



中国交建
CHINA COMMUNICATIONS CONSTRUCTION



上海振华智慧产业集团

Digital transformation by terminal automation technology in maritime operations





China Communications Construction

Fortune 500

No.103

ENR Ranking

1st in China

Subsidiaries

Over 60

Covers Countries & Regions

Exceed 150

2017 Revenue

¥482.8 Billion

SASAC Annual Evaluated

12-year A

**World's
Biggest**

Port, Road and Bridge Construction & Design Company;
Dredging Company

**China's
Largest**

International Project Contracting Company; Design
Company; Thruway Investor; Merchant Fleet



Shanghai Zhenhua Heavy

1885-2018

Century-old

Production Bases

10

Overseas Branches

24

Product Spreading
Countries & Regions

100

Port Machinery
Covers Terminals

300

Market share
for 20 years

Over 70%

World's Largest

One of the Heavy Equipment Manufacturers

驻外机构 与备件库

Office & ZPMC
Spare Parts Center

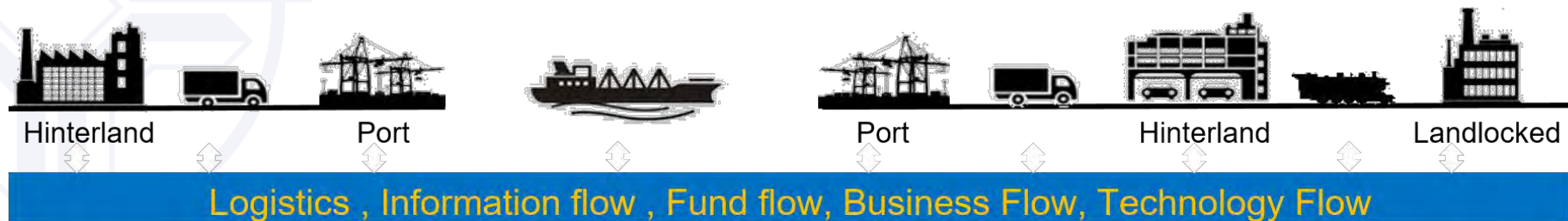


Part 1

What is Smart Port?



Modern Port Logistic Chain



Export Processing Area

Bonded Processing
Bonded Manufacturing
Bonded Assembly

Port Operation Area

Container Terminal
Bulk Terminal
Liquid Terminal
Ro-Ro Terminal



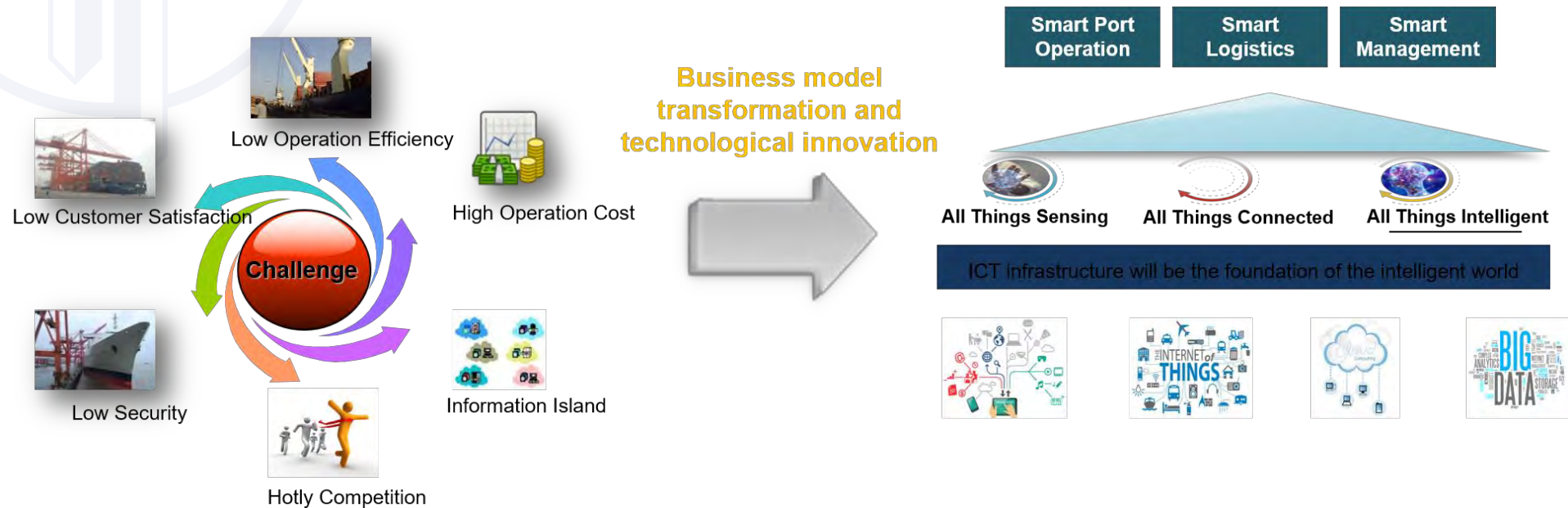
Logistic Park

Bonded Storage
Bonded Transport
International distribution
International Purchasing

