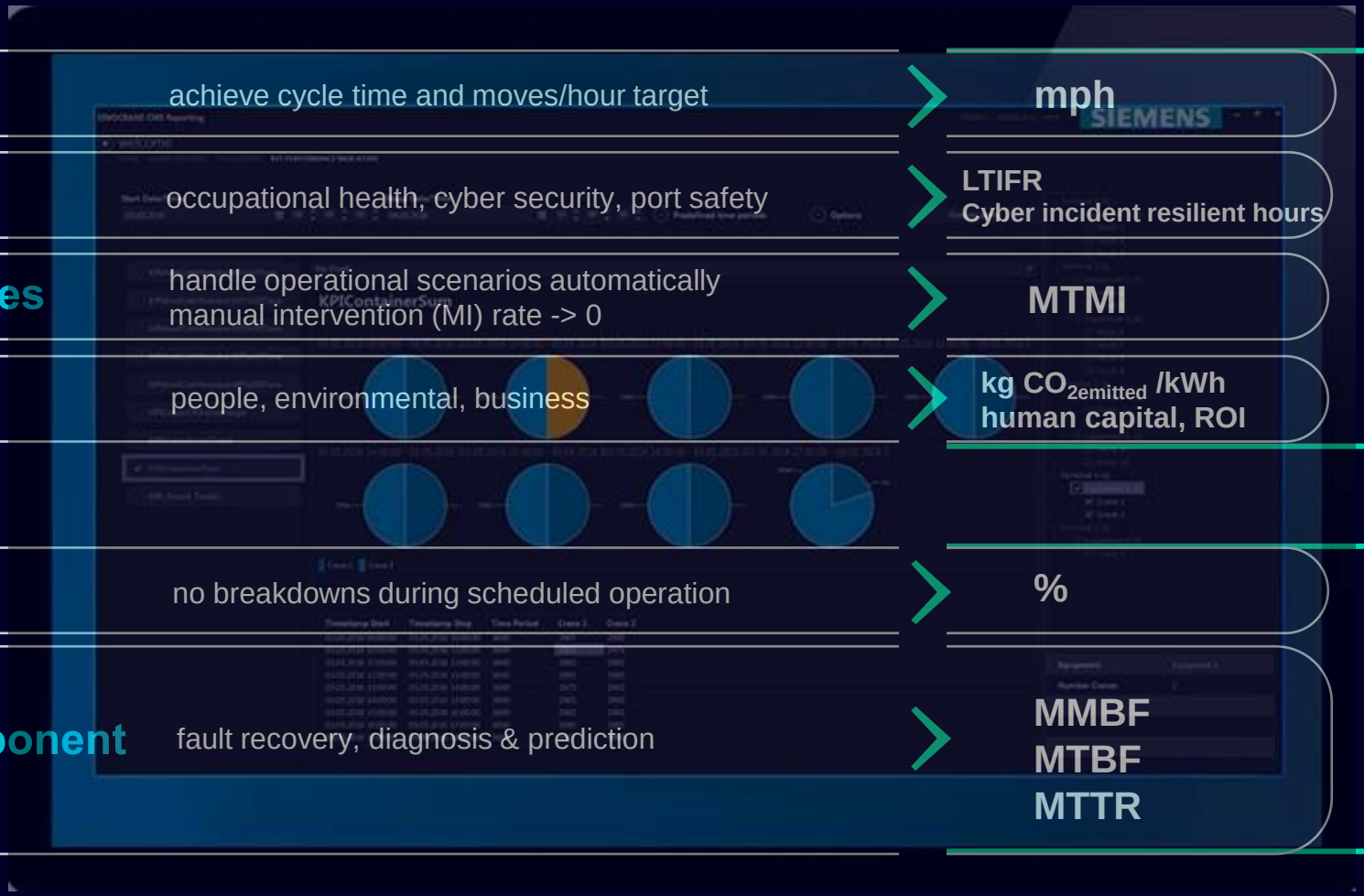
# Unlocking data insights across terminals

Productivity improvements via
Standardized KPI’s & Data Collection with
Simulation through Digital Twins of Equipment & Process

# Key challenges managing terminal operations

- Increasing data volume
- Need for fast decision making
- Operational efficiency
- Technology integration
- Workforce management
- Environmental and Safety

