



**XANATOS MARINE**  
MARITIME DOMAIN AWARENESS SOLUTIONS

# EMPOWERING PACIFIC PORTS WITH SMART SOLUTION: THE TITAN SENTINEL ADVANTAGE

*DEVELOPED IN CANADA, FOR THE WORLD*

 Shailendra Shukla, Executive Director, Xanatos Marine Ltd.

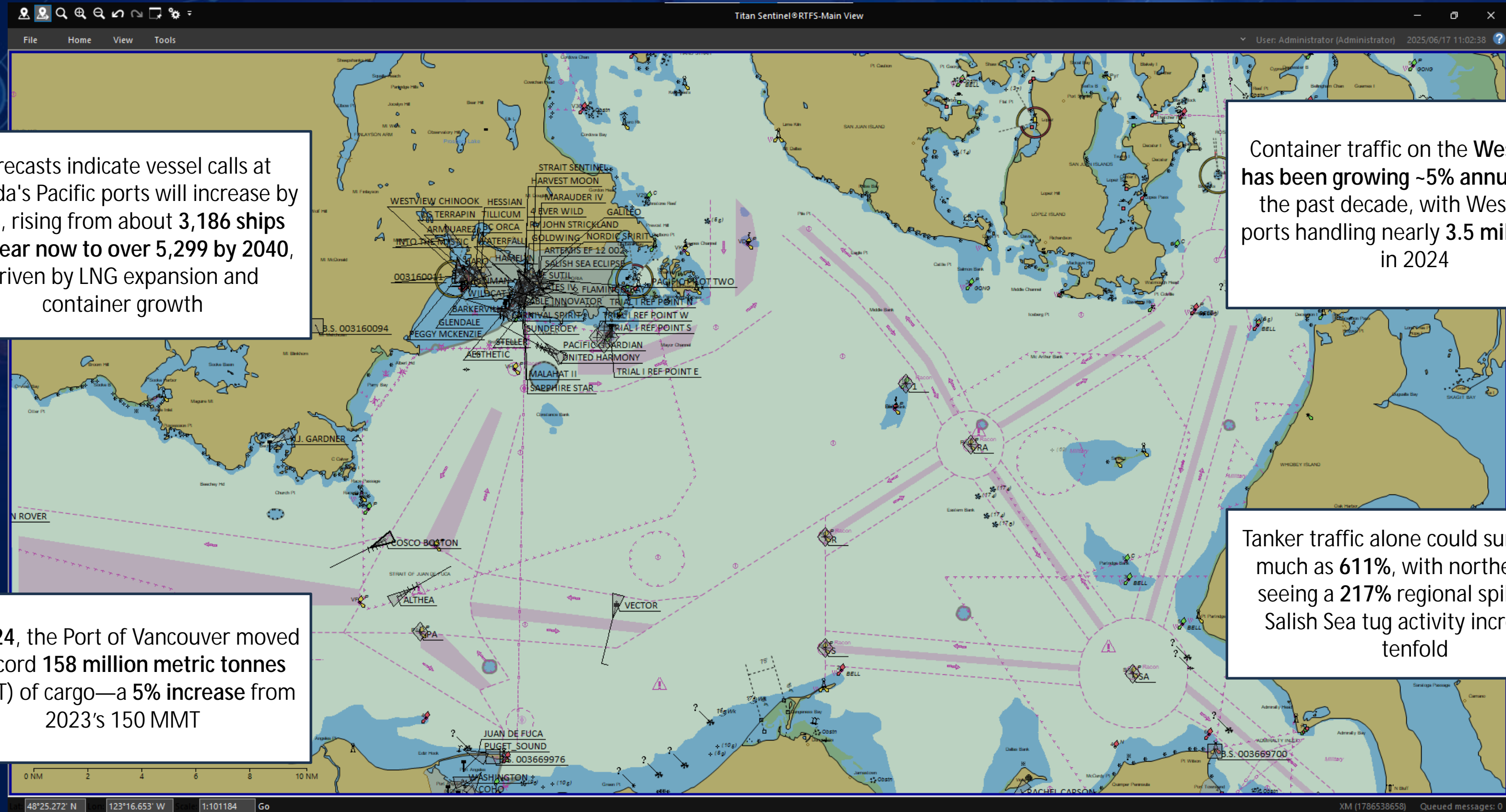
# PREPARING FOR GROWTH: SMARTER VESSEL TRAFFIC STARTS NOW

