The Future of Real-Time Video Communication

INSTITUTE FOR THE FUTURE

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The Technology Horizons Program combines a deep understanding of technology and societal forces to identify and evaluate discontinuities and innovations in the next three to ten years. Our approach to technology forecasting is unique—we put people at the center of our forecasts. Understanding humans as consumers, workers, householders, and community members allows IFTF to help companies look beyond technical feasibility to identify the value in new technologies, forecast adoption and diffusion patterns, and discover new market opportunities and threats.

ABOUT THE INSTITUTE FOR THE FUTURE ...

The Institute for the Future (IFTF) is an independent, nonprofit strategic research group with more than 40 years of forecasting experience. The core of our work is identifying emerging trends and discontinuities that will transform global society and the global marketplace. We provide our members with insights into business strategy, design process, innovation, and social dilemmas. Our research generates the foresight needed to create insights that lead to action. Our research spans a broad territory of deeply transformative trends, from health and health care to technology, the workplace, and human identity. The Institute for the Future is located in Palo Alto, California.

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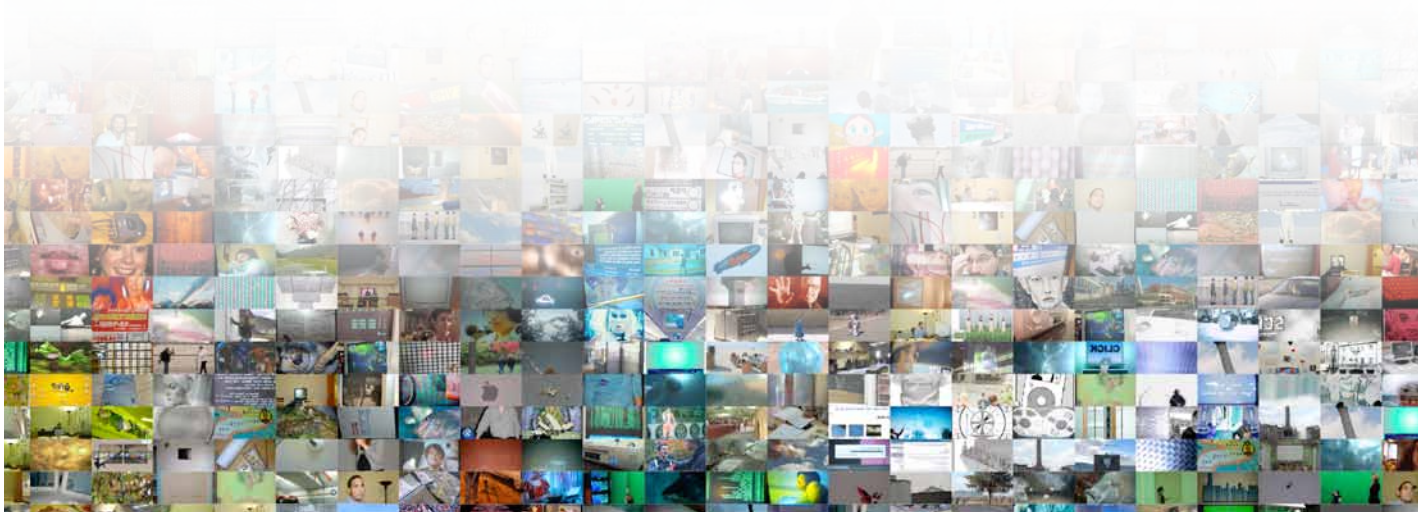
EXECUTIVE SUMMARY

What is the future of real-time video communication? What will it feel like to live and work in a world where real-time video is ubiquitous? And what are the most important user, technological, market, and policy forces that will shape the course of global real-time video development and diffusion? These are the questions we set out to explore in this report, *The Future of Real-Time Video Communication.*

Video technologies are improving dramatically and rapidly, supporting mobile and ubiquitous real-time video experiences. Low-cost, simple platforms for real-time video will become an essential part of the way we communicate with each other, and will spawn the next generation of consumer behavior, business practice, media culture and economics, and innovation policy.

For consumers, real-time video will:

- Foster short-burst, high-engagement interaction, where richer, more intimate and information-rich communication is possible and preferred.
- Foster extended low-engagement co-presence, where people simply "spend time together" via video portals.
- Create new traditions, practices, and habits of communications—transforming holidays, special events, and personal relationships.



For business practice, real-time video will:

- Allow for more lightweight communications options that will increase the agility, flexibility, and efficiency of all companies—small, medium, and large.
- Offer new options for deeper customer relations and outreach, as well as for improved internal and external collaboration.
- Redefine office space and employee travel patterns.

For technology and innovation, real-time video will:

- Encourage designers and hardware-makers to turn their products into multi-functional, inter-operable, networked communications devices.
- Drive the need and incentives for increased bandwidth capacity for the mobile and fixed Internet, and create an opportunity space for applications and software developers to maximize quality within a constrained environment.

For society, real-time video will:

- Transform distance, bringing individuals, groups, and cultures together around the world. It will allow people to connect with friends and strangers in new ways.
- Allow us to collectively watch unfiltered events both trivial and profound, and bear witness to history as it happens.

For government and policy, real-time video will:

- Challenge the logic and efficacy of our current communications policies.
- Force us to address the necessity of affordable access to open communications platforms for the function of democracy, for the social good, and for economic growth.
- Offer new avenues for officials to communicate with each other and with constituents.

The Institute for the Future (IFTF) has a long history of research into electronic computing and communications networks—from the early days of the ARPA-Net to mobile and locative media to our most recent work on blended digital/physical realities and the future of video. We've tracked and forecasted generations of disruptive and transformative technologies—always looking for the differences that matter to organizations, businesses, and society.

Transformations in networked communications are approaching and whizzing by us today at accelerating speeds and are more complex than ever. An extended time horizon and expansive view of the landscape help us reduce the vertigo of accelerated change that confronts analysts and forecasters today.

This broad scope and ten-year time horizon gives us a framework to see the realities for real-time video beyond the hype cycle. It helps us to uncover in which domains Internet-enabled synchronous audio-video communications (i.e, real-time video), will have the most impact, and what forces will be most important to its future growth.

This report is organized into three main chapters. Following the Introduction, Chapter 1 provides an overview of the new cultures and vernaculars that are blooming around video, and how video is transforming the Web. Chapter 2 lays out four visions or narratives for use cases of real-time video in ten years, built on our research, and explained in detail in the chapter. These scenarios integrate the complex interactions of technical, social, and market forces into stories of everyday human use of real-time video. Chapter 3 takes a more analytical approach to explore the major trends and drivers shaping real-time video, providing the foundation for our conclusions.

Our conclusions are, in short, that growth and innovation in the technological infrastructure and software ecology of the Internet are giving consumers easier access to high quality, real-time video communication. The next decade will see billions of people using Web-based real-time video as a preferred communications and social networking choice, joining blogging, micro-blogging, IM, email, texting, and voice calls in the menu of options. Real-time video is not only transforming how we communicate with each other; it's also changing how we form the networks that connect our lives together. From workplace to living room, from the streets to our backyards, real-time video will reorganize the way we talk to each other, the way we conduct business, and the way we participate in human events, large and small.

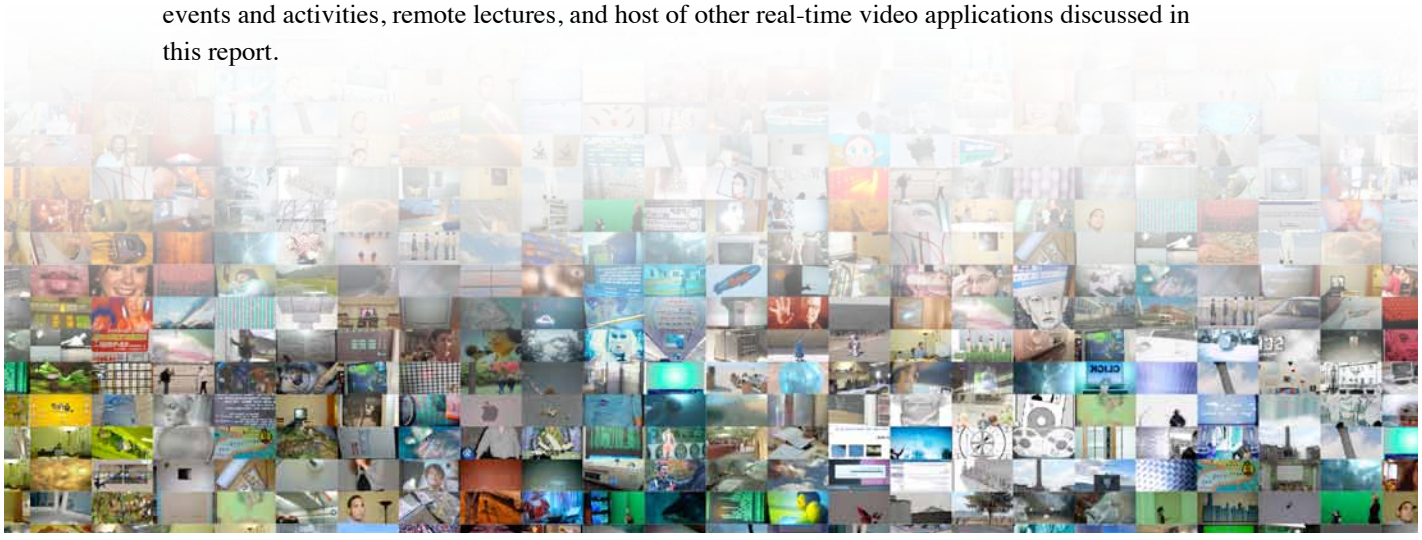
INTRODUCTION:
REAL-TIME VIDEO AT THE INFLECTION POINT

Albert Einstein said our technologies have exceeded our humanity. And while that may be true for certain technologies of destruction, we've also built, and are building, technologies that are enabling our humanity. Networked computing devices have been transformed from information sharing and storing devices into a global communications platform unequaled in history. We are engaged in a cultural and civilization shift, happening through billions of conversations—person to person, group to group, culture to culture.

