Infrastructure Prospects for the Media Enterprise

A Midterm Report Ten Years Since 2016

By Al Kovalick

In 2016, I presented the paper "Looking Deep into the Future: Infrastructure Prospects for the Media Enterprise in 2036" at the SMPTE Annual Technical Conference. The paper, which was presented in conjunction with the 100th anniversary of SMPTE's formation, was subsequently published in the *SMPTE Imaging Journal* in May/June 2017.[1]

Recently, I wondered how the 2016 forecasts stood the test of time: ten years after the paper, but ten years shy of the 2036 targets. This paper provides a snapshot of the forecast progress on the 110th anniversary of SMPTE.

The 2016 paper examined six key topics that underpin media infrastructure, each serving as an umbrella for related subcategories:

1. Storage Capacity
2. Computing Performance
3. Networking Capability & IP Transition (file- and stream-based workflows)
4. Software-Defined Media Infrastructure (SDMI)
5. Public Cloud Migration (live and post)
6. Artificial Intelligence

These six top-level pillars remain relevant; none have been sunset in the past ten years, and one has had a brilliant sunrise. Together, these six themes enable the transition from static, hardware-locked facilities to distributed, networked, software-driven pipelines. Of course, streaming A/V has timing and delay constraints, but with timestamps, synchronized clocking, and (near) lossless transport (ST 2110, RIST, SRT, others), IT infrastructure has proven it can meet the challenges.

The Value of Midterm Performance Review

What is the value of looking back ten years to 2016? In finance, it is often said, "Past performance does not predict future gains." Nonetheless, impressive past achievements provide strong clues of potential future growth and momentum patterns. This, in turn, validates the forecast models and should provide system architects and executives with a useful measure of forward-looking confidence.

What approach is used to grade the forecasts? Objectively, verified by state-of-the-art data points in 2026 (the midterm). At times, this coverage will mid-course-correct a trend if new 2036 forecast data is compelling. However, there is no full-throttle re-crafting of the next ten years' projections.

Forecast Models Used in the 2016 Paper

Although it's difficult to forecast even 10 seconds in advance for some events, predicting the future state of some technologies is possible by extending relevant historical trends.

Among the most potent predictors are exponential growth and the "S-Curve" **(Fig. 1)**. This curve applies to many technologies fundamental to media infrastructure.[2]

A classic example of this curve is the adoption of videotape recording/playback. Starting in 1956, Ampex introduced its VRX-1000 machine. The exponential phase for all vendors (Ampex, RCA, and Sony were early major vendors) ran from 1956 to 1980, with a CAGR (Compound Annual Growth Rate) of about 30% computed from 1956 shipments to 1980 shipments.[3] By 2000, the market was in decline as standalone video servers using MPEG compression and disk drives began to take hold. This author participated in the Hewlett-Packard MediaStream video server project (1995) and played a part in the early days of its S-curve rise.

So, were S-curves, with their exponential rises, a valid forecasting approach in 2016? Let's see how the predictions turned out by reviewing the six pillars cited earlier. Due to space constraints, the original graphs of growth predictions are not repeated here.

How Accurate Were the Forecasts?

Storage Capacity

Storage, as related to infrastructure, covers hard disk drive (HDD), solid state drive (SSD), Linear Tape-Open (LTO), dynamic random-access memory (DRAM), and more. In the 2016 paper, only HDD was considered.

2016 Forecast: Projected a conservative 26% CAGR, predicting that hard drive capacities would double roughly every three years. The trajectory put 2026 storage capabilities at between 32 Tbyte and 64 Tbyte per individual commercial drive unit.

