

# *Whither Ubiquitous Video?*

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Lawrence A. Rowe  
Berkeley Multimedia Research Center  
University of California at Berkeley  
<http://bmrc.berkeley.edu/~larry>

## Simple Thesis

- Widespread use of video predicted for decades
  - Distributed collaboration/videoconferencing
  - Desktop video for training and entertainment
  - Video media widely used in documents/web pages
- But, video is not ubiquitous
  - Few people use videoconferencing
  - Video rarely used in documents/web pages
  - TV at home continues to be major use  
*Notwithstanding recent surveys about computer and TV use*
- Why?

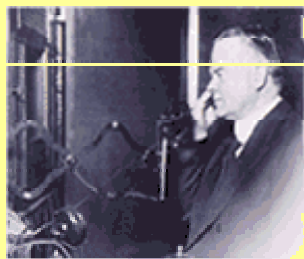
## Discussion

- PC vendors anxious for next generation killer-app to energize sales
  - Need app that will require cycles and storage
  - But, video requires network bandwidth
- Video communication has been predicted since late 1930's
  - And 50's, and 60's, and 70's, ...
  - Newest entrant in hype-wars: cell phones
- TV/motion images continue to hold dominant entertainment mind share
  - Advocate:** "Everyone will become TV producer just like we all do desktop publishing and use digital cameras"
  - Critic:** "TV is passive – people are couch potatoes; they do not want the hassle required to produce video"

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## VideoPhone



- 1927 early demos
- 1930's: commercial service
  - Point-to-point with phone booths around NY
- 1960's: PicturePhone
  - Too expensive
  - Poor quality
  - Limited users
  - Too big and bulky
- 1970's: H.32x VidConf
  - Widespread deployment
  - Limited use

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Thanks M. Chen for 1927 picture.

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## H.32x Standards



- Expensive
- Single stream?
- Requires MCU and operator → scalability?
- Commercial products with support

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## Quick Survey

1. How many people have speakers on desktop PC?
2. How many people have video camera and microphone on desktop PC?
3. How many people engage in desktop/cellphone vidconf more than ...  
once a month? week? day?
4. How many people use room-level vidconf once a week?
5. How many people watch streaming media ...  
once a month? week? day?

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## Quick Survey (cont.)

6. How many people have authored document or web page with video media?  
streaming media?
7. How many people have used a non-linear video editor?
8. How many people have copied music from the Internet and written it to a CD or DVD?
9. How many people have shot, digitized, and compressed video?

## Simple Example

- Why move this session to Yorktown?  
Why not use multiple rooms at Hawthorne and Yorktown with participation from any room?
- Why not allow remote participation?  
Many researchers elsewhere want to join this workshop
- Will the workshop be captured for on-demand replay by research community?  
Will it be published so anyone can watch it?

Because...

- expensive to produce
- complex to control
- different experience

## Conclusion: Video Not Ubiquitous!

*Many examples of doing specific tasks on one platform or of using a specific demo application, but facilities and software not integrated.*

## Possible Explanations?

- Setting up and running the hardware, software, and networking is hard and expensive
  - What is benefit?
- Software is too complicated to use
  - Who has time to learn new apps?
- High cost of infrastructure and support
  - Justify use of scarce funds?
- Low perceived value of video apps
  - People who need video use it today, so what is the problem?

## Setup is Difficult

- Cameras/mics not plug compatible with apps
  - How much time wasted trying to figure out why audio and video input do not work?
  - “We use a phone to debug problems with audio streaming!”
- Network bandwidth not available
  - How much time wasted trying to figure out why packets are being dropped and jitter is high?
  - Campus, organization, and home bandwidth constraints
  - Protocol constraints: Internet multicast to every desktop?
- What apps are deployed on every desktop?
  - NLE? WYSIWYG multimedia editor? Videoconferencing app?
- Who provides support?

## Setup is too Difficult (cont.)

- How many meeting rooms and spaces are audio/video enabled?
  - Raises serious privacy and access control issues!
  - What about portable video – need cameras on people having conversation → wearable?
- Technology does not integrate into existing home environments
  - How do you connect to TV or phone?
  - Is it ready for widespread deployment by novices?

