



Magical Realism

a look at NAB 2019

Mark Schubin

(who has visited every booth at every
NAB show since 1973)

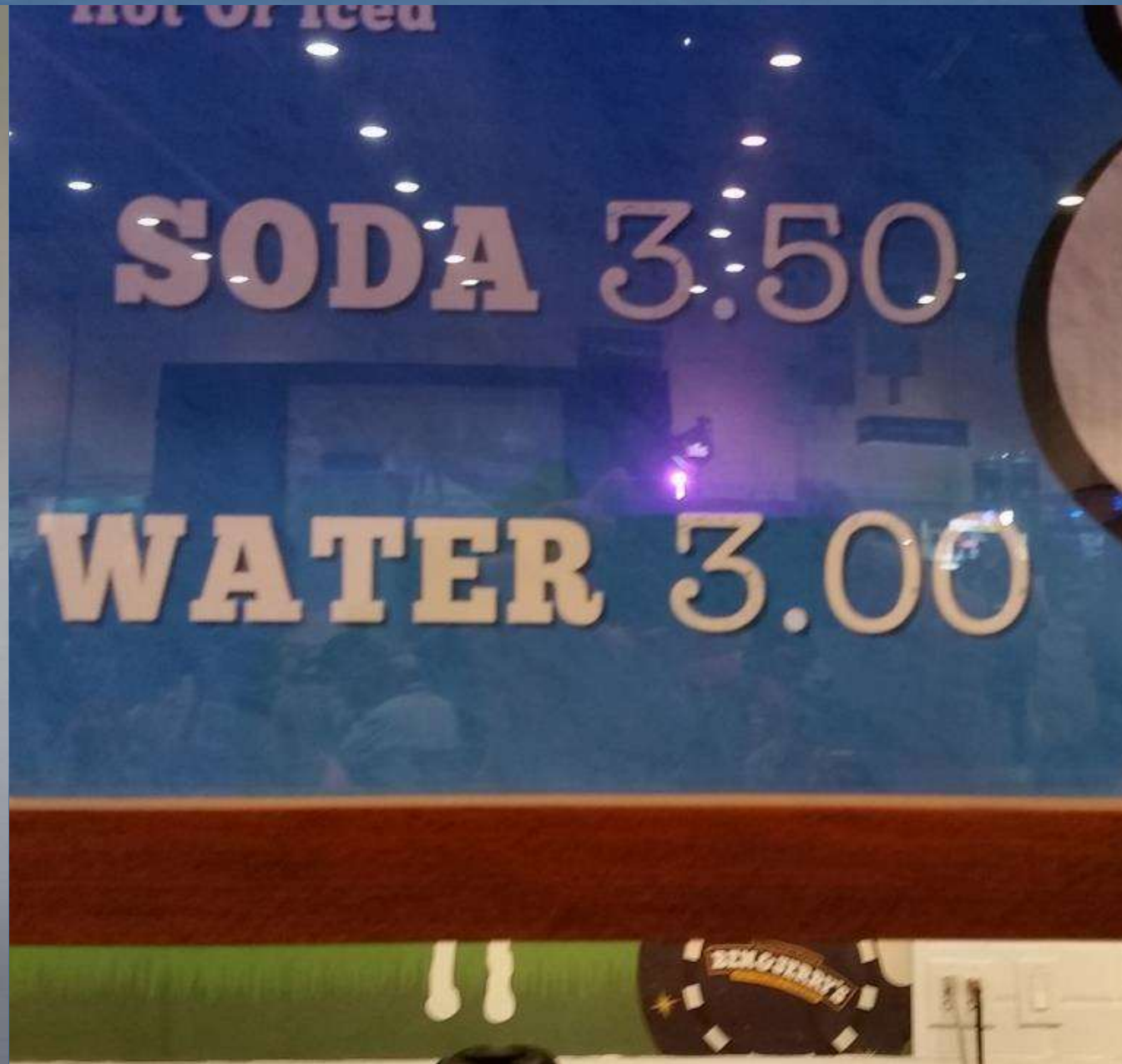
a .pdf of these slides is at
bit.ly/smpteny-nab19

Some Things I Love ❤️

- AI
- 3D
- 4K
- 5G
- 8K
- 16:9
- AR
- ATSC 3.0
- broadcasting
- cloud
- direct-view cinema
- esports
- HDR
- HFR
- IP
- LED screens
- quantum computing
- satellites
- SMPTE 2110
- SRT
- streaming
- UHD
- VR
- zoom lenses (good ones)

Magic

Reality



Magic



Reality



Attendance

<https://www.tvtechnology.com/show-news/2019-nab-show-focused-on-stories>

Reality

- People:
 - 2017: 103,443 (unaudited)
 - 2018: 93,171 (unaudited)
 - 2019: 91,406 (unaudited)
- Companies:
 - 2018: 1718
 - 2019: 1632

Magic

- 2018: 92,912 (audited)
- 2019: self-identified buyers up

Mel Feliciano
@MelFeliciano

Follow

Replying to @Dugdale @ErikNaso

Things that I miss from old NAB Shows: Apple, RED, and DJI booths; the live streaming shows from the Teradek Studio; Video reports from @ChrisNiccolls , @thatJordanDrake , and @Dugdale . The legendary live streaming from @StronzV and the gang. Thanks God we still have @ErikNaso.

12:14 PM - 12 Apr 2019

1 Like

https://www.provideocoalition.com/random-thoughts-on-nab-2019-my-saddest-nab-ever/

PROVIDEO COALITION

NEWS LATEST TOPICS

NAB Show

Random thoughts on NAB 2019, my saddest NAB ever

It wasn't the products, they were okay; or the friends, they were awesome



Scott Simmons April 22, 2019

Was NAB 2019 boring? Maybe. Admittedly I did spend a lot of time upstairs in the South Hall teaching classes for [Post|Production World](#). But after walking the show floor several times and talking to a lot of fellow NAB attendees the verdict was a resounding ... *shoulder shrug*. On the post-production side of things by far the biggest buzz was for a [\\$1000 editing keyboard](#) that wasn't shipping and won't work with the current video editing tool of choice! If that doesn't sum up NAB 2019 I don't know what does.



NAB President Gordon Smith Keynote

- “The Next Gen TV attachment with this phone lets me watch my favorite stations anywhere I am.”



NAB President Gordon Smith Keynote

- “The Next Gen TV attachment with this phone lets me watch my favorite stations anywhere I am.”



<https://www.broadbandtvnews.com/2019/04/09/apple-refusing-to-add-broadcast-chips-to-products/>

Broadband TV News
Independent. Since 2003

Apple 'refusing' to add broadcast chips to products

bhic-corp.com

ATSC (1.0) vs. ATSC 3.0

- No adjustability
 - 19.39 Mbps
 - 15.2 dB SNR
 - no simultaneous variability
- MPEG-2 video coding
 - allowed HD in 6 MHz channel
- Transition 1996 (to 2009)
- Govt. mandated w/funding
 - single-broadcaster transitions
 - reception mandated
 - 2G cellular, no OTT
- Adjustability
 - bit rate (0.83 to 57 Mbps)
 - SNR -5.5 to 36.5 dB
 - up to 4 variable “pipes”
- Many codings, incl. **HEVC (H.265)**
 - perhaps 4x efficiency of MPEG-2
- Authorized late 2017
- Govt. permitted
 - mkt.-b'caster reliance req'd 5 yrs.
 - reception voluntary
 - 5G deploying, OTT soaring



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Broadcasters Make Big 3.0 Bet At NAB

by Glen Dickson April 11, 2019 10:18 EDT

LAS VEGAS — After several years of mostly behind-the-scenes work on the ATSC 3.0 next-generation standard, the country's biggest broadcasters finally showed their hands in a very public way at the NAB Show in Las Vegas this week by committing to launch ATSC 3.0 on stations in the top 40 markets by the end of 2020 — the same time 3.0 TV sets should be hitting retail shelves in meaningful volume.



L-r: Anne Schelle, the Pearl Group; John Hane, Spectrum Co.; Mike Bergman, Consumer Technology Association; Gordon Smith, NAB; and FCC Commissioner Brendan Carr (at podium).

NAB President Gordon Smith Keynote

- “The Next Gen TV attachment with this phone lets me watch my favorite stations **anywhere** I am.”
 - Does it let him watch, say, a Washington, D.C., station in Las Vegas?



NAB President Gordon Smith Keynote

- “The **Next Gen TV attachment with this phone** lets me watch my favorite stations anywhere I am.”



