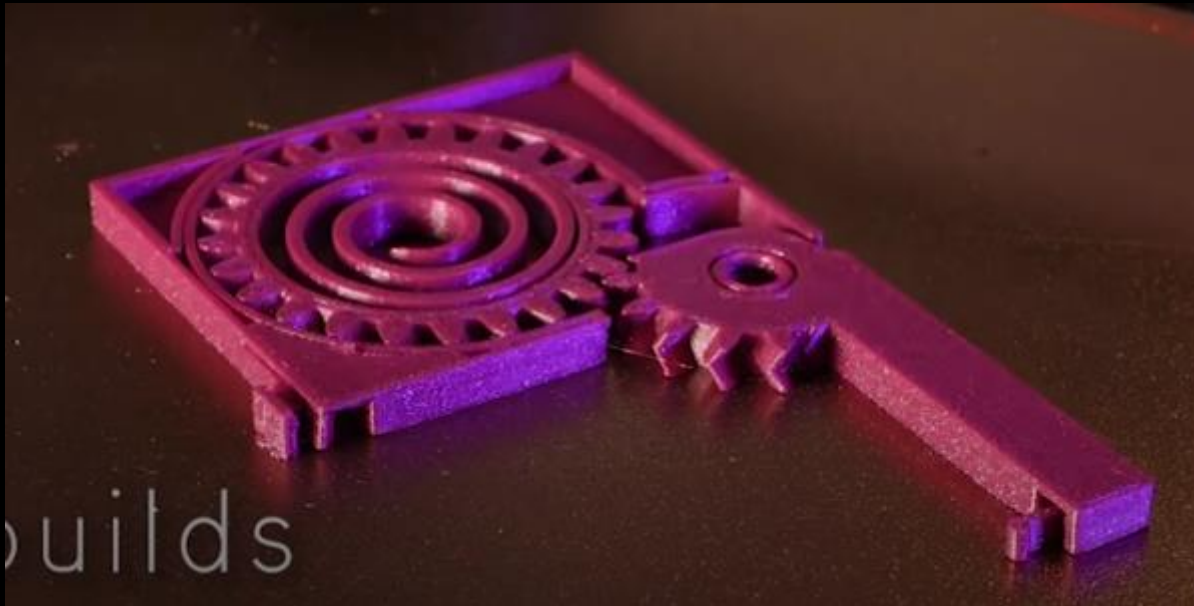




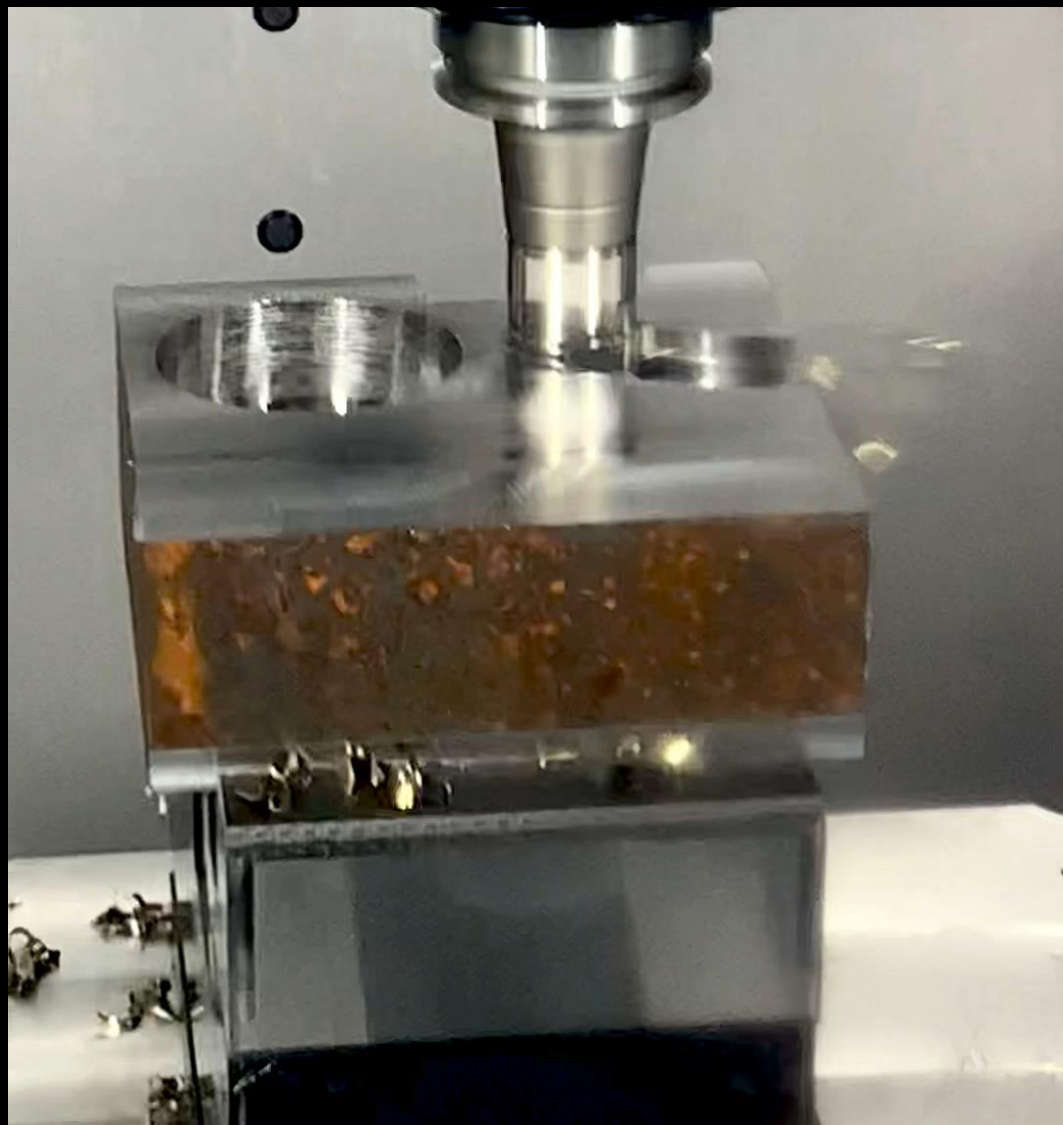
LIQUIDTOOL.

Agenda – CNO Panel 2021

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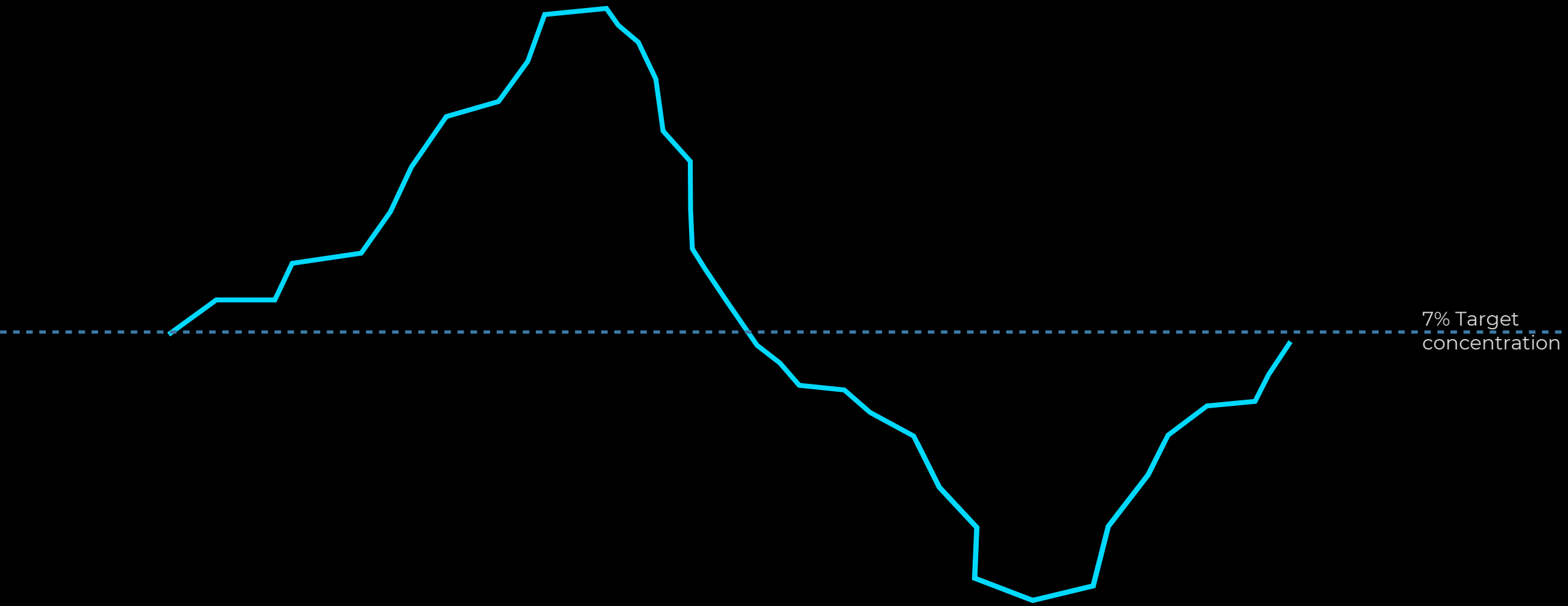
builds





