



Sistemi ICT per il Business Networking

Internetworking

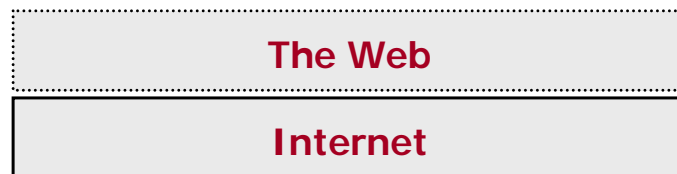
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Internet

- **Internet** (or simply **the Net**): the publicly accessible worldwide system of interconnected computer networks that transmit data by packet switching using a standardized **Internet Protocol (IP)**
- It is made up of **thousands** of smaller commercial, academic, domestic, and government **networks**
- Internet carries various **information** and **services**, such as
 - electronic mail,
 - online chat,
 - interlinked Web pages
 - other documents (resources) of the World Wide Web

The Internet vs. the Web

- **Important:** the Internet and the World Wide Web are **NOT** synonymous
 - the **Internet** is a collection of interconnected computer networks, linked by copper wires, fiber-optic cables, etc.
 - the **Web** is a collection of interconnected documents, linked by hyperlinks and URLs, and is accessible using the Internet



Creation of the Internet

- **October 29, 1969:** the first node went live at UCLA on what would be called the **ARPANET**, the "eve" network of today's Internet
- **January 1, 1983:** **the first TCP/IP wide area network** was operational → this is technically **the birth of the Internet**
 - The United States' National Science Foundation (NSF) constructed a university network backbone that would later become the NSFNet (followed by the opening of the network to commercial interests in 1995)
- **Important separate networks:** Usenet, Bitnet, CompuServe, and JANET → The ability of TCP/IP to work **over pre-existing communication networks** allowed for a great ease of growth

Creation of the Internet

- **August 1991**: CERN in Switzerland publicized the new **World Wide Web project**
- **1993**: Tim Berners-Lee had begun creating **HTML**, **HTTP** and the first few **web pages** at CERN in Switzerland
- **1993**: the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign released the **Mosaic web browser version 1.0**
- **1996**: the word "Internet" was common public currency
- The **growth** of Internet is often attributed to
 - the **lack of central administration**, which allows organic growth of the network
 - the **non-proprietary open nature** of the Internet protocols, which encourages vendor **interoperability** and prevents any one company from exerting too much control over the network

Internet today

- The Internet **relies on**:
 - the complex **physical connections** that make up its infrastructure
 - **technical specifications or protocols** that describe how to exchange data over the network
 - bi- or multi-lateral commercial **contracts**

World Regions	Population (2006 Est.)	Population % of World	Internet Usage, Latest Data	% Population (Penetration)	Usage % of World	Usage Growth 2000-2005
Africa	915,210,928	14.1 %	22,737,500	2.5 %	2.2 %	403.7 %
Asia	3,667,774,066	56.4 %	364,270,713	9.9 %	35.7 %	218.7 %
Europe	807,289,020	12.4 %	290,121,957	35.9 %	28.5 %	176.1 %
Middle East	190,084,161	2.9 %	18,203,500	9.6 %	1.8 %	454.2 %
North America	331,473,276	5.1 %	225,801,428	68.1 %	22.2 %	108.9 %
Latin America/Caribbean	553,908,632	8.5 %	79,033,597	14.3 %	7.8 %	337.4 %
Oceania / Australia	33,956,977	0.5 %	17,690,762	52.9 %	1.8 %	132.2 %
WORLD TOTAL	6,499,697,060	100.0 %	1,018,057,389	15.7 %	100.0 %	182.0 %

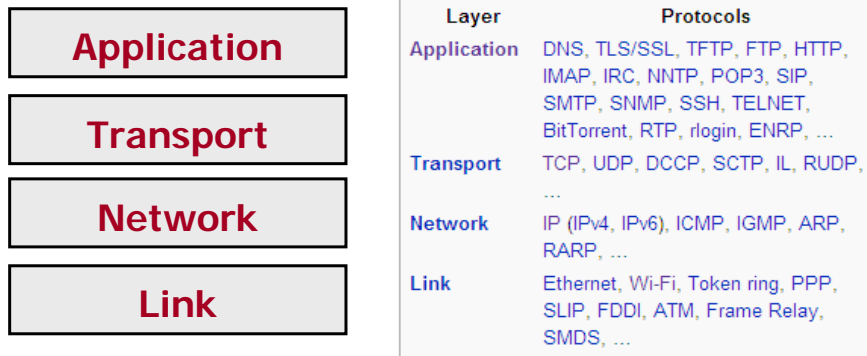
Internet protocols

- The Internet protocol suite was deliberately designed to be **independent** of the underlying **physical medium**
 - **Any communications network**, wired or wireless, that can carry two-way digital data can carry Internet traffic (e.g. copper wire, coaxial cable, and fibre optic, Wi-Fi)
- All these networks, sharing **the same high-level protocols**, **form the Internet**
- The Internet protocols originate from the **Internet Engineering Task Force (IETF)** and its working groups (which are open to public participation and review)
 - They produce **Request for Comments** (RFCs) documents
 - Some RFCs are raised to the **Internet Standards** by the IETF process (e.g. DNS, POP3, SMTP, HTTP, HTTPS, Telnet, FTP, SSL)

