BROADCAST OVER THE INTERNET

→ A New Vision

Akamai

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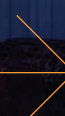
Contents

BRINGING DOWN THE WALLS

They say all the stories ever told boil down to a handful of plots.

But what happens to the plot when the story and its audience are no longer separate?

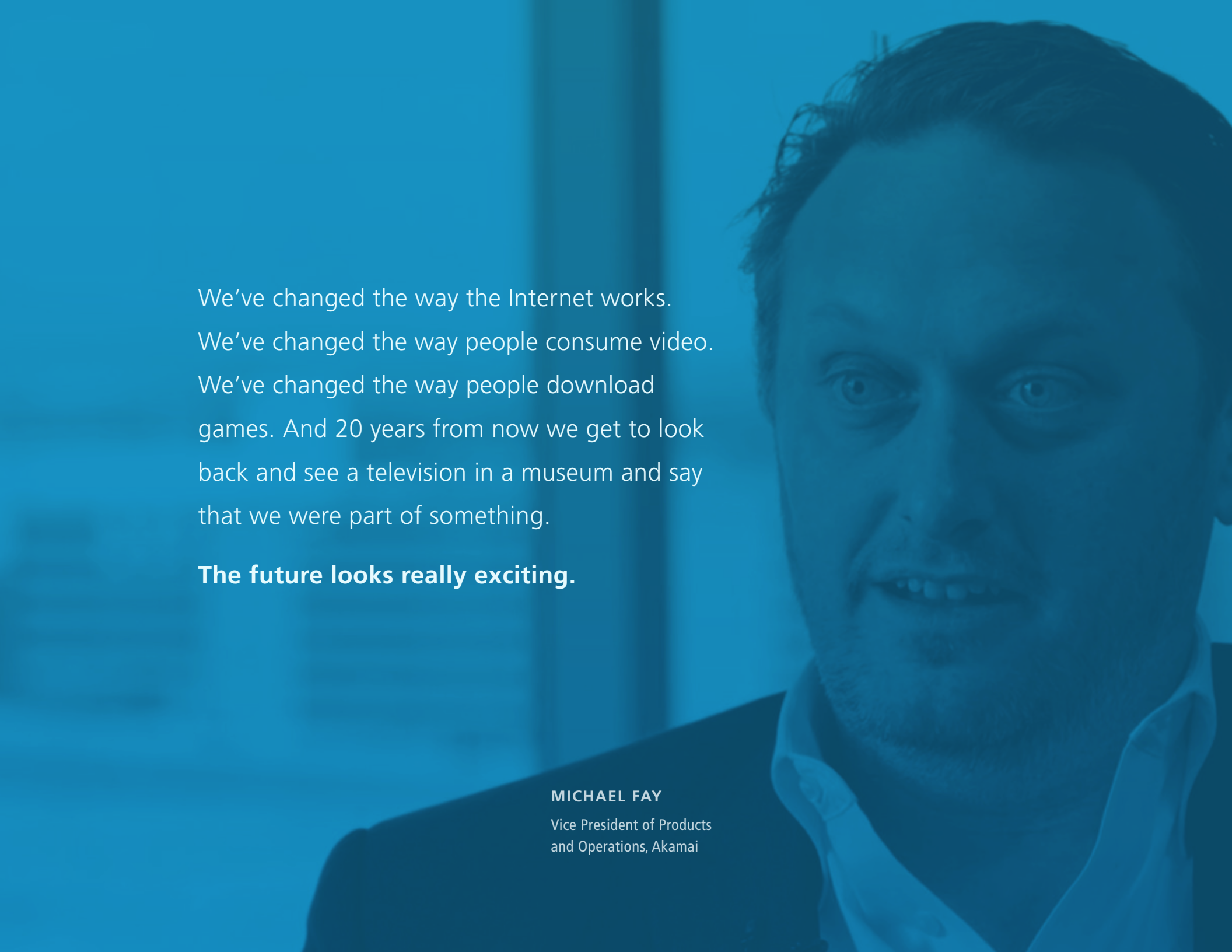# How does storytelling change when the 'fourth wall' isn't just shattered, but erased?

What happens when the drama of live sport becomes immersive? When our daily *scroll* through news and current events becomes a literal *stroll?*

What new possibilities emerge when the viewer isn't just watching content, but driving it?

WHAT HAPPENS WHEN WATCHING AND LIVING CONVERGE?

$\longrightarrow$

We've changed the way the Internet works.
We've changed the way people consume video.
We've changed the way people download
games. And 20 years from now we get to look
back and see a television in a museum and say
that we were part of something.

The future looks really exciting.

MICHAEL FAY

Vice President of Products
and Operations, Akamai

Bending the Web

To work in media and broadcasting is to stand at the juncture of technology, content, and audience.

Today, these categories are merging in unprecedented ways that drive important preoccupations in the here and now — *What does* *'quality'* *actually mean? How do we optimize the economics of OTT video?* — and also beg a much larger question:

WHERE IS IT ALL GOING?

There's no crystal ball, of course, and innovation and disruption will make the way forward less like a paved road and more like a 'garden of forking paths.'

But one thing we know for sure: Every path circles back to the same singularity that has ruled since the first mind realized it was separate from the world around it:

THE VIEWER

The Internet was not originally designed to deliver video (let alone virtual reality), but it turns out that video is precisely what the viewer wants.

So, as innovators of next-generation experiences, content providers and delivery networks must continue to bend the Internet to the viewer's will, to make it do things it was never *intended* to do — but things that, paradoxically, *only it* can do.