## Complicated Software Apps

- Video capture and editing too complicated
  - NLEs are expert-user tools
  - Need end-user tools (iMovie) that integrate with other content archiving (RTSP servers) and authoring tools
  - Recall desktop publishing: simple end-user tools lead to explosion in use
- VidConf applications
  - Limited functionality
    - Point-to-point (NetMeeting?), only one stream (H.32x), poor audio/video quality (Mbone tools)*
  - Fragile
    - Mbone/Access Grid unreliable and very poor UI*
  - Require gurus to run
    - Need a/v techs and trained operators at every site*
  - Not widely deployed
  - Biased for low-bandwidth communications to reduce cost

## Access Grid: N-way Collaboration



### PRO

- Large contiguous display
- See everyone at same time
- Seamless audio/video
- Virtual room metaphor for connection protocol
- Emerging distributed collaboration standard

### CON

- Requires multicast
- Expensive equipment/room setup
- Requires trained operator
- Fragile software

## Complicated Software Apps (cont.)

- Webcast, event, and vidconf production tools extremely limited

Need capabilities in typical TV production system

*Select one or more video streams from large number of choices*

*Apply effects: titling, compositing, fades/wipes, etc.*

*Record to archive, replay selected clips back into session*

*Floor control and back-channel audio*

*Customization by end-user*

*Scale to very large sessions with multiple conversations*

*Move/forward streams between sessions with/without audio*

*Audio control: auto-adjust levels, music composition*

Need seamless interface between conventional production world and streaming media world

*Indiva middleware is one example*

Must reduce need for operators → automation!

*User turns on lights and it works...*

## High Infrastructure/Support Costs

- Audio/video infrastructure costs similar to network infrastructure costs

Requires equipment **and** people

- Network bandwidth is too expensive!

Home links are 1.5Mbps down/128Kbs up at best

Most businesses are symmetric 1.5Mbps

*Is IBM ready to pay for an OC3 link to allow publication of streaming media and synchronous video collaboration?*

Ubiquitous video requires more bandwidth!

*Typical n-way AG collaboration requires 10-15 Mbs per session*

## Perceived Value of VidApps is Low

- People do not need video apps
  - Cost and complexity barrier too high
  - Remember Napster: “users wanted this service”
- But, eLearning will drive use...
  - N-way collaboration is challenging
  - Synchronous –vs- asynchronous learning aid
- But, vidconf replaces travel...
  - Yes, but we all came to NY for this meeting!
  - Holding an on-line conference or workshop is more than just n-way collaboration
    - Many off-line discussions, often private*
    - Meeting moves around for meals, demos, etc.*
    - Mimic spontaneity of someone in audience shouting out a question?*
    - Must see participants!*

## What Needs to Change?

- Research funding for experimental systems
  - Duplicate the Unix and Internet experience for video
    - Substantial funding to build and deploy tools*
    - Commitment to use them for real work*
  - Funding to upgrade campus networks
    - Current NSF plan is to spend \$10M/year to build a multiple terabit network when the existing 600 Mbs Internet2 network is essentially unused*
  - \$35M ARPA BAA for image analysis and recognition
- Vendor support for open standards
  - Goal: interoperability of tools produced by different vendors
  - “Dream on Larry, they have no incentive to do it”
  - Must distinguish between transport compatibility, codec compatibility, and software portability

## What Needs to Change? (cont.)

- Substantial commitment by someone to fund video software and applications research – think \$5-10M per year for 10 years
  - Remember, all-electronic TV first demonstrated in 1927 but it took 10 years and \$500M to produce NTSC system
  - Anybody care to guess how much was spent on the Internet?
- Research community focus on the grand challenge:  
*find a compelling application*

Ask yourself after every talk today:

**Will this contribution encourage me  
to use video in my day-to-day life?**

## Conclusion

- Video will be the next insanely great thing!
- But, will it be this decade?
- ...or this century?