

AVEVA XR (Extended Reality)

Focus on Unified Learning and XR for Training

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EXTENDED REALITY (XR)

Agenda

General Overview

- Definitions
- XR an enabling technology for Digital Transformation
- Video Examples – XR Applications
- XR for Training
- AVEVA XR Development Plans
- Questions

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Definition of XR

XR

Extended Reality

AR

Augmented Reality



Augmenting the real world view captured via a device camera with 2D/3D digital information

AR often thought of as applied to Smart Phone/Tablets

MR

Mixed Reality



A form of augmented reality that blends the holographic images more seamlessly with the real world using spatial recognition

MR often thought of as applied to Wearables

VR

Virtual Reality



A 3D real-time synthetic world, typically interactive, that totally encloses the user using a head mounted display (HMD) or Cave automatic virtual environment (CAVE)

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XR – an enabling technology for Digital Transformation

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A **new lens** for AVEVA Industrial Software



AR
Augmented Reality



MR
Mixed Reality



VR
Virtual Reality

XR
Extended Reality



Connect

Visualise

Interact

Collaborate

A **paradigm shift** for
access and **interaction** with the **living digital twin**

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Where can Extended Reality (XR) add value?

World Leading
AI, Predictive Analytics, Asset Performance Strategy, Mobility Solutions

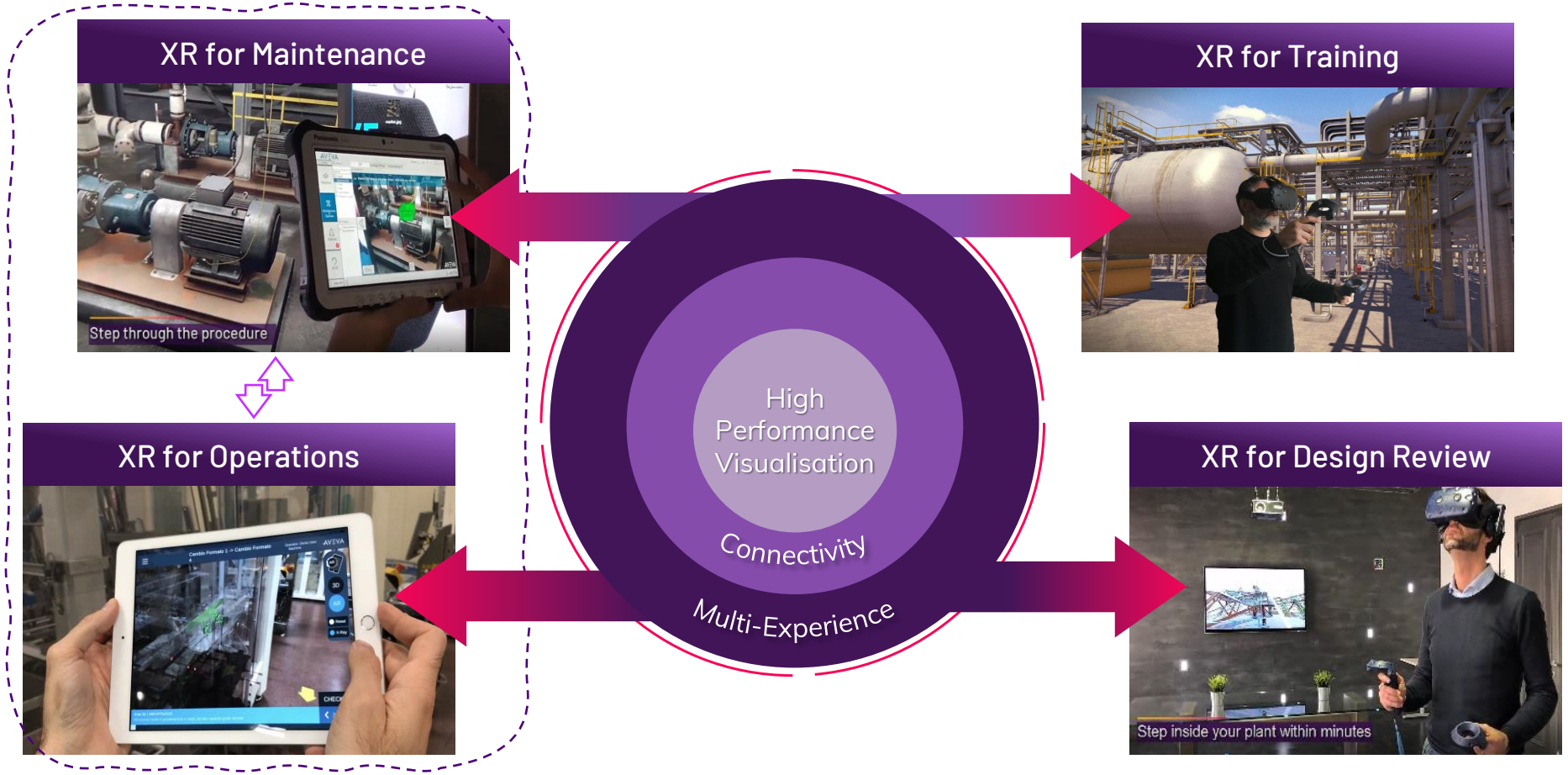


World Leading
HMI/Scada, iIOT Edge, Real-time Operations Information Management

World Leading
Plant and Marine Engineering Design, and Asset Information Management

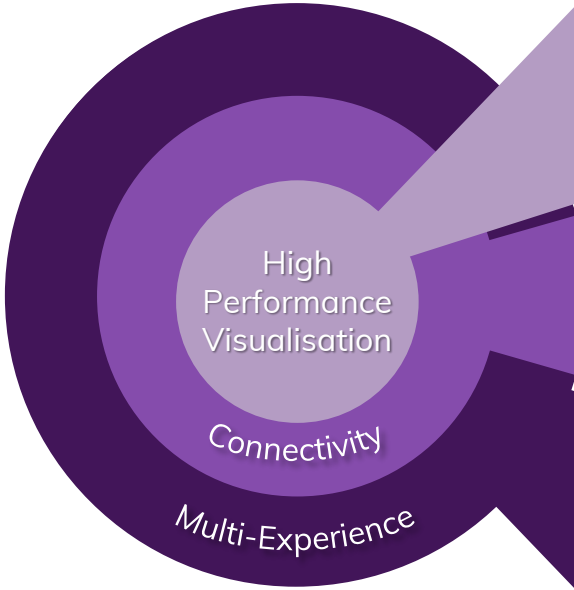
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AVEVA XR value available today



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Key technology features to drive XR Applications



High Performance 3D real-time rendering

- The capability to render photo realistic graphics at very high frame rates (~90Hz for VR)
- The capability to render very large 3D scenes (entire plant/asset)





Connectivity

- The capability to connect any information from either the Asset or Operations Lifecyle to the visual context
- Bi-directional connection and management of information

AVEVA Unified Learning

AVEVA Asset Information

AVEVA Unified Operations

Multi-Experience

- The ability to deploy the same application on ANY hardware device (Desktop, Mobile, Wearable), locally and from the CLOUD
- AR and MR features enabled through XR software and hardware devices

