

Interactive Entertainment

PlayStation VR and an Update from the Game Developers Conference

Key Takeaway

Sony officially announced that the PlayStation VR will be available starting in October and will cost \$399 for the headset only. We explored the Game Developers Conference (GDC) which had a heavy focus on virtual reality and sampled some of what the future has to offer. We continue to believe that Sony is best positioned in the high quality head mounted display market given its large install base (~36MM units) and large slate of games already announced.

Sony PlayStation VR will go on sale in October for \$399. Kicking off the Game Developers Conference in San Francisco, Sony held a brief keynote address officially announcing the PlayStation VR ship date and pricing. For \$399 consumers will receive the headset bundle (including a processor unit), though consumers will also be required to have a motion-sensing camera device (sold separately for \$60). Users will be able to use either PS Move controllers (~\$80 sold separately) or a PS4 controller (~\$60 sold separately).

Hands on with the Sony PlayStation VR. We had the opportunity to perform a hands on demonstration of the PS VR (HMD + PS Move Controllers + PS4 Camera) and came away impressed with the technology. Overall, the experience is comparable to the Oculus Rift + Touch or the HTC Vive Pre. There was no screen door effect as the PS VR maintains a screen resolution of 960 x 1080 per eye (versus 1080 x 1200 per eye for the Rift / Vive). Sony's external Processor Unit was confirmed with the release of the headset and is expected to drive the processing of object-based 3D audio and multi "social" screen displays.

Sony PlayStation VR is best positioned among the high quality Head Mounted Displays given its large install base and relative pricing. As of the end of 2015, Sony had sold ~36MM PS4s representing a large market opportunity for consumers that will not need to make additional investments to utilize the VR headset. In comparison, our quick math estimates that there are already ~8m PCs capable of running a VR headset without the need to upgrade. Additionally, a survey by the Gamer Network (a series of video game related websites heavily skewed towards PC gamers) revealed that despite 75% of participants owning a gaming PC (i.e. VR ready), only 15% intended to purchase a VR headset in 2016. PlayStation VR was the most cited headset to be purchased (by ~20% of respondents, 35% already owned a PS4).

Takeaways from GDC:

Strong Presence from Component Suppliers - INTC / NVDA / AMD. Given the thirty-thousand tech enthusiasts in attendance, the PC component suppliers were heavily invested in GDC 2016. INTC had a large demo space, showing off its developer toolkit including various applications of its Real Sense technology and multiple SkyLake SKUs. NVDA's booth came equipped with multi-GPU rigs running Fallout 4 and The Division, the latest from Ubisoft. AMD's "Capsaicin" Event, kicked off VR-GDC and was well-attended by game developers, members of the press, and representatives from the financial community. AMD CEO and Chief Graphics Architect made presentations announcing a new GPU Roadmap through 2019 as well as Radeon Pro Duo, a new platform for designers and developers to create graphically intensive visuals more rapidly. AMD also demonstrated a working version of Polaris, the 14nm FinFET GPU expected to be released mid-2016.

We continue to believe that the focus of 2016 will be introducing virtual reality to the masses, but mass adoption and disruption will come later. Initial launch content will be impressive, but will be more episodic rather than full feature. A majority of the games will be casual experiences rather than in-depth AAA titles by major game publishers which won't come until the install base reaches a critical mass.

Links to Related Research:

[Virtual Reality Handbook: The Next Computing Platform](#)
[Virtual Reality is a hit at the Mobile World Congress in Barcelona](#)

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Updates From GDC 2016

Sony PlayStation VR

The headline news out of GDC 2016 was the announcement of Sony's PlayStation VR. The PS VR specifications were widely speculated upon and the announcements broadly met our expectations. We outline our puts and takes below.

