Disrupting the datacenter: Qualcomm Centriq™ 2400 Processor

November 8, 2017

Qualcomm Centriq is a product of Qualcomm Datacenter Technologies, Inc.

Safe Harbor

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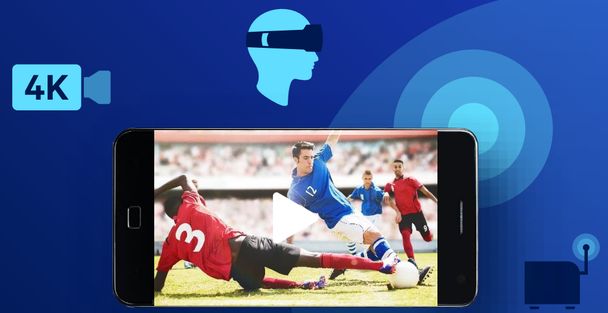
Transforming our world

Technology leadership in advanced computing, connectivity, security, and systems design

Inventing technologies that fuel innovation

Long history of anticipating big industry challenges and developing system-level solutions to solve them

5G will power a new cloud and connectivity paradigm



Enhanced mobile broadband

Mission-critical services

Massive Internet of Things

A unified connectivity platform facilitating distributed intelligence between cloud and device

Distributed intelligence drives new requirements

Intelligence distributed from cloud to device

Utilizing our technology leadership to drive innovation at scale across industries

- Automotive
- Computing
- Networking
- Media consumption
- Industrial IoT
- Smart homes

High performance at leading process nodes

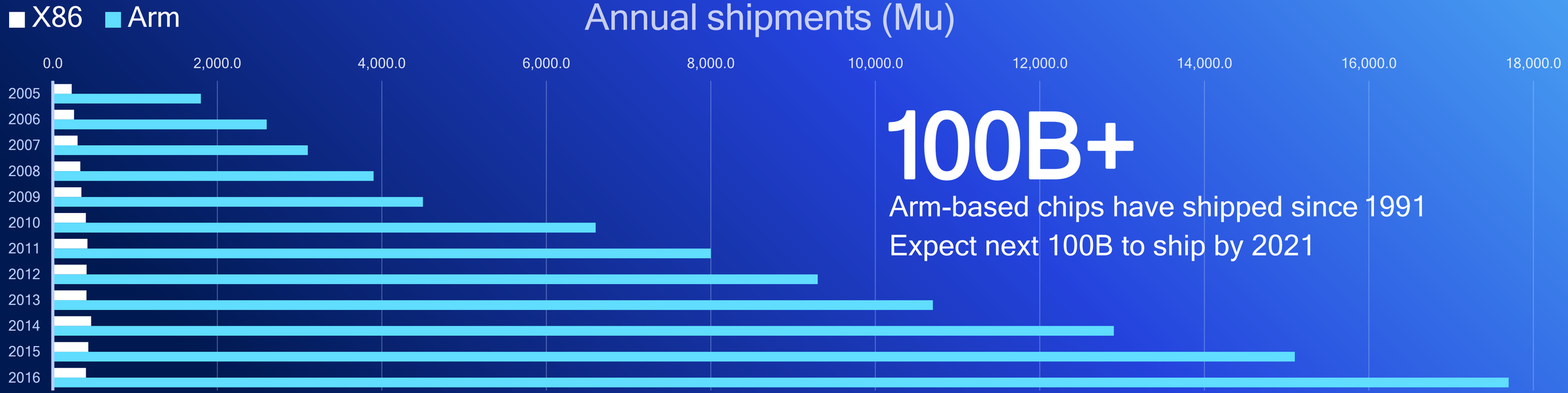
5G for high speed, low latency connectivity

Low power, efficient, integrated computing platforms

Optimized machine learning

Comprehensive security

Arm vs x86: Architectural footprint



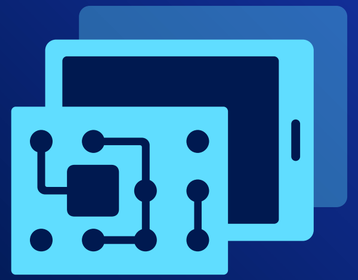
100B+

Arm-based chips have shipped since 1991

Expect next 100B to ship by 2021

Source: IDC, September 2017.

