# Joint Technical Workshop

## "Improving Port Efficiency through Digitalization and Disruptive Technologies"

chaired and composed by

# Masaharu SHINOHARA
### Port Operations and Logistics Committee
&
# Jordi Torrent Pujol
### Trade Facilitation and Port Community System Committee

# Agenda

1. Opening address by Masaharu SHINOHARA

2. Masaharu SHINOHARA on "Overview of Digitalization and Disruptive Technologies"

3. Yuuji Nakamura, Port of Hakata on "HiTS (Hakata Port Logistic System)"

4. Justine Camoin, MGI on "Artificial Intelligence"

5. Q & A session moderated by Jordi Torrent Pujol

6. Closing

May 10, 2018
Joint Technical Workshop
Baku, Azerbaijan

# Overview of
# Digitalization and Disruptive Technologies
# in Port Operation/Management and Logistics

Masaharu SHINOHARA
Chair, Port Operations & Logistics Committee
Vice President, IAPH
Executive Officer
Kobe-Osaka International Port Corporation

# Outline

1. Emerging trends surrounding port operation
2. On-going projects regarding port operation/ management utilizing digitalization and disruptive technologies
3. Example: some projects by Kobe-Osaka International Port Corporation

# Emerging trends surrounding port operation

➢ **Rapid development of e-commerce**

Alibaba & Maersk, Alibaba & Kuhne+Nagel

➢ **Cooperation between different industries**

DP World & Elon Musk (Tesla Motors, Hyperloop, The Boring Company)

Maersk Line & IBM, Maersk Line & Microsoft

➢ **Possible new entrants into container terminal operators**

Amazon and Walmart may operate container terminals.

➢ **Proliferation of cyber attacks against logistics chain**

Theft of valuable containerized cargoes, smuggling of illegal goods.

Secured logistics information sharing by <u>Blockchain</u> technologies.

# DP World & Hyperloop

## Speed: 1300km/hour



"DP World Invests in Hyperloop"

"Hyperloop One...have announced a further US$50 million in funding, provided by DP World, taking the total seed money raised to $160 million...." [Port Technology Oct 14, 2016]

**(by Richard Brough, ICHCA)**

# What is Blockhain?   By  Wikipedia

- A blockchain is a continuously growing list of records, called blocks, which are linked and secured using cryptography.

- Each block typically contains a cryptographic hash of the previous block, a timestamp and transaction data.

- By design, a blockchain is inherently resistant to modification of the data.

- It is an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way.

- Once recorded, the data in any given block cannot be altered retroactively without the alteration of all subsequent blocks, which requires collusion of the network majority.

- This makes blockchains potentially suitable for the recording of events, medical records, and other records management activities, such as identity management, transaction processing, documenting provenance, food traceability or voting.
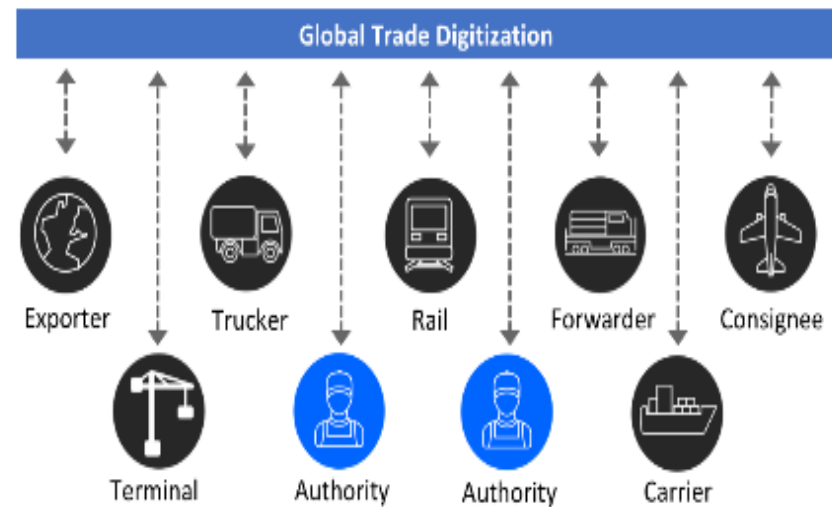
# A global trade platform using blockchain
## aimed at improving the cost of transportation, lack of visibility and inefficiencies with paper-based processes



