



Stepping forward with Transportation Management System

# CHES Introduction

April 19th, 2018

**6<sup>th</sup> MED PORTS**

**2018**

# Company Profile

Since 1988, **Total Soft Bank Ltd. (TSB)**, has devoted to developing the ideal solutions for port and maritime industry, focusing on solutions for shipping, terminal, port community and simulator.

- **Office**
  - Head Office in Busan, Korea
  - Global Networks throughout world
  - *Regional Offices in Greece, Spain, Egypt, Hong Kong, Shanghai, Vietnam, Colombia*
  - *Sales Agent in Taiwan*
- **Human Resources**
  - HQ: 120 employees+ (Vietnam: 45/Greece : 15)
  - 70% of employees in Development, R&D and Professional services
- **Qualification**
  - ISO 9001 certified and INNOBIZ certified
  - KOSDAQ listed  
*KOSDAQ: Korean Securities Dealers Automated Quotations*
  - GMP(2011), GS(2011)
  - Green technology certificate
  - Software process quality assurance certificate Lv.2



## SAIL TO THE FUTURE

1988~  
1989

- Establishment of TSB
- TSB Supercargo

1990~  
1999

- CASP
- CASAS
- Launching of TSB R&D Center
- CATOS
- M3I
- Launching of Service Centers (USA, Japan, Malaysia)

2000~  
2009

- ODCY
- Crane Simulator
- MOST
- ATC Supervisor
- PLUS (VCS<sup>plus</sup>, MSS<sup>plus</sup>, CMS<sup>plus</sup>)
- TPES/TPSS (Terminal Simulator)
- Launching of Joint Venture (USA, Japan)
- Listed at KOSDAQ
- Launching of Services Centers (Taiwan, Thailand, Spain & China)
- ISO 9001
- Completion of Governmental Project (TOS for ACT)
- 20<sup>th</sup> Anniversary of Establishment
- SS-Planner

2010~  
2012

- ESTOS / CHESS
- INNOBIZ Certificate
- RCMS (Reefer Monitoring)
- TGPS, Smart Client and RFID M/W
- Automated Terminal System

2013~

- 25<sup>th</sup> Anniversary of Establishment
- Clouding service
- TMS (Transport Management System)

Vertically Integrated Total Solution in Maritime & Port Logistics



Marine Terminal

Maritime Terminal Operating System



Shipping

Ship Operation & Management System



Port Community

Port Community System



Simulator

Simulation System



## Marine Terminal

TSB supplies mission-critical maritime terminal solutions that provide business success and the best practices.

### CATOS Computer Automated Terminal Operating system

is a fully integrated TOS with customization and process optimization, now serving over 80 container terminals in the world.

### ATC Supervisor

is an innovated system interface for automated equipments with built-in intelligence and automatic management designed for the trend of automated terminals.

### ODCY Off Dock Container Yard

is an easy-to-use system designed for Off Dock container terminal uses.

### MOST Multi-purpose Operating System for Terminals

is a web-based system to enhance the productivity and optimized the management efficiency of multi-purpose terminals.

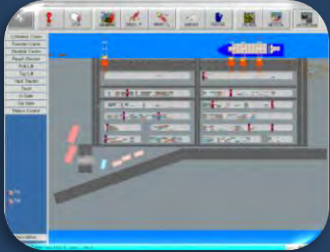
### RCMS Reefer Container Monitoring System

is the world's first and revolutionary solution to prevent claims of reefer container for Container Terminals and Shipping Lines.

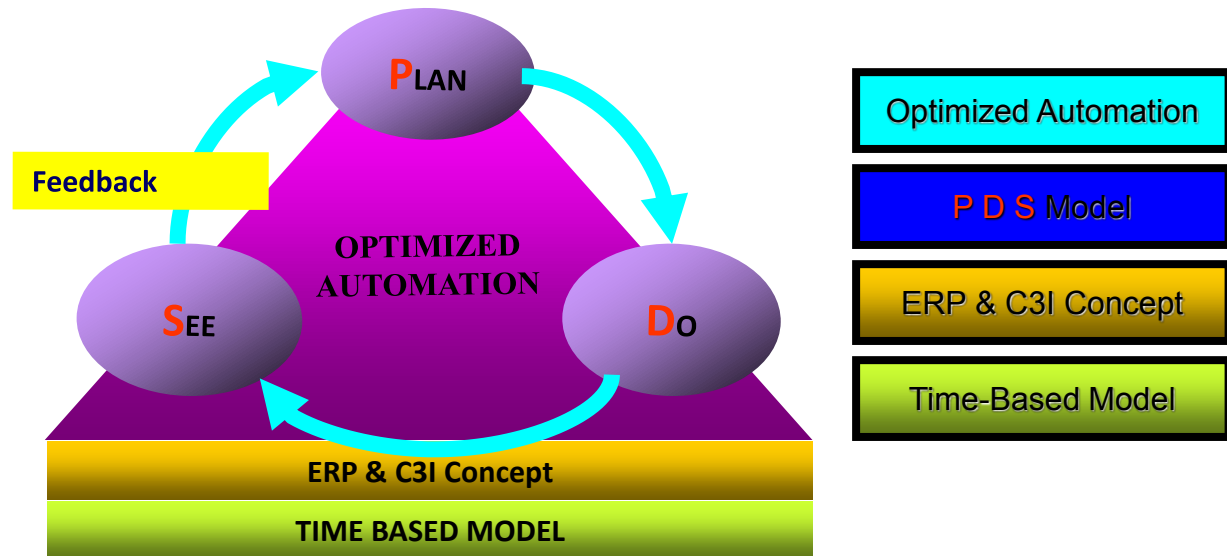
## CATOS

Optimized Container Terminal management system  
for best efficiency.

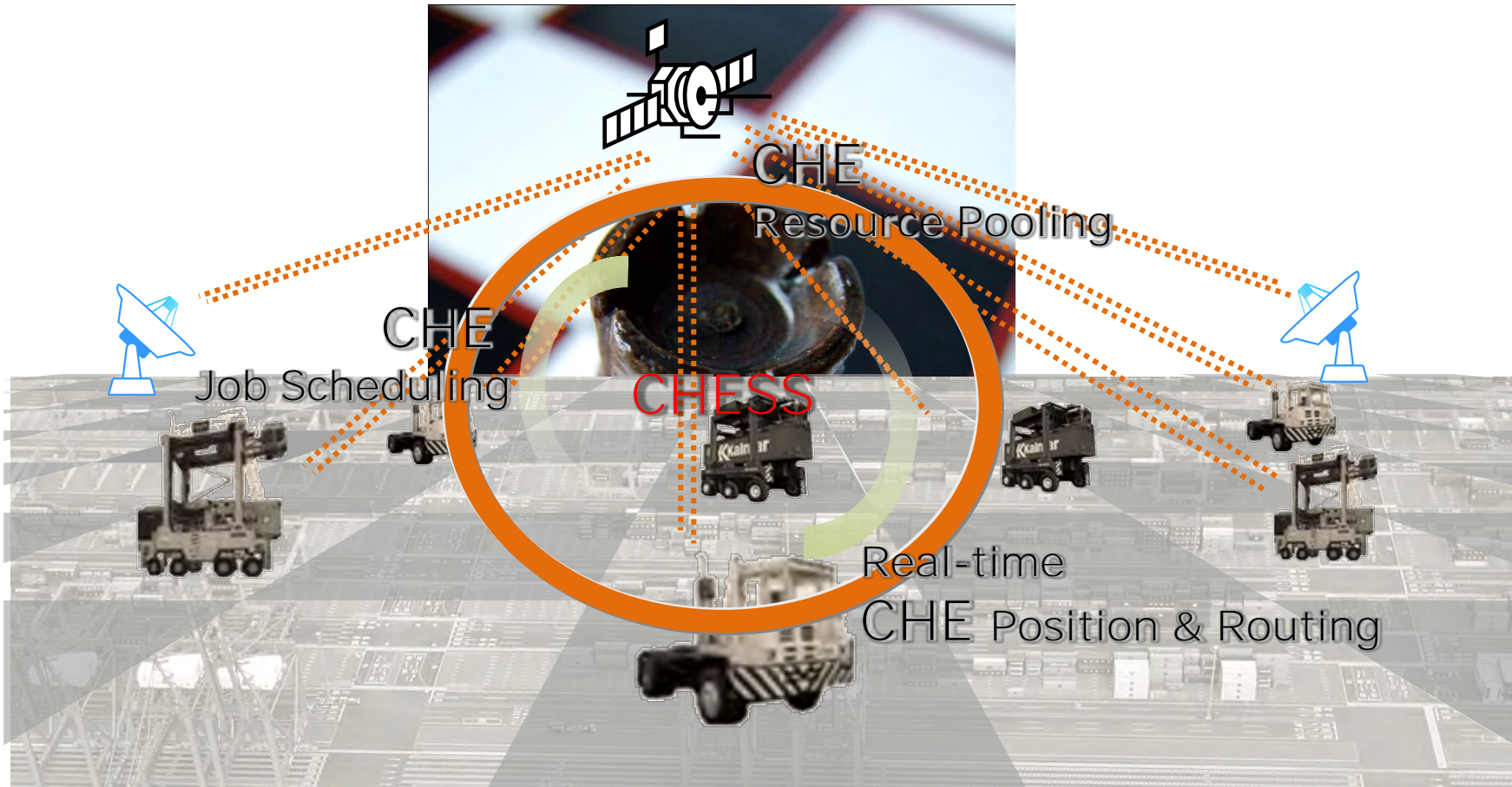
- Powerful Planning & Intelligent Control System
- Real-time Operation Control
- Algorithm for Maximum Utilization of Terminal Resources



