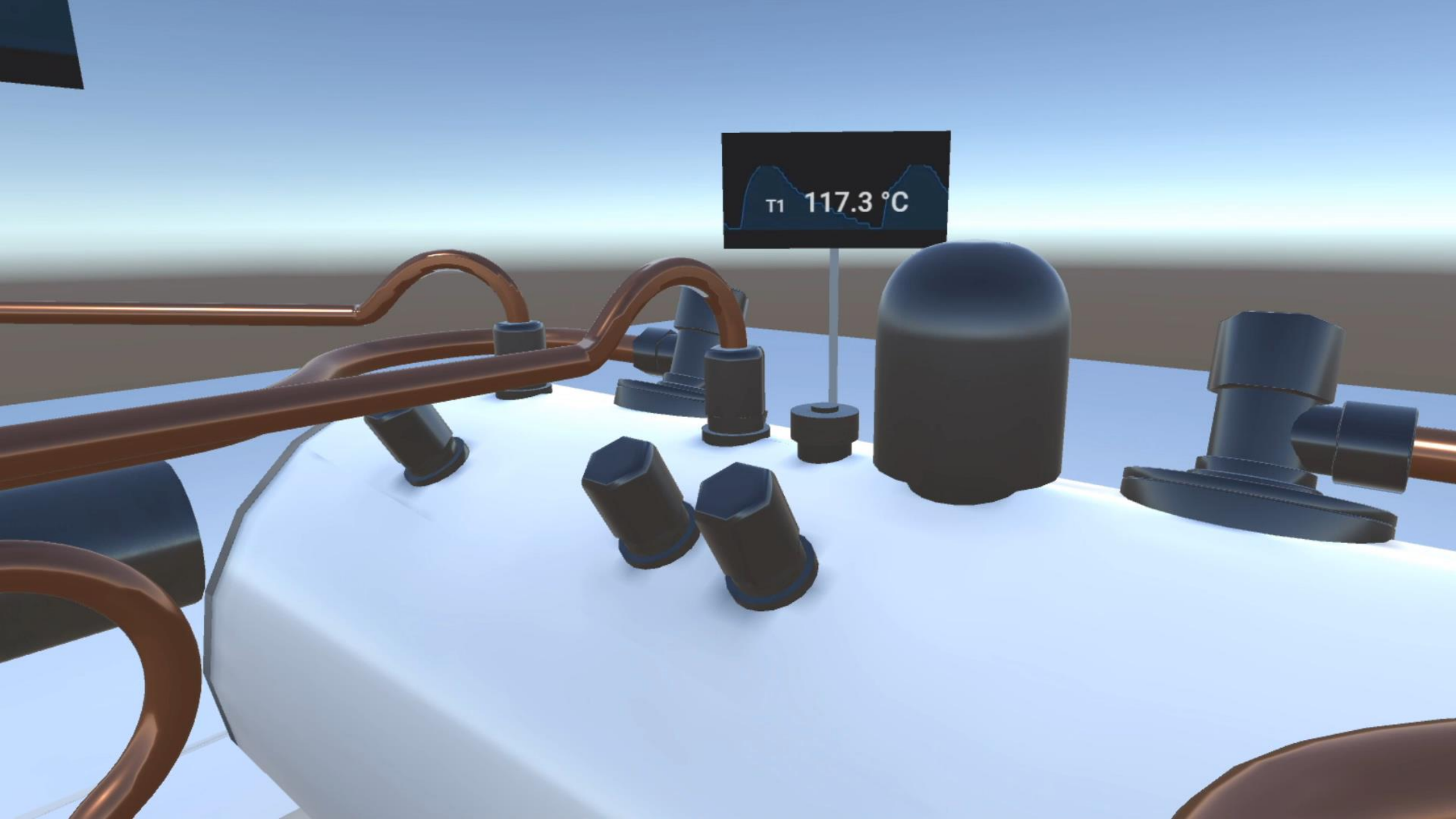
Stretching the value chain from IoT to Digital Twins

