
SKF

SKF Enlight Collect IMx-1

Using a mesh network in bearing condition monitoring application

CRESITT - Orléans
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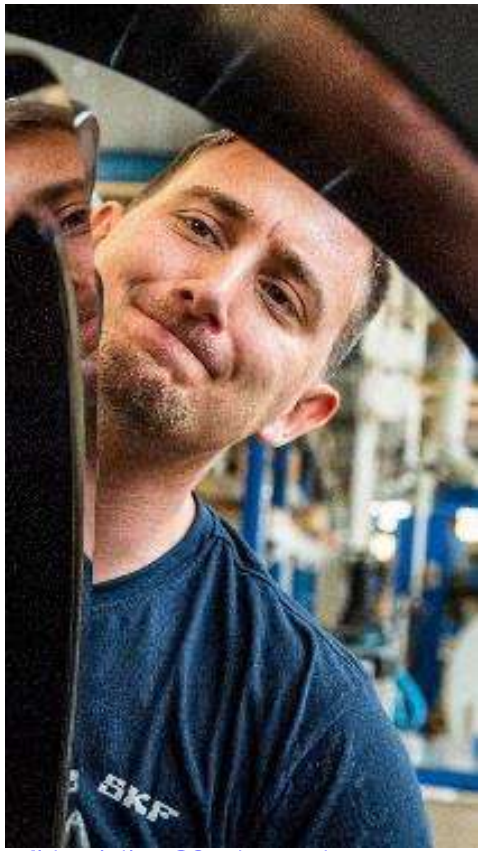
THIS IS SKF

