Thunderbolt™ Update

Shahaf Kieselstein – VP and General Manager
Jason Ziller – Marketing Director
CCD, Client Computing Group
Intel Corporation
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THUNDERBOLT™

Thunderbolt™ 3 Technology Introduced at Computex 2015

One **Year** Later**...Strong PC** Adoption

More than **60** PC designs shipping from leading vendors

THUNDERBOLT™

One **Year** Later...Strong Momentum in Device Ecosystem

20 Devices announced

65 in the development pipeline

Under US$100

Major device OEMs shipping Thunderbolt

Thunderbolt™ 3 brings Thunderbolt to USB-C

The USB-C that does it all.

More **Speed**

40 Gbps
fastest connection

More **Pixels**

Dual 4K displays
60Hz

More **Power**

100W
charging

15W
device

More **Protocols**

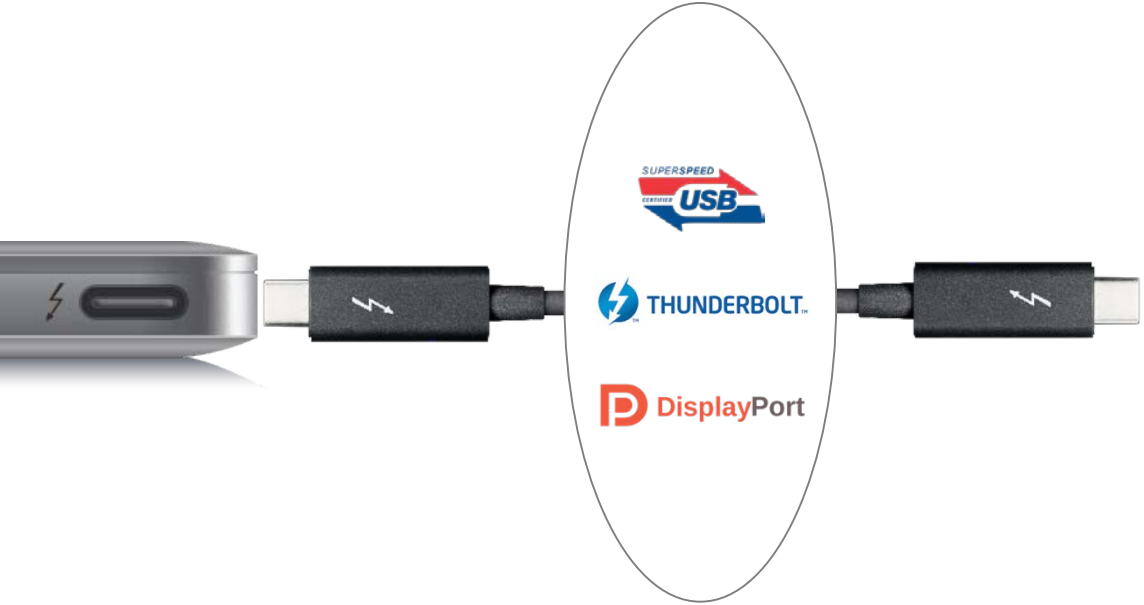
THUNDERBOLT™

DisplayPort™

SUPERSPEED USB

PCI EXPRESS

More **Protocols = Simple, It Just Works**



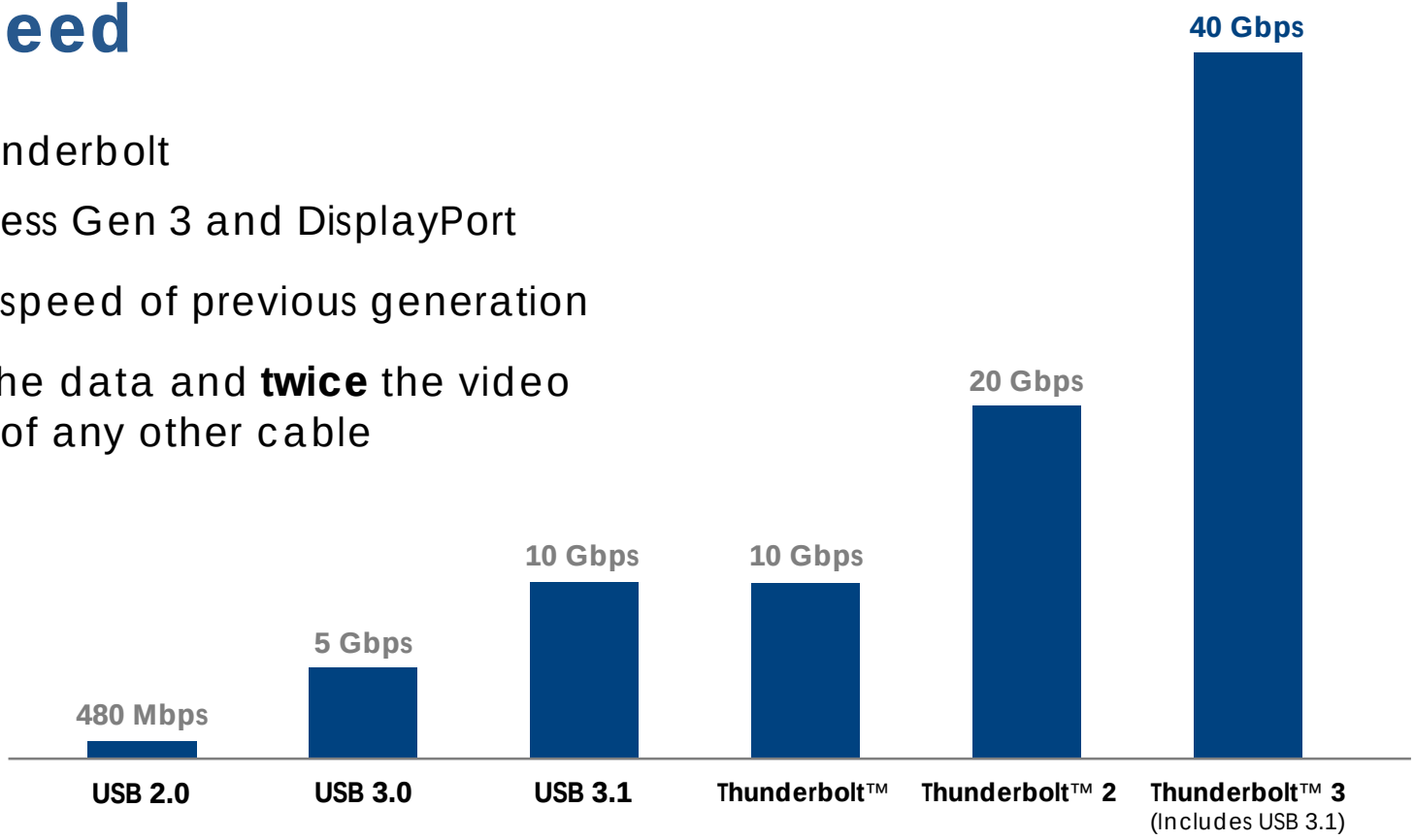
More protocols than any other I/O controller

Connect *any* dock, device or display, including billions of USB devices

Thunderbolt™ 3 integrates a USB3.1 (10Gbps) host controller – among the industry's first to market

More **Speed**

- **40Gbps** Thunderbolt
  - PCI Express Gen 3 and DisplayPort
- **Double** the speed of previous generation
- **Four times** the data and **twice** the video bandwidth of any other cable



