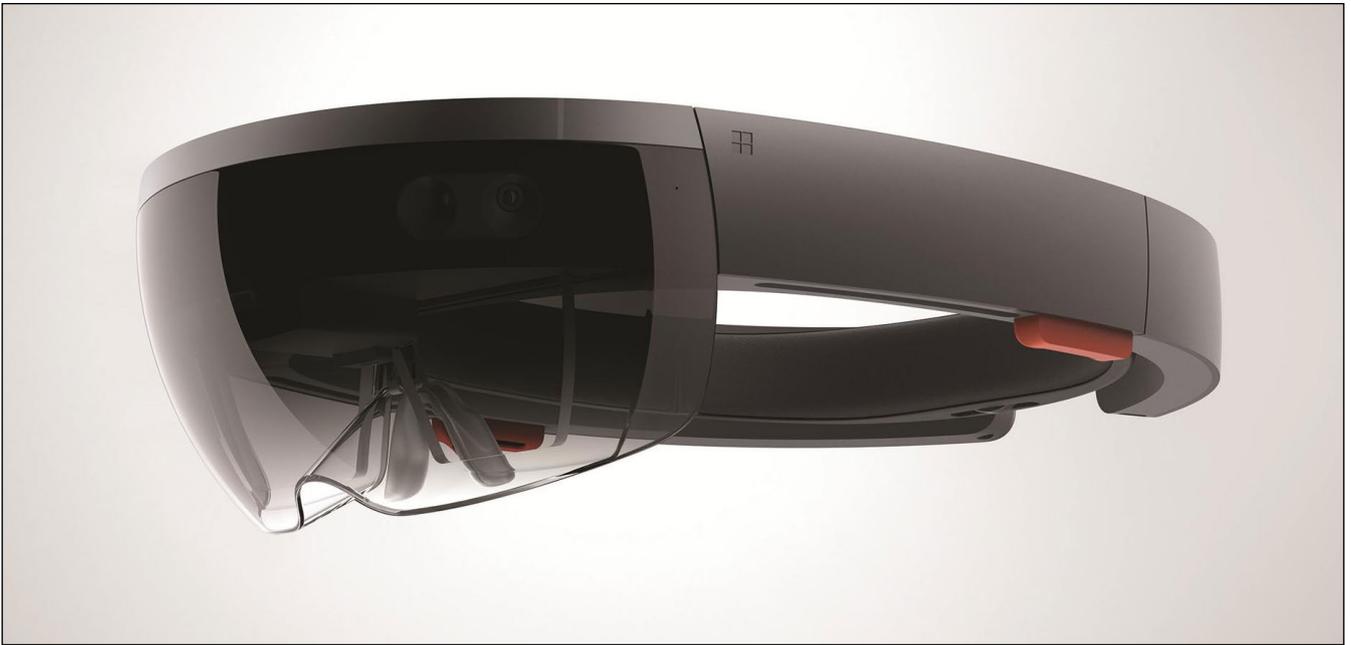


Microsoft HoloLens

Not Just Another VR Headset



Don't call HoloLens VR. It's AR . . . and holograms!

2015 is rapidly becoming the year of the virtual reality headset. Oculus VR, HTC and Valve, Sony, Samsung, Razer, and others have all announced VR equipment that effectively consists of a pair of displays built into a headset with some form of motion tracking technology to give the wearer a sense that the split images represent an interactive 3D virtual world. Despite the momentum these products have behind them, especially as gaming peripherals, it would be a mistake to lump Microsoft's HoloLens in with them.

At its Windows 10 press event back in January, HoloLens stole the show as an augmented-reality headset that doesn't shield your eyes with high-resolution LED-backlit displays, but uses a transparent pair of lenses and a vaguely-described "light engine" to

effectively project 3D imagery onto and over your existing surroundings. We're talking about frickin' holograms. HoloLens can make 3D aliens dance around your living room furniture, let you watch movies on your wall, browse the web and check your email on your coffee table like it was a giant display, and manipulate, walk around, and interact with virtual 3D objects as though they were real. HoloLens isn't Microsoft's version of a VR headset, it is Microsoft changing the subject entirely.

