AR/VR for Maintenance

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AR/VR for Maintenance

Scope & Agenda

Scope of the slides:

- Present current applications and ideas for future use-cases for Augmented / Virtual Reality for maintenance at the ESO Observatories.

Agenda:

- Current Applications & Prototyping

- Future Use-Cases

- Conclusion

Current Applications of AR/VR

Several areas of prototyping & active applications

Current active applications of AR/VR:

- Planning of installation activities for major components of the ELT

Current prototyping:

- Photo-realistic digital twin, for placement of equipment in the facilities

- Comparison as-built with as-designed for facilities
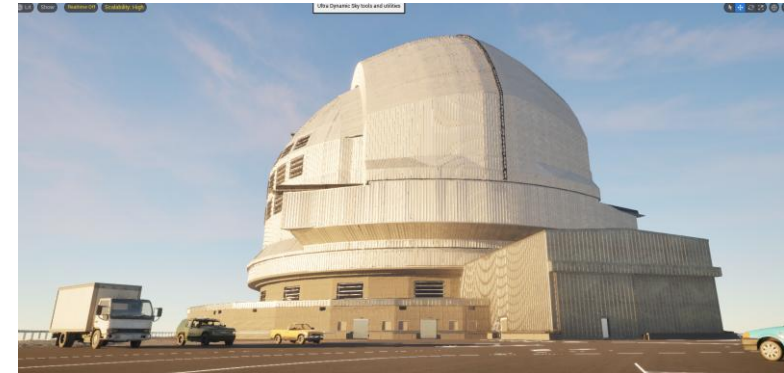
Current Applications of AR/VR

Planning of installation activities for major components of the ELT with VR

Use-Case:

A huge number of procedures need to be developed, and people trained in the installation & maintenance procedures:

- M1 Segments Exchange
- M2 Cell integration
- M5 integration
- M3 integration

VR tools would greatly help on the development of these procedures, and then for the training on their realization.