For most technologies, it takes about 10 years of infrastructure build-out, software development, user interface design, social adoption, and network effects before full maturity is reached. We've had video on the Web since the late 1990s, with Quicktime and .mpeg, but it took more powerful CPUs, increased bandwidth capacity, affordable and embeddable digital cameras, and simple distribution platforms for sharing clips to create the video explosion we are seeing today.

These developments opened the floodgates of video on the Web, transforming the Web from an information and text communications tool to a rich media environment for communications and content. In 2005, YouTube combined a simple user interface with a strong community identity to become (and remain) the most popular site for video on the Web today—registering billions of views each month and adding over 20 hours of video every minute (and growing). We are witnessing the evolution of the text-Web into the rich-media-Web right before our eyes.

We are accelerating toward the take-off point for another communications transformation as well. The convergence of the "real-time Web" and the "video Web" has set the stage for the transformation of the Web into a real-time video communications platform. For the purposes of this report, we define real-time video communication as *a synchronous audio-visual interaction between individuals or groups, carried out over the network infrastructure of the fixed or mobile Internet*. This definition includes peer-to-peer video calls, multi-point video conferences, live streaming of events and activities, remote lectures, and host of other real-time video applications discussed in this report.



Today, many devices are able to conduct live video communications, and many more are in the pipeline—transforming the design, implementation, and use of those devices. Simultaneously, as real-time video communications becomes part of our daily lives and our suite of business tools, we are seeing the beginnings of persistent conversations across contexts—tied more to the user than the devices being used. As we move through office, car, home, and elsewhere, our devices will be coordinated and linked to maintain the continuity of our communication events. In other words, I could start a conference call on my office computer, shift the call to my mobile device for my commute home, and finish the call on my home computer or web-enabled television.

Software clients like Skype have made voice calls over the Web possible for everyone with a web-enabled device. Yet a recent poll showed that only 30% of Americans have ever made a real-time video call on the Web, compared that to the over 86% who watch, or have watched, recorded videos on the Web.[1] As video converges with Web-based real-time communication, synchronous video will play a major role in the next generation of Web communication—which makes it ripe for innovations that will push this mode of communication into the mainstream for consumers and businesses.

Growth and innovation in the technological infrastructure and software ecology of the Internet are giving consumers easier access to high-quality, real-time video communication. But real-time video is not only transforming how we communicate with each other; it's also changing how we form the networks that connect our lives together. From workplace to entertainment spaces, real-time video has the potential to reorganize the way we share tasks, the way we connect to business services, and the way we participate in human events, large and small.

New applications, access, and user practices are thus giving people exciting new ways to use the Web. But they are also creating unprecedented demand on broadband capacity. Players from the enterprise market, device-makers, social networking platforms, and software developers will all be vying for a stake in this game-changing communications arena. Within the next 6–12 months, we will see both massive disruption and consolidation of the market that will reward companies with the right mix of quality, user base, flexibility, trust, market acumen, and foresight—making their names synonymous with real-time video communications for the next decade and beyond.

BECOMING PEOPLE OF THE SCREEN: THE POWER OF VIDEO CONNECTION

1

"When media change, human relationships change."

–Michael Wesch, media anthropologist.

We've seen throughout history that each new medium comes with its own possibilities and limitations, impacting individuals and the social order in profound ways. The printing press democratized communication and made a literate (and revolutionary) civil society possible. Ubiquitous and accessible communication applications are now allowing more people to join the growing global symphony of text, voice, and video conversations, with vibrant new cultures and practices emerging. We all have the potential to use video-enabled networked devices to communicate in modes and manners we never have before. As Kevin Kelly of *Wired* magazine wrote, we are witnessing the birth of a new culture around video communication—we are in the midst of becoming "people of the screen."

Source: IFTF, 2008

The 2009 Technology Horizons research task, *Becoming People of the Screen.*

The way people are using their webcams and mobile cameras reflects the social nature of video. The camera eye, internalized into the way we see the world, is more akin to a personal paparazzo or tabloid journalist than an inspired video artist. Within the context of our social networks, we are looking to capture "share-worthy" or "news-worthy" footage that we think our friends would enjoy. With real-time video, we can stream events to the Web and have instant feedback on our lives and experiences. As new media cultural anthropologist Mimi Ito argues, the majority of user-created videos are about "social belonging, about identity, about participation in community, about pleasure, about having fun together. Creativity is a side effect of social participation, not the other way around."

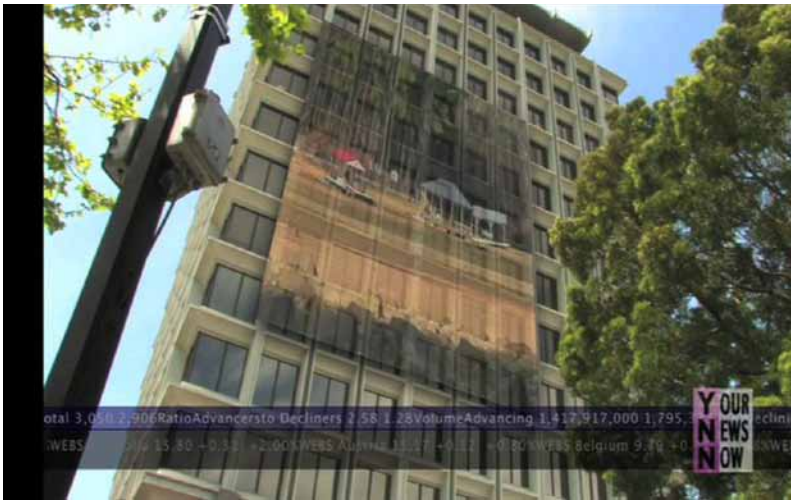
Becoming people of the screen is not about video replacing text, voice, or other media, but rather it is about the increasing power of video to connect us together as friends, as colleagues, and as a global community.

THE UBIQUITY OF VIDEO

Video communication is becoming pervasive—on TVs, laptops, desktop computers, mobile devices, even appliances. The commercialization of flexible OLEDs and software that allows accurate projection of images on complex and irregular surfaces will eventually turn virtually any surface into a screen.

Users will interact with video everywhere, and they will expect their communication sessions to continue seamlessly from context to context, device to device. By 2015, social media networks will be an integral element of TV viewing experiences, and many televisions will come equipped with a small video camera for face recognition and broadband Internet-based video teleconferencing.[2]

Images from *See-through World*, an IFTF digital story produced for the Technology Horizons Future of Video Conference.



Source: IFTF, 2009

At the same time, convergence of TV and the Web is emerging differently in different regions based on technology policy, market competition, and user preferences. China, for example, has been one of the most mature p2pTV markets in the world for the past several years. The Chinese people have a wide range of choices (such as TVants, TVUPlayer, PPLive, QQLive, Feidian, PPStream, SopCast) for watching television and movies on their computer screens. More and more of these solutions now allow users to create their own broadcast channels as well.

This convergence will significantly change how people negotiate their domestic space, and how ambient awareness of others in our networks will mean sharing more and more of our lives with the people we care about the most. In addition to this continuous shared intimacy that we will experience with close family and friends, Web-enabled TV video communication will provide opportunities for situational intimacy, such as increasing engagement during video games, or watching programs or events "together" with friends or even strangers. The TV will become part of an integrated device ecosystem, delivering a robust communications experience.

Software will be the key to make transitions across devices possible and relatively seamless. Conversations will be linked to the people involved, wherever they are, not to any one device. Devices and hardware will be essential, but ubiquitous and ambient, fading into the background of user awareness.

THE TRANSFORMATIVE POWER OF VIDEO

Turning passive consumers into media-creators and engaged participants changes the entire dynamic of markets, innovation, and creativity. Video communication, with increasingly low barriers to entry, is allowing almost everyone a chance to be an active stakeholder in the emerging media community. Of course, levels of participation and engagement in the video world will vary—from people who live their lives on the screen to those who only occasionally watch videos of people they know. However, the broad shift in culture and the new vernaculars that video communications is generating will be felt by everyone.

Video culture is developing its own new language, one that must be understood in order to communicate effectively within this community. During the shift of a technology into a communications medium, hybrid genres, grammars, and conventions smooth the transition from old media to new, often making the new mode appear more familiar, palatable, and natural. Based on the way people are using real-time video communication—especially via laptop webcam—video appears to be shifting from simple voice call replacement and developing its own native genres and modes of communication. For example, with the cost barrier removed, people are simply "spending time" together through their computers, giving some, but not all, of their attention to people in other locations.

Becoming people of the screen also signals new ways of constructing our identities and forming and maintaining relationships with those around us. In our 2009 report, *The Future of Video* (SR-1219), IFTF commented that these meanings emerge when we blend the digital and physical worlds, enabling users to be the "stars of their own shows:"