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More Pixels

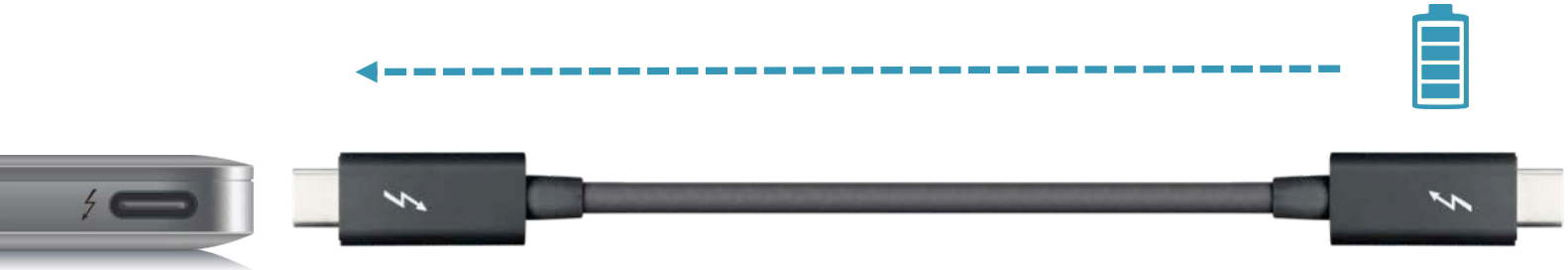
Large displays with **amazing** detail

- Twice the video bandwidth of any other cable
- **Single-cable** connection for **two 4K 60Hz** or a **5K 60Hz** display
- 2 streams (eight lanes) of DisplayPort 1.2

More **Power**

Optional - Notebook Charging up to 100W

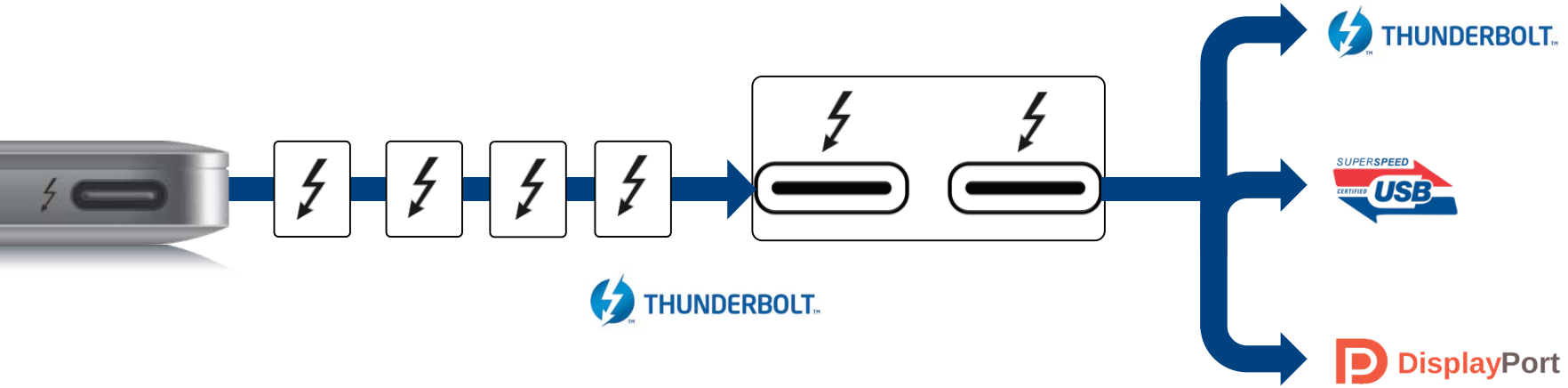
According to USB PD specification



Standard - 15W to bus-powered devices

- Higher speed and capacity storage
- Portable displays
- High-performance adapters

Device Configurations

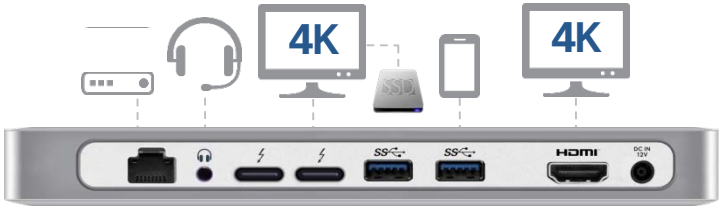


Second device port operates the **same as computer port** and supports Thunderbolt, USB, and DisplayPort devices

