Dataderevet vedlikehold og digital tvilling

203,5m

31,5m

Bengt Hergart, Anlæggsdirektør Øresundsbron

Long term targets

+100 Life time

100% Always open

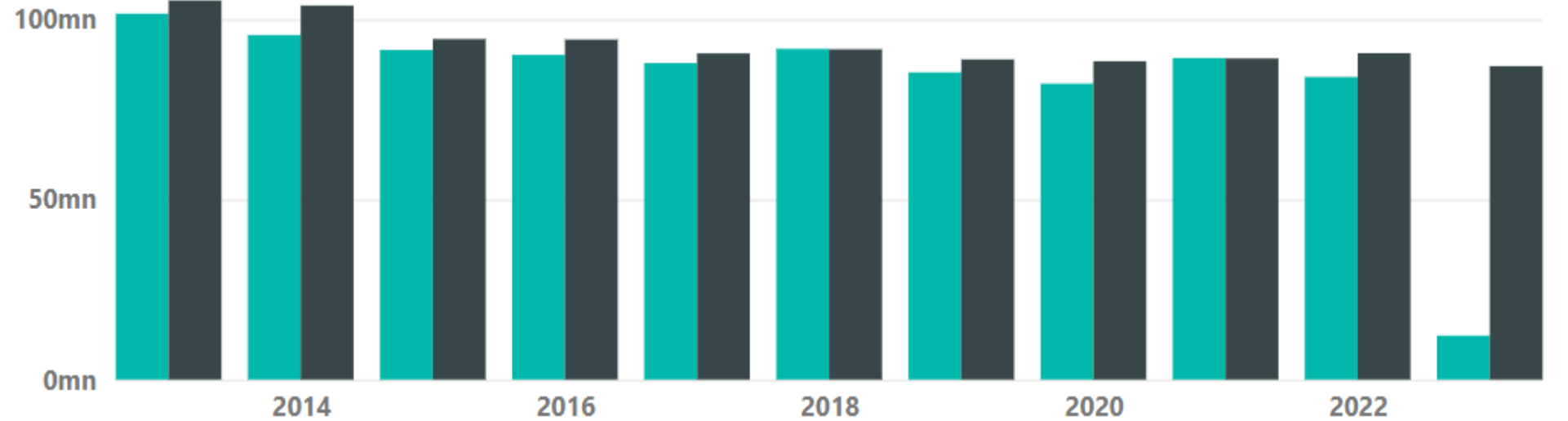**100%** Accident free