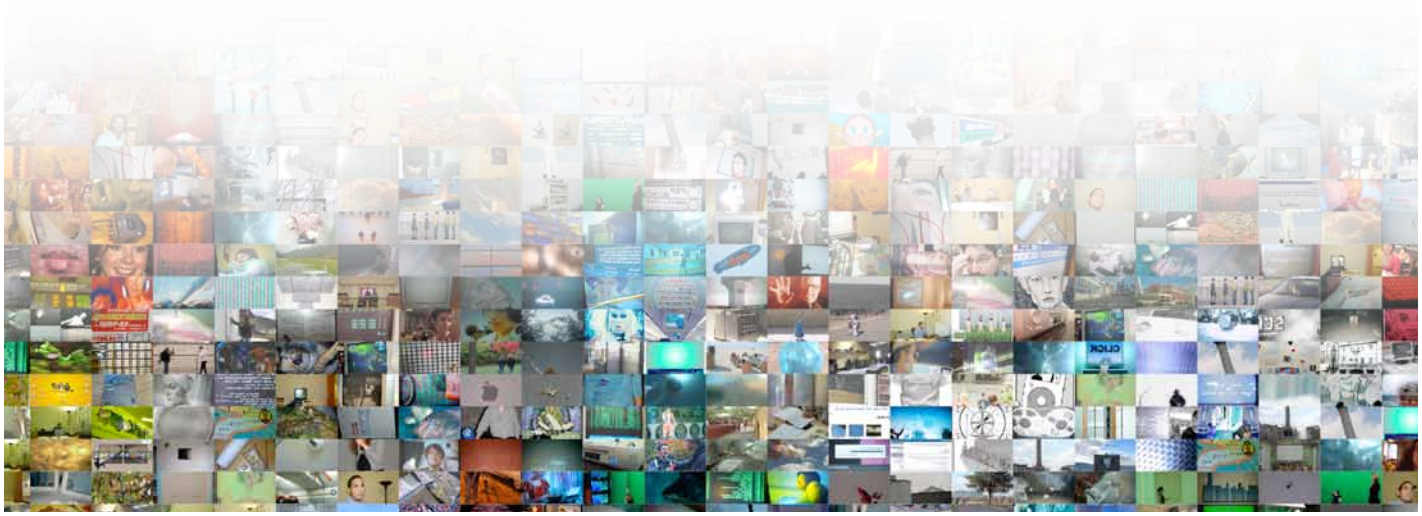
> "All of the new audiences we create and that acquire a constant, ambient presence in our lives—our Facebook friends, Twitter followers, blog readers, lifecast fans, and more—provide new reference points for creating and shaping our identities, our senses of self. Not only are we creating multiple new reference points and feedback loops through which we view ourselves, but we are gaining a new level of awareness about their presence in our lives.[3]"

Real-time video communication is becoming an integral part of the way we talk to each other, watch each other, and find warmth in the light of each other's daily lives. It is bringing people and communities closer, keeping loved ones within reach, and enriching millions of people's everyday lives.

THE FUTURE ECOLOGY OF REAL-TIME VIDEO: FOUR SCENARIOS FOR COMMUNICATION IN 2020

2

To explore the future ecology of real-time video, this chapter presents four scenarios that depict a world of dense video communication and connection. These scenarios embody four major use cases that are likely to drive adoption and use of real-time video communication, both for the fixed and mobile Internet. They highlight the drivers that are making real-time video communications an essential part of the way we talk, celebrate, do business, build relationships, enjoy entertainment, and navigate our day.



SCENARIO 1:

THE ENGAGEMENT PARTY

Video Makes Special Occasions More Special

Nawal's parents knew that Bram was planning to pop the question to her during the young couple's upcoming trip to Hawaii, and they couldn't wait to celebrate the engagement. Bram had arranged for a "Digital+" suite at the hotel, with a high-end video teleconferencing package. Bram's next surprise (if Nawal said "Yes!") would be a remote tele-engagement party with both sides of the new family and many of their closest friends. He thought about waiting until they got back to Belgium to have the party. But he wanted everyone to feel the excitement of the moment, and maybe more importantly, he knew that he couldn't get people from three different continents together with his own set-up back home.

Still, with the time differences between Hawaii, Jeddah, Antwerp, and several other cities, he knew it would be difficult to get everyone together at the same time, and he was nervous that the party would be disappointing. But if people couldn't make the live party, he told them to record their "congrats" greeting that would automatically play when he flung open the door of the hotel room.

Nawal's grandparents in Jeddah had been rationing their Web use for weeks, hoping not to exceed their broadband monthly quota. While most of the world's broadband capacity had been built-out over the last few years to handle the rich media that made up the bulk of Internet communications, rural areas around the world—and many areas with state-owned telcoms—still had intermittent quality and often had very limiting terms of service for users.

Since there would be at least 10 separate feeds coming in, Bram couldn't afford the premium multi-point package—the option with no advertising and guaranteed quality of service. He opted instead for the limited advertising option—just discreet visual ads from the hotel's parent travel company—targeted to each participant's location. He looked at the free service from the hotel, but that included what he thought were very tacky augmented reality ads that popped-up every time they said a certain word, or when they opened their gifts.

"Checking In" to the Celebration

Source: IFTF, 2009
Photo credits: flickr users bradleypjohnson and dlisbona

The sunset proposal on top of Haleakala could not have been more romantic. With the "yes" confirmed, Bram pushed the proposal to his private lifestream storage account, and set his MyLyfe™ networking account to "2°" so close friends and family could follow them live and prepare for the party. He and his bride-to-be walked on a cloud back to the hotel. As they neared the suite, Nawal could see the bright glow from under the door. Bram swung the door open to three wall screens full of teary-eyed family and friends, and to the simultaneous scream of (in at least different five languages): "Congratulations!"

DISCUSSION OF "THE ENGAGEMENT PARTY"

According to Skype user data, video calls as a percentage of overall Skype minutes increased 66% during the 2008 holiday season.[4] People clearly seem to prefer video calls for special occasions and holidays because it is a much fuller and more intimate experience than other modes of communication, if they can't be there in person. There will be a growing use of video calling among friends and families during holidays, major life events, and other high-engagement episodes. This use will likely be promoted and marketed like other special-event products and services, creating a new "traditions."

While "The Engagement Party" scenario shows a use case of real-time video bringing people together from disparate locations, video is transforming the distances we once considered necessary to make travel prohibitive and telecommuting necessary. The intimacy and effectiveness of a live video call is, as Skype President Josh Silverman observed, "changing the definition of 'live far away.'" Instead of driving across town to see friends or relatives, or to conduct business, video conferencing is delivering the fidelity, efficiency, and intimacy to overcome the deficits of and need for travel.

The future will likely be dominated by common platforms or unified communication tools that will tie all elements of a user's information and communication stream together. In other words, one UI will allow location information, social networks, and recorded lifestreams to be coordinated and consolidated. There will be customized options to broadcast lifestreams live and to broadcast or store recorded events privately to a friend network or to post them to a fully public site.

Possible real-time video communication revenue models will include premium service tied to quality, using contextual advertising arrangements with network providers, software and applications platforms, and end-users. In the context of intimate, real-time video calling, advertising must not drastically interfere with the experience. Pre- or post-call advertisements and bottom-third banner ads will be tolerated—as they are with asynchronous video today—but obtrusive video or audio within the more private, intimate space of real-time video calling will greatly diminish the experience and drive away users.

Although economic uncertainties, a movement toward reducing our footprint on the environment, and global climate disruption may influence how and where human migration takes place, more close friends and family are likely to be living at a distance from one another. Uneven access and broadband capacity, as well as usage regulation associated with access and carrier regulation, will create multiple usage adaptations, quality expectations, and pricing regimes among users in different locations. A user-interface dashboard showing connection speed, broadband usage, and pricing options will greatly improve users' navigation and understanding of the conditions underpinning their video call experience.

SCENARIO 2

FIRST DAY:
Employees Navigate a Video Bureaucracy ... or Don't

Jim looked around at the huge, dark screens on the walls. They were impressive, but strangely disquieting. His first day at work and he was stuck in this dark room, in some corner of the building he never wanted to see again. Finally, a company representative came in and told him that he was about to get his initial screening by the company doctor. One of the large screens lit up quickly and on the other side of the screen was ... Dr. Vuko, in another room that looked very similar to the one Jim was in, except for some typical medical equipment and supplies in the background. The assistant took his vital signs, and entered notes as Jim discussed his medical history with the doctor.

After the assistant left and the screen went dark, Jim sat for another few minutes before a new representative came in. He gave Jim a small box with a rolled screen and a new, foldable mobile computer with a pico projector. The assistant unrolled the screen, placed it on the table in front of Jim, entered a code on the computer and exited silently. Following a short boot-up, the screen lit up and started a canned company orientation and tutorial. After listening to the saccharine corporate speak for half an hour, Jim scoffed and muttered aloud, "What is the point of this?"

At that second, his screen shifted from the pre-recorded orientation to a live person—one who did not seem pleased to be speaking with Jim. "Is there a problem, Mr. Drobik?"

"Uh, no ... no problem. Just want to get on with the training."

"Good!" said the man on the other end, "and please keep your eyes on the screen." The orientation picked up where it had paused.

Jim was very happy that he would be spending most of his time in the open space of the third floor. He wondered (silently this time) why all this space and bureaucracy was needed to do what was essentially a very simple job. He

Amplified Workers in the Distributed Work Place

Source: IFTF, 2009
Photo credits: flickr users stevegarfield, craig1black, Liza 31337, konch

had several friends in start-ups who worked all day at their "office" in Central Park. Their "boss" was basically a secure software platform that structured their day and tracked performance in real-time, providing suggestions on what techniques were working most effectively at any time as well as instant feedback on their performance. The platform also gave them access to the searchable video database of team and client meetings.

And they were using video in much more exciting ways than he saw in his new environs. Not just multi-point teleconferencing and virtual meetings, which were standard practice, but one guy he knew developed a tool that allowed him to use video in his presentations almost like a VJ—mixing video references and clips on the fly.

"Hmmm," thought Jim. He got up from the desk and searched for his friend's number. As he was walking out the door, he heard the recorded orientation stop suddenly, and that grumpy old voice he never wanted to hear again calling out, "Mr. Drobik? Mr. Drobik? Are you there?"

DISCUSSION OF "FIRST DAY"

The tele-presence market has become a pitched battleground. According to a *Wall Street Journal* article, quoted by Andrew Winston of the *Harvard Business Review*, the tele-presence market saw growth up "30% from last year as businesses look to reduce travel expenses." Winston also notes the convergence of green values and economic austerity, "These companies are cashing in on the business world's pressing need to get lean, while also appealing to the desire to get green." At a recent IFTF Conference, Saul Griffith, inventor and MacArthur Genius Grant recipient, said that "video conferencing could possibly be one of the most important technologies for reducing our environmental impact."[5]

However, there has been little evidence to show that increased tele- and voice-communications leads to reduced travel over the long term. In fact, it has been shown to lead to more face-to-face contact, and thus, more travel. Employees also often resist tele-commuting because there are many advantages to shared office space, including creating a common culture and company identity, as well as a place to host and impress clients. We may be seeing the "perfect storm" of economics, environment, and energy trends that finally induce a longer decline in business travel, but it is not safe to assume that, this time, we're finally looking at a true travel substitution scenario.

