SMARTTWIN

NNTC

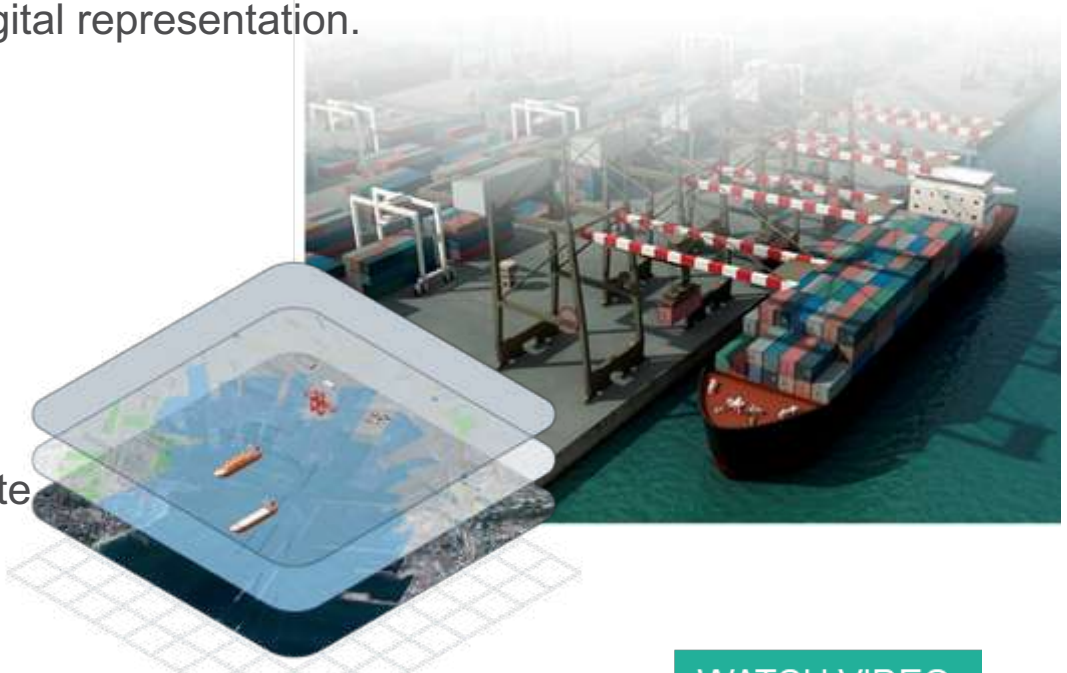
INNOVATIVE TECHNOLOGY COMPANY

The RTLS platform for the Cargo Terminal

SMARTTWIN – THE RTLS MANAGEMENT PLATFORM

Digital Twin concept represents the convergence of the physical and the virtual world where every operation or asset will get a dynamic digital representation.

- Single high-level platform fulfilled with Big Data
- 3D visualization of assets and operations
- Data collection and analytics
- AI for operation optimization
- Simulation of processes, services and asset locations
- Reducing human errors and improving productivity
- Smart enterprise platform for real-time onsite or remote management
- End-to-end integration with existing management systems



WATCH VIDEO

Fast ROI for SmartTwin Deployment

Revenue Growth

Reduction of Operating Cost

HOW SMARTTWIN CAN HELP

- **Data exchange bus** – to collect the data from different sources
- **Data visualization** – human-friendly interface connected to the real world with augmented data representation
- **AI and Simulation Modelling** - data analysis and modelling *"What if…"* scenarios
- **Metadata about each object or process** – multiple data streams help to drill down in information and get all details
- **Data consistency check** – the system can detect anomalies in data related to the same process in different systems and highlight them on the digital twin of the port

