Fremantle Port

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SIS48 – Towards Sustainable Technology Drive Port City Development Management

Improving Port Landside Efficiency and Sustainability through Intelligent Systems

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Intelligent Transport Systems World Congress - Singapore

FREMANTLE PORTS

Victoria Quay
Rous Head
North Quay
Fremantle Inner Harbour

SMART MOVES

Road and Rail

Port Landside Challenges

- Efficient preparation of freight for pick up from / delivery to terminals
- Entry/Exit to terminals, without delay or difficulty
- No congestion on port or port access roads
- Supply Chain (particularly Terminals and ECPs) incentivised (*and monitored*) to perform (*i.e.: provide freight in timely manner, operate after hours, utilise non-road (e.g. rail options), reduce externalities (e.g. road noise)*)
- Vehicle overloading (*safety, road damage*)
- Reducing the numbers of vehicles to/from ports (efficient loading)
- Increase visibility of freight operations to allow improved planning, increased speed and prevention of errors/double handling
- No Data Silos
- Balanced charges throughout the supply chain

Inner Harbour operates adjacent to urban areas

Challenges operating close to residential areas

Real Time Port Operation

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Digital Twin
Virtual Digital Twin of the Port to provide real time 3D visualisation of port operations and to enable simulation modelling and "what if" scenario planning

Port Community EcoSystem Portal
An interconnected digital platform that facilitates information exchange among stakeholders in the port value chain. from both the public and private sectors. This would facilitate ships berthing on arrival, consuming services just in time and reducing turnaround times. Service and logistics providers would be able to plan and allocate pilots, berths, ship supplies and other port services more efficiently.

Intelligent Port Orchestration
Unified platforms for integrating real time data from multiple sources to provide a unified real time, spatial view across Fremantle port operations. Coordinated execution of land side and ship side operations to facilitate inter-modal cargo flow and connections. Intelligent notification and harmonisation of train, truck and vessels scheduling.

Smart HSEC
Health, Safety, Security and Environmental risks in ports will be addressed pre-emptively or in real time by infusing surveillance systems with video and data analytics, and machine-triggered responses. Real time location tracking and geo-fencing to improve security and safety that is integrated with a streamlined permit to work system.

Intelligent Vessel Traffic Mgt Info Systems
Next generation systems that leverage Data Exchange Systems, Digital Technology, Predictive and Data Analytics and Smart Applications to enable seamless transfer of data across the port ecosystem and improve vessel navigation and logistics.

Drones
The use of Drones will improve operational efficiency and can be used for ship inspections, navigational awareness, port surveillance and emergency management.

Industrial Internet of Things (IIOT) Solutions
Internet of Things (IoT) solutions for machine learning enabled, data driven optimisation.

Inner Harbour - Fremantle | Port Ops & Enterprise | Outer Harbour - KBJ & KBT

Visual Representation
To create a real-time and dynamic representation of the port environment to enhance FPA's situational awareness in order to understand, learn, and respond to changes. Key focus areas could include:
- Ship information, movements, schedules and notices
- Berth management, allocation and scheduling
- Marine infrastructure status, incidence and maintenance
- Safety incidents, notifications & alerting
- Land side logistics, traffic and rail movements
- Financial and throughput tracking and alerting

Data Contextualisation & Aggregation
To provide richer information for more informed decision making, data must be understood in context. In order to create context, data will need to be:
- Measured and captured at its source points (eg: sensors, controllers and devices)
- Integrated, linked and combined from various systems inside and external to the FPA
- Automatically aggregated
- Continually fed and made available to visualisation systems

Technology Platforms
In order to digitally represent contextualised data, FP will need to consolidate, utilise and leverage common technology platforms, such as:
- Data ingestion technologies that capture relevant IT and OT data sources
- Unified data repositories and management to store and share information
- Common business management systems, for example an ERP
- Visualisation & Intelligence (eg: BI & Geospatial)
- Process control and automation (ie: HMI, SCADA and Historian)

Intelligent Berth Risk Management
Real time capturing of operational data combined with real time calculation and intelligent prediction to provide automated alerts to avoid damage to berthing assets. Also intelligent berth planning and scheduling.
MVP1: Berth Loading Alerts (Cranes on Berth/ Ships Against)
MVP2: Bollard Loading Alerts
MVP2: Shore Tension Alerts
MVP4: Ship Alerts eg. anchor dragging, grounding risk

Port Automation
Automation and augmentation of manual port processes.
MVP1: Berth planning
MVP2: Berth scheduling

Port Activity Monitoring
Real time visibility of key port activity.
MVP1: Real time operational view - live traffic
MVP2: Maintenance operations eg. Diving, Berth Maintenance
MVP3: Inner harbour light vehicle tracking
MVP4: KBT light vehicle tracking
MVP5: COP Data Integration (vessel and visit details)
MVP6: Navigation Aid status (including ability to turn on)
MVP7: Real time train tracking
MVP8: COP Predictive View
MVP9: Real time truck tracking

Port Ecosystem & CDM (Collaborative Decision Making)
Digitisation and real time data exchange between actors for Port Calls.
MVP1: Movement of Dangerous Cargo
MVP2: General Cargo Berth Clearance
MVP3: Tracking and Automation of Clearance Handover

