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HP VR SALES PLAYBOOK

As an HP Sales Representative or Channel Partner, this playbook is designed help you:

- Understand Virtual Reality (VR) use cases by segment
- Gain insights into where to look for new VR opportunities
- Watch for and address common issues and objections

It will arm you with the background information to start productive conversations with customers.

The professional VR market is ramping up quickly and the value chain is complex. For those needing more context, Appendix A provides orientation to the VR market and its challenges, along with common terminology. Appendix B is an introduction to HP VR desktop systems, mobile systems, head-mounted displays (HMDs), and other accessories.

We have a great VR value proposition today—read the playbook, learn all you can, and become a valuable business partner for your customers.

TARGET MARKETS FOR VR

Businesses want to provide better customer experiences, optimize investments in training and simulation, and shorten development cycles from concept to production. These compelling interests for adopting VR vary by market segment. Target markets include:

- Architecture, Engineering, and Construction (AEC)
- Healthcare
- Location-Based Entertainment (LBE)
- Military and First Responder
- Product Development



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AEC

AEC use cases

- Design review
- Presentations
- Construction planning
- Configuration
- Decoration
- Facilities management

THE MARKET

According to a recent Chaos Group survey, 80% of architects use VR today or plan to use it in the next twelve months. There are over 6 million end-users in AEC-related markets.

USE CASES

VR enables architects, engineers, real estate developers, contractors, constituents, and the public to immerse themselves in a building design before it is built. At a 1:1 scale, VR immersion emulates the physical essence of the design to facilitate design choices and identify errors, omissions, and improvements much more efficiently than other communication mediums.

DESIGN REVIEW

VR makes it easier for clients to envision how a building fits within its surroundings. Architectural visualization, interior design visualization, and internal and client executive design review are some of the many situations where VR's capability for a human scale, simulated real-world experience makes a huge difference to workflows.

CONSTRUCTION PROCESS

VR empowers key stakeholders to visualize all the systems and structures in a complete integration to quickly perform clash detection (areas of conflict and fit/function issues). AR is increasingly used to visualize construction changes to be made in-process—for example, detecting and avoiding pipes and electrical behind walls by using AR to overlay sub-systems on top of live video.

PRESENTATIONS

Using combinations of applications like Revit and Enscape to enable an interactive approach for visualizing design options and alternatives enhances client engagement and satisfaction.

FACILITIES MANAGEMENT

Re-creation of a given building in VR along with assistance for documenting and training on its systems provides for quick learning and an ability to intelligently manage all related aspects.

SALES TIPS

VR is new to most prospective users in AEC, and they will likely have questions about performance requirements, headset options, and form factor recommendations. They will likely also request guidance on the software workflow, for example "how do I show my building design in VR?", or "can I design in VR?" These are early days for VR in AEC, but much is already possible with standard off-the-shelf software solutions, and even more is possible with professional VR services. Prior to visiting AEC customers for VR discussions, you should become familiar with the software and solution options in this area.

APPLICATIONS

It's important to understand the customer's interests and objectives early on related to VR and AR as part of providing value-add sales consultancy. VR solutions exist for workflows within and around core applications like Autodesk® Revit, Trimble Sketchup, Rhino, and most other AEC platform solutions. Some third-party solutions include:

- Autodesk® Revit Live (review Revit models in VR) - autodesk.com/products/revit-live/overview
- Enscape (real-time viewing of models in Revit, Rhino, and Sketchup) - enscape3d.com
- InsiteVR (real-time VR collaboration for architectural designs) - insitevr.com
- IrisVR (presenting architecture and construction to key stakeholders) - irisvr.com



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* **Footnote:** Ted Jones, Todd Moore, James Choo, "The Impact of Virtual Reality on Chronic Pain," PLoS ONE 11(12) (December 20, 2016): e0167523, doi.org/10.1371/journal.pone.0167523



HEALTHCARE

Healthcare use cases

- Surgical planning
- Medical evaluation
- Patient education

THE MARKET

Grand View Research predicts healthcare VR will be a \$5 billion industry by 2025. Futurists Sarbjit Nahal of Bank of America, Merrill Lynch Global Research, and Joseph Quinlan of U.S. Trust include VR in their top five healthcare innovations in 2017. Innovative startups are developing solutions to address opportunities in healthcare. Now is the time to talk to your customers about the benefits of VR.

USE CASES

Physicians use VR to visualize tumors, plan and conduct difficult surgeries, and improve diagnoses. Medical students use VR to train, practice, and experiment in a lifelike environment. Patients use VR to reduce chronic pain, overcome phobias and crippling anxiety, and become better educated and more involved in their own healthcare.

VR can transfer knowledge broadly. For example, doing an ultrasound of a shoulder requires on-the-job apprenticeship and that isn't scalable. With VR, you can create a 3D shoulder, then record and playback the scene as needed, enabling students to practice and learn in a virtual 3D world.

Another example is perioperative nurse training, which typically occurs in an OR. It is not practical to have several students scrub in and practice handling tools to a doctor during procedures. Simulation centers can spend upwards of \$100K for mannequins. Using technology like VR to simulate working environments and train nurses and other key staff provides significant economic value and is scalable.

