# CCN: Introduction

**Dr. E.SURESH BABU**

**Assistant Professor**

**Computer Science and Engineering Department**

**National Institute of Technology, Warangal.**

**Warangal, TS, India.**

# Goals:

- ❖ How Networks Impact Daily Life
- ❖ Networking is Relevant
- ❖ Why Learn about Networking (Internet)?
- ❖ Basics of Computer Network?
- ❖ Computer Network Applications
- ❖ Internet Usage Report
- ❖ Internet Structure: Network of Networks

# Networking is Today's World

## How Networks Impact Daily Life

❖ Benefits of instantaneous communication and how it supports and improves our lives.
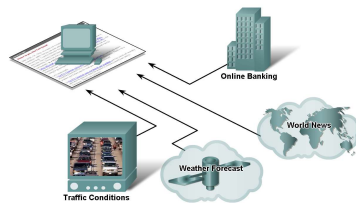
## How Networks Impact Daily Life....

❖ Characteristics and **purpose of popular communication** media such as, **IM, Blogs, Podcasting, and Collaboration Tools**

  ✓ **Instant messaging** : Real time communication between two or more people based on typed text

  ✓ **Weblogs (Blogs):** Web pages created by an individual

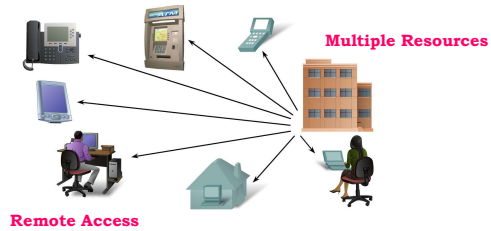  ✓ **Podcasting:** Website that contains audio files available for downloading
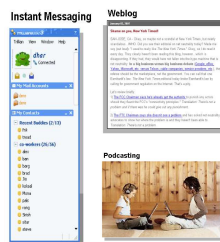
## How Networks Impact Daily Life....

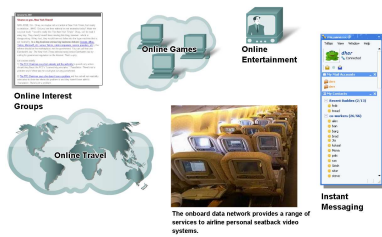❖ Using information networks to share and collaborate improves teaching and learning
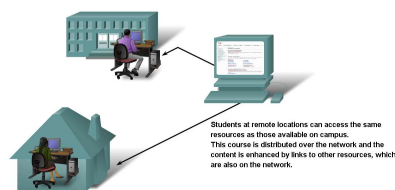
## How Networks Impact Daily Life....

❖ Ways of communication over a network changes the way we work

Multiple Resources

Remote Access

## How Networks Impact Daily Life....

❖ Ways communication over a network supports the way we play

Online Games

Online Entertainment

Online Interest Groups

Online Travel

Instant Messaging

The onboard data network provides a range of services to airline personal seatback video systems.

## Networking is Relevant

## Current Trend in Networking

❖ Indispensable part of modern society

  ✓ **Commercial:** E-commerce, Banking, Inventorying, Telecommunications , Archiving, Health

  ✓ **Social:** Critical Infrastructure, Homeland Security, Policing

  ✓ **Human Interaction/Communication:** Email, Chat, Videoconferencing, Social Networking, Entertainment

## Current Trend in Networking

Information wants to be free because it has become so cheap to distribute, copy, and recombine... It wants to be expensive because it can be immeasurably valuable to the recipient.                                                    (1985)



Stewart Brand

Can everyone be on Facebook?