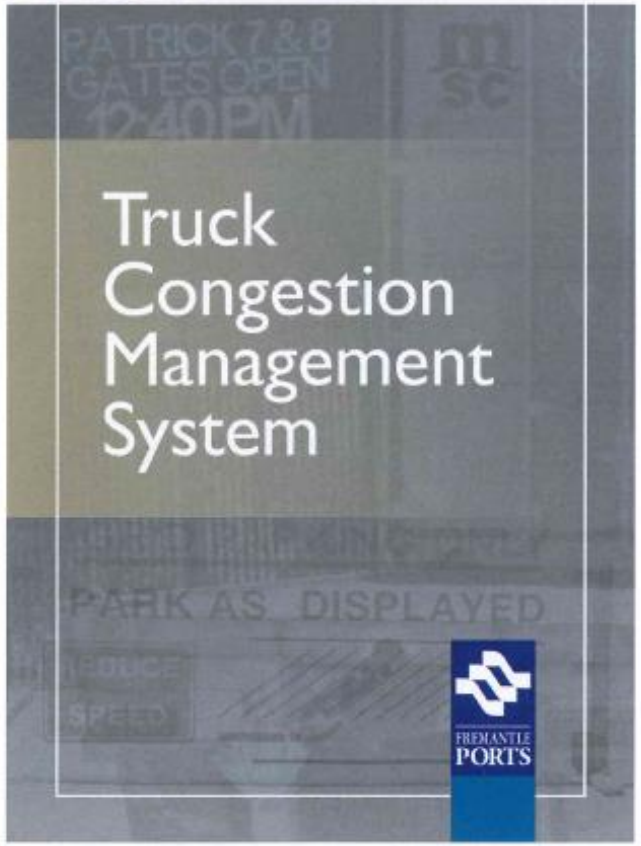
Port Security Information Management
Integration of security systems and incident management.
MVP1: Land side boundary breaches
MVP2: Incident alert and camera repositioning
MVP3. Container movement tracking
MPV4: Real time detection of uncleared containers leaving site
MVP5: Automatic Drone Detection and Intervention

Scheduling and Work Force Mgt
Automated workforce scheduling and HSEC support
MVP1: Electronic Permits to Work Outer Harbour
MVP2: Electronic Permits to Work Inner Habour

MVP1: Real time work scheduling, rostering and handover mgt
MVP2: Real time mobile access to work scheduling, rostering and handover information
MVP3: HSEC alerting
MVP4: Fatigue mgt

JOURNEYONE

Fremantle Ports "4.0"



What we've been doing - Landside

- Getting better co-ordination of heavy vehicles into and out of a sensitive precinct
- Looking at better ways of doing it – Innovation
- Go beyond Australia … to be world standard
- Actually making a difference – not just co-ordinate but take action

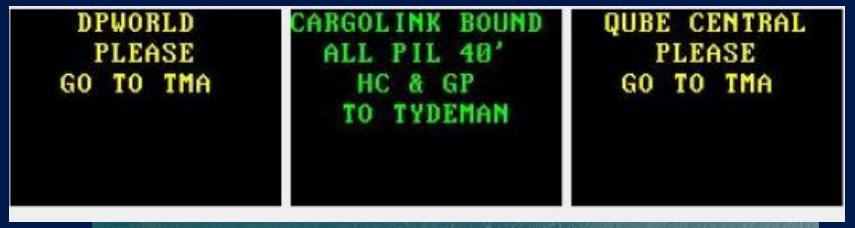
Congestion Management
Truck Marshalling
Vehicle Detection System – instant monitoring of delays
Messaging
In Cab Telematics Driver Information

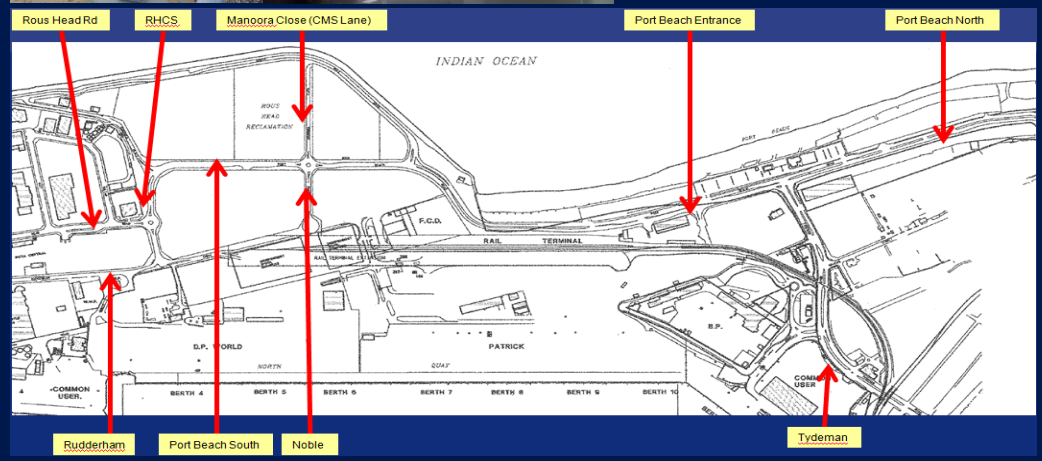
Queuing Control
Key Performance Indicators
Port Trading Community Eco-system
"Digital Twin" Development
The Future!

