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ASIA PACIFIC INSIGHT

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Global Semiconductors

How will China chip in? Seizing cloud semi strength in China

We expect China's cloud capex to reaccelerate from 2020 to a 20%-plus CAGR in the next three years. Our stock selection is based on three criteria – high China datacenter exposure, localization opportunities, and technology upgrades. We initiate on Montage at OW and stay OW ASMedia.

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How will China chip in? Seizing cloud semi strength in China

We expect China's cloud capex to reaccelerate from 2020 to a 20%-plus CAGR in the next three years. Our stock selection is based on three criteria – high China datacenter exposure, localization opportunities, and technology upgrades. We initiate on Montage at OW and stay OW ASMedia.

Strong cloud capex growth in China: Cloud has been a high-growth area of tech for several years, mainly owing to the strength of US hyperscalers. Cloud infrastructure expanded quickly from 2008 to early 2018 before entering a downcycle in 2019 and, we believe, normalizing thereafter (see Asia Insight: Cloud capex semi plays bottoming out). In this period of normalization, China's cloud capex will become a more crucial growth driver as the country catches up on datacenter build-out. We estimate China's cloud capex will grow by at least 20% annually in the next three years vs. global levels of 20% or slightly lower annually. We thus think there will be growth opportunities for Greater China semi stocks.

We select cloud semi stocks using three criteria: 1) China datacenter exposure: We think companies with higher China exposure could benefit more. **2) China semi localization:** Companies capable of replacing foreign vendors are likely to see new order wins in China. **3) Technology upgrades:** Given the ongoing growth of Internet traffic, datacenter speeds (i.e., interfaces) also need to be upgraded. This will be positive for industry leaders as design complexity will rise, bringing higher ASPs.

What are cloud semis? We define cloud semis as the key semiconductors used in datacenter servers. Key components include CPUs, power management controllers, BMCs (baseboard management controllers), and interface chips. CPUs are mainly supplied Intel, power management ICs by TI and Infineon, BMCs by Aspeed, GPUs by Nvidia, and interface chips by Montage and US analog companies.

How is our view differentiated? 1) We believe China datacenters are recovering faster than expected and will now show sustainable growth. 2) We are most bullish on Montage as the key beneficiary among A-share semi stocks, noting that the stock is undercovered by foreign brokers. Our 2020/21 earnings estimates are 18%/17% higher than consensus. Please refer to our initiation report published today, Montage Technology: Refreshing the China Cloud. 3) We are more bullish than the Street on ASMedia and believe it is an emerging cloud semis play. The recent share price correction means there is now more than 50% upside to our price target.

Where could we be wrong? 1) In the near term, the key risk is the potential negative impact from Covid-19 causing lower IT spending in 2H; 2) a structural slowdown in data traffic, 3) technology changes resulting in less hardware required in datacenters, and 4) cannibalization from the hybrid cloud.

Asia Pacific Industry View

Greater China Technology Semiconductors — Attractive

Greater China Technology Hardware — In-Line

Exhibit 1:

Companies featured

Company	Ticker	MS Rating		PT (LC)		Share price (LC)	Upside
		New	Old	New	Old		
Montage	688008.SS	OW	-	100	-	76.2	31%
Asmedia	5269.TW	OW	OW	1069	1069	698.0	53%
Parade	4966.TWO	OW	OW	777	777	598.0	30%
Aspeed	5274.TWO	EW	EW	999	999	1,100.0	-9%

Source: Company data, TEJ, Morgan Stanley Research. Closing share prices as of March 24, 2020.

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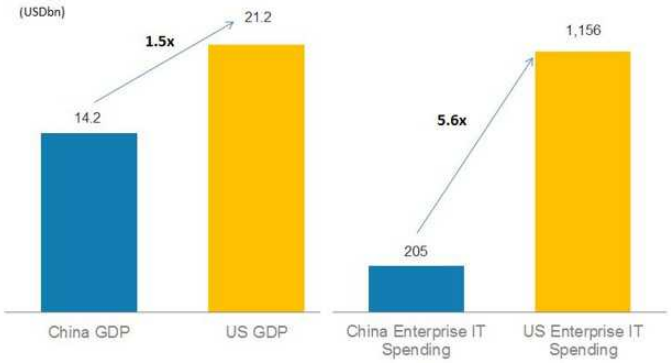
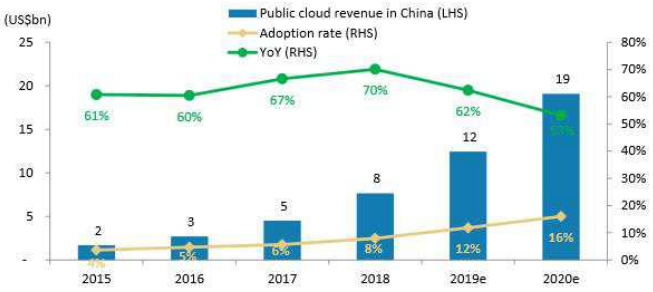
Key charts

Exhibit 2:
US enterprise IT spending was 5.6x higher than China's in 2019 despite the small gap in GDP (1.5x) between the two countries



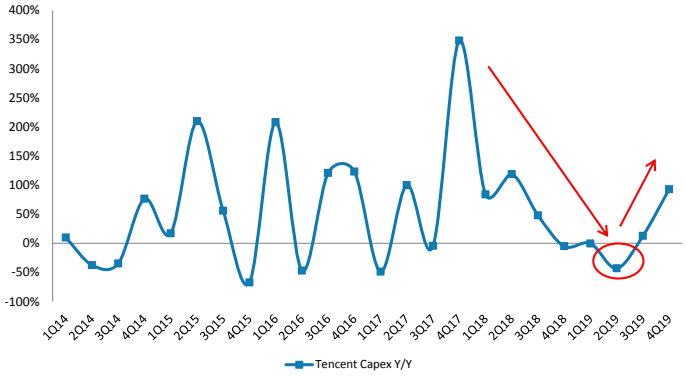
Source: Gartner, Morgan Stanley Research

Exhibit 3:
We forecast China's public cloud market to grow 53% to US$19bn in 2020, representing a 16% adoption rate (up from 8% in 2018)



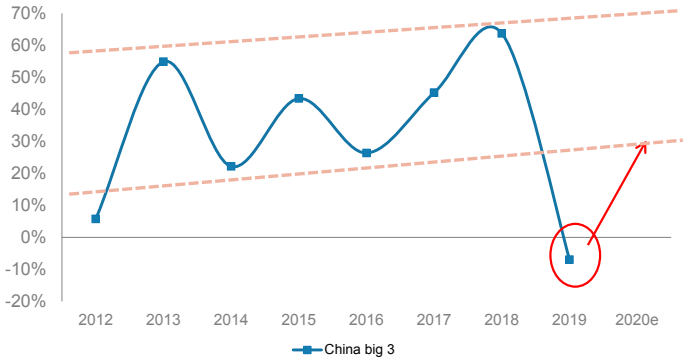
Source: Gartner, Morgan Stanley Research (e) estimates

Exhibit 4:
Tencent's operating capex slowed significantly in 1H19, down >40% Y/Y in 2Q19, but picked up from 3Q19, earlier than the US. 4Q19 capex rose more than 90% Y/Y



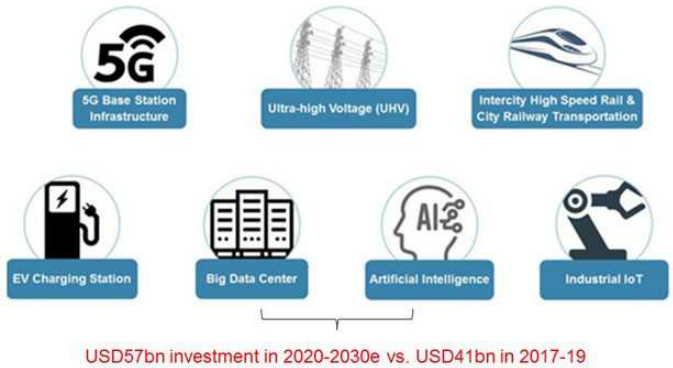
Source: Company data, Morgan Stanley Research estimates

Exhibit 5:
We think China's cloud capex has hit bottom, and we estimate a 20%-plus CAGR in the next three years



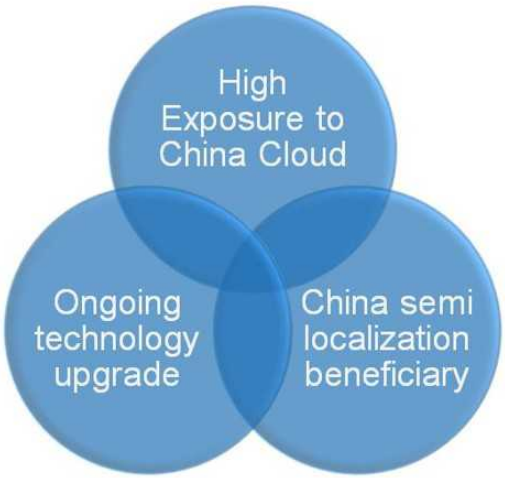
Source: Company data; China's big 3 capex is Tencent, Alibaba and Baidu; Tencent/Alibaba capex is based on the operating capex

Exhibit 6:
We estimate that total capex from government support related to AI/datacenters will be US$626bn in 2020-30 (on average US$57bn per year vs. US$41bn in the last three years



Source: Company data, Morgan Stanley Research

Exhibit 7:
We believe Montage ticks all the boxes and is the best proxy within cloud semis



Source: Morgan Stanley Research

Datacenter localization is taking place in China

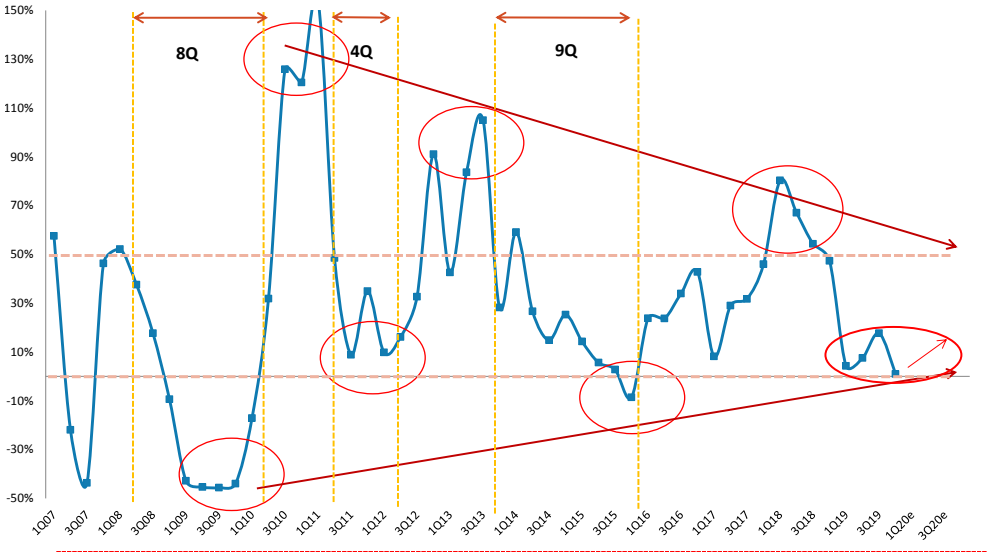
Where are we in the cycle globally? Bottoming out

As we articulated last year, cloud capex bottomed out in 2Q19, offering a good re-entry point for cloud semi stocks. Aspeed's revenue momentum, for example, started to pick up from 3Q19 from a year-over-year perspective. Aspeed's recently released February sales were up 51% Y/Y, suggesting cloud demand remains strong. However, we noticed two things:

1. When we compared Aspeed's revenue trend with US cloud capex, we did not see a corresponding pickup. A partial explanation could be that capex is now going more to equipment and facilities rather than datacenter construction, but typically the trend is similar.
2. Aspeed's revenue strength is also reflected in its share price, suggesting the market could already hold a positive view on some cloud-related stocks. This means these companies (e.g., Aspeed) could have limited upside surprises and are more a beta play than offering alpha for investors.