TVTechnology



NEWS OPINIONS PRODUCTS EVENTS RESOURCE CENTER



NAB Announces Successful ATSC 3.0 Transmission Of Audience Measurement Tech

Next Gen TV standard successfully installed and transmitted Nielsen watermarks.

Michael Balderston · Apr 3, 2019

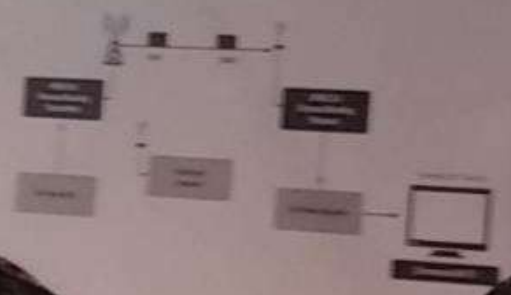
tip of the hat to Albert Manfredi for calling this to my attention

KOREA UHD ON AIR

ETRI Electronics and Telecommunications
Research Institute

Terrestrial 8K Broadcast Using ATSC 3.0 Channel Bonding

ETRI SAMSUNG KBS LG Electronics KallMedia TAGOS
MIRUENG LUCAS NCCO CXC EBS TV





Aktina Vision



3D display with 330,000 pixels

Aktina Vision

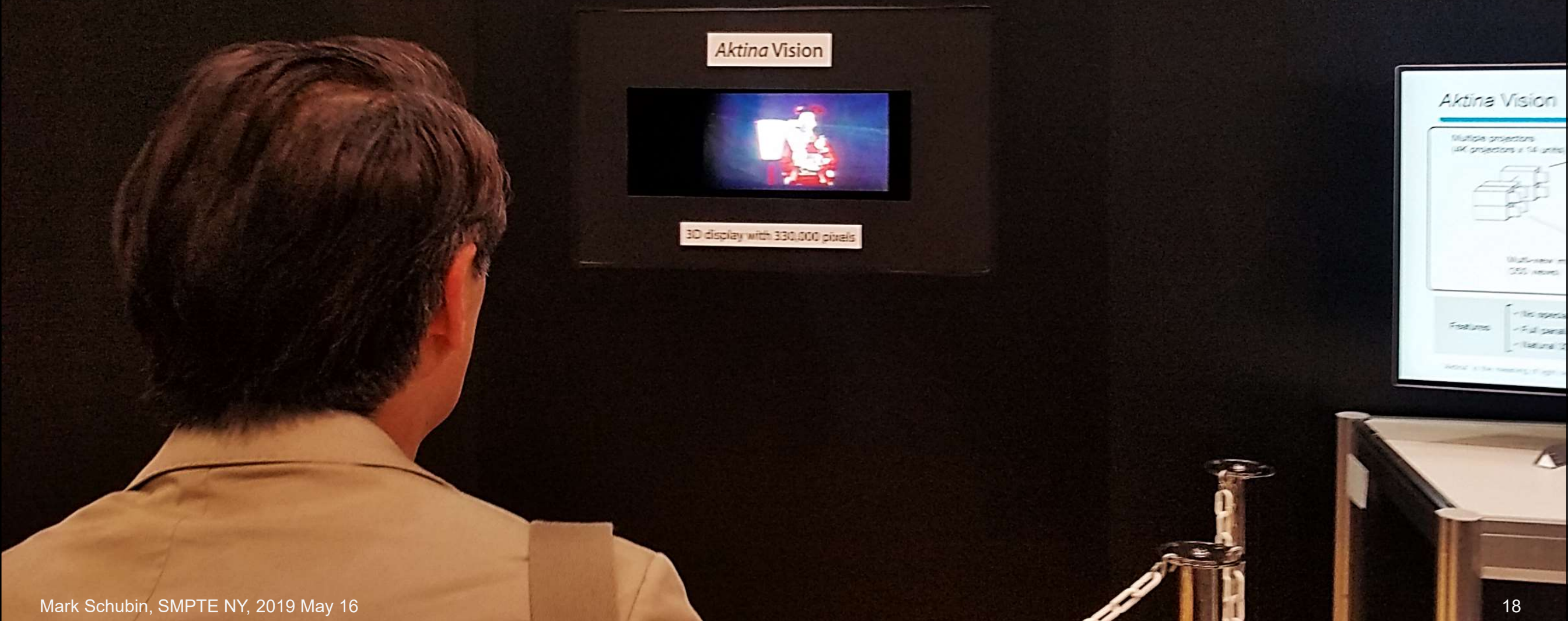
Multiple projectors
(4K projectors x 14 units)



Multi-view m
(250 views)

- Features
- 140 speakers
 - Full parallel
 - Natural 3D

Very Little 3D, AR, MR, or VR





Andy Setos with Glass Glasses

and what does
he see coming
after 4K & 8K?

Andy Setos with Glass Glasses

Special®



Kellogg's trademark

Michael Zink, Chair UHD Alliance

← → ↻ <https://www.smpte.org/publications/newswatch>



“A lot of people use the term UHD synonymous with 4K in terms of resolution,” he explains. “However, it has become pretty clear that just increasing resolution from HD to UHD isn’t really going to give the consumer a complete value proposition. It was different when we transitioned from SD to HD—then you could see the difference easily. But when we started the UHD Alliance a few years ago, I think it became clear that resolution increases alone are not representative of the full value we can give consumers.”

Ultimately, Zink believes that other display characteristics and advances, such as high dynamic range (HDR), greater color gamut, and faster frame rates, make even more beneficial contributions to the consumer experience than resolution alone. Zink says HDR, in particular, makes a more discernable difference for the average viewer than resolution changes. As such, he suggests, a proper discussion of UHD needs to include all features that contribute to the improved user experience, including HDR, wider color gamut, increased bit depth, and immersive audio, in addition to increased resolution.

Into Production
The Millennial's
February 2018

SMPTE ST 2110:
Next Step
January 2018

Preservation and
Next Generation
November 2017

SDI in an IT World
October 2017

Making Immersi

Judder Sensitivity in Cinema Exhibition Spaces

Psychophysical Experiment

This project explores the sensitivity to **judder** (motion artifacting) that is experienced between both **HDR** and **SDR** exhibition spaces. As HDR continues to become more supported, higher display **contrast ratios** can be achieved. The higher the scene contrast is, the more sensitive the eye is to these artifacts. This amplifies distortions that fall into the category of “**perceived jerkiness or judder**”. Proposed solutions to solving the increased judder issue within HDR are increasing **frame-rate** or using a new signal processing method.

This research explores the solution of increasing framerate as an option, by measuring observer sensitivity to judder at each viewed frame rate.

Judder-sensitivity can be explored between both exhibition spaces by performing a **magnitude estimation experiment**.

Experimental Components:

- HDR and SDR outputs
- 7 frame rates (24-120fps)
- 2 controlled panning speeds
- G-Sync/HDR display



HDR scene that was captured on a RED EPIC M-X at varying frame rates. The captured scene achieved 13 stops of dynamic range.

Trevor Brashich | twb9@rit.edu

APRIL 11, 2019

5:39pm PT by Carolyn Giardina

NAB Show Wrap: The Trends That Mattered This Year

The **Hollywood**
REPORTER

The Spotlight Dims on LED Cinema Screens

A year ago, the proposal to replace cinema projection with ultra-bright, high-resolution LED video walls — led by demos from Samsung and Sony — was one of the most talked-about subjects at CinemaCon, as well as among the film community at NAB. Not this year.

As CinemaCon opened last week in Las Vegas, Samsung announced two new scheduled installations of its Onyx LED Cinema Screen in the U.S., at the Star Cinema Grill in Texas and at Warehouse Cinema by HighRock Group in Maryland — bringing the total in the domestic market to three. The Onyx screen, which was only introduced one year ago, has also had

SONY

Crystal LED Display System

DON'T JUST DISPLAY. ASTONISH.



F1.8
1/3200 sec., F1.8, ISO

SONY

Crystal LED Display System
DON'T JUST DISPLAY. ASTONISH.

SONY

Crystal LED Display System
DON'T JUST DISPLAY. ASTONISH.



An Investigation of Creative Power and the Value of Wide Color Gamut in Motion Picture Mastering

Advancements in cinema and display technologies have allowed for **wider color gamuts** to become realizable. With this, these technologies have the capability to support and reproduce **highly-saturated color content**.

It is important to remember, however, that the ability to produce colors with an extremely-high chroma component is strictly a **capability of the technology** and **not a necessity that the image content must follow**. In short, the decision to utilize the expanded gamut available in advanced cinema technologies is at the discretion of the creative forces behind the project.

