CLEVELAND RESEARCH COMPANY

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Hyperscale Capex Recap – Read Thru's to CRC IT Component Coverage

Important disclosures can be found in Appendix

Hyperscale Capex Lower for 2022 and into 2023 - Seeing Broad Based Component Digestion (Cleveland Research)

The following is our analysis of Hyperscale Revenue and Capex results, IT Component recaps of Hyperscale/Server Demand, and our expectations for how Capex trends may impact our Coverage.

Key Takeaways

1. Capex grew +22% Y/Y below our prior +27% (last Q 13%) – GOOG, MSFT and China CSPs lower and AMZN decels.
2. See 2022 Capex +19% (prior 23%) with 2023 Capex tracking in high-teens (prior low-20's) with downside risk.
3. 2Q and 3Q component purchase behavior slower tied to broad-based inventory digesting and supply chain limitations.
4. Long-term feedback on datacenter/Capex investments remains healthy, despite concerns over next few Q's.

Read-Throughs to Coverage

- **WDC (-)** -- Slower Capex likely aimed primarily at reducing NAND output. NAND inventory appears more elevated than other components – hearing US hyperscaler's holding 12+ weeks, likely to weigh on demand in C2H. NAND vendors likely considering revisions to bit production. HDD demand softer on weaker orders on pockets of digestions.
- **MU (-)** -- Lower Capex driven by DRAM inventory digestion near-term. Hear Hyperscale inventory in excess of 10-12+ weeks (slightly better vs NAND). Feedback optimistic on content growth in 2023 as hyperscale spend remains generally healthy and new CPUs drive trade-up. DRAM vendors appear focused on matching supply growth to demand in 2023.
- **INTC (**-) -- Positioned to see outsized impact from any downside to Capex as share loss to AMD continues (more pronounced in hyperscale vs enterprise). INTC has noted digestion from enterprise OEMs.
- **STX (-)** -- HDD inventory elevated at US hyperscale on non-HDD component shortages and China hyperscale demand softer. Inventory likely in a comparatively better position vs NAND/DRAM.
- **NVDA (+/-)** -- GPU spend generally prioritized over other components as customers look to prioritize AI+ML investments; enterprise demand softer in near-term and some risk should we see cuts to 2023 Capex plans.
- **AMD (+/-)** -- Any impact from slower Capex spend likely somewhat muted by ongoing share gains from INTC – with share gains expected to continue throughout 2023.

Conclusion

Our channel work has highlighted inventory digestion risk at US Hyperscaler's the last few months – we expect these risks to persist through 3Q and into 4Q. China Hyperscale demand commentary continues to worsen and remains weak, with limited recovery seen to date. Capex in 2Q appeared a bit light of our expectations back in May – with our 2022/2023 estimates moving lower as a result of the weaker 2Q and commentary in our work suggesting component/server digestion and more tempered spending. Capex growth in 2Q looks up +22% vs our prior forecast at +27% - with the delta driven by slower China, GOOG and MSFT vs. our estimates; AMZN IT spend growth also slowed vs the prior Q. We are now forecasting 2022 Capex up +19% Y/Y vs prior +23% and a moderation to +17% in 2023 (prior low-20's) with potential for further cuts. The slower Capex environment likely has more impact on MU, WDC and INTC in the near-term; AMD and NVDA likely impacted less vs the rest of our coverage due to share gains for AMD and spend prioritization for NVDA.

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Hyperscale Capex Analysis and Themes

<u>Hyperscale Capex growth below forecasts for 2Q and a decel vs 1Q22 – 2022 & 2023 outlooks more modest.</u> Of note – our calculation now uses an IT Spend estimate for AMZN based on management commentary. Capex growth in 2Q came in +22% Y/Y, below our forecast for growth of 27%, driven by slower China hyperscale capex and slower spend from GOOG and MSFT, with META spend stronger vs our estimate. We estimate Amazon IT spend grew 15% Y/Y, a moderation from 31% in 1Q – and not comparable to our prior estimates (which used capital leases as a proxy for IT oriented Capex). As a whole, we are forecasting 2022 Capex +19% Y/Y vs prior 23%, and see 2023 growing high-teens vs prior low-20's. We see potential for downside to 2023 Capex in light of top-line pressure in advertising/eCom and macro/recession concerns.

