Investor Webinar

DCAI Business Update

John Pitzer
Corporate Vice President
Investor Relations
Disclosures and Forward-Looking Statements

- Future node performance and other metrics, including power and density, are projections and are inherently uncertain and, in the case of other industry nodes, are derived from or estimated based on publicly available information. Intel’s node numbers do not represent the actual dimension of any physical feature on a transistor or structure. They also do not pinpoint a specific level of improvement in performance, power or area, and the magnitude of a decrease from one node number to the next is not necessarily proportionate to the level of improvement in one or more metrics. Historically, new Intel node numbers were based solely on improvements in area/density; now, node numbers generally reflect a holistic assessment of improvement across metrics and can be based on improvement in one or more of performance, power, area, or other important factors, or a combination, and will not necessarily be based on area/density improvement alone.

- Statements in this presentation that refer to business outlook, plans, and expectations are forward-looking statements that involve risks and uncertainties. Words such as “accelerate,” “achieve,” “adjust,” “allow,” “anticipate,” “believe,” “committed,” “continue,” “could,” “deliver,” “drive,” “estimate,” “expand,” “expect,” “focus,” “forecast,” “future,” “goal,” “grow,” “guide,” “improve,” “increasing,” “manage,” “may,” “on-track,” “opportunity,” “outlook,” “plan,” “positioned,” “potential,” “progress,” “ramp,” “refocus,” “regain,” “roadmap,” “sharpen,” “should,” “support,” “will,” “would,” and variations of such words and similar expressions are intended to identify such forward-looking statements. Statements that refer to or are based on estimates, forecasts, projections, uncertain events or assumptions, including statements relating to Intel’s strategy and its anticipated benefits, including our February 2022 Investor Meeting financial model, the transition to an internal foundry model, and updates to our reporting structure; Intel’s process and packaging technology, roadmap and schedules, including future node performance, progress, timelines, ramps, and other metrics; financial projections; projected costs and yield trends; pending transactions, including the acquisition of Tower Semiconductor Ltd.; the sale of our NAND memory business, and the wind-down of our Intel Optane memory business; expected completion and impacts of restructuring activities and cost-saving or efficiency initiatives; uncertain events or assumptions, including statements relating to total addressable market, product or customer demand or market opportunity or share; business plans and financial expectations; future economic conditions, including related to interest rates and inflation, as well as regional or global downturns or recessions; future legislation, including any expectations regarding anticipated financial and other benefits or incentives thereunder; tax- and accounting-related expectations; future responses to and effects of COVID-19, including manufacturing, transportation, and operational restrictions or disruptions; future products, technology, and services, and the expected regulation, availability, production and benefits of such products, technology, and services, including product ramps, and manufacturing plans, goals, timelines, and future progress; expectations regarding customers, including with respect to designs, wins, orders, and shipments; projections regarding competitors; and anticipated growth trends in our businesses or the markets relevant to them, including future demand and industry growth, also identify forward-looking statements.

- Unless specifically indicated otherwise, the forward-looking statements in this presentation do not reflect the potential impact of any divestitures, mergers, acquisitions, or other business combinations that have not been completed as of the date of this presentation. Such statements involve many risks and uncertainties that could cause actual results to differ materially from those expressed or implied in these forward-looking statements. Important factors that could cause actual results to differ materially are set forth in Intel’s earnings release dated January 26, 2023, which is included as an exhibit to Intel’s Form 8-K furnished to the SEC on such date, and in Intel’s SEC filings, including the company’s most recent reports on Forms 10-K and 10-Q, such as changes in product demand or product mix, the complexity of our manufacturing operations, competition, investments in R&D and our business, products, and technologies, vulnerability to product and manufacturing-related risks, the effects of the COVID-19 pandemic, supply chain risks, cybersecurity and privacy risks, investment and transaction risk, evolving regulatory and legal requirements, and the risks of our global operations, among others. Copies of Intel’s SEC filings may be obtained by visiting our Investor Relations website at www.intc.com or the SEC’s website at www.sec.gov.

- Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. Intel does not control or audit third-party data. You should consult other sources to evaluate accuracy. © Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.