Our combined offer

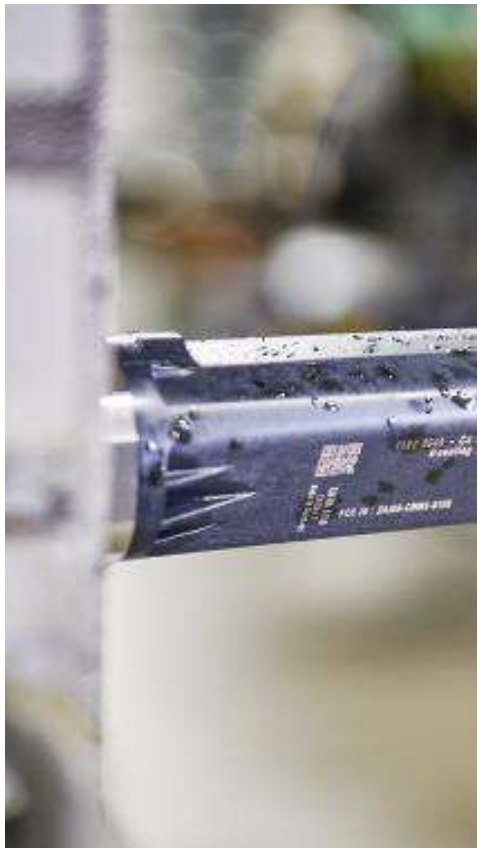
BEARING AND UNITS



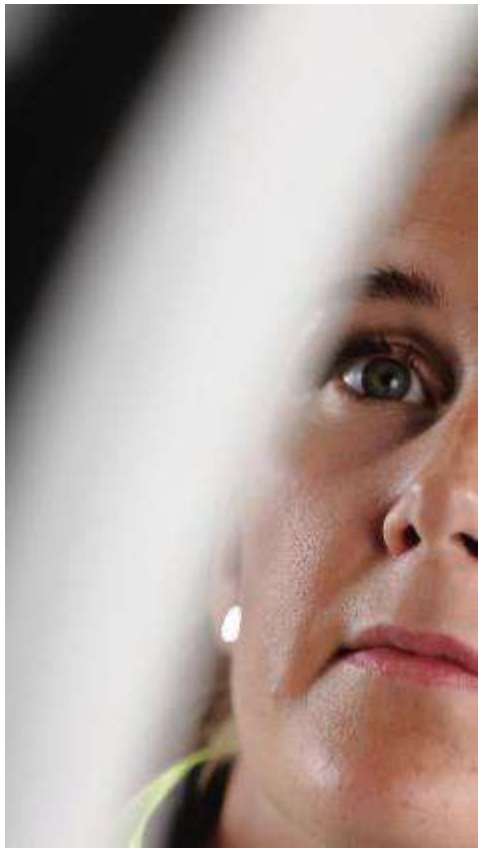
SEALS

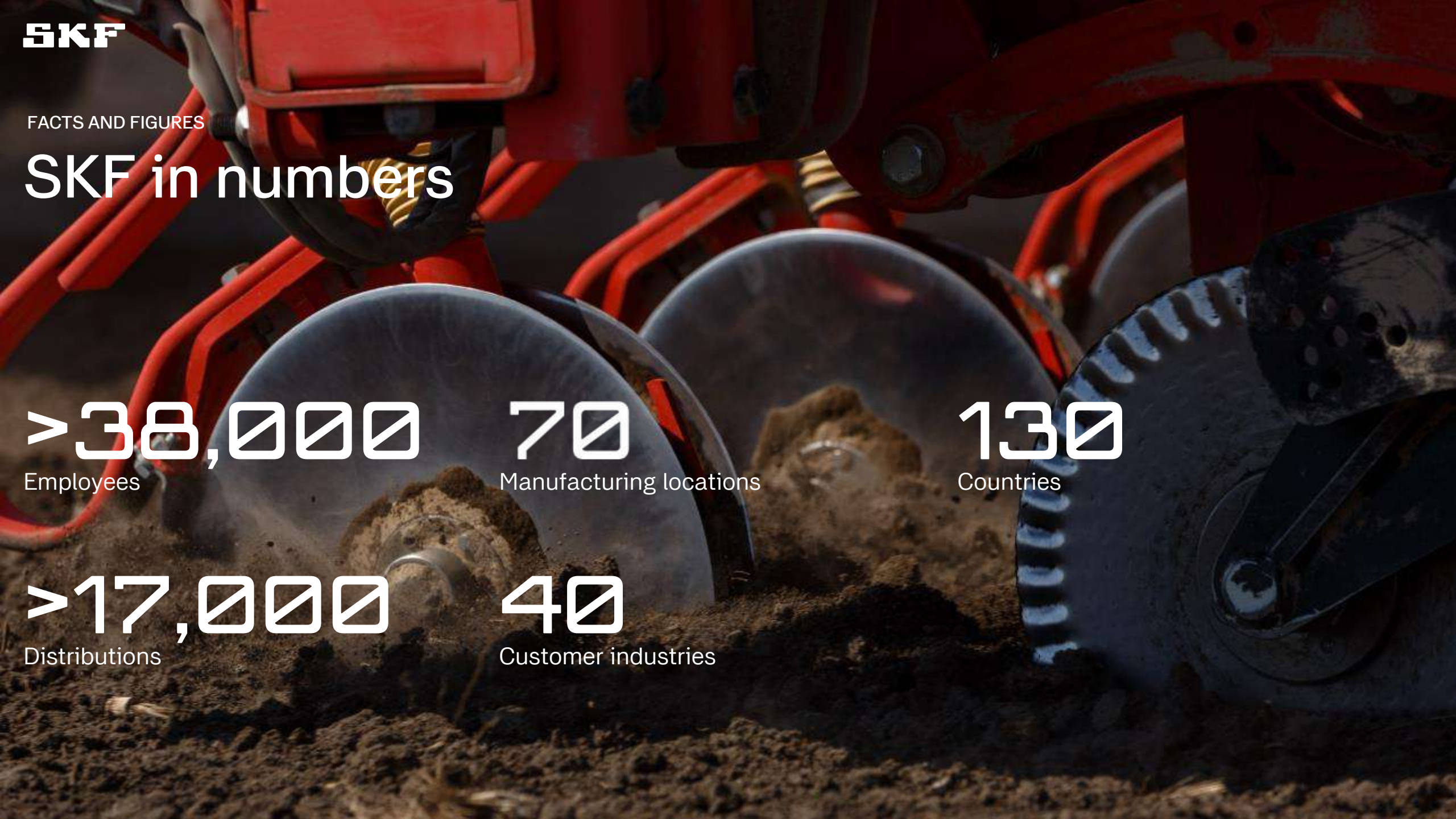
LUBRICATION

CONDITION MONITORING



SERVICE





FACTS AND FIGURES

SKF in numbers

>38,000
Employees

70
Manufacturing locations

130
Countries

>17,000
Distributions

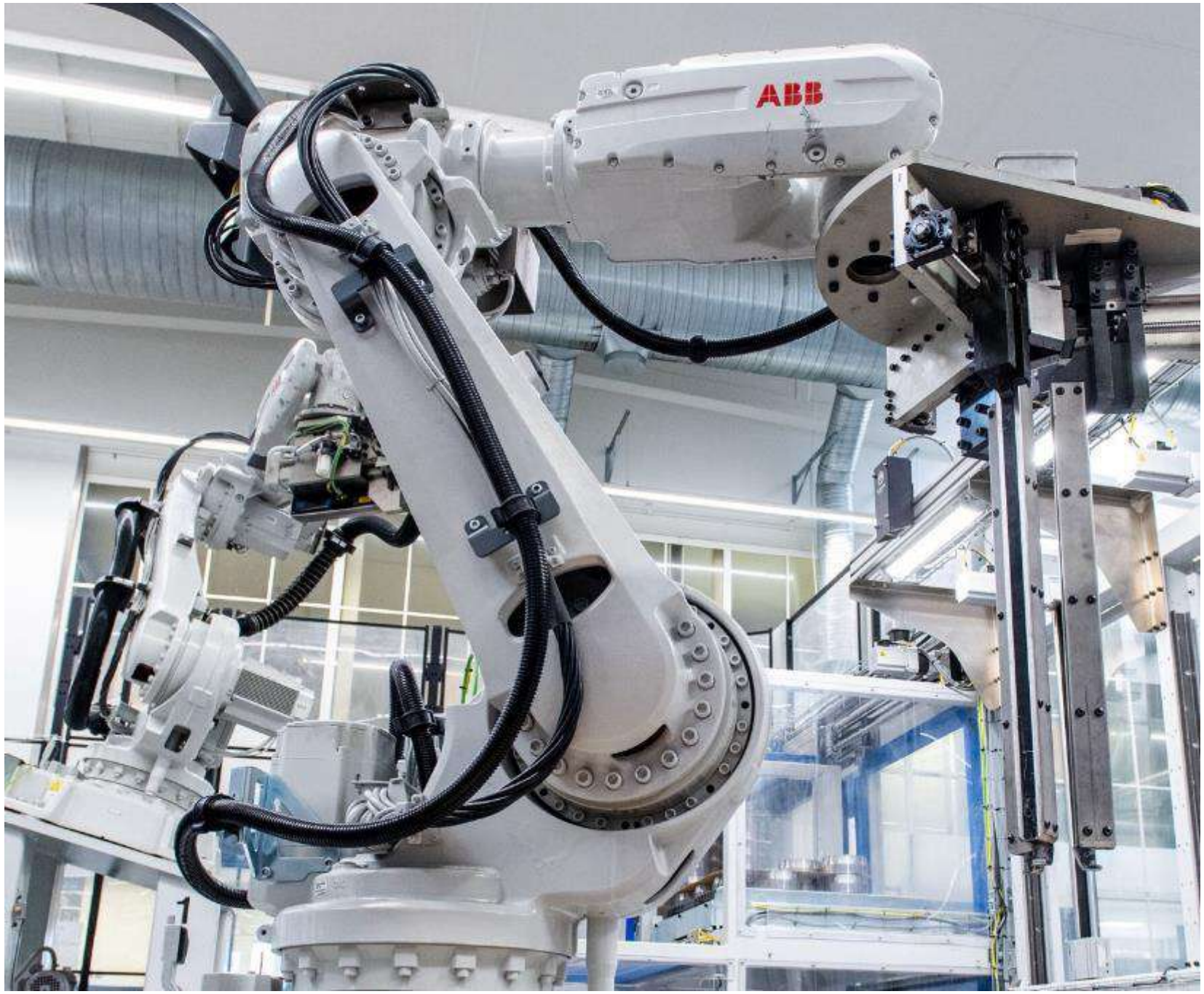
40
Customer industries

FACTS AND FIGURES

Our industrial and automotive business

70%
Industrial business
(of net sales)