Research Director Dr. Tomas Eric Nordlander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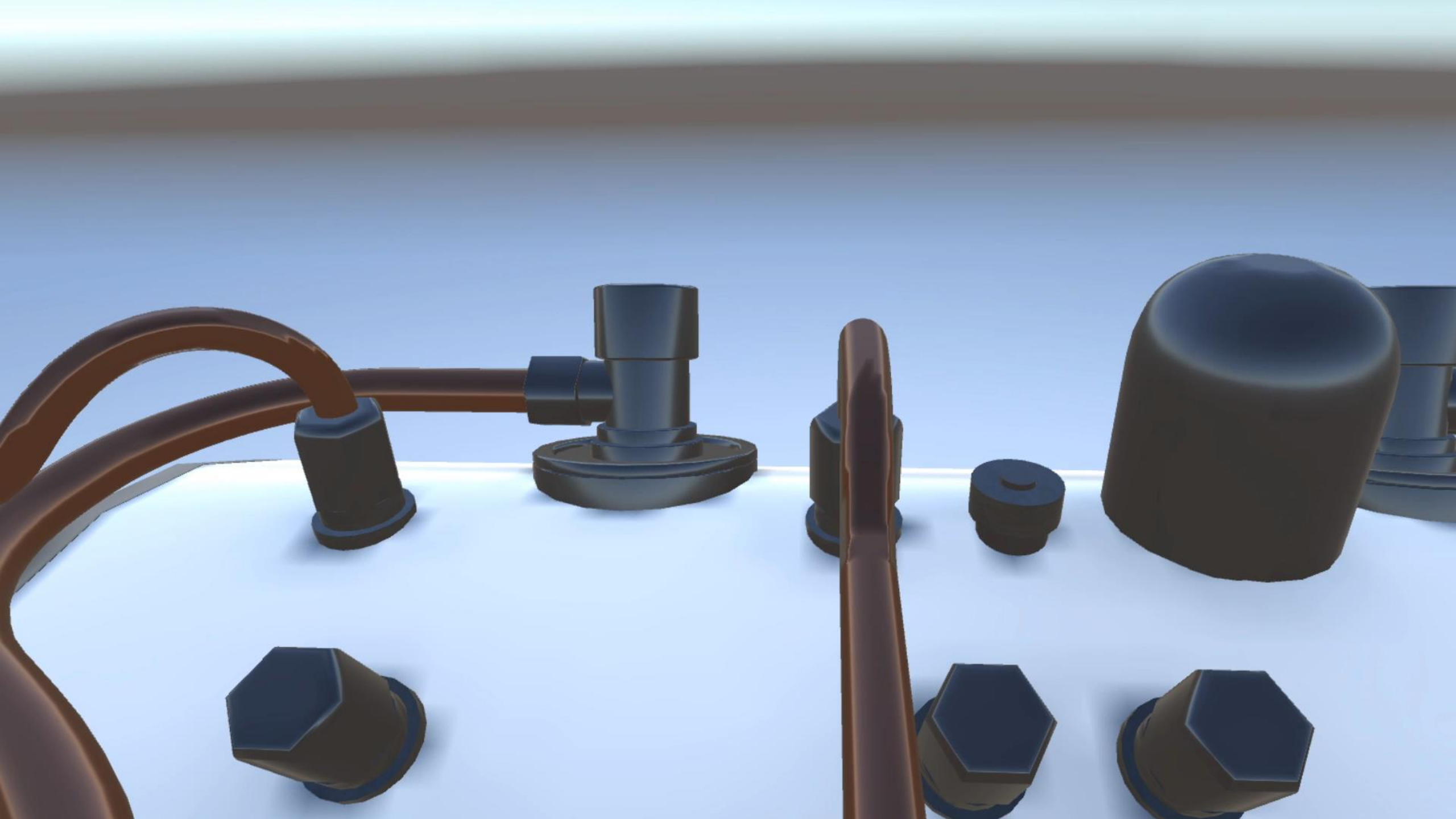