Microsoft's AR Vision

At the event, Microsoft's vision for augmented reality spanned computer-aided design, gaming, multimedia, entertainment, education, scientific research, and productivity applications.

Although HoloLens appears to have more in common with Google Glass than it does to the ubiquitous VR headsets slated to come out in the near future, HoloLens is not something you'll see people walking around in public wearing.

This is a UI peripheral, designed to stand in for the mouse and keyboard in a handful of (but not all) computing scenarios, particularly those that have a collaboration and interactivity element. According to Microsoft, anything you do with your PC can be done better through augmented reality. The more we learn about what HoloLens can do, the more we're realizing just how integral Windows 10 will be for the peripheral. In fact, HoloLens is a full-featured Windows 10 device.



HoloNotes for Skype adds an interactivity element to the video chat application.

One of the demos Microsoft showed at the event was HoloNotes in Skype, which lets a HoloLens wearer participate in a Skype chat where the remote party equipped with a tablet can draw virtual arrows and notes on objects within HoloLens' field of view. The wearer can interact with the holographic items and the viewer can hear and see everything the wearer sees and says. HoloNotes and Skype are ideal for tutorials, distance learning,

video conferencing, and everything else we already use Skype for.

In another demo, HoloLens was used to project a virtual gas tank, seat, and fairings on a real motorcycle. The HoloLens wearer was using hand gestures to manipulate the shape of the gas tank in real time. This demo emphasizes the technology's ability to "pin" holograms to real objects, letting the wearer walk around them and view them from any angle.

Other professional applications of the technology mentioned during Microsoft's briefing included an architect showing off virtual blueprints to a remote client, a surgeon learning how to perform a difficult procedure without ever picking up a scalpel, and an engineer seeing instructions in the context of her work.

Gaming is a big focus of HoloLens. Project HoloLens chief inventor, Alex Kipman, describes the technology's ability to blend virtual creatures and scenery with your real surroundings for a gaming experience that is virtually indistinguishable from the real events occurring around us. Microsoft's newly acquired IP, Minecraft, was used to demonstrate the potential. In the demo, the HoloLens wearer was able to view miniature Minecraft buildings, scenery, and mobs, fully animated and alive on a coffee table, sofa, the floor, and on the walls. Hand gestures were used to build and interact with the game and the wearer can physically explore the game world instead of moving an avatar through the world using the traditional keyboard and mouse or controller.

NASA had a hand in helping Microsoft create a Mars rover demo that lets HoloLens wearers explore a virtual representation of the Red Planet's surface, dropping markers and collaborating with others to explore the terrain. In July, NASA plans to start using HoloLens for Mars missions, perhaps even issuing commands to Curiosity based on video images sent back and projected by HoloLens, in real time.

What's Inside HoloLens?

Kipman calls HoloLens the most advanced holographic computer the world has ever seen. He describes it as fully untethered, meaning it has no wires for power or data transmission to a PC. There's also no need for a connection to a phone or other standalone device, either wired or wireless. The lenses themselves are composed of three layers of glass tinted red, green, and blue, respectively.

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The HoloLens' light engine bounces light particles between the layers to generate the holograms. The high-definition transparent lenses look a lot like a standard pair of rectangular-lensed glasses, but they're mounted to a thick headband that wraps around the wearer's head. There's also a tinted transparent shield that spans from the top of the headband to the tip of the wearer's nose.

Although the units that press got to try out at the event were prototypes, Microsoft claims that the headset itself will weight approximately 14 ounces or so and adjust to fit any adult head size. On the latest iteration of HoloLens, there are three buttons: one for power, another for volume, and a third for adjusting contrast. Those demoing the contraption also suggested that the unit features active cooling and that heat is vented out and away from the head.