30%
Automotive

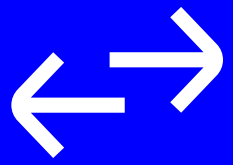


PRESENTATION OUTLINES

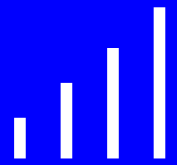
SKF IMx-1 system Mesh solution

Needs and application

Constrain and choice



Imx-1 Solution



Wireless Communication

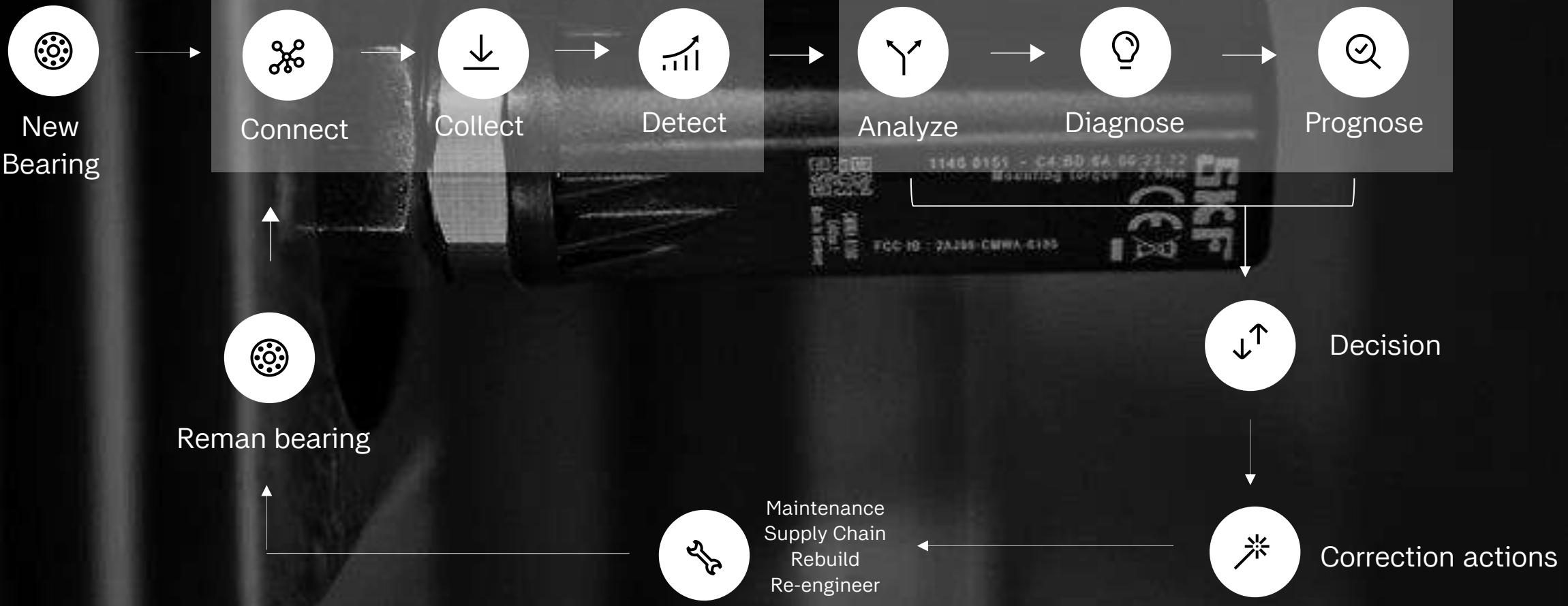
Data versus Energy

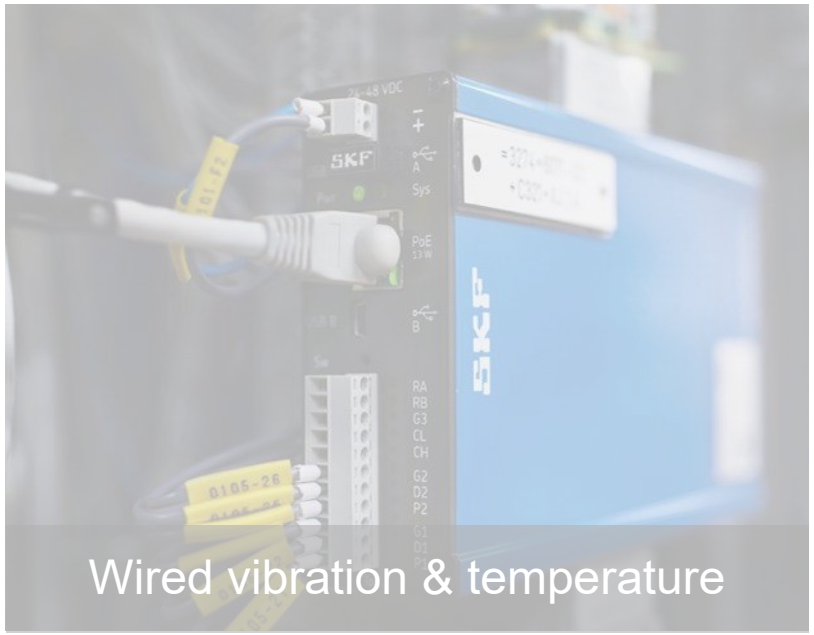
One example

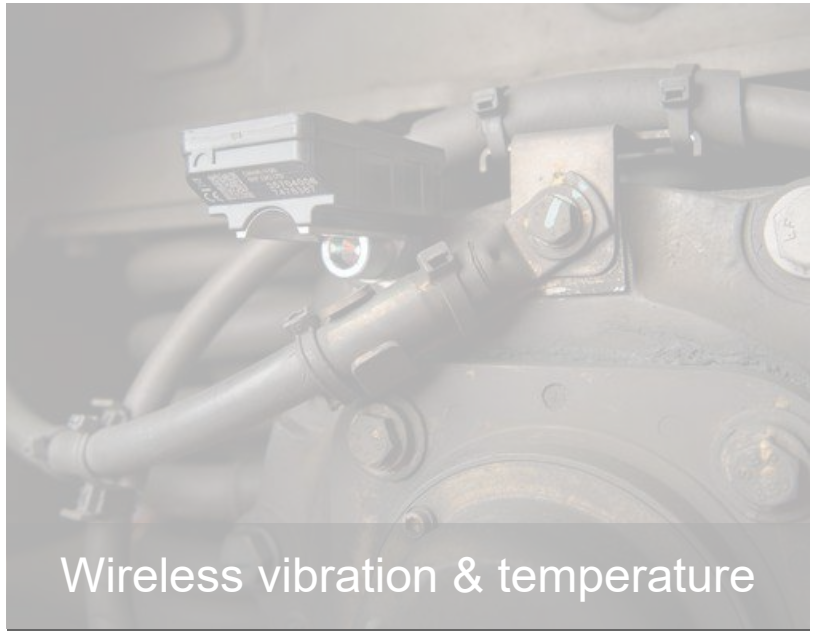
Needs & application overview

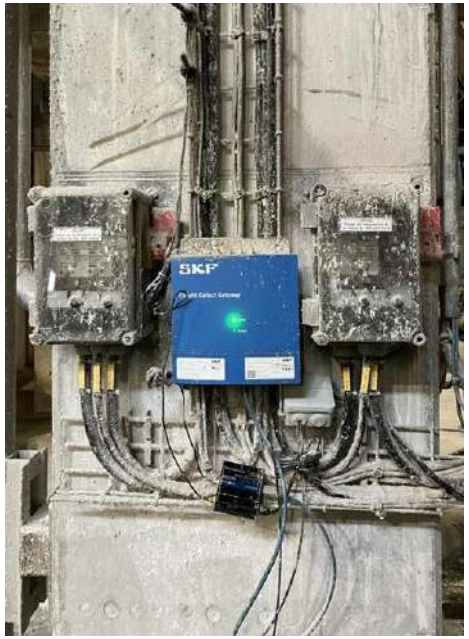
CONDITION MONITORING

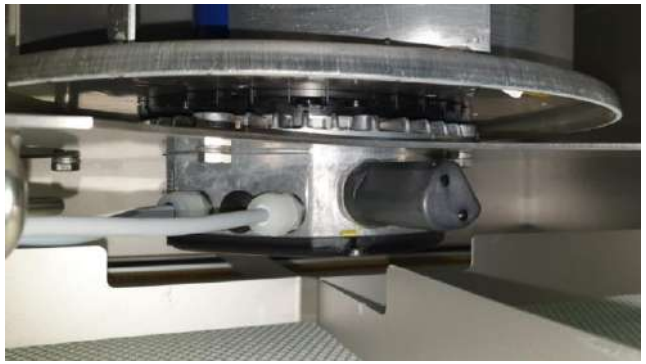
From Data to Decision



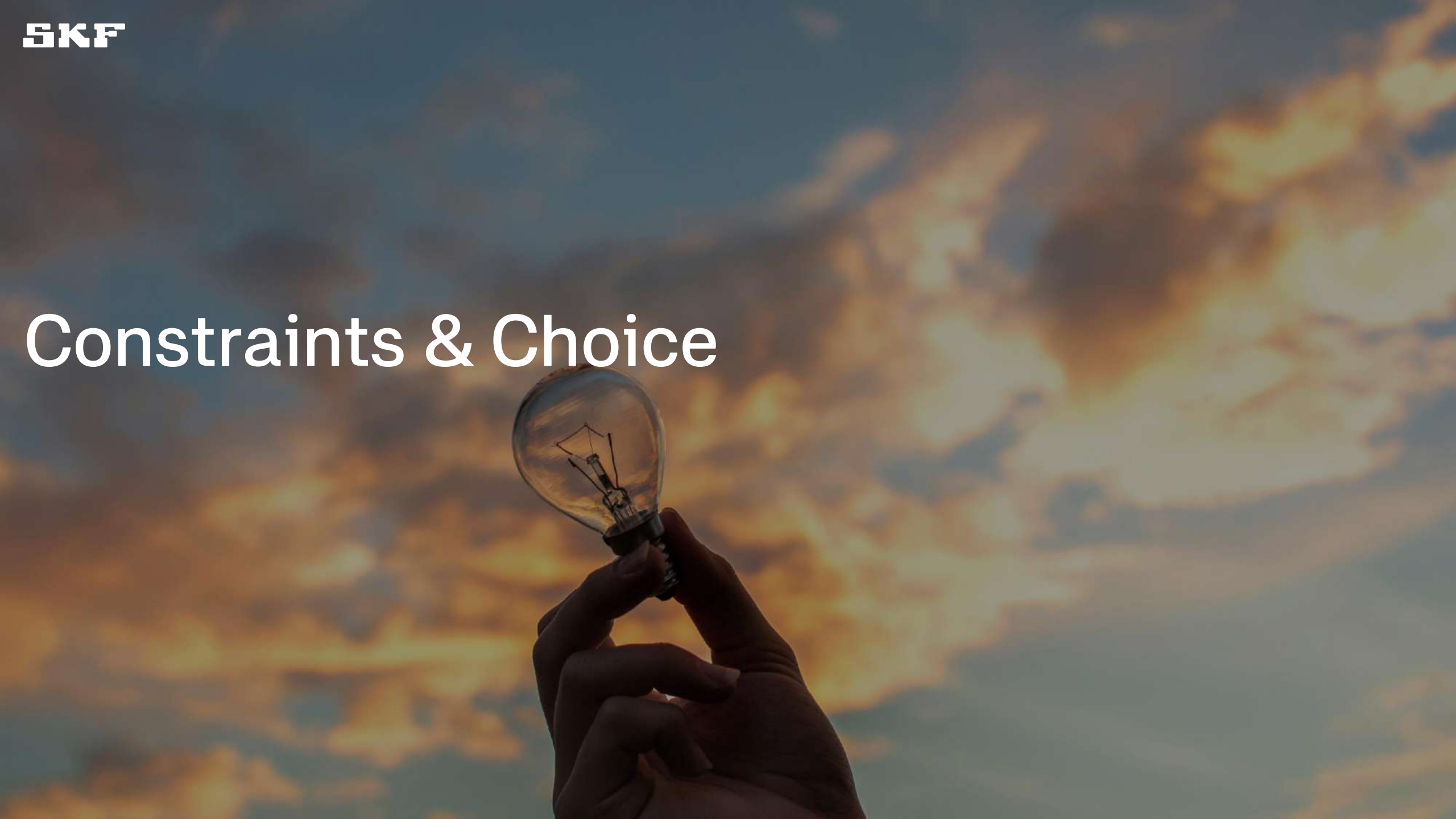








Constraints & Choice



CONSTRAINTS AND CHOICES

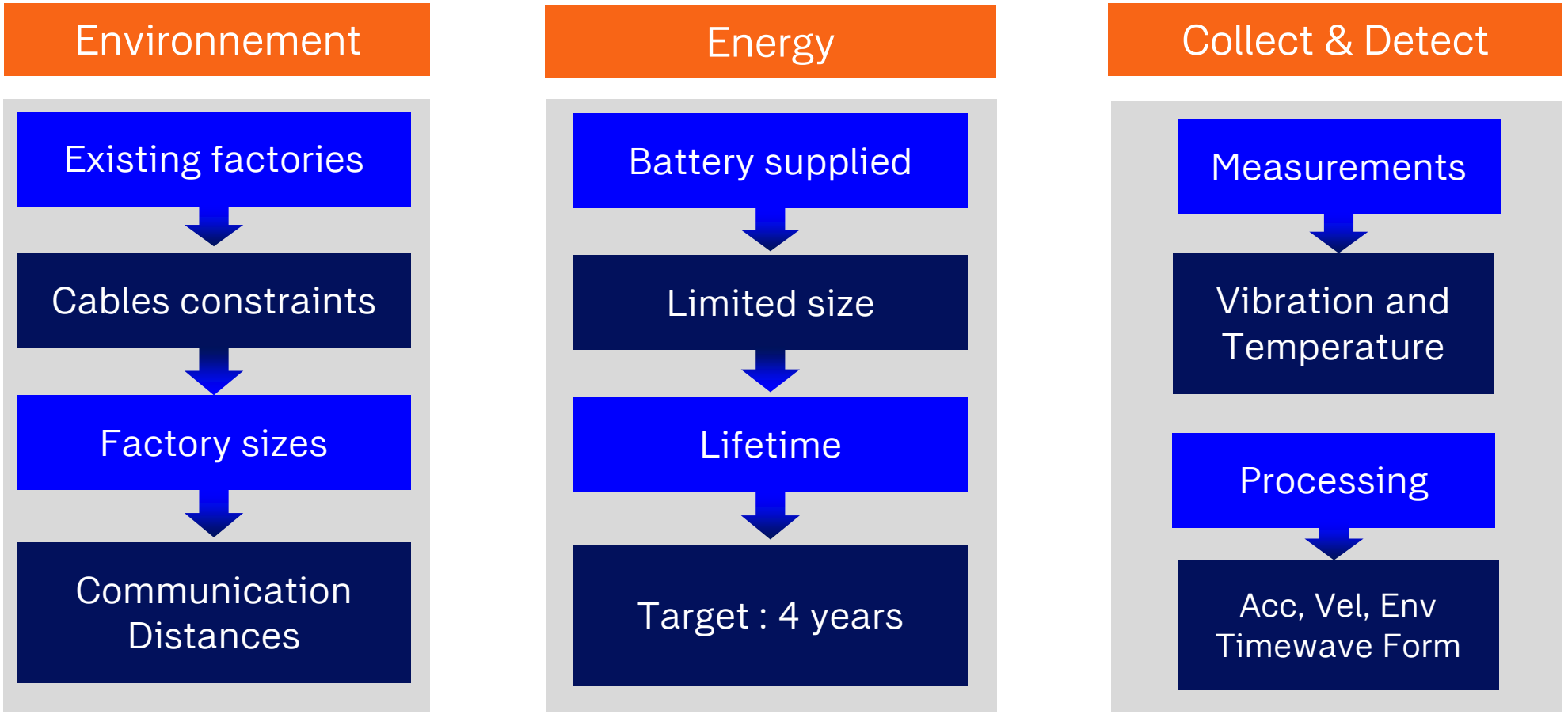
Wires in industrial environment ?

	Machines	Capabilities	Product Cost	Installation cost
	Critical Minute	Advanced • Variable speed • Sync • Multiple gating	€€	€€