100% CO_2 free

TCO Reduction
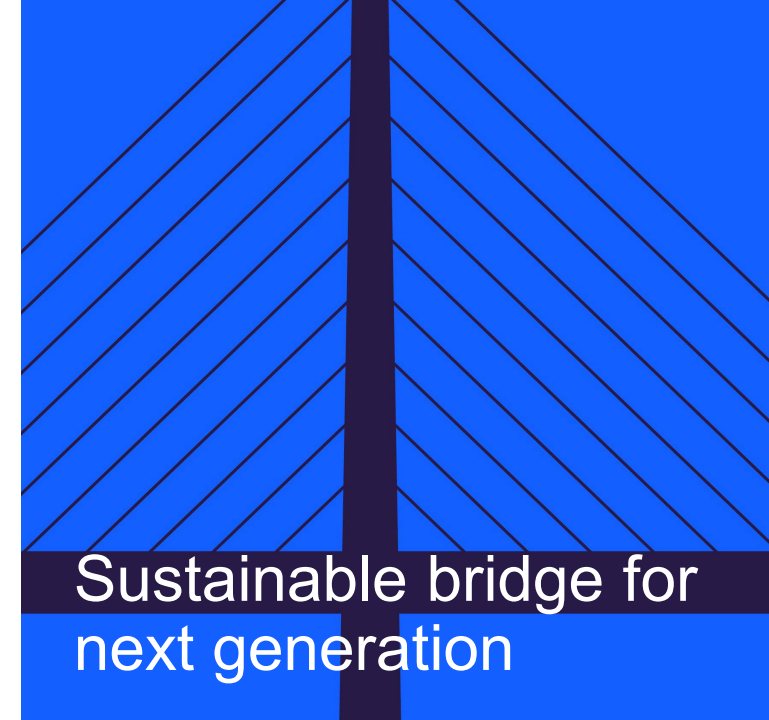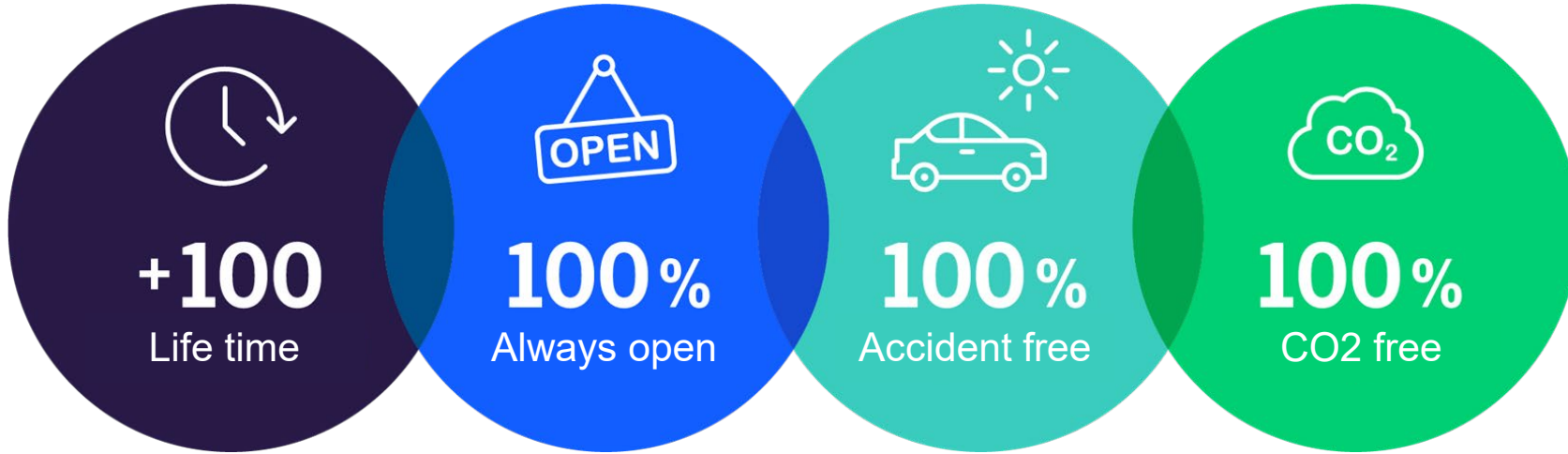
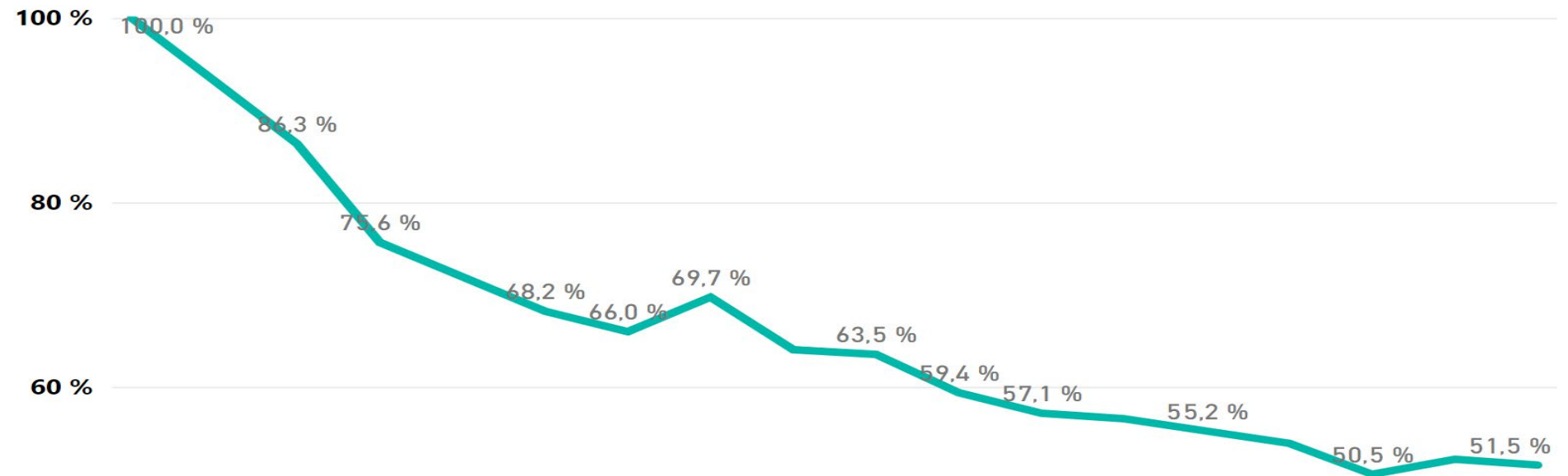Sustainable bridge for next generation

Business minded

So far so good!