Exhibit 8:

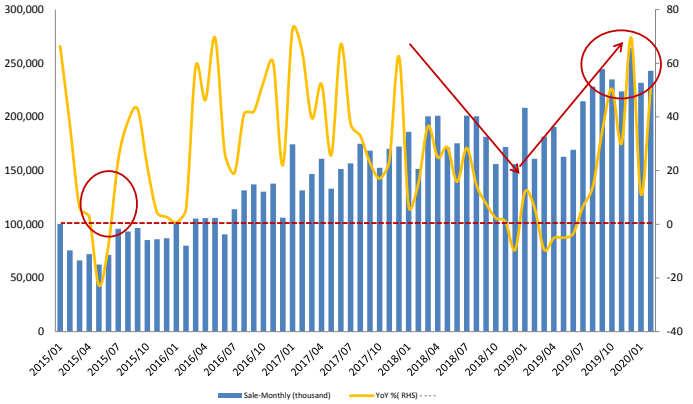
US cloud capex has already hit bottom but has not significantly picked up



Source: Company data, Morgan Stanley Research estimates

Exhibit 9:

Cloud capex is inconsistent with Aspeed's monthly sales trend – Feb 2020 sales hit 50% Y/Y growth

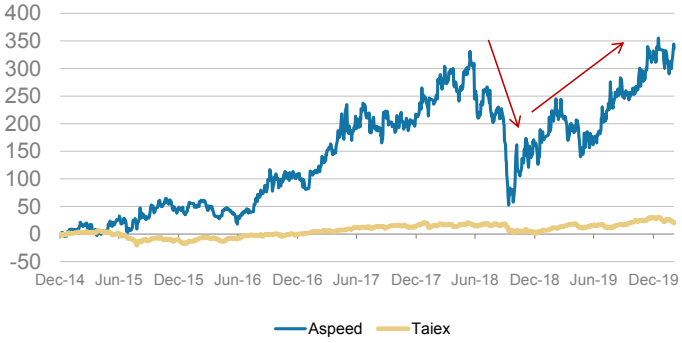


Source: Company data, Morgan Stanley Research

Exhibit 10:

Aspeed's share price is highly correlated with Y/Y growth of revenue

Aspeed share price performance vs. Taiex (%)



Source: TEJ

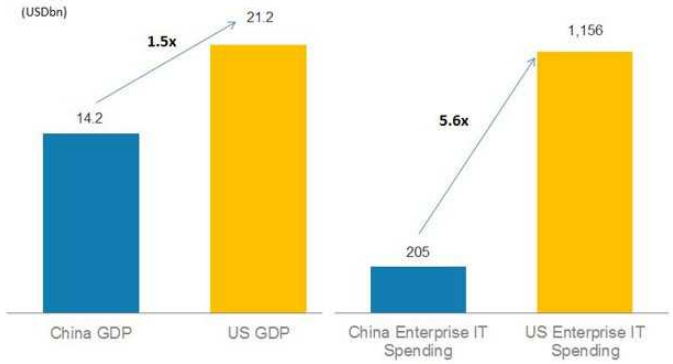
China is becoming more important to end demand

We think the mismatch between US cloud capex growth and Aspeed's revenue growth is due to stronger cloud demand in China. We adopt the same approach to analyze China's demand and the cycle.

1. The industry trend: We see considerable potential for IT spending in China, which has tended to underinvest in enterprise IT. Video resolution continues to trend higher, with more live streaming applications. The China online gaming market was reaccelerating from 2019 and public cloud adoption remains low at 16% in 2020e.

Exhibit 11:

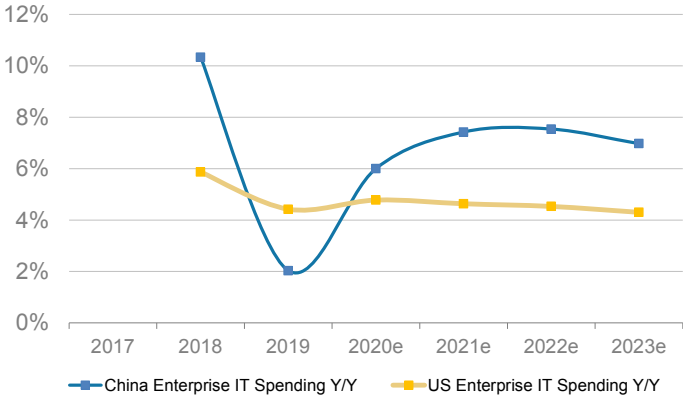
US enterprise IT spending was 5.1x higher than China's in 2018 despite the small gap in GDP (1.6x) between the two countries, implying considerable potential for IT spending in China...



Source: Gartner, Morgan Stanley Research

Exhibit 12:

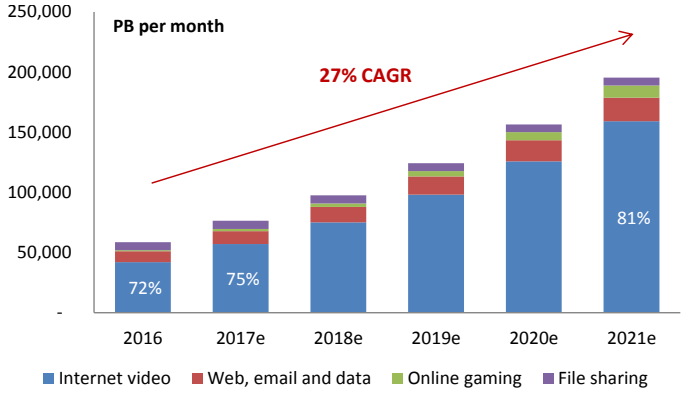
China's IT spending growth will outgrow the US in the next three years



Source: Gartner

Exhibit 13:

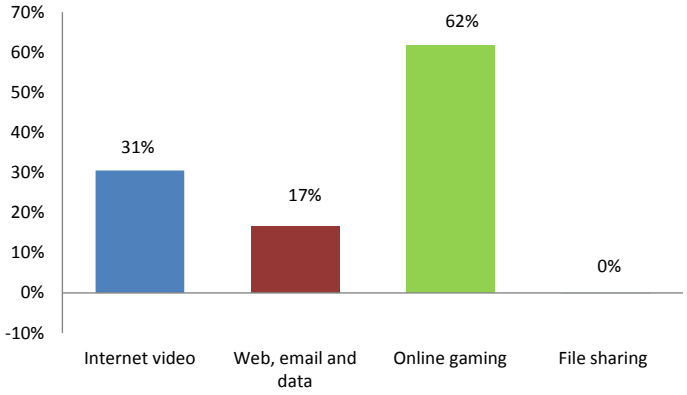
Consumer internet traffic to grow at a 27% CAGR



Source: Cisco

Exhibit 14:

Consumer internet traffic growth by segment (CAGR, 2016-21)



Source: Cisco

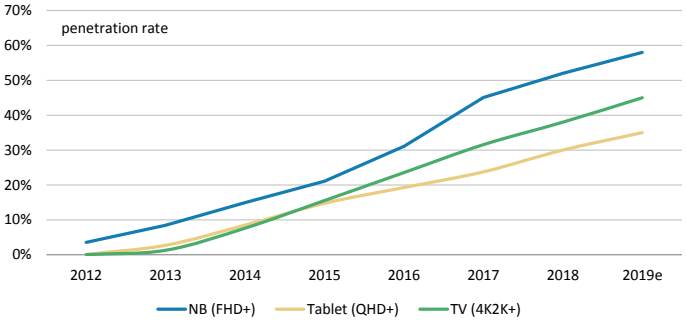
Exhibit 15:

Online video being offered at higher resolutions

Source: Youtube

Exhibit 16:

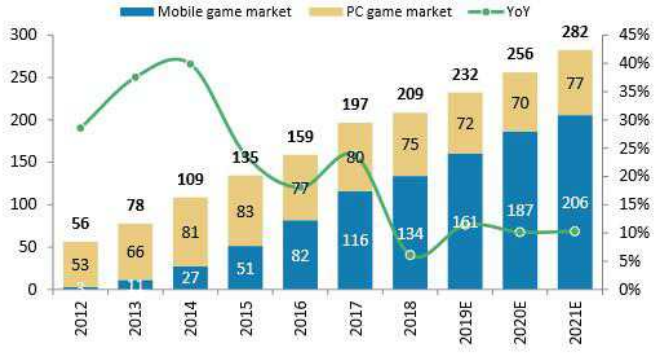
Display resolutions are trending higher



Source: IHS, Morgan Stanley Research estimates

Exhibit 17:

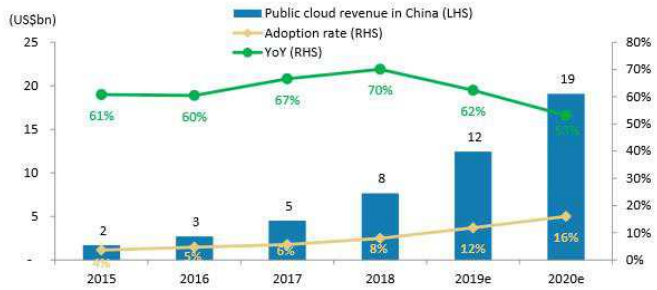
Online game market: China reaccelerated in 2019



Source: GPC, IDC, CNG, Morgan Stanley Research estimates

Exhibit 18:

We forecast China's public cloud market to grow 53% in 2020, representing a 16% adoption rate in 2020e (from 8% in 2018)...



Source: Gartner, IDC, Morgan Stanley Research estimates

2. The government's support: The Chinese government announced a "datacenter buildup" as a key focus of the new investment plan on March 4. We estimate overall investment in the next ten years could trend up to US$57bn annually from US$41bn in the past three years. We believe tax incentives and R&D will be needed for incremental upfront investment.

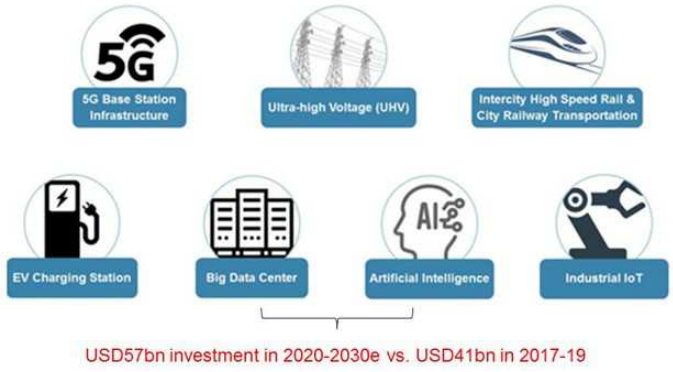
3. Top-down approach by looking at cloud capex: We look at annual cloud capex growth in China (from Alibaba, Tencent and Baidu). After hitting single-digit growth in 2012, China's cloud capex growth stayed above 20% annually in 2013-18. The 2019 downturn was mainly driven by slowdowns at Tencent and Baidu. However, we noticed that on a quarterly basis, Tencent's capex indeed bottomed out from 1Q19, turned positive in 3Q19 and hit 93% Y/Y in 4Q19. We also believe some private companies could already be big enough vs. Baidu. With Tencent's growth and incremental capex coming from another large player, we think annual China cloud capex could regain significant growth momentum from 2020.

4. Bottom-up analysis from key cloud semis supplier: We use Aspeed's BMC shipments in our bottom-up analysis. Despite the US also showing recovery, the strongest growth in absolute terms is coming from a Chinese customer, Inspur. Inspur is the key server supplier to BAT and government projects. We believe Huawei also showed stronger growth from 2H19 based on our channel checks (Hisilicon is the supplier for Huawei).

We thus believe China's cloud capex is still in an expansionary stage and could outgrow US cloud capex in the coming years.

Exhibit 19:

China's new infrastructure investment plan



Source: Morgan Stanley Research estimates

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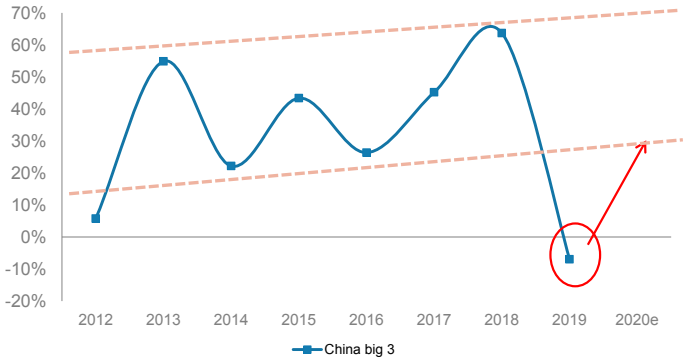
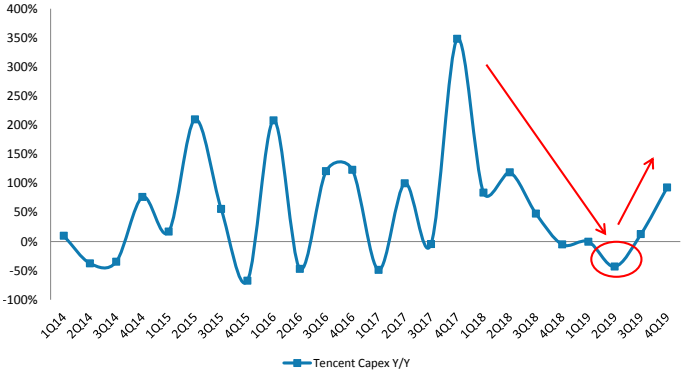
We think China's cloud capex has hit bottom, and we estimate a 20% plus CAGR in the next three years



Source: Company data; China's big 3 capex is from Tencent, Alibaba and Baidu; Tencent/Alibaba capex is based on operating capex

Exhibit 21:

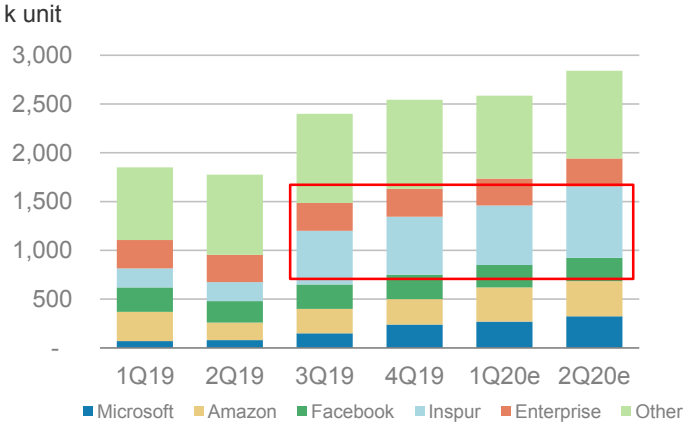
Tencent's cloud capex showed a significant slowdown in 1H19, down >40% Y/Y in 2Q19, but picked from 3Q19 and hit >90% Y/Y in 4Q19



Source: Company data

Exhibit 22:

Aspeed: Quarterly BMC shipments mix – Inspur accounts for a larger portion now



Source: Company data, Morgan Stanley Research estimates

Which stocks are the best plays on China's cloud strength? We look at stocks that fit the following themes:

1. Technology upgrades

In the past, CPUs have been the biggest factor affecting the performance and speed of datacenters. However, if there are bandwidth limitations, even the most powerful CPU cannot deal with increasing data traffic. To achieve faster networking speeds, then, a more diverse range of companies needs to work together, including semiconductor manufacturers, hardware players, and telecom operators. Semiconductor companies, for example, need to come out with more switch ICs to deal with internet traffic.