A mounting body of evidence demonstrates the therapeutic value of VR. There is wider adoption of VR as a standard treatment for chronic pain and rehabilitation. In one recent study, patients reported a 60- to 70-percent pain reduction during treatment, with benefits lasting up to 48 hours post treatment.* In mental health applications, exposure therapy enables the patient to safely simulate, rather than simply imagine, the original traumatic experiences.





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SALES TIPS

Often, VR is championed by pioneering doctors. It is imperative to move beyond the conceptual stage. Pilot the technology and once it is proven, customers will buy and deploy across their healthcare system. And you need to convince IT. Security and manageability are extremely important to healthcare IT departments due to regulatory requirements and the sensitive nature of patient data.

It's also important to discuss the business side and cost structure with your healthcare customers—hospitals are reluctant to spend money on VR, even with its notable benefits. The budget is held by IT and to convince them to spend it on VR, they need to see a tangible ROI, along with proof that it will be secure and manageable. They look to their peers for successes, so share case studies, and coordinate peer-to-peer communication. Once you convince healthcare executives of VR technology's ROI, adoption follows.

A VR system on an Ergotron cart enables providers to visit patients in their rooms. In healthcare, the HP ZBook 17 or an HP Z2 Mini offers the mobility, security, and manageability required. It becomes part of the fleet and doesn't need to be siloed. HP OMEN is not secure or manageable from an IT perspective, but is sometimes used at small clinics or for proof-of-concept work because of its lower cost. The Windows Mixed Reality Business Edition HMD with inside-out tracking is a plus in the environment since it doesn't require base stations, but can pose operational challenges, primarily in set-up. The HTC VIVE requires base stations and a defined space, so portability is an issue.

HP Healthcare Edition products should be sanitizable. The default face gaskets on the VIVE headset have open pores that are not cleanable, so offer the Windows Mixed Reality Business Edition HMD instead, which is wipeable. Understand that this is a step down from sanitizable, but still your best option.



MEDICAL EDUCATION

Medical education is part of continued learning in healthcare systems and in higher education. VR makes complex topics easy to teach and results in a more engaging learning experience for medical students. At the University of Illinois College of Medicine, Dr. Dominguese converted a 60-minute knee and joint presentation into three, five-minute learning objective-oriented VR experiences. As anticipated, the new material could be more efficiently delivered in the VR lab and initial data showed more effective knowledge transfer than conventional instruction. Attention rates improve with VR, and it has high potential for better comprehension and retention.



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LBE (LOCATION-BASED ENTERTAINMENT)

Location based entertainment (LBE) virtual reality is rapidly growing as malls, retailers, cinemas, real estate players, and entertainment operators increasingly look to drive new audiences through exciting virtual-reality experiences. Since VR technology is at the heart of these new experiences, the number of machines needed can be very large, even for a start-up.

Business locations with rapid VR expansion and interest in purchasing the technology include:

- VR arcades (standard)
- VR arcades (hyper/free-roam)
- Theme parks
- Family entertainment centers
- Theatres/cinemas
- Retailers
- Museums
- Pop-ups
- Gaming and game development
- Movie/animation content development

Within these locations, there are different types of VR experiences that range from arena-style/free roam/hyper-reality where the virtual world is overlaid on top of the real world, to arcades and pop-ups with seated and standing experiences, to motion-controlled platform.

THE MARKET

HP's strategy in LBE is to be the trusted partner for VR businesses creating, designing, and experiencing VR. The future of computing is VR, and we are in the early adoption phase of the technology lifecycle. We need to position HP as a leader along with the supporting why—the HP brand is about inventing and reinventing technology and the future.

Greenlight Analytics predicts that by 2023, LBE will be a \$12B business. HP is committed to be a market leader with LBE VR solutions for application development and deployment.

USE CASES

VR is rapidly growing at LBE operators including theme parks, family entertainment centers, cinemas, arcades, restaurants, and retailers. Experiences use VR, motion tracing, haptic feedback (a way to feel the environment), and special effects to create immersive single and multi-player experiences.

- For free-roam or arena style single-player or multiplayer experiences, we recommend the HP Z VR or Omen X backpack. It lets users move around, unconstrained and untethered.
- For single player experiences where the user is seated, standing, or only moving in a small vicinity, we recommend VR-ready towers or notebooks with high-end graphics cards.



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TURNKEY SOLUTIONS

Some LBE customers want a turnkey solution that includes hardware, software, content, and a ready-to-use buildout. Customers who have expressed interest in this type of solution include family entertainment centers, casinos, retailers, restaurants—generally where VR is an add-on and not the primary business.

Listed below are some turnkey solution providers that we can partner with to include HP hardware. The VR Team can help facilitate introductions:

- Exit Reality
 - VRrsenal
 - VR Studios
 - D-Box
 - Positron
- Springboard
 - Survios
 - Hologate
 - MK2

SALES TIPS

In LBE, most customers are start-ups and not existing HP clients. This provides HP a strong acquisition opportunity for VR hardware as well as the potential for POS and 3D printing.

Clients primarily focus on the GPU to meet their needs. They are tech-savvy and know what they want. LBE customers often build their own systems to start. As they scale, they begin to see the value of a company like HP, so be sure to cover the value of HP VR-ready systems.

A typical LBE company has from 1-5 to 10-20 locations, where each location needs equipment. At each deployment location, they may need 20-25 systems—20 locations with 25 systems each equals a sizable deal.