Why is it important?

- Lengthens the useful life of vital infrastructure
- Improves the relationship with our community partners
- Increases efficiency and makes our Western Australia more competitive
- Increases the value and importance of the Port in everyone's eyes
- Shows that we at the forefront of innovation

Congestion Management System is a core example





That

sustainability

celebrating sustainability triumphs wherever they originate

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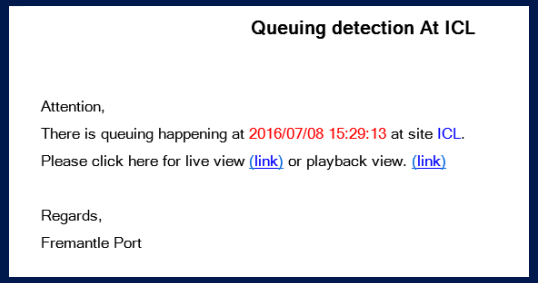
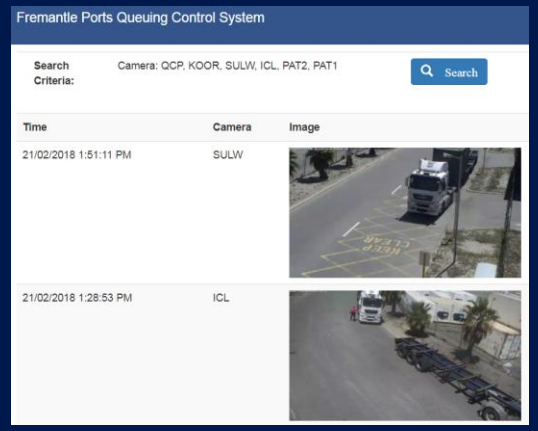
ISCA

Site Key Performance Indicators

- Newly created land areas have given the Port the opportunity to guide key land-side efficiencies.
- KPIs linked to results we wish them to achieve
- KPIs included in all new leases – Incentive for good performance
- Tenant Operating Performance System (TOPS)
- Verification through Intelligent Transport Systems

Truck Control System - The Developments





Queuing Control

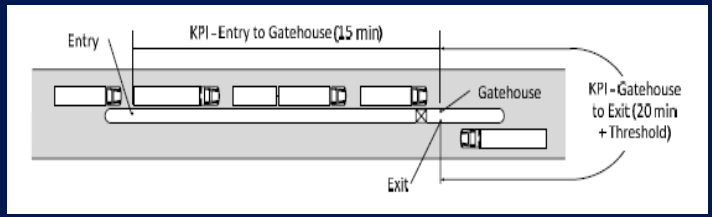
- Largley impractical manual means of determining this
- Eliminates Queuing – environmentally friendly, community aware and driver amenity focussed
- Focuses attention on this neglected area of logistics (“what do I care about queues?”)

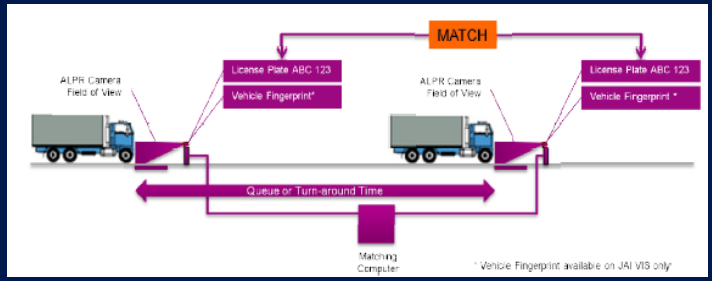
Vehicle Detection (including Truck Turn Time - TTT)

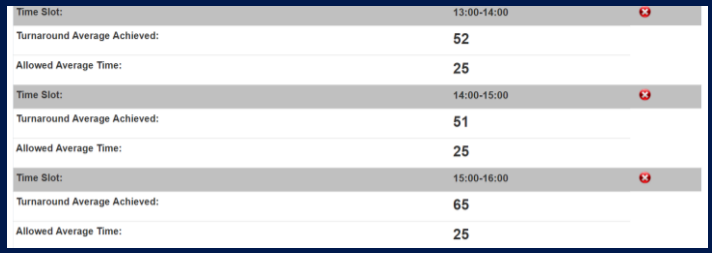
- Measurement of duration at port – CO2 implications
- Increase throughput

In Cab Telematics (IVU) – Driver Information System

- Take information from Congestion Management System and send direct to driver – Go live end19
- Driver able to act on issue prior to arriving at port – keeping trucks away from port (Virtual TMA?)

