LEADING IN
PRODUCTION
EFFICIENCY

DÜRR

IIoT – Intelligent painting processes

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www.durr.com

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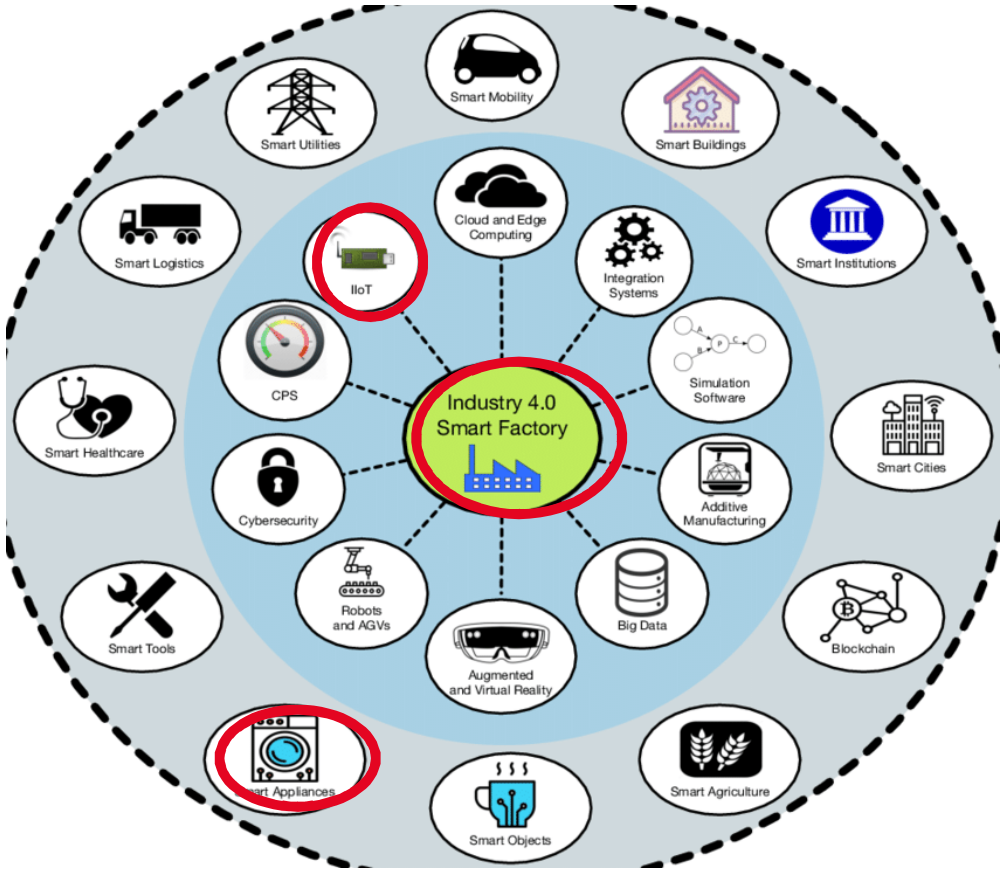
IIoT – a brief introduction

Definition and related terms

- **Internet of Things** (IoT) may be defined as the interconnection of devices consisting of actuators and sensors, in order to create beneficial functions for consumers.
- **Industrial Internet of Things** (IIoT) focuses on industrial processes and manufacturing instead of consumers.
- IIoT is often named in the context of closely related buzzwords.
  - Among which „**Industry 4.0**“can be seen as the collective term for all of these buzzwords.
  - And „**Smart**“ often labels the real beneficial functionality



Source: T. Fernandez-Carames, P.Frage-Lamas (2018)

IIoT – a brief introduction

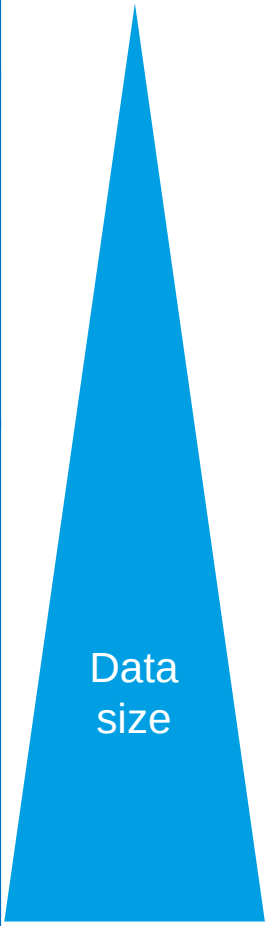
Why do integrators/customers (not) use IIoT?

