AMD

Ryzen™ Processor With Radeon™ Vega Graphics

PRESENTER NAME

RYZEN

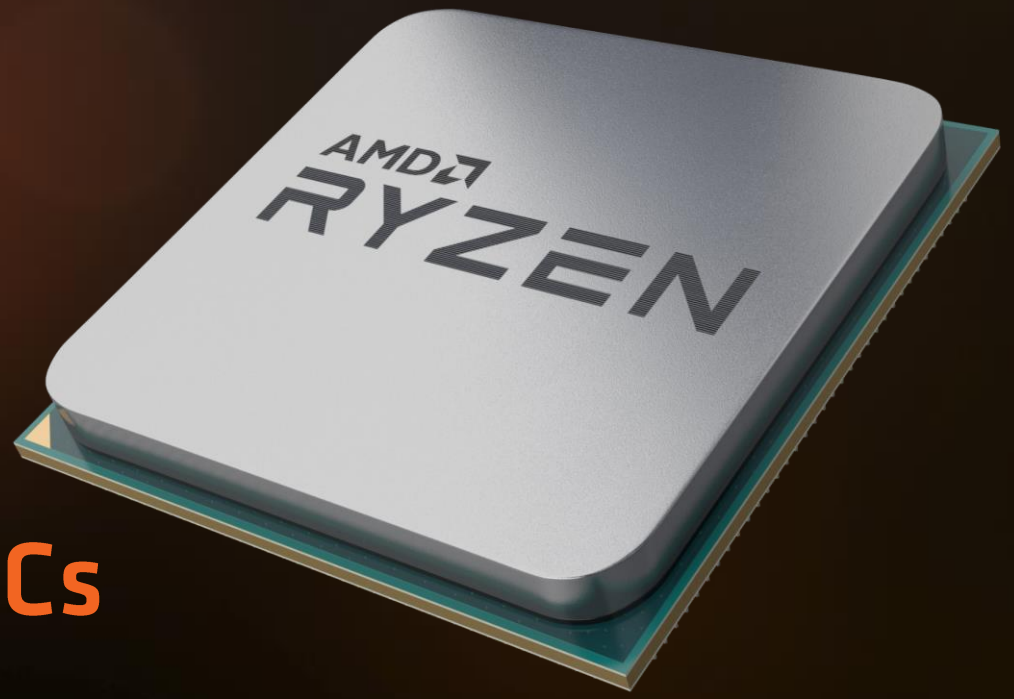
With Radeon™ Vega Graphics

World's Fastest Processor for Ultra Thin Notebooks

* See footnotes for details.

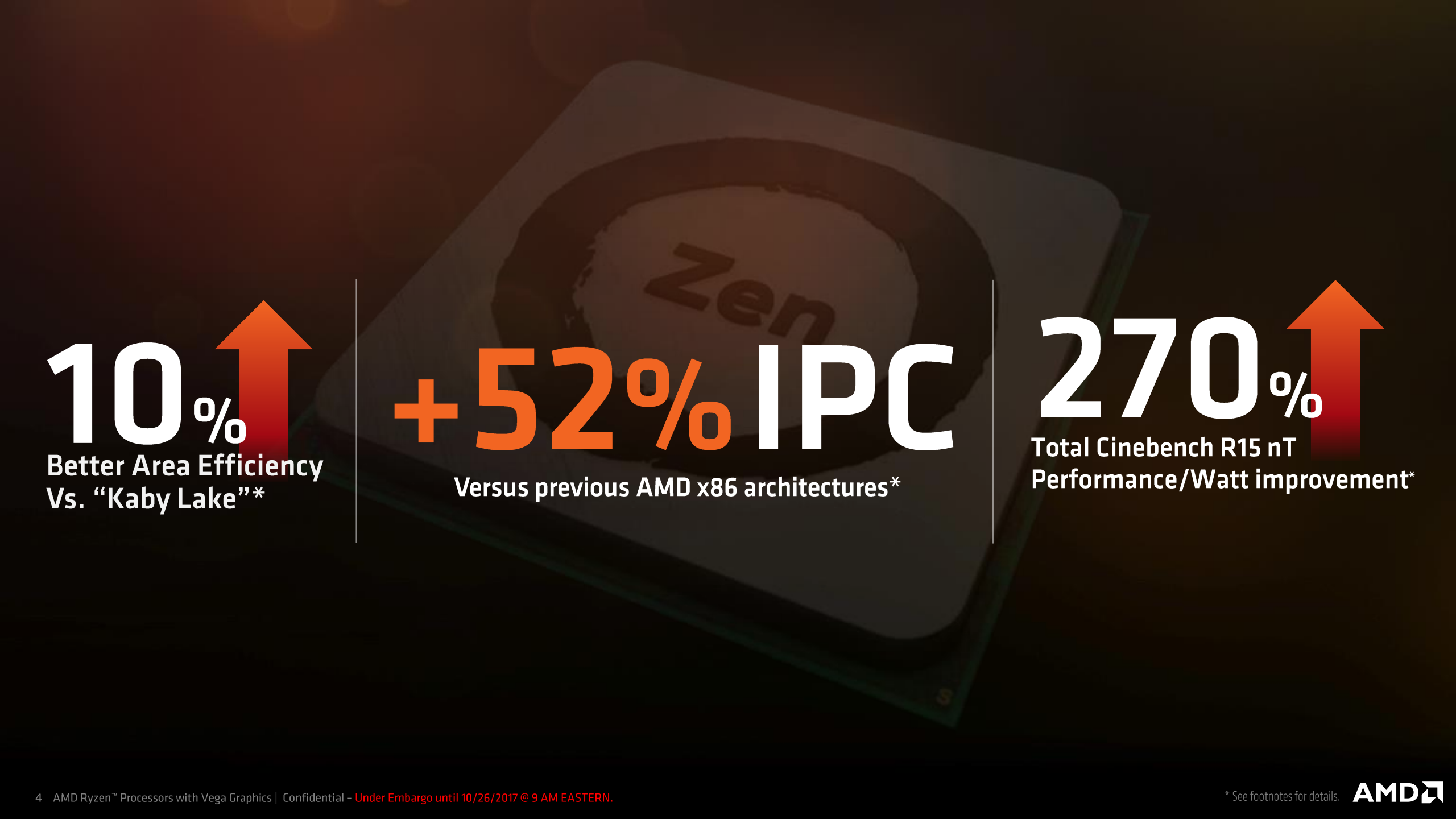
RYZEN

A RETURN TO INNOVATION FOR HIGH-PERFORMANCE PCs



Increased R&D | Faster Rate of Innovation | Injecting Excitement Back in PCs

AMD



10%
Better Area Efficiency
Vs. "Kaby Lake"*

+52% IPC
Versus previous AMD x86 architectures*

270%
Total Cinebench R15 nT
Performance/Watt improvement*

* See footnotes for details.

AMD

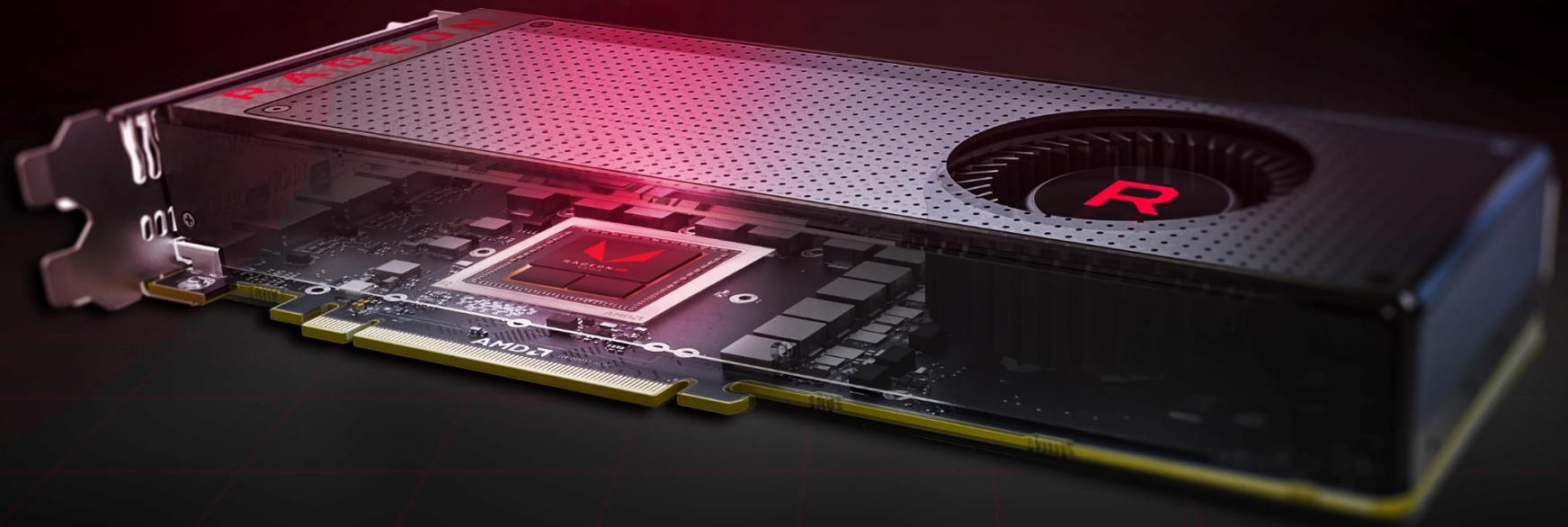
"From Ryzen 3 to Threadripper, AMD has redefined performance at every price point, to the benefit of consumers, businesses, and pretty much everybody – except, of course, Intel."

EXTREMETECH

AMD

Radeon™ RX Vega GPUs

AMD's return to
enthusiast gaming



METICULOUSLY ENGINEERED
FOR ENTERTAINMENT

HIGHLY SCALABLE PERFORMANCE

FULL-SPECTRUM FEATURES*

GAME-READY SOFTWARE

* See footnotes for details.

AMD

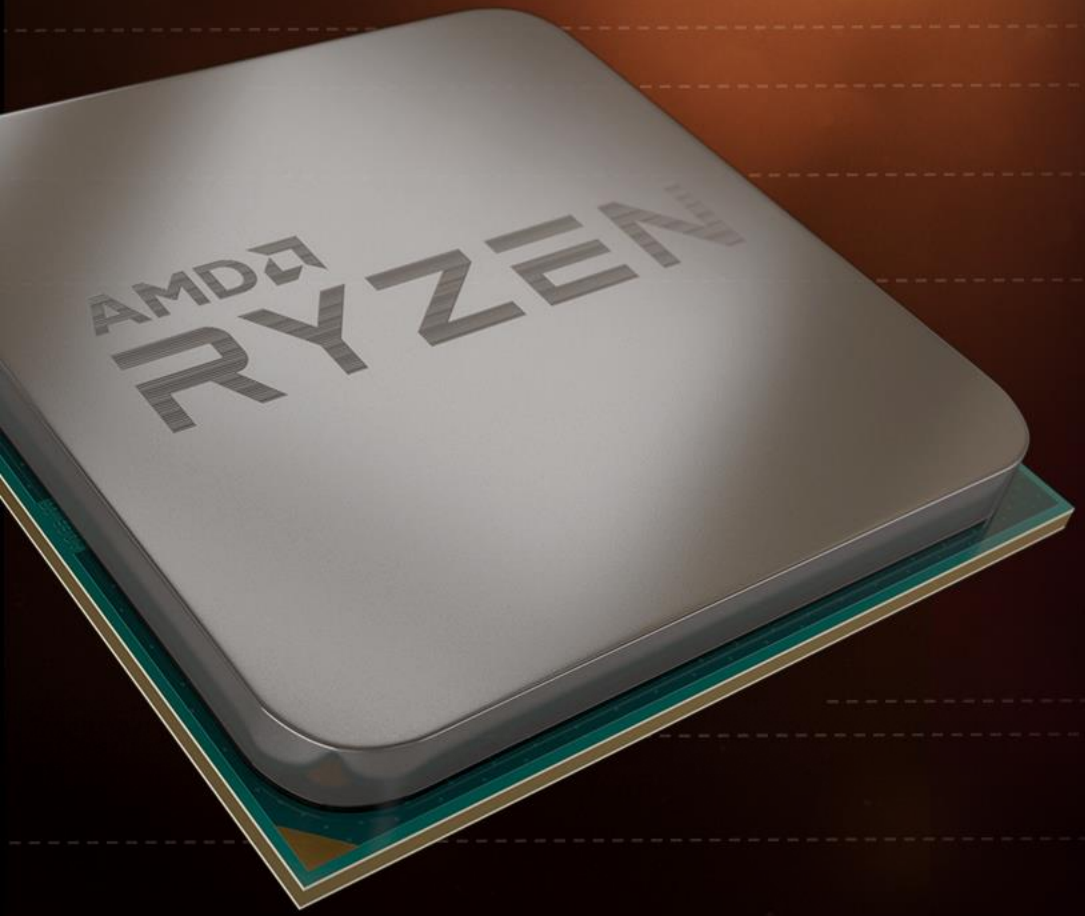
JUST FOUR MONTHS OF "VEGA" GRAPHICS

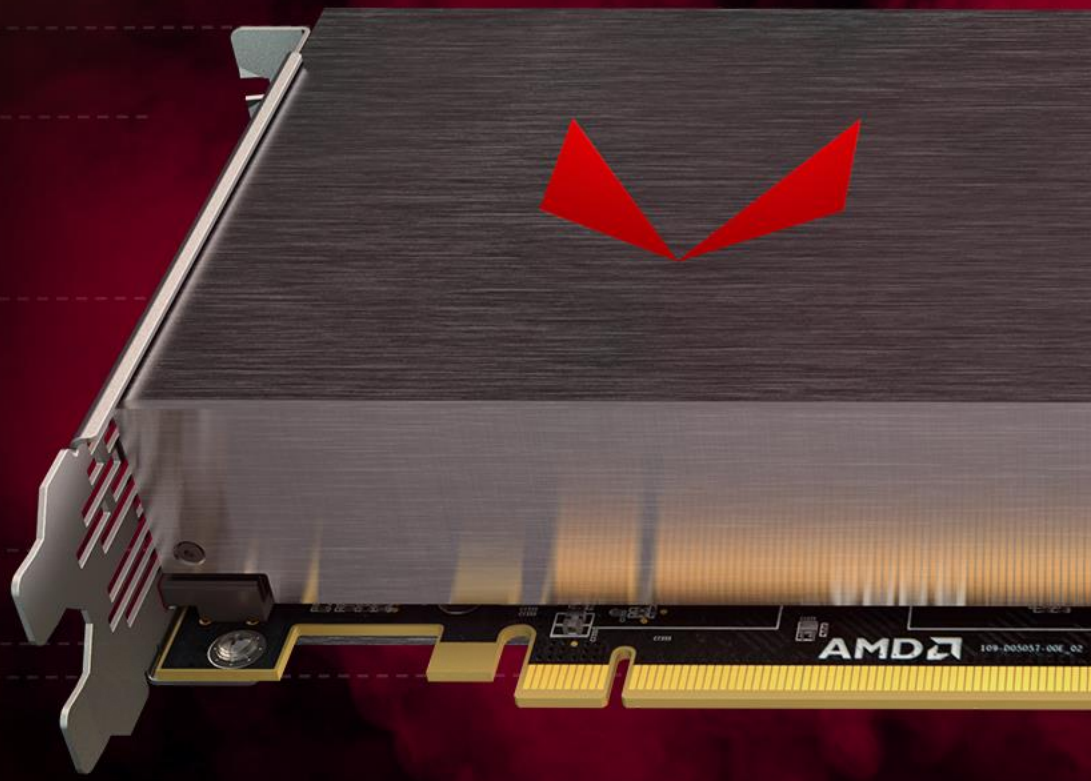
Project 47
1 PFLOP Rack

Apple iMac Pro
Workstation

High-End Gaming PCs

AMD

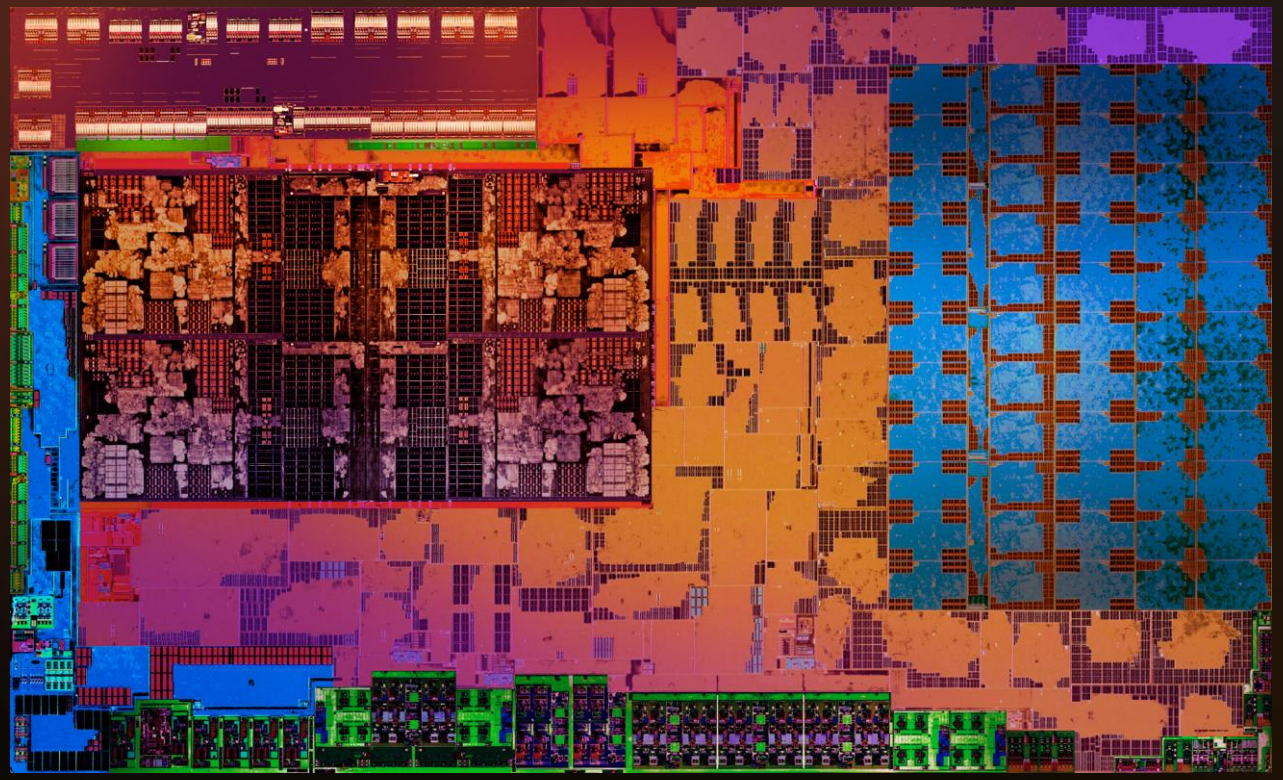




ONLY AMD INTEGRATES

PREMIUM CORES & PREMIUM GRAPHICS

AMD



RYZEN

With Radeon™ Vega Graphics

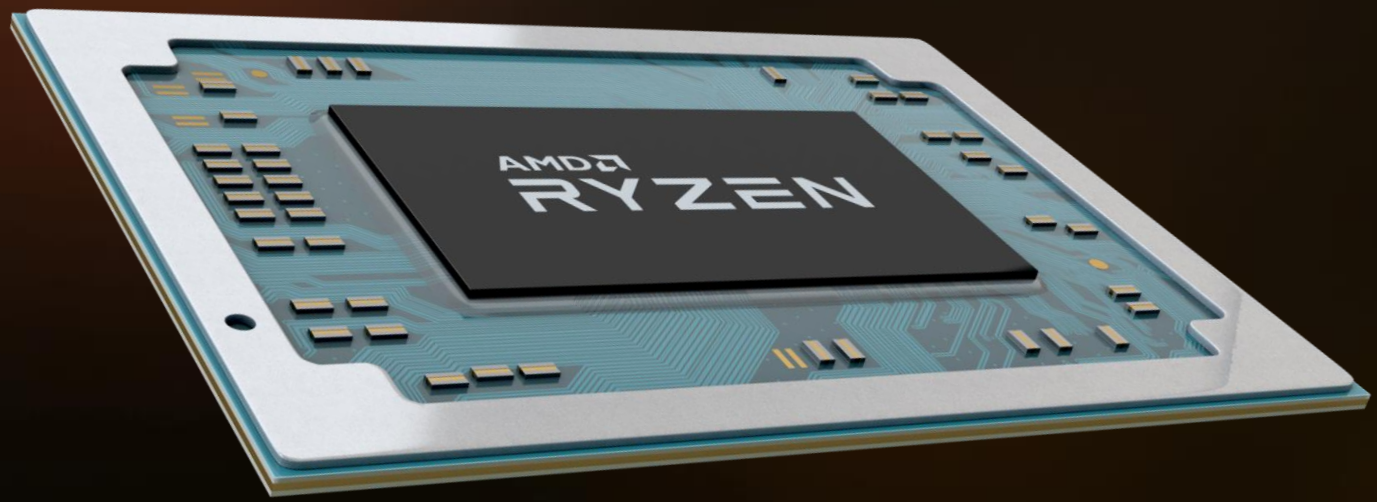
RYZEN™ PROCESSOR WITH RADEON GRAPHICS

"ZEN" CORES MEET "VEGA" CORES

AMD

AMD'S CLEAR VISION

THE WORLD'S FASTEST PROCESSOR FOR ULTRATHIN LAPTOPS



Powerful Performer

Completely Entertaining

Efficiently Designed

* See footnotes for details.