Service Area

Commerce Service
Financial Service
Government Service

Port intelligentization in meeting global challenges



Part 2

Smart Port Solution



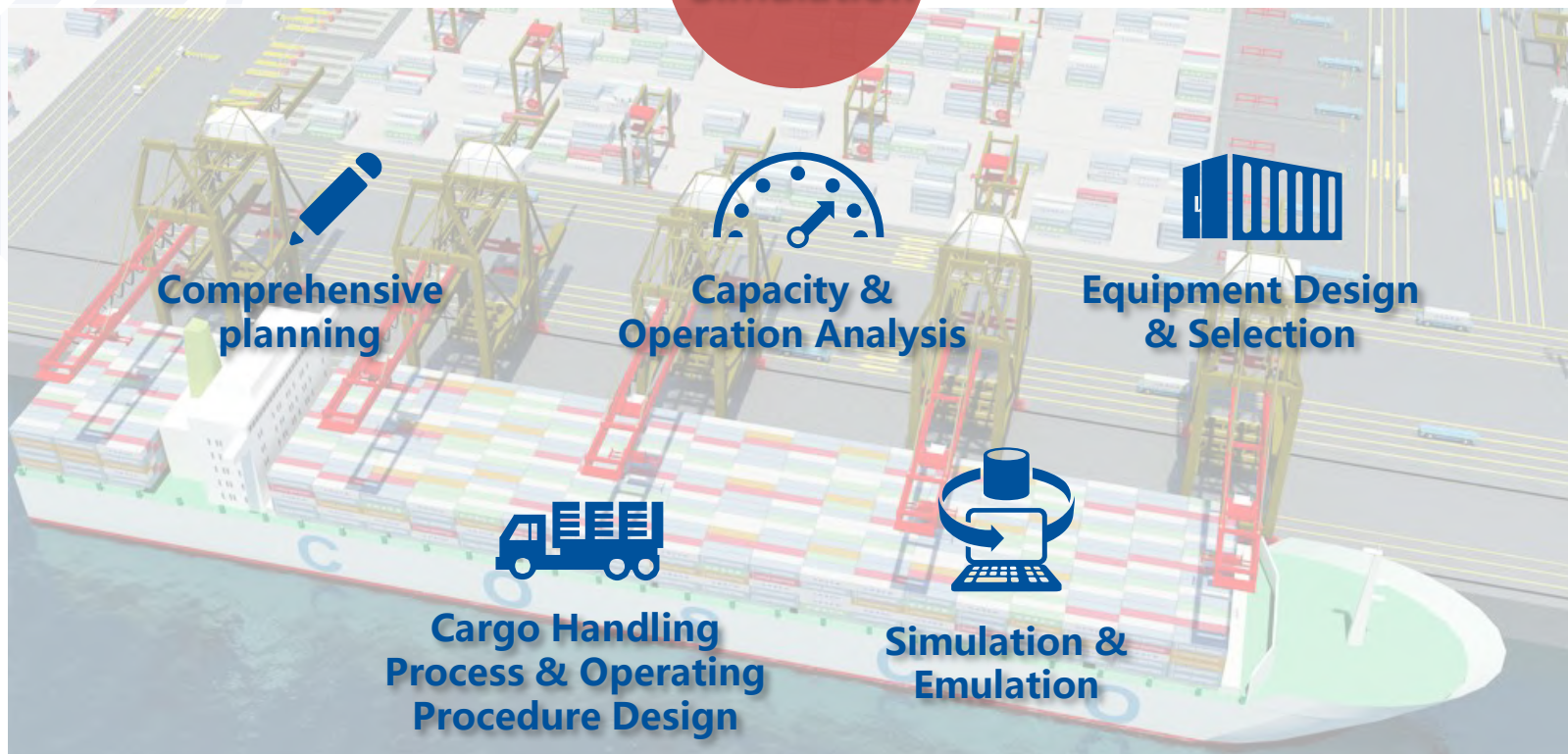
Solution

Port Master Plan

Port Information

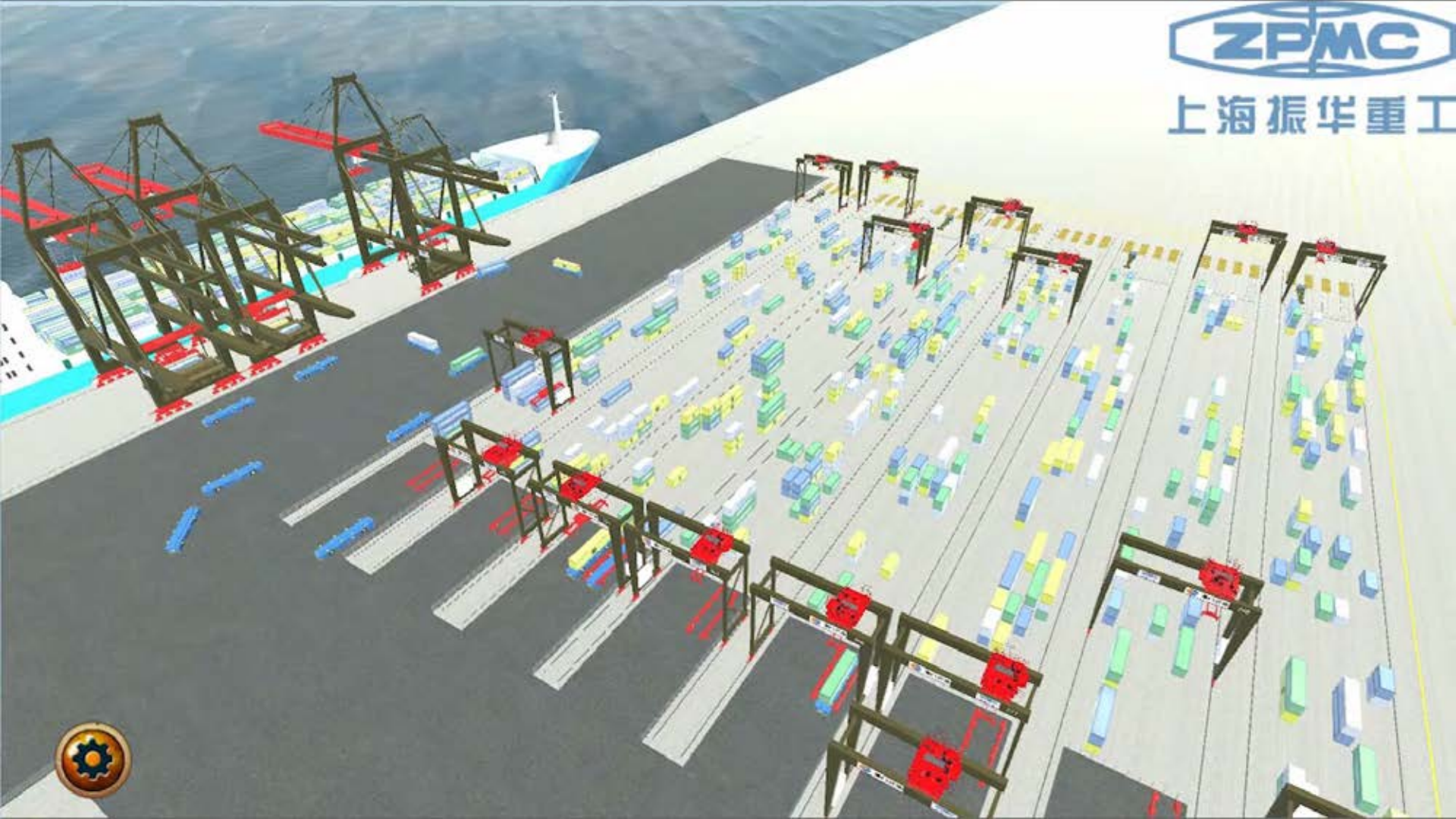
Port Automation

Planning & Simulation





上海振华重工



Solution

Port Master Plan

Port Information

Port Automation

Trunking Application



TOS Application



RCMS Application



Other Applications



Core Network



eLTE @ Trunking

- Licensed frequency (400MHz, 1.4G, 1.8G)
- Data/voice/video, all-in-one
- High performance