Before we focus on where media and broadcasting are now, and how to move them forward, let's look at what lies on the horizon.

Emerging Formats

Immersive Viewing

Today, viewers have near-complete control over their viewing habits. OTT (over-the-top) video streaming lets them choose when and how they watch, while IP (Internet Protocol) enables new interactions unavailable with traditional broadcasting.

While today's viewers are flocking to consume live/linear streams over IP, we're thinking about what's coming next: AR (augmented reality) and VR (virtual reality) experiences delivered seamlessly, anywhere in the world, over wired and wireless networks, with amazingly low latency. It's what consumers will demand — sooner than you may think.

This immersive paradigm is the logical extension of viewer-centricity. After all, what are VR and AR but the ultimate viewer-centric experiences?

This emergent space is already gaining momentum. We see it with gaming engines that can deliver fully rendered computer-generated VR experiences.

NEXT, IT'S VIDEO'S TURN ⟶

Experts are now developing technical standards for streaming 360-degree 4K VR video. As the next big content category after 4K UHD to command content producers' attention, it will only be a few years before delivering a good VR experience becomes a priority.

Improvements in headsets, better production technology, and growing volumes of content further suggest that the ramp-up to a viable VR market is right around the corner.

We can talk about where technology is going, but at certain points unforeseen influences step in and disrupt.

A good example is binge watching.

We knew back in 2006 that on-demand viewing was here to stay. But storytellers took that technology and made richer stories that unfolded more like a book where you just had to turn the page.

The technology made binge-watching possible, but the storytellers fed the beast.

If we think about this phenomenon in the context of VR and AR, it gets just as interesting.

It will be fascinating to see how storytellers pick up the next phase.

BILL WHEATON

Executive Vice President and
Chief Strategy Officer, Akamai

4K UHD TV

RESOLUTION → Two developments have made 4K UHD (ultra high definition) a top priority for the premium video industry: the emergence of HDR (high dynamic range) as a key differentiator of the 4K UHD viewing experience and the soaring global penetration of 4K UHD-enabled smart TVs.

Even today, most 4K UHD TVs in retail stores are equipped to support HDR. And as prices drop, household penetration is expected to rise significantly over the next few years — up to 34% by 2019 in the United States alone.[1]

DELIVERY → These formats will require far more bandwidth than HD, and online premium video distributors will have little choice but to take a new approach to delivering content.

In addition, following closely on the heels of 4K UHD, AR and VR will need dual 4K feeds for 3D viewing. While 8K UHD is farther off, adjustments in content distribution technology sufficient to accommodate 4K UHD will help lay the groundwork for 8K and VR.

[1] IHS Markit, TV Sets Intelligence Services, December 2015

SHARP RESOLUTION MEETS BIG FEEDS

(THE ELEPHANT IN THE ROOM)

CONTENT CATCHES UP

(THEN DRIVES THE PACE)

CONTENT → As for 4K UHD content, in the OTT domain Netflix and Amazon have led the way so far by adding HDR-enhanced programming to the 4K portfolios they've been building since 2014.

Other suppliers, like Vudu, M-Go, and Sony with its Ultra streaming app, are populating the Internet with ever more UHD Premium-formatted options.

And YouTube, which has built a sizable library of 4K content, has brought long-form HDR-enhanced UHD programming into the mix of channels offered on its Red subscription platform.[2]

And as online UHD content ramps up, the first live 4K satellite TV broadcasts are emerging in the United States and elsewhere, often with commitments to adding HDR enhancements in the near future.

[2] 4K.com, Ultimate 4K Movies and UHD Content Guide, September 2016

Emerging Video Delivery Protocols

AR, VR, 4K UHD, and beyond have greatly intensified the search for a new approach to streaming premium video.