Since they are often startups, LBE companies are cost conscious, but they’re growing quickly. They need to set up for success from the beginning in order to scale. Systems like the HP VR Backpack PC, towers or notebooks, headsets, and extra batteries can continuously run LBE experiences.





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* IDC FutureScape: Worldwide Connected Devices and Augmented Reality/Virtual Reality 2018 Predictions.

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MILITARY AND FIRST RESPONDER THE MARKET

Governments across the world, both federal and state, spend billions of dollars each year on simulation and training products. Use cases range from multi-million-dollar flight simulation systems to small, laptop based training tools and virtual experiences.

While virtual training reached mass adoption years ago in this market, VR is still emerging with no clear leader. Many agencies are exploring opportunities with VR, but there is a need for credible technology suppliers with realistic, high-fidelity training.

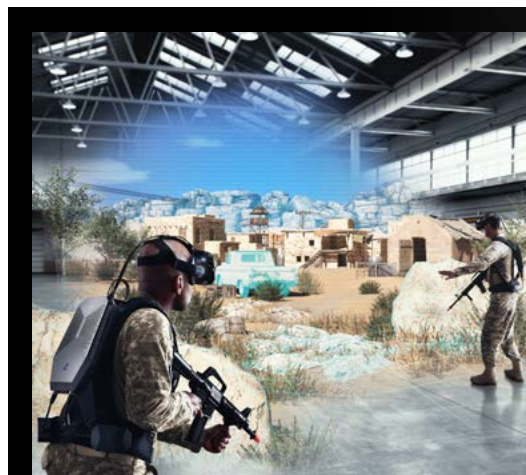
Trends that drive AR/VR for military and first-responder training include:

- Budget pressures, without sacrificing quality
- Shifting workforce demographics (millennials and digital natives)
- Global instability
- Training mishap frequency

The U.S. military is shifting focus to incorporate AR and VR into training to improve efficacy and efficiency. Today, they are primarily engaged in proof-of-concept studies. IDC predicts that by 2020, VR will transform 20% of corporate training, increasing effectiveness and cutting costs by half.* The military will follow suit. You need to plant the seeds now and expect a longer roadmap for scaling out proofs of concept (around 2 years). Applications aren't lacking; solutions are lacking.

The market is ramping quickly and will hit a tipping point within the next two to three years. Applications are lacking—there are small players and start-ups producing content with Unity or Unreal Engine, and HP is forming strategic relationships with the best of these businesses.

For military training, the HP Z VR Backpack PC is viewed favorably. Deal sizes range from a mere 2-4 units for proof-of-concept work and testing, to large deals with multiple locations and 20-30 HP Z VR Backpacks each.



DISMOUNTED TROOP TRAINING OPPORTUNITY

Synthetic Training Environment (STE) & Squad/Soldier Virtual Trainer is the largest opportunity within this segment. The U.S. Army has launched the STE program that will be a live-virtual-constructive architecture enabling soldiers at their home installation to don goggles and special gloves to train with allies in virtual "megacities" involving thousands of virtual combatants and miles of complex terrain. This is a massive (\$1.8B) undertaking with several components and opportunities over the next 5-10 years.

The best opportunity for HP in the near term (~2020) is the Squad/Soldier Virtual Trainer which will consist of a large motion-capture (mocap) complete training system that can train up to 15 service members in VR simultaneously in a 100- x 100-foot facility.



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USE CASES

Primary use cases within next three years are listed below, in priority order. Consider all branches of the military and local first responders.

The potential for VR in military training is wide-ranging. Use cases include maintenance and procedural training for equipment, dismounted troop training, dangerous environments, cultural/soft skills training, and custom scenarios.

Procedural and maintenance training - Military personnel can conduct training on the proper procedures and protocol in maintaining complex systems, such as an M1 battle tank or F-35 fighter jet. Navy sailors can conduct a VR engine room walkthrough and train on the steps for proper inspection and emergency firefighting procedures. VR is a scalable, cost-efficient, and a less risky means to train for maintenance and operations.

Dismounted troop training - The U.S. Army is interested in source motion capture for dismounted troop training to increase efficiency and safety. They want to train multiple personnel in team and squad combat operations through immersive, realistic, virtual environments to enhance proficiency through repetition, variety, and detailed after-action reviews.

Custom scenarios training - There are many seemingly simple situations that military and first responders encounter. However, there are an unlimited number of outcomes that are tough to train for. Imagine approaching a car at a red-light as a police officer at night—there are many ways the encounter could unfold. Having randomized, high-volume scenarios for training and testing is extremely valuable. VR enables this randomization.

Dangerous environment training - VR can be used for riot control and de-escalation scenario training, like patrolling an Afghan village to gain situational familiarity and to practice dealing with potential issues. Operating in challenging environments and being able to practice de-escalation is a driving factor for incorporating VR and AR. In modern warfare, operating in semi-permissive environments and de-escalating disorderly civilian populations is crucial. These situations are tough to train for, but VR makes it possible.

