

Semiconductors

Cloud Instance Analysis - Apr '20. Power of the Ecosystem

May 29, 2020

Key Takeaway

We analyze Cloud Instances offered by the top 4 CSPs. Key takes: Incumbent ecosystems dominate. In Processor Instances, x86 holds 98% share, Amazon Graviton (64-bit ARM) is only 0.6%. In Accelerator Instances, NVDA dominates w 87% share, followed by XLNX (4%), AMD (2%), INTC (2%), and two new entrants Amazon Inferentia (2%) and Google TPU (1%). We think the power of the x86 and NVidia ecosystems are underestimated, and start-up risk overestimated by the Street.

Is CPU/GPU Use Driven by the Processor, or the Ecosystem? If someone were to offer you a new phone with a different set of software and apps, or a new PC with a different OS and different software from your family and colleagues, odds are that you would not take it, even if it was cheaper or had longer battery life. The reason is that we have become entrenched in our cellphone (Apple or Android) and PC (Wintel or Apple) ecosystems. We think the same is true with data center processing. 64-bit ARM CPUs have been around for a decade, and are not even registering 5% of Processor instances. NVidia started investing in its CUDA Accelerator Ecosystem 12 years ago, a full decade ahead of anyone else. Our "4th Tectonic Shift in Computing" thesis argues that one ecosystem captures 80% of any computing market, and we think that will be the case for NVidia as the center of gravity in data center processing shifts to a parallel processing paradigm. We will continue to track Accelerator instance share to make sure, but we think the threat of startups gaining material share is overestimated by the Street, and we continue to view NVDA as a core semi holding during the current tectonic shift in computing.

NVidia Dominates Accelerator Instances. NVidia's share of Dedicate Accelerator Instances has been relatively stable at 87% over the past 8 months. XLNX is a distant #2 with 4% share, followed by INTC and AMD with 2% each. The two newest accelerators Amazon Inferentia, and Google TPU have only 2% and 1% share, and there are no obvious signs of inflections in uptake.

x86 Dominates Processor-Only Instances. Taken together, INTC and AMD x86 account for 98% of Processor-Only Instances. Amazon's Graviton CPU, which is based on a 64-bit ARM architecture accounts for only 0.6% of instances, and has been flat at that share level for the past 8 months.

Why Look at Cloud Instances? We look at processor and accelerator instances at the top 4 CSPs (Cloud Service Providers). Available instances have grown >40% in the past 9 months, underscoring a longstanding trend of enterprises outsourcing to the cloud, so we think an analysis of Cloud Instances is instructive for assessing broader CPU and GPU share trends. Our instance analysis does have two limitations: 1) it does not account for internal CSP workloads, 2) it is not an exact measure of processors deployed. Nevertheless, we think it is a reasonable proxy for market share at enterprises, and useful for identifying trends in processor usage. Last month we highlighted AMD share gains in "Processor-Only" instances, this month our main take is that the Ecosystems of X86 in CPUs and NVDA in Accelerators appear well entrenched.

