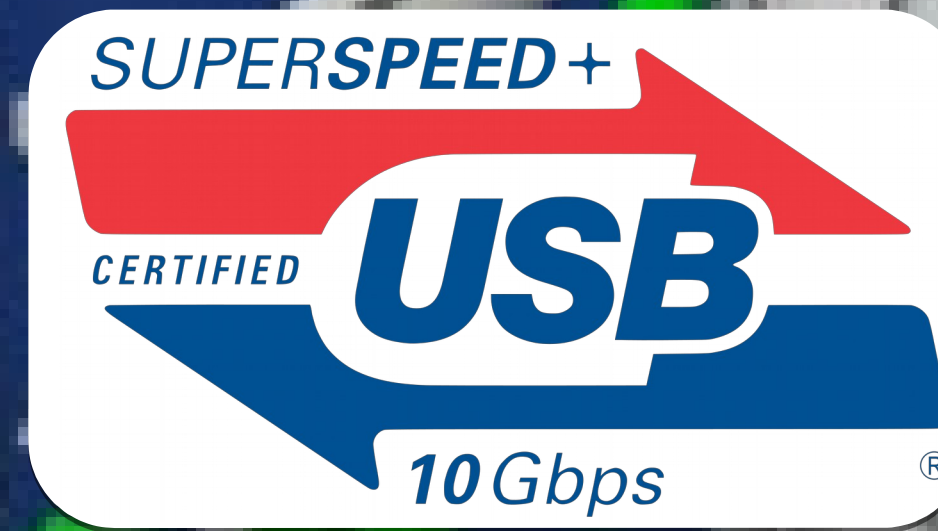


KILLER APPS

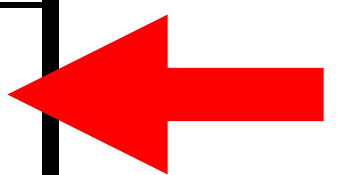


Ali Khan
VP Business & Product
Development

USB SuperSpeed+



Standard	Release Date	Maximum Transfer Rate
USB 1.0	January, 1996	Full Speed (12 Mbit/second)
USB 1.1	August, 1998	Full Speed (12 Mbit/second)
USB 2.0	April, 2000	High Speed (480 Mbit/second)
USB 3.0 / USB 3.1 Gen 1	November, 2008	SuperSpeed (5 Gbit/second)
USB 3.1 Gen 2	July, 2013	SuperSpeed+ (10 Gbit/second)



- **USB 3.1 Gen-2 ratified in 2013. Many commercial products exist**
- **Only 2 IP suppliers are USB-IF fully certified**
- **10 Gbps bandwidth enables new Apps**
- **Those Apps are driving USB3.1 Gen-2 adoption**