WEGA

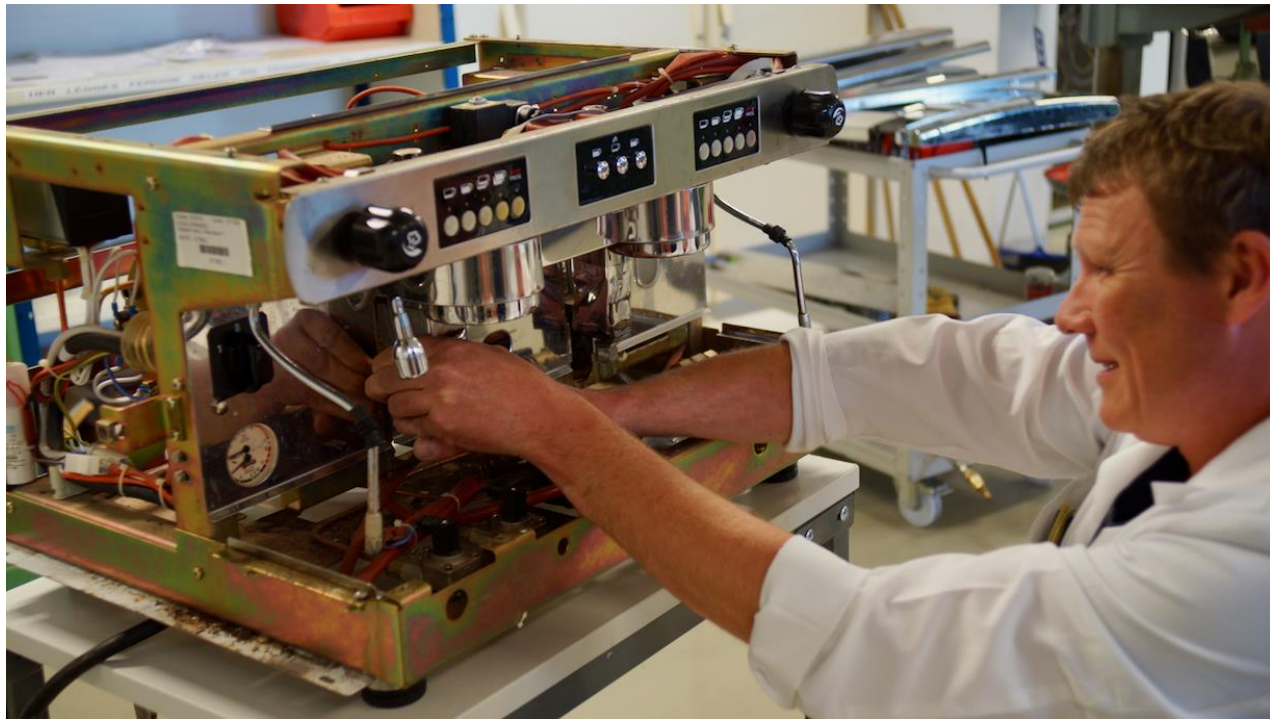
Research Vehicle

- Allow us to show our IoT, AI, VR, AR and Digital twin capabilities on, for many, a understandable process
- 8 Departments at IFE
- Internal project
  - Dig Espresso Twin

