



Introduction to Web Services

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Agenda

- **Web Technologies**
- What is a Web Service?
- Why Web Services?
- Web Services Architecture and Standards
- Where are Web Services?
- Web Services Development



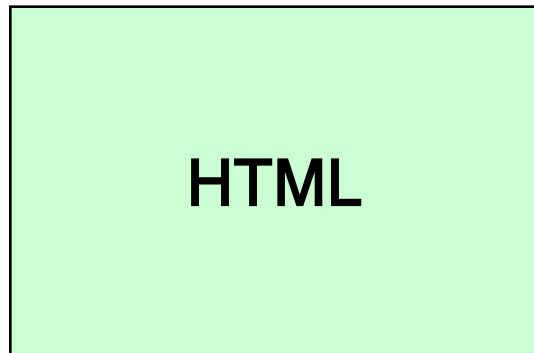
Web Applications (1/2)

- Application delivered to users from a web server over a network such as the World Wide Web or an intranet
- Users usually access Web application via the Web browser
- Human interaction with programs
 - HTML forms
 - Web programming

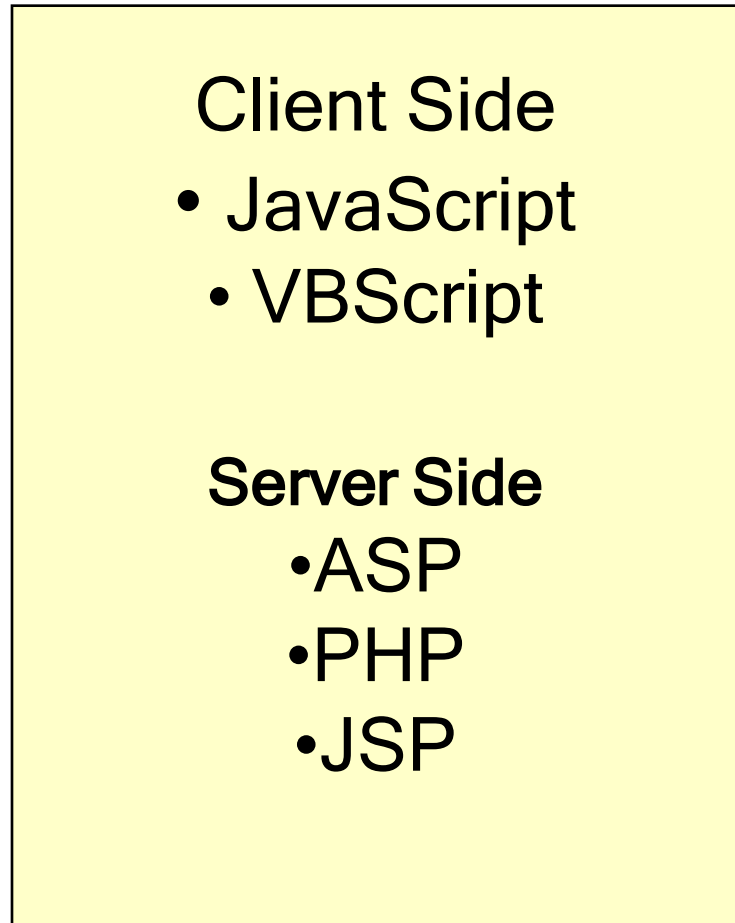


Web Applications (2/2)

Static Web

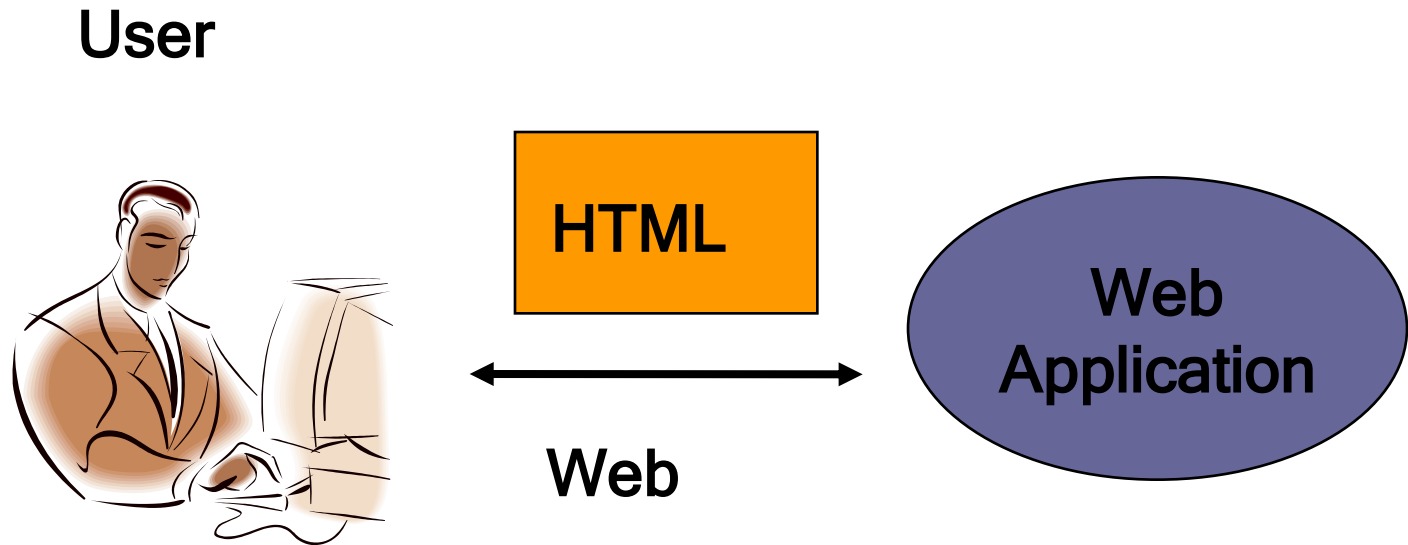


Dynamic Web





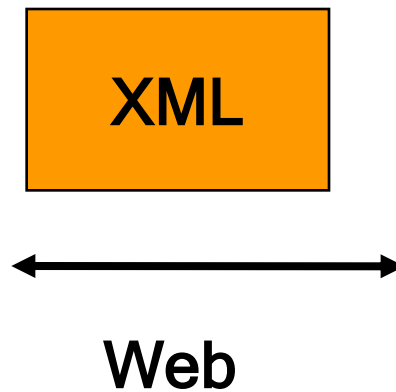
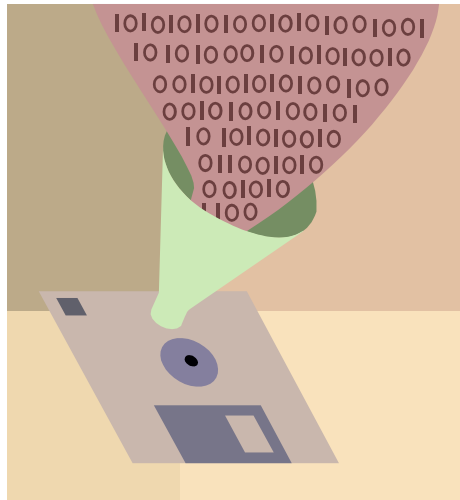
Traditional Web Interaction





Web Services Interaction

Application





Web Application vs. Web Services

□ Web Application

- HTML
- User-to-program interaction
- Static integration of components
- Monolithic service

□ Web Services

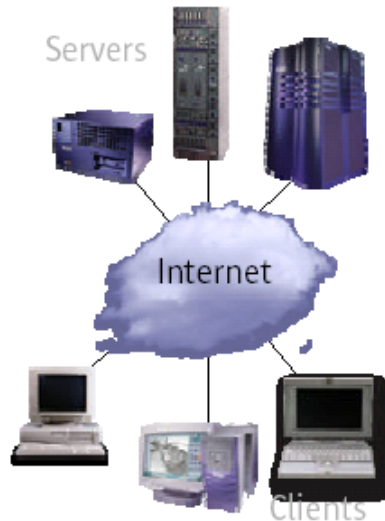
- XML
- Program-to-program interaction
- Dynamic integration of components
- Service aggregation



