KONECRANES®
Lifting Businesses™

AUTOMATION GROWTH PATH IN YARD OPERATIONS IMPACTS ON EFFICIENCY

Antti Halonen
Konecranes Port Solutions

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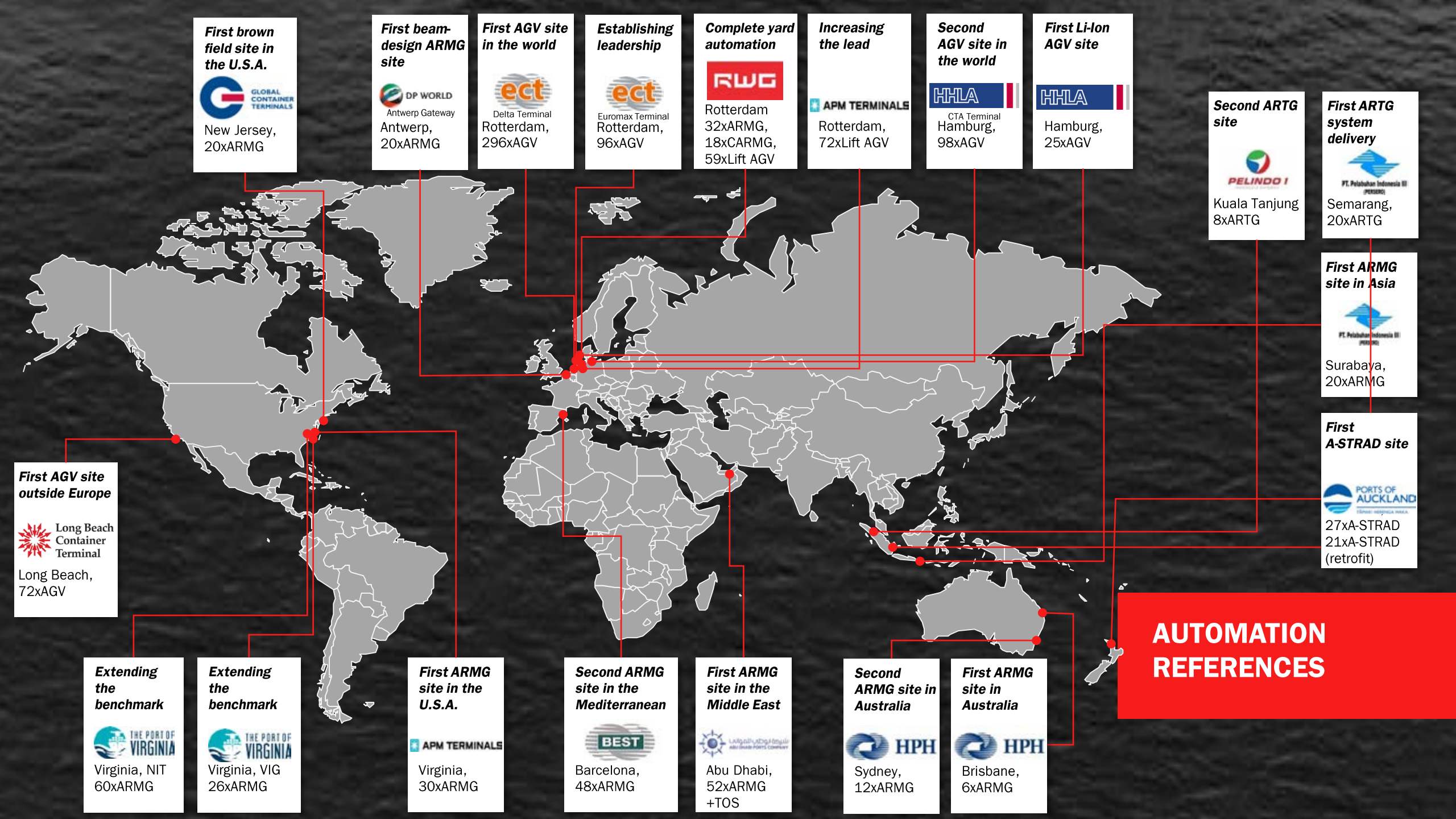
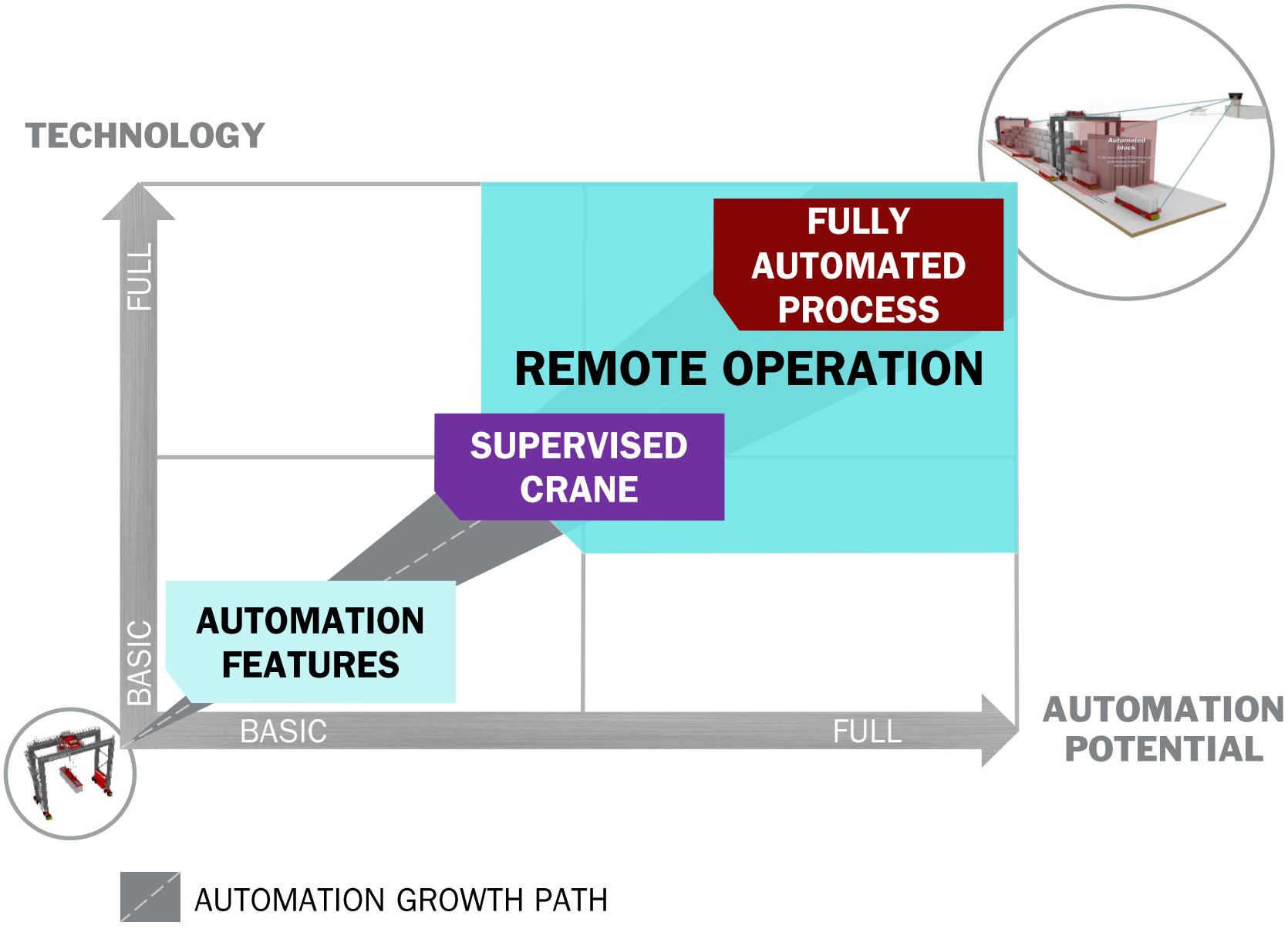