The Challenge

Coolant Concentration



7% Target
concentration



Human compatibility

Coolant consumption



Foam

9% upper limit

7% Target concentration

5% lower limit

Smell



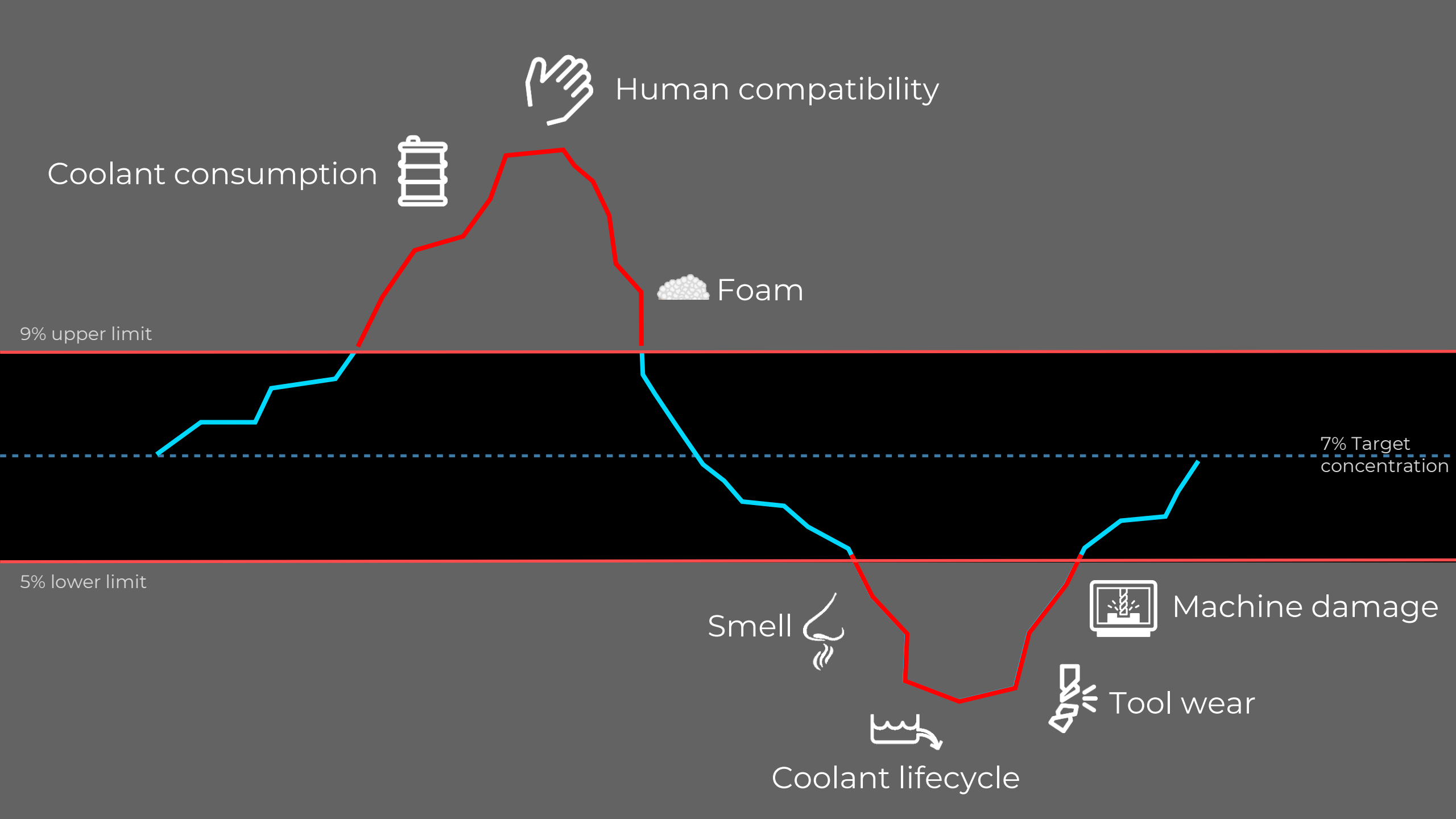
Machine damage



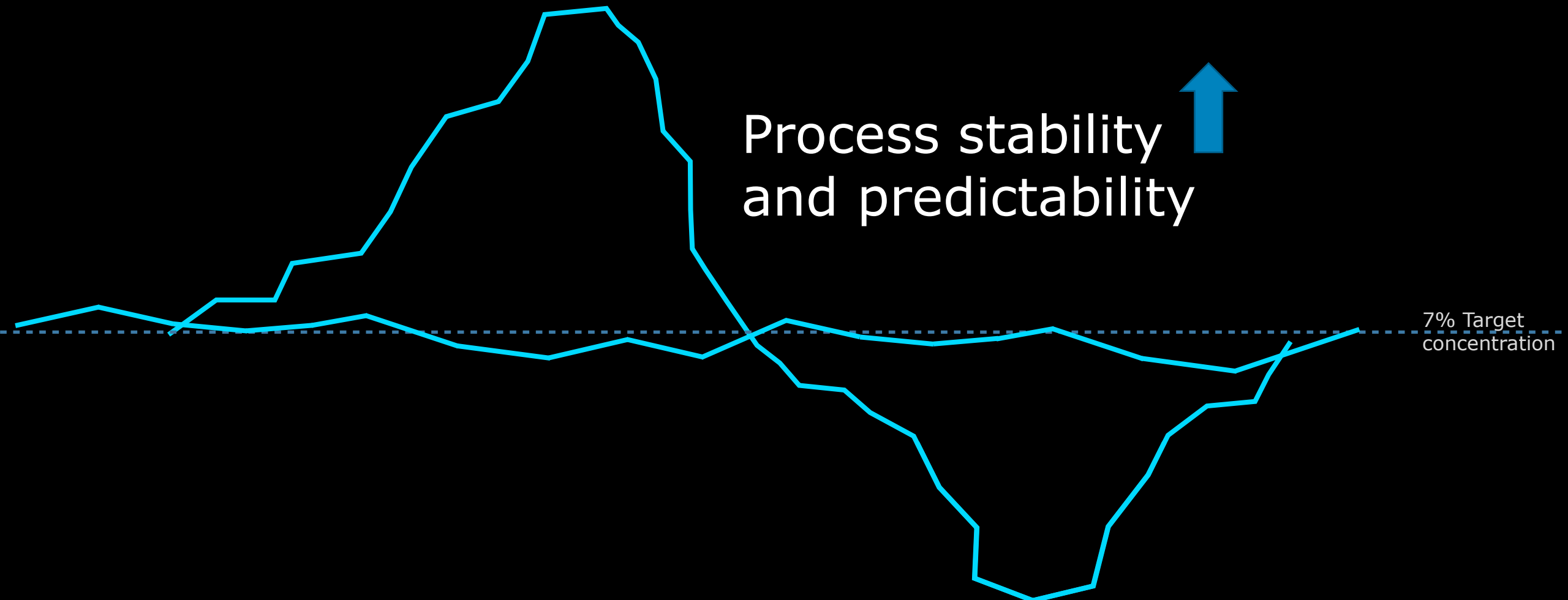
Tool wear



Coolant lifecycle



Coolant Concentration



Process stability
and predictability

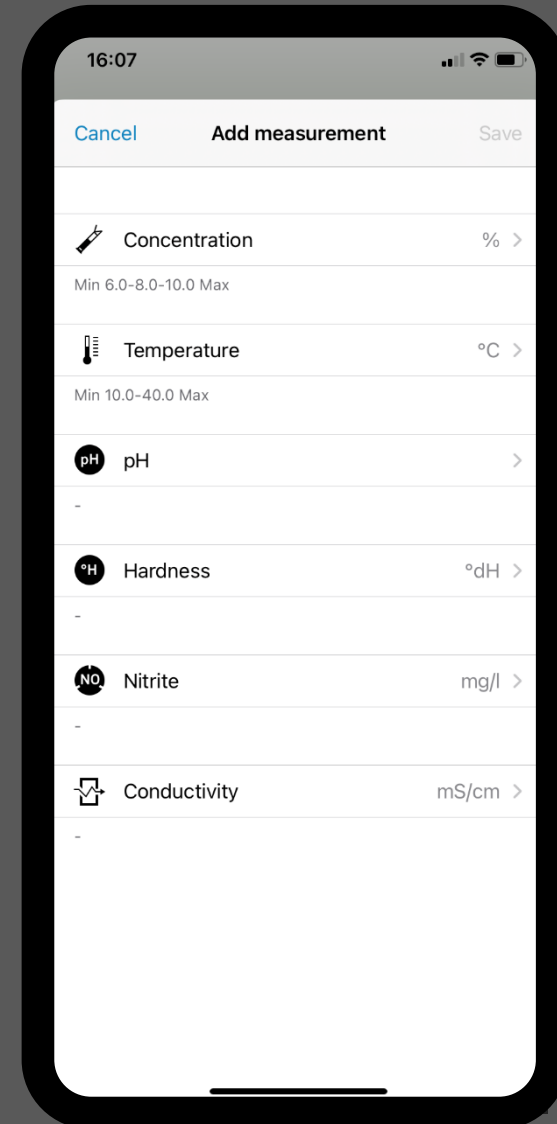
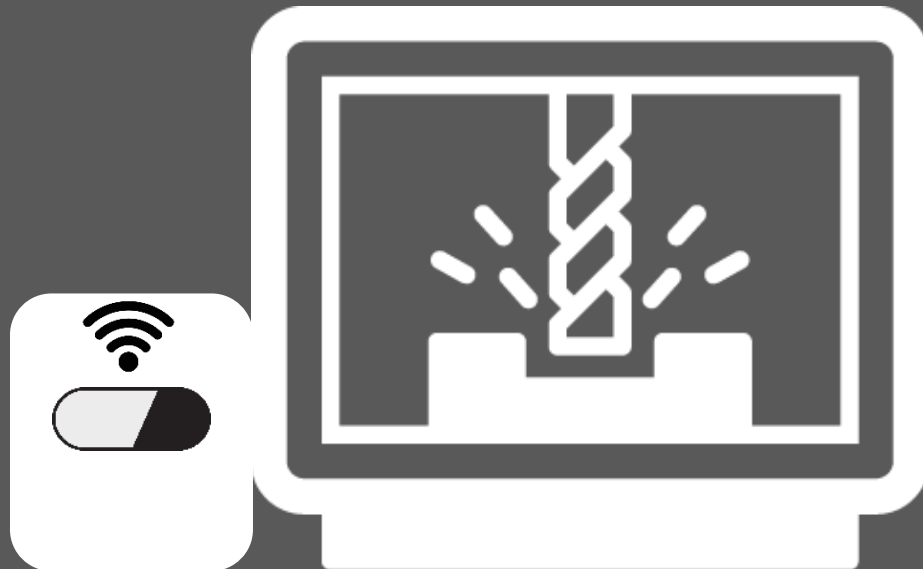


7% Target
concentration

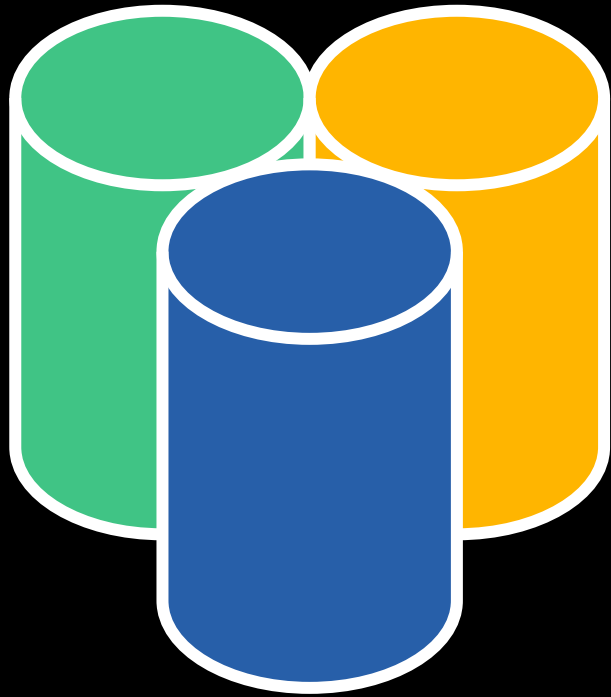
The Solution

Smart Coolant Management

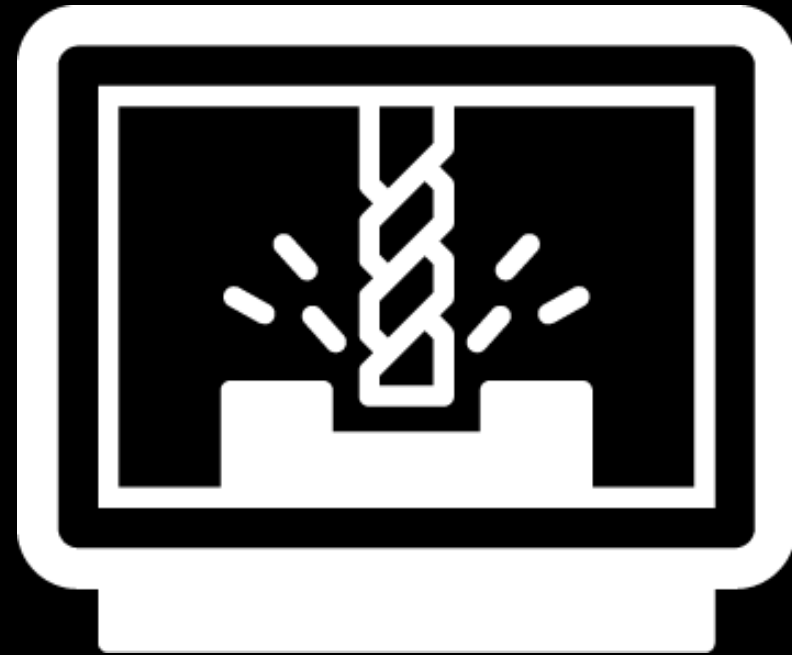
- ✓ Concentration anytime und control
- ✓ Documentation of all relevant measurements
- ✓ History anytime available