2026 Reality: Commercial enterprise hard drives (using technologies like HAMR—Heat-Assisted Magnetic Record-

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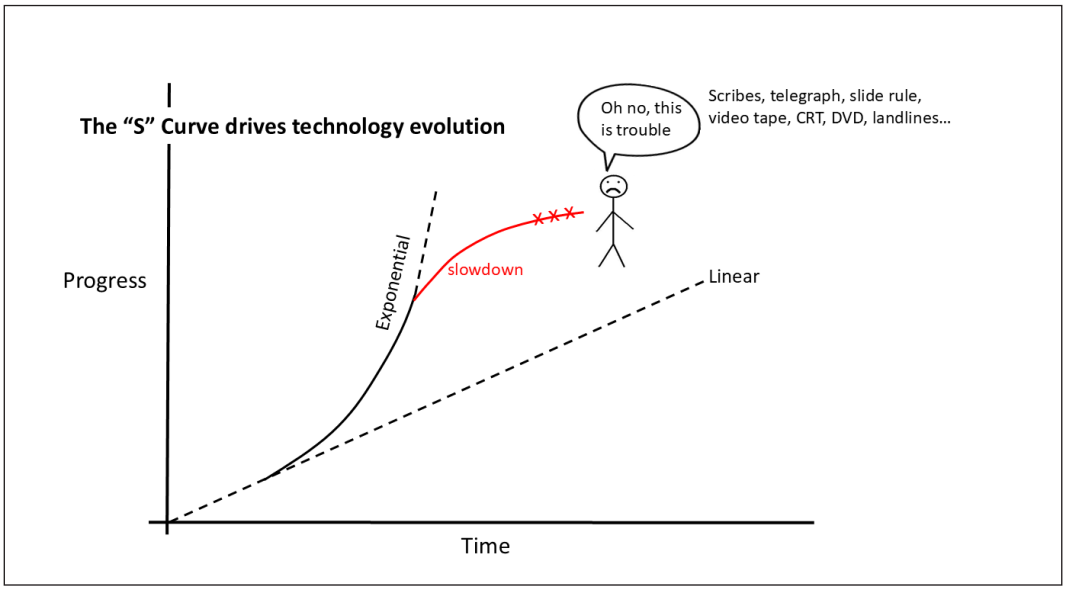

FIGURE 1. Exponential growth and the S-Curve (from 2016 paper).

ing) hit 30 Tbyte in 2024. Seagate's production Mozaic™ 4+ platform, using HAMR–based storage, supports capacities up to 44 Tbyte per hard drive in 2026. So, the prediction is on target.

Industry projections from the Advanced Storage Research Consortium (ASRC) and major drive manufacturers place realistic flagship HDD capacities in 2036 at roughly 150 Tbyte to 220 Tbyte. That's closer to a 15% CAGR. Not a big surprise to see some slowdown after a long run.

Computing Performance (CPU Cores per socket)

2016 Forecast: Applying Moore's Law (see Endnote A) at a 26% CAGR, this predicted an increase in computing cores to 16x to 32x (in 2026) compared to the 2016 24-core Intel Xeon CPU baseline. This was a straightforward scaling of a single-die CPU and carried the risk of slowdown.

2026 Reality: While traditional single-die monolithic x86 CPUs didn't scale linearly in the way older CPUs did, the architectural pivot to "chiplets" gave the CPU a new life. A chiplet-based CPU is a processor built by combining multiple smaller, modular silicon dies on a single package instead of using one monolithic chip. See **Fig. 2.**

The current "per socket" core count is Intel (288), Arm (256), and AMD (192, with 384 threads). So actual core growth was 12x, short of the low-end of 16x. This is close to the forecasted metric, though below it. Expect to see "single socket" core growth over the next ten years.

Foundries dictate the physical ceiling for what CPU architects can design. Both Taiwan Semiconductor Manufacturing Company (TSMC) and Intel Foundry have established an industry target: 1 trillion transistors in a single multi-die package by 2030.[4] Imec (Belgium) predicts that by 2033 chips will use Complementary Field Effect Transistors (CFET), a radically more compact 3D form of CMOS transistors.[5]

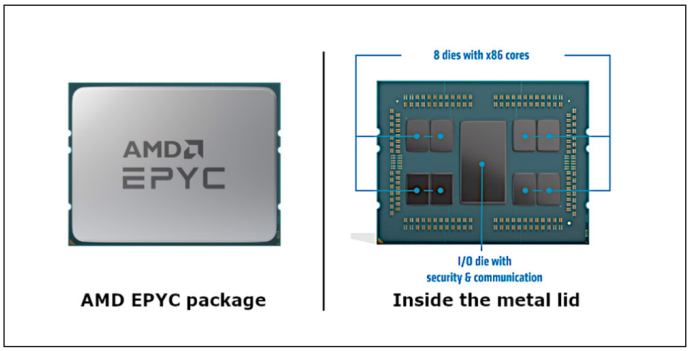

FIGURE 2. Chiplets enable massive core growth (Source: AMD).