Distributed Computing Technologies



Client-server silos



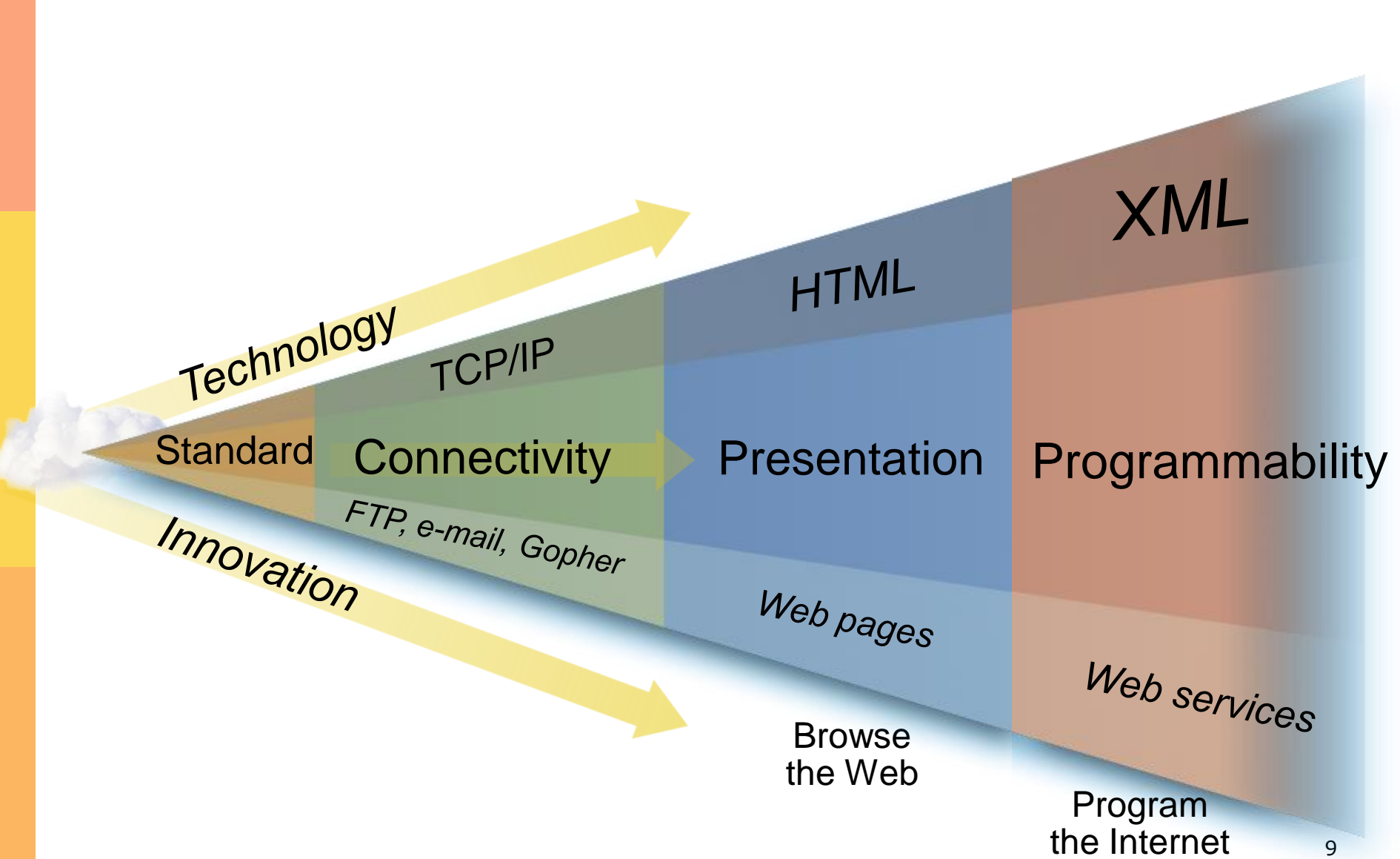
Web-based computing



Web Services/Peer-to-Peer



Internet Evolution





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Where do Web Services come from?

- ❑ This is not certain, but the term Web Services appears to have originated as an answer to the question “What are you developing SOAP for?”
- ❑ The main evidence for this is the chaotic nature of replies to the question “What is a Web Service?”



What are Web Services? (1/5)

- The term Web Services refers to an architecture that allows applications to talk to each other. Period. End of statement
 - By Adam Bosworth



What are Web Services? (2/5)

- Web Services are enabling technologies that facilitate the assembly and integration of applications in order to create new, more meaningful and/or more user-specific applications, all at the speed of the Internet.
 - By HEKATE (Higher Education Knowledge and Technology Exchange), "Web Services Enabling Technology for Application Integration and Assembly"



What are Web Services? (3/5)

□ Basically, Web Services are a means of allowing applications to talk to one another using XML (Extensible Markup Language) messages sent via the standard Web protocol of HTTP (HyperText Transfer Protocol is used to request Web pages from Web servers, and combines it with XML to pass structured information back and forth between computers).

■ By

<http://www.convergemag.com/magazine/story.phtml?id=30079>



What are Web Services? (4/5)

- [1] A Web service is a software system identified by a URI [RFC 2396], whose public interfaces and bindings are defined and described using XML. Its definition can be discovered by other software systems. These systems may then interact with the Web service in a manner prescribed by its definition, using XML based messages conveyed by Internet protocols.
- [2] A collection of EndPoints. [WSD Reqs]
 - By W3C Web Services Glossary

