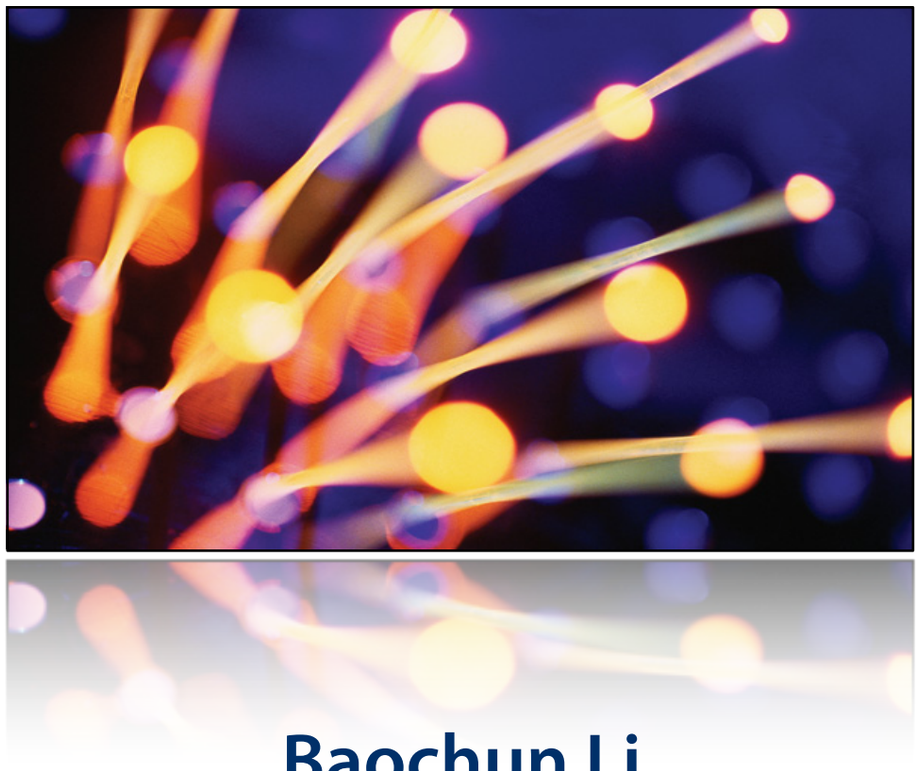
Multimedia Networking — What's Over and What's Coming



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ICCCN 2011 Multimedia Networking Panel

Two stories to tell about multimedia networking

Baochun Li, Department of Electrical and Computer Engineering, University of Toronto

What's in the rear view mirror and what's coming up?

Baochun Li, Department of Electrical and Computer Engineering, University of Toronto

Traditional multimedia applications

Baochun Li, Department of Electrical and Computer Engineering, University of Toronto

Streaming and conferencing

Baochun Li, Department of Electrical and Computer Engineering, University of Toronto

Networking for multimedia: the holy grail

Late 80s to late 90s: Quality of Service support in the core Internet infrastructure

Late 90s to late 00s: Let the end hosts contribute their resources

Beyond 2010: Now what?

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Rear-view mirror: Quality of Service in the 90s

The main idea: Making reservations to guarantee quality

A second idea: Allow market prices to work

Eventual debate: Over-provisioning vs. reservations

Why it's over? Too complex to deploy?