In 2016, the industry reached consensus on the need for a streaming protocol that would support robust online distribution of 4K UHD (and all live programming) at high quality.
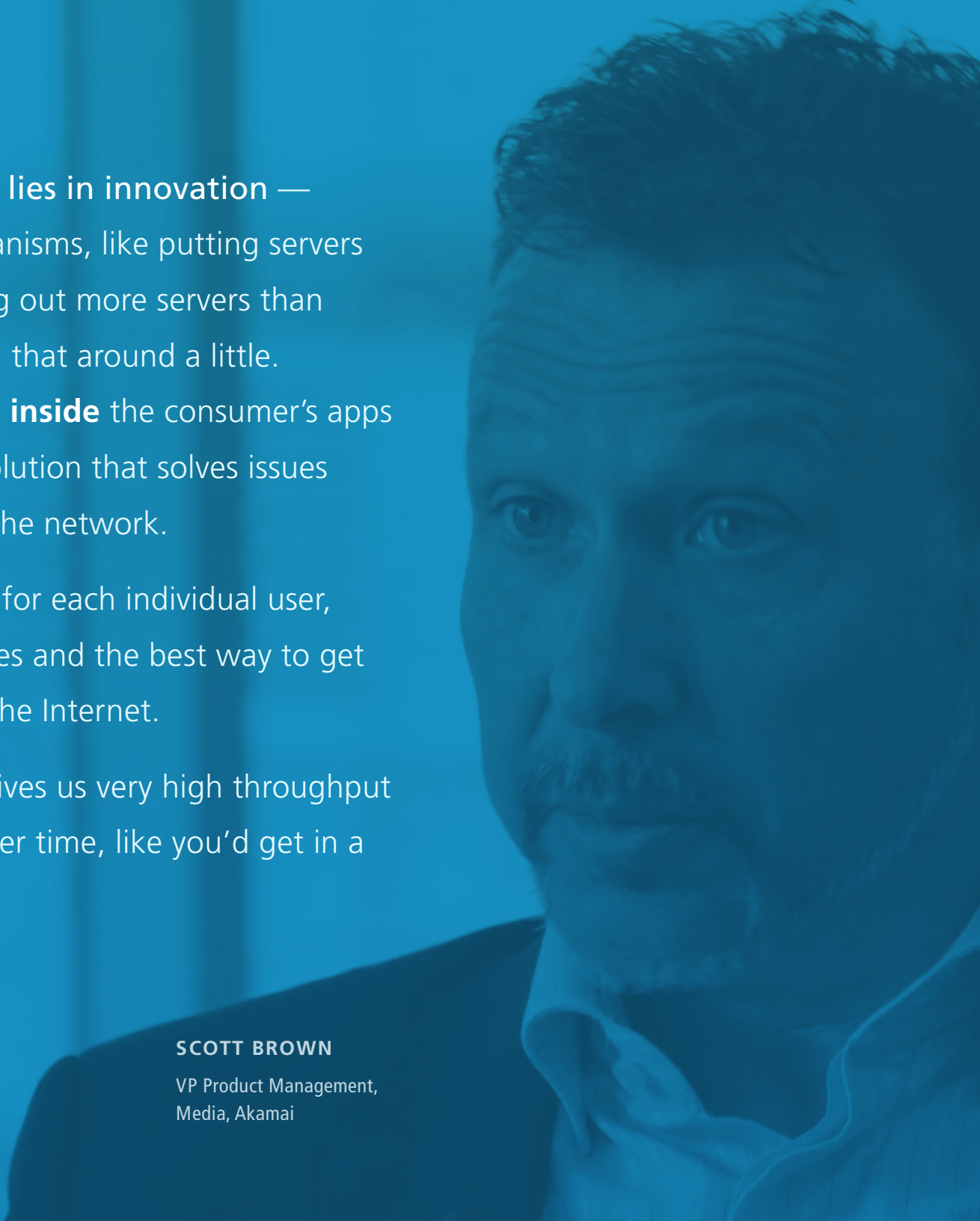
To promote the widest possible adoption, we at Akamai decided to provide compatibility with the emerging Internet Engineering Task Force standard UDP-based approach to streaming known as QUIC (Quick UDP Internet Connections) — a protocol first proposed by Google and now enabled by default on its Chrome browser.

Adding QUIC compatibility to advanced UDP (user datagram protocol) techniques means that media and broadcast companies will be able to adopt key network advancements to improve congestion control, manage large-scale live content distribution, and provide many other benefits with simple software upgrades in the field.

So, what's the goal here?

To empower content providers to use the Internet as a true broadcast network, by reducing latency, buffering, packet regeneration, and other fun-busters — for a top-quality viewing experience regardless of Internet infrastructure.

The solution to quality lies in innovation — taking our normal mechanisms, like putting servers closer to users, or putting out more servers than anyone else, and flipping that around a little. Actually putting our tech **inside** the consumer's apps to make a user-centric solution that solves issues from the user back into the network.

This approach allows us, for each individual user, to choose the best sources and the best way to get high-quality video from the Internet.

UDP-based technology gives us very high throughput and consistent quality over time, like you'd get in a normal TV experience.

SCOTT BROWN

VP Product Management,
Media, Akamai

Emerging Capabilities

Sub-Second Latency

Low latency is crucial for VR streaming to be feasible, but it's also indispensable here and now. What could be more frustrating, for example, than watching your team charge the net only to hear your neighbours with a better connection cheer before the wind up?

From the network side, every progression — live streaming, VR — is about payload and low latency. Two years ago, latency was 45 to 60 seconds for a live sporting event.

WE GOT THAT DOWN TO 15 SECONDS IN 2016

We're now working on ultra-low latency — actually beating television. Technical innovations have already reduced OTT's typical 30- to 60-second end-to-end delays to 10 seconds — which is within a few seconds of broadcast TV from camera capture to playback.

Emerging innovations will reduce latency even further, soon pushing us past broadcast TV and eventually to the sub-second ranges necessary for amazing new viewing experiences like interactive, streaming AR and VR.

Predictive Content Delivery

In the emerging environment, viewers are increasingly focused on having the content they want there when they're ready to access it — and less enthused about being shackled to the Internet.

PCD (predictive content delivery) will allow providers to better support this new set of expectations. It will allow viewers to cache videos on a device asynchronously for better searching, faster playback, and offline viewing.

This model allows providers to maximize the efficiencies of low-traffic troughs in the network while delivering the latest season of a viewer's favourite show automatically to their device — which they can watch at their leisure with instant playback at the highest quality.

And it all comes with unprecedented opportunities for prompts, ads, and related content geared to that specific user, creating a highly targeted **Audience of You.**
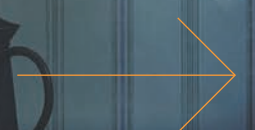
THE AUDIENCE OF YOU

Broadcasting is not new.

We humans have been doing it since the days of smoke signals and ceremonial drums.

But broadcasting specific messages across distances beyond the range of human sight or hearing in almost no time?

That is much newer.

Internet broadcasting can trace its roots to a number of moments in history. One of these is 08:45 Eastern Standard Time on the morning of Friday, May 24, 1844, at the United States Capitol in Washington, D.C.

That's the moment when Samuel Morse sent an encoded telegraph signal over a 44-mile series of wire and relays to the Mount Clare train depot in Baltimore, Maryland…

AND CHANGED THE WORLD

Building on the work of Morse and others around the globe, innovation accelerated.