**Note - estimates now use an Amazon IT Spend Estimate based on Management commentary vs. prior methodology that used Amazon Capital Leases as a Proxy – Management suggested they are moving away from Capital Leases going forward and it no longer appears a useful proxy for IT spend. Prior methodology using Capital Leases would have yielded a weaker 2Q result and 2022/23 outlooks.*

Top Hyperscale Capex	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22e	FY18	FY19	FY20	FY21	FY22E	FY23E
Baidu	200%	93%	92%	98%	35%	-2%	-3%	83%	-29%	-11%	105%	-10%	6%
Ali Baba	-31%	-16%	-6%	95%	27%	-2%	-18%	63%	-20%	17%	-3%	2%	13%
Tencent	33%	-23%	-17%	23%	-9%	12%	11%	52%	28%	11%	2%	-5%	15%
Meta	18%	41%	17%	15%	25%	64%	76%	107%	13%	0%	22%	61%	20%
Google	-1%	-10%	26%	16%	-3%	24%	0%	73%	4%	-2%	7%	10%	15%
Amazon	59%	64%	28%	21%	31%	15%	23%	13%	-6%	28%	38%	22%	10%
Ebay	-15%	1%	20%	-39%	0%	32%	-13%	-2%	-15%	-10%	-10%	5%	6%
Microsoft	54%	26%	35%	26%	5%	19%	9%	39%	14%	14%	33%	15%	31%
Oracle	5%	66%	144%	63%	166%	98%	-2%	-28%	8%	15%	70%	47%	11%
SAP	-50%	28%	49%	17%	29%	4%	14%	15%	-45%	-2%	-2%	13%	6%
IBM	-28%	-1%	-28%	-33%	-29%	-28%	-14%	7%	-25%	7%	-23%	-6%	13%
Equinix	41%	44%	20%	2%	-27%	-30%	1%	52%	-1%	10%	22%	-13%	6%
Twitter	47%	70%	41%	-53%	-10%	-44%	-41%	201%	12%	62%	16%	-22%	7%
Apple	22%	34%	8%	-20%	13%	0%	43%	12%	-33%	-6%	4%	8%	9%
Total Y/Y *(Amazon IT Est)*	21%	20%	22%	16%	13%	22%	18%	40%	-3%	8%	20%	19%	17%
Top 4 US Y/Y *(Amazon IT Est)*	27%	24%	27%	20%	13%	28%	22%	51%	6%	8%	24%	25%	19%
US Tier 2 Y/Y	6%	33%	20%	-12%	17%	5%	11%	11%	-26%	2%	8%	8%	9%
China Hyperscale Y/Y	1%	-13%	-4%	54%	10%	3%	-7%	61%	-6%	12%	7%	-2%	13%

Source: Cleveland Research estimates, company reports

Top Hyperscale Capex	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22e	FY18	FY19	FY20	FY21	FY22E	FY23E
Baidu	$ 231	$ 386	$ 413	$ 661	$ 312	$ 380	$ 400	$ 1,317	$ 930	$ 826	$ 1,691	$ 1,522	$ 1,613
Ali Baba	$ 937	$ 1,686	$ 1,987	$ 1,452	$ 1,193	$ 1,659	$ 1,625	$ 6,655	$ 5,303	$ 6,229	$ 6,061	$ 6,182	$ 6,986
Tencent	$ 1,200	$ 1,070	$ 1,110	$ 1,837	$ 1,098	$ 1,200	$ 1,235	$ 3,600	$ 4,620	$ 5,119	$ 5,217	$ 4,956	$ 5,699
Meta	$ 4,423	$ 4,733	$ 4,546	$ 5,542	$ 5,548	$ 7,747	$ 7,996	$ 13,914	$ 15,779	$ 15,819	$ 19,244	$ 31,000	$ 37,200
Google	$ 5,942	$ 5,496	$ 6,819	$ 6,383	$ 5,786	$ 6,828	$ 6,800	$ 22,739	$ 23,548	$ 23,016	$ 24,640	$ 27,000	$ 31,050
Amazon IT Estimate	$ 5,037	$ 5,823	$ 6,340	$ 7,411	$ 6,580	$ 6,708	$ 7,800	$ 14,836	$ 13,923	$ 17,800	$ 24,611	$ 30,025	$ 33,028
Ebay	$ 83	$ 99	$ 159	$ 103	$ 83	$ 131	$ 139	$ 651	$ 554	$ 496	$ 444	$ 465	$ 494
Microsoft	$ 6,000	$ 7,300	$ 7,400	$ 6,800	$ 6,300	$ 8,700	$ 8,100	$ 15,800	$ 18,000	$ 20,600	$ 27,500	$ 31,700	$ 41,500
Oracle	$ 414	$ 717	$ 1,062	$ 925	$ 1,101	$ 1,423	$ 1,038	$ 1,468	$ 1,591	$ 1,833	$ 3,118	$ 4,575	$ 5,078
SAP	$ 184	$ 230	$ 231	$ 230	$ 238	$ 240	$ 264	$ 1,670	$ 913	$ 897	$ 875	$ 986	$ 1,045
IBM	$ 529	$ 688	$ 638	$ 526	$ 378	$ 494	$ 550	$ 3,888	$ 2,907	$ 3,106	$ 2,381	$ 2,250	$ 2,544
Equinix	$ 564	$ 692	$ 678	$ 855	$ 413	$ 485	$ 685	$ 2,096	$ 2,080	$ 2,282	$ 2,789	$ 2,414	$ 2,547
Twitter	$ 181	$ 279	$ 411	$ 140	$ 163	$ 155	$ 242	$ 484	$ 541	$ 874	$ 1,011	$ 788	$ 844
Apple	$ 2,269	$ 2,093	$ 1,927	$ 2,803	$ 2,575	$ 2,102	$ 2,753	$ 13,858	$ 9,247	$ 8,702	$ 9,092	$ 9,846	$ 10,733
Total *(Amazon IT Est)*	**$ 27,994**	**$ 31,291**	**$ 33,721**	**$ 35,667**	**$ 31,767**	**$ 38,252**	**$ 39,627**	**$ 102,976**	**$ 99,936**	**$ 107,599**	**$ 128,673**	**$ 153,708**	**$ 180,360**
Y/Y	21%	20%	22%	16%	13%	22%	18%	40%	-3%	8%	20%	19%	17%
Top 4 US *(Amazon IT Est)*	**$ 21,402**	**$ 23,352**	**$ 25,105**	**$ 26,136**	**$ 24,214**	**$ 29,983**	**$ 30,696**	**$ 67,289**	**$ 71,250**	**$ 77,235**	**$ 95,995**	**$ 119,725**	**$ 142,778**
Y/Y	27%	24%	27%	20%	13%	28%	22%	51%	6%	8%	24%	25%	19%
US Tier 2	**$ 4,224**	**$ 4,798**	**$ 5,106**	**$ 5,582**	**$ 4,951**	**$ 5,030**	**$ 5,671**	**$ 24,116**	**$ 17,833**	**$ 18,190**	**$ 19,710**	**$ 21,324**	**$ 23,285**
Y/Y	6%	33%	20%	-12%	17%	5%	11%	11%	-26%	2%	8%	8%	9%
China Hyperscale	**$ 2,368**	**$ 3,142**	**$ 3,510**	**$ 3,950**	**$ 2,603**	**$ 3,239**	**$ 3,260**	**$ 11,572**	**$ 10,853**	**$ 12,174**	**$ 12,968**	**$ 12,660**	**$ 14,298**
Y/Y	1%	-13%	-4%	54%	10%	3%	-7%	61%	-6%	12%	7%	-2%	13%