# Need for key performance indicators



| | | |
|---|---|---|
| **Productivity** | achieve cycle time and moves/hour target | **mph** |
| **Safety** | occupational health, cyber security, port safety | **LTIFR**<br>**Cyber incident resilient hours** |
| **Autonomy cranes** | handle operational scenarios automatically<br>manual intervention (MI) rate -> 0 | **MTMI** |
| **Sustainability** | people, environmental, business | **kg $CO_{2emitted}$ /kWh**<br>**human capital, ROI** |
| **Availability** | no breakdowns during scheduled operation | **%** |
| **Maintenance system & component reliability** | fault recovery, diagnosis & prediction | **MMBF**<br>**MTBF**<br>**MTTR** |

**Operational KPI**

LTIFR lost time injury frequency rate
MI manual intervention

**Maintenance KPI**

MMBF mean moves between failures
MTBF mean time between failures
MTTR mean time to repair



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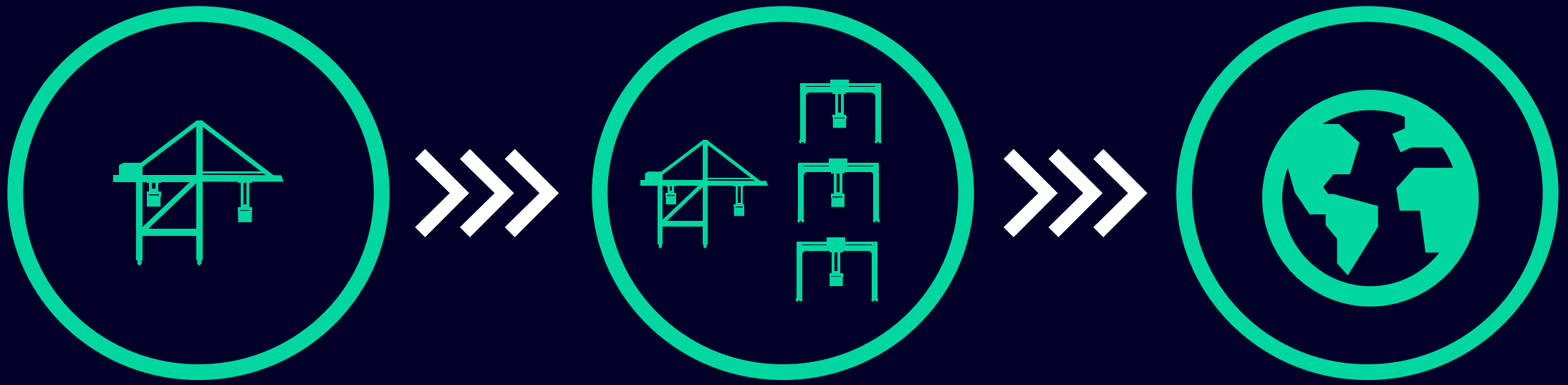
# Digital Twins enable Data drive decision making in terminals