Nevertheless, reduced travel is not a prerequisite for increased real-time video conferencing for business, and the space is primed for innovation. Lanny Smoot and researchers at Bell Labs showed that productive collaboration among co-workers is directly related to physical distance—those who work closer seem to work better together. But when video tele-presence technology was added at common spaces around the office and workplace, productivity amongst those working collaboratively at a distance increased significantly.

While the enterprise market will continue to integrate high-end teleconferencing systems, mid- to small-size companies that are looking for more lightweight solutions will be seeking a secure, networked platform—an "infrastructure in a box" as IFTF's Kathi Vian calls it. These solutions are likely to be small, portable Web-enabled devices that can provide real-time video access with searchable video from team and client meetings, customer calls, and training or policy information.

Business use of video in presentations and corporate communications will also grow. These agile, distributed, smaller scale business contexts are where rapid innovation is most likely—and where real-time video communication will fuel disruptive business evolution.

SCENARIO 3:

THE DELHI GAMES: Video Redefines the "Fan" Experience

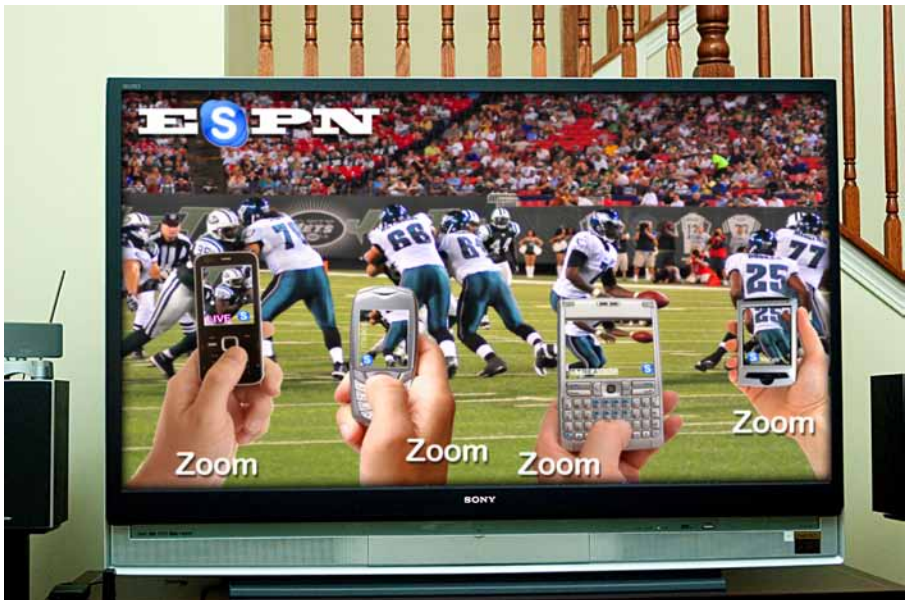
After the near fan revolt at the Rio de Janeiro Olympic games in 2016, Delhi officials decided to allow crowds to stream live media and descriptions to the Internet. Not that they had much choice. When fan video and image uploading brought down the entire mobile Internet in Rio during the opening ceremonies, officials took the Draconian measure of blocking all mobile usage at the major events for the rest of the Games. The International Olympic Committee (IOC) responded by mandating massive mobile and fixed bandwidth capacity increases at all future Olympic sites. Delhi moved quickly to meet the standards imposed by the IOC for the 2020 games. If stadiums, traffic models, accommodations, and service capacity had previously been the core Olympic infrastructure needs—by 2016, bandwidth had emerged as an essential requirement.

One of the most competitive mobile markets in the world, India, had seen incredibly rapid mobile broadband adoption rates during the early part of the decade—and with it came all the problems associated with bandwidth capacity and shrinking profit margins for providers. So India coordinated a massive effort between telecoms, carriers, and software developers to handle the coming tsunami of media and information that would be inundating its networks.

One of the biggest hurdles, however, was not technical but political. Indian intelligence agencies had been successful in blocking Skype and other VoIP software applications, which were deemed a security threat following the use of real-time social networking tools to aid the 2008 Mumbai attacks. But after Rio, fan experience and satisfaction was a top priority, and the blocking of real-time video and voice applications—even those that did not follow India's "right to intercept" law—was suspended.

Live streaming fan videos from sporting events and other live performances have become part of most people's viewing experience. In the United States, an initial back-

On-the-ground Perspectives through Live Streaming Fan Videos



Source: IFTF, 2009
Photo credits: flickr users fensterbme and Ed Yourdon

lash against real-time video at sporting events by the sanctioning bodies and leagues led to very fan-unfriendly policies.[6] But eventually, most began to see the value of increased fan involvement, both in person and through digital networks. The Southeastern Conference (SEC), a league of college football teams, switched from the most prohibitive social media policy in 2009 to the most open and accessible policy in 2012. When "videosynth" broadcasts of SEC games began in 2017, digitally stitching together live fan videos to give a 360º view of the game revolutionized live sports and performance viewing forever. The NFL soon followed. Fans who streamed their video to the ESPN network were given discounts on tickets and merchandise during the game. The sight of thousands of people holding their mobile devices in front of their faces as they recorded the games was strange at first, but creative one-handed cheers became fan favorites.

DISCUSSION OF "THE DELHI GAMES"

Always-on mobile connection to the Internet and real-time mobile video communications are potential game-changers. Mobile Internet and asynchronous video usage show extremely high growth. The consumer desire for more ways to use real-time video on mobile devices will drive hardware and application innovation, market disruption, policy dilemmas, and capacity build-out.

Responses to the disruptive characteristics of mobile real-time video communication will be varied and inconsistent. For example, while today, the Southeastern Conference has instituted very restrictive policies around social media for fans and journalists to protect its exclusive television partners from competition, the Big Ten Conference is encouraging use of real-time media at its sporting events. Over the long term, especially in markets driven by spectator interest and revenue, integrating real-time media will be essential to the fan experience.

On the dark side of the spectrum, dangerous or criminal use of the communications infrastructure (like any infrastructure) is unavoidable.[7] Nevertheless, this will not stop governments from trying to control usage—and to demand access to information exchanged over the Web. India's intelligence agencies were frustrated by Skype's refusal to share its encryption code. VoIP operators can expect pressure from every government for increased access to user information. But cooperating with governments for legitimate investigation must be weighed carefully with both the human right to communicate freely and privately and the consumer backlash that will ensue if that right is compromised by the owners of the technology they are using.

SCENARIO 4

A CONSTANT COMPANION:
Video Builds the Small Business Service Economy

Tian took the jacket and pants into the changing room, set her G9 in the device cradle (a great little addition that the new Gap in Zibo included), and accessed her personal shopping network. After a few seconds of determining her location, scanning the clothes she chose, and reading her mood message, Tian's phone's pico projector fired up, and Nadia's smiling face covered the wall opposite the mirror. Tian had been directed to Nadia before, and loved Nadia's sense of style. She knew she'd get Nadia's honest, if slightly expensive opinion, about the styles she'd chosen and what looked good on her. Over the course of the next 30 minutes, Tian tried on various outfits, and Nadia sneered and frowned through all of them—she was not a fan of the Gap.

Nadia suggested Tian try one of the stores near Zhuangcun, where all the chic shops were (and where Nadia would get a referral fee!). Tian signed off and looked at the live traffic cams around Zhuangcun. No way she was going to try to brave that throng. So she decided to call her boyfriend instead. She could see his active lifestream, but her pings were not getting his attention. Strange.

Tian then headed to a quiet Internet café and found a booth to talk to her Mom back home. She got a very jumpy image (again!), and she couldn't quite make out what her mom was saying. After trying several times to reconnect, she gave up and texted her mom, saying that she would call later. Video calls to that part of the province were notoriously bad.

Anywhere, Anytime Trusted Expertise

Source: IFTF, 2009
Photo credits: flickr users gaelx and gaab22

Finally, she clicked on her home surveillance cam and saw her sweet little puppy, Kong, sleeping blissfully on his warm pad. The smile returned to her face.

DISCUSSION OF "A CONSTANT COMPANION"

Small business services will greatly benefit from easy and inexpensive access to clients. From personal shoppers to real-time counseling and consulting, to live how-to and instruction assistance, small and large businesses will use real-time video to enhance the personal touch with their clients. Context and location awareness will combine with services, like LiveOps,[8] that algorithmically match customer need to the skill, cost, and reputation of a service provider.

Video is a "great way to reach customers," Skype President Josh Silverman noted, because the "times when you need a live call is when interaction is required between all the participants." While one doesn't always need a live video experience, the connection made when seeing a live person on the other end can make customer relations much more effective and lead to greater customer satisfaction and retention.

Chinese families are more mobile today than they have been for the past 50 years. Although Chinese manufacturing is undergoing some geographic reorganization in response to the global recession, rural workers will continue to travel for work in large numbers, driving a growing demand for video chat via fixed and mobile screens. Chinese professionals are becoming more mobile as well. But quality and reliability for real-time video communication, especially in more rural areas of China and around the world, will be intermittent.

This is also an era of constant companionship and digital tethering. Home "nanny cams" and personal surveillance tools will allow us to track people who let us follow their video streams, as well as the places that we have connected by camera. Constant companionship with other people—and even with our pets—will be a major reason people will desire to be always connected.