There are a number of different factors that can contribute to the creative color decisions made for motion pictures, with the primary factor being the **aesthetic nature of the content produced**. Through creative-preference assessments of saturation in various image content, the **value of the expanded color gamut in motion picture mastering** is being estimated.

Jake Zuena | jwz1170@rit.edu



Major Experiment Components:

- Three images of comparable chroma histograms were selected for evaluation. Images featured human skin tones, animated characters, and natural scenery
- Image saturation was altered in the perceptually-uniform ICtCp Color Space and content was encoded in X'Y'Z' for observer evaluation
- Images were displayed using laser-projection technology, with many saturated images exhibiting color content outside of DCI-P3

Determining A Consumer Preference for Motion Blur

A Psychophysical Experiment

Motion blur plays an important role in how a viewer interprets the subjective quality of a scene. The effects of motion blur will be reduced at higher frame rates, but a feature film will usually playback at 24fps in a theater, and increasing frame rate may also result in the "**soap opera effect**" as well as other uncanny features.

Shutter speed has always been utilized in the past creatively for achieving a desired immersive effect depending on the type of scene. In *Saving Private Ryan* (1998) a high-speed shutter was used in the opening battle scene to make it feel like footage that would be broadcast live on the news. A **higher speed** was used in *Mad Max: Fury Road* (2015) to create a **tense 'shaky'** feeling during some action sequences. In other sequences, a **lower speed** was used to create a smooth and **calming feeling**.

Depending on the scene content, audiences have claimed in that past that certain speeds cause an **unpleasurable** feeling of uneasiness or dizziness. This project asks participants to **judge clips of various objects at various shutter speeds** using both a fast and slow panning camera to determine if there will be a unanimous preference.



An example of two clips that will be shown during the experiment. A pinwheel spinning with a 1/24 shutter (left) and a 1/120 shutter (right). The goal will be to find out what subjects choose and why.

Thomas LaMagna | tkl5003@rit.edu



Search

THE MEDIA PROFESSIONAL'S INSIDE PERSPECTIVE

Immersive Digital Experience Alliance Launches at NAB 2019

By Debra Kaufman
April 11, 2019

The Immersive Digital Experience Alliance (IDEA) has debuted, with the stated goal of creating royalty-free specifications for all immersive media formats, including light field technology. The Alliance's founding members include CableLabs, Charter Communications, Light Field Lab, OTOY and Visby. The Alliance has started developing the Immersive Technology Media Format (ITMF), slated for release in 2019, which the group believes will "serve as an interchange and distribution format that will enable high-quality conveyance of complex image scenes."



Search

THE MEDIA PROFESSIONAL'S INSIDE PERSPECTIVE

Innovators, Analysts Examine New Entertainment Paradigms

By Debra Kaufman
April 9, 2019

At 30 Ninjas, chief executive Julina Tatlock noted that "the urge for immersion" is one of the chief disruptors that she and her partner, director Doug Liman, see in the M&E industry today. Whether it's augmented reality, virtual reality or 360-degree imagery, she challenged the members of an NAB 2019 panel on emerging entertainment to pick the one they think will impact production in the next two years. Greenlight Insights VR/AR analyst Alexis Macklin picked all of them — plus cloud computing and AI tools.



TV Tech Industry News

Found by Fairmile West

Listen. Connect. Deliver.

Home Broadband Business Content Development Technology UHD

APRIL 8, 2019

US proposes ATSC 3.0 as digital standard

standard

https://www.businesswire.com/news/home/20190408005229/e

Business Wire
A Berkshire Hathaway Company

United States Proposes ATSC 3.0 as International Digital Broadcast Standard

ITU Considering World's First IP-based Broadcast System

April 08, 2019 08:00 AM Eastern Daylight Time

GENEVA--(BUSINESS WIRE)--The United States of America has proposed to the International Telecommunication Union (ITU) adoption of the ATSC 3.0 digital broadcast standard for use by all countries in the world. The proposal is the first major step in the evaluation process for worldwide acceptance of the standard.

https://www.tvtechnology.com/atsc3/u-s-proposes-atsc-3-0-be-adopted-as-an-international-broadcast-standard

TVTechnology

NEWS OPINIONS PRODUCTS EVENTS RESOURCE CENTER

U.S. Proposes ATSC 3.0 Be Adopted As An International Broadcast Standard

Decision is up to International Telecommunications Union



TV Tech Industry News

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TVTechnology

NEWS OPINIONS PRODUCTS EVENTS RESOURCE CENTER

U.S. Proposes ATSC 3.0 Be Adopted As An International Broadcast Standard

Decision is up to International Telecommunications Union

so were NTSC-M
& Brazil's PAL-M

RIDE THE ROAD



HD Radio
Digital AM & FM



TOYOTA

FCA

HD Radio
Digital AM & FM

Broadcast Monitor Solutions



LG
OFFICIAL
4K UHD TV PARTNER



15 SHARES



NOW READING

Virtual driver Enzo Bonito beats Formula E champion Luca di Grassi in one-on-one ...

Virtual driver Enzo Bonito beats Formula E champion Luca di Grassi in one-on-one real race; e-sports gamers are ecstatic

- The 23-year-old Italian defeated former F1 driver Di Grassi in Mexico's Race of Champions Nations Cup
- Virtual racers say it proves simulator drivers can make the step up to real race conditions

PUBLISHED : Wednesday, 23 January, 2019, 2:42pm

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esports

EXPERIENCE

☆☆☆☆☆

esports

EXPERIENCE

NABSHOW
Where C

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N1522

10:30 AM - 11:00 AM
Game On: How 3D and eSports will Radically Change the Playing Field for Service Providers
Tadashi Higuchi from Singtel, Todd Stone from Verizon

11:00 AM - 12:00 PM
College Sports Competition, Education, Coverage
John Hines from ESPN

1:00 PM - 2:00 PM
eSaaS: Emerging Platform for the Next Generation of Mobile Services
Bryan Berman from Verizon

esports EXPERIENCE

LG
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UNPARALLELED QUALITY UNPRECEDENTED CONTROL

ENHANCING & DELIVERING LIVE TELEVISION GLOBALLY

www.theswitch.tv

Impact of Multiplayer Games on Entertainment and Cinema

By Debra Kaufman

April 9, 2019

At a panel during this year's NAB Show, Unity Technologies head of cinematics Adam Myhill reported that video game revenue has topped movie revenue for the last two years. "The top 25 IPs in the world are games now, and some of them are worth \$10 billion, which is staggering," he said. "On a quarterly basis, more people play Unity games than watch TV. Games reach three billion people, and the world's population is a little more than twice that." The point was, with such massive scale, games are bound to influence movies and other entertainment.

Esports Panel



Is esports the only thing eating into Netflix audiences?

Netflix Says US Streaming Is Down 32 Percent vs Super Bowl LIII



“Apparently this Super Bowl thing is kind of a big deal,” company tweets out around halftime

Tony Maglio | February 3, 2019 @ 6:05 PM

Last Updated: February 3, 2019 @ 7:12 PM





Whoops

Currently there is no content available for this page. Refresh page to retry.

[REFRESH PAGE](#)

Elements Console Sources Network Performance Memory Application Security Audits Ember

top Filter Default levels Group similar

- [Deprecation] Styling master document from stylesheets defined in HTML Imports is deprecated. Please refer to <https://goo.gl/EGXzpw> for possible migration paths.
- Could not find style data in module named iron-flex [polymer.js:260](#)
- Could not find style data in module named ytu-styles [polymer.js:260](#)
- Failed to load resource: the server responded with a status of 500 () [youtubei/v1/unplugge...YmjJZ5UG-D6Y-vkMc:1](#)

Alex Virdee @alex_virdee · 21h
Great job for going down on us during the England match @YouTubeTV



The BBC iPlayer proved almost as popular as the England football team during the World Cup, but the tournament also revealed the current limits of online video for live events; now though the corporation's R&D team says it has solved the problem of delays when mass audiences watch live internet streams.



Fault! Prime draws fire for US Open coverage

**ADVANCED
TELEVISION**

August 29, 2018

Amazon Prime has been deluged with so many complaints about its coverage of the US Open that it has stopped viewers from posting anymore bad reviews.



