Building Your Very Own Internet Service Provider (ISP)

A Very Quick Introduction
Introduction
Internet Service Provider

- Generic term used to denote a provider that provides **Internet access** and other related services to subscribers

- **Value Added Service (VAS)**
  Telecommunications Provider under Philippine Law (De-regulated. No need for congressional franchise)
Key Services Provided

- **Internet Access**
  - Provide access, routing and all necessary services to provide subscribers with access to the Global Internet. Most important service!

- **Electronic Mail**
  - The Internet's most value application
  - Still today's killer application
Other Services

- **Hosting and Co-location Services**
  - Provide service to host one's websites, services and applications
  - Can either be shared or dedicated

- **Advanced Services**
  - Website and online application development
  - Information security services
Emerging Services

- **Internet Telephony**
  - Providing voice and telephony services using Voice-over-IP technology
  - Legality currently being discussed by NTC

- **Application Service Provider (ASP)**
  - Outsource hosting and management of key business applications (CRM, financials)
  - Available to a certain extent
The Players
Sampling of Industry Players

- Global Upstream Providers
  - Have direct connectivity to the Global Internet backbone
  - **MCI** (also called Worldcom, parent of UUNet), **Asia Netcom** (former AGC), **Reach** (subsidiary of PCCW/C&W HKT), **Singtel**, **Sprint**, **AT&T**, **OpenTransit** (operated by France Telecom), **Teleglobe**, **British Telecom**, **NTT** and many others
Sampling of Industry Players

- Traditional Telecommunications Companies
  - Also provide regular telecommunications service such as NDD, IDD and leased lines
  - Control most of the available last mile facilities in the country
  - PLDT, Bayantel, Digitel, Innove (fixed line business of Globe), ETPI, PT&T and many others
Sampling of Industry Players

- New Generation Telecommunications Companies
  - Use alternative and emerging technologies such as fiber optics and wireless
  - Fiber Optic Cable – Fibercity, EMVI
  - Metropolitan Wireless - Broadband, Meridian Telekoms (now 40% SMART owned), Textron
Sampling of Industry Players

• Pure Play Internet Service Providers
  • Provide only ISP services
  • Mozcom, Pacific Internet, Inter.net Philippines, Tri-isys, Destiny

• Pure Play Internet Telephony Providers
  • Provide only VoIP services
  • Helius Technologies, Blue Media, Capwire
Internet Exchanges (IX)

- Entities that exist to allow ISPs to interconnect with each other
- Allows local Internet traffic to stay within the Philippines
- **CORE** (operated by PHNET), **PHiX** (operated by PLDT), **MIX** (operated by ETPI), **GIX** (operated by Globe)
Terms

• **Upstream**
  • Is an Internet Service Provider you purchase capacity from

• **Peer**
  • Is an Internet Service Provider you bi-laterally agree to exchange traffic with

• **Downstream / Customers**
  • Buyers of Internet capacity
Peering Relationships

Diagram showing relationships between Telco, Exch, PP, and Global Upstream.
Building It
Summary of Ingredients

- Upstream Provider
- Upstream Access Equipment
- Downstream Access Equipment
- Network Security and Management
- Edge of Network Services
- Bringing it all together
Upstream Provider
Upstream Provider

- Entities you intend to purchase Internet capacity from
  - Every in the Internet is simply a reseller of access to everybody else
- *To hedge on multiple providers is a Good Idea™*
- Need to balance between cost and performance
Provider Selection

- Closer to the backbone
- Better Performance
- Lower latency
- Single source
- > $8,000 per month (E1)

- Further from the backbone
- Mediocre Performance
- Higher latency
- Diversified
- < $5,000 per month (E1)
Options for Interfacing

- **Leased Lines**
  - Traditional Wireline (E1, E3, DS3)
  - Ethernet-type Wireline
  - Wireless Microwave (Point-to-Point Radio)

- **Remote Access Services**
  - Dial-up
  - Cable
  - DSL
Upstream Access Equipment
Core Internet Router

- Must be able to handle the current and projected future capacity
- Must support upstream interfaces (V.35, G.703) and protocols (ATM, FR, E1)
- **Border Gateway Protocol** (BGP) is the de-facto protocol used
- Typical brands are: **CISCO**, **Juniper**, **Extreme** and **Huawei**
Modem