**So, what are these
killer apps that need
10Gbit/sec bandwidth?**



TransferJet

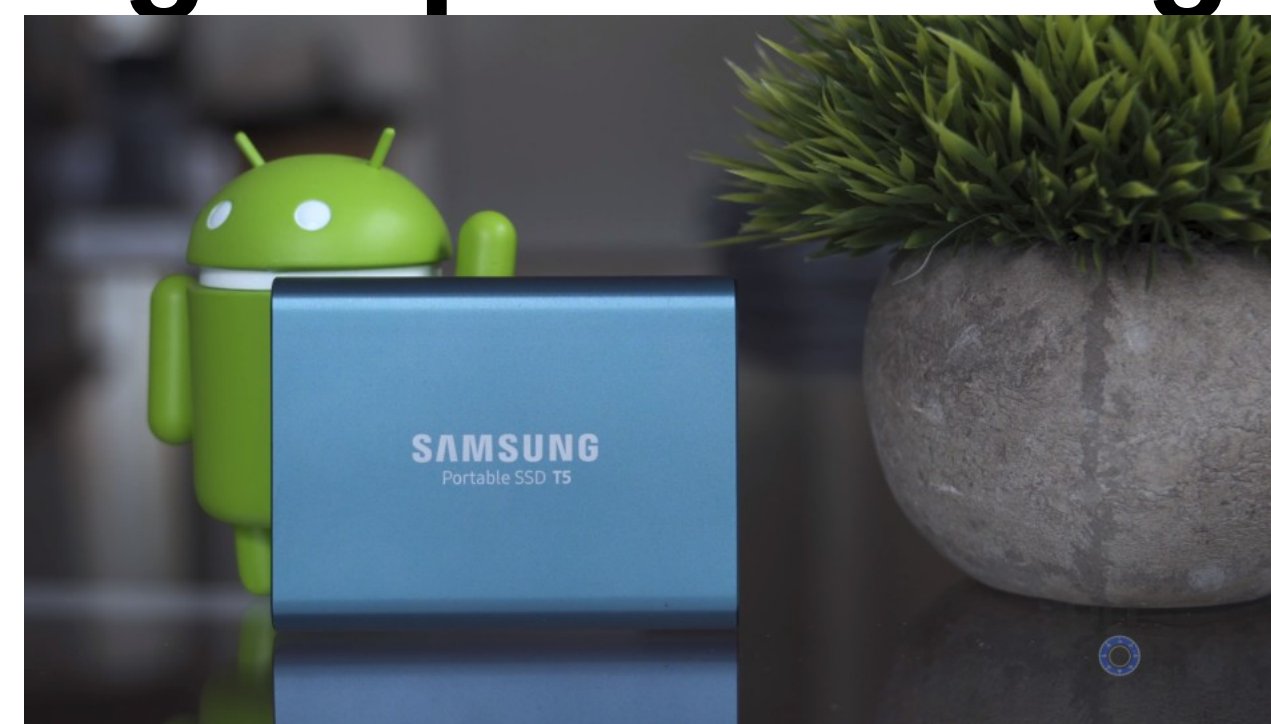
IEEE 802.15.3e standard

- **Close proximity wireless transfer technology**
- **Data exchanged between two touching devices**
- **TransferJet X enable data speeds of 13Gbps+**
- **USB 3.1 Gen-2 required to support TransferJet X docks**