Best Practices  
of  
Marine Terminal



## Container Handling Equipment Supervisor System designed for CHE pooling & Dispatching

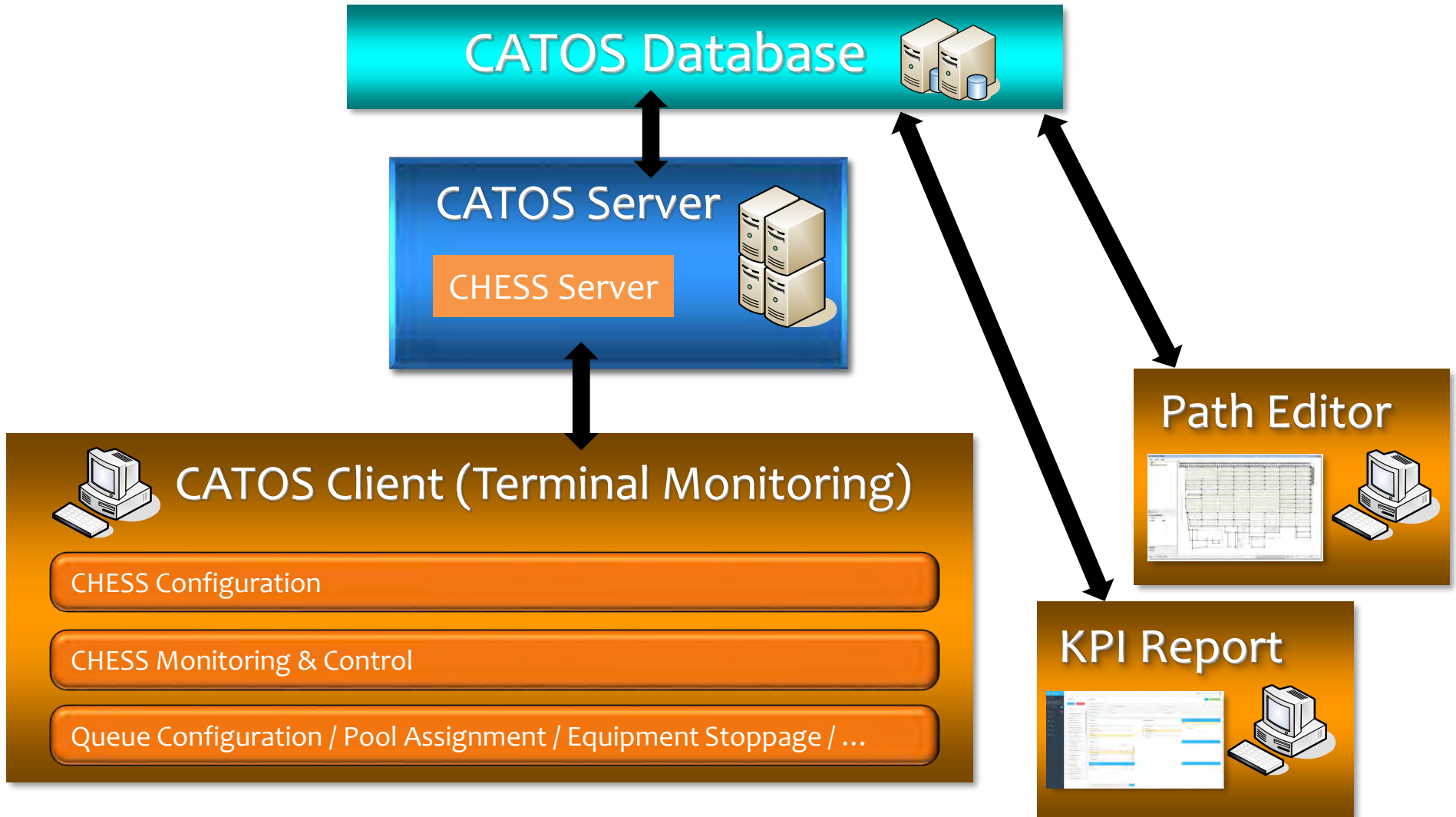


## Table of Contents

- System Overview
- System Technology
- Major Features
- Path Editor & KPI Report Tool
- Reference Site
- Q & A



## CHESS System In CATOS Server



## Table of Contents

System Overview

System Technology

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Path Editor & KPI Report Tool

Reference Site

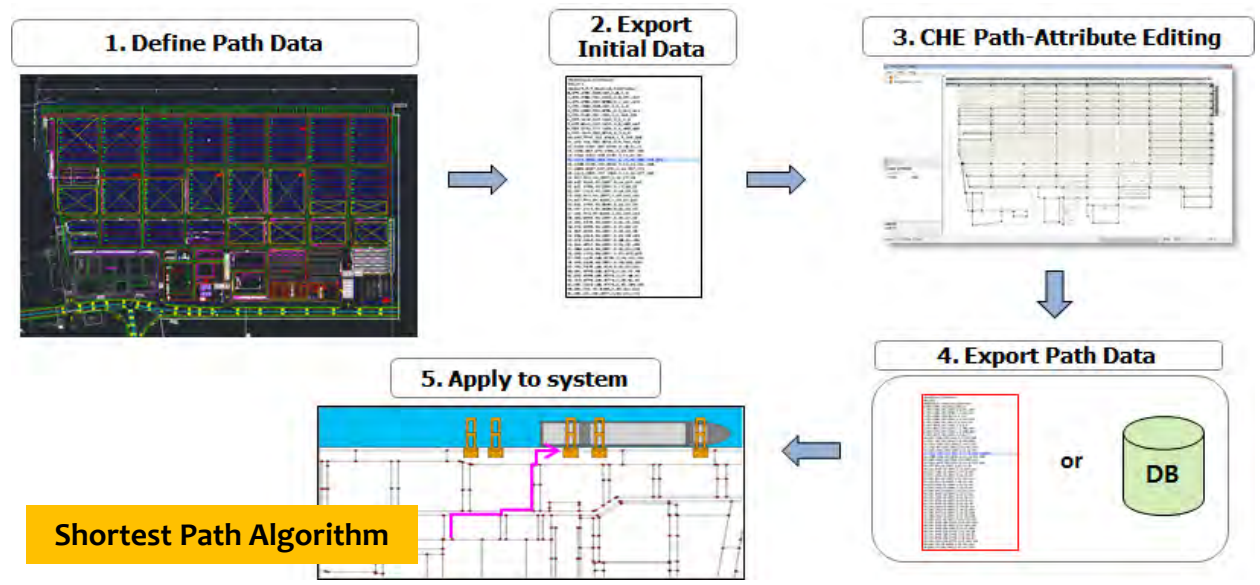
Q & A

## Equipment Position

- Last Reported Location & Real Time Position



- Routing and Travel Time Estimation



# Case Study: Yard Truck Positing

## Yard Truck Positing

- Last job position
- GPS integrated in Yard Truck VMT
- Yard Truck speed is taken into the calculation