	Protection Second	Advanced • Advanced processing • Can stop machine in a short time	€€€	€€

Mainly for advanced offers

CONSTRAINTS AND CHOICES

Wireless constraints



CONSTRAINTS AND CHOICES

Wireless in industrial environment ?

		Machines	Capabilities	Product Cost	Installation cost
	Wireless	Basic Hour	Standard & Average • Fixed / Variable speed • Simple and advanced processing	€	€
	Wired	Critical Minute	Advanced • Variable speed • Sync • Multiple gating	€€	€€
	Wired	Protection Second	Advanced • Advanced processing • Can stop machine in a short time	€€€	€€

Solution presentation

IMX-1 SYSTEM

4 components

Sensors

- Measurements
- Embedded data processing
- Self powered
- Mesh

Gateway

- A link between sensors and the outside world
- Network Master
- Requests data collection from sensors

Mobile App

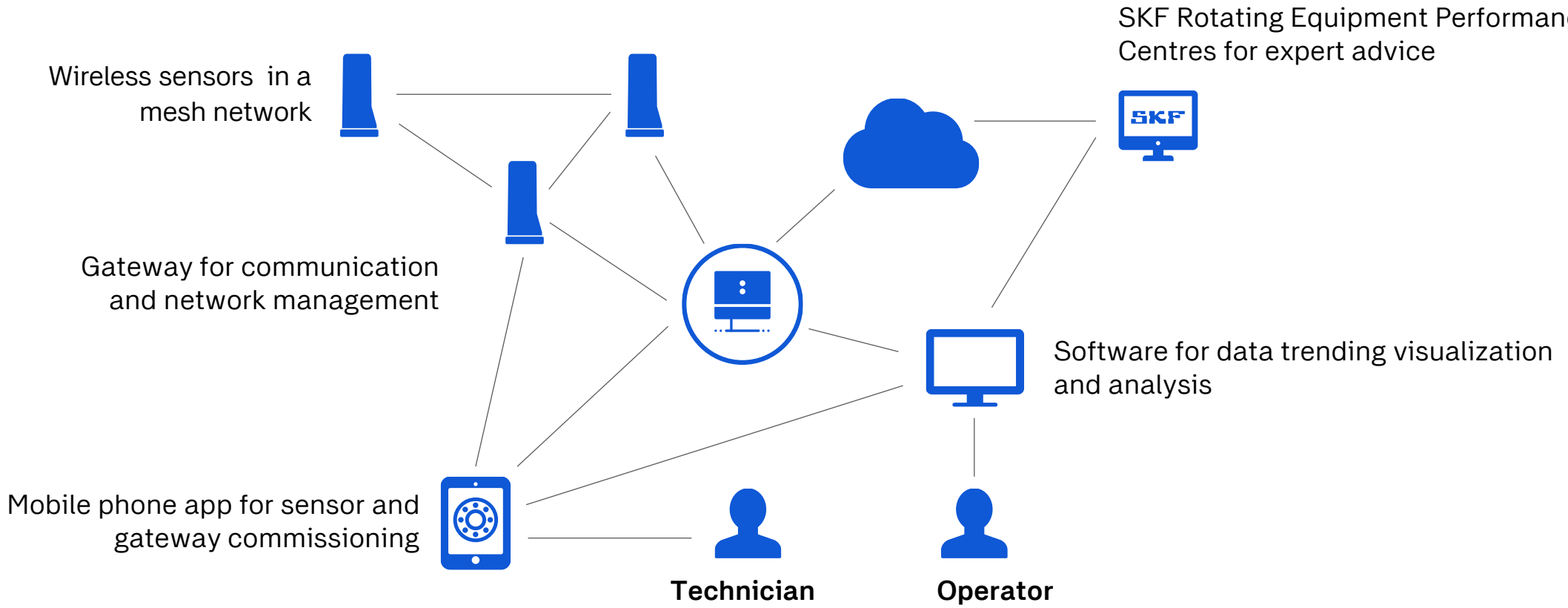
- Set up sensors during installation
- Match sensor to location in the host software