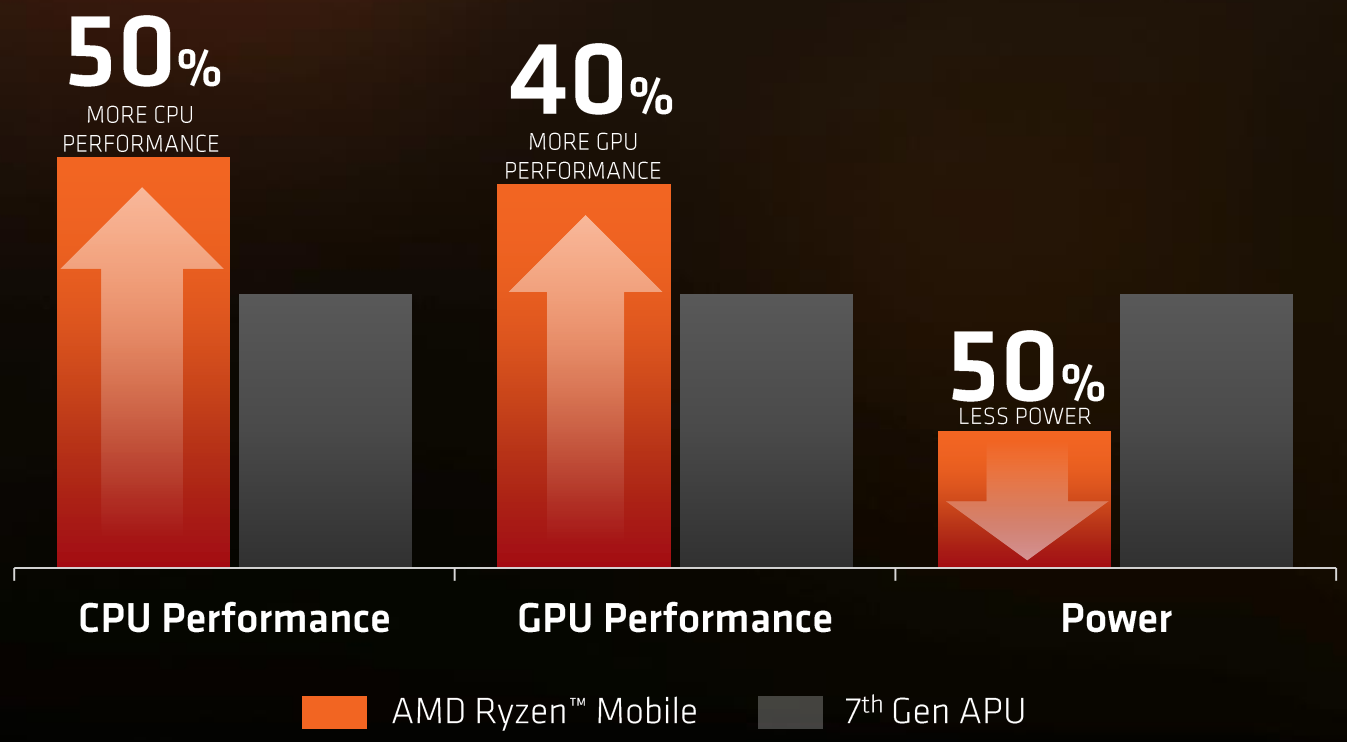
AMD

RYZEN

With Radeon™ Vega Graphics

OUR VISION HAD AMBITIOUS TARGETS

- First
  "Zen"-Based APU
- High-Performance
  On-Die "Vega"-Based Graphics
- Long Battery Life
  Premium Form Factors



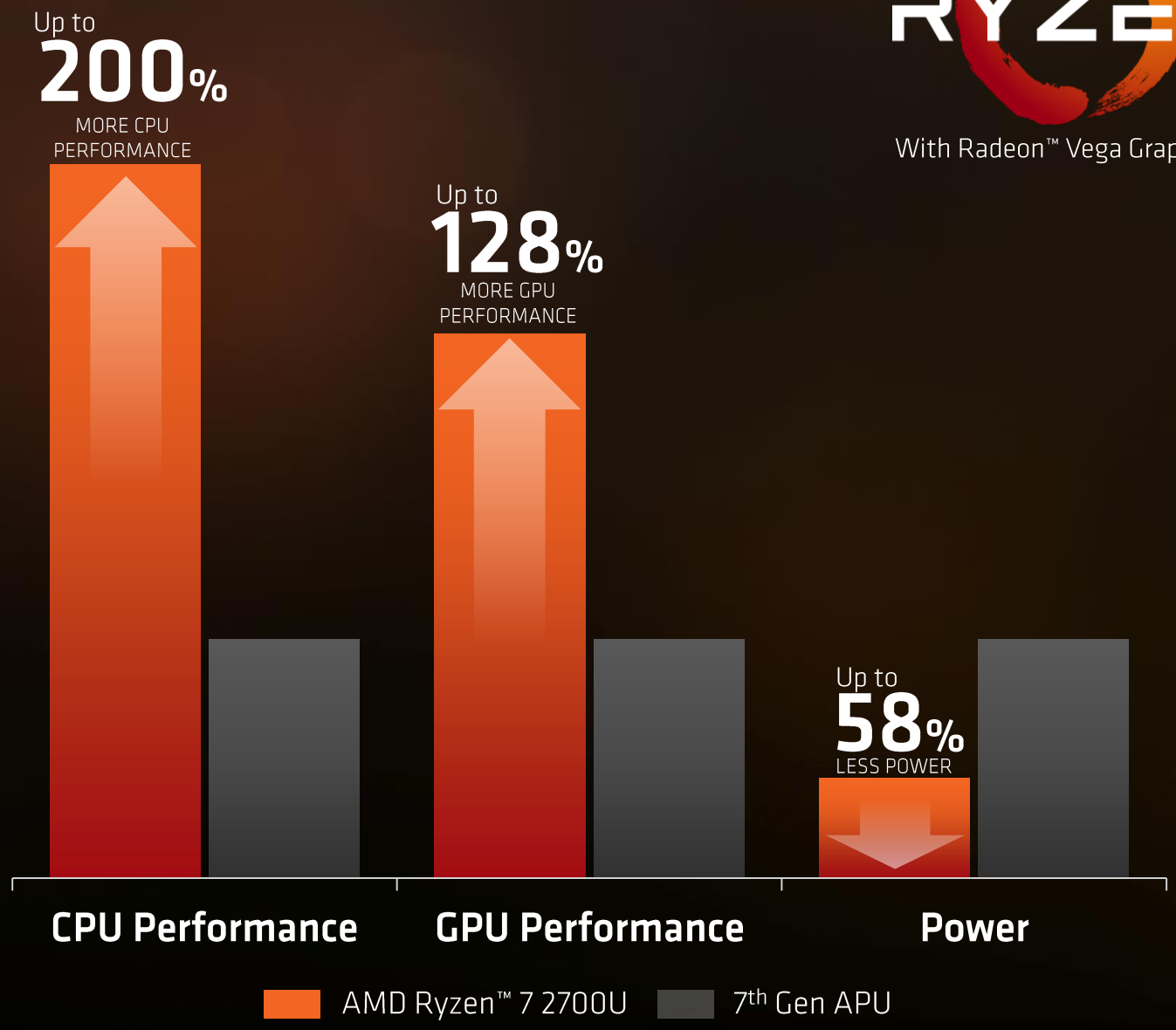
* Based on AMD internal estimates.

AMD

WE BEAT THOSE TARGETS

- First "Zen"-Based APU
- High-Performance On-Die "Vega"-Based Graphics
- Long Battery Life Premium Form Factors

RYZEN
With Radeon™ Vega Graphics

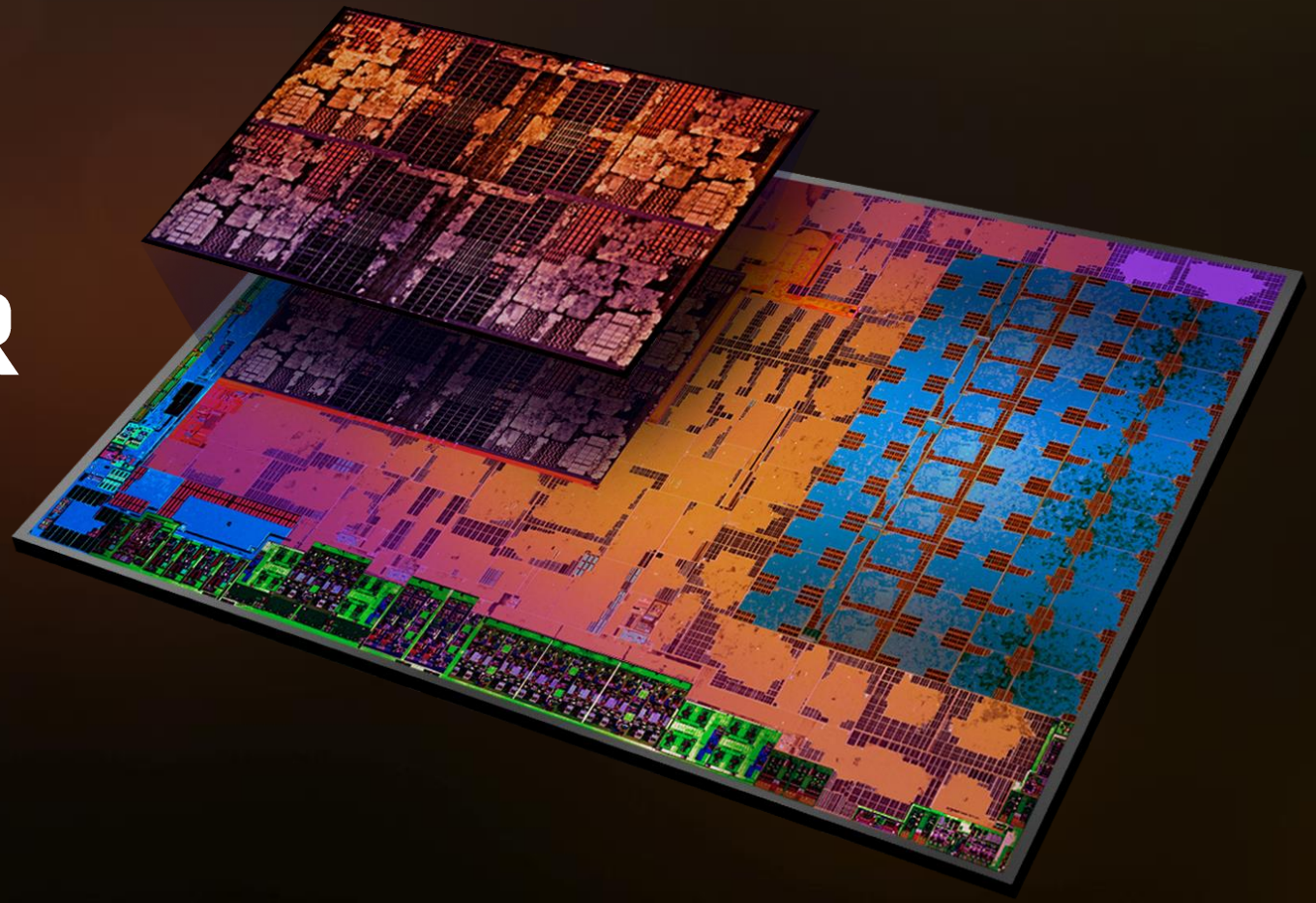


* See footnotes for details.

AMD

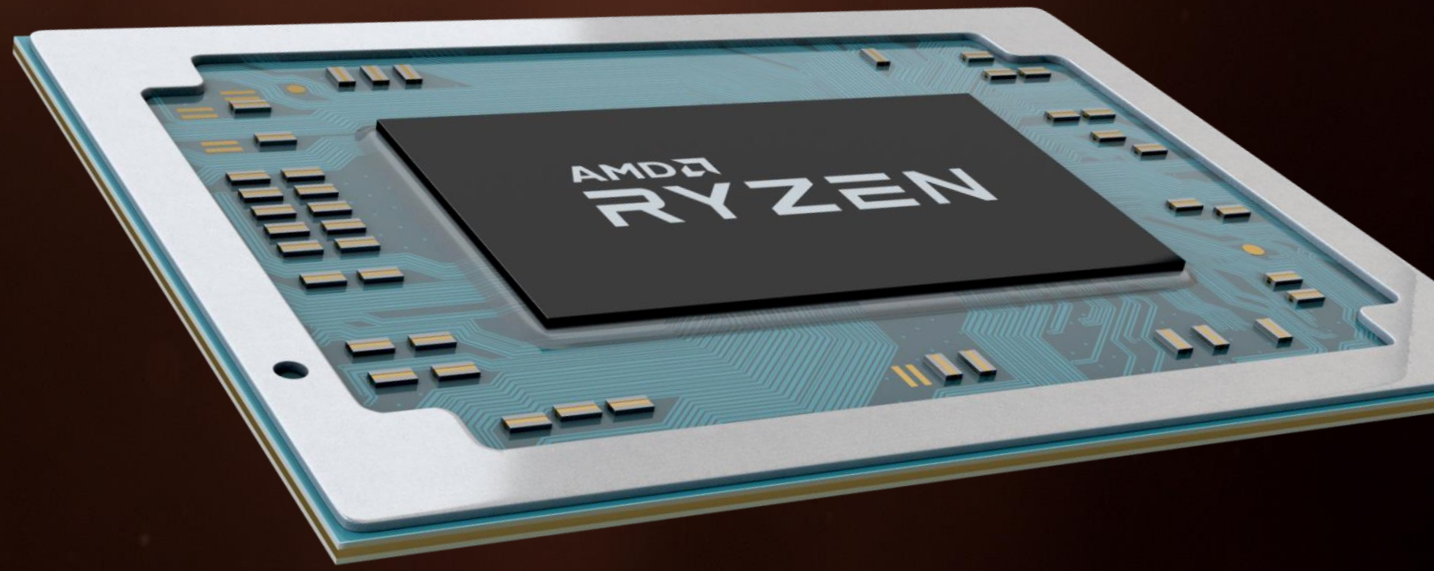
GREAT MOBILE EXPERIENCES

RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS



Powerful Performer | Completely Entertaining | Efficiently Designed

AMD SenseMI Technology



Pure Power

Smart sensors work in concert to optimize power consumption

Precision Boost 2

Gracefully supercharges CPU frequencies on one to many cores

Mobile XFR

Premium notebook cooling can raise average CPU performance*

Neural Net Prediction

A neural network AI can improve performance by learning your apps

Smart Prefetch

Learning algorithms can improve performance by pre-loading vital data

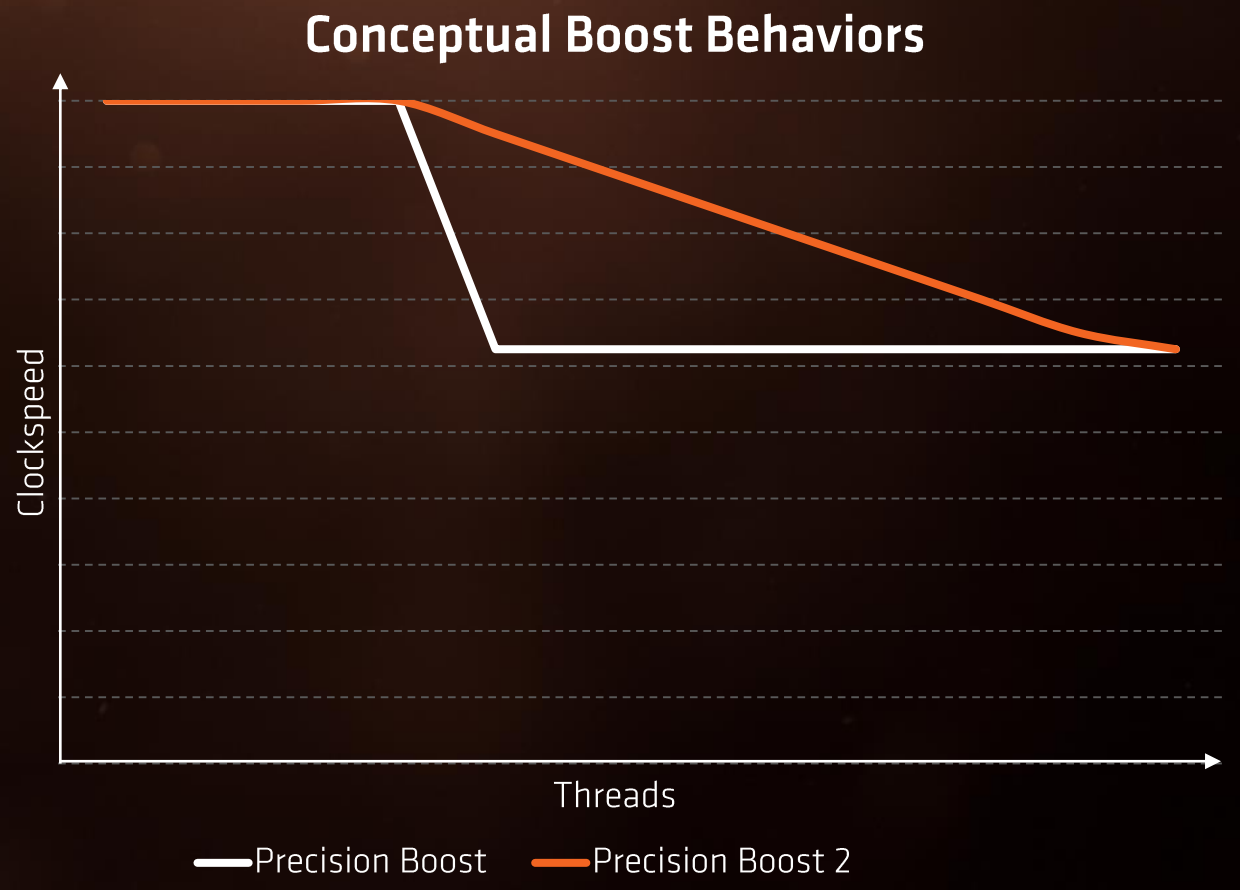
* AMD SenseMI technology is built into all Ryzen processors, but specific features and their enablement may vary by product and platform. Learn more at http://www.amd.com/en/technologies/sense-mi. mXFR enablement must meet AMD requirements. Not enabled on all notebook designs. Check with manufacturer to confirm "amplified mXFR performance" support.