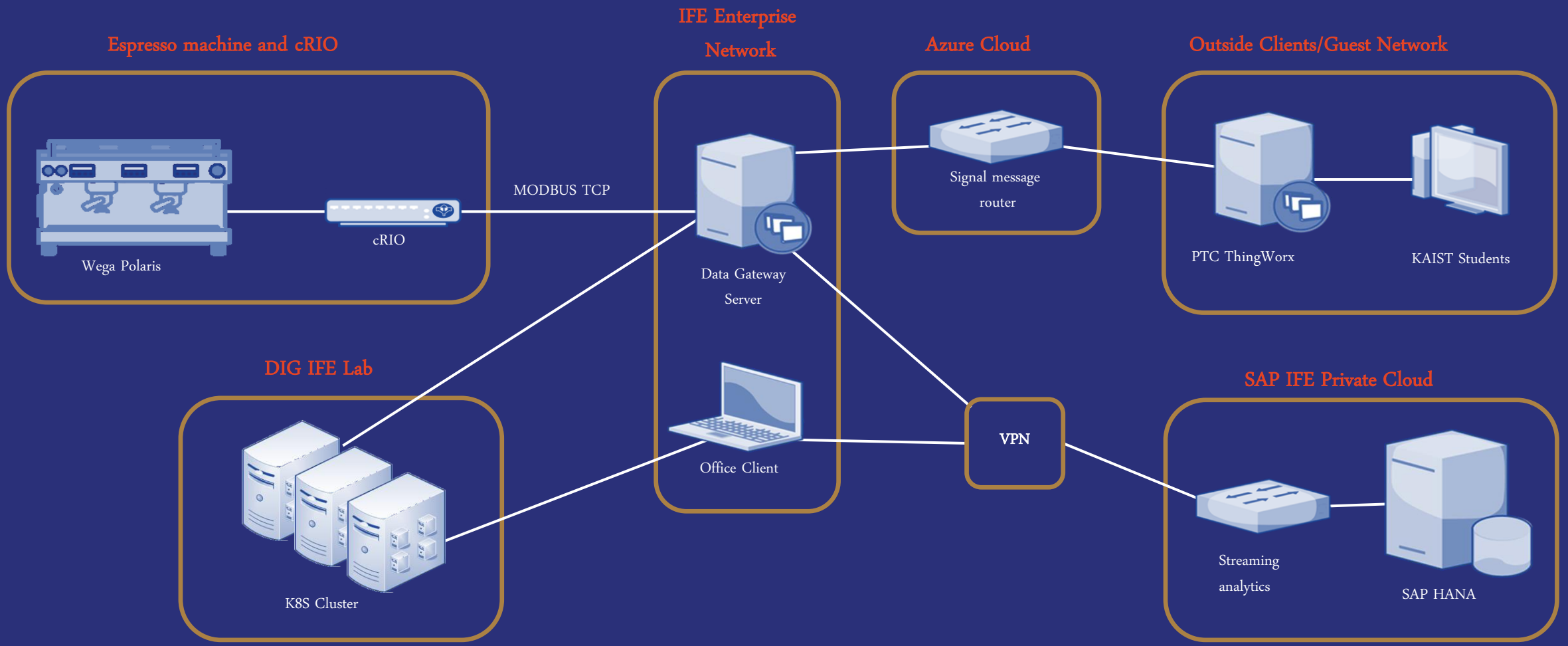
IoT

IFE Sensor lab

- Long experience of sensors in the nuclear industry
- Filled the machine with sensors
- Probably the most sensor equipped espresso machine in the world



From IoT to Big Data to allow real-time analytics



35 years of AI

V.C. Summer Nuclear Station
USA

Fault Diagnosis through Transient Classification using recurrent neural networks VC Summer Nuclear Power Plant in the USA (2002)

A large Oil and Gas company

Analysis and prognostics Calculate technical index and remaining useful life for process equipment

ConocoPhillips
Norway

Neural Network to Estimation of NOx emission of gas turbines on offshore platforms ConocoPhillips Norway (2009)

Loviisa Nuclear Power Plant
Finland

Fault identification ability of physical models Fortum - Loviisa Nuclear Power Plant in Finland (2000)

Orskarshamn Nuclear Power Plant Sweden

Feed Water Flow, Use of AI-model, Detect 3 kg/s drift, Safety margin, ±3.5 MNOK/y income recovery (2000)