First brown field site in the U.S.A.
GLOBAL CONTAINER TERMINALS
New Jersey, 20xARMG
First beam-design ARMG site
DP WORLD Antwerp Gateway
Antwerp, 20xARMG
First AGV site in the world
ect Delta Terminal
Rotterdam, 296xAGV
Establishing leadership
ect Euromax Terminal
Rotterdam, 96xAGV
Complete yard automation
RWG
Rotterdam 32xARMG, 18xCARMG, 59xLift AGV
Increasing the lead
APM TERMINALS
Rotterdam, 72xLift AGV
Second AGV site in the world
HHLA CTA Terminal
Hamburg, 98xAGV
First Li-Ion AGV site
HHLA
Hamburg, 25xAGV
Second ARTG site
PELINDO I
Kuala Tanjung 8xARTG
First ARTG system delivery
PT. Pelabuhan Indonesia III (PERSERO)
Semarang, 20xARTG
First ARMG site in Asia
PT. Pelabuhan Indonesia III (PERSERO)
Surabaya, 20xARMG
First A-STRAD site
PORTS OF AUCKLAND
27xA-STRAD
21xA-STRAD (retrofit)
First AGV site outside Europe
Long Beach Container Terminal
Long Beach, 72xAGV
Extending the benchmark
THE PORT OF VIRGINIA
Virginia, NIT 60xARMG
Extending the benchmark
THE PORT OF VIRGINIA
Virginia, VIG 26xARMG
First ARMG site in the U.S.A.
APM TERMINALS
Virginia, 30xARMG
Second ARMG site in the Mediterranean
BEST
Barcelona, 48xARMG
First ARMG site in the Middle East
Abu Dhabi, 52xARMG +TOS
Second ARMG site in Australia
HPH
Sydney, 12xARMG
First ARMG site in Australia
HPH
Brisbane, 6xARMG
AUTOMATION REFERENCES