Daisy-chain up to six devices with Thunderbolt

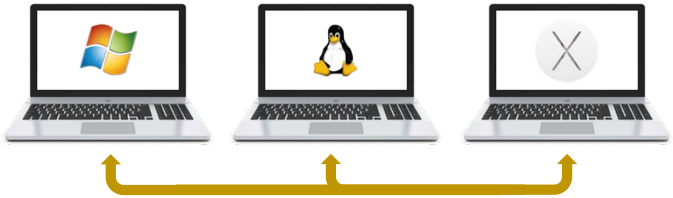
More **Possibilities**

4K Video



Single-cable docking
with charging

External graphics



Thunderbolt™ networking

4K Video

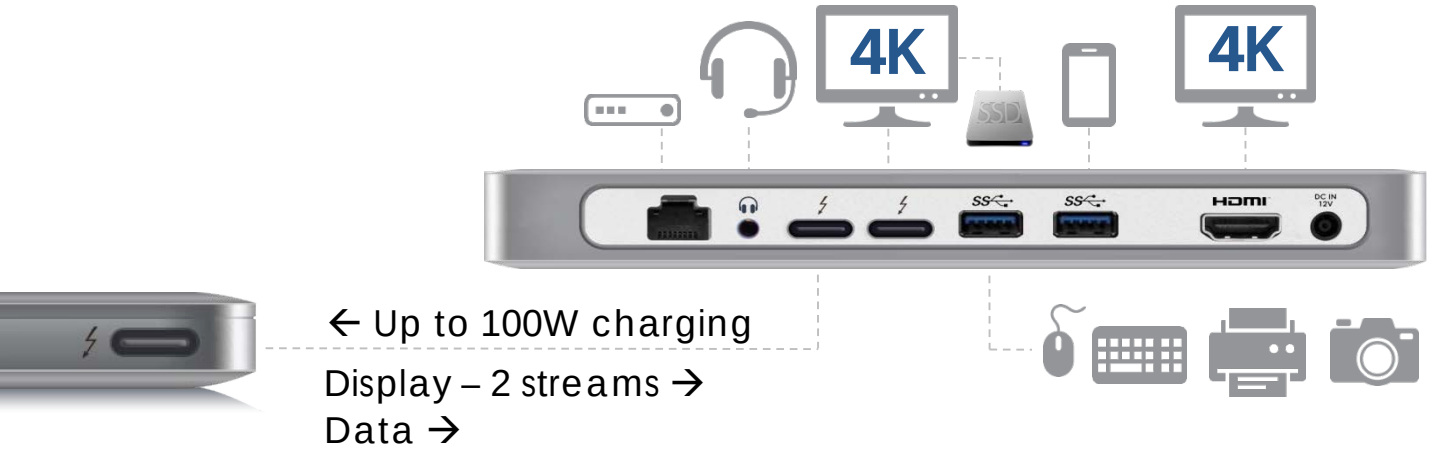
Moving from HD to 4K creates **substantially more** data than the transition from SD to HD

Two 4K displays has nearly **16 million more** pixels than one HD display

View and edit photos and video on a **notebook** while **simultaneously** connected to 4K 60Hz display and external storage from a single port