Pros

As expected, the price point of \$399 (excluding approximately \$140 of necessary peripherals) came in below the bundled package for the Oculus Rift (\$599 excluding the Touch controllers) and the HTC Vive (\$799). The per eye pixel density of 960 x 1080 is below the resolutions flaunted by the Rift and the Vive at 1080 x 1200, but based on our physical review the difference is marginal. Along with the launch Sony announced over 230 developers currently working on titles to be released on the PS VR. Sony plans to have 50+ titles available for the PS VR upon launch (see below). Additionally, Sony teased an upcoming VR experience in coordination with EA & its popular multiplayer shooting game Star Wars Battlefront.

Cons

The timing of the release (October 2016) is later than we anticipated, but given the 35m PS4's currently in the market, should not have an adverse impact on the launch. We believe the PS Move Controllers and the PS4 Motion Camera will not provide the same precision as the Rift or the Vive. While the inclusion of these peripherals significantly cut down the development cost of the platform, the enthusiast gamer may not find the hand controllers to be sufficient for some content. Based on our demos, the same can be said about the Motion Camera. It's also important to note that the development list for titles on the PS VR is currently limited to video games. The practical applications (Education, Real Estate, Design, Film, Sports, Entertainment, etc.) released for the PC-tethered HMD's have yet to be demonstrated on the PS VR.

Exhibit 1: PS VR Announced Launch Titles

Allumette	Drive Club	Gary the Gull
Golem	Harmonix Music VR	Job Simulator
Joshua Bell: Immersive Experience	Megaton Rainfall	Playroom VR
Star Wars: Battlefront VR Experience	SuperHyperCube	Thumper
Tumble VR	EVE: Valkrie	Waltz of the Wizard
Wayward Sky		Xing: The Land Beyond

Source: PlayStation

Takeaways

We believe that the PlayStation VR is the best positioned platform to gain initial momentum in the high quality Head Mounted Display. The PlayStation VR has a lower price all in (see chart 2) and relatively large initial install base (~36MM at the end of 2015) giving it an advantage to the PC driven counterparts. A recent survey by the Gamer Network revealed there will be tepid demand, even in the segment thought of as early adopters. Over 13,000 people were surveyed on the site with ~75% already owning a gaming PC. Only 15% of those who responded intended to purchase a VR headset this year. PlayStation VR had the highest purchase intent with ~20% saying they intended to purchase it (~35% already own a PS4). The HTC Vive came in second with 15.5% and the Rift in third with 14%.

AMD “Capsaicin” Event

AMD hosted developers, members of the press and financial community at their Capsaicin event, kicking off Game Developers Conference. AMD’s CEO Lisa Su and SVP/Chief Graphics Architect Raja Koduri presented 3 key takeaways: 1) an unveiling of its GPU roadmap through 2019, 2) a working demonstration of the 14nm FinFET Polaris GPU, and 3) the announcement of the Radeon Pro Duo.

GPU Roadmap through 2019

AMD discussed its GPU product roadmap through 2019 for the first time publicly. Following Polaris will be Vega. Vega is expected to be released in early 2017 and will feature high-bandwidth memory 2. AMD announced its plan to work towards their next GPU architecture, Navi, in 2018.

14nm FinFET Polaris GPU

AMD continues to demo its beta version of a working Polaris GPU and this event was no different. Recall that AMD is particularly excited about Polaris because this is its first 14nm FinFET product and the first refresh of its GPU in a long time. The company believes it will introduce its desktop discreet FinFET GPU before NVDA does, and therefore expects to take share.

Radeon Pro Duo

AMD announced the upcoming availability of the Radeon Pro Duo product – a dual GPU card, which will drive 2x performances on various design benchmarks. AMD announced that the Radeon Pro Duo will be available in 2Q16 for \$1,500.