1900
FESSENDEN'S VOICE TRANSMISSIONS

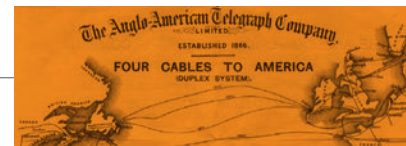### 1928
ZWORYKIN'S CAMERA TUBE

1844
SAMUEL MORSE SENDS LONG-DISTANCE TELEGRAPH

1901
MARCONI DELIVERS WIRELESS TELEGRAPH

1929
PHILO FARNSWORTH'S IMAGE DISSECTOR

1866
TRANSATLANTIC TELEGRAPH SYSTEM
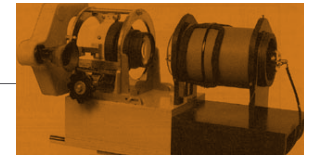
1928
TAKAYANAGI'S VIDEO TRANSMISSIONS

Within 6 years of Morse's 44-mile run, 20,000 miles of telegraph wire criss-crossed the United States. By 1866, anyone could send or receive a transatlantic telegraph.

Marconi's wireless telegraph and Fessenden's voice transmissions came next, then De Forest's first public radio broadcast. Takayanagi's video transmissions, Zworykin's camera tube, and Philo Farnsworth's image dissector followed. Broadcast flowed inevitably to the convergence of audio and video.

The general public got its first real look at a television at the 1939 World's Fair in New York City, but it wasn't until after the Second World War that television, benefitting from wartime technologies, was thrust into ubiquity.

In 1945, about 8,000 U.S. homes had TVs. Within a decade, that number had grown to 35 million.

The Viewer Takes Control

Though the tech evolved, the business model stayed the same through the golden age of radio and television. Programming and delivery remained squarely in the hands of broadcasters and advertisers.

From AT&T to home-based amateurs, radio broadcasters began 'toll broadcasting' in the early 1920s. Versions of sponsorship and advertising models continued through television's global ascendancy. In fact, the bond between broadcasters and advertisers came to define the viewing landscape. Television broadcast was dominated by ad-driven, scheduled programming over provisioned networks.
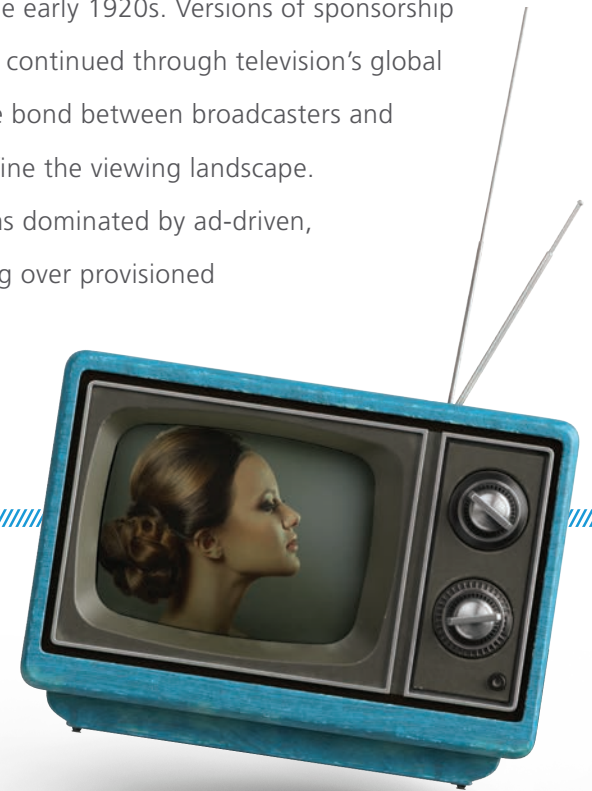
1939
TELEVISION DEBUTS AT 1939
WORLD'S FAIR IN NEW YORK

1945
8000+ U.S. HOMES HAVE TVS

Cable emerged in the 1950s as a last-mile solution for homes that couldn't easily receive over-the-air broadcast signals. In the early 1970s, only about 10% of US homes had cable.[3] But by the end of that space-age decade, cable and satellite were bringing more content to viewers than ever before.

In the 80s and 90s, premium and superstations emerged to compete with network programming. VCRs, TiVo, and time-shifting gave viewers additional choice. The viewing experience still centered around models defined by broadcasters and advertisers — ratings and share — but viewers gained more control over what to watch and when.

'50s

CABLE EMERGES

'70s

CABLE &SATELLITE ENTER MARKETPLACE

'80s & '90s

PREMIUM AND SUPERSTATIONS EMERGE TO COMPETE

[3] Valerie Bello, The History of Broadcast Media, 2014

You Are Here

Now we find ourselves in a new phase. And it's as significant a social and industry disruption as the telegraph, the radio, or the television.

The Internet is changing broadcasting the way it has changed retail: by putting the users in control of their own experience. The core bond — broadcasters and advertisers — is ceding ground to a new bond: Content providers and viewers.

It's a shift from breadth to granularity, from demographics to personalization…from 'prime time audience' to 'the audience of you' — where it's *always* prime time.

A Moving Picture

Even at this early stage of OTT video, viewers have near-complete control over what, when, how, and how much they watch. With subscription and on-demand models, advertisers may not even factor in.

Consumption is 24/7. People no longer watch video on just a single device or a single platform. A 'broadcaster' can be any content provider with an Internet connection. And IP introduces a layer of interactivity that traditional over-the-air broadcasting simply can't provide.