Source: Cleveland Research estimates, company reports

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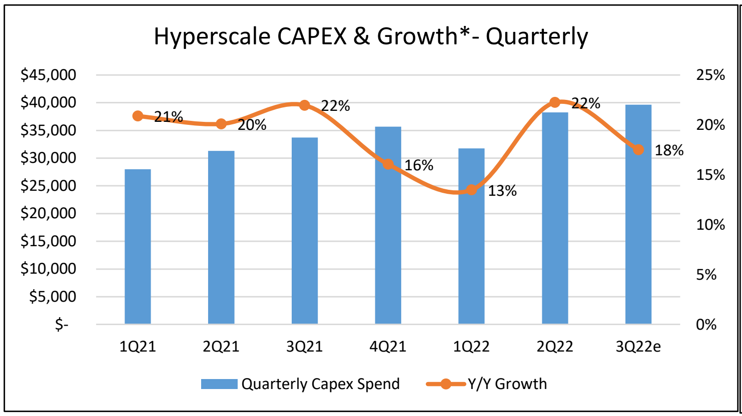
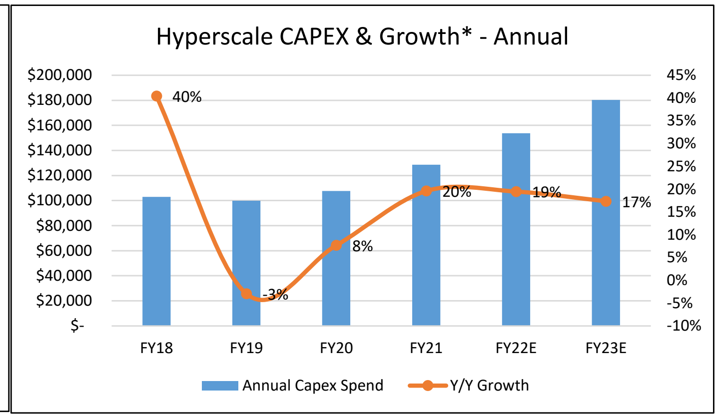
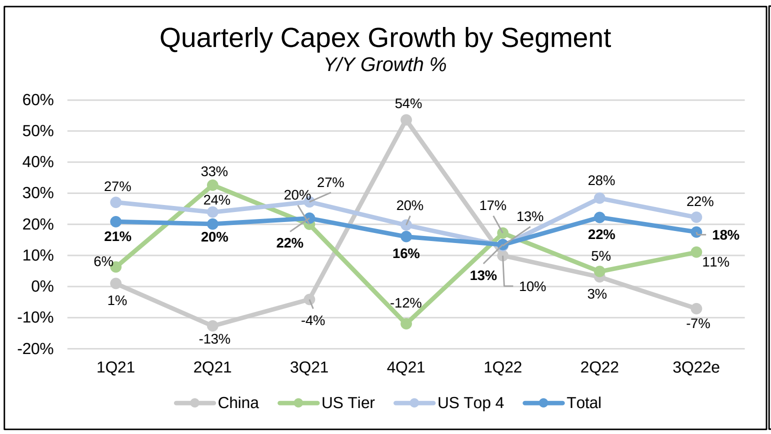
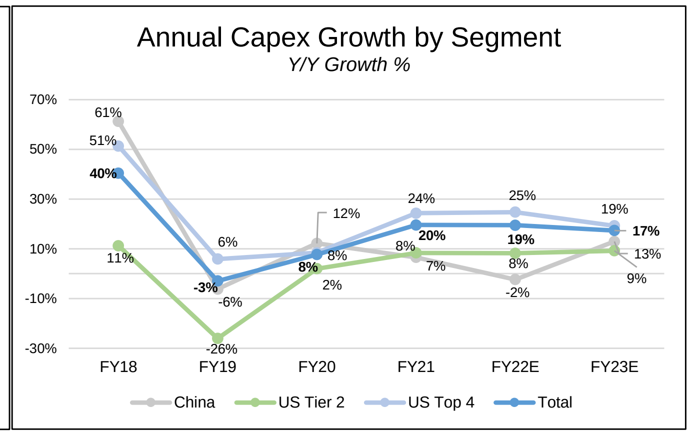