Observer

- Upload data to the SKF Cloud
- Get an overview of the status of your equipment

IMX-1 SYSTEM

The system



Wireless communication

WIRELESS COMMUNICATION

The mesh network operation

The mesh is **self-healing** – each nodes determines the best route for the data from every node to travel, based on:

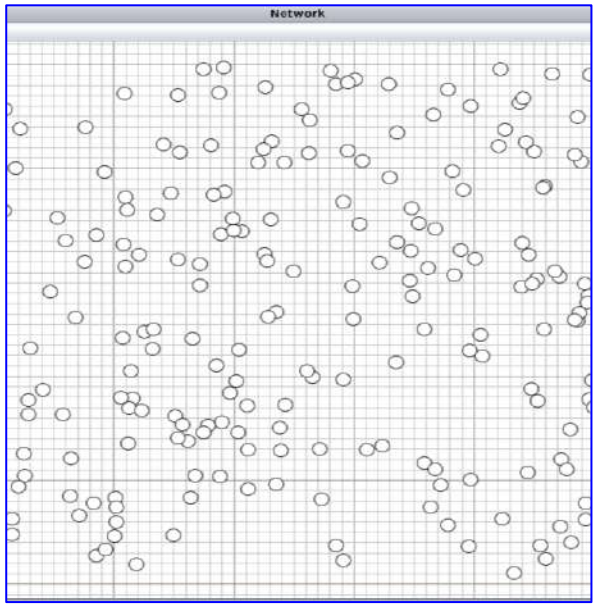
Signal Strength
to navigate around electromagnetic obstacles

Number Hops
to minimize power consumption

WIRELESS COMMUNICATION

The mesh network operation

The **more nodes, the better** is a rule for a stable system.

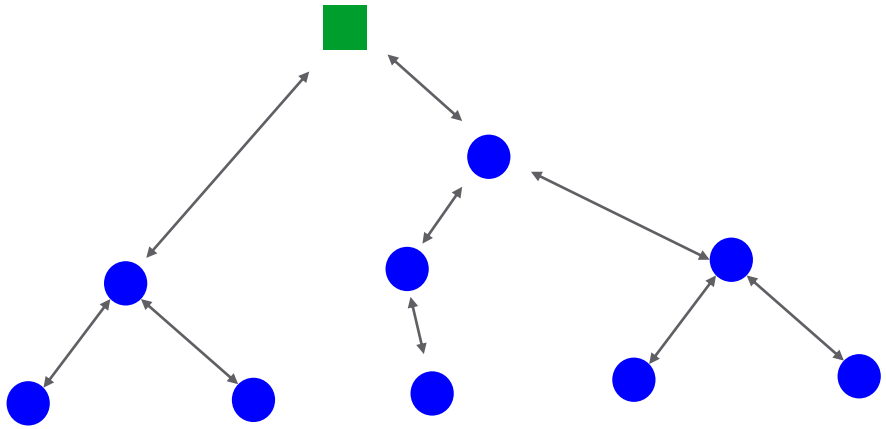


Auto adaptation
Adaption to environment condition

Availability
Many path available

WIRELESS COMMUNICATION

Firmware update



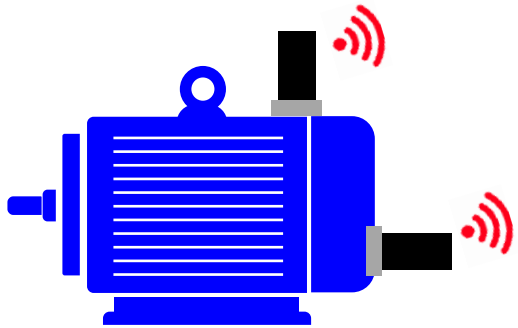
Propagation to Children / Grand Children, not from GW

The update spreads gradually like a virus - the whole process could typically take 10 to 30 hours.

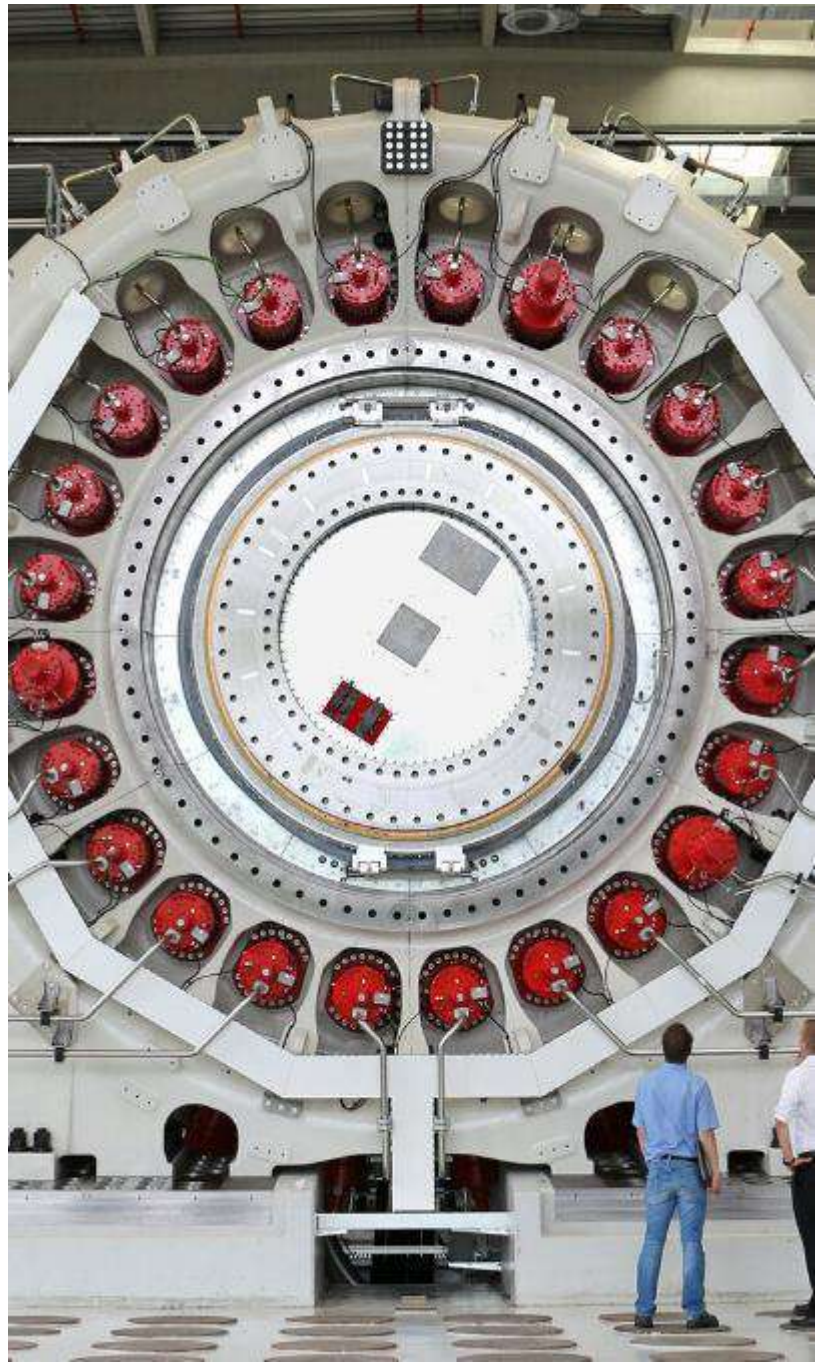
WIRELESS COMMUNICATION

Time Synchronization

BLE	MESH
2-3 ms	30 µs



- Advanced Vibration analysis
- Speed (wired or wireless)
- Speed compensations
- Multi-sensor measurement



