



# Intel® Data Center Technical Training

## Fall 2020 Virtual Event





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### Emerging Cloud Workloads

Sagar Zanwar

# Please No Photos, Videos, or Audio Recordings



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# Agenda

State Of Hybrid-Multi Cloud

Emerging Cloud Workloads

Intel's Advantage



# Cloud Services Market Trends

BY 2024



Digital advertising  
**\$517B<sup>1</sup>**



Digital video & media  
**\$124B<sup>2</sup>**



Cloud SaaS  
**\$226B<sup>3</sup>**



Cloud PaaS/IaaS  
**\$186B<sup>3</sup>**

Rapid, disruptive change **is the new normal**  
Laying a **modern foundation** is critical

See [Sources](#)

# Customer Evolution to Multi-Cloud

84%

of enterprises  
have a  
multi-cloud  
strategy



61%

of SMB have a  
Multi-cloud  
strategy



5

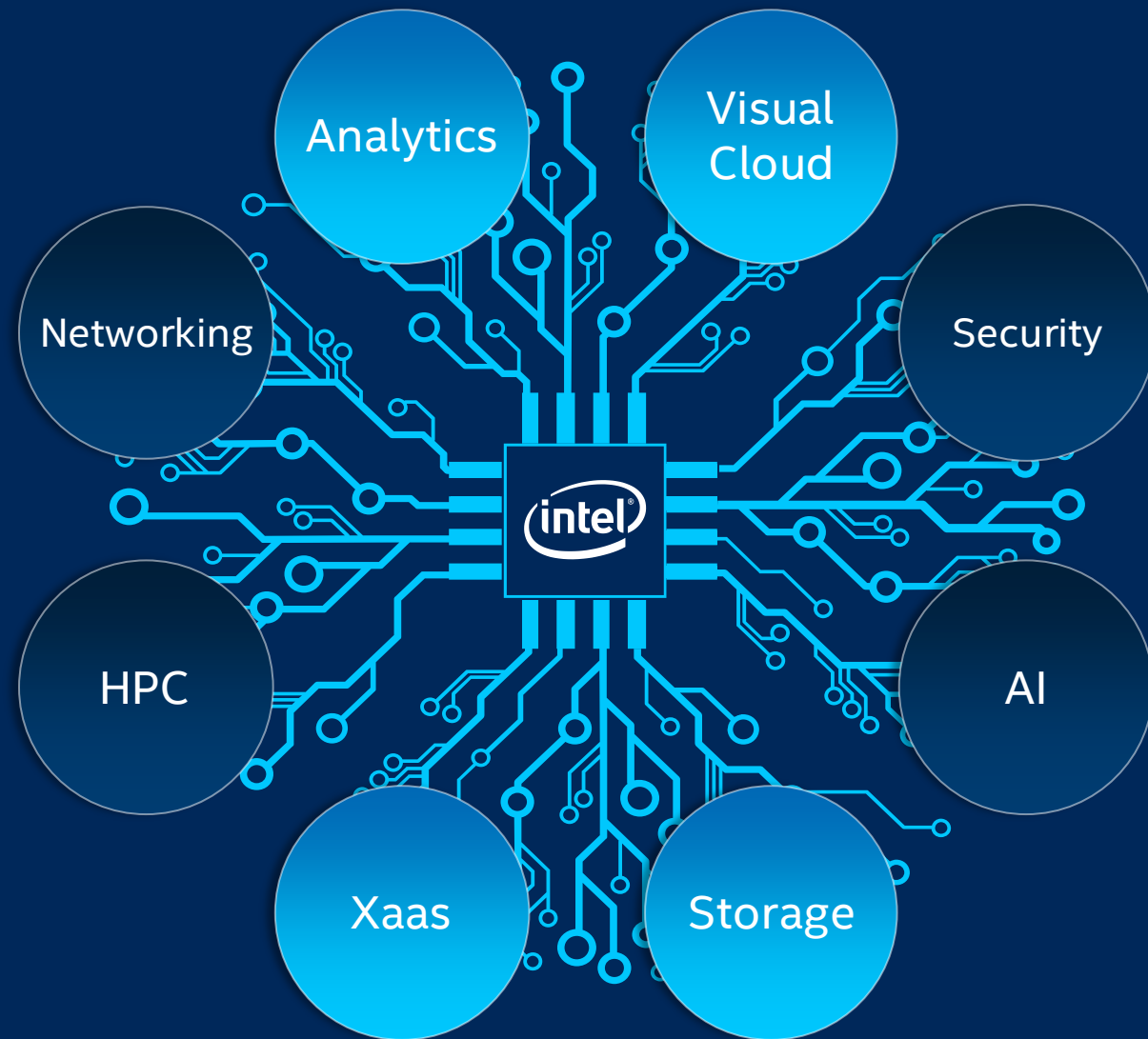
is the number of  
average clouds an  
organization uses