# Why Learn about Networking (Internet)?

# Why Learn about Networking
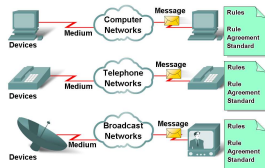
❖ Prolific field to pursue graduate studies

  ✓ Many problems remain unsolved

  ✓ Research funding is still strong

# Basics of Computer Network



---

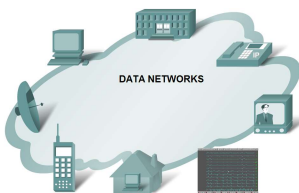# Definition of a Computer Network

❖ A System that carries information between Two or more entities, in the form of electric signals

❖ Two computers are said to be interconnected if they are able to exchange information



---

# Definition of a Computer Network…..

❖ A Computer Network can provide a powerful communication medium among Various Devices.
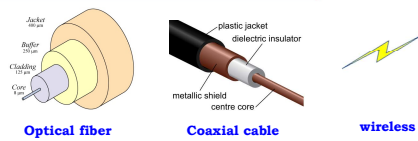


DATA NETWORKS

✓ Imagine your life with out any of these convenience

## Network Elements.....



| Desktop Computer | Laptop | Server | Switch | Router |

| Firewall | HUB | CLOUD | Bus |

## Network Elements.....



Optical fiber     Coaxial cable     wireless

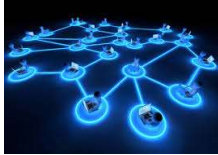## Advantages of Computer Networks

❖ Important benefits of computer networks are:

✓ Resource sharing

✓ Powerful communication medium

✓ Higher reliability

✓ Higher flexibility

✓ Lower cost

✓ Incremental expansion

# Computer Network Applications



---

# Computer Network Applications

❖ The main area of applications can be broadly classified into following categories:

    ❖ **Scientific and Technical Computing**

       ✓ Client Server Model, Distributed Processing

       ✓ Parallel Processing, Communication Media

    ❖ **Commercial**

       ✓ Advertisement, Telemarketing, Teleconferencing

       ✓ Worldwide Financial Services



---

# Computer Network Applications

    ❖ **Network for the People (Currently used applications)**

       ✓ Telemedicine, Distance Education,

       ✓ Access to Remote Information,

       ✓ Person-to-Person Communication,

       ✓ Interactive Entertainment

## Other Computer Network Applications

❖ **Marketing and Sales:**

   ✓ Marketing professionals use them to collect, exchange, and analyze data related to customer needs and product development cycles.

   ✓ Sales application includes teleshopping, online-reservation services for hotels, airlines and so on.



## Other Computer Network Applications

❖ **Financial Services:**

   ✓ Application includes credit history searches, foreign exchange and investment services, and electronic fund transfer.



## Other Computer Network Applications

❖ **Manufacturing:**

   ✓ Computer networks essentially provides two services are computer-aided design (CAD) and computer-assisted manufacturing (CAM)

   ✓ Allow **multiple users** to work on a project simultaneously.

## Other Computer Network Applications

❖ **Directory services:**

✓ Allow list of files to be stored in central location to speed worldwide search operations.

❖ **Information Services:**

✓ Bulletin boards and Data banks.

✓ A World Wide Web site offering technical specification for a new product is an information service.

## Other Computer Network Applications

❖ **Electronic mail:**

✓ Probably E-mail the most widely used computer network application.

❖ **Teleconferencing:**

✓ Allows conference to occur without the participants being in the same place.

## Other Computer Network Applications

❖ **Voice over IP:**

✓ Computer networks are also used to provide voice communication.

✓ Pretty cheap as compared to the normal telephonic conversation.
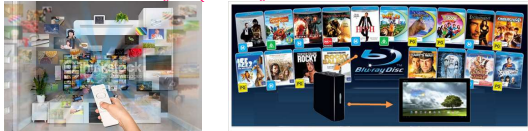
## Other Computer Network Applications