One of online video's early landmarks was the 1999 Victoria's Secret Fashion Show webcast. With Internet traffic in the 1 Gigabit per second range, it was considered massive at the time. In 2016, the Olympic Games in Rio saw peak traffic of 4.53 Terabits per second during the first three days. That same year, the European Football Cup exceeded 7 Terabits per second.

By 2021, live linear OTT video is expected to grow from its $1 billion mark in 2016 to $7 billion.

And that's just live linear.

And we're just at the beginning.

Where TV has hit their ceiling, we're just hitting our stride. We're putting out 4K experiences, higher fidelity, higher frame rates than what television can do. And the expectation is it's all going to happen online.

JOHN BISHOP

Corporate Technology Officer, Media Business, Akamai

OTT trend lines point to ever-mounting volumes of live streaming and ever-growing consumption of video.

Global online video entertainment revenues over fixed broadband networks within 51 reported countries will reach $42.34 billion by 2020. SVOD movie, episodic TV, and live sport services are expected to drive more than $9.45 billion in revenues in Europe alone by 2018.[4]

And in the Asia-Pacific region, about 977 million OTT users will drive video revenues to grow by more than 254% to $12.4 billion by 2020 (by contrast, revenues were $3.5 billion in 2014).[5]

[4] Ooyala, 24% CAGR expected as APAC online video revs top $12.4B by 2020, 2015

[5] Ooyala, 24% CAGR expected as APAC online video revs top $12.4B by 2020, 2015

EUROPE

$9.45B

SVOD movie, episodic TV, and live sport services

BY 2018

51 REPORTED COUNTRIES

$42.34B

Global online video entertainment revenues over fixed broadband networks

BY 2020

ASIA-PACIFIC REGION

$12.4B

977 million OTT users will drive video revenues by more than 254%

BY 2020

Video is the method of communication that this generation, and future generations, will use.

BILL WHEATON

Executive Vice President and Chief Strategy Officer, Akamai

The Plot Thickens

The change is upon us. The opportunities are enormous. And the challenges…

…WELL, THE INTERNET WASN'T DESIGNED FOR ANY OF THIS.

Morse designed the telegraph and his eponymous code to work together. Radio equipment was purpose-built for sending and receiving radio signals. Ditto television.

But the Internet is a spaghetti factory, a network of networks of variable strength that was never designed to deliver flawless, uninterrupted video.

At first, viewers were sufficiently mesmerized by the magic of a live stream on their computer screens to forgive slow loading or rebuffering or poor image resolution.

But two decades later, as media companies are learning, viewers consider TV-like quality a basic requirement — whatever the device they're watching on, wherever they are.

In fact, viewers disengage with emotive storylines by nearly 20 percent and feel their negative feelings grow by 16 percent when they face a disruption like buffering — regardless of the provider's brand or how interested they are in the content.[6]

And if the disruptions continue? About 67 percent of viewers say they would cancel or stop using the service.[7]

[6] Akamai, The Video Experience Equation, 2017

[7] Ibid., p.26

Go Beyond

So, viewers expect the smooth, uninterrupted quality of traditional TV as a baseline. But there's more, because increasingly they are looking beyond 'as good as' — to 'better-than-broadcast.'

The good news is that — whether on a smart TV or smartphone; whether live, linear, or on-demand — OTT video allows viewer-centric control over the entire digital experience in a way that television cannot.

The key challenge? Meet the Quality Mandate...

Or risk everything.

→

THE QUALITY MANDATE

When it comes to 'quality,' fifty years of television solidified viewers' expectations. TV plays instantly. There's no buffering or loading. The resolution is sharp.

Over the last few years, the lines between the TV broadcast experience and the online experience have blurred as the quality of online video improves by orders of magnitude.

On the other hand, viewer expectations are growing at the same precipitous rate. And nowadays, it just takes one technical glitch for us to feel the world owes us something we didn't even know existed 30 seconds ago.

The Basic Package:
A TV-Like Experience

For ad-based on-demand video (AVOD) providers, 'quality' is all about viewer engagement — providing an experience where video (including ad content) loads and plays quickly at great resolution.

For providers of subscription-based on-demand video (SVOD) and transactional on-demand video (TVOD), solid, buffer-proof performance is the ticket.

From the viewer's point of view, though, it's about enjoying a TV-like experience on the best screen available. Viewers want to watch what they want, on the device they want, when they want, interrupted only by the need for more popcorn.

'TV-like' means different things — great content, high picture quality, instant start-up, zero errors or delays or buffers. But the underlying technicalities of bitrate, global scale, and device specifics fly under viewers' radar. They just want to click and watch. That's 'TV-like.' That's 'quality.'
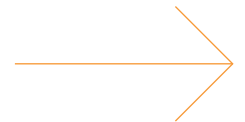
There's so much content available now – a glut – that publishers are trying to find new ways to make their services shinier, to differentiate in order to attract subscribers. Quality is a key differentiator.

MARK RAMBERG

Global Business Development, Media Division, Akamai

The Consequences of #FAIL

What consumers don't want is for their viewing experience to fail. In any way, ever.

That makes intuitive sense, but the science we've gathered on the subject is especially eye-opening for content providers.

Consumers don't associate a bad viewing experience with the device they're watching on or the content delivery network…They associate it with you, the content provider.

The consequences of bad experiences are dire. This is why we call quality a 'mandate.'

One study [8] found that viewers will begin to abandon a stream after a two-second delay in start-up. For every additional second of delay, the abandonment rate grows by 5.8%.