For any situation

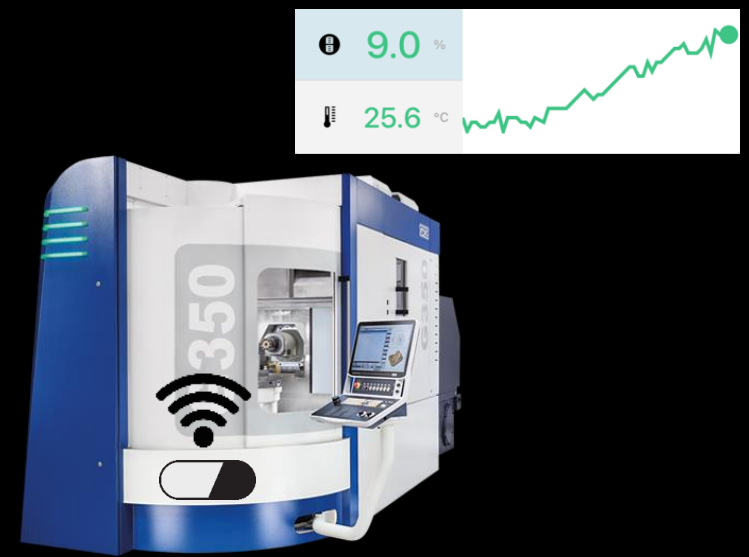


Any Coolant



Any Machine

Overview of all Machines

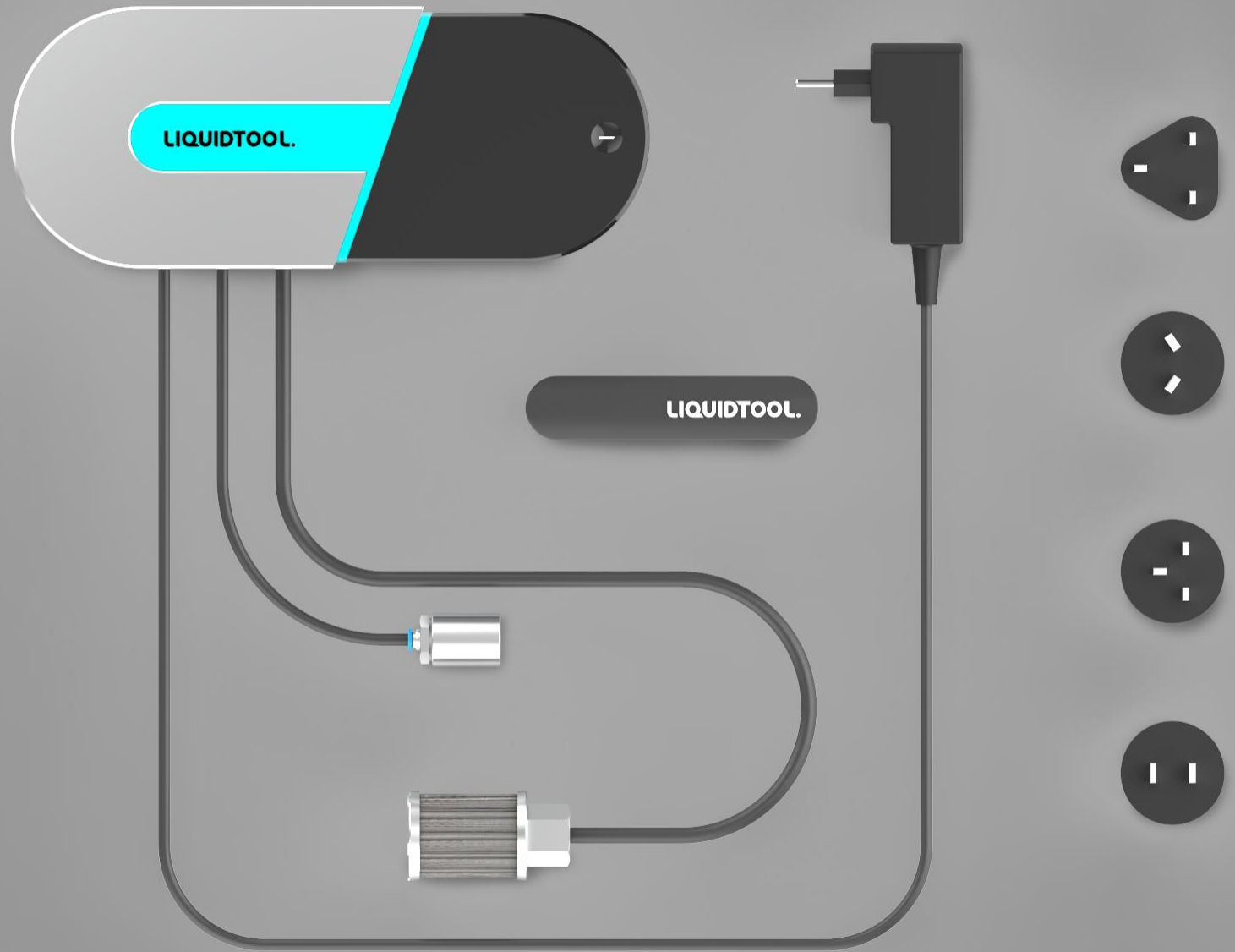


The Device

LIQUIDTOOL.

Sensor 01



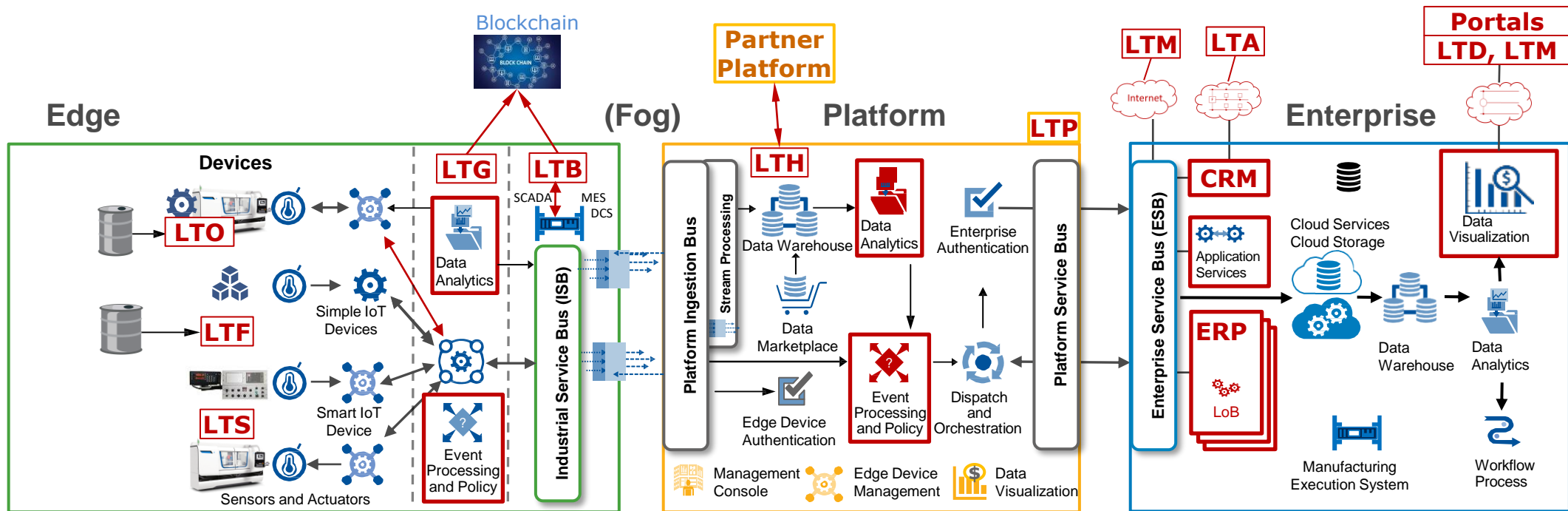


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Liquidtool System Überblick

- Basierend auf dem Gartner IoT Reference Modell



Platform – LTP

- RabbitMQ Message Broker als genereller Eingangspunkt und Verteilpunkt für jegliche Sensordaten
 - Messdaten
 - Events
 - Logs (zweite Instanz)
 - Commands (zum Device)
- User und Device Authentication
- Edge Device Management und Überwachung
- Datenspeicherung
- Data Analytics
- Event – Processing
- Messaging & Help



