Go to air from edit to output in 20 seconds.

Move HDTV from New York to LA in 70 milliseconds.

Store and access 50,000 commercials without ever having to pull a tape.

Realize global programming distribution to 1 million PC screens at the click of a mouse.

content at light

Collaborate in real-time with 12 people in 12 cities around the world while screening your latest ratings champ.

speed

Deliver true video-on-demand over fiber

Create new revenue streams— the only streams that matter.

Video at Speed of Light:
The Optical Revolution Delivers True Convergence

Dr. Sid Ahuja

Multimedia Communications Research Vice President,

Bell Labs, Lucent Technologies

How should we network everyone in the world?

- Today's Networks (separate highways!)
    - Voice network for interactive conversations
    - Video broadcast network for entertainment
    - Data network for information access
    - Radio networks for audio entertainment
- Tomorrow's Network (One Information Highway)
    - Always-On
    - Every user wants multimedia traffic
    - Every user wants 'custom' traffic
    - Enough bandwidth for different types of content
    - Specific bandwidth for different users
- Virtual Networks
    - Content provider/user groupings
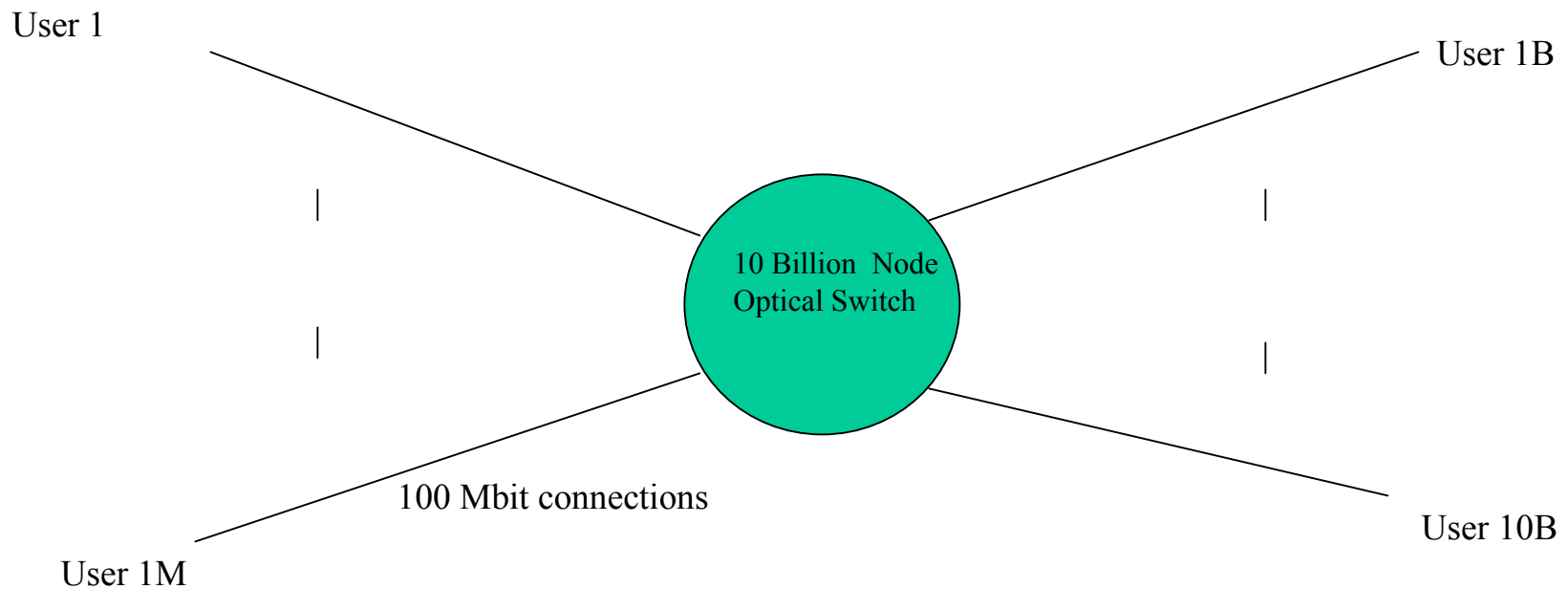   - On-demand and media specific