The case for a better way

TODAY → FUTURE

IBM    https://www.ibm.com/blogs/blockchain/2018/01/digitizing-global-trade-maersk-ibm/
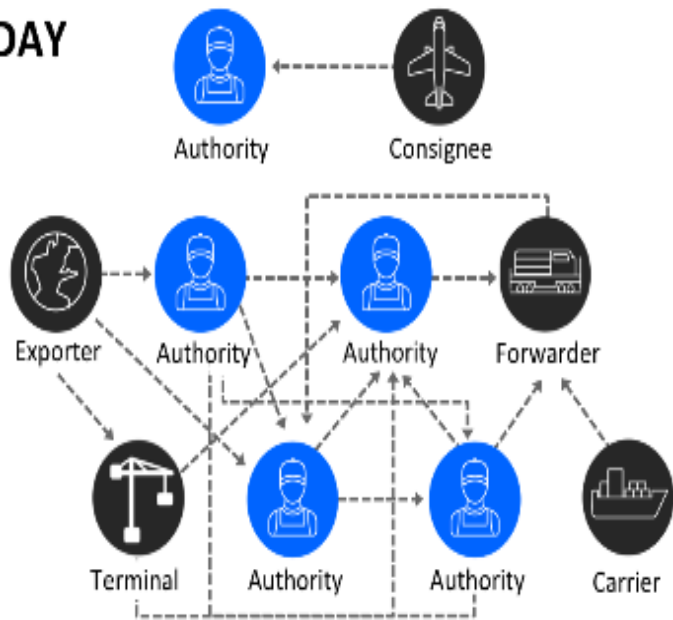
# Keywords or Buzzwords for the future port

➢ **IoT**

➢ **Big Data**

➢ **Artificial Intelligence**

➢ **Blockchain**

➢ **Mobile communication and application**

➢ **Virtual Reality & Augmented Reality**

➢ **High-precision Positioning System**

# Mobile application for truck drivers
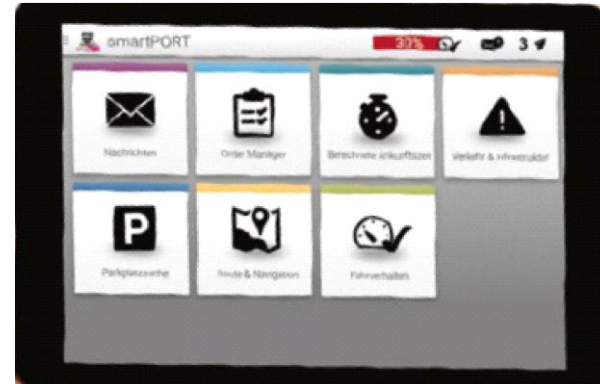






**Functions:**
- ➤ **Recommendation of the optimal road route.**
- ➤ **Management of parking lots.**
- ➤ **Appointment of container hauling in/out.**
- ➤ **Hamburg Port Authority provides all the container truck drivers with the mobile tablet.**
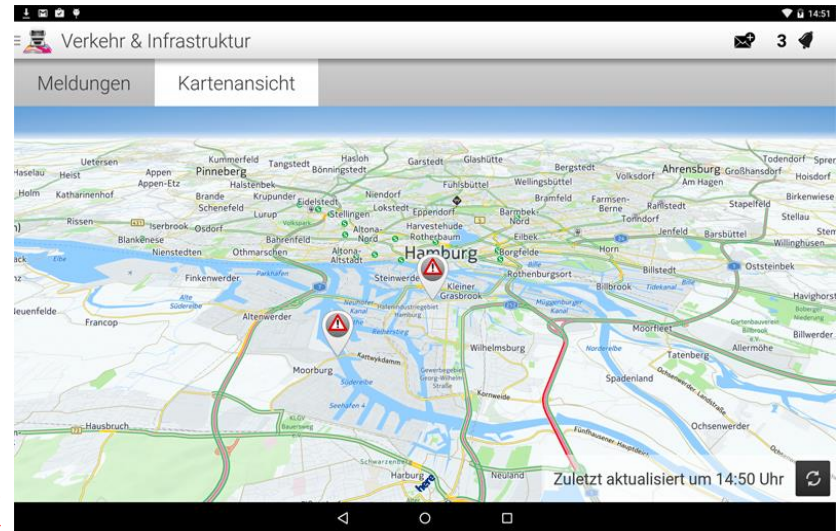
**By Hamburg Port Authority**