## GPS Module

- Integrate in the Yard Truck VMT
- With outdoor antenna

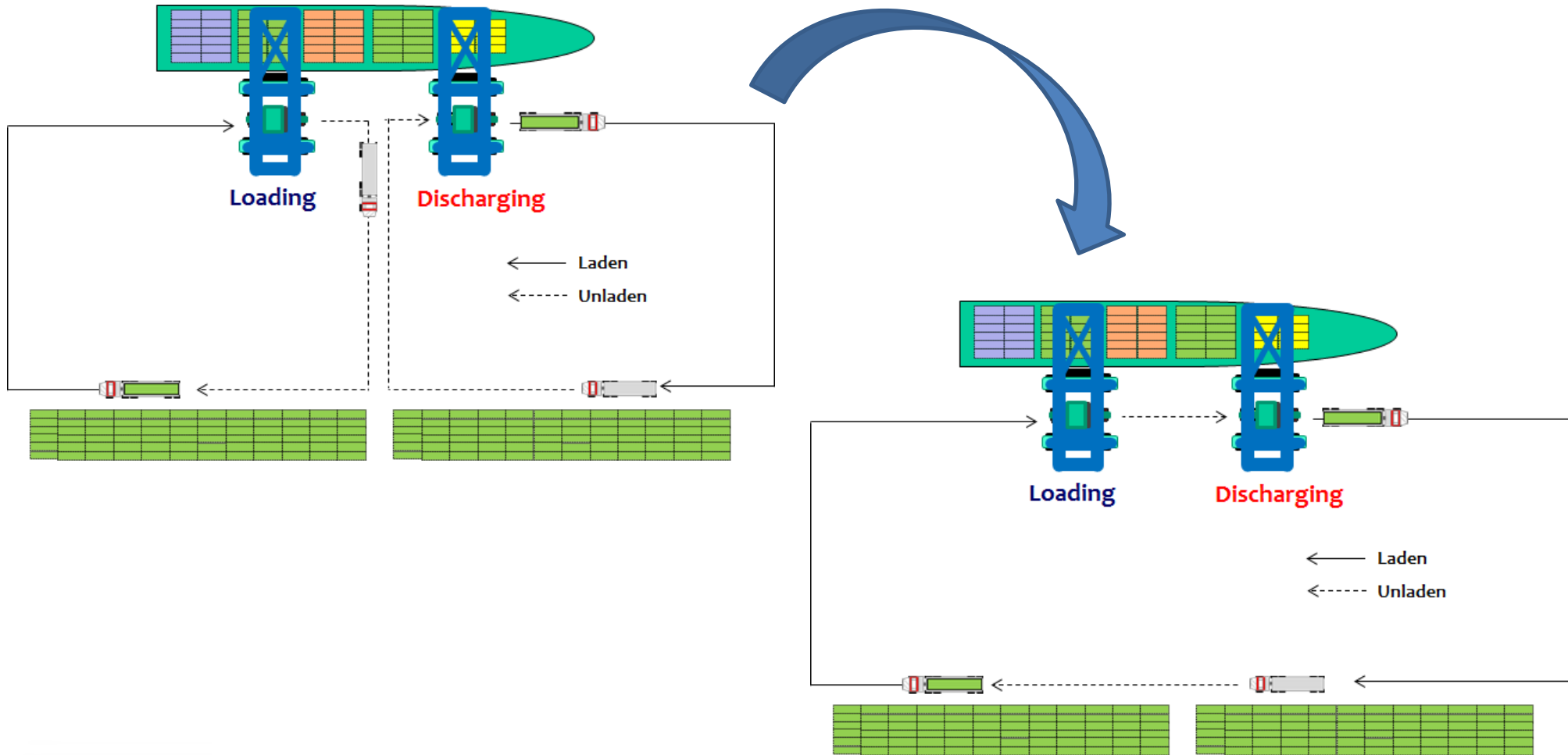
## Data Transaction

- Transfer the yard truck position data to CHESSE server every 5 seconds



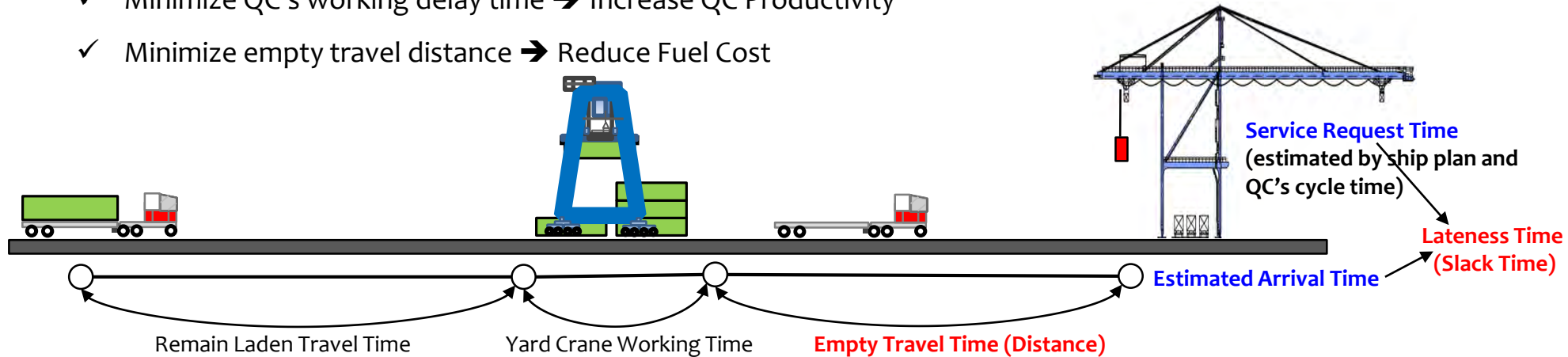
## Equipment Pooling

- Quay Crane Dedicated vs. Pooling

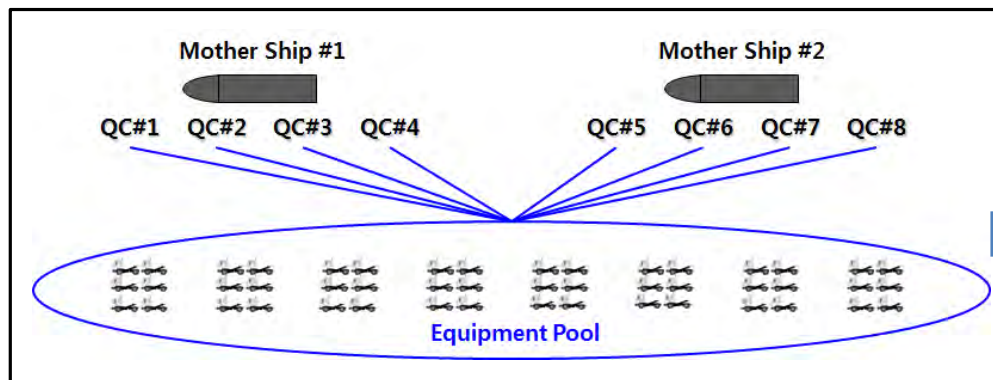


## Job Scheduling & Consideration Factor

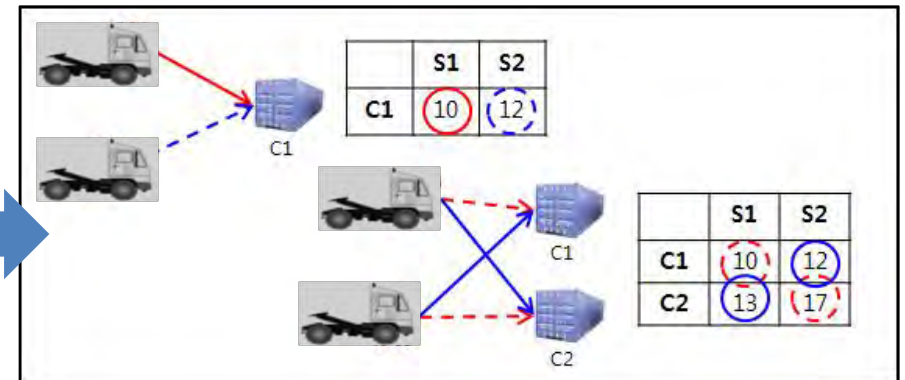
- Determination of weight on Job Scheduling Criteria
  - ✓ Minimize QC's working delay time → Increase QC Productivity
  - ✓ Minimize empty travel distance → Reduce Fuel Cost



## ● Job Dispatching and Configuration of each pool



Pool (Job Queue and Equipment)



Evaluation combinations between target job and target equipment

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## CHES Configuration > Optimization

- Priority for Job Scheduling : Configuration on evaluation criteria and weight for each job type
  - Configuration Template : Create/Update/Delete
  - Criteria : Ratio of Service Lateness Time and Empty Travel Time
  - Weight : Priority of Job Type (1~10)
  - Threshold : inputted by user (second)
  - Forced Weight : Weight by Threshold (1~10)
  - Out of sequence



CHES Configuration

Operation Optimization Yard Crane Working Time

Job Priority

test Test Template [New] [Save] [Delete]

Type	Criteria (Lateness - Distance)	Weight (Low - High)	Thres hold	Forced Weight (Low - High)	Discard Slack	Late	Early
VO	0 100		10000		<input type="checkbox"/>	0	999
VI	61 39		10000		<input type="checkbox"/>	0	999
RO	60				<input type="checkbox"/>	0	999
RI	60				<input type="checkbox"/>	0	999
SI	60 40		10000		<input type="checkbox"/>	0	999
SO	60 40		10000		<input type="checkbox"/>	0	999
YO	60 40		10000		<input type="checkbox"/>	0	999

Allowed out of sequence 1

Idle Equipment Handling

Consideration Equipment Idle Time 3 sec

Priority Multiplier 2 times

Service Request Time (estimated by ship plan and QC's cycle time)

Lateness Time (Slack Time)

Estimated Arrival Time

Remain Laden Travel Time

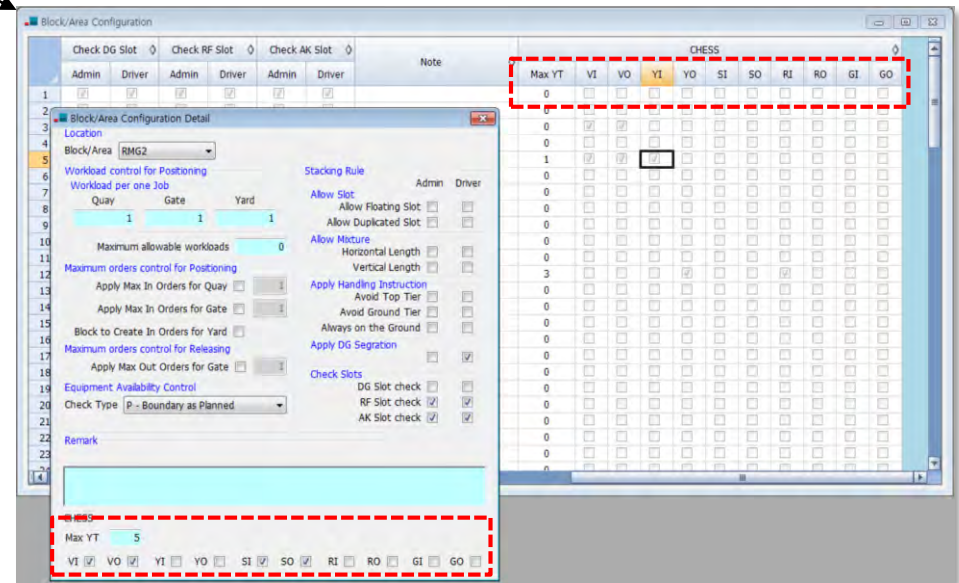
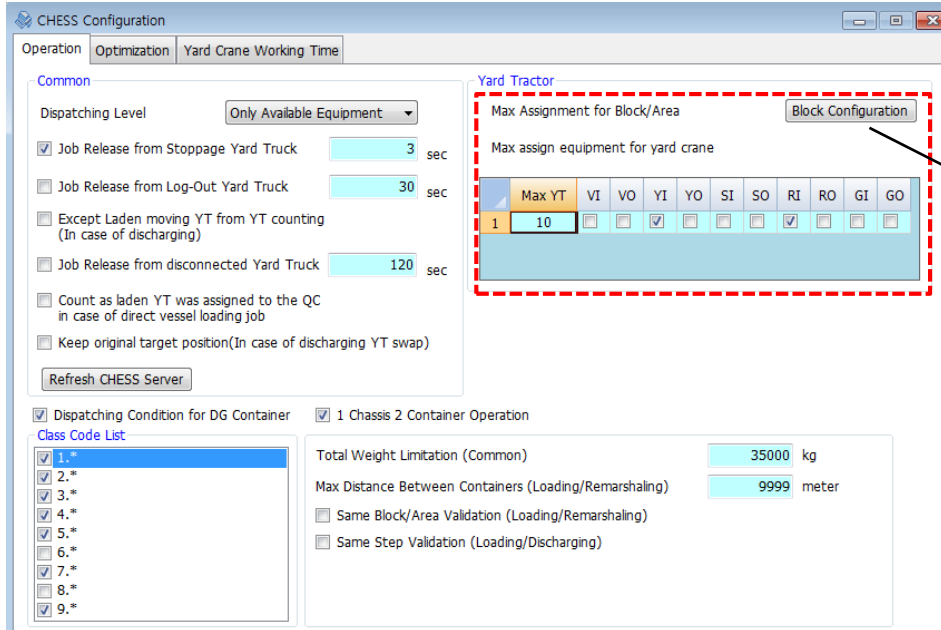
Yard Crane Working Time

Empty Travel Time (Distance)

Same Input Different output  
"Scheduling Equalizer"

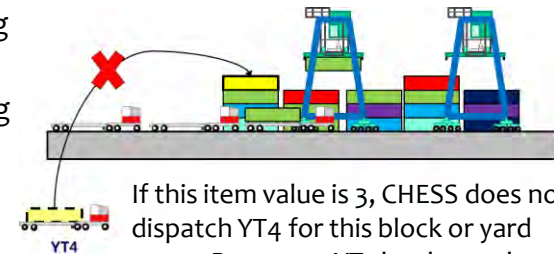


## CHES Configuration > Operation



### Max assign equipment for one block/area and yard crane

- CHES consider the number of YTs on working for same block/yard crane.
  - ✓ for Block/Area: CHES will not dispatch YT any more if there are certain number of working YTs in same block/area.
  - ✓ for Yard Crane: CHES will not dispatch YT any more if there are certain number of working YTs in same yard crane
- Objective: To prevent predicted waiting caused by previous working jobs.
- Effect: Not only reducing predicted waiting time but also getting a chance for other jobs.