Cultural/soft skills training - Military and law enforcement interact with local populations that may not speak the same language and are irritated with their presence. 21st century warfare and effective policing require winning the support of the local population, both leaders (think tribal elders in Afghanistan or sheiks in Iraq) as well as individual members of the community. Training to this standard is hard and expensive, as it requires actors and detailed logistics. VR can help—imagine interacting with an avatar that responds to your answers, questions, and body language, then scale this up to interacting with a whole community in VR.

CHALLENGES

There are many challenges around VR training for this segment:

- **Accessibility** - Military and first responders need to maximize their training time with innovative solutions that are accessible in the field.
- **Realism** - Military and first responders have a mantra “train like you fight” and training must be as realistic as possible, especially for dismounted troop training. This is crucial for effective training and acceptance in this market. Factors affecting realism include:
 - Feedback – haptics need to provide immediate feedback and even hurt when trainees do something wrong or else it is just a game (military uses paintballs frequently when training because they hurt!)
 - Geospatial terrain/data – terrain should be as close to the real atmosphere as possible
 - Immersion technology – for example, using the Hi5 VR Glove for fully immersive hand interactions in VR
 - Content quality - randomization and fidelity of VR experiences
- **Simplicity** – set-up and use of equipment, content management, and cloud distribution

VR VS. AR FOR MILITARY AND FIRST RESPONDER TRAINING

VR and AR both play roles across the training continuum. VR is the practical application portion of training while AR is useful for evaluation/execution.

As an example, conducting maintenance training in VR enables trainees to learn the concepts and procedures while reducing risk to equipment. After they understand the proper procedures, trainees can then transition to AR and conduct maintenance on the equipment in real time with step-by-step procedures imposed on the equipment.





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SALES TIPS

Consider the following requirements as you develop and propose solutions for military and first responder customers:

- Wide area tracking, including body tracking (feet, waist, hands, etc.)
 - Depends on the use case—wide area tracking makes training more realistic, which is the guiding principle behind VR in this segment!
- Other peripherals, including guns or other special human input (e.g. simulated equipment)
 - If applicable, guns and maintenance peripherals are extremely important to make the training realistic
- Special battery specifications (current solution more POC than final)
 - U.S. Army requires 4 hours of continuous play
- Ruggedness
 - Needs to be mobile/deployable and withstand weather conditions (rain, sand storms, snow, etc.)
- VR versus AR (near and longer term)
 - This is a training continuum
 - » Lesson
 - » Practical application in VR
 - » Evaluation in VR/AR
 - » Execution in AR
 - Both VR and AR serve a purpose, but they are not the whole picture
- Head Mounted Display (HMD) resolution and feature/form-factor, mixed reality, AR (pass-through versus see-through)
 - Need sound for all use cases
 - WMR preferred over VR due to quick set-up and free roam
 - Higher resolution is more realistic and preferred
- Wearable compute
 - If untethered—wireless is best option as it enables “train like you fight” so soldiers or police can have their full kit on without a backpack. Wireless technology currently has latency concerns, but eventually backpacks could be obsolete.

Key partners in this market include:

- [DiSTI](#)
- [Pixo](#)
- [Heartwood](#)
- [Motion Reality](#)
- [V-Armed](#)



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PRODUCT DEVELOPMENT

Use cases

- Design review and collaboration
- Human machine interaction (simulation)
- Engineering (clash, CFD, assembly process, team collaboration)
- Training for manufacturing, safety, other
- Assisted manufacturing (last mile training—AR only)
- Large equipment customer engagement and sales

THE MARKET

According to Jabil Green Point, 89% of companies expect vendors to help meet AR/VR requirements—from developing plans to delivering full manufacturing capabilities. By leveraging outside AR/VR talent and technology, many companies expect to focus on their core strengths while integrating immersive capabilities. Per the same research, 69% of companies expect AR/VR to be mainstream in the next 5 years, having a major impact in many areas of product development and business workflows. The best solutions will be driven by leading software partners that already serve most or all of these existing use-cases and can integrate extended reality (XR) into their solutions.

USE CASES

Design review and collaboration – Product development depends on the collaboration and close communication of cross-functional teams. Executive and key stakeholder review based on a 3D immersive, all-digital conceptual design process accelerates and streamlines product refinement and related decisions.

Products/platforms that provide immersive VR-based design review include Epic Unreal Engine, Unity, Dassault 3D Experience, Autodesk® 3DS Max, Maya LT, Project Play, and VRED. Emerging solutions are coming from primary providers like Siemens, PTC, and others.

Human machine interaction – Companies that embrace a commitment to leadership use VR that matches physical models to evaluate and optimize human factor aspects of a product experience. This is often called “hyper-reality” (a virtual world or product that ties directly to a corresponding physical world or product). This requires custom development that is most frequently performed with a game development platform like Unreal Engine.

Product development engineering – Engineers can simulate mechanical dynamics, computational fluid dynamics, materials analysis, and assembly feasibility much earlier in the engineering process using digital conceptual models, minimizing the cost of physical prototyping iterations. Viewing from every angle and from within designs often provides breakthrough capabilities for visualizing engineering aspects and collaborating with subject matter experts.

Products like IC.IDO from ESI offer these capabilities. Primary engineering CAD solution platforms, such as Dassault CATIA and Solidworks, Siemens NX, and PTC Creo, are also rapidly integrating related capabilities.