A Review of the Specs around the Upcoming Head Mounted Displays

Chart 1: Comparison of Oculus Rift vs HTC Vive vs PlayStation VR

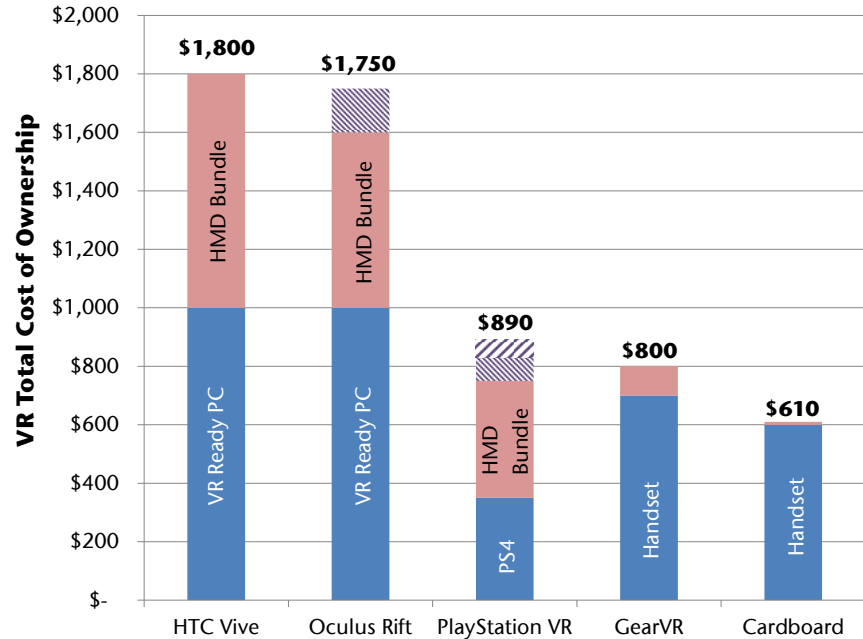
	Oculus Rift	HTC VIVE	Sony PSVR
Display	OLED	OLED	OLED
Resolution	1080 x 1200 (per eye)	1080 x 1200 (per eye)	960 x 1080 (per eye)
Refresh Rate	90Hz	90Hz	120Hz, 90Hz
Platform	Oculus Home	SteamVR	
FoV	110 degrees	110 degrees	100 degrees
Tracking Area	5 x 11 feet	15 x 15 feet	
Built-In Audio?	Yes	Yes	
Built-In Mic?	Yes	Yes	Yes
Controller	Oculus Touch, Xbox One Controller	SteamVR controller, any PC compatible gamepad	PS Move, PS4 Controller
Sensors	Accelerometer, gyroscope, magnetometer, 360-degree positional tracking	Accelerometer, gyroscope, laser position sensor, front-facing camera	360-degree positional tracking, 9 sensors
Connections	HDMI, USB 2.0, USB 3.0	HDMI, USB 2.0, USB 3.0	
System Requirements	NVIDIA GTX 970 / AMD 290 equivalent or greater Intel i5-4590 equivalent or greater 8GB+ RAM Compatible HDMI 1.3 video output 2x USB 3.0 ports Windows 7 SP1 or newer	NVIDIA GTX 970 / AMD 290 equivalent or greater Intel i5-4590 equivalent or greater 4GB+ RAM Compatible HDMI 1.3 video output 1x USB 2.0 ports	PS4 External Processing Unit "PU"
Release Date	Pre-Orders ship March 28	April 5th	Oct-16
Price	\$600	\$800	\$400* That price does not include the PlayStation Move camera (est. \$60) needed to track the headset, or the PlayStation Move hand-tracking controllers (est. \$80) needed for many games.

Source: Jefferies

Total Cost of Ownership for Virtual Reality Experiences

Including the \$1,000 VR-ready PCs, the total cost of ownership for the Vive and the Rift outweigh the all-in cost of the PS VR

Chart 2: Total Cost of Ownership for VR



Source: Jefferies. *Note that the total cost of ownership for the HTC Vive and the Oculus Rift include a \$1,000 estimate for a “VR-Ready” PC. The Oculus Rift includes an estimate of \$150 for the Oculus Touch controllers. The TCO PlayStation VR includes the \$350 PS4 and \$140 for the PS Move Controllers + PS4 Motion Camera. The Samsung GearVR and the Google Cardboard include estimates for a high end smartphone.

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