Forecasts indicate vessel calls at Canada's Pacific ports will increase by **60%**, rising from about **3,186 ships per year now to over 5,299 by 2040**, driven by LNG expansion and container growth

Container traffic on the **West Coast** has been growing **~5% annually** over the past decade, with West Coast ports handling nearly **3.5 million TEU** in 2024

In **2024**, the Port of Vancouver moved a record **158 million metric tonnes (MMT)** of cargo—a **5% increase** from 2023's 150 MMT

Tanker traffic alone could surge by as much as **611%**, with northern B.C. seeing a **217%** regional spike, and Salish Sea tug activity increasing tenfold



# PREPARING FOR GROWTH: SMARTER VESSEL TRAFFIC STARTS NOW



## CONGESTION

Forecasts in calls at Canada's Pacific ports increase by 60%, rising to 1.5 million ships per year by 2040, driven by LNG expansion and container growth

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## DIGITALIZATION

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## INDIGENOUS TECH



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## ALIGNMENT WITH CANADA'S MARITIME GOALS

Supporting National Ocean Protection & VTMIS Expansion Plan - Aligns with Canada's Oceans Protection Plan (OPP) by offering advanced situational awareness solution

Enhancing Maritime Safety, Security & Environmental Sustainability - Addresses Canada Coast Guard strategic pillars: asset investment, modernization, and partnerships

Working together to create a safe, efficient, and sustainable maritime environment.



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**VTMIS SYSTEM**



**AIS MONITORING**



**CSS SYSTEM**



**SENSOR TECHNOLOGY**



**IMPROVING SAFETY AND EFFICIENCY OF MOVEMENT OF VESSELS, WHILE PROTECTING THE ENVIRONMENT THROUGH A MODERN, MULTI-SENSOR INTEGRATED SYSTEM.**



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# AGE OF SMART PORTS:

Transforming Global Trade through Digitalization & Automation

**HIGHER  
EFFICIENCY**

**REAL-TIME DATA &  
DECISION-MAKING**

**SUSTAINABLE  
OPERATIONS**

**INTEGRATED  
DATA ECOSYSTEM**

**ENHANCED  
SAFETY**



# TITAN SENTINEL PLATFORM

**Automated Traffic Management** adjust schedules, reducing congestion and ensuring seamless operations.

**Predictive analytics for maintenance and risk assessment**

Enables operators to identify inefficiencies, predict outcomes, and implement proactive solutions

**Monitors equipment and infrastructure health, predicting potential issues to reduce unplanned outages**

## AI-Based DSS

## Digital Twin Technology

**Data-Driven Insights:** Actionable strategies for improving efficiency and reducing operational costs

Integrated platforms providing a comprehensive digital representation of port systems, enabling real-time monitoring and decision-making.

**Integrated Electro-Optical Systems (EOS)** for tracking vessels competently.

Alerts, alarms & reporting of any anomalies including secure communication tech.

## VTMS

Empowering ports to achieve new levels of safety and reliability

Integration with other SMART Port technologies

**Minimizing manual intervention**, to enhance operational efficiency, creating a more resilient and sustainable port environment.

From vessel emissions to energy-intensive cargo handling, our **port automation solutions** are designed to monitor, measure, and reduce carbon footprints