If this item value is 3, CHES does not dispatch YT4 for this block or yard crane. Because 3 YTs has been already dispatched to Block or Yard Crane.

## CHES Configuration > Operation

**CHES Configuration - Operation**

**Yard Crane Working Time**

**Yard Tractor**

Max Assignment for Block/Area: 10

Max assign equipment for yard crane

Total Weight Limitation (Common): 35000 kg

Max Distance Between Containers (Loading/Remarshaling): 9999 meter

**Facility List**

Facility Type: YT : Yard Truck

	Facility Type	Name	Productivity (V/H)	Loadable Weight	Speed	Tag No.
1	YT	QY01	5.00	65,000	0.00	
2	YT	QY02	5.00	65,000	0.00	
3	YT	QY03	5.00	65,000	0.00	
4	YT	QY04	5.00	65,000	0.00	
5	YT	QY05	5.00	65,000	0.00	

**Control Quay Job**

Quay Job Order Command: Execute

Quick Filter: G/C QC05, Show All Quay Job Orders

Quay Job Order Command: Execute

Quick Filter: Vessel, Step

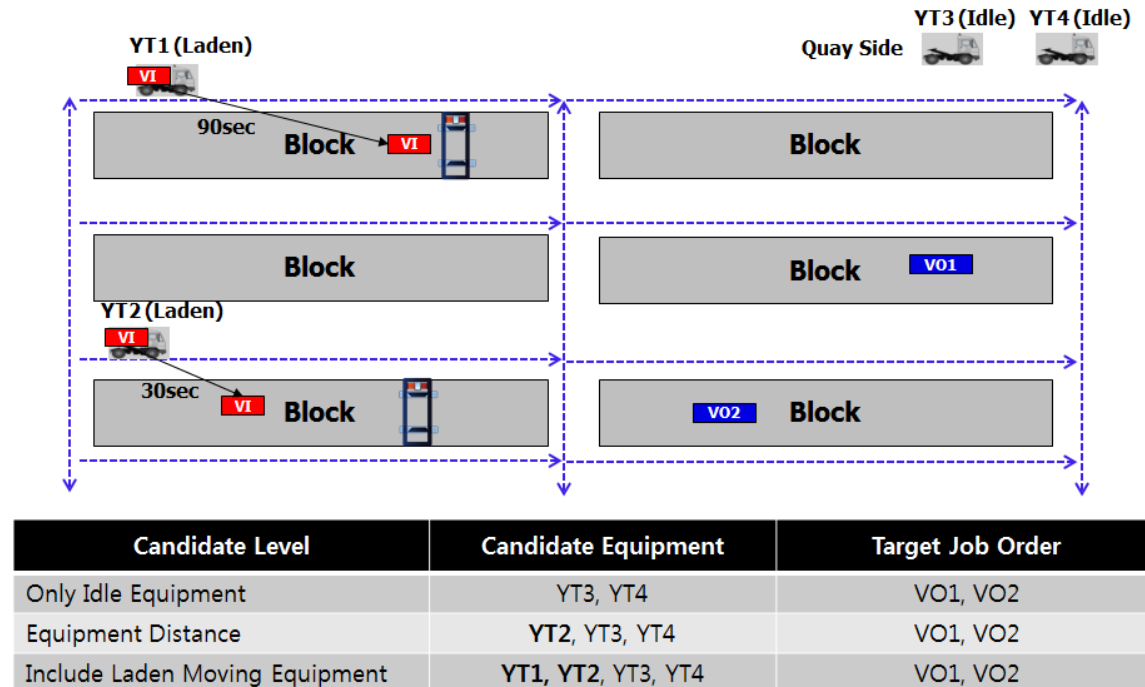
Vessel	Container	Step	CD	Act	Plan Seq	Operation Seq	Pos (Vessel)	Pos (Yard/SS)	YC	YT
1	8ECO 8MOU5182846	100	GD	22	QC05/1-01	QC05/100-01	18-06-84/D			EKA8256/M
2	8ECO TCNU9143060	100	GD	22	QC05/1-02	QC05/100-02	18-04-84/D			YT6222/M
3	8ECO TQLU7085965	300	GD	22	QC05/3-10	QC05/300-10	14-05-84/D			YT6223/M
4	8ECO GVDU8400112	300	GD	22	QC05/3-11	QC05/300-11	14-07-84/D			EKA8628/M
5	8ECO DFSU1256032	300	GD	22	QC05/3-12	QC05/300-12	15-08-82/D			YT6224/F
6	8ECO SEGU1008938	300	GD	22	QC05/3-13	QC05/300-13	15-06-82/D			
7	8ECO TRJU0563060	301	GD	22	QC05/3-01	QC05/301-01	14-04-86/D			
8	8ECO CBHU3714390	330	GD	22	QC05/3-17	QC05/330-01	15-03-82/D			
9	8ECO CBHU5764430	400	GD	22	QC05/4-42	QC05/400-42	13-05-04/H			
10	8ECO CBHU8573680	610	GD	22	QC04/5-04	QC05/610-10	02-00-82/D			

### 1 Chassis 2 Container Option

- This option is for twin carry (2 X 20ft container) in case Twin Planning is not made.
- CHES will dispatch one YT for two 20ft container by this configuration.
- Total Weight Limitation : Basically system consider YT's specification in Yard Define. This value is default value.
- Max Distance Between Containers : System check estimated distance between 2 containers based on yard position.

## CHES Configuration > Optimization

- Candidate Level : Users can configure on candidate equipment for dispatching
  - Consideration Range : Only Idle Equipment < Equipment Distance < Include Laden Moving
  - Include Laden Moving : All Container lift-on is completed.
  - Equipment Distance : The estimated travel time from current YT position to lift-off position less than the time inputted by user. (In case lift-off position of 2oft x 2 container is different block, system considers last container)



## CHES Configuration > Optimization

- Idle Equipment Handling : Equipment Isolation Prevention
  - Consideration Equipment Idle Time : User can set limit over which idle YT to be considered in the below calculation
  - Idle Equipment Priority Multiplier : User can set the multiplier for the below calculation

Type	Criteria (Lateness - Distance)	Weight (Low - High)	Thres hold	Forced Weight (Low - High)	Discard Slack	Late	Early
VO	85	15	10000		<input type="checkbox"/>	0	999
VI	84	16	10000		<input type="checkbox"/>	0	999
RO	12	88	10000		<input type="checkbox"/>	0	999
RI	12	88	10000		<input type="checkbox"/>	0	999
SI	12	88	10000		<input type="checkbox"/>	0	999
SO	11	89	10000		<input type="checkbox"/>	0	999
YO	3	97	10000		<input type="checkbox"/>	0	999

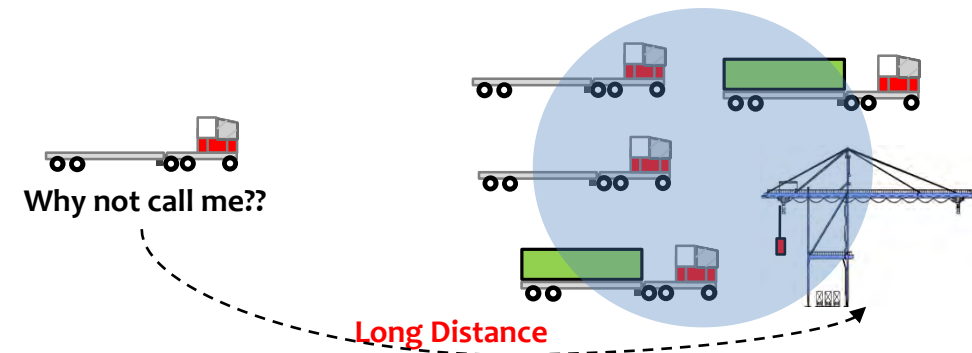
Allowed out of sequence

Candidate Level

Ladden Equipment Handling  
 Waiting Time for Lift-Off  sec

**Idle Equipment Handling**  
 Consideration Equipment Idle Time  sec  
 Idle Equipment Priority Multiplier  times

Description  
 In case of equipment idle time exceeded 'Consideration Equipment Idle Time', the following formula will be applied. After that, system will recognize that equipment is nearby target work, even though equipment is far from target work.  $\text{Equipment Empty Travel Time} = \text{Equipment Empty Travel Time} - (\text{Equipment Idle Time} * \text{Idle Equipment Priority Multiplier})$

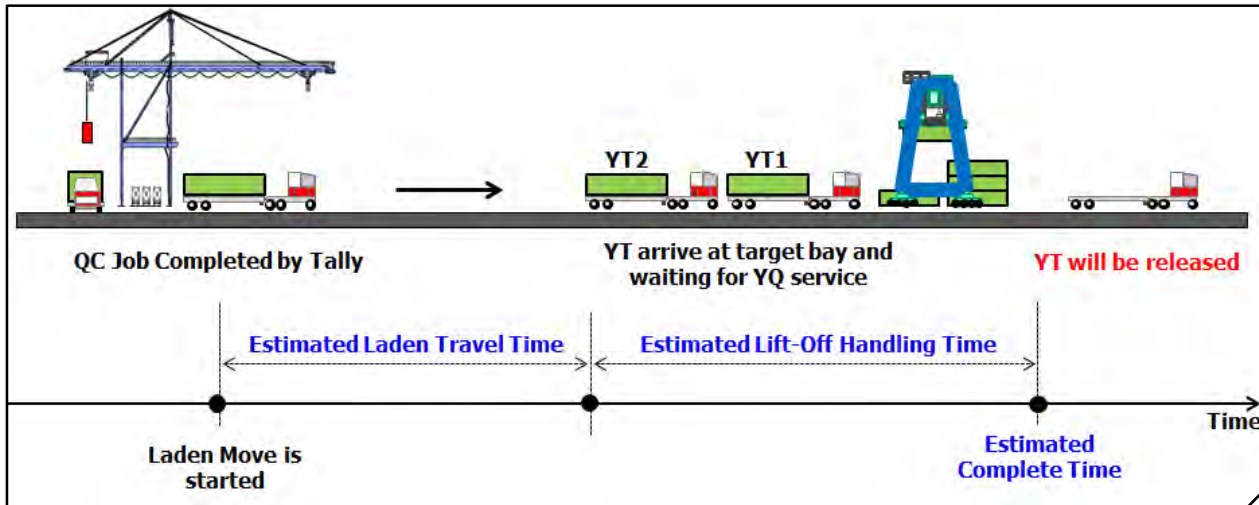


This following formula will be applied when system calculates estimated empty travel time for preventing isolation for yard truck.