User's Bandwidth Needs:

- HDTV program (19.2 Mbits/sec.)
- Multiple(1 - 5) MPEG2 streams (4 –6 Mbits/sec. each)
- Multiple(1 - 5) CD quality audio streams (1.5Mbits/sec each)
- Multiple(1 - 5) voice connections (64Kbits/sec each)
- Fast Internet service (10Mbits/sec.)
- Total < 100Mbits/sec

- Bandwidth for 10 Billion people – 1Million Terabit (10**18)
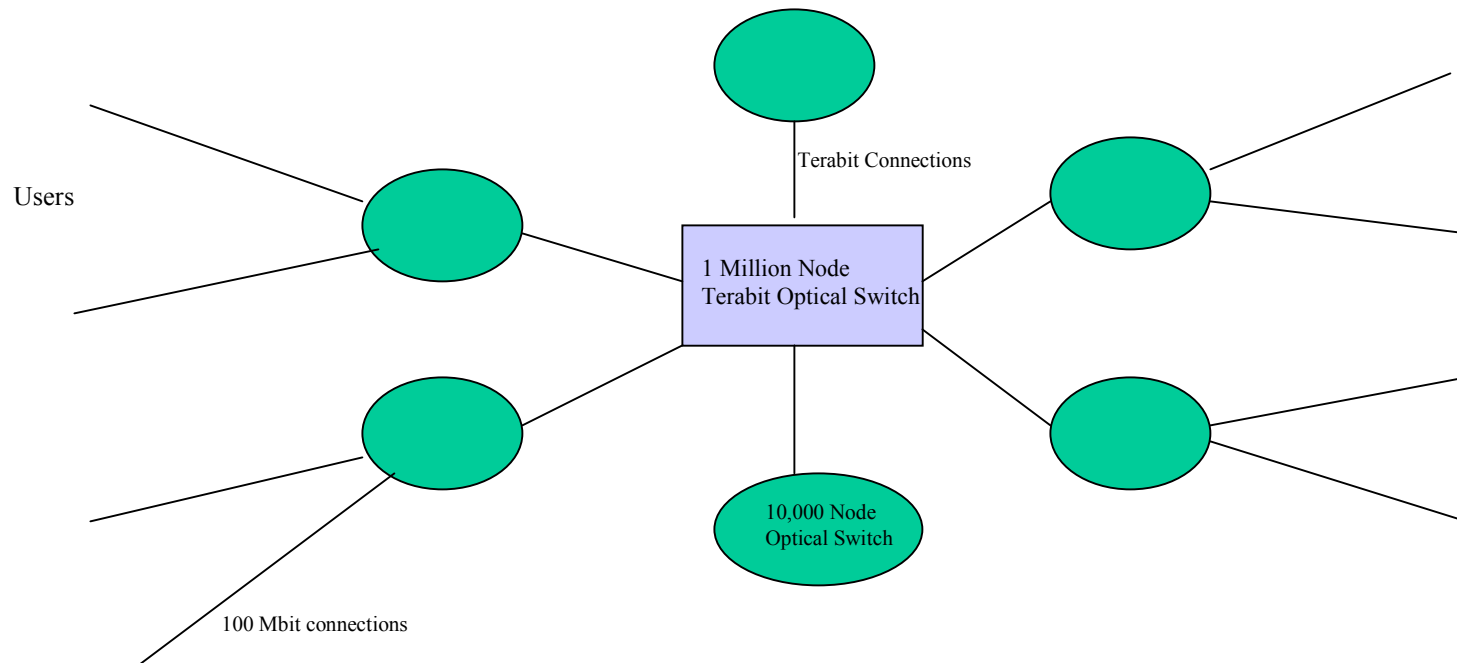
↓