Training – Virtual reality offers ground-breaking ways to implement training solutions by immersing the user in a real-time, 3D interactive world. Training for manufacturing is one of the most challenging aspects of product development. Self-guided, self-paced VR solutions can streamline training and track skill development and quality of know-how.

HP has developed a relationship with DiSTI as an end-to-end solution provider. Please contact Jay Fraser or Dan Schneider in HP for assistance and the right contacts at DiSTI.

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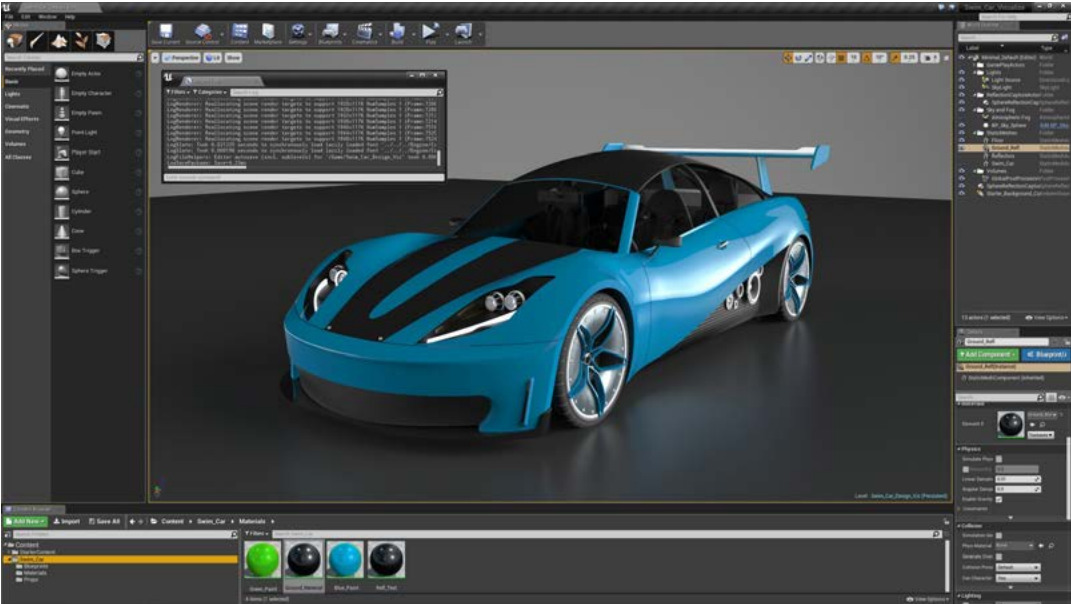


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Assisted manufacturing (AR only) – Augmented reality, often benefited by AI and Deep Learning, can assist and even correct product assembly performed by human beings. This is not a focus area for HP currently, because AR solutions are still not adequately mature. However, we anticipate this will be a large and significant market opportunity ramping to reasonable volumes by 2020.

Large equipment sales – Companies that engineer and produce large equipment face challenges due to the difficulty of bringing customers to the equipment (sales centers) and the inadequacies of 2D presentations to highlight features and functions. By bringing the equipment virtually to customers, they can experience it at human scale and with real-world application of features and benefits. VR is a game-changer for the marketing and selling of these types of products. This requires custom development that is most frequently performed with a game development platform like Unreal Engine.



SALES TIPS

VR is new to many prospective users in Product Development, and they will likely have questions about performance requirements, headset options, and form factor recommendations. They will likely also request guidance on the software workflow, for example “how do I show my product design in VR?”, or “can I design in VR?” Most use cases can already be served with standard off-the-shelf software solutions, and even more is possible with professional VR services.

Prior to visiting PD customers for VR discussions, you should become familiar with the software and solution options in this area. PD segment leadership and your regional VR business development manager are excellent resources to assist with latest information and advice.



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HANDLING OBJECTIONS

I REQUIRE NVIDIA® GEFORCE®, NOT NVIDIA® QUADRO® FOR PRODUCT DEVELOPMENT OR AEC.

Some VR applications/plugins explicitly state NVIDIA® GeForce® in their minimum/recommended system requirements documentation. If this is the case, do not attempt to convince the customer to go to NVIDIA® Quadro®. Also, dedicated systems for VR application development may perform as well or better when configured with NVIDIA® GeForce®. Tread lightly.

If application or plugins are not an issue, systems that run CAD/AEC software and VR application development platforms will benefit from NVIDIA® Quadro®. Educate the customer on the benefits of NVIDIA® Quadro® vs. NVIDIA® GeForce®—global availability, reliability, certification, support—and of the GPU options in our ‘VR-Ready’ product line.

The HP Z VR Backpack is certified for CAD/AEC applications and is designed for commercial use. If your customer isn’t set on GeForce®, for a slightly higher price they get a high-end Quadro® solution with twice the video RAM, workstation value-add advantages, and security and manageability features not found on the OMEN X Backpack.

I REQUIRE NVIDIA® GEFORCE®, NOT NVIDIA® QUADRO® FOR MY LBE.

Developers typically come from a gaming background and prefer to develop on cards they are familiar with—such as the NVIDIA® GeForce® GTX 1080 (8 GB) graphics card. Don’t push too hard against the knowledgeable customer. Consider OMEN X as a viable option. The OMEN X is a consumer solution offered at a lower starting price and comes with NVIDIA® GeForce® GTX graphics.

