

AGENDA ITEM IIA: SMART PORTS AND SUPPLY CHAINS: INTERNET OF THINGS (IOT) AND BLOCKCHAIN

ASSOCIATION OF CARIBBEAN STATES (ACS)

**2ND COURSE ON MARITIME PORT UPGRADE FOR EXECUTIVES OF THE
GREATER CARIBBEAN
(VIRTUAL MEETING)**

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TOS - Innovation and Automation

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Creating the Future, **Now.**

Agenda 1

TOS - Automation



Zodiac Key Functions vs. Productivity Improvement Matrix

#	New Features	RTG Productivity	ITV Productivity	QC productivity	Saving on Manpower
1	Advance Yard Crane Scheduling	✓	✓		✓
2	Yard Strategy-Auto Yard Planning (No need of yard boundary setting)	✓	✓	✓	✓
3	Dynamic stowing for Laden Boxes	✓	✓	✓	✓
4	Dynamic workload distribution for RTG	✓	✓	✓	✓
5	Auto Job Queue Activation				✓
6	Auto CHE Range	✓			✓
7	ITV scheduler against Zone – Ripple Concept	✓	✓	✓	✓
8	Alert Center (Exception Dashboard)	✓	✓	✓	✓
9	Forecast CHE allocations to meet the demand (Increase or Decrease)	✓			✓
10	Generic empty loading & deliver rules	✓	✓	✓	✓
11	VMT Count Down	✓	✓	✓	

Zodiac Key Functions Explanation

#	Description
1	Advanced Yard Crane Scheduling >> RTG will be deployed dynamically based on the workload – <u>Manually need to schedule and deploy the machines</u>
2	Yard Strategy – Auto Yard Planning (No Boundary Setting) >> Yard Strategy team to create only the rule no need to define the yard range. System automatically define the yard range based against outbound carrier berth – <u>Yard Planner to create yard boundary for the defined rules</u>
3	Dynamic Stowing for Laden Boxes >> System will create pre-plan based on MOVINS and load the container dynamically (Overcome out-of-sequence)
4	Dynamic Work Load Distribution for RTG >> Based real-time of machine / ITV location system automatically distribute the jobs – <u>Work load distribution will happen on the defined range only</u>
5	Auto Job Queue Activation >> The job queue will be activated automatically based on finishing of previous job (Finish to Start)
6	Auto CHE Range >> Equipment Controller no need to set the range. System automatically define the range

Zodiac Key Functions Explanation

#	Description
7	ITV scheduler against Zone - Ripple Concept >> ITV will get nearest job and will reduce un-laden distance – <u>Based on move-time NOT on ITV travel distance</u>
8	Alert Center (Exception Dashboard) >> Exception Alert Center – Manage operation by exception
9	Forecast CHE allocations for Resource Demand >> Machine Resource forecasting to increase or decrease the machine (<u>Manually calculate</u>)
10	Generic empty loading & delivery rules >> No need to create to MT Load List. System dynamically create load list based on age, easy access
11	VMT Count Down >> Monitoring Transaction Processing based on gantry speed, target position, machine cycle time.

Agenda 1

Gate Automation



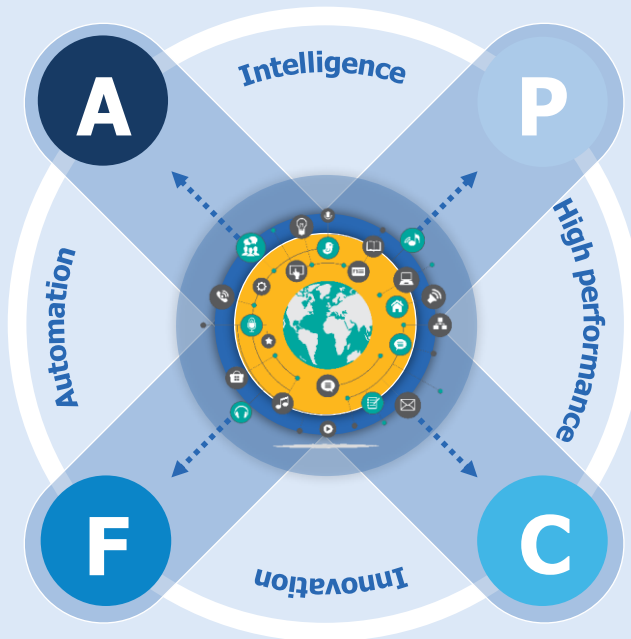
Key features of Zodiac AGS

Artificial Intelligence(AI)

- Continuous self-learning, self improving (target over 99%)
- Software driven with minimum H/W dependency
- Strong potential to future improvement (Facial recognition for safety, Automatic damage detection, Unregulated License Plate)

Flexible Design

- Support flexible gate operation process (Single gate, Double Gate layout)
- Reusing existing H/W.
- Mobility support (Mobile gate, Mobile slip)



Performance

- Accuracy increase as per size of data without any further S/W changes.
- Less maintenance, less human intervention
- Enabled with IOT concept (Real-time device monitoring, remote control, history & Statistics)

Cost-effectiveness

- Minimum H/W, less infra requirement
- Complete technological governance without any license cost.
- IP, Design are all owned by ZODIAC, product overhead cost is minimum.