OPTICS : The Only Way To Go

The Ultimate Optical Switch

User 1

User 1B

10 Billion Node Optical Switch

100 Mbit connections

User 1M

User 10B

Multi-Stage Network

Terabit Connections

Users

1 Million Node
Terabit Optical Switch

10,000 Node
Optical Switch

100 Mbit connections

- •Multistage Optical Networks can be built economically
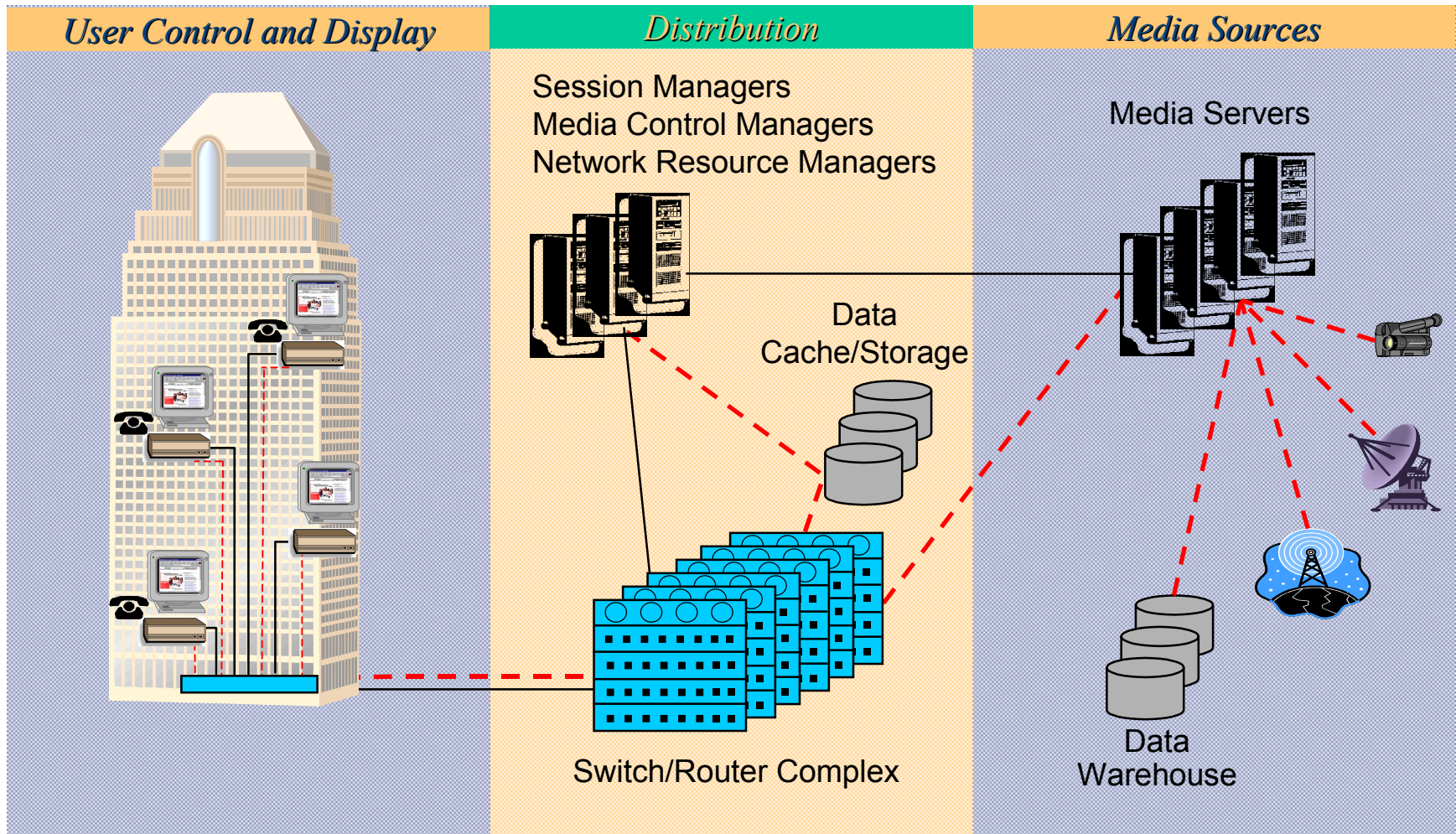- •Large bandwidth needed only in the backbones
- •Fibers can support Terabits

