THR2304

Surface Connect and USB C

A connector comparison

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Microsoft

Session objectives and takeaways

At the end of this session, you should be better able to…

- Understand the capabilities of USB C
- Understand the capabilities of Surface Connect and the in development USB C docking adapter.

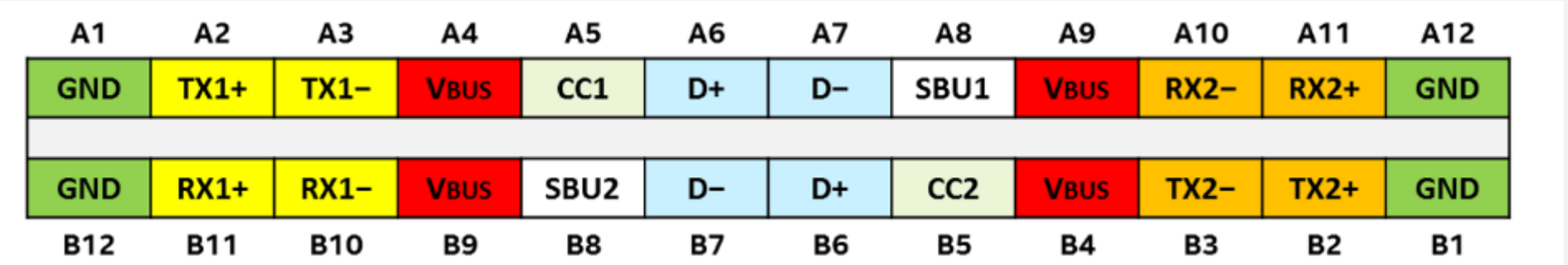
Key takeaways

- Surface Connect and USB C are similar in capabilities and can co-exist on a given device.
- USB C is an open ecosystem with increasing adoption, pockets of innovation, but leading to a confusing experience and fractured ecosystem.
- Surface Connect is a curated ecosystem that allows Microsoft to have stronger ability to insure a good experience.

Introduction

- Microsoft released the Surface Connect (Surface Connect) connector with the Surface Pro 3, before the type C spec was final.
- Microsoft, including Surface engineers, were heavily involved in the USB C specifications.
- USB C was evaluated for inclusion in our recent products, but not included in order to insure the best customer experience.

USB Type C


A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12
GND TX1+ TX1− VBUS CC1 D+ D− SBU1 VBUS RX2− RX2+ GND
GND RX1+ RX1− VBUS SBU2 D− D+ CC2 VBUS TX2− TX2+ GND
B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2 B1

History of USB

How to think about USB C

- USB C is a physical connector that is thin, symmetrical and reversible.
- Can support devices as small as 4mm thick.
- USB C mates to devices mechanically with retention force.
- Over time it will replace USB A, B, and the micro/mini variants.
- USB PD is the power delivery protocol that runs over the connector on a CC (Communication Channel) line on cable to negotiate power contracts, role swaps, and alternate modes.
- USB 3.1 (Gen 1 today and Gen 2 in the future) is the USB data protocol that runs over high speed data lanes.
- USB 2.0 in addition is always available.

But that's not all …

Additional USB C characteristics

- Roles can be reversed. Data host can become device, power provider and consumer can be swapped.
- High speed data lines can be repurposed by selecting “alternate modes”.
    - The most common repurposing is changing some or all of the high speed lanes to display port for video.
    - Thunderbolt 3 also repurposes the data lanes.
- Power contracts can change at any time in voltage, current, and who is providing the power.
- Eventually will mitigate needs to travel with multiple chargers.
- Cables are marked indicating how much current they can handle when cables can handle more than 3A.
- 20V at 5A (100W) is the maximum power allowed over Type C.