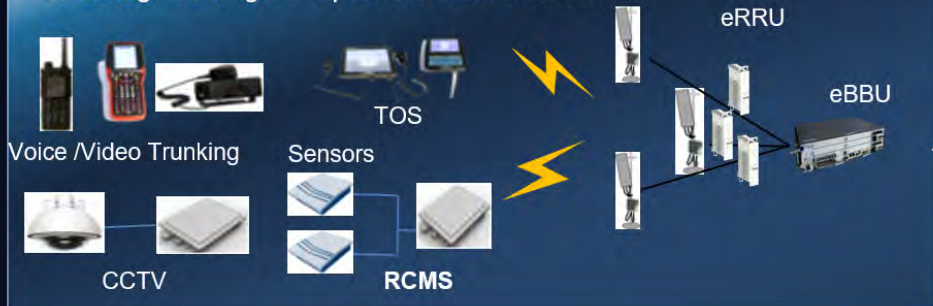


eLTE @ Unlicensed

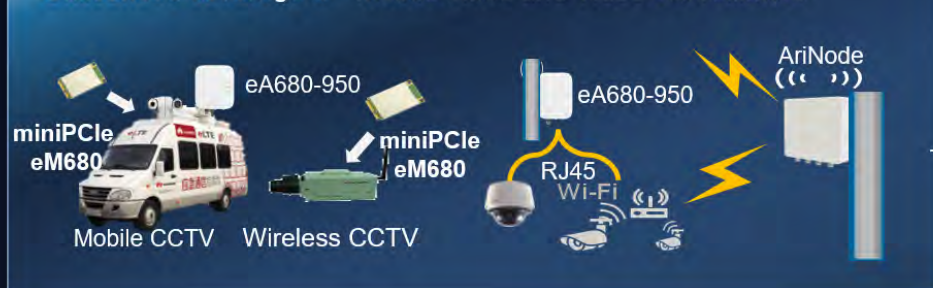
- Unlicensed frequency (5.4 GHz, 5.8GHz)
- Easy deployment
- Better performance than Wi-Fi

Data Center

Trunking coverage 1- operation data network



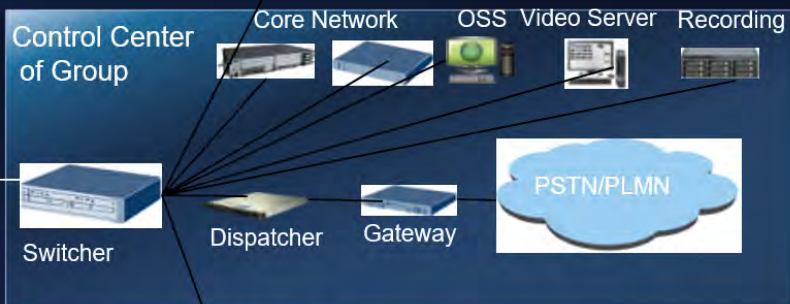
Unlicensed coverage 2—Mobile office and Video Surveillance



Control Center 1 of Quay



Control Center of Group



Control Center 2 of Quay



One Monitoring Platform guarantee the Whole Process



360-degree protection in terminal, container yard, and off shore, realizes complete security coverage