Ahuja 4.22.01

Virtual Fiber to User (A Color of Light per User)

- Virtual Fiber to User   High-Speed LAN
  - managed bandwidth   unmanaged bandwidth
  - guaranteed bandwidth   no bandwidth guarantees
  - multiple streams, each with guarantees no bandwidth guarantees
  - no routing   routers, hubs
  - no intermediate buffering   intermediate buffers
    - low delay   buffering delays
    - lower expense   buffer expenses
  - no large storage (data pass-through)
  - for large files (e.g., video)
  - session controls   no sessions
    - supports billing
    - supports events and associated services
  - more reliable
  - more accountability
  - better maintenance

Virtual Fiber to User

User Control and Display

Distribution

Media Sources

Session Managers
Media Control Managers
Network Resource Managers

Media Servers

Data
Cache/Storage

Switch/Router Complex

Data
Warehouse

Lucent Technologies
Bell Labs Innovations

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Optical Infrastructure

Lucent Technologies
Bell Labs Innovations

MFN and others MANs

WAN

To Europe

To Asia

To Latin America

Metro POPs

Router

Traffic Manager

Video Server

Ahuja 4.22.01
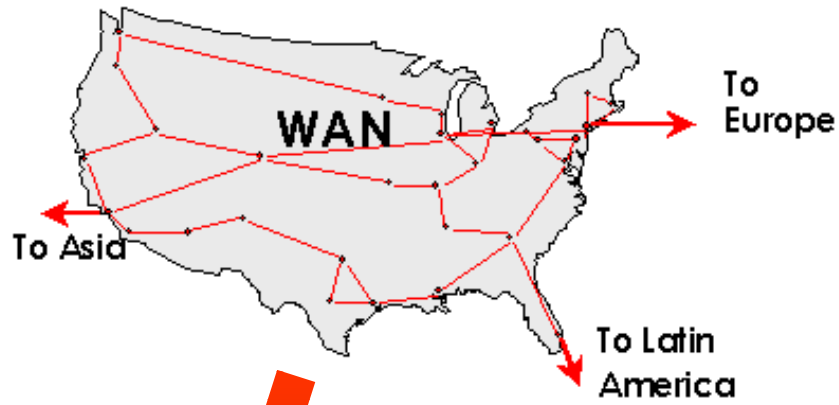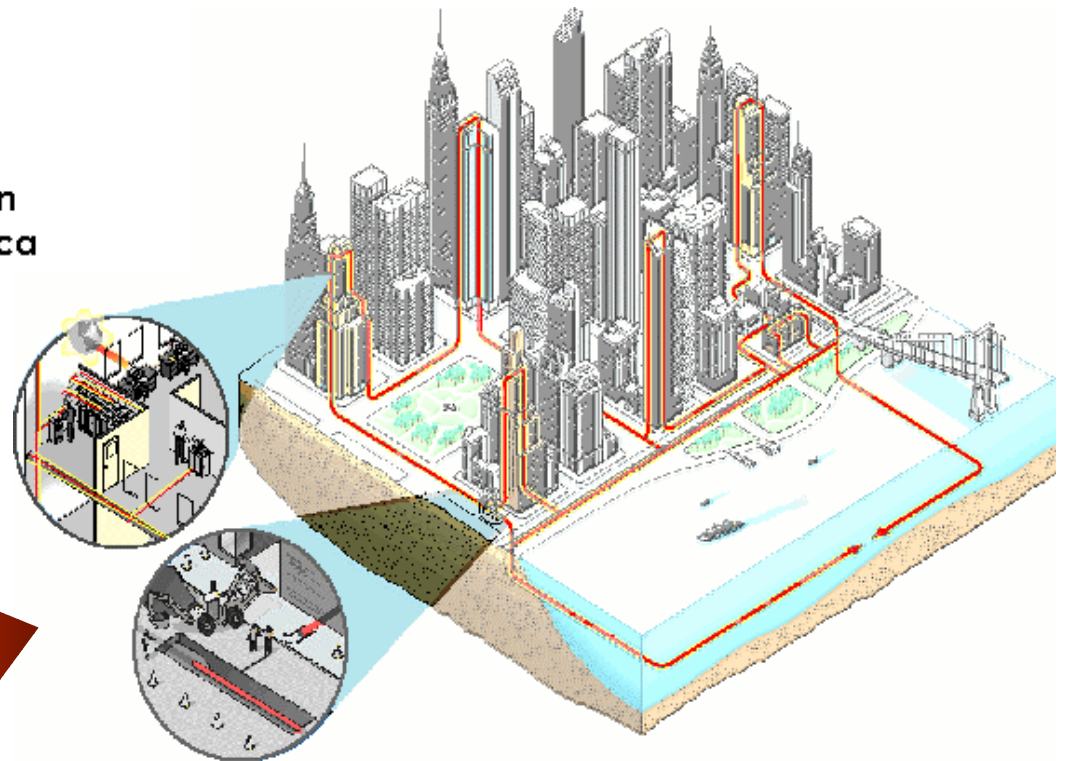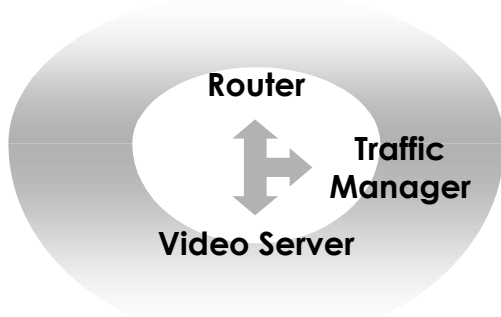
User's Programming Needs