For backpack PCs, graphics are the biggest differentiator between the HP VR Backpack and the OMEN X backpack. The HP Z VR Backpack PC is a workstation-class system with NVIDIA® Quadro® P5200 graphics (16 GB). With twice the amount of dedicated graphics memory, performance is significantly increased. For customers set on GeForce®, be pragmatic and follow their lead.

I PREFER TO BUILD MY OWN SYSTEM.

Encourage your customers to consider the complete cost-of-ownership. As they scale out, support issues will prove challenging. Consistent hardware from a leading supplier simplifies training, service, repairs, and future expansion. If they are planning to expand globally, HP’s service and offerings across the globe will prove valuable in negotiating international expansion, retail, customs, etc.

I NEED COST PREDICTABILITY IN OUR HARDWARE AS WE EVOLVE.

HP extended our Device-as-a-Service (DaaS) offering to VR solutions, including HMDs. We can equip users with the right hardware, support, and lifecycle services to improve end-user productivity, IT efficiency, and cost predictability with one price per device. Users offload the time-consuming tasks of supporting, securing, and managing multi-OS devices so they can focus on their business.

I WANT OCULUS RIFT HMD.

HP is headset agnostic. We are primarily focused on providing computing power for our customers. We understand different customers have different headset needs and preferences.

For HMDs, we sell the Windows Mixed Reality Headset, Professional Edition with included wireless motion controllers or the HTC VIVE Business Edition. Wireless HMD systems provide great freedom of motion because they have no cables, but they also tend to be heavier and less comfortable (and may be subject to RF interference resulting in dropped frames). A high-end tethered headset and computer can handle more complex VR experiences with lower latency.

Note: For the Oculus Rift HMD to work properly with HP Z VR and OMEN X Backpack solutions, it requires additional tracking technology such as OptiTrack. For compatibility with backpack solutions, the tracking cameras must be stationary AND connected to the backpack computer (voiding the tether-free principle). Oculus Rift is best configured into use-cases that depend on stationary computers. If your customer wants an Oculus Rift HMD, visit www.oculus.com/rift/.

SMALL LBE ACCOUNTS AREN’T WORTH MY TIME AND EFFORT.

Bring in a Channel Partner. The VR segment is fast growing and some customers start small, but may scale quickly based on early success and with the right funding. Be careful not to judge each opportunity. Take care of the customer. And, please be aware that a number of customers will scale to large quantities quickly in the next one to three years and now is the right time to capture them into the HP brand.

COMPETITOR SYSTEMS WEIGH LESS.

The comfort-engineered HP ZVR Backpack harness distributes weight across the user’s body so it isn’t felt. Due to good ergonomics, heat management and a raised platform, it feels lighter and more comfortable than alternatives. Performance enhancing features like NVIDIA® Quadro® graphics, hot swappable batteries, and a superior build quality make the HP Z VR Backpack weigh slightly more.

The HP solution is built to run very quietly, minimizing the invasiveness of the experience. With the HP Z harness, the computer sits on a back plate, so users don’t feel the heat directly. Competitive products place the computer directly on the user’s back, which can be uncomfortable and hot.

COMPETITOR SYSTEMS HAVE MORE PORTS.

HP took a system approach that includes as many or more ports when the dock is taken into account. It’s a well-thought out design for the ports needed when wearable or docked. To see how HP VR products compare to competitor systems, view the HP Competitive Battlecards.



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INTRODUCTION TO VIRTUAL REALITY

Virtual reality (VR) is a computer technology that immerses a user in an imagined or replicated world or simulates presence in the real world. The user experiences VR through a headset or projected environment, often with sensory feedback, and interacts with the virtual world in real time.

Once an entertaining attention grabber, VR has matured and is quickly becoming an essential tool for designers, engineers, and educators. This is largely due to advancements in performance and displays, smaller system size for better mobility, and longer battery life in wearable technology. Development applications are more readily available now, and the overall cost for implementing VR is down.

WHY USE VR

An immersive 3D visualization of an object is more intuitive than a two-dimensional format, such as in architectural walkthroughs, virtual prototyping, and scientific visualization. Walking through a project in VR enables users to experience proportion, scale, and interaction in a naturally intuitive way. In a collaborative VR environment, multiple users can interact with the same object to problem solve.

VR can simulate real spaces for workplace occupational safety and health purposes, education, or training. In a virtual environment, users can develop their skills without the real-world consequences of failing. Examples include interacting with potentially dangerous situations, like tracking a tornado, practicing surgery, or learning to safely clean up a toxic spill. It can also be used to study past events, such as the volcanic eruption at Pompeii or the formation of the galaxy.

Learning through virtual exploration includes design teams collaborating on a prototype or students visiting a museum or a foreign country. Entertainment venues that incorporate VR include gaming, amusement parks, and 3D cinema.

VR can be an effective marketing and sales tool for the automotive, hospitality, tourism, and real estate industries. When stakeholders experience a detailed tour of a concept car, five-star resort, or new office, it can have a positive impact on the sales conversion.



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MARKET INSIGHTS

The commercial VR market is rapidly expanding. According to IDC, the total addressable market for VR in 2018 is estimated to be \$9B (\$2B commercial, \$7B consumer). The commercial VR market is expected to grow to \$27B by 2027. Now is the time to position HP as a leader in VR.