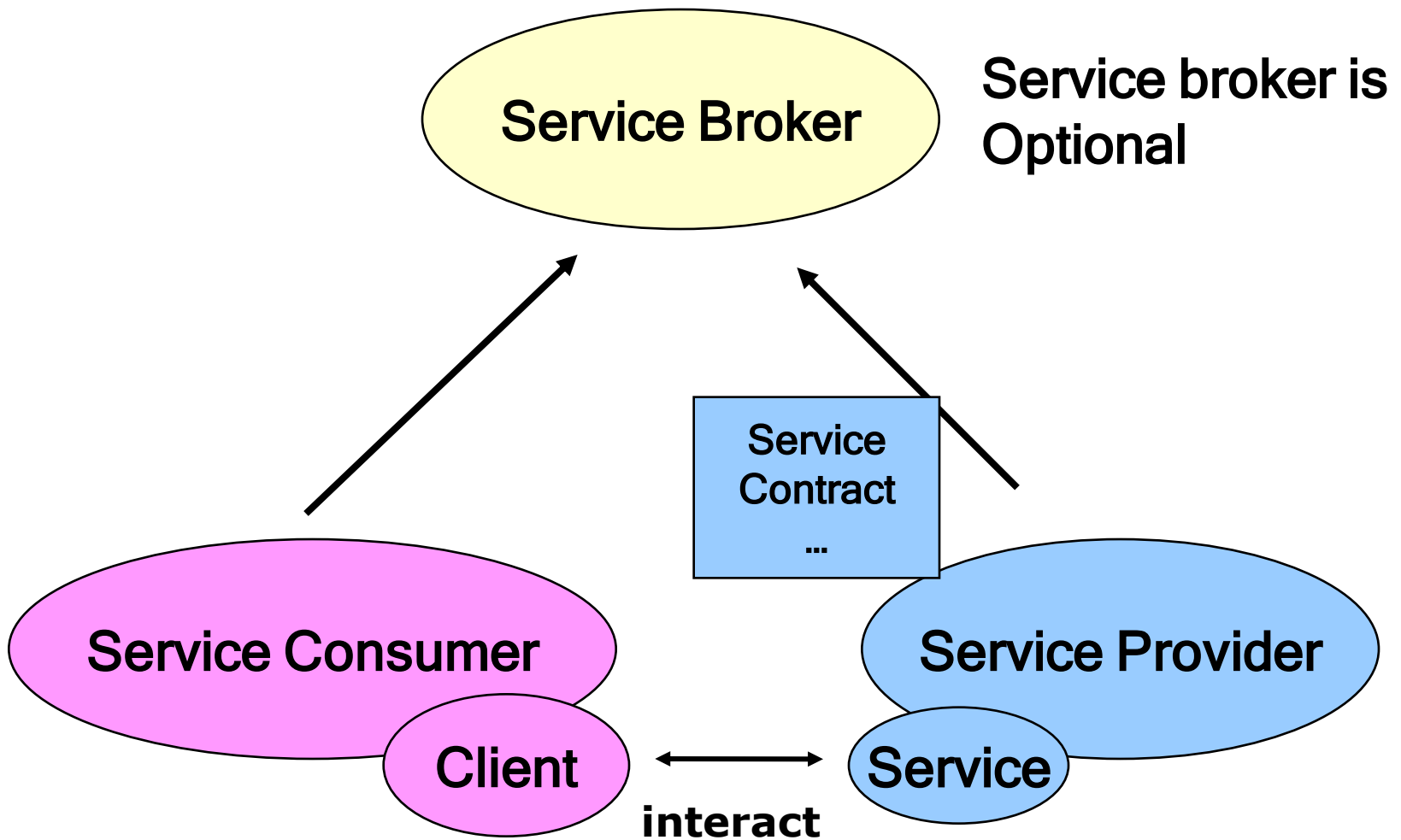


What are Web Services (5/5)

- Distributed system
- In which applications communicate with applications
- via XML messages
 - By C. M. Sperberg-McQueen, W3C
- Everything else follows from this. Most obviously:
 - messaging (e.g. SOAP, XML)
 - description (e.g. WSDL, XML Schema)
 - discovery (e.g. UDDI)
 - security (e.g. TLS, SSL)



Service-Oriented Architecture



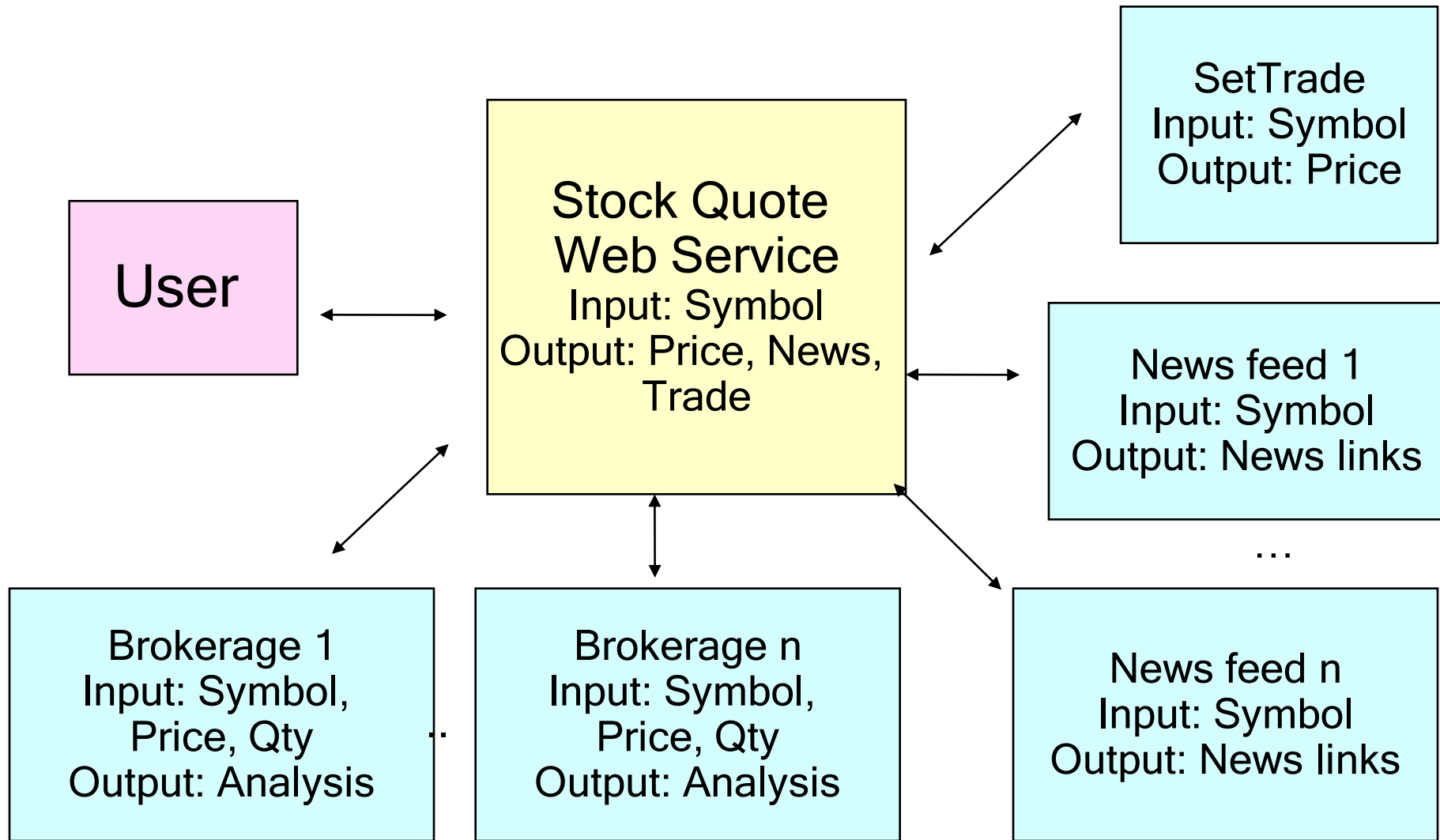


Characteristics of Web Services

- ❑ XML based everywhere
- ❑ Message-based
- ❑ Programming language independent
- ❑ Could be dynamically located
- ❑ Could be dynamically assembled or aggregated
- ❑ Accessed over the internet
- ❑ Loosely coupled
- ❑ Based on industry standards



Sample Web Service





Sample Web Services Usage Scenario

- ❑ E-commerce: order books, office supplies, other products
- ❑ Track packages: UPS, FedEx
- ❑ Weather forecast
- ❑ Search location on Maps
- ❑ Telephone redirection, customizable rules and messages



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Web Services Enabled through XML



New user experience
Software for smart device
Connected Web services



Enabled through XML



Why Web Services? (1/3)

- Platform neutral
- Accessible in a standard way
- Accessible in an interoperable way
- Use simple and ubiquitous tools
- Relatively cheap
- Simplify enterprise integration



Why Web Services? (2/3)

- ❑ Interoperable - Connect across heterogeneous networks using ubiquitous web-based standards
- ❑ Economical - Recycle components, no installation and tight integration of software
- ❑ Automatic - No human intervention required even for highly complex transactions