Structural trends driving tectonic shift in the data center



Cloud

Opportunity aligned with our vision

Manufacturing process

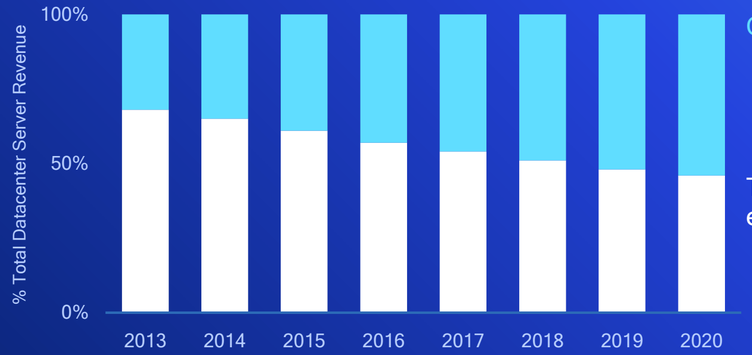
A new world in datacenter—cloud

Then

On-premise
Centralized system

Monolithic architecture

Worldwide cloud IT infrastructure shifts to cloud*



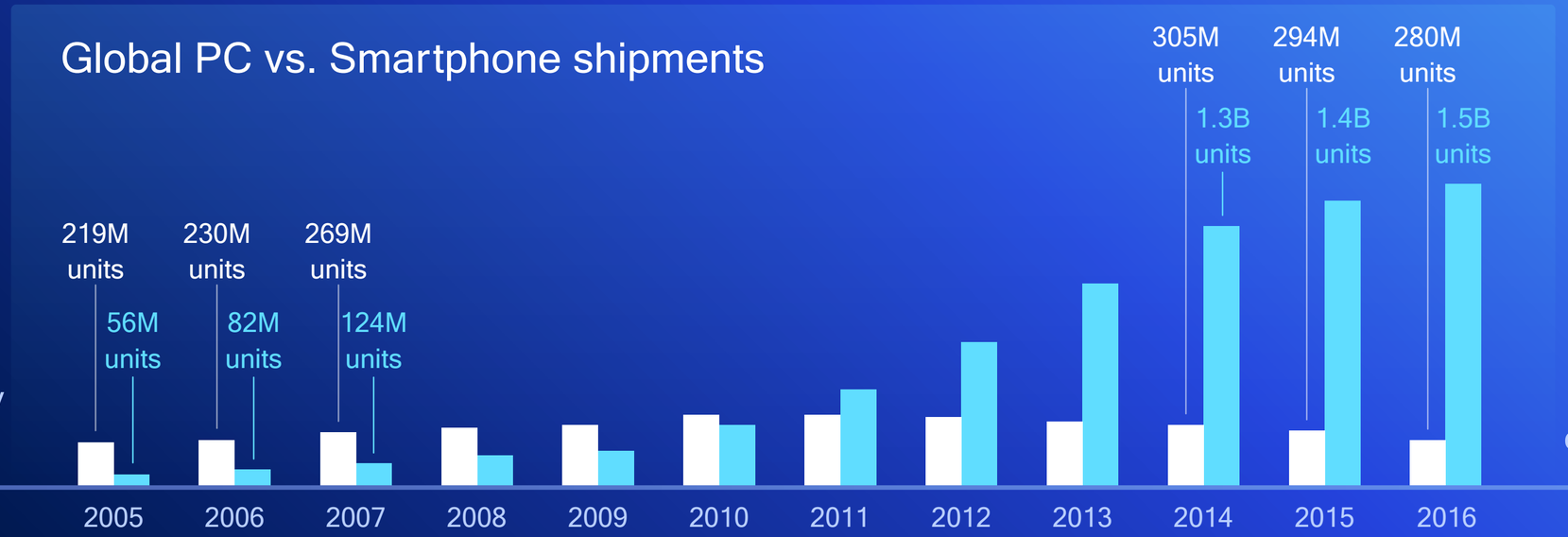
Scale-out architecture

Now

Cloud distributed system

*Source: IDC Dec 2016

A new world in datacenter—manufacturing process



Then
Fab process technology driven by PC

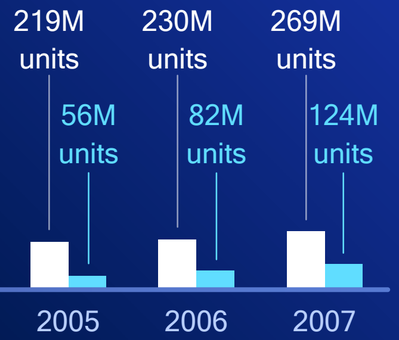
Now
Fab process technology driven by mobile phones

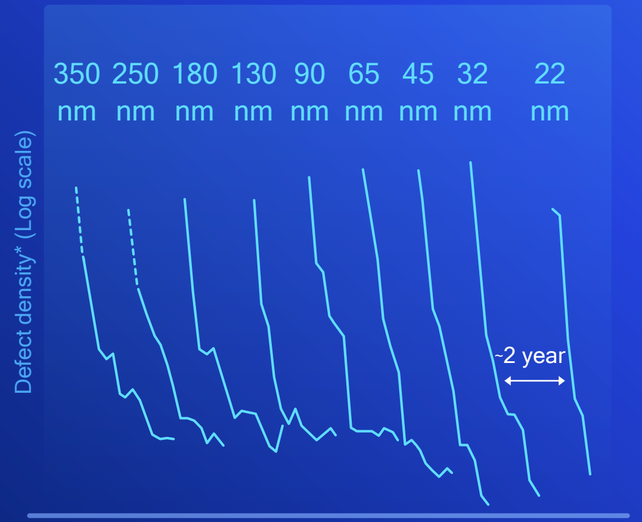
* Source: IDC

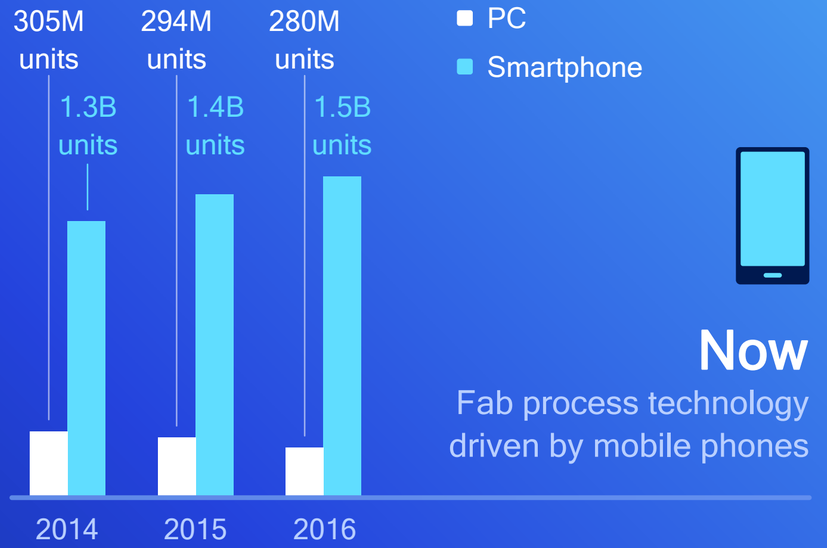
A new world in datacenter—manufacturing process

Then

Fab process technology driven by PC







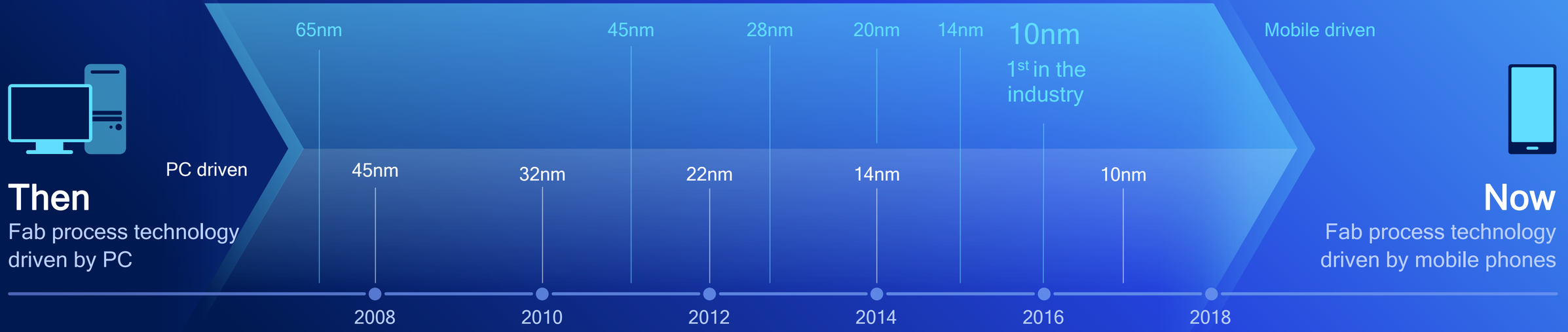
Now

Fab process technology driven by mobile phones

* Source: IDC

A new world in datacenter—manufacturing process

Qualcomm Datacenter Technologies is uniquely positioned to utilize mobile growth and drive datacenter process leadership



Then

Fab process technology driven by PC

Now

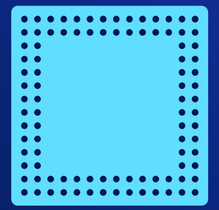
Fab process technology driven by mobile phones