***Reliability & Availability***

***Availability & Performance***

***Performance & Efficiency***

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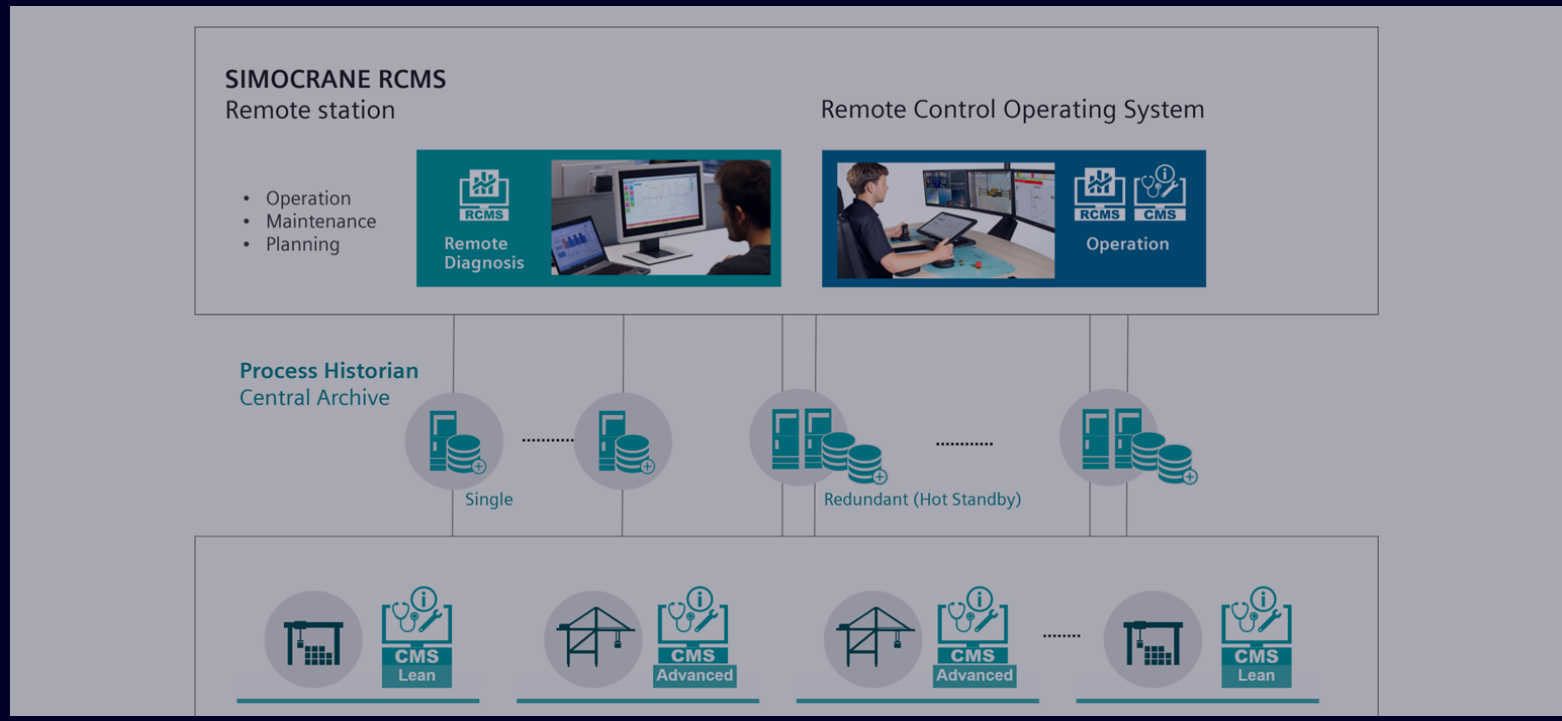
# Data driven operation for cranes
Collect, store, visualize and analyze

- **> 2.000 Datapoints**
- **~ 10 mil. messages / hours**
- **Values of  a motion**
- **Analog values**
- **Bytes of binary status**
- **Vibration & temperature sensors**
- **Event, alarms & fault messages**
- **Operator performance**
- **Job logs**

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# Condition monitoring & predictive analytics