Common USB Modes

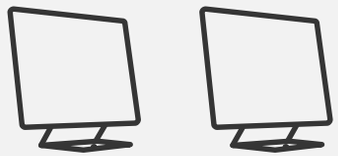
Default Data

Video

Video + Data + Power

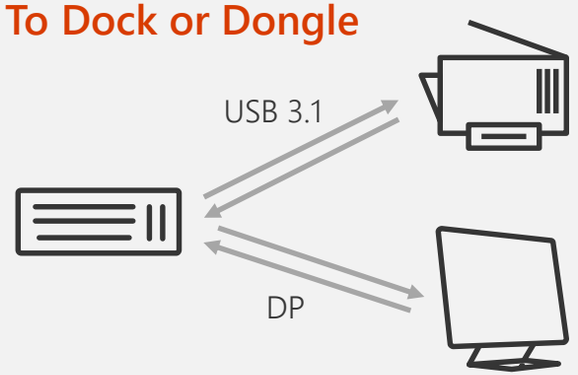
To USB Peripheral

To Monitor



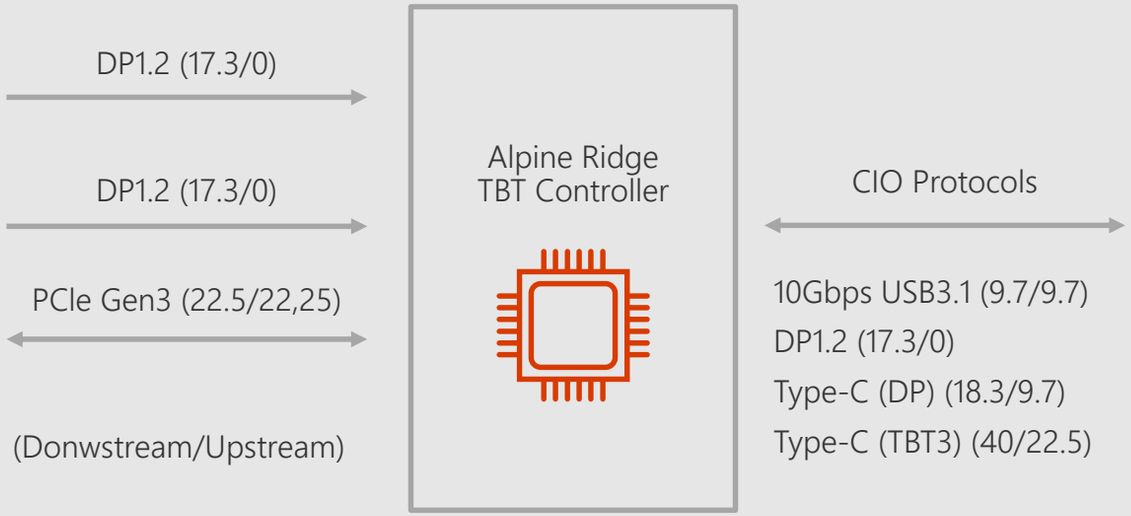
Up to two 4Kx30Hz monitors or One 4K @ 60Hz