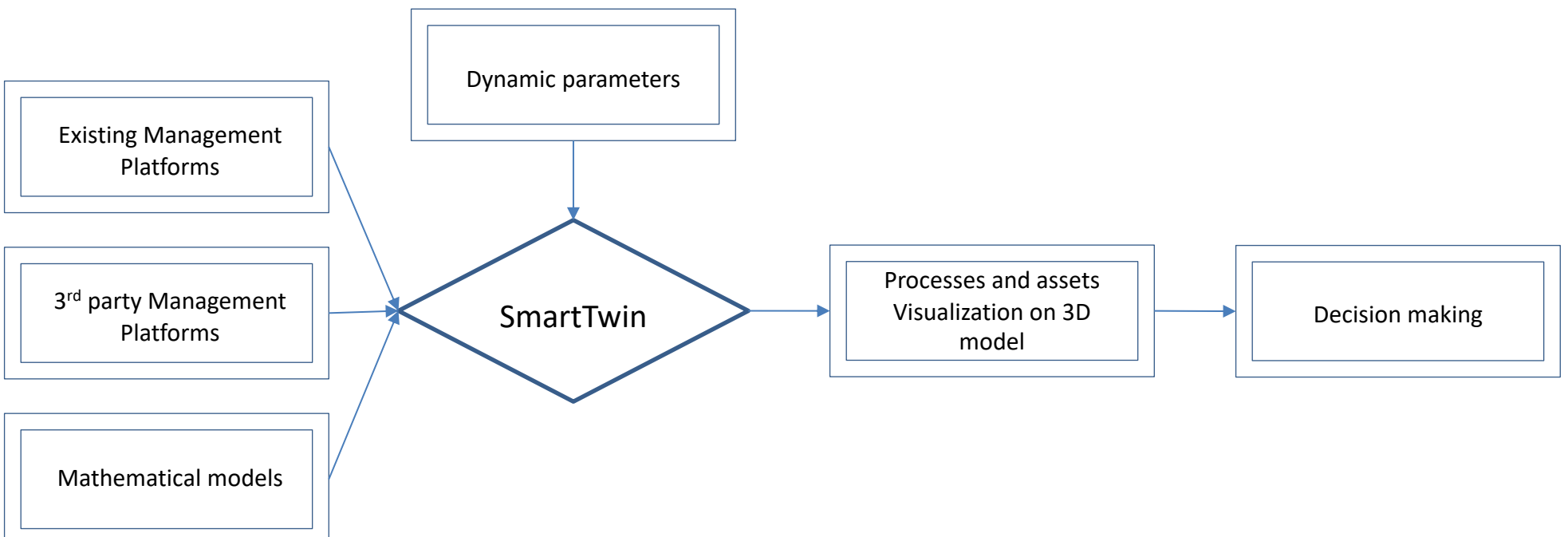
WHY 3D

- User friendly interface with natural view on virtual environment
- User can observe on any object on the screen from different distance and angle
- Zoom and rotation in 3 dimensions help to see everything from the best angle and distance without going on site

USER FRIENDLY INTERFACE

- The data collected from sub-systems is representing in Realistic 3D view
- Real-time updates and reliable information
- Direct access to any device or object at the Seaport
- Monitoring and control on machinery
- Different user profile settings
- Objects and cargo search
- Technological processes visualization
- Visual planning of cargo placement in the storage zone

SMARTTWIN: BREAK DOWN SILOS WITHIN CONNECTED ENVIRONMENTS



OPTIMIZATION MODULES

MACHINERY OPTIMIZATION MODULE

- Simultaneous real-time optimization of all equipment and jobs
- Route optimization for the trucks on the yard
- Reduced idle-time of equipment
- Control of assigned jobs within their accepted time windows
- Combines jobs where possible for enhanced productivity
- Integration of geo-positioning and safety systems
- Optimization of all vehicle equipment types and operational mode (manual, semi-and fully automated).
- Improved equipment maintenance schedules.
- Simulation Modelling for calculation of the best combination of cranes and trucks required for cargo operations for each vessel

YARD OPTIMIZATION MODULE

- provides an optimized yard allocation for load units to reduce number of useless shuffle moves as well as improve resource and storage area utilization.
- optimization for all cargo types
- simulation on optimized cargo placement on 3D Model of the terminal
- Machine Learning and AI improve the accuracy of operational data, Improves automated terminal performance and storage area utilization

WHERE IS AI

- AI modules are working in the background and analyze Big Data coming from different sources
- AI helps in decision making for different user roles
- AI optimizes the cranes and truck management, berth allocation for vessels, cargo storage, container placement, etc.
- AI reduces the cost of operations and improves the time
- AI helps to detect and prevent accidents on the yard