Desktop & Multi-touch



Virtual Reality



Mobile & Wearable



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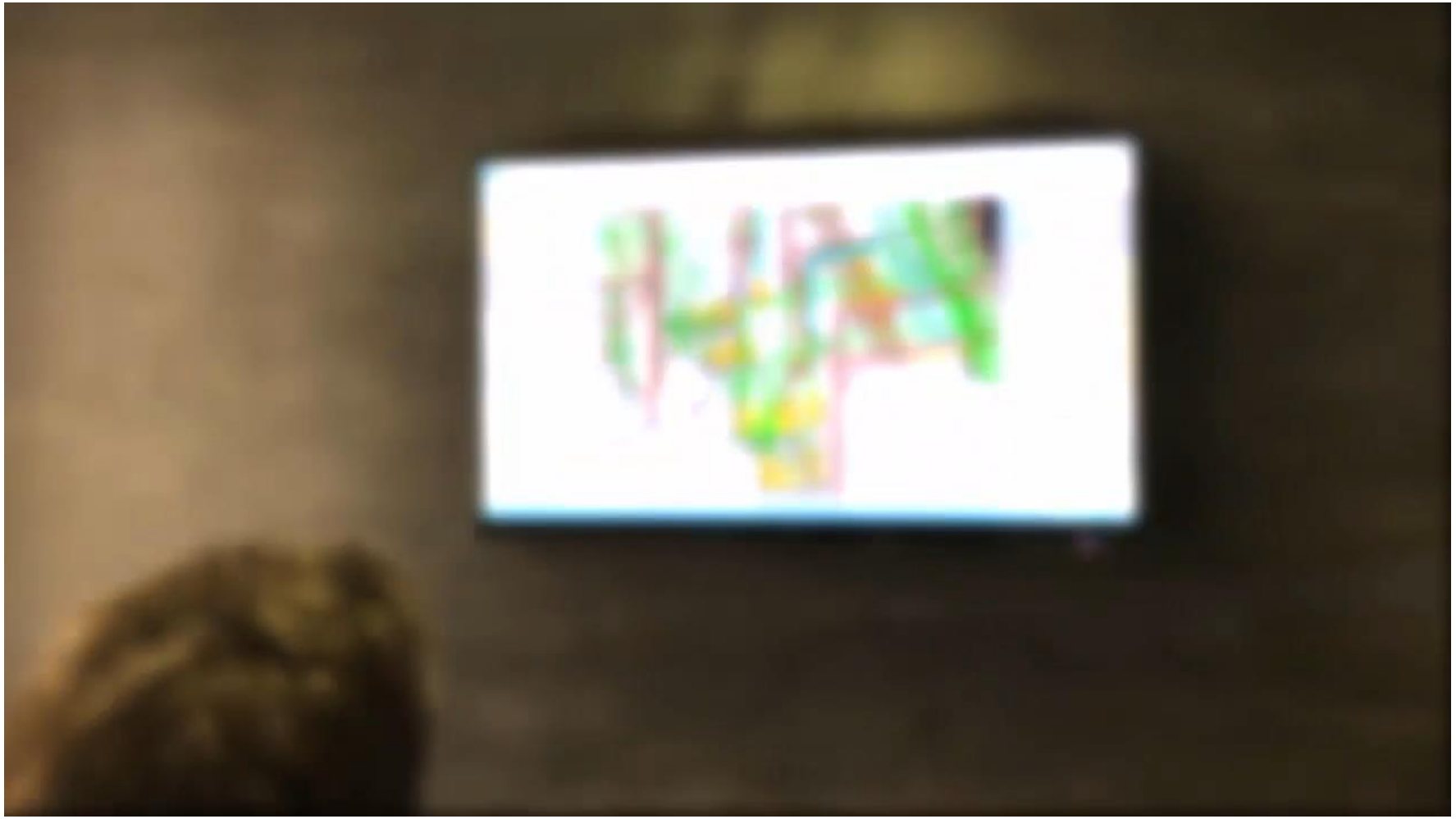
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Video Examples of XR applications

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XR for 3D Design Review

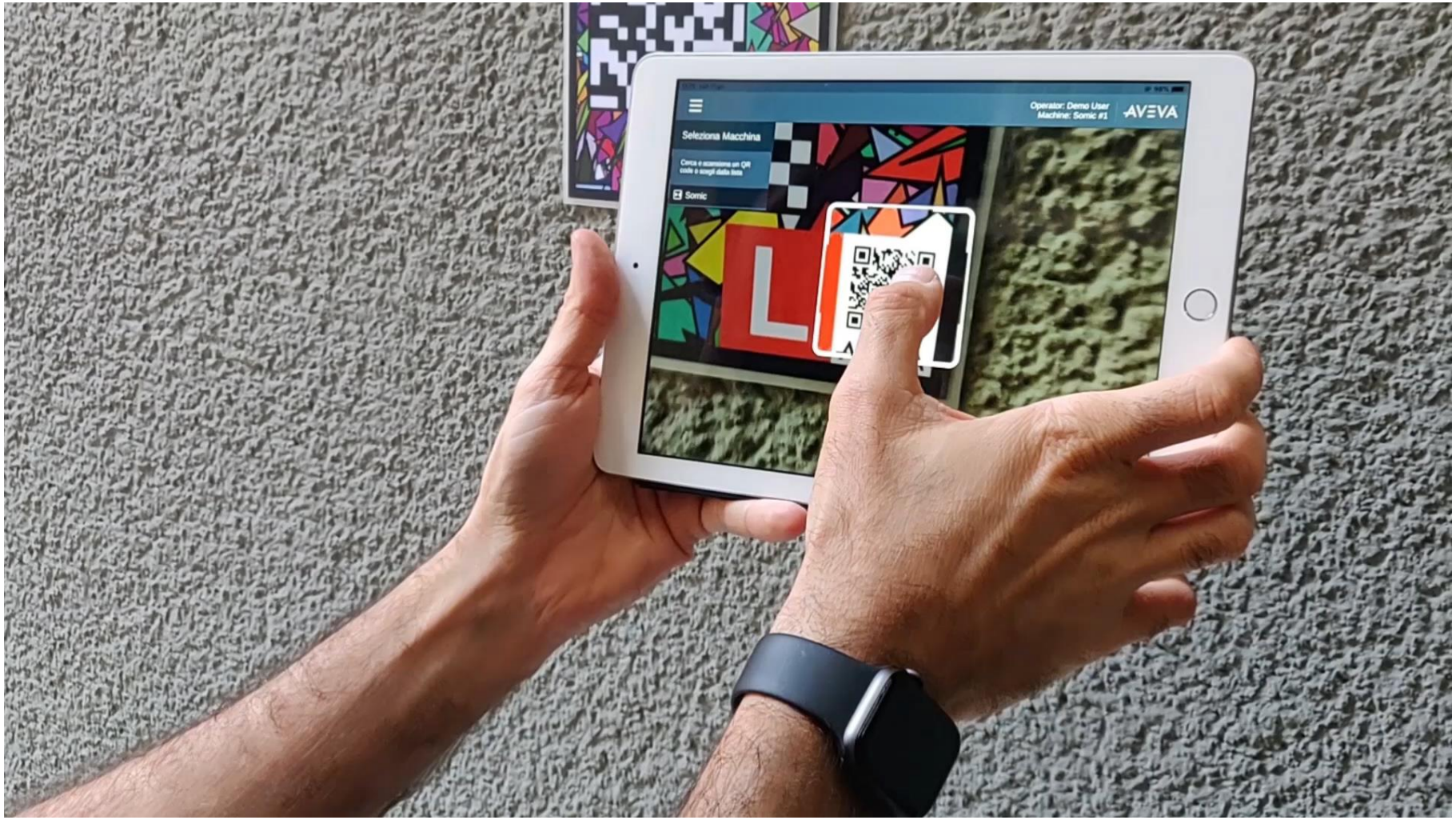




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XR for Operations and Maintenance





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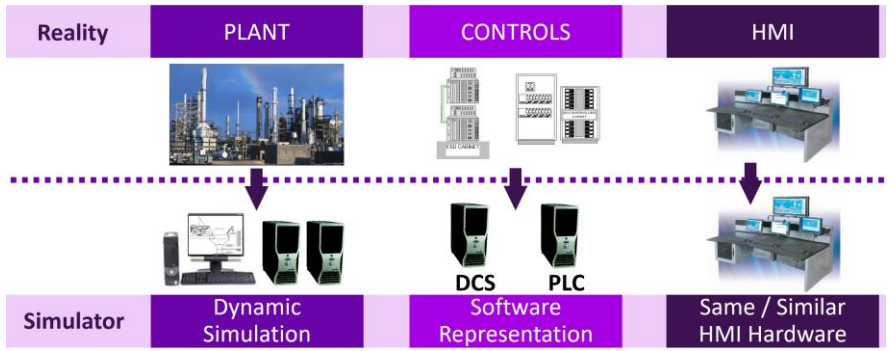
XR for Training