AUTOMATION GROWTH PATH

AUTOMATION GROWTH PATH - OVERVIEW



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TECHNOLOGY REQUIREMENTS

EQUIPMENT REQUIREMENTS

YARD REQUIREMENTS

KONECRANES

RMG	RTG	HORIZONTAL	QUAY

SOFTWARE PRODUCTS

AUTOSTORE · COMMTRAC · TEAMS · YCS · CHIMNEY APP

PROCESS AUTOMATION

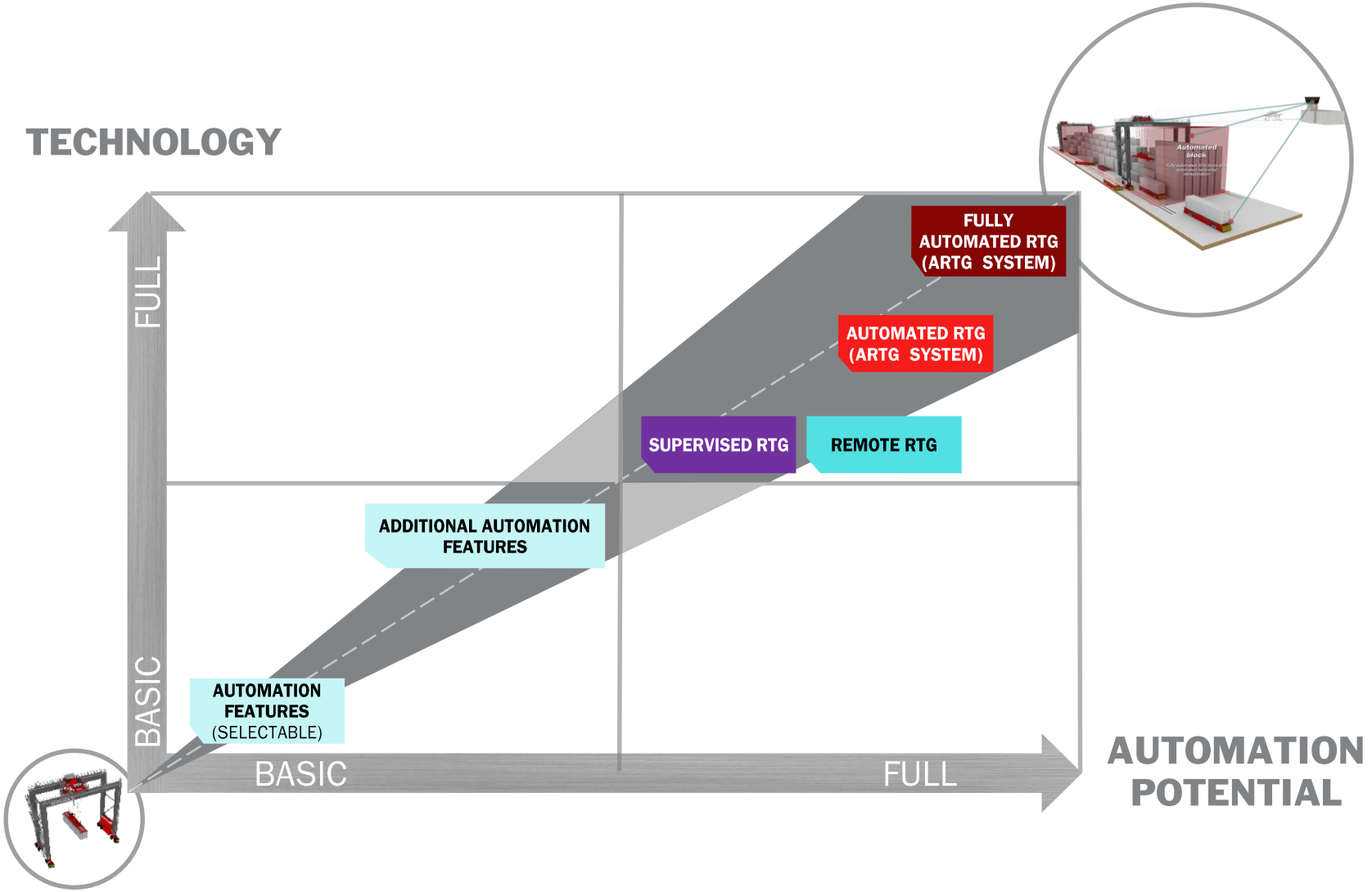
UX

UX USER E**X**PERIENCE DRIVEN DESIGN
HMI HUMAN **M**ACHINE **I**NTERFACES

EQUIPMENT AUTOMATION

CRANE COMPONENTS

AUTOMATION GROWTH PATH - YARD CRANES



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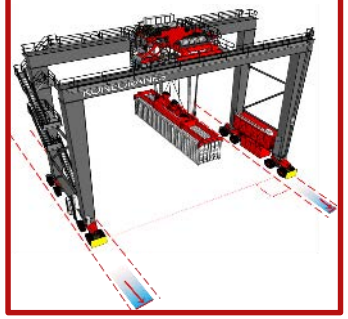
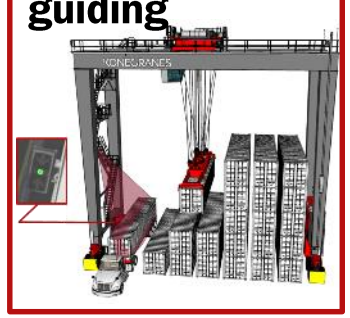
AUTOMATION FEATURES IN MANUAL OPERATIONS

Auto-steering

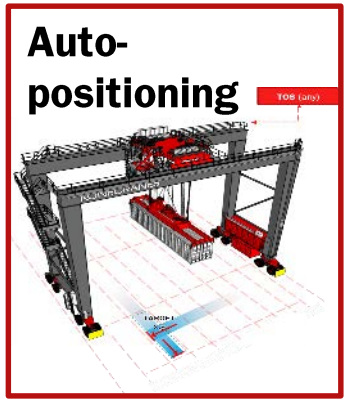


Auto-TOS reporting

Auto-truck guiding

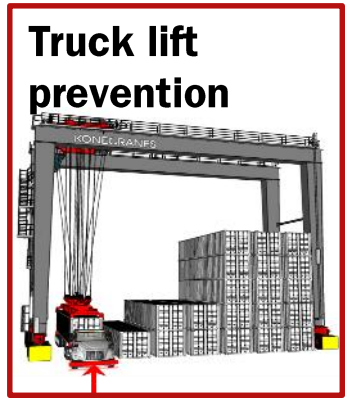


Auto-positioning



Stack collision prevention

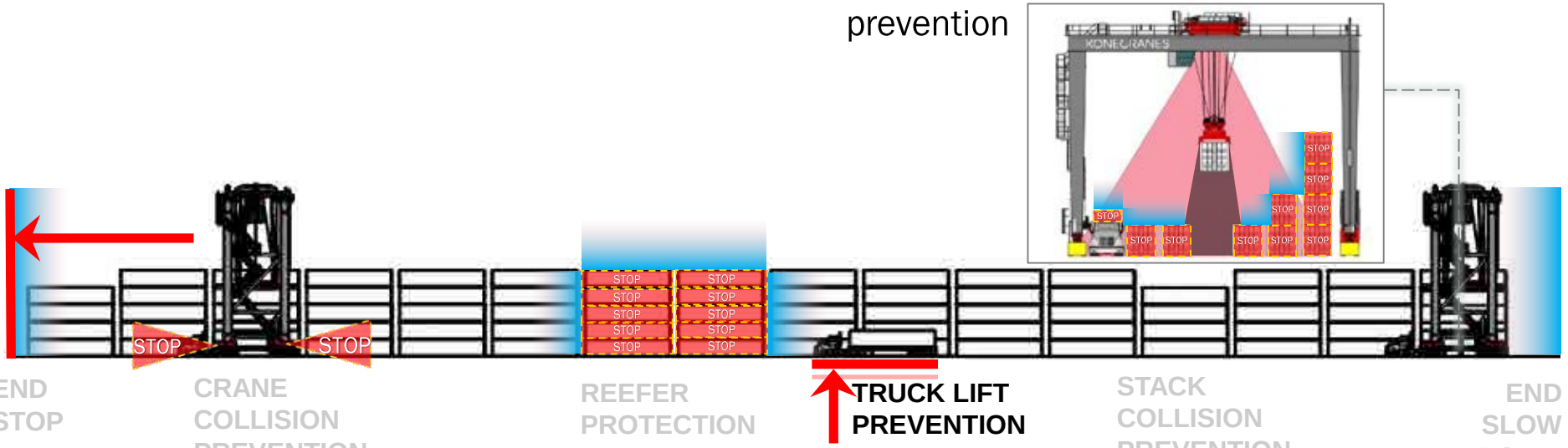
Truck lift prevention



RTG AUTOMATION

INCREASING PRODUCTIVITY AND SAFETY

- Objective
  - Create a RTG block for the crane driver that enables better control and safety
  - Ensure that the driver is always in control with ”hold-to-run” principle and can focus on the most important work
- Solution
  - **Collision prevention** between lifted load and stack, load and reefers, crane-to-crane and crane-to-trucks
  - **Slow down** zones at block end and forbidden areas
  - **Safety stops** at block end, truck lift prevention



