

# Preparing for Future Ports Automation: Opportunities and Challenges

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# Terminal Throughput is at an All Time High



Record high throughput



Balancing act between  
Customer service & profit



Increased risk of  
human error





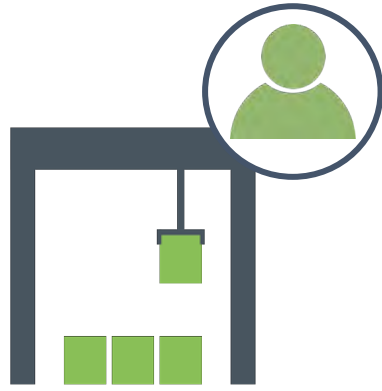
## Customer Needs

*“I don’t want my drivers to decide what job they do next. Rather, the TOS should tell the driver what drive to do based on certain criteria.”*

*“I want the TOS to help me with determining how many RTGs to deploy and where so I can avoid RTG clashes, keep the productivity I need while minimizing my opex.”*

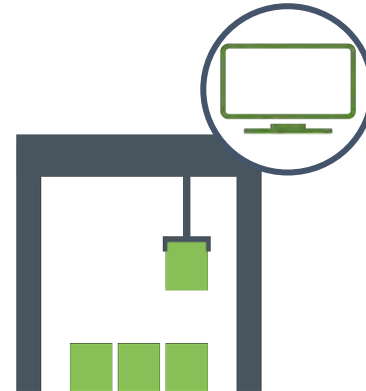
*“I want my controllers to go from **reactive** to **proactive**. The TOS should help me by giving all the relevant information in a single graphical location so I will react to what is about to happen, as opposed to reacting what has already happened because I didn’t have the information to see it coming.”*

# Types of Automation



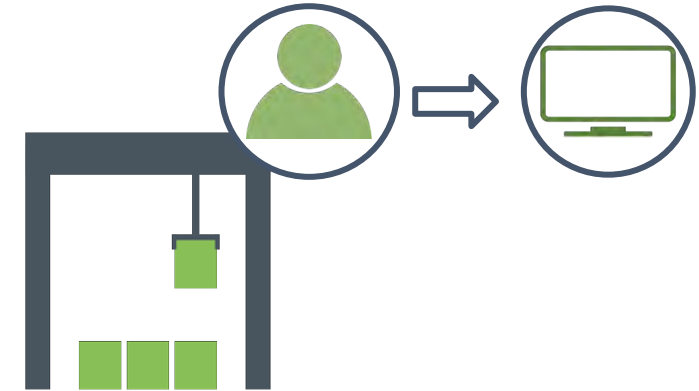
**Manned RTG optimization**

*“I have a **existing manned RTG terminal** and want to **reduce my cost per TEU** over my fleet”*



**AutoRTG**

*“I’m building a **new terminal** and want to use **robotised RTGs**”*



**AutoRTG retrofit**

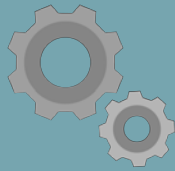
*“I have a **existing terminal with manned RTGs** and want to transition **robotised RTGs**”*



# Manned RTG Challenges



**Manually intensive and time consuming ops**  
(e.g. CHE-Range management)



**Limited integration of data and KPIs**  
(e.g. decking, RTG placement, vessel planning)



**Inefficient RTG utilization**  
(e.g. unbalanced workloads, RTG clashes)



**RTG productivity** ↓

**Cost per TEU** ↑

**Service levels** ↓



# Optimization Challenges

## Current challenges

As a super user...



“I do not know **where to start** when configuring the parameters.  
How do I choose the **parameters values**?”



“It is hard to understand the **link to operations**.  
How does my **strategy influence the performance** of my terminal?”



“The **dependencies between parameters** are unclear.  
How can I **gain intuition** on the impacts of a parameter tweak?”





# Optimization Configurations

The screenshot shows the navis software interface. At the top left is the navis logo. A search bar is at the top right. On the left side, there is a vertical navigation bar with a gear icon. The main content area displays a configuration scenario titled "Scenario 1 of 3".

