LEVERAGING MBSE FOR EQUIPMENT DIAGNOSTICS

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Powered by industry, academia and TNO

ASML TNO ESI

INTRODUCTION ROUND

- Who works at a high-tech equipment manufacturer?
- Who has hands-on experience diagnosing high-tech equipment?
- Who considers the diagnosis of their systems to be challenging?
- Who thinks that availability of their equipment is business critical?

Please raise hands!

EVERYTHING IS BIGGER IN THE WORLD OF EUV

100,000 parts, 40,000 bolts, and 3000 cables

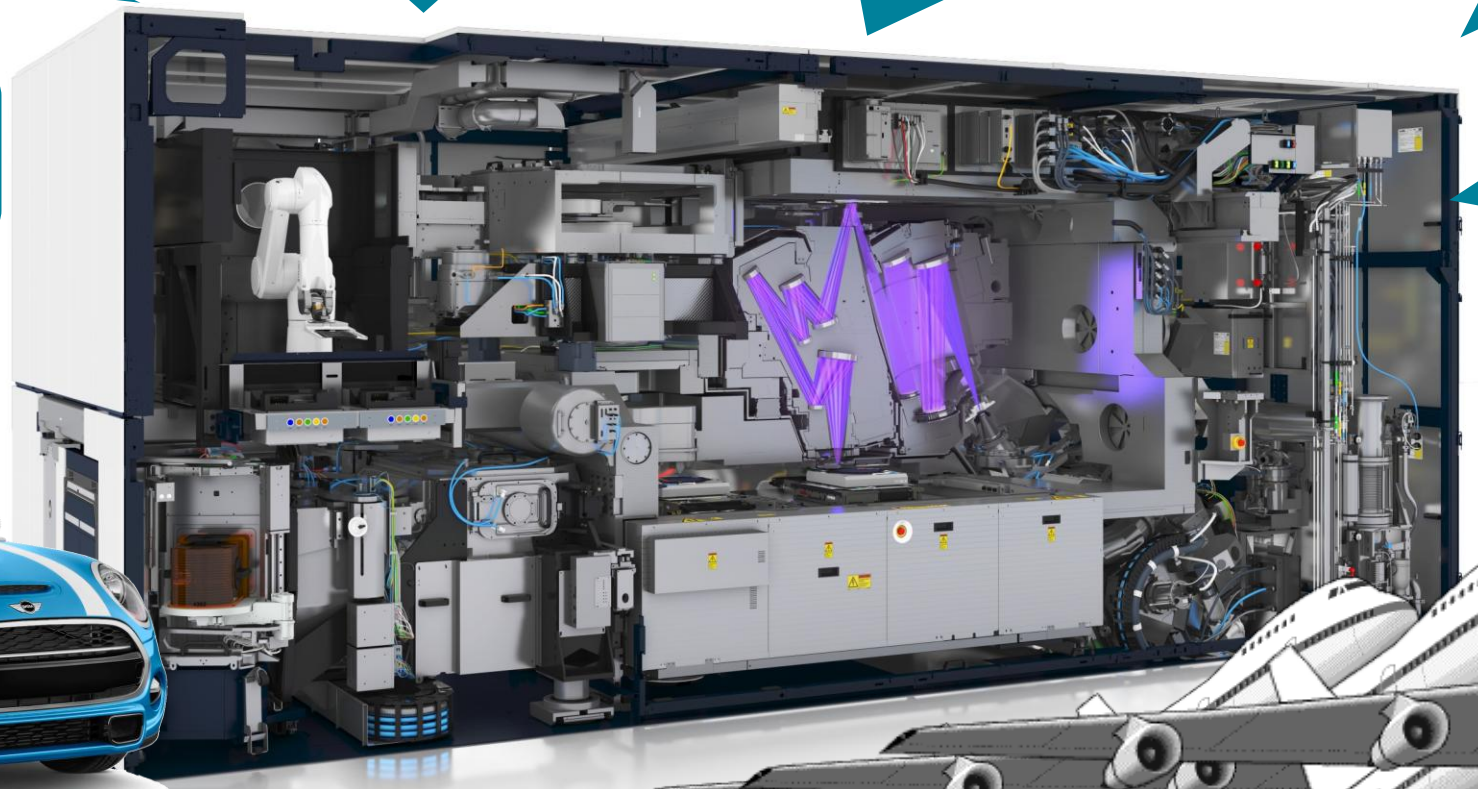
20 years of R&D