- Select live content from 1000's of channels
- Video connect to 'billion' web sites
- Voice calls to any one in the world
- Join in any of 'millions' of video chat rooms
- Watch events in small to 'whole world' groups
- Receive targeted Ads and Discounts
- On-line enrollment in services

$\downarrow$

Control Nightmare

Virtual Theaters to the Rescue!

- Each service is a separate Virtual Theater
    - Has a number of seats..end points
    - Has particular lighting and sound .. MPEG1 Video/Audio, etc.
    - Has its own distribution of media ..multicast, VOD, etc.
- Virtual Theaters are network overlays on common optical fabric
- Each 'Program' can be a separate instance of a virtual theater
    - Targeted to its specific users
    - Has its own interaction model
    - Has its own advertisements
    - Can be an interactive class
- A user can in realtime buy a ticket and electronically join a theater
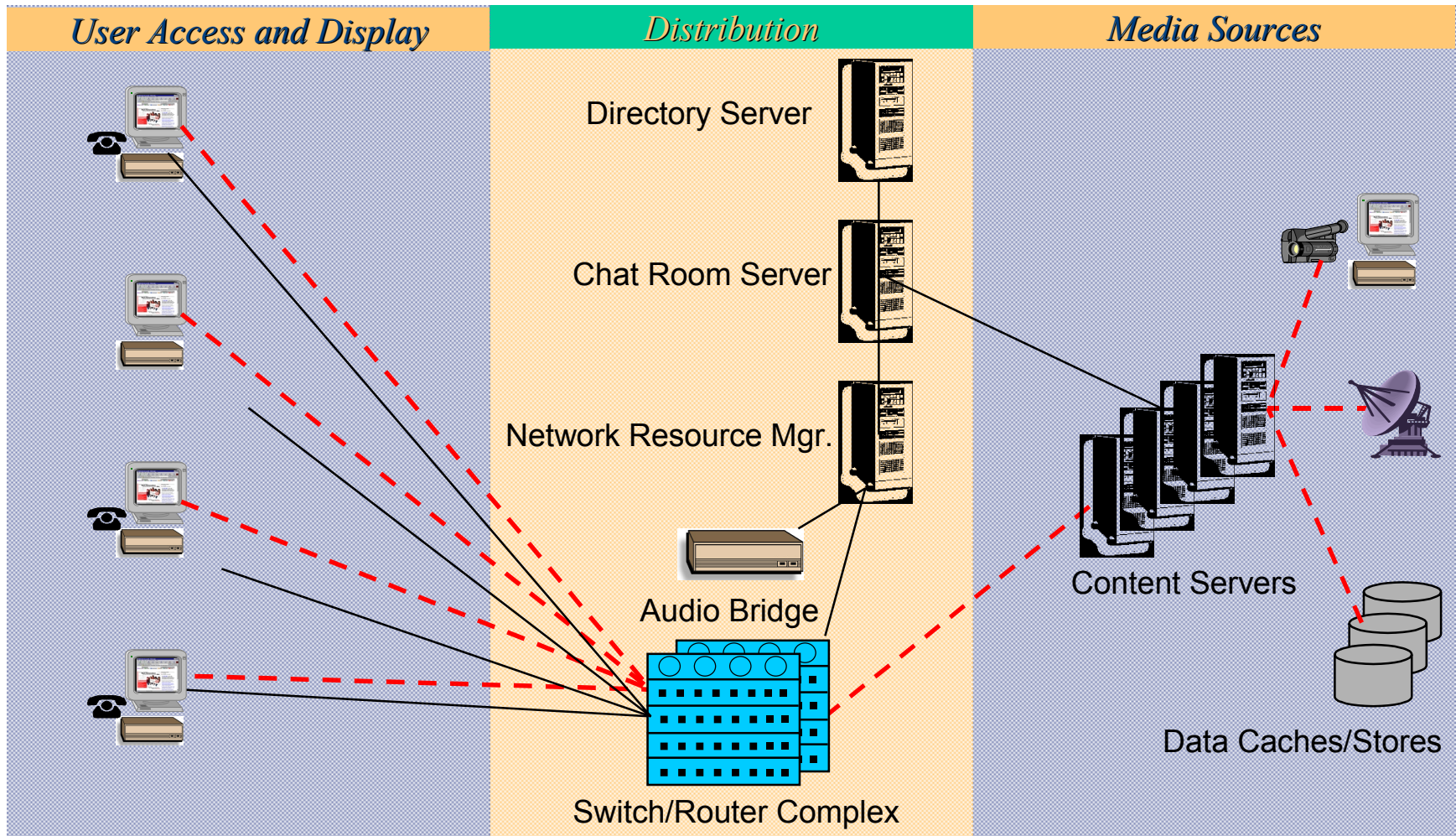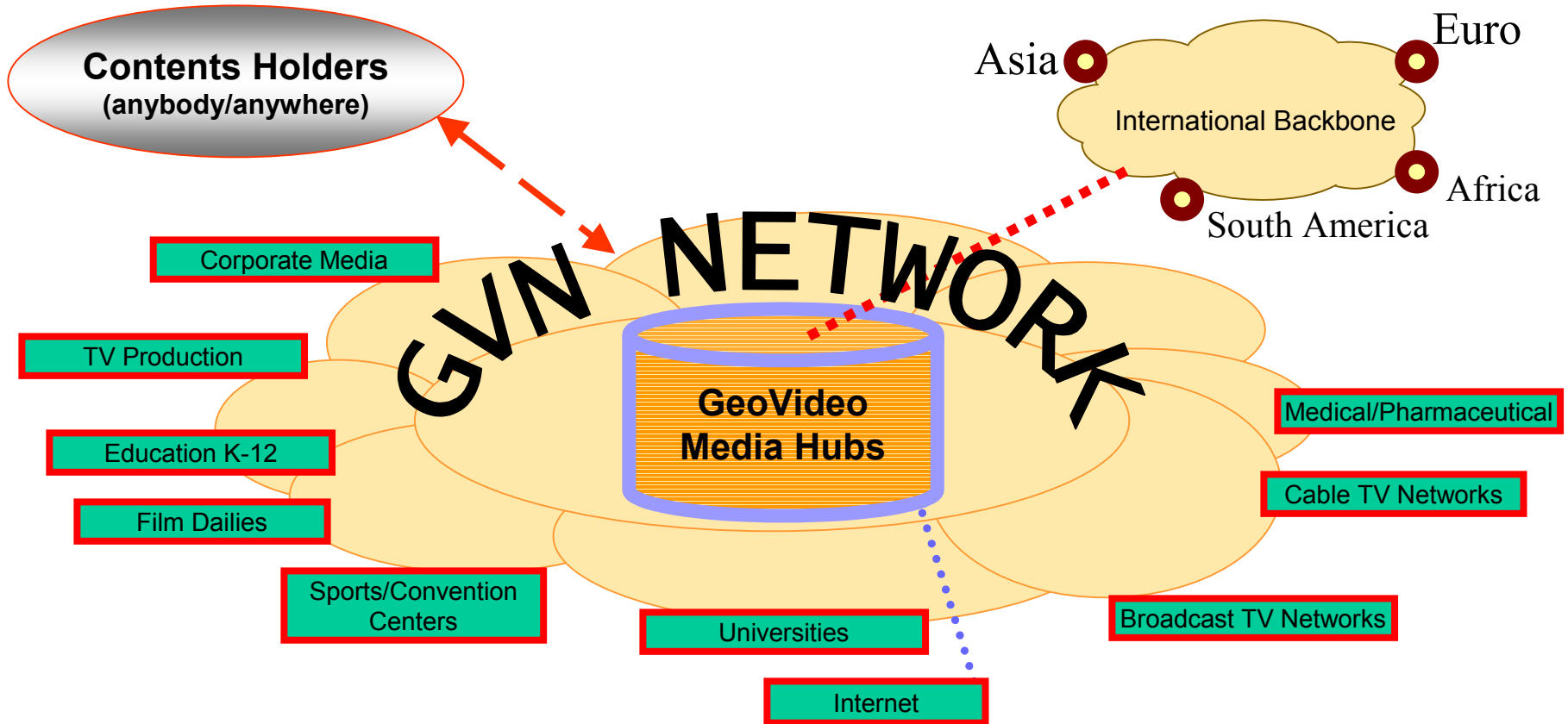- Content in a Virtual Theater can come from real-time sources or stored