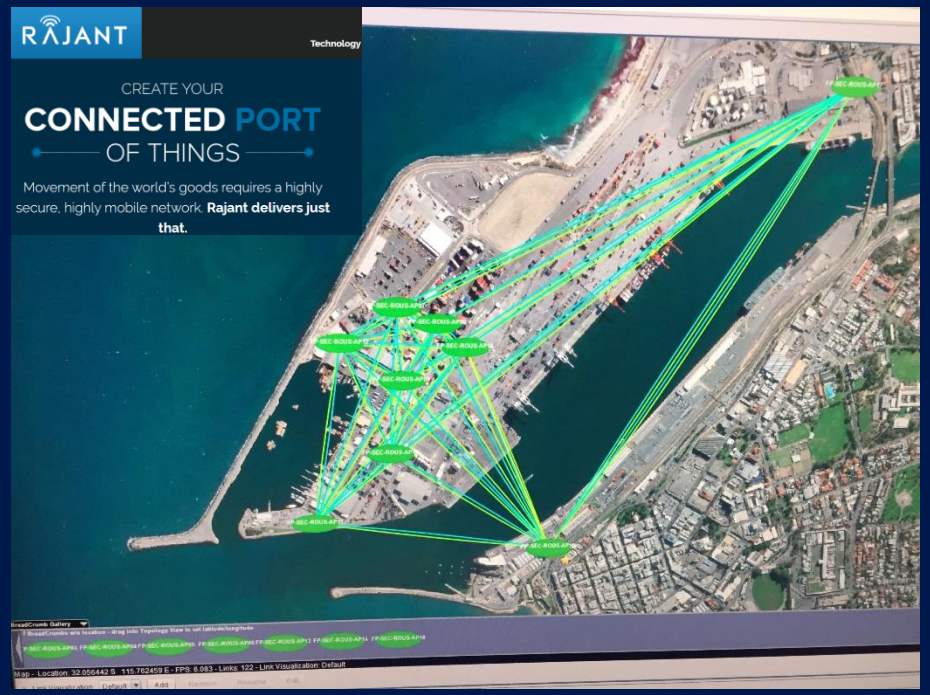


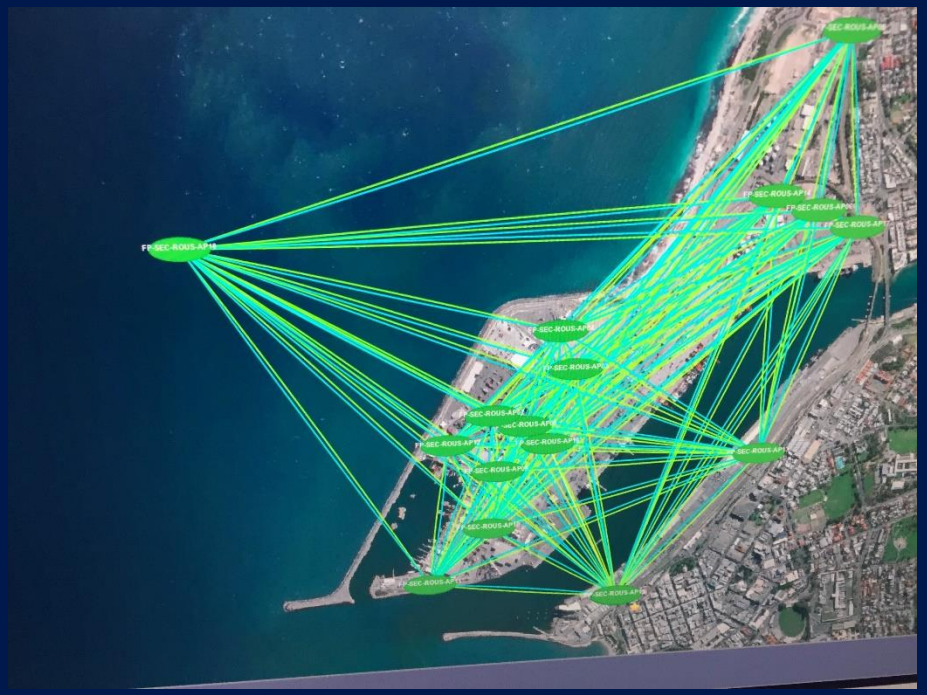




Smart Camera Technologies

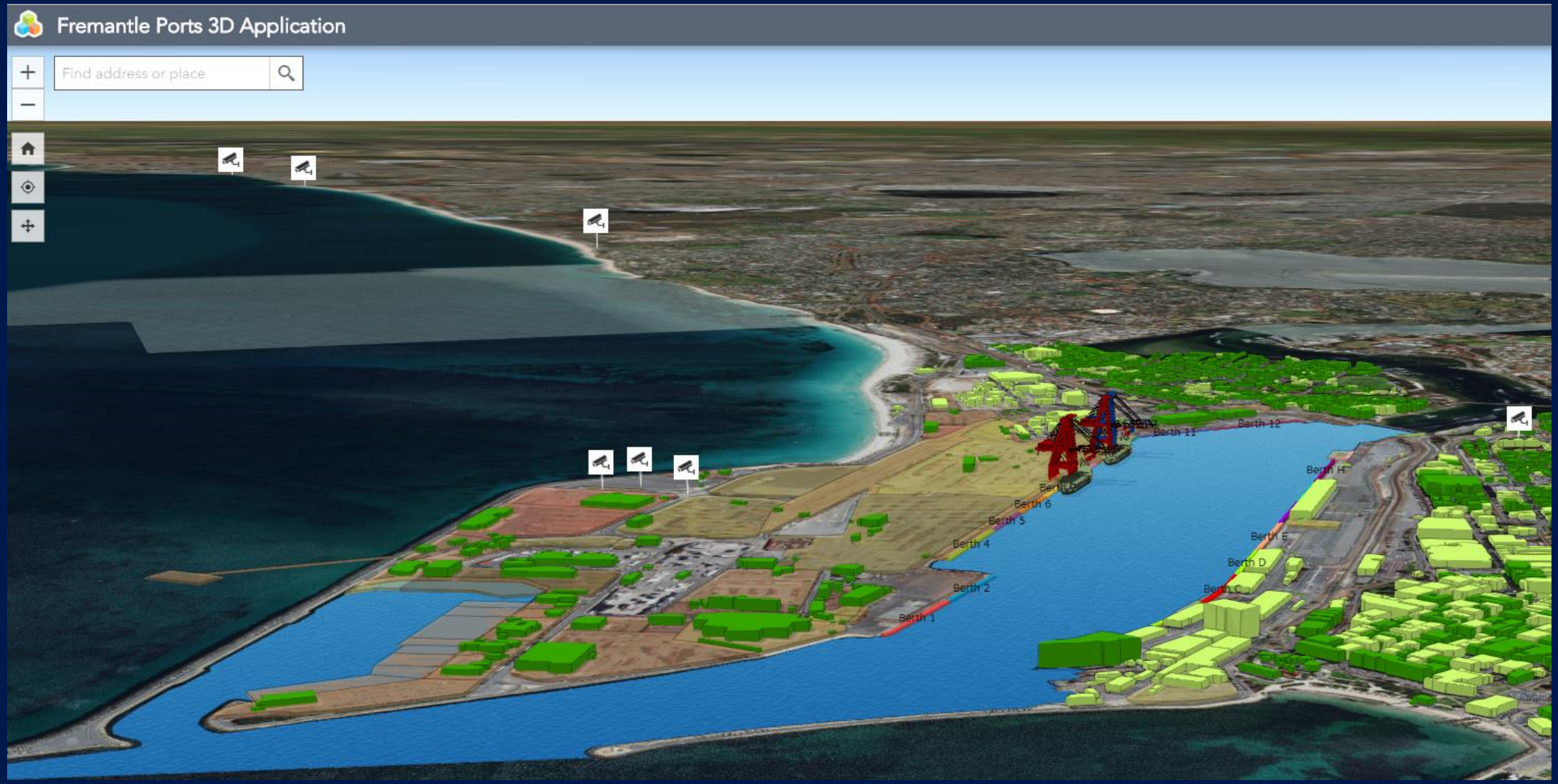
- Independently, Transport for NSW and Fremantle Ports are working on projects to use camera analytics to improve supply chain visibility
- Mobile cameras, combined with Rajant wireless mesh, allow totally flexible deployment with direct linkage of high bandwidth video and other data feeds straight into port-own fibre network
- New ANPR-enabled Trailercams (see below) is the final element of the Truck Control System
- The inclusion of mobile units increases the mesh strength considerably.
- Fremantle Ports is also considering the associated Wireless Mesh Technology to allow connectivity with operational data sources (e.g. Drones)