## with sensors

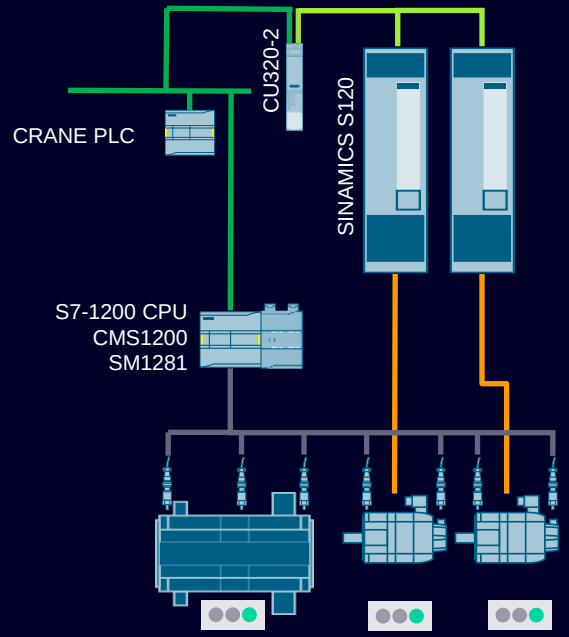
**Implementation complexity: high**

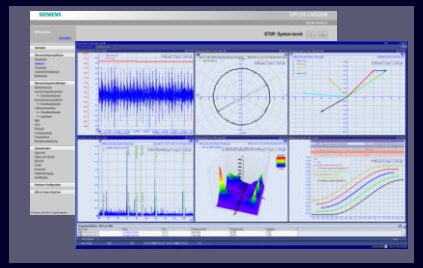
**Mech. detail: high**

Mechanical analytics
based on sensor readings

**Elec. detail: n/a**

Optional IPC can be connected



## without sensors

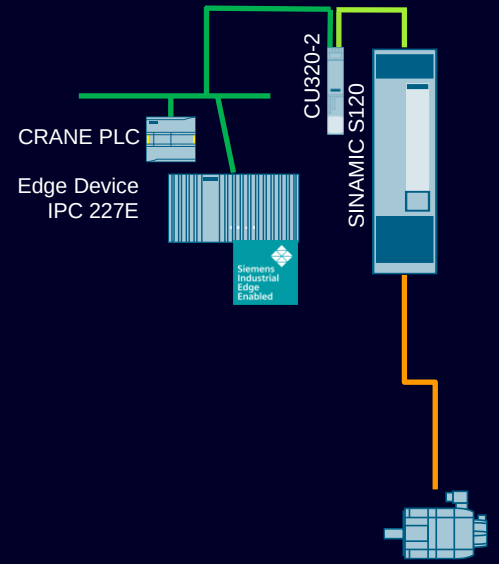
**Implementation complexity: low**

**Mech, detail: low**

Mechanical analytics
based on drive parameters

**Elec. detail: high**

Analytics of life-time
based on relevant parameters
for drives







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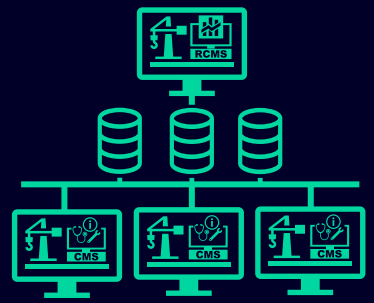
# Visualization in operation: Dashboards, KPI Templates, Reports, Data representation in different views

## Operational Data

- Uptime, downtime, idle time
- Moves per hour / MMBF
- Load values
- MTTR (mean time to repair)



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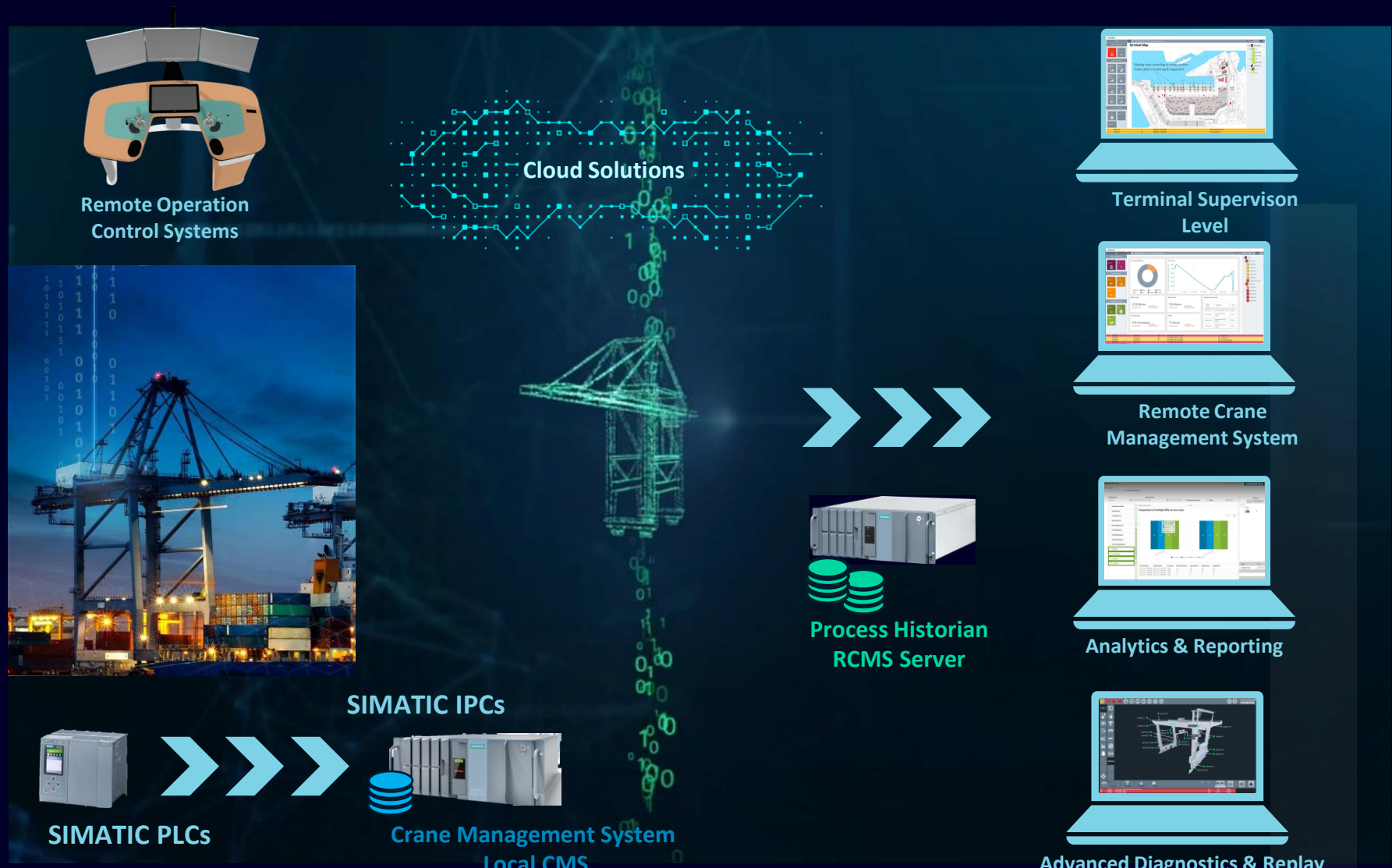
# SIMOCRANE CMS & RCMS
## Transform crane data into crane information