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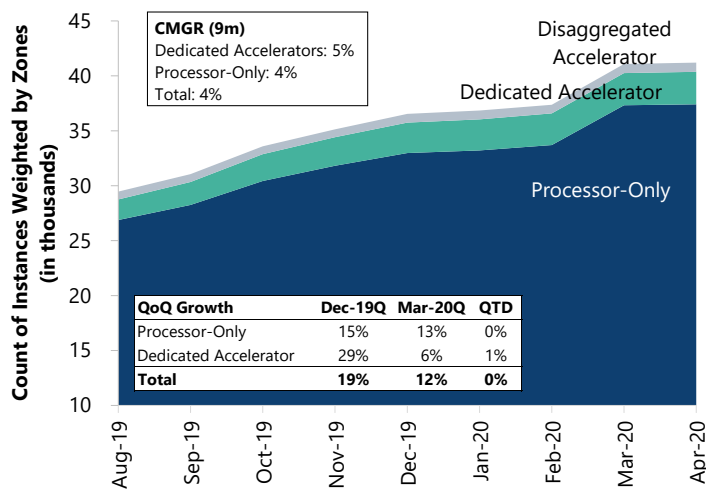
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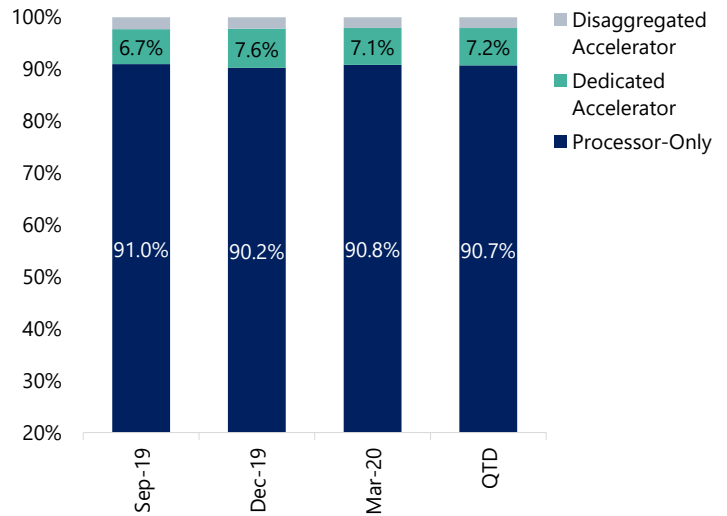
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Chart 1 - Accelerator vs. Processor Only Instances Weighted by Zone Availability



Source: Liftr Insights, Jefferies

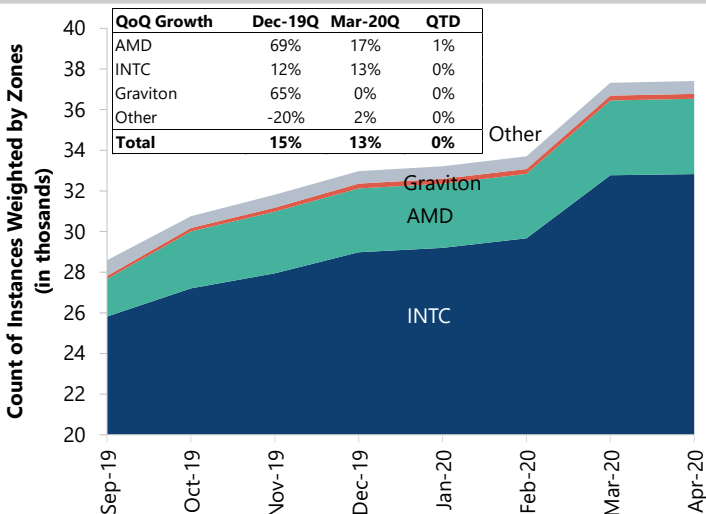
Chart 2 - Processor Only vs. Dedicated Accelerator Share



Source: Liftr Insights, Jefferies

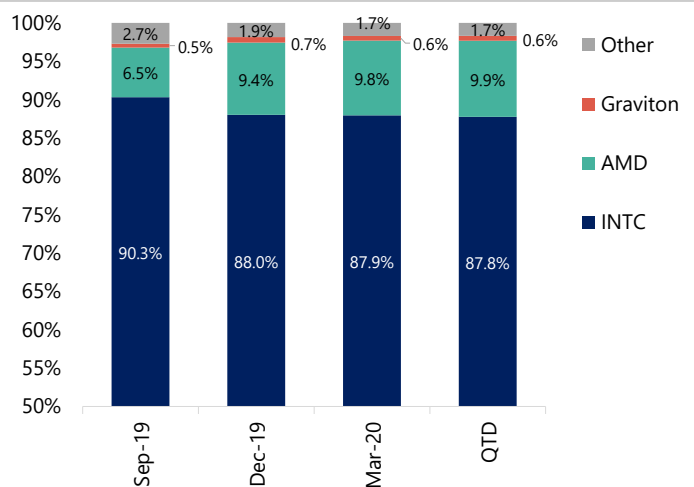
The total number of zone-weighted instances deployed by the top 4 CSPs were flat in Apr-20 vs. Mar-20. In the month of April, Processor-Only instances were flat MoM and Dedicated Accelerator instances grew by 1%. Over the last 9 months, Dedicated Accelerator instances grew at a CMGR of 5%, greater than the processor-only instances. This suggests that the processor growth in CSPs is shifting to parallel processors, consistent to our "4th Tectonic Shift in Computing" thesis.