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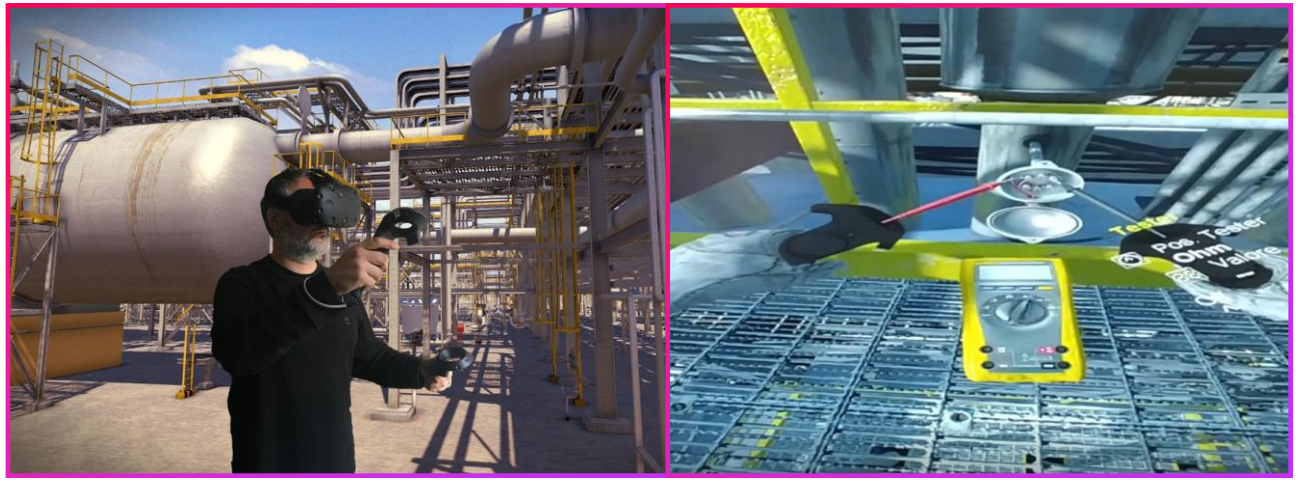
OTS and ITS

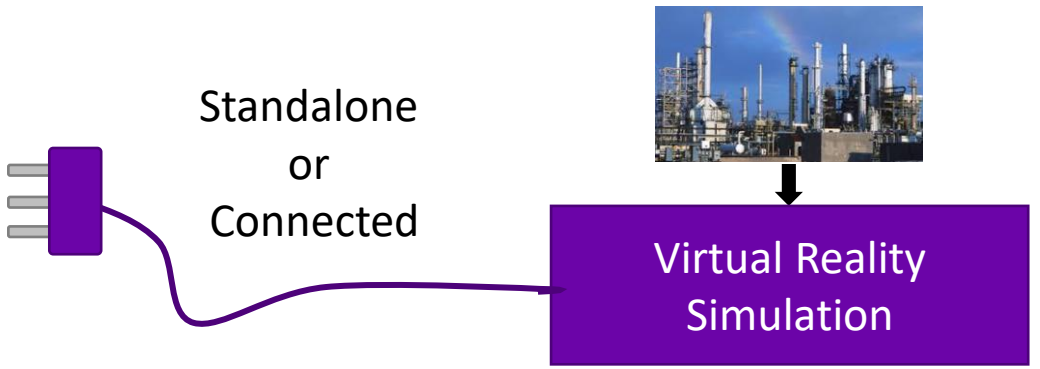
Operator Training Simulator (OTS)





Immersive Training System (ITS)





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XR fits seamlessly inside a bigger picture

ENTERPRISE WIDE LEARNING

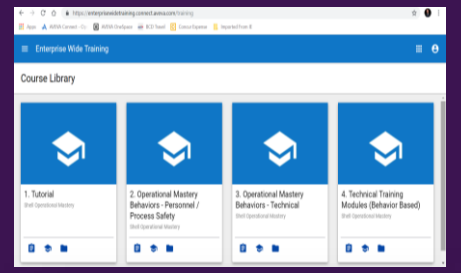
EXTENDED REALITY

TRAINING SIMULATOR

DCS & PLC CHECKOUT

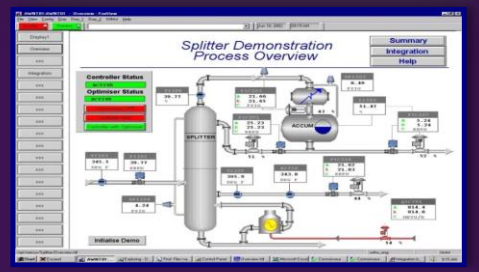
DESIGN

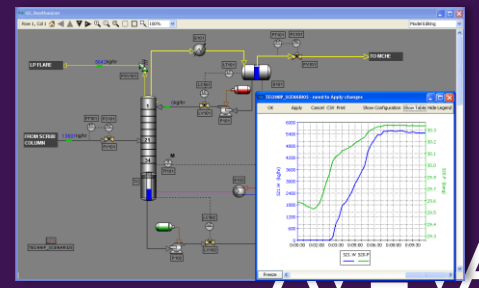












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XR for Training Types

Team Training



Panel and Field working together

Product, Machine, Equipment Training





Process and SOP Procedural Training

Electrical and Mechanical Training





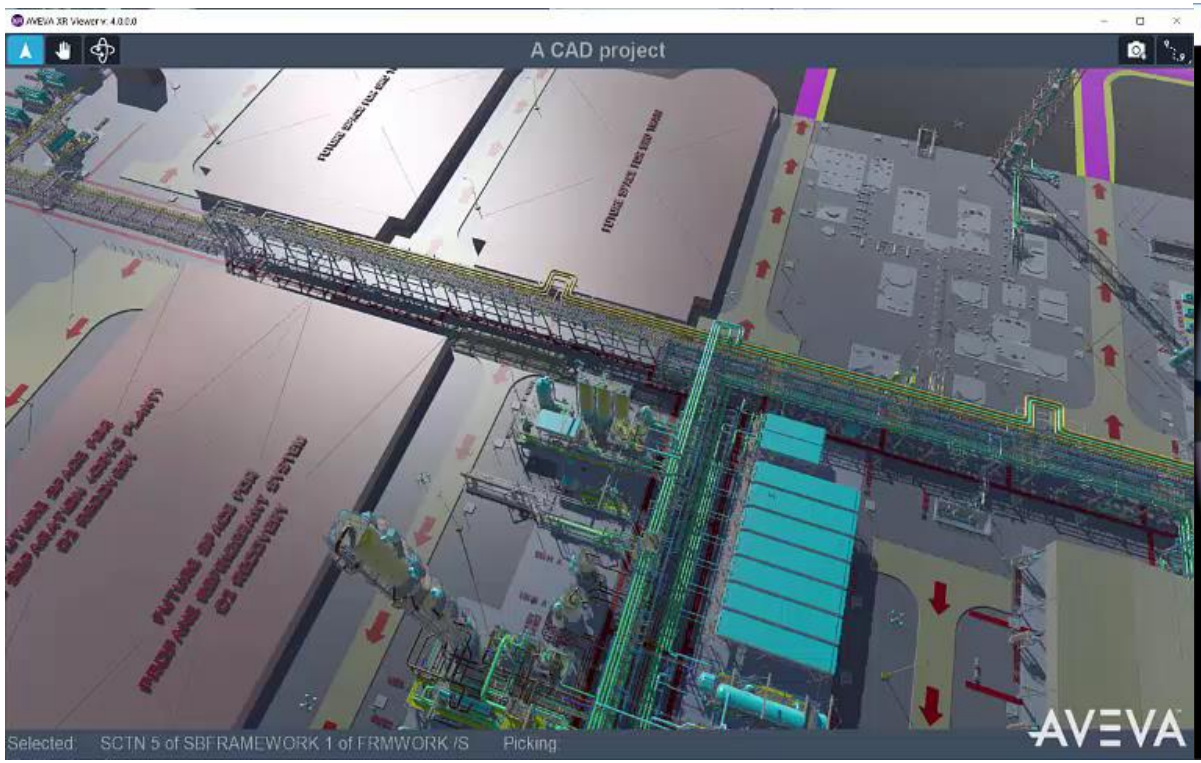
Behavioral, Hazzard Recognition, and Safety Awareness

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Familiarisation of the plant in minutes.