The New York Times



Digital Divide Is Wider Than We Think, Study Says

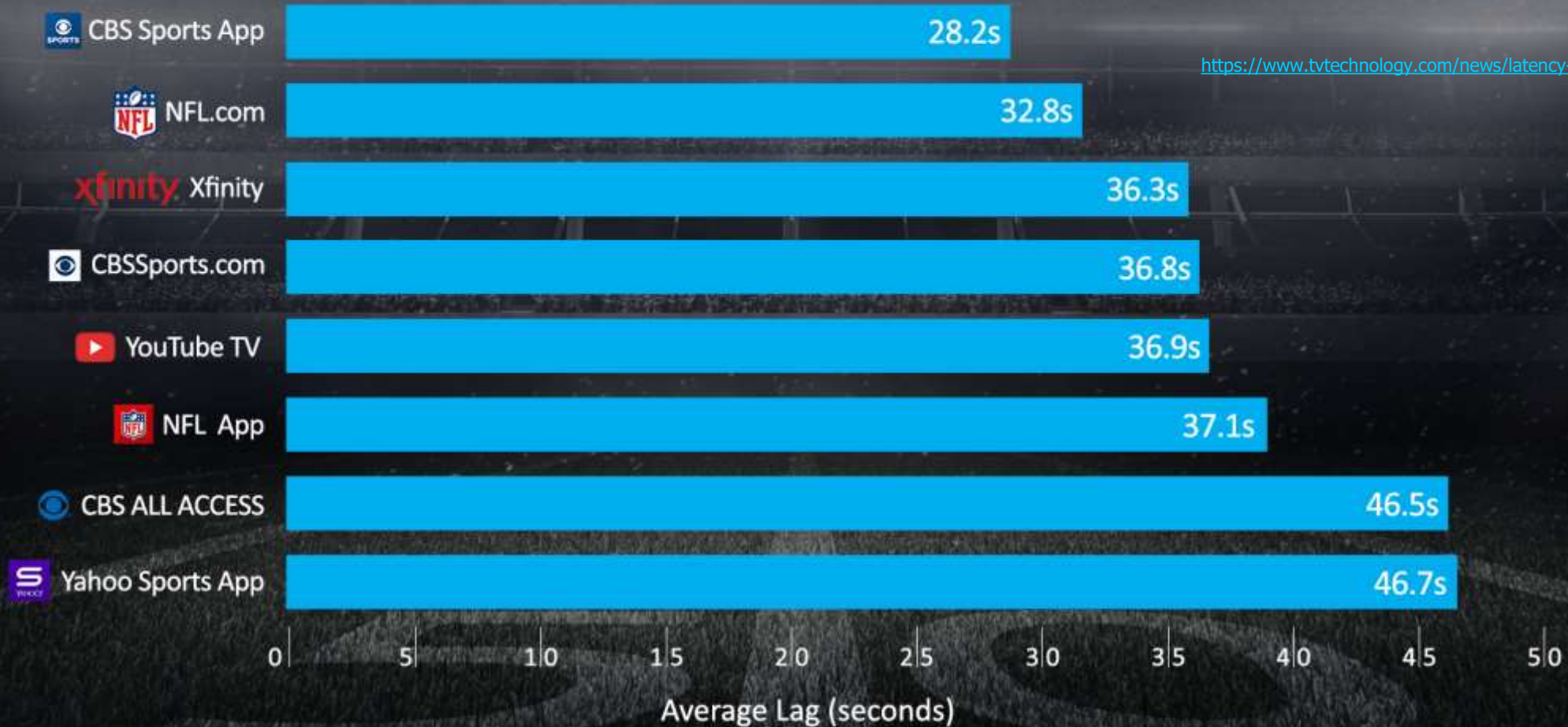
Over all, Microsoft concluded that 162.8 million people do not use the internet at broadband speeds, while the F.C.C. says broadband is not available to 24.7 million Americans. The discrepancy is particularly stark in rural areas. In Ferry County, for example, Microsoft estimates that only 2 percent of people use broadband service, versus the 100 percent the federal government says have access to the service.

By Steve Lohr

Dec. 4, 2018

Super Bowl 2019: Measured Lag Behind Real-Time

Comparing various streaming sources with the on-field game



source: Phenix
via *TV Technology*

<https://www.tvtechnology.com/news/latency-plagues-super-bowl-video-streams-finds-phenix>

Conclusion: Viewers on all platforms are significantly delayed, leading to spoilers and a degraded user experience.

Editorial Board

Sports Betting Is Legal. Watch Out.

Punters are welcome in eight states and counting. Here's how to prevent a disaster.

By Editorial Board

January 20, 2019, 9:00 AM EST



DESIGN > NETWORKS

Wall Street Going Wireless in Bid for Ultra-Low Latency

There's growing interest in wireless as a way to get faster connectivity for financial customers conducting low-latency trading, a trend seen in announcements this week from 325 Hudson and Hudson Fiber Networks.

Jason Verge | May 07, 2013



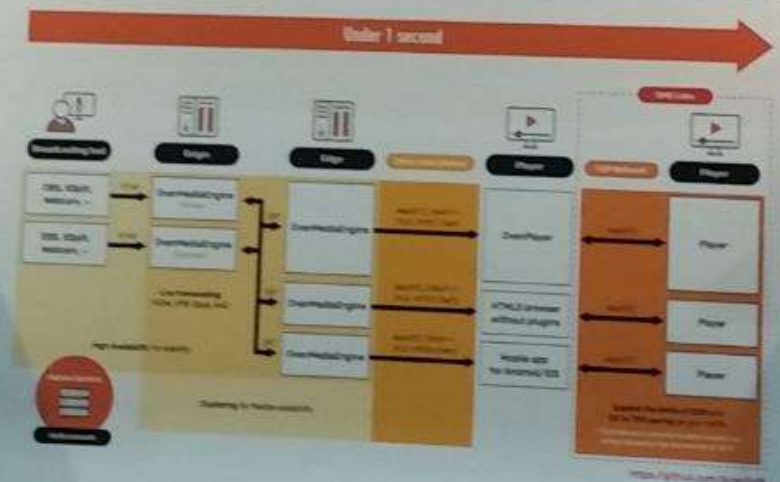
AIRENSOFT

Open Source Ultra-Low Latency Streaming Engine & Media Player

<https://airensoft.com>



Ultra-Low Latency Streaming Engine & Media Player



OverMediaEngine

OverPlayer

Ultra-low latency streaming engine

The most optimized



MEDIA

LIMELIGHT REALTIME STREAMING

Los Angeles

Paris

SUB-SECOND
LIVE STREAMING
GLOBALLY

AND ON-DEMAND VIDEO DELIVER

- Guaranteed Lowest Rebuffer Ra
- Sub-Second Live Streaming Glob
- Integrated OVP, Ad Insertion, Storage and Security

ADVANCED ADVERTISING

SEMI-CONDUCTOR

MEMPHIS

Reliable Injection to Cloud Traffic Sim

Traffic Sim
Reliable Injection to Cloud



DNS

ADDITIONAL INSTITUTIONS



ZIXI

GLOBAL LEADER IN BROADCAST QUALITY LIVE VIDEO OVER IP

ZIXI

GLOBAL LEADER IN BROADCAST QUALITY LIVE VIDEO OVER IP

NAB

April 9th - April 11th 2016

CONFIDENTIAL

AWARDS WALL LOGOS:

- amagi, ARRIS, ZIXI, GateMe, AWS
- AT&T, BROADCAST, BEAMR, Brightcove
- IBM Cloud Video, OPEN
- JVC, KODAK, RED BEE, VITEC
- and many others.

ADVANTECH

BIRTV

KOBA 2016



SRTALLIANCE
SECURE RELIABLE TRANSPORT



Mark Schubin, SMPTE NY, 2019 May 16

DWX Digital Wireless for ENG/Broadcast Studio

New Ultra-Wideband DWX 3rd Generation



Now with AES67
Dante
SPOKEN HERE





DWX Digital Wireless for ENG/Broadcast Studio
New Ultra-Wideband DWX 3rd Generation