Opportunity – Navigating the complexity of managing multiple clouds

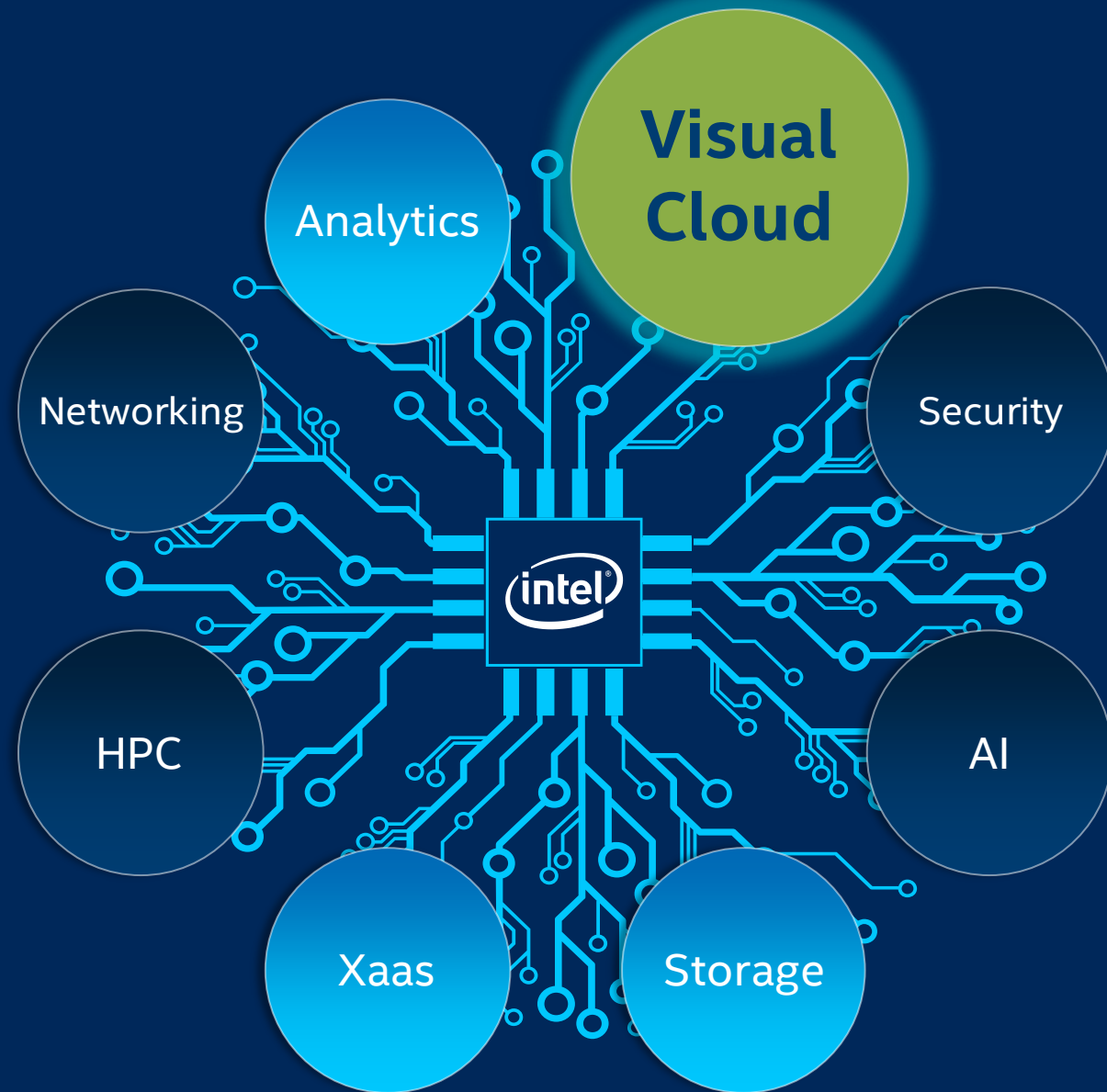
\* Right Scale : 2019

# Emerging Cloud Workloads





# Emerging Cloud Workloads



# Visual Cloud – Market Opportunity

## Media Processing & Delivery



### Typical use cases:

- Encoding
- Decoding
- Transcoding
- Video streaming

## Media Analytics



### Typical use cases:

- AI-guided video encoding
- Offline media analytics (content classifying, tagging)
- Smart city applications (pedestrian/vehicle tracking, crowd security)

## Immersive Media



### Typical use cases:

- AR-guided service procedures
- 360° live streaming of concerts or sporting matches
- VR-enhanced, location-based experiences