- All information in this presentation reflects management’s views as of March 29, 2023. Intel does not undertake, and expressly disclaims any duty, to update any statement made in this presentation, whether as a result of new information, new developments or otherwise, except to the extent that disclosure may be required by law.

- Intel technologies may require enabled hardware, software or service activation. No product or component can be absolutely secure. Your costs and results may vary. Product and process performance varies by use, configuration and other factors. Learn more at www.intel.com/PerformanceIndex and www.intel.com/ProcessInnovation. Future product and process performance and other metrics are projections and are inherently uncertain.
<table>
<thead>
<tr>
<th>Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Center TAM Update</td>
<td>Sandra Rivera</td>
</tr>
<tr>
<td>Roadmap Update</td>
<td>Sandra Rivera &amp; Lisa Spelman</td>
</tr>
<tr>
<td>Winning in AI</td>
<td>Sandra Rivera &amp; Greg Lavender</td>
</tr>
<tr>
<td>Wrap Up and Q&amp;A</td>
<td>Sandra Rivera</td>
</tr>
</tbody>
</table>
**DCAI Silicon TAM Opportunity**

- **Primary TAM Drivers**
  1. Growth in heterogeneous computing
  2. Growth in AI, networking, security and other strategic workloads

- Source: Intel forecast based on amalgamation of analyst data and internal analysis
Silicon Revenue Will Follow CPU Core Trends

- Compute demand has strong growth trajectory
- Xeon core growth increasing at a faster rate than previous generations
- Delivering customer value through CPU cores, built-in acceleration & heterogenous computing

Mainstream Compute Cores Growing at Mid-20s CAGR

Source: Intel forecast based on amalgamation of analyst data and internal analysis
Delivering the Broadest Portfolio
Driving Innovation from the Cloud, through the Network to the Intelligent Edge
Delivering the Broadest Portfolio
Driving Innovation from the Cloud, through the Network to the Intelligent Edge

Single code base across multiple architectures
Data Center Infrastructure Requirements Evolving

- Different requirements driving $TCO
  Perf/Core, Perf/Watt, Perf/VM, Perf/Socket
- Continued demand for high-core performance
- Growing demand for cores that deliver highest performance-per-watt
CPUs Optimized for Mainstream Compute

- High-core performance
- Workload-optimized performance with built-in accelerators

- Performance-per-watt optimized
- High-core density
- High-throughput performance

P-core

Optimized for Performance

E-core

Optimized for Efficiency
4th Gen Intel® Xeon® Arrives with Strong Customer Adoption

450+ DESIGN WINS
The most ever for any Xeon family

200+ DESIGNS SHIPPING TODAY
Most ever on embargo lift/intended shipping day

50+ ALL MAJOR OXMS* SHIPPING
* Original equipment manufacturers + original design manufacturers

Top 10
Global CSPs* deploying now and throughout 2023
* Cloud service providers

Supply
Meeting customer demand today and healthy throughout 2023
5th Gen Intel Xeon Scalable Processors
Formerly codenamed “Emerald Rapids”

Sampling today, on schedule to deliver in Q4 2023

- High-quality silicon
  - Volume validation underway

- Higher performance-per-watt in same power envelope
  - Increased gen-on-gen core density

- Same platform as 4th Gen Xeon
  - Easy migration path, from previous generation
Intel® Xeon® Processors codenamed Granite Rapids

On schedule to deliver in 2024, closely following Sierra Forest

- Excellent silicon health
  - Hitting all major engineering milestones

- Performance optimized
  - First P-Core Xeon on Intel 3

- Platform improvements
  - Increased core density, memory & I/O innovations
“As the market leader in this segment, our focus is on strategic adoption of new technologies that keep us ahead of the curve and in front of the competition. The initial platform progress we are seeing with Intel’s Sierra Forest is fueling our confidence and invigorating that mission.”