Source: Cleveland Research estimates, Company Reports





Source: Cleveland Research estimates, Company Reports

<u>**Capex outlooks appear generally healthy, but lower vs our prior 2022/2023 estimates.**</u> We see 2022 Capex growing +19% vs prior +23% and are now forecasting 2023 growth of 17% (vs prior low-20's). We lowered our Capex estimates across our sample, with the most notable reduction coming from BABA, GOOG, MSFT and AMZN – smaller hyperscaler's saw similar reduction. Our META estimate is largely unchanged and ORCL estimate actually higher. Into 2023 – we see Capex tracking to 17% vs our prior estimates for low-20's capex growth. We hear that there could be incremental downside to this estimate due to 1) top-line pressure for advertising/eCom hyperscaler's, 2) an increased focus on cost reductions, 3) macro uncertainty and recession risk.

<u>The following are interesting highlights across the major vendors regarding Capex.</u>

- **GOOG – $6.8B Capex in 2Q vs $5.5B a year ago Q, up 24% Y/Y vs -3% in 1Q22.** Capex in 2Q was said to be driven by datacenters and office facilities. Commentary pointed to expectations for continued growth in 2022 on investment in tech infrastructure globally, with server spend making up the largest portion of growth. Commentary sounded similar or slightly more modest vs. the 1Q call when Google suggested Capex would meaningfully increase in 2022 vs 2021 – with spend for the remainder of the year to be focused on technical infrastructure, with the bulk going into Server. Our work continues to point to Google aggressive in testing/ramping new tech across components, despite some commentary pointing to high hyperscale memory/storage inventories and some near-term digestion.
- **AMZN – Estimated IT spend at $6.7B in 2Q vs $5.5B a year ago Q, +15% Y/Y vs +31% in 1Q.** 2Q tech infrastructure spend was noted to have ramped Q/Q. The company noted roughly ~40% of the $60B in Capex spend in 2021 went to tech infrastructure (remaining for fulfillment capacity, transportation, and corporate space/physical stores). In 2022, the company expects the tech infrastructure portion of spend to continue to grow Y/Y (with more modest expectations

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in other areas), expected to take Tech infrastructure spend to a bit more than 50% (prior approx. ~50%) of Capex in 2022. Growth in tech spend was noted as supporting rapid growth and innovation at AWS. The company noted a belief they are still in the early stages of enterprise and public sector adoption of the Cloud, and highlighted a great opportunity to invest in the business – expanding into new regions, with new service offerings.