ONE OF THE EXAMPLE OF AI: CONTAINER STORAGE LOCATION OPTIMIZATION

Task: Container storage location optimization at the Container terminal

Initial data: Real historical data of the container location for the last 12 months

Advanced features of AI-powered container storage location optimization module and components:

Model No. 1: based on the data about the occupied cells considering predefined limits for available storage locations for container placement

Model No. 2, based on the history of dwell time for every container in the terminal

Model No. 3 (mixed), based on forecasted container arrival time and taking in account conditions from Model № 2 and available storage locations from Model No. 1 plus ranging locations depending on the estimated number of shuffle moves

The module work result: The highest-rated location recommended for container placement

WHAT DOES AI GIVE

- Reducing the average number of shuffle moves – **up to 33%**
- Reducing number of shuffle moves compare to the other container management systems by **up to 20%**

- Reducing the time required for cargo operations for each ship
- Reducing cost for the machinery maintenance
- Reducing the human factor influence

- Improving business transparency and manageability
- Improving equipment utilization and reducing fuel consumption

... the module uses self-learning AI algorithms, which are improving cargo operations, reducing the cost of them and collecting data for further analysis and operations optimization

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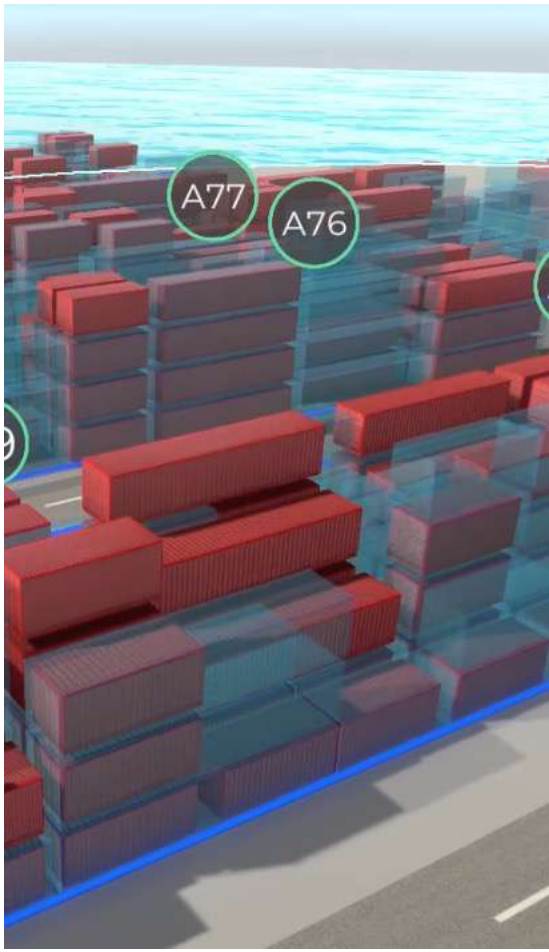
SIMULATION MODELING

The simulation model could be used for modeling of port operation including ships, internal and external trucks, berths, yard, warehouses, transit yard, ro-ro berths, cranes, forklifts, etc. in statistical-mathematical terms

Key benefits of the simulation modelling:

- statistics on cargo flows,
- utilization of berths and equipment
- productivity indexes
- answer on “what if…” question
- helps in forecasting and planning resources
- improves productivity, machinery utilization, throughputs, eliminates bottlenecks in processes, reduce development and construction cost



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SIMULATION MODELING FOR OPTIMAL CARGO OPERATION

Task: Optimization of machinery usage for cargo operation with vessel (loading / unloading) at the Container terminal

Initial data:

1 General:
- Date and time of simulation start
- Weather condition
- External constraints according to topology terminal (railway crossings, road repair)

2 Ships:
- Distribution of cargo inside the vessel (per bay)
- The number of cargo to be unloaded and loaded
- Hatch cover clearance
- Cranes assignment per each bay

3 Resources availability:
- Total number and types of available cranes, reach stackers, trucks, etc.)
- Number of accidents with assets
- Performance characteristics (performance, load capacity, resistance to wind, loads, etc.)
- Work schedule

4 Scope of Works:
- Start time and duration of shifts
- Used procedures
- Data about vessel
- Time of operations for the job
- Trucks\railways schedule