Security by Design

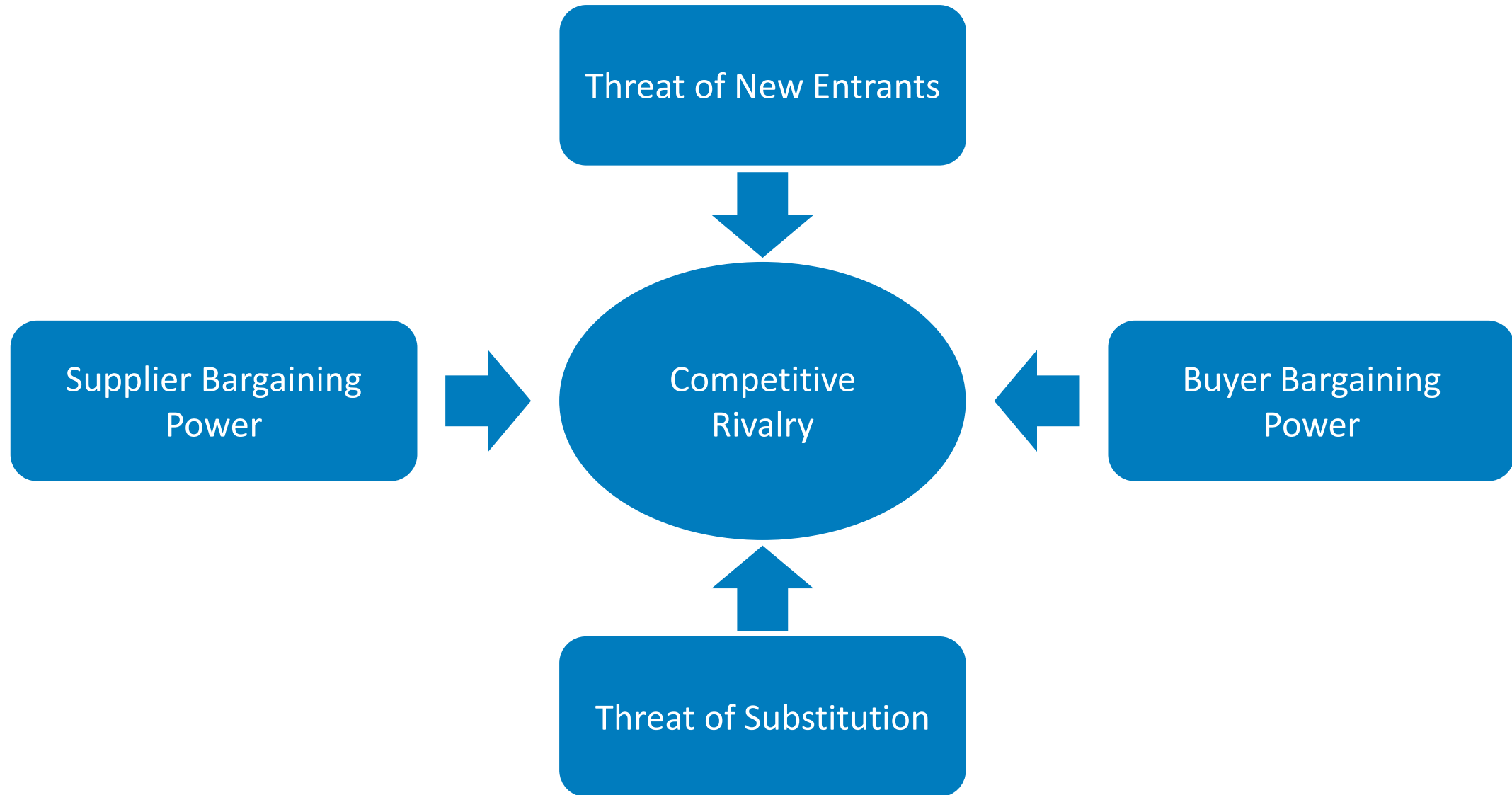
- PKI Infrastruktur mit TPM Chip auf Edge Devices
- Zertifikatserstellung und Signierung sowie Device Enrollment erfolgt im letzten Schritt der Produktion beim Manufacturing Partner
- Komplette Authentifizierung erfolgt über Zertifikate (keine Passwörter mehr benötigt)
- Alle Messdaten werden direkt auf dem Device signiert
- Nutzen der gängigen Linux Security Functions auf Devices wie auch auf Servern (z.B. Fail to Ban)



Agenda – CNO Panel 2021

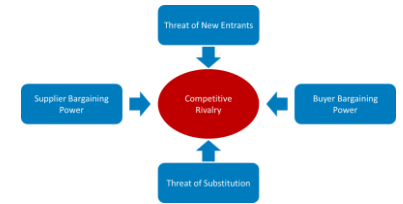
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In Search of Digital Excellence



Rivalry among existing Competitors

- Number of competitors
- Diversity of competitors
- Industry concentration
- Industry growth
- **Quality difference**
- Brand loyalty
- Barriers to exit
- **Switching costs**

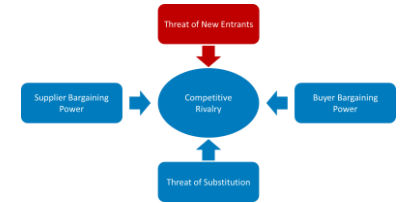


- Ease of use
- Ease of application
- Easy setup
- Easy (no) maintenance

- Integration
- Support
- Service

Threat of New Entrants

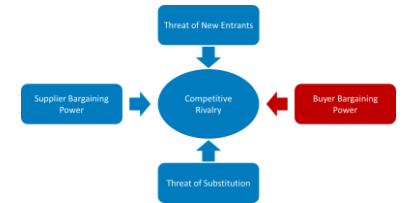
- Barriers to entry
- Economies of scale
- Brand loyalty
- Capital requirement
- Cumulative experience
- Government policies
- Access to distribution channels
- Switching costs



- Try fast, fail fast
- Attach differentiating functions to brand
→ product naming
- Torture devices in alpha/beta tests
- Integration with distributors
- Value add for distributors
- Support

Power of Buyers

- Number of customers
- Size of customer orders
- Differences between competitors
- Price sensitivity
- Buyer's ability to substitute
- Buyer's information availability
- Switching costs



- Holistic solution
- Consider buyer's business process and daily operation procedures
- Design for security
- Torture devices in alpha/beta tests
- Automate tests
- Design for quality (defensive programming)
- Support

Threat of Substitution

- Number of substitute products available
- Buyer's propensity to substitute
- Relative price performance of substitute
- Perceived level of product differentiation
- Switching costs

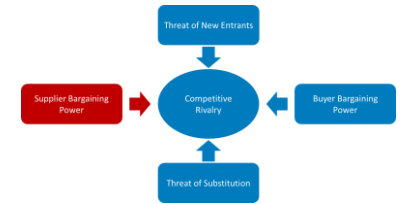


- Holistic solution
- Consider buyer's business process and daily operation procedures
- Design for security
- Torture devices in alpha/beta tests
- Automate tests
- Design for quality (defensive programming)
- Support



Power of Suppliers

- Number and size of suppliers
- **Uniqueness of each supplier's product**
- Focal company's ability to substitute



- Use widely established products
- Maintain alternate supplier list

Summary

Attraction

- Holistic solution
- Consider buyer's business process and daily operation procedures
- Ease of use, ease of application
- Easy setup, easy (no) maintenance
- Integration (with customer)
- Attach differentiating functions to brand
→ product naming
- Integration with distributors
- Value add for distributors

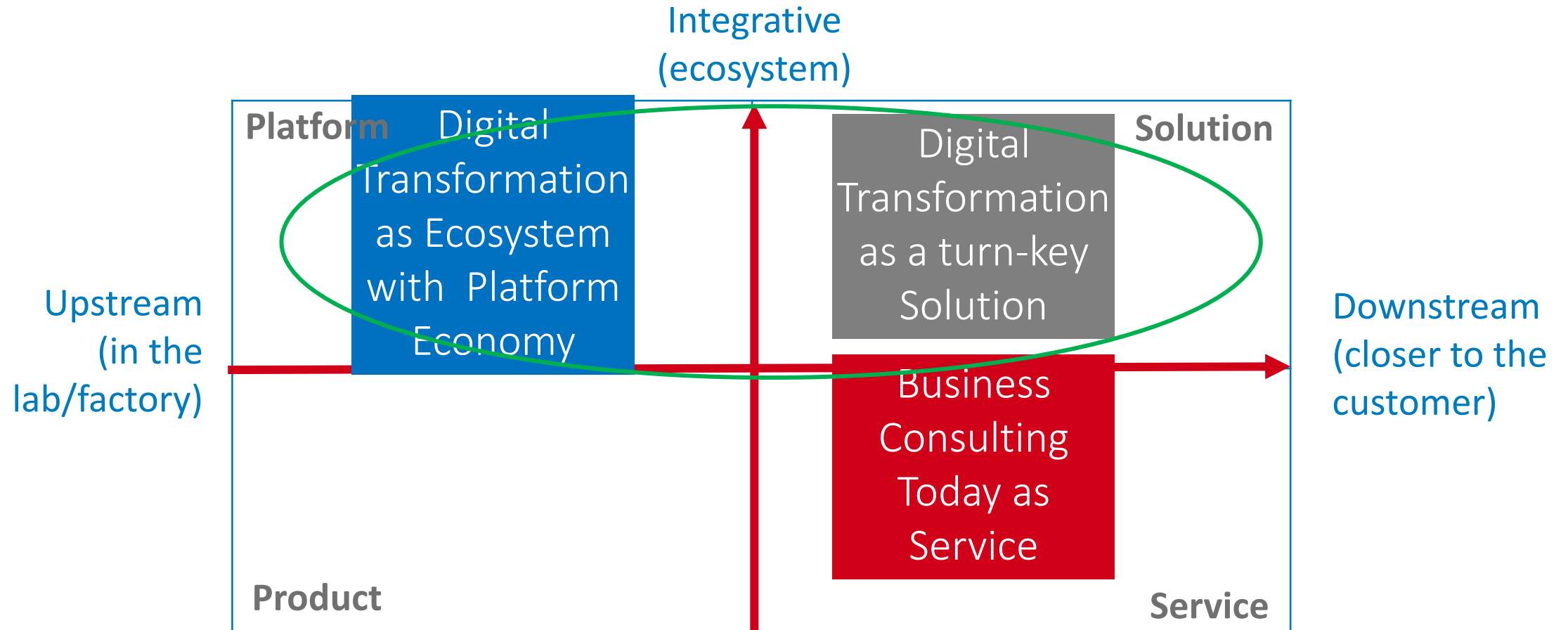
Conversion

- Try fast, fail fast
- Automate tests
- Torture devices in alpha/beta tests
- Design for security
- Design for quality (defensive programming)
- Use widely established products
- Maintain alternate supplier list