- **MSFT – $8.7B Capex in 1Q, vs $7.3 a year ago Q, up 19% Y/Y vs +5% in 1Q**. Capex was in line with commentary that pointed to a Q/Q increase Capex – with the company noting spend was driven by Q/Q step up in Cloud spend – aimed at new datacenter builds and adding capacity to existing datacenters. Into 3Q, Microsoft pointed to a Q/Q decrease in spend, tied to timing and normal quarterly spend variability in Cloud investment – but continued focus on adding new units and datacenter usage capacity for customers. Longer term commentary suggested continued healthy investment in datacenter based on significant customer demand and usage signals. The company noted higher supplier payments in the Q related to hardware inventory build as they manage an uncertain supply chain. Into 2Q, the company expects a Q/Q increase in capex as Microsoft invests to meet growing global demand for cloud services.
- **META – $7.75B Capex in 2Q vs. $4.3B Capex in year ago Q, growing 64% Y/Y vs +25% Y/Y in 1Q.** 2022 guidance was narrowed & slightly raised – with META now calling for Capex in the $30-34B range (prior $29-34B). Management noted the big step-up in Capex – both on a Y/Y basis and Q/Q was Server spend, including AI infrastructure. The company noted investment in AI through the downturn in their business to drive superior ad products and a meaningful tech advantage vs peers in the ad space.

Channel Component Themes and Recent Component Commentary

2022 Hyperscale demand sounds more modest as supply and inventory issues drive near-term digestion. End demand feedback in US Hyperscale sounds generally upbeat, with datacenter build plans generally intact, to accommodate growing Cloud demand; China hyperscale demand continues to sound softer M/M (a trend since March). Near-term, we see more cautious component buys in areas like memory, storage, and processors, tied to 1) notably higher inventories/plans for digestion, 2) more conservative inventory management in light of macro concerns, 3) gating component constraints (TXN IC's, AVGO NICs) limiting builds, and 4) Sapphire Rapids delays postponing some spend. While some note macro weakness & pressure in eCom/Ad revs could limit Capex, we see growth in AI & Cloud driving generally healthy spend in 2022. Some feedback suggests 2023 capex is likely to moderate Y/Y and could see downside given macro/business challenges in 2022.

Hyperscale inventory build sounds most pronounced in DRAM & NAND, see HDD, CPU, & GPU inventory elevated. In DRAM & NAND, we have seen instances of some US CSPs carrying 16+ weeks of inventory (others at 12+ weeks), and outlooks calling for 3Q ASP declines of 10-15%+, potentially similar in 4Q. HDD & CPU inventory build sounds elevated but to a lesser degree, with plans for lower 2H orders to burn inventory. GPU spend in 2H looks limited by gating component constraints, though we see GPUs as likely to outperform broader server on AI-prioritization and attach rate gains.

Longer-term commentary was encouraging as growing CSP demand + competitive dynamics drive investment. Our work continues to suggest healthy long-term Capex across the US CSP & Hyperscale segment – with a robust appetite for next-gen tech in memory, storage, CPUs, and GPUs; and capacity growth as CSPs compete for share as more business shifts into the Cloud. We hear some speculate Capex could moderate in light of top line pressure in areas like advertising/eCom, though this sounds somewhat offset by efforts to remain at the leading edge for AI and newer cloud workloads.

The following are interesting highlights across major IT component vendors regarding hyperscale demand in 2Q & 2H22. Commentary highlights healthy Cloud demand, but more limited upside spend in the near-term as macro concerns and elevated inventories across most components appear to be driving volume cuts and more conservative 2H outlooks. Most also note component constraints as a limiting factor, and weak demand from China CSPs extending longer than expected into 2H22. Longer term commentary remains upbeat on datacenter demand, and growth in Cloud driving healthy investment over the next couple years.