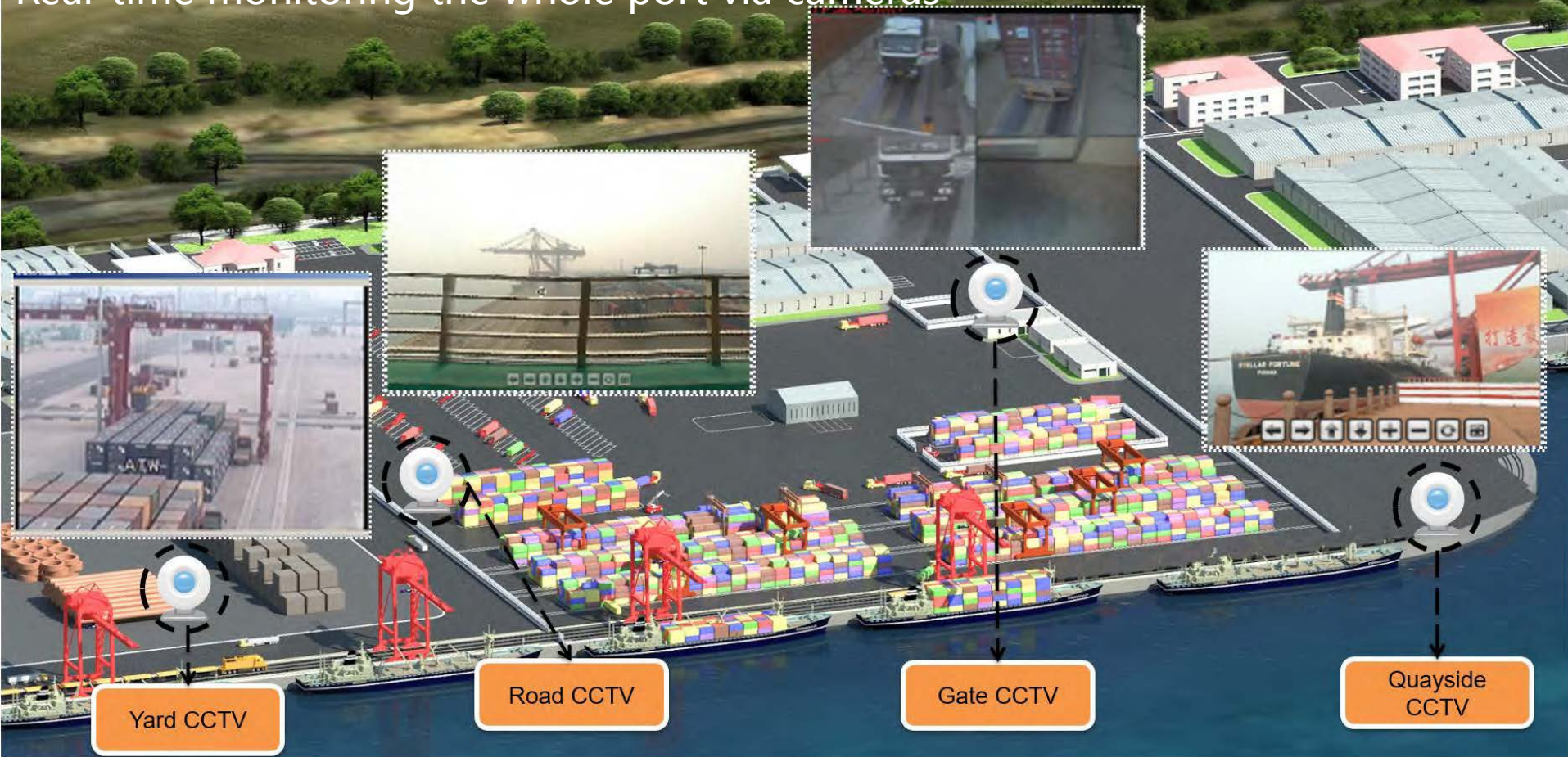


Intelligent, reliable and open platform, provides effective support on public security and operation safety



Convergent command and visualized dispatching to support efficient emergence response

Real-time monitoring the whole port via cameras



Key elements of Smart Port



Stowage
Planning Process



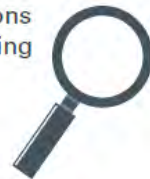
Vessel Voyage
Optimization



Integrated Planning &
Holistic Optimization



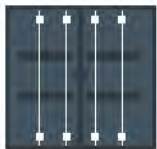
Operations
Monitoring



Collaboration across
the Container Flow



Cargo Information



Vessel Visit Management
& Port Processes Control



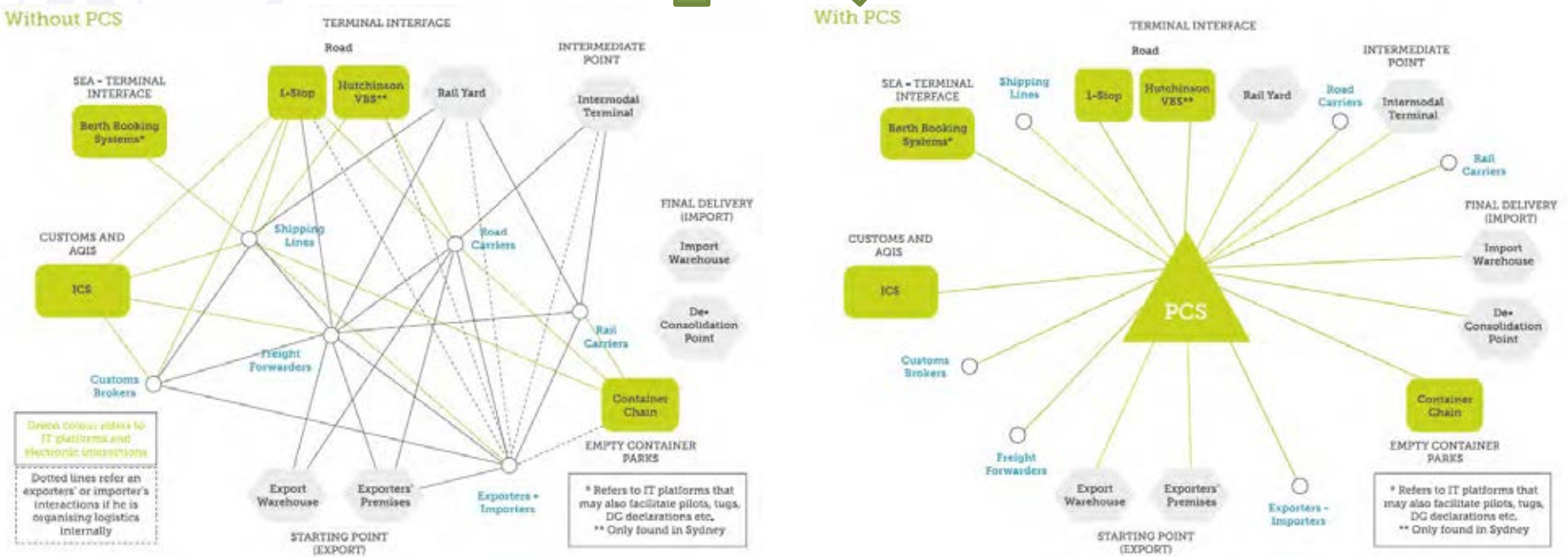
Berthing
Management



Advanced Integration
among Ports



Port Community System



Solution

Port Master Plan

Port Information

Port Automation



Quay Side



Transportation



Yard Storage

Remote
Operation

Quay Crane

Ship Scan

Double-trolley

Chassis
Positioning

Dual 40ft





No.	Terminal	Type of CaRane	System	Qty.	Status	Remark
1	Xiamen Automated Termianl (COSCO)	STS/double trolley	EZ-Siemens	3	Handover	automation terminal/AGV
2	Qingdao Terminal Automated Handling System	STS/double trolley	EZ-Siemens	7	Handover	automation terminal/AGV
3	YangsShan Stage IV Automated Terminal	STS/double trolley	EZ-Siemens	10	Handover	automation termianl/AGV
4	HPH Saudi Arabia IPS Terminal	STS	EZ-Siemens	3	Handover	remote control
5	HPH Pakistan SAPT Terminal	STS	EZ-Siemens	5	Handover	remote control
6	HPH Oman OICT Terminal	STS	EZ-Siemens	4	Handover	remote control
7	Ningbo Mei Shan Container Terminal	STS	EZ-Siemens	2	Handover	remote control
8	HPH Thailand HLT Terminal	STS	EZ-Siemens	3	Handover	remote control
9	HPH Mexico ICARE Terminal	STS	EZ-Siemens	2	Handover	remote control
10	HPH Pakistan SAPT Terminal	STS	EZ-Siemens	3	Handover	remote control
11	HPH Saudi Arabia IPS Terminal	STS	EZ-Siemens	2	Handover	remote control
12	APMT TM2 container Terminal	STS/double trolley	EZ-Siemens	12	In Commissioning	automation terminal/ShC
13	HPH Panama FCP Terminal	STS	EZ-Siemens	3	In Commissioning	remote control
14	HPH Felixstowe Terminal	STS	EZ-Siemens	2	In Commissioning	remote control
15	YangsShan Stage IV Automated Terminal	STS/double trolley	EZ-Siemens	6	In Commissioning	automation terminal/AGV
17	Ports of Auckland, New Zealand	STS	EZ-Siemens	3	In Commissioning	remote control
18	Ningbo Mei Shan Container Terminal	STS	EZ-Siemens	4	In Commissioning	remote control
19	HPH Thailand HLT terminal	STS	EZ-Siemens	3	In Commissioning	remote control
20	HPH Pakistan SAPT Terminal	STS	EZ-Siemens	3	In Commissioning	remote control
21	HPH Oman OICT Terminal	STS	EZ-Siemens	2	In Commissioning	remote control
22	Qingdao Qian Wan Container Termnial	STS	Retrofit/EZ-Siemens	1	Handover	
23	Shanghai Hudong Container Terminal	STS	Retrofit/EZ-Siemens	1	Handover	