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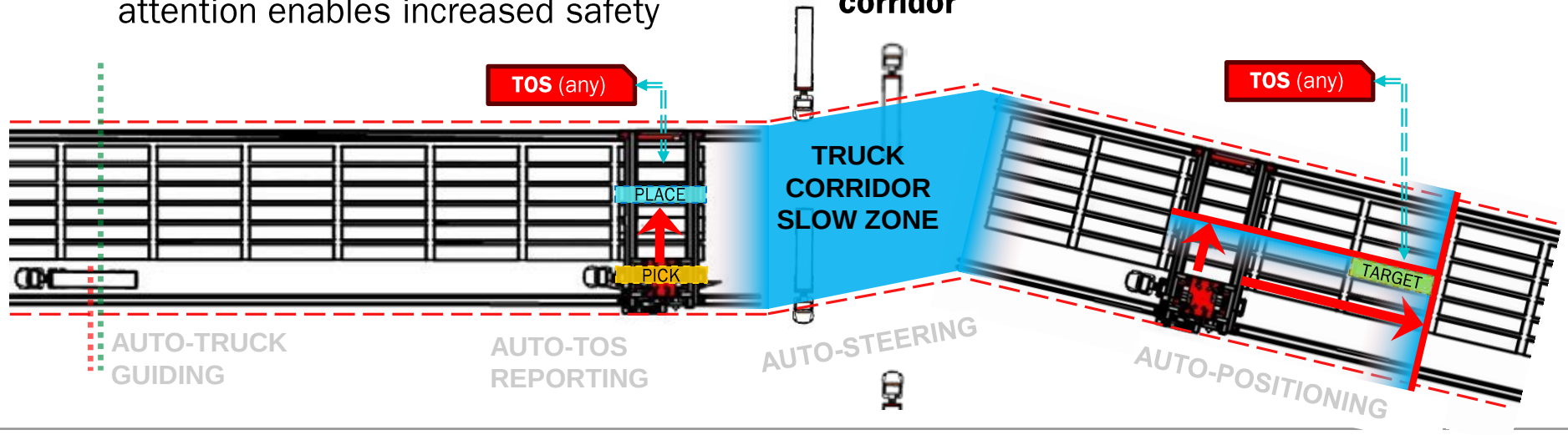
RTG AUTOMATION

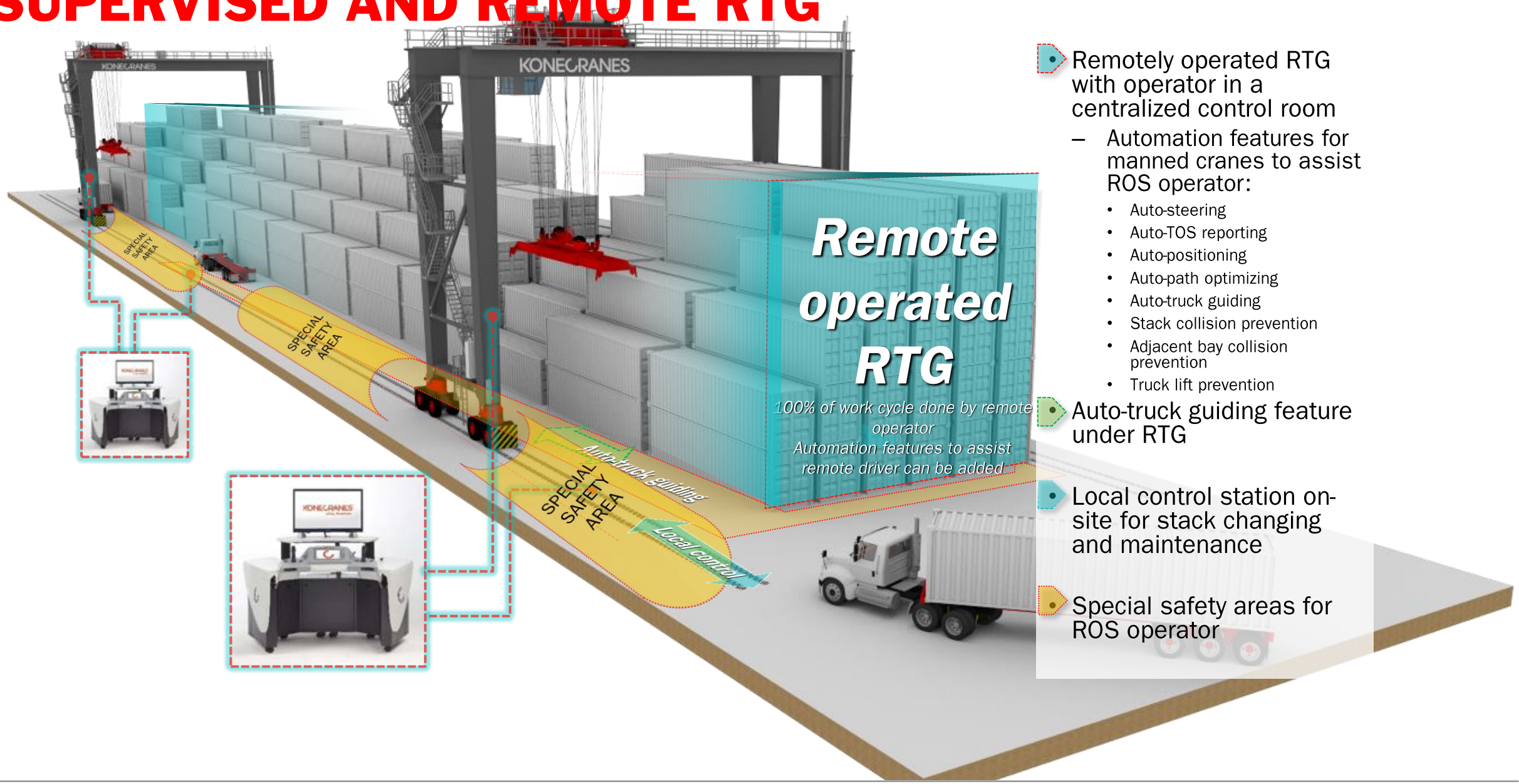
INCREASING PRODUCTIVITY AND SAFETY

- Objective
  - Automate repetitive and routine work, free driver attention
  - Ensure container inventory up-to-date to prevent missing containers/wrong moves
  - Improve positioning accuracy and speed of load and equipment, free driver attention
  - Slow the process where the driver attention enables increased safety

