E-Business
Lecture 3: Chapter 3

E-business infrastructure
Outline

- E-business infrastructure
- Internet and Web technology
- Internet standards
- Internet governance
- Software as a service
E-business infrastructure

• E-business infrastructure:
  – Hardware
  – Software
  – Content

to deliver E-business services to
  – Employees
  – Customers
  – Partners
Outline

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• Internet and Web technology
• Internet standards
• Internet governance
• Software as a service
Internet and Web technology

• QUESTION: What is the difference between the Internet and the Web?
History of the internet

Innovation phase (1961-1974)

- 1961: Paper on packet switching (Kleinrock)
- 1972: Invention of email (Ray Tomlinson)
- 1973: Invention of Ethernet and LAN (Metcalf)
- 1974: “Open Architecture” networking and TCP/IP protocols (Vint Cerf and Bob Kahn)
History of the internet 2

Institutional phase (1975-1995)

- 1980: TCP/IP official standard protocol DoD
- 1980: Invention of the PC
- 1984: Introduction of Hyperlinks (Apple Hypercard)
- 1984: Introduction of Domain Name System (DNS)
- **1989**: Introduction of HTML (Berners-Lee)
- 1990: NSFnet “civilian” Internet
- 1993: First graphical Web browser Mosaic
- **1994**: First banner advertisement on hotwired.com
History of the internet 3

Commercialisation phase (1995-present)

- 1995: Commercial Internet backbone
- 1995: Start of Amazon and eBay
- 1998: Start of Google
- 2004: Start of Facebook
- 2008: Internet “Cloud Computing” takes off
- 2009: Internet-enabled smartphones
- ....
The size of the Internet

(Source: Netcraft)
Outline

• E-business infrastructure
• Internet and Web technology
• Internet standards
• Internet governance
• Software as a service
Protocol stack: ISO OSI Model

- ISO:
  - International Standards Organisation
- OSI:
Layer 1: Physical layer

**Protocol Stack**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Specify details of interacting with network hardware</td>
</tr>
<tr>
<td>Presentation</td>
<td>Transmission of raw bitstream</td>
</tr>
<tr>
<td>Session</td>
<td>Forms the physical interface between devices</td>
</tr>
<tr>
<td>Transport</td>
<td></td>
</tr>
<tr>
<td>Network</td>
<td></td>
</tr>
<tr>
<td>Data link</td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td></td>
</tr>
</tbody>
</table>
Layer 2: Data Link Layer

**Protocol Stack**

- Application
- Presentation
- Session
- Transport
- Network
- **Data link**
- Physical

**Responsibilities:**

- Specify how to organize data into *frames* and how to transmit frames over a network
- Provides *reliable transfer* of information *between two adjacent nodes*
Layer 3: Network layer

- **Responsibilities:**
  - Path selection between end-systems (**routing**)
    - Dynamic routing
    - Fixed routing
  - Fragmentation & Re-assembly
  - Translation between different network types
Layer 4: Transport Layer

- **Responsibility:**
  - Provide **reliable data transfer for different applications**
  - Provide virtual end-to-end links between peer processes
  - **End-to-end flow control**
## Layer 5: Session Layer

### Protocol Stack

<table>
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<tr>
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<tr>
<td>Presentation</td>
</tr>
<tr>
<td><strong>Session</strong></td>
</tr>
<tr>
<td>Transport</td>
</tr>
<tr>
<td>Network</td>
</tr>
<tr>
<td>Data link</td>
</tr>
<tr>
<td>Physical</td>
</tr>
</tbody>
</table>

### Responsibilities:

- Established, manages, and terminates a communication session with remote systems.
- Groups several user-level connections into a single “session”
Layer 6: Presentation Layer

- Responsibilities:
  - Represents data properly
  - Data encryption
  - Data compression
  - Data conversion
Layer 7: Application Layer

- Responsibilities:
  - Anything not provided by any of the other layers
  - Implements communication (protocol) between two applications of the same type, e.g.:
    - FTP
    - HTTP
    - SMTP/POP3/IMAP (email)
TCP/IP

- Developed 1960’s by Robert Kahn, Vint Cerf:
- Three basic ideas:
  1. Simplicity
  2. Speed
  3. Independence
- Four rules:
  1. Networks communicate with other networks
  2. Communication on best-effort basis
  3. Black boxes to connect networks
  4. No global control of transmissions
TCP/IP Layering Model