Remote QC Project List

Yard Crane



(Cantilever)
Interact with AGV

Dual 20ft on
the shore



Automated
(container)
truck

Accurately
pick up and
put down







Yard/QC Automation with ARMG/STS

#	Terminal Name	Location	Project Period	Crane Number	Type
1	HIT	HongKong	2011.09 - 2014.07	ARMG(24)	Retrofit
2	FICT (Phase1)	TianJin	2013.07 - 2015.02	ARMG(3)	Retrofit
3	SIPG ZCT	Shanghai	2015.09 - 2016.11	ARMG(2)	New
4	Vado Ligure	Italy	2015.09 - now	ARMG(14)	New
5	TSPGC	TangShan	2016.07 - now	ARMG(14) STS(5)	New
6	TM2	Morocco	2017.01 - now	STS(12)	New
7	KPCT2	Abu Dhabi	2017.10 - now	ARMG(32) STS(11)	New
8	Adani Vizhinjam	India	2017.12 - now	ARMG(24) STS(8)	New
9	FICT (Phase2)	TianJin	2018.03 - now	ARMG(31)	Retrofit
10	DCT	Dalian	2018.08 - now	ARMG(3)	Retrofit

Yard Automation with ARTG

#	Terminal Name	Location	Project Period	Crane Number	Type
1	SIPG SECT	Shanghai	2016.02 - 2016.12	ARTG(3)	Retrofit
2	HLT	Thailand	2017.01 - now	ARTG(10)	New
3	MSCT	Ningbo	2018.01 - now	ARTG(24)	New



**ZPMC SMART
PORT SYSTEM
ON KHALIFA
PORT,
ABU DHABI**



AGV



Automated
straddle carrier



Horizontal Transport

Shuttle trolley



Automated truck



AGV DELIVERED

PSA
Singapore



XOCT
Xia Men



QQCTN
Qing Dao



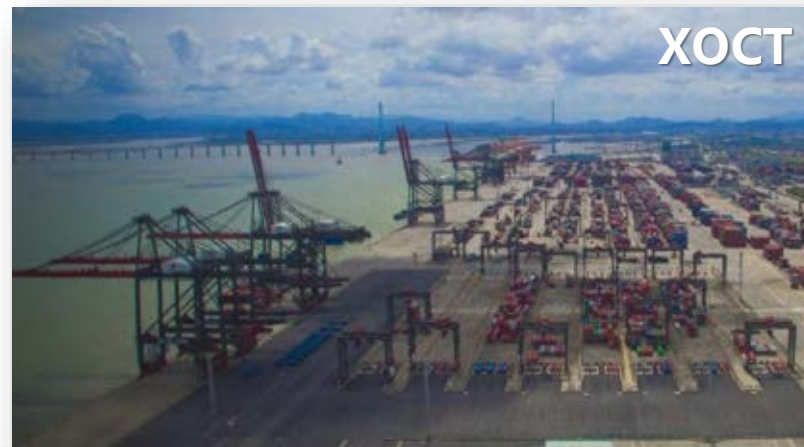
SIPG
Yang Shan



Quantity	4 AGVs	18 AGVs	AGVs	80 AGVs
Driving System	SIMENS	ZPMC	ZPMC	ZPMC
Control System	ZPMC	ZPMC	ZPMC	ZPMC
Power Pack	Hybrid	Full Electrical	Full Electrical	Full Electrical
Battery Type	LFP	LFP	LTO	NCM
Battery Brand	LI YUAN	LI YUAN	TOSHIBA	GSY
Re-charging System		Opportunity Charging	Opportunity Charging	Battery Swap

Fully Automated Container Terminal

#	Terminal Name	Location	Project Period	Crane Number	Type
1	XOCT	Xiamen	2013.03 - 2016.12	STS(3) AGV(18) ASC(16)	First ACT in China
2	QQCTN	Qingdao	2015.06 – 2017.05 Now is Phase 2	STS(16) AGV(83) ASC(58)	fastest implementation in the world
3	SIPG SDCT (YS Phase4)	Shanghai	2015.07 – 2017.12 Now is Stage 2	STS(16) AGV(80) ASC(88)	The largest single ACT in the world