Rear-view mirror: peer-to-peer in the 2000s

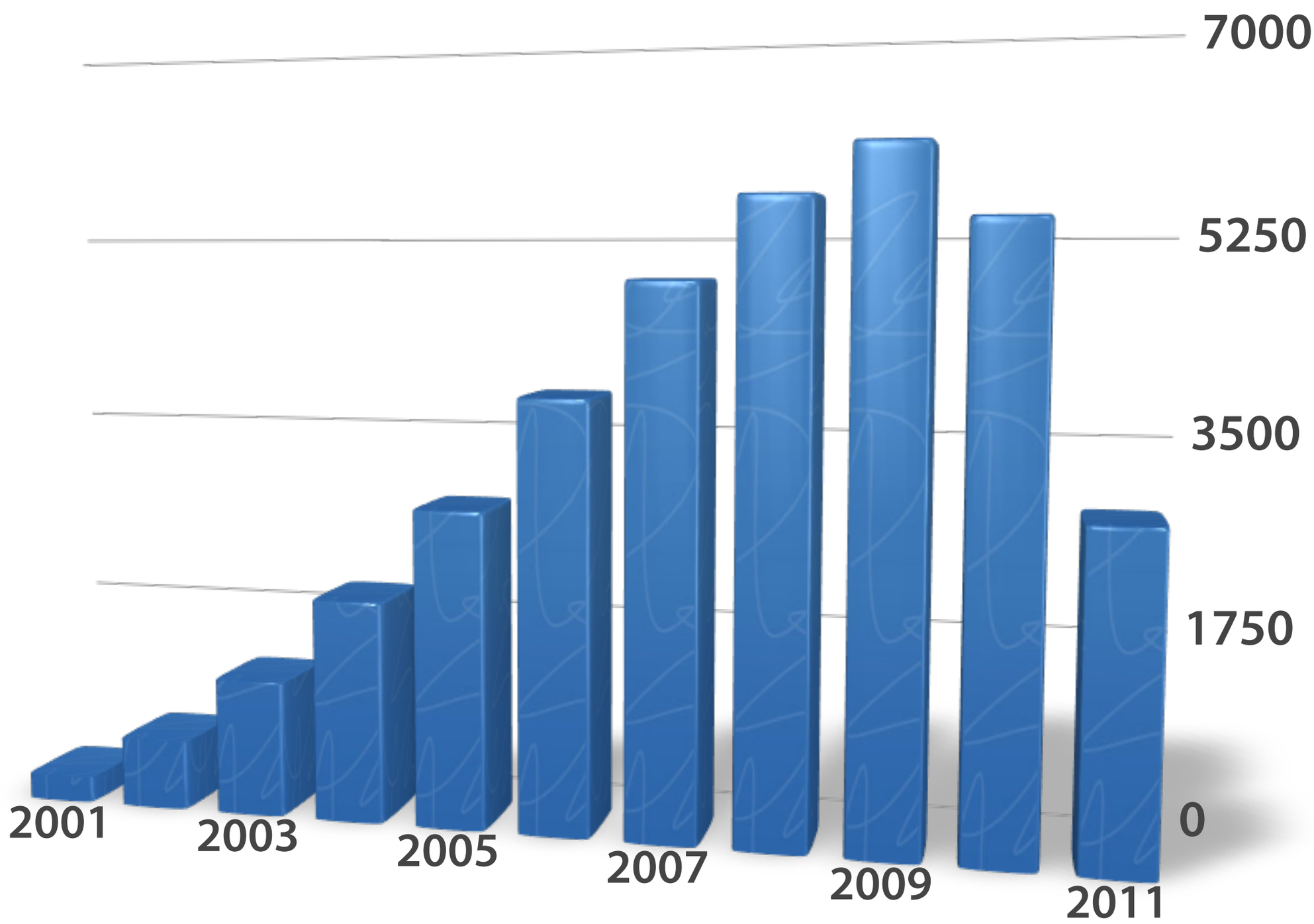
The main idea: Ask the end hosts to contribute their last-mile bandwidth to improve quality and to save costs

Simple to deploy: Used by millions of users for on-demand and live streaming

Eventual debate: Cloud or P2P?

Is P2P over by now?

Yes, P2P is (almost) over



*** Advanced Google Scholar search: "P2P" in the paper title**

It’s now 2011 — what’s coming?