Do you have a 3D CAD model of your plant?





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XR for Training Electrical and Mechanical teams

Digitize best practice, transfer knowledge, reduce downtime, improve safety

Example of electrical and mechanical technician training



Trainee View



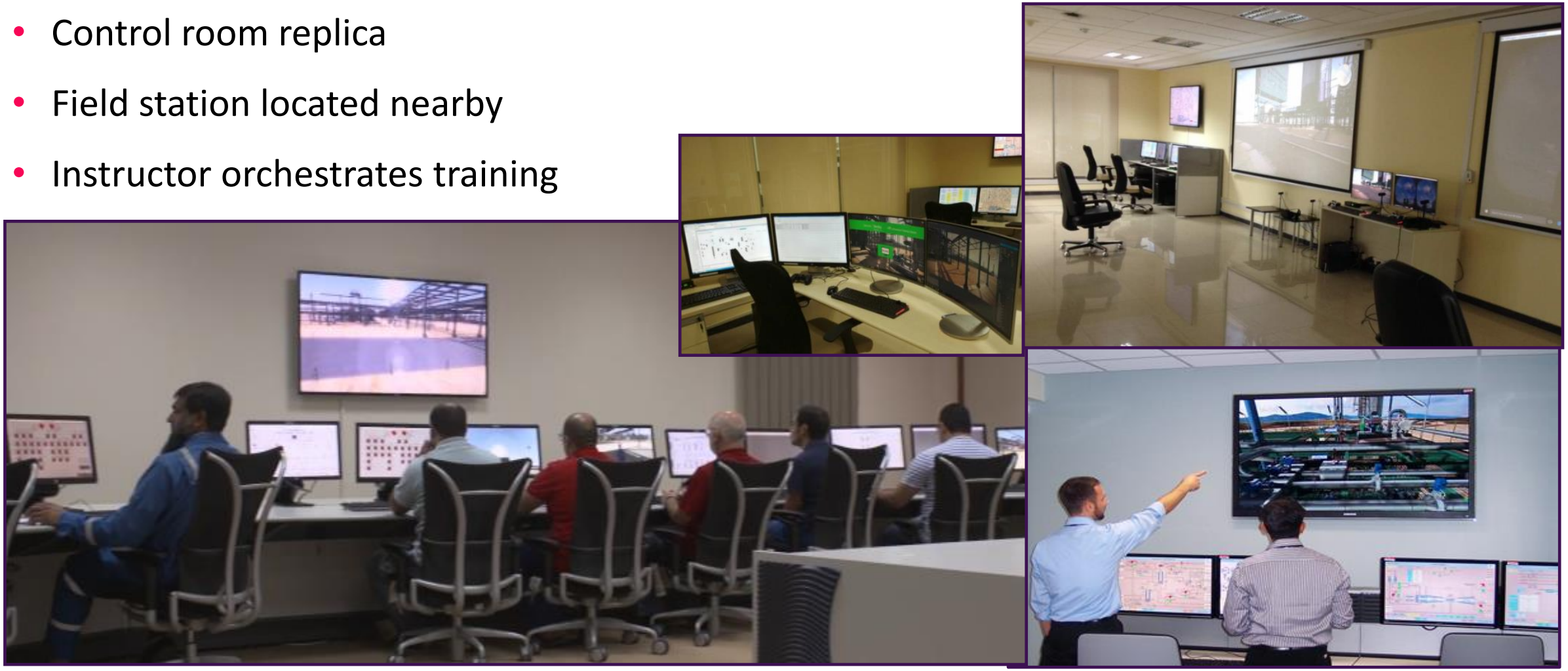
Instructor View
(videos are not synchronized)

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Control Room + Field Operators

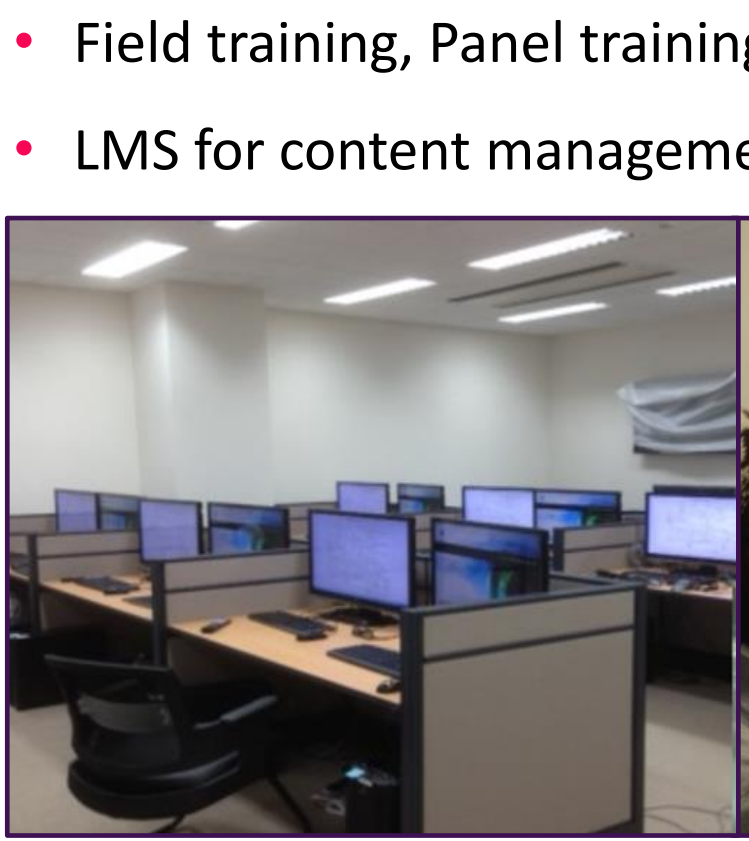
- Control room replica
- Field station located nearby
- Instructor orchestrates training

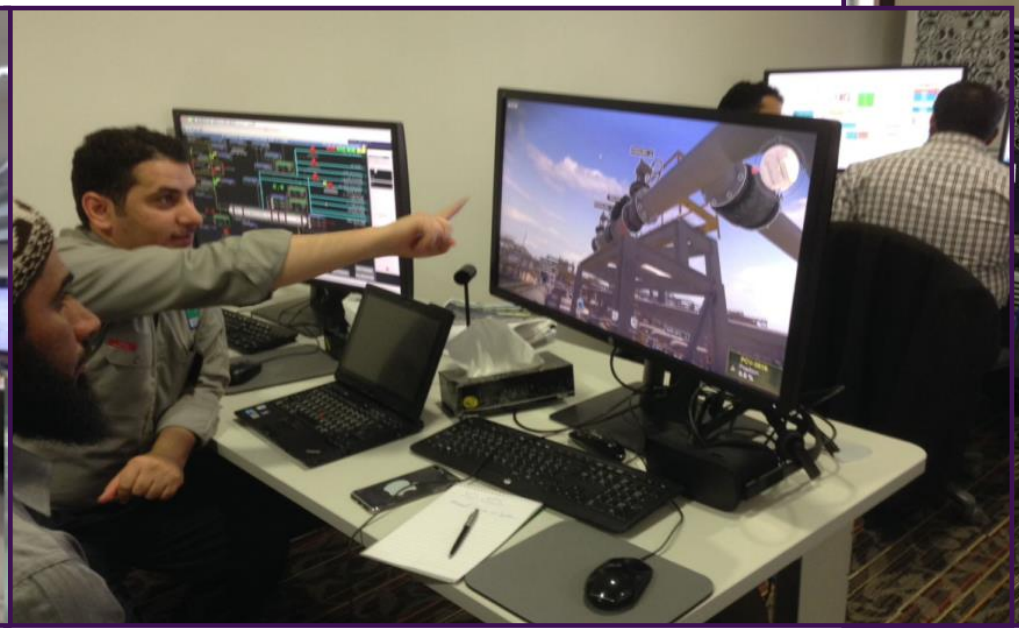


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Classroom Based Training

- Automated Self-learning scenarios or Instructor Led
- Field training, Panel training or both combined
- LMS for content management & assessment