	Estimated Empty Moving Time	Idle Time (elapsed time from previous job is completed)	Advantaged Empty Moving Time
YT1	60	10	60
YT2	70	80	70
YT3	150	120 ( $\geq 100$ sec)	$150 - (120 * 1) = 30$

## CHES Configuration > Yard Crane Working Time

- Estimation yard crane's working sequence and complete time in order to expect when YT will be released.
- Job Prioritization Rule : User define configuration
- Calculation estimated complete time based on job sequence and yard define (specification, yard slot, ...)



CHES Configuration

Operation Optimization Yard Crane Working Time

	Job Type	Condition	Waiting	Truck Assigned	After Container	Gate In Completed
1	VO	Greater Than	70	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	RO	Greater Than	50	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
3	SI	Greater Than	80	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
4	YO	Greater Than	60	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5	SI	Greater Than	50	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	RO	Less Than	100	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
7	SD	Greater Than	90	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
8	SI	Less Than	80	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
9	SI	Less Than	60	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10	RI	Greater Than	23	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

- If Truck Assigned is unchecked, waiting time means elapsed time from yard job was created time
- If After Container is unchecked, it means fore-container or 40ft or 45ft
- If Gate In Completed is checked, waiting time means elapsed time from the time all Gate-In was completed.

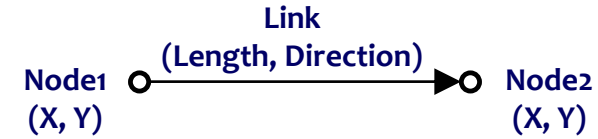
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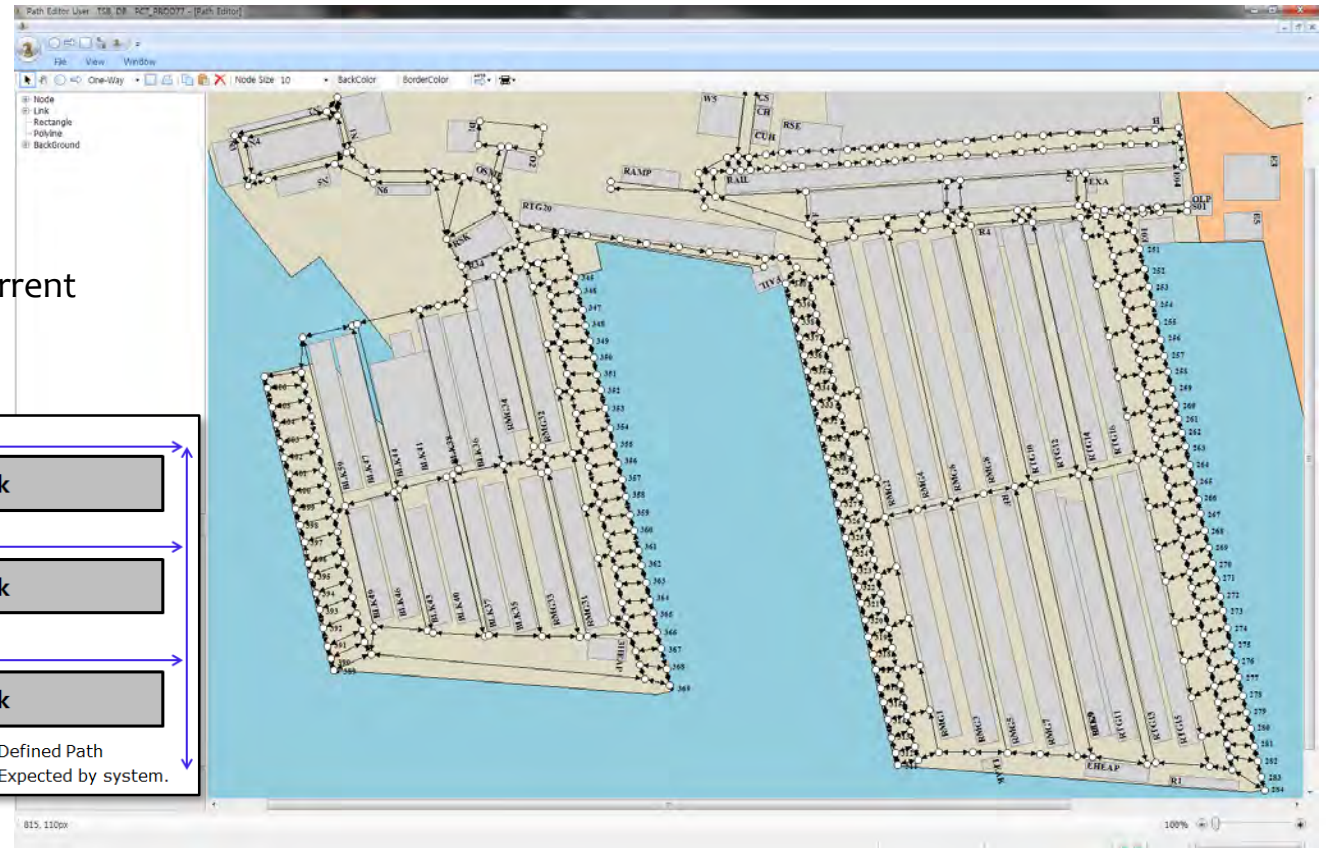
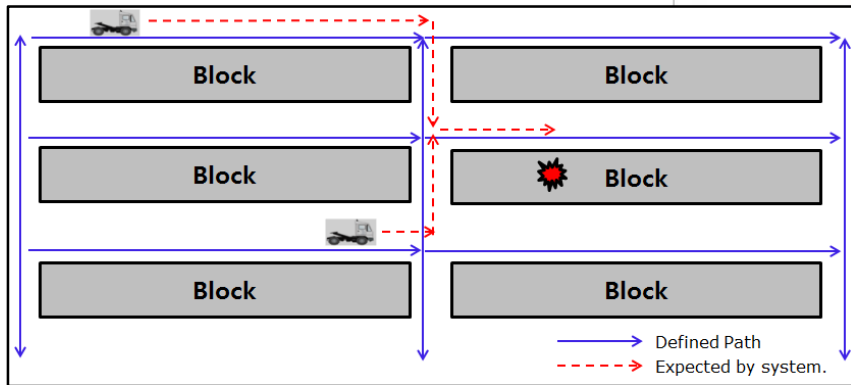
## Path Editor > Truck Path Editor

User can define **truck path data(Node/Link)** and other facility using this tool

- Display Yard Definition (Block, Area, Bitt)
- Import/Export path data from/to Database or file
- Layer-level path data management
- The property of path attribute management (Max Speed, Enable/Disable)
- Zoom In/Out
- Add/Remove Node and Link