However, CPUs are approaching certain limits as their computing power cannot fully match the requirements of big data analysis. As a result, GPUs have emerged as an alternative to be used in parallel computing for AI training. Networking speeds continue to rise but data transmission within the system has reached a limit. This implies that interfaces in the system also need to be upgraded to speed up the whole datacenter. Both I/O and communications interfaces need to be upgraded.

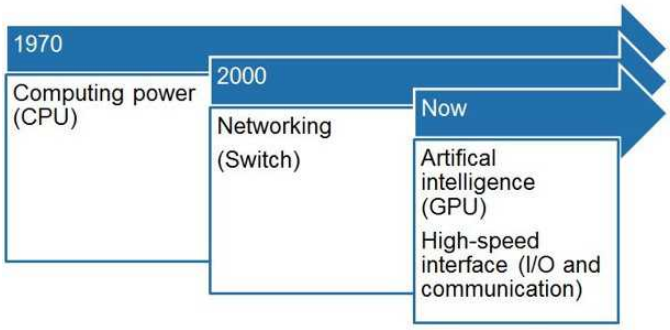
2. Semi localization in China

Localizing datacenter semiconductors is a tough task because of the high technology entry barriers. For example, Hisilicon has introduced its own CPU for Huawei servers, and government also wants to fully support it and increase the penetration. But given the performance gap with Intel, the pace of increasing penetration will be gradual. The power management IC sector is also dominated by foreign companies like Infineon and TI.

However, high-speed interfaces are now presenting great opportunities for Greater China semi companies. Right now most high-speed interface chips are still dominated by US companies. However, we believe the performance gap between Greater China semis and their US peers is small. Some companies in Asia have even better design capabilities than US companies. Huawei, Inspur, and Dawning account for 20-30% of global server demand and offer significant opportunities for Greater China semi companies.

Exhibit 23:

Spec upgrades in datacenters



Source: Morgan Stanley Research

Exhibit 24:

China semi localization in different areas

Product	US vendors	China local vendors	Other Asia vendors	Major foundry
Power Amplifiers	Qorvo, Skyworks	HiSilicon	Richwave, Murata	WIN Semi
Analog Digital Coverters	ADI, TI	HiSilicon		TSMC
Power IC	TI	Silergy, SG Micro, Will Semi		UMC, TSMC
CMOS Image Sensor	ON Semi	Will Semi, GalaxyCore		TSMC, SMIC, HLMC
FPGA/ASIC	Xilinx	HiSiliocn , Guoxin	GUC	TSMC, SMIC
Networking chip	Broadcom	HiSilicon		TSMC, SMIC
Smarphone processor	Qualcomm	HiSilicon	MediaTek	TSMC
Server DRAM interface	IDT, Rambus	Montage		TSMC
CPU	Intel, AMD	HiSilicon, Loongson, Phytium	Via Technology	TSMC
MCU	Microchip	GigaDevice		UMC, TSMC
DRAM/NAND/NOR	Micron	YMTC, Innotron, GigaDevice	Phsion, Nanya Tech	SMIC, XMC
LCD driver IC/FP sensor	Synaptics	Goodix	Novatek, Egis	TSMC, UMC, SMIC
Other high-speed interface	TI, Avago, Pericom, IDT	Analogix	Asmedia, Parade	TSMC, UMC

Source: Morgan Stanley Research

3. High exposure to China cloud – The indirect benefit from customers' China localization

We also think the companies with high exposure to the China cloud could benefit from China's cloud capex strength. We believe BAT and other Chinese enterprises will adopt more servers from domestic brands. This will result in indirect market share gains for cloud semi vendors. For example, Aspeed is currently not a supplier to Dell and HP. If Inspur could gain more market share from Dell in China, it would suggest Aspeed could have some room for further share gains.

In its latest earnings call, Dell management attributed weak server sales to continued weakness in China, as well as soft demand from the large enterprise segment in the US and EMEA. Additionally, during the F3Q call in November, the company acknowledged China server weakness was also partially attributable to lost server share to local vendors as Dell balances profitability and growth in the China market.

Which semi stocks are the best proxies? We think Montage is the best proxy while ASMedia is the emerging play.

Montage Technology (OW; Rmb100 PT). Please refer to our initiation report published today, Montage Technology: Refreshing the China Cloud. We view the company as the best proxy for the three important trends in the datacenter space (spec upgrades, China semi localization, customer market share gains in China). The company is a Chinese IC design house and an industry leader in high-speed interfaces for DRAM servers. The company is competing with US peers and we expect it to take more market share in China. Also, after the DRAM interface migrates to DDR5 from the current DDR4, the ASP will be lifted given the 50% to 100% faster speed. Given the ongoing growth of cloud demand, we think the company could trade up to 65x our 2021 EPS estimate. We believe the total addressable market for DRAM interfaces is US$1.2bn for Montage vs. its 2019 revenue of US$250mn.

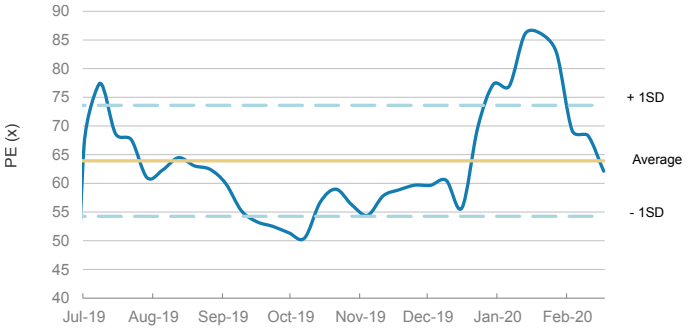
ASMedia (OW; NT$1,069 PT): The company meets two of our three criteria (spec upgrades, China semi localization). It is gaining share in Chinese server brands, including Huawei, Inspur, and Dawning. After the PCI-E interface migrates to gen 4, the company's packet switch ASP could be lifted by 50%. We estimate the incremental TAM for ASMedia is US$1.5bn vs. current revenue of US$400mn. We expect the stock to trade up to 37x our 2020 EPS estimate thanks to close to 80% EPS growth in 2020.

Parade (OW; NT$777 PT): Although the company has only a small exposure to cloud and is not the key beneficiary of China semi localization, it is starting from a low base and could benefit from spec upgrades. We believe Parade has the potential to become the datacenter leader for PCI-E Gen 4 re-timers.

Aspeed (EW; NT$999 PT): We believe the company can benefit from market share gains by Chinese server brands during the country's strong cloud capex cycle. However, expectations for the stock are already high. We thus stay EW and may consider turning more positive once the market's expectations cool down. Please refer to our note: Aspeed Technology: Cloud semis: A potential order cut in 2Q? (9 Mar 2020).

Exhibit 25:

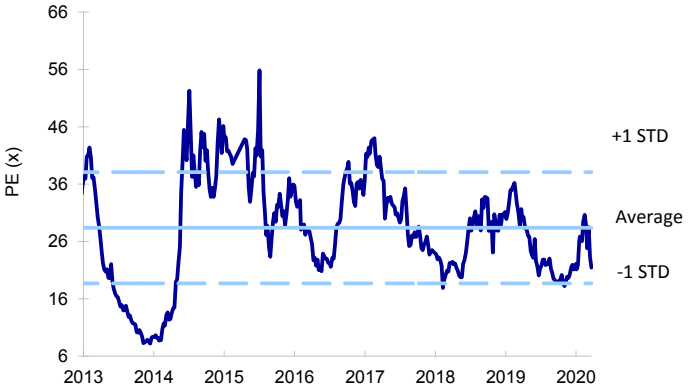
Montage Technology: In the middle of its historical trading range



Source: Company data, Morgan Stanley Research estimates

Exhibit 26:

ASMedia: In the mid to low end of its historical trading range



Source: Company data, Morgan Stanley Research estimates

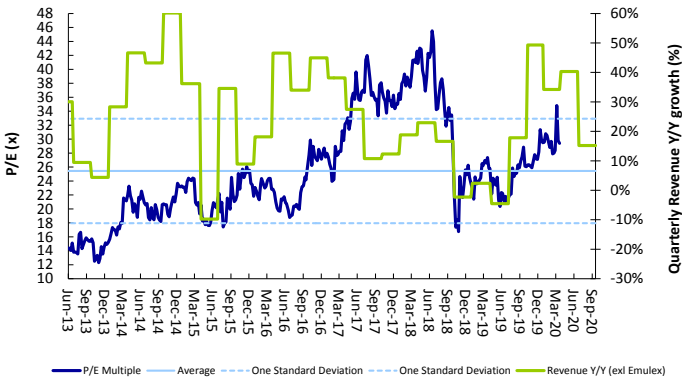
Exhibit 27:

Parade: At the middle of the historical trading band; Share price will re-rate on the datacenter story

Source: Company data, Morgan Stanley Research estimates

Exhibit 28:

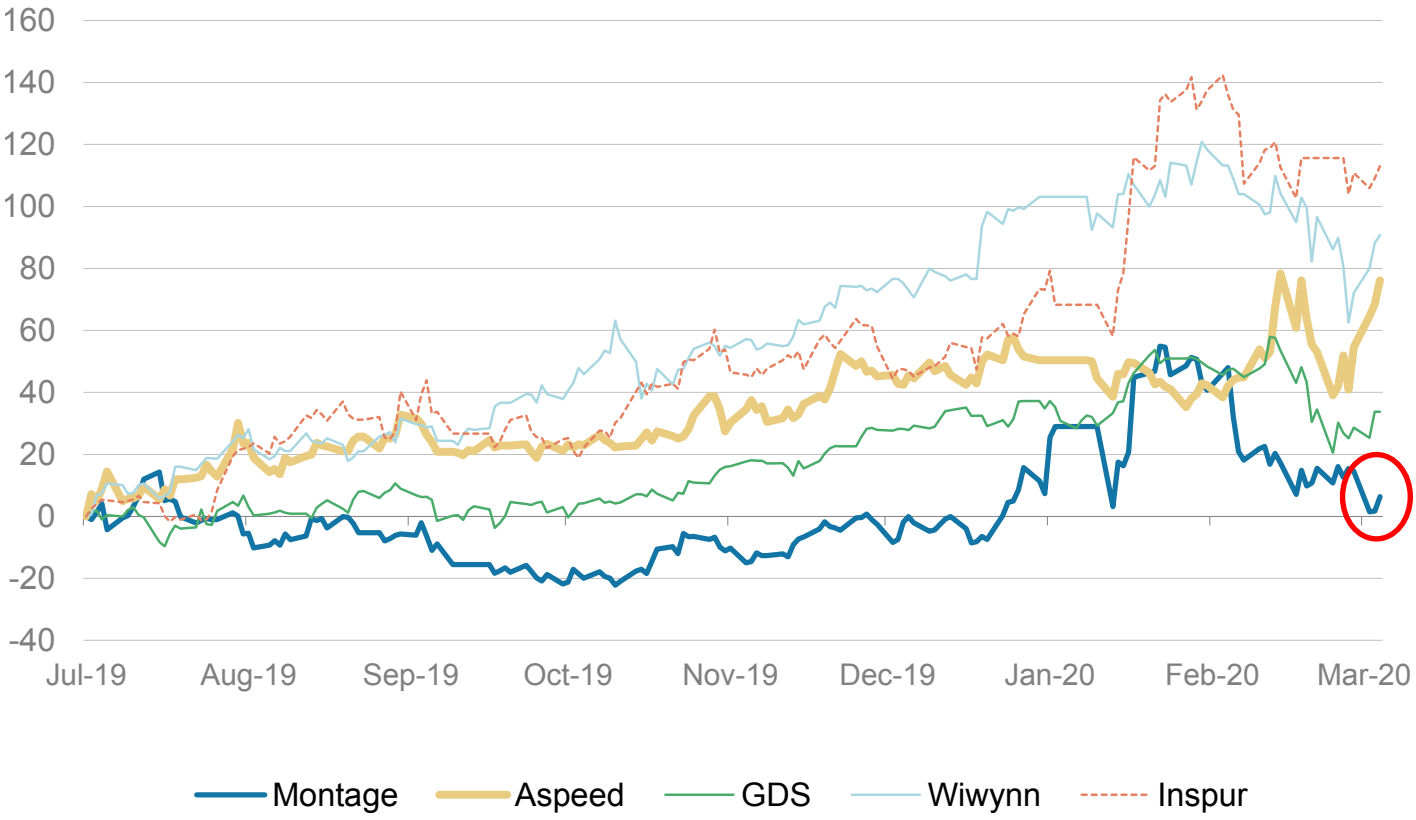
Aspeed: At the mid to high end of its historical trading range



Source: Company data, Morgan Stanley Research estimates

Exhibit 29:

Share price performance for high cloud exposure companies in Asia – Montage is still underappreciated by the market



Source: Thomson Reuters

Exhibit 30:

Global cloud preference table

	Montage 688008.SS	FII 601138.SS	Asmedia 5269.TW	Parade 4966.TWO	Seagate STX.O	Wiwynn 6669.TW	Intel INTC.O	GDS GDS.O	Hoya 7741.T	Aspeed 5274.TWO
Rating	Overweight	Overweight	Overweight	Overweight	Overweight	Overweight	Overweight	Overweight	Equal-Weight	Equal-Weight
Trading Currency	CNY	CNY	TWD	TWD	USD	TWD	USD	USD	JPY	TWD
Price Target	**100.0**	**20.0**	**1,069.00**	**777.0**	**56.0**	**840.0**	**61.0**	**60.0**	**10,000.0**	**999.0**
Current Price	76.2	13.0	698.00	598.0	43.5	668.0	52.4	53.5	8,234.0	1,100.0
Upside/(Downside) (%)	31%	54%	53%	30%	29%	26%	16%	12%	21%	-9%
Market Cap (in USD mm)	11,301.0	36,316.8	1,389.4	1,592.6	11,472.9	3,865.0	237,383.3	7,902.7	27,822.1	1,241.6
Avg Daily Traded Vol (in USD mm)	85.0	135.9	17.3	11.6	144.8	28.9	1,246.2	41.6	93.9	9.1
Street View: Ratings										
Buy/Overweight	57%	76%	71%	83%	30%	73%	32%	85%	64%	79%
Hold/Equal-weight	14%	24%	14%	17%	48%	27%	48%	15%	36%	21%
Sell/Underweight	29%	0%	14%	0%	22%	0%	20%	0%	0%	0%
Bull Case Value	120.0	28.6	1,220.00	877.0	66.0	1,070.0	77.0	80.0	12,000.0	1,349.0
Upside (%)	57%	120%	75%	47%	52%	60%	47%	50%	46%	23%
Bear Case Value	40.0	10.9	560.00	402.0	35.0	500.0	36.0	30.0	8,500.0	599.0
Downside (%)	-48%	-16%	-20%	-33%	-20%	-25%	-31%	-44%	3%	-46%
Morgan Stanley Estimates										
FY19e	CNY	CNY	TWD	TWD	USD	TWD	USD	CNY	JPY	TWD
Sales	1,738	402,842	3,746.1	11,811	10,391	163,600	71,965	4,122	589,731	2,484
EBITDA	978	19,975	1,299.8	2,498	2,080	7,973	34,578	1,622	190,768	1,030
EBIT	943	17,546	1,169.2	2,398	1,539	7,919	23,752	480	155,765	1,008
EPS	0.88	0.82	16.08	30.60	4.82	34.88	4.87	(3.32)	335.02	24.39
FY20e										
Sales	2,655	400,726	5,619.5	12,909	10,405	206,309	72,899	5,748	625,103	3,134
EBITDA	1,560	20,910	2,211.8	2,979	2,023	11,186	32,243	2,411	216,814	1,354
EBIT	1,515	18,170	2,071.2	2,877	1,526	10,829	24,043	910	172,433	1,354
EPS	1.24	0.81	28.85	34.92	4.94	48.80	4.88	(1.30)	383.41	32.16
Valuation Multiples at Last Close										
FY19e										
P/E	86.6x	15.8x	43.4x	19.5x	9.0x	19.1x	10.8x	-113.9x	24.6x	45.1x
EV/EBIT	72.8x	17.9x	32.1x	17.8x	9.7x	14.3x	12.3x	129.6x	17.9x	30.9x
EV/EBITDA	70.2x	15.7x	28.9x	17.1x	7.1x	14.2x	8.4x	38.4x	14.6x	30.3x
EV/Sales	39.5x	0.8x	10.0x	3.6x	1.4x	0.7x	4.1x	15.1x	4.7x	12.6x
FCF Yield	1.3%	2.5%	2.8%	4.1%	9.0%	6.4%	7.8%	-8.1%	2.7%	2.5%
FY20e										
P/E	61.2x	16.1x	24.2x	17.1x	8.8x	13.7x	10.7x	-291.7x	21.5x	34.2x
EV/EBIT	48.2x	10.7x	19.0x	13.7x	8.8x	10.8x	10.2x	78.2x	15.9x	26.4x
EV/EBITDA	46.8x	9.3x	17.8x	13.3x	6.6x	10.5x	7.6x	29.5x	12.6x	26.4x
EV/Sales	27.5x	0.5x	7.0x	3.1x	1.3x	0.6x	3.4x	12.4x	4.4x	11.4x
FCF Yield	1.6%	4.0%	3.3%	5.2%	10.8%	4.3%	6.6%	-10.9%	4.4%	2.9%

Source: Company data, Morgan Stanley Research estimates. Closing share prices as of March 24, 2020.

Read-across to the supply chain

China datacenter construction/ software

GDS (GDS.O, OW, covered by Yang Liu): China datacenter operators see strong demand from cloud customers in 2020 after a muted 2019. GDS, the leading player in China, which is mainly exposed to hyperscalers, plans to add 100k sqm of datacenter IT areas in 2020, equivalent to 40k cabinets, which is 25% higher than the 2019 and 2018 levels, driven by strong demand. This does not even include demand in remote areas, which GDS addresses via its JV with GIC. Other datacenter vendors such as VNET and AtHub also expect to accelerate their capacity delivery in 2020 given the big procurement plan indication from leading cloud vendors, and they set higher capex for that.

Datacenter hardware

Foxconn Industrial Internet (601138.SS, OW, covered by Sharon Shih): We believe FII's cloud offering (server + storage) will outgrow the global market TAM (2020 +5.5% Y/Y) in view of market share gains among existing US clients (Amazon, Microsoft) and strong momentum among new China clients (e.g., JD, Alibaba). Enhanced partnerships with key account clients also offer long-term business potential, such as working on a liquid-cooling datacenter project with Alibaba and teaming up with Microsoft on its next-generation cloud hardware design.

What are the implications for the big cap names in Asia?

TSMC (2330.TW, OW, covered by Charlie Chan): We estimate that cloud semis accounted for 10-15% of TSMC's 2019 revenue. Its key customers in cloud semis include Avago and Xilinx in data communication chips, Marvell for storage controller ICs, AMD/Cavium for niche server CPUs, and NVIDIA for AI GPUs. Montage, ASMedia, and Aspeed use TSMC to produce their chips. We think stronger China cloud semi demand is a positive for TSMC's HPC (high performance computing) segment. We keep our forecasts and OW rating but remain aware of Apple's inventory management, as we highlighted in our recent report: TSMC: Apple started to manage semi inventory in foundry supply chain (24 Mar 2020).

Samsung (005930.KS, OW, covered by Shawn Kim): Samsung is one of the largest suppliers of memory chips to datacenters globally and stands out from memory peers with a dominant market share (44% DRAM, 35% NAND), best-in-class technology (memory, logic, display, mobile, consumer electronics), and a solid track record on execution. Server DRAM and hyperscaler NAND demand has shown material acceleration entering 1Q20, driven by US and China cloud customers. It has a solid balance sheet (US$80bn net cash as of 4Q19) which enable the company to accelerate growth if needed, and liquidity safety in the current volatile macro environment with scope for special returns. Historically, Samsung has performed well in times of heightened uncertainty and valuations already reflect extreme outcomes. The stock is down 32% from the peak while outperforming KOSPI throughout and should be driven by long-term structural trends such as 5G and outsized cloud/datacenter exposure, which should remain a growth engine under most scenarios. Valuation appears undemanding at 1.1x trailing PB, 2.5x NTM EV/EBITDA and 9x NTM PE, even if short-term belt-tightening emerges among customers.

HOYA (7741.T, EW, covered by Kazuo Yoshikawa): HOYA supplies 3.5-inch glass disks for Seagate's nearline HDDs. We expect HOYA to benefit from China's cloud capex expansion, as Seagate now dominates 16TB nearline HDDs. If other HDD makers face technological difficulties to ramp MAMR or other technologies using aluminum disks, they may consider adopting HOYA's glass disks as well.

US semi and IT hardware

Seagate (STX.O, OW, covered by Katy Huberty): Seagate supplies nearline HDDs for storage in hyperscale cloud datacenters. Infrastructure demand from cloud service providers continues to be an area of upside surprise, despite Covid-19 disruption in traditional enterprise infrastructure demand. Earlier this month TSR published data showing a significant increase in nearline HDD production in January with 56% Y/Y growth, up from 18% in December and 12% in November. January also reflected the highest level of nearline unit production on record with 6.28mn drives, 8% higher than the prior peak in August 2018. Lastly, sustained demand from Chinese datacenters building out capacity is a positive for the company given its 40% market share of nearline HDD revenue. Historically, Seagate shares have been among the most correlated to cloud capex spending cycles and we see the company positioned to take market share with its 16TB HDD (near-term) and HAMR technology (longer-term).

What about memory stocks?

Strong demand from Chinese datacenters will be a longer-term positive for memory stocks. In the near term, we are seeing strong demand from datacenters driving upward order revision. We thus expect to see stronger price hikes in 2Q. Price hikes into 2Q20 are secure and the server DRAM supply shortage has become more severe due to (i) Covid-19 driving stronger cloud and PC demand from both the US and China, (ii) depleted producer inventory, and (iii) mobile customers being unwilling to reduce orders on concerns over future supply allocation – this is driving 0-5% price hikes in mobile DRAM in Q2. NAND prices are also moving +10% higher in Q2 on cloud data storage demand. We see a mild risk of memory capex reducing/pushed out near term as a result, especially for DRAM. We continue to like Samsung (covered by Shawn Kim), and Micron (covered by Joseph Moore). Please refer to Shawn Kim's update on the memory space Asia Technology: Memory Recessions – Similar But Different (24 Mar 2020).

Exhibit 31:

Companies under coverage that are most exposed to datacenter infrastructure

	Ticker	Rating	Share price (Local currency)
US IT Hardware			
Analyst: Katy Huberty			
Seagate	STX.O	Overweight	43.46
US Semiconductor			
Analyst: Joseph Moore, Craig Hettenbach			
Intel	INTC.O	Overweight	52.40
Xilinx	XLNX.O	Overweight	76.91
NVidia	NVDA.O	Overweight	249.18
Broadcom	AVGO.O	Overweight	212.76
Inphi	IPHI.N	Equal-Weight	71.17
Marvell	MRVL.O	Equal-Weight	21.86
Infinera Corp	INFN.O	Equal-Weight	4.80
US Communications system			
Analyst: Meta Marshall			
Ciena Corporation	CIEN.N	Overweight	38.87
Arista	ANET.N	Equal-Weight	186.56
Cisco	CSCO.O	Equal-Weight	38.60
F5 Networks	FFIV.O	Equal-Weight	102.71
Juniper	JNPR.N	Underweight	19.45
Korea Technology			
Analyst: Shawn Kim			
Samsung Electronics	005930.KS	Overweight	46,950.00
Greater China Semiconductor			
Analyst: Charlie Chan			
TSMC	2330.TW	Overweight	267.50
Silicon Motion	SIMO.O	Equal-Weight	34.06
Analyst: Daniel Yen			
Montage	688008.SS	Overweight	76.00
Asmedia	5269.TW	Overweight	698.00
Parade	4966.TWO	Overweight	598.00
Aspeed	5274.TWO	Equal-Weight	1,100.00
Greater China IT Hardware			
Analyst: Sharon Shih			
Foxconn Industrial	601138.SS	Overweight	13.02
Landmark	3081.TWO	Underweight	256.00
Analyst: Howard Kao			
Wiwynn	6669.TW	Overweight	668.00
Quanta	2382.TW	Overweight	57.30
Inspur	000977.SZ	Equal-Weight	39.25
Wistron	3231.TW	Equal-Weight	21.10
China Software/Datacenter construction			
Analyst: Yang Liu			
GDS	GDS.O	Overweight	53.51 USD
21Vianet	VNET.O	Overweight	13.00 USD
Shanghai AtHub	603881.SS	Equal-Weight	54.31

Source: Morgan Stanley Research, Thomson Reuters. Closing share prices as of March 24, 2020.

Debate #1: Will China become a more crucial cloud driver? Which stock is the best play?

Market view: No, the US is still the most important. The market thinks the cloud recovery from 2H19 is mainly being driven by the US and US cloud will continue to lead growth.

Our view: Yes, China is getting more important. We think China will become more important given the higher growth rate onwards. Montage is the best proxy in semis, while ASMedia is an emerging play.

Where we could be wrong: The macro environment slows down significantly.

Metrics to monitor: Data traffic growth and sales growth from new hyperscalers.

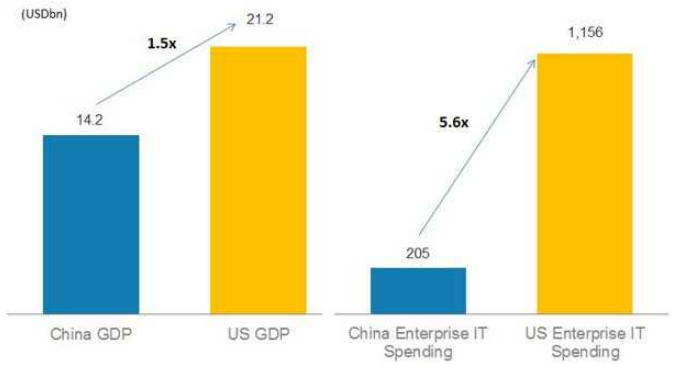
Conclusion

We think China cloud capex will become a more crucial driver in the future. We estimate that China's cloud capex could grow by more than 20% annually in the next three years vs. a global growth rate of 20% or slightly lower annually. We thus think there could be opportunities for greater China semi stocks which have higher exposure to Chinese datacenter construction.