## Cloud Graphics



### Typical use cases:

- Cloud rendering at different levels of performance, latency, and scalability

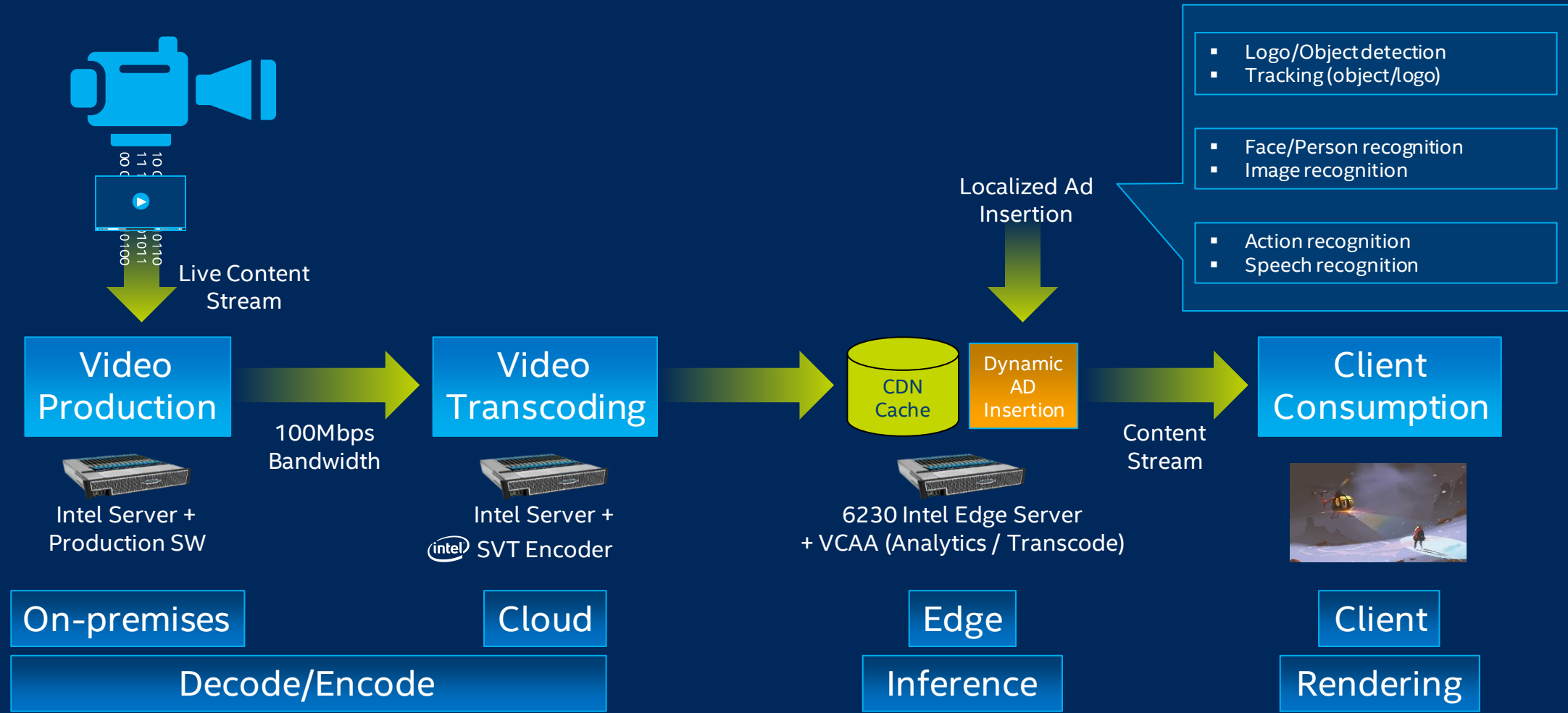
## Cloud Gaming



### Typical use cases:

- Cloud gaming services that allow gamers to access and play games streamed from the cloud

# Use Case: Dynamic Ad Insertion



# Customer Success Story: Video Transcoding



Anevia (Genova Live) provides **22%** better performance on Intel Xeon Gold 6252 processor than the previous generation Intel Xeon Gold 6152.

Due to new Intel Deep Learning Boost (Intel DL Boost) technology, increased number of cores, improved memory bandwidth



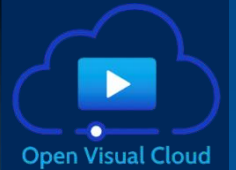
## At A Glance

### Configurations:

Genova Live, 2S Intel Xeon 6252

### Platform Features:

Intel Deep Learning Boost (Intel Advanced Vector Extensions 512)

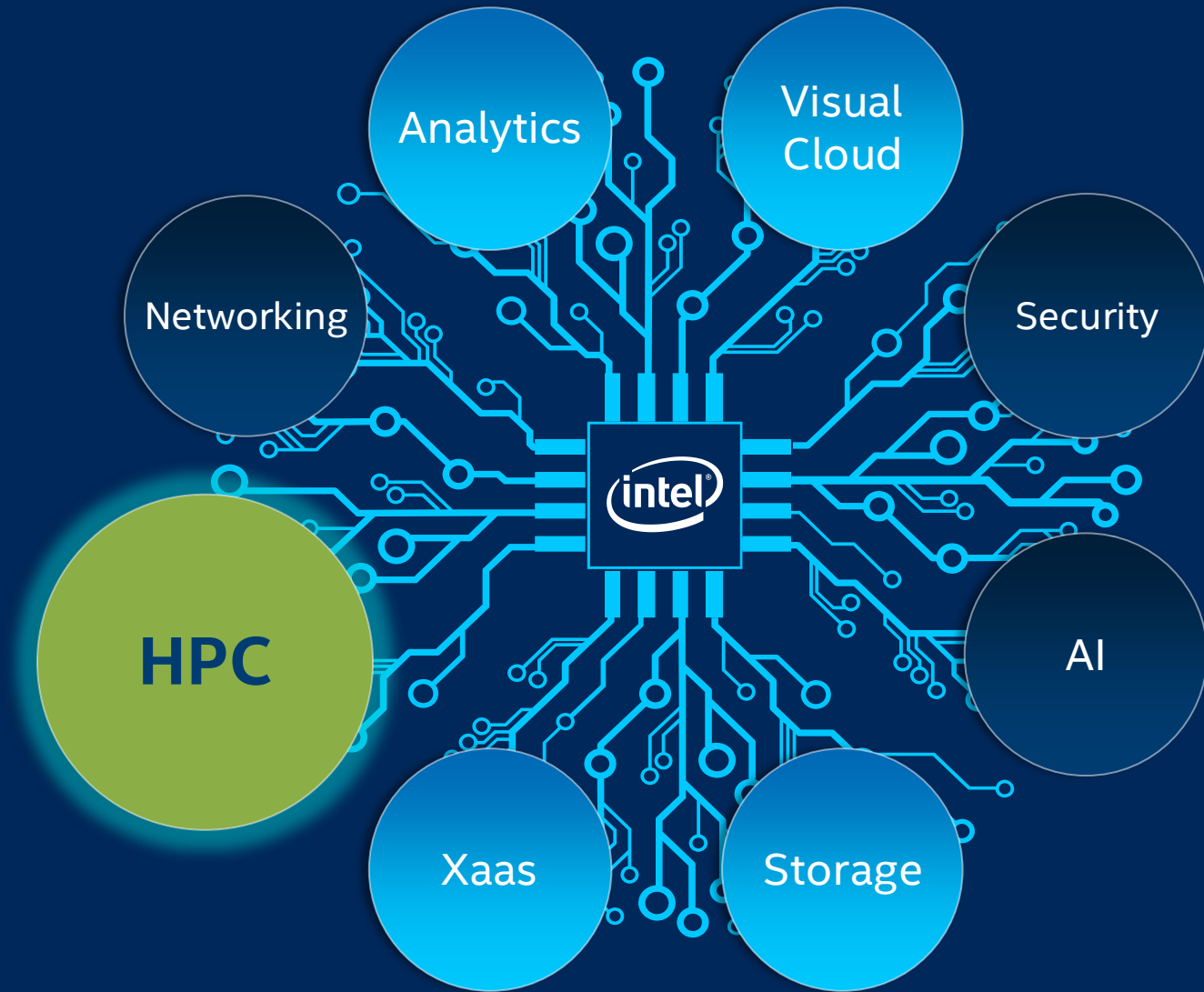


Software encoding = lower streaming cost + high video quality

See [Sources](#)