<table>
<thead>
<tr>
<th>OSI Model</th>
<th>TCP/IP Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Application</td>
</tr>
<tr>
<td>Presentation</td>
<td>Transport</td>
</tr>
<tr>
<td>Session</td>
<td>Network</td>
</tr>
<tr>
<td>Transport</td>
<td>Host to Network Layer</td>
</tr>
<tr>
<td>Network</td>
<td></td>
</tr>
<tr>
<td>Datalink</td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td></td>
</tr>
</tbody>
</table>
TCP/IP Network Layer

- Protocol: IP, ICMP, IGMP
  - Assign addresses to hosts on the Internet
  - Determine how to forward messages over the Internet
TCP/IP Transport Layer

- **Protocol: TCP, UDP**
  - TCP provides a reliable flow of data between two hosts; including mechanism of connection setup, congestion control, and retransmission
  - UDP provides a simpler service which is unreliable
Internet Address

- Every interface on the Internet has a unique address
  - In IPv4 every address is 32-bit,
  - in IPv6 every address is 128-bit
- Usually specified with dotted-decimal notation: written as 4 decimal numbers, one for each byte
  - www.cs.uu.nl: 131.211.84.188
Domain Name System (DNS)

- Dotted-decimal addresses are both hard to remember and meaningless
- Use a structured name for each host
  - For example, www.cs.uu.nl
- DNS is a distributed naming system for computers, services, or any resource connected to the Internet.
- It is implemented as a distributed database providing mapping between IP addresses and hostnames
DNS Hierarchy

- root
  - com
  - org
  - net
  - edu
  - gov
  - nl
  - be
  - uu
  - vu
    - science
    - Library
      - www
      - csstaff
The TCP/IP protocol

Data (part of e-mail or web page)

TCP packet breaks up and recombines data into/from packets

Bytes 1 to 500

IP packet (addressing information)

From: 192.112.36.5
To: 128.174.5.6

The TCP/IP protocol
Packet Switching

Physical and network infrastructure components of the Internet
UUNET’s Global Internet Backbone

Slide 3.29

For more information visit www.uu.net

E-Business Infrastructure
AMS-IX

AMS-IX - Amsterdam Internet Exchange
The Internet and all its applications have almost become part of our senses these days. Many of us feel the need to be online 24 hours a day, being interconnected with your friends, family, colleagues and customers - interconnected with the world at large. This interconnectivity of people is fed by the interconnectivity of the networks they are using, which is the main purpose of AMS-IX.

AMS-IX News
21 January 2011, AMS-IX just reached the 400 connected ASN mark!
As of the last hours, The 400th Autonomous System (ASN) Number was added to peer at the Amsterdam Internet Exchange. More are set to connect shortly and with many more expected to join through-out 2011, AMS-IX continues to aim in adding growth and diversity of peers and bring value to all its connected members and community.
Click here to review the list of connected members.

19 January 2011, Looking back at AMS-IX growth in 2010
2010 was an exceptionally good year for AMS-IX and its members. With a clear promise of growth, the 2009 theme of "evolvability" surfaced its results through

Upcoming events
NANOG51, Miami, USA, 30-02-02/2011
North American Operators Group - Technical conference were we meet existing & new members.
http://www.nanog.org/meetings/nanog51/

APRICOT, Hong Kong, China, 15-25/02/2011
Throughout Asia and the Pacific Rim, Internet service providers, backbone and regional networks, web hosting facilities, firewalls, and intranets are being created, deployed, and installed at a staggering pace.
http://www.apricot.net/

Capacity Middle East 2011, 28-02/03/2011
Capacity conferences are focused on wholesale telecommunications for the decision makers from
E-business related protocols

Applications:

• Secure communications (Protocol: SSL)
• World Wide Web (Protocol: HTTP)
• Email (Protocol: SMTP, POP3, IMAP)
• File transfer (Protocol: FTP)
• Terminal (Protocol: Telnet)
World Wide Web

- Protocol: HTTP
- Client: Web browser (Mosaic, Navigator, Explorer…)
- Server: Web server
  - Static webpages
  - Dynamic webpages
  - Logs, web analytics
- Identifiers: URI, URL, URN
- Example URL: http://www.cs.uu.nl/docs/vakken/ebu/index.php?id=1
E-business related standards

Presentation and data exchange:

- HTML (Hypertext Markup Language):
  - Unstructured text content: Presentation
- XML (eXtensible Markup Language):
  - Structured text document: Presentation and data exchange
- EDI (Electronic Data Interchange):
  - Standardized and structured trading data
  - Data exchange
HTML Example

<body>
<h1>Webwinkel</h1>
<p>Welkom bij onze webwinkel.</p>
<h2>Assortiment</h2>
<p>We verkopen onder andere:</p>
<ol>
<li>Schroeven</li>
<li>Moeren</li>
</ol>
<p>We hebben elke week een <b>leuke</b> <a href="http://www.aanbieding.nl">aanbieding</a>.</p>
</body>
XML Example