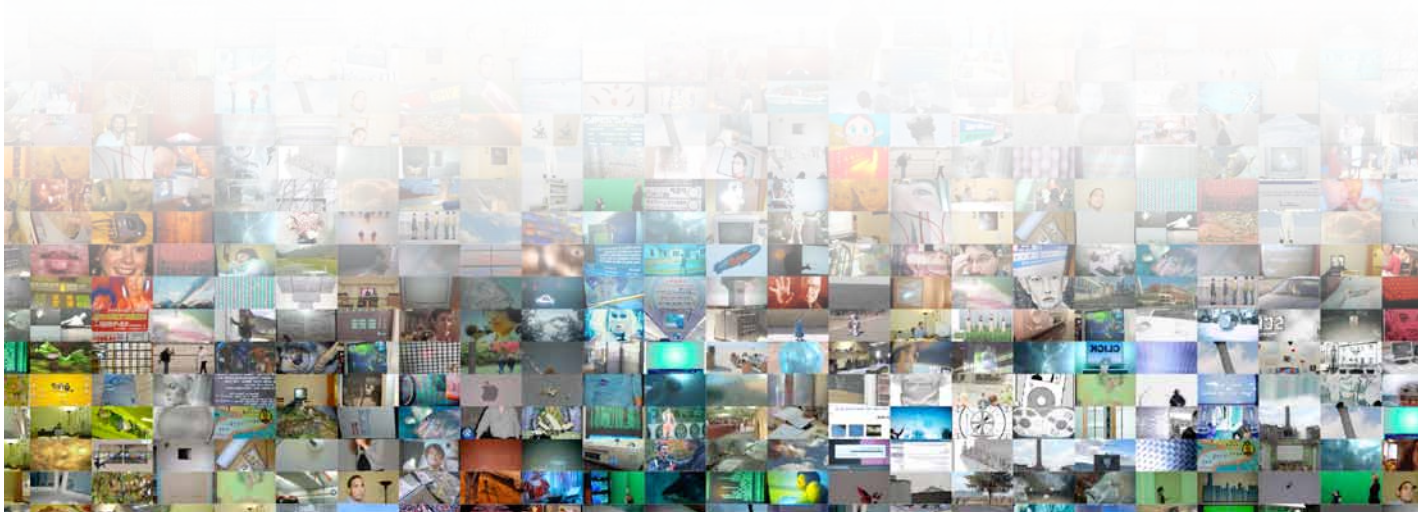
HOW WE GET THERE: FOUNDATIONAL TRENDS IN THE REAL-TIME VIDEO LANDSCAPE

3

The long-term future for real-time video communication as a tool for the enhancement of human relations, business practice, and technological innovation is very bright. However, the path from now to the future scenarios presented in Chapter 2 will be forged through a complex terrain. It will take creative design, forward-thinking policy, and individuals and organizations willing to make bold investments and question many of the dominant assumptions about the future of the Web and Web-based communications. In short, it will take much of the same vision, commitment, and resourcefulness that produced the Internet itself.

The previous chapters presented a vision of a world transformed and enhanced by new communications technologies. This chapter examines the forces that must be addressed in order to get us there, and explores the foundational trends and factors driving the direction of real-time video communication.

Scenarios for the future of real-time video are based on an ecology of interdependencies between users' technology adoption trends, applications' demand for fixed and mobile bandwidth, the capacity and business models of carriers' networks, communications policy, and international politics. These interdependencies will shape the future of real-time video communication, and how those services will diffuse worldwide.



SIMPLICITY, QUALITY, AND ENGAGEMENT: THE CRITICAL USER EXPERIENCE

People are drawn to video—it engages multiple senses—sight, sound, and often touch. It is now well understood that much of human communication is non-verbal: gestures, facial expressions, posture, and comportment all contain rich data for conveying meaning. Many cultures, especially in Asia, much prefer seeing colleagues, rather than speaking only by voice or text. A video call allows much more information to be communicated, and it can bring a sense of presence and intimacy that is hard to achieve by other modalities.

The perceived immediacy and intimacy of Web and mobile video, both live streaming and recorded, has also given video the hard-to-measure quality of authenticity. The aesthetic conventions and social contexts associated with video communication are becoming the *de facto* language of visual authenticity, creating closer relationships between people on both sides of the screen.

Although video calling has been technically feasible for some time, historically its appeal has been limited. Today, that seems to be changing. Why? What has changed to fuel the rapid adoption we are seeing today and the increase we are forecasting for the coming decade?

Simplicity

One of the most important changes is that real-time video has been made much simpler. It was only a few years ago that live communication by video required the purchase of a webcam, installation of the webcam software, configuring the correct ports, and getting all the settings right (and hoping that the people you want to talk with have done the same)—and then one could try to make that call over a slow, dial-up connection. Now, with a simple client download and a built-in webcam, we can reach millions of peers instantly on a high-bandwidth connection.

This simplicity has also helped overcome the limiting factors of the network effect. “It’s no fun to be the only person who owns a fax machine,” as Skype’s Sten Tamkivi puts it.

History has shown that technologies and applications that are easy to use generally win out over more complicated technologies (even if they are higher quality or have more features). Almost 50% of Americans surveyed agreed that they would start making video calls if the technology were simpler, while only 12% agreed that it is already simple enough. (For respondents under 30, over 21% thought the technology is already simple enough.)[9]

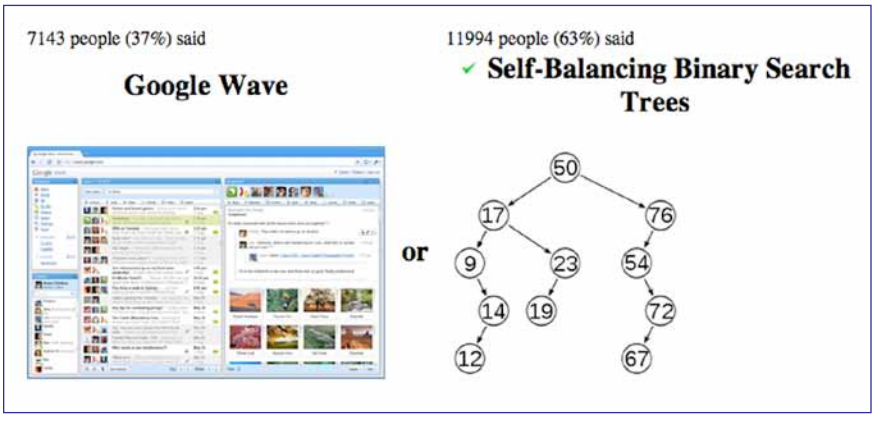
So, we are just now crossing the simplicity threshold, where anyone with an Internet-enabled device, a webcam, and free software can make a video call to almost anyone else in the world with equal access. Still, simplicity is a relative term. Today, downloadable stand-alone peer-to-peer clients dominate real-time video communications, ensuring high quality and reliability. But very soon, high-quality video will be available through browser plug-ins; then eventually, native browser interfaces will be the way most people make video calls.

And within a few years, user-facing cameras on Internet-enabled mobile devices, TVs, and appliances will make ubiquitous video calls from almost anywhere an immediate possibility (all shaped by the network, policy, and market trends mentioned in Figure 1).

> "Companies that focus on traditional measures of quality—fidelity, resolution, features—can become myopic and fail to address other, now essential attributes like convenience and sharability."
>
> —*Robert Capps, Wired Magazine*[10]

Over the next decade, simplicity will remain a consumer preference, a business strategy, and a technological necessity.

Figure 1
Which is Easier to Understand?



Source: http://easiertounderstandthanwave.com/

Quality

But surely quality still matters?

Quality will be a major challenge and a major solutions space in the real-time video ecosystem.

Just as simplicity is a relative term, so is quality. Psychologist Vicki Bruce has studied how people receive and react to technological conditions during a video call. She found that poor screen resolution and jitter were much more readily tolerated than disruptions to communication caused by lag or latency. The most negative user responses came when video and voice were out of sync and when there was significant time lag between speaking and hearing. The key message here is that communication quality is highly sensitive to timing: in maximizing limited bandwidth resources, it is more important to maintain sync and eliminate lag than it is to provide a high-resolution picture.

Quality is also highly relative to price. Since almost all the platform players will be video chat-enabled, easy access to free services will be ubiquitous. But quality on these platforms will be uneven at best. Paid premium services that can guarantee quality of service will also find a growing market for both enterprise and consumer sectors.

Both mobile and fixed line carriers are likely to offer uniform access to their networks. Some may attempt to throttle or block access for real-time two-way video, reserving low-cost, high-performance for their own video service. Other network operators may demand premium, if not prohibitive, fees for applications to traverse their networks with reserved video VPNs. Considering the significant stresses on bandwidth and reliability, and few proven monetization strategies, the environment is primed for a dichotomous situation in which the enterprise players dominate the high end, and the low end is the terrain of agile software innovators, as well as DIY hackers and developers designing experimental solutions to boost quality.

Engagement

Simplicity and quality are just the necessary conditions to get to the real user payoff—engagement.

As an isolated technology, video chat has many benefits, but users are looking for new ways to interact. In addition to video as a means of real-time communication, companies are looking into the world of real-time interaction or engagement. The popularity of new applications that let users play games, browse Facebook, and watch videos together, all through a shared interface, are growing rapidly.

The main factors that enable some of the benefits of face-to-face presence are awareness and context-sharing. Awareness is a measure of presence and availability and is based on simple visual or auditory clues. The subtle signals we give when we share a space physically do not transfer well to the digital experience.[11] Context-sharing is the ability for speakers on any node of a remote conversation to sense the objects and surroundings from other nodes. This also includes the ability to easily share files or to work on a design or document together in real-time.

As with simplicity and quality, engagement is also relative. Successful video communication rewards multiple levels of engagement. Compare two forecasts for the future of video. The first is by Robin Sloan, Director of Strategy for Current TV:

> "We don't use video as a super-intense, connected communication channel, but as a way to simulate being in the same place for a while. Video is as mundane as turning on a light. You fade up the lights, and you fade up the video. It's not so prized, it's as natural as seeing a printed sign somewhere."

The second is by Loic Le Meur, founder of Seesmic:

> "The power of video is that the impact is much more than text. It's only when you really care that you create a video. When you want that extra information and meaning that can only be conveyed (or best be conveyed) by video."

Although 70% of Americans polled have never made a video call, the majority believes that real-time video communication will be as available and as common as voice and text communication in the next decade.[12] Note that, amongst demographic segments of the population that are more frequent video callers, especially those under 30, their estimates of the speed of adoption and comparative use are less sanguine than those that have made few or no video calls.

Even when a critical mass of users is reached, the technical issues are addressed, and user interfaces improved, real-time video calling must take its place in a broader communications ecosystem. Video calls are going to be very important—in many ways, indispensable—but they will find their place within a context and situation of use. There will be times and places when video calls are preferred, and times and places when other media are better suited. A unified software environment and UI that can efficiently and effectively help a user coordinate the multiple strands of media, devices, social networks, and personal context will be a core element of effective user engagement, and will be a game changer in the communications market.