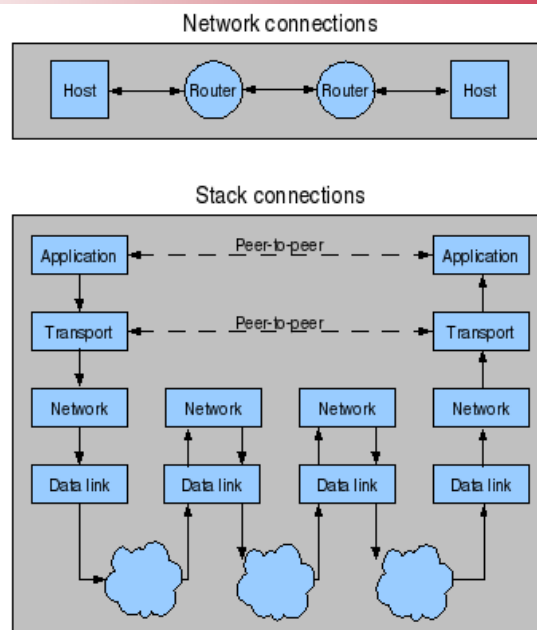
Internet protocols

- **Services on the Internet** make use of these protocols
 - e.g. e-mail, newsgroups, file sharing, Instant Messenger, the World Wide Web, mailing lists, blogs, Internet radio, etc.
- **Internet protocol suite**: the set of communications protocols that implement the protocol stack **on which** the Internet and most commercial networks **run**
 - Sometimes called the **TCP/IP** protocol suite: the **Transmission Control Protocol (TCP)** and the **Internet Protocol (IP)**

Layers in the internet protocol suite stack



Physical network connection of two hosts via two routers and the corresponding layers used at each peer



Intranet

- A **private network** that **uses** Internet Protocols, network connectivity, and possibly the public telecommunication system to securely share part of an **organization's information** or operations with its employees
- **In case of access** from the organization's internal network to the **Internet**, there will usually be a firewall, along with user authentication, encryption of messages
 - Company information and computing resources can be **shared** by **employees working from external locations**
- Being used to deliver **tools and applications** (e.g. collaboration to facilitate working in groups and for teleconferences or sophisticated corporate directories, sales and CRM tools, project management, etc.) **to increase productivity**

Intranet: advantages

- **Workforce productivity:**
 - **to quickly find and view** information and applications relevant to individual roles and responsibilities
 - **web browser** interface: **anytime** and (subject to security provisions) **anywhere** access
- **Time:** organisations can make more information available to employees on a "**pull**" basis rather than being deluged indiscriminately by emails
- **Communication:** Intranets can serve as powerful tools for **communication within an organisation**, both vertically and horizontally

Extranet

- A **private network** that **uses** Internet protocols, network connectivity, and possibly the public telecommunication system to securely **share** part of a business's information or operations with **suppliers**, **vendors**, **partners**, **customers** or **other businesses**
- Can be viewed as part of a company's **Intranet** that is **extended to users outside the company**
- A **way** to do business with other companies as well as to sell products to customers
- Requires **security** and **privacy**
 - Firewalls, server management, the issuance and use of digital certificates or similar means of user authentication, encryption of messages

Local area network (LAN)

- A computer network covering a **small local area**, like a home, office, or small group of buildings such as a home, office, or college
 - Current LANs are most likely to be based on switched **Ethernet** or **Wi-Fi** technology running at from 10 to 10000 Mbit/s

Wide area network (WAN)

- A computer network covering a **wide geographical area**, involving a vast array of computers
 - The **most well-known** example of a WAN is the Internet
 - Used **to connect LANs** together, so that users and computers in one location can communicate with users and computers in other locations
 - **Many WANs** are built for one particular organization and are private
 - **Others WANs** are built by Internet service providers and provide connections from an organization's LAN to the Internet

Personal area network (PAN)

- A computer network used for **communication among computer devices** (including telephones and personal digital assistants) **close to one person**
- The devices may or may not belong to the **person** in question
- The reach of a PAN is typically **a few meters**
- **Intrapersonal communication**: communication among the personal devices
- Personal area networks may be
 - **wired** with computer buses such as USB and FireWire
 - **wireless** with network technologies such as IrDA and Bluetooth

Metropolitan Area Network (MAN)

- **Large computer networks** usually spanning a campus or a city
- **Typically** use wireless infrastructure or optical fiber connections to link their sites
- Examples: a university or college may
 - have a **MAN** that joins together many of their local area networks (LANs) situated around site of a fraction of a square kilometer
 - have several **wide area network (WAN) links** to other universities or the Internet

Wireless LAN (WLAN)

- A wireless local area network that uses **radio waves** as its carrier: the last link with the users is wireless, to give a network connection to all users in the surrounding area
- Areas may range **from a single room to an entire campus**
- The backbone network usually uses cables, with one or more **wireless access points** connecting the wireless users to the wired network
- WLAN is **expected** to continue to be an **important form of connection** in many business areas → The market is expected to grow
 - **So far** WLANs have been installed in universities, airports, and other major public places
 - Large future markets are estimated to be in **health care, corporate offices** and the **downtown area** of major cities

Wi-Fi

- A set of product compatibility **standards** for **wireless local area networks (WLAN)** based on the **IEEE 802.11** specifications
- **New standards** beyond the 802.11 specifications, such as 802.16(WiMAX), are currently in the works and offer many enhancements, anywhere from longer range to greater transfer speeds
- Wi-Fi was intended to be used for **mobile devices and LANs**, but is now often used for Internet access
 - It enables a person with a wireless-enabled computer or personal digital assistant (PDA) to connect to the Internet when in proximity of an **access point**
 - The geographical region covered by one or several access points is called a **hotspot**

Virtual Private Network (VPN)

- A **private communications network** usually used within a company, or by several different companies or organizations, to communicate over a public network
- VPN message traffic is carried on
 - **public networking infrastructure** (e.g. the Internet) using **standard (often insecure) protocols**
 - **service provider's networks** providing VPN service guarded by well defined **Service Level Agreement (SLA)** between the VPN customer and the VPN service provider

References

- **Internetworking** (provided by the teacher)