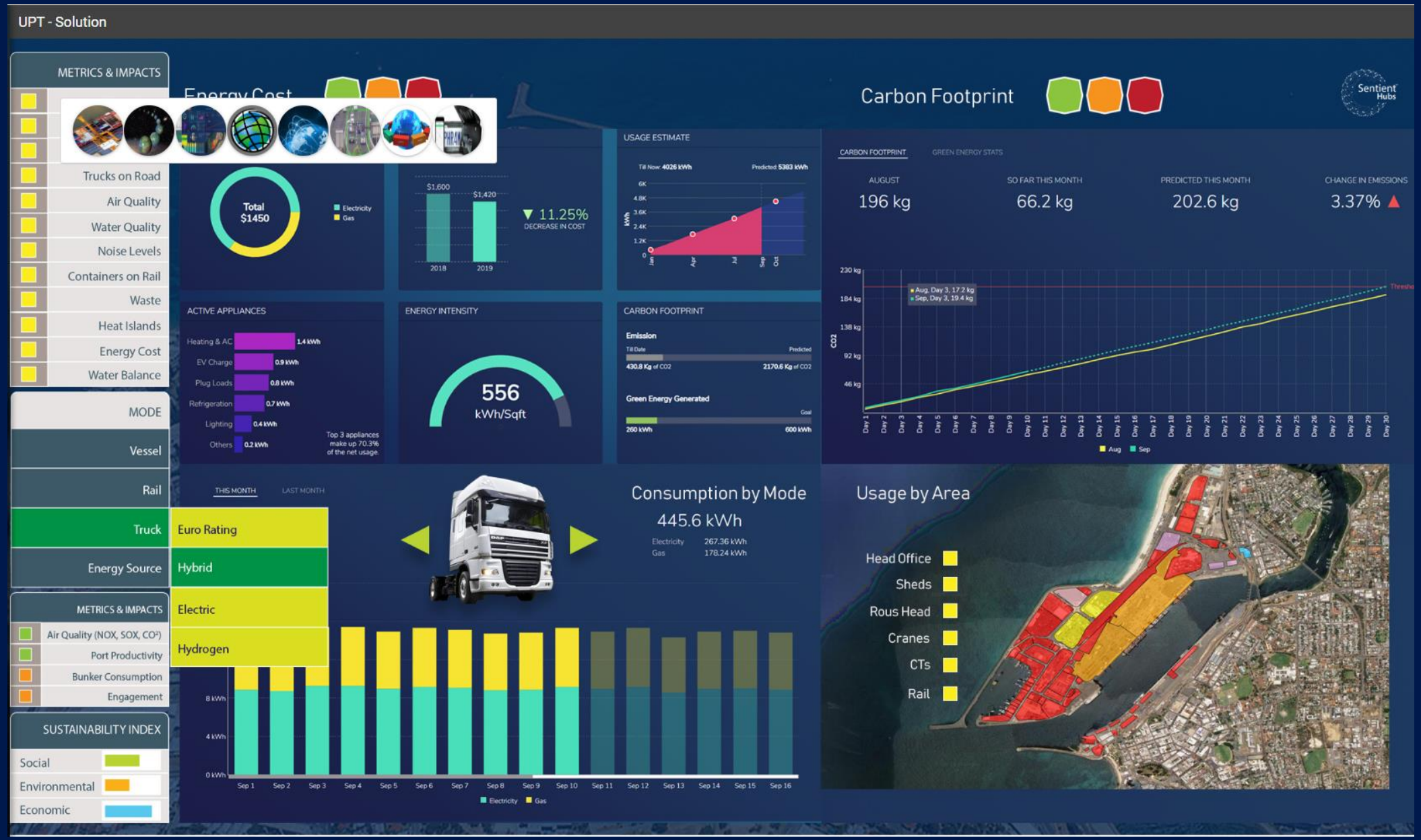


Innovation and Supply Chain Excellence Awards - Five received in 2018

Port “Digital Twin” Developments (Data Feeds used for Analysis)



Port “Digital Twin” Developments (Examples: Carbon Measurement)

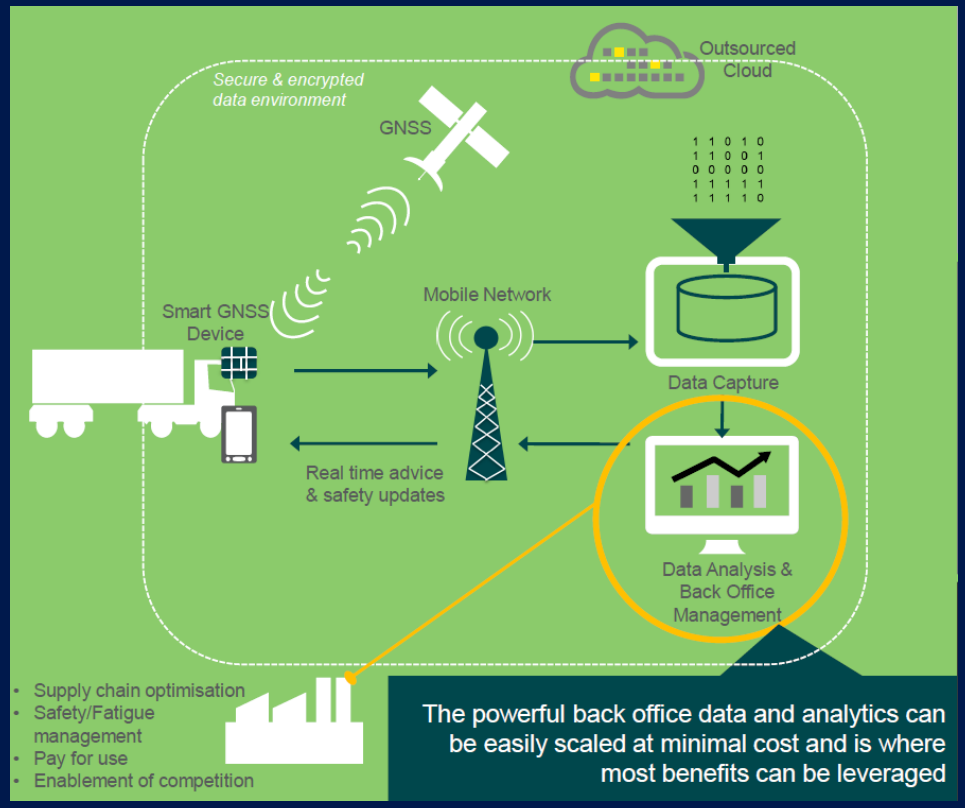


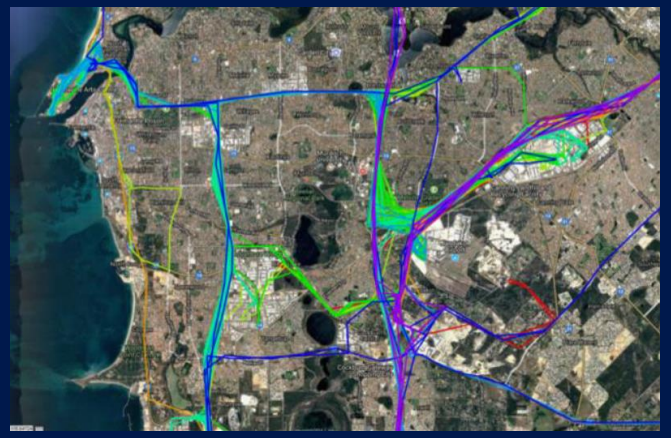
“Smart” Plates

- How to better identify vehicles, within and outside the port – medium term?
- Global Navigation Satellite System (GNSS) enabled licence plates
- Allows better data on port-related vehicle activity on public roads