NEW

Precision Boost 2

In AMD SenseMI Technology

- New opportunistic algorithm
- Retires “2-core” v. “all-core” boost
- Governed by CPU temperature, current, load
- Seeks highest possible frequency from environmental inputs, graceful roll off
- Opens new boost opportunities for real world nT workloads (e.g. games)
- 25MHz granularity



* Diagram for illustrative purposes only. AMD SenseMI technology is built into all Ryzen processors, but specific features and their enablement may vary by product and platform. Learn more at http://www.amd.com/en/technologies/sense-mi.

NEW

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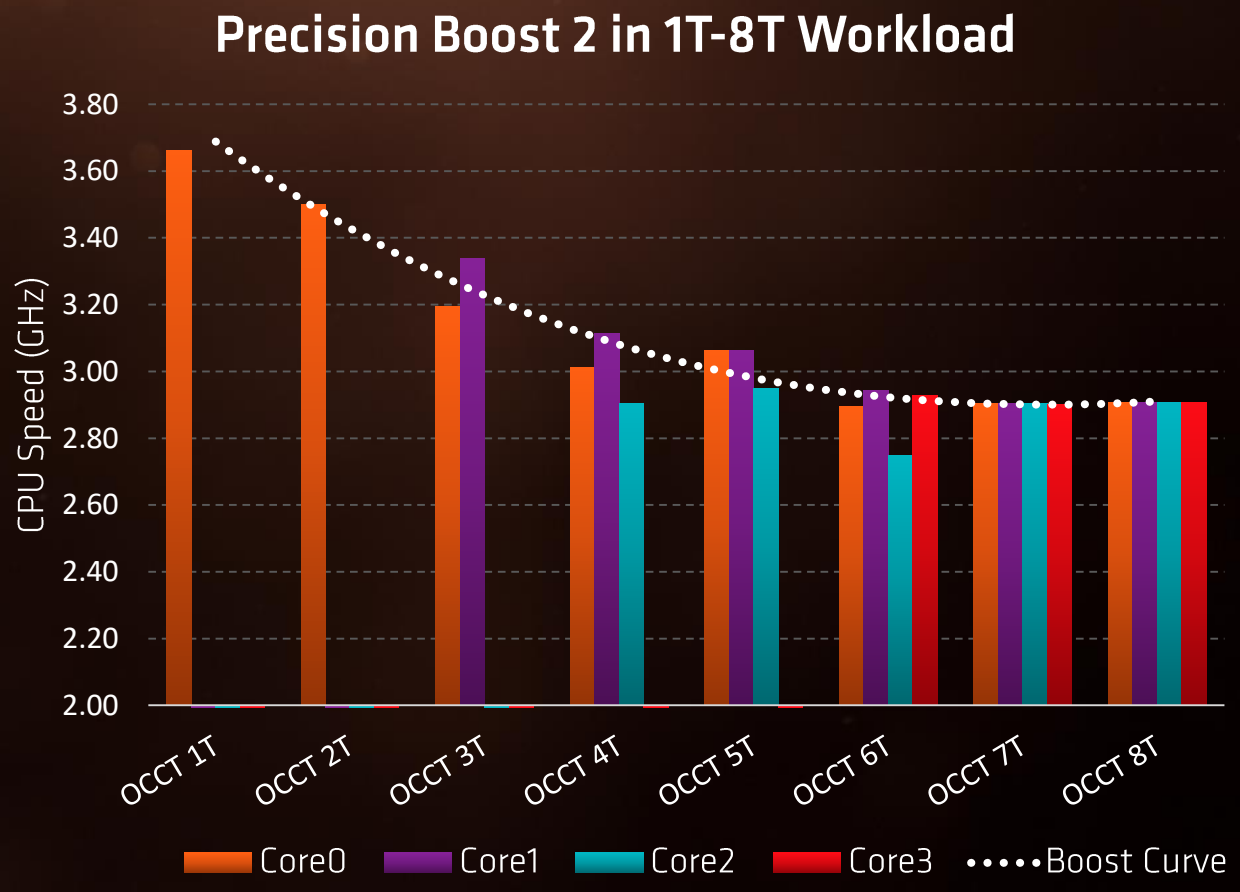


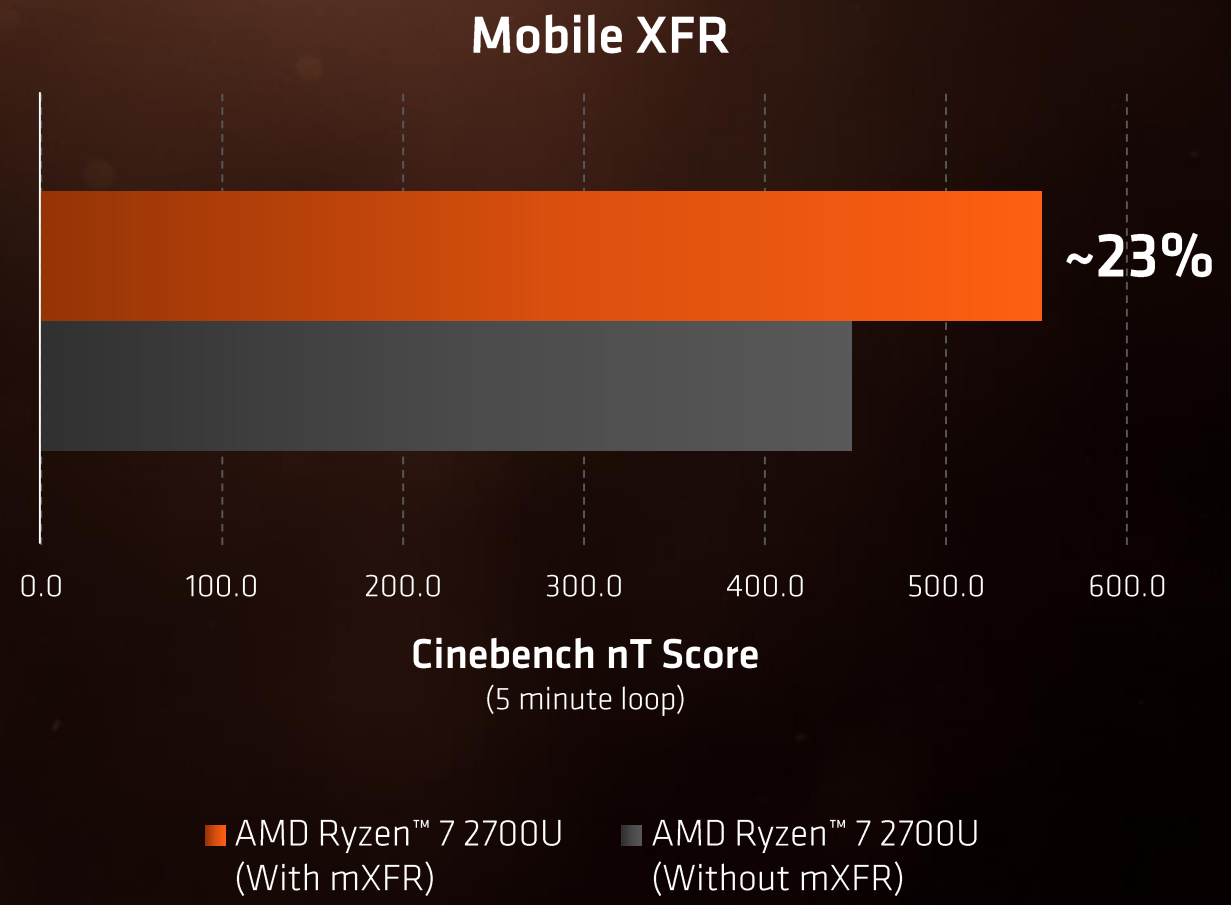
* Based on AMD testing of as of 9/25/2017. System configuration(s): AMD Reference Platform, AMD Ryzen™ 7 2700U APU, 2x4GB DDR4-2400, graphics driver 17.30.2015. AMD SenseMI technology is built into all Ryzen processors, but specific features and their enablement may vary by product and platform. Learn more at http://www.amd.com/en/technologies/sense-mi.

NEW

Mobile XFR (mXFR)

In AMD SenseMI Technology

- Raises sustained clock speeds in premium notebooks with great cooling solutions
- Leverages temperature awareness of Precision Boost 2
- Fully automatic, no user input required
- Notebook must meet AMD performance criteria to offer mXFR



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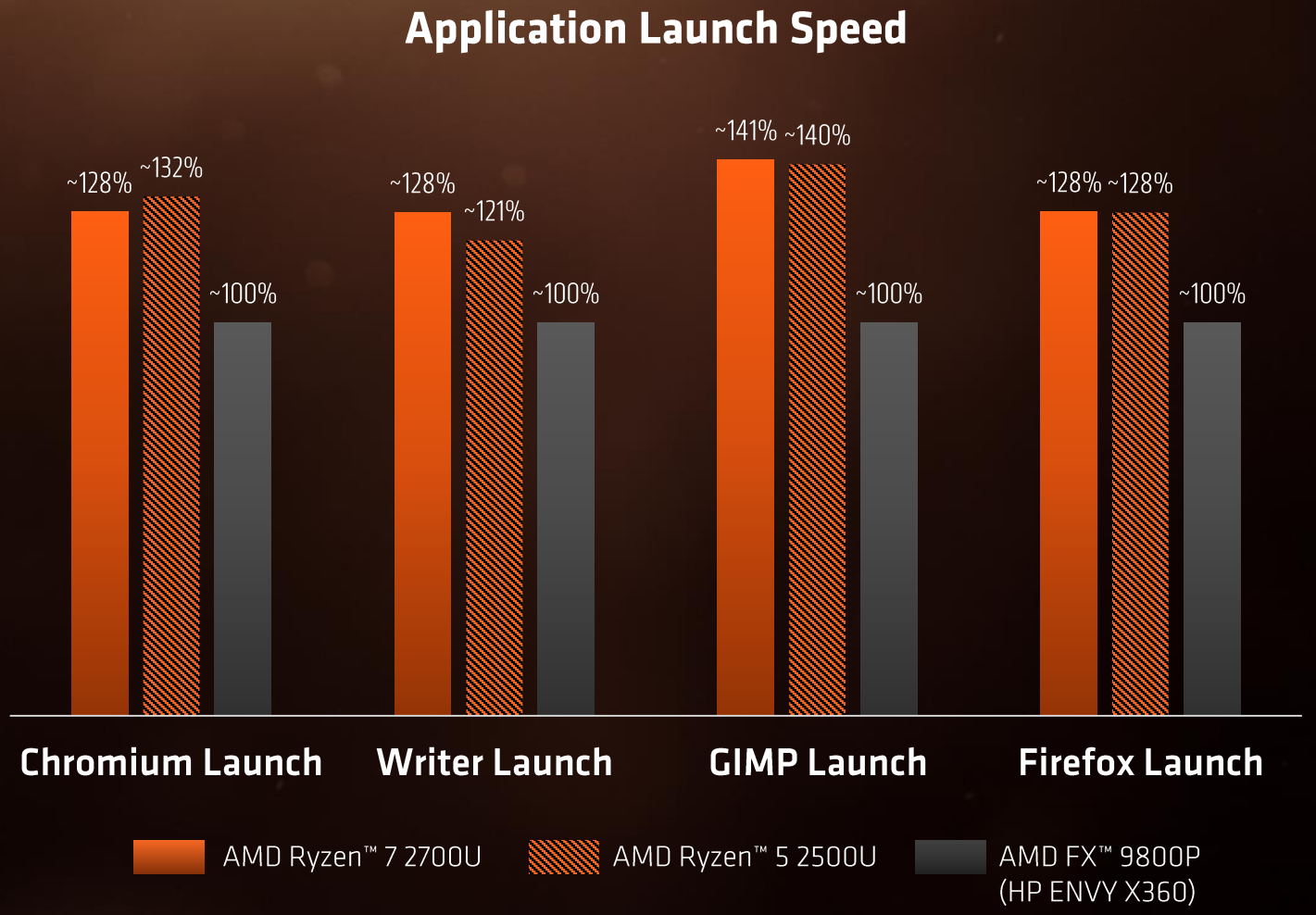
AMD

START APPS UP TO 41% FASTER

RYZEN

With Radeon™ Vega Graphics



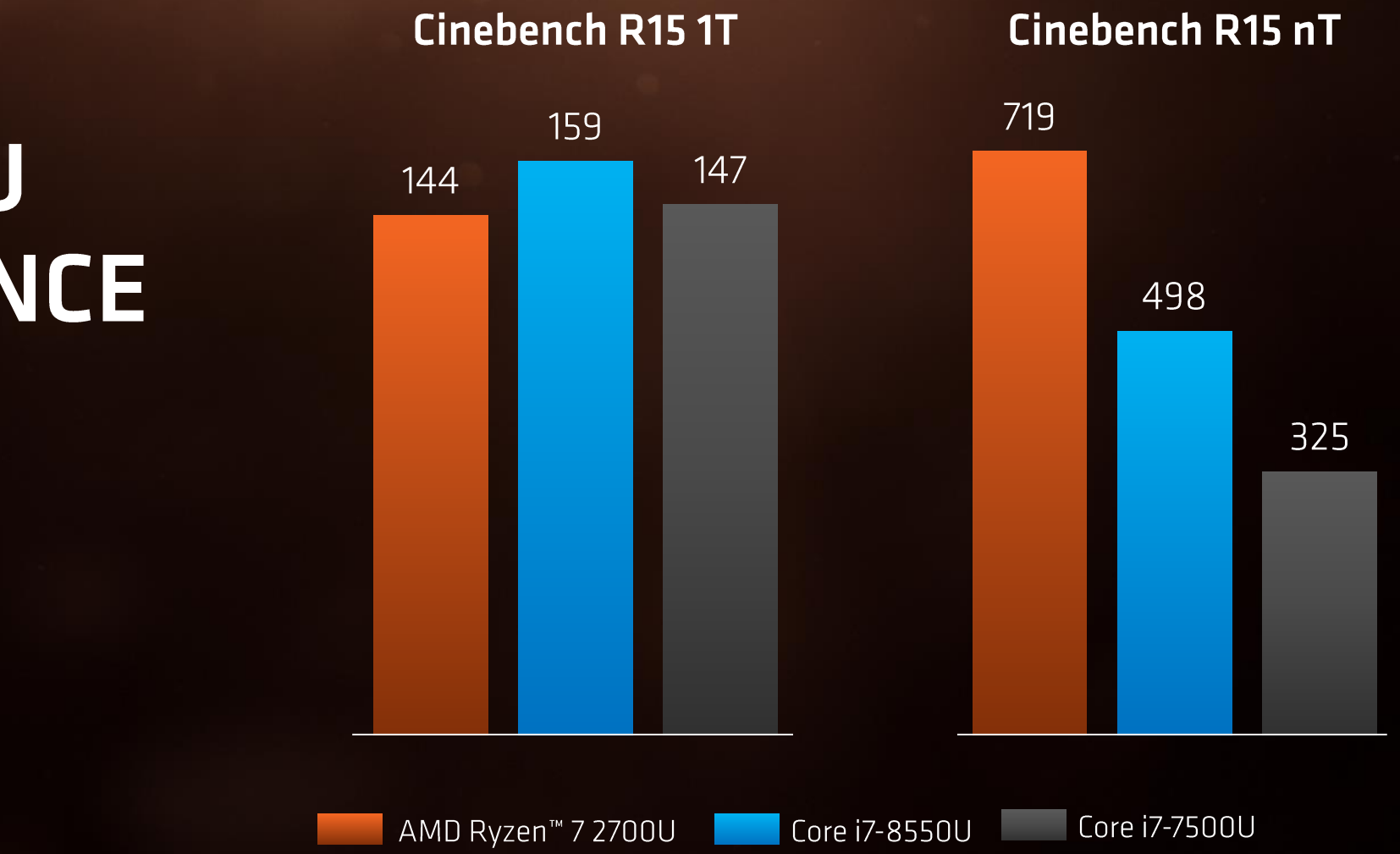
* See footnotes for details.

AMD

ELITE CPU PERFORMANCE

RYZEN

With Radeon™ Vega Graphics

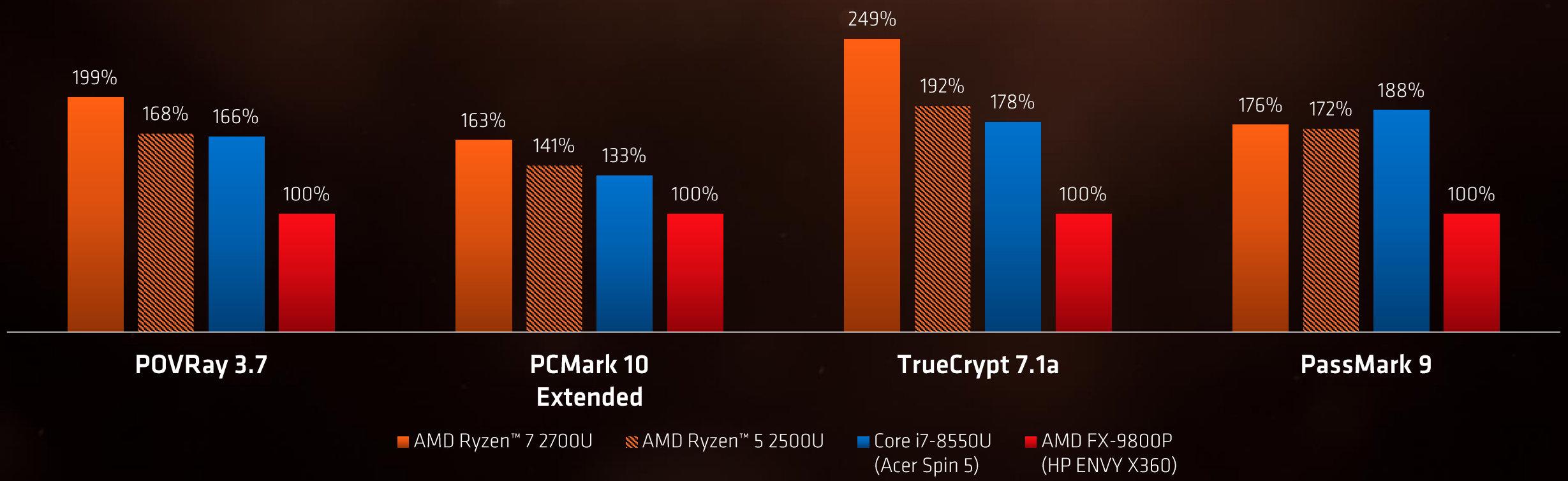


* See footnotes for details.