We believe Montage Technology is the best play on China's strength in cloud semis, while ASMedia's share price is still being underappreciated by the market.

Exhibit 32:

IT spending comparison – China has significant room to catch up



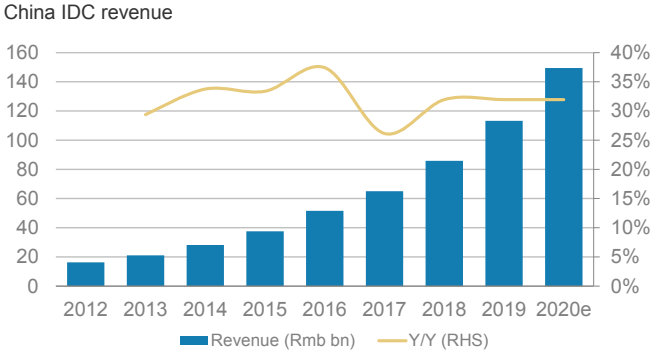
Source: Gartner, Morgan Stanley Research

A broader view of China cloud capex – outgrowing global cloud capex, driven by higher IT spending and stronger IDC revenue growth

US enterprise IT spending was 5.1x higher than China's in 2019 despite a relatively small gap in GDP (1.6x) between the two countries, implying considerable potential for IT spending in China. According to CAICT, China's IDT revenue CAGR is running at around 30% in 2015-20 vs. a global growth rate of 10-15%. This suggests the incremental data traffic from China is growing faster than the US. Five years ago, China's BAT – Baidu, Alibaba, Tencent – accounted for only 15% of the big seven's hyperscaler capex. However, we estimate this could increase to around 30% in 2020 thanks to stronger growth.

Exhibit 33:

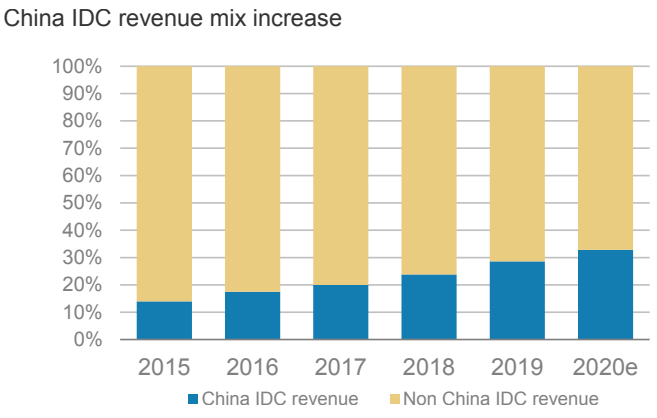
China IDC revenue: A 30% CAGR in 2015-20, higher than the global rate of 10-15%



Source: CAICT

Exhibit 34:

China IDC revenue mix to increase to more than 20% from 15% within three years



Source: CAICT

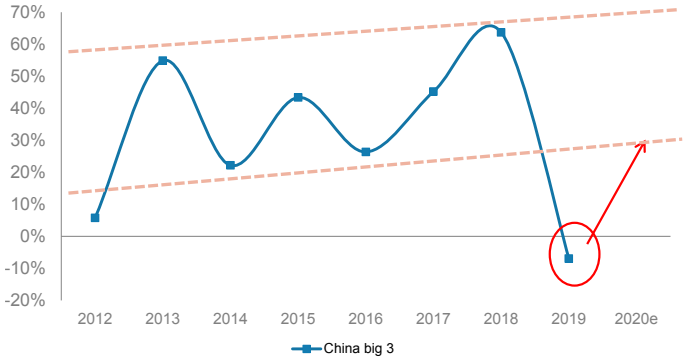
The China cloud capex recovery led by Tencent; Inspur is the key server supplier

Global cloud demand started to recover from 2H19 and the market believed it was only led by US hyperscalers. However, if we look at the 4Q19 capex from US hyperscalers, only Amazon showed positive growth, at 40-45% Y/Y – in fact the capex growth rate in 4Q19 was the lowest since 2016. On the other hand, we have started to see a meaningful recovery from China as Tencent's quarterly capex turned positive from 3Q19 in Y/Y terms and hit over 90% Y/Y in 4Q19. Although Baidu is on the downward trend, we think another large player will become bigger to offer incremental capex growth.

We also use Aspeed's BMC shipments in our bottom-up analysis. Despite the US also showing recovery, the strongest growth in absolute terms is coming from a Chinese customer (Inspur). Inspur is the key server supplier to BAT and government projects. We believe Huawei also showed stronger growth from 2H19 based on our channel checks (Hisilicon is the supplier for Huawei).

Exhibit 35:

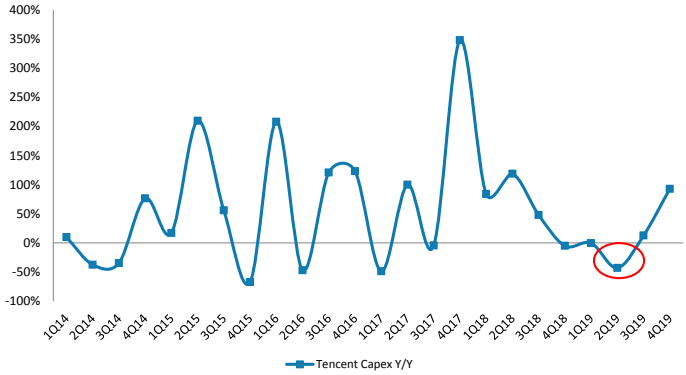
China's annual cloud capex hit negative territory in 2019 due to the weak 1H



Source: Company data

Exhibit 36:

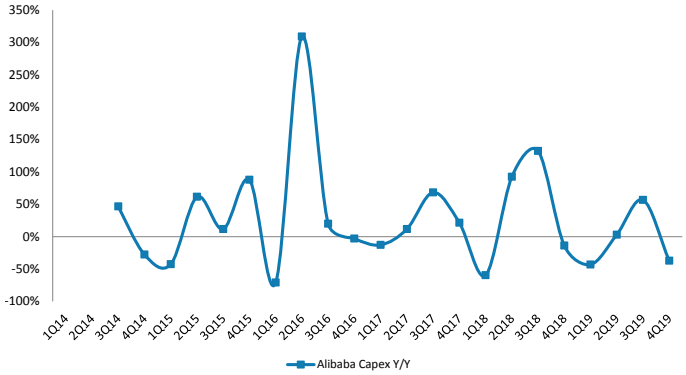
Tencent's quarterly operating capex growth picked up strongly from 3Q19 and hit more than 90% Y/Y growth in 4Q



Source: Company data, based on the operating capex

Exhibit 37:

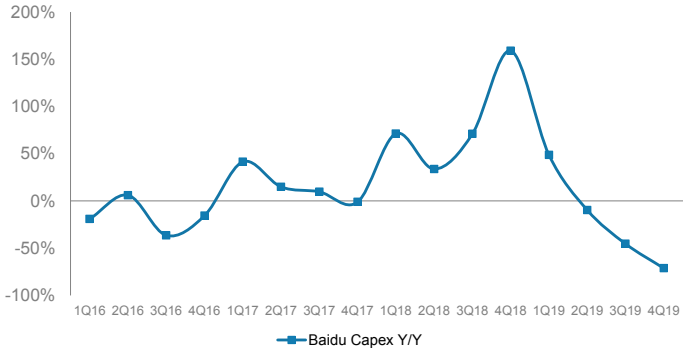
Alibaba's quarterly Y/Y operating capex growth



Source: Company data, based on the operating capex

Exhibit 38:

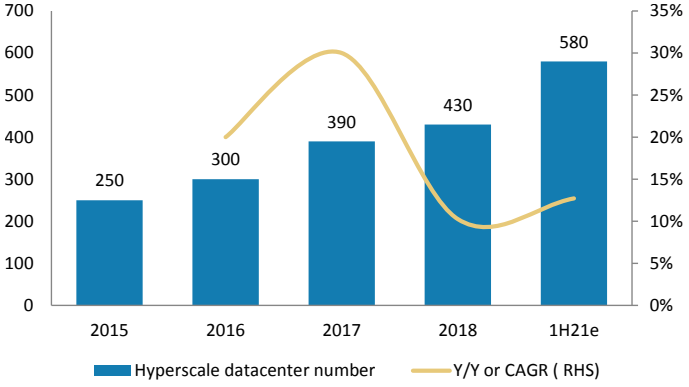
Baidu's quarterly Y/Y capex growth – capex likely to enter a downtrend



Source: Company data,

Exhibit 39:

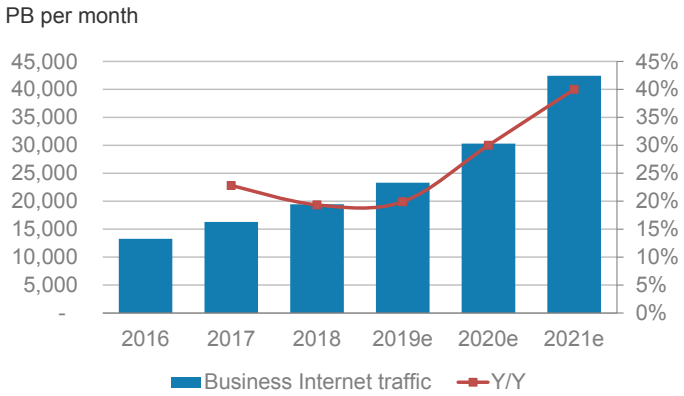
Global hyperscale datacenter numbers – growth rate will rise again but then normalize



Source: Company data, Morgan Stanley Research estimates

Exhibit 40:

Global business Internet traffic



Source: Cisco, Morgan Stanley Research estimates

Government support matters – The coronavirus issue further accelerates China's digital infrastructure plan

We believe the Covid-19 outbreak will push accelerated growth in China cloud demand as everything from high-speed rail to smart cities to industrial IoT is digitalized. According to Tencent, the outbreak first affects the online habits of users (online channels for teaching, learning and receiving medical advice) and could then boost Internet demand in traditional industries.

Internet traffic globally has been mainly driven by consumer traffic (consumers are 80% of the mix with a higher CAGR of close to 30%, compared with business traffic at 20% of the mix and a 20% CAGR). We think China's effort to digitalize everything (particularly in light of Covid-19), we believe business Internet traffic could grow by close to 40% in 2021.

New infrastructure opportunities (contributed by Yang Liu)

China is eyeing new infrastructure projects to mitigate the economic impact of Covid-19 and tackle its big city problems. Datacenter construction is a focus area. In 2020-30, we project that China will add 8mn datacenter cabinets, 3x the existing capacity as of end-2019. Fast-rising data computing, transmission, and storage volume, along with the higher level of IT outsourcing, are the key fundamental drivers of the secular growth. Adoption and expansion of both public cloud (cloud vendors) and private cloud (large enterprises or government) will contribute to the growth.

We estimate that total capex related to datacenters will be US$626bn in 2020-30 (on average US$57bn per year). Of this, US$135bn will be made by telcos and carrier-neutral datacenter operators for infrastructure investment, and US$491bn will be made by enterprises or cloud vendors for datacenter systems, mainly servers and network equipment.

For infrastructure-related capex, we believe carrier-neutral IDC vendors will outgrow telcos in the datacenter field, and make roughly 60% of the infrastructure investments (US$80bn in 2020-30). The state-owned telcos will make up the remaining 40% (US$55bn in 2020-30).

For equipment capex, the split between the public and private sectors should be more skewed to the latter (30% public sector – US$147bn, and 70% private sector – US$344bn) compared with China's overall FAI (where public investment accounts for 36%).

According to GDS, though it is still in the early stage of policy discussion, management thinks it is possible to see some supportive policy in the following fields: 1) release slightly more carbon quotas in tier one markets, 2) better funding support, 3) lower tariffs, 4) shut down inefficient small/in-house datacenters and migrate to green, professional and hyperscale datacenters.