SONY

SONY

Now with AES67

Dante
SPOKEN HERE



Dante

IP: SMPTE ST2110 But Also

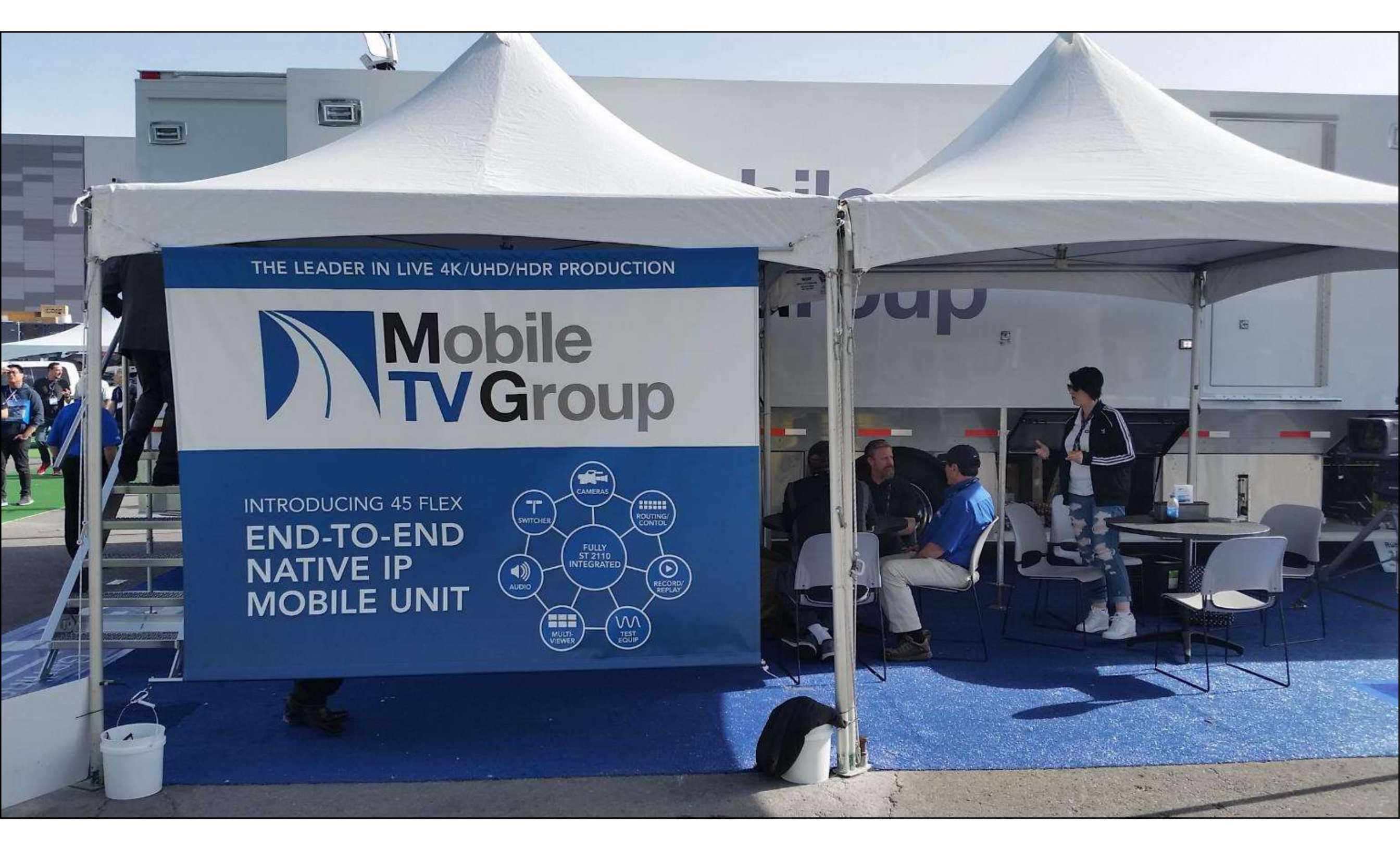


THE LEADER IN LIVE 4K/UHD/HDR PRODUCTION



Mobile TV Group

INTRODUCING 45 FLEX
END-TO-END
NATIVE IP
MOBILE UNIT

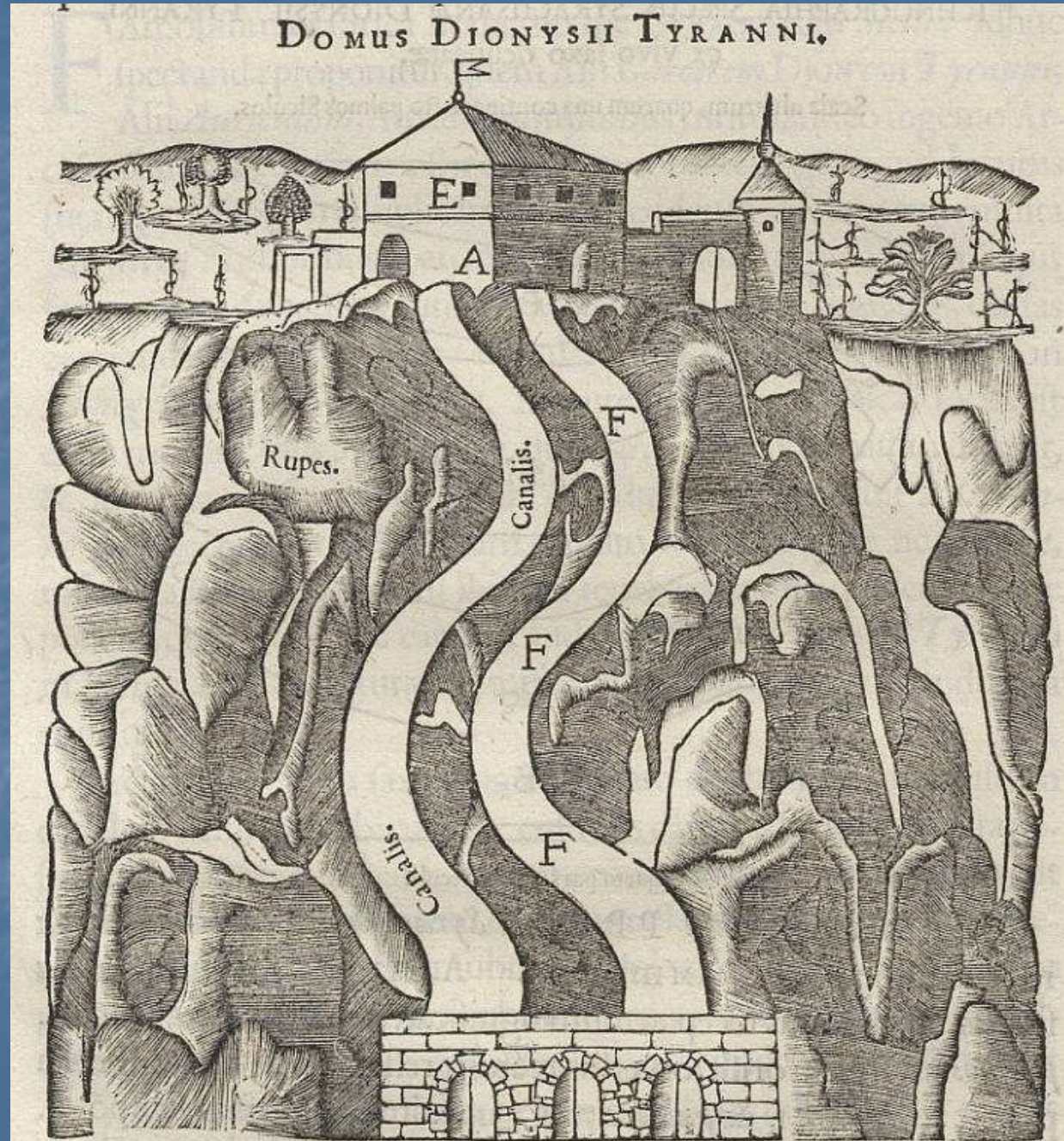


Pre-Electric Telephone Office



acoustic
speaking
tubes

Not a New Idea Even Then



acoustic intercom
c. 4th-century BCE
from a 1673 book

U.S. Navy in the 21st Century



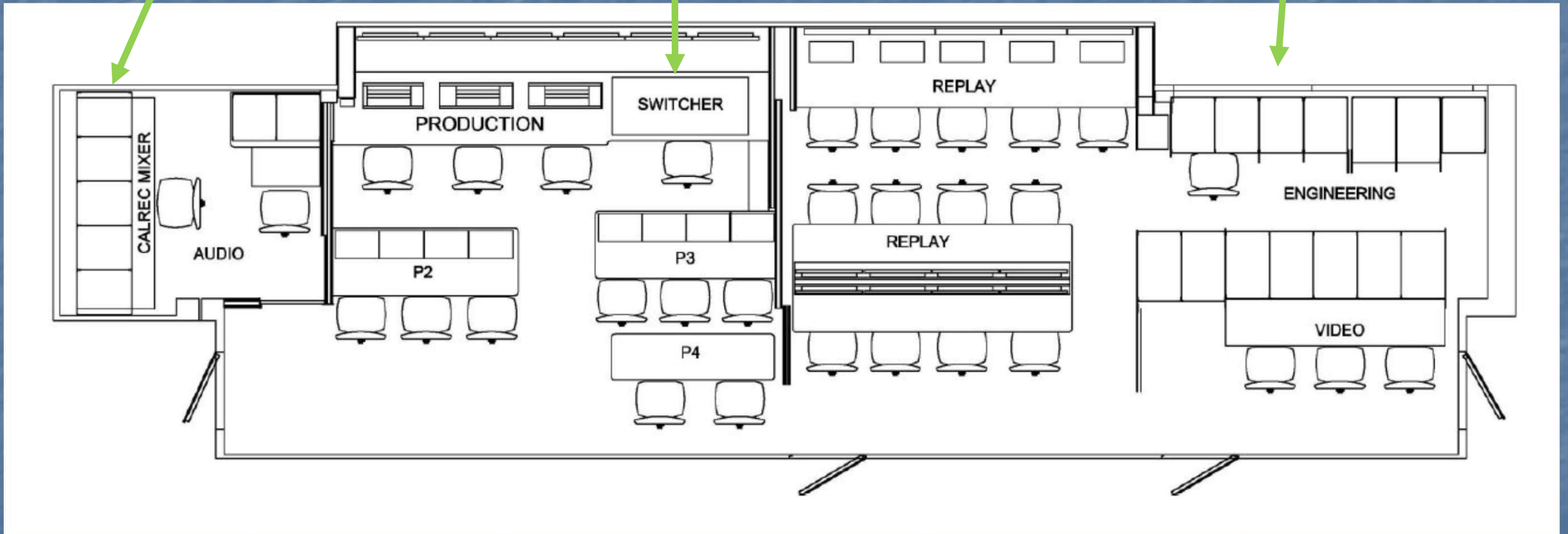
mission critical

“End-to-End Native IP Truck”

analog mixer available

baseband inputs

patch panels



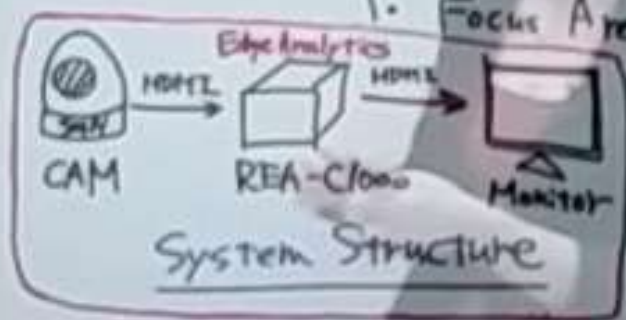
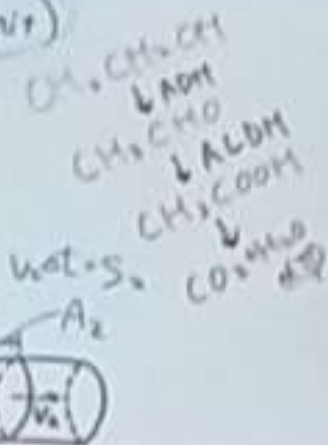


Sony

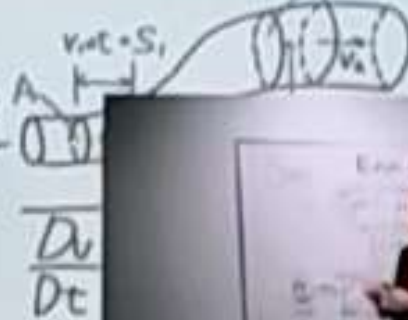
Edge Analytics Appliance (Main Unit)

Option
Licence

- Handwriting Extraction ← Live Demo
- PTZ Auto tracking
- Close-up by Gesture
- Chroma key-less CG Overlay ← Live Demo
- Focus Area Cropping



It's a SONY



Handwriting Extraction



NAB 2019: Streaming services among most targeted by credential hack attacks

Joseph O'Halloran | 10 April 2019

Research from content delivery network Akamai has identified wide-ranging credential abuse attacks against online video and music streaming services.

Among the purposed the stolen credentials are used for include enabling non-subscribers to view content via [pirated streaming accounts](#). Compromised accounts are also sold, traded or harvested for various types of personal information, and they are often available for purchase in bulk on the Dark Web, according to Akamai researchers.

“Hackers are very attracted to the high profile and value of online streaming services,” said Akamai's

CES 2019: Synamedia Offers AI Solution to Password Sharing

By Debra Kaufman

January 7, 2019

At CES 2019 this week, Synamedia will debut Credentials Sharing Insight, a service enabled by artificial intelligence to discover and halt password sharing, from the casual to the criminal. It's part of a growing trend among pay TV and streaming video services to curtail the use of shared passwords, especially among friends and family. Synamedia chief product officer Jean-Marc Racine noted that, "the way you secure OTT is evolving." Parks Associates estimates a loss of as much as \$9.9 billion due to password sharing by 2021.

Variety reports that, "previously, TV operators largely relied on secure devices, including locked-down set-top boxes and smart cards to decrypt satellite TV." But with the rise of streaming content, services designed sign-on solutions that were easy for consumers but also hard to control: "Most services have tried to curtail

After analyzing the Christchurch video, we conclude that video artificial intelligence can detect the firearms immediately from the eruption of violence, enabling rapid takedown by the curation process. Allowing AI to flag content for human moderation rapidly from live stream can give a human moderator more time to react and take harmful and dangerous streams down.

We believe that AI can be used for good and preventing the spread of such hateful violence is a prime example of how. We foresee that governments will be taking more regulatory action in the near future and we hope that the social platforms will follow, with the aid of technology that is already deployed.