# Utilization of Virtual Reality and Augmented Reality for the maintenance

Hamburg Port Authority

**3-dimensional graphics of the port area**

# A list of on-going projects regarding port operation/ management utilizing digitalization and disruptive technologies

## These projects are classified into the following 9 categories.

### 1. Blockchain-based Platform
- Blockchain solution for safe, efficient container release pilot project (Port of Antwerp)
- Blockchain to improve global trade (Maersk, IBM)
- Blockchain Solution (Agility, Maersk, IBM)
- Blockchain Trial from Chongqing to Singapore (Singapore)
- Blockchain system for logistic industry (MTI, Agility Science)
- The first blockchain platform for marine insurance (EY, Maersk, Microsoft)
- Blockchain Technology in Cross-Border Trade Operations (Japan Consortium)
- Blockchain Technology Adopted in Shipping & Logistics (HMM, Samsung)
- Smart Bill of Lading (CargoX)

### 2. Port Information Platform
- HiTS (Port of Hakata)
- SmartPort Logistics (Port of Hamburg)
- 5G mobile network (Port of Hamburg)
- Port Optimizer (container data platform pilot) (Port of Los Angeles)
- PortMaps (Port of Rotterdam)
- Digitalization of port's operational environment (Port of Rotterdam)
- Smart port (Port of Durban)

# A list of on-going projects regarding port operation/ management utilizing digitalization and disruptive technologies (continued)

### 3. Port Security
- Port Security Command Center (Smiths Detection)

### 4. Supply Chain Management
- Logistics Visualization Service (India)

### 5. Container Monitoring
- Remote Container Management (Maersk, Ericsson)

### 6. Equipment Monitoring
- Equipment Monitoring (Port of Cartagena)
- Equipment Monitoring (CHS engineering)

### 7. Onboard IoT platform
- Onboard IoT Platform (NYK Group)

### 8. Initiative on IoT development
- Smart Port Challenge (Singapore)
- Blockchain technology field lab (Rotterdam)

### 9. Others
- Dynamic real-time lighting (Valencia)

# 1. Blockchain-based Platform

**Blockchain solution for efficient container release pilot project**

T-mining, Port of Antwerp
Antwerp (Belgium)
June 2017

T-Mining is working on a pilot project that will make container handling in the port of Antwerp more efficient and secure.

**Joint venture to provide global trade platform**

Maersk, IBM
New York (USA)
January 2018

Maersk and IBM announced their intention to establish a joint venture to provide global trade digitization platform.

**Agility is first forwarder to work with Maersk IBM on Blockchain Solution**

Agility, Maersk, IBM
February 2018

Agility is the first freight forwarder to collaborate on a Maersk-IBM solution to provide more efficient and secure method for global trade.

# 1. Blockchain-based Platform

## Blockchain trial from Chongqing to Singapore

PIL, PSA, IBM
Chongqing (China), Singapore
February 2018

Shipping company PIL, port group PSA and technology company IBM Singapore have completed a blockchain-based supply chain platform trial.

## Pilot test of blockchain technology for logistics industry

MTI, Agility Science
August 2017

Logistics technology company Marine Transport International (MTI) and Agility Sciences announced successful pilot of blockchain technology
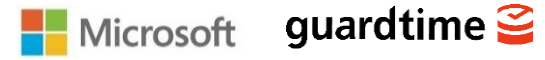
## The first blockchain platform for marine insurance

EY, Maersk, Microsoft, Guardtime
MS Amlin, XL Catlin
August 2017

Accounting giant EY plans to launch the first blockchain platform for marine insurance, alongside Microsoft , A.P Moller Maersk and others.

# 1. Blockchain-based Platform

**Test of blockchain technology in cross-border trade operations**

SMFG, SMBC, JRI, Mitsui&Co, MOL, MSI, IBM
December 2017

Consortium has agreed to start a demonstration test to verify the applicability of blockchain technology for cross-border trade operations.