Another study found that a viewer's likelihood to go back to a service where the video start-up failed is 54% lower than for viewers who don't have that experience. [9]

AND THEN THERE'S THE VIDEO EXPERIENCE EQUATION.

[8] University of Massachusetts, Video Stream Quality Impacts Viewer Behavior, November 2012

[9] ScreenPlays, Multiscreen Monetization Potential Gets Real with Gains in QA for ABR, November 2013

Our groundbreaking research with Sensum Co. reveals that quality (or lack thereof) measurably and significantly affects viewers' emotions.

It affects them enough to directly impact the success of your business model, your brand, your ability to engage viewers in the content itself, and viewers' willingness to pay for a service.

And it affects them even when the difference in quality is imperceptible.

The Video Experience Equation

Our latest research is unique because it doesn't just measure how viewers characterize their feelings about performance issues (though it does measure that too), it measures the physical responses we humans can't control.

Galvanic skin response, facial coding — these biometric indicators capture emotional response at a physical level, adding depth and insight to our understanding of viewers' perceptions.

Read the full report here

Heart Rate Meets Bitrate

Of course buffering gets everyone in a tizzy. That Swirling Circle of Doom always seems to know when the bad guy's about to confess or the aliens are breaching the hull.

But even without a buffer event, bitrate alone can cause measurable differences in engagement.

→ Higher bitrates produce *10%* higher emotional engagement than lower bitrates, even when viewers can't see the difference.[10]

→ During moments of intense action, there is a *20%* difference in emotional engagement between high and low quality.[11]

→ Even when people watch video with no intense action, their engagement is *10.4%* higher when the resolution is higher quality.[12]

→ In moments of high intensity, resolution makes an even bigger difference to emotional engagement — to the tune of *19.8%*.[13]

[10,11,12,13] Akamai, The Video Experience Equation, 2017 (p. 6)

Hold My Popcorn

Viewers' quality expectations and perceptions are deeply enmeshed with the business model under which they're watching.

→ Although it's the most expensive model, TVOD does not drive the highest engagement. Collectively, viewers watching through a TVOD and AVOD business model were **64%** less engaged than the SVOD audience in the most exciting parts of a video.[14]

→ And SVOD viewers are not as distracted by interruptions. Viewers with a TVOD and AVOD arrangement were **64%** less engaged than the SVOD audience if viewing was interrupted by a poor streaming experience.[15]

→ TVOD services were the most adversely affected by low quality — TVOD viewers' feelings of captivation were *22%* lower in low-quality experiences; their feelings of delight were *20%* lower.[16]

[14,15] Akamai, The Video Experience Equation, 2017 (p. 6)

[16] Ibid., p. 8

This research clearly links quality to brand perception and business success. Two-thirds of participants said they would stop using a service if a problem like buffering occurred several times. The more frequent the bad quality experiences, the more often negative feelings toward the brand are reinforced.

And of course social media can transform disappointment into a PR disaster.

#FAIL.
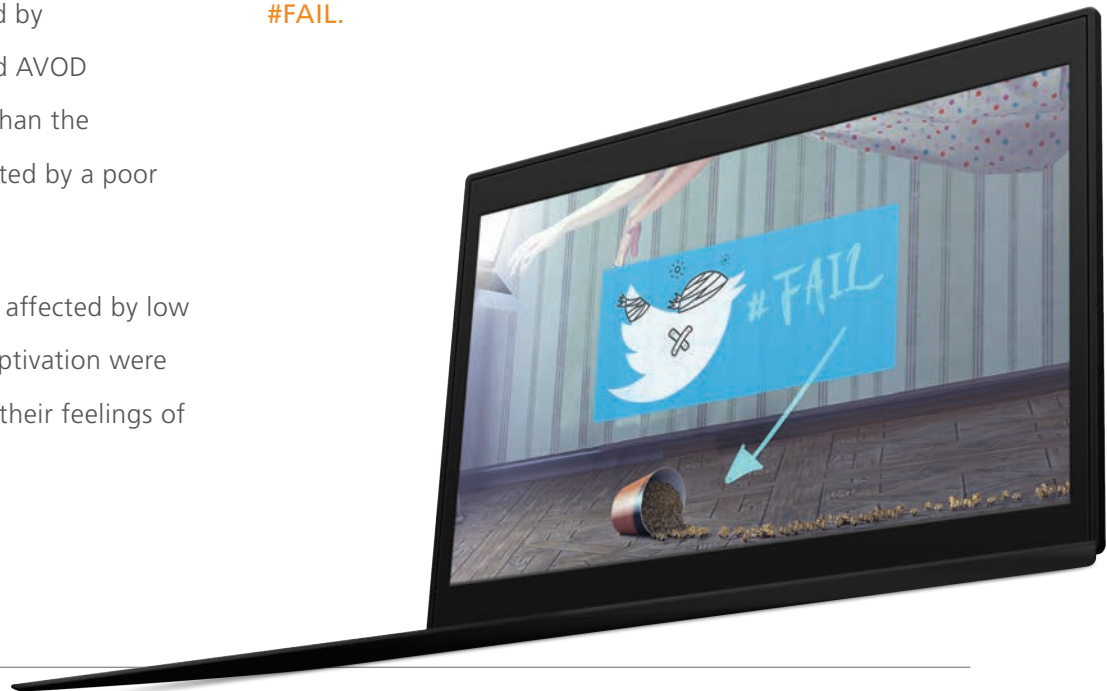
The Art of the Possible

Consumers understand the art of the possible.