- **Simocrane CMS**
  Data Collection on each crane for diagnostics, replay, preventive maintenance, crane performance

- **Simocrane RCMS**
  Share information, analytics & reports, manage crane KPI's

- Centralized logging framework. On-Premise & Cloud solutions for Crane Data Analytics



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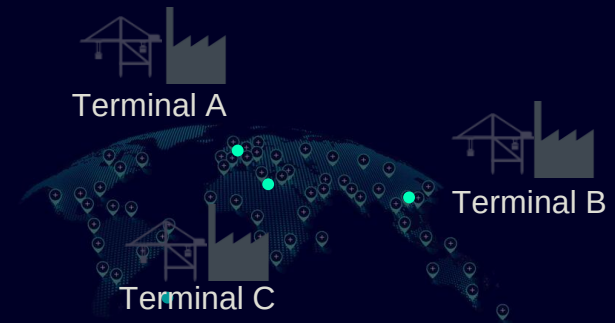
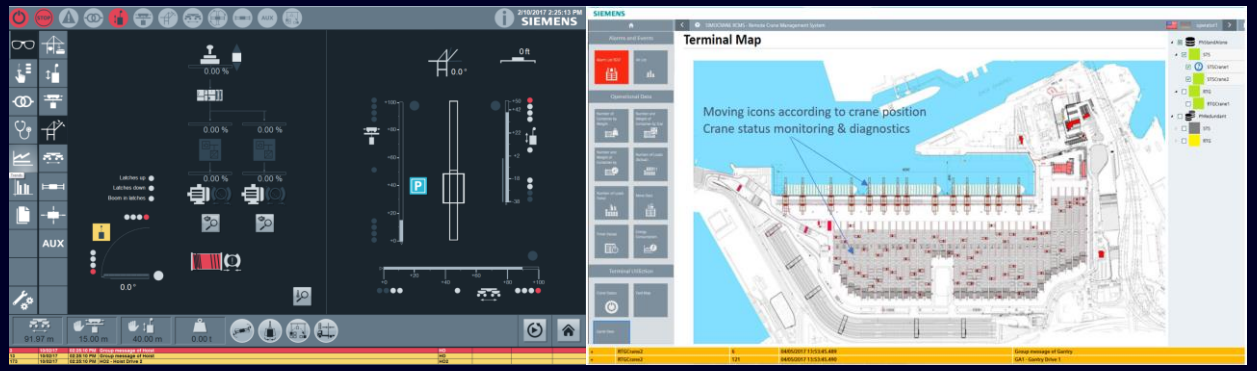
# Next level for data driven in operation with SIMOCRANE solution