# Emerging Cloud Workloads



# Market Opportunity

HPC in the Cloud  
Revenue

**\$7.4B** in 2023

**24.6% CAGR**  
'19-'23<sup>1</sup>

**20%**  
of HPC  
workloads  
moved to the  
cloud<sup>1</sup>

## Why HPC in Cloud

- Flexibility – Extra capacity
- Cost – better economic decisions
- Specialized HW/SW
- Hybrid environment

HPC Cloud use has ramped up quickly, and has  
**substantial room for growth**

See [Sources](#)

# Customer Success Story: HPC as a Service



Remote visualization and data transfer acceleration tools  
Customer can do visual pre/post processing in the cloud  
and see results on their local workstation



## Solution

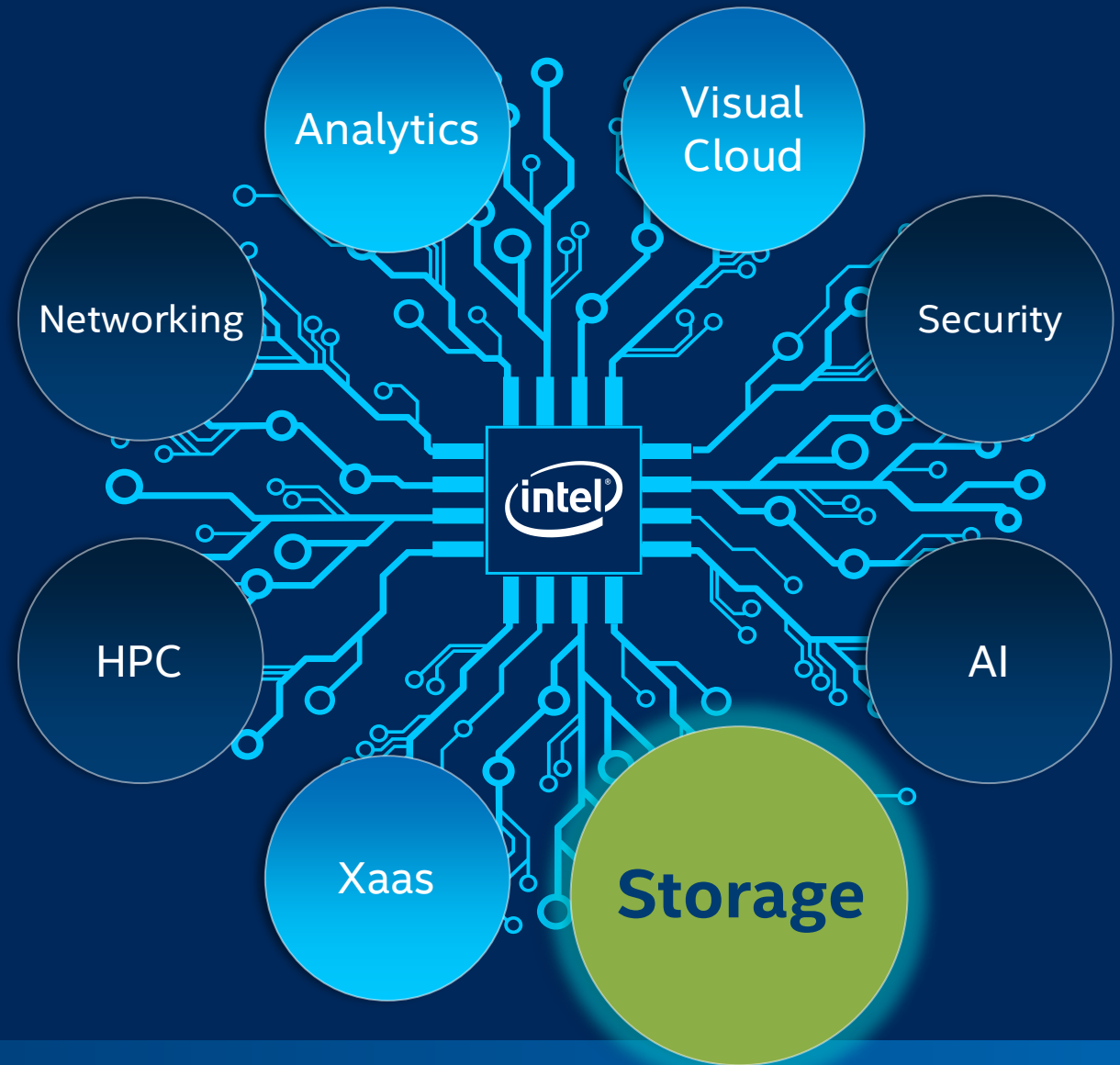
Intel Xeon Scalable processors  
Intel Omni-Path Architecture  
as the foundation for their HPC  
software stack

## Results

- Latency reductions based on newer configurations
- Increase hardware utilization → for Gompute and for end customer
- Cost reductions → for Gompute and for end customers
- Solution flexibility: in-house support and/or through Gompute cloud