V A L O S S A



PHONES

At CES 2019, 5G is even more of a confusing mess than ever

Commentary: Everyone's talking about 5G at the show, even if they can't agree on what 5G actually is.

BY ROGER CHENG | JANUARY 10, 2019 5:00 AM PST



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PHONES | LEER EN ESPAÑOL

Testing Verizon's early 5G speeds: 3 major issues with the next-gen data network and how to fix them

Verizon claims incredible 5G speeds on its brand-new network. That's not what happened for me.

BY JESSICA DOLCOURT | APRIL 8, 2019 10:37 AM PDT



PHONES

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BY ROGER CHENG | JANUARY 10, 2019 5:00 AM PST



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5G WORD GAMES —

AT&T sued by Sprint, must defend decision to tell users that 4G is "5G E"

Sprint says AT&T's "5G E" campaign violates laws against false advertising.

JON BRODKIN - 2/8/2019, 2:52 PM

REMARKS OF FCC CHAIRMAN AJIT PAI AT THE WHITE HOUSE

WASHINGTON, DC

APRIL 12, 2019

Thank you, Mr. President, for your compelling vision of U.S. leadership in 5G. I also want to thank Larry Kudlow, Director of the National Economic Council, for your steadfast support of this vision.

Mr. President, as you observed, America must win the race to 5G, the next generation of wireless connectivity. This matters for two key reasons.

The first is national competitiveness. We want the good-paying jobs that develop and deploy 5G technologies to be created here. We want these technologies to give our economy a leg up as we compete against the rest of the world.

The second reason U.S. leadership matters is that 5G will improve Americans' lives in so many ways. From precision agriculture to smart transportation networks to **telemedicine** and more, we want Americans to be the first to benefit from this new digital revolution, while protecting our innovators and citizens. And we don't want rural Americans to be left behind.



PHONES

At CES 2019, 5G is even more of a confusing mess than ever

Commentary: Everyone's talking about 5G at the show, even if they can't agree on what 5G actually is.

BY ROGER CHENG | JANUARY 10, 2019 5:00 AM PST



DESIGNLINES | WIRELESS AND NETWORKING DESIGNLINE

Infrastructure Focus Clouds Bull View on 6G

By Loring Wirbel, 02.07.19 2

ADVANCED TELEVISION

71% of US consumers plan to keep cord

August 28, 2018

New Cord Evolution research from GfK MRI shows that almost three-quarters (71 per cent) of all US consumers say they have cable, satellite, or telco TV service and have no plans to drop it. This includes the majority of the crucial 18-to-34 age group (58 per cent), as well as 69 per cent of people ages 35 to 49, and 80 per cent of those 50 and over.

similar from other sources



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Westminster Dog Show: King Continues Reign of Terriers

By Kelly Whiteside

Feb. 12, 2019



When King, a wire fox terrier, won best in show honors at the 143rd Westminster Kennel Club Dog Show on Tuesday night, it was not a crowd-pleasing announcement. Boos and grumbles filled Madison Square Garden when the judge handed King the coveted pewter cup.