Gartner Group predicts that by 2019, 1 in 5 large enterprises will make VR, AR, or MR (mixed reality) part of their digital transformation strategy. That means your customers have less than 20 months to ensure they are part of the leading 20% of their industry—or risk being left behind.

HP is the one-stop trusted partner for commercial customers designing, creating, and experiencing VR. Through thought leadership, partnerships with industry-leading companies, and the best and most powerful devices, HP is helping businesses make VR a reality.

ORIENTATION TO REALITIES

Here are some terms you should know:

Virtual Reality (VR): A computer technology that uses head-mounted devices (HMDs) to generate realistic images, sounds, and other sensations that simulate a user's physical presence in a virtual environment. HP is focused here.

Augmented Reality (AR): Digital content is superimposed onto a user's view of the real world, using a reflective visor, camera pass-through, or direct retinal projection.

Mixed Reality (MR): Virtual objects that appear real are integrated into the natural world.

Extended Reality (XR): An umbrella term for VR, AR, and MR.

Virtual World: A three-dimensional, computer-generated environment in which one can interact.

COMMERCIAL VR CHALLENGES

- No single source provider of solutions
- Requires lab and floor space for proper implementation
- May cause nausea or motion sickness
- Content development workflow and resources
- Low-end VR and poor content has left negative perceptions
- Hype results in a wait and see approach for VR technology

COMMERCIAL VR BENEFITS

PROVIDES CUSTOMERS NEW WAYS TO EXPERIENCE THEIR PRODUCTS

- Compelling product and purchasing experience
- Fewer mismatches in expectations
- Better and quicker buying decisions

OPTIMIZES INVESTMENTS IN TRAINING AND SIMULATIONS

- Dangerous/critical operations cost effectively handled with VR training
- Reduce costly training mistakes (people and equipment) expectations
- Better trained personnel

SHORTENS CONCEPT/DESIGN TO PRODUCTION DEVELOPMENT CYCLES

- Collaborative virtual design—faster design decisions
- Higher quality design choices
- Better verification of product fit/form/function
- Fewer costly prototypes



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COMPONENTS OF A VR EXPERIENCE

The components needed for a commercial VR experience include a VR-ready computer, HMDs and controllers with accurate tracking, and well-designed immersive content.

VR-READY DESKTOP COMPUTERS

Table 1: Desktop HP Z Workstation VR-ready systems



	HP Z4 G4	HP Z6 G4	HP Z8 G4
CPU	Intel® Xeon® W-series (3.6 GHz, 4 - 8 cores)	1-2 Intel® Xeon® SP series (3.2 GHz, 4-8 cores)	1-2 Intel® Xeon® SP series (3.2 GHz, 4-8 cores)
Memory	16 GB+	16 GB+	32 GB+
Graphics	NVIDIA® Quadro® P5000 NVIDIA® Quadro® P6000	1-2 NVIDIA® Quadro® P5000 NVIDIA® Quadro® P6000	1-2 NVIDIA® Quadro® P5000 1-2 NVIDIA® Quadro® P6000
Storage	HP Z Turbo Drive 256 GB+	HP Z Turbo Drive 256 GB+	HP Z Turbo Drive 256 GB+
OS	Windows 10 Pro Fall Creators Update	Windows 10 Pro Fall Creators Update	Windows 10 Pro Fall Creators Update

While there is not yet an industry-standard definition, VR-ready describes a system that has enough CPU and graphics performance to provide an effective, first-rate VR experience. Table 1 summarizes the HP desktop VR-ready systems for content development and deployment.

Desktop VR systems are richly-configured gen 4 HP Z4, Z6, and Z8 workstations, with one or two Intel® Xeon® processors (4-8 core), at least 16 GB of memory, and one or two high-end professional graphics cards, such as the NVIDIA Quadro® P5000 or P6000. We also recommend fast PCIe-based storage like the HP Z Turbo Drive. The preferred OS is Windows 10, version 1709, also known as the Fall Creators Update, a spatial OS that works with VR hardware and applications.



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VR-READY MOBILE SYSTEMS

HP Z VR BACKPACK PC



The award-winning HP Z VR Backpack PC is a complete system for VR content creation and consumption. It quickly transitions between a high-powered desktop (via a dock) for VR content design and a wearable VR PC (via a backpack) to validate creations. Weighing in at around 10 lbs., the comfortable backpack lets users experience VR without getting tangled up in cords because the HMD attaches with a short cable over the shoulder. Hot swappable batteries provide continuous unrestricted freedom.

It is equipped with a 4-core Intel® Core™ i7 processor, 32 GB of memory, and an NVIDIA® Quadro® P5200 graphics card with 16 GB of graphics memory. Add your customer's preferred VR HMD, or use our custom integration for the HTC VIVE BE or the HP Windows Mixed Reality Headset. To complete the system, add the HP Z VR backpack harness, backpack battery pack, charger, appropriate cables for the HMD, and the dock.

HP ZBOOK 17 G5

If your customer prefers a traditional notebook form factor, the HP ZBook 17 G5 is a VR-ready portable powerhouse. With the latest NVIDIA® Quadro® P5200 graphics card, your customers can easily develop 360-degree content, experience enhanced visualization, and develop life-like VR experiences on-the-go. Performance components include 8th gen Intel® Core™ or Intel® Xeon® Processors and up to 64 GB of RAM.