**Assessment of blockchain technology adopted in shipping & logistics**

HMM, Samsung SDS
December 2017

HMM and Samsung SDS have conducted blockchain technology- integrated pilot voyage and assessment.

**Smart Bill of Lading**

CargoX
January 2018

CargoX will create an open system based on Ethereum and encrypted permanent decentralized data storage which will enable the creation and exchange of Bill of Lading documents.

# 2. Port Information Platform

**SmartPort Logistics**

Hamburg Port Authority, SAP
Hamburg, Germany
April 2016

HPA worked on 20 projects collectively called SmartPort Logistics.
Cloud platform is used to enable a real-time connection to the port's various stakeholders through a mobile business cloud.

**5G Testing ground in Port of Hamburg**

Hamburg Port Authority, Deutsch Telekom, Nokia
Hamburg, Germany
February 2018

HPA, Deutsche Telekom, and Nokia have launched a testbed that stretches across some 8,000 hectares of port area.

**Maritime shipping data platform pilot "Port Optimizer"**

Port of Los Angeles, GE Transportation
Los Angeles, USA
August 2017

Port of Los Angeles and GE Transportation are expanding digital solution to include all container terminals and shipping lines at the port information portal.

# 2. Port Information Platform

**PortMaps**

Port of Rotterdam
Rotterdam, Netherlands
December2015

The interactive Harbour Master Port Map provides a clear overview of terminals, jetties, dolphins, berths and water depths.

**Digitization of port's operational environment**

Port of Rotterdam, IBM, CISCO, Axians
Rotterdam, Netherlands
January 2018

Port of Rotterdam and IBM announced their collaboration on a multi-year digitization initiative to transform port's operational environment using IoT in the cloud.

**Smart port**

Transnet, T-Systems, Huawei
Durban, South Africa
March 2017

The port solution entails the deployment of LTE network and telematics solutions such as drone, tracking and sensor technology to improve the overall operations.

# 3. Port Security

## smiths detection

### enterprise-level security command centre

Smiths Detection
November 2017

Smiths Detection unveiled enterprise-level security command center, secure, cloud-based, digital ecosystem that integrates data from a vast array of devices and processes, to support critical ports and borders security.

# 4. Supply Chain Management

## ⊞DMIC⊞
## NEC

### Joint venture to provide logistics visualization services

DMIC Trust, NEC Corp.
India
April 2016

The joint venture will provide shippers and operators with logistics visualization services, enabling real-time searches based on accurate position information.

# 5. Container Monitoring

## MAERSK    ERICSSON

### Remote Container Management

Maersk, Ericsson
November 2016

Ericsson's technology has allowed Maersk's fleet of reefers to transmit vital statistics via satellite, such as temperature, location and power supply.

# 6. Equipment Monitoring

# 7. Onboard IoT Platform



## Equipment Monitoring

Port of Cartagena, IBM
Cartagena, Colombia
August 2016

Monitoring engine
temperature, engine speed,
and run hours which
improved efficiency and
lowered maintenance costs.



## Equipment Monitoring

CHS Engineering Services, DP World
London, UK
July 2017

Sensors are attached to quay
cranes and temperature,
vibration and humidity is
monitored. Information is sent
via SIM card to cloud platform
for real time analysis.



## Onboard IoT Platform

NYK, MTI, NTT, NTT DATA
Japan
February 2018

The NYK and NTT group have
conducted a proof of concept
experiment for a next-
generation onboard IoT
platform.

# 8. Initiative on IoT development    9. Others

**Smart Port Challenge**

Maritime and Port Authority
Singapore (MPA)
September 2017

The Smart Port Challenge,
organized by the MPA was
launched June 2017. 81
proposals were received and
12 were eventually shortlisted.

**BlockLab**

Municipality of Rotterdam, Port of
Rotterdam
September 2017

The Municipality of Rotterdam
and  the Port of Rotterdam
Authority jointly launched a
field lab for the development
of concrete application and
solutions based on blockchain
technology

**Dynamic real-time lighting**

Noatum Container Terminal,
Ingenieria de Aplicaciones
Energeticas SLU
Valencia, Spain
July 2015

Dynamic Lighting System that
allows container port
terminals to better manage
and reduce energy
consumption of lighting in an
intelligent and efficient way.