Kipman says that HoloLens features a high-end CPU and GPU. Sources familiar with the hardware inside HoloLens report that the CPU is based on Intel's yet-to-be-released Cherry



Collaborate at your job much? With HoloLens, working on a joint project in real time is possible.

Trail Atom processor, which is a 14nm Airmont microarchitecture-based chip designed primarily for tablets. This is a 64-bit x86 processor, which makes sense as Microsoft has been pushing

for better interoperability between Windows 10 across all platforms. The processor is a quad-core unit with 2MB of L2 cache and base clocks ranging from 1.44GHz to 1.6GHz. Each variant of the Atom X5 and X7 Z8000 series processors, the Cherry Trail chips we know about, supports a burst frequency to up to 2.4GHz.

The GPU aspect of these processors is based on the execution units in Intel's current Broadwell chips, with dynamic clock speeds that start at 200MHz and go up to 600MHz. The three Atom chips that make up Cherry Trail support one or two channels of Low Power DDR3-1600 for total memory bandwidth of up to 25.6GBps. Microsoft's Surface 3 tablet currently runs on a platform that is remarkably similar to that of HoloLens.

HoloLens features a third –and utterly unique– chip, which Microsoft is referring to as an HPU or holographic processing unit. This is the processor that is going to be doing a majority of the sensor input processing. There's really not much information about what this



HoloLens wants to enhance every interaction you have with your computer.

chip is or how it does what it does, but it's probably very similar in nature to the PrimeSense chip in the current iteration of Microsoft's Kinect sensor. The chip in the Kinect is able to process 2GB of data per second to read its environment. Given Microsoft's "Terabytes of data" statement regarding the HoloLens' processing power, the HPU in this device appears to represent a significant upgrade compared to the Kinect's environment-mapping capabilities.

According to Microsoft, HoloLens features "advanced sensors [that] allow you to see your world and move confidently in it." Depth sensing will be performed by a 120 by 120-degree FOV depth sensor and front-facing time-of-flight camera, similar to the one inside the Kinect. This component typically consists of a light emitter (such as the infrared light grid generator on the Kinect), an image sensor, a wide-angle lens, and driver electronics that are capable of syncing the light pulses with the image sensor. The HPU's job is to take it all in and calculate for location and movement, factoring in latency and countless other environmental conditions to ensure

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holograms remain bright, dimensionally accurate, and realistic.

Other sensors that HoloLens may rely on include a three-axis gyroscope, three-axis accelerometer, three-axis magnetometer (compass), and likely an ambient light sensor, which are all features of Google Glass. HoloLens' guts will also likely include a microphone for picking up voice commands and environment sounds, as well as some form of eye tracking technology. The audio output specifications of HoloLens are also rather impressive, with "built-in spatial

sound" that lets the wearer hear sounds as though they are coming from the holograms themselves. There's also going to be a built-in battery, and we wouldn't be surprised to learn that it supports Wi-Fi and Bluetooth.

More Than Just A Neat Toy

Like everything else at Microsoft, software is going to be the reason people buy HoloLens, and for that, Microsoft needs help. Holograms are Windows Universal apps, which is the term Microsoft is using for applications that work on any Windows 10 device, whether it's a PC, mobile device, or a device like HoloLens. Developers are desperately needed to take the holographic APIs that exist in every Windows 10 device and make something fun and useful with them.

The Minecraft demo, gesture-controlled 3D modelling software, and HoloNotes for Skype were all neat and fun augmented-reality applications that spark the imagination. But Kinect also had demos that were similarly inspiring, and it failed to achieve mass adoption. Although HoloLens has been in the works for years, much needs to happen between now and its release later this year for it to achieve more than an early adopter and hobbyist following. We remain hopefully optimistic that holograms are finally here to stay. Without third-party support, however, not even Obi-Wan Kenobi can help Microsoft. ■



Gaming is a big part of HoloLens' appeal.