**Scenario 1 of 3** During daytime vessel export loading operations you have three outbound containers in yard block A1, below.

Container 01 is the next one in RTG10's work sequence.

Container 02 is vessel load move, and your terminal considers it urgent.

Container 03 is an out of sequence move of another kind, like gate, rail, or vessel.

The diagram shows a horizontal yard block A1 with a grid pattern. Three containers are represented by blue rectangles with labels 01, 02, and 03. A vertical rectangle labeled RTG10 is positioned between containers 02 and 03.





Which container would you prefer the RTG to move next?



- Container 01, to maintain the existing Work Queue
- Container 02, to prioritize the urgent move
- Container 03, depending on the move kind we prioritize differently


Next


# Configurations to Fit Your Business Needs


**navis**


RTG Optimization    


Strategic Penalties  


▼ Terminal Operations  


▼ Urgent Moves  


Move Marked For Priority Fetch  


Inbound Reefer Moves  


Urgent Road Moves  






Follow Preferred Sequences  

Strategy Name  

DefaultRtgStrategy  











# Increased RTG Driver Visualization

POW: QC7 - User: Steve.A.Dore - Equip: RTG002

Trabajando

01	Contenedor <b>TVOU558773 9</b>	Origen OTR6765567	Destino BLK02.09.04.c	ISO 4400	🚚
02	Contenedor <b>HBBU488013 0</b>	Origen BLK02.09.02.a	Destino QC7	ISO 4400	→
03	Contenedor <b>TVOU445004 5</b>	Origen BLK02.11.04.C	Destino QC7	ISO 45G1	→
04	Contenedor <b>CECU621750 1</b>	Origen OTR6765567	Destino BLK02.11.03.b	ISO 45G1	🚚
05	Contenedor <b>SHTU767733 0</b>				

Seleccionar trabajo a realizar

User: Steve.A.Dore - Equip: Mos02

Target container

Container  
**FURU 488647 9**

Origen  
BLK02.19.04.b

Destination  
...45685

ISO  
2200

Complete to...

Rehandle

Working

**TXWU679231 8**

		TXWU 679231 8			
		FURU 4886479			
	DARU 154294 6	XAGU 806789 9			
	DARU 154294 6	TDEU 755659 7			
TNRU 613924 1	DARU 154294 6	CBNU 890157 4			
SICU 742127 2	ASKU 763134 5	HDFU 903984 1			

