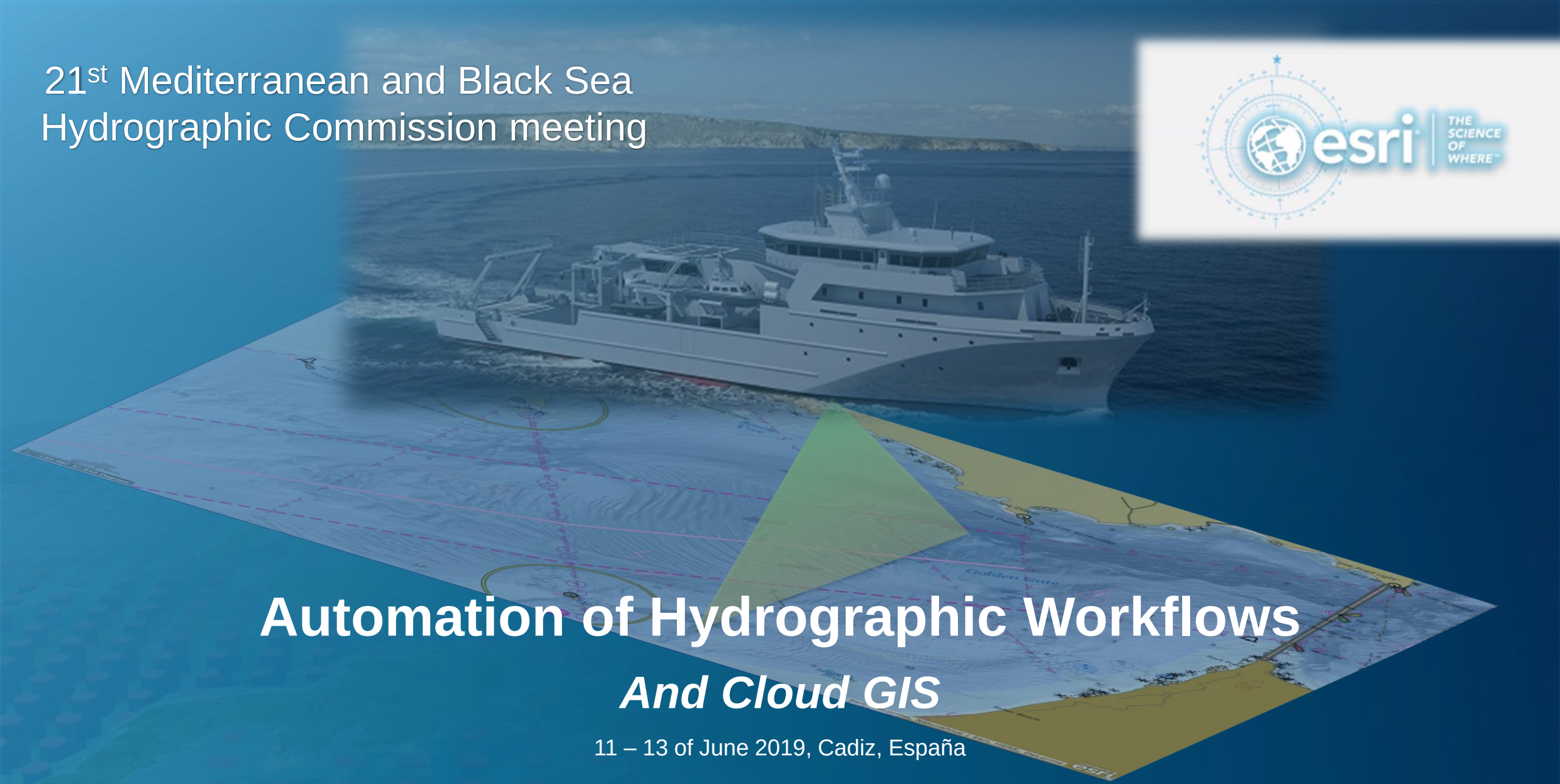
21st Mediterranean and Black Sea Hydrographic Commission meeting