AMD

PERFORMANCE YOU CAN **COUNT ON**

AMD RYZEN™ 7 2700U PROCESSOR



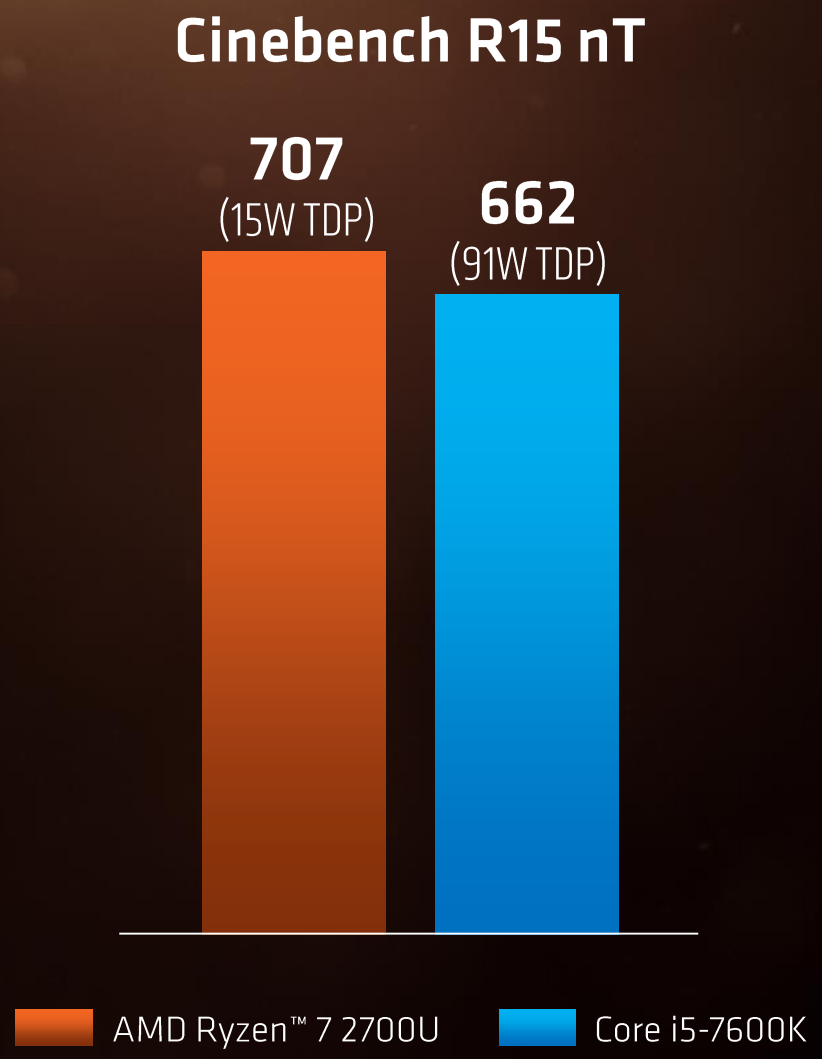
* See footnotes for details.

AMD

DESKTOP-CLASS PERFORMANCE *IN AN ULTRATHIN*

RYZEN

With Radeon™ Vega Graphics

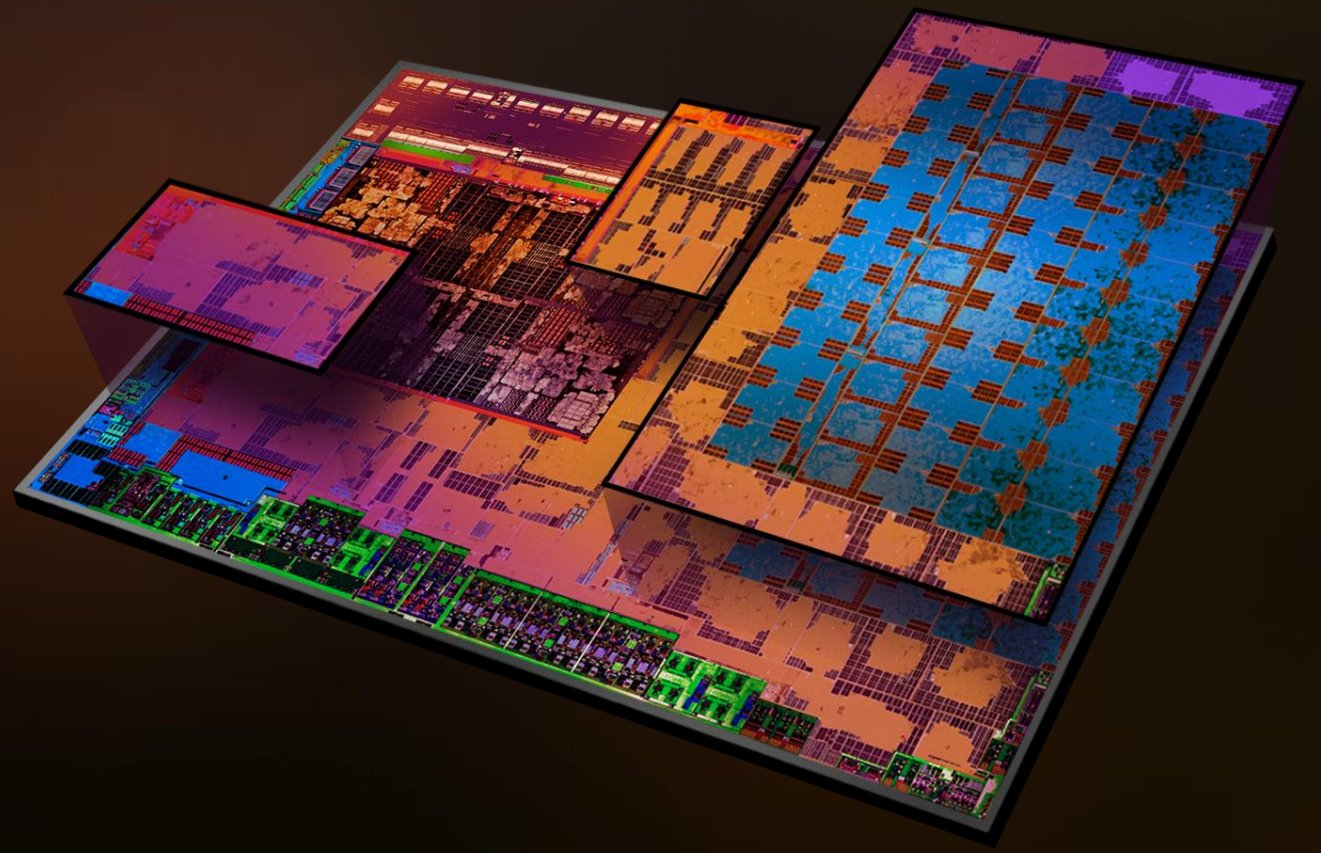


* See footnotes for details.

AMD

GREAT MOBILE EXPERIENCES

RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS

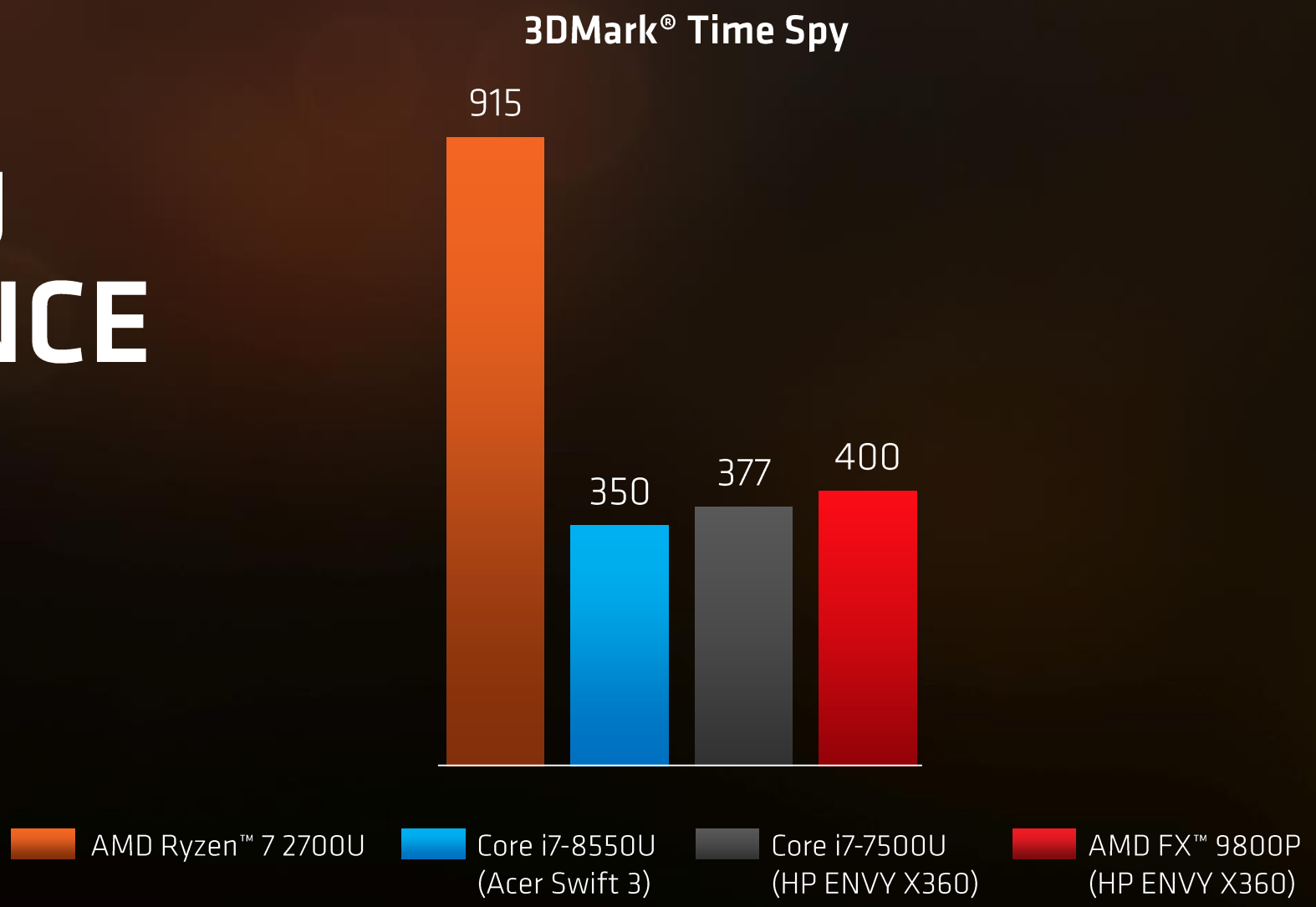


Powerful Performer | **Completely Entertaining** | Efficiently Designed

ELITE GPU PERFORMANCE

RYZEN

With Radeon™ Vega Graphics

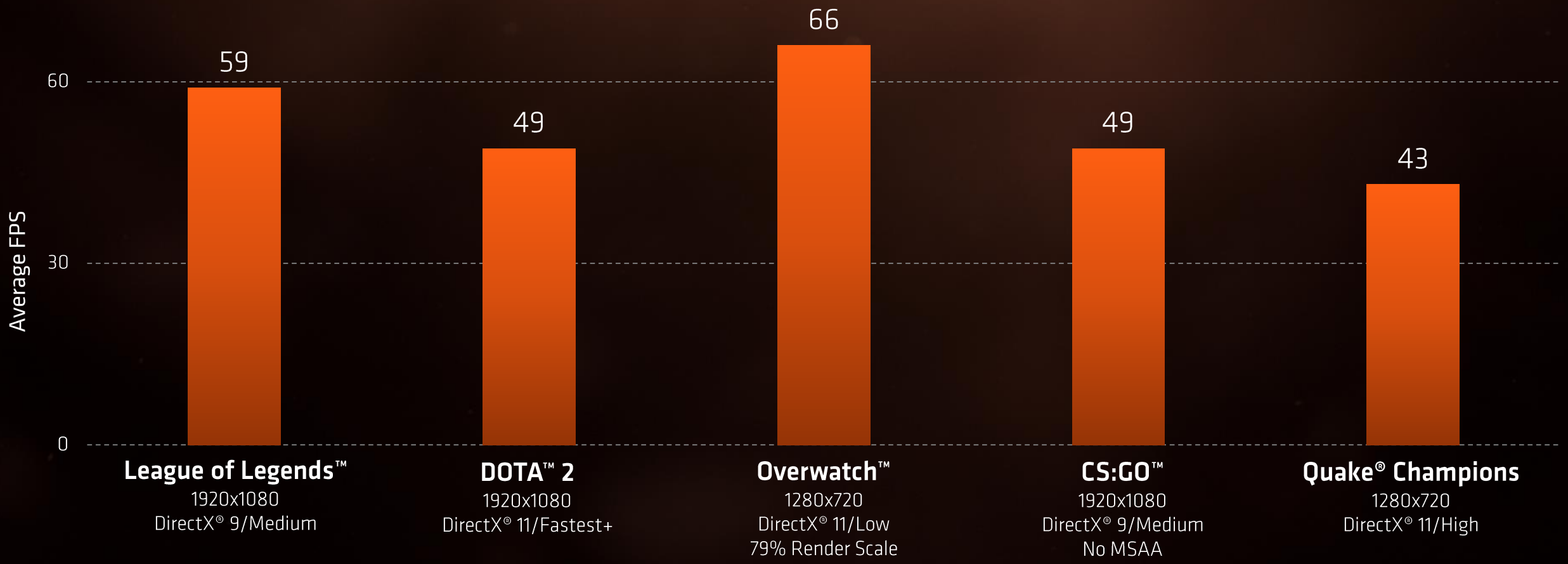


* See footnotes for details.

AMD

GAMING ON THE GO *IN AN ULTRATHIN*

AMD RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS



* Based on AMD testing as of 9/25/2017. System configuration(s): HP ENVY X360, AMD Ryzen™ 7 2700U, 2x4GB DDR4-2400, Samsung 850 Pro SSD, Windows 10 x64 1703, Graphics Driver: 17.30.1025, BIOS F11.

AMD

READY FOR 1080P AND 4K STREAMING

Watch your favorite premium content at home or on the go

AMD

ON YOUR DESK OR IN YOUR NOTEBOOK

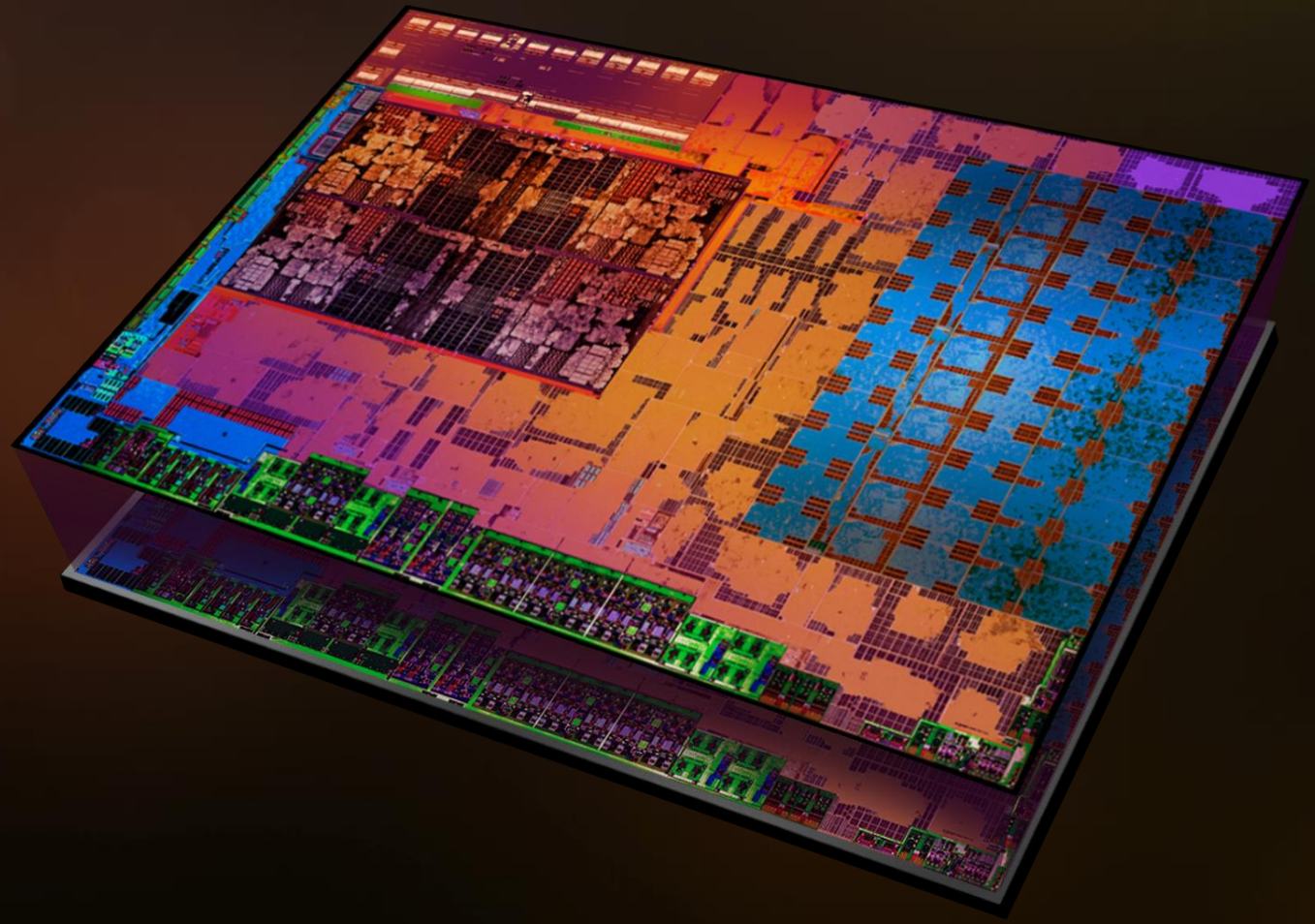
READY FOR THE MOST ADVANCED & BEAUTIFUL DISPLAYS

* See footnotes for details.