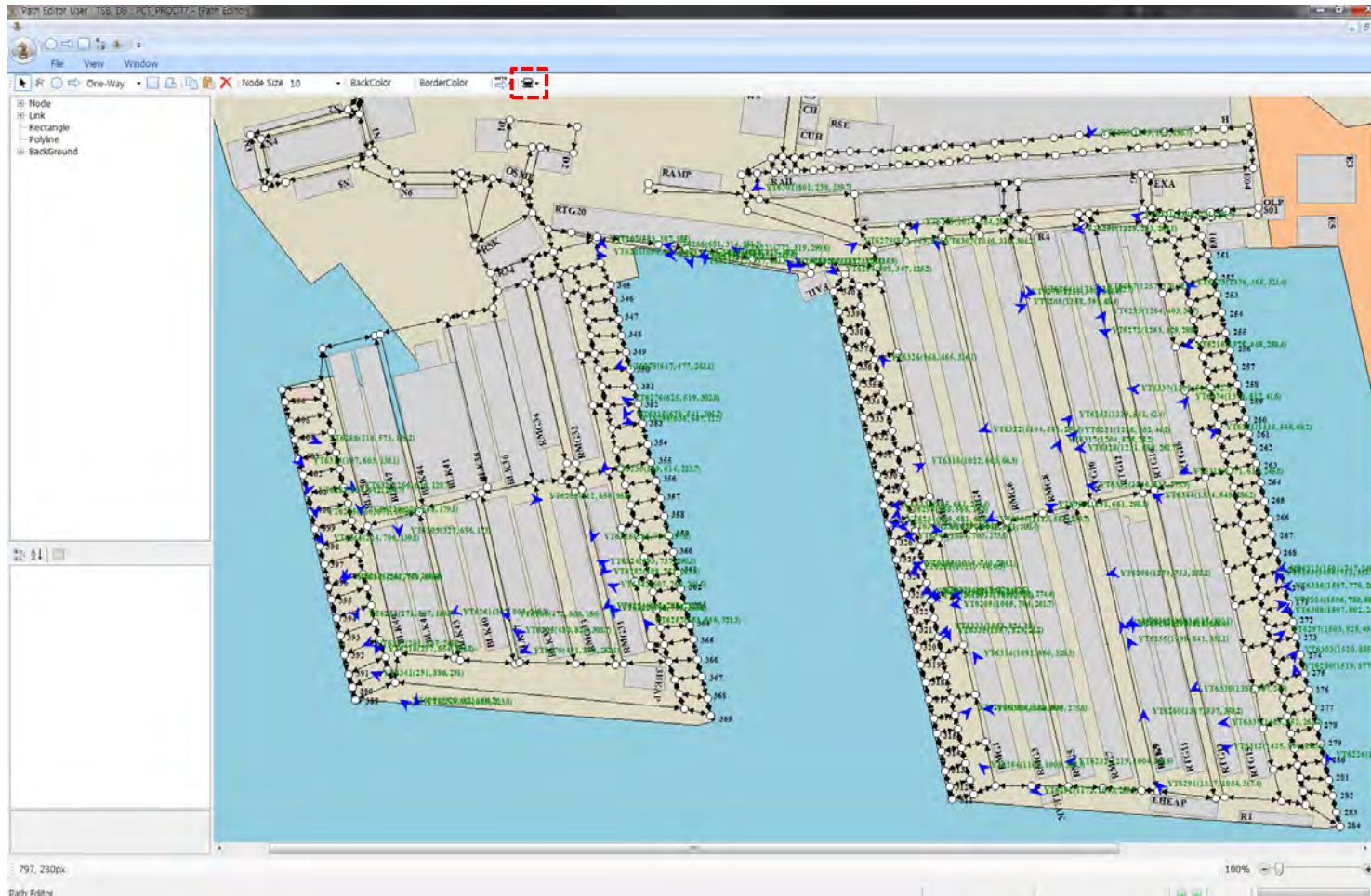


Estimation of yard truck movement :  
Travel distance is estimated based on current position of yard truck and defined path  
(Refer to image below)



## Path Editor > Real-Time Monitoring

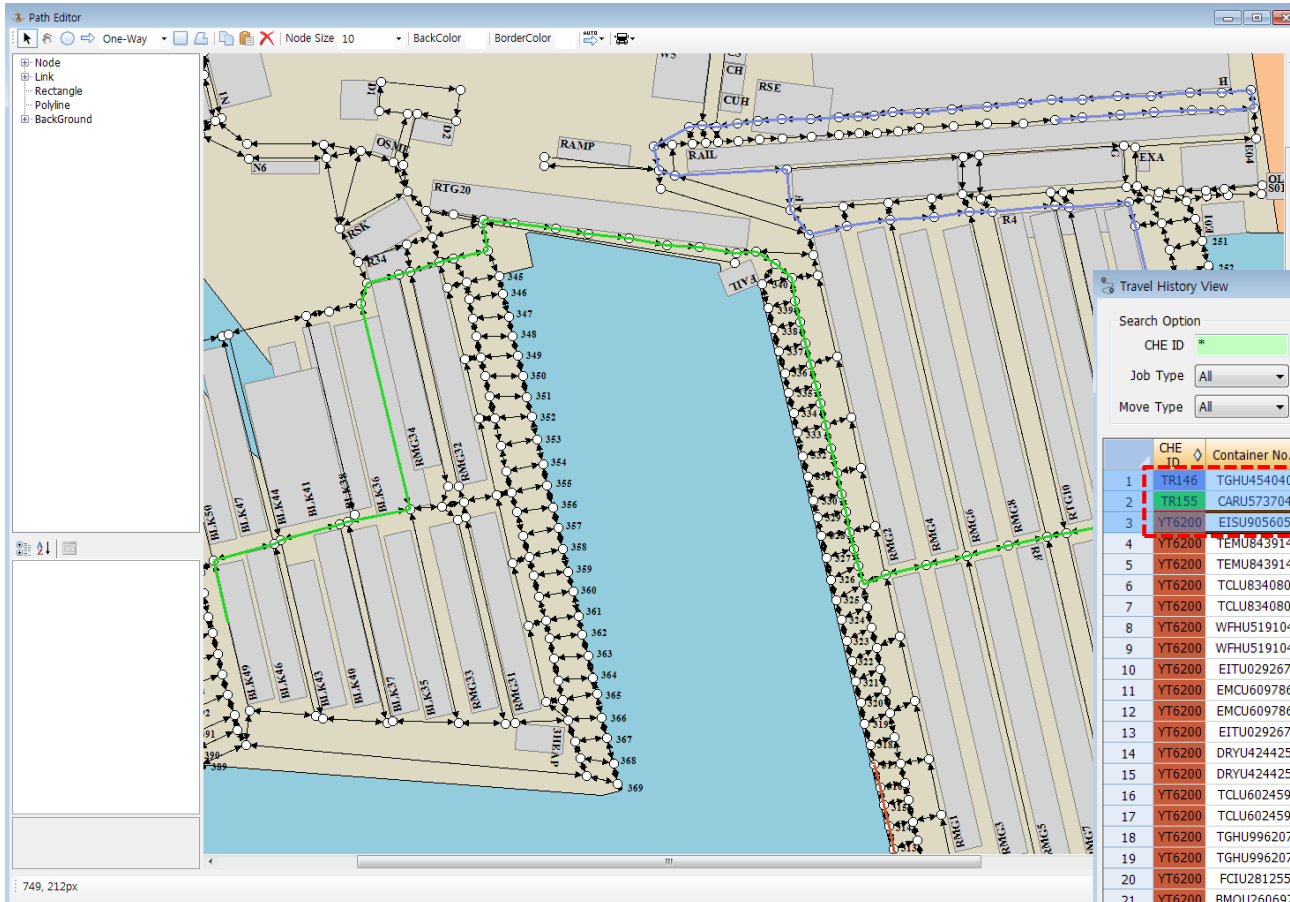
- Current position of yard truck based on interface data from PDS(Position Detection System)
- User can set Enable/Disable of this function and refresh interval





## Path Editor > Travel History View

- Whenever job is completed, system saves travel history of each yard
- Travel history is separated empty/laden move based on start, lift-on and lift-off position



If select row(s) in the Travel History View, System display truck traveled routing in the Path Editor View.

Travel History View

Search Option

CHE ID: \* [ ] Dispatched Time: 2017-04-11 05:54:22 - 2017-04-11 11:54:22

Job Type: All Move Type: All Container No: [ ] Search

Drawing Option:  Path Define  Direct Path Link

CHE ID	Container No.	Job Type	Laden/Empty	Completed Time	From Position	To Position	CHESS Posi
1	TR146	TGHU4540405	VO	Laden	2017-04-11 오전 9:16:22	RAIL(1243,0,195)	QC20(1558,0,10)
2	TR155	CARU5737046	VO	Laden	2017-04-11 오전 9:16:27	BLK49(326,756)	QC20(1558,0,10)
3	YT6200	EISU9056058	VI	Laden	2017-04-11 오전 5:57:30	QC15(1027,0,92)	RTG13(1398,830)
4	YT6200	TEMU8439145	VI	Empty	2017-04-11 오전 6:13:19	YT6200(1379,0,8)	QC20(1552,0,98)
5	YT6200	TEMU8439145	VI	Laden	2017-04-11 오전 6:22:59	QC20(1552,0,98)	RTG16(1335,455)
6	YT6200	TCLU8340807	VI	Empty	2017-04-11 오전 6:27:44	RTG16(1335,455)	QC17(1001,0,80)
7	YT6200	TCLU8340807	VI	Laden	2017-04-11 오전 6:35:27	QC17(1001,0,80)	BLK37(464,741)
8	YT6200	WFHU5191043	VI	Empty	2017-04-11 오전 7:04:33	YT6200(462,0,74)	QC31(684,0,710)
9	YT6200	WFHU5191043	VI	Laden	2017-04-11 오전 7:11:41	QC31(684,0,710)	H(986,138)
10	YT6200	EITU0292673	VI	Empty	2017-04-11 오전 7:19:13	YT6200(966,0,19)	QC33(684,0,710)
11	YT6200	EMCU6097868	VI	Empty	2017-04-11 오전 7:19:30	QC33(730,622)	QC33(730,622)
12	YT6200	EMCU6097868	VI	Laden	2017-04-11 오전 7:29:10	QC33(684,0,710)	F(1026,275)
13	YT6200	EITU0292673	VI	Laden	2017-04-11 오전 7:29:58	F(1026,275)	F(989,278)
14	YT6200	DRYU4244250	VO	Empty	2017-04-11 오전 7:33:53	YT6200(1003,0,2)	BLK38(448,633)
15	YT6200	DRYU4244250	VO	Laden	2017-04-11 오전 7:40:19	BLK38(448,633)	QC15(1027,0,92)
16	YT6200	TCLU6024590	VI	Empty	2017-04-11 오전 8:08:46	YT6200(1085,0,1)	QC15(1018,0,88)
17	YT6200	TCLU6024590	VI	Laden	2017-04-11 오전 8:22:28	QC15(1018,0,88)	RTG11(1366,967)
18	YT6200	TGHU9962070	VI	Empty	2017-04-11 오전 8:27:40	YT6200(1394,0,9)	QC08(951,0,588)
19	YT6200	TGHU9962070	VI	Laden	2017-04-11 오전 8:32:50	QC08(951,0,588)	RMG7(1227,822)
20	YT6200	FCIU2812554	VO	Empty	2017-04-11 오전 8:37:19	RMG7(1227,822)	RMG6(1140,571)
21	YT6200	BMOU2606977	VO	Empty	2017-04-11 오전 8:40:12	RMG6(1140,571)	RMG6(1137,571)

## Path Editor > Travel History View

**Travel History View**

Search Option

CHE ID:

Job Type:  Dispatched Time: 2017-04-11 05:54:22 - 2017-04-11 11:54:22

Move Type:  Container No:

Drawing Option

Path Define

Direct Path Link

Search

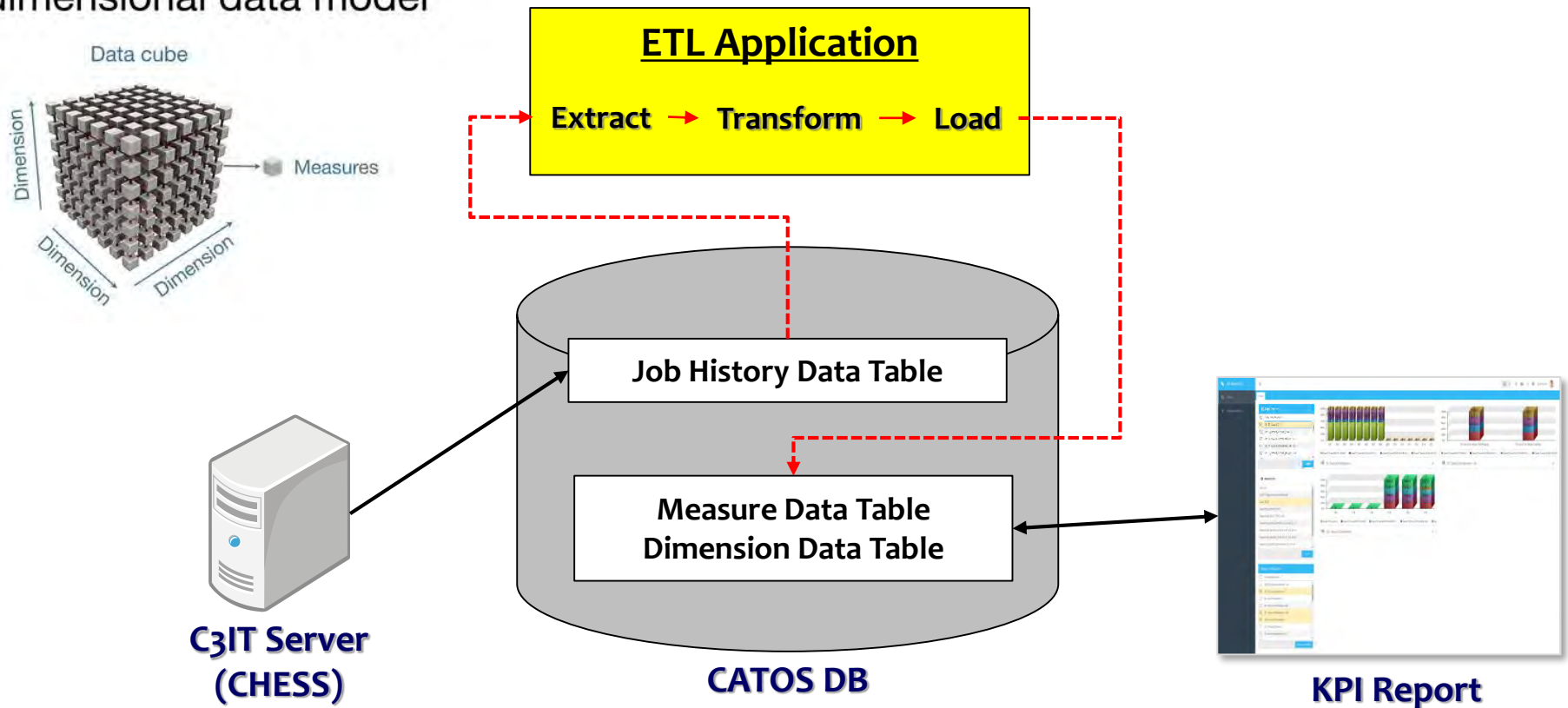
CHE ID	Container No.	Job Type	Laden/Empty	Completed Time	From Position	To Position	CHESS Posi
3	YT6200	EISU9056058	VI	Laden	2017-04-11 오전 5:57:30	QC15(1027,0,92)	RTG13(1398,830)
4	YT6200	TEMU8439145	VI	Empty	2017-04-11 오전 6:13:19	YT6200(1379,0,8)	QC20(1552,0,98)
5	YT6200	TEMU8439145	VI	Laden	2017-04-11 오전 6:22:59	QC20(1552,0,98)	RTG16(1335,455)
6	YT6200	TCLU8340807	VI	Empty	2017-04-11 오전 6:27:44	RTG16(1335,455)	QC17(1001,0,80)
7	YT6200	TCLU8340807	VI	Laden	2017-04-11 오전 6:35:27	QC17(1001,0,80)	BLK37(464,741)
8	YT6200	WFHUS191043	VI	Empty	2017-04-11 오전 7:04:33	YT6200(462,0,74)	QC31(684,0,710)
9	YT6200	WFHUS191043	VI	Laden	2017-04-11 오전 7:11:41	QC31(684,0,710)	H(986,138)
10	YT6200	EITU0292673	VI	Empty	2017-04-11 오전 7:19:13	YT6200(966,0,19)	QC33(684,0,710)
11	YT6200	EMCU6097868	VI	Empty	2017-04-11 오전 7:19:30	QC33(730,622)	QC33(730,622)
12	YT6200	EMCU6097868	VI	Laden	2017-04-11 오전 7:29:10	QC33(684,0,710)	F(1026,275)
13	YT6200	EITU0292673	VI	Laden	2017-04-11 오전 7:29:58	F(1026,275)	F(989,278)
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15	YT6200	DRYU4244250	VO	Laden	2017-04-11 오전 7:40:19	BLK38(448,633)	QC15(1027,0,92)
16	YT6200	TCLU6024590	VI	Empty	2017-04-11 오전 8:08:46	YT6200(1085,0,1)	QC15(1018,0,88)
17	YT6200	TCLU6024590	VI	Laden	2017-04-11 오전 8:22:28	QC15(1018,0,88)	RTG11(1366,967)
18	YT6200	TGHU9962070	VI	Empty	2017-04-11 오전 8:27:40	YT6200(1394,0,9)	QC08(951,0,588)
19	YT6200	TGHU9962070	VI	Laden	2017-04-11 오전 8:32:50	QC08(951,0,588)	RMG7(1227,822)
20	YT6200	FCIU2812554	VO	Empty	2017-04-11 오전 8:37:19	RMG7(1227,822)	RMG6(1140,571)
21	YT6200	BMOU2606977	VO	Empty	2017-04-11 오전 8:40:12	RMG6(1140,571)	RMG6(1137,571)
22	YT6200	FCIU2812554	VO	Laden	2017-04-11 오전 8:46:52	RMG6(1137,571)	QC20(1557,0,10)
23	YT6200	BMOU2606977	VO	Laden	2017-04-11 오전 8:46:54	QC20(1584,868)	QC20(1584,868)

27

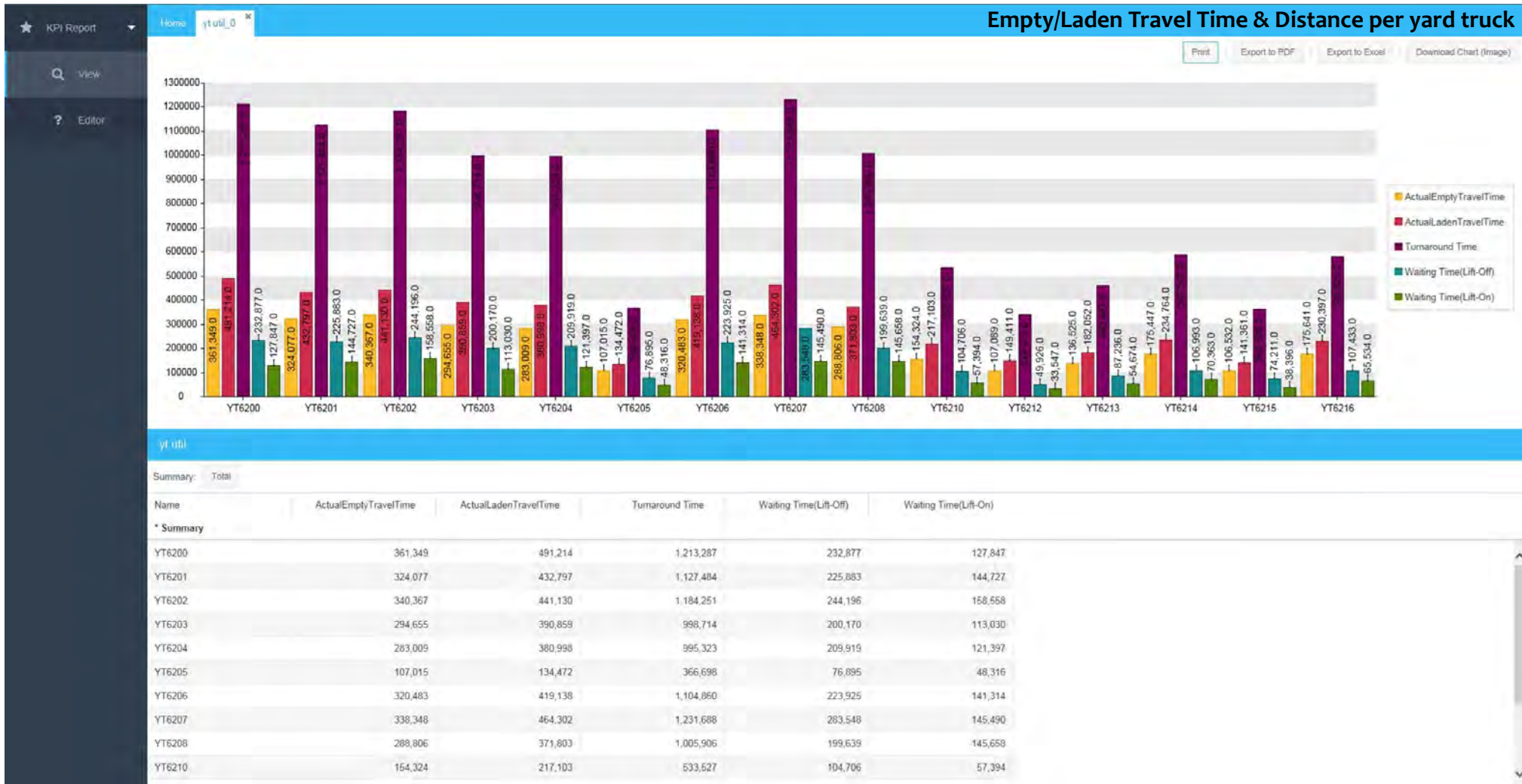
## KPI Report System > Architecture & ETL (Extract Transform Load)

- Need to transform source data to measure and dimension of data cube.
- Whenever work shift is changed, application run this ETL process by time trigger.