OUTCOMES

Some key capabilities

Network

Adapting its environment

→ Robustness

FOTA

FW update

→ From GW, by sensors

Sensor Sync

Few µs

→ Advanced processing


SKF
Data versus energy use

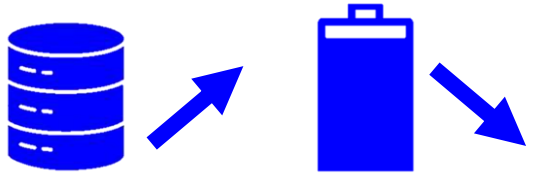
DATA VERSUS ENERGY USE

Data vs battery

Standstill is the main consumer

97%
of time

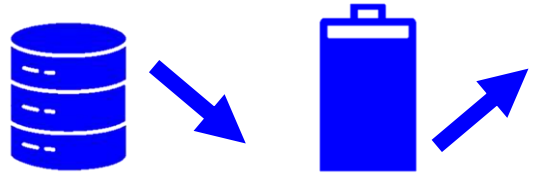
HW design focusing on standstill consumptions



50 Kb
Per day

1 year
Lifetime

Application knowledge



50 Kb
Per week

4 years
Lifetime

Limit the amount of data to send

DATA VERSUS ENERGY USE

Mesh, Relay, Leaf modes

Sensor can be set in different node type.
This will impact its communication behaviour and thus its lifetime in a direct way

	Mesh	Relay	Leaf
Measurement	✓	✗	✓
Data transfer	✓	✓	✗

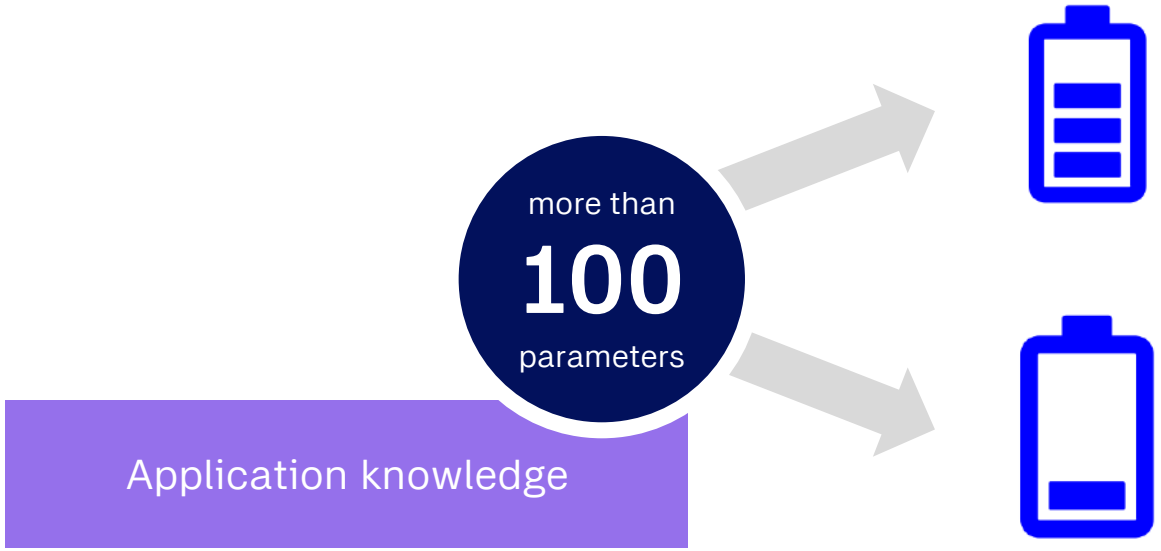
Leaf vs Mesh
+30%
longer

Application knowledge

DATA VERSUS ENERGY USE

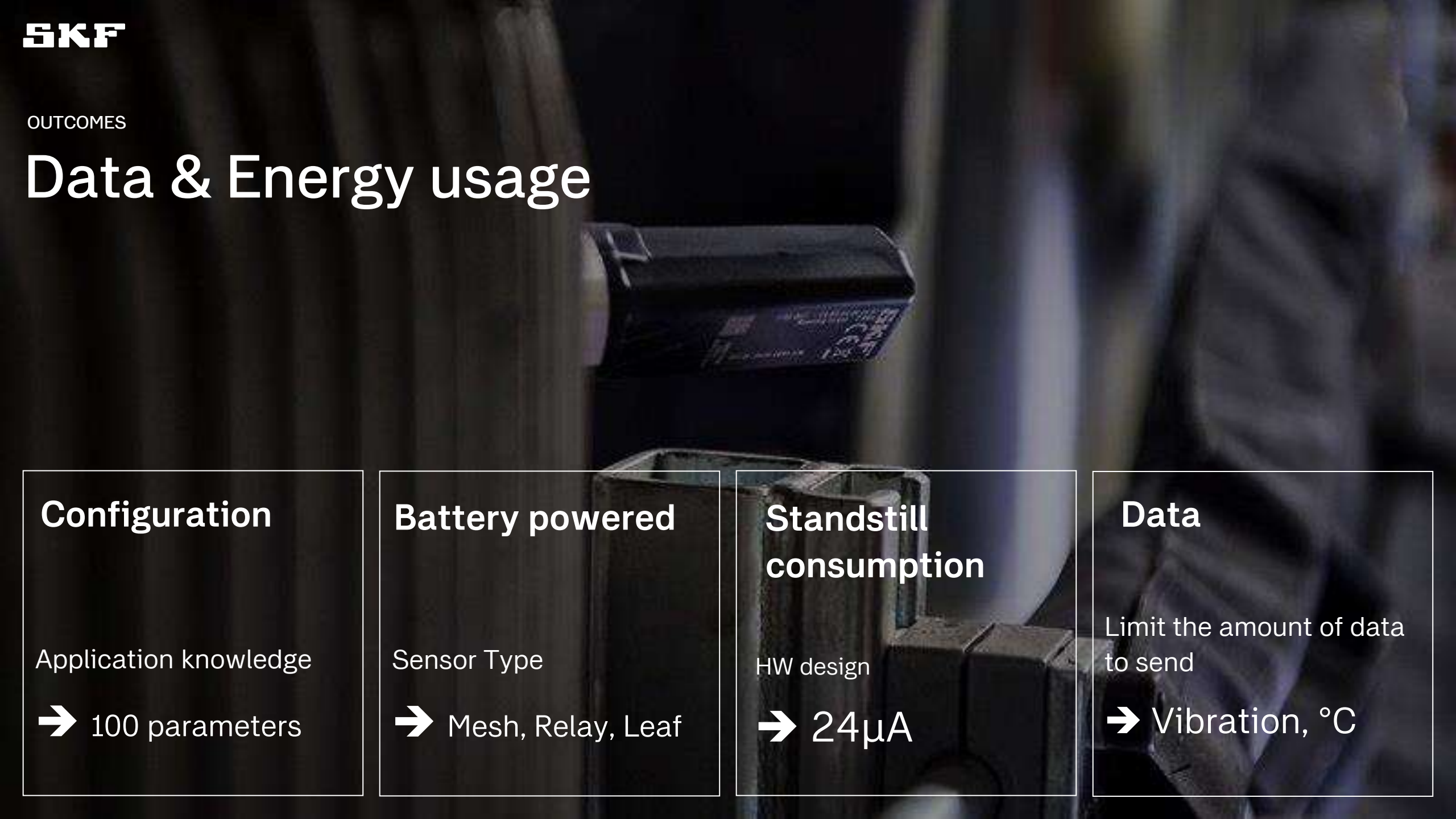
Sensor configuration

The application knowledge is key to properly setting up a sensor
This enables optimization of its lifetime through appropriate parameter settings