AMD

GREAT MOBILE EXPERIENCES

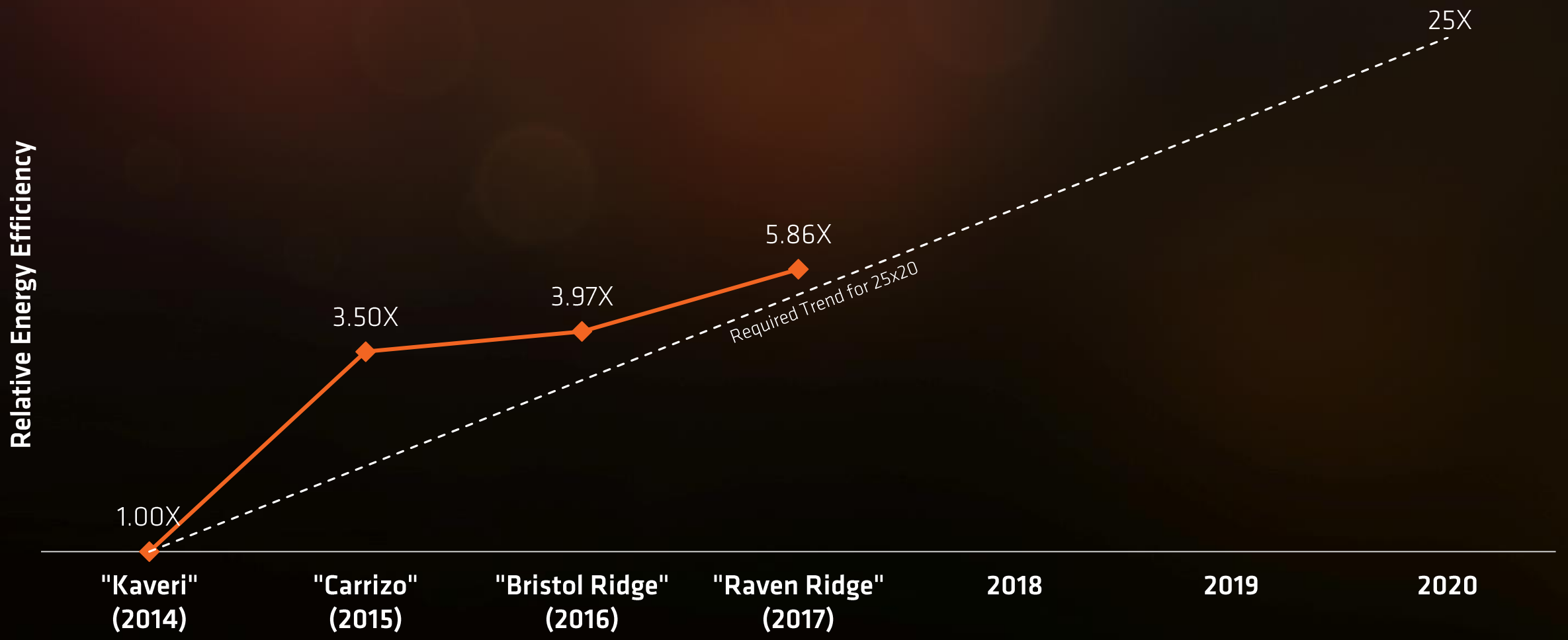
RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS



Powerful Performer | Completely Entertaining | **Efficiently Designed**

RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS

AHEAD OF PACE FOR 25x20

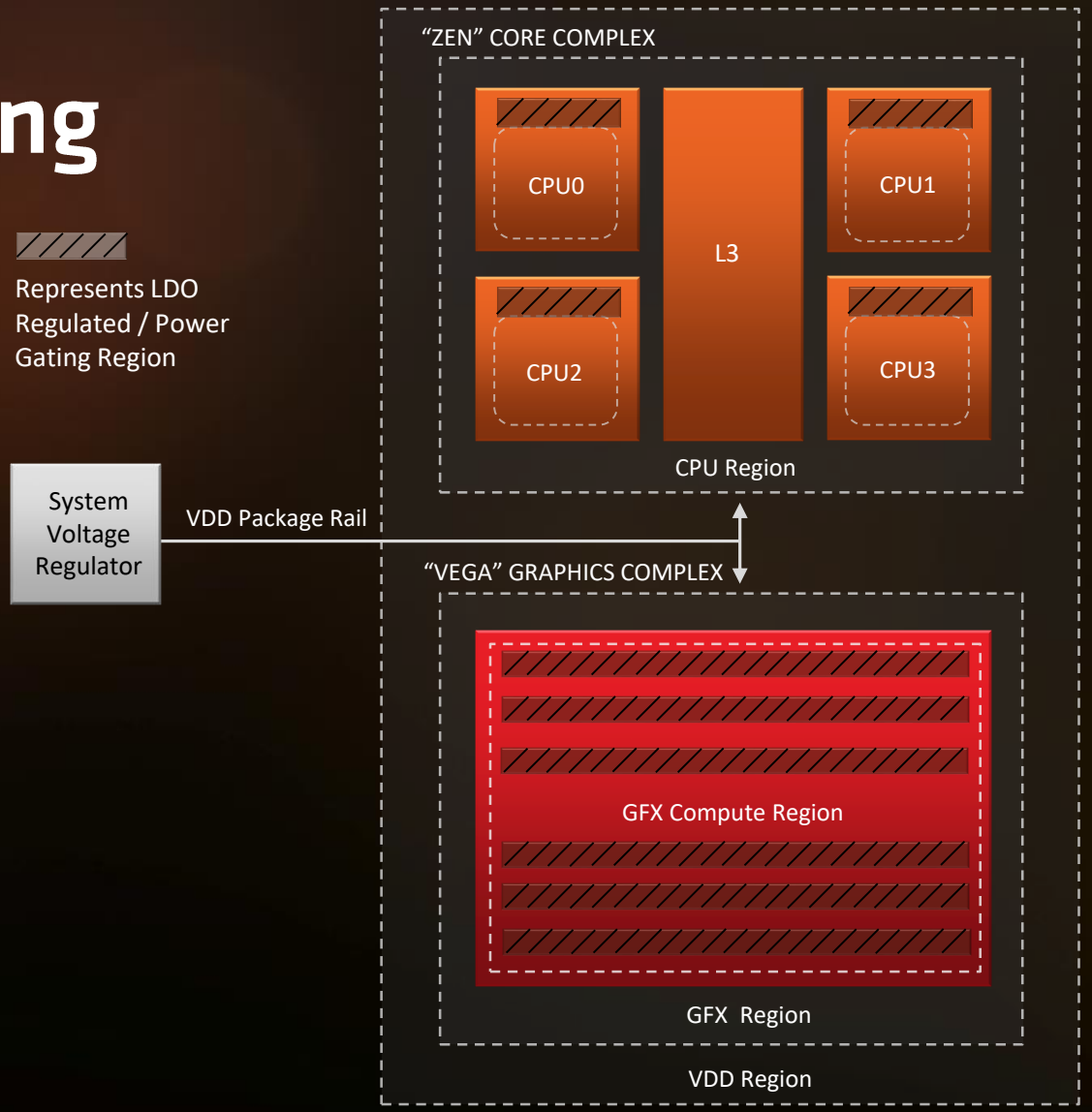


* See footnotes for details.

Synergistic Power Rail Sharing

With Digital Low-Dropout Regulators

- Unified VDD power rail for the SoC
  - 1st stage: off-chip motherboard vreg
  - 2nd stage: on-chip vreg with digital LDO
- Multiple digital LDO regions for CPU cores, graphics core and subregions
- LDO doubles as a power gate when engines are idle
- Reduces total max current requirements by 36%



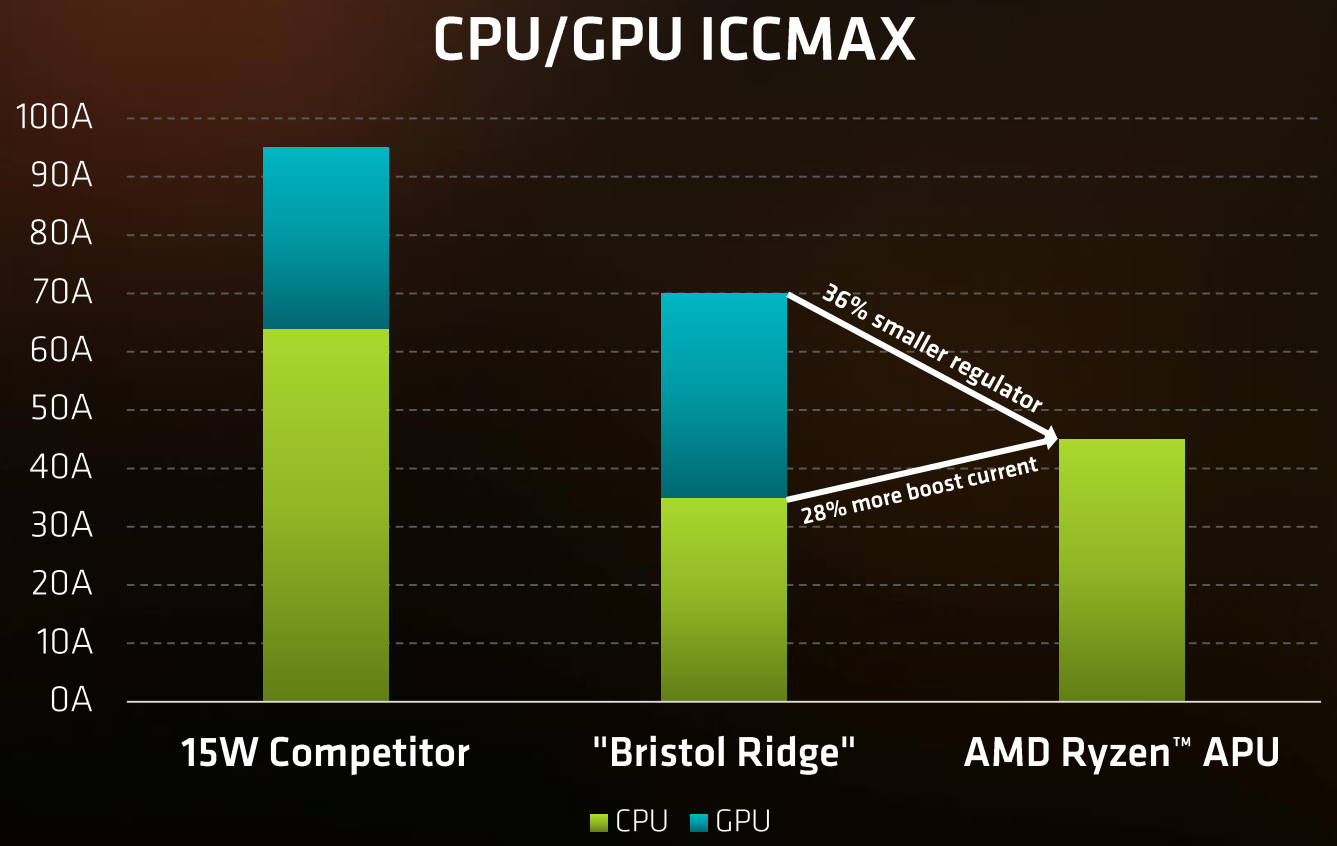
* Based on AMD internal data of an optimized AMD Ryzen™ Mobile APU reference platform as of 9/25/2017. PC manufacturers may vary configuration yielding different results.

AMD

Synergistic Power Rail Sharing

With Digital LDO Regulators

- Shared vreg reduces vreg current requirements
- Enables smaller, lighter laptops
- Allows more peak CPU/GPU current to improve boost performance

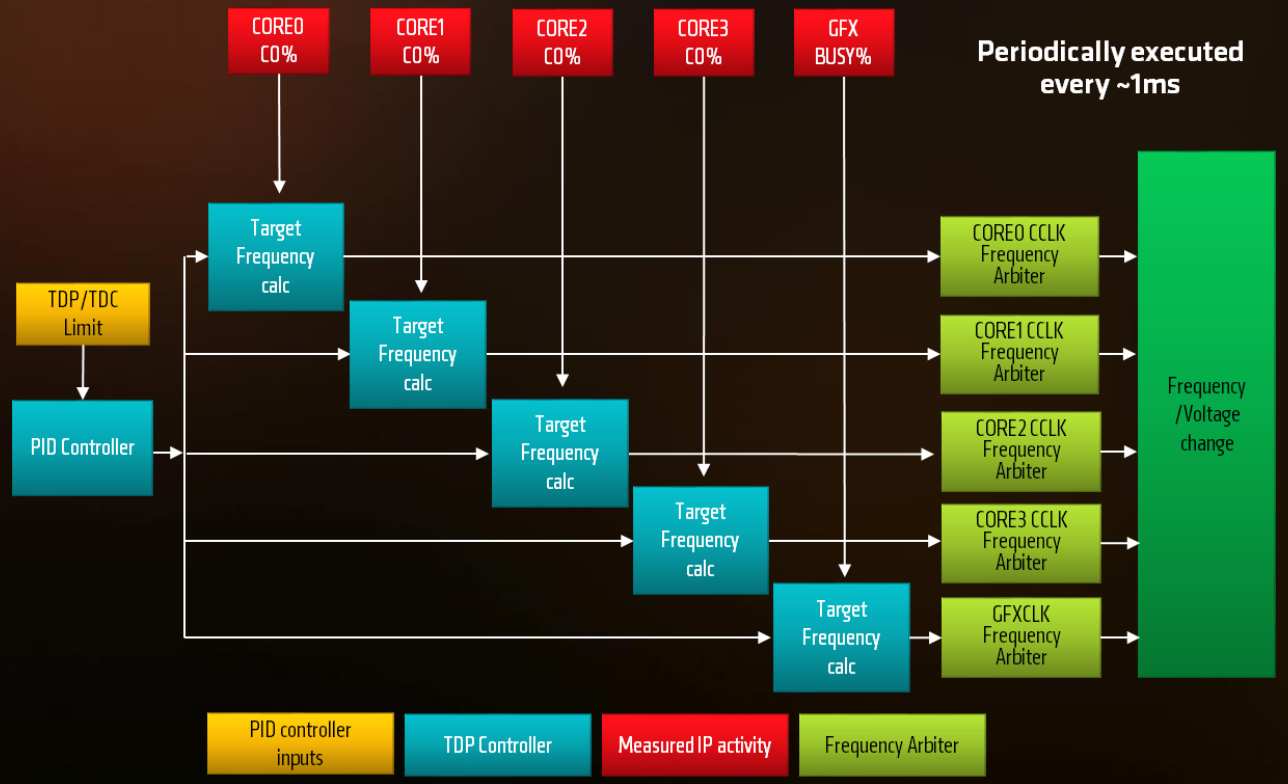


* Competitor ICCMAX data obtained from Table 7-2 and Table 7-3 of 7th Gen Core Family Mobile U/Y Processor Lines Data Sheet (Vol 1) as of 10/12/2017. Source: https://www.intel.com/content/dam/www/public/us/en/documents/datasheets/7th-gen-core-family-mobile-u-y-processor-lines-datasheet-vol-1.pdf

Per-core Frequency and Voltage

Smarter dynamic power management

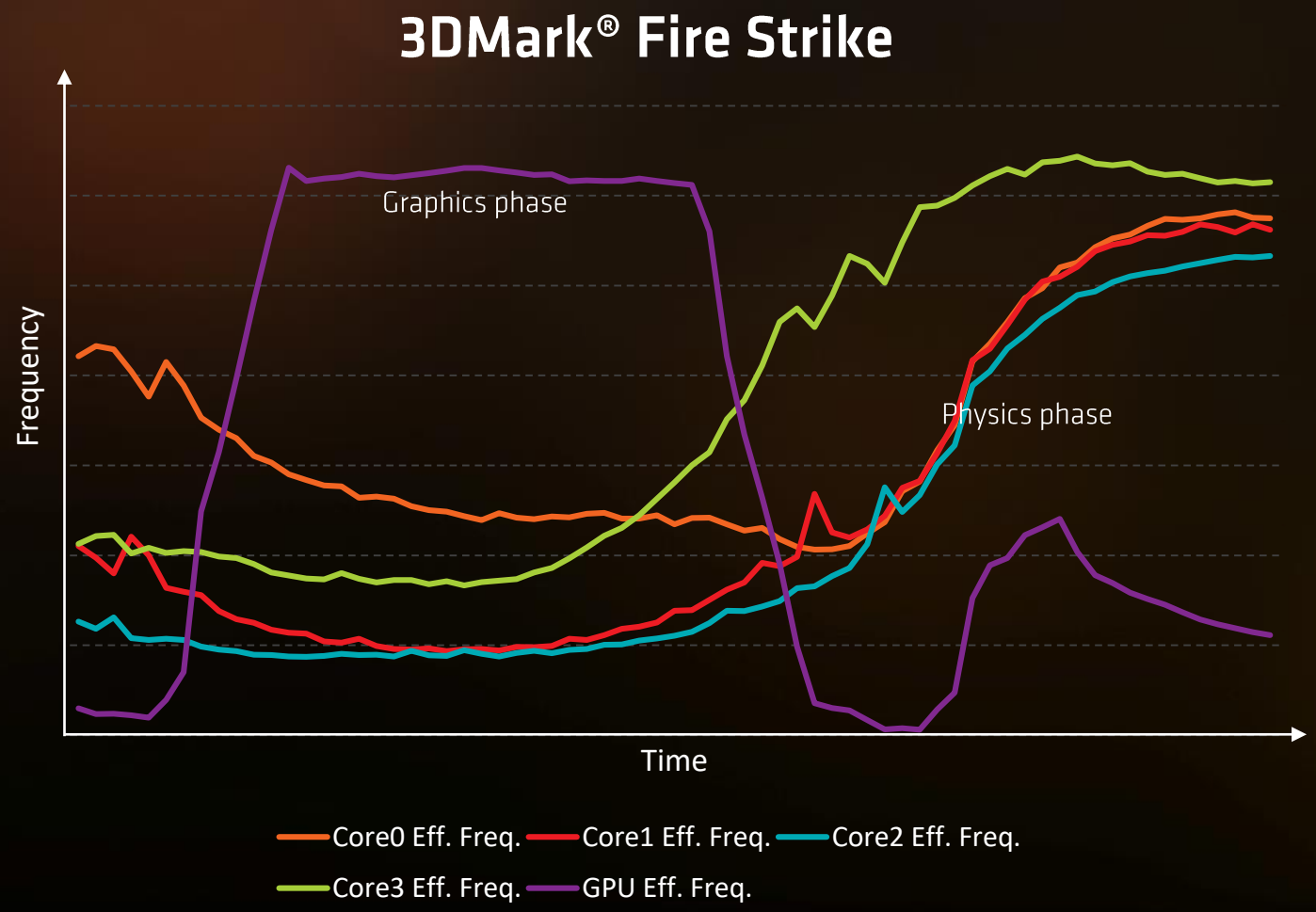
- AMD Ryzen™ APU exploits fine grained integrated voltage regulation:
  - Set frequency and voltage for each core (CPU0-3, GPU)
  - Based on utilization
- All threads are not equal in compute demand:
  - Steer power to the most demanding ones



Per-core Frequency and Voltage

Steer power where it's best used

- Trade power/current based on dynamic utilization:
  - Core↔Core
  - CPU↔GPU
- On-die regulation and fine-grained frequency control of Precision Boost 2 enables fast, accurate frequency and voltage changes



* Based on AMD testing as of 10/11/2017. Clockspeed plot is a snapshot of 8 seconds of 3DMark Fire Strike. "Effective frequency" is the product of the reported clockspeed and %time in active workload C0 C-state.