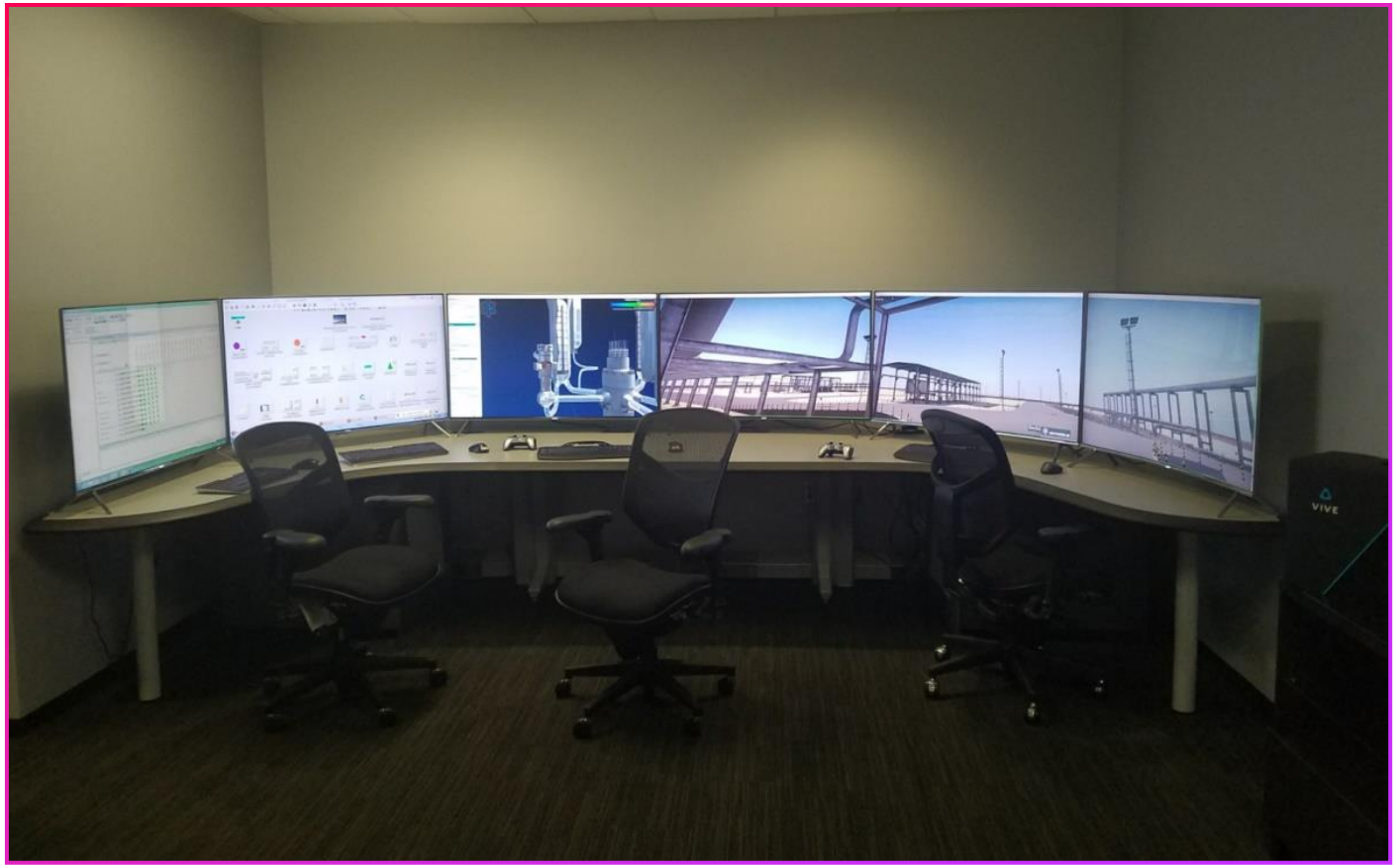






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Multi-screen







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Kiosk Training Systems

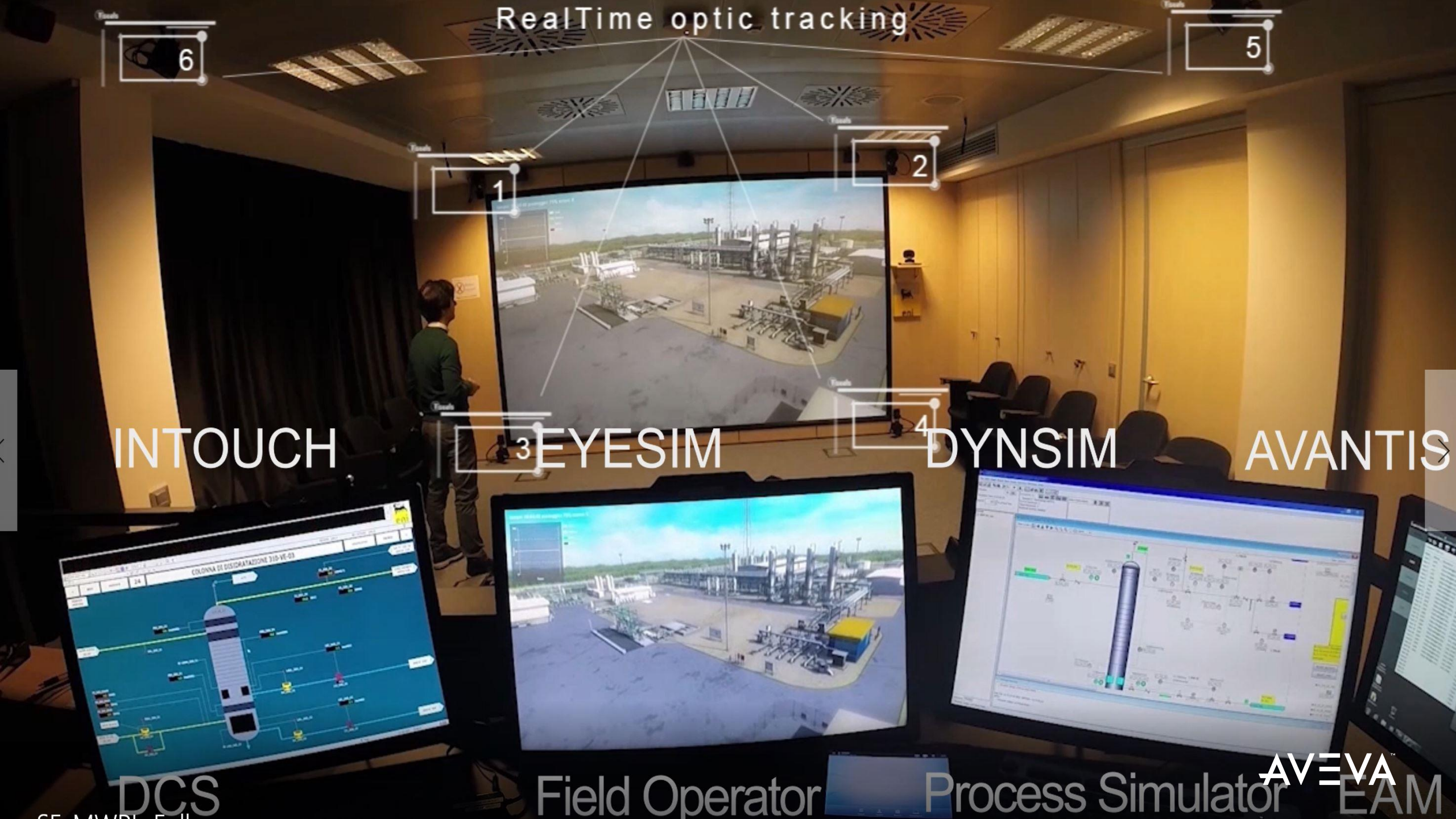
- Self contained units with ruggedized design
- Badge Identification for simple sign on