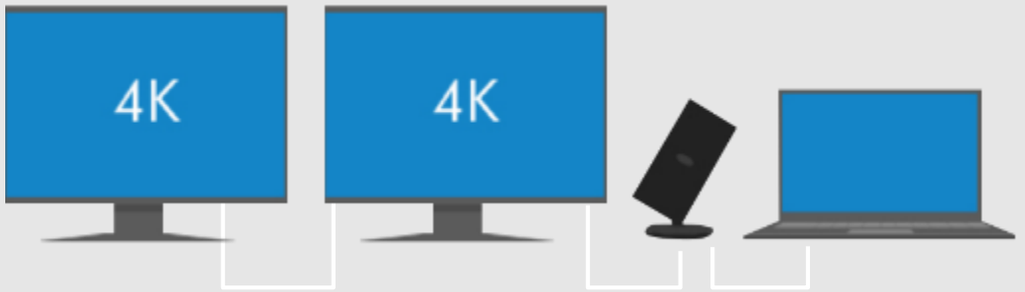
To Dock or Dongle



Thunderbolt 3

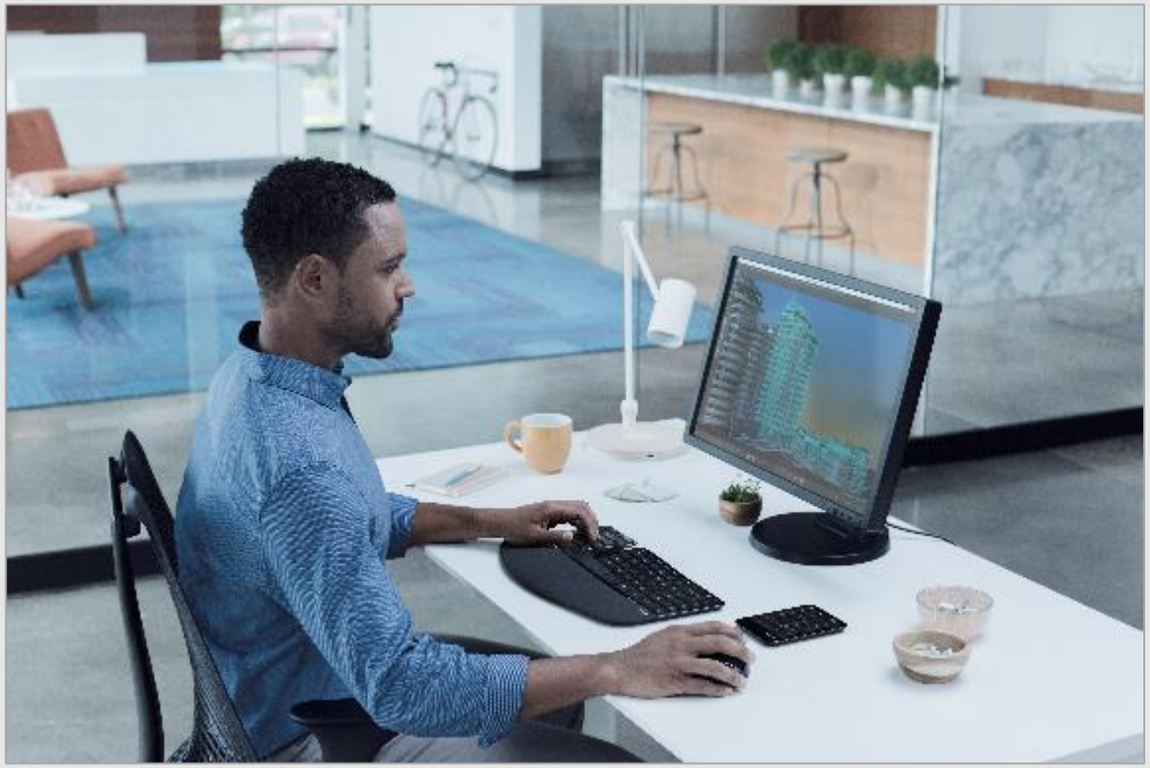
- Thunderbolt takes many slower lanes (DP & PCI-e) and time multiplexes at a more efficient coding rate and faster speed
- Uses all 4 high speed lanes for the Thunderbolt protocol.
- Adds product cost and results in higher power draw when USB port is in use (about 1.5W)
- Converged-IO (CIO) is Intel's attempt to transform TBT3 into an industry standard. VESA (Display technologies) is standards body Intel selected. (CIO adds the USB 3.1 data traffic into the mix.)
- Thunderbolt chips are required in both the host and in accessories.
- In a accessory the PCI-E, and DP are split out from the Thunderbolt protocol.
- Enables 8Kx60Hz monitors, dGPU docks, dual 4K@60Hz, high speed video editing on fast external drives.