DIGITAL VIDEO ABUNDANCE: THE CAPACITY OF USERS TO PRODUCE

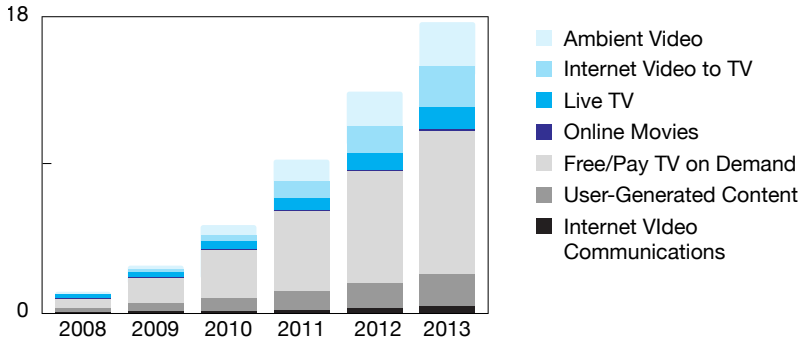
The proliferation of video capability in personal electronics such as cameras, phones, and computers; in built environments such as security stations, elevators, and offices; in public spaces and infrastructures; and in toys and games, will produce an explosion of raw digital video. At the same time, cloud computing and online video services will permit easier storage, retrieval, and redistribution of even the most trivial events. (See Figure 2.)

According to current projections, by 2013, the Internet will be nearly four times larger than it is in 2009; 64% of the world's mobile data traffic will be video; and all forms of video will account for over 91% of global consumer traffic. This is a huge opportunity space for all players in communication—from network providers to software and applications developers to device makers.

Mobile devices will also become an increasingly important node in the capture, viewing, and distribution of video. Cameras were first introduced into mobile phones in 2001 in Japan and quickly became a standard feature worldwide. Video has only recently been added to a few mainstream mobile devices like Apple 3GS, iPod Nano, G1 Android, and some Nokia phones, but will soon be included in almost all mobile devices.

With global adoption of mobile phones well over 50% of the population already, and with high turnover rates for new devices, video-capture and sharing capabilities will be in the hands of billions within a few years. By 2015, Smartphones the size of a credit card with Web, voice, text, GPS, and sensor features will be affordable for almost every human being on the planet who wants one, while service costs will still be prohibitive for many people.

Figure 2
Exabytes per Month



Source: Cisco VNI, 2009

Today, those relative few who do have video-enabled phones are already capturing and uploading extraordinary amounts of media. Just five days after the launch of iPhone 3GS, with its video function, mobile uploads to YouTube soared 400%.[13] It is clear people are beginning to see their mobile devices as video communications tools, and polls show that over 60% of Americans believe that video calls will be as popular as voice calls within ten years.[14]

Many new devices capable of supporting real-time video are starting to come online, but aside from Apple computers and a few others, there are few native mainstream devices currently adopted in a meaningful numbers by any user groups. Many current and future users will continue to use peripheral video cameras attached to their PCs.

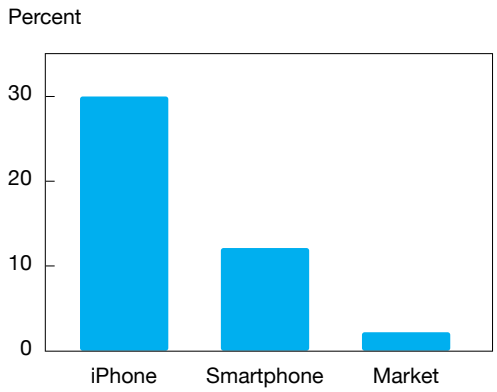
New mobile phones with built-in video cameras have the lenses pointing away from users, and so are not yet useful for mobile video conferencing. Even if two-way real-time video-capable mobile phones with cameras pointed at the user were introduced today, it would take three to five years to achieve a reasonable market penetration to support widespread usage of mobile real-time video applications. (See Figure 3.)

We can reasonably forecast the same timing for use of two-way real-time video for living room TVs. Although a few manufacturers today may be willing to introduce TVs with built-in cameras, widespread adoption will probably lag five to ten years, as people replace current generation HDTVs.

Credit Card-sized Phone

Source: Sun Labs

Figure 3
Users Who Watched TV or Video from Phone



Source: Cisco VNI, 2009

REAL-TIME MEDIA: THE REINVENTION OF PUBLIC COMMUNICATION

One of the most interesting developments resulting from the enormous popularity and rapid adoption of microblogs like Twitter, as well as status and mood updating on Facebook and Skype, is the arrival of a real-time Web. The public and mainstream media became aware of the potential of the real-time Web to disrupt familiar information infrastructures and reconceive public communication, when users began updating information during the initial outbreak of H1N1, the terrorist attacks in Mumbai, and the election protests in Tehran.

Like many people who were following the Iran elections drama, IFTF's Lyn Jeffery was drawn into the real-time stream. She described her experience as "intense, almost addictive, emotional, visceral, tactile, like a game of 'virtual hot potato' because links come in and you choose them and click them and move around in between them, and maybe you pass them on. It's about becoming part of the flow."[15]

While mainstream media was struggling to find sources of information during these fluidly evolving situations, thousands of people posted real-time text, image, and video updates to Twitter, Facebook, Flickr and YouTube. This real time (or near real time) means of communication gave outside observers unprecedented views of the dynamic events taking place on streets in far away places, or at conferences and other live events. Key words and hash tags like #iranelections became real-time discussion channels between participants on the ground and observers worldwide. We can see the

Twitter and the Real-Time Web

Source: http://crave.cnet.co.uk/software/0,39029471,49302354,00.htm

same phenomena unfolding at many media and technology conferences where people use search results for an agreed event tag, like #emergingtech, to provide a back channel for real-time commentaries during presentations from the podium.

Searching for key word tags and hash tags is also becoming an important and powerful tool for marketers to track, in real-time, interactions and attitudes about their products and brands. Mainstream media, like CNN, are already incorporating real-time messaging on Twitter and Facebook as part of their standard suite of media offerings, as are politicians and leaders of all political stripes.

Twitter recognizes the potential of these new media applications and has been quoted as characterizing their service as the "Pulse of the Planet." Based on the potential monetary value of real-time search, Twitter has already established a $1 billion valuation for their nascent venture. Real time means real revenue.

Although video posts played a significant part in the Iran election drama, Twitter dominated the media meta-story. However, with increasing ubiquity of camera capture (via passive surveillance cameras and citizen journalism) and live streaming capabilities, the near future will see one-to-many or many-to-many video broadcasting playing a similar role in the tracking of real-time world events. And the same real-time addictive quality of Twitter will apply to streaming video as well, and maybe even more so.

VIDEO IN THE UNIFIED COMMUNICATION CLIENT: CLOSED VS. OPEN STRATEGIES

Video will be embedded everywhere—in websites, mobile devices, ubiquitous screens, and in every platform and application. As Skype's Christopher Dean has noted, most people are going to want "all their communications integrated into a single UI."

Dean continued, "Enterprise voice vendors coming at it from one side, and the traditional enterprise text vendors coming at it from another side, and the software-as-a-service guys coming at it from yet another side—all coming in to deliver the unified communication client that spans asynchronous to synchronous communications across the entire spectrum."

The challenge for service providers and applications developers is to systematically analyze the ecosystem to determine where to compete most effectively with the large platform players, and when and where it is most advantageous to collaborate. Clearly Google, Microsoft, Cisco, and Apple all have various integrated collaborative messaging environments, including real-time video capabilities. Aside from Google's Android, these are currently closed environments: there is no apparent open opportunity to make a third-party video conferencing capability embeddable in their collaborative environments. But it may make sense for Skype to create open APIs that would enable users to include a widget in environments like Google Wave, as long as Skype's distinct brand identity is maintained.

The developer ecosystem has proven to be a very effective model for players like Google and Apple.

For Apple, opening the App Store has paid huge dividends. As of October 2009, more than 85,000 applications have been created; there is a developer community of over 100,000, with over 1.5 billion downloads, and 30 million iPhones sold.

An open API might also enable new service developers to build a service that combines real-time video with other open services, like Twitter microblogs. For an application like Skype, it may make sense to incorporate external services into the Skype experience. Mutually embedded applications and widgets will be part of communications platforms, allowing users the choice of when and how to use their favorite applications no matter what their "home" platform might be.

Social network platforms present a challenge to the control of the unified communications space, and many of these platforms occupy a strong market position for certain domains of people's lives: Twitter for mostly text-based communication with an extended network; LinkedIn for business contacts; YouTube and Flickr for video and photos; Facebook for a closer network with many media options; and Skype for chat, voice, and video with an intimate circle of close friends and family.