HMDs

VR is delivered via an HMD (head-mounted display). This is a major component of VR and the technology chosen can make or break the experience. HMD solutions include tethered, wireless, AiO, and wearable systems. There are pros and cons for each, and you should be able to articulate these to your customers.



TYPES OF HMDs

Tethered: These systems offer the highest performance of the HMD options. They produce rich content, high resolution, and excellent tracking. Drawbacks include limited motion, safety issues due to the tether, and difficulty in relocating.

Wireless: A wireless HMD is one that sends and receives its display information from the host system over a Wi-Fi, WiHD, WiGig or other high speed RF link. Generally the display information is compressed to fit into the available channel bandwidth. Benefits include freedom of motion, delivery of rich content, and excellent tracking. Drawbacks include issues with RF congestion or RF obstruction, resulting in dropped frames or limited resolution.

AiO (aka mobile VR): All-in-one devices offer freedom of motion, are easy to deploy, and are economical. They also work well for 360 video, however; content complexity is limited. AIOs are not categorized as enterprise-development platforms, and the tracking is not as good as other HMDs.

Wearable: These systems offer freedom of motion and high performance to deal with rich content, high resolution, and excellent tracking. Wearable devices are not truly wireless, but often have short tethers. Battery capacity can be a concern along with weight.



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SELECTING HMDS

Important considerations when selecting HMDs are resolution, field of view, and frame rate.

Resolution: The number of pixels in the HMD display is quoted as X by Y. Sometimes this is quoted per eye and sometimes quoted for both eyes. For example, the HTC Vive has 1080 x 1200 per eye or 2160 x 1200 across both eyes. Shorthand notation such as "2K" or "4K" is sometimes used, but this is less descriptive than specifying the actual X and Y pixel count.

Field of view: The user's visual field angle of degrees is an important consideration when selecting an HMD. Having a higher field of view is important because it contributes to a feeling of immersion in a VR environment. The viewing angle for an average human eye is about 200 degrees and a wide field of view is considered to be >95 degrees.

Frame rate: If the frame rate and/or latency is inadequate, participants may experience VR sickness with symptoms such as headache, nausea, vomiting, drowsiness, and disorientation. 90 Hertz is generally considered the minimum comfortable rate for VR.

HP HMDS

HP sells two HMDs—the Windows Mixed Reality Headset – Professional Edition and the HTC VIVE Business Edition. They were selected for resolution, refresh rate, and field of view. If your customer prefers another HMD (like an Oculus Rift), that is not problem. Equipping them with workstations for development and deployment is your first priority.

The Windows **Mixed Reality Headset – Professional Edition** uses a camera on the headset for tracking. Notable specs:

- 1440 x 1440 pixels per eye
- 90 Hz refresh rate
- 100 degree field-of-view
- 6-degrees of freedom with no tracking boundaries

The **HTC VIVE Business Edition** uses base stations for tracking. Notable specs:

- 1080 x 1200 pixels per eye
- 90 Hz refresh rate
- 110 degree field of view
- 16'4" max. between base stations

DAAS

HP Device as a Service (DaaS) is a one-stop solution that helps companies manage their multi-OS and multi-device environments. HP DaaS now includes VR solutions—your customers can get everything from hardware to lifecycle services to improve efficiency and free up IT resources. A complete end-to-end solution for commercial environments lets your customers reduce expenses by essentially renting hardware and getting quality IT support for workers' numerous devices.

By combining predictive analytics and proactive endpoint and security management for a fixed price per device, HP DaaS helps reduce purchasing complexity and improve cost predictability with simple plans that are easy to tailor and scale—a great option for enabling VR pilots.

SOFTWARE FOR VR

Unlike traditional workstation markets with a few large ISVs that we certify on our platforms, VR is a collection of start-ups vying for a place in the market. You need to be aware of popular VR development toolkits such as **Unity** and the **HP VR Launch Kit for Unreal Engine**. Features include rapid iterative development, stereoscopic rendering, and integration with leading VR device manufacturers.

VE Studio® from DiSTI® provides a content management platform for virtual training solutions. HP and DiSTI have partnered to create VR training solutions with best-in-class hardware and a patented, proven virtual training solution content management platform.



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COMPLEMENTARY VR TECHNOLOGIES

VR experiences are enhanced by complementary technologies, such as eye and hand tracking, and haptics. Here are some technologies you should be aware of in case your customer asks about them.



Eye Tracking

- Tobii
- Fove

Wireless Tracking

- TPCast
- Vive Pro

Hand Tracking

- Leap Motion
- Ultrahaptics

Haptics

- Tesla Suit
- Hardlight Suit
- Tactsuit
- Haptx Glove
- VRGluv
- VRFree Glove
- Tactical Haptics Reactive Grip Motion Controller



VR SALES PLAYBOOK

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- [HP Enterprise VR Customer Presentation](#)
- [Workstation Competitive Insights](#)
- [WSTC Sales](#)

DELIVER THE ULTIMATE POWER FOR VR CONTENT
CREATION AND FULLY-IMMERSIVE EXPERIENCES.

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