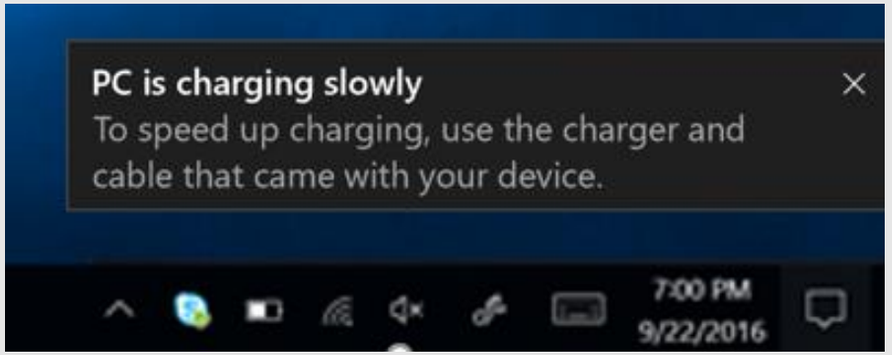
A Fractured Ecosystem

- With a given USB C port, the user does not have a good idea of what modes are supported nor its output power capabilities.
- USB, DP, and power in and out are typically available on laptops and tablets.
- Only having 2 lanes of DP concurrent with USB 3.1 causes confusion in the docking scenarios.
    - Must trade off data speed for highest video resolutions.
    - A dock that consumes more video bandwidth than a single 4Kx60Hz display must drop to USB 2.0 speeds.
- Dongles/adapters are needed for connecting to devices that do not have USB C.
- There are many poor quality chargers, cables and adapters on the market.
- Some cables are power and USB 2.0 data only, these cannot handle video or Super Speed.
    - There is no marking on cables that indicate their power and data capabilities.



Windows Power Messaging Support

- Windows is adding more notifications to help users understand when the charger is inadequate for the device.
- There are also notifications to the user of unsupported alternate modes, like Thunderbolt



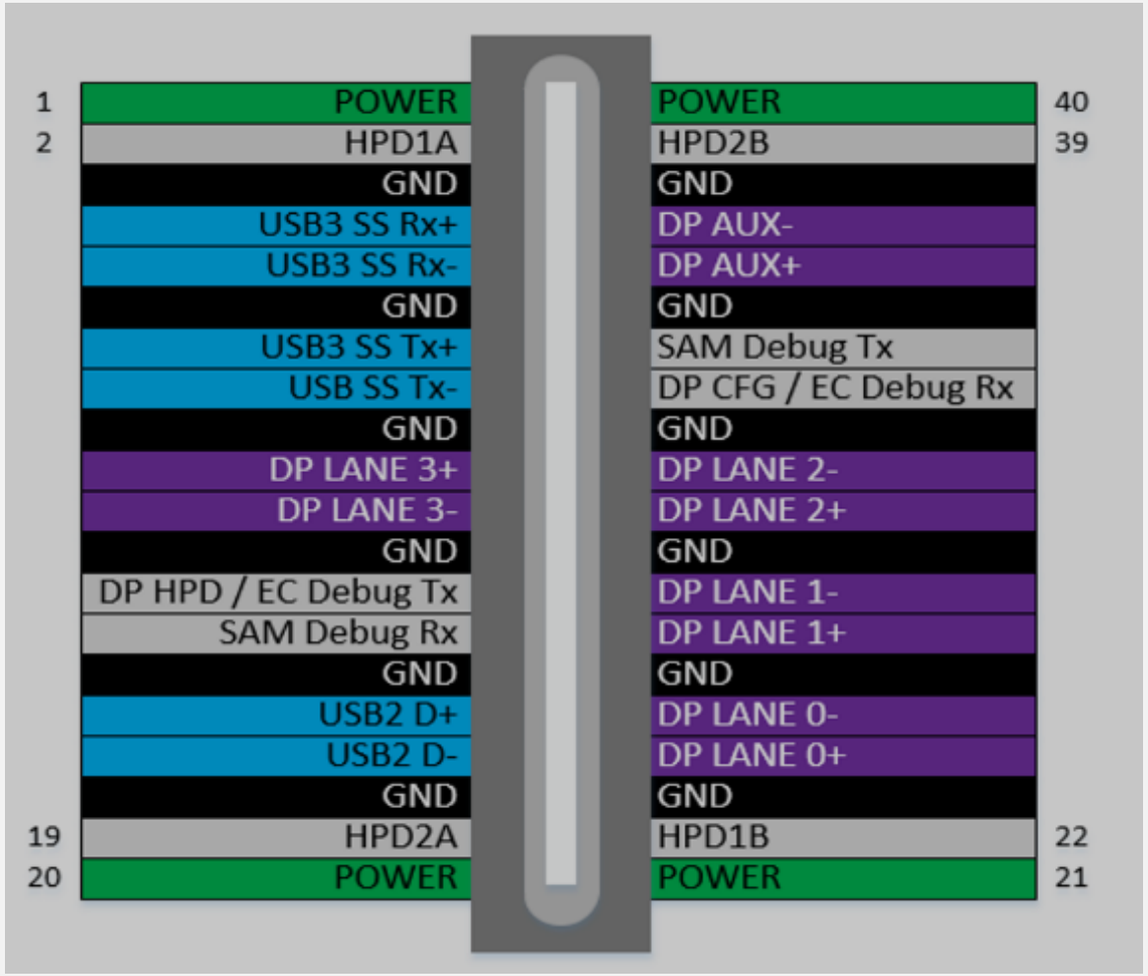
A. Slow charging notification [existed in TH2]