4K TV's and displays for **under $499**

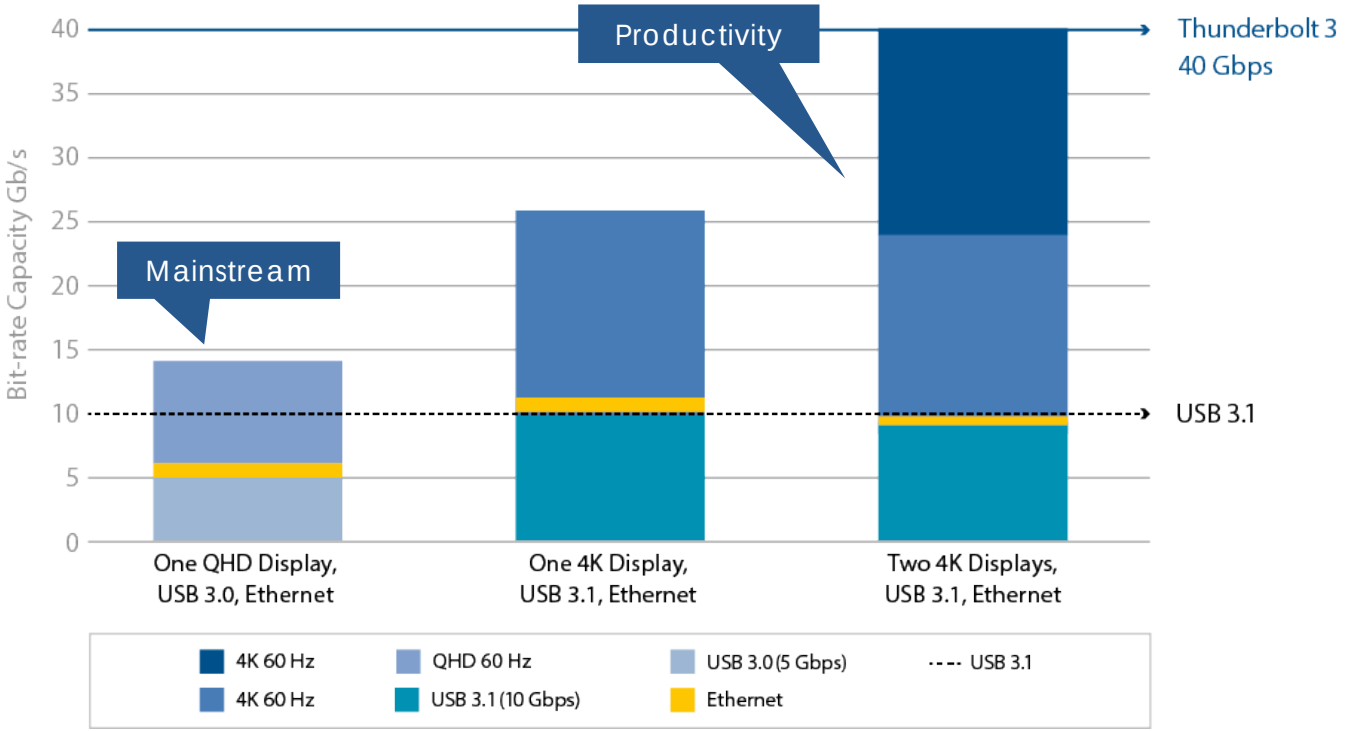
Unrivaled **single-cable** docking



Effortlessly connect to everything you need

- Only way to get 4K 60Hz video + data from one USB-C
- Connect two 4K 60Hz displays with a single cable from computer
- Quick notebook charging

Enough **speed** to dock to **everything**



Showing max bandwidth for each protocol listed - many other protocols are possible depending on dock configuration (eSATA, card slots, Firewire, HDMI, Wi-Gig)

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Thunderbolt™ **external** graphics