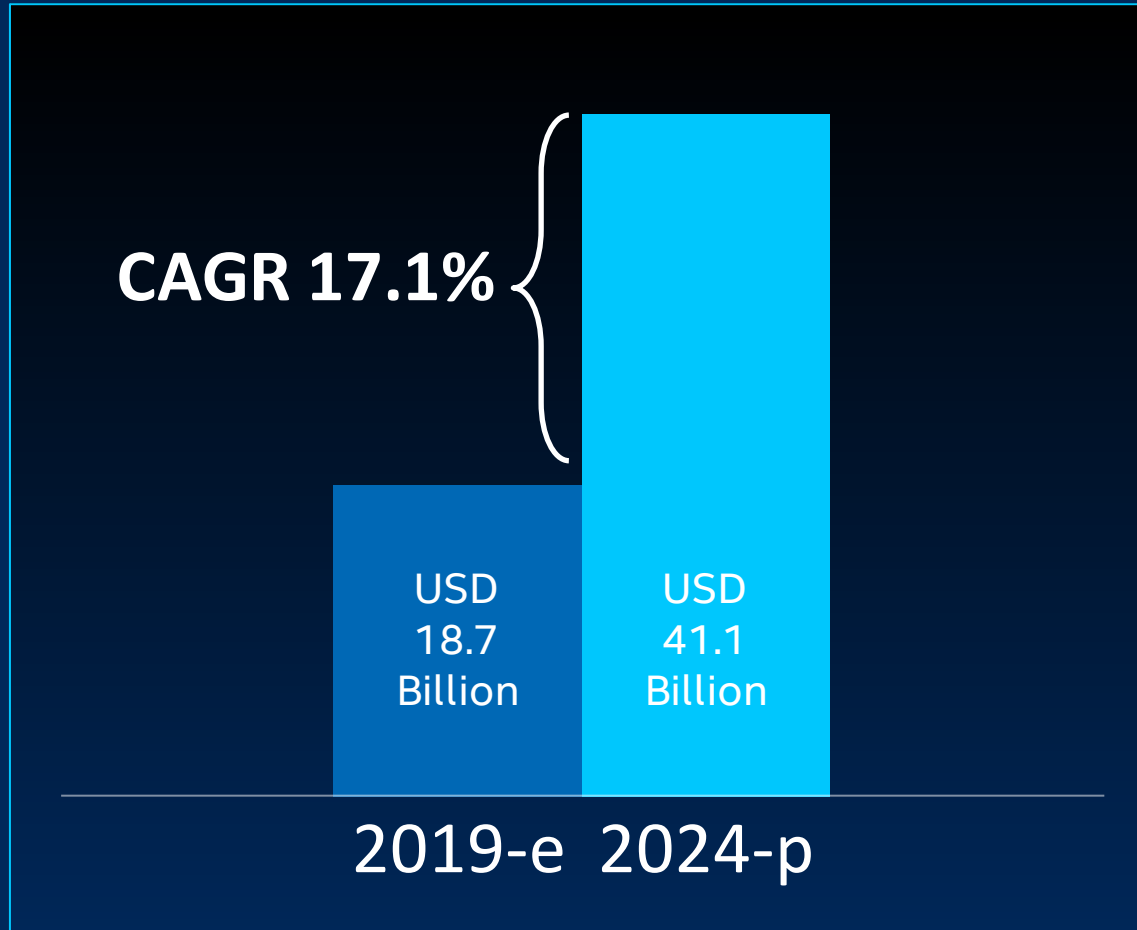
See [Sources](#)

# Emerging Cloud Workloads





# Cloud Storage Services Market Opportunity



Market growth driven by **data generated** in

- Life Sciences
- Enterprise Mobility
- Technological Advancements

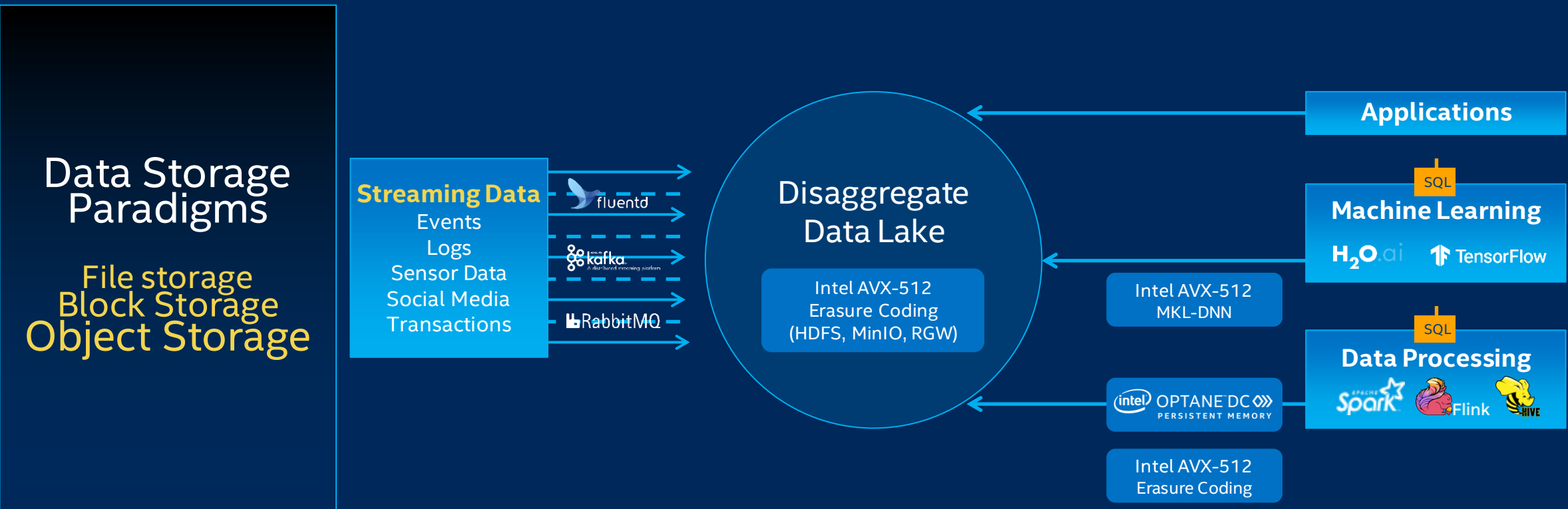
**Application and demand in personalized medicine** offers extensive opportunities for market players in **data analysis, storage and management market**

33 zettabytes growing to **175ZB by 2025**  
**Core, Edge, Endpoints** interdependencies  
**Costs** associated with data: purchasing, maintaining, protecting storage, and data loss

See [Sources](#)

# Modern Use Cases for Storage

Decoupling the data created from the application creating it enables an entirely new paradigm for data management.



