

Next generation detector operations with augmented reality

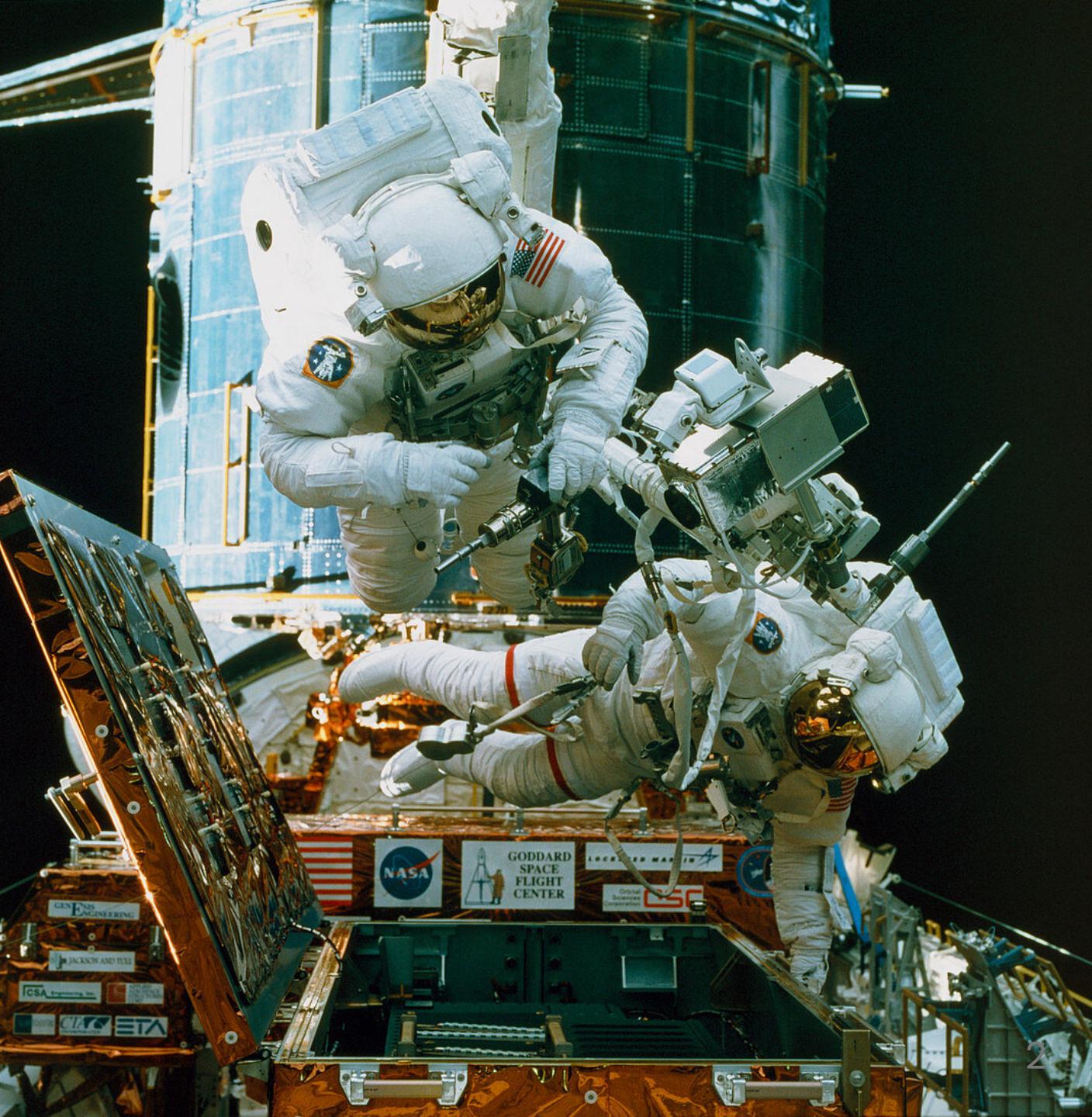
Lorenz Gärtner (LMU) on behalf of
Thomas Kuhr (LMU), Stephan Paul (TUM),
Hans-Günther Moser (MPP), Jochen Kuhn (LMU),
Christian Ailg (VR-Lab)



How to get things fixed?

Does it move?