	Integrators	Customers
Opportunities	■ Gain technological leadership ■ Enhance/Extend product portfolio ■ Improve margins ■ Build long term customer relation in addition to spare part business ■ Enter new markets	■ Increase uptime/throughput ■ Reduce operating costs/cycle time ■ Improve quality/first-run rate
Risks	■ Software Know-How required ■ Conservative customers ■ High initial R&D costs	■ Not measurable or long ROI ■ Additional investment costs ■ IT-Experts required

IIoT – a brief introduction

Layers

	IIoT Layer	Dürr Products	Typical examples
Extendable by Integrator	Application layer	■ **Sequence editor** ■ **DXQ3D.OnSite**	■ Predictive maintenance ■ Condition monitoring
	Platform layer	■ **Tapio**	■ Data management ■ Machine learning
Provided by Dürr	Connectivity layer	■ E-Stop ■ **Ethernet UDP** ■ Profinet / EtherCAT* ■ USB	■ Profinet ■ EtherCAT ■ DeviceNet ■ CanOpen
	Device layer	■ **Eco**AUC ■ **Eco**PUC MC ■ **Eco**RP 10 R1100 ■ **Eco**Dose 2K	■ 3rd Party products

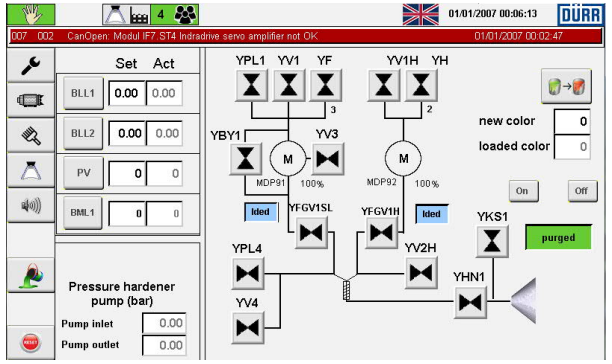


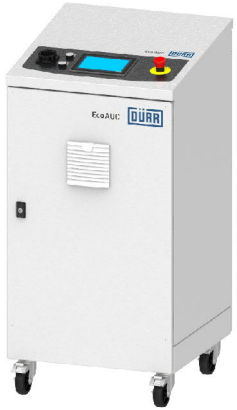
** For **Eco**RP 10 R1100 only*

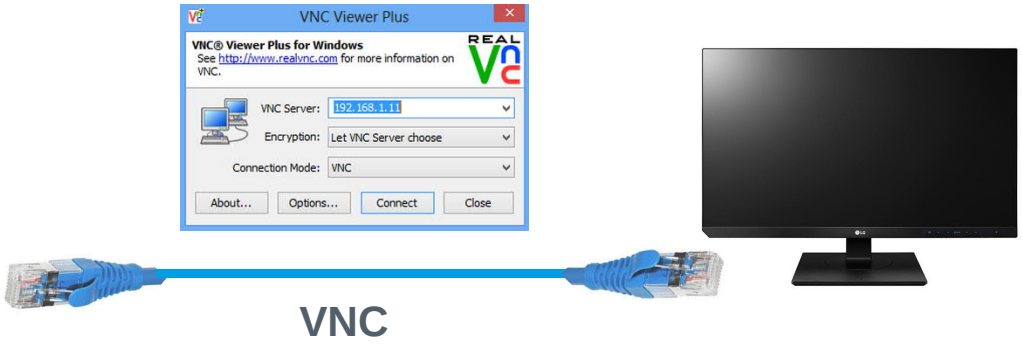
Devices

Included functionalities

- All IIoT-related Dürr products **include even in their most basic configuration**:
  - Ethernet UDP Interface
  - Double channel E-Stop (in and out)
  - USB-Port to manage backups, sequences, log files
  - Modern HMI translated into 11 languages
  - Open VNC-Connection
  - Regular, free of charge software updates
- Competitors often charge abovementioned functions or don‘t offer them