See [Sources](#)

# Storage Services with Intel Technology Optimizations

## Storage Services

### Disaggregated object storage workloads

- Big Data Analytics / Data Lakes
- Machine Learning
- Artificial Intelligence
- High Performance Computing
- Content Distribution Networks
- Data Protection
- **Latency-Sensitive Object Storage (S3)**
- Visual Cloud
- IoT Edge
- Online Gaming

## Intel Technology



Intel Xeon SP Storage SKU's



Storage Performance Development Kit (SPDK)  
Persistent Memory Development Kit (PMDK)



Intel Optane™ DC Persistent Memory Module (DCPMM)

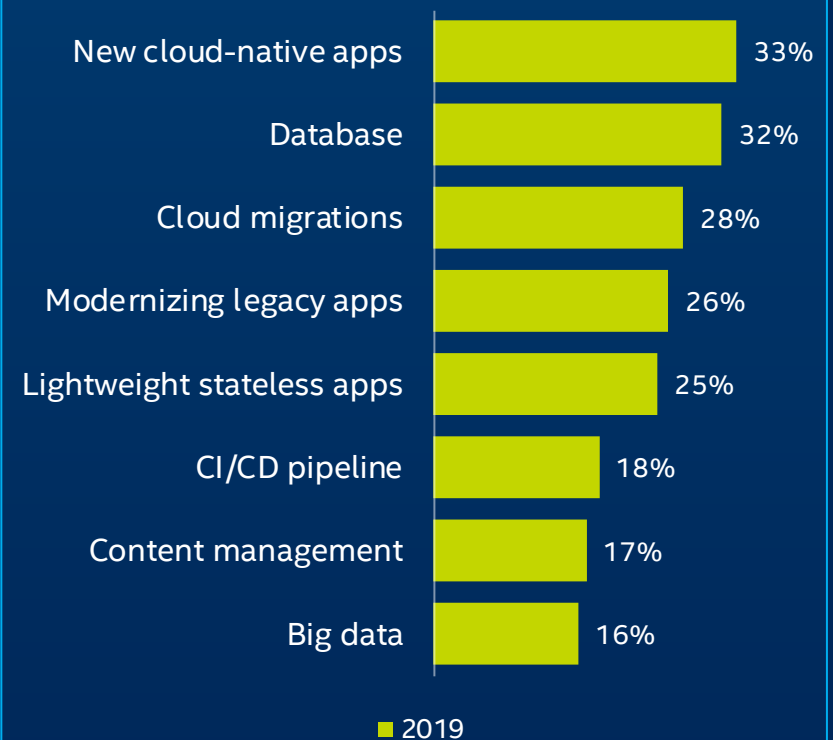


Intel SSD Data Center Family



10/25/40/50/100 Gigabit Intel Ethernet Network Adapters

## Databases emerged as a top use case for 2019



# Customer Success Story: Hybrid Cloud & Containers



Based in Korea, NCSoft is one of the world's premier publishers of massively multiplayer online role player games, delivering games via the cloud to allow gamers to play online against each other in real time.



Intel® Ethernet Network Adapters

## Challenge:

- Optimize performance using in-house infrastructure
- Enable applications hosted in the data center to scale smoothly into the public cloud

## Solution:

- Software modules that require dynamic performance and scalability are based on the Intel® Xeon® Gold processor
- Used Intel® SSDs to accelerate the writing of player logs
- Deployed a hybrid cloud container-based infrastructure, with Kubernetes

## Results:

- Enabled fluid scalability in the hybrid cloud
- Increased performance by removing storage bottlenecks

See [Sources](#)



# Intel Select Solutions for Containers/Kubernetes Platform



## Intel Select Solutions-

- Google Anthos
- Red Hat OpenShift

- Designed to simplify transition to a hybrid or multi-cloud environment
- Optimized performance across compute, storage, and networking leverages the best of trusted Intel architecture
- Anthos- Built on VMware stack and tools and designed to integrate seamlessly with Google Cloud
- Tested and verified by Intel for balanced and optimized performance - from the hardware, firmware, vSAN software and Anthos on-prem layer

**OEM Validated - Intel Verified**

# Optimized Workloads Run Best on Intel Xeon Scalable Processors

## Cloud

Public. Private. Hybrid.  
Intel delivers on the promise of performance everywhere.

Intel Perf Numbers

Azure Stack HCI

Up To **2X**

more IOPS, 13.7K, than the previous record, 6.7K<sup>23</sup>

Amazon (AWS)

Up To **4.65X**

better HPC performance on 96 vCPU **compared to Competition**<sup>24</sup>.

VMware

Up To **10X**

better price-performance improvement with vSAN 6.7 + Intel Xeon Scalable processor + Intel Optane SSD<sup>25</sup>.

Redis

Up To **2X**

node reduction and 74% HW cost savings with Intel Optane Persistent Memory<sup>26</sup>.