Qualcomm Centriq™ 2400 Processor

Disrupting the datacenter

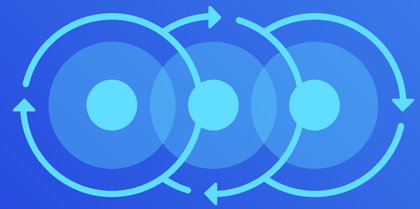
Reimagining the datacenter

Delivering the most advanced Arm-based processor on the most advanced process node



Process technology leadership
Custom design expertise

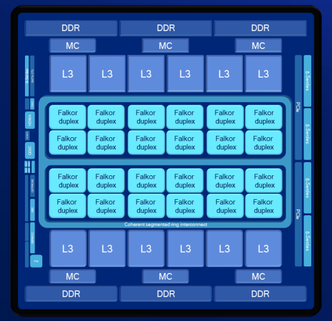
Built for the cloud



Open ecosystem

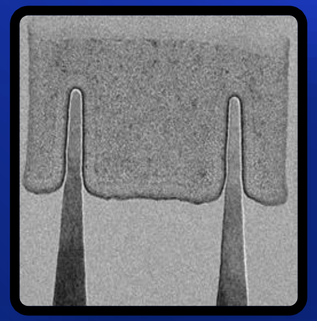
Industry's first and only 10nm server processor.

Innovative design on leading edge node



World class design

+



Industry leading process node

=

"Samsung's 10nm process technology with specific optimizations for high performance, combined with QDT's leading-edge custom SoC design, allow us to deliver a world-class server processor that will disrupt the datacenter market."

ES Jung, President and GM, Foundry Business, Samsung Electronics

Qualcomm Centriq processor is a product of Qualcomm Datacenter Technologies, Inc.

Benefits of leading edge node

18+ Billion transistors, 398mm^2

Better performance, power, area

Transistor speed	Higher performance
Transistor density	Lower cost
Transistor power	Higher perf/Watt

Qualcomm Centriq™ 2400

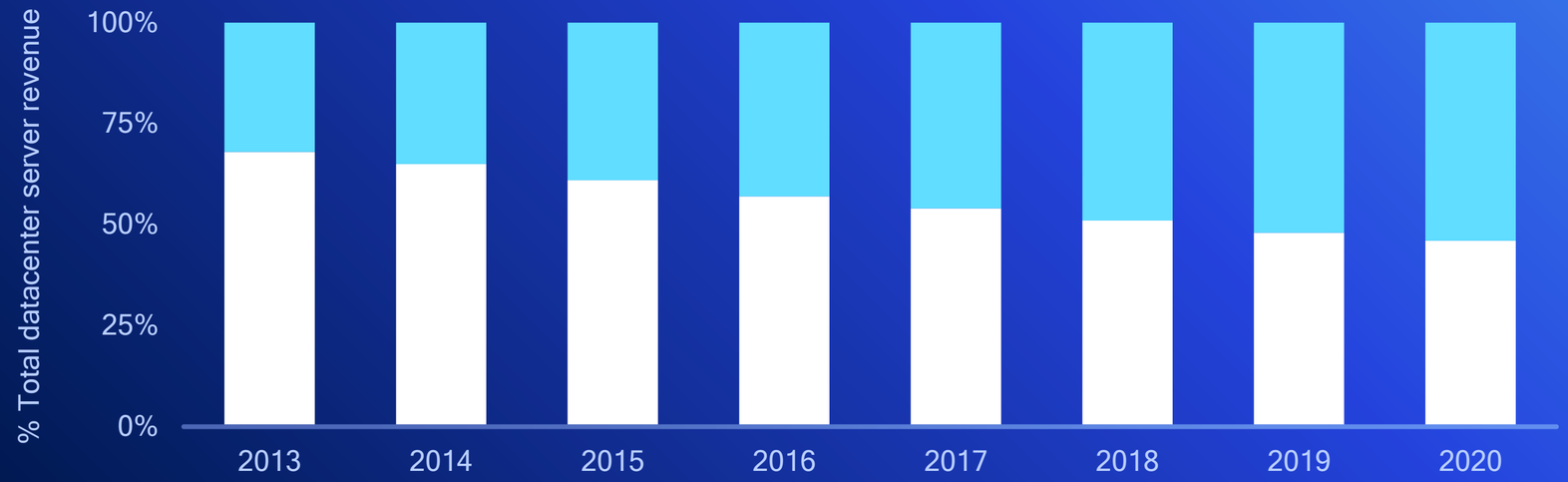
World's first 10nm server processor

Now shipping for revenue*

*In limited volumes in Q4 2017

Industry is shifting to the cloud

Cloud accounts for >50% of server shipments by 2020



*Source: IDC Dec 2016

Cloud software trends

Infrastructure services

Platform services

Software and API services

Applications increasingly decoupled from ISA

Monolithic SW

Microservices, containerized SW

Cloud native applications

Multi-threaded

Scale out

Portable

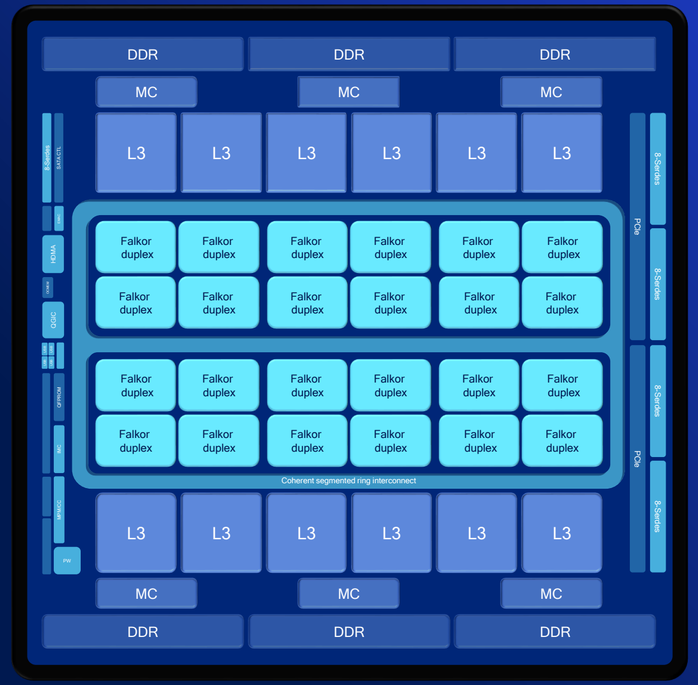
What cloud means for processor architecture

Throughput performance
Thread density
Quality of service
Energy efficiency

Key metrics

- Perf / thread
- Perf / Watt
- Perf / $

Qualcomm Centriq 2400: Built for cloud



Qualcomm® Falkor™ CPU

- 5th-generation custom core design
- 2.2 GHz base frequency, 2.6 GHz peak*
- Arm v8-compliant
- AArch64 only