Operational Cost over time

Reduced cost of re-investments

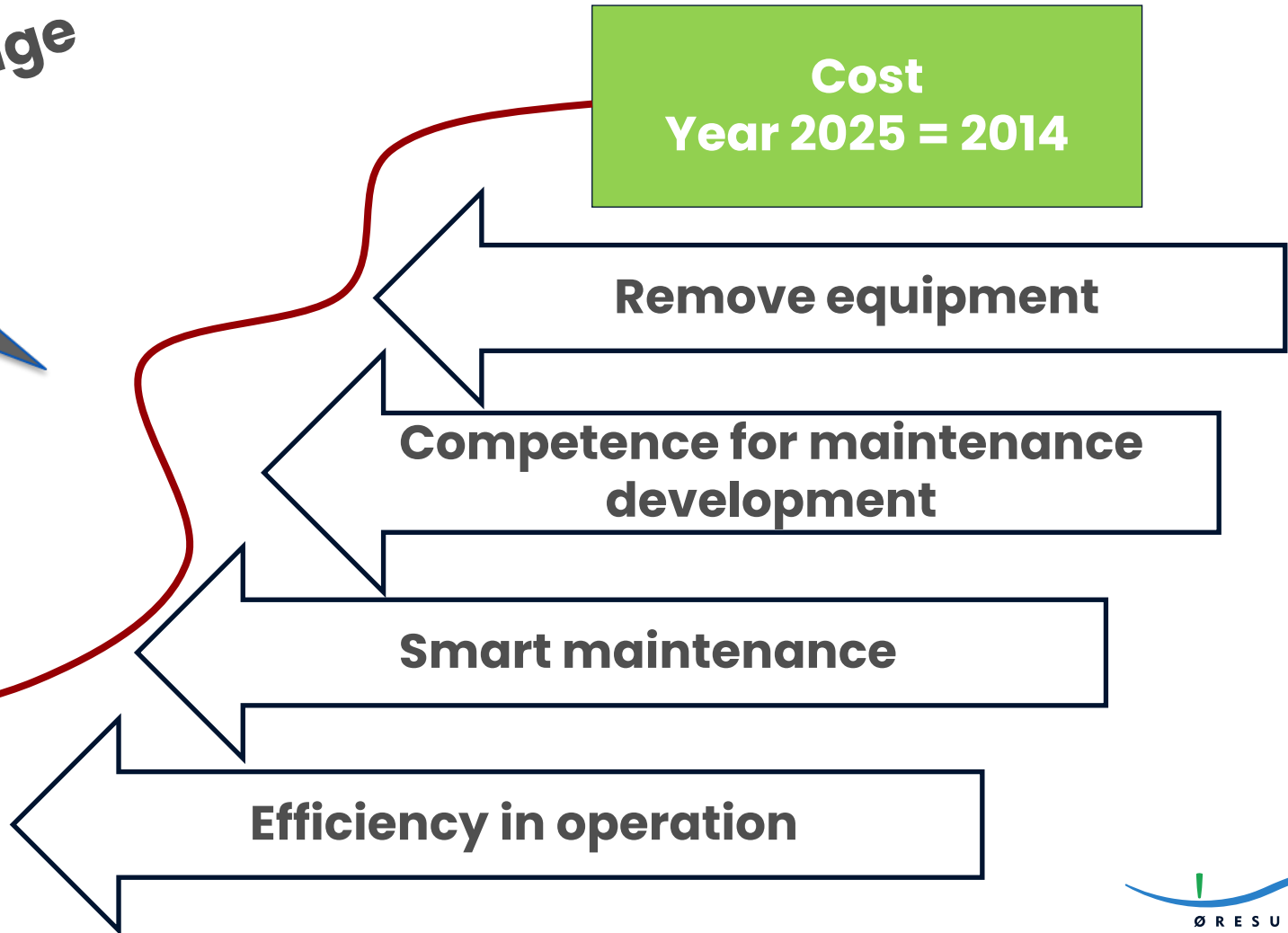# Smart maintenance is part of the solution