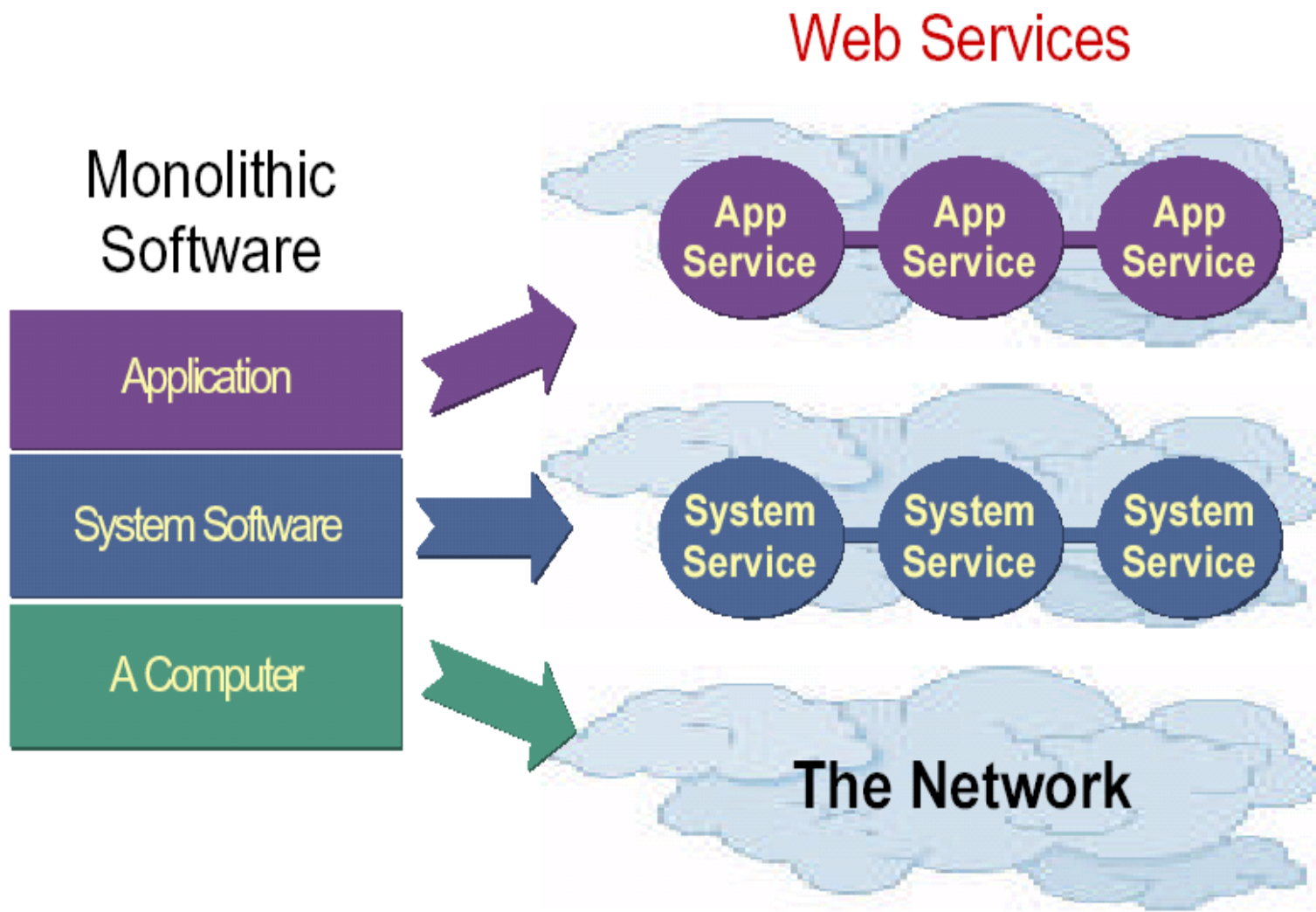


Why Web Services? (3/3)

- Accessible - Legacy assets & internal applications are exposed and accessible on the Web
- Available - Services on any device, anywhere, and anytime
- Scalable - No limits on scope of applications and amount of heterogeneous applications



Impact of Web Services





Myths about Web Services (1/2)

- Web Services are something completely new
 - Web services is distributed computing all over again - only now it is based on the web
 - Web services are XML-based
- You have to write Web Services from scratch
 - Tools available for developing Web services, such as MS .NET, Apache Axis, J2EE, and Systinet



Myths about Web Services (2/2)

- Web services require only SOAP, WSDL, and UDDI
 - We need more high-level semantics
- Web services are based on the RPC paradigm
 - Document-driven model would be more popular communication model
- Web services must be based on HTTP
 - Other transports such as SMTP can also be used

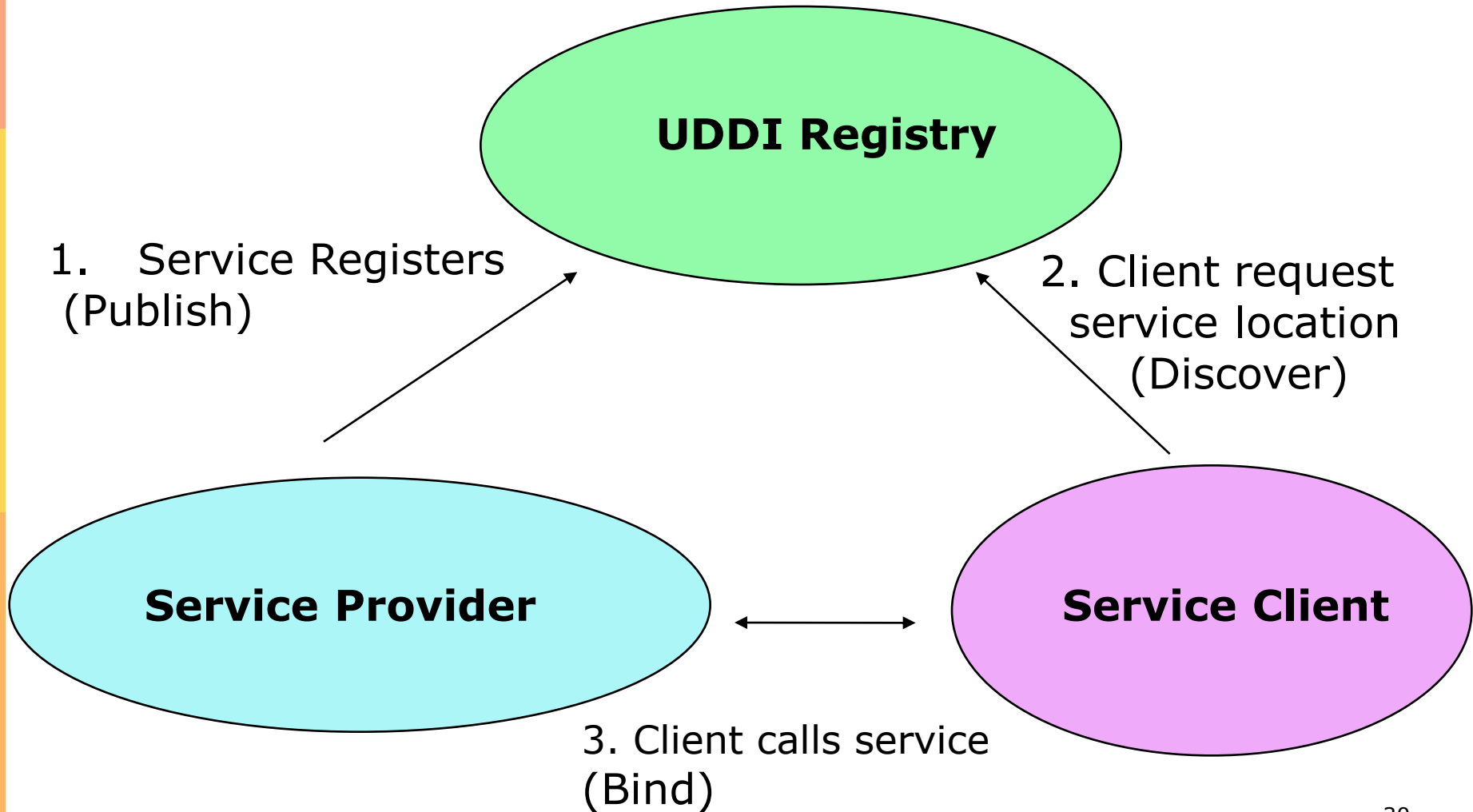


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Web Services Architecture





Operation Models for Web Services (1/3)

□ Web Service Provider

- Creates the Web service typically as SOAP-based service interfaces
- Deploys the service and makes them available for invocation over a network
- Describes the Web service as a WSDL-based service description
- Registers the WSDL-based service description with a service broker, which is typically a UDDI registry



Operation Models for Web Services (2/3)

□ Registry

- Stores the service description as binding templates and URLs to WSDLs located in the service provider environment
- List various service types, descriptions, and locations of the services that help the service requesters find and subscribe to the required services