OUTCOMES

Data & Energy usage



Configuration

Application knowledge

➔ 100 parameters

Battery powered

Sensor Type

➔ Mesh, Relay, Leaf

Standstill consumption

HW design

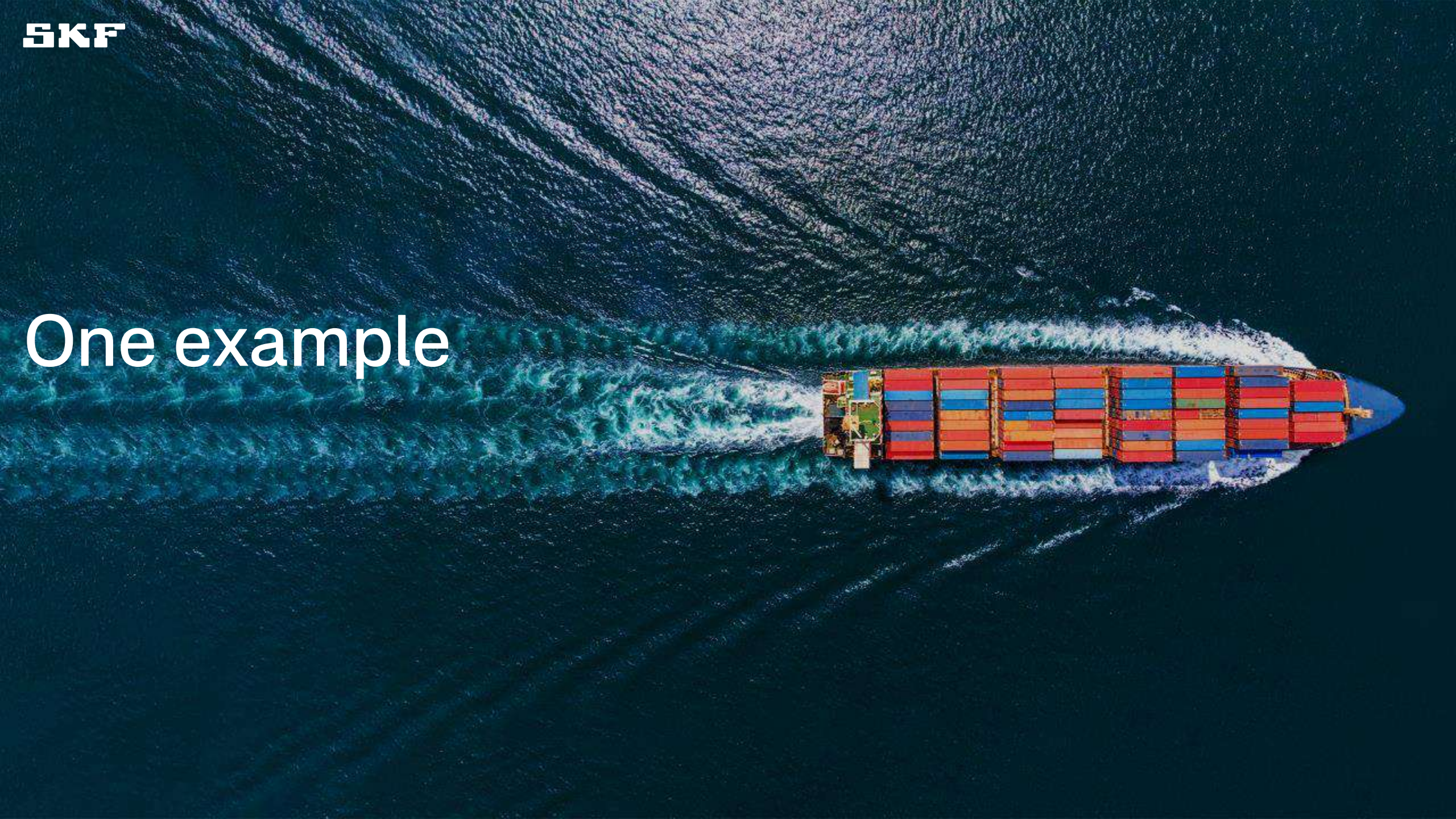
➔ 24µA

Data

Limit the amount of data to send

➔ Vibration, °C

One example



EXAMPLE

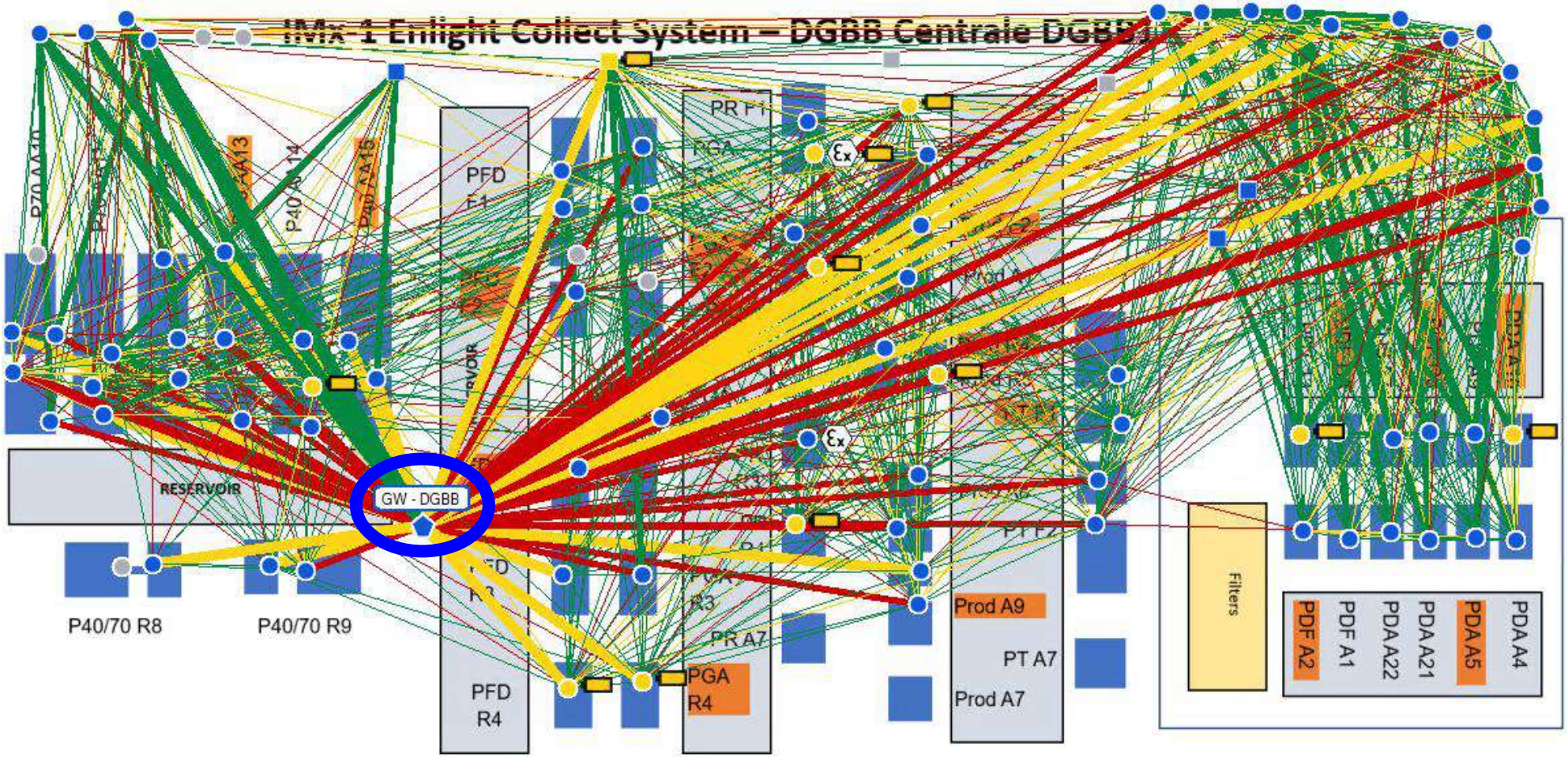
SKF Installation