## Decarbonization through Automation

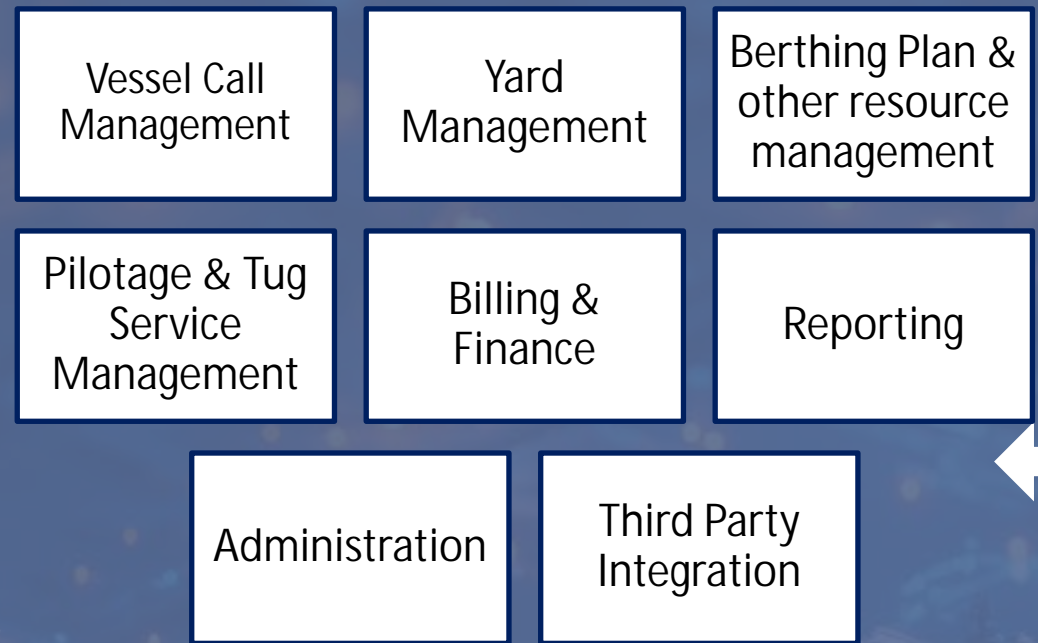
### OUR SMART PORT SOLUTION COMPONENTS, ENABLING DIGITAL PORT ECOSYSTEMS WORLDWIDE

By leveraging AI and through comprehensive risk assessment, it detects anomalies in real-time, flagging potential **cyber threats** before they escalate.

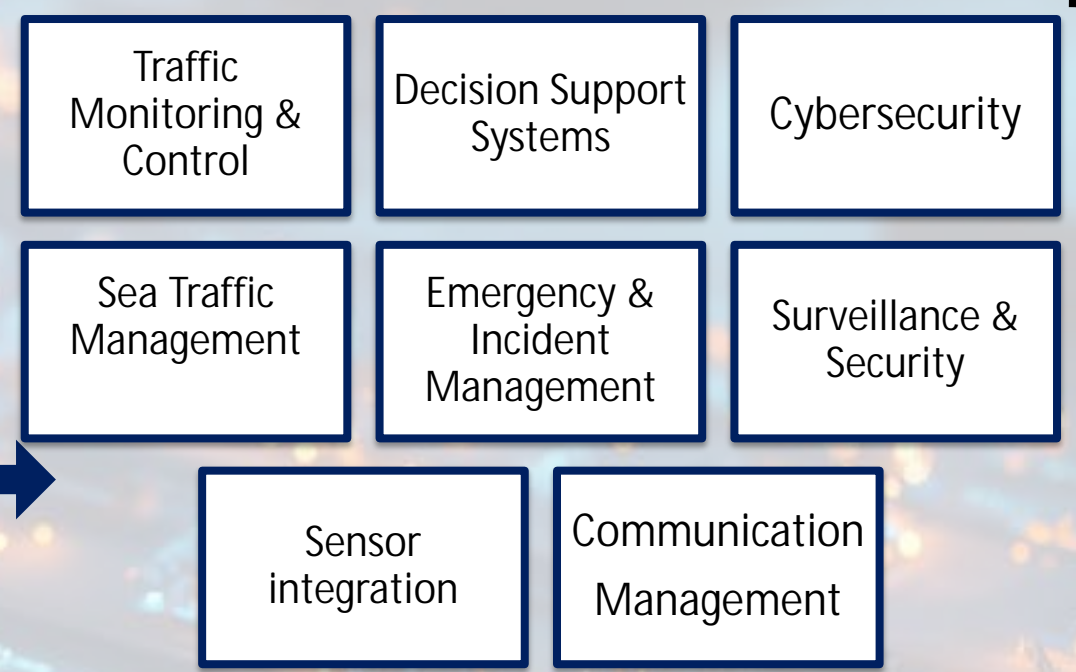
**A multi-layered cyber security system** to safeguard sensitive data and secure data flow with third party/external systems.