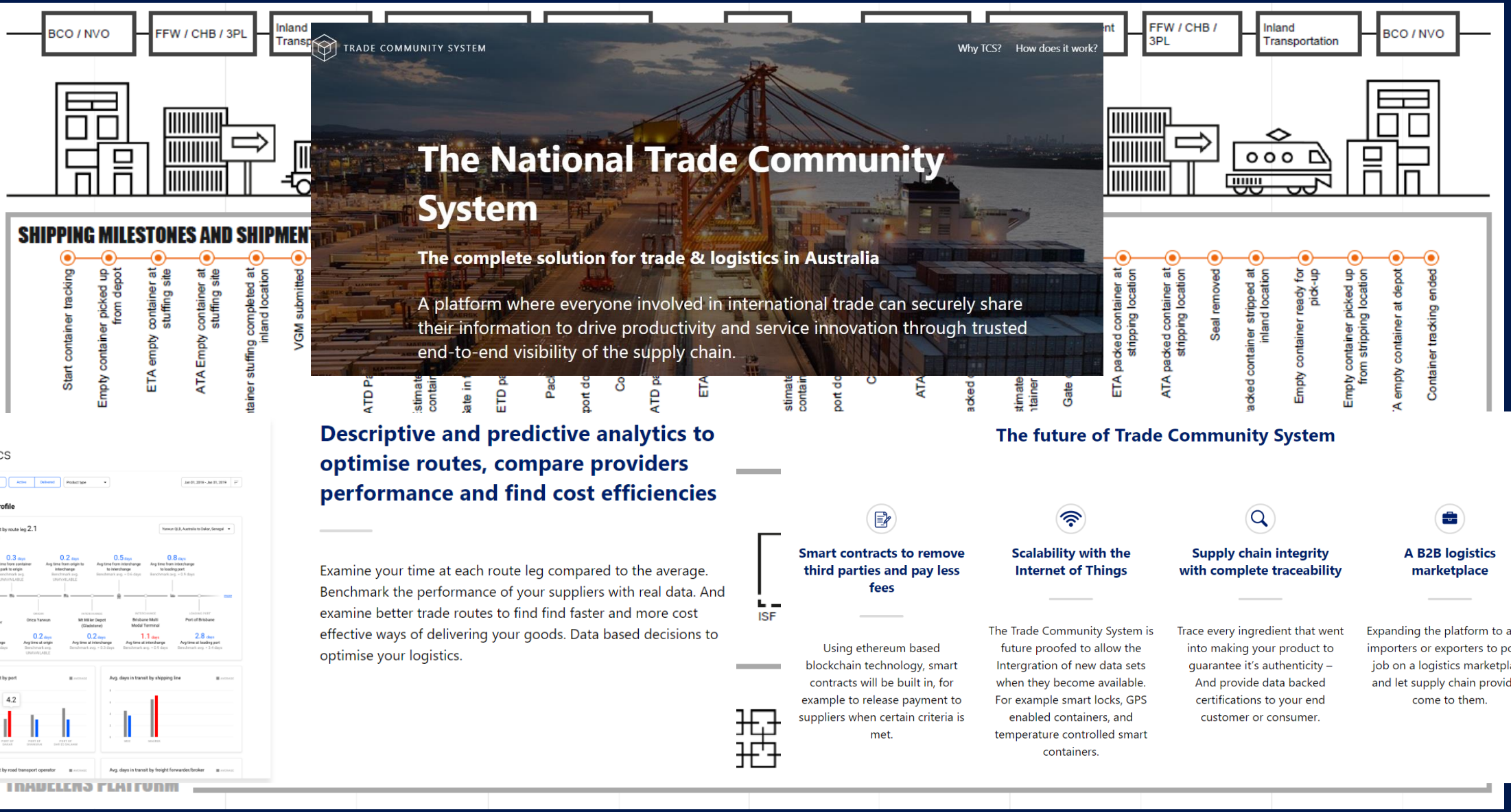
GNSS & Mobile Network (Primary Solution)

+ Scalable & Flexible. Accurate Positioning
+ Non intrusive
+ Supports multi-laned free flow (MLFF)
+ 2 way communication technology
  Cost effective
- Urban Canyoning (i.e. between buildings)
- Mobile network black-spots