Connectivity

Ethernet UDP – basics of communication

- Every type of communication is based on:
  - Device
  - Language
  - Medium
- Standards do not only apply to humans but also to machines
- The standard framework for machine communication is called: Open Systems Interconnection Model (OSI)

- Cable vs. Wireless

- German vs. Spanish

- Visual vs. Acoustic

Connectivity

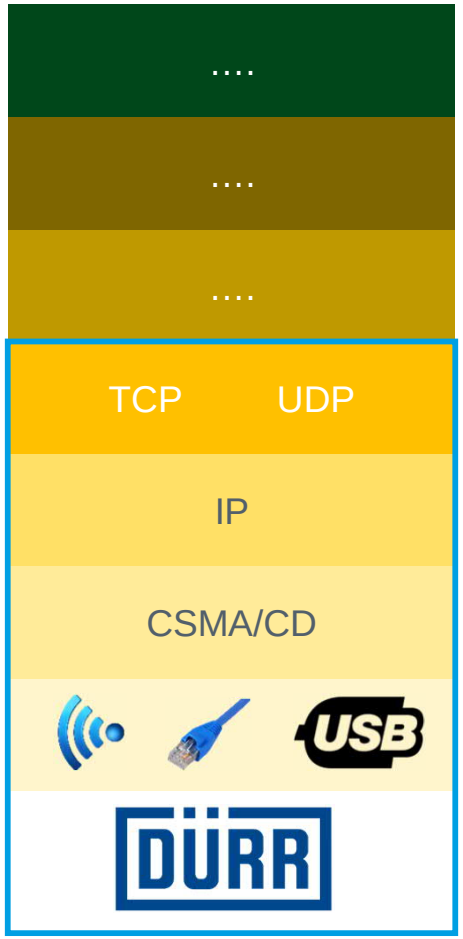
Ethernet UDP – OSI model

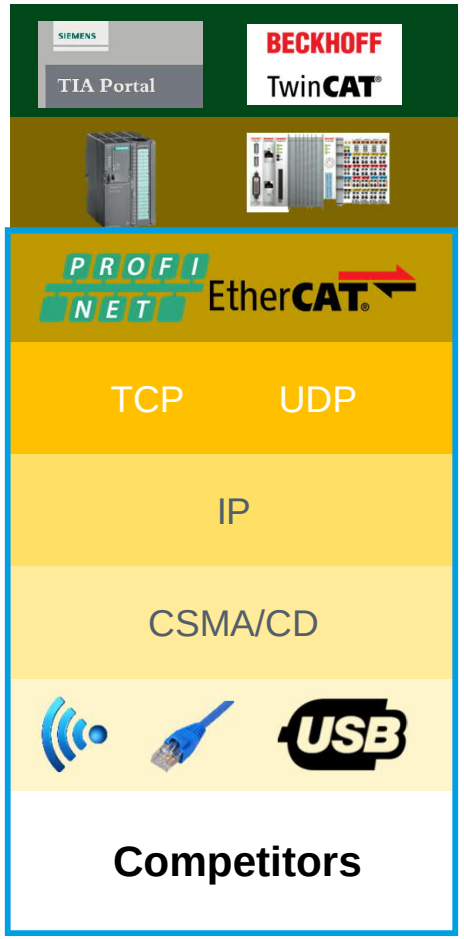
- The OSI-Model consists of 7 Layers:
  - Layer 1: Physical Layer – e.g. copper cable, fiber optical cable, wireless
  - Layer 2: Data Link Layer – e.g. failure correction
  - Layer 3: Network Layer – e.g. Adress, routing
  - Layer 4: Transport Layer – e.g. Data size and type
  - Layer 5: Session Layer – Connection between 4 and 5
  - Layer 6: Presentation Layer – e.g. Windows, Linux
  - Layer 7: Application Layer – e.g. Outlook, Firefox, etc.