Retention

- Support and Service
- Integration

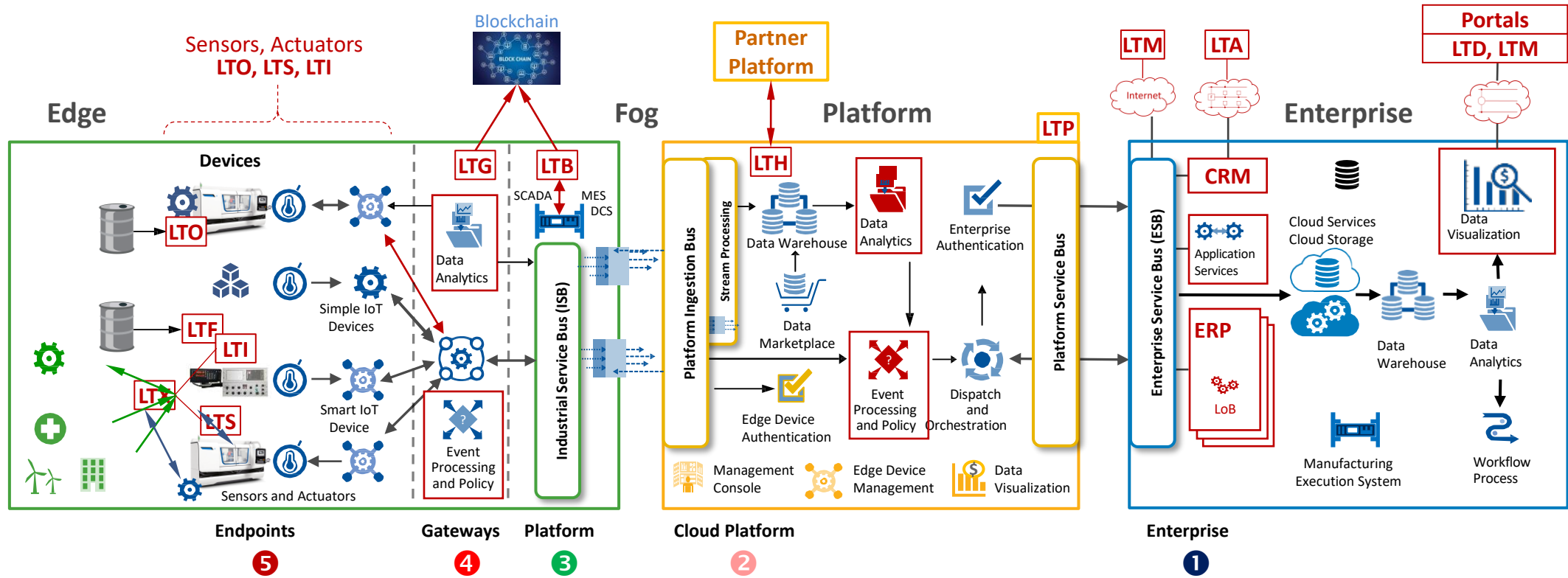
Market (Digital Matrix)



Liquidtool: Product and Service on open Platform

Focused (single-firm)

Liquidtool IIoT Reference Architecture



Legend:

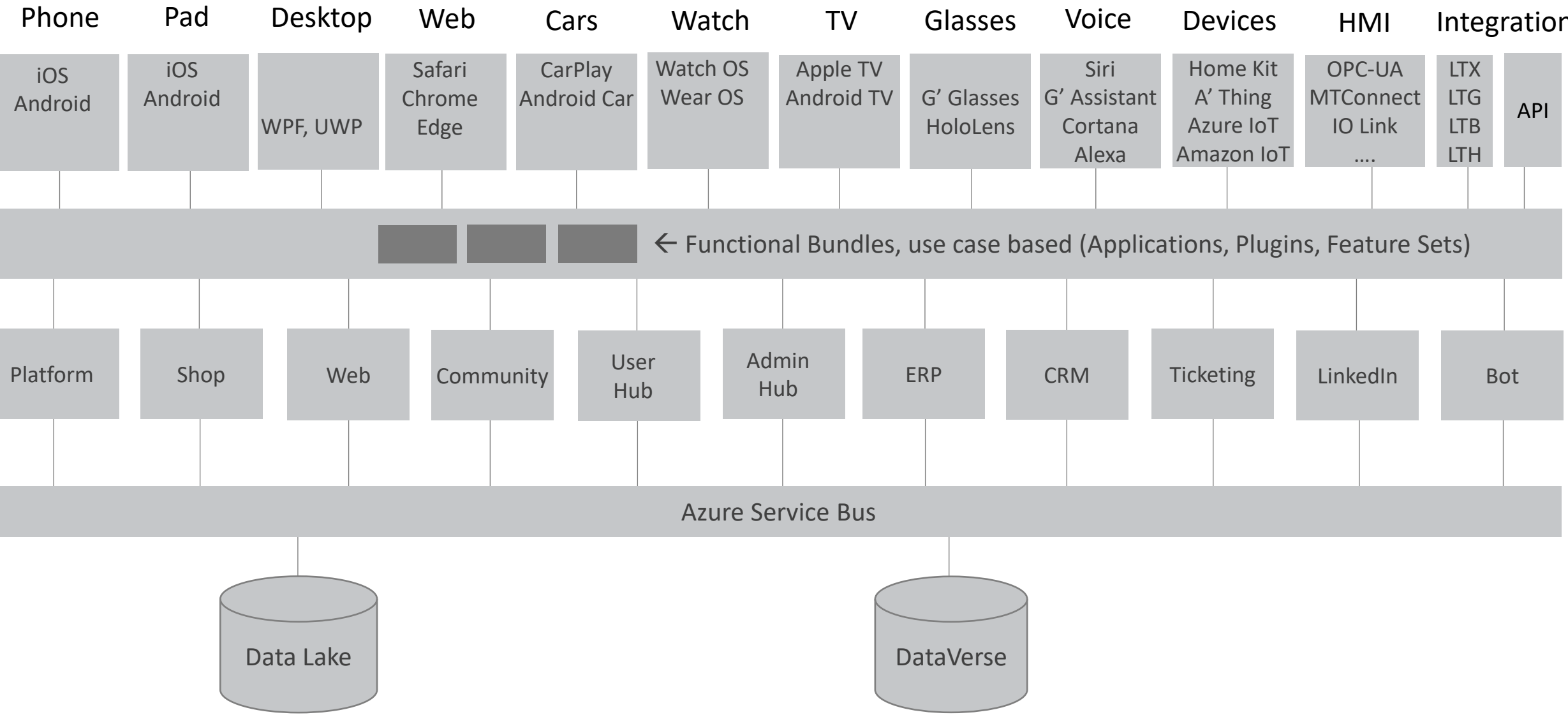
LTA: Liquidtool Analyzer
 LTB: Liquidtool Bus (Industrial Service Bus)
 LTD: Liquidtool Dashboards (Distribution, Compliance)
 LTF: Liquidtool Filler (individual refilling/mixing)
 LTG: Liquidtool Gateway
 LTH: Liquidtool Hub (distributed platform interaction)
 LTI: Liquidtool Inside (embedded sensor and/or actuator)

LTM: Liquidtool Manager (and Monitor)
 LTO: Liquidtool Operator
 LTP: Liquidtool Platform
 LTS: Liquidtool Sensor
 LTX: Liquid Tool Extender

Security by Design

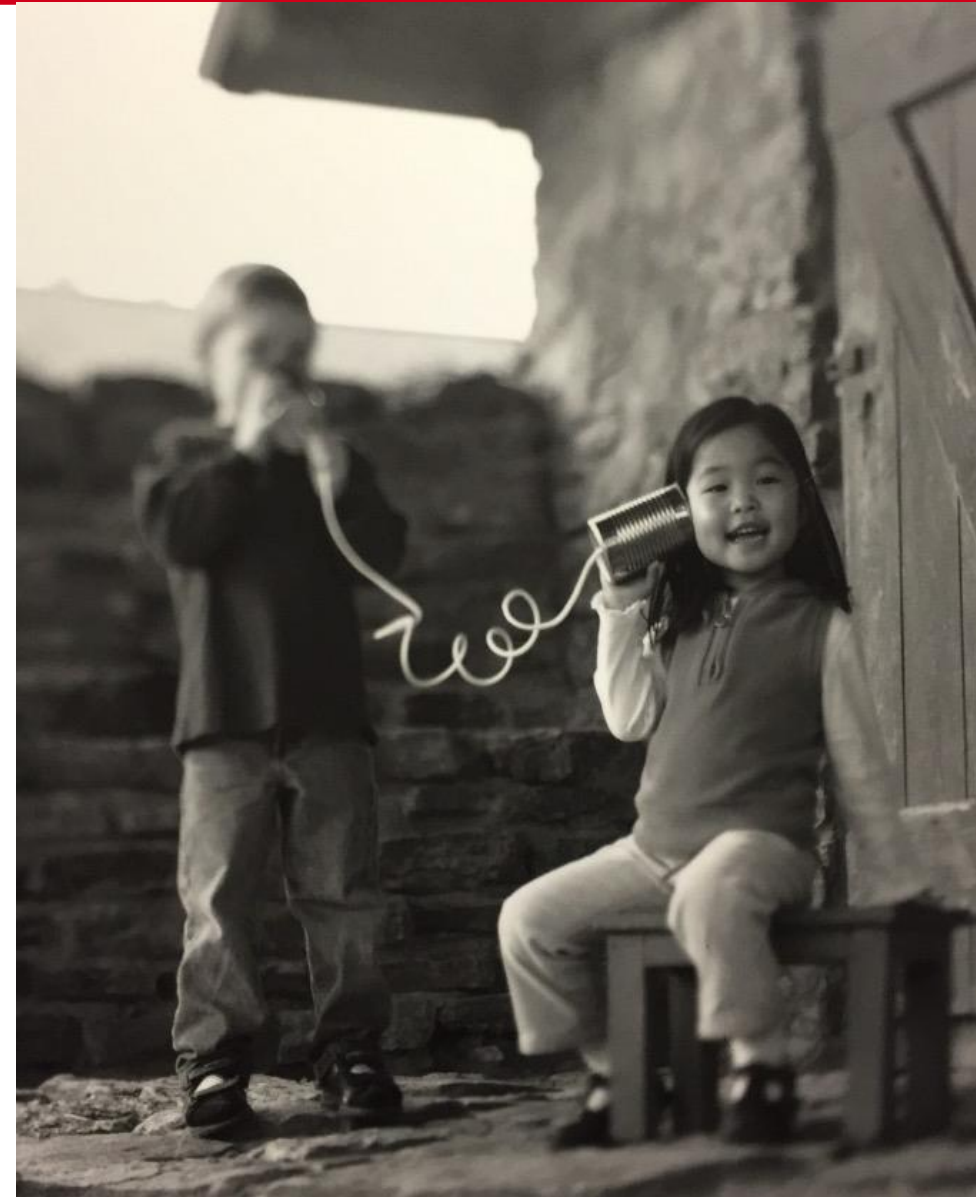
- No Default Mobile Net
- No arbitrary USB Data fetch
- TPM on Sensor
- Signed Data
- Blockchain recording (distributed ledger)