- Short for modulator-demodulator (but you already know that)
- Interfaced directly to Core Ruter
- Necessary when using leased lines and normally provided by upstream
- Other types of interface equipment can be used
Downstream Access Equipment
Downstream Technologies

• Tools and technologies necessary to provide access to customers

• Major types:
  • **Direct Interface Technologies** – typically used by telecommunications providers
  • **Remote Access Service (RAS)** – popular amongst retail pure play providers

• The choice depends on size of customer
Distribution Switching

- Enterprise-class switching technology with large amounts of network backplane
- Common amongst Telcos
- Supports large amounts of bandwidth (limits are defined by technology used)
- Difficult to scale and capital intensive
- Sometimes large routers have this functionality
Distribution Switching

- Must support various local loop signaling and technologies (T1, E1, ISDN, Frame-Relay)
- **MPLS** and **ATM** are common switching technology of large providers
- Typical brands are: **Allied Telesyn, Avaya, Nortel, Siemens, Ericsson, CISCO**
Dial-up Technology

- Mother of retail access technologies
- Most common form of downstream access
- Provides up to theoretically 56 kbps of Internet throughput for subscribers
- Ideal for maximizing existing telephone infrastructure
- Easiest to scale
Dial-up Options

- **Modem Pool**
  - Purchase individual telephone lines
  - Connect them into individual modems

- **Wholesale**
  - Purchase trunks (E1R2) from Telco
  - Connect them to a RAS Device

- **Fully Outsourced**
  - Purchase a backhaul link from Telco
Other Options

• Other options are typically very infrastructure intensive such as:
  • Cable Internet
  • Digital Subscriber Line (DSL)
  • Fiber Ethernet Connectivity

• Most of these require some form of franchise

• Loads of equipment
Network Security and Management
Firewall

• A device that restricts network connectivity
• Normally, operates in ISO-OSI L3 or L4
• Used to protect customers and services from unwanted access
• Some customers do not like being firewall and would like to do it themselves
Traffic Shaper

- Provisions bandwidth to customer
- Ensures that these provisions are followed (Most notably limits)
- Sometimes, a functionality of the Core Router
- Typical vendors for both Firewall and Traffic Shaper: CISCO, Sonicwall, Netscreen
Network Management

• Tools and technologies needed to effectively manage networks

• Major components are:
  • Monitoring. Tools like Nagios and MRTG.
  • Metering. Technologies like CISCO Netflow.
  • Profiling. SVI STORMS™, CA iCan, CISCO
  • Billing. SVI STORMS™, CA iCan
Edge-of-Network Services
Edge-of-Network Services

- Not directly related to the business of bringing in Internet bandwidth
- Auxiliary services provided to enhance the usability of Internet access
- Can be hosted in one or many servers
- Commonly, deployed using **Unix** and **Linux** systems. However, **Microsoft** also has EON technology
Domain Name Service

- Provides IP address to name translation and vice versa
- *We wouldn't want our subscribers to memorize IP addresses?*
- Must provide both:
  - Authoritative DNS for your own domain
  - Forwarding DNS for user DNS resolution
- Most common DNS software: **BIND**
HTTP Web Proxy

- Provides caching services to subscribers
- Allows ISP to conserve upstream bandwidth by saving commonly accessed web content
- Increases the overall user experience
- HTTP Web Proxy software
  - Squid HTTP Caching Server and MS IAS
Web Server

• Provide access to web content for external users
• Allow customers to upload personal websites
• HTTP Web Server software
  • Apache HTTP Server and MS IIS
Electronic Mail (email)

• *The killer app*

• System to provide storage, transmission and retrieval of email

• Nowadays, usable web interfaces to these email systems are in-demand

• Electronic Mail Software:
  • Courier IMAP, Sendmail, Postfix
  • MS Exchange, IBM Lotus Domino
Bringing It All Together
Other Concerns
Nuts and Bolts: The Details

- To be discussed in Networks II
  - Capacity Planning and Provisioning
  - Network Policies and Guidelines
  - Space and Location
  - Security and Management
- To be discussed in CS 159.5
  - Service and application planning
  - Configuring Edge-of-Network Services
Questions and Comments