High core count

- Up to 48 single-thread CPU cores

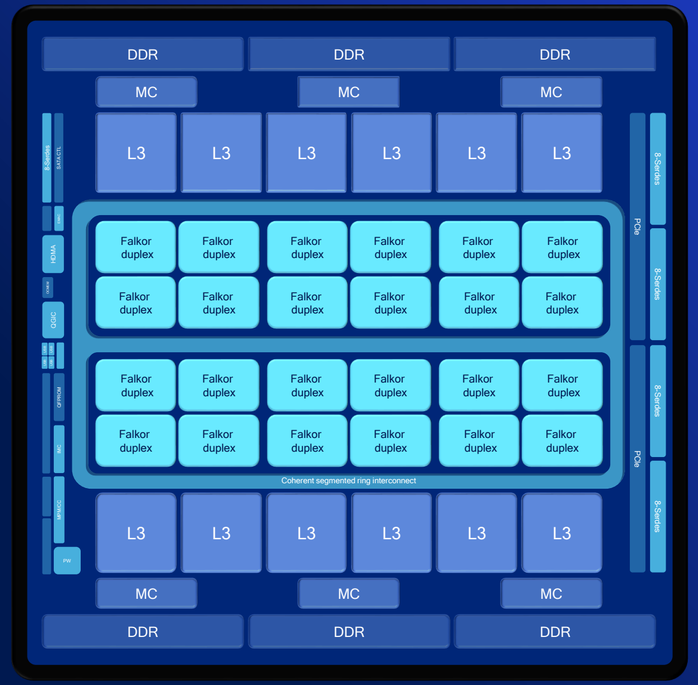
Large cache

- 64 KB L1 instruction cache with 24 KB single-cycle L0 cache
- 512 KB L2 per duplex
- 60 MB unified L3 cache

Bi-directional multi-ring

- Fully coherent
- >250GB/s aggregate bandwidth

Qualcomm Falkor CPU is a product of Qualcomm Datacenter Technologies, Inc.; * For 48 core Qualcomm Centriq 2460



Qualcomm Centriq 2400: Built for cloud

Highly integrated SoC

- Distributed architecture
- Single chip platform-level solution
- Arm SBSA Level 3-compliant

High memory BW

- 6 Channels of DDR4 2667 MT/s
- Up to 768 GB of memory
- 128 GB/s peak aggregate BW

Low power

- Up to 120W TDP

Security

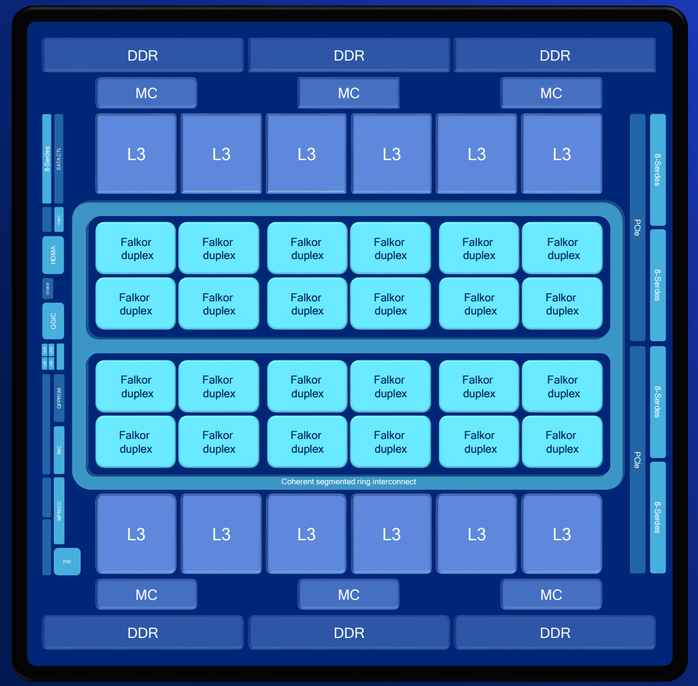
- Immutable root of trust
- EL3 (TrustZone) and EL2 (hypervisor)

Cloud workload enhancers

- Inline memory bandwidth compression
- Cache Quality of Service

Integrated chipset

- 32 PCIe Gen3 lanes with 6 PCIe controllers
- Low speed IO; integrated management controller

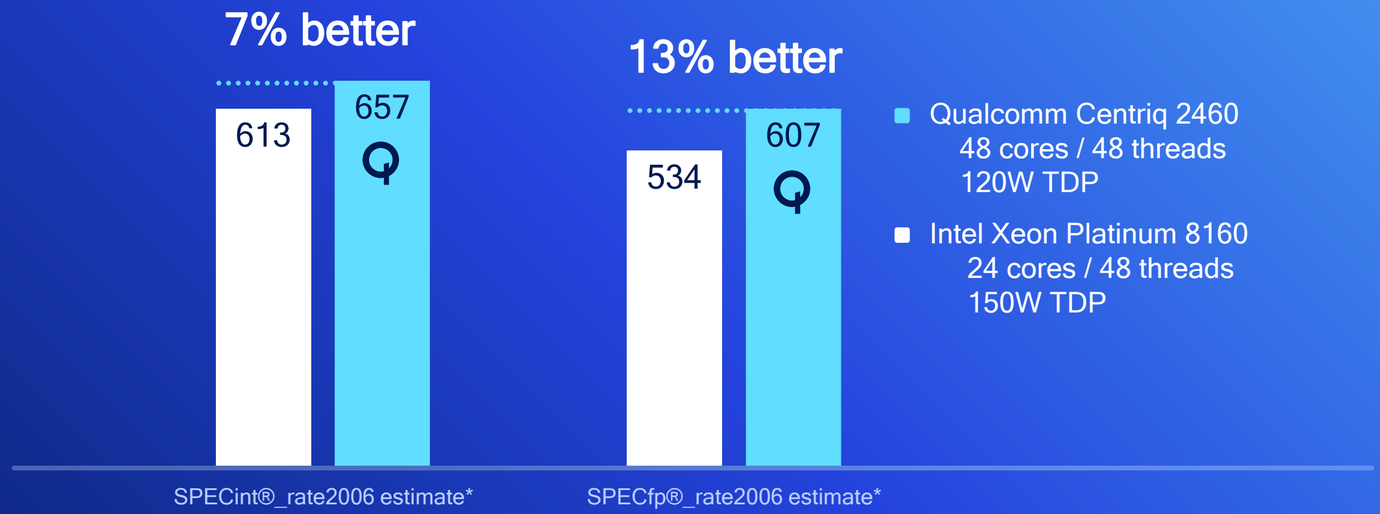


Qualcomm Centriq 2400: Built for cloud

- 48 physical 2.6 GHz custom cores with large cache
- High bandwidth coherent ring
- Constant peak frequency
- Cache quality of service
- Inline memory bandwidth compression
- Security rooted in hardware
- Leading performance and power efficiency

Qualcomm Centriq performance leadership

Throughput performance leadership at same thread count



*Measured internally with gcc -O2; more details are in end notes.