Beyond just expecting a TV-like viewing experience, they intuitively understand the potential of digital compared to TV. They're thinking beyond. They're flocking to TV over IP because it can be more personal. They can get information about what they're watching, while watching it. They get more from their experience.

The key theme of better-than-broadcast is personalization.

Watching is evolving from TV's programmed viewing to the Channel of Me. Linear isn't going away, but it's also no longer the only way.

Think of the sports fan. Here you have someone who is interested in her team, or his announcer; her perspective, his language. Specific players. Fantasy leagues. They want to watch everything that's available — live, linear, on-demand. All of this extra content keeps engagement high. And getting the right ads in front of the right fan at the right time drives engagement even higher.

And what about the content I don't even know I want yet?

Use my viewing data to predict what I'll like and deliver it to me.

There's no TV precedent for this kind of viewing experience — it's an online-only expectation.

It's the art of the possible.

The Science of the Possible

And while consumers understand the art of the possible, we at Akamai understand the technological innovation that underpins it.

Meeting the basic TV-quality requirement, embracing the better-than-broadcast potential of IP-based viewing — these business necessities depend on very real and battle-hardened technologies.

When viewers want to see amazing detail as they watch the Mother of Dragons release her flying offspring, or want the next episode to load to their device automatically and play beautifully, they are actually referencing an enormous technological landscape.

A landscape filled with the geeky details we at Akamai thrive on… like how ABR-produced variations in bitrates can increase abandonment rates, sometimes by more than *400%*. Or how, in a home with 20 Mbps broadband access service, a typical Wi-Fi system can register a *3%* packet loss even with signal strength running at *97%* of capacity… And that whether it occurs in or out of home, a *3%* packet loss rate can translate to an *87%* drop in throughput on TCP, for example, going from 7 Mbps to [17]

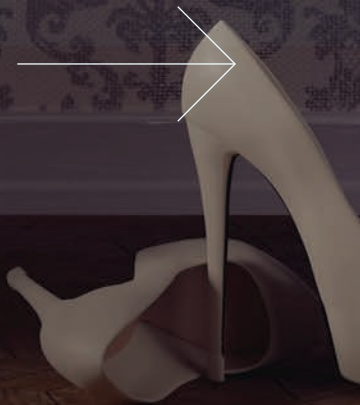[17] Akamai, The Video Experience Equation, 2017 (p. 6)

This is our landscape. We've mapped its terrain for the last 20 years. And successfully navigating it means adopting the **Workflow Innovation Mandate**

THE
WORKFLOW
INNOVATION
MANDATE

Great experiences are as
important as great content.

In "Breaking Down the Walls," we looked at the amazing places broadcast over the Internet is going — immersive viewing, 4K and 8K UHD, new delivery protocols, new capabilities, and more.

And in "Audience of You," we saw how broadcast history presents an important pattern: where technology delights, ubiquity follows.

We have seen this pattern repeated in the uptake of OTT video.

Today, the Internet connects more than 3 billion humans through nearly every facet of life.

That's 3 billion unique perspectives on how, when, where, and how much to watch — a situation that, as we saw in "The Quality Mandate," content providers ignore at their peril.

For Akamai, every viewer expectation is a surface feature of a vast and complex technical topology. Satisfying and delighting online viewers means using technical innovation at each stage of your workflow. Each of these innovations must center on creating the highest-quality viewing experience.

The First Mile

Giving viewers the best possible experience starts at the very beginning of the delivery chain. We estimate that 70% of streaming quality issues are related to transcoding, packaging, or storage.[18]

These pre-delivery steps are complex. Not only must you package your stream to support a vast range of form factors, screen resolutions, network capabilities, formats, codecs, and protocols, but you have to securely and reliably store the mountain of resulting files.

So building this process around the viewer means tightly integrating and automating resource-intensive and error-prone tasks so that your video delivery chain starts with the best possible quality and you only need to worry about producing a single-source video.

For live/linear streaming, accelerated media ingest is a core first-mile capacity. This approach to encoding, contributing, and ingesting raw, high-quality source signals requires the ability to map the network to match broadcast quality.

We call this 'self-healing,' and it's how we guarantee the reliability you need if you're streaming a large event or a 24x7 channel. This innovation can also let you achieve extremely low latency — as close to live broadcast as possible.

For on-demand content, first-mile innovations like automated workflows for transcoding, packaging, and securing content stored for on-demand viewing allow you to quickly process content for the highest-quality digital experiences.

[18] Akamai, Content Delivery for an Evolving Internet, 2016 (p. 7)

Broadcast O

Transport

The name of the game in this phase is efficiency.

Most video delivery happens over TCP-based HTTP (Hypertext Transfer Protocol) using adaptive bitrate technology. But as viewers' quality expectations rise, so do bitrates. And when bitrates go up, the limitations of TCP-based HTTP for video delivery begin to reveal themselves.

TCP connections were designed for reliability, so they carry a lot of overhead — especially in the face of network congestion. With TCP, lost packets need to be re-transmitted, taking additional round trips that lead to poor-quality streams and the dreaded Swirling Circle of Doom.

This is where UDP comes in. This lightweight protocol was designed for real-time communications and lets packets drop when congestion crops up, so that stream latency is not affected. When UDP is combined with forward error correction techniques, you gain the best of both worlds: TCP's reliability and UDP's speed, even across congested routes.

What does it mean to you? It means you can stream HD and UHD video without buffering or reducing bitrates when congestion hits.

Although the Internet as a whole has only begun to support such protocol upgrades, building resilient UDP transport into your servers and video player footprints now will keep you ahead of the curve.