Inflation Aging of the bridge

**Cost
Year 2025 = 2014**

Remove equipment

Competence for maintenance development

Smart maintenance

Efficiency in operation
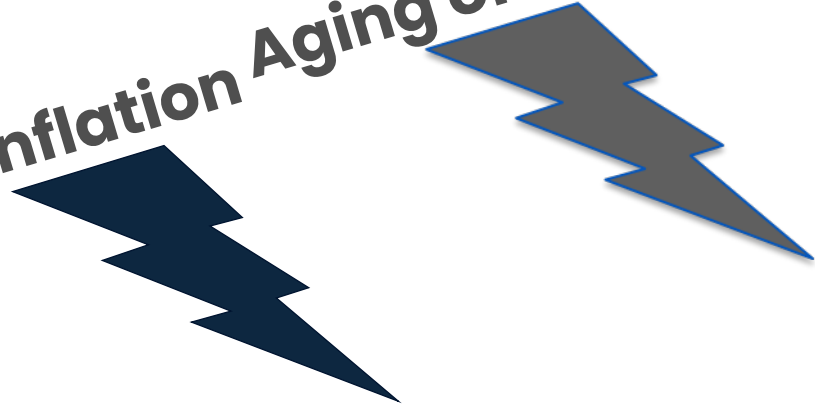
Present situation
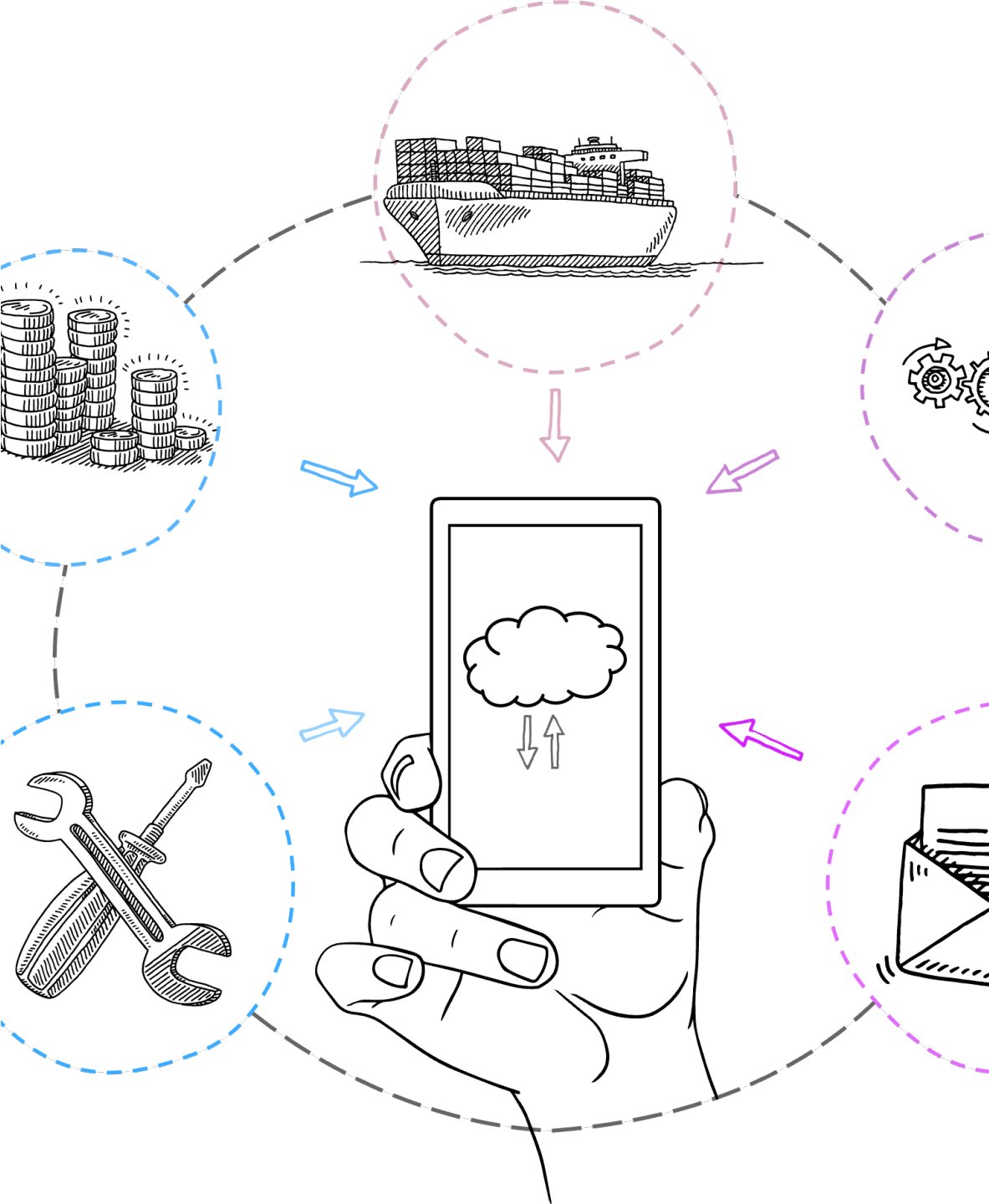
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Smart Maintenance Øresundsbron

