventure.com/pcforum. Contact Daphne Kis with any questions at 1 (212) 924-8800 or daphne@edventure.com. ☑️

**EDventure's High-Tech Forum in Europe – canceled for this year**

We are very sorry to announce our decision to cancel this year’s High-Tech Forum. Unfortunately, despite an excellent line-up of speakers, we simply did not get the critical mass of delegates that normally makes this event so valuable for meeting partners and sharing ideas. Rather than compromise on quality, we have decided to cancel this year's event so that we can come back with undiminished enthusiasm next year.

Events Esther plans to attend.

Events Kevin plans to attend.

Lack of a symbol is no indication of lack of merit. The full, current calendar is available on our Website, www.edventure.com. Please contact Irene Lawrence (irene@edventure.com) to let us know about other events we should include.
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