B. Not charging notification and details in Battery UI

USB Survival Gear

- Charger
- Battery Bank
- C to Micro B Cable
- Micro B to C adapter
- C to C full feature cable
- C to A cable
- A to smart watch pogo pin connector
- Video+Data dongle
- Ethernet Dongle
- Power meter
- Also Recommended
- C to A adapters

Surface Connect



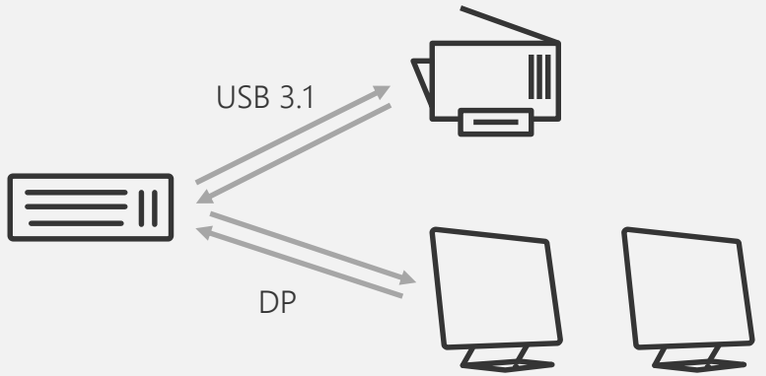
Surface Connect

- Surface Connect is a physical connector that is symmetrical, magnetically attached and reversible.
- The main complaint by MacBook Pro users is the loss of a magnetic attached power supply.
- Surface Connect can support products as thin as 4mm.
- Surface Connect is mainly used for charging, but 6 high speed data lines are always available and used by our dock.
- 2 Lanes for USB 3.1 Gen 1
- 4 Lanes for DP 1.2
- Plus USB 2.0
- UART communication is used to negotiate special power needs and in some cases manage cable orientation and other advanced features.
- Surface Connect chargers range from 24W to 95W, 12V or 15V.
- Surface Connect can provide up to 7.5 watts out for accessories.

Surface Connect when used with our Dock

Video + Data + Power

To Dock or Dongle



USB C and Surface Connect Feature Comparison

Feature	USB C	Surface Connect
Connector	24 pin mechanical	40 pin magnetic
Reversibile	Yes	Yes
High Speed Lanes	4	6
Power in from charger	5-20V at 3 to 5A	12-15V at 2 to 6.6A
Power out from Laptop	Typically 5W to 15W	10W
Repurposing of data lines via MUXing	Yes	Not needed
Video in and out	Yes, but only video out is widely deployed	Video out only
Ecosystem	Open	Curated
Video bandwidth (non TBT3)	2 DP lanes with USB 3.1, 4 DP with USB 2.0	4 DP lanes always

Why a Curated Ecosystem

- Surface Connect has the functionality that meets the most common needs for power and docks.
- Our touch display and pens have very strict requirements on noise generated from chargers.
  - We cannot guarantee best touch and inking behavior with off the shelf type C chargers and docks.
- We carefully test our own power supplies, docks and adapters for interference with LTE and WiFi to prevent de-sense of antennas that would degrade wireless performance.