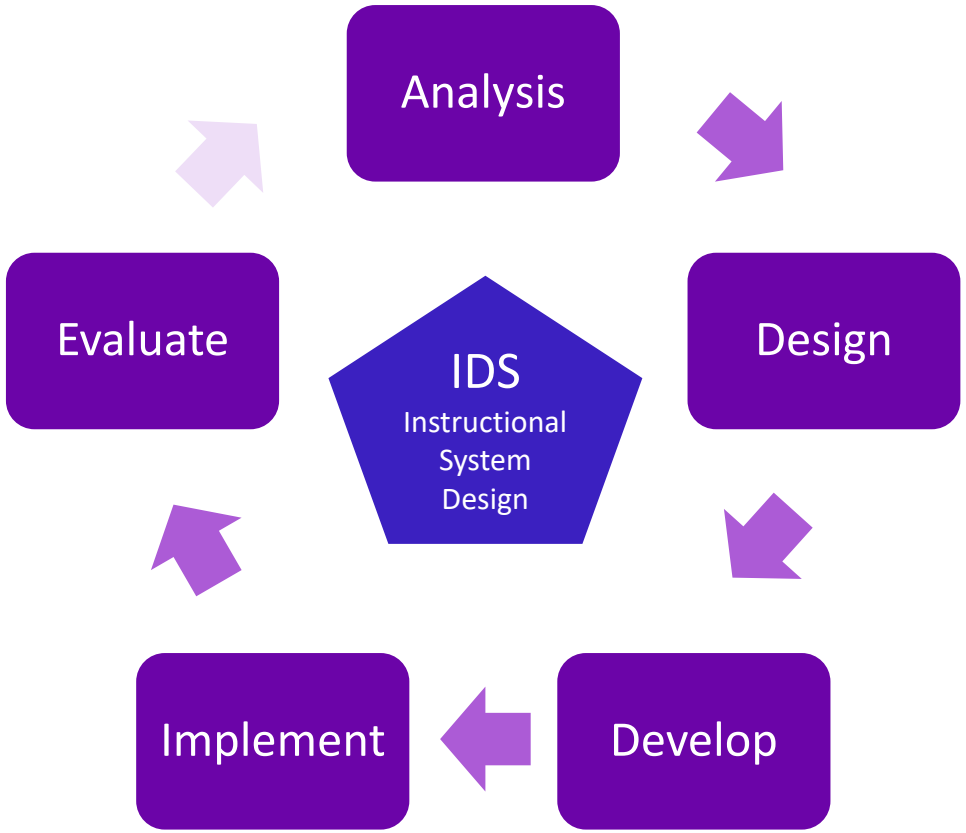




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RealTime optic tracking
6
5
1
2
3
4
INTOUCH
EYESIM
DYNSIM
AVANTIS
DCS
Field Operator
Process Simulator
EAM
AVEVA

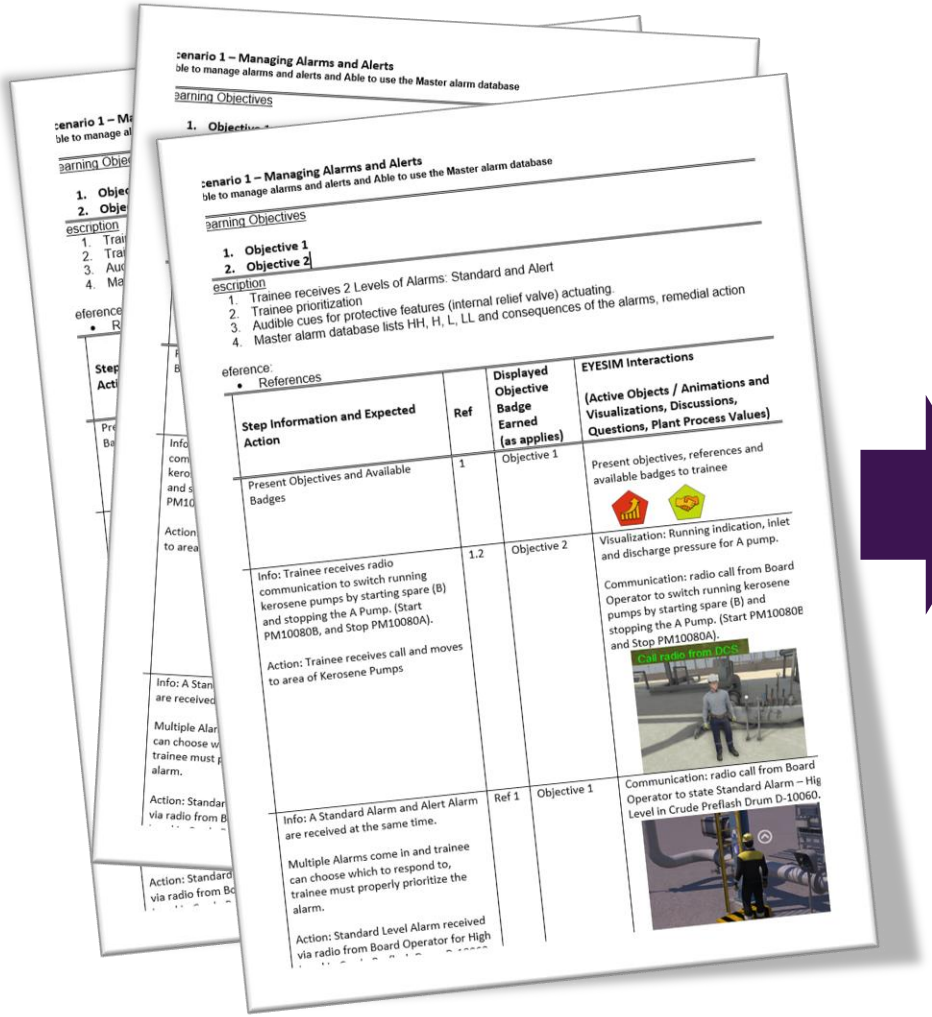
Training System Design





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Good “Training Design” leads to valuable training





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Safety and Behavioral Training is a new application of XR for Training

Cloud-based VR learning for all industrial personnel on AVEVA Unified Learning

- ✓ Situational awareness
- ✓ Managing abnormal situations
- ✓ Safe work planning and execution
- ✓ Proactive monitoring
- ✓ Managing instruments and alarms
- ✓ PPE
- ✓ Safety intervention and improvement

Goes beyond understanding and practicing the operating procedures:

- Ensures workers understand expectations and what to do when faced with particular challenges that may involve colleagues or even supervisors
- Assesses how people behave when faced with unexpected situations in the plant