Enhanced Gate States

With Digital LDO Regulators

Emphasizes lowest activity common idle cases

For CPU cores:

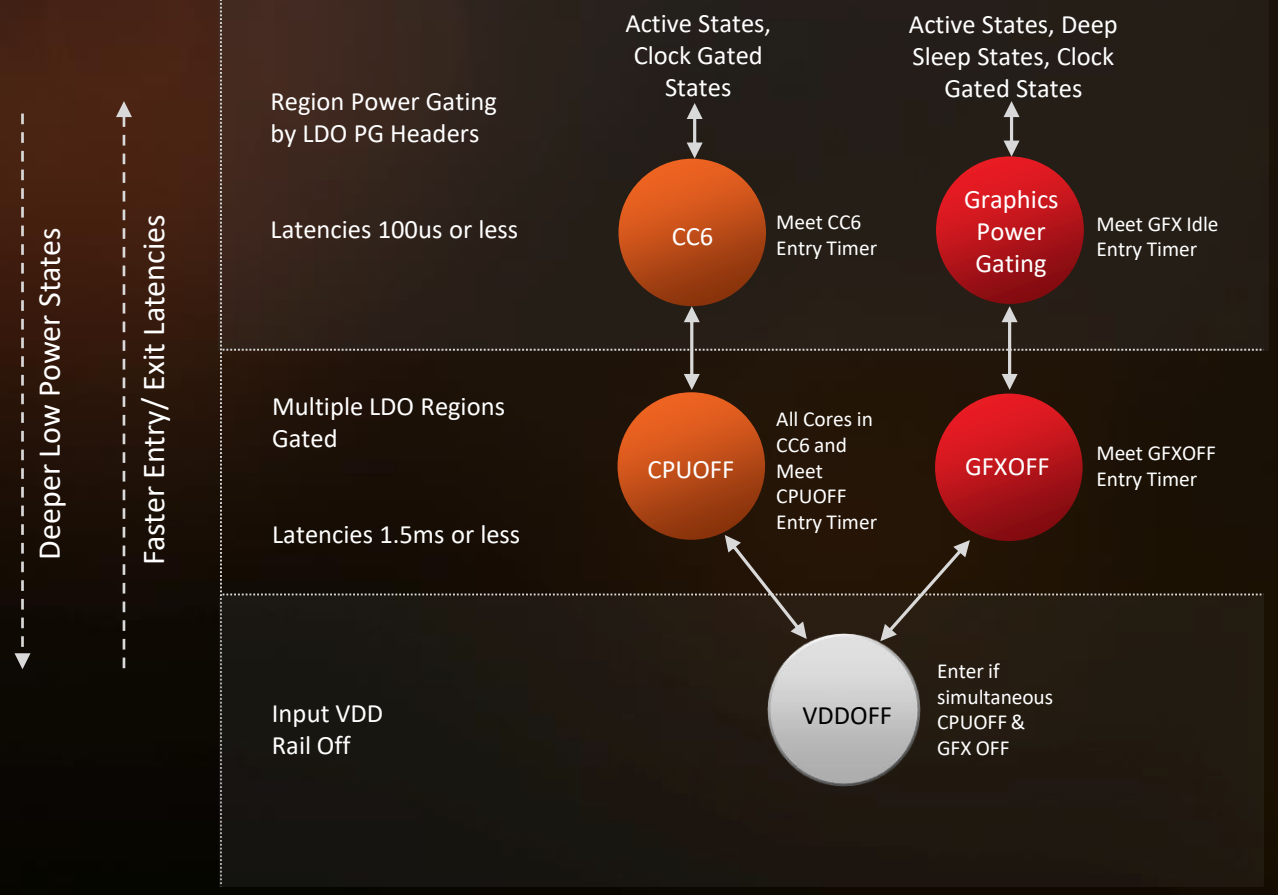
- Each core can enter CC6 power gating
- *CPUOFF* can lower L3$ power when all cores in CC6

For graphics:

- Gating can power down up to 95% of the GPU
- *GFXOFF* can further power down GPU uncore

GFXOFF+CPUOFF=VDDOFF; halts system VDD regulator

- Up to 99% residency in Windows static screen idle*

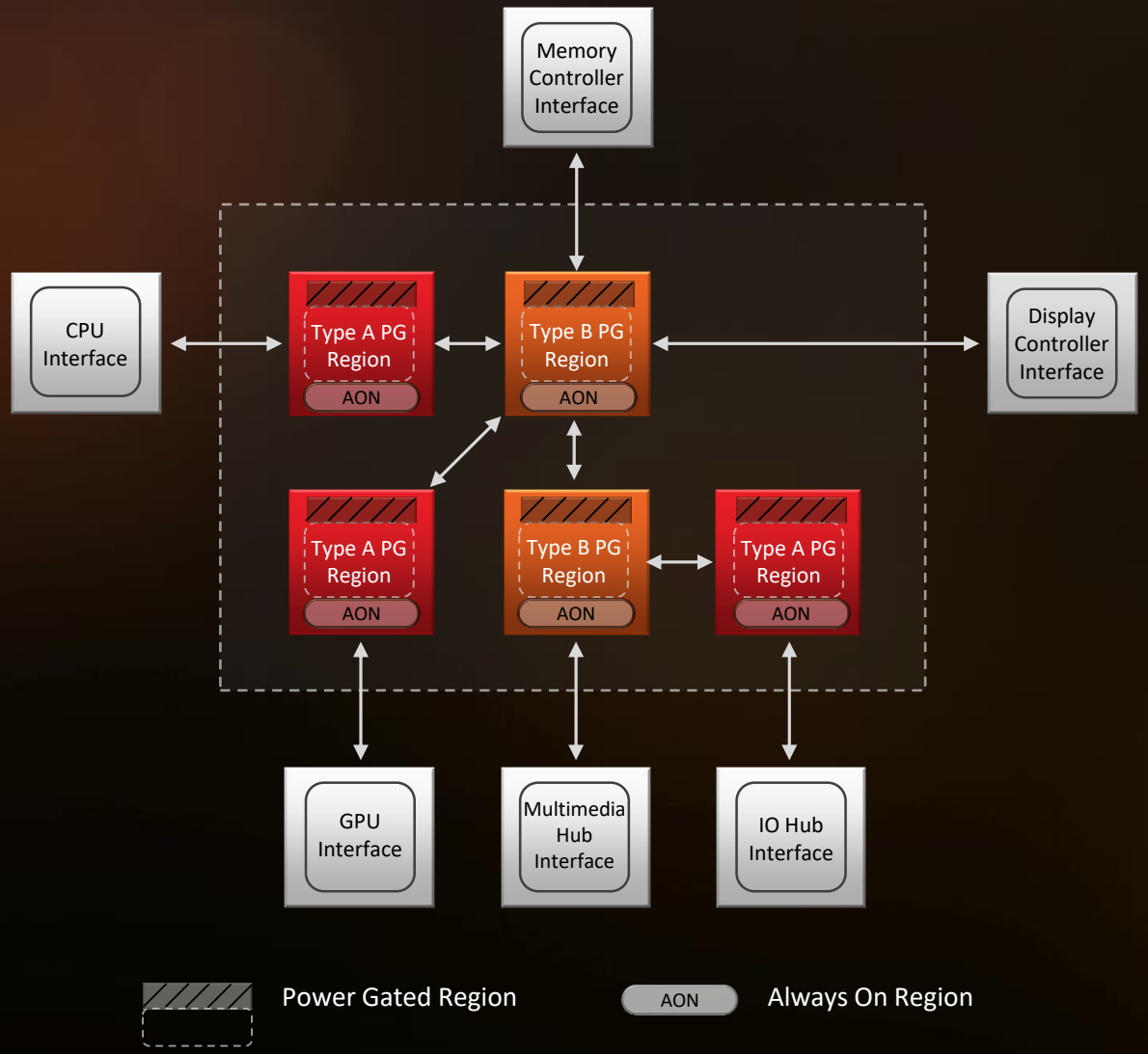


* Based on AMD internal data of an optimized AMD Ryzen™ Mobile APU reference platform as of 9/25/2017. PC manufacturers may vary configuration yielding different results.

Dual Region Power Gating

With Infinity Fabric

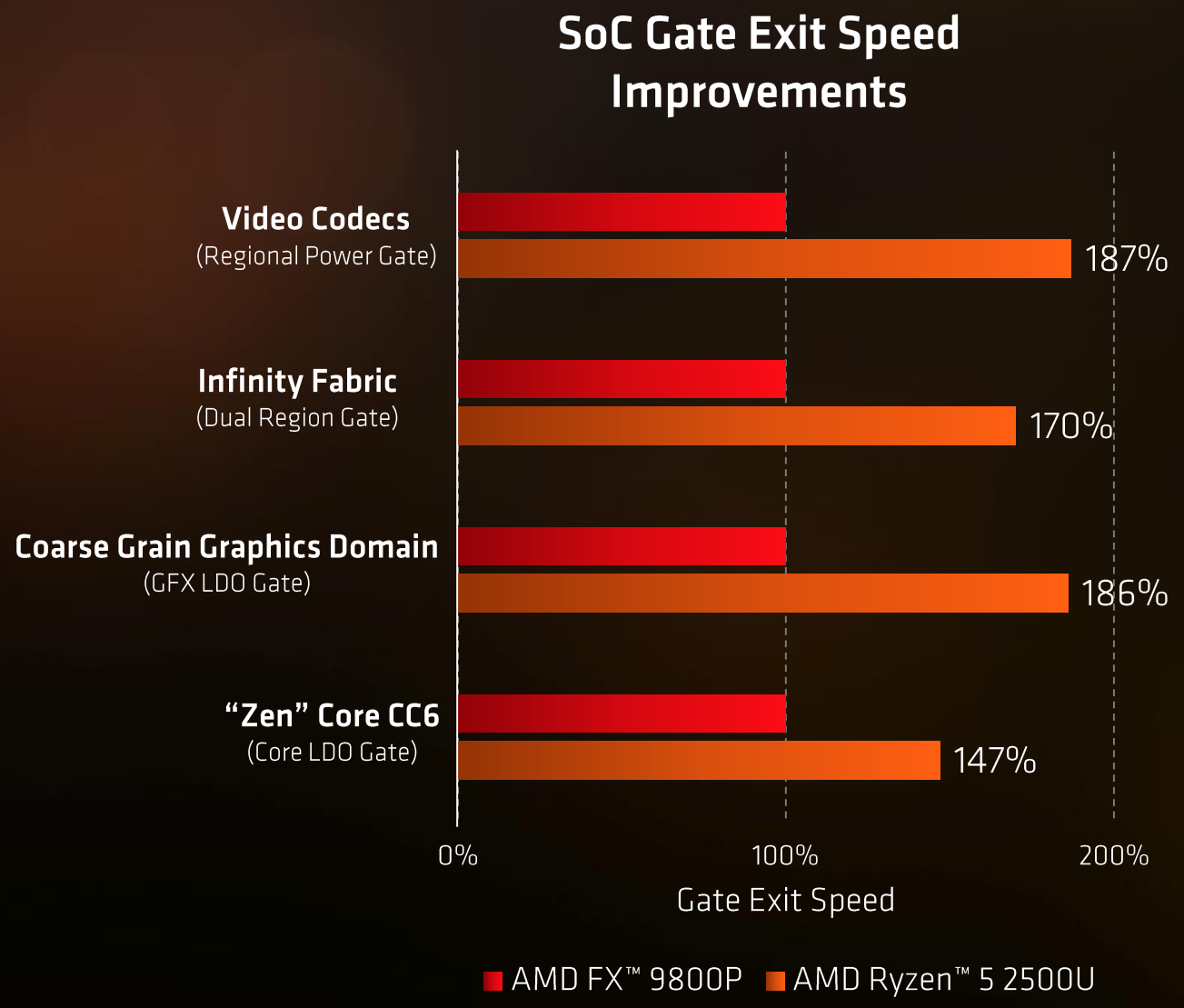
- SoC elements organized into regions:
  - Type A Region: can remain gated during display refresh
  - Type B Region: can become briefly active
  - State machine can control both when display is buffered and Fabric clients are idle
- Dual-region approach minimizes Type B regions to save more power during common battery life scenarios



Faster Gate Exit

With Infinity Fabric

- Dovetails with deeper low power states to accelerate exit from those states
- Fast exit a focus throughout the SoC
- Key innovations:
  - "Zen" pipeline register bus for save/restore
  - "Vega" retention registers reduce saving
  - SoC PLL clock bypass can eliminate PLL startup and lock penalties



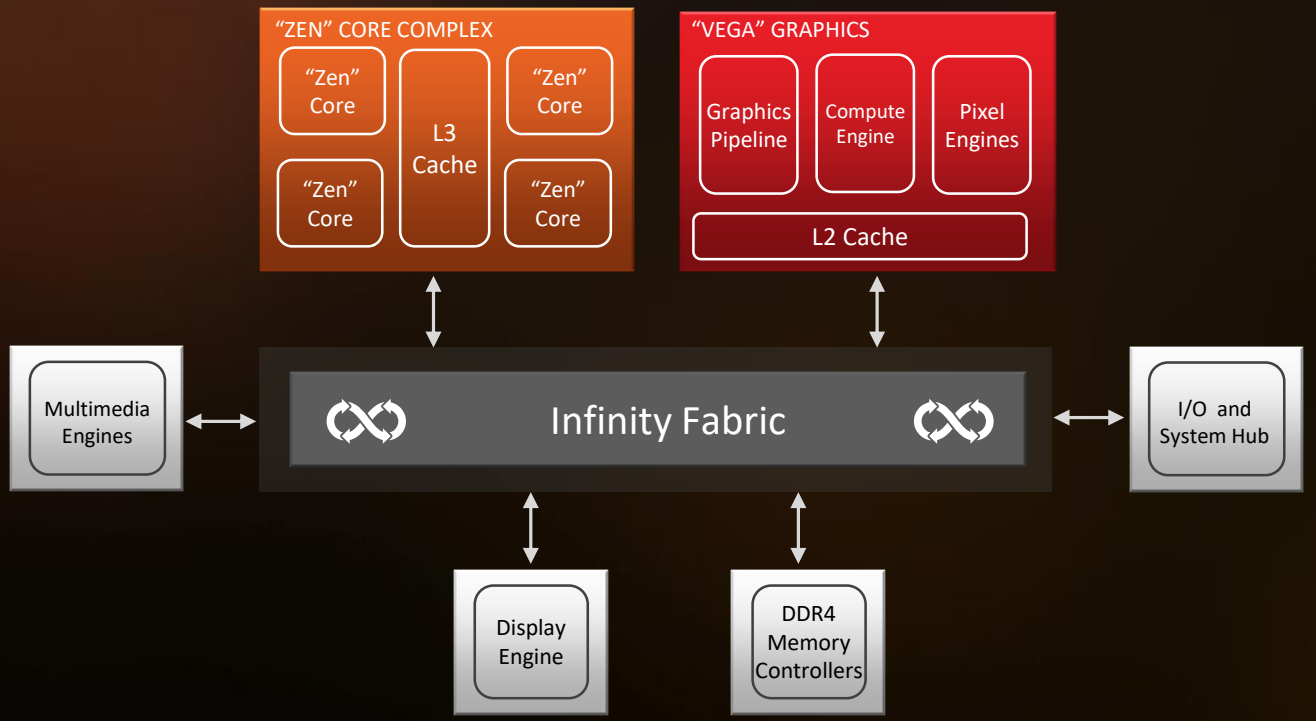
* Based on AMD internal data of an optimized AMD Ryzen™ Mobile APU reference platform as of 9/25/2017. PC manufacturers may vary configuration yielding different results.

AMD

Uniting “Zen” and “Vega”

With Infinity Fabric

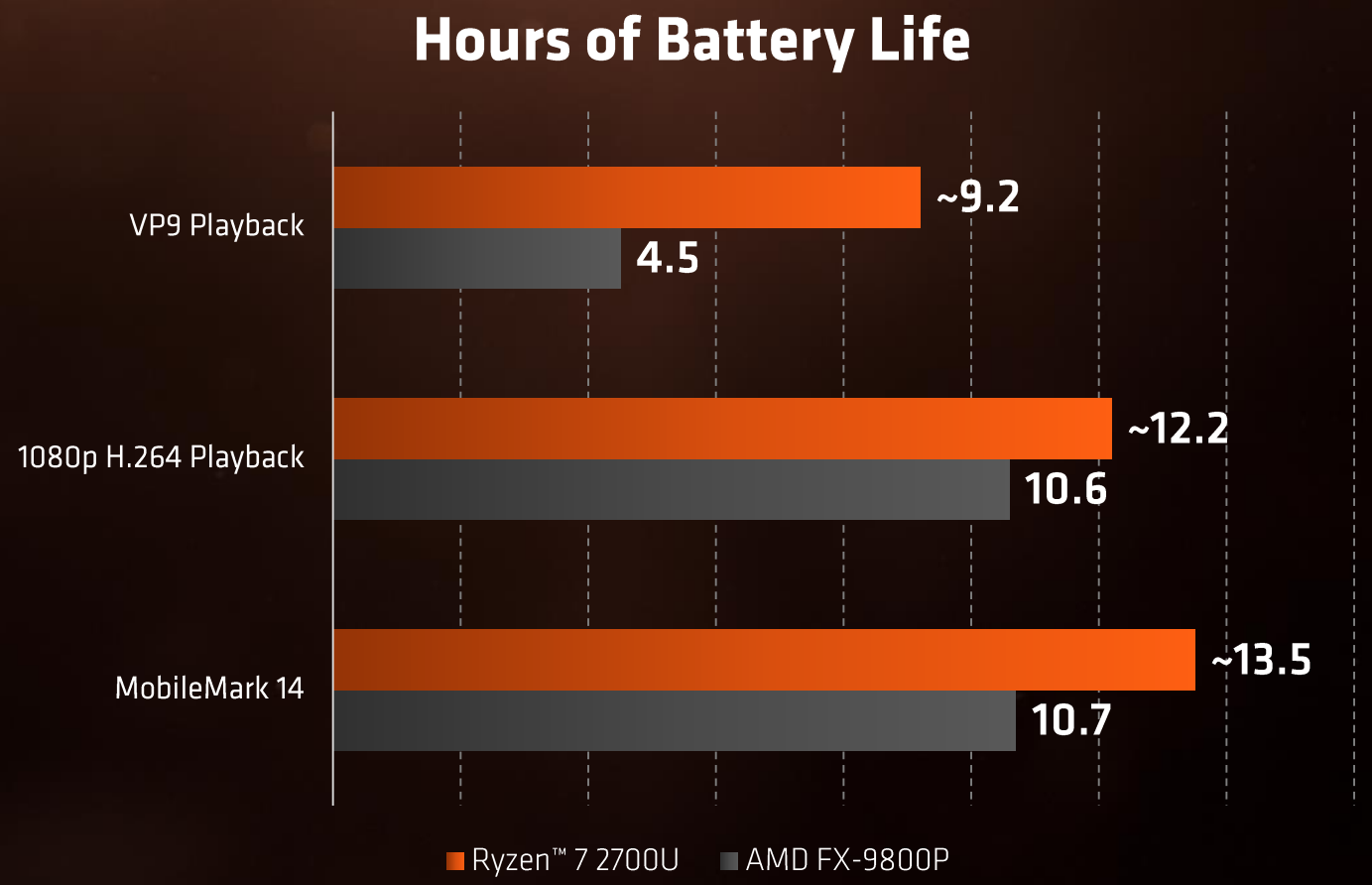
- Our Fabric is the backbone of the AMD Ryzen™ APU
- One coherent control and data interface to integrate and manage the full SoC
- The Fabric services six clients in the SoC
- Telemetry monitoring in Infinity Fabric also governs Precision Boost 2 and mXFR*
- A project 4 years in the making



* mXFR enablement must meet AMD requirements. Not enabled on all notebook designs. Check with manufacturer to confirm “amplified mXFR performance” support.