- **Bench marking & KPI**

- **Analyzing big data**

- **Predictive Maintenance**

- **Digitalized methods**

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| NCA resultat				
MAIN	**DDD**	**HCR**	**INI**	**EXI**
0.0	NN	NN	NN	NN
3.3	NN	NN	NN	NN
6.7	NN	0.6	NN	NN
73.3	17.7	36.0	36.9	27.1
76.7	17.7	63.1	38.5	34.3
80.0	44.6	68.8	54.5	41.2
83.3	50.6	71.1	54.5	41.2
86.7	55.0	79.2	63.0	47.4
90.0	55.0	90.2	63.0	61.4
93.3	84.8	90.2	63.0	70.3
96.7	84.8	90.2	63.0	70.3
100.0	84.8	90.2	63.0	70.3

Data driven Decisions

External integration
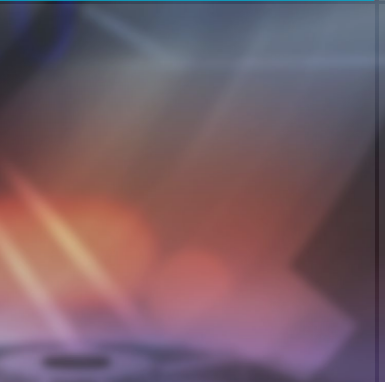
Smart Maintenance

Human capital resources

Internal integration

Bokrantz, & Skoogh, Chalmers
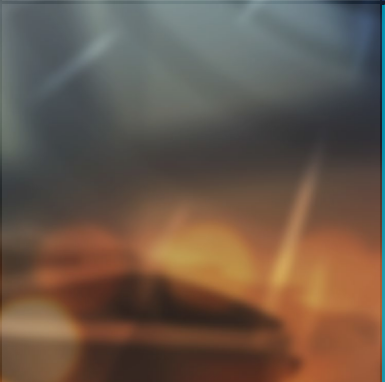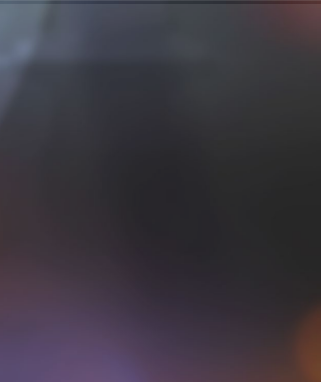
KPI: Data-driven Maintenance