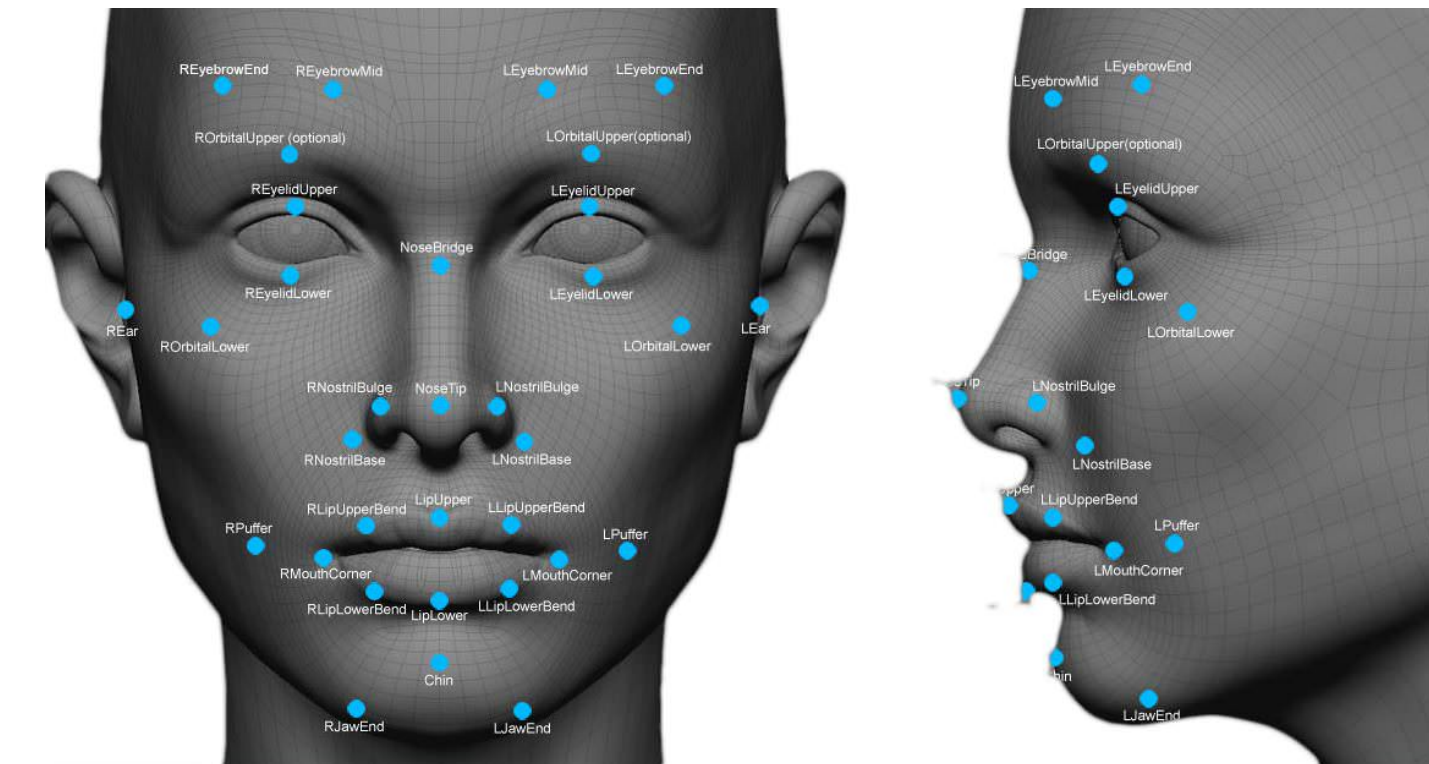
4K UHD Video Applications

- **Capture:** high resolution cameras providing uncompressed video
- **Viewing:** high resolution monitors
- **Editing:** software tools using uncompressed video
- **Saving:** demands for high speed storage devices