Current Prototyping of AR/VR

Photo-realistic digital twin, for placement of equipment in the facilities

Use-Case:
Desktop-application with a Panorama-Tool.
Includes a co-registration of the REVIT model of the facility.
Allows to place equipment into the facility,
(virtually) walk around,
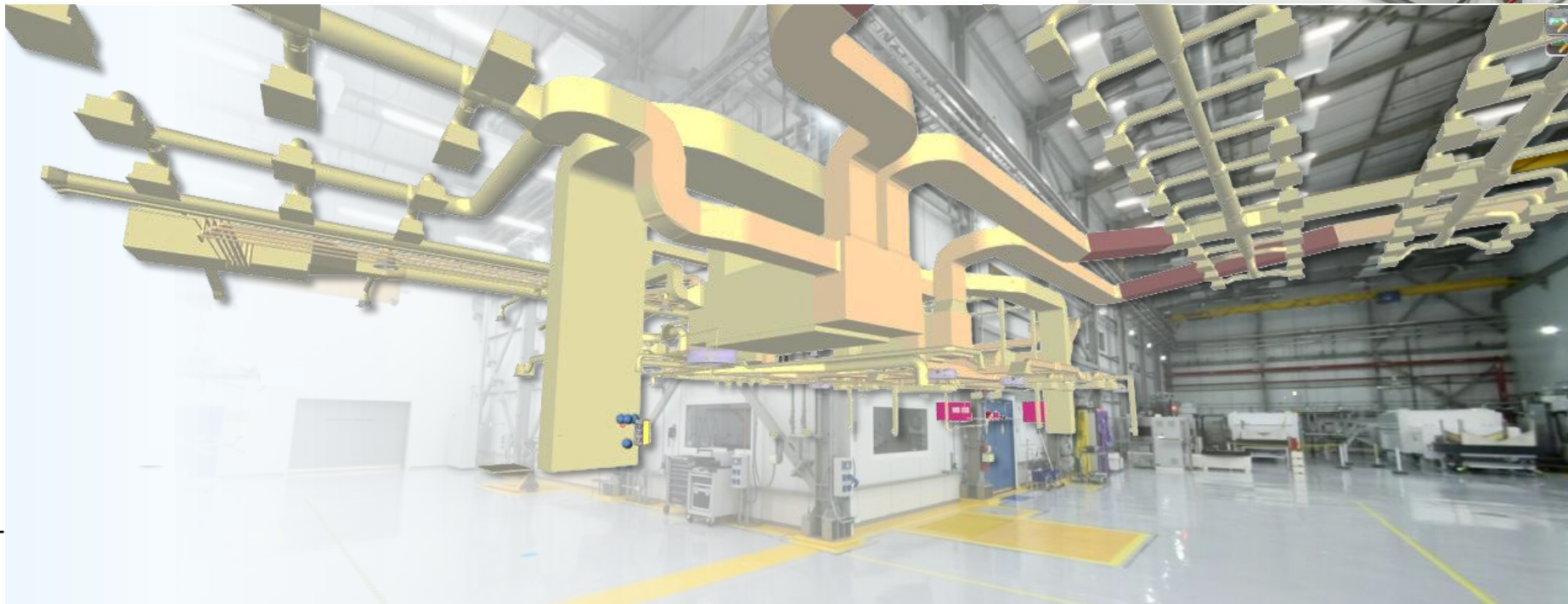and check that also with the current configuration the new equipment will fit.
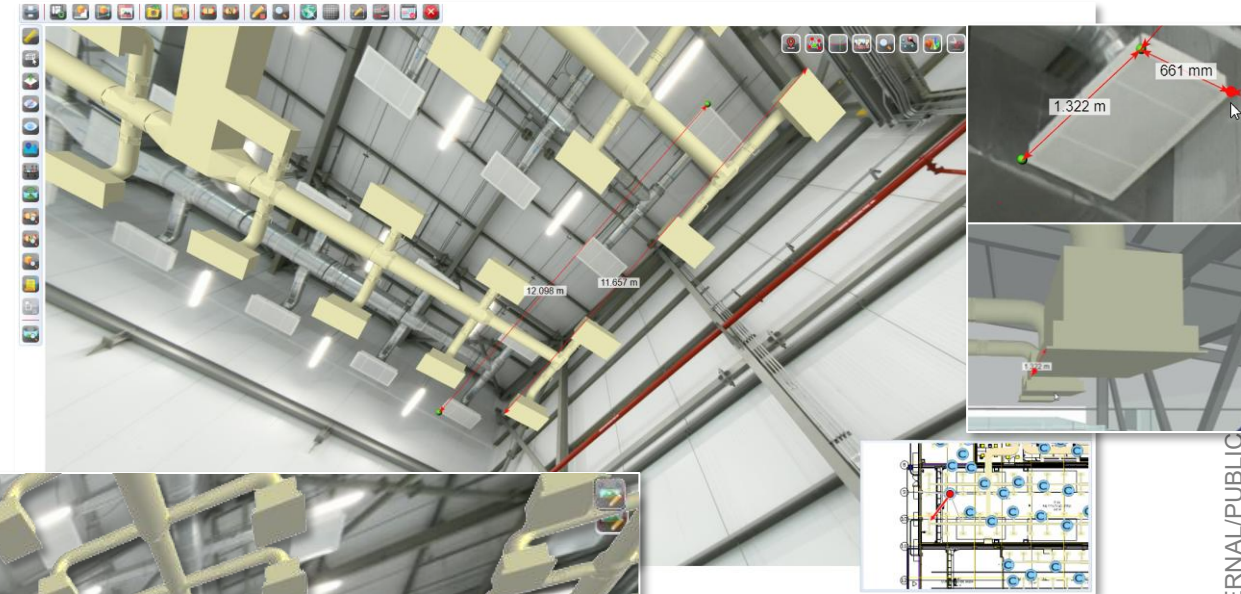
Current Prototyping of AR/VR

Comparison as-built with as-designed

Use-Case:

Desktop application to overlay the REVIT model with the panorama images.

Allows to take measurements on the panorama images and compare the as-built (panorama images) with the as-designed (REVIT).