Next



Lift TXWU679231 8 from BLK02.10.D.6 and place at BLK02.10.C.5



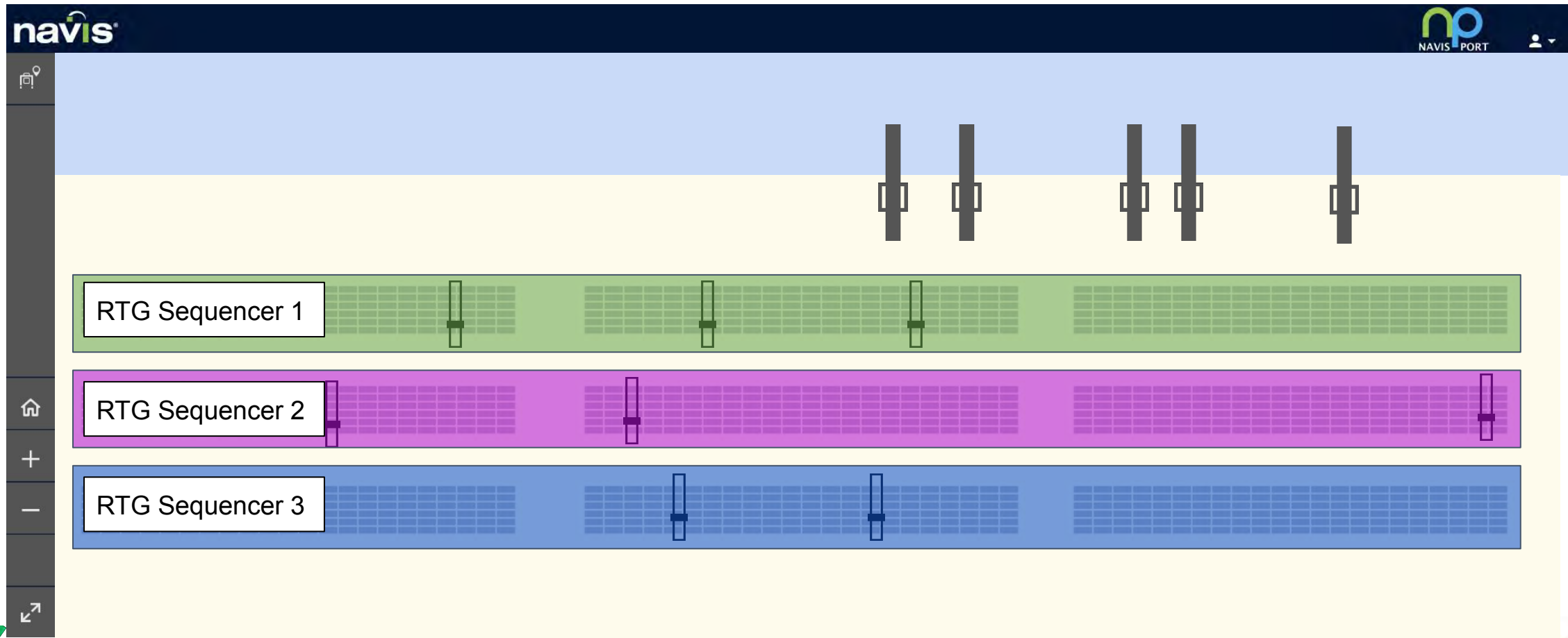
# Increased RTG Dispatcher Visualization



