AL-FARABI UNIVERSITY COLLEGE
Computer Engineering
Department 4th Class
Subject: Internet Technology

Lecture 2

Internet Service Providers (ISPs)

Definition of Internet Service Provider (ISP)

- A common perception of the Internet service provider is that of "an organization that sells access to the Internet" – an access provider.

- ISP also could be defined as an access provider that may additionally "provide various value-added services, such as email, bulletin board services and others".

- The services provided by ISPs fall into five broad categories: basic access, frontier access, networking, hosting and Web page design.

Table 2.1 Examples of some Service Providers

Role	Services	Companies
Internet Service Provider	Access, Hosting, Email	AOL, Mindspring, @Home
Network Service Provider	High Bandwidth, Backbone Services, VoIP, VPN	Level (3), Concentric, Qwest, UUNet
Application Service Provider	Storefront, Help Desks, Enterprise Resource Planning, ...	Digex, GTE, Savvis, Vantive, Siebel, Oracle, Corio
Full Service Provider	Turnkey Enterprise Services, Supply Chain, IT Services	EDS, AT&T Worldnet, Exodus
Portals	Aggregate Content, Destination	Yahoo, Excite@Home, AOL

2.1 A Classification Model for ISPs

- A company is defined as a real-world entity that is taking on one or more roles.
- A role represents a group of functions to provide a set of related services to customers (see Figure 2.1).
- Functions can be divided into internal functions, which do not directly affect the customers and services (external functions) that are offered to the customers.

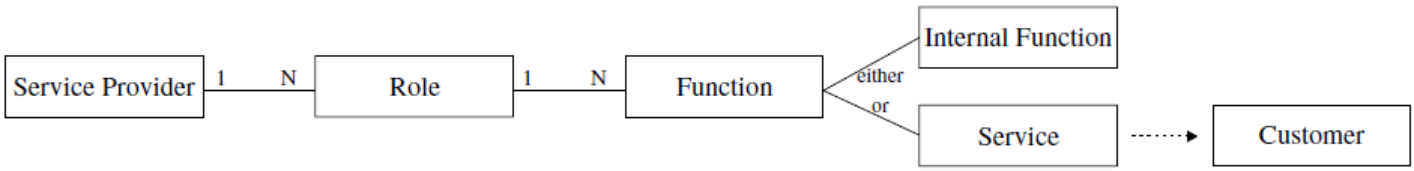


Figure 2.1 General Role Model

- Example: Real-world ISPs like AOL (America Online) are often engaged in more than one role. AOL, for example, provides Internet access to its subscribers. This is its core role. However, AOL also offers web space, email, online games and a marketplace for other companies to sell their products. One role, for example, that of offering Internet access, consists of several services, like the Internet dial-up access by modem, ISDN (Integrated Service Digital Network), cable or DSL (Digital Subscriber Lines). Internal functions in that context involve authentication and accounting actions by the provider or the operation of a routing protocol; they are transparent to the customer.

2.1.2 Internet Service Provider Roles

- The ISP roles can be classified as follows (see Figure 2.2).