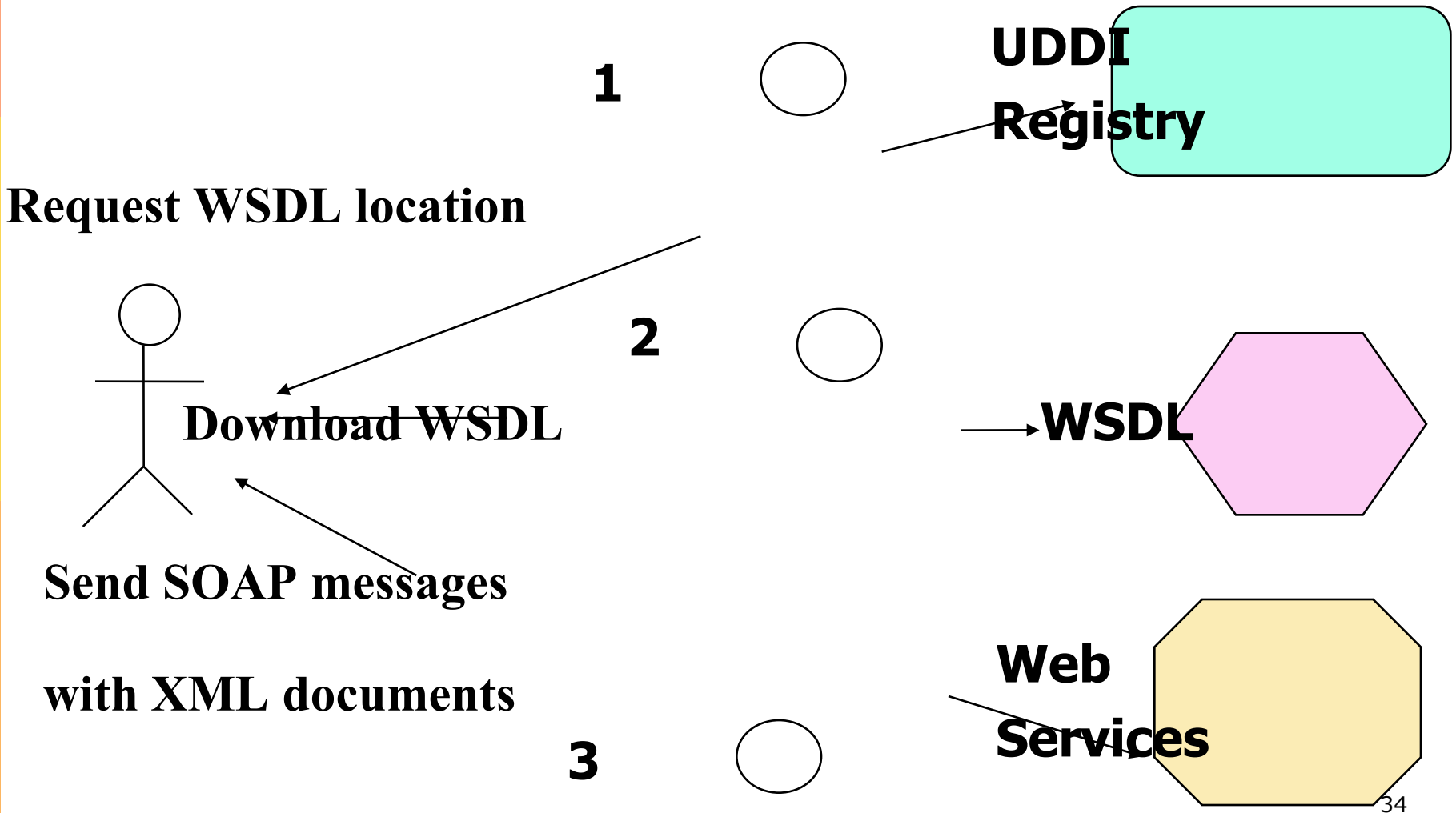
Operation Models for Web Services (3/3)

□ Service Clients

- Locates the required services by querying the UDDI registry
- Obtains the binding information and the URLs to identify the service provider
- Invokes the service provider
- Retrieves the WSDL Service description for those registered services
- Communicate with the service provider
- Exchange data or message by invoking the available services in the service container



Web Services Interaction Diagram





Web Services Standards

- XML (Extensible Markup Language)
- SOAP (Simple Object Access Protocol)
- WSDL (Web Services Description Language)
- UDDI (Universal Description and Discovery Integration)



Extensible Markup Language

- Text-based Markup Language
- Markup is the extra information for describing and formatting data
- Standard language for exchanging and representing data on the Internet
- Both XML and HTML are markup languages
 - `NSC`
 - `<event>NSC</event>`



Sample XML Document

```
<?xml version="1.0"?>
```

```
<nation>
```

```
  <name>Thailand</name>
```

```
  <location>Southeast
```

```
Asia</location>
```

```
</nation>
```



Desirable Features of XML (1/2)

- ❑ Simple and extensible
- ❑ License-free
- ❑ Platform independent
- ❑ International language support
- ❑ Read and edit XML using any standard text-editing tool
- ❑ Several applications and usage



Desirable Features of XML (2/2)

- ❑ Easy data exchange
- ❑ Customizing Markup Languages
 - ebXML (Electronic Business Markup Language)
- ❑ Self-describing
 - Make automation of data processing possible
- ❑ Validation
 - Apply semantic rules to specify the structure of document for validation



XML Applications

- ❑ System independent and vendor independent
- ❑ Has metadata markup and is deliverable via the Web
- ❑ There are style sheets for views and transforms information
- ❑ XML enables integration of legacy systems and new systems



Web Services Standards

- XML (Extensible Markup Language)
- **SOAP (Simple Object Access Protocol)**
- WSDL (Web Services Description Language)
- UDDI (Universal Description and Discovery Integration)



What is SOAP?

- ❑ SOAP stands for Simple Object Access Protocol
- ❑ SOAP is a lightweight protocol intended for **exchanging structured information**
- ❑ SOAP uses XML technologies to define an **extensible messaging framework**
- ❑ The framework has been designed to be **independent of any particular programming model** and other implementation specific semantics



Web Services Standards

- XML (Extensible Markup Language)
- SOAP (Simple Object Access Protocol)
- **WSDL (Web Services Description Language)**
- UDDI (Universal Description and Discovery Integration)



What is WSDL?

- WSDL stands for Web Services Description Language
- **XML language for describing web services**
- XML service is described as
 - A set of communication endpoints (ports)
- Endpoint is made of two parts
 - Abstract definition of operations and messages
 - Concrete binding to networking protocol and message format



Web Services Standards

- XML (Extensible Markup Language)
- SOAP (Simple Object Access Protocol)
- WSDL (Web Services Description Language)
- **UDDI (Universal Description and Discovery Integration)**



What is UDDI?

- UDDI stands for Universal Description, Discovery and Integration
- Programmatic registration and discovery of business entities and their Web services
- Based on SOAP, HTML, and XML
- Registry data
 - Business registrations
 - Service type definitions



What is REST? (1/2)

- **Representational State Transfer (REST)** is a style of software architecture for distributed hypermedia systems such as the World Wide Web
- The term was introduced in the doctoral dissertation of Roy Fielding in 2000, one of the principal authors of the Hypertext Transfer Protocol (HTTP) specification



What is REST? (2/2)

- REST strictly refers to a collection of network architecture principles that outline how resources are defined and addressed
- The term is often used in a looser sense to describe any simple interface that transmits domain-specific data over HTTP without an additional messaging layer such as SOAP or session tracking via HTTP cookies.