❖ **Video Conferencing**
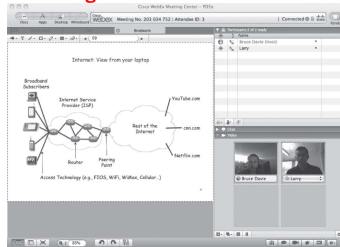


## Other Computer Network Applications

❖ **Video on demand:**

✓ Future services may include video on request

✓ where a person can request the cable television networks for a particular movie or any clip at anytime
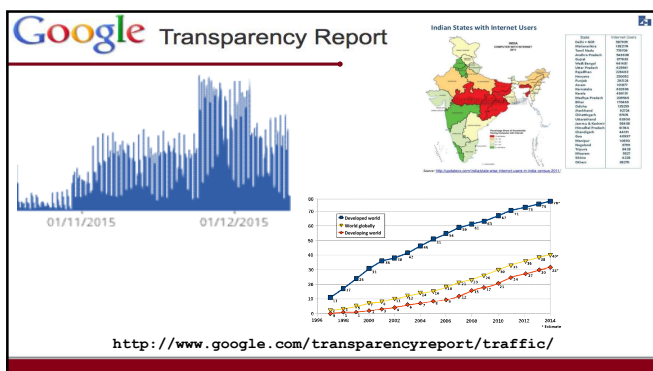


## More Computer Network Applications

❖ Appears in every facet of engineering

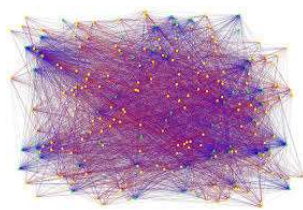✓ **Modern Trend :** Network every (electronic) device (computers, phones, sensors, planes, cars, TVs, appliances, heart monitors, ...)
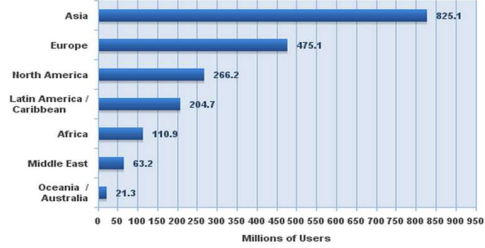


**Internet Refrigerator**

**Sensorized, Bed Mattress**

**Web-enabled Toaster + Weather Forecaster**

**Internet Phones**

**Slingbox: Watch, Control Cable TV Remotely**

**IP Picture Frame Http://Www.Ceiva.Com/**

**Tweet-a-watt: Monitor Energy Use**

**Internet Usage Report:**



Google Transparency Report



http://www.google.com/transparencyreport/traffic/

How does the Internet Look Like?

## How does the Internet Look Like?



You are here

Map of the Internet, The Opte Project, www.opte.org

## How Many Users?



| Region | Millions of Users |
|---|---|
| Asia | 825.1 |
| Europe | 475.1 |
| North America | 266.2 |
| Latin America / Caribbean | 204.7 |
| Africa | 110.9 |
| Middle East | 63.2 |
| Oceania / Australia | 21.3 |

Source: Internet World Stats - www.internetworldstats.com/stats.htm
Estimated Internet users are 1,966,514,816 on June 31, 2015

## How many more Users?



iPhone + iTouch vs. NTT docomo i-mode vs. AOL vs. Netscape Users
First 20 Quarters Since Launch

JAN 2015 AVERAGE NET CONNECTION SPEEDS
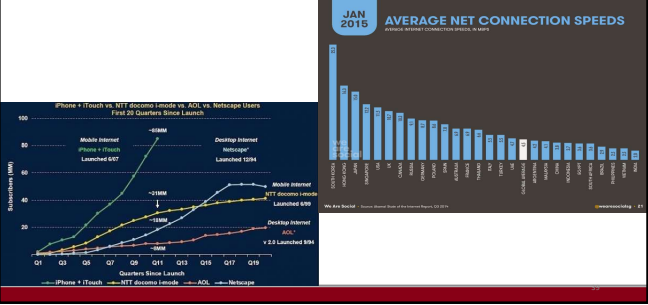
## How much Traffic?