Baochun Li, Department of Electrical and Computer Engineering, University of Toronto

Multimedia going social, and moving to mobile devices

Baochun Li, Department of Electrical and Computer Engineering, University of Toronto

One side of the coin: asynchronous social

Sending media (photos + videos) to other users when they are offline

Via IM, Facebook-like or Twitter-like social networks

Cloud hosting services will become completely transparent: no one cares where media is hosted

- Throughput is not important when uploading, as long as the media is reliably stored
- Throughput is not that important when downloading — as long as the streaming rate is satisfied, a problem that depends on last-mile capacity

The flip side: synchronously social

Interacting synchronously with others

But not necessarily limited to Skype-like audio or video conferencing!

Users are more willing to synchronously push application-specific metadata to their friends in a social setting —

- Location coordinates in 3D maps
- Player-specific states in an interactive game

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Socialize with mobile devices in the same room

With users addicted to their smartphones, socializing can be in the same room, in addition to around the world

Baochun Li, Department of Electrical and Computer Engineering, University of Toronto

One idea: streaming gestures — just like video

Streaming gestures from one user to all participating users in a group

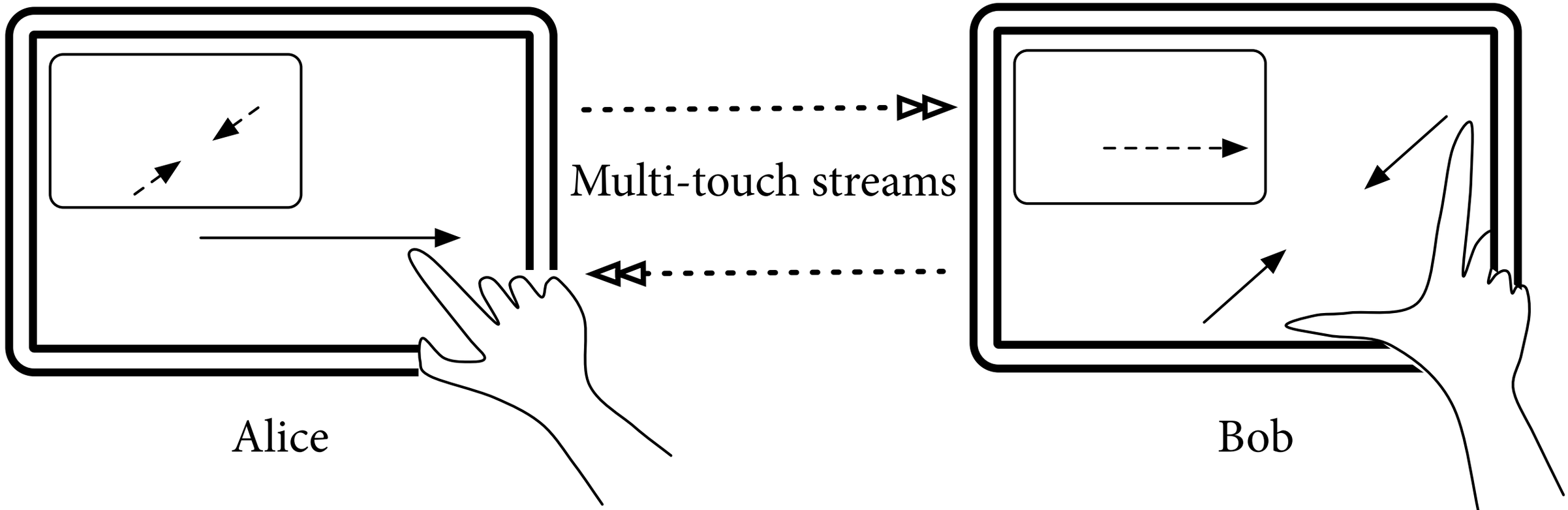
Reusable across applications that use gestures