Among American consumers who were asked "what services would have the most impact on the Internet in the next decade," e-commerce was the most popular choice overall, followed closely by social networking. Importantly, amongst those under 30, social networking was predicted to have the most impact. Correlate that with the fact that those under 30 have much higher scores for video's impact on the Internet as well, and you can see that a generation of users and consumers who are just starting their adult life will be demanding video-enabled social networking.[16] (See Figure 4.)

iPhone Backlash

Source: Freetheiphone.com

Figure 4
Social Networking by Age (Frequency and percentage)

	18–29		30–49		50–64		65+	
	F	%	*F*	%	*F*	%	*F*	%
VIDEO	71	17.7	80	9.9	29	6.3	21	6.3
ELECTRONIC COMMERCE	105	26.1	249	31.0	153	33.1	115	33.7
SOCIAL NETWORKING	126	31.3	229	28.4	111	24.0	35	10.4
BLOGS	30	7.4	31	3.9	20	4.3	20	6.0
TWITTER	5	1.2	38	4.7	16	3.4	12	3.4
OTHER/NOT SURE	66	16.3	177	22.1	134	29.0	138	40.2
TOTAL	**402**	**100.0**	**804**	**100.0**	**462**	**100.0**	**342**	**100.0**

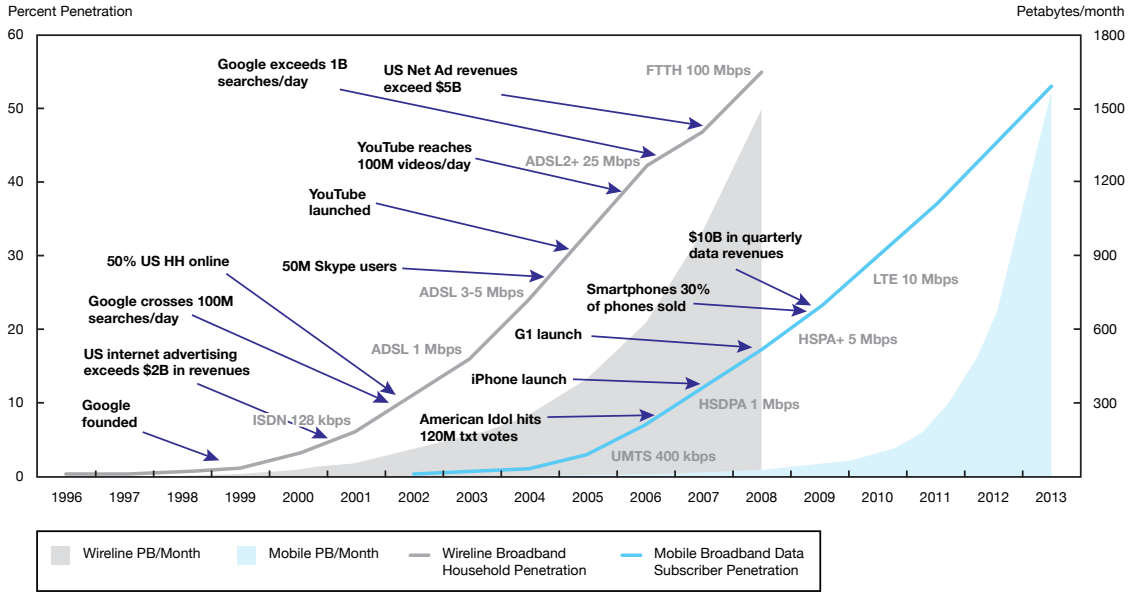
Source: Zogby, 2009

BANDWIDTH SCARCITY AND NETWORK CONGESTION: SETTING EXPECTATIONS FOR SERVICE

The dual challenges of bandwidth scarcity and network congestion set the stage for both near-term crises in video services and longer-term disruptions in the technologies and business models for providing network services. Although one must be skeptical about the "Internet is dying" arguments that have been ubiquitous since the birth of the Web—in part because we have been able to build and innovate our way around major structural challenges—there are valid reasons to believe that network capacity will be pushed to its limits by the flood of rich media and communications entering the Internet. The situation is ripe for another round of telecommunications infrastructure build-out in fixed line and wireless last mile links, and trunk capacity from access points to the peered cloud, as well as disruptive innovations in and around the Web communications space.

The abundance of video and other rich media on the Internet is already becoming a challenge to quality, creating indeterminate performance for both fixed and mobile services (See Figure 5.) Video conferencing quality on fixed-line networks will also be increasingly indeterminate due to variable routes across the net, traversing congested nodes.[17] Network congestion and indeterminate routing could prove to be a persistently daunting problem for at least the next five years, and maybe longer. Available bandwidth for two-way video will likely lag significantly behind demand.

Figure 5
Broadband Penetration and Traffic for Wireline and Mobile (US)



Source: Chetan Sharma, from the report "Managing Growth and Profits in the Yottabyte Era," June 2009. http://www.chetansharma.com/Managing_Growth_and_Profits_in_the_Yottabyte_Era.pdf

Bandwidth and congestion forecasts are controversial, however, with little consensus on measurements and forecasting assumptions. Also different forecasts look at different facets of the problem. For example:

- **The capacity of cellular networks.** The existing cellular networks are ill-prepared for two-way real-time video. The spectrum is not yet effectively provisioned for symmetrical two-way video. Mobile networks are congested at both cell towers and in the backbone trunk connections to and from the cloud. iPhone users' disproportionately large adoption of video and other high-bandwidth services have revealed the inadequacy of AT&T and other networks' provisioning models, which were based on demand for low-bit rate services like e-mail and texting.

- **Over-subscription ratios used by Internet service providers.** Robert Cringely describes this problem as follows: "The Internet as we know it is a shell game, with ISPs building their profits primarily on how many users they can have practically share the same Internet connection. Based on the idea that most users aren't on the Internet at the same time and even when they are online they are mainly between keystrokes and doing little or nothing when viewed on a per-millisecond basis, ISPs typically leverage the Internet bandwidth they have purchased by a factor of at least 20X and sometimes as much as 100X, which means that DSL line or cable modem that you think is delivering multi-megabits per second is really only guaranteeing you as much bandwidth as you could get with most dial-up accounts."

- **Uneven build-out of mid- and last-mile infrastructure.** There may actually be sufficient bandwidth available inside the cloud of major backbone IP networks. Most significant congestion problems reside in middle-mile and last-mile networks, between the user and the high-performance cloud. In some locales, where networks are robust, real-time video connections will be very good, but they will vary dramatically by geography. By 2015, there will be some excellent network support for real-time video over IP across broad geographies, but more rural and remote regions of the world will still lack networks capable of supporting the widely popular usage of real-time video over IP services. By 2020, even remote and rural areas will begin to enjoy near ubiquitous fixed and wireless real-time video services.

- **Carrier capitalization.** Carriers are looking to capitalize on tiered routing options and enhanced high-margin service features to generate additional revenue. This could mean dependence on monopolistic dominance of high-margin real-time video services, relying on only internal or authorized partners in the developer community, risking potential subscription churn and loss due to mediocre implementation, and overall chilling effects on innovation around new media and services. However, Nate Anderson of Ars Technica reports: "New research out today from Arbor Networks and the University of Michigan shows that 'over the last five years, Internet traffic has migrated away from the traditional Internet

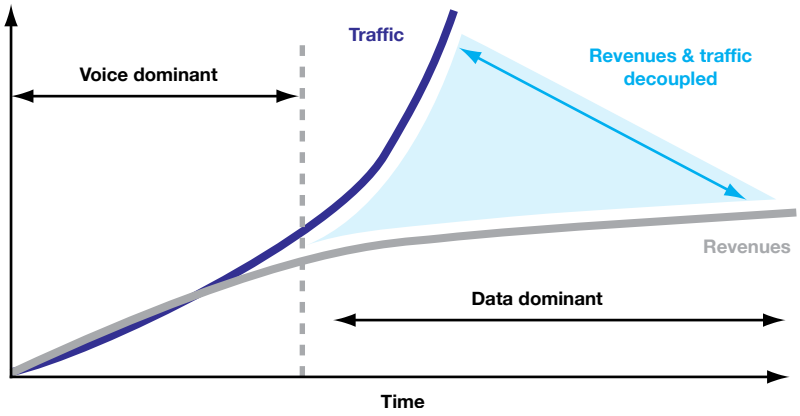
core of 10 to 12 Tier-1 international transit providers.' Today, the majority of Internet traffic by volume flows directly between large-content providers, datacenter/CDNs and consumer networks. Consequently, most Tier-1 networks have evolved their business models away from IP wholesale transit to focus on broader cloud/enterprise services, content hosting, and VPNs."[18]

- **Equipment vendor strategies.** Given the projected international shortage,[19] in the face of widespread demand for real-time video services, major equipment vendors are ramping up heavy investments to both drive demand and adoption of video services, and of the network equipment and infrastructure to support the demand they are helping to create.

- **Consumer expectations.** Video consumes huge amounts of bandwidth. But consumer willingness to pay for a video service is not correlated with the bandwidth consumed by that service. In the data-dominated world, unlike the voice-dominated world, increased traffic does not result in proportionate increased revenue. In the data-dominated world, the value to end-users of applications is not proportional to data volumes. Revenues and traffic have become decoupled. (See Figure 6.) Although some observers claim that the cost per bit is dropping dramatically, many operators claim experiencing a 10-fold increase in data traffic but more like a 10% increase in data revenue.[20] Good data is rare and unreliable.

Given the near-term issues in mobile bandwidth for video services in many markets, software developers will be challenged to offer real-time video services supporting reliably predictable user experiences depending on global quality-of-service and service level agreements. As Long Term Evolution (ETE) and Wimax (which requires middle mile and backbone broadband services) are deployed, network infrastructure will eventually be at a level to support global real-time video communications reliably.

Figure 6
The Traffic and Revenue Challenge



Source: Unstrung.com

UNIFORMITY, AFFORDABILITY, AND PROFITABILITY: THE TRIAD OF SUCCESSFUL POLICY

The policy arena for real-time video communications will be shaped by all the trends discussed above. If network operators can demonstrate that video traffic places a disproportionate demand on their networks, the need to recover costs will be a compelling argument to build out massive broadband infrastructure to support a real-time video Web. But applications developers also need to have an incentive and investment structure that rewards their innovations—innovations that are driving uptake of mobile devices and are beneficial to network carriers.

So it makes sense for software providers and carriers to negotiate together an international regimen that aligns incentives for video-over-internet protocols, enabling:

- Uniform performance across networks
- A reasonable cost for users
- A reasonable return for network operators.