Comparative SKU lineup

Intel Xeon – Top bin Platinum, Gold, Silver SKUs*

SKU	Core Count	L3 Cache	Frequency (base and turbo** freq)	Power (TDP)
Intel Xeon Platinum 8180	28	38.5 MB	2.5 / 3.8 GHz	205W
Intel Xeon Gold 6152	22	30.25 MB	2.1 / 3.7 GHz	140W
Intel Xeon Silver 4116	12	16.5 MB	2.1 / 3.0 GHz	85W

Qualcomm Centriq Processor SKUs

SKU	Core Count	L3 Cache	Frequency (base and peak** freq)	Power (TDP)
Qualcomm Centriq 2460	48	60 MB	2.2 / 2.6 GHz	120W
Qualcomm Centriq 2452	46	57.5 MB	2.2 / 2.6 GHz	120W
Qualcomm Centriq 2434	40	50 MB	2.3 / 2.5 GHz	110W

*Source: https//ark.intel.com. ** Intel Xeon Turbo frequency is lower when all cores are running; Qualcomm Centriq 2400 processor peak frequency is for all cores running.

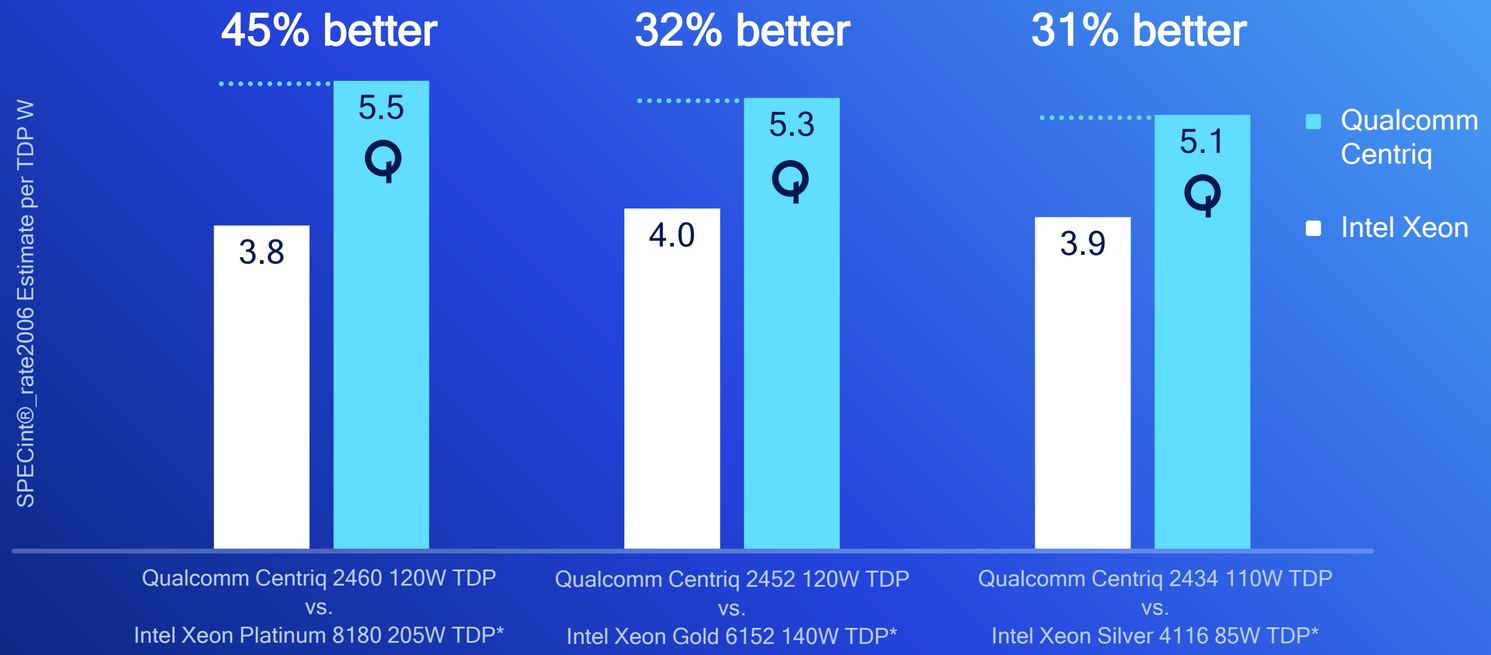
Qualcomm Centriq performance leadership

Performance per thread leadership vs. top end Intel Xeon Platinum, Gold, and Silver

*SPECint®_rate2006 estimate extrapolated from published icc numbers using icc to gcc -O2 scale factor derived from internal measurements on Intel Xeon Platinum 8176, Intel Xeon Platinum 8160 and Intel Xeon Silver 4110; more details are in end notes.

Qualcomm Centriq performance leadership

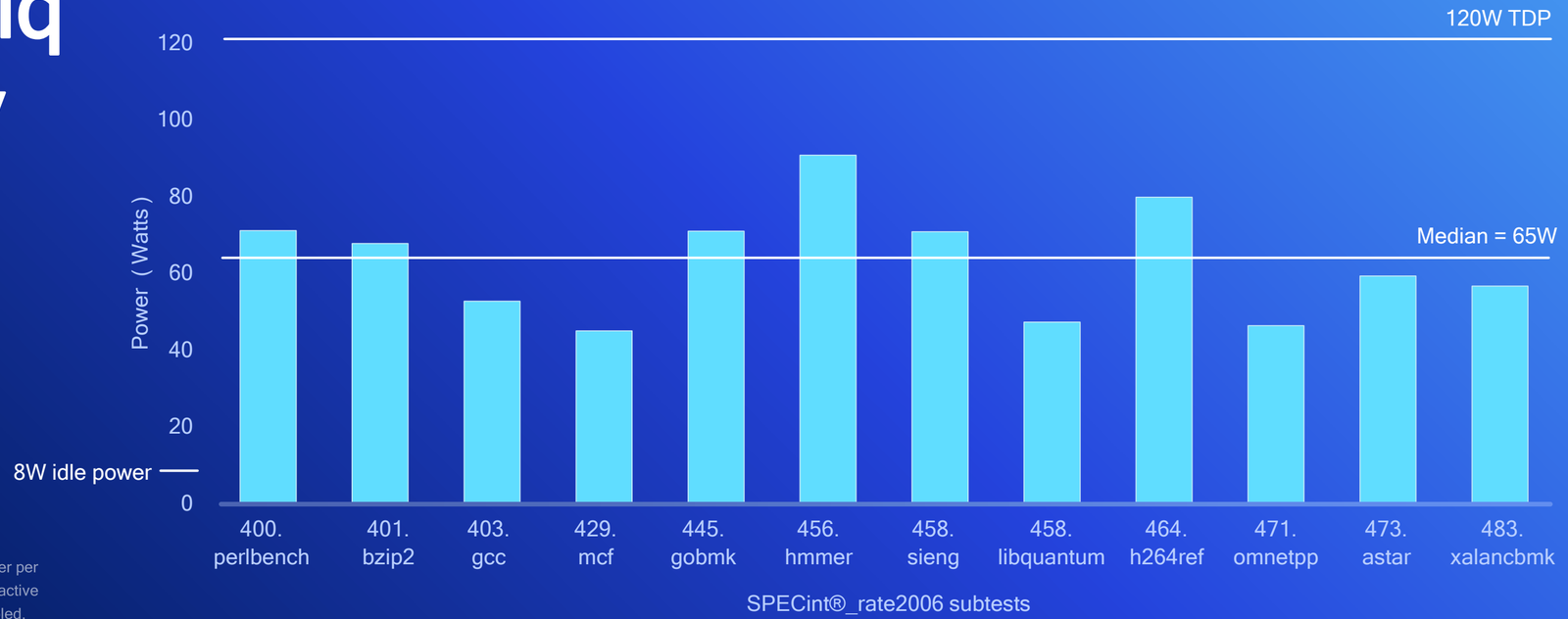
Performance per Watt leadership vs. top end Intel Xeon Platinum, Gold, and Silver