- Solution
  - Automated corrective **gantry steering** using accurate RTG navigation on ”virtual rails”
  - Automated container **move reporting** with TOS, wrong move prevention
  - Automated **guiding of trucks** under RTG to get truck containers aligned
  - Automated maximized **spreader approaching** speed and fast positioning to target
  - **Slow down** areas where RTG cross a **truck corridor**



SUPERVISED AND REMOTE RTG



- Remotely operated RTG with operator in a centralized control room
  - Automation features for manned cranes to assist ROS operator:
    - Auto-steering
    - Auto-TOS reporting
    - Auto-positioning
    - Auto-path optimizing
    - Auto-truck guiding
    - Stack collision prevention
    - Adjacent bay collision prevention
    - Truck lift prevention
- Auto-truck guiding feature under RTG
- Local control station on-site for stack changing and maintenance
- Special safety areas for ROS operator

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REMOTE OPERATING CENTER

Remote control and supervision of container handling operations

REMOTE OPERATING CENTER

Remote control and supervision of container handling operations

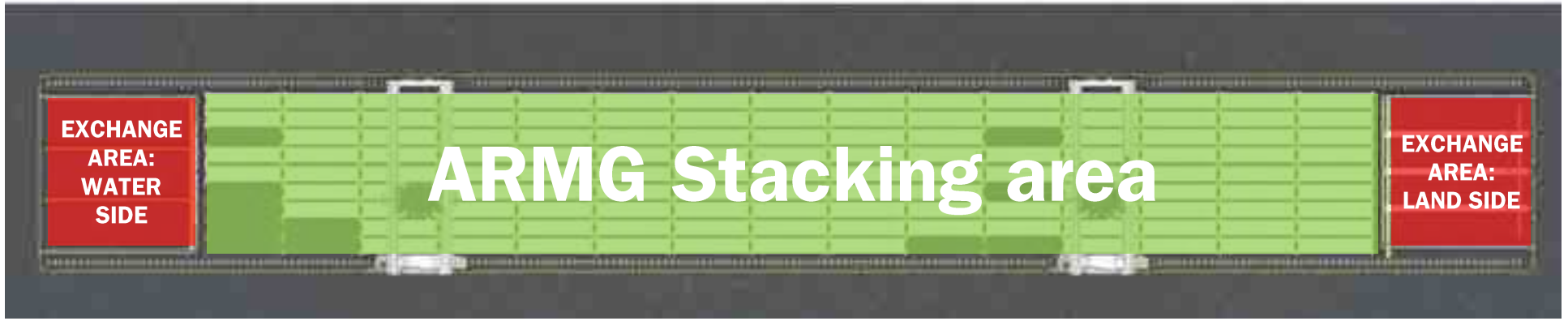
Equipment Control System (+TOS client)

Exceptional/intervention handling with Remote Control Desk (RCC)