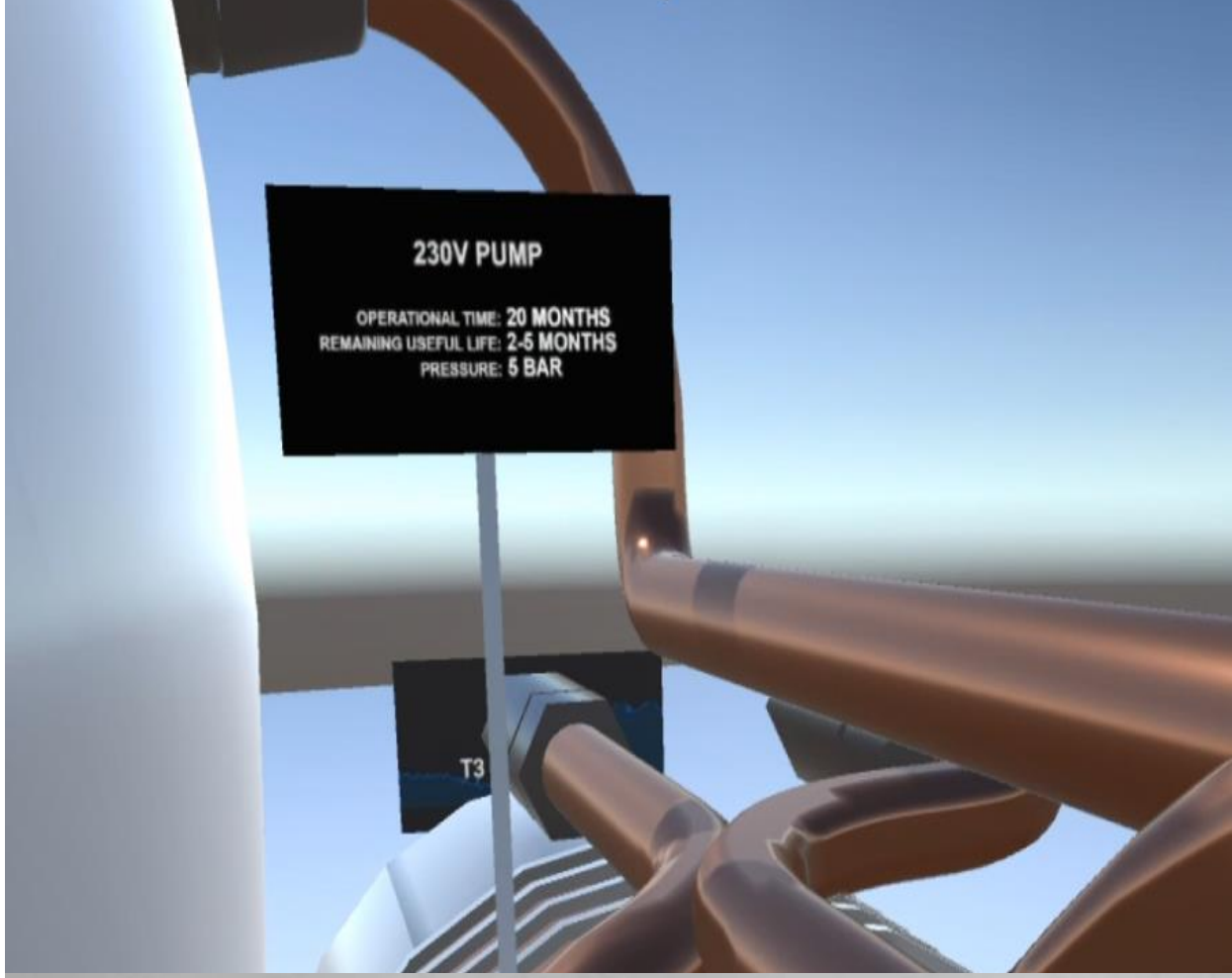
Kjeller Nuclear Reaktor
Norway

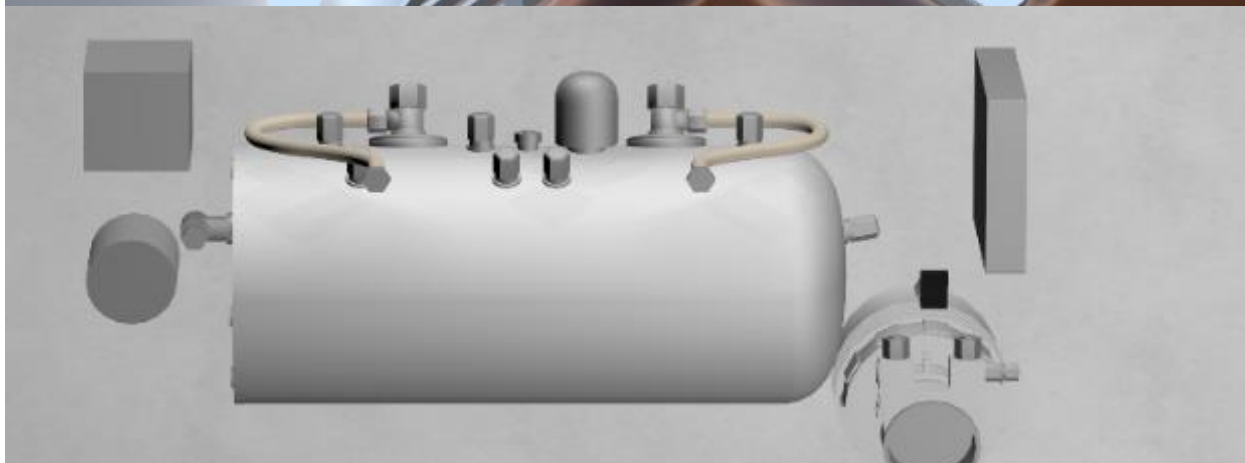
Remaining Useful Life estimation of air filters (2013)