Limelight
Networks



120 awards

67 images in gallery



Carbon
Fiber
Material

12KG
Payload

Compatible
with Ronin
Stabilizer

2.4G
Control

Cruise
Control

Ronin
stabilizer
control

Video
Camera
Control

Tradition



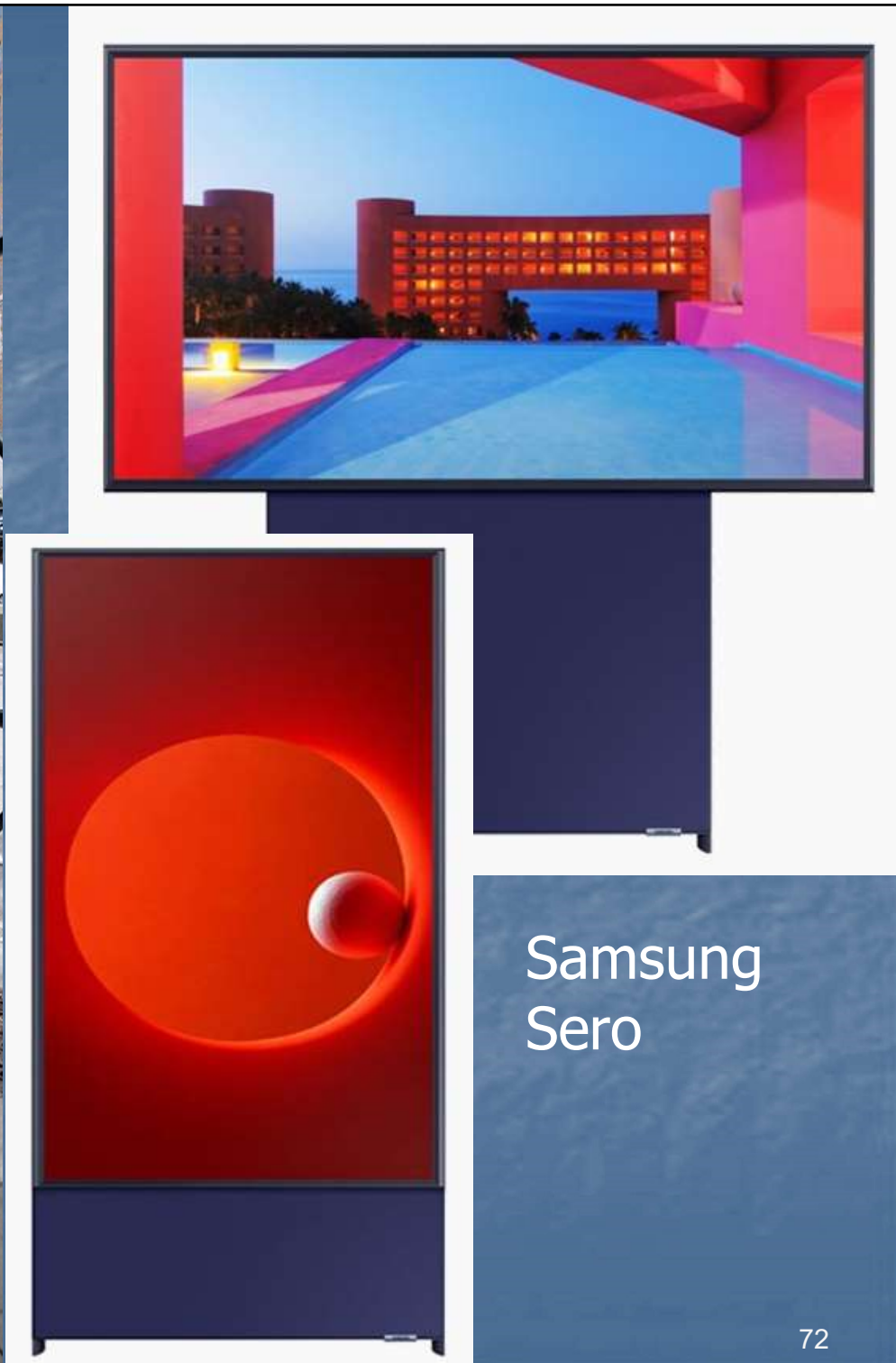
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125 x 8

Ikegami UHD-430 w/Portrait Extraction

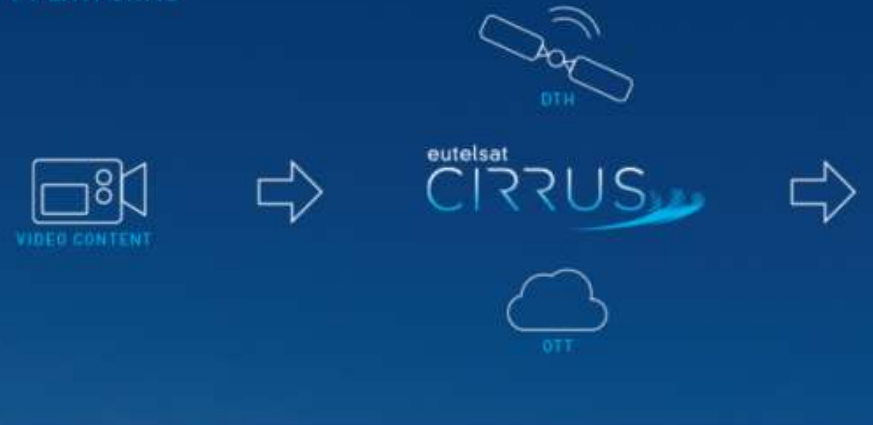




Samsung
Sero

All-inclusive end-to-end delivery platform

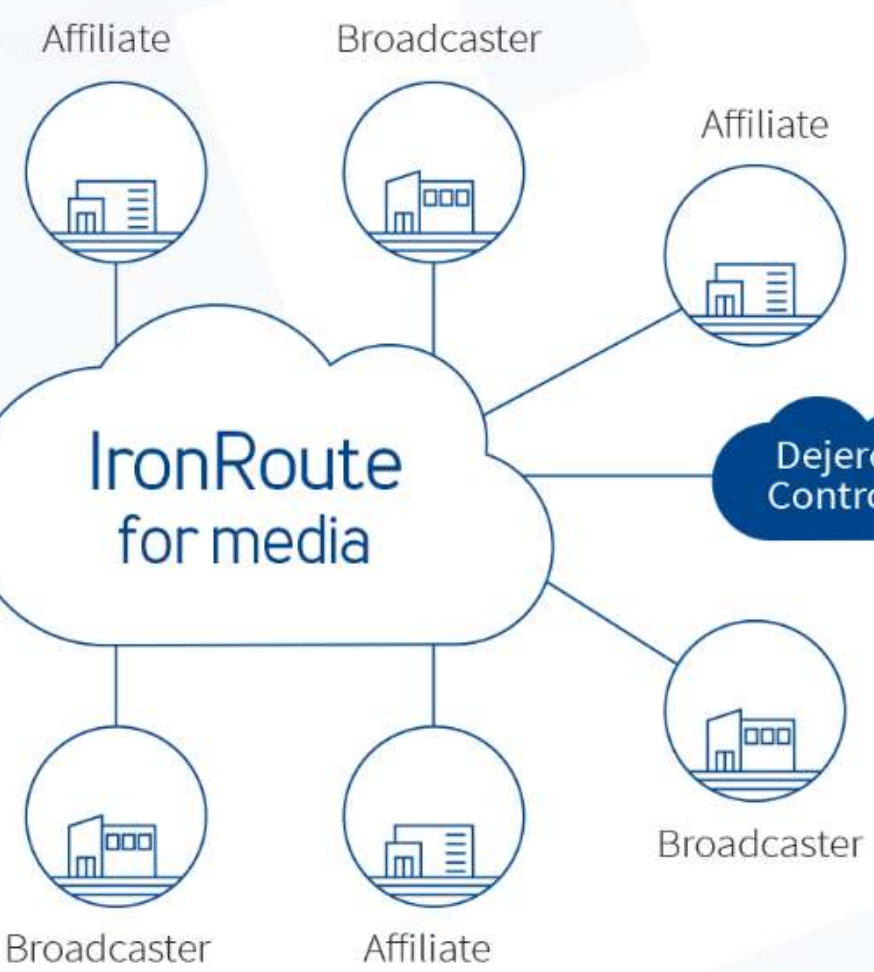
TV PLATFORMS



Eutelsat

Intelsat

Content Provider /
Broadcaster



A/V Delay Analysis




Sarnoff Analyzer

SARNOFF

Image Analysis

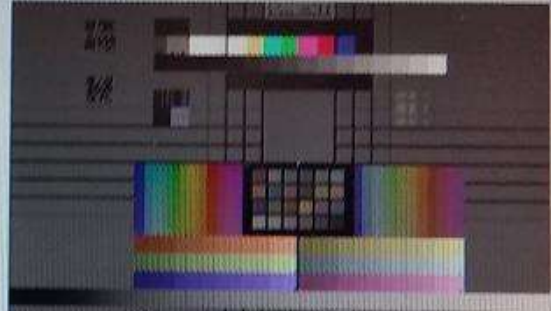
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Black Value	64
Super Black	29
YUV matrix	2020
EOTF	PQ
Color Gamut:	2020
Diffuse White 100%	58.11 IRE
Max Nits	10000.0
A/V Offset	-19.0 ms