Chart 3 - INTC vs. AMD vs. Graviton Processor Only Instances



Source: Liftr Insights, Jefferies

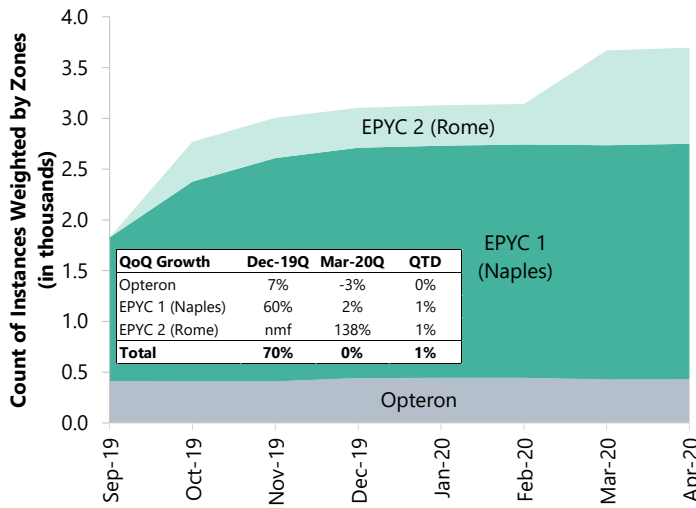
Chart 4 - INTC vs. AMD vs. Graviton Share of Processor-Only Instances



Source: Liftr Insights, Jefferies

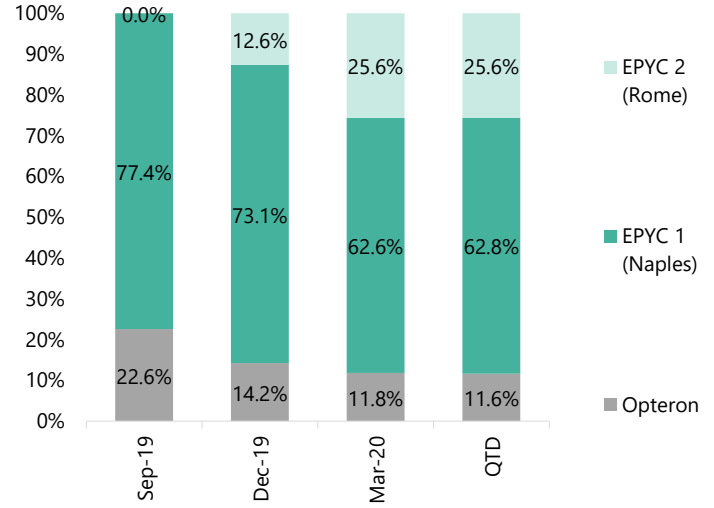
AMD's share in Processor-Only instances increased to 9.9% in the month of April from 9.8% in Mar-20Q. On a MoM basis, AMD Processor-Only instances increased by 1% in the April. INTC's processor-only instances were flat in April. Note that Liftr Insights calculates share of processors deployed in instance types as a product of regional availability and the number of zones in each region.