AI showcase

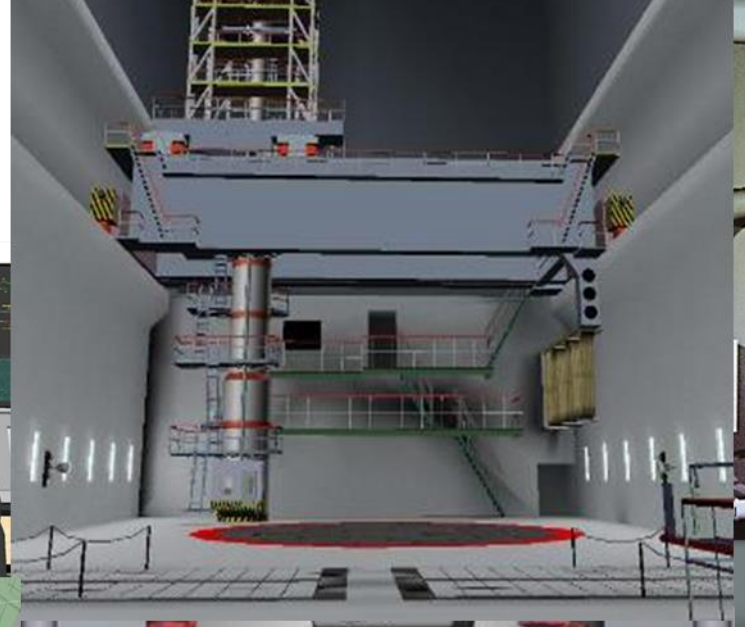
- Condition Based Monitoring
  - Remaining Useful Life estimation
  - Predictive maintenance

