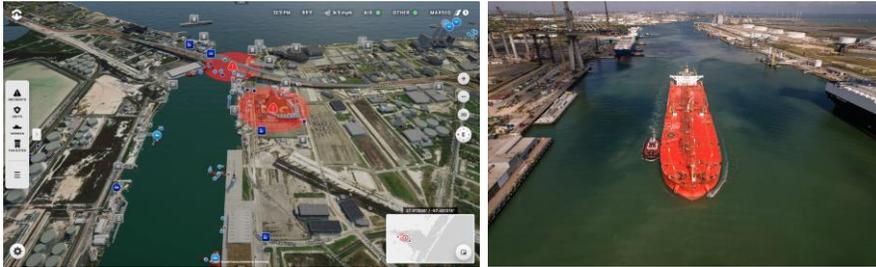




AAPA Lighthouse Award Project Highlight

OPTICS 3D Active Digital Twin



Port of Corpus Christi
Corpus Christi, TX

Project Overview

OPTICS 3D Active Digital Twin

Award Category: Excellence in Technology Solutions

Completion Date: 9/17/2025

Description: The Port of Corpus Christi Authority (PCCA) developed OPTICS (Overall Tactical Information Computer System), a 3D active digital twin, to transform security operations and incident response. Integrated with PCCA's enterprise GIS platform GeoPORT, OPTICS unifies real-time data from police dispatch systems, vessel tracking and infrastructure assets into a single location-based interface.

Goals:

- Provide comprehensive situational awareness with real-time in situ visualization
- Streamline decision-making for faster safer incident response
- Expand functionality to asset management, operations and commercial planning

Key Features:

- 3D modeling of fixed and movable assets using Esri GIS and Unity technology
- Real-time data integration from CAD, AIS and GIS sources
- Single-point access for security, operational and commercial systems

Impact:

In the short term, OPTICS improves response speed, safety and tactical decision-making for PCCA security teams. Long term, it sets a new benchmark for digital twin technology in the maritime sector, supporting operational efficiency, asset management, and future innovation for public port authorities nationwide.

Inspiration

The PCCA team was driven by the need to overcome the complexity and inefficiency of managing multiple, independent data systems during real-time incident response. Before OPTICS, dispatchers and field officers had to interpret fragmented streams of information — vessel tracking, security alerts, infrastructure data — across different platforms, slowing down decision-making when speed and accuracy were critical.

The vision was to create a single, integrated platform capable of unifying all these data sources into a real-time, three-dimensional view of port operations. By combining video gaming technology, machine learning and geospatial intelligence, the team wanted to give security personnel and first responders comprehensive situational awareness that would dramatically improve safety, response times, and coordination.

The team's ambition extended beyond security alone. From the start, the goal was to build a tool that could expand into asset management, operational planning, and even commercial decision-making while also enabling collaboration with partners like the U.S. Coast Guard. The project was fueled by a desire to modernize maritime technology, set a new industry benchmark, and demonstrate what's possible when cutting-edge visualization and predictive analytics meet port operations.

Challenges

The Port of Corpus Christi Authority (PCCA) faced major challenges integrating diverse data streams — including GIS base layers, CAD incident data and AIS vessel tracking — into a single real-time platform while ensuring strict cybersecurity standards, accurate 3D visualization, and scalability for future enhancements like live camera feeds and partner integrations. The team overcame these hurdles by leveraging Esri GIS software, Unity technology, and existing dispatch systems to create a unified platform with layered encryption, role-based access controls, and machine learning for predictive vessel tracking. Custom GIS water layers and careful system architecture allowed for realistic visualization and easy expansion while meticulous documentation ensured OPTICS could serve as a replicable model for other ports.

Lessons Learned

The OPTICS project taught PCCA the value of designing with scalability in mind, unifying data sources for faster decision-making, and embedding cybersecurity measures early to protect sensitive information. Leveraging innovative technologies like gaming visualization, machine learning, and custom GIS layers proved essential for realistic real-time insights. Finally, meticulous documentation of processes and lessons learned ensures other ports can replicate and adapt the system efficiently, reducing cost and complexity.

Value

PCCA takes pride in OPTICS because it represents a breakthrough in maritime innovation, bringing together diverse data streams and technologies to create a single powerful platform for real-time situational awareness. By achieving a major leap in security efficiency, safety and vessel tracking — including the use of artificial intelligence to eliminate data lags — OPTICS has transformed how the Port responds to incidents and manages its operations. The project not only sets a new standard for digital integration in the maritime industry but also reflects PCCA's commitment to sharing knowledge so other ports can benefit from its success, amplifying the impact well beyond the Coastal Bend region.

Quotes

"The ability to have instantaneous, comprehensive situational awareness and threat assessments is of the highest value. The availability of accurate, virtual visualization of real-world events allows us to right-size our response and refine tactics in real time, translating into enhanced efficiency and safety

for our most valuable asset—our people—when we ask them to act on behalf of PCCA.”

— Mark Gutierrez, Director of Security

“The extent that the Executive Team becomes the policy team under our Incident Management Command Structure, affording us real-time, in situ points of view translates directly to more informed, more involved, and ultimately more effective decision making.”

— Jeff Pollack, Chief Strategy Officer

Additional Information

N/A

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Resources

OPTICS 3D Active Digital Twin Demo Video

<https://taa.io/img/optics-hero-1080.mp4>