Networking Capability and IP Transition (ST 2110 and COTS)

2016 Forecast: Standard commercial-off-the-shelf (COTS) IT equipment and IP routing were predicted to replace custom SDI matrix switchers. The paper pointed to the then-emerging SMPTE ST 2110 suite as the bedrock of this shift. In 2016, the maximum commonly deployed Ethernet link rate was 40 Gbit/s (40 GbE). No numeric prediction for Ethernet speeds in 2036 was given. Instead, the expected performance gains were based on Moore's Law 2.0 (Endnote A) and transistor speed improvements across the chain.

Historically, Ethernet link rates grew from 10 Mbit/s standardized by the IEEE in 1983, to 400 Gbit/s reached in trials around 2019. This is roughly a 40,000x increase over 36 years

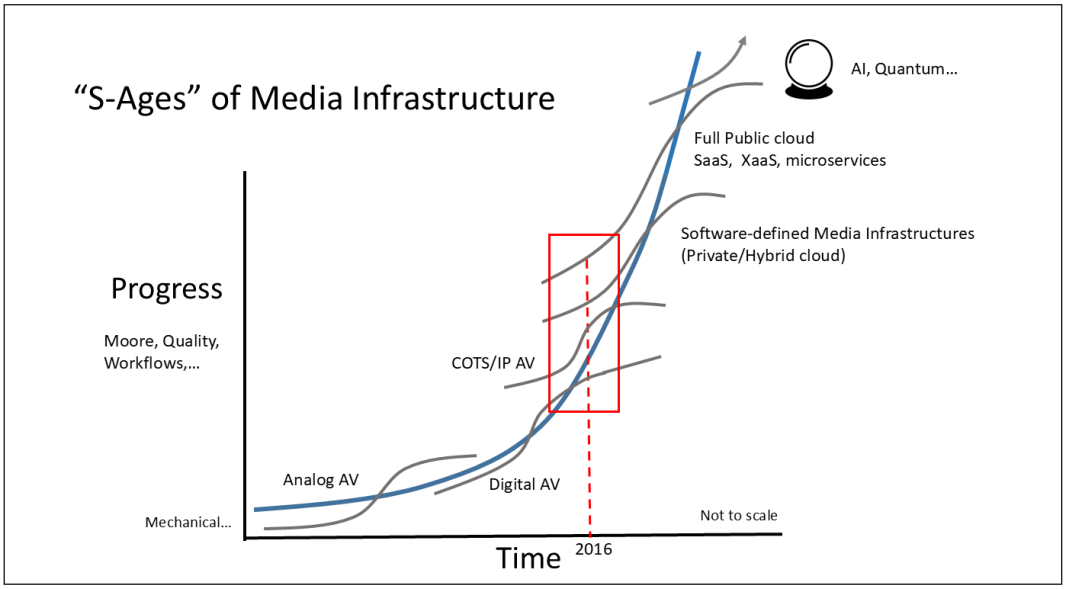

FIGURE 3. The "S-Ages" of Media Infrastructure.

or end-to-end CAGR of about 35%. Very impressive. See Endnote B.

2026 Reality: Over the past decade, the broadcast industry continued its migration to ST 2110. Tier-1 broadcast facilities, mobile production trucks, and central hubs built since 2018 rely heavily on COTS IP network fabrics running on 40G/100G switch ports. That said, SDI remains favored in some studios and regional stations for plug-and-play reliability and the absence of complex Precision Time Protocol (PTP) timing systems.

Throughput for Top-of-Rack switches, grew at roughly 35% CAGR from 2016 to 2026. Commonly available switch ports jumped from 40G to 800G in one decade.