Connectivity

Ethernet UDP – Dürr vs. Competitors

- Dürr uses Ethernet UDP, as it only defines the first four OSI-Layer
- Competitors use common Fieldbus systems, which define the first five OSI-Layers
- Advantages of Dürrs approach:
  - All PLCs which are either compatible with ProfiNet, EtherCAT or DeviceNet are also compatible with EthernetUDP. Therefore the PLC type is not predetermined.
  - Often no additional communication interface required
  - Identical interface setup for all PLCs
- In other words: Dürrs approach is **platform independent**





Platforms

Tapio

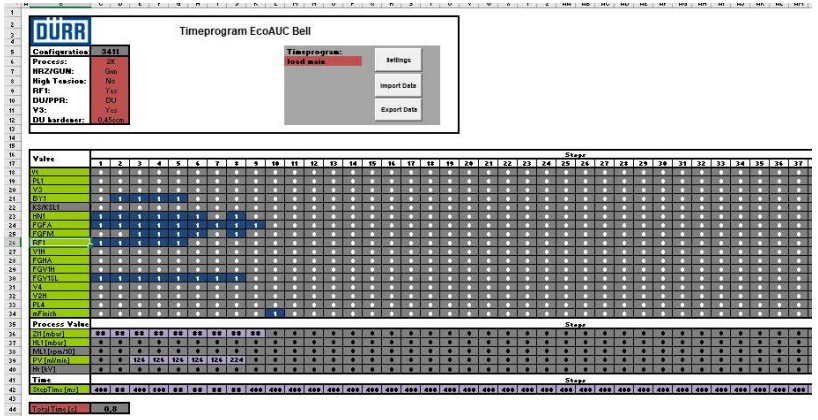
- Tapio (www.tapio.one) is an independent framework that provides the infrastructure to link the network layer with the application layer
- This includes among others:
  - App Store
  - Payment system
  - Databases
  - Basic analytic functions
  - Manufacturer independent-apps
- **Partners benefit from development synergies** within the large partner network and may set industrial standards

Tapio partner network

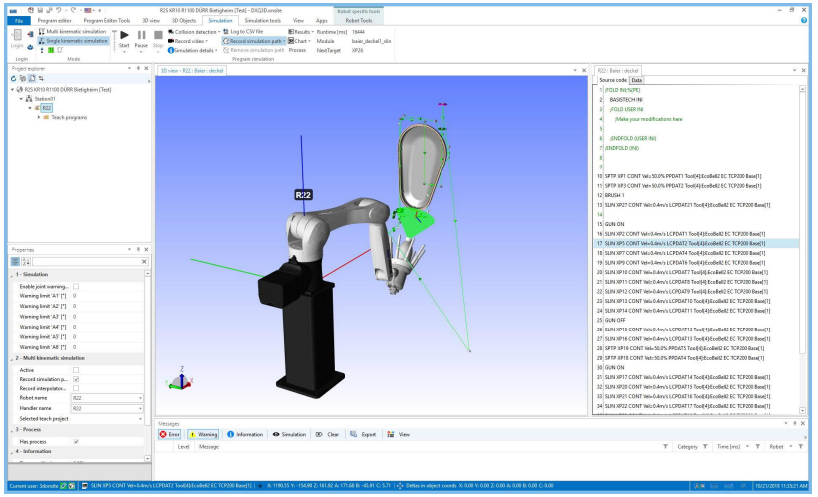
Applications

Sequence editor and DXQ3D.OnSite

- **Sequence Editor** is an Excel-based tool to create and edit valve sequences – no additional software required
- Sequences are used for example for flushing, loading, pre-mixing
- **Eco**AUC, **Eco**RP 10 R1100 and **Eco**Dose 2K make use of sequences and are delivered with a set of predefined sequences
- Access to sequences is given via USB (user-level required)