LIQUIDTOOL APPLICATION ARCHITECTURE

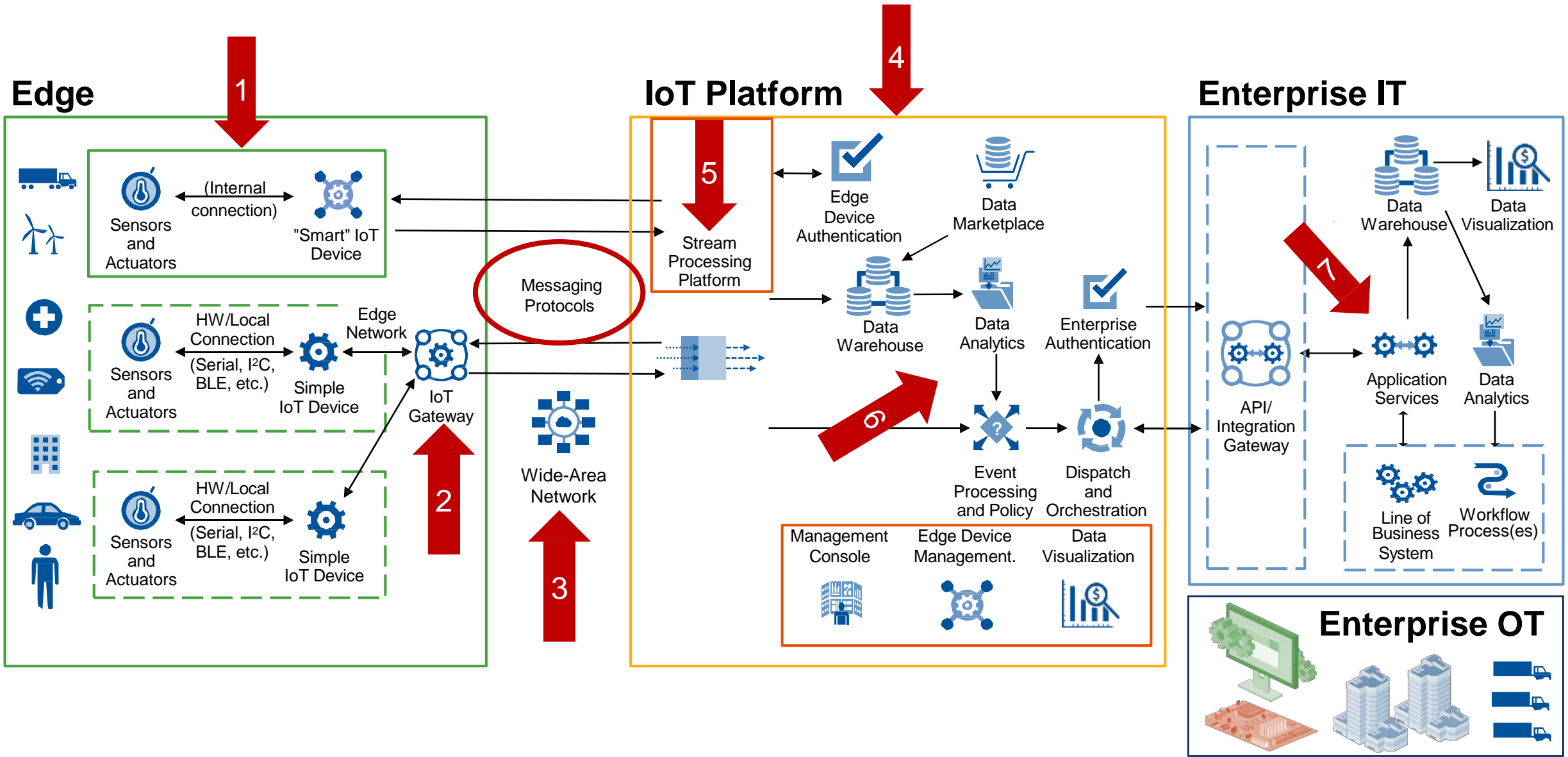


Challenges

1. Don't underestimate *communication bandwidth constraints!*
2. Don't underestimate the *complexity of integration!*
3. Don't fall into the «*Swiss disease of Overengineering!*»!



Must Integrate Many Products, Services and Technologies

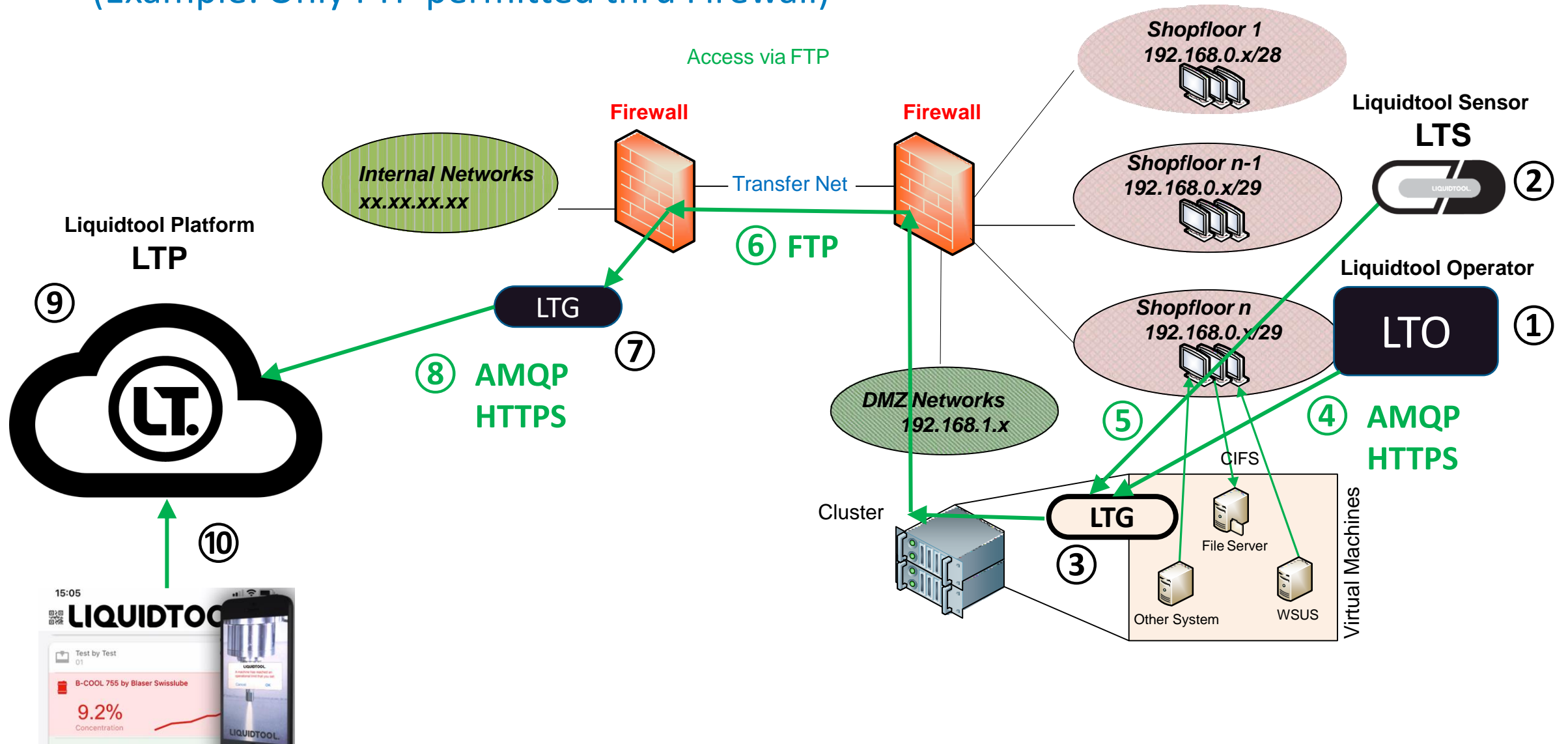


Must Integrate Many Products, Services and Technologies (IoT Protocols)

Technology	Description	Architecture	Further Information
Advanced Message Queuing Protocol (AMQP)	Standard (Oasis and ISO/IEC) for message-oriented middleware	<ul style="list-style-type: none"> • Publish/subscribe • TCP-based • Broker-based • Security: SSL/TLS, SASL 	<ul style="list-style-type: none"> • AMQP standard • AMQP portal • AMQP GitHub
Constrained Application Protocol (CoAP)	Standard (RFC 7252) binary communication protocol for constrained nodes and networks	<ul style="list-style-type: none"> • Request/response • UDP-based • Brokerless • Security: DTLS 	<ul style="list-style-type: none"> • CoAP standard • CoAP portal • CoAP GitHub
Data Distribution Service (DDS)	Standard (OMG) middleware messaging protocol	<ul style="list-style-type: none"> • Publish/subscribe • UDP- and TCP-based • Brokerless • Security: SSL/TLS (TCP) 	<ul style="list-style-type: none"> • DDS standard • DDS portal • DDS GitHub
MQ Telemetry Transport (MQTT)	Standard (Oasis) binary communication protocol for lightweight machine-to-machine transfer	<ul style="list-style-type: none"> • Publish/subscribe • TCP-based • Broker-based • Security: SSL/TLS 	<ul style="list-style-type: none"> • MQTT standard • MQTT portal • MQTT GitHub
XMPP Extension Protocol (XEP)	IoT extensions to the Extensible Messaging and Presence Protocol (XMPP)	<ul style="list-style-type: none"> • Publish/subscribe • TCP-based • Broker ("node") based • Security: SSL/TLS 	<ul style="list-style-type: none"> • XEP standard • XMPP portal • XMPP GitHub

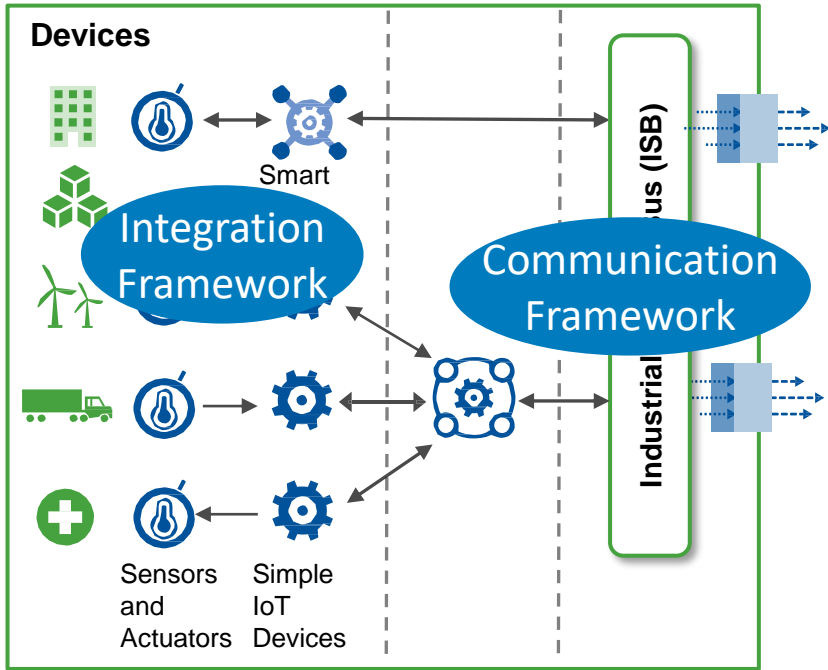
Liquidtool Gateway – Topology for Network Integration

(Example: Only FTP permitted thru Firewall)