What's next? 1.6 Tbit/s Ethernet will likely be available in 2027 or 2028. InfiniBand supports 400/800G today, with 1.6 Tbit/s promised by 2028.[6]

So, the 2016 predictions were on target, and growth will continue.

Software-Defined Media Infrastructure (SDMI)

2016 Forecast: The original paper (page 44)[1] described the "SDMI S-Curve" as a composite of software-defined computing (SDC), software-defined storage (SDS), and software-defined networking (SDN). APIs enabled this, moving away from static hardware setups. This author has been bullish on SDMI for many years. See, for example.[7,8] Service-oriented architecture (SOA) was the first hope, but it evolved into Microservices Architecture and modern Cloud-Native design.

2026 Reality: Broadcast infrastructure transitioned from "video running over SDI cables" with dedicated hardware to fully virtualized environments. Features like containerization (Docker, Kubernetes) and software-orchestrated cloud routing of live video elements are now standard practice for some major media enterprises.

For example, during the Paris 2024 Olympics, OBS (Olympic Broadcasting Services) operated three production galleries using a server cabin. Their setup relied on SDC, which virtualized demanding tasks like vision mixing and audio processing with COTS data servers and GPU cards. SDS replaced fixed-function appliances with server-based media buffers and shared storage pools for scalable replay and recording. SDN used SMPTE ST 2110 IP routing and hybrid gateways to manage high-bandwidth streams, expand network ports easily, and let engineers reconfigure and troubleshoot live productions remotely.[9]

So, the 2016 predictions were on target. This trend will be amplified using AI agents that orchestrate facility workflows at all levels.

Public Cloud Migration (Live and Post-Production)

2016 Forecast: The public cloud is in the exponential-growth phase of its S-curve. However, many designers and systems integrators of media workflows are conservative and take a wait-and-see approach. Expect cloud-based media solutions to mature and follow the cloud's growth patterns.

2026 Reality: According to Josh Stinehour (Devoncroft Partners, 2025).[10] "The transition to cloud in the global media industry has been called inevitable, has been labeled as a fundamental disruptor to media workflows, and has been described as promising salvation to the media technology industry." The trend got a big bump during the COVID-19 pandemic but has since slowed. According to Stinehour, the transition to public cloud has stalled, partly because facility stakeholders need a better understanding of costs.

The 2016 paper predicted public cloud adoption for media workflows would follow public cloud growth. This happened in some sweet-spot workflows, but many workflows still need to be converted.

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Artificial Intelligence

2016 Forecast: The paper discussed digital assistants (referencing Siri and Alexa) and machine intelligence helping to manage media files and infrastructure. Relying on a consensus of AI experts from 2016, the paper predicted a 50% chance of AI reaching human capability between 2040–2050.

2026 Reality: The rapid rise of Generative AI since 2022 far exceeded all expectations, with the paper's predictions falling woefully short. At least AI was cited as a "promising technology." It's clear AI will reshape media enterprises in ways we can't even imagine.

Conclusion

Figure 3 shows the overlapping S-curves of progress in media infrastructure from the early days of John Logie Baird and Philo Farnsworth. The main takeaway is the relentless march of S-curves across time. What new S-curves will be added? Unified AI "Media Brains"? AI-designed media systems? Quantum-accelerated AI for media? Only time will tell.

I thoroughly enjoyed revisiting the 2016 paper's 2036 forecasts. Considering all that could have changed over the decade, it was gratifying that most midterm predictions were on target or nearly so—except, unsurprisingly, in the case of AI.

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Endnotes

A: **Moore's Law 2.0**: Around 2005, Dennard scaling—the power-scaling partner to classical Moore's Law—hit thermal-power limits, ending annual clock-frequency gains and eventually driving multi-core designs. By the late 2010s, 2D single-die scaling also neared physical and economic limits, shifting the industry toward "Moore's Law 2.0" (*More than Moore*). We should expect sustained computing core growth through modular chiplets and stacking rather than a single monolithic silicon die.

B: Transport rate improvements: Using Moore's Law to evaluate Ethernet data rate growth is only one factor. Transistor speed improvement is also a notable factor. Using optical rather than coax also improved transfer rates.

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