Port Community Trading Eco-Systems



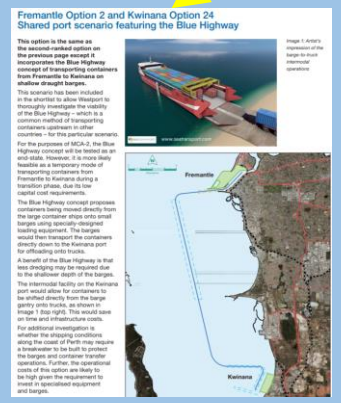
With acknowledgement and thanks to Mr. Daniel Wilson – Tradelens and Port of Brisbane

UN Sustainable Development Goals Analysis – Recent Considerations

UN SDG		Importance to Westport	Alignment to ISCA Sustainability Categories[1]	MCA Criteria Relevant to SDGs	How the Westport Strategy can impact the UN SDGs		
					Plan & Procure	Design & Construct	Operate
	Make cities and human settlements inclusive, safe, resilient and sustainable	High	• **Context** • **Resilience** • **Options Assessment and Business Case** • **Benefits** • Energy and Carbon • Green Infrastructure • Environmental Impacts • Resource Efficiency • **Stakeholder Engagement** • **Heritage**	• Land use compatibility • Net amenity impacts • Heritage • Land transport safety • Terrestrial environmental impacts • Marine environmental impacts • Energy and carbon • Infrastructure capacity, scalability and operational efficiency	• Collaborate with cities and governments to find solutions to future freight mobility needs that minimize environmental impact while making transport safer and more affordable. • Bring together government, NGO's and citizens to jointly analyse, discuss and act so that Westport Strategy contributes to making our cities more competitive, safe, resource-efficient, resilient and inclusive. • Reform private sector finance investment strategies to support integrated and sustainable urban development like sustainable urban transport, low-carbon buildings, and resilient infrastructure • Plan to protect and enhance heritage values which may be impacted by the project • Reward suppliers who implement corporate giving or volunteering programs that provide food for disadvantaged social groups	• Interpretation strategies are prepared to enrich understanding of the place while providing guidance for aspects of the development of the area that will build on its unique characteristics. • Bring heritage values in design and construction	
	Strengthen the means of implementation and revitalize the global partnership for sustainable development	Very High	• **Leadership and Management** • Sustainable Procurement • **Resilience** • Resource Efficiency • **Stakeholder Engagement** • Legacy	• Governance / ownership flexibility • Heritage	• Collaborate with ISCA, IA & IAWA, City deals, PIANC universities and NGO's to support the achievement of the sustainable development goals. • Develop Kaart Koort Waarnginy (Head, Heart, Talking) Aboriginal engagement process. • Bring together government, NGO's and citizens to jointly analyse, discuss and act so that Westport Strategy contributes to making our cities more competitive, safe, resource-efficient, resilient and inclusive. • Commit to forward procurement to challenge industry to innovate to meet a project need – e.g. to commit to purchase a service or product once developed that will reduce waste. • Seek innovation in supply chains to gain greater shared value and to generate new markets.	• IMO, ISCA, SBEnrc, GBCA Greenstar Communities, Waste Authority, Ports Australia, FLC, POTF • Kaart Koort Waarnginy (Head, Heart, Talking) Aboriginal engagement process • PIANC WwN • IMO, ISCA, SBEnrc, GBCA, Waste Authority, Ports Australia, FLC, POTF.	• Collaborate with global ports and terminal operators to share information in digital supply chains to promote more efficient and secure transactions, information sharing and industry wide innovation.

Westport "Thinkathon" – Disruptors and Solutions

- Minimal finished product imports – manufacturing will be done locally in automated, "3D printer" type factories.
- If not, then new products – WA as a "Halal hub"
- Imports will be concentrated raw products not available locally.
- Roads will be better utilised handling many more "motion platforms" (vehicles) than today, meaning shorthaul rail will disappear.
- Grade Separated / Platform roads and more tunnels
- If there are warehouses, they will be vertical and automated (both internally and loading/unloading).



Other Future Considerations?

Potential Disruptors?

- Autonomous Vehicles
- Trade Community Systems - Visibility along the chain (Distributed Ledger)
- Smart contracts as part of Distributed Ledger?
- Digital Printing and automated factories - why produce in and import when you can produce locally at the same cost?
- Advanced Drone and/or Elevated Sky-rail/Cable-car technology - when the container can be lifted aerially rather than terrestrially
- Land-bridging (in at one end of the country and rail delivery to other end)
- 24/7 operations (e.g. overcoming the a variety of costs and extending the use of vehicles = overcome the issue of infrastructure bottle-necks on roads)
- Ever more efficient and emission friendly vehicles - less community resistance to night operations

Boosting Multi-modality?

- Subsidies for rail
- KPI's for rail operators using port infrastructure (cost to deliver to rail the same as the cost to place onto truck)
- KPIs with incentives for on-port operator tenants (terminals, logistics operations)
- Incentive pricing systems on transport operators (peak period pricing, exemptions for rail)
- Port access road charges
- Utilise rail lines for ITV use when the rail is not running
- Move the port and design the new one:
  - Using AGVs to move containers to an IMT
  - With IMT built around a Logistics Village concept (direct access from rail to warehouse by reachstacker)
  - With IMT that is fully automated

For general consideration – not necessarily the views of Fremantle Ports nor the Government of Western Australia

Many thanks

Further Queries

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