What's Needed to Implement Virtual Theaters

- Network Protocols to allow Program creators to reach specific consumers with the required Quality of Service
- Network hosting of 'Virtual Theaters'
- Network help in efficiently distributing content (multicasting)
- Network help in collecting events and record keeping
- User/network interaction model for on-line provisioning

GEOVIDEO NETWORKS
A Lucent Technologies Venture

Lucent Technologies
Bell Labs Innovations

Contents Holders
(anybody/anywhere)

Asia
Euro
International Backbone
Africa
South America

GVN NETWORK

Corporate Media

TV Production

Education K-12

Film Dailies

Sports/Convention Centers

GeoVideo Media Hubs

Universities

Internet

Medical/Pharmaceutical

Cable TV Networks

Broadcast TV Networks

High Capacity Video Content Gateway

Ahuja 4.22.01

The GeoVideo Browser

- **IP video to the desktop PC**
- **High quality video – 30 fps**
- **16+ simultaneous windows**
- **Integrated functionality**
  - **Real Time**
  - **Video On demand**
  - **Conferencing/collaboration**

What does this offer you?

- Optics will allow users to be flooded with video just as they are with information on the net
- Rich video distribution models will become available
- Each program can be distributed differently and marketed separately
- Rich interactive programming allows easier creation, distribution and subscription to new video services