Dave Lincoln
VP of Networking & Emerging Server Solutions

“For decades, HPE and Intel have collaborated on engineering projects to usher in advanced performance and efficiency for a number of enterprise workloads. Combining our forces is what keeps our industry moving forward. We are pleased to continue that strong collaboration and help play a role in influencing the design and architecture of Granite Rapids, Intel's future-generation processor. We look forward to welcoming Intel’s upcoming innovation.”

Krista Satterthwaite
Senior Vice President and General Manager, Mainstream Compute, at HPE

“Leveraging Lenovo’s established in-house design and manufacturing strategy and Intel’s deep engineering capability, the future platform based on Intel’s Granite Rapids processors booted in record time. This was one of the fastest and most efficient power-on implementations we have experienced and we are excited to deliver this new emerging technology faster to further enable our customers’ digital transformations.”

Kamran Amini
Vice President and General Manager of Server & Storage, Lenovo Infrastructure Solutions Group
Intel® Xeon® Processor codenamed Sierra Forest
First Xeon processor with Efficient-core (E-Core)

Sampling today, shipping 1st half of 2024

Excellent silicon health
- Silicon power-on;
  Operating systems booted in <18 hours

Lead vehicle for Intel 3
- 144 processor cores

New class of Xeon
- Built for cloud-optimized workloads
Executing on Our Xeon Roadmap

- **Today**: 4th Gen Intel® Xeon® Scalable processors
- **Q4 2023**: 5th Gen Intel® Xeon® codenamed Emerald Rapids
- **2024 (First Half)**: Next-Gen Intel® Xeon® codenamed Sierra Forest
- **2024 (closely following Sierra Forest)**: Next-Gen Intel® Xeon® codenamed Granite Rapids
- **2025**: Next-Gen Intel® Xeon® codenamed Clearwater Forest
# DCAI Architecture Evolution

## CPU P-Core
- 4th Gen Intel® Xeon® Scalable processors
- Intel® Xeon® CPU Max Series
- 5th Gen Intel® Xeon®
  - codenamed Emerald Rapids
- Intel® Xeon® Processors
  - codenamed Granite Rapids

## CPU E-Core
- Intel® Xeon® Processors
  - codenamed Sierra Forest
- Intel® Xeon® Processors
  - codenamed Clearwater Forest

## GPU
- Intel® Data Center GPU Flex Series
  - codenamed Arctic Sound-M
- Intel® Data Center GPU Max Series
  - codenamed Ponte Vecchio
- Intel® Data Center GPU Flex Series
  - codenamed Melville Sound
- Next-Generation Accelerator Architecture
  - Codename: Falcon Shores

## Dedicated AI
- Habana®
  - Gaudi® 2
- Habana®
  - Gaudi® 3
- Next-Generation Accelerator Architecture

## FPGA
- Intel®
  - Stratix 10
  - eASIC
  - AGILEX
- 15 new FPGAs on schedule to PRQ in 2023
- Intel®
  - eASIC
  - AGILEX
- Next Gen FPGAs

## Roadmap: 2023-2025

DCAI Investor Webinar March 2023
AI Accelerator Opportunity

$40B Logic Silicon TAM by 2027*

General Compute
- Primarily managed by CPUs
- Processing, ingesting, management and movement of data
- Small- to medium sized AI models

Accelerated Compute
- Serviced today by GPUs and special accelerators
- Large models (>100B parameters)

*Source: Intel forecast based on amalgamation of analyst data and internal analysis
Using AI to Accelerate Internet Video

**Video Processing**

- **Build**
  - Statistical AI analysis using AVX-512 and Intel® DL Boost to accelerate the video processing pipeline

**Content Distribution**

- **Deploy**
  - Accelerated & encrypted content for distribution using Intel DSA and Intel QAT

AVX = Advanced Vector Extensions, DLBoost = Deep Learning Boost, DSA = Data Streaming Accelerator, QAT = Quick Assist Technology
“We recently presented a benchmark using Habana Gaudi2 and the Hugging Face Transformers library that enables you to run inference faster than with any GPU currently available on the market.”

Jeff Boudier
Product Director, Hugging Face

“Intel has enabled stable diffusion models to run efficiently on their heterogenous offerings from Intel 4th Gen Xeon Scalable Sapphire Rapids CPUs to accelerators like Gaudi and hence is a great partner to democratize AI. We look forward to collaborating with them on our next generation language, video and code models and beyond.”