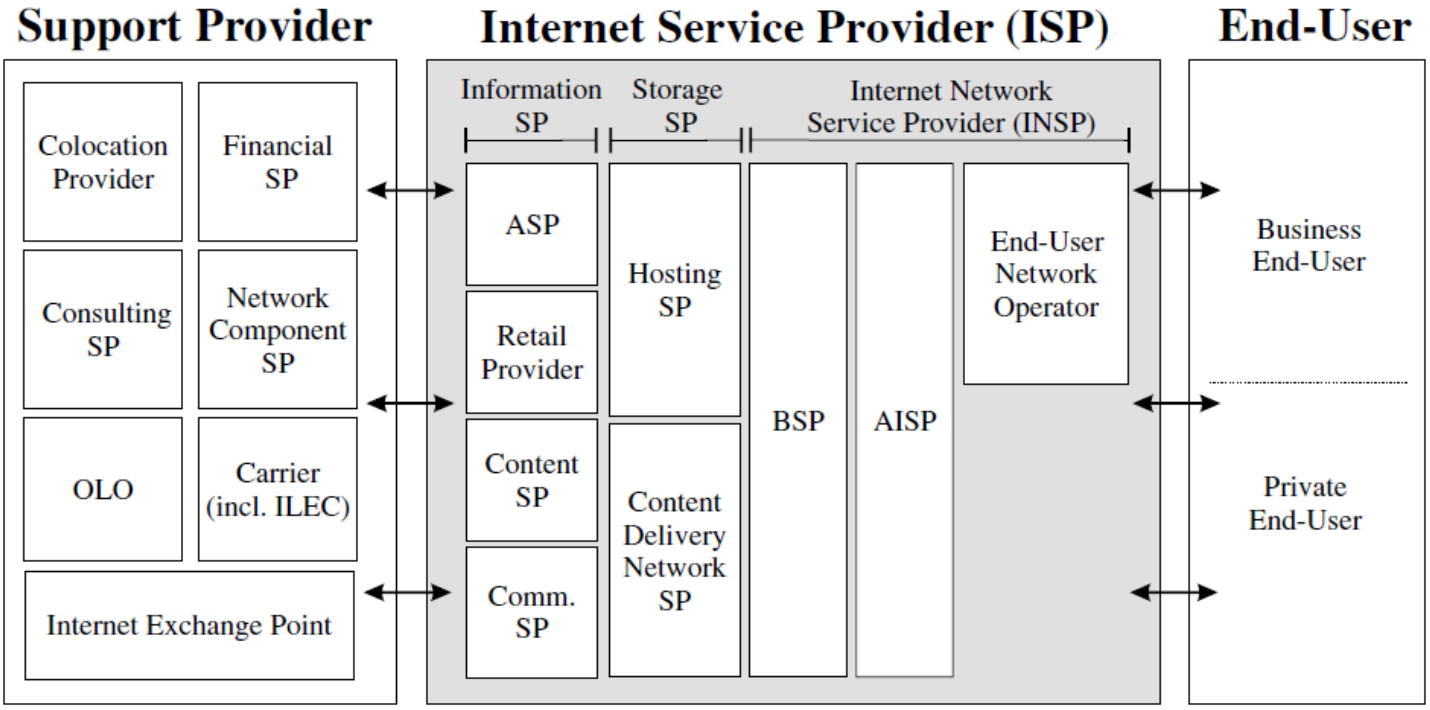
1. Internet Network Service Providers (INSPs)

The Internet Network Service Providers (INSPs) are responsible for the Internet connectivity; they operate a network and offer packet forwarding services. There are three types of INSPs:

1.1 The ENOs (End-user Network Operators) operate end-user network edges, The services include forwarding the packets within the business end-user's network to the access point of the access ISP (AISP).

1.2 The AISPs (Access ISP) connects end-user networks with the Internet and forwards their IP packets toward their destination. AISPs aggregate

traffic from network edges and forward it directly to the destination host if that host is reachable from within their network. Otherwise, the traffic is forwarded to other AISPs and BSPs.



SP	Service Provider
AISP	Access Internet Service Provider
BSP	Backbone Service Provider
OLO	Other Local Operator
ASP	Application Service Provider
ILEC	Incumbent Local Exchange Carrier

Figure 2.2 ISP Role Model

1.3 The BSPs (Backbone Service Providers) provides packet forwarding services without direct contact to the end-user networks; typically across long distance. BSPs operate large Internet backbone networks, aggregate the traffic from AISPs and transport them over their networks. A backbone network is supposed to have large capacities while concurrently spanning large geographical areas. (See figure 2.3)

2. The Storage Service Providers offer server and storage space in the Internet. Other ISPs might depend on this to be able to offer their own service or employ the storage services (e.g. caching) to improve the performance of their own services.