XOCT



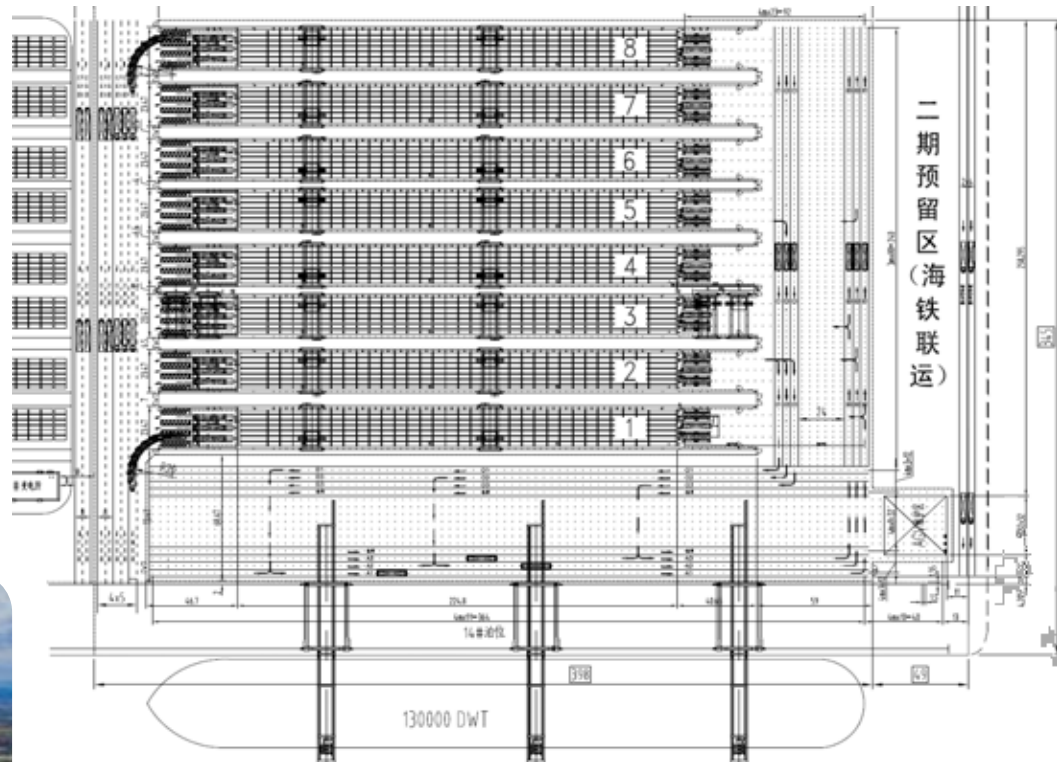
SIPG SDCT



QQCTN

Project Overview - XOCT

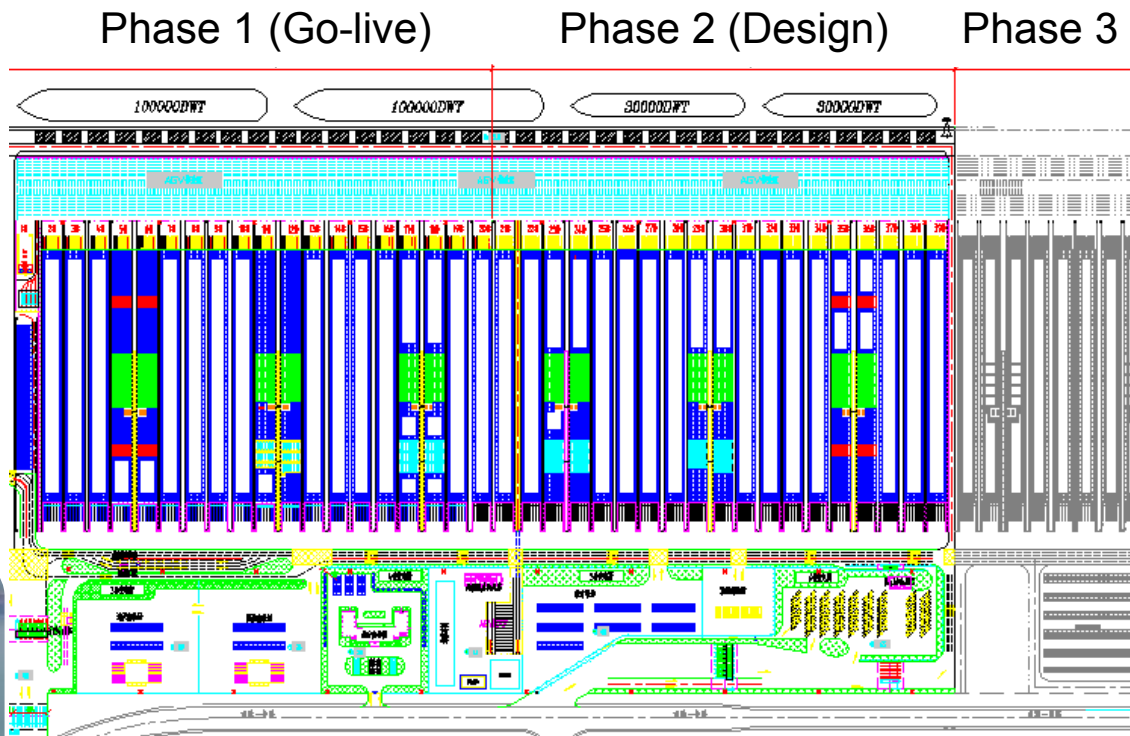
- ✓ Coastline: 447M
- ✓ throughput: 700 thousand annually
- ✓ *Mar. 2013 – Mar. 2016*
- ✓ Parallel layout with quay side
- ✓ Both automated and manual STS crane can work together for the same vessel



One Berth with 3 QCs, 18 AGVs and 16 ARMGs
Go-live on Mar 12th, 2016.

Project Overview - QQCTN

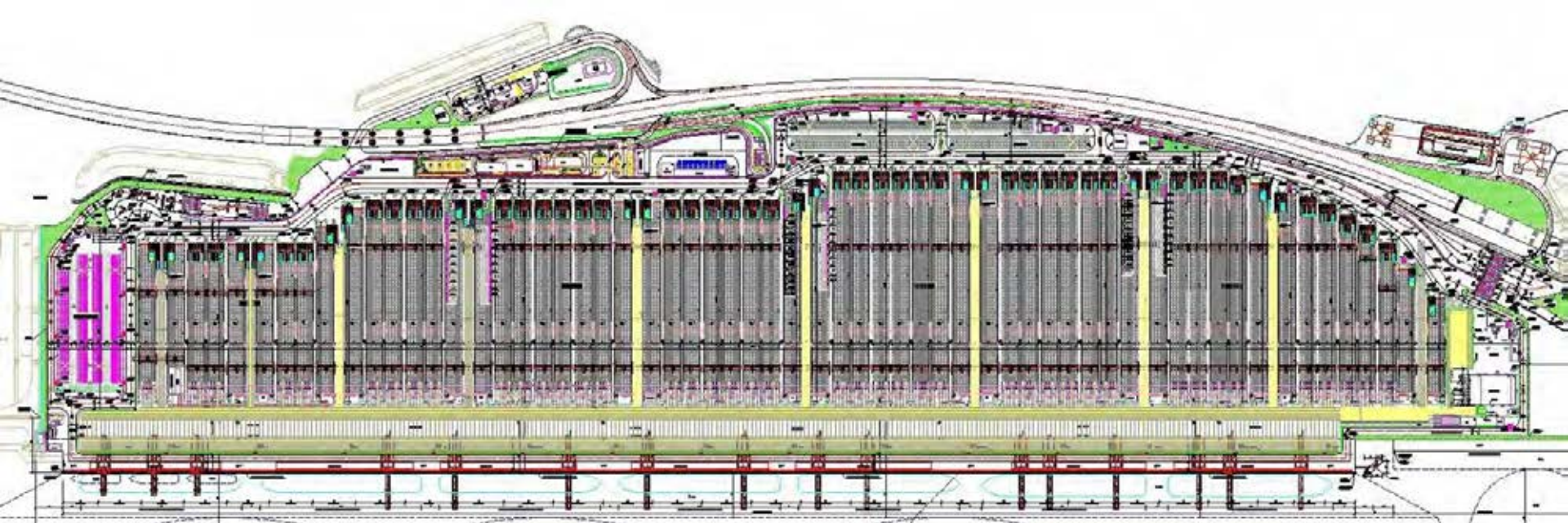
- ✓ Coastline: 2088M
- ✓ throughput: 5.2 million annually
- ✓ *Jun. 2015 – May. 2017*
- ✓ 22.5 months implementation
- ✓ 25.9 Moves/hour on go-live day
- ✓ 42.9 Moves/hour maximum