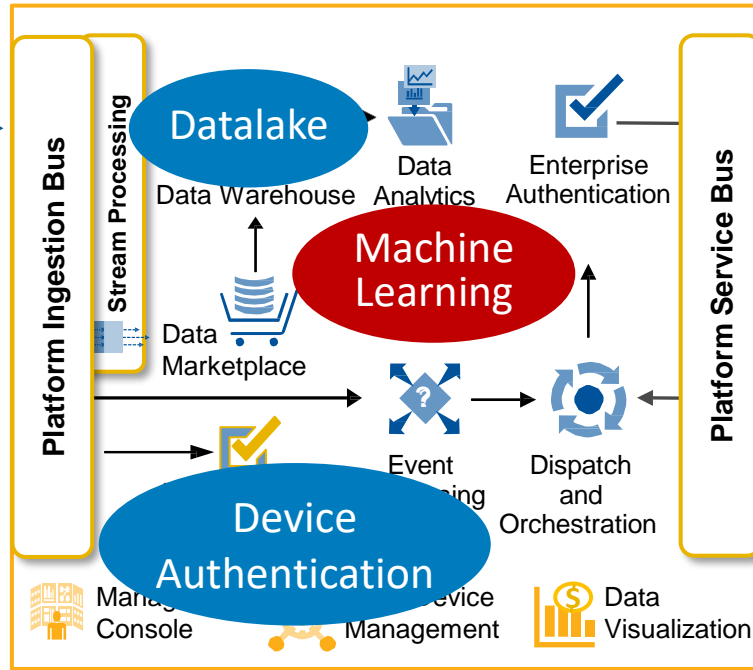
Internet of Things – Focal Points

Edge



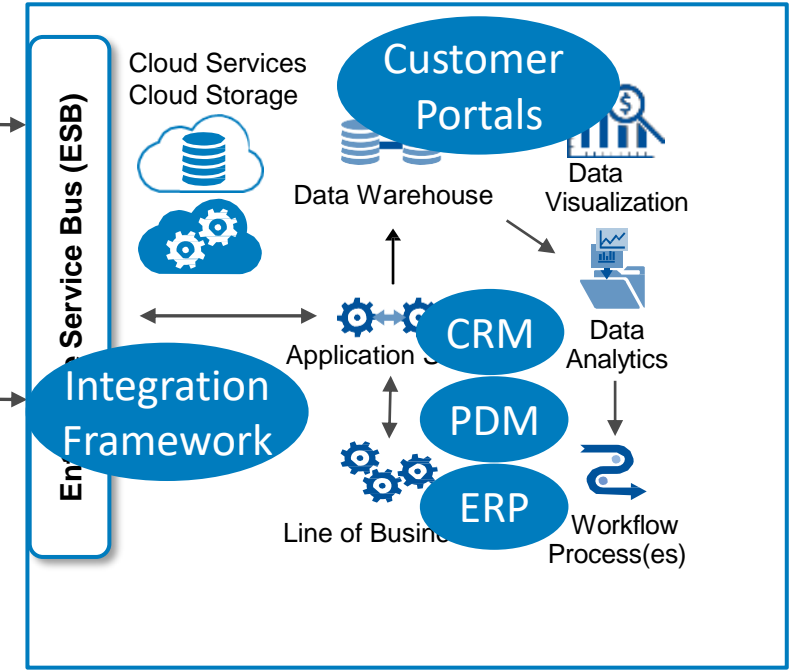
Sensors, Actuators
Communication

IoT Platform



Mass Data Ingestion
Artificial Intelligence

Enterprise IT



Integration
New Process Models

Enterprise IT/OT IIoT Reference Model (based on Gartner Models 2018/2019)

Scalability – Support and Assistance

Edge

IoT Platform

Enterprise IT



- Help Trouble Shooting
- Educate Machine Operator
- Alert Machine Operator
- **Self Service**
- **Self Repair**

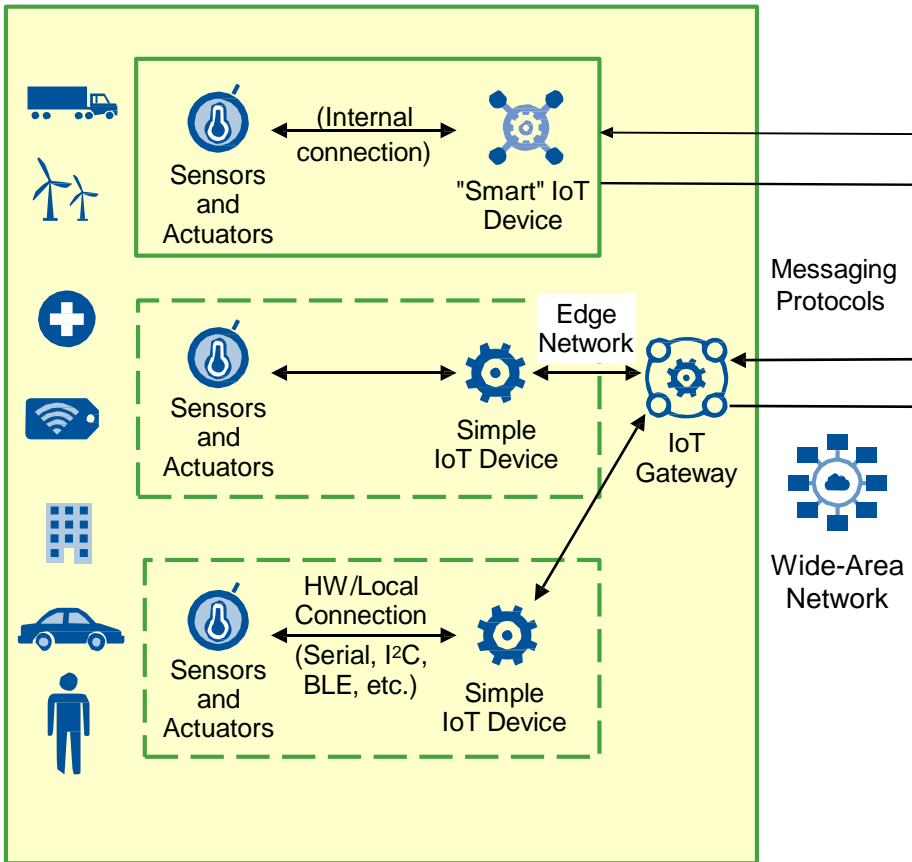
- Associative Help
- Context Related Instruction
- Predictive Problem Interception

- Active Repository
- Modular Instructions Database
- Rules Database

IT (Information Technology) meets OT (Operations Technology)

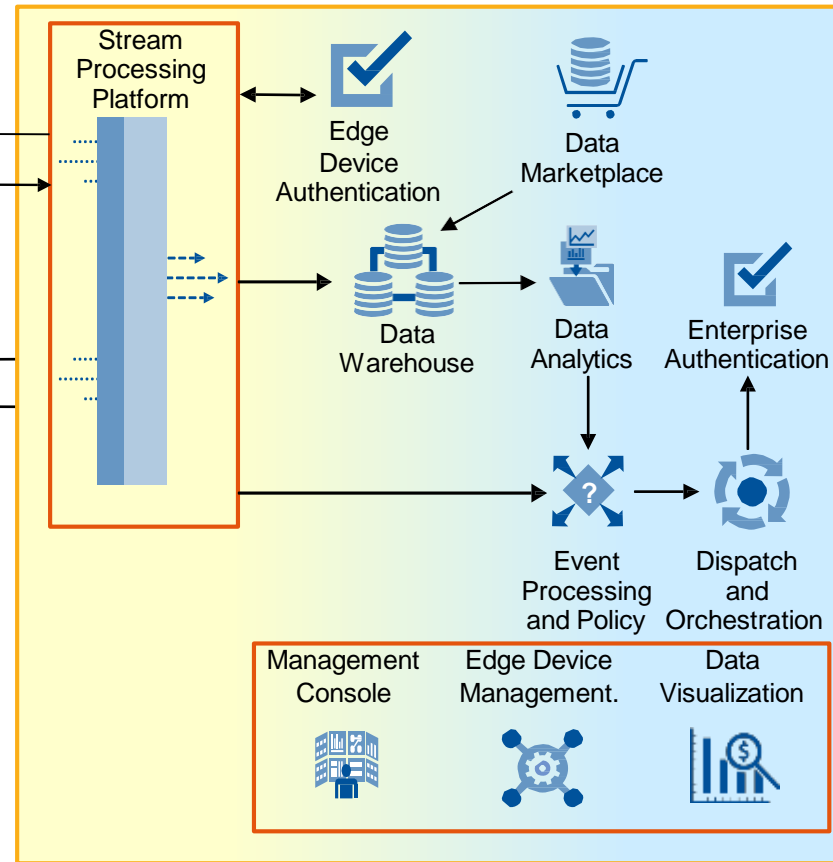
ERP, CRM, TFS, PDM, CAD, IWP, BI, Reporting, ...

Edge: OT (Customer Operations)

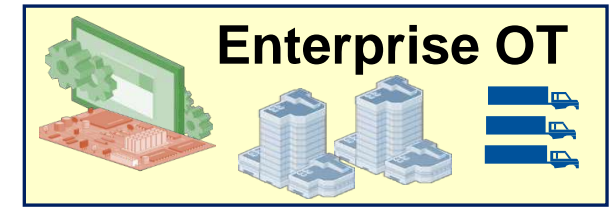
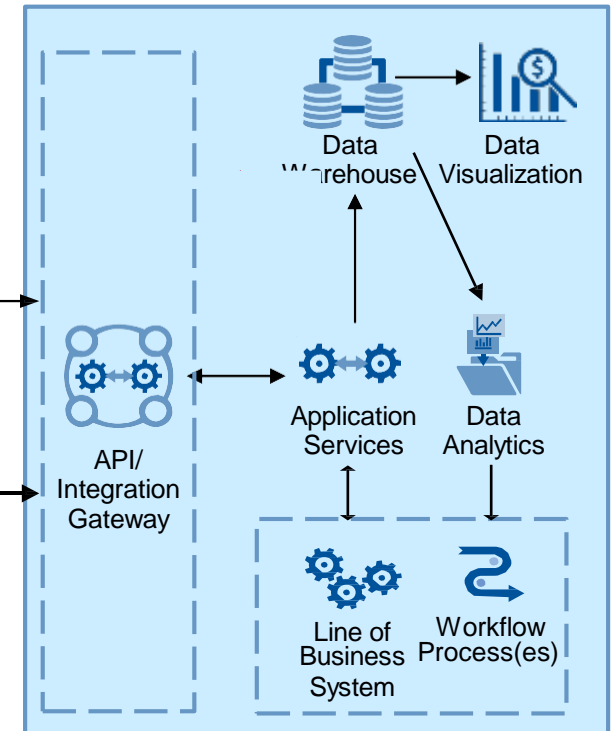


SCADA, DCS, BMS, Analytics, Monitoring, general purpose Customer Operation ...