Example of a factory equipped with 100 sensors for test purposes

- A lot of metal (reflexions)
- Several stairs
- Different machine speeds

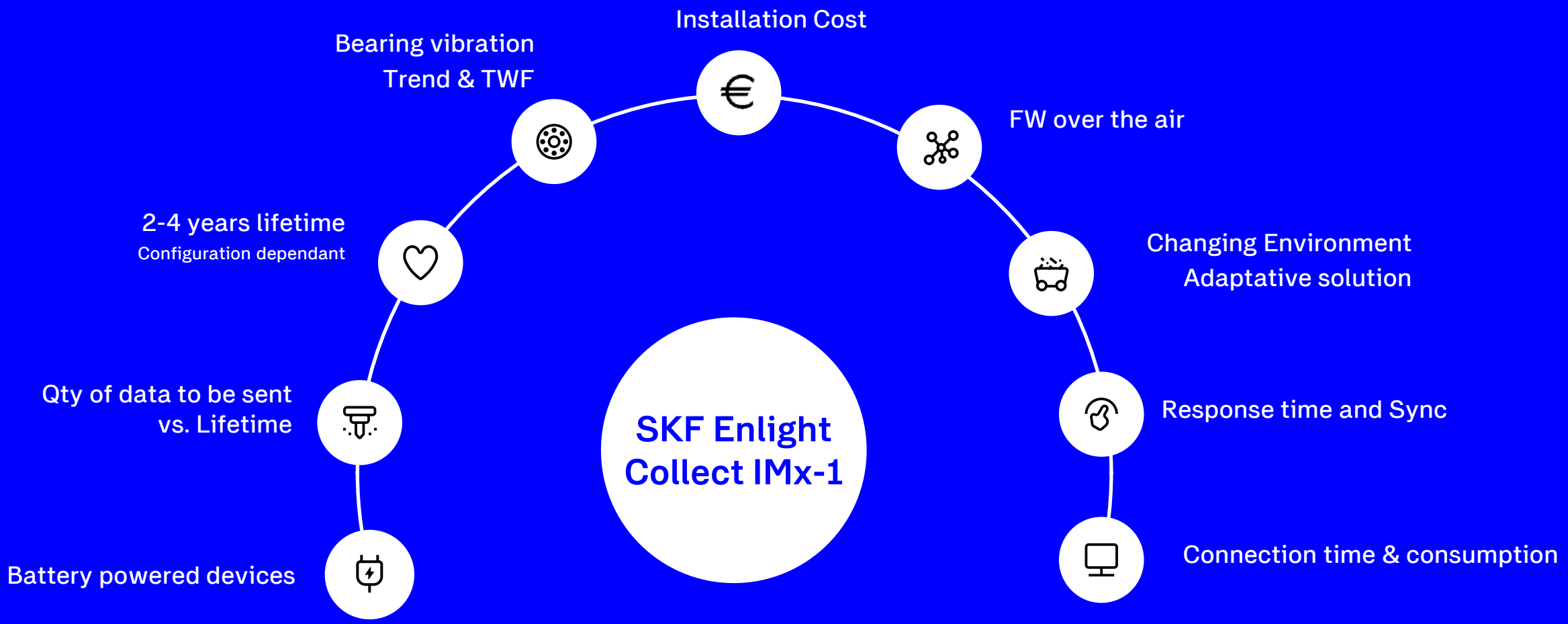
EXAMPLE

Network topology



CONCLUSION

Challenges for IMx-1 Mesh network



Thank you!

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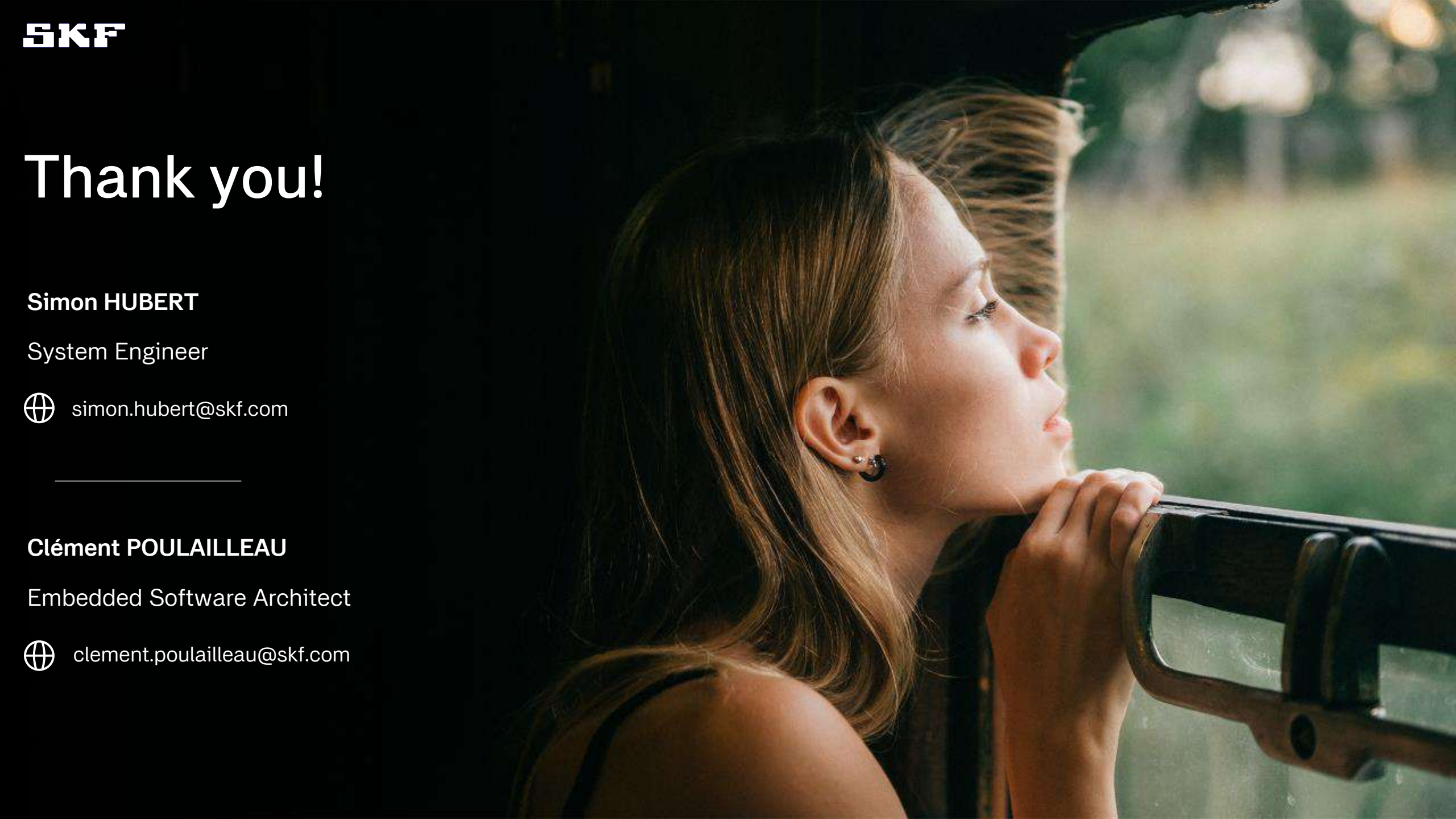


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