SOAP Example (1/2)



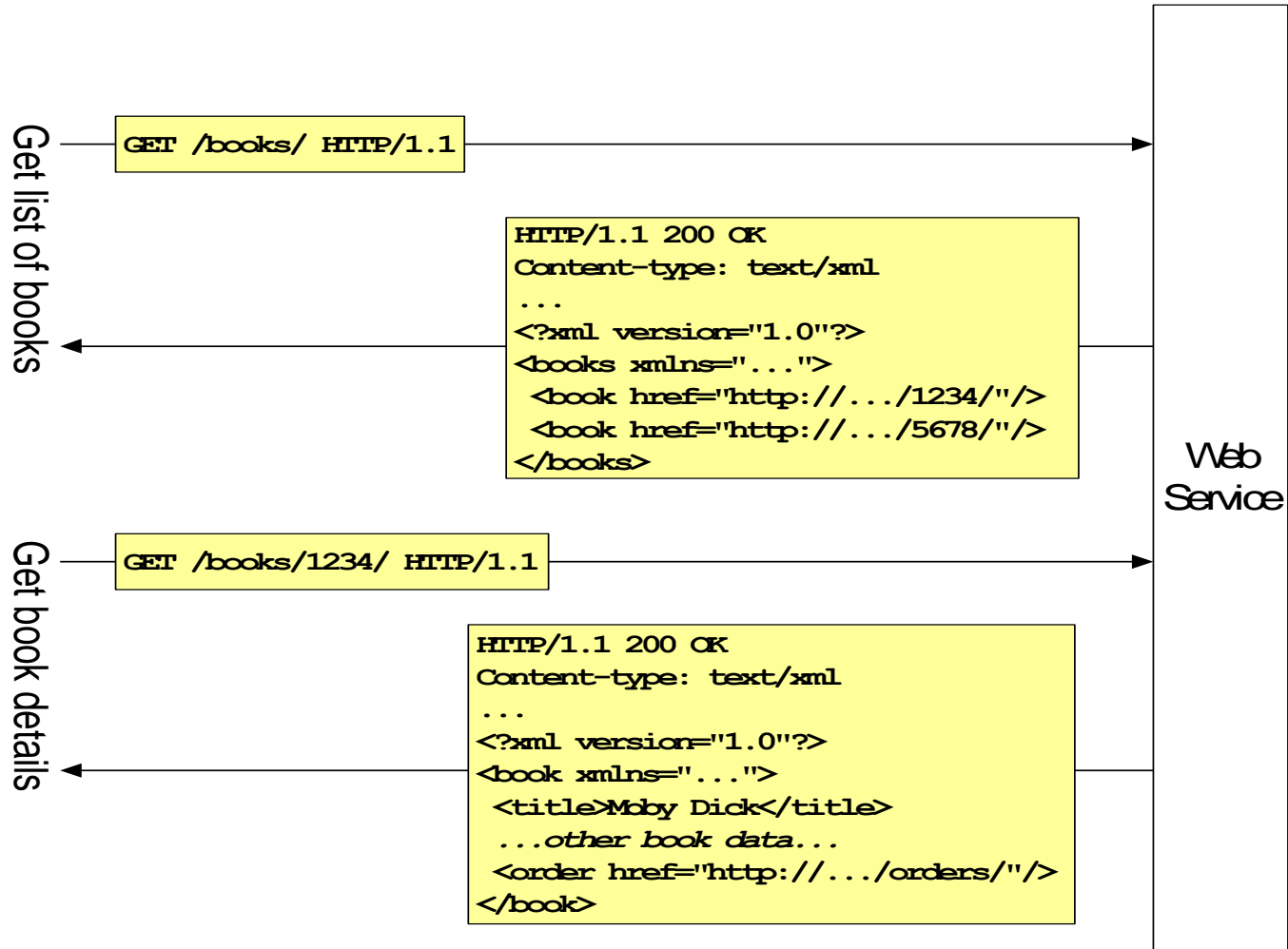


SOAP Example (2/2)



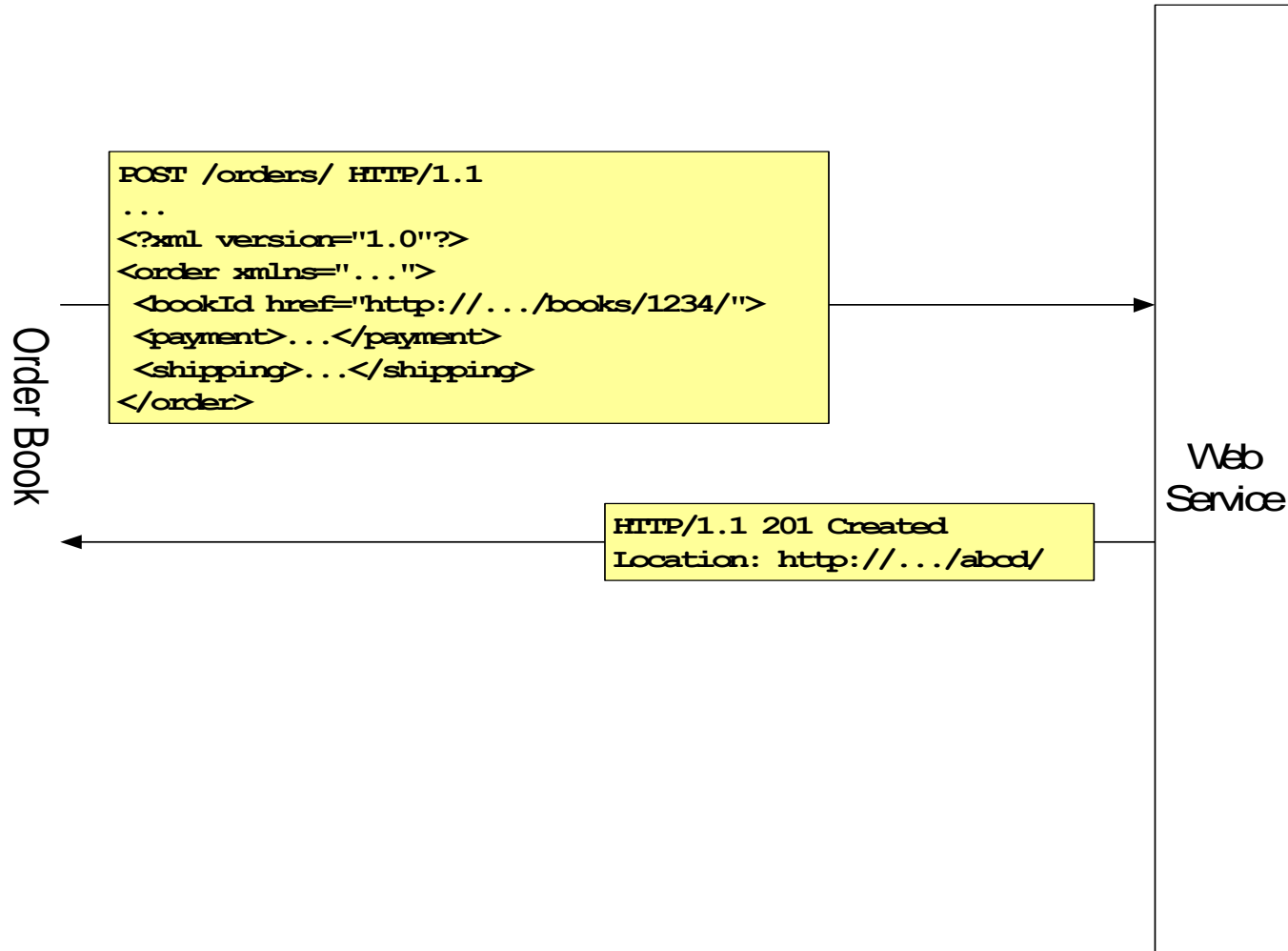


REST Example (1/2)





REST Example (2/2)





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Amazon Web Services

http://aws.amazon.com

The screenshot shows a browser window titled "Amazon Web Services - Bon Echo (Thai WBR Patch Beta4a)". The address bar shows "http://aws.amazon.com/". The page features the AWS logo, navigation menus for "About AWS", "Products", "Solutions", "Resources", and "Support", and a "Contact Us" link. The main content area has a "Welcome to the Cloud" section with a cityscape illustration and a "Get Started" sidebar with a "Sign up for" button and sections for "Developers" and "Business M".

Amazon Web Services - Bon Echo (Thai WBR Patch Beta4a)

File Edit View History Bookmarks Tools Help del.icio.us

http://aws.amazon.com/

Contact Us

amazon web services™

About AWS Products Solutions Resources Support

Welcome to the Cloud

Amazon Web Services makes cloud computing a reality for hundreds of thousands of customers looking for a cost-effective infrastructure to deploy highly scalable and dependable solutions.