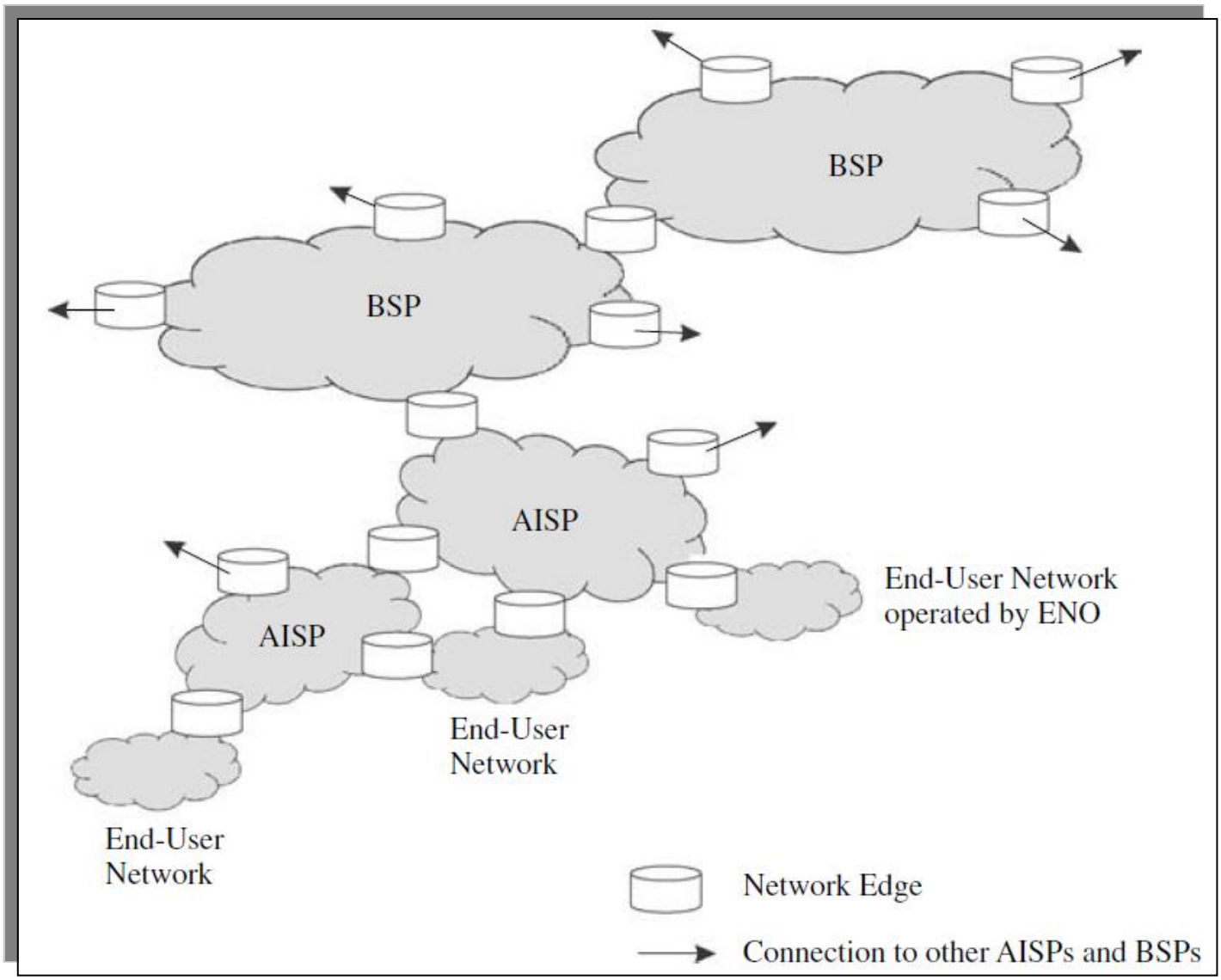


Figure 2.3 INSP Roles

2.1 Content Delivery Network (CDN) (Details in Lecture 3):

- CDN is a collection of web servers (cache servers) distributed across multiple locations to deliver content more efficiently to users.

