Hardware & Networking

2026 Hardware & Semis Management Access Forum Takeaways

IT Hardware/ Telecom & Networking Equipment

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We hosted the J.P. Morgan 2026 Hardware & Semis Management Access Forum in Palo Alto, where we heard from executives and IR representatives from seven companies, including Applied Optoelectronics, Avicena, Cadence Design Systems, Lam Research, Lumentum, Qualcomm, and Ranovus, as well as from market research firm 650 Group. *Company-specific takeaways are below; those for Cadence and Lam, which are covered by Harlan Sur, can be found here and here, respectively.*

Qualcomm (QCOM)

We hosted investor group meetings with Brett Simpson, SVP and Head of IR, and Jacob Magdaleno, VP of IR and Finance for Qualcomm. *Please see takeaways below:*

- **Data center business ramp for FY27 is expected to be back half weighted; Custom silicon programs to drive vast majority of revenues.** The data center business is expected to start generating material revenue from Dec-Q, with management largely agreeing with sell side consensus of $500–600 mn, with a more aggressive ramp in the back half of the year translating to a $5 bn revenue guide in FY27. Vast majority of FY27 revenue is expected to come from two custom silicon programs with hyperscaler customers (one U.S. based and the other China based) - with each adding ~$2 bn of revenue. In relation to margins for the custom silicon engagements, management largely agrees with expectations of mid-30% gross margins.
- **Differentiated memory architecture - HBC to extend beyond data centers.** The core idea behind HBC is to stack LPDDR directly on top of the logic in a 3D TSV-based structure, containing data movement within the vertical stack rather than shuttling it across a substrate between GPU and HBM, which sharply reduces the power envelope and addresses the memory wall that constrains decode. The architecture delivers ~6x bandwidth-per-watt versus today's HBM setups at comparable density, using multiple die in package and no interposer, and is purpose-built for decode. Importantly, HBC is not a data center point solution but a horizontal Qualcomm capability and is expected to migrate into auto platforms and, over time, into edge devices.
- **Connectivity business from Alphawave continues to be a critical part of the data center strategy.** The business today generates revenue from 800G DSPs spanning copper (AEC), optical, and PAM4, with 1.6T now being introduced into the market and with expectations of ramp through FY27. On the SerDes roadmap, Qualcomm is about to ramp 1.6T built on 200G SerDes, with 400G SerDes (enabling 3.2T) already in R&D and not far from tape-out — all developed internally rather than through third parties like Synopsys. SerDes IP is a critical building block underpinning the custom silicon business.
- **CPU program with Meta guarantees a minimum share based on hitting required specifications.** The custom CPU is distinct from the other ARM-based players (Graviton, Google Axion, ARM's own AGI), and builds a fully custom core (based on ARM's instruction set), the same approach that has let Apple extract performance that standard ARM cores cannot match. On Meta specifically, the contract includes a minimum share commitment contingent on

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hitting the agreed specs — a bar the team is comfortable with; along with the potential likelihood of tracking to higher than minimum share.

- **Adoption of Gen 5 chips in Auto, led by China, should support robust growth.** The current robust growth in Auto is linked to Gen 4 chipsets (*unlocked L2+ autonomy and a more sophisticated digital cockpit*), which began shipping in 2025 and really accelerated through 2026. Gen 5, which is expected to start shipping in next 2-3 months and is anticipated to command 8x higher content relative to Gen 3, competes head-to-head with NVIDIA's Thor platform, as well as Horizon in China. Initial Gen 5 ramp is expected to be led by Chinese automakers, whose aggressive compute intensity is pulling the rest of the industry to move faster, which is increasingly leading Western OEMs to hand Qualcomm the entire compute platform rather than piecemeal infotainment, connectivity, or ADAS sockets.
- **Industrial IoT represents another underappreciated long-term growth opportunity.** Industrial IoT represents another robust growth opportunity, with the first wave of demand centered on computer vision (embedded in the pipeline discussions below), followed by later waves of industrial agents and physical AI. Robust demand is well reflected in $7 bn+ industrial pipeline and $3.5 bn+ of design wins year-to-date in FY26, spanning applications like retail, warehousing, manufacturing, and oil & gas, as customers move from kicking the tires to committing to volume rollouts. Management is working to expand channel presence in this market via efforts like the acquisition of Arduino — a prototyping company that caters to developers focused on industrial and robotics.