*SPECint®_rate2006 estimate extrapolated from published icc numbers using icc to gcc -O2 scale factor derived from internal measurements on Intel Xeon Platinum 8176, Intel Xeon Platinum 8160 and Intel Xeon Silver 4110. Power based on TDP rating; more details are in end notes.

Qualcomm Centriq energy efficiency

Active power well below 120W TDP

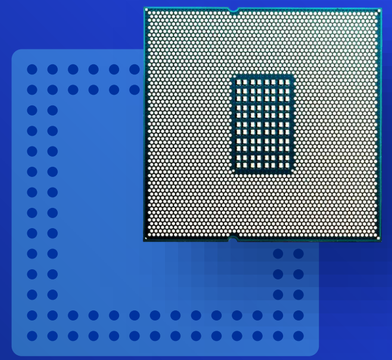


Qualcomm Centriq 2460 power measured internally on typical material at room temperature. Power per subtest is average over duration of each subtest while running SPECint®_rate2006 with all cores active using gcc -O2. Idle power measured during OS idle with only C1 enabled. With all idle states enabled, measured power is below 4 W. More details are in end notes.

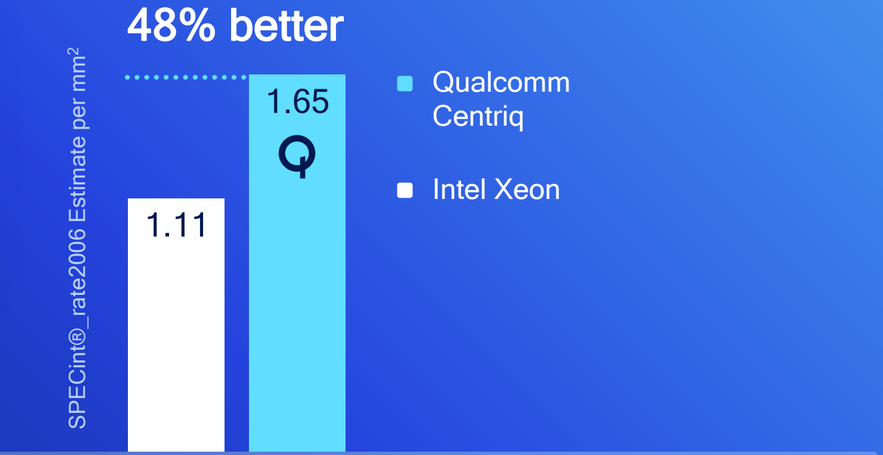
Qualcomm Centriq performance leadership

Performance per mm² leadership

398mm² in Samsung 10LPE
(50M transistors per mm²)



698mm²** in Intel 14nm
(37.5M transistors per mm²)



*SPECint®_rate2006 estimate extrapolated from published icc numbers using icc to gcc -O2 scale factor derived from internal measurements on Intel Xeon Platinum 8176, Intel Xeon Platinum 8160 and Intel Xeon Silver 4110. **Source: https://www.anandtech.com/show/11839/intel-core-i9-7980xe-and-core-i9-7960x-review/3; Transistor density from https://s21.q4cdn.com/600692695/files/doc_presentations/2017/TechnologyManufacturingDay/2017_TMD_MarkBohr_MooresLaw_FINAL.pdf. More details are in end notes.

Qualcomm Centriq performance leadership

Performance per CPU $ vs. top end Intel Xeon Platinum, Gold, and Silver

*SPECint®_rate2006 estimate extrapolated from published icc numbers using icc to gcc -O2 scale factor derived from internal measurements on Intel Xeon Platinum 8176, Intel Xeon Platinum 8160 and Intel Xeon Silver 4110. Intel Xeon list prices from https://ark.intel.com. Qualcomm Centriq 2460 list price = $1995; Qualcomm Centriq 2452 list price = $1373; Qualcomm Centriq 2434 list price = $888. More details are in end notes.

Optimized for cloud native workloads

Highly threaded
Applications

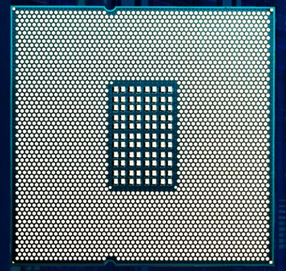
Microservices and containers
Based instances

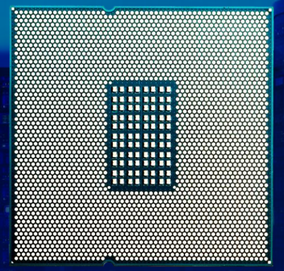
Scale-out
Topologies

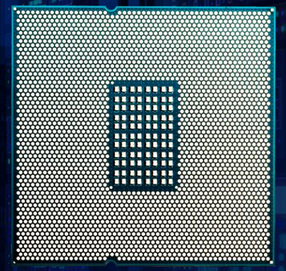
Software ecosystem momentum

Enabling tech	Memcached	MongoDB	My SQL	NGINX	Hadoop	Apache Spark	Redis	Cassandra	OPNFV	Apache Tomcat
Cloud / mgmt	Kubernetes	Openstack	Mesos	Cloud Foundry						
Languages, runtimes	Java	Azul	Python	Open JDK	PHP	Node	Golang			
Tools	GCC / LLVM / Debuggers (JTAG, GDB) / Libraries (glibc, others)									
Virtualization	KVM	Xen	Docker							
OS	Canonical	Redhat	Suse	CentOS						
Firmware platform mgmt	HW Root of Trust / Trusted Execution Environment / Power Management / Secure Boot							American Megatrends		

Cadence of innovation







Now

Qualcomm Centriq 2400

Falkor Core

Next

Qualcomm® Firetail™

Qualcomm® Saphira™ Core

Future

Qualcomm Firetail and Qualcomm Saphira are products of Qualcomm Datacenter Technologies, Inc.