Exhibit 41:

Government policy on IDC supply

City	Regulation	Regulator	Time	Details
Beijing	List of prohibitions and restrictions on new industries in Beijing	Municipal Bureau of Economy and Information Technology	26-Sep-18	In Beijing city: Prohibit building new data centers or expanding capacity for data centers with PUE>1.4 In Beijing central urban area: Prohibit building any new data centers or expanding capacity for data centers
Shanghai	Shanghai Information Infrastructure Construction Three-year Plan 2018-20	Municipal Bureau of Economy and Information Technology	29-Oct-18	In Shanghai city: New cabinets no more than 60K by end of 2020; and total number of cabinets less than 160K New IDC PUE should be <1.3; existing IDC PUE should be <1.4
Shenzhen	Notification about Reviewing Data Center Energy Consumption	Shenzhen Development and Reform Commission	15-Apr-19	Required to IDC vendors improve the energy management system and promote upgrade and renovation of old data centers. At the same time, at the policy level, data centers with PUE below 1.4 will be given energy consumption support
Beijing	Catalogue for Guiding Industrial Restructuring (2019)	China Development and Reform Commission	9-Nov-19	Reclassified IDC, cloud computing and IT service into encouraged industries since Jan 2020, guiding more favorable policy environment for them

Source: Morgan Stanley research

Exhibit 42:

Network requirement for different cloud applications

Cloud Application Level	Upload	Download	Latency	Example
Basic	250kbps	750kbps	>160ms	Online video and music, text communication, web phone calls, web conferencing, website browsing
Medium	251-1000kbps	751-2500kbps	100-159ms	ERP, CRM, AR/VR gaming, Electronic health records, VoLTE<, HD online video streaming
High	>1000kbps	>2500kbps	<100ms	Remote surgery, HD web conferencing, High frequency stock trading, automotive networks

Source: Cisco

How should we play China's datacenter strength within cloud semis? We look at three criteria:

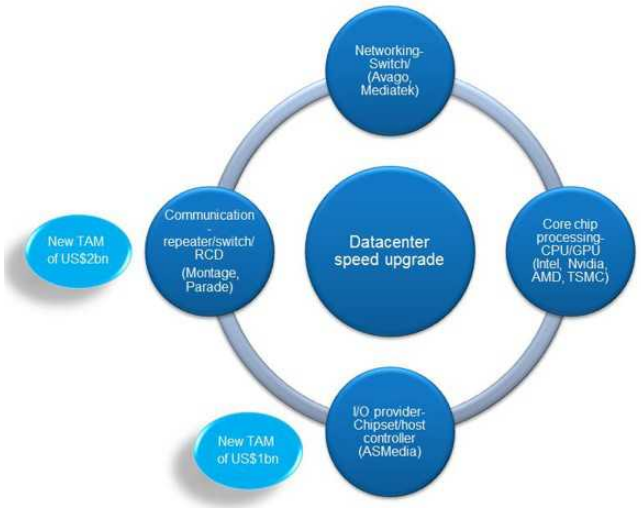
1. Technology upgrades

We believe CPUs, networking and high-speed interfaces will need technology upgrades in the future. CPUs and networking chips are currently mainly dominated by US vendors. However, we see opportunities for Greater China semi companies in high-speed interfaces. Right now most of the high-speed interface chips are still dominated by US companies but we believe the performance gap between Greater China peers and US peers is small. Some companies in Asia have even better design capabilities than their US counterparts.

We estimate the TAM for high-speed interface chips could reach US$3bn, which is small for US vendors but big enough for Asian vendors to see growth (Montage's total revenue was US$250mn in 2019, with Parade at US$380mn and ASMedia at US$120mn).

Exhibit 43:

Datacenter spec upgrades



Source: Morgan Stanley Research

2. China semi localization

China semiconductor localization in datacenters is a tough task because of higher technology entry barriers. For example, Hisilicon has introduced its own CPU for Huawei servers, but given the performance gap with Intel and AMD, penetration remains low. Power management ICs are also dominated by foreign companies like Infineon and TI.

However, if we look at server market share for Chinese brands, Huawei, Inspur, and Dawning account for 20-30% of global server demand. If Asian companies can provide competitive products, there would be great opportunities for these semi companies.

3. High exposure to Chinese datacenter demand

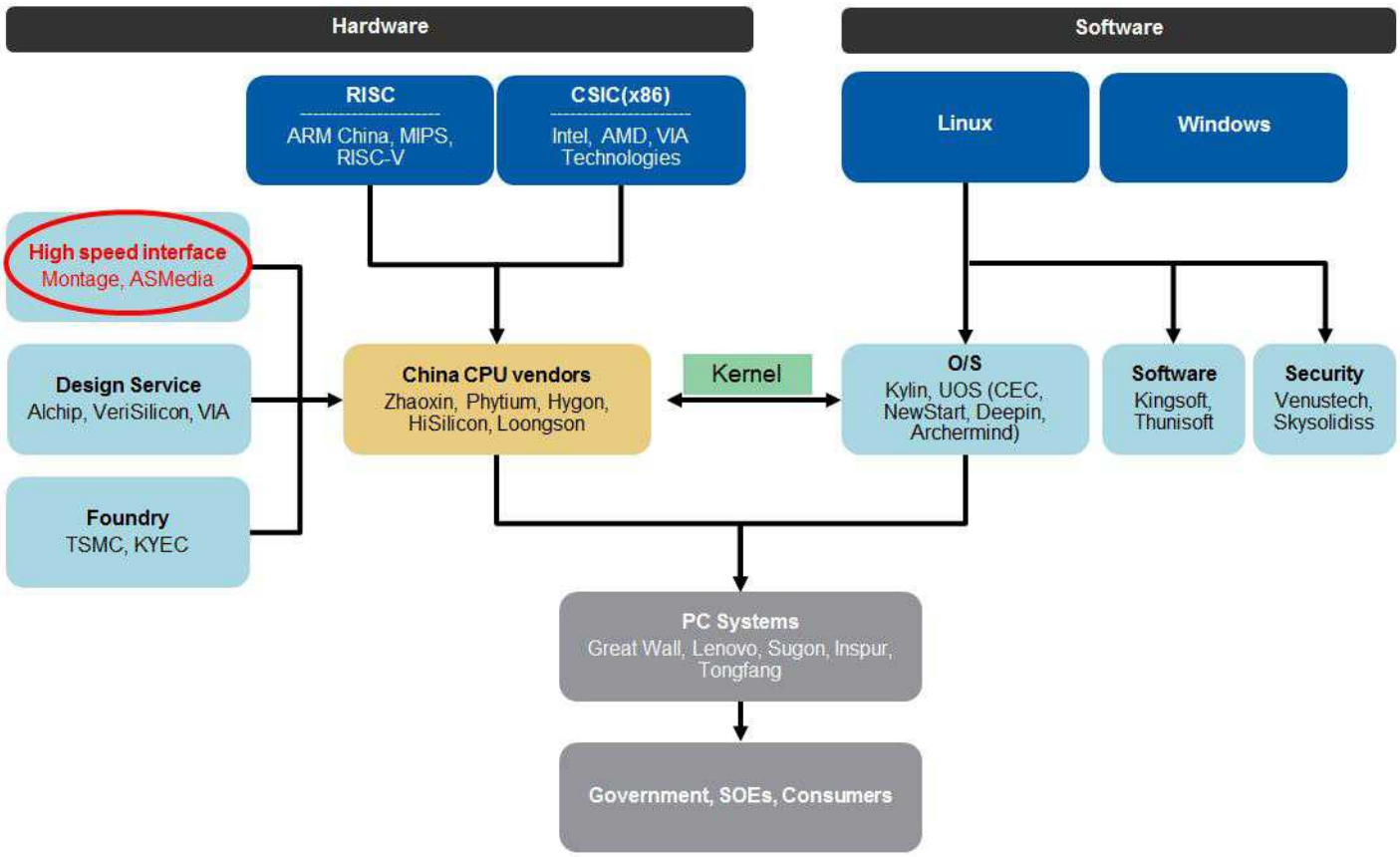
We believe BAT and Chinese enterprises will adopt more servers from domestic brands. This will result in an indirect market share gain for cloud semi vendors. For example, Aspeed is currently not the supplier to Dell and HP. If Inspur could gain more market share from Dell and HP in China, this also suggests it could benefit from hardware localization.

In its latest earnings call, Dell management attributed server weakness to the large enterprise segment in the US and EMEA as well as continued weak China server sales.

Conclusion:

We think Montage fits all three criteria within the cloud space, and ASMedia is an emerging play.

Exhibit 44:
China CPU localization supply chain



Source: Morgan Stanley Research

Debate #2: Could ASMedia become a China play?

Market view: Not really. It will take time for the company to ramp up its China business. ASMedia also has no support in China.

Our view: Yes. The company has been working on the China business for more than two years. It is starting with government PCs first and ramping up to industrial and servers.

Where we could be wrong: Slower China semi localization; competition heating up in China; slower technology development.

Metrics to monitor: China PC/datacenter development schedule, Chinese government announcements, ASMedia's monthly sales.

Exhibit 45:
The packet switch is the key high-speed interface chip on a server

Source: ASMedia

Conclusion

ASMedia is well known as the AMD proxy by the market, but the market still underappreciates its development in China (please refer to our double upgrade note in January). We believe ASMedia could become an emerging play in China and the total addressable market could be around US$100mn vs. the company's current revenue scale of US$120mn in 2019.

The goal of the Chinese government is to replace all chips on the motherboard, and high-speed interface chips are one of the important items. We carried out a deep-dive analysis on the company's China opportunities in datacenter, PC and industrial.

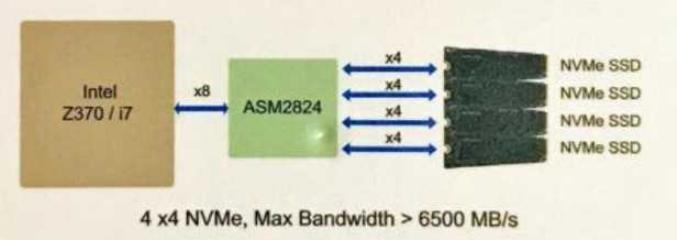
China datacenter server opportunities

Server interface chip dominated by Avago

High-speed interface chips in servers are mainly packet switches used for enabling more NVMe drives on a server or NAS systems. Globally, the dominant player is PLX Technology, based in the US. The company was acquired by Avago in August 2014. Currently, PLX has nearly 100% market share in datacenters, while ASMedia is only in NAS systems for some small enterprises.

The entry barrier for packet switches is quite high. This is because in datacenters, there is high lanecount required by the hyperscalers. For example, Amazon requires between 100 and 400 lanecounts in its datacenter servers. PLX is so far the only company that offers such high lanecount products, costing more than US$100, on Intel's platform. ASMedia can only support up to 24 lanecounts.

Exhibit 46:
ASMedia 2824 PCI-E gen3 packet switch – upstream 8 lanes and downstream 16 lanes



Source: ASMedia

However, China semi localization is creating opportunities for ASMedia

We think ASMedia could gain market share over Avago for three reasons.

1. The best technology in Asia: Despite ASMedia's technology is not as good as Avago, its 24-lanecount PCI-E gen 3 packet switch is proven for function. The company is also developing the PCI-E gen 4 packet switch to support the next gen interface.

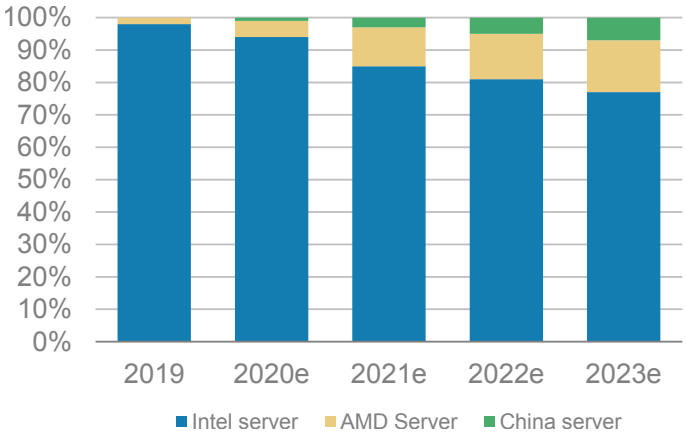
2. China's CPU localization: Local server CPUs are not as fast as PC CPUs. We are seeing progress for Hisilicon, Phytium and Loogson. The reference design will be ASMedia as no other Asian vendor can supply the packet switch. We think Phytium's progress will be faster than Loongson's. Hisilicon's chip is mainly for in-house solutions. ASMedia is engaging with all China sever brands: Huawei, Inspur, and Dawning. We believe Dawning is trying to get local CPUs into all servers, and Inspur is replacing the majority of its CPUs with local ones as well.

3. China's interface chip localization: Intel is still mainly using PLX's solutions. However, as the decision maker is the brand, we believe ASMedia could have a chance to replace PLX even on Intel's platform. Usually on Intel's CPU platform, it needs lanecounts of 100 and above, which suggests the content per server could be 4x in Intel, if ASMedia can replace PLX technology.

We estimate the TAM could be US$200mn, assuming 30% of China servers switch to local CPUs and 10% of Intel servers replace Avago with ASMedia's solution. We exclude the revenue contribution from AMD servers as AMD's new ROME CPU can support very high lanecounts.