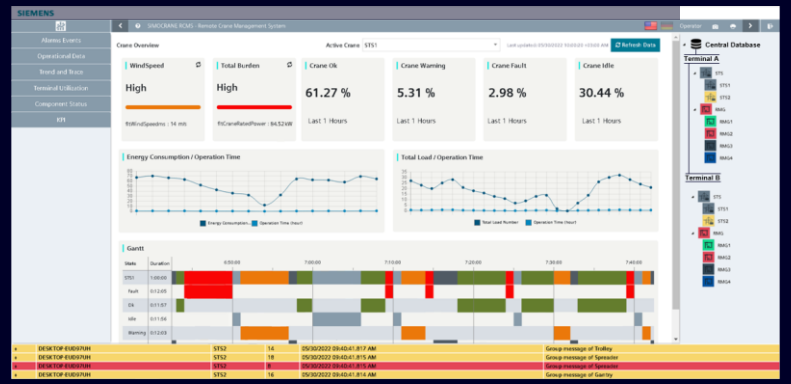
## Local evaluation for each terminal

Terminal A

## Compare multiple terminals



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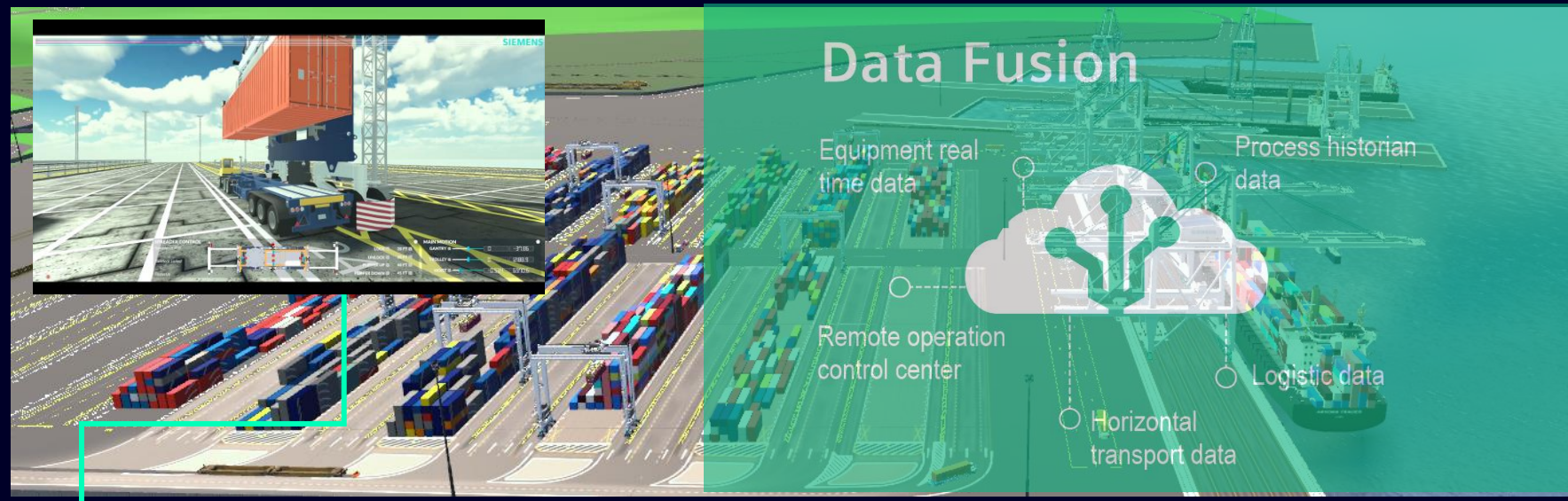
# Digital Twin on the terminal

## Digital Twin of terminal

- Check network coverage (wifi/5G)

**Terminal level** e.g. with AI

- Prediction of incoming problems
- Fuel saving
- Informed decisions




## Throughput Simulator

- Predict the throughput of an automated terminal

## Digital Twin of the Crane

- Test program of the Crane in advanced
- For development (for solutions/products)
- Involve end-user in delivery

## Training people (for new technology)

- Operators
- (Maintenance) Engineers

# Data drive decision making connected terminals

- Container throughput efficiency
- Berth productivity
- Vessel turnaround time
- Terminal energy usage
- Energy cost per container
- Sustainability

*Performance & Efficiency*





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