Gen over UP gen TO **1.33X** Performance Improvement<sup>2</sup>

Mainstream performance improvements

Gen over UP gen TO **30X** AI performance with Intel DL boost

End-to-end accelerated processors

Gen over UP gen TO **1.58X** Performance Improvement<sup>2</sup>

Workload specialized for nfv, cloud and iot

Gen over UP gen TO **2X** Memory Capacity

Breakthrough innovation

**Accelerating workloads** from the multi-cloud to the edge and back

See [Sources](#)

# Resources: Consult Experts

## Builders Program

Intel® AI Builders

Intel® Data Center Builders

Intel® Network Builders

Intel® Cloud Builders



<https://builders.intel.com>

## Intel® Select Solutions



## Intel® Select Solutions for Google Cloud's Anthos

<https://builders.intel.com/intelselectsolutions>

## Builders Program

### INTEL® XEON® PROCESSOR ADVISOR TOOL SUITE

Transition Guide | Workload Advisor (NEW) | TCO Advisor | Advanced TCO Advisor (NEW) | Intel Optane DCPMM  
Scale It Up | OEM System Catalog | Intel Select Solutions | AI Advisor Suite (NEW)

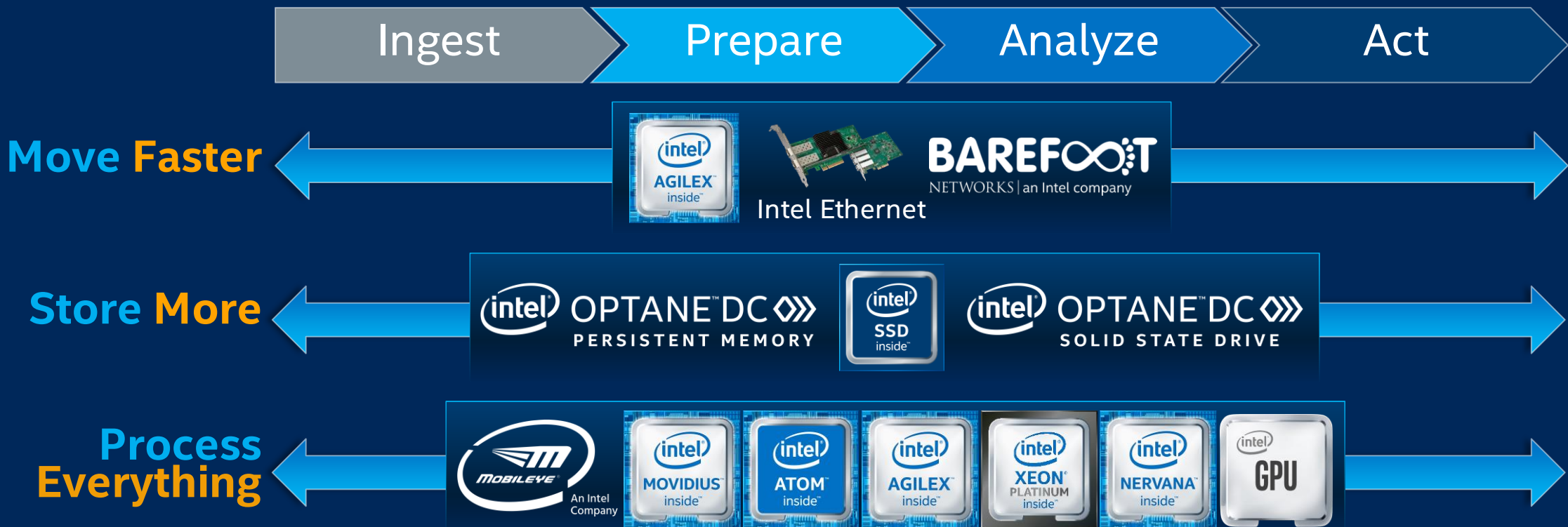
<https://xeonprocessoradvisor.intel.com>

Opportunity – Navigating the complexity of managing multiple clouds

# Our Data-Centric Portfolio

A foundation that drives value today and tomorrow

An End-to-end Portfolio That Is Unmatched In The Industry





Thank You

 **intel**®

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# Q: Which Of The Following Is A Reason Why Customers Are Moving To Multi-Cloud?