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- **INTC (7/29/22) (~33% of rev is datacenter + AI):** Datacenter and AI revs were $4.7B were down 23% and down 16% Y/Y – second consecutive Q/Q decline. Weakness was tied to OEM inventory reduction, mix related ASP declines and both macro and competitive pressure – expected to persist in 2H, with Intel lowering their server TAM outlook for 2022. Intel Sapphire Rapids was noted as ramping slower than expected – with a more material ramp expected in 1H23. Despite the slower Sapphire Rapids ramp, Intel expressed confidence in future products.
- **AMD (8/3/2022) (~23% of 2Q rev is Data Center):** Datacenter revs grew 83% Y/Y (vs. 112% prior Q) – with strength driven by a step-up in Cloud and modest OEM progress – but limited by macro-related slowing & deal-pushout. US Cloud outlooks were said to be strong in 2H22 and into 2023, offsetting China slowing, with 2H datacenter revs expected to see strong growth vs. 1H. Visibility noted to be good in the next 4-6 Q's as hyperscale customers increasingly focus on ensuring long-term capacity. Supply constraints remained a factor in 2Q, with mgmt. expecting an influx of supply towards year-end to further support demand. AMD saw significant datacenter share gains vs Intel as customers focus on TCO – with limited headwinds from Intel price competition. Datacenter GPU footprint appeared broader with supercomputer customer wins + CSP progress – with MI200 expected to drive further AMD penetration. Datacenter GPU revs expected to ramp in 2023 following minimal 2022 contribution.
- **SK Hynix (7/26/2022):** Server set builds were somewhat limited by component shortages in 2Q22 with solid demand following better than expected demand in 1Q. Volumes came in below April guidance with DRAM bits up 10% Q/Q (guide 15%) and NAND bits up 8% Q/Q (guide 20%+) – in part due to slower IT spend. Into 3Q, commentary suggested some customers may need to adjust inventory as businesses cut costs to prepare for recession. Hynix did not provide explicit guidance for 3Q due to elevated uncertainty, but noted plans for bits at least flat Q/Q, with potential for the target to be adjusted lower.
- **Samsung (7/28/2022):** Server demand was noted as strong despite softer macro, though could see further impact in the event of a widespread recession. Samsung noted inventory adjustments at customers due to IC supply issues, but demand fundamentals still strong as large data center customers invest in new growth areas like AI and 5G. Samsung noted continued expansion of high-core CPUs to drive solid demand in memory, but ongoing disruption related to supply issues, and some inventory adjustment to weigh on Server bit shipments in 3Q.
- **MU 7/1/22 & 8/9/22 (~22% of rev is Hyperscale/~16% Enterprise):** As of the May-Q call, commentary on Data center demand remained robust with demand growth tied to AI & Cloud, with 2H22 expected to remain strong, with some Enterprise OEM pull-back due to component constraints and macro-concerns. On 8/9, Micron revised their guidance lower citing weaker demand & greater than expected inventory adjustments across segments, including Cloud. MU pointed to notable inventory corrections as a result of more conservativism given increasing macro concerns. Longer-term, commentary was similar with secular demand growth expected to be driven by Datacenter (and segments like Auto), with memory & storage growth expected to outpace broader semis.
- **NVDA 8/8/22 (~57% of expected Jul-Q rev is Data Center):** Datacenter revs were up 2% Q/Q and 61% Y/Y in Jul-Q, seen as generally healthy but weaker than previously expected on supply chain disruption (following 83% growth in the prior Q). Our work points to softer Data Center demand in GPUs – particularly in China– though feedback suggests GPU servers should continue to outpace the broader Server market tied to AI-prioritization.
- **STX 8/22/22 (~70% of rev is Nearline/Enterprise):** Mass Capacity units were down 1% Q/Q and 8% Y/Y. Nearline EB's of 119EB were up 1% Q/Q and 17% Y/Y – driven by 18/20TB demand from CSPs. US CSP demand noted strong with China softer. STX noted a more tempered near-term Nearline outlook on persistent non-HDD component shortages limiting builds, resulting in inventory build through the June-Q, and an expectation customers reduce inventory levels. Asia-based CSPs notably impacted by COVID mitigation efforts. STX noted efforts to ramp future products quicker in response to slower China demand – implying some cuts to 16/18TB production.
- **WDC 8/5/22 (~46% of 2Q rev is Cloud):** Cloud revenues were 46% of total revs (40% last Q) at $2.1B, up 18% Q/Q and up 5% Y/Y (up 25% Y/Y prior Q) – with WD noting success at 18TB, and eSSD revs more than doubling Q/Q (down 8% last Q). Cloud revs were 46% of total (40% last Q) at $2.1B, up 18% Q/Q and up 5% Y/Y (up 25% Y/Y prior Q) – strength expected to continue in C2H22. Cloud commentary remained upbeat with weaker China offset by easing supply constraints internally, and healthy traction in product ramps. WD noted NVMe eSSD expanding

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to 3 Cloud titans up from 1, though noted eSSD revenues could look lumpy with digestion in hyperscale and a smaller base of customers. WD highlighted traction with SMR - ramping a second cloud customer, and expressed confidence in long-term HDD roadmap plans. WD noted growth in Nearline, traction in SMR (ramping a second CSP), and eSSD revs more than doubling Q/Q – stronger in US/weaker China.

- **ANET 8/2/2022 (~90% of rev is Hyperscale & Datacenter):** 2Q rev better than expected at +49% was better than expected, with 3Q guidance of +37-44% also ahead of expectations. Macro challenges noted to have limited impact on demand, with Hyperscale visibility characterized as good for the next 6-12 months, more limited beyond 12mo. Commentary pointed to increasing use cases in hyperscale adding to confidence in backlog – presently have 5 different use cases adding to visibility and no inventory in channel or at hyperscale. ANET does not appear concerned on delays from Sapphire Rapids – with absolute capacity expansion supporting visibility. ANET also noted normalization in the supply chain could result in less extended visibility from hyperscale, with analog supplier challenges above 100nm expected to improve into 2023. Enterprise is viewed as long tail opportunity – with Arista less aggressive leaning into the Enterprise momentum near-term due to lack of inventory/product.