Emad Mostaque
Founder and CEO, Stability AI
Scaling AI Compute
From the cloud, to the network, to the edge

Large-scale data center cluster
- Hundreds of billions of parameters models
- 256 Xeon processors
- 512 Gaudi deep learning accelerators

System-level approach
- Networking
- Memory bandwidth & capacity
- Software supporting industry frameworks

Portable models with Intel OpenVINO
- Build once, deploy anywhere
- Millions of downloads, hundreds of thousands of developers
- Used across a broad range of verticals

97% Scale Efficiency

Source: Configuration based on Internal testing on large-scale development cluster with key partners. Results may vary.
Democratizing AI
with software

Greg Lavender
Senior Vice President, CTO
General Manager, Software and Advanced Technology Group
Democratizing AI for Everyone

- **Open** Programmability
- **Choice** Compatibility
- **Trust** Inference at the Edge
- **Scaled** Delivery Mechanism Infrastructure

Open Accelerated Computing for AI

Hardware / Architecture
Open = Ecosystem Adoption

SOURCES
- https://github.com/pytorch/pytorch/pulse
Open = Programmability
**Choice = Open Accelerated Computing**

**Choice** Compatibility

**1**

oneAPI

**over 85%**

Increase in Install Base ‘21-’22

SOURCE: Internal Intel measurement based on telemetry from our software installers.
Choice = Open Accelerated Computing


Choice
Compatibility

1
oneAPI

OpenVINO

1

6.2 million
Intel active developers

64%
of AI/ML developers using Intel tools
Choice = Compatibility

CUDA Code Migrated Automatically to SYCL

~90%

SOURCE: Intel estimates as of September 2021. Based on measurements on a set of 70 HPC benchmarks and samples, with examples like Rodinia, SHOC, PENNANT. Results may vary.
Trust = Security at the Edge

Trust
Inference at the Edge

Open Federated Learning
(OpenFL)

Scale = Intel® Developer Cloud

Scaled Delivery Mechanism
Infrastructure
cloud.intel.com
Democratizing AI for Everyone

Open
Programmability

Choice
Compatibility

Trust
Inference at the Edge

Scaled
Delivery Mechanism Infrastructure

Open Accelerated Computing for AI

Hardware / Architecture
In Summary

Competing in a **large and growing TAM**

**Our roadmap is on track** and we’re hitting key milestones

Deploying assets to **truly democratize AI**
Notice and Disclaimers

Performance varies by use, configuration and other factors. Learn more at
Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. No product or component can be absolutely secure.

Intel technologies may require enabled hardware, software or service activation.

Altering clock frequency or voltage may void any product warranties and reduce stability, security, performance, and life of the processor and other components. Check with system and component manufacturers for details.

Intel does not control or audit third-party data. You should consult sources to evaluate accuracy.

© Intel Corporation. Intel, the Intel logo, and other Intel marks are the trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.

Performance Disclaimer: Intel Max Series GPUs deliver up to 50% better performance for physics applications versus competitive products.

Configurations:

- Testing as of 1/31/2023 Intel Platform: 1-node 1x Intel® Xeon® 8360Y, HT On, Turbo Enabled, total memory 256GB DDR4-3200, 1x Intel® Data Center GPU Max 1550, Ubuntu 20.04, Kernel 5.15, oneAPI icpx Nightly 20230109
- Testing as of 1/18/2023 Competing Platform: 1-node 1x Intel® Xeon® 8360Y, HT On, Turbo Enabled, total memory 128GB DDR4-3200, 1x PCIe NVIDIA H100, Ubuntu 20.04, Kernel 5.15, GPU Driver 525.60.13, Intel LLVM 20230109, CUDA 12.0
- Workload: Alfvén Wave for grid sizes: 36³, 48³, 72³, 96³, 132³, 192³, 264³, 390³, and 516³ cells. DPEcho GitHub: https://github.com/LRZ-BADW/DPEcho