Chart 5 - Share of AMD's Processor Generations



Source: Liftr Insights, Jefferies

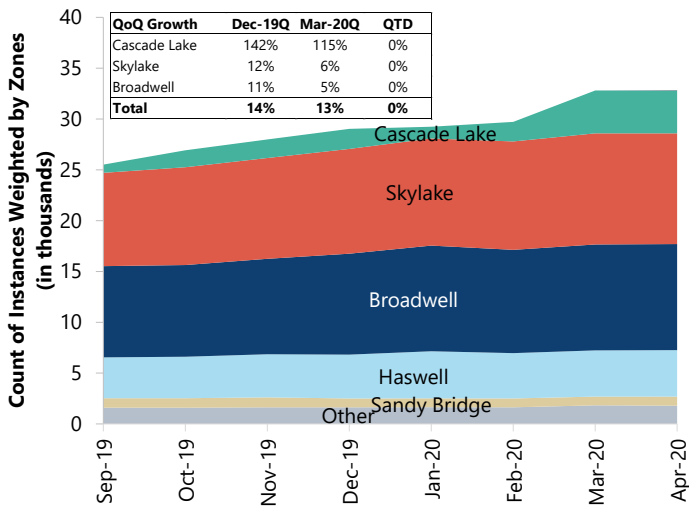
Chart 6 - AMD's Gen Share of Processor Only Instances



Source: Liftr Insights, Jefferies

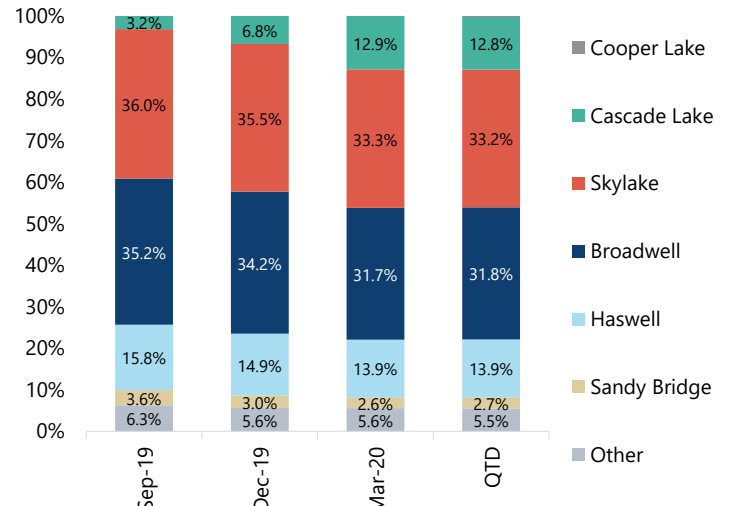
Since the launch of AMD's EPYC 2 (Rome) processor in Oct-19, the number of zone weighted instances using Rome processors has more than doubled, and represents 26% of total AMD based Processor-Only instances and 2.5% of total Processor-Only instances including INTC & Graviton. Nearly all of AMD's growth of Rome instance occurred during the month of March.

Chart 7 - Share of INTC's Generations



Source: Liftr Insights, Jefferies

Chart 8 - INTC'S Gen Share of Processor Only Instances

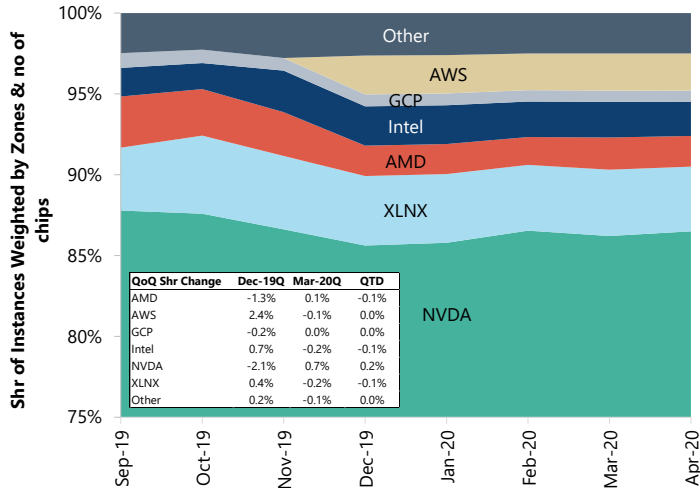


Source: Liftr Insights, Jefferies

INTC's Cascade Lake based instances remained flat in the month of April after a strong QQ increased of 115% Mar-20Q. Nearly all the Cascade Lake growth for the MarQ occurred during the month of March.