Future Use-Cases for AR/VR

Some challenges & future ideas of usage of AR/VR

Possible future use-cases, which could be investigated for their applicability & usefulness at ESO:
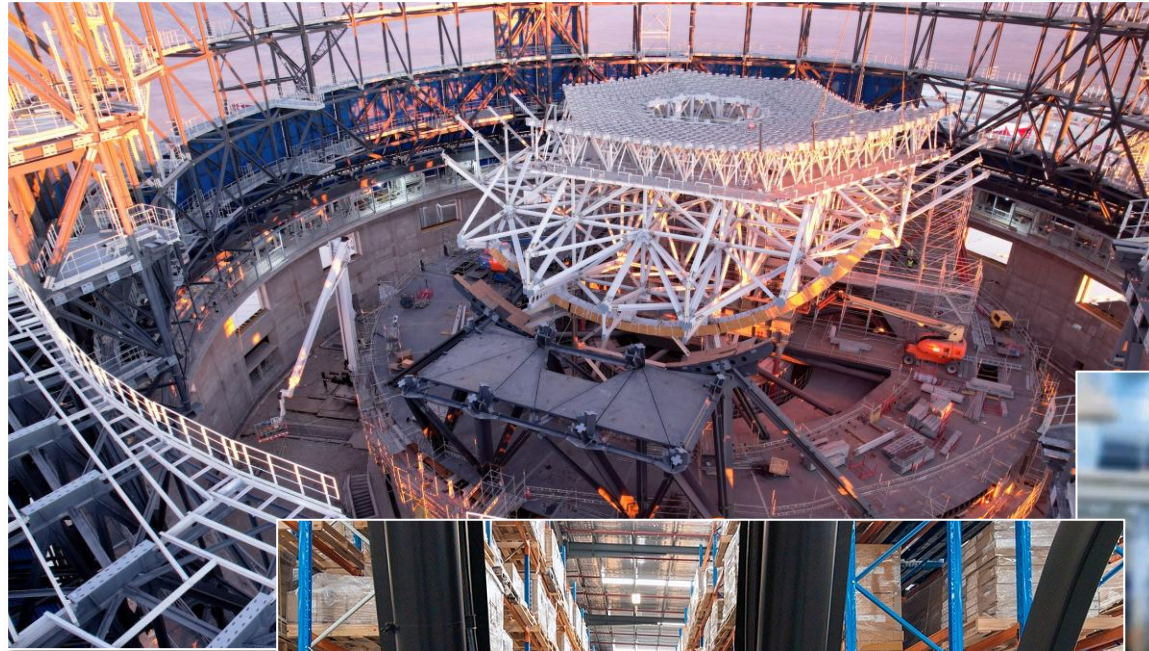
- Navigation to relevant location for maintenance.

- Comparison of as-designed with as-built in the field, with support by AR.

- Support to maintenance with AR to illustrate maintenance steps.

- Display of real-time machine parameters in the field.

Future Use-Cases for AR/VR
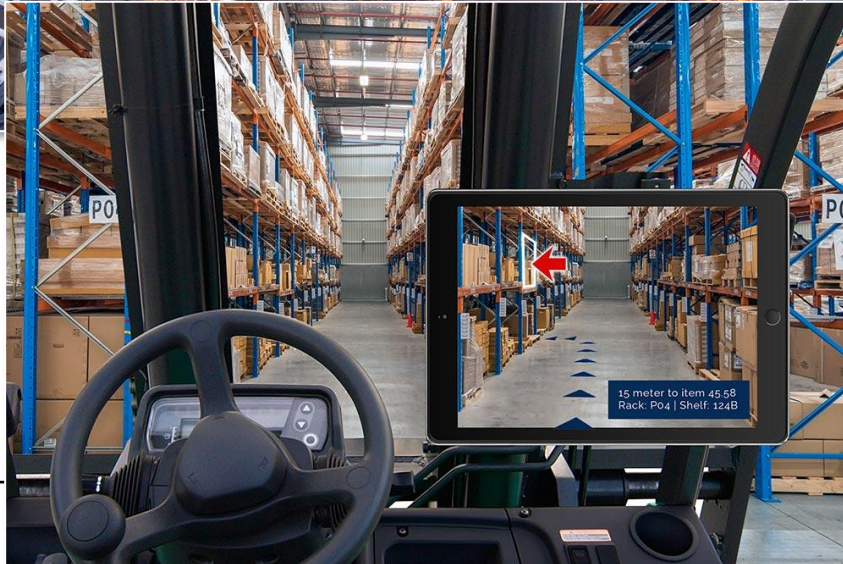
Navigation to relevant location for maintenance