Phase 1: Two Berth with 7 QCs, 38 AGVs and 40 ARMGs
Go-live on May 11th, 2017.

Phase 2: Two Berth with 9 QCs, 45 AGVs and 18 ARMGs
Contract signed on Sep, 2018.





Project Overview - Yangshan Ph4

- ✓ 7 berth with 2350 meter coastline, the throughput annually is 4 million (initial) / 6.3 million (final).
- ✓ Initial phase is consist of 16 quay cranes, 80 AGVs and 88 ARMGs. (Achieved in 2018)
- ✓ Final phase is consist of 26 quay cranes, 130 AGVs and 120 ARMGs.
- ✓ Go-live on Dec.10th, 2017. All system and equipment are in operation by initial phase.



上海洋山四期自动化码头
Shanghai Yangshan Phase IV automated terminal

Part 3

How to implement?





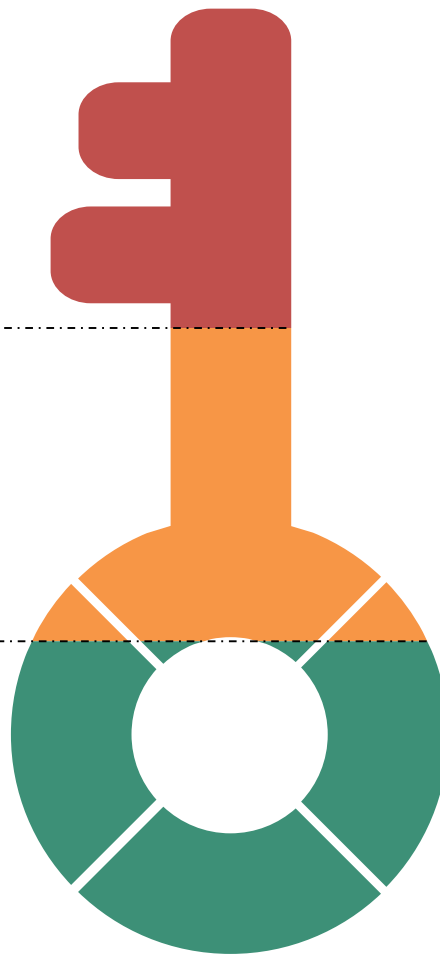
**Planning
&
Simulation**



**System
Integration**



**Operation
&
Maintenance**



Planning & Simulation

Port &
Terminal
Master Plan

Capacity &
Operation
Analysis

Equipment
Design &
Selection

Operating
Procedure
Design

Simulation &
Emulation

Automated STS Crane



Automated Yard Crane



Automated HTZ Equipment



Shuttle Trolley



Unmanned Truck

System Integration

System

**Plan
Level**

TOS(Terminal Operation System)

**Control
Level**

ECS(Equipment Control System)

QCMS

(Quay Crane Management System)

VMS

(Vehicle Management System)

BMS

(Block Management System)

STS-ACCS

(Automated Crane Control
System)

NS

(Navigation System)

RTG/RMG-ACCS

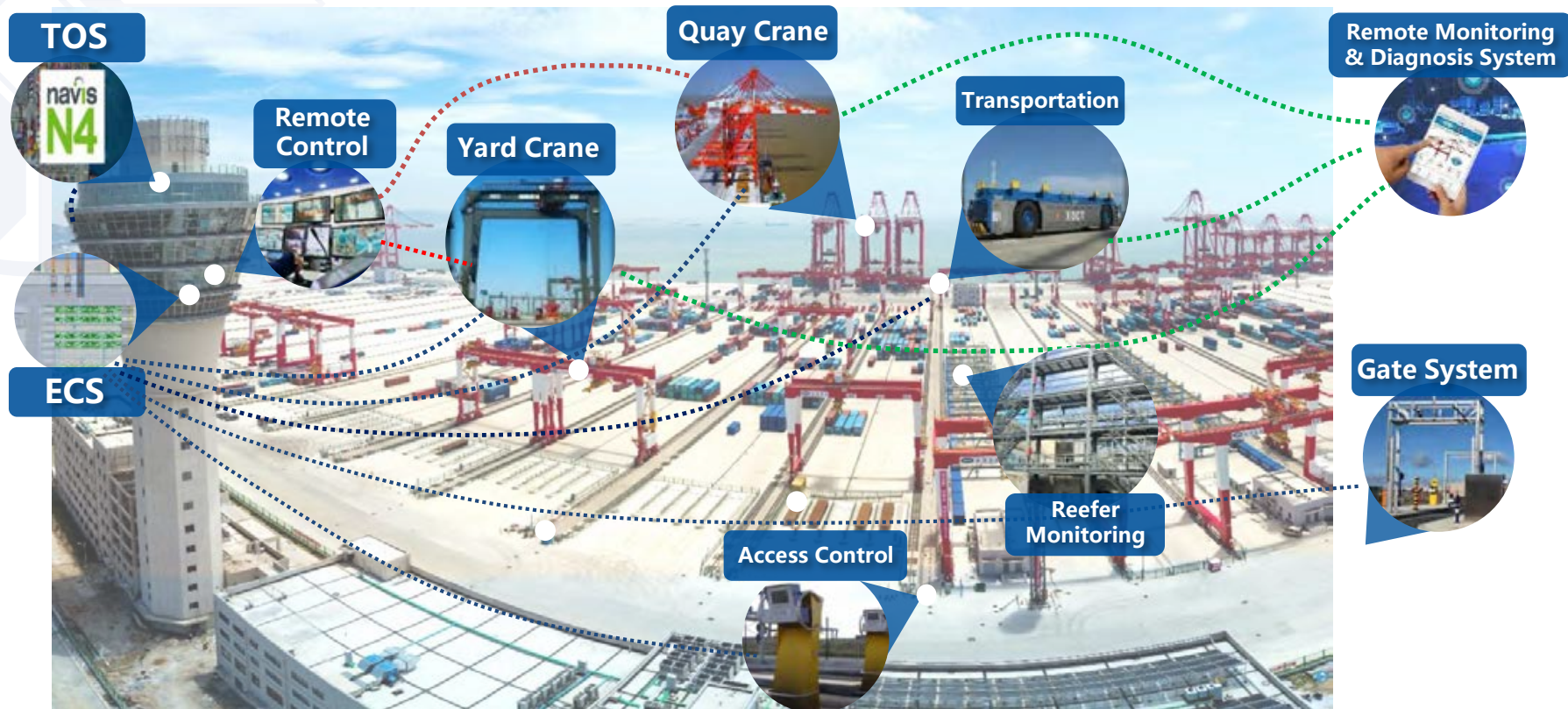
(Automated Crane Control
System)