BATTERY LIFE TARGET

UP TO 2X IMPROVEMENT



* Based on AMD testing as of 10/11/2017. Battery life targets for the AMD Ryzen™ Processor with Radeon™ Graphics assume a 50Wh battery, a fully power-optimized software/hardware solution stack, and the following system configuration: AMD Reference Platform, AMD Ryzen™ 7 2700U, 2x4GB DDR4-2400, graphics driver 17.30.1025, Windows 10 x64 (1703). VP9 battery life improvement of 4.5 hours to 9.2 hours represents 2.04. Actual battery life may vary with system configuration.

AMD

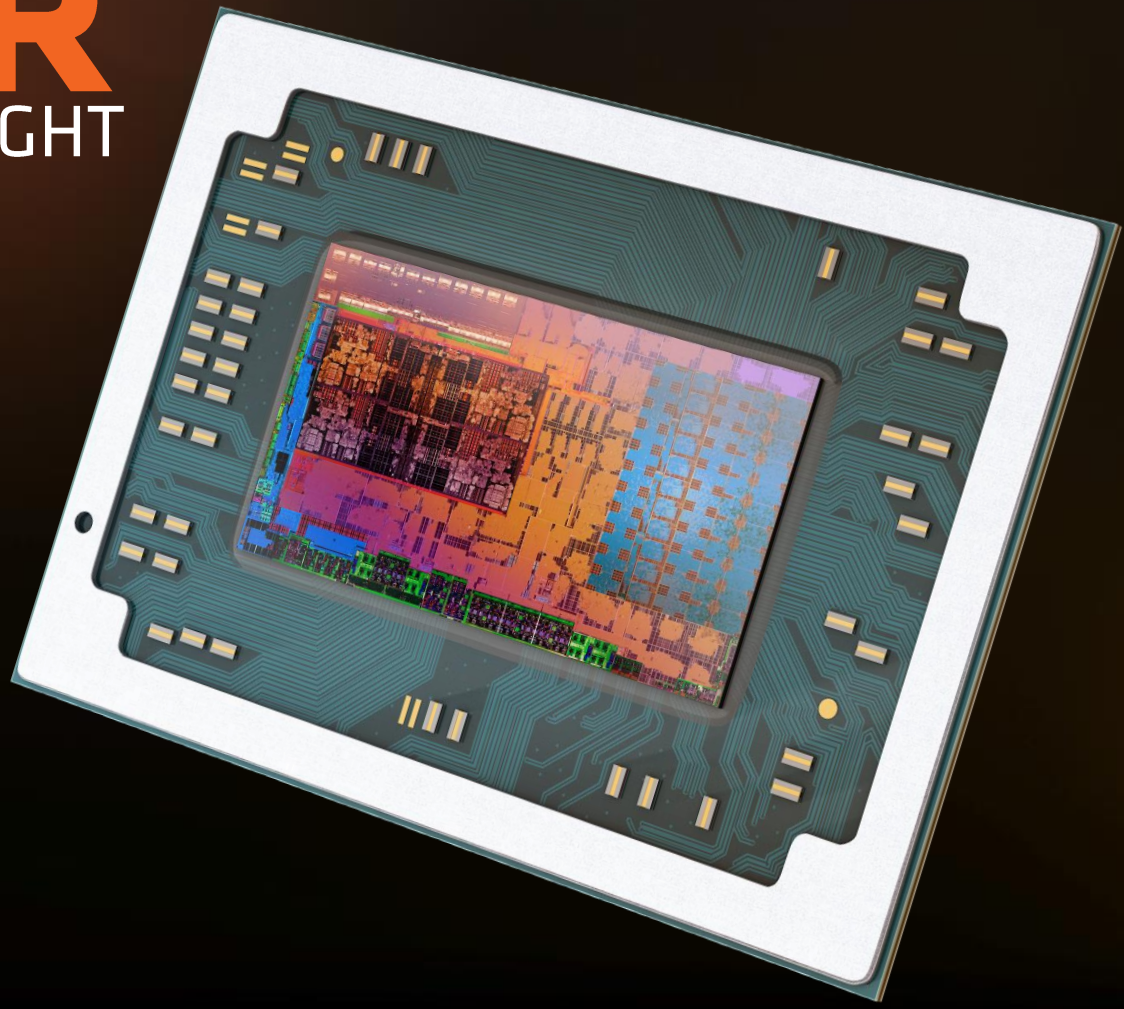
RYZEN

With Radeon™ Vega Graphics

BUILT FOR THE SLEEKEST NOTEBOOKS

24% THINNER

Max Z-HEIGHT



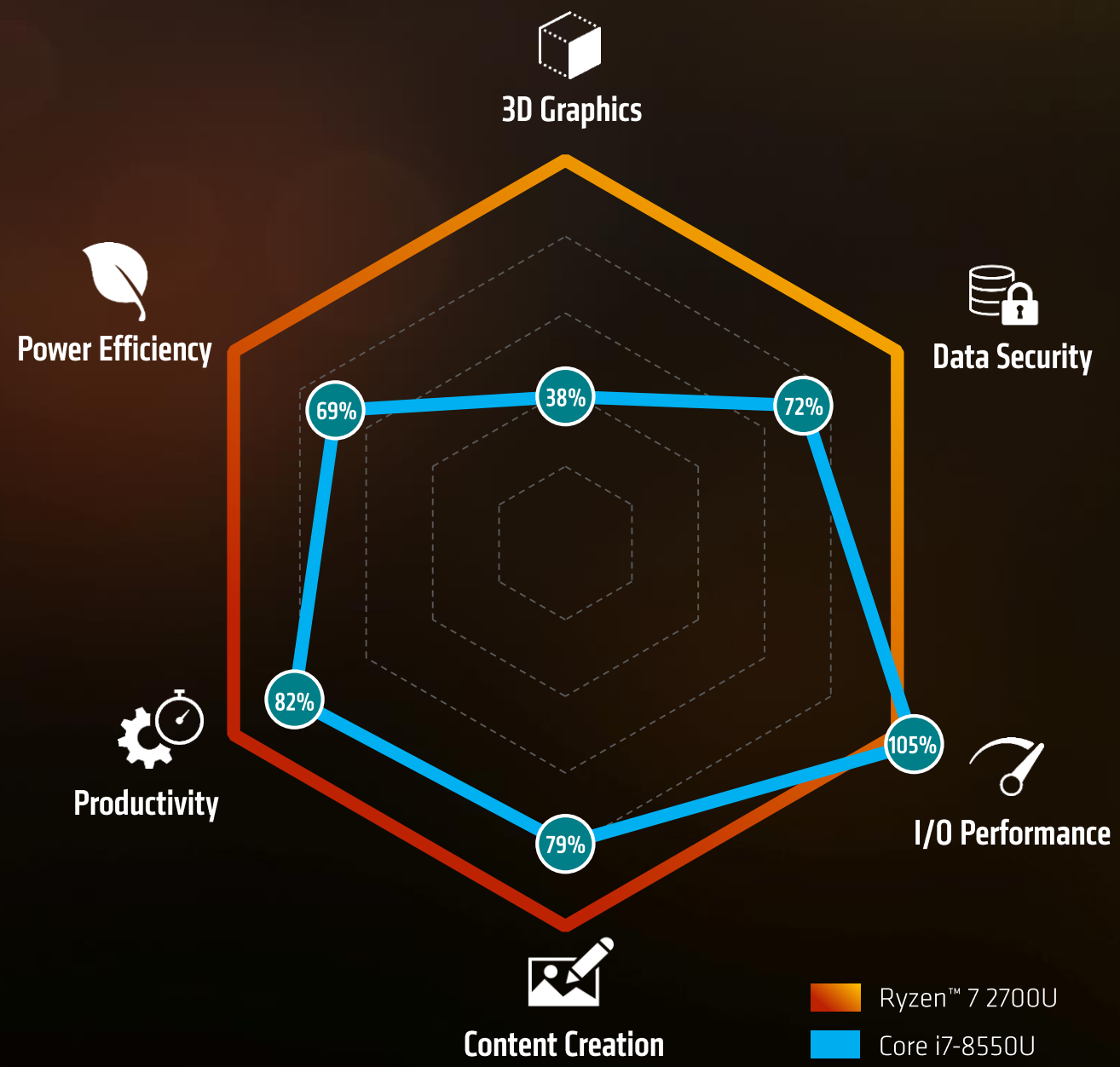
* AMD Ryzen™ mobile processor max Z-height 1.38mm. AMD 7th Gen APU max Z-height 1.82mm. A reduction of 24%.

AMD

AMD RYZEN™ 7 2700U
VS.
CORE i7-8550U

RYZEN

With Radeon™ Vega Processor Graphics



* See footnotes for details.

AMD

VANGUARD DESIGNS STARTING IN Q4

ENVY X360

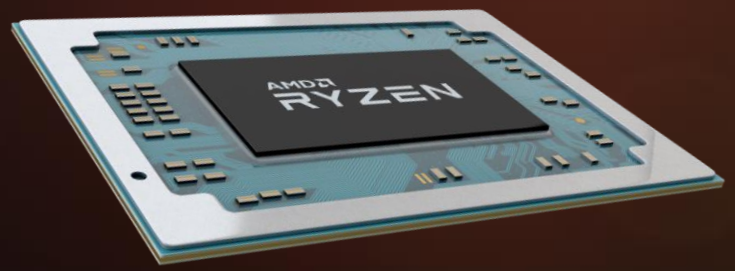
Processor	AMD Ryzen™ 5 2500U
RAM	Dual channel DDR4-2400 (up to 8GB)
Storage	Up to 512GB SSD or 1TB HDD
Display Options	15.6" 1920x1080
Dimensions	360x249x19.5mm
Weight	≤2.15kg
Battery	55.8Wh
Special Feature(s)	Touch display, USB Type-C™ (DisplayPort™ and Power)

Lenovo IDEAPAD 720S

Processor	AMD Ryzen™ 5 2500U AMD Ryzen™ 7 2700U
RAM	Single channel DDR4-2133
Storage	Up to 1TB SSD
Display Options	13.3" 1920x1080 (IPS) 13.3" 3840x2160 (IPS)
Dimensions	306x213x13.6mm
Weight	≤1.14kg
Battery	48Wh
Special Feature(s)	USB Type-C™ (DisplayPort™ and Power)

acer SWIFT 3

Processor	AMD Ryzen™ 5 2500U AMD Ryzen™ 7 2700U
RAM	Dual channel DDR4-2133 (up to 8GB)
Storage	Up to 256GB SSD
Display Options	15” 1920x1080
Dimensions	388x255x18mm
Weight	≤1.8kg
Battery	48Wh
Special Features	IPS Display



AMD Ryzen™ Processor

With Radeon™ Vega Graphics

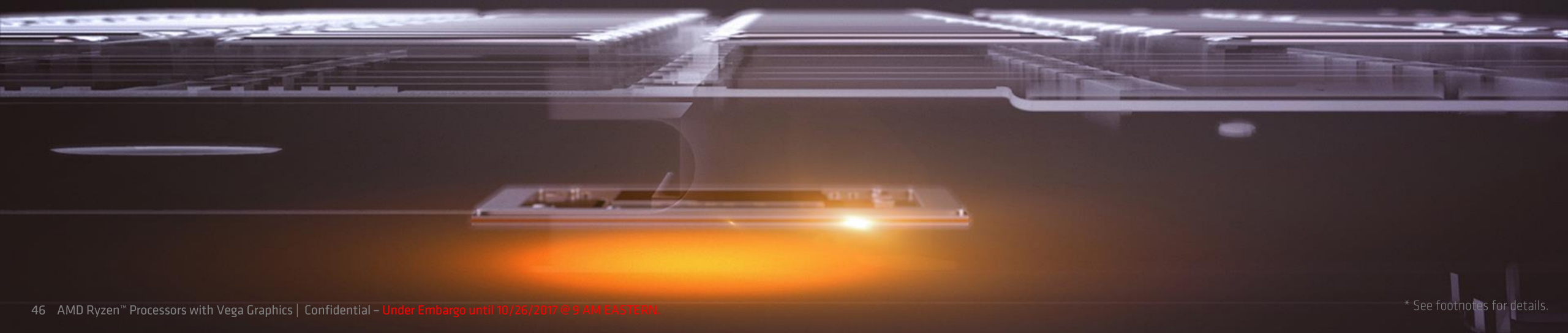
	4 Cores, 8 Threads, 10 CUs	3.8 GHz / 2.2 GHz
7 2700U		
5 2500U	4 Cores, 8 Threads, 8 CUs	3.6 GHz / 2.0 GHz

Select Systems Available Holiday 2017

RYZEN

With Radeon™ Vega Graphics

World's Fastest Processor for Ultra Thin Notebooks



* See footnotes for details.

BACKUP SLIDES

AMD

AMD RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS

SPECIFICATION REFERENCE

	AMD Ryzen™ 7 2700U	AMD Ryzen™ 5 2500U
CPU Cores	4 Cores, 8 Threads (1 CCX)	4 Cores, 8 Threads (1 CCX)
CPU Base Clock	2.2GHz	2.0GHz
CPU Boost Clock	3.8GHz	3.6GHz
GPU Cores	10 Radeon™ RX Vega CUs	8 Radeon™ RX Vega CUs
GPU Clock	Up to 1300MHz	Up to 1100MHz
L1$	64K I$, 32K D$ per core	64K I$, 32K D$ per core
L2$	512K per core	512K per core
L3$	4MB Shared	4MB Shared
TDP	9-25W (Configurable), 15W Nominal	9-25W (Configurable), 15W Nominal
DRAM Supported	Up to DDR4-2400 (Dual Channel)	Up to DDR4-2400 (Dual Channel)

AMD RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS

CODEC CAPABILITIES

VIDEO DECODE CAPABILITIES

CODEC	Max FPS @ 1080p 4:2:0	Max FPS @ 2160p 4:2:0
MPEG2	60 FPS	N/A
VC1	60 FPS	N/A
VP9 8bpc	240 FPS	60 FPS
VP9 10bpc	240 FPS	60 FPS
H.264	240 FPS	60 FPS
HEVC 8bpc	240 FPS	60FPS
HEVC 10bpc	240 FPS	60 FPS
JPEG 8bpc	240 FPS	60 FPS

VIDEO ENCODE CAPABILITIES

CODEC	Max FPS 1080p	Max FPS 1440p	Max FPS 2160p
H.264 8bpc	120	60	30
H.265 8bpc	120	60	30

AMD RYZEN™ PROCESSOR WITH RADEON™ GRAPHICS

DISPLAY SUPPORT

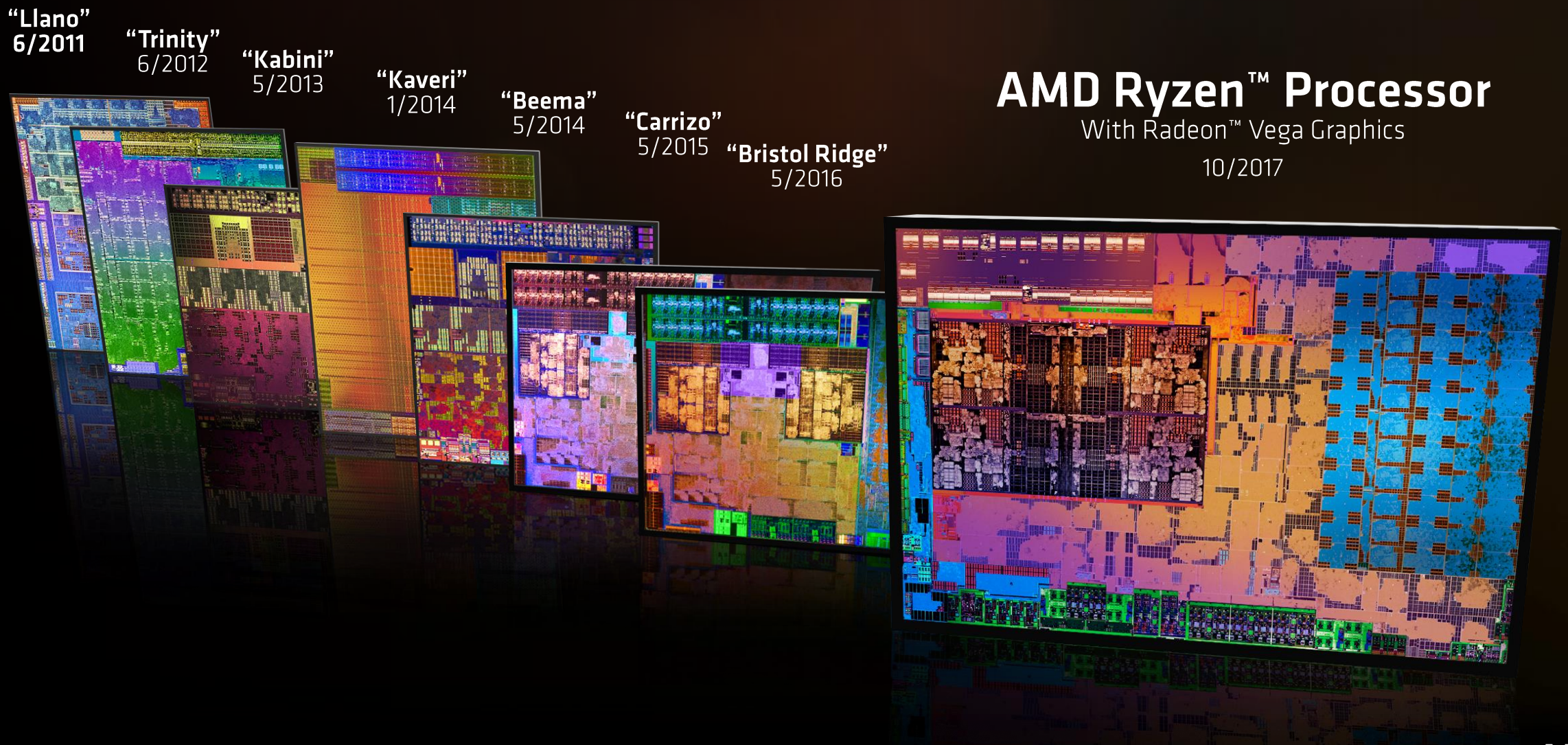
EXTERNAL DISPLAYS & AMD FREESYNC™ RANGE

RESOLUTION	Max Hz @ SDR (32-bit surface)	Max Hz @ HDR (64-bit surface)
1920x1080	20-240Hz	20-120Hz
2560x1080	20-144Hz	20-60Hz
2560x1440	20-144Hz	20-60Hz
3440x1440	20-60Hz	20-60Hz
3840x2160	20-60Hz	20-60Hz