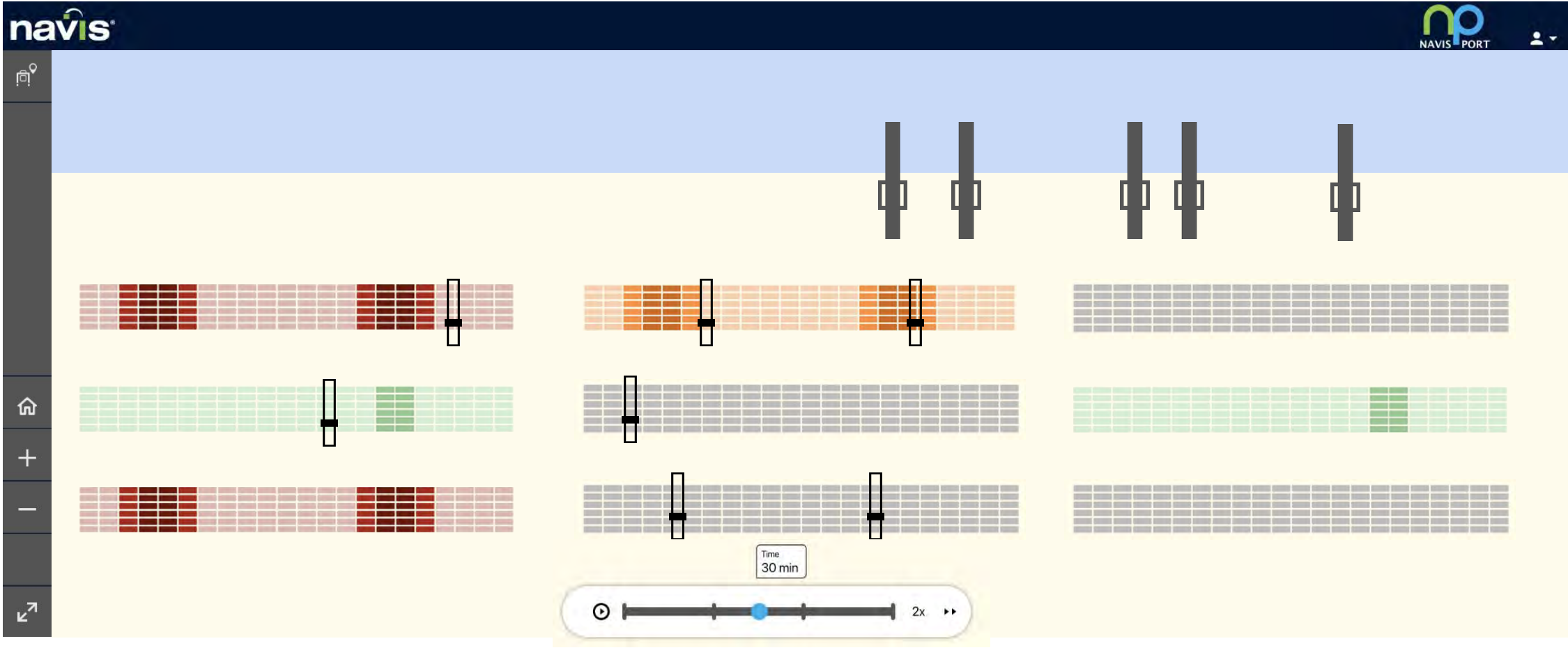


# Manned RTG Optimization - How?

Automate RTG job and block assignment within a lane with **RTG sequencer**



# Visualize Upcoming Yard Busyness & Block Utilization





# Suggest RTG Lane Changes with Yard Crane Balancer

The screenshot displays the Navis software interface for managing RTG lane changes. The main area shows a yard layout with RTG lanes and cranes. A sidebar on the left lists lane changes by duration, and a right-hand panel shows detailed data for selected blocks and lanes.

### Lane Changes

Hide proposed | Show only current

Duration	CHE ID	Origin	Destination
0-10 min	R31	BF	80
	R32	BF	80
10-20 min	R47	BH	80
20-30 min	None		
30-40 min	None		
40-50 min	None		
50-60 min	None		