EXTRA SLIDE

YARD CRANE AUTOMATION
ARMG and ARTG SYSTEM

ARMG stack layout



ARTG stack layout

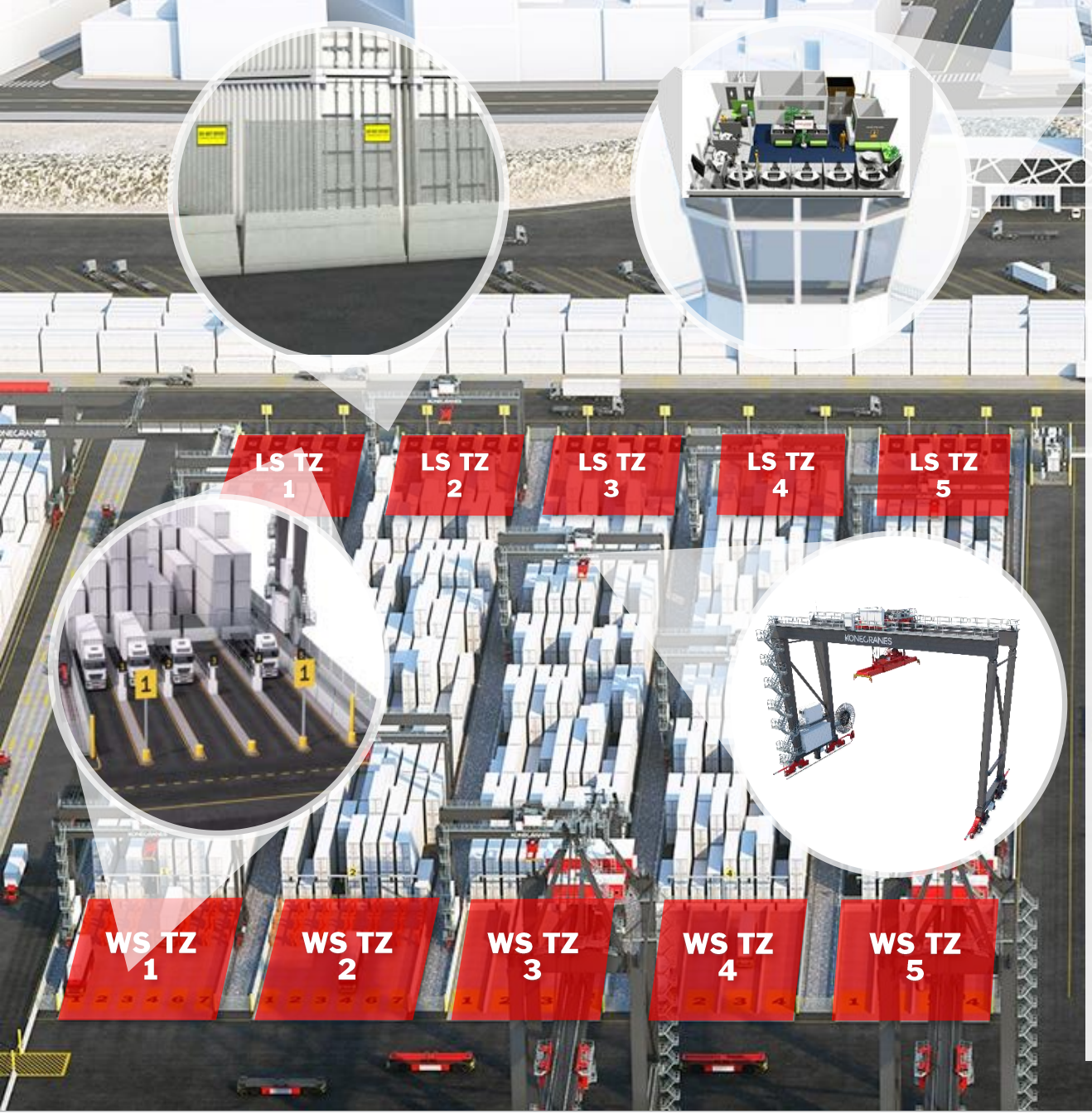
ARMG

Automated RMG (ARMG)

Transfer areas

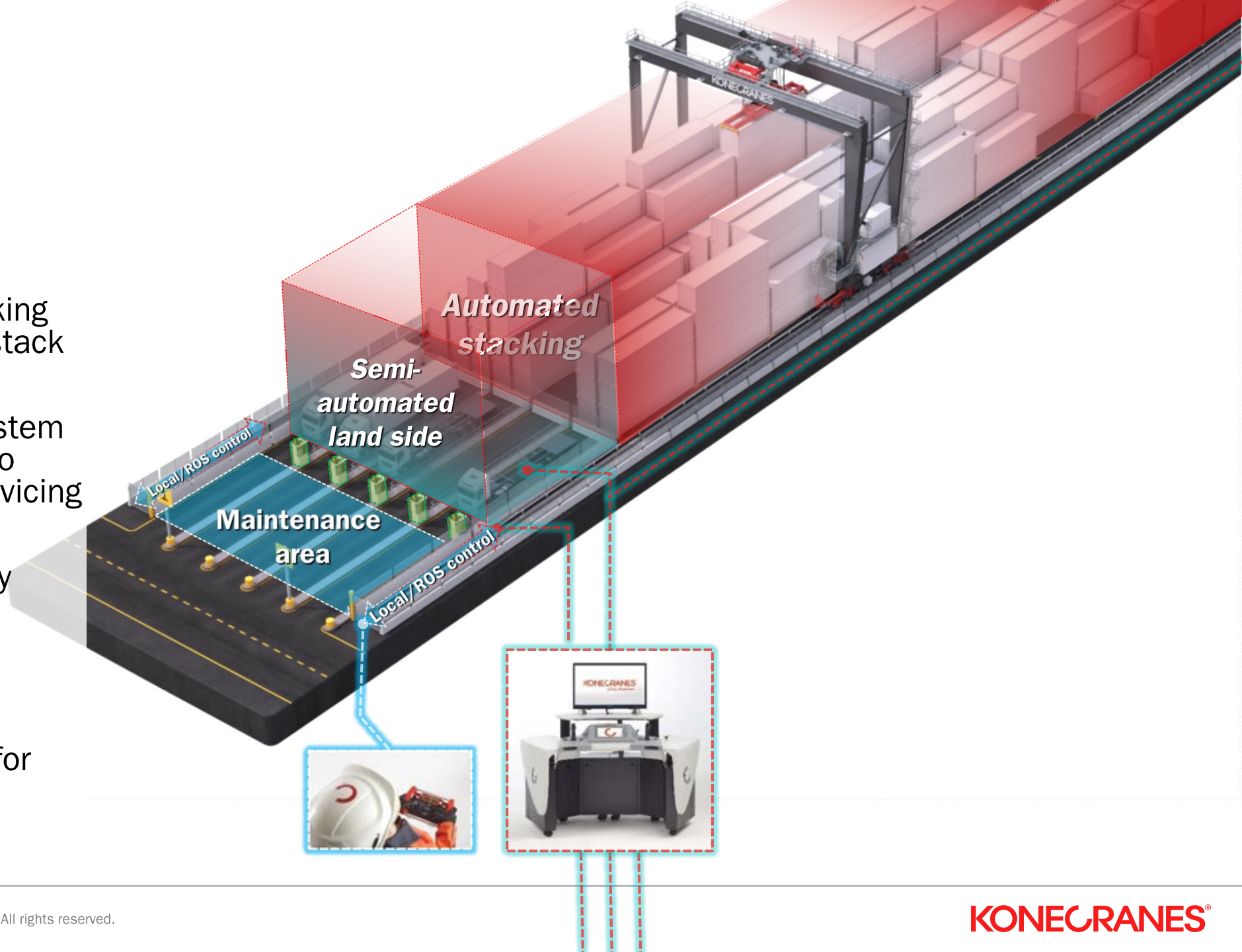
Fencing and access control

Remote Control Center



ARMG SYSTEM
LANDSIDE

- Fully automated stacking inside the container stack
- Truck driver safety system and lane separation to ensure safe truck servicing
- Final truck handling by remote operator with Remote Operating Station(s) (ROS)
- Local control station for maintenance



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ARMG SYSTEM
WATERSIDE

- Exchange area gate keeper
  - Virtual fence to detect unauthorized entry
  - Immediate controlled stop of waterside transfer area when trespassing detected
  - Separate maintenance personnel access control with interfaces to personnel identification system
- Horizontal transport gate controller
  - Detection of approaching horizontal transports
  - Opening of virtual fence and block transfer area shut-down prevention
  - Vehicle presence monitoring in exchange area
- Automated container pick and place (loading and unloading of e.g. horizontal transports):