## How is Time Spent?
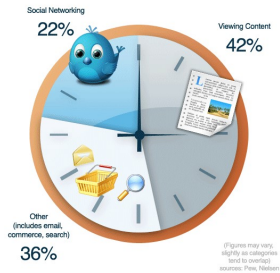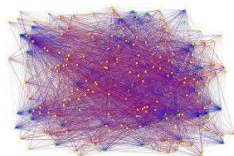


## What Do Users Expect?
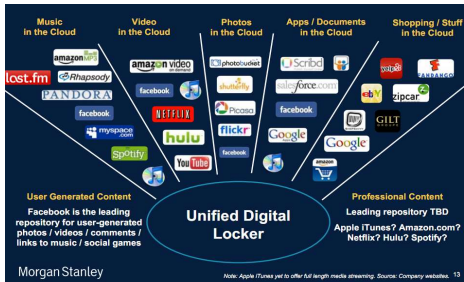
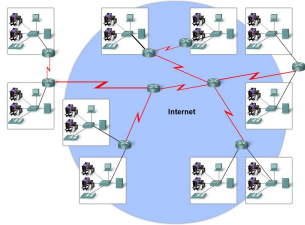## How do they get it?
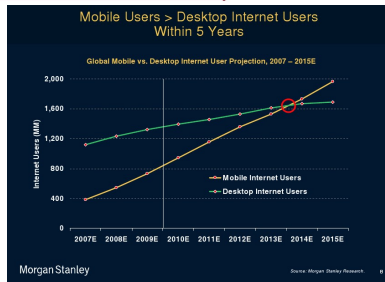


## Where are we headed?
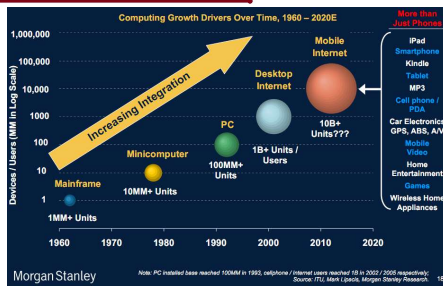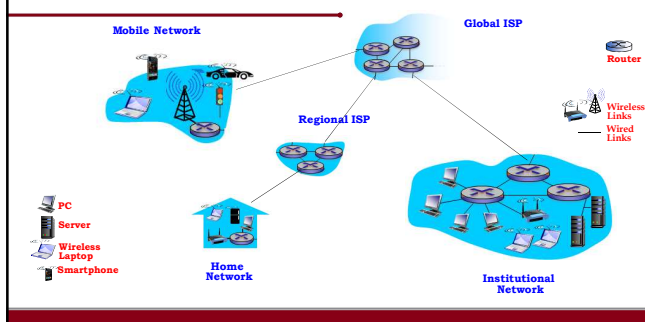


## Internet Structure:
### Network of Networks

## The Internet

❖ Internet is a **collection of networks or network of networks**.

✓ It allows various applications such as **E-mail, File Transfer, Remote Log-in, World Wide Web, Multimedia**, etc run across the internet.



## The Internet



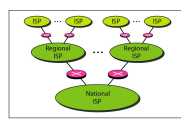## The Internet

❖ **End systems** connect to **Internet via access ISPs** (Internet Service Providers)
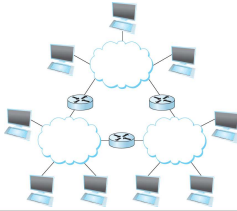
✓ **Residential, Company And University ISPs**

❖ **Access ISPs** must be interconnected.