The module work result: The most optimal set of cranes & trucks and min time required for cargo operations for each vessel

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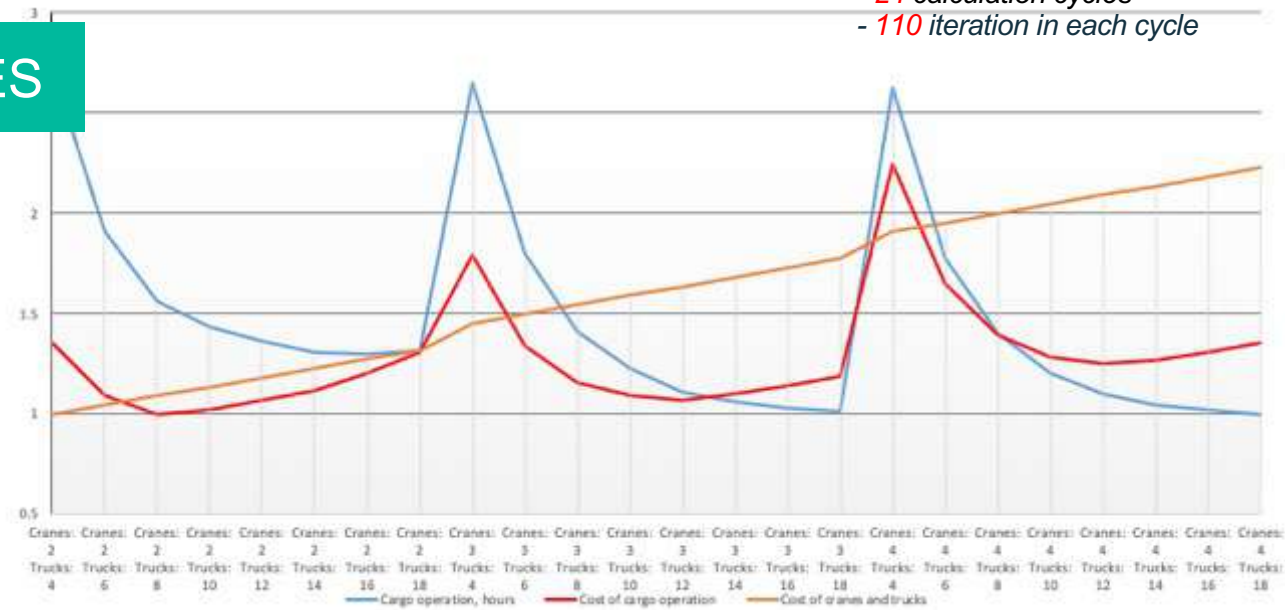
WHAT PREDICTIVE ANALYTICS GIVES

Based on:
- 24 calculation cycles
- 110 iteration in each cycle



Result: the best combination of

1. cost of operations
2. min number of cranes & trucks
3. min required time

- Estimation for work completion time, operating hours, downtime
- Forecasting the machinery utilization, which allows the most efficient movements without queues
- Assessment of the influence of factors on the machinery downtime, number of accidents, optimal routes, movements of railway / auto trains, distribution of works between cranes)
- Reducing the time required for cargo operations for every ship
- Reducing cost for the equipment maintenance
- Reducing the human factor influence
- Increasing business transparency and manageability
- Improving equipment utilization and reducing fuel consumption

NNTC 0013

FULL OPERATIONAL CONTROL ROOM

- SmartTwin allows to connect different isolated management systems in one single management platform providing full visibility on different processes correlation in real-time environment.
- Enterprise class Decision Support System based on Big Data analytics
- Has a “rewind” feature which allows user to see the stage of terminal in any day in the past by keeping a log of all events, resources, jobs and assets location

INTEGRATION

- Dedicated development team for product integration and customization
- Smooth Integration with many 3rd party data management systems
- Wide list of ready to use API connectors for:
  DBMS Oracle, MS SQL Server, PostgreSQL etc.
  Solvo.TOS, Master Terminal, iPortman etc.
  MS Dynamics AX, SAP HANA
  Red Hat JBoss Fuse,
  IBM Integration Bus,
  MS BizTalk Server
  and others

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THANK YOU