And when you add to the mix a network that can deliver your streams from servers close to nearly any viewer, you can offer HD-quality streams to broadcast-size audiences around the globe.

The Last Mile

Getting your content to your viewers quickly and efficiently is essential, but last-mile problems can erode the experience even if your ingest and transport phases are optimized.

And this leg of the journey is full of impediments, ranging from random noise in signal transmission across metro backbones, hubs, nodes, and access links to signal power fluctuations in a house's Wi-Fi router.

In the last mile, the next frontier of innovation is at the device level:

→ Device-level technology that communicates in real time with the network to deliver video that is optimized for the device capabilities, network type, and specific viewing conditions.

→ Pre-positioned content delivery that overcomes limitations like capped data plans and poor quality networks by allowing users to download content at low-traffic times for viewing later. So they can schedule download of their favorite news program, for example, when they're on Wi-Fi and watch it later when they're on 3G without eating into their data plan. Or schedule an automatic download of a movie and watch it without disruption while someone else in the house is streaming a show or playing an online game.

Combining prepositioning capabilities with personalized predictive analytics takes things one step further, helping you optimize viewers' experience and keep them coming back for more.

Unlike television, which has a pristine dedicated pipe out to viewers, OTT providers have limitations on their capacity out to users. As more people come online with services, the problem grows as congestion builds.

OTT is also shared. Video, YouTube, video games — they're all shared in your house. So innovation means looking to multitasking technologies to lower the load.

Pre-download is one example. It allows content providers to pre-deliver the latest show or new season to devices overnight when Internet traffic in their area is low. The show starts instantly when the viewer's ready — regardless of their connection — at highest quality. This is an awesome experience for the end user.

MARK RAMBERG
Global Business Development,
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The Platform for 'Better-Than-Broadcast'

Server or encoder problems, network overloads, the inability to fend off denial-of-service attacks, or even just a missed opportunity to stream your video globally — each is a platform-level issue.

Even if you incorporate every workflow innovation we've described above, if you're not streaming on the right platform — one that's powerful, secure, self-aware, and self-healing — you're subject to the vagaries of the decentralized and threat-filled Internet.

Clearly, we think Akamai is that platform. And with good reason.

When we pioneered the CDN (content delivery network) space two decades ago, we began with a straightforward idea: server proximity boosts user experience. Delivering content to users from the closest possible server maximizes the creative and business potential of the Internet.

Given the Internet's decentralized nature, being geographically and topographically (in the network sense) close to the end user is a physical strategy for minimizing latency and evading congestion and routing problems.

It's simple, but profound. A highly distributed network is central to performance, scale, and reliability. So over the last 20 years, we've made tremendous investments of time, expertise, and capital in building a platform that's matchless in its distribution.

Today, our distributed footprint consists of software on more than 216,000 servers in more than 1,500 networks in more than 120 countries. We serve more than two trillion Internet interactions every day.

Building this kind of platform — one that's unique in the world — isn't something a company can do in a few years. There are no shortcuts. It means developing partnerships and relationships with thousands of network providers. It means building sophisticated software. It means getting the world's leading experts on board.

The CDN marketplace is much larger now than it was 20 years ago, and the principle of proximity is table stakes. But as users, devices, and networks become more distributed and content gets more dynamic, the number and distribution of points of presence matters more, not less.

In an environment where it takes more than 600 networks to cover 90% of Internet access traffic, having a true highly distributed platform and the capacity to accurately map users to nearby servers is essential.[19]

[19] Akamai, Content Delivery for an Evolving Internet, 2016 (p. 2)

Better-Than-Biggest

At Akamai, we innovate across the world's biggest, most reliable, and most secure global platform. This gives our customers' users the best chance of a high-quality viewing experience. It also gives our customers the highest capacity for insight into their viewers' experience (down to the level of the individual viewer) with monitoring and diagnostics.

This capacity for consumer insight isn't just a nice-to-have. It directly impacts each stage of workflow. Near real-time monitoring and signal performance reporting in first-mile distribution, contribution workflows, end-user devices, and more transform raw data about ingestion bitrates, fluctuations over a given time period, packet losses, latency, and errors into game-changing business information.

Having the world's biggest network allows us to continually map the Internet for a comprehensive picture of network conditions. Our customers can get instant device-level insight into their customers' experiences, to optimize their experience and to stop security threats.

At the same time, our team of broadcast experts with hybrid skills across media and networking bring together best practices from online video streaming, network operations, and television broadcasting into a central monitoring and support hub.

And with cloud-based services, you also have the option of outsourcing part — or all — of your workflow, benefiting from the ability to scale infrastructure on demand, and get as-you-need-it access to computing, storage, delivery resources.

THE POSSIBILITIES ARE LIMITLESS.

Though viewing experiences like interactive streaming AR and VR are still a few years away, companies like Akamai and its partners are right now establishing standards for how this experience will be delivered. As hardware makers perfect their devices and content makers innovate, infrastructure companies like us make it possible.

As these spaces converge over the coming years, Akamai sits ahead of the curve, surrounded internally and externally by the very people who have developed the standards of today, the standards we're all used to as consumers of online content.

It's exciting to see these people now solving how to make the future possible, repeatable, and marketable for content producers of all sizes — all focused on creating an exciting new world for the viewer.

NELSON RODRIGUEZ

Media and Gaming Campaigns
and Industry Insight, Akamai

We've been there from the beginning of OTT, defining its core structures.

We're here with you right now, helping to delight your viewers with the highest-quality viewing experiences today.

We'll be there when viewers travel to the future's amazing new spaces.

And we'll work with you to get them there — to enjoy all you have to offer.

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