Some projects (conceptual phase)
by
Kobe-Osaka International Port Corporation

# New High-precision Satellite-based Positioning Technology

## Quasi-Zenith Satellite Systems
Japan's satellite positioning system
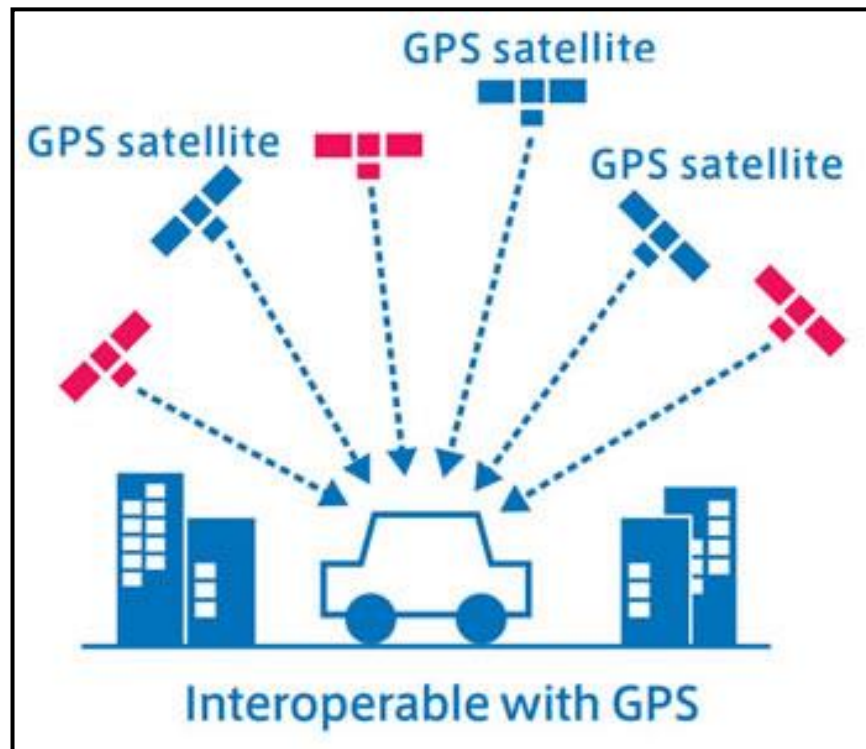
# Quasi-Zenith Satellite Systems

## ➢ System Overview

- QZSS is a Japanese satellite positioning system composed mainly of satellites in quasi-zenith orbits.
- It complements GPS for a satellite positioning service that is more precise and stable.
- Four satellites constellation will be established and the service will start in 2018. And efforts will be made to establish a seven-satellite constellation in the future
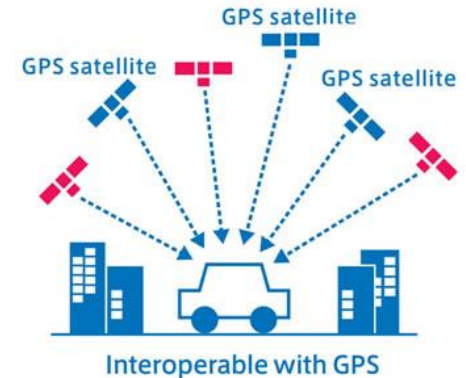


## ➢ Service Overview

### Positioning- related service

**① Satellite Positioning Service**

The service to provide satellite positioning as same as GPS. (Improve stability and availability)

**② Sub-meter Level Augmentation Service**

The service to provide accurate positioning around 2-3 meters. （※）

**③ Centimeter Level Augmentation Service**

The service to provide highly accurate positioning around 10 centimeters. （※）

※ Ionosphere disturbance(fluctuations), multipath and others will affect the accuracy.

### Messaging Service

**④ Satellite Report for Disaster and Crisis Management**

The service to provide users in the field with disaster management and rescue .