Class	Sub-group
Corrective	Immidiate
	Deferred
Preventive	Pre-determined
	Condition-based, manual
	Condition-based, data
Predictive	Machine learning, AI
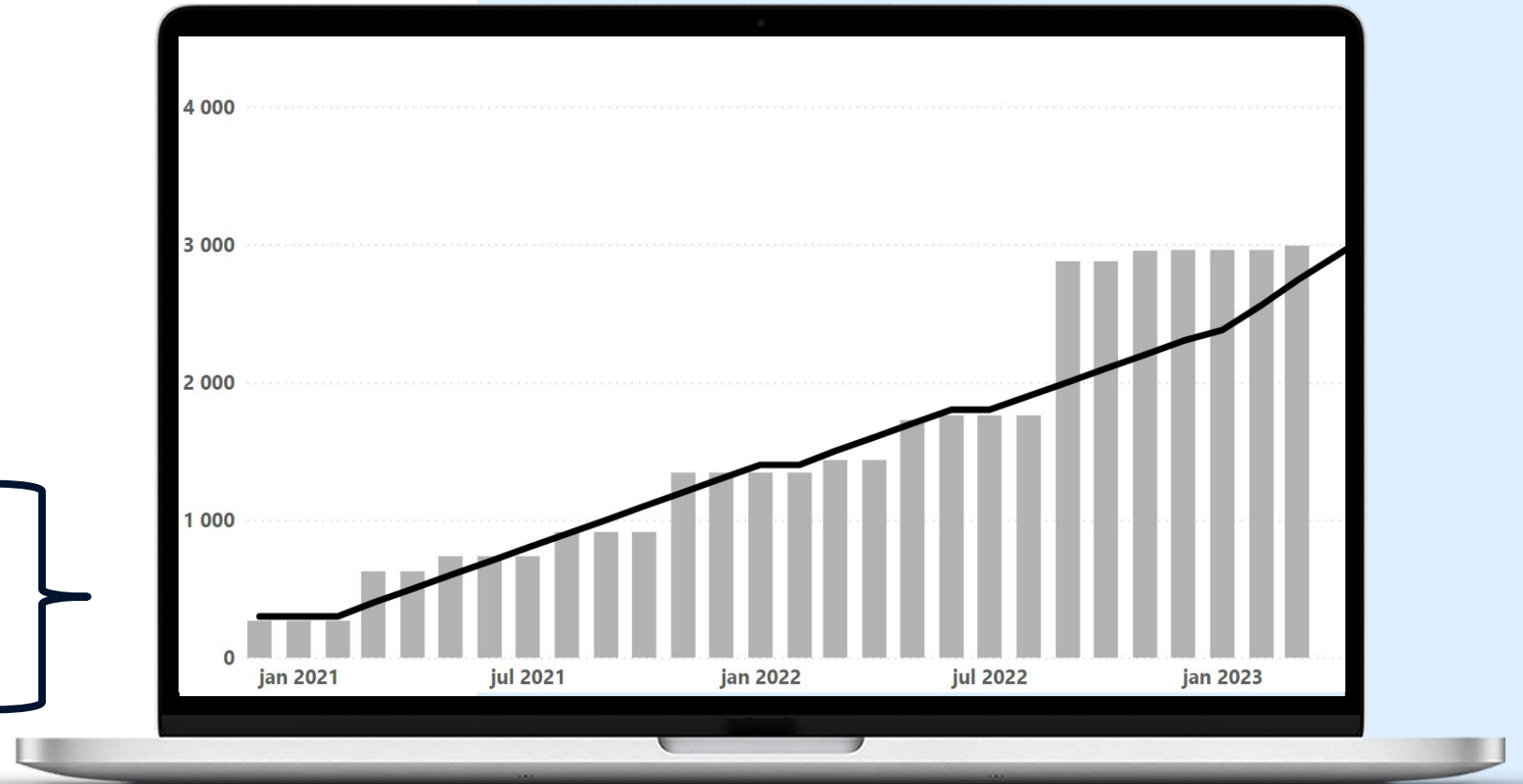
Analyzing big data
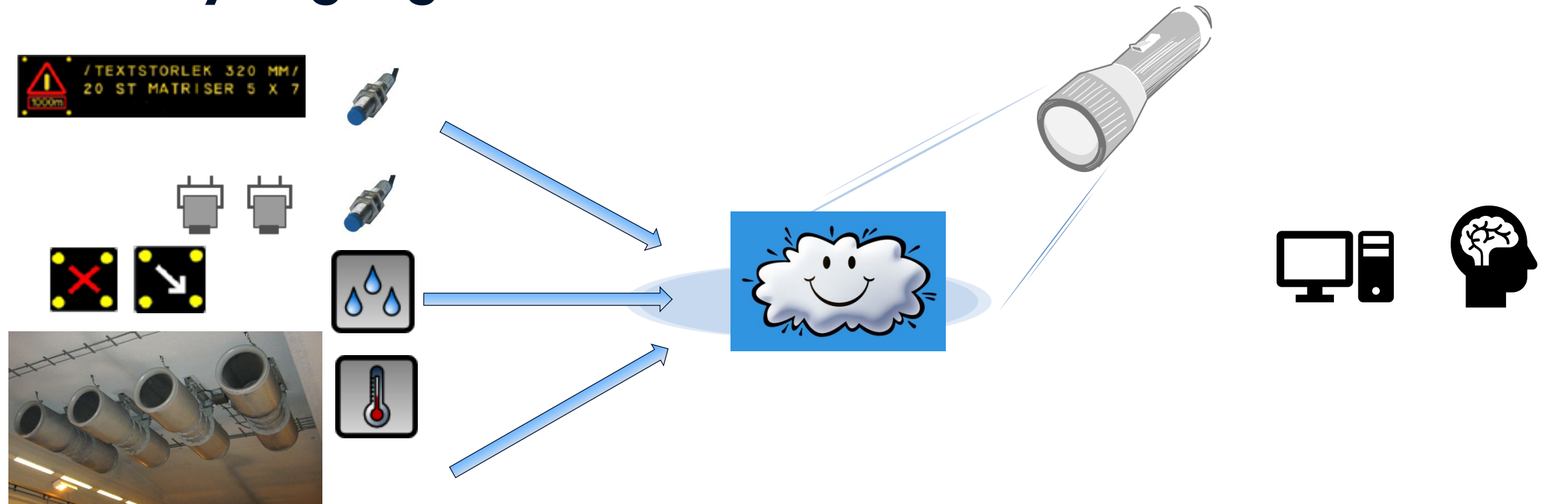
Equipment   **Sensors**   **Collect**   **Store**   **Analyze**   **Tools & Competence**