### Block 8G (RTG Block)

Capacity:	0
Coverage:	Under
Demand:	4

### Lane 56789G (RTG Lane)

Capacity:	0
Demand:	0

### Block 58 (RTG Block)

Capacity:	0
Coverage:	Under
Demand:	0

### Lane 56789B (RTG Lane)

Capacity:	1
Demand:	0

Timeline: Now | 10 | 20 | 30 | 40 | 50 | 60 Mins



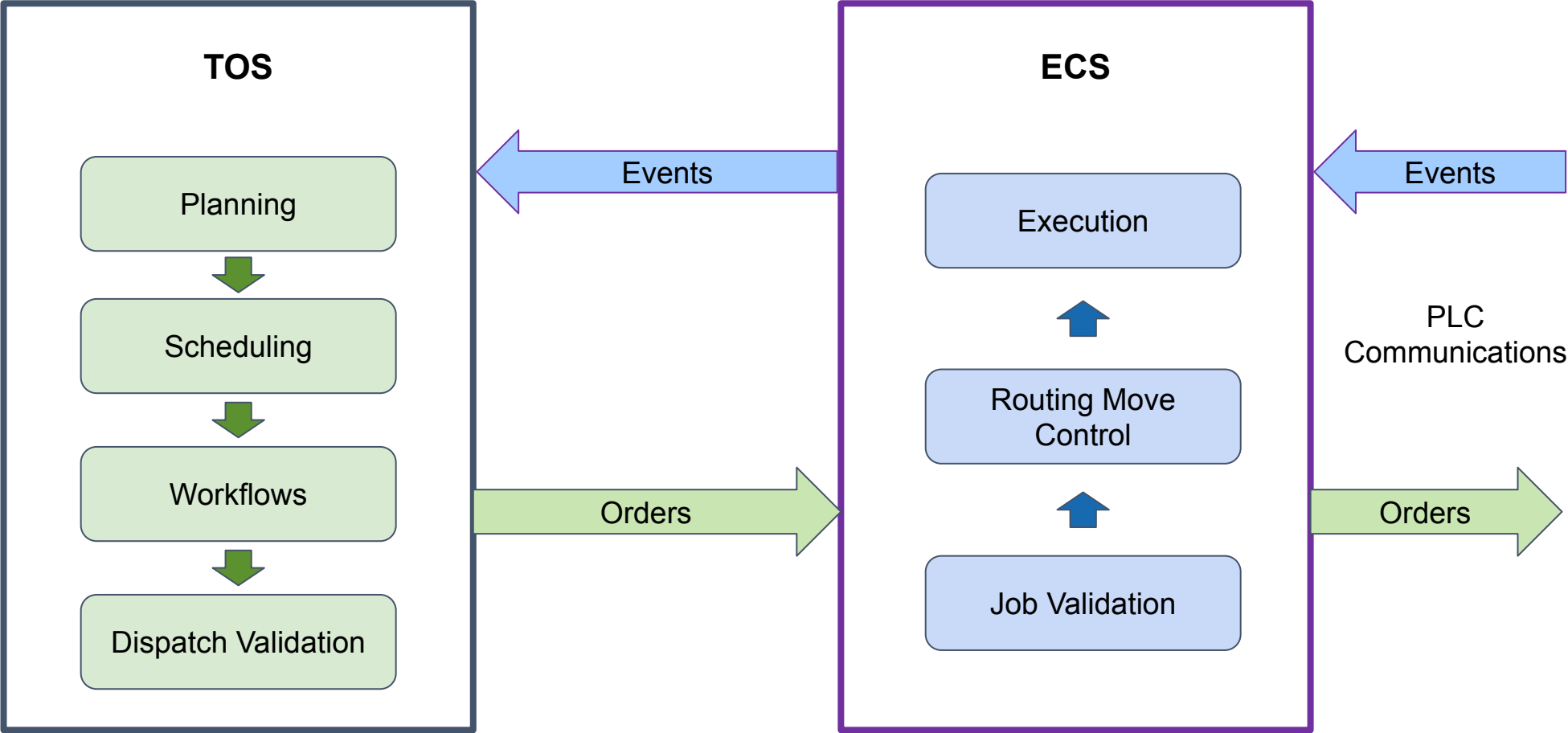
# Manage Exceptions with Alert Notifications

- Load work instructions late for loading
- Load reefers still plugged in yard
- Holds and permissions in active work queues
- Load OOGs in active work queues
- RTGs being IDLE for more than x minutes
- RTGs in the same jobstep for more than x minutes