Lumentum (LITE)

We hosted a fireside chat with Michael Hurlston, CEO of Lumentum. *Please see takeaways below:*

- **NPO to widen opportunity beyond a single CPO customer.** Management framed NPO as a TAM expander rather than a transitional bridge as CPO remains largely concentrated in a single customer, benefiting from solid optical engineering resources and TSMC's COUPE platform. By contrast, NPO spans roughly half a dozen meaningful engagements, with optical lane intensity running above what management sees from CPO, and delivers 85% of the benefit at 25% less complexity. Importantly, management views the content opportunity as substantially unchanged across the two architectures, since the distinction ultimately reduces to whether the optical engine sits on or off the chip substrate. On magnitude, management pointed to $50-100 mn in C4Q26, crossing $100 mn in C1Q27, with the recent upside in demand signals biased toward scale-up, which does not contribute until calendar 2H27.
- **Embedded-based NPO packaging complexity points to value near parity with ELS solutions.** For NPO, while the alternative design relative to ELS leverages a lower-power, lower-cost laser packaged near the optical engine, the packaging difficulty was described as incrementally higher given tighter space and thermal constraints, driving an initial expectation that the value lands closer to parity with ELS-based designs. That said, timing is expected to favor ELS solutions, with the embedded configurations only starting to ramp in 2028, albeit with a materially higher barrier to entry versus the ELS version.
- **Merchant CW lasers add new leg to datacom chip business.** The merchant CW laser opportunity is expected to track to 10%-20% of the datacom laser business, in addition to the EML opportunity, which for example remains on track to grow units by +50% by year-end, led by better-than-planned fab efficiency. Importantly, management outlined three motivations: 1) CW attach rising to 50%-60% in the 1.6T generation (vs. 20%-30% in 800G); 2) Industry supply imbalance driving negotiating leverage and concessions across the portfolio (OCS, transceivers, and EML pricing); and 3) A redesigned CW

reducing the margin variance between CW and EML. That said, management continues to expect the mix to revert back toward EML with 3.2T, given the associated challenges. As it relates to Chinese competition, management reiterated limited visibility into the supply line and highlighted a defensible gap emerging as the market transitions to 150mW or higher.

- **EML backlog extending into 2028 and 2029 with higher pricing; Sees broadening LTAs covering most of the portfolio.** EML backlog is covered through 2027, with negotiations underway to extend into 2028 and 2029, and pricing was characterized as generally moving higher, despite visible industry capacity additions. Separately, the completed round of LTAs across pump and narrow-linewidth lasers, covering the network equipment OEMs, was highlighted as beginning to contribute in 2H. Following these agreements, LTAs now broadly cover a high portion of most of the portfolio outside of TRx.
- **Scale-Across compounds as pumps lead and visibility extends past three years.** Scale-across is compounding faster than it is being credited for, and Lumentum is benefiting across NL lasers, pump lasers, CDMs, and WSS. Pumps are a standout, with Lumentum boasting 80% share and among the strongest gross margins in the portfolio as Lumentum reiterated its target to expand volumes 4x by early 2028, surpassing NL lasers in early 2027, which are still growing solidly. By comparison, CDMs are growing fastest off a smaller base, while WSS, effectively a duopoly, is growing more slowly. Demand drivers include inferencing workloads that no longer fit within a single facility, compounded by a shift toward smaller, more modular buildouts driven by local siting constraints. Interestingly, demand signals were characterized as stabilizing at a higher level, but still rising without the step-function increases of the prior three months, while multi-year construction timelines are translating into three-plus years of contracted visibility.
- **TRx margins face a multi-quarter climb.** While admittedly still disappointed with the margin profile of TRx, the company pointed to design as a bright spot, suggesting it is now first to market with most module designs, which supports pricing. That said, the residual problem is manufacturing execution, including yields, automation, and factory efficiency, with management explicitly benchmarking against peers' operations. To that end, the path to gross margins in the mid- to high-30% range represents a multi-quarter climb, aided by 1.6T mix, where the crossover is expected in early 2027.

Applied Optoelectronics (Not Covered)

We hosted a fireside chat with Dr. Stefan Murry, Chief Financial Officer and Chief Strategy Officer of Applied Optoelectronics. *Please see takeaways below:*

- **CPO timelines remain unchanged, while NPO engagement activity picks up.** CPO adoption is still expected to be material in 1H of 2028, with initial deployments potentially beginning around the end of 2027. NPO engagement has become more active versus prior years, building on work that dates back to 2016 or 2017, but it remains incremental to the broader CPO trajectory. Core advantage within CPO/NPO market is captive manufacturing of high-power, NL lasers, where direct laser sales command lower dollar revenues but high margins (%), while ELS modules imply higher dollar content but lower margins.
- **Data center revenue growth and customer diversification is constrained by capacity availability.** The near-term ramp in the data center business is led by strong 800G demand and some 400G contribution from a major hyperscale customer, with momentum extending into 4Q and beyond. A second large hyperscale customer is also ramping 800G, with acceleration linked to expanding manufacturing capacity. At least through mid-2027, the binding constraint is the ability to produce enough product, including executing factory builds cleanly and scaling output without disruption. Customer concentration

therefore persists until incremental capacity unlocks broader multi-customer fulfillment.