Differentiated approach

Functional relationsships

Unknown

Known

Comparison between units

Machine learning to find non-linear

Rule-based one parameter

Historical pattern, several parameters, hard to automate

One parameter & Linear

Many parameters & and non linear

Functional complexity

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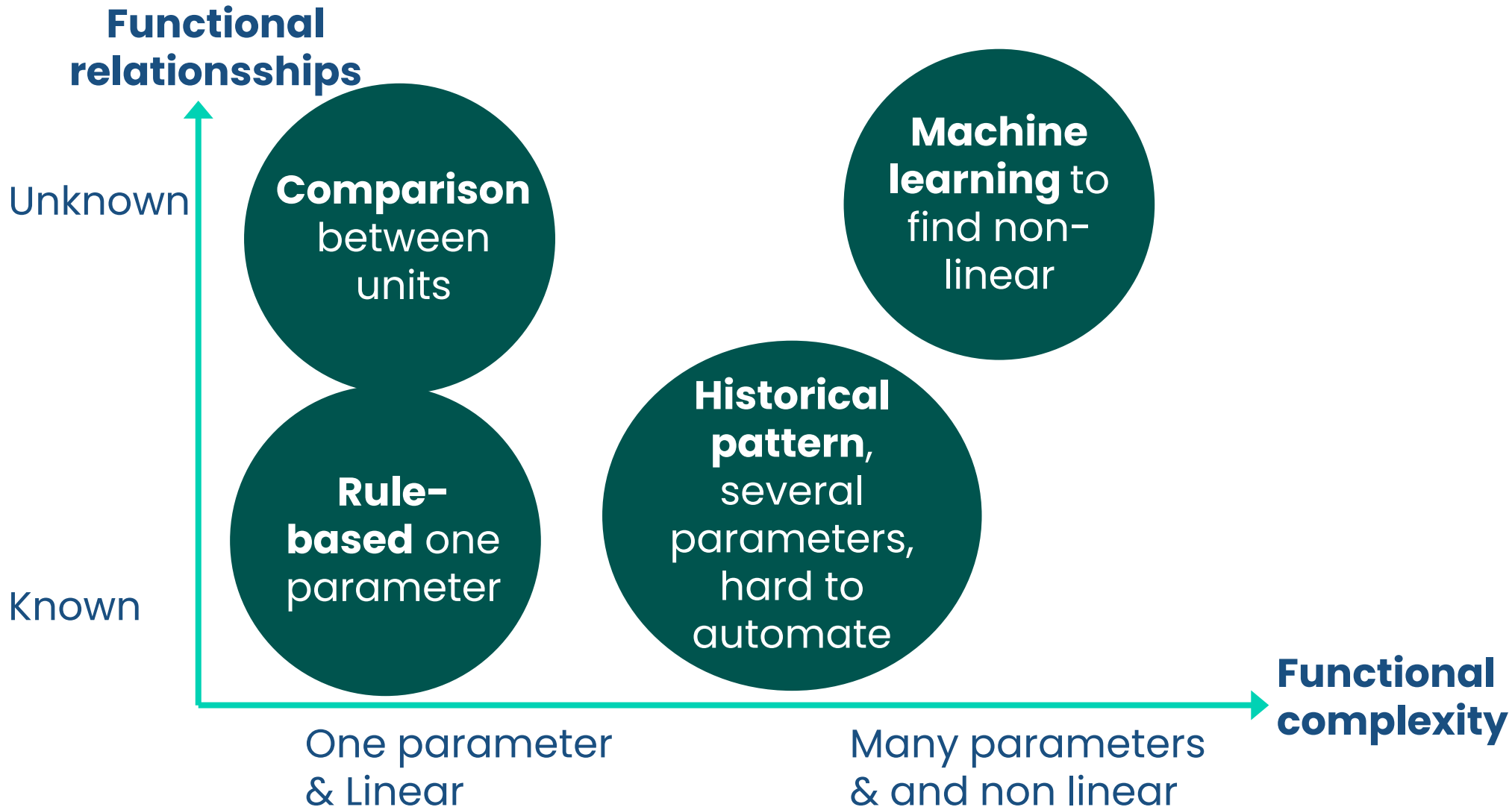
EXAMPLE: MACHINE HEALTH IN RAILROAD SWITCH

98.86%
99.41%

97.7%
98.74%

98.85%
99.85%

Example: Solar cell plant

Example: Dehumidifier inside steel girder

Better monitoring of the dehumidifiers functions and health.