AGV, L-AGV, FRAME	STRADDLE, GROUND SLOT
PICK	PICK
PLACE	PLACE

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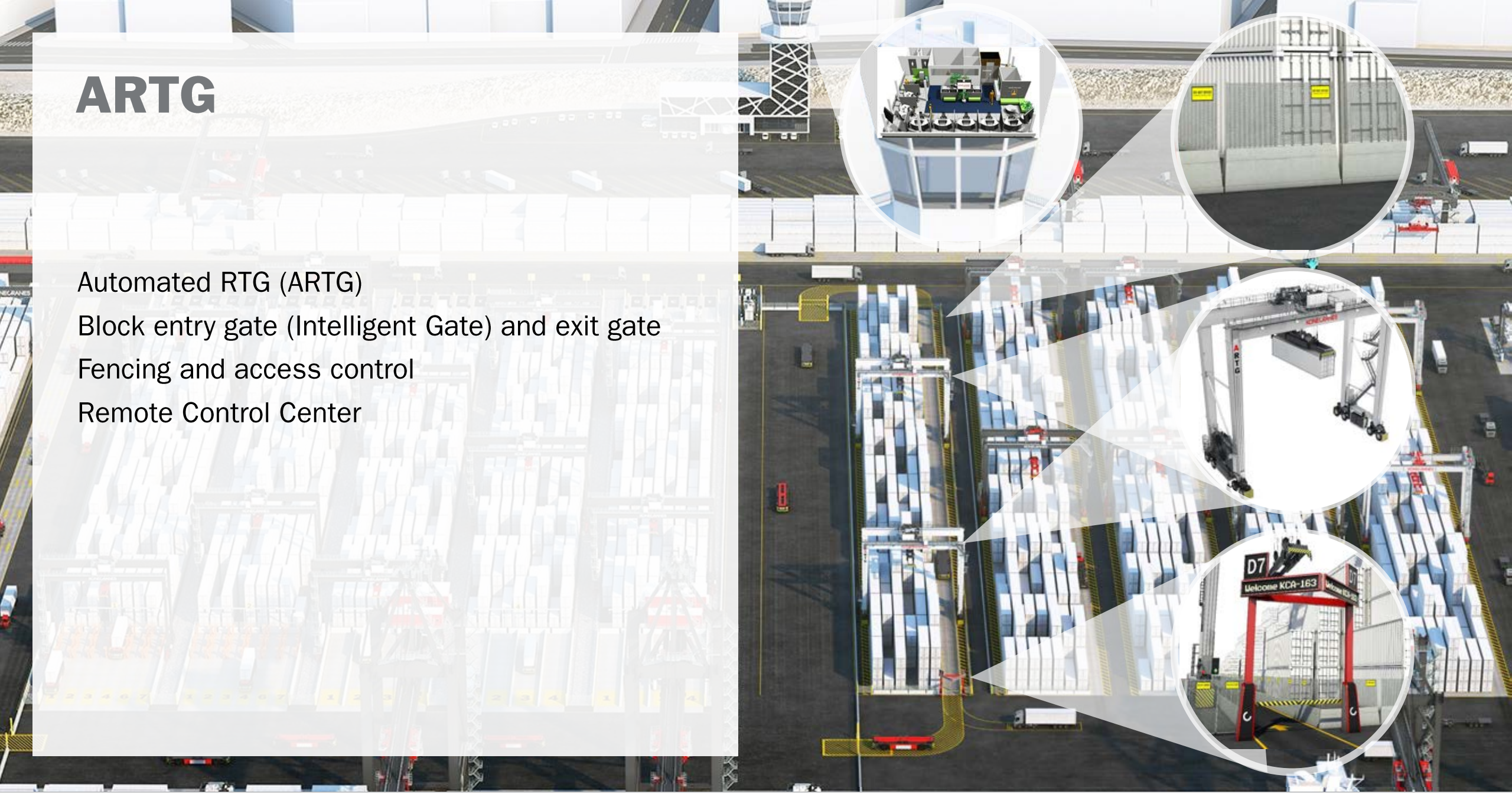
ARTG

Automated RTG (ARTG)

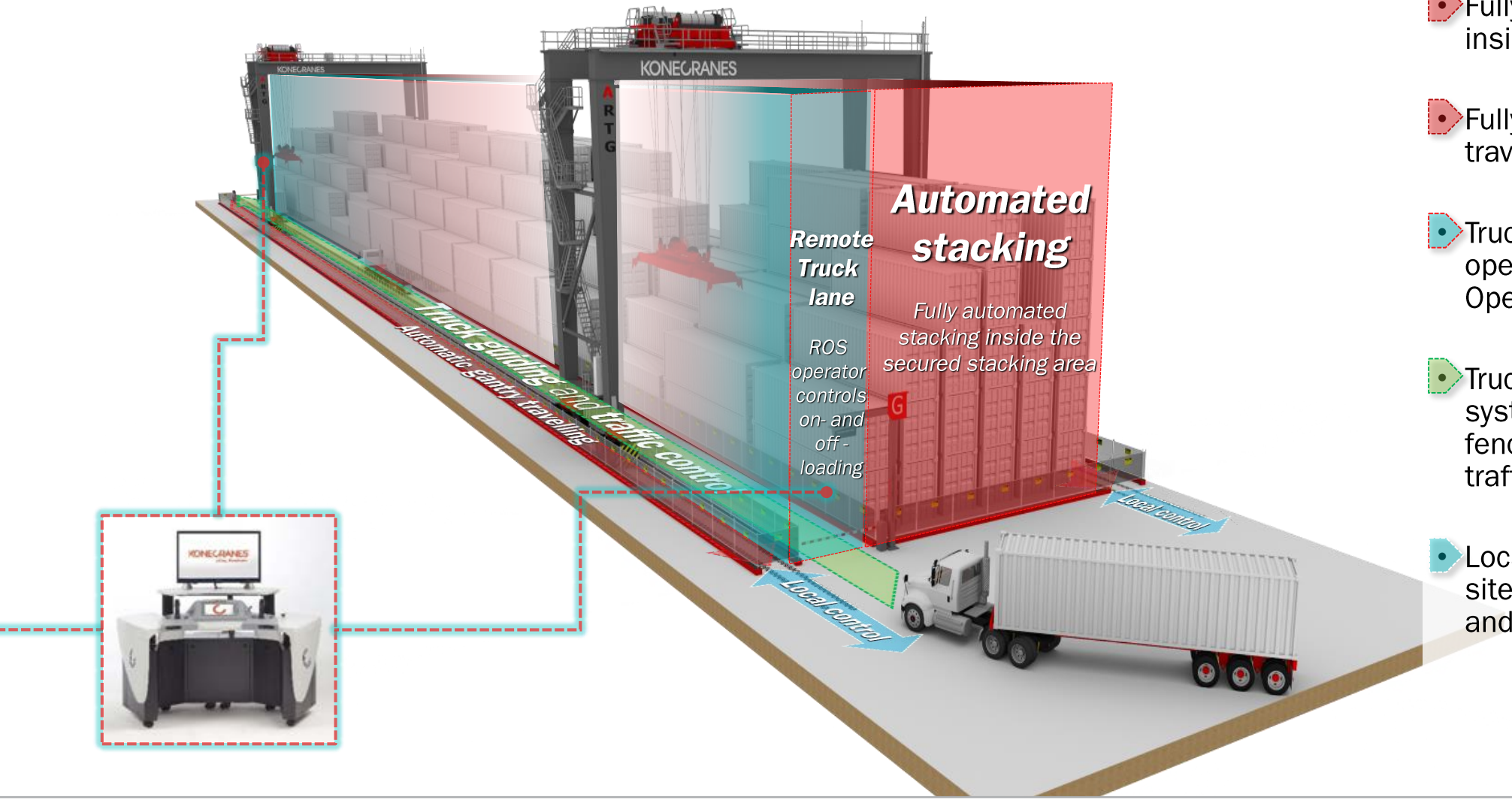
Block entry gate (Intelligent Gate) and exit gate