- **Gross margin is contingent on the trajectory of product mix shift.** In relation to gross margins, 100G is a headwind, 400G is a slight drag as well, while 800G and 1.6T are accretive to margins, with ramp for the latter products (*1.6T is expected to start contributing in 4Q with a larger ramp into early 2027, while 800G remains the larger mix until about mid-2027*) supporting mid-30% gross margins by the mid-2027; with layering in of CPO opportunity beyond that could help support margins up to 40%.
- **Broader laser shortages, in combination with automated manufacturing lines, serve to protect against customer plans to make in-house transceivers.** High-power, NL lasers remain a scarce input, with AOI's in-house capabilities helping to create a moat as a vertically integrated laser manufacturer. In relation to major customers pursuing a custom transceiver pathway, management is less worried, as it is more linked to expanding transceiver capacity, while the constrained component, which is lasers, should continue to keep AOI as an attractive vendor even for the transceiver volume that is not entirely manufactured by the company. Additionally, beyond the laser itself, the automated transceiver assembly capability and accumulated IP adds friction to rapid internalization from customers.
- **Open to sourcing as well as selling the laser externally, although neither is currently being done.** Historically, about 20%-25% of lasers were purchased from outside suppliers to satisfy customer preference for a viable second source given only a single internal fab. As laser supply tightened toward the end of last year, external sourcing effectively became unavailable, driving an internal capacity push and the rapid transition to four-inch wafers. On merchant laser sales, there is clear inbound interest, but no lasers are being sold externally today given internal demand; over time, selling merchant lasers is on the table on a selective, case-by-case basis (avoiding broadly enabling direct transceiver competitors).

Optical Panel Discussion (Ranovus & Avicena - Private)

We hosted Hamid Arabzadeh, the co-founder and CEO of Ranovus, and Marco Chisari, CEO of Avicena, for a panel discussion on optical technologies. *Please see takeaways below:*

- **Ranovus is working on the optical engine, while Avicena is looking to disrupt short distance interconnects with microLED based optics.** Ranovus, founded in 2012 with an HQ in Ottawa, runs the full optical stack — photonics, in-house laser design/ manufacture, TIA and control — for both CPO and NPO. Ranovus is targeting to create an independent North America-based supply chain for CPO and NPO, instead of becoming part of Nvidia or Broadcom supply chain. Ranovus is on track to double revenues in 2026. Avicena is more radical, replacing the laser entirely with microLEDs and owning its own microLED fab, having shipped the industry's first 1 Tbps microLED kit. MicroLED based interconnects are primarily expected to cater to short distance connections.
- **Avicena is targeting to use microLED based optics, instead of laser, to achieve wide-and-slow architecture at the chip's native speed.** Rather than serializing thousands of signals up to 224G lanes via SerDes, and then converting to optical with complex modulation, and reversing it all with DSP on the far side, Avicena drives microLEDs directly at a few Gbps per lane with a handful of transistors - thereby eliminating the need for SerDes, DSP retiming, and complex modulation. The payoff is dramatically simpler manufacturing and integration, plus significantly lower power, higher reliability and lower cost, spanning interconnect from a few millimeters to 10-20 meter cables.
- **Avicena's density unlock comes from escaping edge/beachfront I/O and instead transmitting optically through the full 2D surface of the die.** Conventional interconnects are constrained to the chip's perimeter — a limited shoreline through which all channels must exit — which caps how much I/O a package can support. Avicena's

approach bonds the microLED/photodiode array to the bottom of the chip and transmits light directly from underneath, turning the entire die area into available I/O rather than just its edge. This is enabled by extruded plastic fiber packing 1,500–2,000 cores in under a square millimeter, which can be immersed directly into the substrate.

- **Interconnect is the next great bottleneck after compute, HBM and SSD; HBM optical interconnect is huge long-term opportunity.** With GPU, accelerator, HBM and SSD supply constraints being worked through, interconnect is next in line, and it uniquely sits as the bridge between compute and HBM, which together make more than than half the entire semi industry. Hyperscalers are pulling hardest here, as Google and Microsoft have even stood up internal interconnect development because the industry was not moving fast enough, and Avicena describes engagement rising "beyond exponentially" in recent months. The clearest structural tell is on the memory side: as HBM routing scales from 2,048 to 4,096 copper traces, copper becomes untenable and optics becomes unavoidable.
- **Seviceablility of CPO is one of the key tenets guiding design philosophy for Ranovus.** More than half of the revenues for Ranovus are expected to be linked to NPO in 2027, with CPO contracts ramping in 2028. Their integrated 3.2T chip bundles driver, TIA, photonics, photodetector and control, leaving only an external DSP, and help to make CPO repairable and removable in the field. That serviceability requirement, and the associated supply-chain fragility, directly informed how Ranovus architected its portfolio, including mean-card and socket-based designs that let customers swap the optical engine.
- **Ranovus agrees with laser and optical engine value to be roughly in-line with each other.** Pricing dynamics differ across lasers and optical engines, with lasers priced on per milliwatt basis while silicon is priced on gigabit/dollar basis, and because the laser cavity is physically larger with more discrete elements, it retains meaningful value. Ranovus develops its own lasers, packaging them inside the optical engine for NPO/modules and as an ELS for outside placement, and is indifferent to share of value across laser and optical engine (as it has both capabilities), but agrees with 50/50 estimate to be a durable mix.
- **Ranovus is productizing around application-specific optical engines.** Because switch-side beachfront density is fairly standardized, that layer behaves as a merchant market, while accelerators are all custom silicon, so Ranovus has worked with ~8 different IP providers over three years, each embedding something proprietary. Announced customers span the model cleanly: AMD for merchant silicon, MediaTek for custom silicon, and Cerebras for wafer-scale packaging.