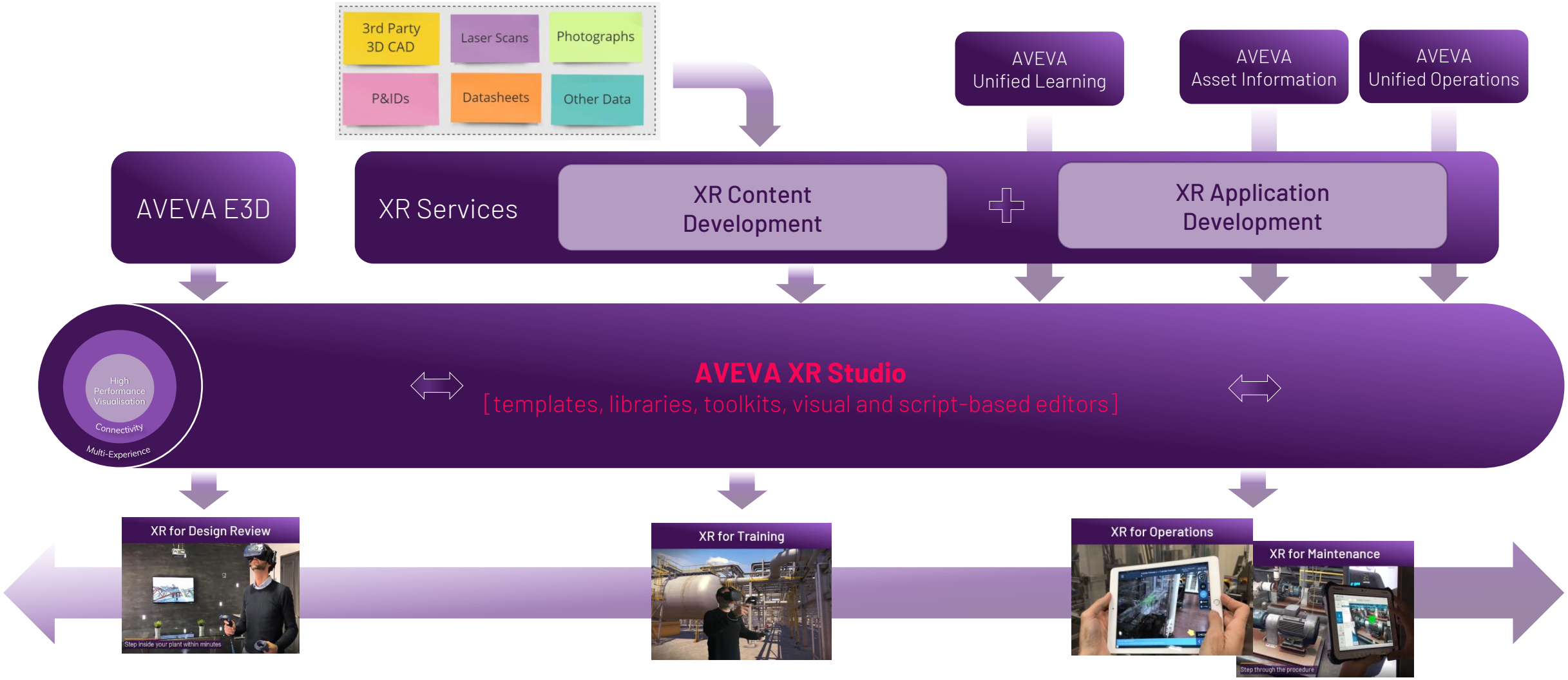
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How is an XR application created?

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Extending the value of the living digital twin



Workflow for XR Application Types



Prepare E3D Model → Import to XR Studio → Add XR Features [Optional] → Publish XR Runtime



Create Application Design → Prepare 3D Data → Create XR Content In DCC tool* (3D graphics/CGI) → Import to XR Studio → Add XR Features → Publish XR Runtime



Create Application Design → Prepare 3D Data → Create XR Content In DCC tool* (3D graphics/CGI) → Import to XR Studio → Add XR Features → Publish XR Runtime

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* DCC = Digital Content Creation tools such as Blender, 3D StudioMax and Maya

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XR Content Creation – Define the visual quality

Scalable Visual Quality: defined by the XR application type and customer requirements and budget

Level 0: CAD-Like



- Geometries taken directly from the 3D model
- Some enhancements via automated shaders and real-time lighting
- Background context added (Land/Sky/Sea)

Level 1: Realistic



- Some object optimization and grouping for application building
- Bulk texturing with generic textures and materials
- Occasional photo-real objects added

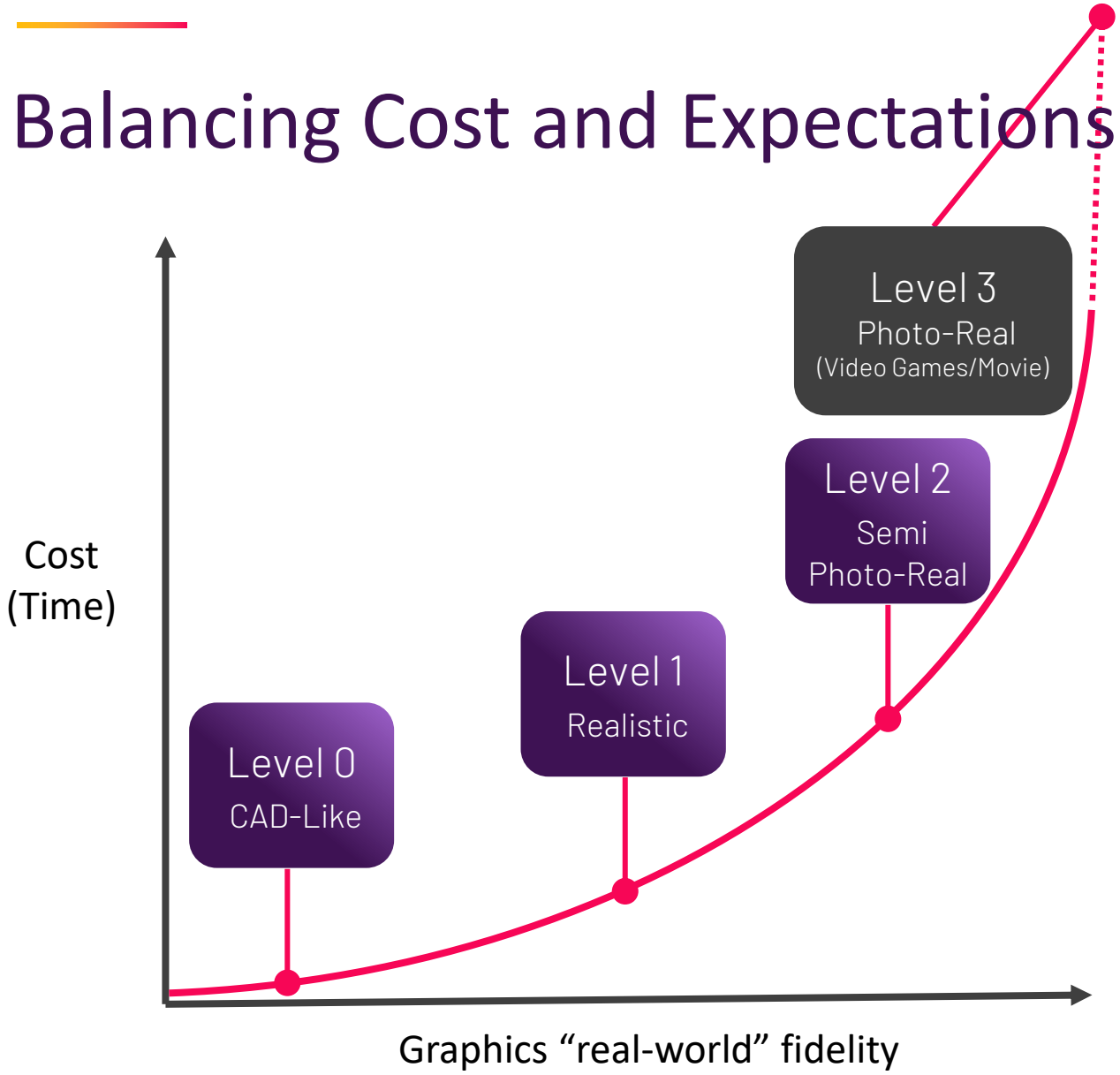
Level 2: Semi Photo-Real



- Highly optimized object structure for High Quality & High Performance
- Key elements created with photo-real appearance from photographs
- Accurate texturing with realistic shaders and materials wherever possible

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Balancing Cost and Expectations



Percentage of photo-real objects

Level 2 → Level 3

~20-30% ~80-100%



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How do you create XR Content?