Transported by 3 fully loaded 747s

Contains 1,500 sensors

Weighs 180,000 kilograms

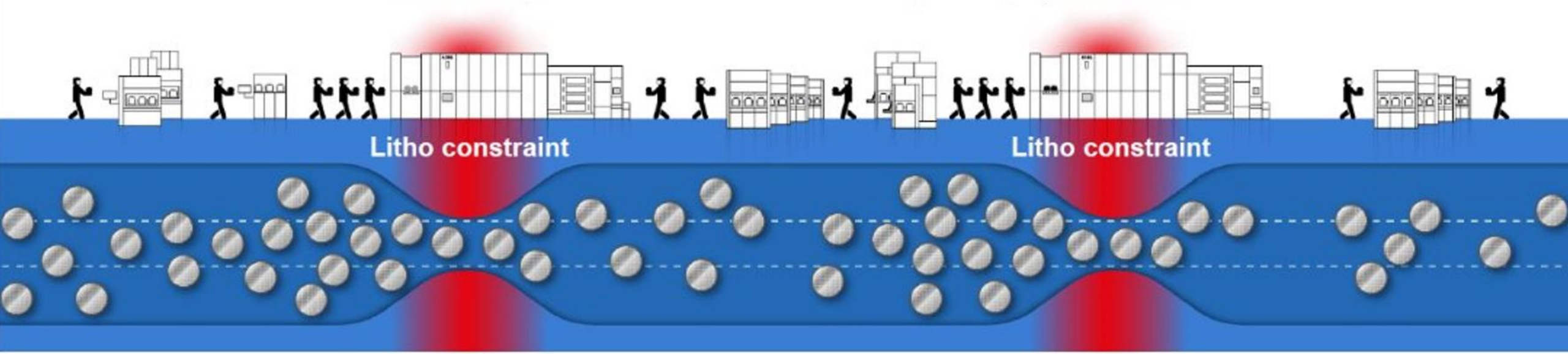
That's 140 Mini Coopers!



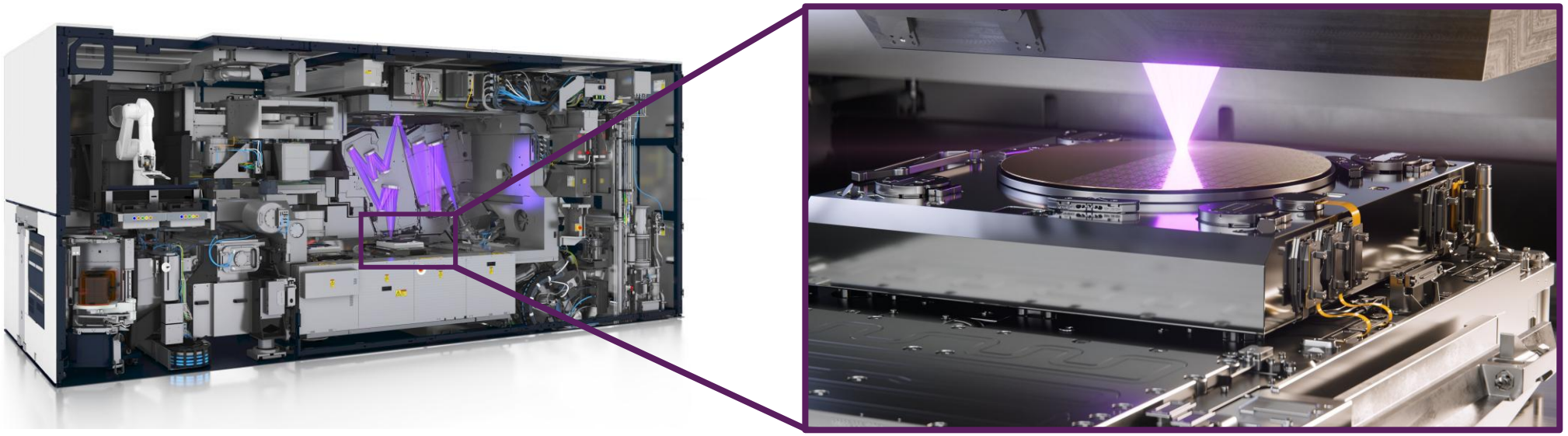
Generates 4.5 TB of data per day

That's 45 km of A4 pages!

CUSTOMER FABS ARE DESIGNED WITH LITHOGRAPHY AS THE CONSTRAINT



CHALLENGES OF DIAGNOSING MECHATRONIC SYSTEMS



- Symptoms are spread across the machine.
- Expertise is needed to find the root cause.
- The use case differs from one customer to another.

Requirement: bring the machine back to production level specifications as quickly as possible.