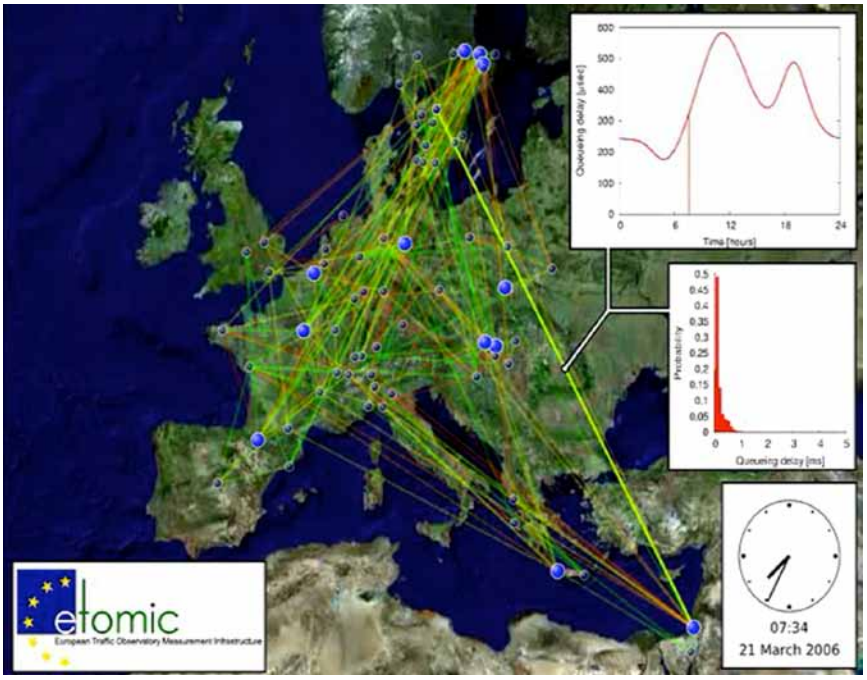
Any policies that support less than all three of these will threaten uniform reliably and affordable services for users of two-way real-time video services, especially users in rural and remote regions of the world.

Until there is uniform performance across networks and across geographies, other approaches will be required to help users of free real-time video platforms understand that the congestion is elsewhere on the Internet, not under the software providers' control. One approach, already implemented for the Skype PC client, is to give users a dashboard view of network congestion. Below is an example of a European Union project to graphically represent real-time congestion on IP networks. (See Figure 7.)

The social importance of affordable Internet access across an open network is a major policy issue as well. To much fanfare and praise amongst those who see the Internet and Internet-based communications as a tool of democracy, the government of Finland just deemed access to a broadband network a right for every citizen in the country.

In the United States, 75% of those polled believe that affordable mobile access to the Internet will improve people's lives, and over 86% believe local civic meetings should be broadcast over the Internet. When viewed as a tool for citizens to talk to citizens, for citizens to talk with government officials, and for the government to talk to its citizens, the importance of affordable Web access and network openness for the functioning of democracy is clear. Governments will increasingly be asked, or forced, to take this higher, "social layer" into account as it crafts wireless and Internet innovation and competition policies.[21]

Figure 7
The ETOMIC Tomography Movie Showing Network Congestion in Europe

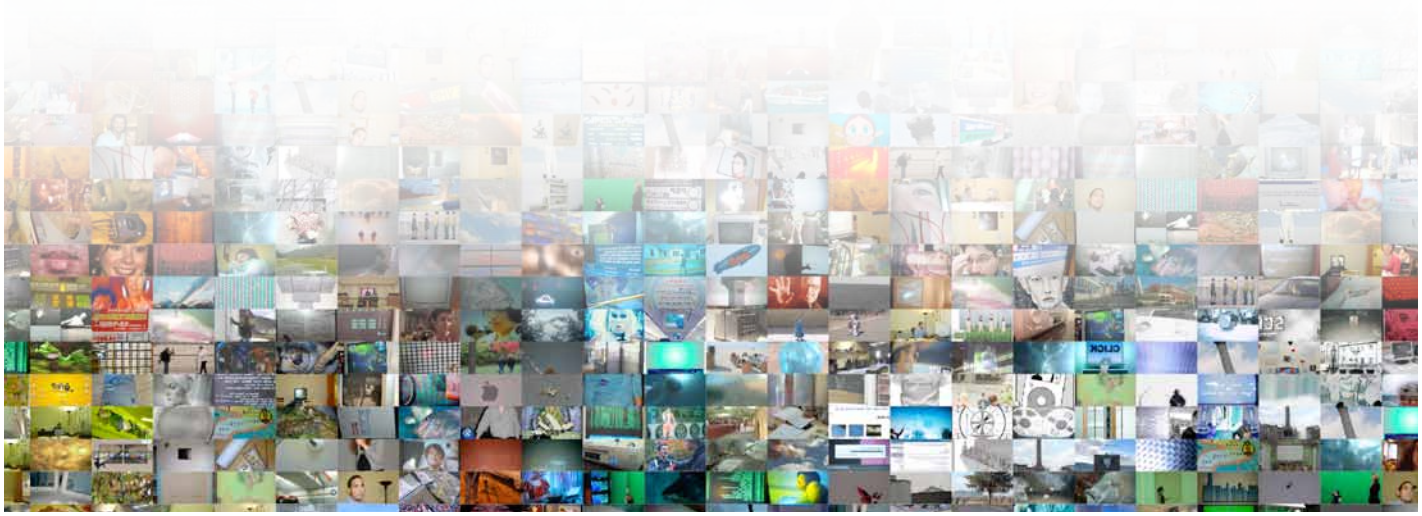


Source: ETOMIC.org

CONCLUSION:
PUSHED BY DESIRE, PULLED BY SIMPLICITY

The infant smiling at her grandparents on the laptop screen. The young couple having a dinner date across an ocean. The recent immigrant reconnecting with his loved ones back home. The small-business owner. The street protester. The caregiver. These are the faces of real-time video communication. We are spending time and sharing presence with close friends and family, we are sharing knowledge and skills with our colleagues and peers, we are opening avenues for cross-cultural communication and understanding, and we are seeing the previously unseen dramas unfolding around the world. The multitude of uses for real-time video, from the intimate to the pragmatic, from world changing to the mundane, is creating a powerful new wave of global communication and human connection.

It is a wave pushed by the desire for deeper and more meaningful human connection and pulled by the force of simplicity—the technologies and applications that have made video easy to produce, disseminate, and view. This simplicity is allowing hundreds of millions of everyday people to use the Web, at home or on their mobile device for video communication. But this simplicity is also creating dilemmas of scale and a thicket of challenges for the technical infrastructure of the Internet, for policymakers who wish to keep the web working for all stakeholders, and for businesses trying to capitalize on the opportunities in this new ecosystem.



The next decade will see millions (maybe billions) of people using Web-based real-time video as a frequent and preferred communications and social networking option, joining blogging, micro-blogging, IM, email, texting, and voice calls in the menu of choices. In an interactive survey of adults, 82% agreed that by 2020 we will be consuming ALL our video content through the backbone of the Internet.[22] This massive increase in pure number of users—along with the increase in consumption of rich media per user—is pushing the bandwidth capacity of both the fixed and mobile Internet beyond its breaking point, requiring upgrades to core network infrastructures to avoid significant degradation of quality and to ensure the reliability of the Internet itself.

So, we enter a landscape of great promise and daunting challenges—of lowered barriers for easy and cheap communication by people all over the world, and raised stakes for the software developers, carriers, policymakers, and the everyday users who rely on the Internet for information and communication. The potential for real-time video communication to improve business efficiency and quality, to transform the Web into a new mode of connection, and to provide people with the opportunity to engage with each other in more meaningful and fulfilling ways means that the challenges will most likely become opportunities for innovations—innovations that may be both disruptive and transformative of the communications landscape we see today.

ENDNOTES

1. Zogby463 Interactive Survey of Adults
2. http://www.iptv-news.com/iptv_news/july_09/20mn_wireless_networked_tvs_to_ship_in_2011
3. IFTF Report, *Blended Reality: Superstructing Reality, Superstructing Ourselves* (SR-1221), p. 7
4. Sten Tamkivi, interview, September 2009
5. Saul Griffith, IFTF Technology Horizons Conference, *When Everything Is Programmable,* October 13, 2009.
6. "Ticketed fans can't produce or disseminate (or aid in producing or disseminating) any material or information about the Event, including, but not limited to, any account, description, picture, video, audio, reproduction or other information concerning the Event." http://mashable.com/2009/08/17/sec-new-media-policy/
7. http://www.thesmokinggun.com/archive/years/2009/0803091pranknet1.html
8. http://www.liveops.com/
9. Zogby463 Interactive Survey of Adults
10. Capps, Robert (2009) The Good Enough Revolution. *Wired,* p. 114.
11. On the cutting edge of research in this area is the Human-Computer Interaction Program at Tufts University. Researchers there are combining functional near infrared spectroscopy (a neural imaging technique) with "non-command, adaptive user interfaces from our work on eye movement-based interaction" to develop the next generation interface that will improve the way subtle cues and context are communicated effectively via networked video. See: http://hci.cs.tufts.edu/bciabout.html
12. 18-29yo: highest percentage of respondents who have made video calls, and highest percentage of Web video viewers—yet, when asked when do you think video calls will be as popular as voice calling, only 15.9% said within 5 years, compared to 28.3% for 30-49yos, and 36.5% of 50-64.]
13. www.appleinsider.com/articles/09/06/25/iphone_3gs_spurs_400_increase_in_mobile_video_uploads_to_youtube.html
14. Zogby463 Interactive Survey of Adults
15. http://www.iftf.org/node/2902
16. Zogby463 Interactive Survey of Adults
17. Regional highlights of IP traffic growth:
    - North America will reach 13 exabytes /month by 2013 at 39% CAGR
    - Western Europe will reach 12.5 exabytes/month by 2013 at 37% CAGR
    - Asia Pacific will reach 21 exabytes/month by 2013 at 42% CAGR
    - Japan will reach 3 exabytes/month by 2013 at 37% CAGR
    - Latin America will reach 2 exabytes/month by 2013 at 50% CAGR
    - Central and Eastern Europe will reach 2 exabytes/month by 2013 at 49% CAGR
    - Middle East and Africa will reach 1 exabyte per month by 2013 at 51% CAGR

18. http://arstechnica.com/tech-policy/news/2009/10/the-internet-is-about-to-die-literally-die.ars?utm_source=rss&utm_medium=rss&utm_campaign=rss

19. By 2015 +/-70mbit/sec services will be available selectively in the developed world. By 2018 some high-performance services will be available in major centers in Latin America, the Middle East, and Africa, and by 2020, video call providers may assume sufficient international bandwidth will be available to support high-quality user experiences, worldwide.

20. http://www.umts-forum.org/component/option,com_docman/task,doc_download/gid,2089/Itemid,12/

21. Ibid.

22. Zogby463 Interactive Survey of Adults