## Cyber Security

# PMIS



# VTMS



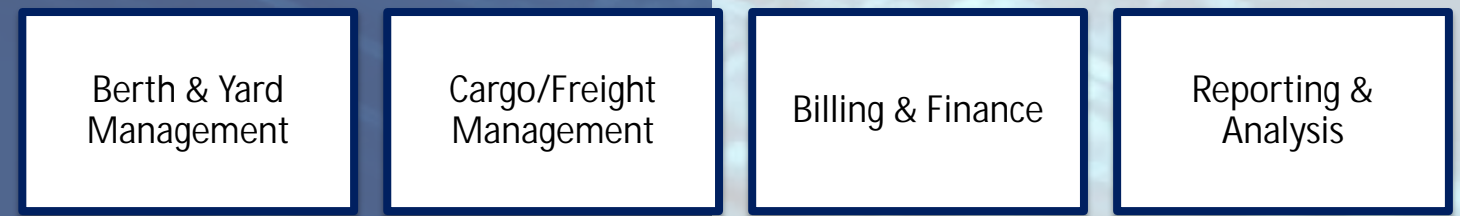
- Vessel Turnaround Time
- Data Integration Capability
- Environmental Compliance
- Berth Utilization & Idle time

- Safety & Risk Management
- Scalability
- Resource Utilization

- Traffic Flow Efficiency
- System Reliability
- Environmental Impact

- Sensor Integration Capability
- Operator Response time
- Search & Rescue

# TOS



- Wide range of Freight types supported
- Multi-terminal support
- Scalability & Customization



- Customer support & satisfaction
- Mobile Friendliness
- Cost Effectiveness
- Cargo Handling Efficiency



# DATA ANALYTICS AND Ai IN MARITIME SECTOR

Data analytics and artificial intelligence (AI) are revolutionizing the maritime and logistics sectors by offering tools to

OPTIMIZE  
OPERATIONS

ENHANCE  
EFFICIENCY

SUPPORT  
SUSTAINABILITY  
GOALS

Enabling  
**PREDICTIVE INSIGHTS, REAL-TIME DECISION-MAKING,  
AND INTELLIGENT AUTOMATION**, transforming ports into  
highly efficient, resilient, and eco-friendly hubs.



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# AI INTEGRATION: KEY FEATURES

## AI-POWERED CONTINUOUS LEARNING



Automatic optimization of system parameters based on learning.

## SCENARIO – BASED OPTIMIZATION



Continuous learning of evolving maritime scenarios specifically for the area of installation.