<Companies>
  <Company>
    <name>ACE MANUFACTURING</name>
    <address>
      <street>234 MARKET STREET</street>
      <city>SAN FRANCISCO</city>
      <country>US</country>
    </address>
  </Company>
  <name>ACME TOOLS</name>
  ...
  <name>ACME TOOLS</name>
</Companies>
EDI

- First idea 1948 (Berlin Airlift)
- UN/EDIFACT standard:
  - Electronic Data Interchange For
  - Administration
  - Commerce and
  - Transport
- Proprietary communications:
  - VAN, secure WAN, VPN over Internet
- Firm base in some industries and countries
EDIFACT example

N1*SH*ACE MANUFACTURING*1*987654321*
N2*RECEIVING*N3*234 MAR*N4*
SAN FRANCISCO*CA*94103*U
XML vs. EDIFACT

EDIFACT:
- Very expensive technology
- Requires special networks
- Intended for machines only
- Large installed base (Europe)

XML:
- Explicit structure
- Easier validation
- Can easily use the Internet
- Cheaper to implement
XML/EDIFACT

Allows EDIFACT message types to be used by XML

• EDIFACT Example:
  NAD+BY+CST9955::91++Candy Inc+Sirup street 15+Sugar Town++55555

• XML/EDIFACT:
  
  \[
  \text{<S\_NAD>}
  \text{<D\_3035>BY</D\_3035>}
  \text{<C\_C082><D\_3039>CST9955</D\_3039><D\_3055>91</D\_3055></C\_C082>}
  \text{<C\_C080><D\_3036>Candy Inc</D\_3036></C\_C080>}
  \text{<C\_C059><D\_3042>Sirup street 15</D\_3042></C\_C059>}
  \text{<D\_3164>Sugar Town</D\_3164><D\_3251>55555</D\_3251>}
  \text{</S\_NAD>}
\]
Semantic Web

- More structure:
  - Enables users to find, share, and combine information more easily
- Based on:
  - XML
  - Resource description
  - Knowledge representation
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Just who runs the internet?

- Internet governance
- Net neutrality: equal access for everyone
- Organizations:
  - IAB: Internet Architecture Board
  - IETF: Internet Engineering Task Force
  - W3C: World Wide Web Consortium
  - ICANN: Internet Corporation for Assigned Names and Numbers
  - ISOC: Internet Society
Net neutrality

• Hier is het een en ander gebeurd. Feb 2014 eerste overeenkomst tussen Netflix en Comcast om tegen betaling een betere QoS voor Netflix customers (video stream) te garanderen.
• Nederland 2012:
  • Vrije toegang tot het internet gegarandeerd
  • Het is verboden nieuwe diensten te blokkeren
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- Software as a service
SaaS: Software as a Service

- Service Oriented Architecture:
  - Platform independent service interface
  - Dynamic allocation and invocation
  - Self-contained services

- Virtualization:
  - Thin layer of software creates virtual machines on the same hardware
  - Allocates hardware resources dynamically
Examples

- Google Drive/Apps
- The “Cloud”
- Salesforce.com
Google apps (www.google.com/apps)

E-Business Infrastructure
In times like these, you need to act fast to win every deal and keep every customer.

More Revenue... Happier Customers... Lower Upfront Costs

In times like these, you have to act fast to win every deal and keep every customer. But you also have to invest in the right tools and technologies that can help you do that. More than 5,000 companies of all sizes are already there with Salesforce CRM.

CRM is the best of both worlds: a complete, fully customizable customer relationship management (CRM) solution that's built on the cloud computing model, so you can get up and running right away and get more bang for your buck than you'd ever could with traditional software.

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Comprehensive On-Demand Business Software as a Service

Salesforce.com enables companies to drive sales productivity, increase visibility, and expand revenues with an affordable, easy-to-deploy service that delivers access to companies of all sizes.

Service & Support

The Salesforce solution for customer service puts companies up and running in days.

Salesforce.com (www.salesforce.com)

E-Business Infrastructure
Begin je eigen webwinkel


▶ Probeer het nu

Waarom mijnwebwinkel?

- Professionele webshop software voor 19 Euro per maand
- Klanten prijzen ons om het gebruiksgemak
- Hulp wanneer je het nodig hebt, in een begrijpelijke taal
- Wij begeleiden je op weg naar succes
- Allerlei extra’s

www.mijnwebwinkel.nl
Recap

- E-business infrastructure
- Internet and Web technology
- Internet standards
- Internet governance
- Software as a service

Next lecture:
- E-business environment