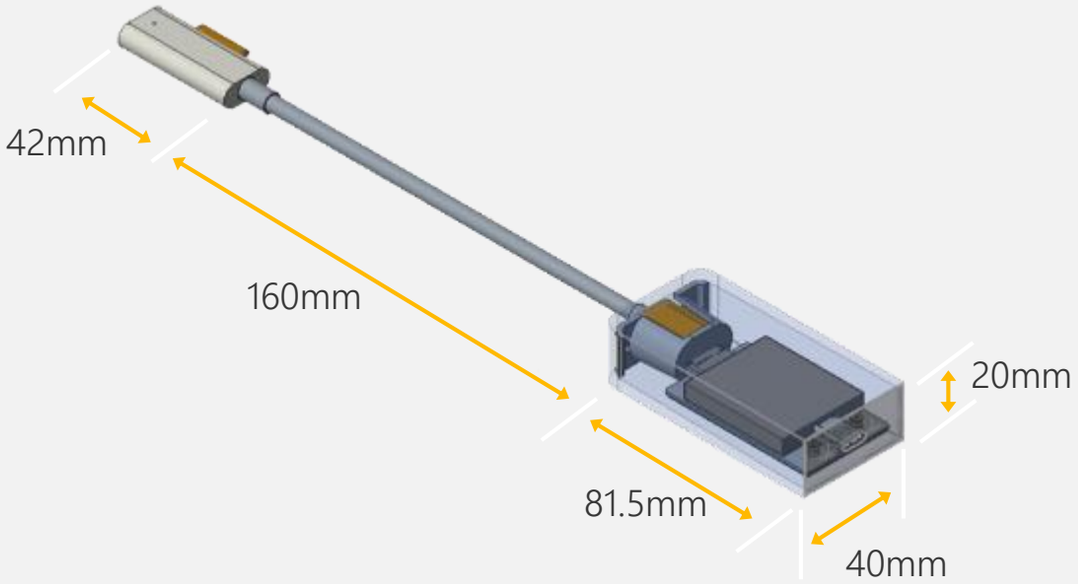
USB-C Docking Adapter

(Working Name, Marketing Name TBD)

USB C Docking Adapter Overview

- Since there are many similarities between Surface Connect and USB C, it is possible to make an adapter that maps USB C onto Surface Connect.
- In order to provide a solution to enterprise customers standardizing on USB C docks, we are developing such an adapter.
- The adapter is primarily targeted for use with docks and chargers that provide at least 27W.
- The adapter will be able to use bus power from the Surface devices to light up low power USB devices like Flash drives.
- It will support the New Surface Pro and the Surface Laptop.
- Targeted to release by end of year, price is TBD.

Form Factor



In review: session objectives and takeaways

- **USB C** is the video, power, data, and docking port of the future.
- **Surface Connect** is a **proprietary magnetic connector** that provides very similar capabilities as USB C.
- This is not an either/or topic, **we can add USB C** to our Surface devices when we think the **timing is right**.
- The USB C Docking Adapter will **allow Surface devices** to be a part of the USB C ecosystem.
- Call to Action: **No need to be apologetic about USB C**.
- Call to Action: **Be clear on the benefits of Surface Connect**.