Learn how you can benefit from cloud computing

Get Started

Sign up for

Sign

Developers

Simply sign up the cloud with tools:

- Technical
- Cloud Arc Whitepap
- Amazon f
- AWS Com

Business M

Learn how Am enables you to faster:

- AWS Solu Enterpris
- Security
- Case Stud Testimon

Explore Products

- Infrastructure Services
 - Amazon Elastic Compute Cloud (Amazon EC2)
 - Amazon SimpleDB
 - Amazon Simple Storage Service (Amazon S3)
 - Amazon Simple Queue Service (Amazon SQS)
 - AWS Premium Support
- Payments & Billing
- On-Demand Workforce
- Web Search & Information

News & Events

What's New?	Media Coverage	Events
Oct 03, 2008	AWS Start-Up Challenge - Extended to Oct. 10	
Oct 01, 2008	Amazon EC2 Running Windows Server: Coming Soon	
Sep 25, 2008	Important changes to Amazon DevPay pricing and policy	
Sep 22, 2008	Oracle Products Licensed for Amazon Web Services	
Sep 18, 2008	New AWS Service Under	



Amazon Web Services Products

- Infrastructure Services
 - Amazon Simple Storage Service
- Payments & Billing
 - Amazon Flexible Payments Service
- On-Demand Workforce
 - Amazon Mechanical Turk
- Web Search & Information
 - Alexa Web Information Service
- Amazon Fulfillment & Associates
 - Amazon Associates Web Service



AWS Solution

□ Application Hosting

- Using Amazon Simple Storage Service (Amazon S3)
- Examples: AdaptiveBlue, LiveLeader, Smartsheet

□ E-Commerce

- Using Amazon Flexible Payments Service
- Examples: GMP Services, Associate-O-Matic

□ High Performance Computing

- Using Amazon Elastic Computing
- Examples: Washingtonpost.com

□ On-Demand Workforce

- Using Amazon Mechanical Turk
- Examples: Casting Words, Hit-Builder



Yahoo! Developer Network

<http://developer.yahoo.com>

The screenshot shows the Yahoo! Developer Network homepage. The browser title is "Yahoo! Developer Network Home - Bon Echo (Thai WBR Patch Beta4a)". The address bar shows "http://developer.yahoo.com/". The main navigation bar includes "APIs & WEB SERVICES", "RESOURCES", "COMMUNITY", and "SUPPORT". A dropdown menu is open under "APIs & WEB SERVICES", listing various services such as Answers, Address Book, APT, BBAuth, BOSS, delicious, Fire Eagle™, Flickr, Hadoop, GeoPlanet™, HotJobs, Local, Mail, Maps, Music, MyBlogLog, OpenID, Pipes, Search, Search Marketing, SearchMonkey, Shopping, Travel, and Upcoming. Other dropdown menus for "RSS FEEDS", "DEVELOPER KITS", and "YUI" are also visible. The right side of the page features a "Y! MUSIC API" button and a "YAHOO! SEARCH" advertisement with the text "Tap into Yahoo! the next great...".



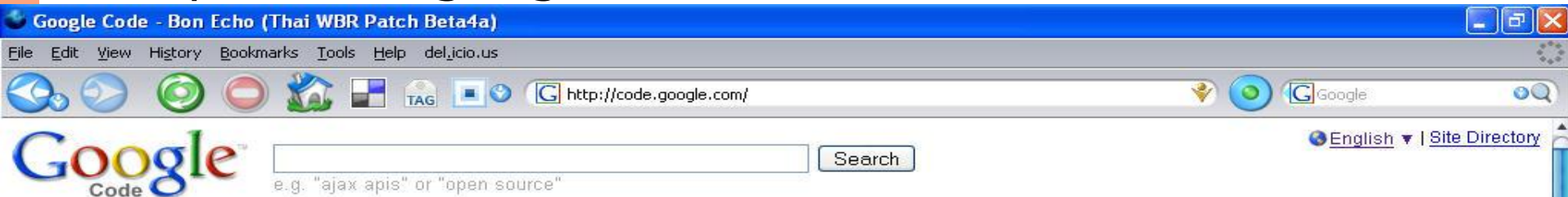
Yahoo! Developer Network

- Yahoo! Answers Web Services APIs
 - Search for expert advice on any topic, from within your very own site
- Yahoo! Local Web Services
 - Local business information and user reviews
- Yahoo! Delicious API
 - Read/write access to your Delicious bookmarks and tags via an HTTP-based interface



Google Code

<http://code.google.com>



Developer Resources



[APIs & Developer Tools](#)

Everything you need to start your project, including developer guides, forums, and tutorials.



[Open Source Programs](#)

Find out about Google's Open Source programs, Summer of Code, and projects we've released.



[Project Hosting](#)

Starting your own Open Source project? Let Google host the code and documentation for you, free.

[More resources »](#)

Featured News



Google Developer Day Israel: Registration now open

We're pleased to expand Google Developer Days further by opening registration for Google Developer Day Israel, which will take place on November 2. If you're not near Tel Aviv, registration is still open for some of the October Google Developer Days, but these will start to close soon.

Google Developer Days are global, one-day events comprising multiple tracks of breakout sessions and hands-on codelabs on Google developer tools and APIs.

[Read more and register for Google Developer Days »](#)

Developer Videos



[Getting Started with the Google Data .NET Client Library](#)

Posted on 10/5/2008



[Getting Started with the Google Data Python Client Library](#)

Posted on 10/5/2008

[More videos »](#)



Google APIs (1/2)

□ APIs & Developer Tools

■ Android

- Build mobile apps for Android, a software stack mobile devices

■ Google Data APIs

- A simple, standard protocol for reading and writing data on the web

■ Blogger Data API

- Enable your apps to view and update Blogger content

■ Feedburner APIs

- Interact with FeedBurner's feed management and awareness-generating capabilities.



Google APIs (2/2)

- Google AdSense API
 - Generate revenue for you and your users by placing ads on your website.
- Google AdWords API
 - Automate and streamline your campaign management activities
- Google Calendar APIs and Tools
 - Create and manage events, calendars, and gadgets for Google Calendar.
- Google Checkout API
 - Start selling on your website.



e-Revenue Web Services (1/2)

□ <http://www.rd.go.th/web-service/>

e-Revenue WebServices

กลับมาแรก www.rd.go.th

ข้อมูลถูกต้อง รวดเร็วทันใจ

เกี่ยวกับโครงการ
About The Project

แนะนำบริการ
Services

ติดต่อสอบถาม
Contact us

แหล่งความรู้เว็บเซอร์วิส
More Info

บริการทั่วไป
For the Public

- ตรวจสอบเลขประจำตัวประชาชน และเลขประจำตัวผู้เสียภาษีอากร
PIN / TIN Verification Info
- ข้อมูลร้านค้าสินค้ามูลค่าเพิ่มนักท่องเที่ยว
VAT Refund for Tourist Info
- ข้อมูลผู้ประกอบการจดทะเบียนมูลค่าเพิ่ม
VAT Registrant Info
- ข้อมูลผู้ประกอบการอัญมณีที่ได้รับการยกเว้นภาษีมูลค่าเพิ่ม
VAT Exempted Jewelry Business Info
- คำนวณภาษีเงินได้บุคคลธรรมดา
Personal Income Tax Calculation

บริการเฉพาะหน่วยงานราชการ
For only Government Organization

- ข้อมูลผลการจัดเก็บภาษีอากร
Tax Collection Summary Info
- ข้อมูลกิจการร่วมค้า และบริษัทต่างชาติ
Joint Venture and Foreign Company Info
- ข้อมูลประเมินภาษีเงินได้บุคคล

Find: Match case



e-Revenue Web Services (2/2)

- Create service oriented organization by providing professional services to citizens to improve efficiency and fairness in tax collection
- Serve as a catalyst in driving e-services / e-commerce take up via business partnership
- Sample services: PIN/TIN Verification Info, VAT Refund for Tourist info



PTT Information Web Services (1/2)

<http://www.pttplc.com/pttinfo.aspx>



The following operations are supported. For a formal definition, please review the [Service Description](#).