Dedicated Accelerator

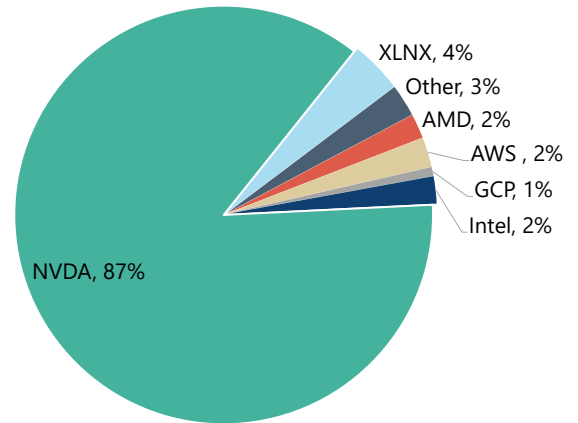
Chart 9 - Dedicated Accelerator Share



Source: Liftr Insights, Jefferies

Chart 10 - Share of Dedicated Accelerator Share

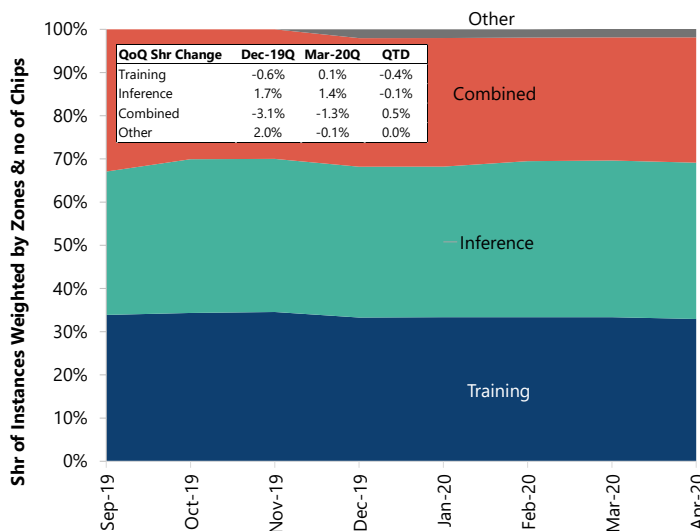
Dedicated Accelerator Share as of Apr-20



Source: Liftr Insight, Jefferies

NVDA dominates Dedicator Accelerator instances with approx. 87% share. Note that Liftr Insights calculates share of chips deployed in instance types as a product of regional availability, the number of zones on each region and the number of accelerator chips deployed in each size offered in each region.

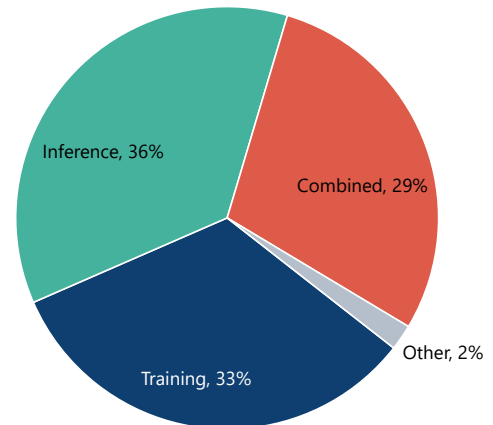
Chart 11 - NVDA's Accelerator Instances by Application



