

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 speed

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

Deliver true video-on-demand over fiber.

Create new revenue streams—the only streams that matter.

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

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Ahuja 422.01

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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

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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)

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OPTICS : The Only Way To Go

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The Ultimate Optical Switch

10 Billion Node Optical Switch

100 Mbit connections

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Multi-Stage Network

1 Million Node Terabit Optical Switch

100 Mbit connection

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

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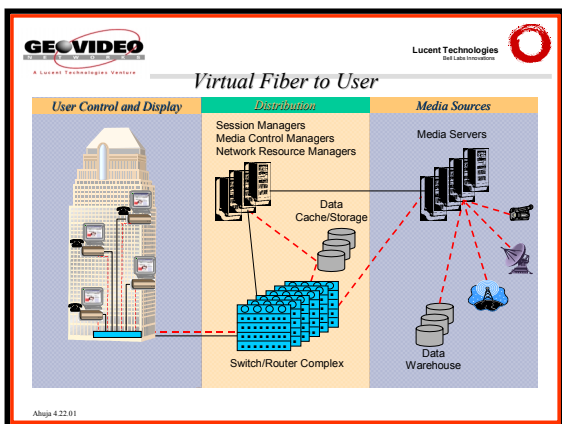
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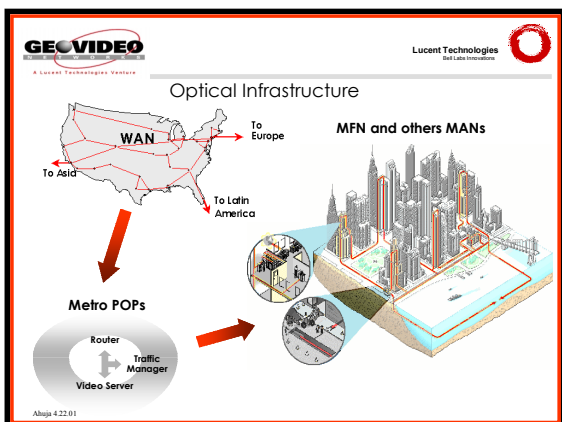
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Virtual Fiber to User (A Color of Light per User)

<ul style="list-style-type: none"> Virtual Fiber to User <ul style="list-style-type: none"> managed bandwidth guaranteed bandwidth multiple streams, each with guarantees no routing no intermediate buffering <ul style="list-style-type: none"> low delay lower expense no large storage (data pass-through) for large files (e.g., video) session controls <ul style="list-style-type: none"> supports billing supports events and associated services more reliable more accountability better maintenance 	<ul style="list-style-type: none"> High-Speed LAN <ul style="list-style-type: none"> unmanaged bandwidth no bandwidth guarantees no bandwidth guarantees routers, hubs intermediate buffers buffering delays buffer expenses no sessions
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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

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Control Nightmare

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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

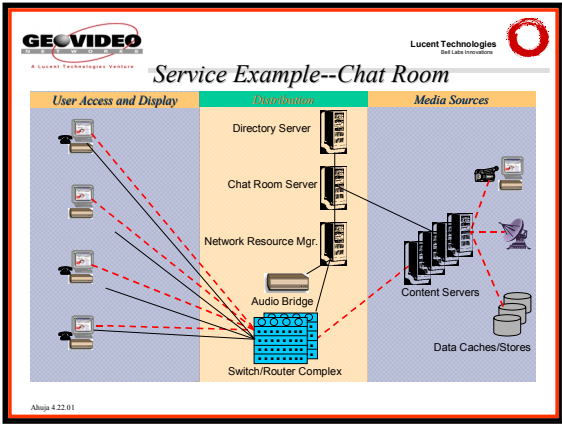
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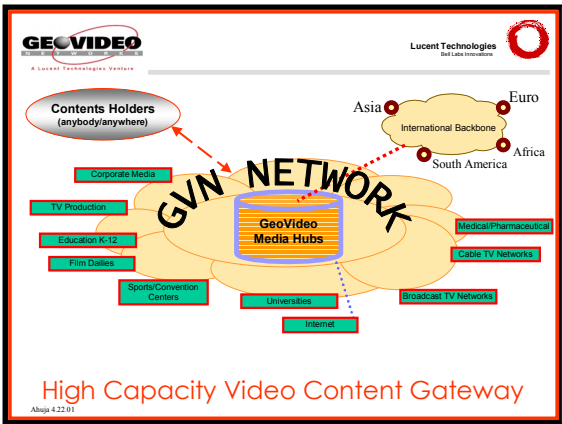
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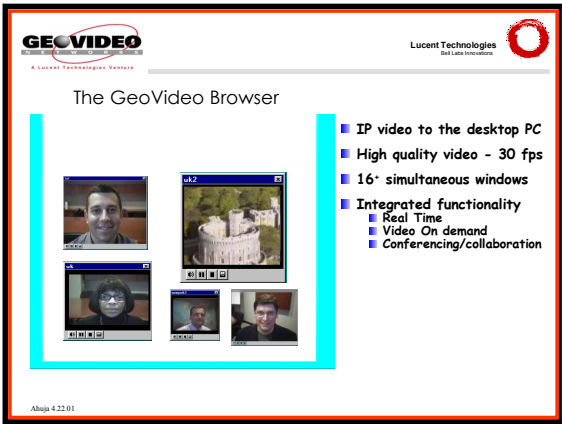
What's Needed to Implement Virtual Theaters

- 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

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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

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