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# ➤ Quasi-Zenith Satellite Orbit (QZO)

Japan Region
- Over 20 degrees elevation
  More than 2-QZS are available
- Over 60 degrees elevation
  1 QZS is available

1 Geostationary satellite

準天頂軌道
Quasi-zenith orbit

Equator

Functional Capability:
- GPS Complementary
- GNSS Augmentation
- Messaging Service

**http://qzss.go.jp/index.html**

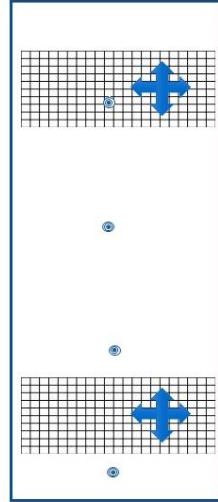Coverage: Asia and Pacific region

# Present Positioning Technologies of Automated Guided Vehicles

## AGV's

- 2 Antennas per AGV
- 1 Transponder / Antenna

RFID
AGV
Rail
RTG
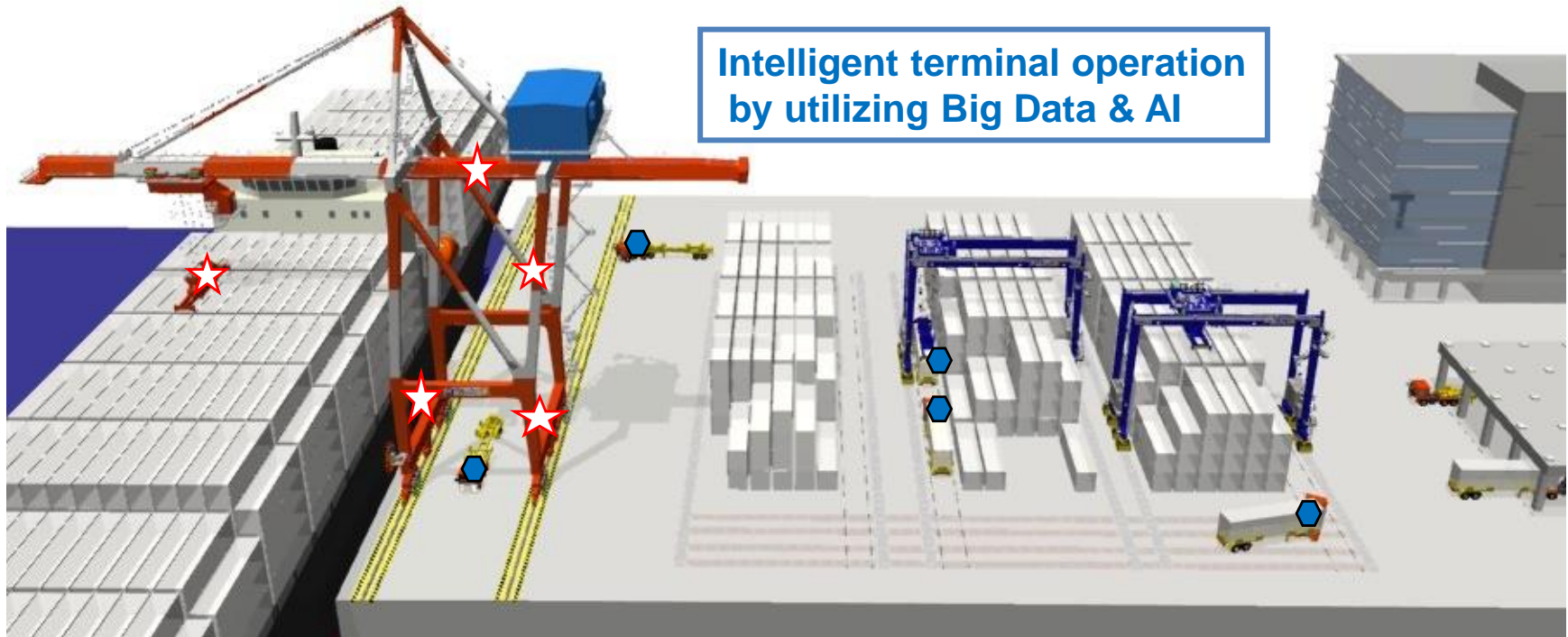IRM

Transponder Installation

www.btg-positioning-systems.com

**Reflective Plates for Millimeter-wave Radar (Port of Brisbane)**

# Possible applications of "IoT" & "Big Data" regarding   container terminal operations

QZSS Satellites

Intelligent terminal operation by utilizing Big Data & AI

★ IoT sensors attached to cranes

⬡ High-precision GPS devices attached to yard chassis

Thank you for your attention!