Hyperscale Revenue Performance

B2B Cloud Service revs decelerated in 2Q but were better than feared amidst macro backdrop. Revs grew +33% Y/Y, a 400bps decel vs 1Q growth as cost optimization caused ~100-200bps slower growth than expected – FX headwinds also impacted the industry by an additional ~400bps. Cloud consumption remained healthy, though slightly slower vs. 1Q with strength in data center migrations, PaaS (data/AI, edge, security), and very large deal activity somewhat offset by optimization work & more deliberation from customers on new projects. Across vendors, Azure performance stood out among the group with growth only slowing ~300bps (ex-FX headwinds) compared to AWS and GCP slowing 400bps and 800bps, respectively. MSFT saw record number of $100M+ and $1B+ commitments in the Q, while AWS' backlog surpassed the $100B mark and added an incremental $12B (last Q added $8B), reflecting strong signings momentum. GCP's backlog expanded after contracting the prior Q, though grew below the market trend (slowed 19 points) as Google appears to be putting more emphasis on converting signings into consumption.

B2B Cloud Services Revenue	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22e	2019	2020	2021	2022e	2023e
AWS	13,503	14,809	16,110	17,780	18,441	19,739	21,426	35,026	45,370	62,202	83,076	108,380
Azure	10,480	9,667	9,151	11,498	15,300	13,533	13,269	18,121	27,207	40,795	58,775	82,284
Google	4,047	4,628	4,990	5,541	5,821	6,276	6,986	8,918	13,059	19,206	26,619	37,266
Alibaba	2,597	2,483	3,135	3,090	2,815	2,665	3,229	5,145	7,917	11,555	12,052	14,850
Salesforce	1,746	1,882	2,177	2,486	2,374	2,446	2,830	4,447	6,366	8,422	10,882	13,929
Oracle	826	905	919	961	1,139	1,131	1,213	2,252	2,786	3,610	4,752	6,178
IBM	732	670	719	852	816	804	806	2,189	2,699	3,330	3,363	3,531
TOTAL	**$36,812**	**$38,226**	**$41,430**	**$47,468**	**$50,302**	**$50,761**	**$51,690**	**$ 84,948**	**$116,512**	**$162,702**	**$219,838**	**$286,344**
Y/Y	**39%**	**40%**	**42%**	**41%**	**37%**	**33%**	**25%**	**44%**	**37%**	**40%**	**35%**	**30%**
2-Yr Avg	*42%*	*39%*	*38%*	*37%*	*38%*	*36%*	*33%*	*46%*	*40%*	*38%*	*37%*	*33%*

Source: CRC Estimates, Co Reports, Factset Consensus

Internet Advertising decelerated vs the prior Q – 2H outlooks reduced by 5-10%. Advertising revenues for Cloud co's grew+7% Y/Y in 2Q, a 900 bps decel vs the prior Q, with 2 year avg growth accelerating. GOOG advertising revs grew +12% Y/Y vs +22% in 1Q and META ad revs were -1% Y/Y vs +6% last Q (first time the company has ever seen a decline). Feedback suggests 3Q industry revenues decelerate further to +4% Y/Y (vs. +7% last Q). Google attributed the weakness largely to a slowdown in YouTube advertising, with Search holding up better (expected to outperform broader internet advertising). META saw a broad-based slowdown across verticals and attributed it to macro pressures and the unwind of COVID-related benefits to eCom and mobile/gaming ad budgets. Our research suggests 2H22 ad spend plans have been cut 5-10% vs. original plan due to macro uncertainty and advertiser margin pressure.

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Internet Advertising Revenue	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22e	2019	2020	2021	2022e	2023e
Google Advertising	44,684	50,444	53,130	61,239	54,661	56,288	57,763	135,042	146,924	209,497	234,442	260,888
Facebook Advertising	25,439	28,580	28,276	32,639	26,998	28,152	26,631	69,655	84,169	114,934	113,240	130,980
TOTAL	**70,123**	**79,024**	**81,406**	**93,878**	**81,659**	**84,440**	**84,394**	**$204,697**	**$231,093**	**$324,431**	**$347,683**	**$391,869**
Y/Y	**37%**	**64%**	**40%**	**28%**	**16%**	**7%**	**4%**	**19%**	**13%**	**40%**	**7%**	**13%**
2-Yr Avg	*25%*	*31%*	*27%*	*27%*	*27%*	*35%*	*22%*	*23%*	*16%*	*27%*	*24%*	*10%*

Source: CRC Estimates, Co Reports

eCommerce rev decline Y/Y for third consecutive Q – expected to return to growth in 3Q. AMZM reported 2Q online retail sales revs that were down 4% Y/Y (vs -3%% in 1Q). Growth in gross merchandise value (GMV – total value of merchandise sold) was +2%, better than expectations for -2% and higher vs +1% last Q. Total sales (eCom + AWS + other) grew 7% Y/Y in 2Q22 vs guidance for 3-7% growth – 3Q22 was guided up 13-17% Y/Y, in line with expectations. AMZN did not say how much Prime Day would benefit 3Q growth, but Prime Day contributed 4pts of growth in 2Q21. AMZN noted progress in mitigating cost pressures like productivity headwinds, with other inflation related costs persisting. We are forecasting 2022 Amazon online store revs +2% vs our prior 4% and 2021 growth of 13% - we see 2023 accelerating to 9%.