- ◆ [CurrentNews](#)
- ◆ [CurrentOilPrice](#)
- ◆ [GetNews](#)
- ◆ [GetOilPrice](#)



PTT Information Web Services (2/2)

- The users can get the information about oil price and news related to oil
- Support these five operations
 - GetOilPrice
 - CurrentOilPrice
 - GetNews
 - CurrentNews



NECTEC Speech Technology Web Services (1/2)

<http://vaja.nectec.or.th/ws/vaja-webservice.html>

VAJA Web service - Bon Echo (Thai WBR Patch Beta4a)

File Edit View History Bookmarks Tools Help del.icio.us

<http://vaja.nectec.or.th/ws/vaja-webservice.html>

NECTEC National Electronics and Computer Technology Center
ศูนย์เทคโนโลยีอิเล็กทรอนิกส์และคอมพิวเตอร์แห่งชาติ

a member of NSTDA

เปลี่ยนค่าค้น
สืบค้นข้อมูล

วิจัยและพัฒนา บริการ ข้อมูลเผยแพร่ ข่าว ติดต่อสอบถาม ผังเว็บไซต์

Speech Technology Web Service

- HOME
- TTS web service
 - VAJA web service คืออะไร
 - VAJA คืออะไร
- ASR web service
 - ISpeech web service คืออะไร
 - ISpeech คืออะไร
- G2P web service
 - G2P web service คืออะไร
 - G2P คืออะไร
- Online demo
- Download demo

VAJA Web Service

VAJA Web Service ให้บริการแปลงข้อความเป็นเสียงพูด (TTS) ด้วยโปรแกรม VAJA ผ่าน Internet มี method ที่ให้บริการ 1 method คือ method vaja โดย method vaja จะรับ argument 3 ตัวคือ ความเร็วเสียง, เพศ, ข้อความ และจะคืนค่า เป็น url ของไฟล์เสียง

VAJA Web service viewer

```
graph TD
    Client[Client Computer] -- text --> HTTP((http))
    HTTP -- URL --> Client
    HTTP --> Server[Web Server]
```



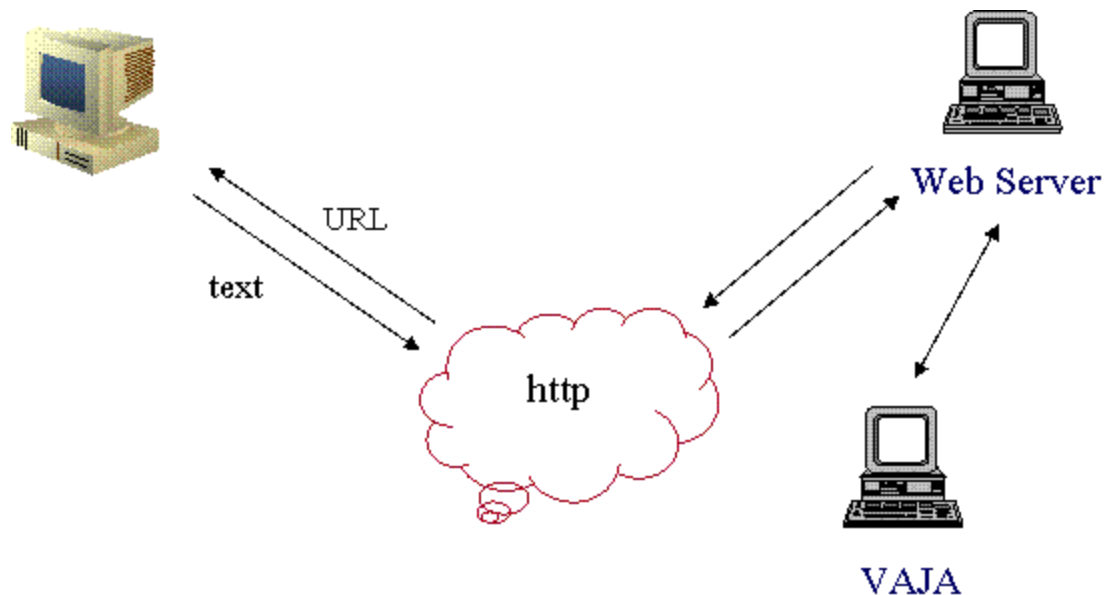
NECTEC Speech Technology Web Services (2/2)

□ VAJA Web Service

- Convert text to speech using Vaja program

□ iSpeech Web Service

- Convert speech to text using iSpeech program





Search for Web Services (1/2)

□ XMethods

- <http://www.xmethods.com>

□ Mindreef

- <http://www.mindreef.net/tide/index.mrj>

□ SOAPClient

- <http://www.soapclient.com/>

□ WebServiceX.net

- <http://www.webservicex.net/WS/wscatlist.aspx>



Search for Web Services (2/2)

□ Pete Cashmore's Mashable

- <http://mashable.com/>

□ Emily Chang's eHub

- <http://www.emilychang.com/go/ehub>

□ ProgrammableWeb - Mashups, APIs, and the Web as Platform

- <http://www.programmableweb.com>

□ Web Services Search Engine

- <http://seekda.com>



Web Services Resources in Thailand

- Web Services Forum at KKU
 - <http://campus.en.kku.ac.th/forums>
- XML and Web Services Course at KKU
 - <http://gear.kku.ac.th/~krunapon/xmlws>
- Thai Java Developers
 - <http://www.thaijavadev.com/>
- Web Services Contest in National Software Const organized by NECTEC
 - http://www.hpcc.nectec.or.th/wiki/index.php/Web_Services_Contest
- Narisa.com
 - <http://www.narisa.com>



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- Axis: the third generation of Apache SOAP
 - <http://ws.apache.org/axis2/>
 - A simple stand-alone server
 - A server which plugs into servlet engines such as Tomcat
 - Extensive support for the WSDL
 - Emitter tooling that generates Java classes from WSDL
 - A tool for monitoring TCP/IP packets



Open Source Web Services Tools in Java (3/4)

- Apache CXF: An Open Source Service Framework
 - Apache CXF is an open source services framework
 - CXF helps you build and develop services using frontend programming APIs, like JAX-WS
 - These services can speak a variety of protocols such as SOAP, XML/HTTP, RESTful HTTP, or CORBA and work over a variety of transports such as HTTP, JMS or JBI
 - <http://cxf.apache.org/>



Open Source Web Services Tools in Java (4/4)

- ❑ XINS is an open-source Web Services framework supporting HTTP protocols such as REST, SOAP, XML-RPC, JSON, JSON-RPC and more.
- ❑ From the specifications written in simple XML, XINS generates the Client API (.jar), the Java server code template (.war), the WSDL and the documentation of the specification in HTML (with the test forms) or in OpenDocument format
- ❑ <http://xins.sourceforge.net/>



Commercial Web Services Development Tools

□ IBM WebSphere Software

- <http://www-01.ibm.com/software/websphere/>

□ MS .NET

- <http://msdn.microsoft.com/webservices/>

□ webMethods

- <http://www.webmethods.com>



Eclipse Web Tools Platform (WTP) Project

- ❑ Extends the Eclipse platform with tools for developing Web and Java EE applications
- ❑ It includes source and graphical editors for a variety of languages, wizards and built-in applications to simplify development, and tools and APIs to support deploying, running, and testing apps
- ❑ <http://www.eclipse.org/webtools/>



NetBeans

- ❑ A free, open-source Integrated Development Environment for software developers
- ❑ You get all the tools you need to create professional desktop, enterprise, web, and mobile applications with the Java language, C/C++, and Ruby
- ❑ Support JAX-WS Web Services and RESTful Web Services
- ❑ <http://www.netbeans.org/>



Summary

- Web services technology exists for making different systems seamlessly work together
 - XML is the language of exchange data
 - Web service standards are open standards
- Web services have been developed and used extensively in many countries
- Thailand should develop and employ Web services technology more for the benefits of more effective management and business profits



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