THE DIAGNOSTIC CHALLENGE

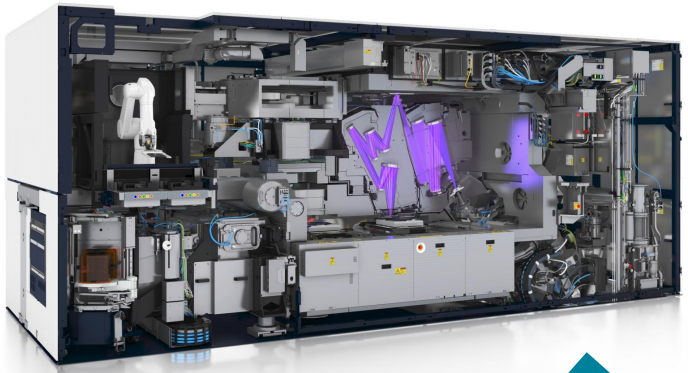
Service technician

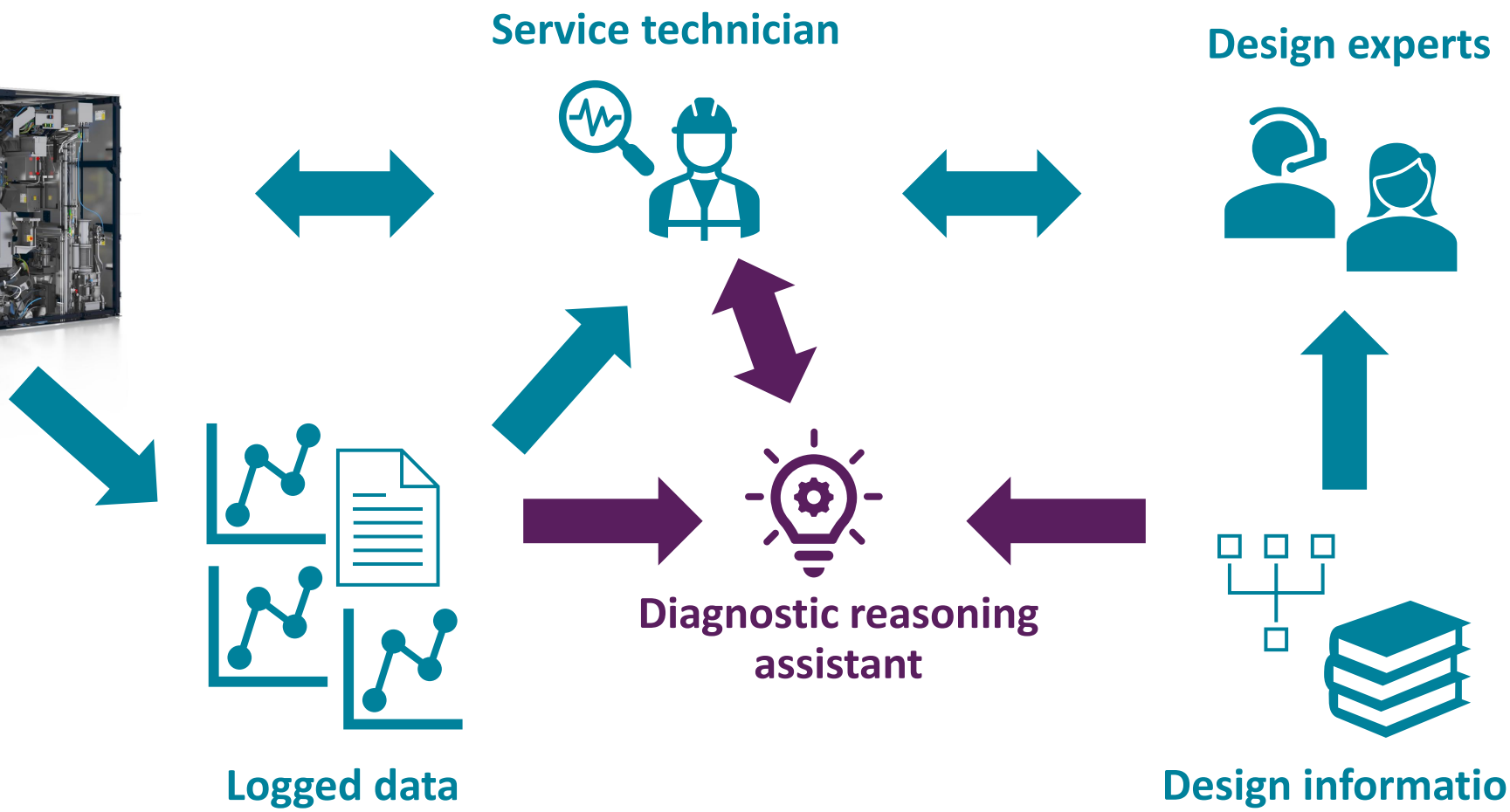
Design experts

Logged data

Design information

KNOWLEDGE-DRIVEN DIAGNOSTIC ASSISTANCE



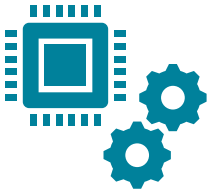


A PYTHON LIBRARY FOR DIAGNOSTICS

Diagnostic reasoning assistant

Top-down MBSE system design knowledge

Knowledge graph as central knowledge base



Probabilistic reasoning

Supports diagnostics during design and operation

DEMO

- Toy example for demonstration purposes: CD-radio player

CONCLUSION

Validation with ASML yields positive results

One model, multiple cases solved

The methodology is generic

Further development with Canon Production Printing, library is open-sourced

Interested? Visit us at our stand!

Many thanks to all contributors to the presented work:
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https://esi.nl/research/output/tools/mbdlyb

THANKS FOR YOUR ATTENTION!

TIME FOR Q&A!

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