IoT Platform: IT-OT (Convergence)

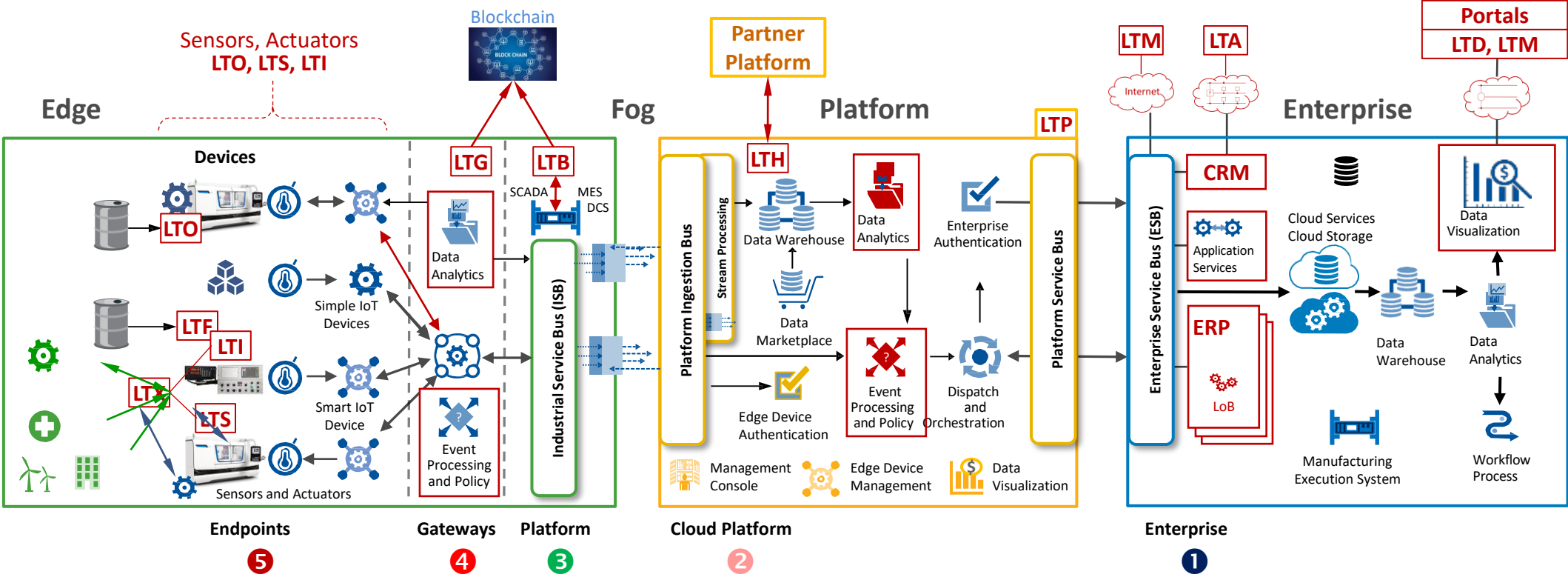


Enterprise IT

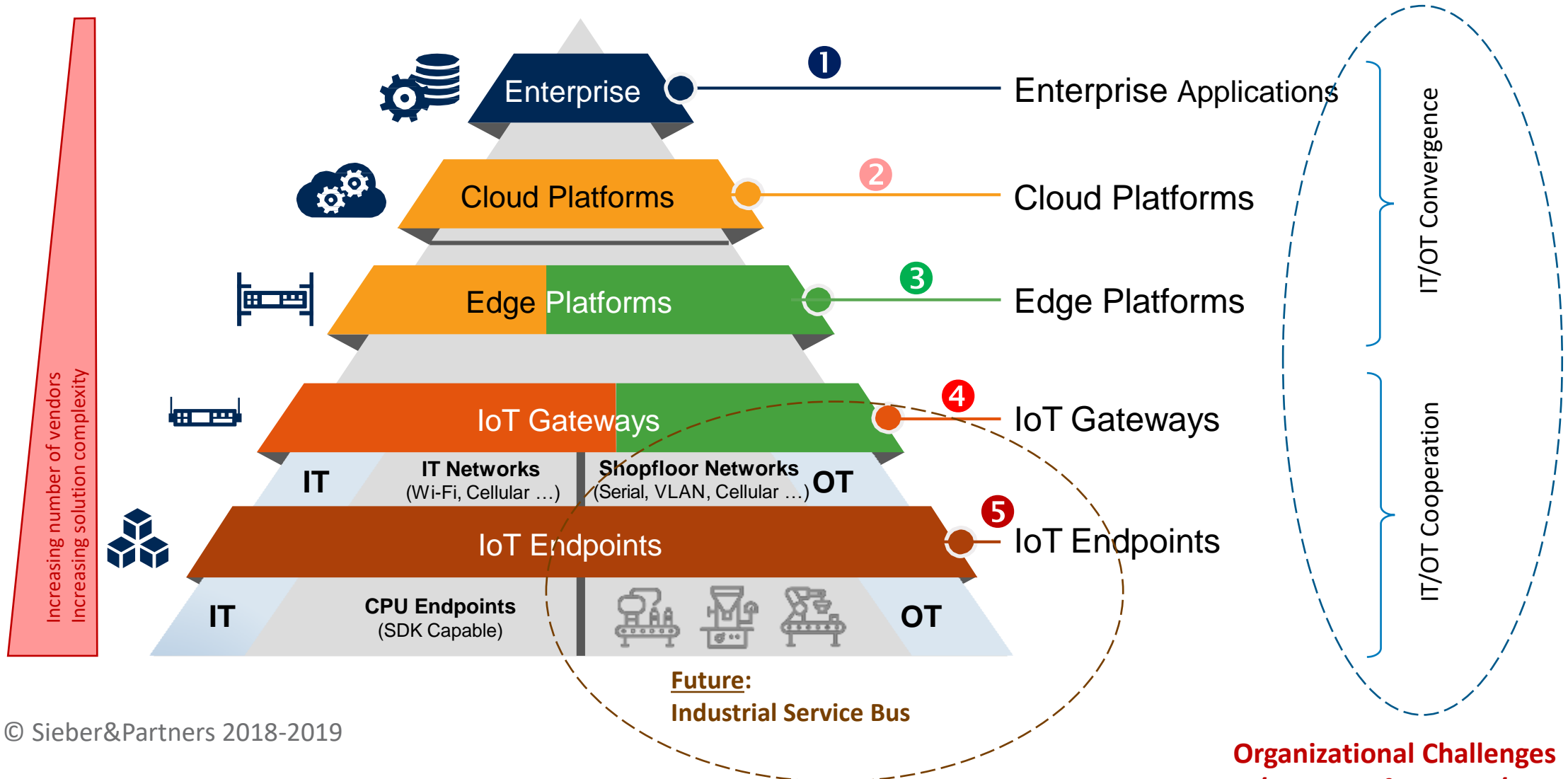


MES, PLC, DCS, CNC, ...

Liquidtool IIoT Reference Architecture



Challenge – Trust and Collaboration at the Edge



© Sieber&Partners 2018-2019

Challenge – IT: Information Technology – OT: Operation Technology

Bridging the IT-OT gap

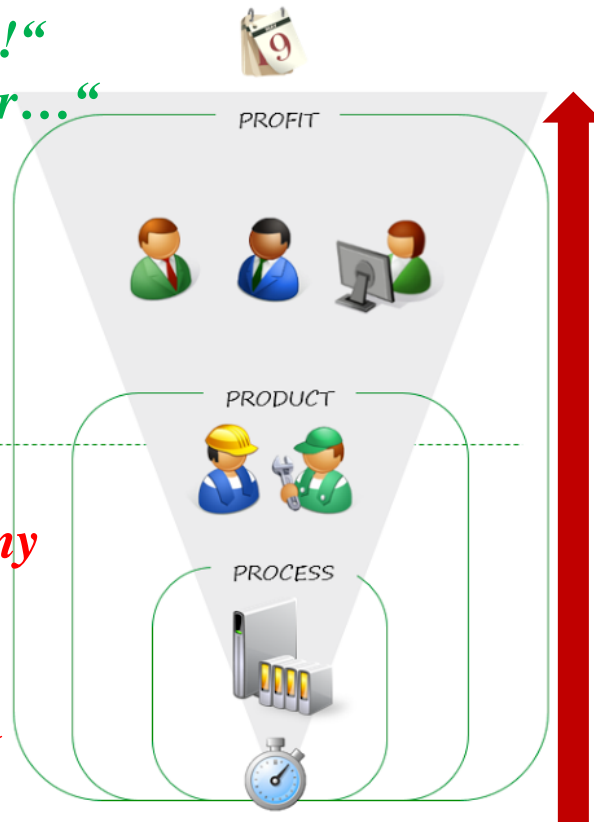
„Wanna upgrade?“

„Yes, new features!“

„we might consider...“

The world of
“MANAGE”
(IT)

The world of
“CONTROL”
(OT)



IT
Information Techn

**IT-OT Convergence
and Collaboration**

OT

The world of
Corporate IT
(ERP)

Systems design assumes
humans as the end-point

Focus is on making money
(revenue, margins, EPS, etc.)

Scope is cross-functional
orchestration of supply chain

Consolidate view across
multi-site plant network

Enforce standard interface
between ERP and plants

Mostly homogeneous policies;
primary risk is loss of data

The world of
Engineering
(Automation)

Designed for controlling
things (non-humans)

Focus is on Process Control
(temperature, emissions, etc.)

Scope is providing detailed
instructions to machines

Communicate production plans
to (islands of) automation

Accommodate multiple
protocols & equipment
interfaces

Diverse, asset-specific policies;
risk includes loss of data and
life

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Hands-on – App download und login

1. Liquidtool App Download




2. Log in

User: cnouser1@re-gister.com

Passwort: CNOPanel

Hands-on – Maschine erstellen

1. Erstelle eine Maschine (Plus Knopf unten in der Mitte drücken)
 - Machine Manufacturer: Frei wählbar
 - Model/Type: Generic
 - Internal machine identifier: CNO 1, CNO 2, CNO 3, CNO 4
 - Location: Factory
 - Add Specialist: Schritt überspringen
2. Drücke "Next" und definiere den Kühlschmierstoff
 - Coolant Manufacturer: Blaser Swisslube
 - Coolant Type: Wähle ein Kühlschmierstoff aus der Liste oder scanne den Produktcode hier:

 - Date of initial Filling: heute

Hands-on – Maschine erstellen

1. Drücke Next
2. Setze die Konzentrationsgrenzen wie folgt:
 - Minimum: 7%
 - Target: 8%
 - Maximum: 10%
3. Drücke Next → Maschine wird erstellt

Hands-on – Sensor mit der Maschine verbinden

1. Gehe auf die Detailansicht deiner erstellten Maschine
2. Drücke den Plus Knopf unten in der Mitte
3. Wähle "Add device"
4. Wähle "Next Step"
5. Drücke den Knopf am Sensor für 3 Sekunden (Bluetooth aktivieren)
6. Wähle den Sensor aus der angezeigten Liste (Nummer überprüfen)
7. Drücke "Next" bis zur Auswahl der WLAN Verbindung
 - **SSID: Liquidtool Hotspot 1**
 - **Passwort: 8697 4974**
8. Drücke Next -> Der Sensor überprüft die Verbindung und registriert sich
9. Warte auf die ersten Messwerte

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