650 Group

We hosted a fireside chat with Alan Weckel, Co-founder and Analyst of the 650 Group. *Please see takeaways below:*

- **Scale-across is the expected to see robust expansion to $100 bn+ TAM by the early part of next decade.** The starting point (for DCI) is still relatively small in absolute terms (<1 mn DCI ports today), yet end-of-decade scenarios contemplate an expansion to ~20–40 mn ports, implying a very significant increase in layer-3 switching/routing, fiber/conduit build, and interconnect spend. By early next decade, scale-across is expected to be $100 bn+ TAM, with 30% of the market being linked to 100 km+ use cases. Anything over 40 km requires coherent optics, while amplification and optical line system requirements creep in at 100 km+. Deployments under 100 km can leverage traditional switches, while anything over 100 km requires routers or Jericho-type Layer 3 switches.
- **Scale-up networking is expected to transition from current embedded solutions to disaggregated switches by the end of the decade.** Near-term scale-up networking is dominated by embedded switching architectures (NVLink) inside racks (leveraging

backplane/power/cooling of the rack), and is expected to remain so for the next couple of years. However, towards the end of the decade, due to operational complexity from potentially using different embedded switches for different XPUs, industry is expected to transition towards disaggregated scale-up switching, which is expected to benefit traditional vendors like Arista and Cisco, relative to current tailwinds from scale up linked more to Celestica (*which benefits from building switches tightly linked to ASICs*). Scale-up configurations are expected to carry very high system value as ASIC density and optical-engine requirements increase, with $100k+ ASP switch systems plausible in next-gen builds.

- **Initial CPO deployments for scale out expected to track to limited volumes; long term opportunity in scale up remains intact**. CPO is expected to start in scale-out first as a technology + manufacturing proof point, with limited early volumes, and is not really delayed relative to prior plans; pluggables are expected to grow for the foreseeable future in this part of the market. However, for scale-up, a meaningful crossover is expected around ~2031, implying that pluggables remain structurally important through this decade. NPO is positioned as a pragmatic intermediate step due to its manufacturability outside the most constrained advanced packaging ecosystem (TSMC's COUPE platform), improving yield/volume scalability with Amazon, Nvidia and Broadcom suggested to be exploring it.
- **Custom ASICs shift from a single flagship design to a fleet should support robust TAM expansion.** The custom silicon opportunity is expected to broaden as customers deploy multiple ASIC types across training and inference, including algorithm-optimized and memory/energy-optimized variants, increasing the number of designs per customer in combination with increasing number of customers pursuing programs. Expected model of maintaining a "fleet" of ASICs expands the aggregate addressable market for incumbent leaders at the performance frontier, while creating room for newer entrants in narrower, node- or workload-specific niches.
- **Supply constraints are concentrated in incremental upside to orders, and not in planned builds.** The market's friction point is less in relation to planned builds, and more for the incremental uplift beyond plans without disrupting other deployments. Vendors with broad, diversified customer sets face tougher allocation choices because incremental demand often requires rebalancing supply across many customers (versus a small set of large, predictable buyers). This dynamic also favors greenfield/new platform ramps where production can be aligned to a single program, versus incumbents managing a large installed base and change requests.
- **Internet is expected to bifurcate between humans and agents, with the latter being the primary bandwidth driver.** Network demand is shifting from human-initiated browsing to persistent machine-to-machine traffic driven by agents hitting databases and application layers continuously - creating a structural step-up in baseline utilization as agents operate 24/7 vs. bursty human sessions. Additionally, content creation on the open internet may consolidate around large frontier platforms (being primary data aggregation points), but traffic intensity would rise as agent workflows multiply.



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Completed 13 Aug 2026 11:25 PM EDT

Disseminated 14 Aug 2026 06:00 AM EDT