**A. Risk mitigation**

**B. Agility**

**C. Performance**

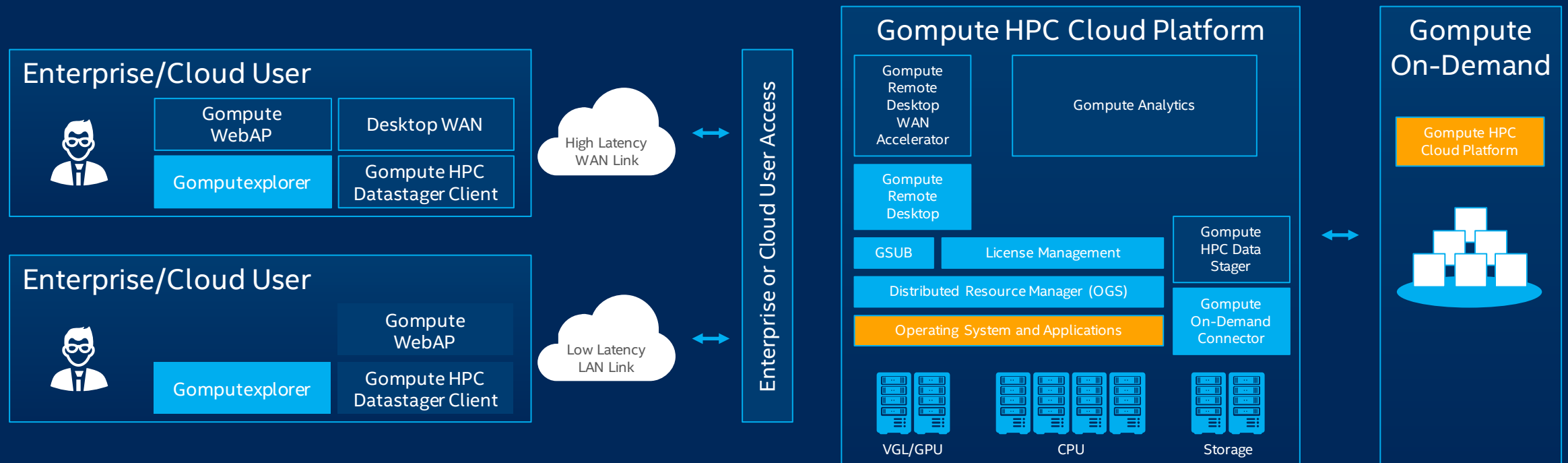




# Customer Success Story: HPC as a Service

**Challenge:** Expand Gompute capacity to support a growing demand for HPC as a Service in its cloud environment

**Customer type of workloads:** Computer Aided Engineering (CAE), computational fluid dynamics, structural analysis.



# HPC Workload Advocacy

Can this animation be removed? It's not on click and doesn't match the rest of the deck.

Why do HPC customers look to the cloud? - Unlimited Scale; SMB; Peak or short term demand  
Growing market; actively involved with Msft, Google and HPC...building the road. Advocacy is still on prem.  
Bldg the road for cloud.

**IBM** | Cloud Why IBM Cloud Paks Products Solutions Pricing Partners More ▾ Search [Cloud sign-up/log-in](#)

## IaaS

### Benefits of HPC on the IBM Cloud

<p><b>Elevate performance</b></p> <p>Bare metal and virtual servers use the latest CPUs and accelerators, such as NVIDIA GPUs — including the NVIDIA Tesla P100 and V100 — along with SSDs, for the power needed for most mixed app high-performance computing and deep learning.</p>	<p><b>Control costs</b></p> <p>With a cloud model, pay only for the compute power you use for bare metal and virtual instances.</p>	<p><b>Accelerate deployment</b></p> <p>With choices for IaaS or a SaaS HPC platform, you don't need deep infrastructure expertise to configure and deploy powerful HPC workloads quickly.</p>	<p><b>Trust the security</b></p> <p>In the era of ever-present attacks and breaches, IBM offers a scalable suite of cloud security technologies and solutions that are made more robust and complete through pervasive encryption and AI plus automation and integration. When you work with IBM, you gain access not only to a full stack of IBM Cloud security solutions but also to an IBM security team.</p> <p><a href="#">Let's talk</a></p>
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**Powerful Intel processors**

Accelerate cloud workloads with Intel Xeon processors and Intel Optane technology running on bare metal and virtual servers.

# Notices and Disclaimers

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration.

No product or component can be absolutely secure.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. For more complete information about performance and benchmark results, visit <http://www.intel.com/benchmarks>.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit <http://www.intel.com/benchmarks>.

Intel Advanced Vector Extensions (Intel AVX)\* provides higher throughput to certain processor operations. Due to varying processor power characteristics, utilizing AVX instructions may cause a) some parts to operate at less than the rated frequency and b) some parts with Intel Turbo Boost Technology 2.0 to not achieve any or maximum turbo frequencies. Performance varies depending on hardware, software, and system configuration and you can learn more at <http://www.intel.com/go/turbo>.

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# Sources

Slide 7 (Cloud Services Market Trends) -

1. Digital Advertising: eMarketer Feb 2019
2. Video On Demand Market Size, Share and Global Trend by Technology (SVOD, TVOD, AVOD), Content Type (Sports, Music, TV Entertainment, Kids, Movies), and Geography Forecast till 2025, June 2019
3. iMarcgroup: (US Only Market Size) Anything-as-a-Service Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2019-2024, June 2019

Slide 14 (Customer Success Story: Video Transcoding)

Source: [Solution Brief](#)

Slide 16 (Market Opportunity)

1. Source: Hyperion Research Market Forecast: 2019 Updated Cloud Market Forecast

Slide 17 (Customer Success Story: HPC as a Service)

1. For more complete information about performance and benchmark results, visit <https://www.intel.com/content/www/us/en/high-performance-computing/gompute-hpc-service-case-study.html>

# Sources

Slide 18 (Customer Success Story: HPC as a Service)

1 For more complete information about performance and benchmark results, visit <https://www.intel.com/content/www/us/en/high-performance-computing/gompute-hpc-service-case-study.html>

Slide 21 (Cloud Storage Services Market Opportunity)

Source: <https://www.marketsandmarkets.com/Market-Reports/hpc-data-analysis-storage-management-market-47829739.html>

Slide 22 (Modern Use Cases for Storage)

Source: <https://minio.io>

Slide 24 (Customer Success Story – Hybrid Cloud and Containers)

1 For more complete information about performance and benchmark results, visit <https://www.intel.com/content/dam/www/public/us/en/documents/case-studies/ncsoft-case-study.pdf>

Slide 26 (Optimized Workloads Run Best..)

19 – [See slide 15 for configuration details](#) 20 – [Google Cloud, Nov. 2017](#) 21 – [See slide 15 for configuration details](#) 22 – [Principled Technologies, Oct. 2018](#) 23 – [Microsoft, April 2019](#) 24 – [See slides 21-22 for configuration details](#) 25 – [Evaluator Group, Sept. 2018](#) 26 – [See slide 23 for configuration details](#) Performance results are based on testing as of dates shown in configuration and may not reflect all publicly available security updates. No product or component can be absolutely secure. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit [www.intel.com/benchmarks](http://www.intel.com/benchmarks). \*Other names and brands may be claimed as the property of others.

Performance results are based on testing as of dates shown in configuration and may not reflect all publicly available security updates. Configurations and benchmark details can be found on slide/page 50 and 53. No product or component can be absolutely secure. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit [www.intel.com/benchmarks](http://www.intel.com/benchmarks).