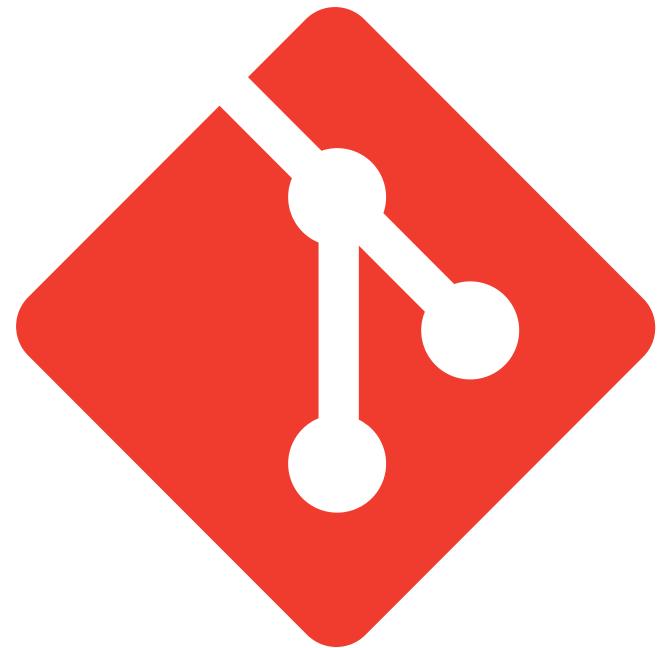
- Yes → send to expert
- No → get expert



For software



LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN

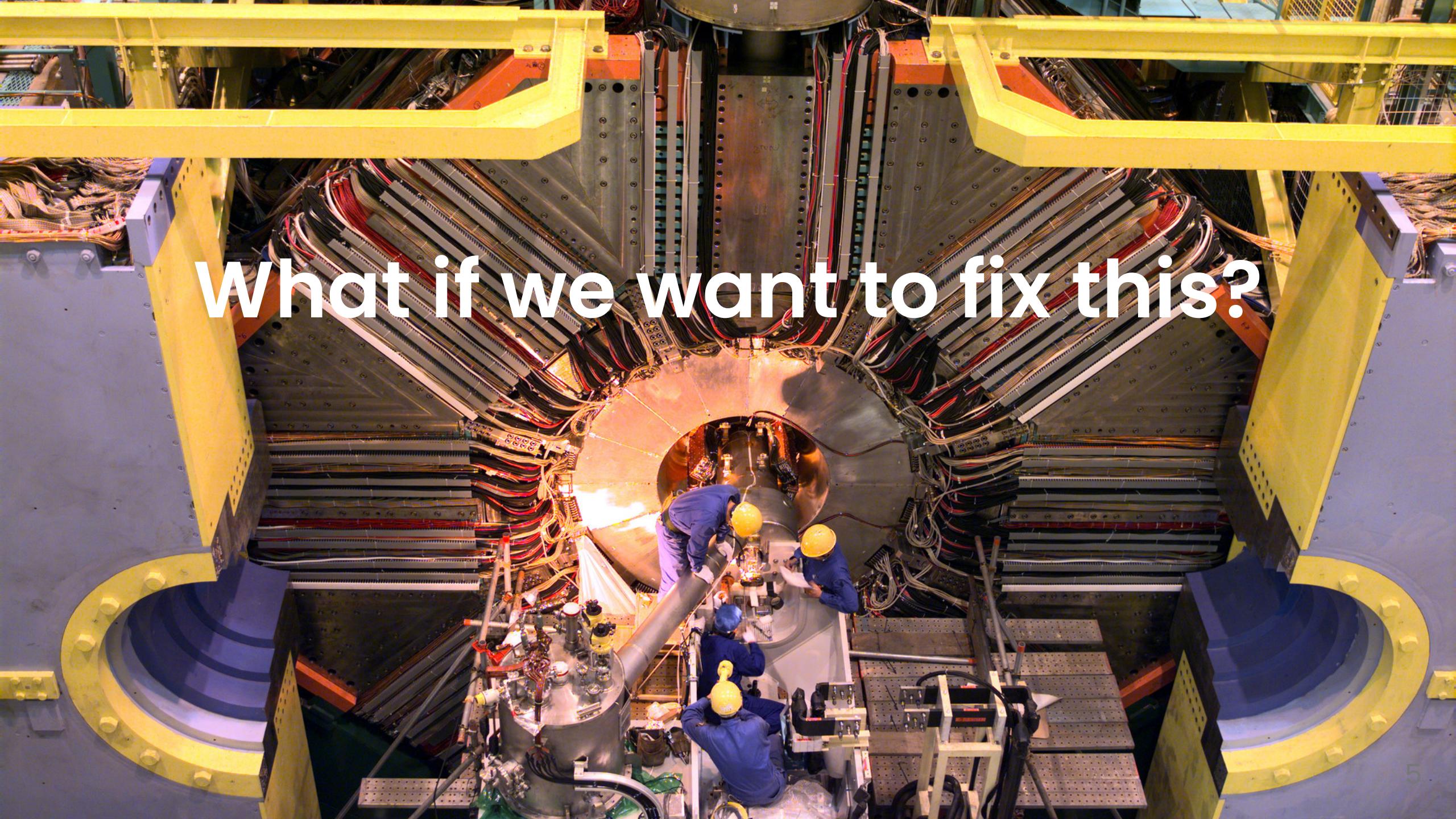


git

+ remotes

... or just screen-share





What if we want to fix this?