**Execution
Level**

Quay Crane PLC

AGV PLC

Yard Crane PLC





Operation



Maintenance

Operation & Maintenance



ZPMC Global Remote Monitoring Center

- ✓ Real-time monitoring of equipment
- ✓ Fault prediction and preventive maintenance based on big data
- ✓ Providing real-time remote support services for global users



Partners

TOS

navis®



华东科技



TOTAL SOFT BANK LTD.

COSMOS

Scheduling Module

navis®



Automatic Electronic Control

TMEIC

SIEMENS

ABB

More



Cameco



Microsoft

STRATEGIC COOPERATION MOU SIGNING WITH NAVIS

ON 19TH, SEPTEMBER, 2016



STRATEGIC COOPERATION MOU SIGNING WITH MICROSOFT

ON 29TH, SEPTEMBER, 2016

微软（中国）有限公司
Microsoft (China) CO., Ltd.

上海振华重工（集团）股份有限公司
Shanghai Zhenhua Heavy Industries CO., Ltd.

战略合作备忘录签约仪式

Signing Ceremony of Strategic Cooperation Memorandum



STRATEGIC COOPERATION MOU SIGNING WITH MOFFATT & NICHOL

ON 2nd, August, 2017

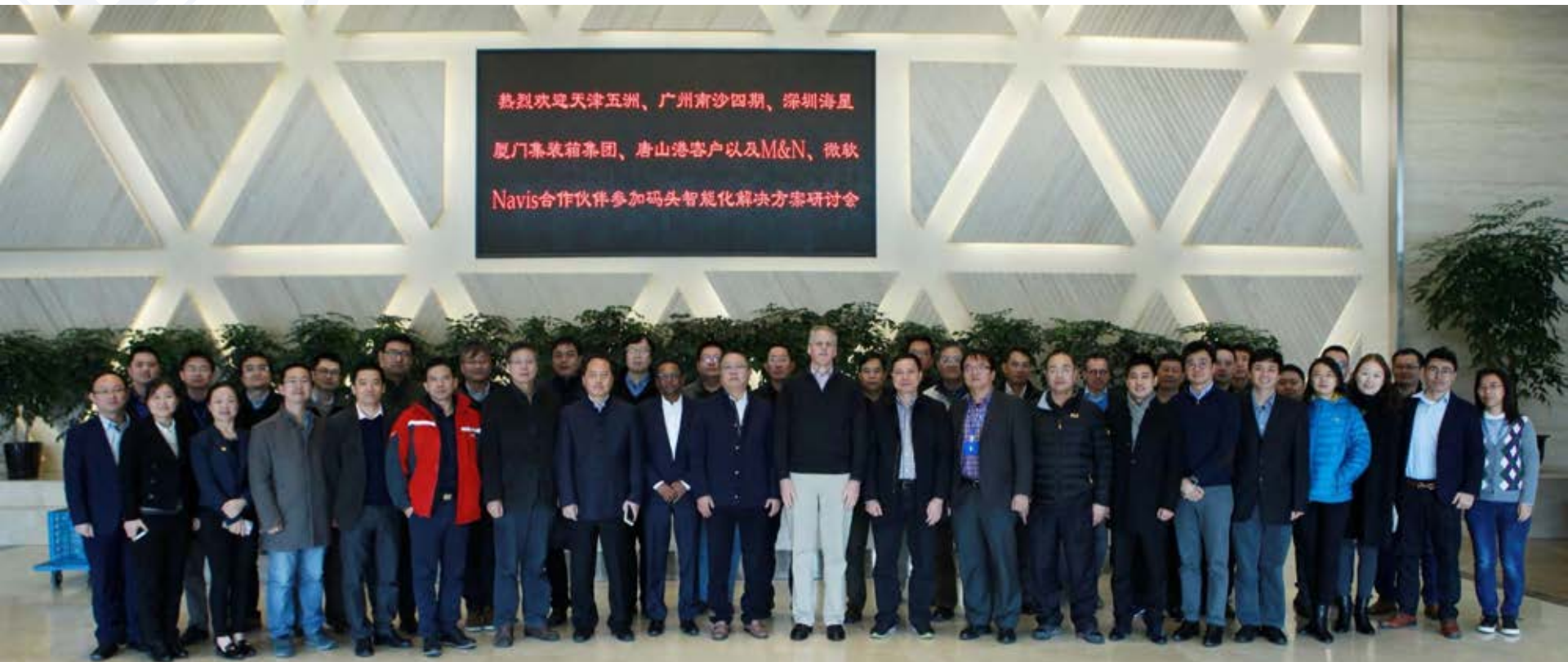


TEAM MEETING WITH OUR PARTNERS ON 4TH, AUGUST, 2017



ZMMN TEAM MEETING WITH OUR CUSTOMERS

ON 8TH, DECEMBER, 2017



ZMMN TEAM MEETING WITH TIANJIN PORT ON 15TH, AUGUST, 2018



ZMMN TEAM MEETING WITH KPA

ON 29TH, OCTOBER, 2018



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