#1 - Geometry

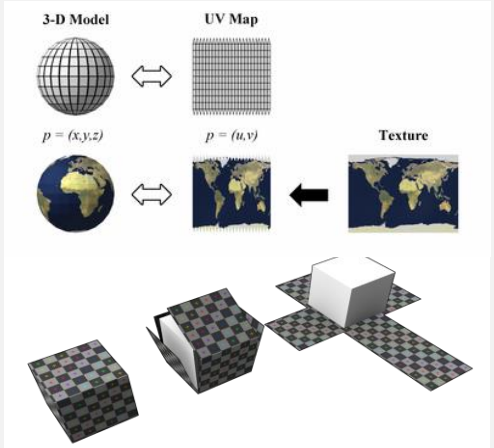
- Manage file import
- Optimize model structure and collate to logical groups
- Build missing geometry
- Reduce/Optimize unnecessary geometries





#2 – UV maps

- UV mapping is the process of projecting a 2D image on to a 3D geometry
- UV map allows a texture file to be assigned to the geometry



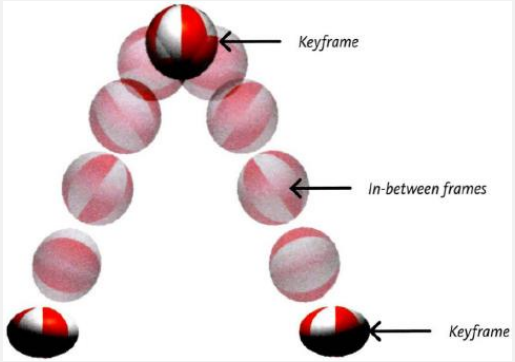
#3 - Materials

- Assign textures to the UV maps
- Assign Materials/Shaders to objects to simulate different types of real-life materials
- Increase the realism of the model



#4 - Animations

- Prepare the objects for any animations needed by the application
- Prepare the key frame characteristics and information ready for animation in XR Studio



#5 – Export XR Assets [FBX/MWX]

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How do you create XR Applications?

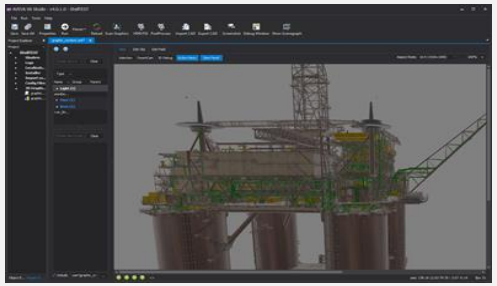
#1 – Select Template

- Decide application type and create a project with desired template:
  - Design Review
  - Training
  - Operations/Maintenance



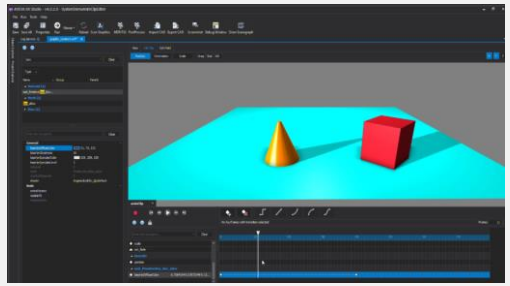
#2 – Import Assets

- Import XR Assets
  - Direct from E3D
  - Via a 3d Modeler tool
  - From XR libraries



#3 – Build Features

- Build the desired application functionality
- Develop via visual editing tools
- Develop using XML scripting tools



#4 – Publish Runtime

- Test the application
- Publish the XR Runtime in the form required for the Target Hardware



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What are we developing?

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Main themes for medium term XR development

XR Rendering & Engine

- Continue the work already underway to combine the best high-performance rendering technologies from AVEVA into a common componentized architecture to enable it to add value across the product portfolio.
- XR Renderer v.1 will combine ARF and NEKO with the first beneficiaries being XR Studio followed by Engage and 3DVS.
- Longer term adding LFM technologies and looking at multiple operating systems

XR Streaming and Deployment

- Develop how we Stream 3D real-time content both as whole applications and into windows within other applications.
- Review how we maximize 3rd party streaming services alongside WebRTC native investigations to achieve our business requirements.
- Review how we add audio/video streaming capabilities, and management of I/O.

XR File Format

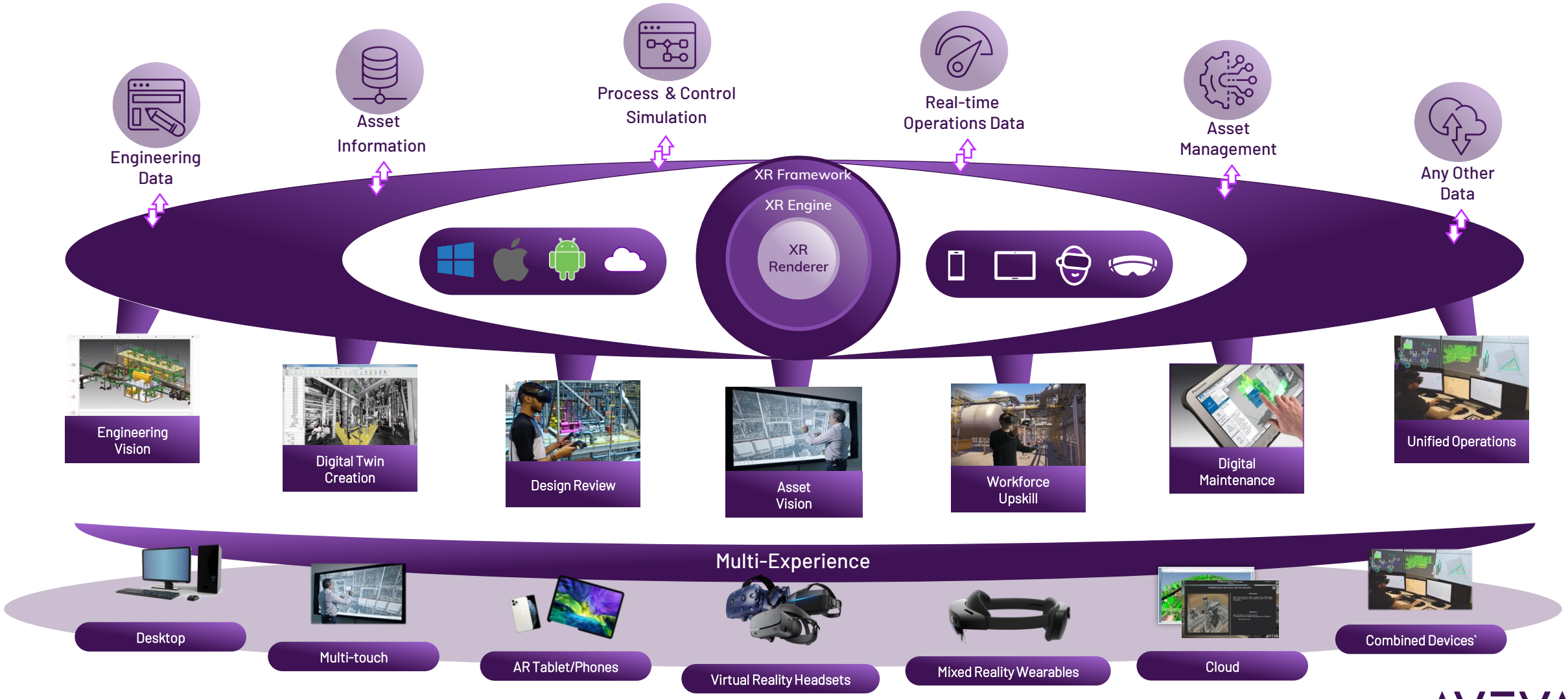
- Development around the AVEVA file format for high performance visualisation requirements to enable the different use case scenarios in a smarter way.
- Architect ready to consider different application needs for the streaming technologies of the future

XR Template Development

- The templates deliver the end customer solution and value from XR applications created in XR Studio.
- Significant development effort will be focused around the use case requirements for Design Review, Training, and Operational and Maintenance support applications.

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Unified Extended Reality and Visualisation



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Questions

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ABOUT AVEVA

AVEVA is a global leader in engineering and industrial software driving digital transformation across the entire asset and operational life cycle of capital-intensive industries.

The company's engineering, planning and operations, asset performance, and monitoring and control solutions deliver proven results to over 16,000 customers across the globe. Its customers are supported by the largest industrial software ecosystem, including 4,200 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 4,400 employees at 80 locations in over 40 countries.

aveva.com

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