Problem:
The ELT will be huge!
And it will be a maze…

Use-Case:
An indoor navigation system,
with support by AR will be extremely
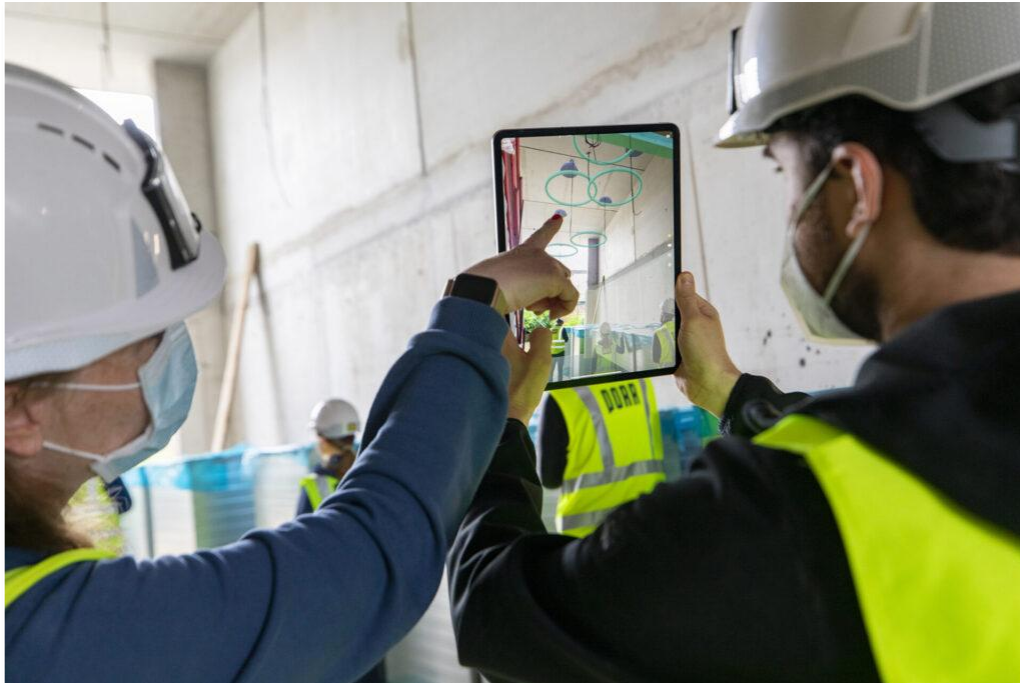useful to guide the technicians to the
maintenance / storage location.

Future Use-Cases for AR/VR

Comparison of as-designed with as-built, with support by AR

Problem:
Construction will be done by several companies.
→ Need to ensure that as-built information is available and can be shared among companies.

Use-Case:
A portable solution, supported by AR, to compare as-built with as-designed in the field and to communicate any discrepancies will be useful.

Data Classification: ESO CO

Future Use-Cases for AR/VR

Support to maintenance with AR to illustrate maintenance steps

Problem:
Maintenance of some components is required only every few years, and/or might be done by different colleagues, requiring very solid instructions.

Use-Case:
Provide detailed maintenance instructions (incl. support with AR) for the technicians in the field. This should include the step-by-step instructions, documentation of the as-run procedure, annotations, any issues, possible proposals for procedural improvements.

Future Use-Cases for AR/VR

Display of real-time machine parameters in the field

Problem:
Many analog sensors are being replaced by connected digital sensors without a display.
For maintenance in the field, an easy access to the current sensor readings will be required.

Use Case:
Provide a tablet application with AR and connection to the sensor real-time database, to display the current readings of the sensors on the tablet for the technicians in the field.

Data Classification: ESO CONFIDENTI

Future Use-Cases for AR/VR

Conclusions and possible next steps

- There are many ideas and possible applications of AR/VR to maintenance at the ESO Observatories.

- Current limitations, as discovered during first Proof-of-Concept projects:

  - Photorealistic digital twin has a great potential for usage at ESO.

  - AR glasses found to be not very useful in the field.

  - Significant investment in setting up the IT & data infrastructure, connecting the tools and preparing the data (asset / location / sensor metadata) is required.

- Support for setting up & further testing of these tools & applications at ESO would be beneficial:

  - Setting up the data infrastructure and integration of the tools / databases.

  - Testing applications in the field and evaluate cost-benefits.

Thank you!

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