Fencing and access control

Remote Control Center



ARTG FUNCTIONALITY



- Fully automated stacking inside the container stack
- Fully automated gantry travelling in the block
- Truck handling by remote operator with Remote Operating Station(s) (ROS)
- Truck guiding automated system and perimeter fencing to control truck traffic flow and safety
- Local control station on-site for stack changing and maintenance

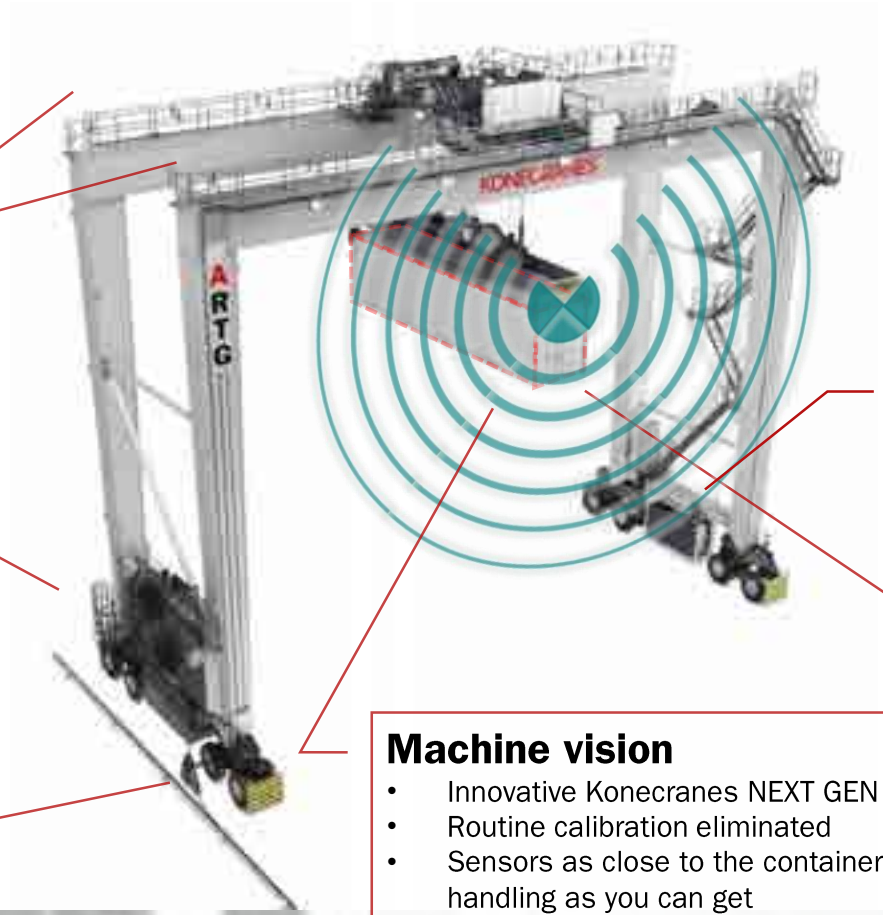
KONECRANES®

ON-BOARD AUTOMATED CRANE

Gantry travelling
- Dual antenna DGPS Auto-steering
- Twin Base Station with automatic switch over for redundancy

Collision prevention
- Real-time relative position
- Lasers

Data transfer
- Wire/reliable connection
- High speed



Machine vision
- Innovative Konecranes NEXT GEN
- Routine calibration eliminated
- Sensors as close to the container handling as you can get

Truck guiding system: Auto-truck guiding
- Truck detection under ARTG
- Traffic lights guidance for accurate truck pre-positioning

Hoist
- Absolute encoders
- Redundant optical system

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IMPACTS ON EFFICIENCY

STABILITY

PREDICTABILITY

PRODUCTIVITY

EQUIPMENT vs. OVERALL PROCESS

KONECRANES

Remote RTG and RMG: The Power of De-Coupling the Crane and Operator

In the container handling industry, automation is unquestionably a megatrend. Konecranes is in a leading position, actively driving this forward. However, automation is not the only way for ports to improve productivity and safety in container yards.

Fueled by Konecranes fact-based TRUCONNECT® analysis of RTG real usage all over the world, Konecranes presents how to improve operator productivity for container yards by De-coupling the Crane and Operator.

Watch Video Here:

https://www.youtube.com/watch?v=Q7oforWX6AU

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NOT JUST LIFTING THINGS, BUT ENTIRE BUSINESSES

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