4K UHD Video Applications

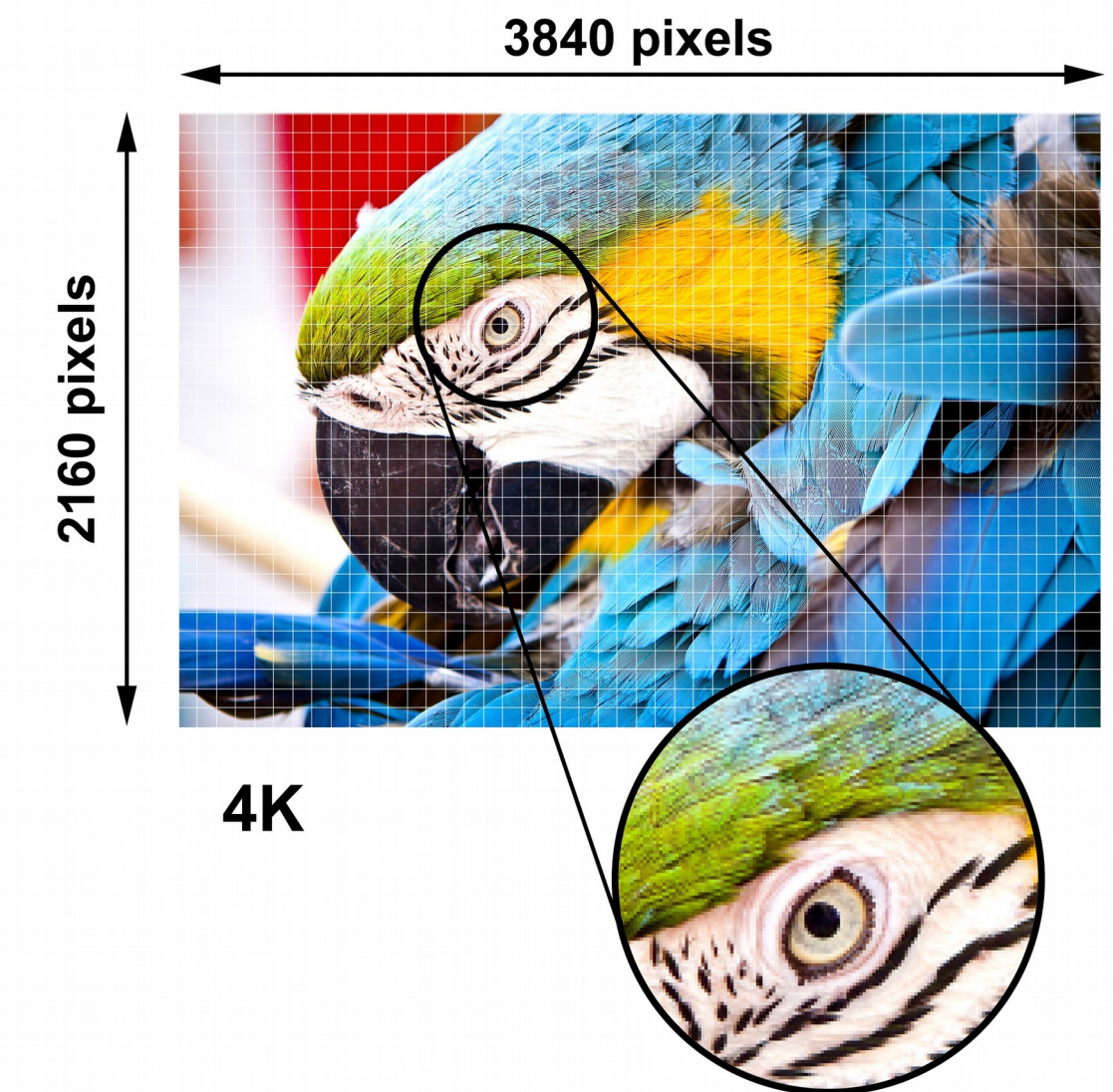
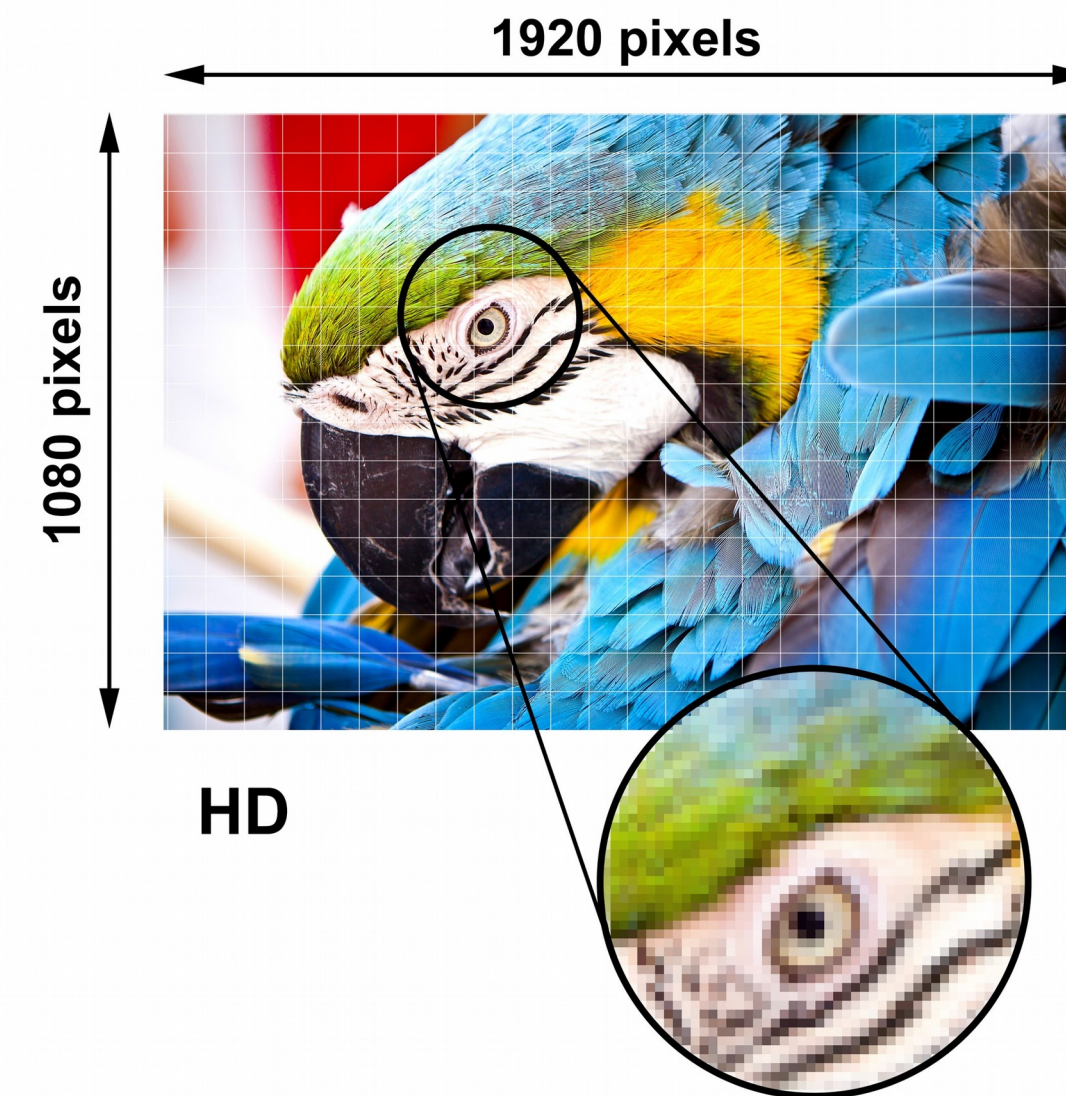
- **Security Systems – uncompressed video**
 - Facial recognition
 - Low light environments
- **Industrial:**
 - Inspections: high resolution cameras to find defects
 - Defect detection requires uncompressed video or high-resolution frame grabbers