World class design team

Austin

Bangalore

Beijing

Boulder

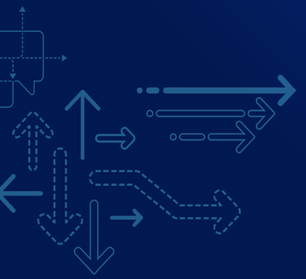
Raleigh

San Diego

San Jose

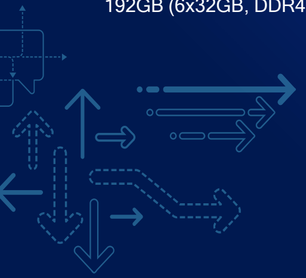
Taipei

End notes



Qualcomm Centriq 2460 delivers 7% better integer performance than Intel Xeon Platinum 8160

Qualcomm Centriq 2460 provides up to 7% better integer performance than Intel Xeon Platinum 8160 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2460 scored 657 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC O2 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot, versus Intel Xeon Platinum 8160 system score of 613 on estimated SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot.



Qualcomm Centriq 2460 delivers 13% better floating point performance than Intel Xeon Platinum 8160

Qualcomm Centriq 2460 provides up to 13% better floating point performance than Intel Xeon Platinum 8160 based on estimates of SPECfp®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2460 scored 607 on estimated SPECfp®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot, versus Intel Xeon Platinum 8160 system score of 535 on estimated SPECfp®_rate2006 using Supermicro SYS-6029P-WTR with Cent OS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot.

Qualcomm Centriq 2460 delivers ~parity performance per thread versus Intel Xeon Platinum 8180

Qualcomm Centriq 2460 provides ~parity performance per thread versus Intel Xeon Platinum 8180 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2460 (48 core/48 thread) scored 657 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot. Qualcomm's internal measurements of the Xeon Platinum 8160 with a system score 612 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 4 240 GB SATA drives for boot show that the 1 socket SPECint®_rate2006 score is 0.286459949 times the published 2 socket icc- based SPECint(R)_rate2006 score of 2140 published on www.spec.org as of 11 July 2017. The same scale factor of 0.286459949 was used to extrapolate a 1-socket Intel Xeon Platinum 8180 (56 core/56 thread) GCC-02 SpecInt® rate2006 estimate of 776 compared to a published 2-socket Intel Xeon Platinum 8180 icc-based SPECint(R)_rate2006 score of 2710 published on www.spec.org as of 11 July 2017

Qualcomm Centriq 2452 delivers 8% better performance per thread than Intel Xeon Gold 6152

Qualcomm Centriq 2452 delivers up to 8% performance per thread versus Intel Xeon Gold 6152 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2452 (46 core/46 thread) scored 636 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot. Qualcomm's internal measurements of the Xeon Platinum 8160 with a system score 613 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot show that the 1 socket SPECint®_rate2006 score is 0.286459949 times the published 2 socket icc- based SPECint_rate2006 score of 2140 published on www.spec.org as of 11 July 2017. The same scale factor of 0.286459949 was used to extrapolate a 1-socket Intel Xeon Gold 6152 (22 core/44 thread) GCC-02 SpecInt® rate2006 estimate of 564 compared to a published 2-socket Intel Xeon Gold 6152 icc-based SPECint®_rate2006 score of 1970 published on www.spec.org as of 11 July 2017.

Qualcomm Centriq 2434 delivers 4% better performance per thread than Intel Xeon Silver 4116

Qualcomm Centriq 2434 delivers up to 4% performance per thread versus Intel Xeon Silver 4116 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2434 (40 core/40 thread) scored 565 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot. Using Qualcomm's internal measurements of the Xeon Silver 4110 with a system score 436 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot adjusted to a 1 socket score of 221 show that the 1 socket SPECint®_rate2006 score is 0.317716 times the published 2 socket icc- based SPECint®_rate2006 score of 697 published on www.spec.org as of 11 July 2017. The same scale factor of 0.317716 was used to extrapolate a 1-socket Intel Xeon Silver 4116 (12 core/24 thread) GCC-02 SpecInt®_ rate2006 estimate of 327 compared to a published 2-socket Intel Xeon Silver 4116 icc-based SPECint®_rate2006 score of 1040 published on www.spec.org as of 11 July 2017.

Qualcomm Centriq 2460 delivers 45% better performance per Watt versus Intel Xeon Platinum 8180

Qualcomm Centriq 2460 provides up to 45% better performance per Watt versus Intel Xeon Platinum 8180 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2460 (120W TDP) scored 657 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 SATA drives for boot. Qualcomm's internal measurements of the Xeon Platinum 8160 with a system score 613 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 4 240 GB SATA drives for boot show that the 1 socket SPECint®_rate2006 score is 0.286459949 times the published 2 socket icc- based SPECint(R)_rate2006 score of 2140 published on www.spec.org as of 11 July 2017. The same scale factor of 0.286459949 was used to extrapolate a 1-socket Intel Xeon Platinum 8180 (205W TDP) GCC-02 SpecInt® rate2006 estimate of 776 compared to a published 2-socket Intel Xeon Platinum 8180 icc-based SPECint®_rate2006 score of 2710 published on www.spec.org as of 11 July 2017.

Qualcomm Centriq 2452 delivers 32% better performance per Watt than Intel Xeon Gold 6152

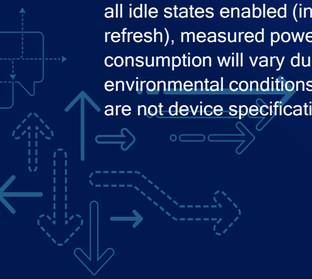
Qualcomm Centriq 2452 delivers up to 32% performance per thread versus Intel Xeon Gold 6152 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2452 (120W TDP) scored 636 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot. Qualcomm's internal measurements of the Xeon Platinum 8160 with a system score 613 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot show that the 1 socket SPECint®_rate2006 score is 0.286459949 times the published 2 socket icc- based SPECint®_rate2006 score of 2140 published on www.spec.org as of 11 July 2017. The same scale factor of 0.286459949 was used to extrapolate a 1-socket Intel Xeon Gold 6152 (140W TDP) GCC-02 SpecInt® rate2006 estimate of 564 compared to a published 2-socket Intel Xeon Gold 6152 icc-based SPECint®_rate2006 score of 1970 published on www.spec.org as of 11 July 2017.

Qualcomm Centriq 2434 delivers 31% better performance per Watt than Intel Xeon Silver 4116

Qualcomm Centriq 2434 delivers up to 31% performance per Watt versus Intel Xeon Silver 4116 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2434 (110W TDP) scored 565 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot. Qualcomm's internal measurements of the 2-socket Xeon Silver 4110 with a system score of 436 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot adjusted to a 1 socket score of 221 show that the 1 socket SPECint®_rate2006 score is 0.317716 times the published 2 socket icc- based SPECint®_rate2006 score of 697 published on www.spec.org as of 11 July 2017. The same scale factor of 0.317716 was used to extrapolate a 1-socket Intel Xeon Silver 4116 (85W TDP) GCC-02 SpecInt® rate2006 estimate of 327 compared to a published 2-socket Intel Xeon Silver4116 icc-based SPECint®_rate2006 score of 1040 published on www.spec.org as of 11 July 2017.