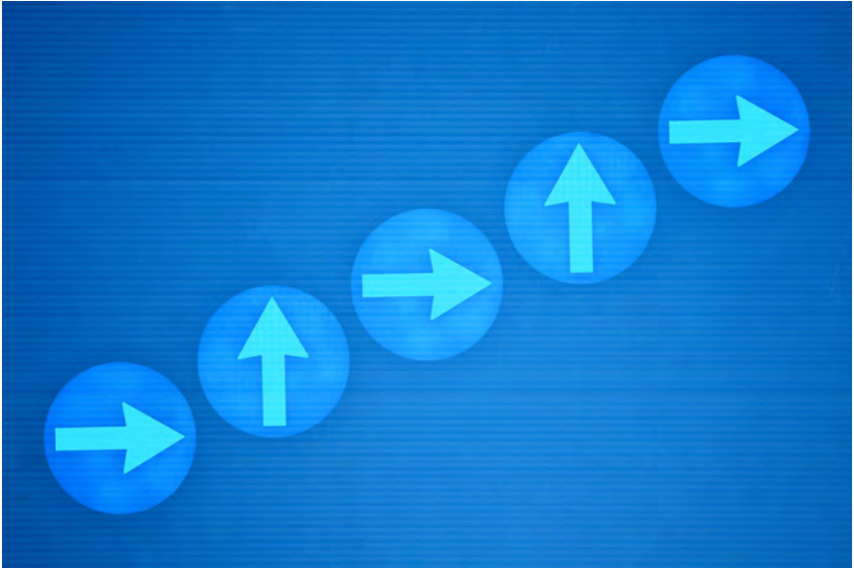


# RTG Automation Integration

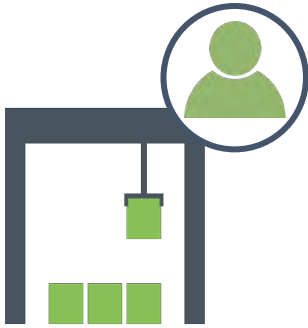


# Every Terminal's Journey is Different

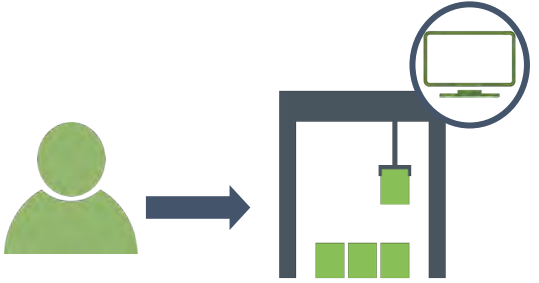
Supporting any stepwise deployment



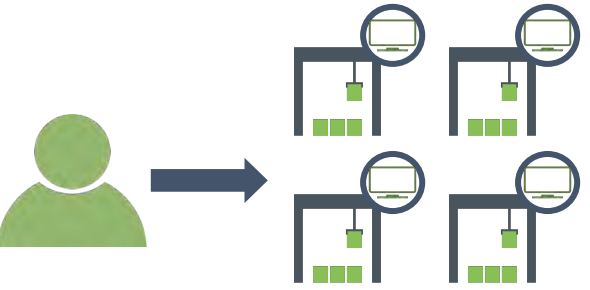
What are the automation steps you are considering?



Conventional RTG Sites



Remote Control RTGs



Pooled Driver Remote Control RTGs



Automated RTGs

# RTG Optimization - A New Reality



**Increase RTG productivity** leveraging AI



**Minimize driver guesswork** with automated decision making on RTG job, block and lane assignment



Promote a shift from reactive to **proactive**  
**Increase visibility and control** to adapt to changing conditions



Improve **usability** for **flexibility**  
**Incremental deployment** of technology and process changes

# Increase RTG Productivity by 5-15%



Get more out of your RTGs and people. Increase the useful life of your equipment and assets. Slow the frequency and need of purchasing more expensive equipment before you really need to.

**Through the N4 RTG optimization module, Navis enables customers to utilize** their RTGs and people in an optimal and efficient way, both for manned as robotic RTGs.



The RTG Optimization Suite can help you increase your RTG Productivity between 5% - 15%, depend on local circumstances



# Tianjin Five Continents International Container Terminal (FICT)



## About FICT

- 12 STS cranes
- 31 RMG cranes
- FICT automated its 31 rail mounted cranes using the Navis N4 system
- The terminal was designed with an initial capacity of 1.5 million TEU and now operating at its maximum capacity
- N4 RMG Automation has enabled operations to grow to 2.7 million TEU in 2019



## Challenges

- Overcome single-sided dual-lane layout of each ARMG yard block
- Difficult increasing the capacity, efficiency of the terminal, and adaptability of the TOS system to side-loading process
- Changing centralized yard planning to decentralized
- Shift single ship focus operation to an optimized overall resources
- Cannot afford to have any down time



## Results

- Terminal adopted Automated Yard Crane Solution which allow the accessibility of remote supervision and fully operational through the modernization project
- Expert Decking + Control Room labor reduction by 1/3
- The equipping of the automation system deliver a stable performance of 30 moves per hour, 10% increase in overall production capacity, and cranes to operator ratio is reduced to 6:1
  - 35% increase in equipment utilization
  - 40% increase in ARMG productivity
  - Avg. vessel berth reduced from 23.45 to 19.15 hours
  - Number of yard crane drivers reduced from 132 to 40
  - Truck turnaround time reduced from 50.9 to 23.2 min

# Automated TOS Solutions







# Thank you

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