Exhibit 47:

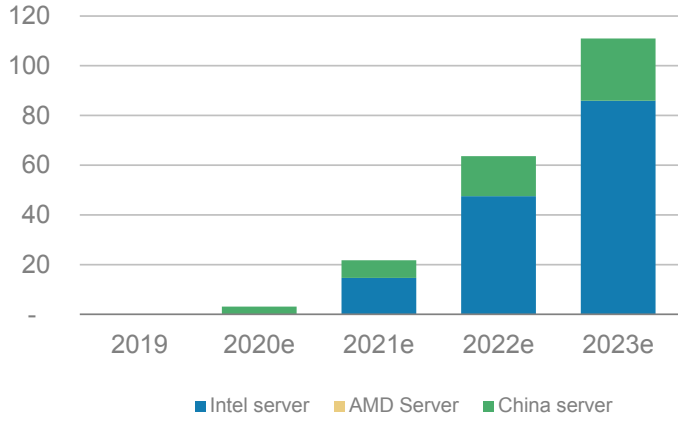
Server market share mix in CPU – we estimate China's local CPU server mix will increase to 6% by 2023



Source: IDC, Morgan Stanley Research estimates

Exhibit 48:

Potential revenue contribution to ASMedia: Assuming 100% market share in local CPUs and 5% share in Intel servers, we estimate potential incremental revenue of around US$110mn vs. US$120mn in 2019



Source: Morgan Stanley Research estimates

Exhibit 49:

Industry model for ASMedia's datacenter business – we calculate the potential revenue contribution to ASMedia

	2019	2020e	2021e	2022e	2023e
k unit					
Intel server	11,316	11,708	11,107	10,908	10,756
AMD Server	231	623	1,550	1,862	2,192
China server	-	125	258	532	754
Server voloume	**11,547**	**12,455**	**12,915**	**13,303**	**13,702**
Server platform market share					
Intel server	98%	94%	86%	82%	79%
AMD Server	2%	5%	12%	14%	16%
China server	0%	1%	2%	4%	6%
Total market share	**100%**	**100%**	**100%**	**100%**	**100%**
Asmedia market share					
Intel server	0%	0%	1%	3%	5%
AMD Server	0%	0%	0%	0%	0%
China server	100%	100%	100%	100%	100%
Asmedia content (USD)					
Intel server (4 24-lane packet switch)	100	120	132	145	160
AMD Server (no packet switch)	100	120	132	145	160
China server (1 24-lane packet switch)	25	25	28	30	33
Asmedia revenue (USD mn)					
Intel server	-	-	15	48	77
AMD Server	-	-	-	-	-
China server	-	3	7	16	25
Total revenue	**-**	**3**	**22**	**64**	**102**

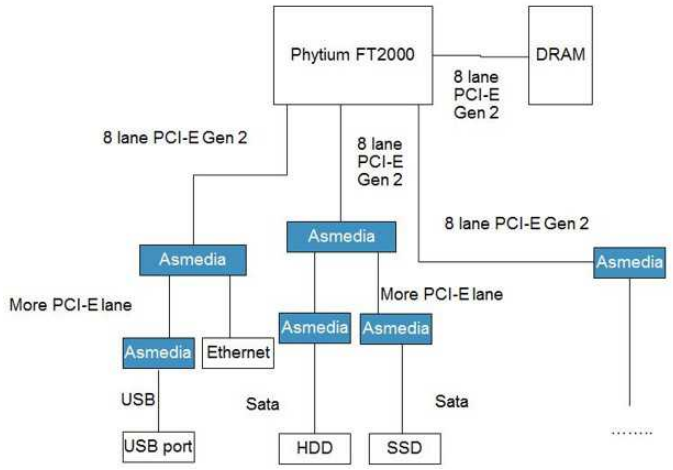
Source: IDC, Morgan Stanley Research estimates

China PC opportunities

On PCs, there are two kinds of product that require ASMedia's high-speed interface products – the chipset and the host controller/other interface chips. The key competitors are also US vendors. We believe the company has successfully penetrated Phytium and Loongson. We believe the Chinese government and military have been very aggressively adopting desktops from local CPU vendors. The company has become the reference design for Phytium and Loongson's PC platform, selling to Great Wall, Lenovo, and other vendors. Given the more simple PCs for Chinese public departments, we think the opportunities lie more with host controllers/other interface chips. A good way to understand ASMedia's technology is via the chart below:

Exhibit 50:

Phytium motherboard diagram – ASMedia could offer multiple interface chips



Source: Morgan Stanley Research

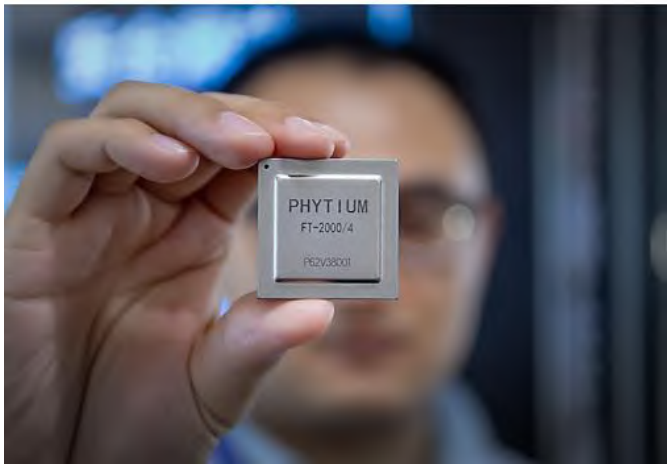
Phytium: We believe the high-speed interface content for Phytium is larger than Loongson. This is because Phytium currently doesn't have solutions for high-speed interface chips. This is a good opportunity for ASMedia. Currently, Phytium FT2000 can only support 32 lanes of PCI-E gen 2 or gen 3. This suggests the company needs multiple interface chips for different applications. After the company migrates to FT2500 by the end of this year, we believe the PCI-E Gen 4 penetration will continue to go up, which is good for the further ASP lift of the high-speed interface.

Loonsong: Loonsong has its own solutions for a high-speed interface, but the specs remain very low (USB gen 2 PCIE gen 2 Sata Gen1). This also suggests the company currently only has the gen 2 interface for their CPU. If the company needs a higher speed, the company would need support from ASMedia. We thus think the content per PC for high-speed interface could be smaller than Phytium's platform, yet potential PC shipments could be bigger as Loonsong is mainly shipping to government offices.

We estimate the TAM could be US$20mn per year (or 15% of revenue). Please refer to How will China chip in? Developing CPU and AI semi designs for the local market.

Exhibit 51:

Phytium introduced its FT-2000/4 for desktop PCs in September 2019



Source: Phytium

Exhibit 52:

Phytium's PC customers include both consumer brands and state-owned entities

Source: Company data

Exhibit 53:

ARM-based CPU comparison – HiSilicon and Phytium from China

Company	Zhaoxin		Hygon	Phytium		Huawei	Loongson
Architecture	x86		x86	ARM		ARM	MIPS/SW6
Licensing	VIA Technologies		AMD				
Key Product	KX-U6880A	KX-U6780A	C86	FT-2000+/64	FT-2000/4	Kunpeng 920	3A4000
Launch Date	May-19	May-19	Oct-19	Mar-19	Sep-19	Jan-19	Dec-19
Cores / Threads	8 / 8	8 / 8	32 / 64	64 / 64	4 / 4	up to 64 / 64	4
Core Name			EPYC Zen1	FTC-662	FTC-663	TaiShan v110	
Base Frequency	3.0 GHz	2.7 GHz	2.0 GHz	2.3GHz	3.0 GHz	2.6GHz	1.8GHz
Cache	8MB L2 Cache	4MB L2 Cache	64MB L3 Cache	32MB L2 Cache	4MB L3 Cache	64MB L3 Cache	8MB L3 Cache
Memory							
Max Type	DDR4-3200	DDR4-3200	DDR4	DDR4-2400	DDR4-3200	DDR4-2933	DDR4-2400
Controllers	1	1	7	8	1	1	2
Channels	2	2	8	8	2	8	
Max Power				96W	10W	180W	40W
Process	TSMC 16nm	TSMC 16nm	GF 14nm	TSMC 16nm	TSMC 16nm	TSMC 7nm	STM 28nm FD-SOI
Application Market	Desktop	Desktop	Server	Server	Desktop	Server	PC / NB

Source: Company data, WikiChip, Morgan Stanley Research

How will coronavirus affect cloud demand? Will there be any longer-term impact?

Our view: The effects will be complicated. The outbreak will create V-shaped volatility in the near term. There were downward order adjustments in February, followed by a stronger rebound in March, driven by increasing demand from online activities. We think 2Q will be strong but hyperscalers' expenses could normalize after the market stabilizes in 2H. We thus will be mindful to have reasonable expectations into 2H.

Conclusion

Cloud semi demand has recovered since 2H19, mainly driven by the strong boost from China. The market in general thinks cloud semis will grow stably with a limited impact from the virus outbreak. However, we believe the outbreak will create order volatility in 1H20, providing a good entry point for some cloud semi stocks in the short term. However, we are concerned about the potential for downward revisions (or normalization) mainly on the US side, after enough servers are acquired in 1H20.

Cloud demand is sensitive to macro conditions

We have been following cloud demand quite closely over the past two years, and demand has been quite volatile in the past year. We have highlighted that demand bottomed out from 1Q19; yet the demand pick-up was pushed back in 1Q-3Q19 given increasing uncertainty over US/China trade tensions. Ever since the G20 with some stabilization of US/China trade tensions, we have started to see US customers pulling more orders. Also, Chinese customers are trying to replace US server vendors. As a result, cloud semis have recovered strongly from 2H19.

The coronavirus has created an order slowdown post CNY

Before Chinese New Year in January, cloud demand was quite solid and growing stably. However, since Chinese New Year there has been a slowdown in orders from the cloud semi side. This is mainly because cloud semi customers faced issues on work resumption and key materials were in short supply, for example specialized PCBs, solder paste, and mechanical parts. As a result, we estimate a 15-20% revenue shortfall for Aspeed's February and March sales.

Exhibit 54:

Work resumption rate for server assembly, module, connectors and mechanical parts

				Estimate->			
	Production Resumption Date	24-Feb	2-Mar	9-Mar	16-Mar	23-Mar	30-Mar
Inventec (server assembly)	10-Feb	50%	65%	70%	90%	90%	90%
Foxconn (server assembly)	13-Feb	29-31%	50-52%	69-71%	74-75%	85-87%	89-92%
Wistron (server assembly)	10-Feb	30%	30%	63%	63%	100%	100%
Key connector producer	10-Feb	35-50%	65-100%	75-100%	88-100%	100%	100%
Key mechanical part producer	10-Feb	25%	50%	60%	70%	80%	100%

Source: Morgan Stanley Research

However, we believe there's stronger demand, which could create a V-shaped order recovery in the short term

Despite the supply disruption, we believe most component suppliers are prioritizing server applications given higher profitability and more stable orders. As a result, despite an ongoing recovery in production, the server sector has seen the earliest recovery.

On the other hand, we noticed that there's stronger end demand as there is more online activity when people work or play games at home. We thus think there will be a V-shaped order recovery once the supply issue is resolved. Aspeed, an early indicator of the cloud semis play, saw its BMC orders revised up in the last week of February. Entering March, the company received customer purchasing orders for 2Q, and there are "ad hoc" projects from Chinese and US customers. As a result, the company is guiding for 2Q revenue growth to be better than expected and could grow at double digits.

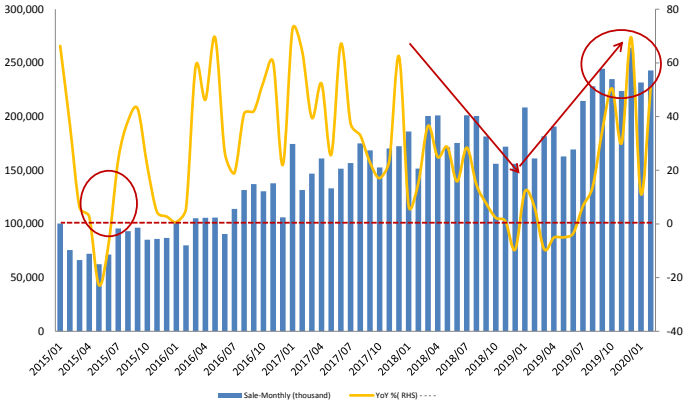
On the China side, the government has issued an announcement that datacenter construction will be a key focus going forward. This could trigger strong demand from Chinese server brands and the related cloud semi supply chain.

But we think expectations may be too high for some stocks

Investor expectations for cloud demand have been improving since the recovery in 2H19. Recently, with Aspeed's bullish 2Q guidance for double-digit revenue Q/Q growth (vs. flattish consensus expectations) and upward revision of its 2020 revenue guidance (which is in line with consensus expectations of +15% revenue growth), the market has become more optimistic on cloud demand strength, as PC/smartphone demand fades. However, we remind investors that cloud customers can adjust order placements on a weekly basis. There's also some lingering uncertainty surrounding supply, since TSMC's 40nm and 8-inch fabs remain tight, downstream manufacturers are not back to 100% utilization, and CPU supply remains constrained.

Exhibit 55:

But the cloud capex is inconsistent with Aspeed's monthly sales trend – Feb 2020 sales hit 50% Y/Y growth

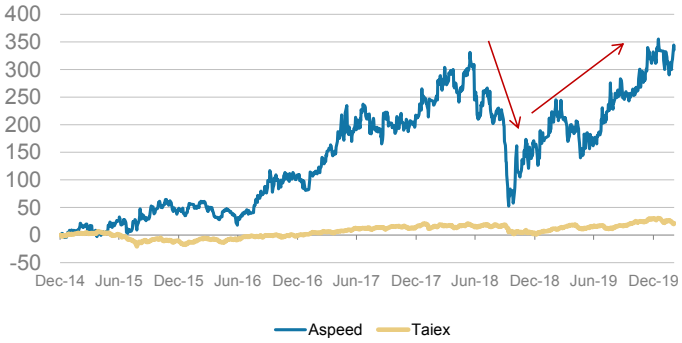


Source: Company data, Morgan Stanley Research

Exhibit 56:

Aspeed's share price is highly correlated with Y/Y growth

Aspeed share price performance vs. Taiex (%)



Source: TEJ

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(as of February 29, 2020)

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Equal-weight/Hold	1457	45%	332	46%	23%	697	48%
Not-Rated/Hold	2	0%	1	0%	50%	2	0%
Underweight/Sell	572	18%	77	11%	13%	224	15%
Total	3,225		721			1457	

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In-Line (I): The analyst expects the performance of his or her industry coverage universe over the next 12-18 months to be in line with the relevant broad market benchmark, as indicated below.