- Detects decreases in efficency
  - → **energy savings**

- From calender based to condition based maintenace
  - → **time and financial saving**

- Optimations of fan and dehumidifier interactions
  - → **50% less runtime**
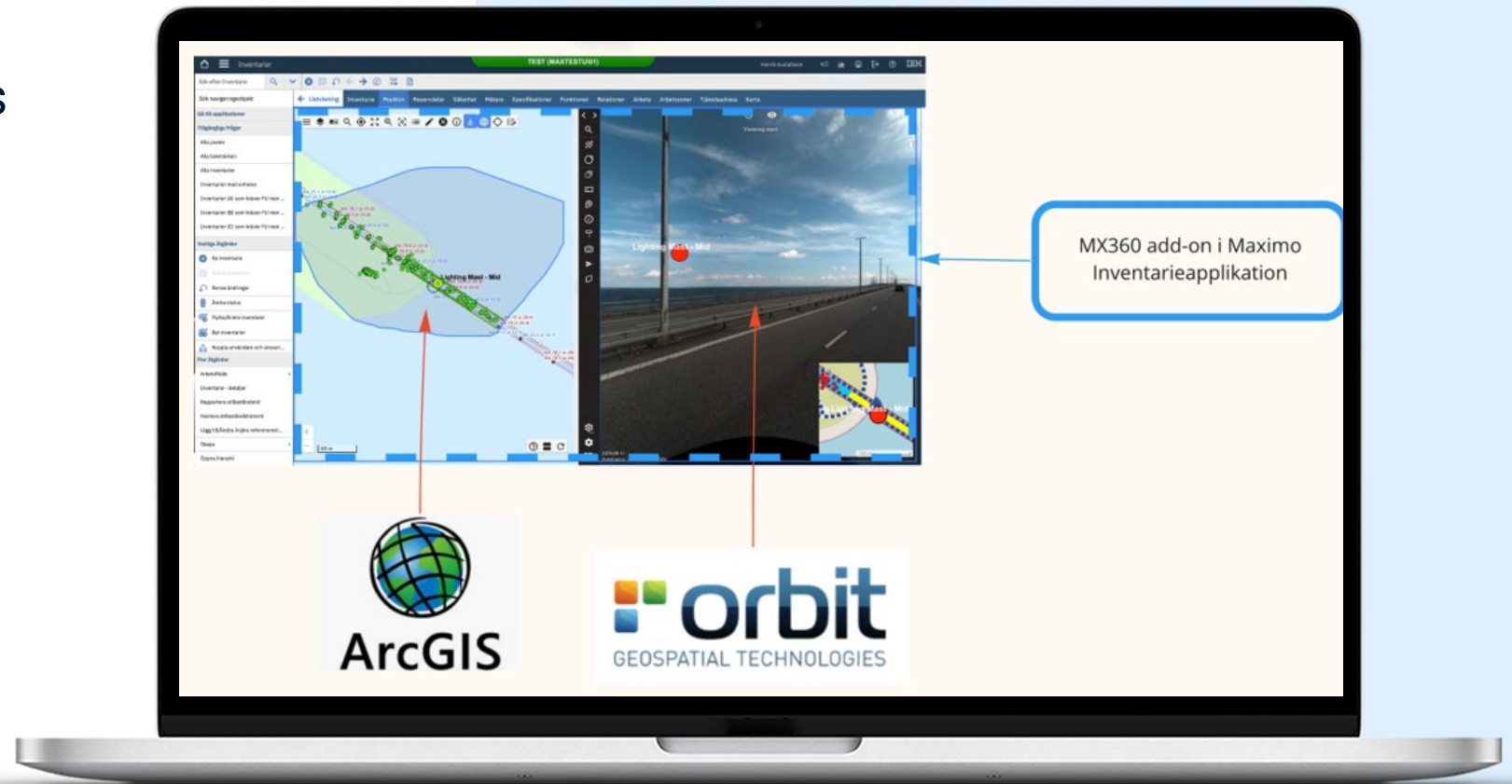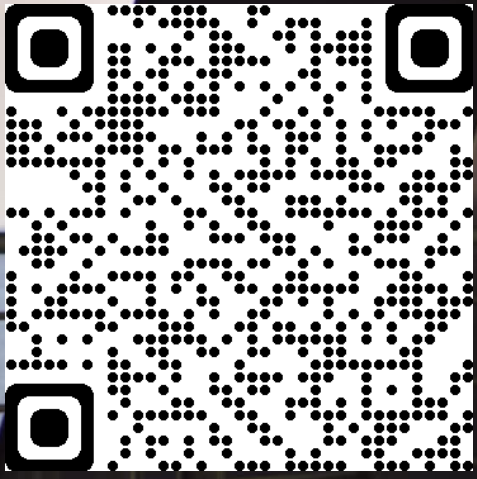 - → **energy savings**

Ø R E S U N D S B R O N

Learnings

- Smart maintenance is a way of cutting cost.

- KPI:s are a way of increasing the speed of change.

- Assessment models for smart maint. can be use across branches.

- ML algorithms are still not a mature business nor scalable.

ØRESUNDSBRON®

MX360 – Our digital twin

- Digital planning in projects

- Training and knowledge

- Accessability

- Low freq. condition inspection

⇒Cost savings

⇒Safety

⇒Avilability

Länk till MX360-Video

Sidefod

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