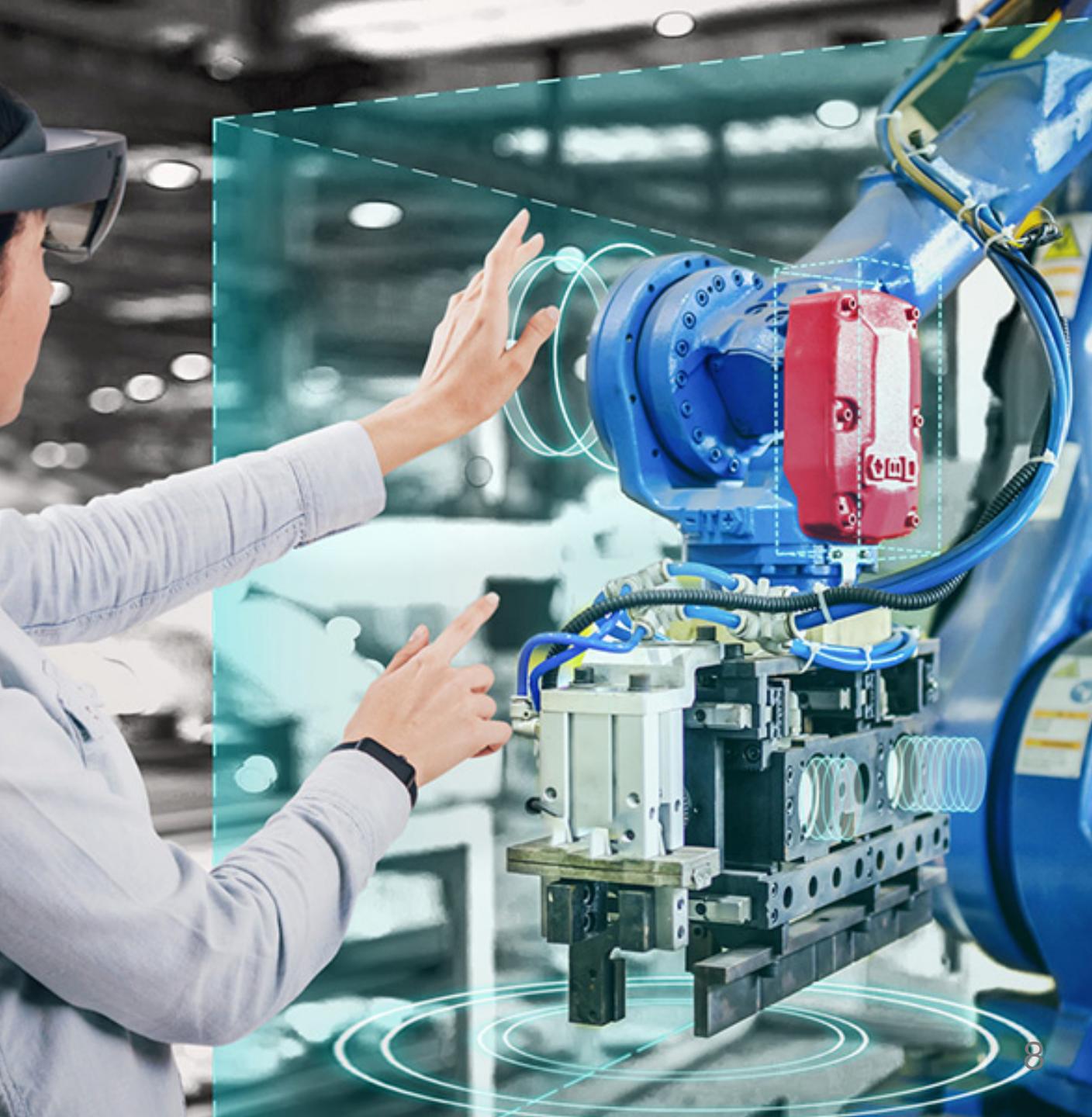


So far ...

- Bring experts to site – **high cost**
- Communication with experts via text / audio – **low quality**

AR approach

Enhance quality of communication with off-site experts



Benefits

- Live audio-visual communication
 - Hands-free work for on-site worker
 - Experts can point/ draw
- + Efficiency
- + Speed
- + Fewer errors





Fermilab – CERN
A successful use case

Cost

- Trimble XR10 with HoloLens 2
- Experts on-site
 - large travel cost
 - massive environmental impact
 - very time consuming



Scalability

If technology meets the needs for remote assistance...

- AR technology is readily available.
- CERN experiments can directly benefit from Belle II test case.



Summary

- Remote repairs using AR
 - Already widely used in science & industry
 - Potential for massive reduction in cost and environmental impact
- ✓ More efficient and reliable detector operation
- ✓ Improved data in particle physics

Budget plan

Total budget needs	
Trimble XR10 with HoloLens2	5400€
Student assistan (9 months)	4500€
Software liscences	800€
Total	10700€