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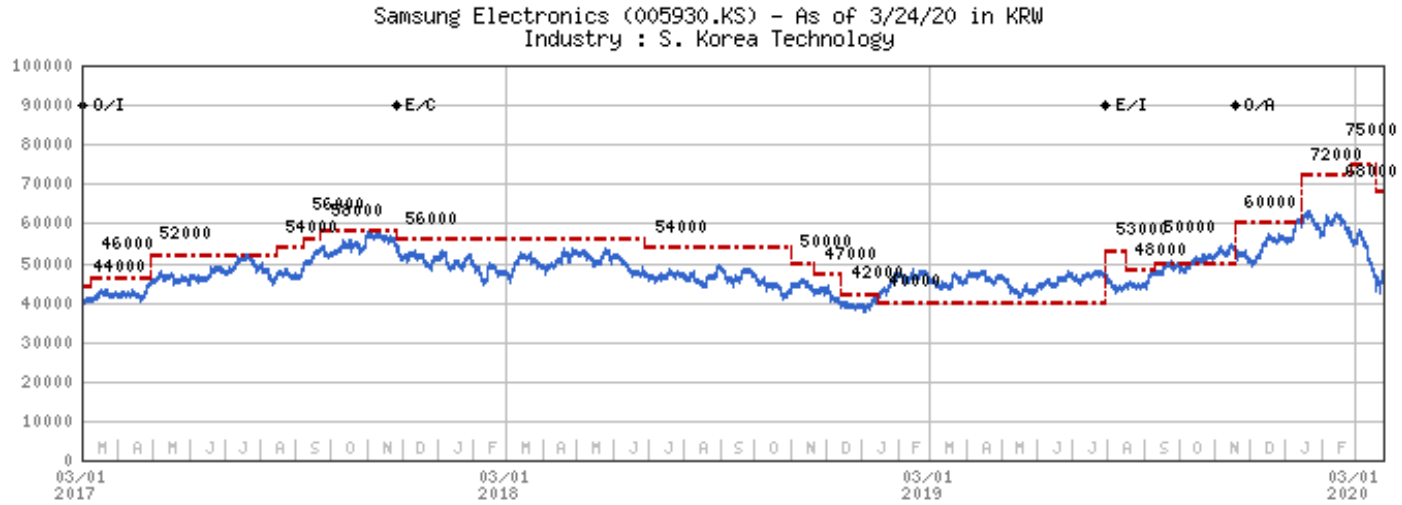

Stock Rating History: 3/1/15 : O/I; 11/26/17 : E/C; 7/30/19 : E/I; 11/18/19 : O/A

Price Target History: 10/31/14 : 32000; 9/14/15 : 30000; 10/30/15 : 32000; 1/29/16 : 30000; 6/6/16 : 32000; 7/3/16 : 36000; 12/12/16 : 40000; 1/25/17 : 44000; 3/8/17 : 46000; 4/28/17 : 52000; 8/15/17 : 54000; 9/7/17 : 56000; 9/22/17 : 58000; 11/26/17 : 56000; 6/28/18 : 54000; 11/1/18 : 50000; 11/21/18 : 47000; 12/14/18 : 42000; 1/15/19 : 40000; 7/30/19 : 53000; 8/16/19 : 48000; 9/10/19 : 50000; 11/18/19 : 60000; 1/14/20 : 72000; 2/26/20 : 75000; 3/19/20 : 68000

Source: Morgan Stanley Research Date Format : MM/DD/YY Price Target No Price Target Assigned (NA)
Stock Price (Not Covered by Current Analyst) Stock Price (Covered by Current Analyst)
Stock and Industry Ratings (abbreviations below) appear as ◆ Stock Rating/Industry View
Stock Ratings: Overweight (O) Equal-weight (E) Underweight (U) Not-Rated (NR) No Rating Available (NA)
Industry View: Attractive (A) In-line (I) Cautious (C) No Rating (NR)

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INDUSTRY COVERAGE: Greater China Technology Semiconductors

COMPANY (TICKER)	RATING (AS OF)	PRICE* (03/25/2020)
Charlie Chan		
ACM Research Inc (ACMR.O)	O (01/22/2020)	US$28.24
Advanced Micro-Fabrication Equipment Inc (688012.SS)	U (03/20/2020)	Rmb144.80
Alchip Technologies Ltd (3661.TW)	O (11/08/2019)	NT$192.50
ASE Technology Holding Co. Ltd. (3711.TW)	E (09/24/2019)	NT$58.90
ASM Pacific (0522.HK)	U (03/20/2020)	HK$74.00
Chipbond Technology Corp (6147.TWO)	O (04/24/2019)	NT$49.40
Chunghwa Precision Test Tech (6510.TWO)	E (11/08/2019)	NT$680.00
Global Unichip Corp (3443.TW)	U (02/12/2020)	NT$179.00
GlobalWafers Co Ltd (6488.TWO)	O (08/16/2019)	NT$342.00
Jiangsu Changjiang Electronics Tech (600584.SS)	U (09/22/2015)	Rmb22.15
King Yuan Electronics Co Ltd (2449.TW)	O (09/24/2019)	NT$30.90
MediaTek (2454.TW)	E (02/17/2020)	NT$334.50
Nanya Technology Corp. (2408.TW)	U (10/08/2019)	NT$52.60
Phison Electronics Corp (8299.TWO)	O (05/21/2019)	NT$251.50
Silergy Corp. (6415.TW)	O (03/06/2020)	NT$988.00
SMIC (0981.HK)	U (02/17/2020)	HK$12.66
TSMC (2330.TW)	O (09/05/2019)	NT$277.00
UMC (2303.TW)	O (12/04/2019)	NT$14.10
Universal Scientific Ind. (Shanghai) (601231.SS)	O (08/04/2015)	Rmb17.79
Vanguard International Semiconductor (5347.TWO)	E (03/20/2020)	NT$59.00
Will Semiconductor Co Ltd Shanghai (603501.SS)	O (09/01/2019)	Rmb148.70
WIN Semiconductors Corp (3105.TWO)	O (04/18/2019)	NT$256.50
Daniel Yen, CFA		
ASMedia Technology Inc (5269.TW)	O (01/17/2020)	NT$701.00
Aspeed Technology (5274.TWO)	E (07/05/2019)	NT$1,150.00
Egis Technology Inc (6462.TWO)	E (11/07/2019)	NT$149.50
GigaDevice Semiconductor Beijing Inc (603986.SS)	O (04/24/2019)	Rmb251.30
Macronix International Co Ltd (2337.TW)	O (04/24/2019)	NT$26.60
Novatek (3034.TW)	O (09/06/2019)	NT$169.00
Parade Technologies Ltd (4966.TWO)	O (03/03/2019)	NT$625.00
Realtek Semiconductor (2379.TW)	O (08/03/2018)	NT$191.00
Shenzhen Goodix Technology Co Ltd (603160.SS)	O (09/06/2019)	Rmb270.01
Winbond Electronics Corp (2344.TW)	O (07/26/2019)	NT$11.65
WPG Holdings (3702.TW)	O (07/31/2017)	NT$34.65
Jeff Hsu		
Silicon Motion (SIMO.O)	E (03/20/2020)	US$34.06

Stock Ratings are subject to change. Please see latest research for each company.

* Historical prices are not split adjusted.

INDUSTRY COVERAGE: Greater China Technology Hardware

COMPANY (TICKER)	RATING (AS OF)	PRICE* (03/25/2020)
Derrick Yang		
AU Optronics (2409.TW)	O (12/09/2019)	NT$6.59
BOE Technology (000725.SZ)	O (09/06/2019)	Rmb4.05
Innolux (3481.TW)	O (02/18/2020)	NT$5.30
TCL Corp. (000100.SZ)	E (06/11/2019)	Rmb4.74
Tianma Microelectronics (000050.SZ)	U (01/24/2018)	Rmb14.11
Visionox Technology Inc (002387.SZ)	E (02/18/2020)	Rmb11.16
Howard Kao		

Acer Inc. (2353.TW)	U (02/01/2018)	NT$13.85
Asustek Computer Inc. (2357.TW)	E (07/20/2016)	NT$180.00
Compal Electronics (2324.TW)	U (12/18/2019)	NT$17.15
Flexium (6269.TW)	E (04/27/2018)	NT$94.30
Inspur Electronic Information (000977.SZ)	E (02/12/2019)	Rmb40.83
Kinsus Interconnect Tech. (3189.TW)	O (02/06/2020)	NT$35.60
Legend Holdings Corp (3396.HK)	E (03/29/2018)	HK$10.22
Lenovo (0992.HK)	E (07/26/2018)	HK$3.94
Pegatron Corporation (4938.TW)	E (12/18/2019)	NT$54.90
Quanta Computer Inc. (2382.TW)	O (04/20/2011)	NT$59.60
Tripod Technology (3044.TW)	O (02/26/2018)	NT$92.00
Wistron Corporation (3231.TW)	E (07/26/2018)	NT$23.20
Wiwynn Corp (6669.TW)	O (08/01/2019)	NT$677.00
Yageo Corp. (2327.TW)	O (10/06/2019)	NT$292.00
Zhen Ding (4958.TW)	E (11/14/2017)	NT$86.80

Ray Wu, CFA

Advantech (2395.TW)	O (08/20/2015)	NT$248.00
AirTAC International (1590.TW)	O (09/23/2019)	NT$412.50
Chroma Ate Inc. (2360.TW)	O (07/25/2019)	NT$111.50
Ennoconn Corporation (6414.TW)	O (02/22/2018)	NT$144.00
Hiwin Technologies Corp. (2049.TW)	O (01/30/2020)	NT$211.50

Sharon Shih

Casetek Holdings (5264.TW)	U (04/18/2018)	NT$35.95
Catcher Technology (2474.TW)	E (11/14/2019)	NT$195.00
Delta Electronics Inc. (2308.TW)	O (07/13/2017)	NT$119.00
Epistar (2448.TW)	U (03/18/2019)	NT$26.75
Foxconn Industrial Internet Co. Ltd. (601138.SS)	O (07/10/2019)	Rmb13.55
Foxconn Technology (2354.TW)	E (08/16/2016)	NT$49.95
Hon Hai Precision (2317.TW)	O (02/25/2020)	NT$71.40
LandMark Optoelectronics Corporation (3081.TWO)	U (03/06/2020)	NT$250.00
Lens Technology (300433.SZ)	U (11/22/2018)	Rmb15.68
Leyard Optoelectronic Co Ltd (300296.SZ)	E (06/17/2019)	Rmb6.73
Lite-On Technology (2301.TW)	U (11/09/2017)	NT$40.50
MLS Company Limited (002745.SZ)	E (09/10/2018)	Rmb11.73
Sanan Optoelectronics (600703.SS)	U (06/17/2019)	Rmb22.01
Tong Hsing (6271.TW)	E (03/18/2019)	NT$105.50
Visual Photonics Epitaxy Co Ltd (2455.TW)	E (03/20/2020)	NT$78.40

Tim Hsiao

Ningbo Joyson Electronic Corp (600699.SS)	U (03/13/2020)	Rmb20.83

Yunchen Tsai

AAC Technologies Holdings (2018.HK)	E (08/26/2019)	HK$40.20
Accelink Technologies Co. Ltd. (002281.SZ)	O (08/29/2018)	Rmb35.29
BizLink Holding Inc (3665.TW)	E (08/13/2019)	NT$147.50
BYD Electronics (0285.HK)	U (04/06/2018)	HK$12.14
Dahua Technology Co. Ltd. (002236.SZ)	E (11/05/2018)	Rmb16.92
Everwin Precision Technology (300115.SZ)	U (04/06/2018)	Rmb20.83
Fiberhome Telecommunication Technologies (600498.SS)	E (06/20/2019)	Rmb39.15
FIT Hon Teng Ltd (6088.HK)	E (06/05/2018)	HK$1.85
GoerTek Inc (002241.SZ)	E (01/21/2020)	Rmb17.08
HIKVision Digital Technology (002415.SZ)	O (11/02/2015)	Rmb28.85
Largan Precision (3008.TW)	O (09/19/2019)	NT$3,890.00
Luxshare Precision Industry Co., Ltd. (002475.SZ)	O (10/24/2016)	Rmb38.95

Merry Electronics Co Ltd (2439.TW)	U (01/21/2020)	NT$123.00
Q Technology Group Co Ltd (1478.HK)	E (07/24/2018)	HK$8.76
Shenzhen O-film Tech (002456.SZ)	E (11/11/2019)	Rmb15.31
Shenzhen Sunway Communication Co. Ltd. (300136.SZ)	E (11/17/2016)	Rmb38.10
Sunny Optical (2382.HK)	U (11/11/2019)	HK$109.50
Sunwoda Electronic Co., Ltd. (300207.SZ)	E (06/25/2015)	Rmb15.92
Yangtze Optical Fibre and Cable (601869.SS)	U (06/20/2019)	Rmb36.98
Yangtze Optical Fibre and Cable (6869.HK)	E (06/20/2019)	HK$14.92
Zhongji Innolight Co Ltd (300308.SZ)	E (08/29/2018)	Rmb55.90
ZTE Corporation (0763.HK)	O (06/20/2019)	HK$25.00
ZTE Corporation (000063.SZ)	E (06/20/2019)	Rmb44.85

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