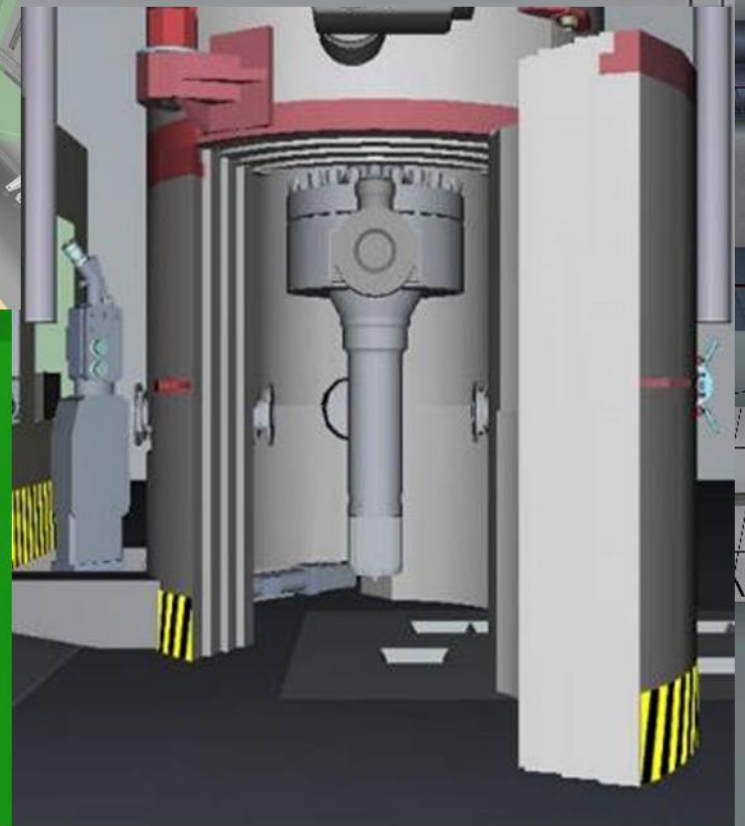
- On
  - Pump
  - Boiler
  - Pipes

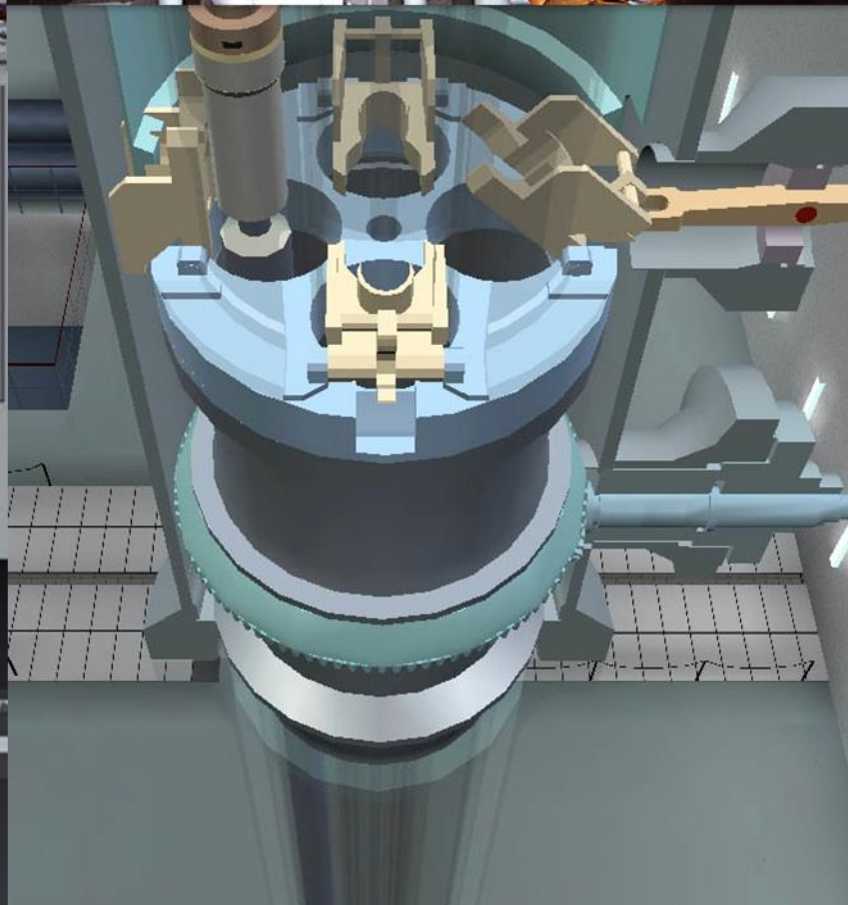




23 Years of VR & AR







VR and AR Showcase

- Augumented Reality
  - Show sensor data in realtime
  - Maintenence information
- Virtual Reality
  - allow us a powerful interface to a digital twin

35 Years of Digital Twin

1983

2010

2018

Digital Twin Showcase

- a platform for modelling and optimising complex processes
- not only mirror a real system but also enable fast-than-realtime simulation of alternative futures
- Enable user to adjust parameters and evaluate consequences of potential optimisations

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