- **DXQ3D.OnSite** is a programming system for all Dürr Robot models
- It allows to create and edit robot programs offline, i.e. without the need of a physically existing robot
- Programs may also be tested for collisions and cycle time with the integrated simulation function

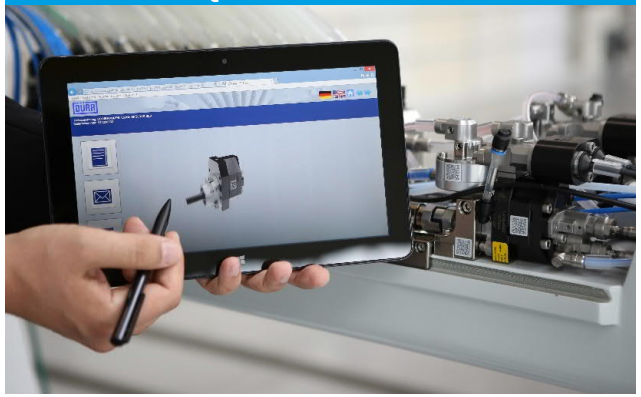


Digital Value Added Services

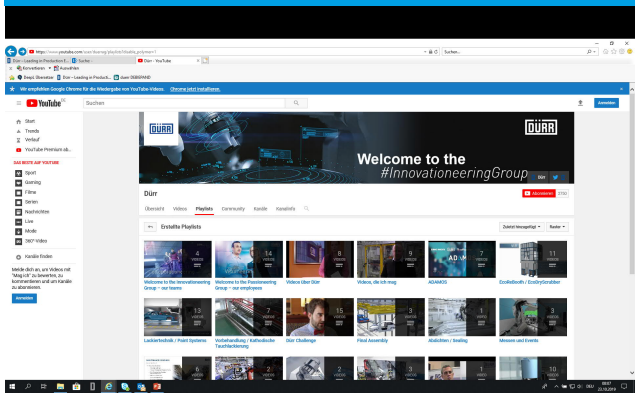
Four examples

Hotline

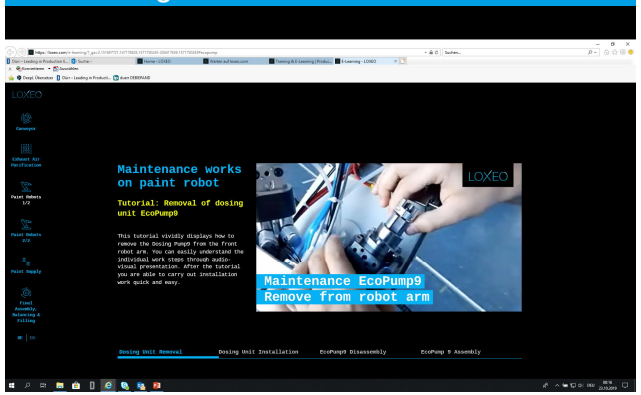
EcoPad & QR-Code



YouTube Videos



eTrainings



Summary

- IIoT allows integrators to enter new markets and customers or to strengthen the existing market position
- All control units within the Dürr portfolio offer a wide variety of IIoT related basic functions that may be used by an Integrator to develop platforms and/or applications
- Other than competitors, Dürr includes IIoT related functions already in the basic configuration of products. Furthermore, most functionalities are platform independent in order to give integrators higher flexibility, especially for retrofit projects.
- Within the tapio partnership program, Dürr is able to support integrators in the development of new applications
- Complex applications which require deep knowledge of a product's architecture are offered by Dürr
- In addition, Dürr offers a wide range of digital value-added services, e.g. Hotline, YouTube Videos, **Eco**PAD, E-Trainings, etc.

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“Subject to change. The information in this presentation contains only general descriptions or performance characteristics, which may vary in different cases. The requested performance characteristics are only binding if they are expressly agreed in the contract.”

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