## COLLABORATIVE AI SUPERINTELLIGENCE



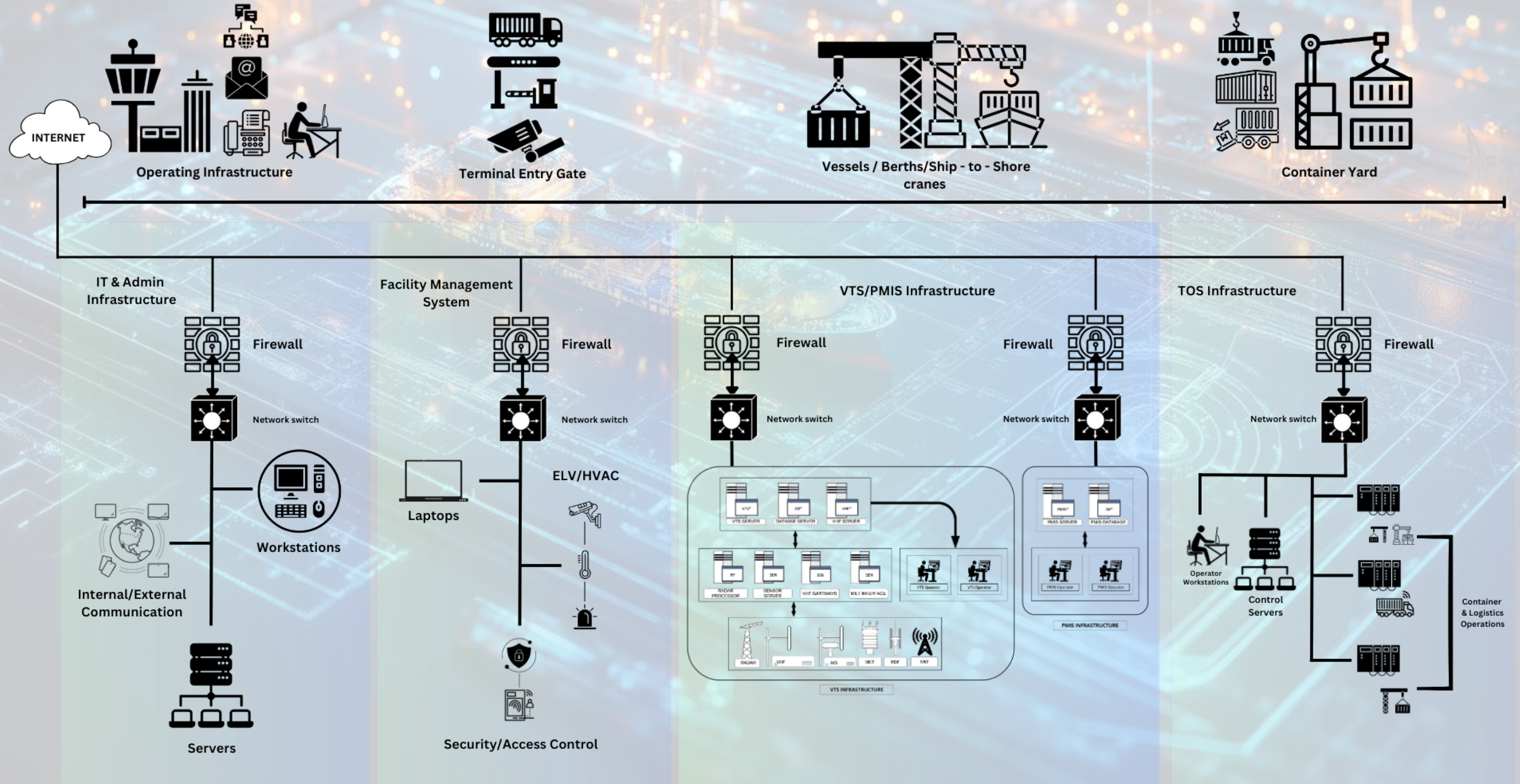
Real-time threat intelligence shared across all stakeholders.

Live anomaly detection for improved situational awareness through sensor integration & adaptive learning.

## ADVANCED ANOMALY DETECTION



# PORT OPERATIONAL TECHNOLOGY ARCHITECTURE





# THE ROLE OF CYBERSECURITY IN SMART PORTS

The advanced digital transformation of port operations has brought complex vulnerabilities, making them prime targets for cyber threats, such as:

01 Unauthorized Access

02 Data Breaches & Interception

03 Ransomware Attacks

04 DDoS

Tackling these challenges requires a robust approach, integrating advanced & holistic cybersecurity strategies to achieve:

01 Critical Infrastructure Protection

02 Data Integrity & Confidentiality

03 Mitigation of Operational Disruptions

04 Stakeholder Trust

05 Preventing Cyber-Physical Threats

06 Compliance with Regulations



# BUILDING A HOLISITIC PORT CYBER DEFENSE

## PROTECT

Building security controls in alignment with applicable Regulatory norms/Standards and/or around the following: **Data, Applications, Infrastructure, and Identities.**

## DETECT

Fortifications through operation of carrying out 24X7 monitoring: To **detect attacks and suspicious activities and Alerts** provided

## RESPOND

The **Incident Response Teams** which **Swing into Action on Alerts**: From restricting to blocking to making changes in policies to enhance cyber security are ways to Respond

## RECOVER

- Restoring normalcy or **BAU after an incident** – which involves Forensics, RCA, Future Risk Mitigation and Prevention techniques.