INTERNAL DISPLAYS, FREESYNC™ RANGE, STATIC SCREEN DRR

RESOLUTION	Max Hz @ 8bpc	Max Hz @ HDR10
1920x1080	20-120Hz	20-60Hz
2560x1440	20-120Hz	20-60Hz
3840x2160	20-60Hz	n/a

AMD'S MOST ADVANCED MOBILE PROCESSOR



FOOTNOTES

- **Slide 2, Slide 11, Slide 47:** "Processor for ultrathin laptops" defined as 15W nominal processor TDP. Based on testing of the AMD Ryzen™ 7 2700U, AMD Ryzen™ 5 2500U, and Core i7-8550U 15W mobile processors as of 10/6/2017. Performance based on Cinebench R15 nT ("CPU performance") and 3DMark® TimeSpy ("GPU performance") in order of AMD Ryzen 7 2700U, AMD Ryzen 5 2500U and Intel 8550U. AMD Ryzen™ 7 2700U: AMD Reference, AMD Ryzen™ 7 2700U with Radeon™ Vega 10 Processor Graphics, 8GB DDR4-2400 RAM, Samsung 850 PRO 512GB SATA SSD, Windows 10 Pro RS2, Graphics driver 23.20.768.9, 26-Sep-2017. AMD Ryzen™ 5 2500U: AMD Reference, AMD Ryzen™ 5 2500U with AMD Radeon™ Vega 8 Mobile Graphics, 8GB DDR4-2400 RAM, Samsung 850 PRO 512GB SATA SSD, Windows 10 Pro RS2, Graphics driver 23.20.768.9, 26-Sep-2017. Core i7-8550U: Acer Spin 5, Core i7-8550U with Intel UHD Graphics 620, 8GB DDR4-2400 RAM, MTFDDAV256TBN - M.2 Sata SSD, Windows 10 Pro RS2, Graphics driver 22.20.16.4771, 12-Aug-2017. Cinebench R15 nT results: 719/144%, 598/120%, 498/100%. 3DMark TimeSpy results: 915/261%, 812/232%, 350/100%. 50:50 weighted sum of relative CPU and GPU performance deltas: 100% for 8550U, 176% for 2500U, 203% for 2700U. Performance results may vary with configuration and driver versions. RVM-13
- **Slide 4 (die area):** Based on 44mm2 die area for a 4C8T AMD "Zen" CCX inclusive of L1/L2/L3$ vs. 49mm2 die area for a 4C8T Intel "Kaby Lake" die inclusive of L1/L2/L3$. Source: "Zen: A Next-Generation High-Performance x86 Core", Advanced Micro Devices, ISSCC Submission RVM-14
- **Slide 4 (IPC):** Updated Feb 28, 2017: Generational IPC uplift for the "Zen" architecture vs. "Piledriver" architecture is +52% with an estimated SPECint_base2006 score compiled with GCC 4.6 –O2 at a fixed 3.4GHz. Generational IPC uplift for the "Zen" architecture vs. "Excavator" architecture is +64% as measured with Cinebench R15 1T, and also +64% with an estimated SPECint_base2006 score compiled with GCC 4.6 –O2, at a fixed 3.4GHz. System configs: AMD reference motherboard(s), AMD Radeon™ R9 290X GPU, 8GB DDR4-2667 ("Zen")/8GB DDR3-2133 ("Excavator")/8GB DDR3-1866 ("Piledriver"), Ubuntu Linux 16.x (SPECint_base2006 estimate) and Windows® 10 x64 RS1 (Cinebench R15). SPECint_base2006 estimates: "Zen" vs. "Piledriver" (31.5 vs. 20.7 | +52%), "Zen" vs. "Excavator" (31.5 vs. 19.2 | +64%). Cinebench R15 1t scores: "Zen" vs. "Piledriver" (139 vs. 79 both at 3.4G | +76%), "Zen" vs. "Excavator" (160 vs. 97.5 both at 4.0G | +64%). GD-108
- **Slide 4 (270% perf/W):** manufacturers may vary configurations yielding different results. Performance may vary with drivers versions. FX 8300: AMD reference motherboard, 8GB dual channel DDR3-1600, AMD Radeon™ R9 290X GPU, Radeon™ Software 16.101.0.0, Windows 10 x64 (build 10586). A12-9800: AMD reference motherboard, 8GB dual channel DDR4-2400, AMD Radeon™ R7 Series graphics, Radeon™ Software 16.101.0.0, Windows 10 x64 (build 10586). Ryzen™ 7 1700: AMD reference motherboard, 8GB dual channel DDR4-2400, NVIDIA GeForce GTX 1070 6GB, GPU driver 21.21.13.7633, Windows 10 x64 (build 10586). Perf/W based on Cinebench R15 nT score divided by TDP of the AMD Ryzen™ 7 1700, AMD FX™ 8300 and AMD A12-9800 processors. Perf/W as Cinebench R15 nT scores/TDP: FX 8300 = 522/95W = 5.49; A12-9800 = 331/65W = 5.09; Ryzen 7 1700 = 1410/65W = 21.69. Relative power efficiency: 21.69/5.49 = 3.95x or 295% more and 21.69/5.09 = 4.26x or 326% more perf/W. RVM-15
- **Slide 7:** HDR content requires that the system be configured with a fully HDR-ready content chain, including: graphics card, monitor/TV, graphics driver and application. Video content must be graded in HDR and viewed with an HDR-ready player. Windowed mode content requires operating system support. 4K resolution requires a 3840x2160 display and content. GRT-6: VR support requires a VR headset compatible with AMD hardware supporting AMD LiquidVR™ technology. Please contact the VR HMD manufacturer directly for pricing and availability.
- **Slide 13:** Testing by AMD Performance labs as of 10/05/2017. PC manufacturers may vary configurations yielding different results. Performance may vary with driver versions. AMD Ryzen™ 7 2700U: AMD Reference, AMD Ryzen™ 7 2700U with Radeon™ Vega 10 Processor Graphics, 8GB DDR4-2400 RAM, Samsung 850 PRO 512GB SATA SSD, Windows 10 Pro RS2, Graphics driver 23.20.768.9, 26-Sep-2017. AMD FX™ 9800P: HP 81AA, AMD FX™ 9800P with Radeon™ R7 Mobile Graphics, 8GB DDR4-2133 RAM, Samsung 850 PRO 512GB SATA SSD, Windows 10 Pro RS2, Graphics driver 22.19.662.4, 19-Jul-2017. Cinebench R15 nT is used to simulate CPU performance; the AMD Ryzen™ 7 2700U scored 719, while the FX 9800P scored 240 for a benchmark score comparison of 719/240 = 3.00X or 200% more. RVM-16
- **Slide 13:** Testing by AMD Performance labs. PC manufacturers may vary configurations yielding different results. Performance may vary with driver versions. AMD Ryzen™ 7 2700U: AMD Reference, AMD Ryzen™ 7 2700U with Radeon™ Vega 10 Processor Graphics, 8GB DDR4-2400 RAM, Samsung 850 PRO 512GB SATA SSD, Windows 10 Pro RS2, Graphics driver 23.20.768.9, 26-Sep-2017. AMD FX™ 9800P: HP 81AA, AMD FX™ 9800P with Radeon™ R7 Mobile Graphics, 8GB DDR4-2133 RAM, Samsung 850 PRO 512GB SATA SSD, Windows 10 Pro RS2, Graphics driver 22.19.662.4, 19-Jul-20173DMark® Time Spy is used to simulate graphics performance; the AMD Ryzen™ 7 2700U scored 915, while the AMD FX™ 9800P scored 400 for a benchmark score comparison of 915/400 = 2.29X or 129% more performance. RVM-17

FOOTNOTES

- **Slide 13:** Based on AMD testing as of 9/28/2017. System configuration(s): AMD Reference Motherboard (2700U), HP ENVY X360 (FX-9800P/"7th Gen APU"), Samsung 850 Pro SSD, Windows 10 x64 1703, 1920x1080. AMD Ryzen™ 7 2700U Graphics Driver: 23.20.768.9. AMD FX-9800P Graphics Driver: 22.19.662.4. 1x8GB DDR4-2133 (AMD FX-9800P). 2x4GB DDR4-2400 (AMD Ryzen™ 7 2700U). Power Consumption defined as joules of power consumed during a complete run of Cinebench R15 nT: AMD FX™ 9800P = 3782 joules (100%) vs. AMD Ryzen™ 7 2700U =1594J (58% less). Different configurations may yield different results RVM-25
- **Slide 18:** Based on AMD testing of an AMD Ryzen™ 7 2700U reference platform as of 9/25/2017. System configuration(s): 2x4GB DDR4-2400, Samsung 850 Pro SSD, Windows 10 x64 1703, 1920x1080, AMD Radeon™ Vega Graphics Driver: 22.19.655.2. AMD Ryzen™ 7 2700U mXFR score of 553 is 23.4% greater than non-mXFR score of 448. In this test case "without mXFR" refers to a 15W cooling solution, and "with mXFR" refers to a 25W cooling solution. mXFR enablement must meet AMD requirements. Not enabled on all notebook designs. Check with manufacturer to confirm "amplified mXFR performance" support. Different configurations may yield different results.
- **Slide 19:** Testing by AMD Performance labs as of 10/10/2017. Common system components: Samsung 850 Pro SSD, Windows 10 x64 1703, and 1920x1080; AMD Ryzen™ Mobile APU Graphics Driver: 23.20.768.9; AMD FX-9800P Graphics Driver: 23.20.768.9; AMD FX-9800P configured in HP ENVY X360 (1x8GB DDR4-2133 RAM); AMD Ryzen™ mobile APUs configured in AMD reference platform (2x4GB DDR4-2400 RAM).Application launch performance based on cold start (not previously loaded in memory) results from PCMark 10 app launch sub-test(s). Results in order of 2700U, 2500U, 9800P (seconds): Chromium Launch [0.89,0.84,1.24], Writer Launch [2.78,3.06,3.78], GIMP Launch [3.34,3.40,5.70], Firefox Launch [2.01,2.02,2.81]. Average of all scores for AMD Ryzen™ 7 2700U and 2500U are +32% and +30%, respectively, of AMD FX™ 9800P. GIMP launch on 2700U (3.34 seconds) is 41% faster than the FX-9800P (5.7 seconds). GIMP launch on 2500U (3.40 seconds) is 40% faster than the FX-9800P (5.7 seconds). Different configurations and different driver versions may yield different results. RVM-18
- **Slide 20:** Based on AMD testing as of 9/25/2017. System configuration(s): AMD Reference Motherboard (Ryzen™ 7 2700U), Acer Spin 5 (8550U), HP ENVY X360 (7500U), 2x4GB DDR4-2400, Samsung 850 Pro SSD, Windows 10 x64 1703, 1920x1080. Intel Graphics Driver: 22.20.16.4691. AMD Graphics Driver: 23.20.768.9. Cinebench R15 1t/nT scores: 144/719 (2700U) vs. 159/498 (8550U) vs. 147/325 (7500U). Cinebench R15 1t scores vs. Ryzen™ 7 2700U Baseline of 144: 7500U = 102%, 8550U = 110%. Ryzen™ 7 2700U Cinebench R15 nT score of 719 is 221% of 7500U and 144% of 8550U. Different configurations may yield different results.
- **Slide 21:** Based on AMD internal testing as of 9/28/2017. Samsung 850 Pro SSD, Windows 10 x64 1703, and 1920x1080; Intel Graphics Driver: 22.20.16.4691; AMD Ryzen™ Mobile APU Graphics Driver: 23.20.768.9; AMD FX-9800P Graphics Driver: 23.20.768.9; AMD FX-9800P in HP ENVY X360 configured with 1x8GB DDR4-2133; All other systems configured with 2x4GB DDR4-2400; Core i7-8550U configured in Acer Spin 5 notebook; AMD Ryzen™ 7 2700U configured in AMD reference platform. Application performance in order of AMD Ryzen™ 7 2700U, Core i7-8550U in Acer Spin 5, and AMD FX-9800P in HP ENVY X360: POV-Ray 3.7 (1320/199%, 1101/166%, 663/100%); PCMark 10 Extended (3102/163%, 2533/133%, 1907/100%); TrueCrypt 7.1a 1GB AES (4.6GBps/249%, 3.3GBps/178%, 1.85GBps/100%); PassMark 9 (3316/176%, 3550/188%, 1887/100%). Results may vary with configuration and driver versions. RVM-19
- **Slide 21:** Based on internal AMD testing as of 9/28/2017. Common system components: Samsung 850 Pro SSD, Windows 10 x64 1703, and 1920x1080; Intel Graphics Driver: 22.20.16.4691; AMD Ryzen™ Mobile APU Graphics Driver: 23.20.768.9; AMD FX-9800P Graphics Driver: 23.20.768.9; AMD FX-9800P in HP ENVY X360 configured with 1x8GB DDR4-2133; All other systems configured with 2x4GB DDR4-2400; Core i5-8250U configured in Acer Swift 3 notebook; AMD Ryzen™ 5 2500U configured in AMD reference platform. Application performance in order of AMD Ryzen™ 5 2500U, Core i5-8250U in Acer Swift 3, and AMD FX-9800P in HP ENVY X360: POV-Ray 3.7 (1192/180%, 1195/180%, 663/100%); PCMark 10 Extended (2693/141%, 2814/148%, 1907/100%); TrueCrypt 7.1a 1GB AES (3.55GBps/192%, 3.5GBps/189%, 1.85GBps/100%); PassMark 9 (3254/172%, 3696/196%, 1887/100%). Results may vary with configuration and driver versions. RVM-20
- **Slide 22:** Based on AMD testing as of 9/25/2017. 2700U System configuration(s): AMD Reference Motherboard (2700U), MSI B250 Gaming M3 (7600K), 2x4GB DDR4-2400 (2700U), 2x8GB DDR4-2400 (7600K), Samsung 850 Pro SSD, Windows 10 x64 1703, 1920x1080. Intel Graphics Driver: 21.21.13.7878. AMD Graphics Driver: 23.20.768.9. Cinebench R15 nT score for 2700U mobile processor vs. i5-7600K desktop CPU: 707 vs. 663, or +7.8%. Different configurations may yield different results.

FOOTNOTES

- **Slide 22:** Based on AMD testing as of 9/25/2017. 2700U System configuration(s): AMD Reference Motherboard (2700U), MSI B250 Gaming M3 (7600K), 2x4GB DDR4-2400 (2700U), 2x8GB DDR4-2400 (7600K), Samsung 850 Pro SSD, Windows 10 x64 1703, 1920x1080. Intel Graphics Driver: 21.21.13.7878. AMD Graphics Driver: 23.20.768.9. Cinebench R15 nT score for 2700U mobile processor vs. i5-7600K desktop CPU: 707 vs. 663, or +7.8%. Different configurations may yield different results.
- **Slide 24:** Based on AMD testing as of 9/25/2017. Common system configurations: Samsung 850 Pro SSD, Windows 10 x64 1703, 1920x1080; Intel Graphics Driver: 22.20.16.4691; AMD Ryzen™ mobile APU Graphics Driver: 23.20.768.9; AMD FX-9800P Graphics Driver: 22.19.662.4; AMD FX-9800P configured in HP ENVY X360 (1x8GB DDR4-2133). AMD Ryzen™ 7 2700U configured in AMD reference platform (2x4GB DDR4-2400). Core i7-8550U configured in Acer Swift 3 (2x4GB DDR4-2400). Core i7-7500U configured in HP ENVY X360 (2x4GB DDR4-2400). Graphics results measured with 3DMark® TimeSpy. Core i7-8550U score (350) is baseline 100%. Core i7-7500U score (377) is 107% of baseline. AMD FX-9800P score (400) is 114% of baseline. AMD Ryzen™ 7 2700U score (915) is 261% of baseline. Different configurations may yield different results.
- **Slide 27:** FreeSync 2 does not require HDR capable monitors; driver can set monitor in native mode when FreeSync 2 supported HDR content is detected. Low-latency HDR only attainable when using a FreeSync 2 API enabled game or video player and content that uses at least 2x the perceivable brightness and color range of sRGB, and using a FreeSync 2 qualified monitor. Based on AMD internal testing as of November 2016. GD-105.
- **Slide 29:**

"Kaveri"	"Carrizo"	"Bristol Ridge"	"Raven Ridge"
AMD Reference Platform AMD FX-7600P 2x4GB DDR3L-1600 Crucial CT256M4SSD2 Windows 8.1 x64 9600 Graphics Driver 13.350.0.0 1366x768	AMD Reference Platform AMD FX-8800P 2x2GB DDR3-1866 Crucial CT256M550SSD1 Windows 10 x64 10586 Graphics Driver 21.19.137.514 1366x768	AMD Reference Platform AMD FX-9830P 2x4GB DDR4-2133 Crucial CT256M4SSD2 Windows 10 x64 10586 Graphics Driver 21.19.137.514 1366x768	AMD Reference Platform AMD Ryzen™ 7 2700U 2x4GB DDR4-2400 Samsung 850 Pro SSD Windows 10 x64 1703 Graphics Driver: 22.19.655.2 1920x1080

Based on AMD internal testing as of 10/12/2017. Relative energy efficiency based on a 50:50 weighted average of CPU+GPU performance (variable "C"), as evaluated by Cinebench R15 nT and 3DMark 11 scores, divided by typical energy usage (variable "E") as defined by: ETEC (Typical Energy Consumption for notebook computers), Energy Star Program Requirements Rev 6.1 10/2014. AMD "Kaveri" represents the baseline of 1.0X for CPU, GPU, and ETEC. AMD "Carrizo" efficiency 1.23C/0.35E=3.51X. AMD "Bristol Ridge" efficiency 1.36C/0.34E=3.97X. AMD "Raven Ridge" efficiency 2.56E/0.44E=5.86X. Scores in order of Cinebench R15 nT/3DMark 11 P Score: "Kaveri" 232/2142 (100%), "Carrizo" 277/2709 (123%), "Bristol Ridge" 279/3234 (136%), "Raven Ridge" 719/4315 (256%). Results may vary with configuration and driver versions. RVM-21

- **Slide 40:** Based on internal AMD testing as of 10/08/2017. Common system configurations: Samsung 850 Pro SSD, Windows 10 x64 1703, 2x4GB DDR4-2400, 1920x1080; Intel Graphics Driver: 22.20.16.4691; AMD Ryzen™ mobile APU Graphics Driver: 23.20.768.9; AMD Reference Platform (2700U); Acer Spin 5 (8550U). All scores listed in order of 2700U vs. 8550U, with 2700U set as the 100% baseline. "3D Graphics" defined as 3DMark TimeSpy (915/100% v. 350/38%); "Data Security" defined as TrueCrypt 7.1a 1GB AES (4.6GBps/100% v. 3.3GBps/72%); "I/O Performance" defined as geomean of the eight Crystal Diskmark storage scores (218/100% v. 229/105%); Content Creation defined as POV-Ray 3.7 (1402/100% v. 1101/79%); Productivity defined as PCMark 10 Extended (3102/100% v. 2533/82%); Power Efficiency defined as Cinebench R15 nT score divided by 15W nominal processor TDP: Cinebench R15 nT scores (719 v. 498), nT Score/15W (47.93/100% v. 33.2/69%). Results may vary with configuration and driver versions. RVM-23