### Multi-dimensional data model

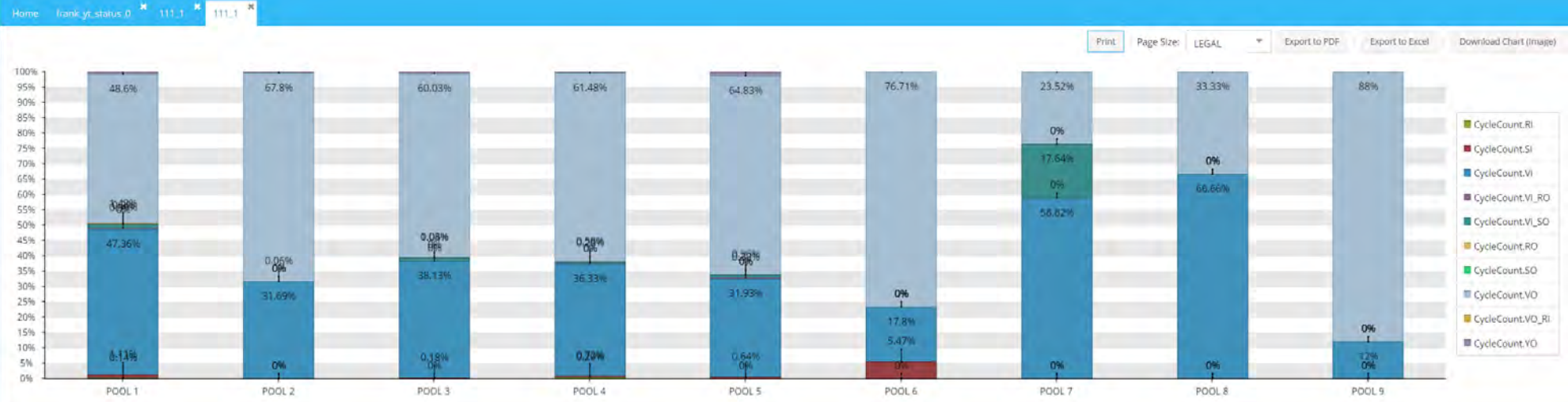


## KPI Report System > Sample Report Template



## KPI Report System > Sample Report Template

### Job Type Distribution per each pool



111 Expand All Collapse All

Pool	CycleCount									
	RI	RO	SI	SO	VI	VI_RO	VI_SO	VO	VO_RI	YO
Grand total	532	731	4,027	33	172,733	1,443	5,181	178,593	0	2,699
POOL 1	530	730	4,012	33	171,019	1,440	5,147	175,480	0	2,674
POOL 2	0	0	0	0	502	0	1	1,074	0	7
POOL 3	0	1	4	0	832	0	23	1,310	0	12
POOL 4	2	0	5	0	250	2	4	423	0	2
POOL 5	0	0	2	0	99	1	3	201	0	4
POOL 6	0	0	4	0	13	0	0	56	0	0
POOL 7	0	0	0	0	10	0	3	4	0	0
POOL 8	0	0	0	0	2	0	0	1	0	0
POOL 9	0	0	0	0	6	0	0	44	0	0

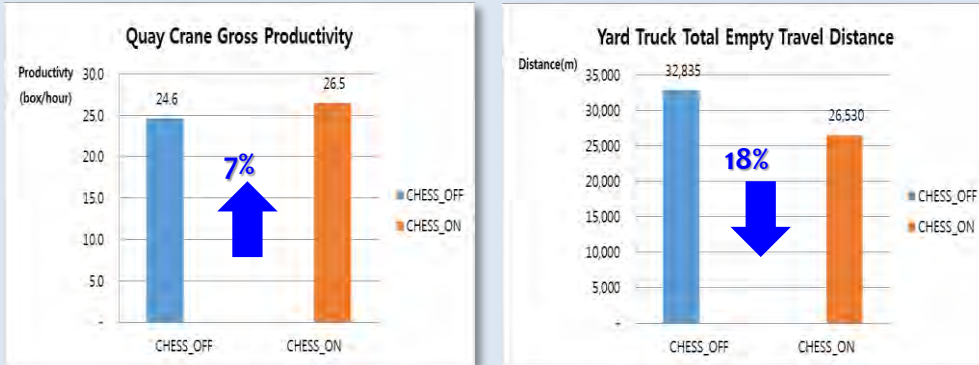
## Table of Contents

- System Overview
- System Technology
- Major Features
- Path Editor & KPI Report Tool
- Reference Site
- Q & A

## ● GOCT (Guangzhou South China Oceangate Container Terminal, China) : Yard Truck Dispatching

✓ Emulation Test (2013) & On-Site Result (2014)

### Yard Truck Dispatching Evaluation (TPES)

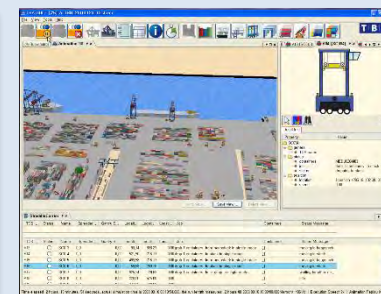
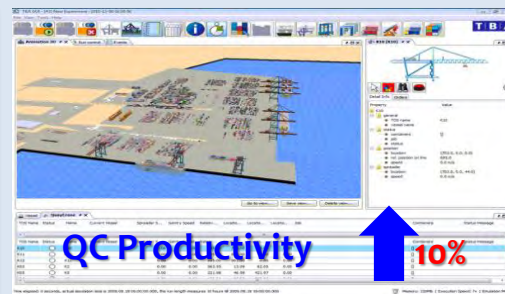
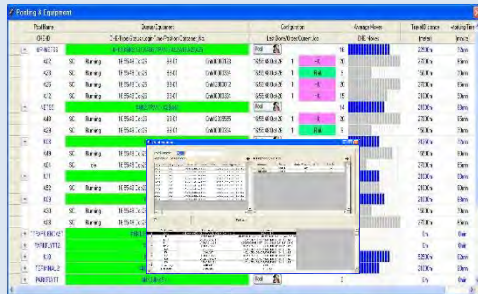


Pool	Working Date	Vessel	Job Count			Dispatch Type		Empty Travel Distance(m)		Job Rate			Double Cycling	Reduced Distance(m)	Reduced Rate
			DF	LO	HK	Double	Normal	Expected	Return	DF	LO	HK			
Vessel4	2014-05-22	2	2,501	1,872	0	384.5	1802.5	2,034,700	2,215,061	57.2%	42.8%	0.0%	17.6%	180,381	8.1%
Vessel4	2014-05-10	1	600	874	0	108	576	604,879	651,591	40.7%	59.3%	0.0%	15.8%	46,712	7.2%
Vessel3	2014-05-01	1	569	1,915	0	142.5	957.5	1,134,885	1,241,142	22.9%	77.1%	0.0%	13.0%	106,217	8.6%
Vessel3	2014-05-06	1	1,760	176	2	73	875	855,612	920,406	90.8%	9.1%	0.1%	7.7%	64,754	7.0%
Vessel2	2014-05-04	2	2,597	1,323	8	413.5	1773	1,742,313	1,938,717	66.1%	33.7%	0.2%	18.9%	196,494	10.1%
Vessel2	2014-05-14	2	19	2,608	0	23.5	1004	1,260,940	1,326,204	0.7%	99.3%	0.0%	2.3%	65,214	4.9%
Vessel1	2014-05-01	2	1,103	3,420	10	218	1690	3,167,309	3,294,101	24.3%	75.4%	0.2%	11.4%	126,792	3.8%
Vessel1	2014-05-11	1	4,266	1,069	7	272.5	2087	2,749,481	3,042,709	79.9%	20.0%	0.1%	11.5%	293,218	9.6%

## ● APMT (APM Terminals Gothenburg, Sweden) : Straddle Carrier Dispatching

✓ Performance Testing : CATOS(+ CHES) & TBA Controls, 2010

### Straddle Carrier Dispatching Evaluation



TBA		Waterside results	
	TBA	TSB	
	QC moves/h		QC moves/h
Manual - 22 SC	25	25.3	
Auto - 22 SC	27.8 (+11%)	27.9 (+10%)	
Auto - 21 SC	26.7 (+7%)		
Auto - 20 SC	25.8 (+3%)	26.8 (+6%)	
Auto - 19 SC	25.1 (0%)	25.9 (+2%)	
Auto - 18 SC	24.9 (0%)	24.6 (-1%)	

• With equal numbers of SCs, we observe 13% improvement in QC moves per hour, versus 10% found by TSB  
 • When required, the TBA control system can be used to dispatch  
 • The improvement in QC moves per hour is larger  
 • When using the TBA control system, the improvement in QC moves per hour is larger  
 • Differences between TBA and TSB outcomes are very small, and can be attributed to statistical fluctuation and slight differences in hardware and setup.

**Simulation Report from TBA**

\* This experiment was not carried out by TSB. There was some confusion over the exact experiment setup used by TSB that caused TBA to re-run the experiment. This has been cleared up, but we decided to keep the results because the same experiment only offers additional insight.

SICAT at Port of Gothenburg / Verification of TSB CATOS pooling using CONTROLS

## ● PCT (Piraeus Container Terminal, Greece)

- ✓ System Upgrade Project : CATOS 7.5 → [CATOS 7.7 + CHESS + Rail & Tandem](#)
- ✓ Terminal Capacity : Total 6.2M TEU (Pier II : 3.2M TEU, Pier III : 3.0M TEU)
- ✓ Facility & Operation : STS(Tandem), RMG, e-RTG, Straddle Carrier, Yard Tractor, Auto Gate, Rail, ITT
- ✓ Global Pooling : 100+ Yard Truck & 20+ Quay Crane