## IMPORTANCE OF UNIFIED MARITIME SITUATIONAL AWARENESS



Canada's vast and complex maritime domain demands **centralized coordination across multiple jurisdictions**—from Arctic routes to the Pacific and Atlantic coasts.



**Fragmented traffic management and siloed sensor networks** increase response times, risk of collisions, and maritime blind spots.



A **nationally integrated VTMIS strategy** ensures efficient routing, safety, security, and sustainability across all regions and stakeholders.



## TITAN SENTINEL'S ROLE IN NATIONAL-LEVEL COORDINATION

A **shared operating picture** by integrating sensor data (AIS, radar, weather, CCTV, AtoN) into a single, intuitive interface.

Supports **multi-region coordination**, allowing for scalable expansion from regional ports to national command centers

**Predictive analytics and decision support tools** enable proactive management of high-traffic corridors and strategic chokepoints.

Enables **multi-agency collaboration** for real-time maritime operations, incident response, and policy enforcement.



## ENABLING AUTONOMOUS NAVIGATION

TITAN SENTINEL provides a **structured data environment** that autonomous vessels can interact with safely—via AIS, radar overlays, geo-fencing, and dynamic digital charts.

Its decision support engine integrates real-time inputs to issue **predictive alerts** and synchronize movements across port zones.

Supports human-in-the-loop operations while evolving toward **machine-autonomous coordination**.

*PREPARING TODAY'S PORTS FOR TOMORROW'S VESSELS*



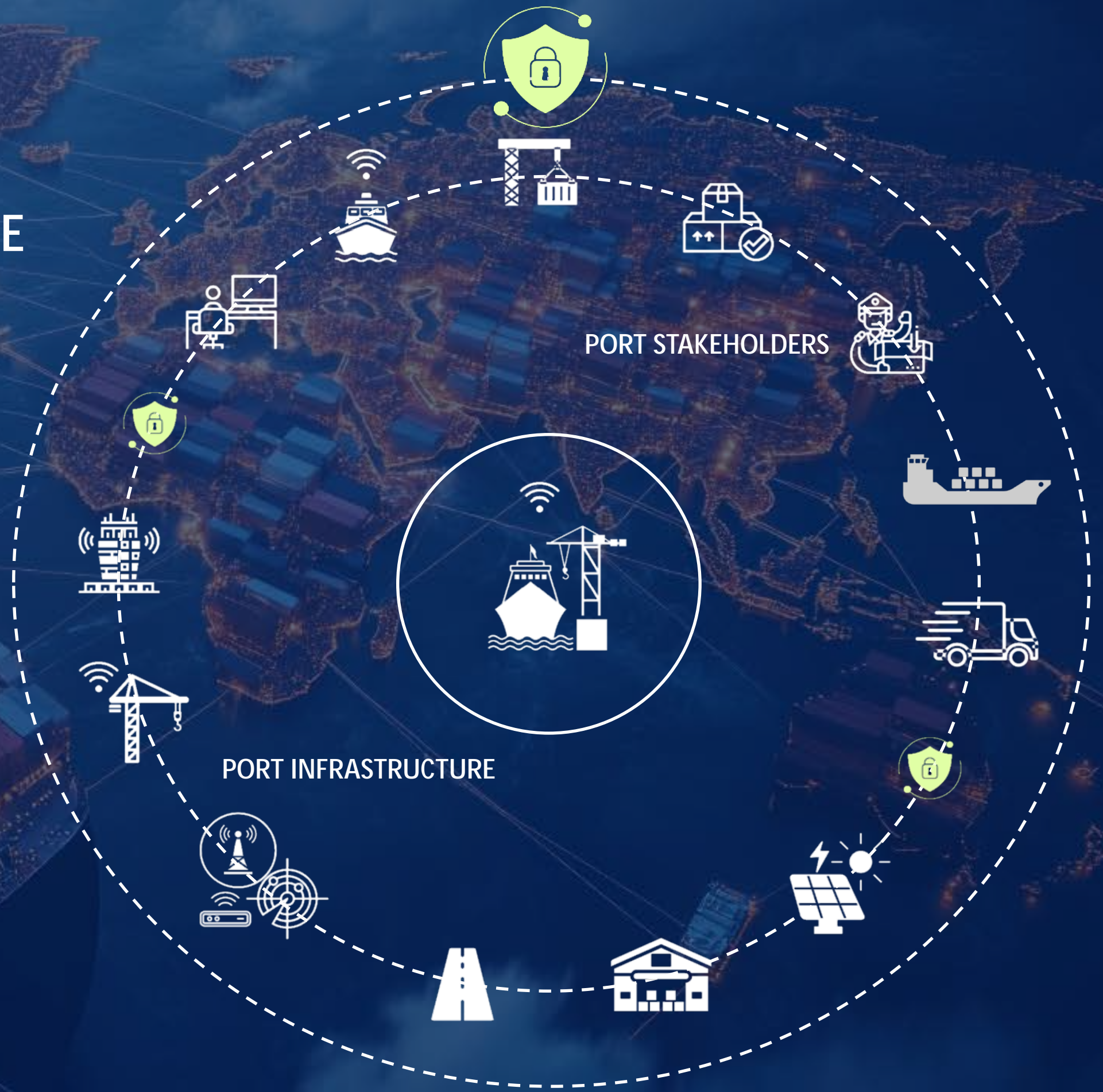
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# SECURING THE FUTURE OF GLOBAL TRADE