Qualcom Centriq 2460 active power well below 120W TDP

Qualcomm Centriq 2460 active power efficiency calculated using power measured on QDT's Software Development Platform v2 with Ubuntu 16.04.2 LTS (GNU/Linux 4.11.0 aarch64), GCC O2 v6.3.1, DVFS enabled with on-demand governor, OS idle enabled, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot, on typical material in lab environment at ambient room temperature. Power per subtest is average over duration of each subtest while running SPECint®_rate2006 with all cores active. Average typical power is mean of individual subtest power values. Idle power measured during OS idle with only C1 enabled. With all idle states enabled (including C4, D4, DDR power-down/self-refresh), measured power is below 4 W. Actual power consumption will vary due to manufacturing tolerances and environmental conditions. Power measurements in this document are not device specifications.



Qualcomm Centriq 2460 delivers 48% better performance per mm2 versus Intel Xeon Platinum 8180

Qualcomm Centriq 2460 delivers up to 48% better performance per mm2 versus Intel Xeon Platinum 8180 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2460 (398mm2) scored 657 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 SATA drives for boot. Qualcomm's internal measurements of the Xeon Platinum 8160 with a system score 613 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot show that the 1 socket SPECint®_rate2006 score is 0.286459949 times the published 2 socket icc- based SPECint(R)_rate2006 score of 2140 published on www.spec.org as of 11 July 2017. The same scale factor of 0.286459949 was used to extrapolate a 1-socket Intel Xeon Platinum 8180 (698mm2) GCC-02 SpecInt® rate2006 estimate of 776 compared to a published 2-socket Intel Xeon Platinum 8180 icc-based SPECint(R)_rate2006 score of 2710 published on www.spec.org as of 11 July 2017. Source for 698mm2 assumption for Intel Xeon Platinum 8180 from https://www.anandtech.com/show/11839/intel-core-i9-7980xe-and-core-i9-7960x-review/3

Qualcomm Centriq 2460 delivers 4 times better performance per CPU $ versus Intel Xeon Platinum 8180

Qualcomm Centriq 2460 delivers 4 times more performance per CPU $ versus Intel Xeon Platinum 8180 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2460 (List price of $1995 as of 11/7/17) scored 657 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 SATA drives for boot. Qualcomm's internal measurements of the Xeon Platinum 8160 with a system score 613 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot show that the 1 socket SPECint®_rate2006 score is 0.286459949 times the published 2 socket icc- based SPECint(R)_rate2006 score of 2140 published on www.spec.org as of 11 July 2017. The same scale factor of 0.286459949 was used to extrapolate a 1-socket Intel Xeon Platinum 8180 (List price of $10009 as of 10/30/17) GCC-02 SpecInt® rate2006 estimate of 776 compared to a published 2-socket Intel Xeon Platinum 8180 icc-based SPECint(R)_rate2006 score of 2710 published on www.spec.org as of 11 July 2017.

Qualcomm Centriq 2452 delivers 3 times better performance per CPU $ versus Intel Xeon Gold 6152

Qualcomm Centriq 2460 delivers 3 times more performance per CPU $ versus Intel Xeon Gold 6152 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2452 (List Price of $1383 as of 11/7/17) scored 636 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot. Qualcomm's internal measurements of the Xeon Platinum 8160 with a system score 613 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 240 GB SATA drives for boot show that the 1 socket SPECint®_rate2006 score is 0.286459949 times the published 2 socket icc- based SPECint(R)_rate2006 score of 2140 published on www.spec.org as of 11 July 2017. The same scale factor of 0.286459949 was used to extrapolate a 1-socket Intel Xeon Gold 6152 (List Price of $3655 as of 10/30/17) GCC-02 SpecInt® rate2006 estimate of 564 compared to a published 2-socket Intel Xeon Gold 6152 icc-based SPECint(R)_rate2006 score of 1970 published on www.spec.org as of 11 July 2017.

Qualcomm Centriq 2434 delivers 2 times better performance per CPU $ versus Intel Xeon Silver 4116

Qualcomm Centriq 2434 delivers 2 times better performance per CPU $ Intel Xeon Silver 4116 based on estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2434 (list Price of $888 as of 11/7/17) scored 565 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 256 GB SATA drives for boot. Qualcomm's internal measurements of the 2-socket Xeon Silver 4110 with a system score of 436 on SPECint®_rate2006 using Supermicro SYS-6029P-WTR with CentOS 7.4, GCC 02 v6.1.1, 192GB (6x32GB, DDR4-2666), 4 240 GB SATA drives for boot adjusted to a 1 socket score of 221 show that the 1 socket SPECint®_rate2006 score is 0.317716 times the published 2 socket icc- based SPECint(R)_rate2006 score of 697 published on www.spec.org as of 11 July 2017. The same scale factor of 0.317716 was used to extrapolate a 1-socket Intel Xeon Silver 4116 (List Price of $1002 as of 10/30/17) GCC-02 SpecInt® rate2006 estimate of 327 compared to a published 2-socket Intel Xeon Silver4116 icc-based SPECint(R)_rate2006 score of 1040 published on www.spec.org as of 11 July 2017.

Qualcomm Centriq 2460 delivers better performance per Watt than Intel Xeon Platinum 8176

Qualcomm Centriq 2460 provides better performance per Watt than Intel Xeon Platinum 8176 based on measurements of power associated with estimates of SPECint®_rate2006. In Qualcomm internal testing, Qualcomm Centriq 2460 measured an average of 65W across SPECint®_rate2006 sub-tests, with a measured score of 654 on estimated SPECint®_rate2006 using QDT's Software Development Platform v2 with CentOS 7.3.1611 (AltArch), GCC 02 v6.1.1, DVFS enabled, 192GB (6x32GB, DDR4-2666), 256 SATA drives for boot, and Intel Xeon Platinum 8176 measured an average of 165W across SPECint®_rate 2006 sub-tests as reported by Intel Performance Counter Monitor tool and including losses due to Fully Integrated Voltage Regulator, with a measured score of 674 on estimated SPECint®_rate2006 using HP ProLiant DL360 Gen10 with Ubuntu 16.04.2 LTS (GNU/Linux 4.11.0 aarch64) gcc version 6.3.1 20170109 (Linaro GCC 6.3-2017.02), turbo enabled, 192GB (6x32GB, DDR4-2666), 240GB SATA drives for boot. Power per subtest is average over duration of each subtest while running SPECint®_rate2006 with all cores active in lab environment at room temperature. Average typical power is mean of individual subtest power values. Actual power consumption will vary due to manufacturing tolerances and environmental conditions. Power measurements in this document are not device specifications.

Thank you

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