Gesture streaming is not very demanding

Reliable and in-order packet delivery

Reasonable delays

Not much bandwidth is needed


Multi-touch streams
Alice
Bob

Title

Voice

Accidental

Semi-tone

Quarter-tone

- 1

- 1/2

0

A4 B4 C5 D5 E5

iPad

11:52 AM

Done

Title

Voice

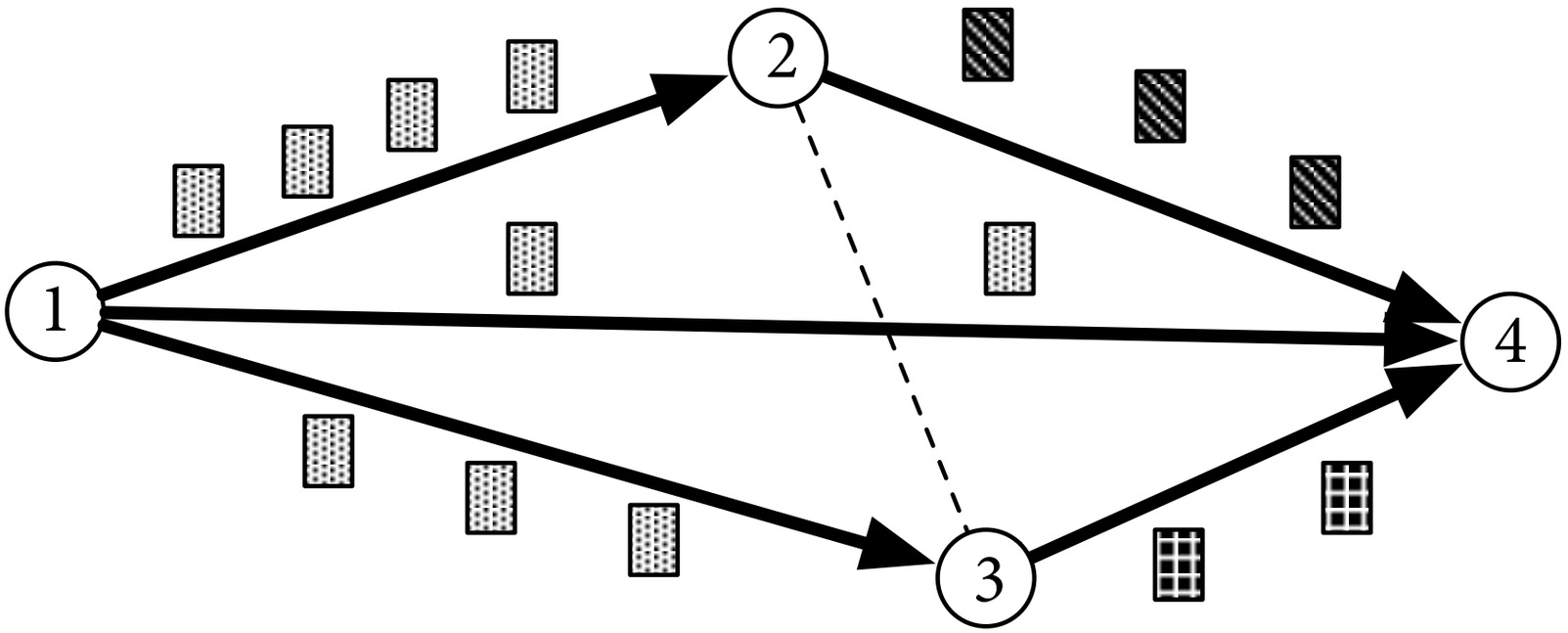
120

F3 G3 A3 B3 C4 D4 E4 F4

Design choices in gesture streaming

To guarantee reliable and in-order delivery — TCP over servers in the cloud or directly over local wireless connections

To minimize streaming delays — Multiple paths if needed



Sync. vs. async. social interaction

Is there a middle ground?

Achieved with real-time notifications and in-app state updates

but no need for a user to respond immediately

Example: collaborative authoring in the same mobile app

I call it "push updates without the push"

What we need to realize

We can move beyond media streaming applications

Mobile applications have become routine

Social media interaction can be synchronous or asynchronous (or somewhere in between)

It is not limited to Skype-like conferencing

New networking solutions can be designed

System frameworks are needed to support social media interaction in mobile applications

Thank you