

# Global AI Trend Tracker

EQUITY: TECHNOLOGY

## AI expert call #68: SerDes trend and impact on AI networking

### Quick Note

We hosted our AI Expert Call Series #68 today (26 May) with an expert specialized in Serializer / Deserializer (SerDes) technology. The expert discussed the SerDes technology roadmap, upgrade cycle, competitive landscape, and commercialization progress. Our key takeaways are below:

#### SerDes' technology evolution

- According to the expert, there are two main technology specs in SerDes: NRZ (Non-Return-to-Zero) is used below 56Gbps, and PAM4 (Pulse-Amplitude Modulation) encoding is used above 56Gbps. PAM4 requires ADC (analog-to-digital converter) and DSP (digital signal processor) for signal processing, encoding and decoding.
- Regarding speed upgrade cycles, the 112G solution is now in volume production, while 224G is still in its early innings, and the expert expects 448G's commercialization to take 3-5 years. Without major breakthroughs in PCB or packaging materials, SerDes' speed may reach the physical limit after 448G, according to the expert.
- As per the expert, due to the physical limits of SerDes' speed, the AI networking sector is gradually moving from copper + optical modules to CPO (co-packaged optics), which will shorten the SerDes transmission distance.

#### SerDes' global competitive landscape

- According to the expert, the competitive landscape of SerDes' supply chain is divided into three categories: the first category consists of system-level vendors like Broadcom (AVGO US, Not rated) and Marvell (MRVL US, Not rated), who develop SerDes technology in-house and integrated it with their own products; the second category includes IP vendors such as Alphawave (unlisted), Credo (CRDO US, Not rated), Synopsys (SNPS US, Not rated), Cadence (CDNS US, Not rated) and eTopus (unlisted), who sell SerDes IP to external parties; and the third category consists of tech giants like Nvidia (NVDA US, Not rated) and Huawei (unlisted), who integrate SerDes with their closed-loop ecosystem.
- As per the expert, both Synopsys and Cadence are subject to the US government's export controls, and there are some SerDes IP vendors in the China market, such as Citrus Technology (unlisted), Joywell Semi (unlisted), Akrostar (unlisted) and eTopus' agent.

#### Export controls and specific impact of SerDes-related technologies and products

- As per the expert, the US does not have explicit restrictions on SerDes products, but a license must be obtained if reaching certain threshold of bandwidth and speeds.
- According to the expert, although China's SerDes production has no major bottlenecks in equipment or materials, the main impediment is regarding design capability and processes, which require many years of industry knowhow. In the expert's view, the 224G SerDes-based product (i.e., DSP) may have a <7nm node, which is also a key bottleneck for China.

#### SerDes solutions combined with optical communications (NPO/CPO)

- Currently, as per the expert, optical industry players are developing LPO products that

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remove DSP from optical modules and strengthen SerDes function in network switches and transceivers.

- The expert also believes that NPO/CPO will move optical engines inside servers to shorten the SerDes distance and reduce signal loss.

# Appendix A-1

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