SARNOFF

Image Analysis

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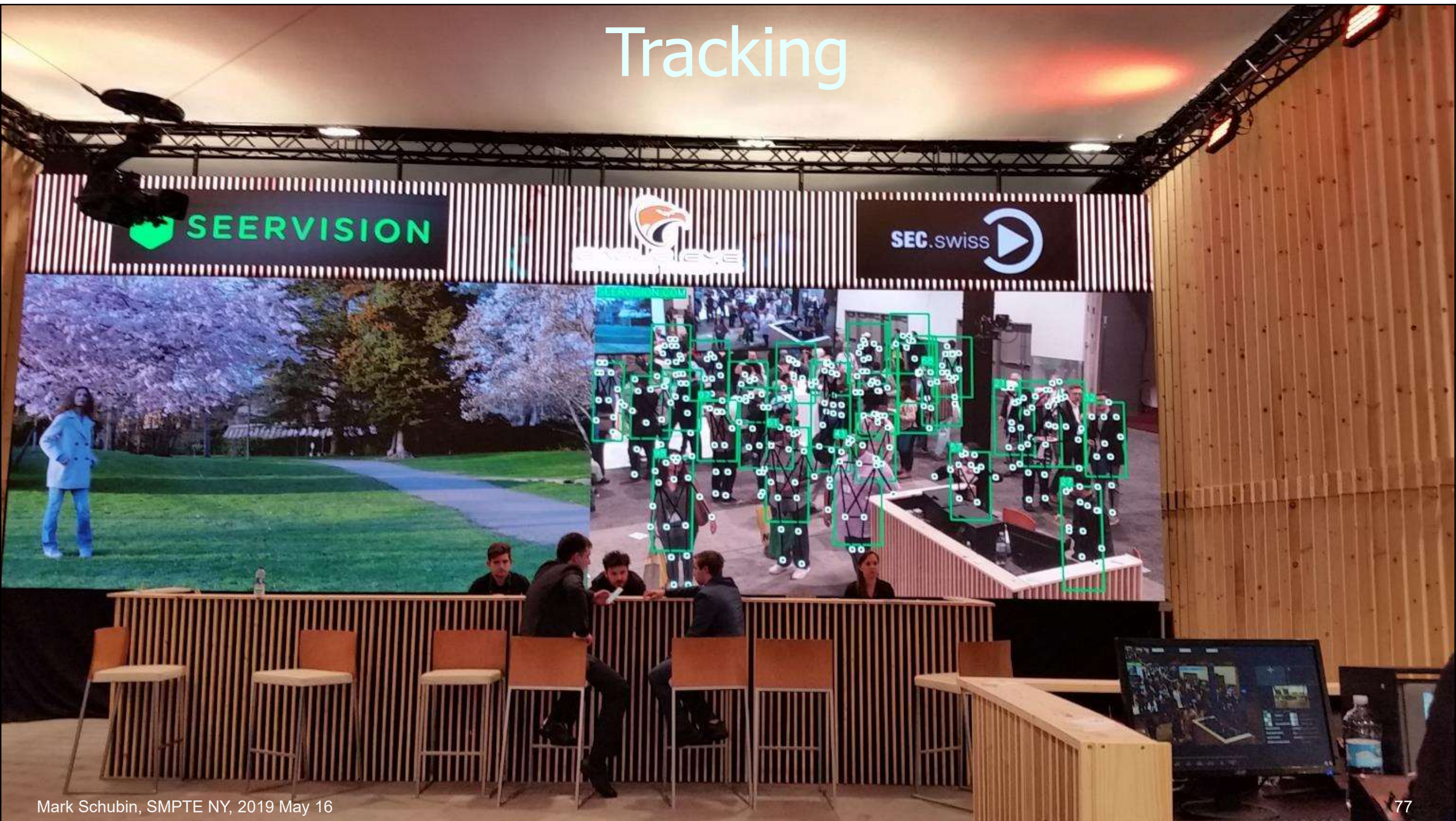
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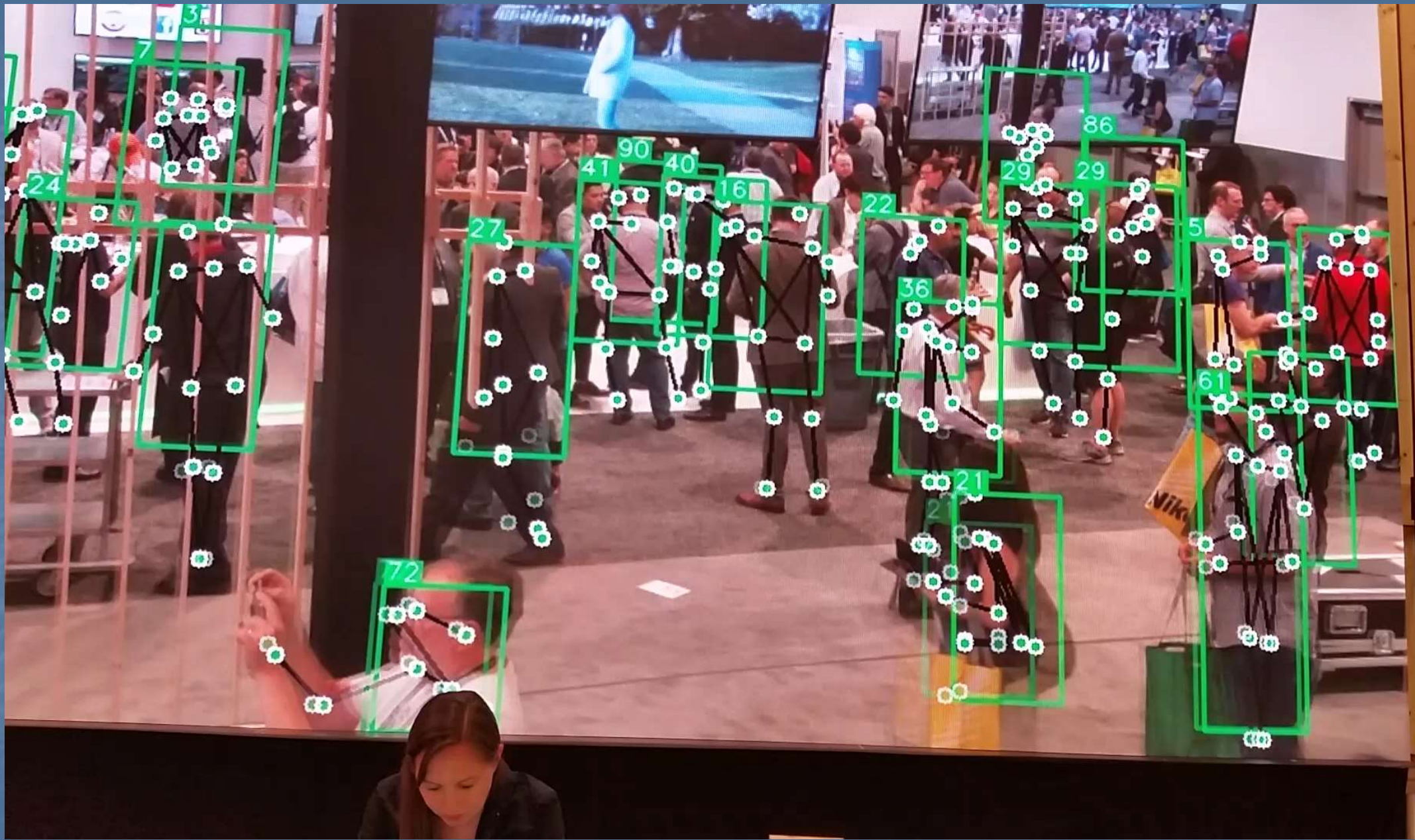
IBM TS4500 Tape Library

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IBM Part
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ra, Blockchain

Tracking





Rushworks VNEWS



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CHEQROOM



WOWZA DEVELOPER BAR
MULTI-PLATFORM LIVE STREAMING SOLUTIONS





a .pdf of these slides is at
bit.ly/smpteny-nab19