Source: Liftr Insights, Jefferies

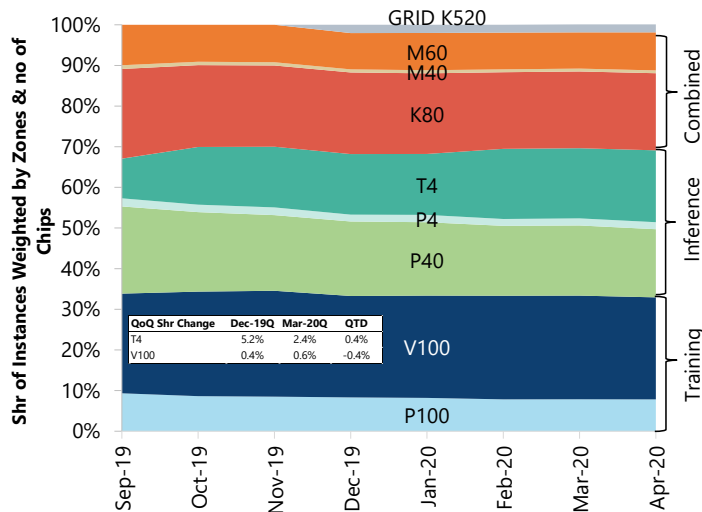
Chart 12 - Training vs. Inferencing Share for NVDA Accelerators

NVDA Accelerator Application Share as of Apr-20



NVDA's inferencing solutions, T4, P4 and P40 GPUs, represent 36% of NVDA's dedicated accelerator instances

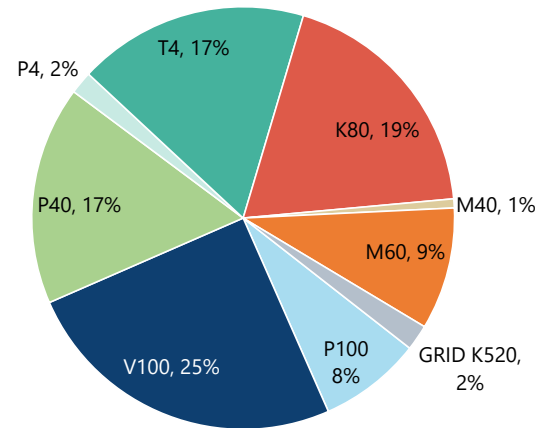
Chart 13 - NVDA's Accelerator Instances Share by Generations



Source: Liftr Insights, Jefferies

Chart 14 - NVDA Accelerator Share by Generation

NVDA Accelerator Share by Gen as of Apr-20



Source: Liftr Insights, Jefferies

Charts 13 & 14 shows that NVDA's new inferencing chip, T4, share increased by 240bps QQ in the Mar-20Q and represents 17% share of NVDA-based accelerator instances.

Announcements by CSPs with no deployments

Based on information provided by Liftr Insights, we track the CSPs' announcement of new instances

INTC:

As of March 15, Aliyun had planned 18 new instance types, of which 14 instances have not yet been deployed. 8 instances are based on INTC's Cascade Lake processors, 4 on Skylake and 1 on Broadwell processors.

AMD:

On Nov 18, 2019 AWS announced 2 new compute optimized type based on AMD EPYC 2 processors (C5a and C5ad) expected to be available in 8 sizes. These new types have not appeared yet.

Xilinx:

Azure: On Oct 1, 2019, Azure planned to deploy 3 different sizes of NP instance type based on Xilinx FPGA accelerators. These have not come live yet.

AWS: On Oct 31, 2019, AWS announced it would launch F1 Xilinx FPGA based dedicated accelerator in Canada during October. This isn't live yet.

Other Processors:

AWS Graviton2: On Dec 3, 2019, AWS announced plans to deploy 2 new instance families based on Graviton2. These have not yet been deployed.

Graphcore IPU: On Nov 18, 2019, Azure announced ND V3 type based on Intel's Skylake processors and 16 Graphcore IPUs. This isn't live yet.

Methodology

What does Liftr Insights track? Liftr Insights runs monthly scans that aggregate the **count** of instance types across 4 CSPs (Microsoft Azure; Amazon AWS, Google GCP and Alibaba Aliyun). Since instance types are defined by the processors that support them, Liftr data can track the count of instances deployed on AMD/INTC/NVDA processors, giving us granularity on the share between the vendors and the processor version. The regions with larger zone counts have more influence when calculating the share of deployed infrastructure at each CSP.