VAS Video processing flow

AI Processing Flow

- ✓ Only 6 cameras with no additional sensor support
- ✓ LPR camera detect truck approach, identify truck and start video stream recording.
- ✓ Camera 1 ~ 5 used for container image, number detection. Also capture streaming end.
- ✓ Video stream fractured to series of image, augmented, and processed by neural network to extract stitched full container images.

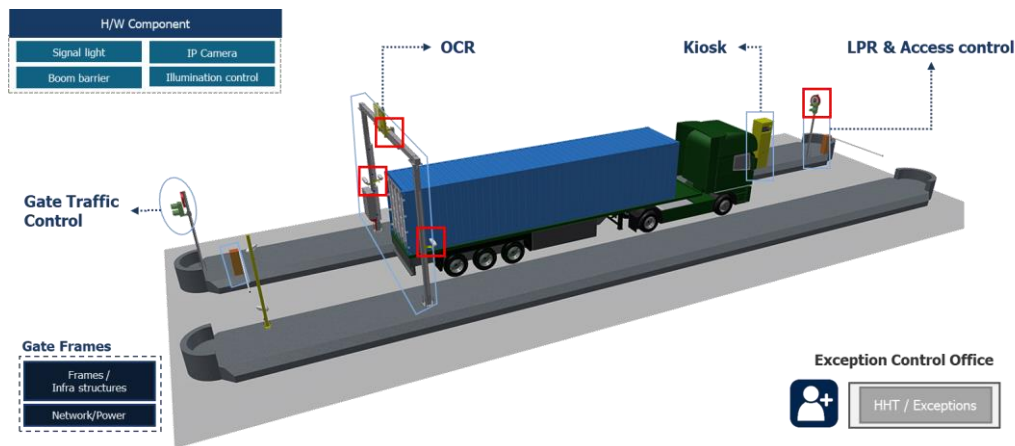
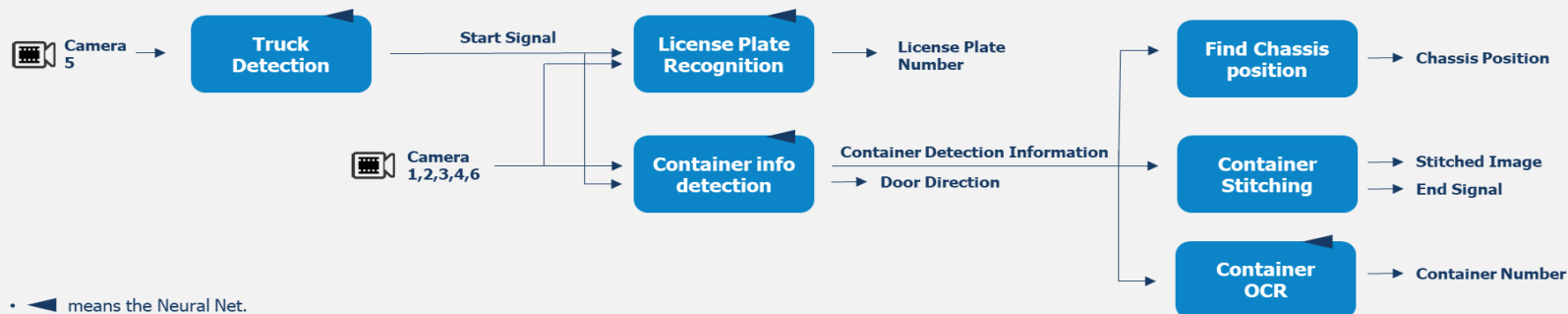


Fig 4. HW infrastructure



Video Analytics Server (VAS) Key Function

1. Container Number & ISO Code

Recognize the Container number based on Deep learning.
(95% above and improving)

2. IMDG Label

The class of IMDG is automatically recognized.
(Under training)

3. Max, Tare weigh

Automatically recognize the Max and Tare weigh of the Container marked in the Rear of the Container.
(Under development)

4. LPR

The OTR number is automatically recognized based on deep learning.
(95% above and improving)



5. Image stitching

Automatically generation of Container Full image based on video stream.
(Quality improvement)

6. Seal presence

System automatically recognizes the seal presence using the real camera image.
(Planned in 2021)

7. DC (Damage Container) detection

Based on the video entered from Camera, DC of Container is automatically recognized.
(Planned in 2021)

8. Chassis position & Door direction

Automatic recognition of container location and door direction information.
(Developed & Under testing)

9. Driver Facial Recognition

The camera installed in the kiosk recognizes the driver's face and automatically takes pictures and stores them.
(Planned in 2021)

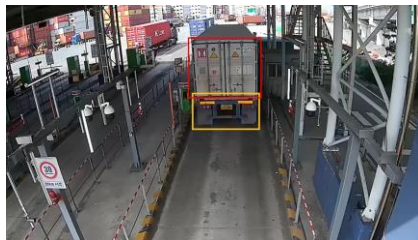
Pilot Testing in PNC, Pusan Korea (August 2nd~)



Test Images



Truck detection and Start/End signal control



License plate detection & Recognition



Container / ISO code detection & Recognition



Image Stitching