Session resources

- USB C Overview: http://www.usb.org/developers/presentations/USB_DevDays_Hong_Kong_2016_-_USB_Type-C.pdf
- Windows 10 USB C architecture: http://www.usb.org/developers/presentations/USB_DevDays_Hong_Kong_2016_-_Win10_USB-C_and_PD_Architecture.pdf
- USB Power Delivery: http://www.usb.org/developers/presentations/USB_DevDays_Hong_Kong_2016_-_USB_PD.pdf
- Microsoft Ready content can be found at https://digital.microsoftready.com/

Q&A

At Ignite

Meet with us

Talk to Surface engineers after sessions and at the booth

Attend sessions

Learn more about Surface technology

Become an Insider

Stop by the Surface booth to sign up and get SWAG

Attend the breakout sessions

Session title	Speaker	Date	Time	Location	Code
Surface product engineering behind the scenes and deep dive on the new Surface Pro	Tim Golick	Tuesday 9/26	4:00 – 5:15 PM	OCCC W304	BRK1059
Surface and LTE: designing for seamless connectivity	Paul Bischof Tim Golik	Wednesday 9/27	9:00 – 10:15 AM	OCCC W206	BRK2366
Bringing the modern workplace to life with Surface and Microsoft 365	Ryan Gavin Paul Bischof Tim Golik Sonia Dara	Wednesday 9/27	10:45 AM – 12:00 PM	OCCC W308	BRK3353
Surface Hub bakeoff: how Surface Hub stacks up against the competition	Frank Buchholz Mark Hodge Joe Dalecki	Wednesday 9/27	4:00 – 5:15 PM	OCCC W307	BRK2368
Service and support for Microsoft Surface: built for the demands of today's enterprise	Nathan Banks Faizan Makhiawala	Thursday 9/28	2:00 – 2:45 PM	OCCC W240	BRK2365

Attend the theater sessions

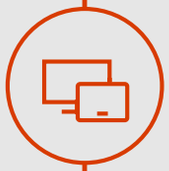
Session title	Speaker	Date	Time	Location	Code
Realizing the most from Surface and Microsoft 365	Frank Buchholz David Alexander	Monday 9/25	1:45 – 2:05 PM	OCCC South – Expo Theater #6	THR1117
Microsoft meeting solutions: Skype Room Systems and Surface Hub	Richard Kott Mark Hodge	Tuesday 9/26	12:05 – 12:25 PM	OCCC South – Expo Theater #6	THR2306R
Unlocking the power of creativity with the Surface portfolio of devices and Microsoft 365	Robert Henry Jeff Nye	Tuesday 9/26	2:10 – 2:30 PM	OCCC South – Expo Theater #6	THR2302
The new Surface Pro and Laptop: an insider's look for IT Pros	Tim Golick Brandon Records Mari Rinta-Piirto	Tuesday 9/26	3:35 – 3:55 PM	OCCC South – Expo Theater #6	THR2299
Surface Hub: manageability tools and OMS deep-dive	Strider Browning Anthony Kinney	Tuesday 9/26	5:35 – 5:55 PM	OCCC South – Expo Theater #6	THR2303
Surface Hub what's new (Windows Insiders, Creators features, Microsoft Teams, LOB apps)	Brent Johnson Arpan Nandani	Wednesday 9/27	10:20 – 10:40 AM	OCCC South – Expo Theater #6	THR2308
Surface connector comparison and designed for Surface accessories	Dave Neff Craig Tellalian	Wednesday 9/27	10:50 – 11:10 AM	OCCC South – Expo Theater #6	THR2304
Surface tools for the enterprise: best practices	Carl Luberti	Wednesday 9/27	12:35 – 12:55 PM	OCCC South Building Theater – Level 2	THR2307
Realizing the most from Surface and Microsoft 365	Frank Buchholz David Alexander	Wednesday 9/27	2:10 – 2:30 PM	OCCC South – Expo Theater #6	THR1117R
Microsoft meeting solutions: Skype Room Systems and Surface Hub	Richard Kott Mark Hodge	Wednesday 9/27	5:35 – 5:55 PM	OCCC South – Expo Theater #6	THR2306

Thank you

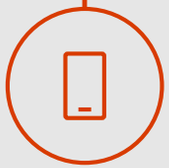
Please evaluate this session

Your input is important!

From your



PC or tablet: visit MyIgnite
https://myignite.microsoft.com/evaluations



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