2.2 Hosting Service Provider (Details in Lecture 3)

Hosting Service Provider are companies that provide space on a server they own or lease for use by their clients as well as providing Internet connectivity. An Internet hosting service allows individuals and organizations to make their own website accessible via the World Wide Web.

3. Information Service Providers

Information Service Providers offer information. They cover the higher Internet layers. Their information is carried by INSPs to the end-user.

3.1 Application Server Provide (ASP):

An application service provider (ASP) is a company that offers individuals or enterprises access over the Internet to applications and related services that would otherwise have to be located in their own personal or enterprise computers.

3.2 Retail Provider:

The Retail Provider can be seen as a merchant that offers its products or provides a marketplace for other companies' products over the Internet.
Often, retail providers simply use their Internet presence to increase the sale of their regular business. This method is often referred to as multi-channel retailing. However, there are a lot of companies that are only engaged in the retail provider role (e.g. Amazon or Ebay).

3.3 Content Provider:

The Content Provider creates or augments content. That content can be news, audio and video content, etc. Usually, content providers operate a central server to store their content or use the service of storage service providers. The services of this role range from offering company and product information on

web pages to offering video-on-demand. Another type of content providers is comprised of information services like search engines (e.g. Google) and encyclopedias (e.g. WhatIs.com) that are published on the Internet. Typically, content providers either charge the end-user directly or more commonly try to finance themselves by advertising.

3.4 Communication Service Provider:

The Communication Service Provider offers Internet-based communication service like email, chat, voice over IP (VoIP)...etc.

For example, companies such as GMX are offering unified messaging services to enable their customers to combine the vast communication options in one service; a customer can thus combine non-Internet-based services like fax or SMS with the Internet service platform.

4. Support Provider Roles

The support provider roles offer services that support and keep the ISP roles running. The services include connectivity services, financial transactions and the supply, maintenance and service of technical equipment.

4.1 Carriers

a. Local Exchange carriers (LECs):

Local Exchange carrier closes the local loop to the end-user by offering layer 2 connectivity between the edge router of the end-user to a POP of the AISP. Originally, many LECs did not have any IP infrastructure and therefore no possibility to connect directly to the Internet; they needed other local operators (OLOs), (see below), to do so. Without the local-loop carrier infrastructure, Internet access would not have been possible for so many people, and the prices would have been higher.

b. Long-Distance Carrier

Long-Distance Carriers provide connectivity to INSPs, for example, leased lines between two POPs. Leased lines range from POTS telephone cables to optical lines.

4.2 Other Local Operator

Other Local Operators (OLOs) typically offer translation services from the LEC's telecommunication networks to the AISPs layer 3 (IP) networks. With increasing competence in IP technology in the telecommunication companies, the importance of pure OLO services has decreased rapidly. The OLO role will instead be part of the LEC or AISP services.

4.3 Internet Exchange Points

The Internet Exchange Point (IXP) provides an exchange point in which ISPs can connect with one another in interconnection arrangements. The IXPs are a key component of the Internet backbone as they offer the possibility of global connectivity.

4.4 Financial Service Provider

A Financial Service Provider provides services around the money transfer between the provider and the customer. Such as PayPal.

4.5 Network Component Service Provider

The Network Component Service Provider offers and maintains hardware and software components that are necessary to operate the Internet infrastructure. They can be differentiated by the type of components they sell to hardware component service providers (e.g. Cisco) and software component service providers (e.g. Oracle). Examples of the offered components are routers, line cards and web servers. Providers that offer installation and maintenance services for these components are also classified as network component service providers.