So how much bandwidth does 4K video need?

USB 3.1 Gen-2 for Killer Apps

Common Names	Frame Width (pixels)	Frame Height (pixels)	Frame Size (pixels)	Maximum Frame Rate (Hz)
720p / HD Ready	1,280	720	921,600	72
1080p / Full HD	1,920	1,080	2,073,600	60
1440p / Quad HD	2,560	1,440	3,686,400	60
UW4K	3,840	1,600	6,144,000	120
2160p / 4K UHD / UHD-1	3,840	2,160	8,294,400	120
DCI 4K	4,096	2,160	8,847,360	120
2540p	4,520	2,540	11,480,800	120
4000p	4,096	3,072	12,582,912	120
4320p / 8K UHD)	7,680	4,320	33,177,600	120

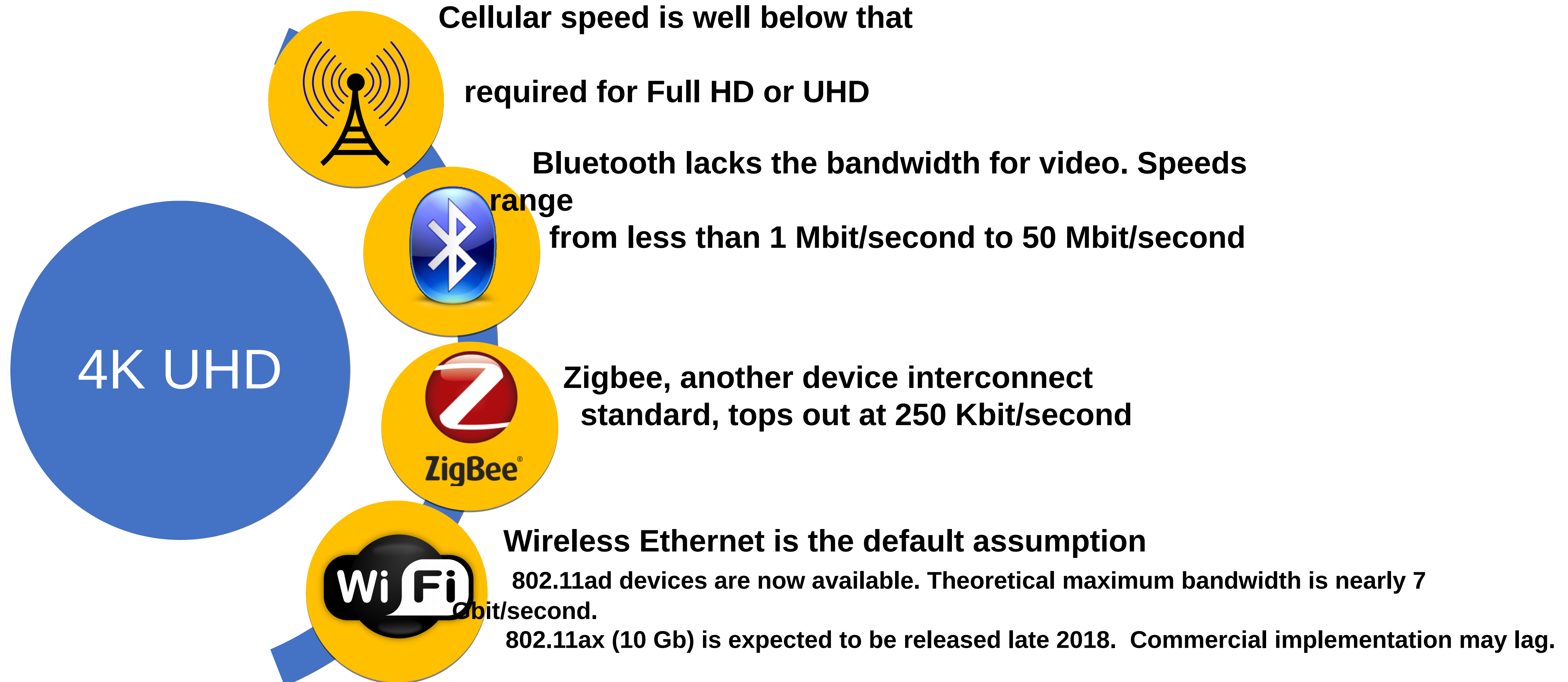


$$(\text{frame size in pixels}) \times (\text{bits/pixel}) \times (\text{frames/second}) = (\text{bits/second})$$

Full HD (1080p):
1Gbps

4K UHD:
7.4Gbps

Options for 4K UHD Connectivity



USB to the Rescue



- **USB 3.1 Gen-2 was released in 2013**
 - 10Gbps enough for the 7.425 Gbps required by 4K UHD video streams
- **USB is an excellent choice for UHD**
 - The demands for UHD bandwidth will likely increase over time.
 - USB 3.2 coming at 20Gbps. Works for the faster 8K version of the standard.
 - Choosing USB 3.1 Gen-2 now enables easier transition to future USB 3.2
- **USB is ideal for streaming video (or audio)**
 - Operates in isochronous mode which is more pleasant to the eye, and ear.
 - For audio and video, data transmission occurs at regular intervals
 - USB accomplishes completeness with “bulk transfer” mode

Things to consider when choosing your USB IP Solution...

- **USB controller should be USB-IF certified**
 - If it's not certified, verification will be more difficult
 - Could also result in field returns, or brand name damage
- **USB Controller should be architected for today's applications**
 - Small gate count, minimal memory requirements, low power
 - Designed for today's USB, without baggage from the past
- **USB Controller should be PHY agnostic**
 - Some vendors will try to lock you into a PHY choice
 - Better to have a standard PIPE interface to work with any PHY



<http://www.usb.org/home>

Corigine USB IP

- ✓ Supports Host (PC + Embedded), Device, Dual-role
- ✓ USB controllers for: 2.0, 3.0 / 3.1 Gen1, **USB 3.1 Gen-2**
- ✓ All controllers are USB-IF Certified
- ✓ Architected for smallest size, lowest power, maximum configurability
- ✓ Complete IP with prototype, verification suite, and PHY from partner
- ✓ Experienced R&D team, responsible for USB IP in millions of devices



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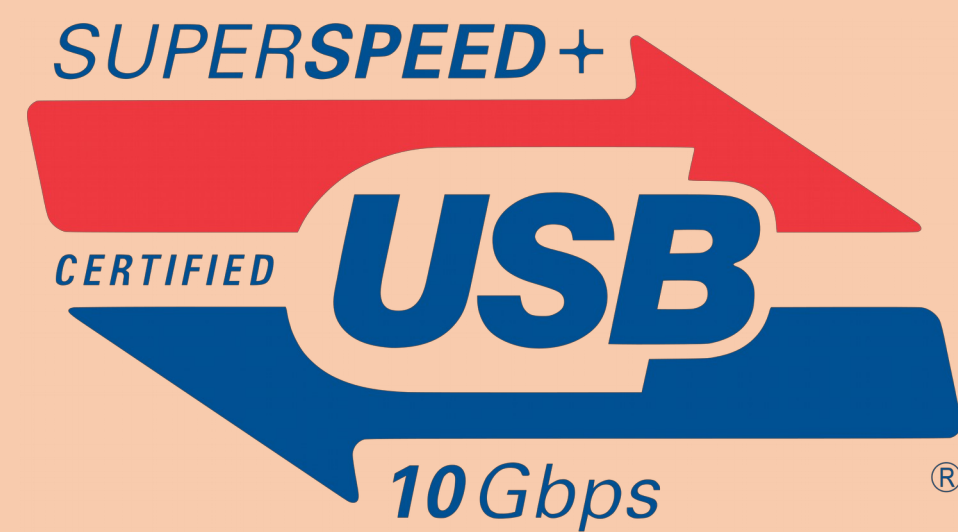
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Thank You