What are Instances? Every CSP (cloud service provider) rents out a portion of their data center (cloud) to their customers. AWS/GCP/Azure build out data centers deploying 1000s of servers and then use a software layer to partition them into virtual machines based on different configuration of compute, storage and networking. This virtual machine (VM) is called an instance.

What are Instance Types? Instances are optimized for certain workloads. For example, AWS groups instances into General Purpose (balance compute/storage); Compute optimized (heavy on compute); Storage optimized (heavy on storage) etc. Within each of these there are multiple instances types bifurcated based on the processor/HW supporting the instance and size of instance, specifically horsepower of the processor supporting the instance, creating an instance type with specific processor and size of processor.

What isn't captured? Many of the cloud providers purchase processors for running their internal workloads. This data doesn't capture the internal consumption. Secondly, the number of instances does not match up to physical servers/processors deployed, since a processor can support many VMs/instances.

Liftr Data Methodology for Estimating Growth and Share. The count of instances across regions is multiplied by the number of zones in a particular region to factor in the size of instance. The regions with larger zone counts have more influence when calculating the share of deployed infrastructure at each CSP.

- Processor-only instance types explicitly exclude any accelerators from configurations, they provision only processor cores. Liftr Insights calculates share of processors deployed in instance types as a product of regional availability and the number of zones in each region.
- Accelerated instances type explicitly include accelerator chip capacity on each configurations, such as GPUs, FPGAs and other compute acceleration chips. Liftr Insights calculates share of chips deployed in instance types as a product of regional availability, the number of zones on each region and the number of accelerator chips deployed in each size offered in each region.

Company Valuation/Risks

Advanced Micro Devices, Inc.

Our \$63 PT assumes P/E ratio of 36.5x on our 2021 EPS of \$1.72. A P/E of 36x is within AMD's historical range of 14x-50x range. We think a multiple towards the higher end of the range is justified given that AMD is undergoing a major sever product cycle and considering the COVID-19 outbreak. Risks include weaker sales of PCs, mis-execution and more aggressive pricing from Intel and Nvidia.

Intel Corporation

Our \$62 PT assumes a 12x multiple on our 2021 non-GAAP EPS forecast of \$5.14. Our valuation assumes a multiple of 12x which falls in the middle of INTC's 5 yr PE range of 9x-15x. We believe a mid-cycle multiple is justified with 1) demand destruction in 2H20 due to COVID-19 outbreak and its impact offset by 2) high probability of INTC streamlining SG&A costs and 3) divesting Memory business. Risks: prolonged demand destruction beyond 2H20 due to COVID-19, decline in PCs; mis-execution on 10nm; and greater competition in servers and PCs.

NVIDIA Corporation

Our \$405 PT assumes 45x P/E on our C2021E Non GAAP EPS of \$9.00, which is towards the higher-end of 5 yr. range of 16x-54x. Downside risks include demand destruction due to prolonged outbreak of COVID-19 virus, slower PC Gaming growth and competition from INTC, AMD or new entrants to deep learning market. Upside risks include faster adoption of DL applications in Datacenter and Auto and early containment of COVID-19 virus.

Xilinx Corp

Our \$100 PT applies a 32.4x multiple to our \$3.09 C'21 EPS. XLNX has traded at NTM P/E multiples in the range of 14x to 36x over the last five years. Coming out of the inventory correction and considering the recent COVID-19 outbreak, we think a PE multiple towards the higher end 5-yr range is justified. Risks include prolonged negative impact due to COVID-19, slowdowns in comm capex, extended inventory correction, share loss, and valuation.

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- Advanced Micro Devices, Inc. (AMD: \$53.80, BUY)
- Intel Corporation (INTC: \$62.93, HOLD)
- NVIDIA Corporation (NVDA: \$355.02, BUY)
- Xilinx Corp (XLNX: \$91.95, BUY)

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Rating and Price Target History for: Intel Corporation (INTC) as of 05-28-2020



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Distribution of Ratings						
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