eCommerce Revenue	1Q21	2Q21	3Q21	4Q21	1Q22	2Q22	3Q22e	2019	2020	2021	2022e	2023e
Amazon	52,901	53,157	49,942	66,075	51,129	50,855	55,051	141,247	197,349	222,075	226,586	246,978
Ebay	2,638	*2,668*	*2,501*	*2,613*	*2,483*	*2,422*	*2,326*	10,800	10,271	10,420	9,736	9,949
TOTAL	**$55,539**	**$55,825**	**$52,443**	**$68,688**	**$53,612**	**$53,277**	**$57,377**	**$152,047**	**$207,620**	**$232,495**	**$236,322**	**$256,927**
Y/Y	**42%**	**14%**	**4%**	**0%**	**-3%**	**-5%**	**9%**	**14%**	**37%**	**12%**	**2%**	**9%**
2-Yr Avg	*32%*	*30%*	*19%*	*21%*	*19%*	*5%*	*7%*	*13%*	*25%*	*24%*	*7%*	*5%*

Source: CRC Estimates, Co Reports, Factset Consensus

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APPENDIX

Important Disclosures

Important Disclosures can be found at www.cleveland-research.com/clients/disclosures

Companies Mentioned

Micron (MU: $62.98 – BUY)
Advanced Micro Devices (AMD: $100.44 – BUY)
Intel Corp. (INTC: $36.20 – NEUTRAL)
Western Digital (WDC: $48.72 – NEUTRAL)
Seagate Technology (STX: $81.63 - NEUTRAL)
Nvidia (NVDA: $187.73 – BUY)
Alphabet (GOOG: $120.86 – BUY)
Meta Platforms, Inc. (META: $174.66 – BUY)
Apple Inc. (AAPL: $174.15 – BUY)
Salesforce, Inc. (CRM: $187.93 – BUY)
Amazon (AMZN: $142.30 – BUY)
Microsoft (MSFT: $290.17 – BUY)
Arista Networks (ANET: $132.74 – NEUTRAL)
Twitter (TWTR: $43.86 – NEUTRAL)
IBM Corp (IBM: $139.07 – NEUTRAL)
Oracle Corporation (ORCL: $79.32 – NEUTRAL)
SAP SE (SAP: $92.46 – NEUTRAL)
Equinix Inc (EQIX: $701.42 – Not Rated)
eBay Inc (EBAY: $48.54 – Not Rated)
Alibaba Group (BABA: $90.74 – Not Rated)
Baidu Inc (BIDU: $128.33 – Not Rated)
Tencent (TCEHY: $39.59 – Not Rated)
Broadcom (AVGO: $558.45 – Not Rated)
Texas Instruments (TXN: $178.46 – Not Rated)

Cleveland Research Company - Ratings Distribution

Rating	Percent
Buy	35%
Neutral	64%
Underperform	1%

Disclosures

Buy: The stock's return is expected to exceed the market due to superior fundamentals and positive catalysts.
Underperform: *The stock's total return is expected to underperform the market due to weak fundamentals and a lack of catalysts.*
Neutral: *The stock is expected to be in line with the market due to full valuation and/or a lack of catalysts.*
Valuation and Risk: *Price targets are established under various valuation methods including P/E, P/S, EV/EBITDA on financial estimates based on forward earnings. Price targets are not established for every stock. The price target's effectiveness may be affected by various outside factors. Risk assessments can be found in the most recent research on these stocks.*
Other Disclosures: *We, Chandler Converse, Ross Walthall, and Henry Gerlach certify that the views expressed in the research report(s) accurately reflect our personal views about the subject security(s). Further, we certify that no part of our compensation was, is, or will be directly or indirectly related to the specific recommendations or views contained in the research report(s). CRC, its principals and partners, have investments and own a minority interest in a fund manager which may or may not have a position in this security in the funds it manages and oversees. Cleveland Research Company provides no investment banking services of any type on this or any company. Proprietary research and Information contained herein which forms the basis for findings or opinions expressed by Cleveland Research Company may be used by Cleveland Research for other purposes in the course of compensated consulting and other services rendered to third parties. The information transmitted is intended only for the person or entity to which it is addressed. Any review, retransmission, dissemination or other use of, or taking of any action in reliance upon, this information by persons or entities other than the intended recipient is prohibited. If you received this in error, please contact the sender and delete the material from any computer.*
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