CREATING AN INTELLIGENT, ADAPTIVE & SECURE ENVIRONMENT FOCUSING ON SUSTAINABILITY, EFFICIENCY, AND ENHANCED STAKEHOLDER COLLABORATION.

THROUGH OUR AI POWERED VTMS & INTEGRATED PMIS SOLUTION,  
**TITAN SENTINEL PLATFORM.**

ACCELERATING PORT DIGITALISATION THROUGH INNOVATION.



# Q & A

THE TITAN SENTINEL ADVANTAGE:  
ENHANCING EFFICIENCY AND SECURITY IN A DIGITAL AGE



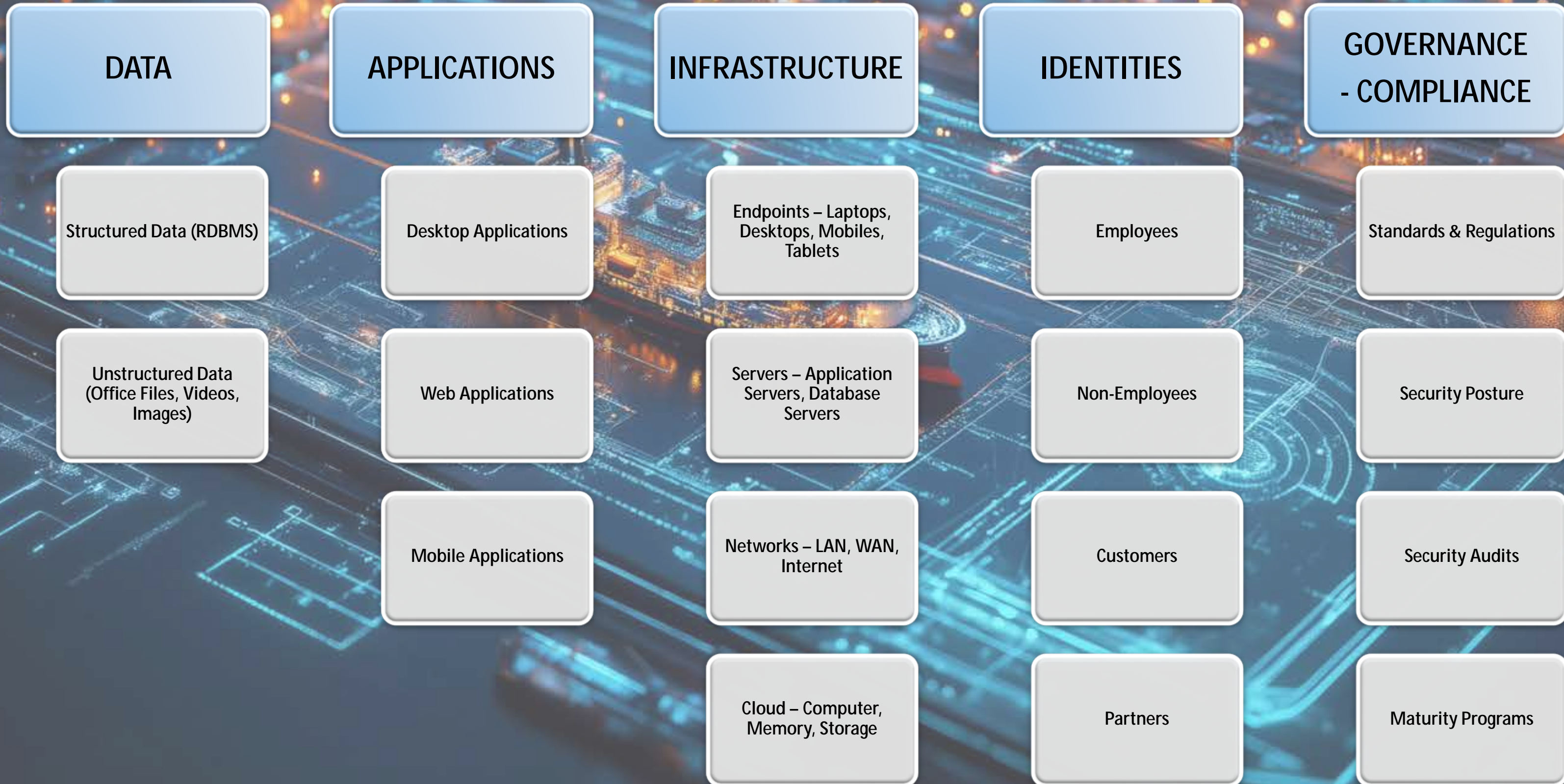
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Xanatos Marine Ltd



# LAYERED SECURITY





# BUILDING A HOLISITIC PORT CYBER DEFENSE

## ZERO TRUST NETWORK ARCHITECTURE

Implementing Zero Trust frameworks ensures that no device, user, or application within the network is trusted by default, regardless of its location

## PERIMETER SECURITY: THE HYBRID APPROACH

Leveraging both on-premises and cloud-based firewalls for a multi-layered, comprehensive security strategy

- Onboard Ships - using on-premises firewalls
- Cloud Integration for Ports & Fleet Management
- Offload Traffic Analysis to the Cloud with layered security of IDS/IPS.

## CONTINUOUS MONITORING

- DSPM – Data Security Posture Management
- CSPM Cloud Security Posture Management
- ASPM – Application Security Posture Management

## DATA SECURITY

- **Data Encryption, Masking, Tokenization:** Using strong encryption protocols (e.g., AES-256) to secure communication between IoT devices, systems, and stakeholders.
- **Data Leak Prevention**
- **Database Activity Monitoring** – Structured Data

## IDENTITY MANAGEMENT

- Identity Management – IGA
- Access Management – SSO & MFA
- PAM Privileged Access Management
- CIAM Consumer Identity & Access Management
- NERM Non Employee Risk Management

## INCIDENT RESPONSE & RECOVERY PLAN

- **Cyber Incident Response Plan:** Having a well-documented and tested incident response plan & redundancy measures in place to handle failover situations is critical.
- **Penetration Testing**
- **Ransomware-specific defenses** : such as data backups, sandboxing, and robust EDR solutions.

## THIRD PARTY RISK MANAGEMENT

Managing third-party risk by ensuring that vendors comply with rigorous cybersecurity standards & regulations is key.

## TRAINING & AWARENESS PROGRAMS

**Simulation and Training:** Conducting regular cybersecurity simulations and exercises involving staff across ports operations to prevent human error & to raise awareness to recognize and avoid common social engineering tactics.