✓ So that any two hosts can send packets to each other



a. Structure of a national ISP

b. Interconnection of national ISPs

## Internet Structure: Network of Networks

❖ Resulting **network of networks is very complex**

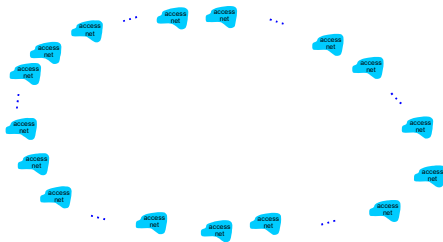  ✓ Evolution was driven by **economics and national policies**



## Internet Structure: Network of Networks

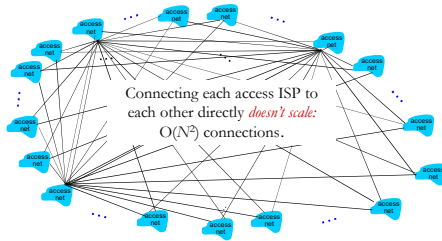❖ Let's take a **stepwise approach** to describe **current Internet structure**

## Internet Structure

*Question:* given *millions* of access ISPs, how to connect them together?
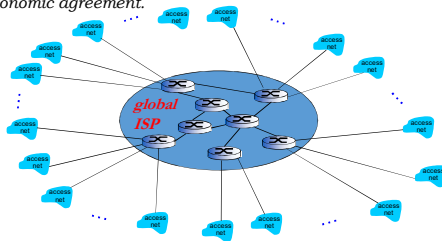
## Internet Structure

*Option: connect each access ISP to every other access ISP?*



Connecting each access ISP to each other directly *doesn't scale:* O(N²) connections.
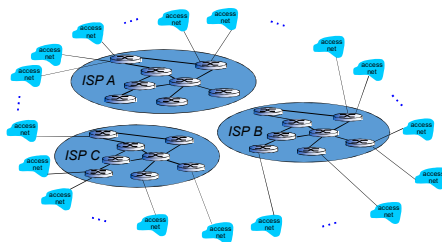
## Internet Structure

*Option: connect each access ISP to a global transit ISP? Customer and provider ISPs have economic agreement.*
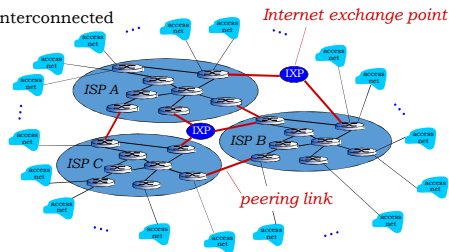


## Internet Structure

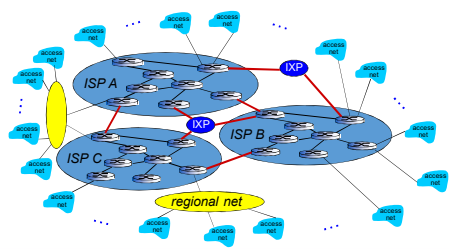❖ But if **one global ISP** is viable business, there will be competitors ....

## Internet Structure

❖ But if one global ISP is viable business, there will be competitors ....  which must be interconnected
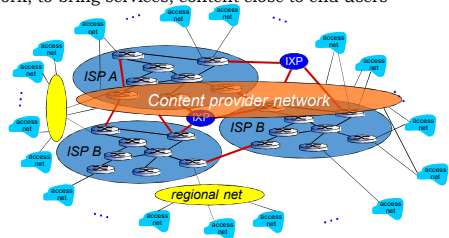
*Internet exchange point*

ISP A

IXP

ISP B

IXP

ISP C

*peering link*

## Internet Structure

... and regional networks may arise to connect access nets to ISPS

ISP A

IXP

ISP B

IXP

ISP C

*regional net*

## Internet Structure

❖ ... and content provider networks  (e.g., Google, Microsoft ) may run their own network, to bring services, content close to end users

ISP A

IXP

*Content provider network*

IXP

ISP B

ISP B

*regional net*

## Goals:

- ❖ How Networks Impact Daily Life
- ❖ Networking is Relevant
- ❖ Why Learn about Networking (Internet)?
- ❖ Basics of Computer Network?
- ❖ Computer Network Applications
- ❖ Internet Usage Report
- ❖ Internet Structure: Network of Networks

# Thank You