Desktop Graphics → Thunderbolt Card Chassis

Mobile Graphics → Thunderbolt Graphics Dock

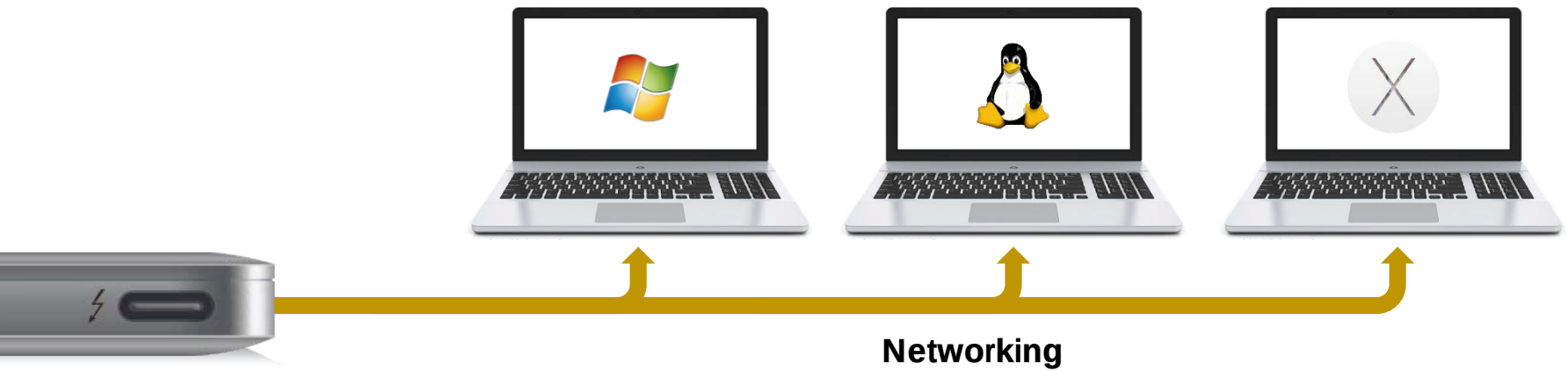
Thin laptop meet **hardcore gamer**

- Longer battery life when mobile – play games at higher quality settings at desk
- Graphics in dock or card chassis
- Supports hot plug/surprise removal

Thunderbolt™ Networking

10Gb Ethernet for Free

- Peer-to-peer
- Bridging multiple computers
- Uses existing OS infrastructure
- Small workgroups, shared storage
- PC migration



More **Cable** options

- Passive copper cables (lower cost)
  - Supports Thunderbolt, USB, and DisplayPort
  - **40Gbps** up to 0.5m
  - **20Gbps** up to 2.0m
- Active copper cables
  - Supports Thunderbolt and USB
  - **40Gbps** up to 2.0m
- Active **40Gbps** optical cables
  - Under development for Thunderbolt 3 (targeting lengths up to 60m)
  - Targeted for early 2017

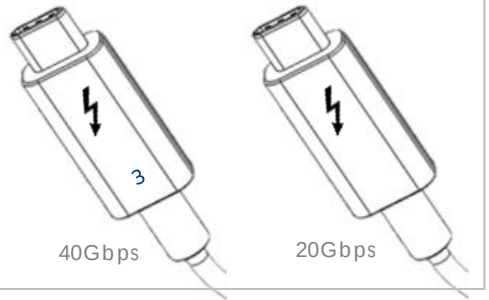
Thunderbolt™ **Compatibility**

Features:

- **Thunderbolt 3 host** to Thunderbolt device
- Thunderbolt host to **Thunderbolt 3 device**

Thunderbolt 3 to Thunderbolt adapter

Branding

Name	Logo	Icon	Product	Placement
Thunderbolt™ 3	THUNDERBOLT™		Computer	
			Device	
			Cable	

Look for Thunderbolt icon on **certified** products and cables

Looking Ahead…

- **Expect** PCs with Thunderbolt™ 3 to double with 7th generation Intel® Core™
- **Expect** dozens of Thunderbolt devices, from external graphics to storage, to be shipping by the end of 2016
- **Expect** Thunderbolt 3 to lead the transition from enterprise mechanical docking to single-cable docking
- **Expect** to redefine gaming with mobile PCs by connecting Thunderbolt 3 external graphics
- **Expect** Thunderbolt 3 to drive next-generation VR solutions with high resolution and refresh rate, and low latency

Summary

- Thunderbolt™ 3 = 40Gbps Thunderbolt, USB 3.1, DP 1.2 on USB-C
- For the first time, one computer port connects to Thunderbolt devices, every display, and billions of USB devices
- Provides four times the data and twice the video bandwidth of any other cable, while also supplying power
- It's unrivaled for new uses, such as 4K video, single-cable docking with charging, external graphics, and built-in 10GbE networking
- One year after initial technology announcement, there are 60 PCs shipping, and 20 devices announced, with many more on the way

Q&A

Go to www.thunderbolttechnology.net for more information

Thank You!