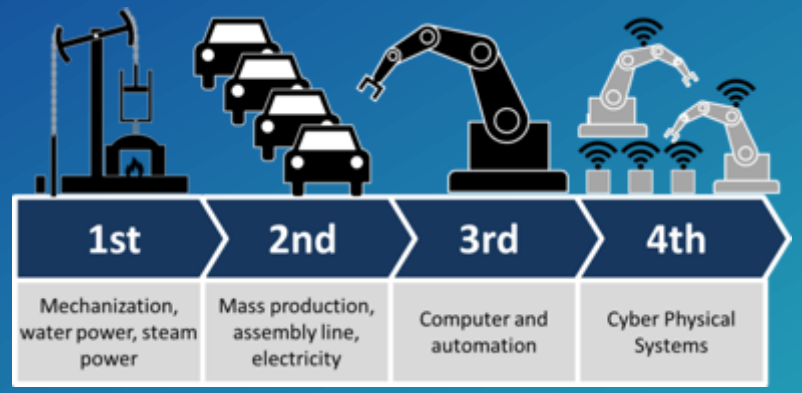
Automation of Hydrographic Workflows

And Cloud GIS

11 – 13 of June 2019, Cadiz, España

Rafael Ponce

How technology is changing our lives:
The Fourth Industrial revolution



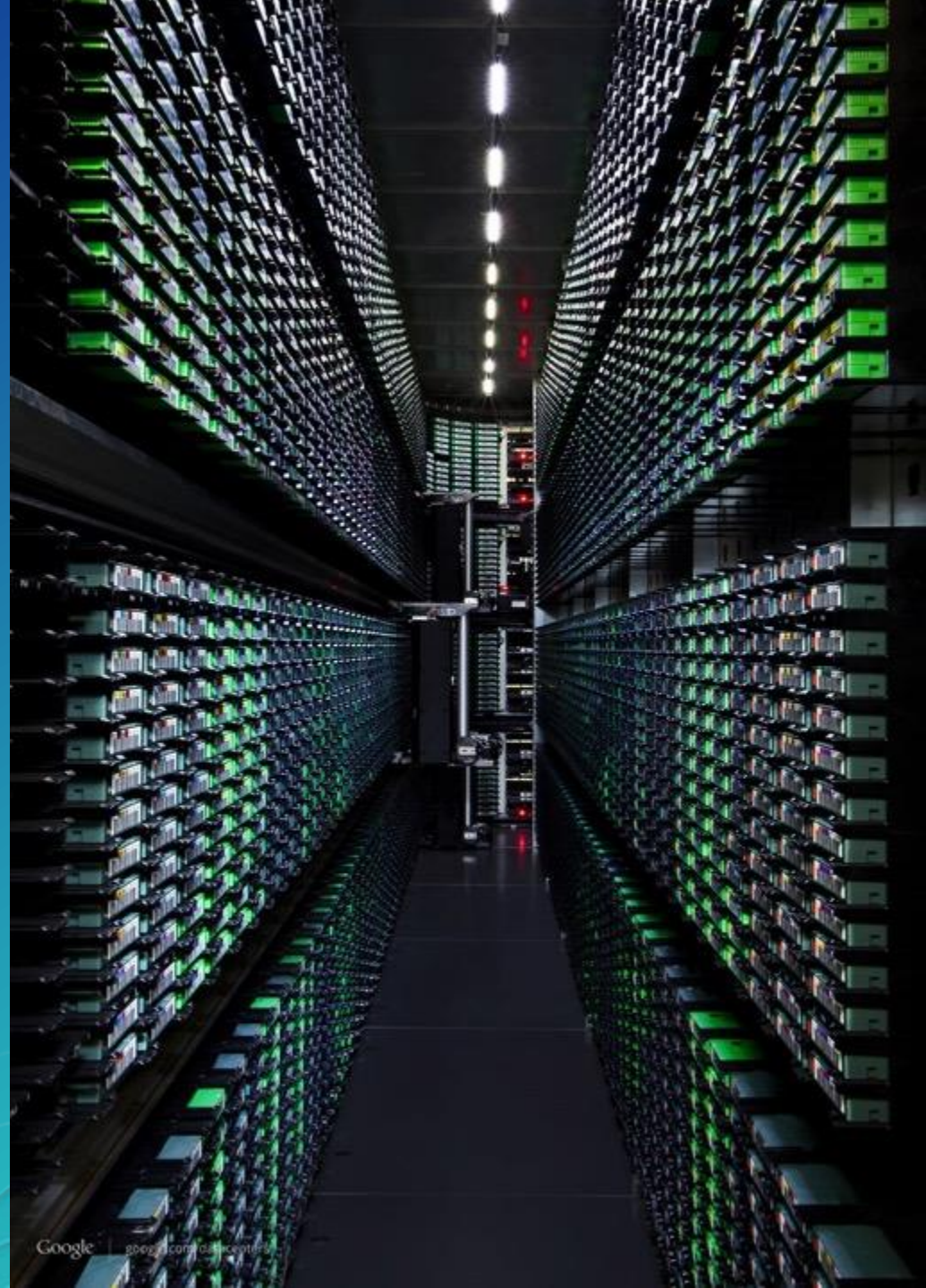
- Lineal Growth vs Exponential growth
- We can't use the past to predict the future
- Change is accelerating
  - Faster changes in the next 50 years than in the past few hundred
  - a new "Seaconomics" era
  - GDP and cargo volumes are decoupled
- Biotech, Cybertech, Robotics and AI – interconnectivity and interdependence
- Smartphones, Web, the Internet of Things and ancillaries are crucial to our networked lives
- Change creates new opportunities – new technologies
- A Digital Vision → powered by Data (in time and space)

What people want?

- **Quick and easy apps**
- **Don’t want to waste much time looking for an answer**
- **To use whatever data is available**
- **Free Data or pay the minimum possible**
- **Reliable information**
- **Shareable information**
- **To combine data for their own needs**
- **S-57 data**

Key IT technological factors

- Big Data
  - Volume, Velocity and Variety
- Internet of Things (IoT)
- Artificial Intelligence (AI)
  - Deep Learning
- Augmented Reality



The shipping industry:
Maritime Autonomous Surface Ships (MASS)

Fast developments
around the world

Bigger, more efficient, more complex: new machine readable products

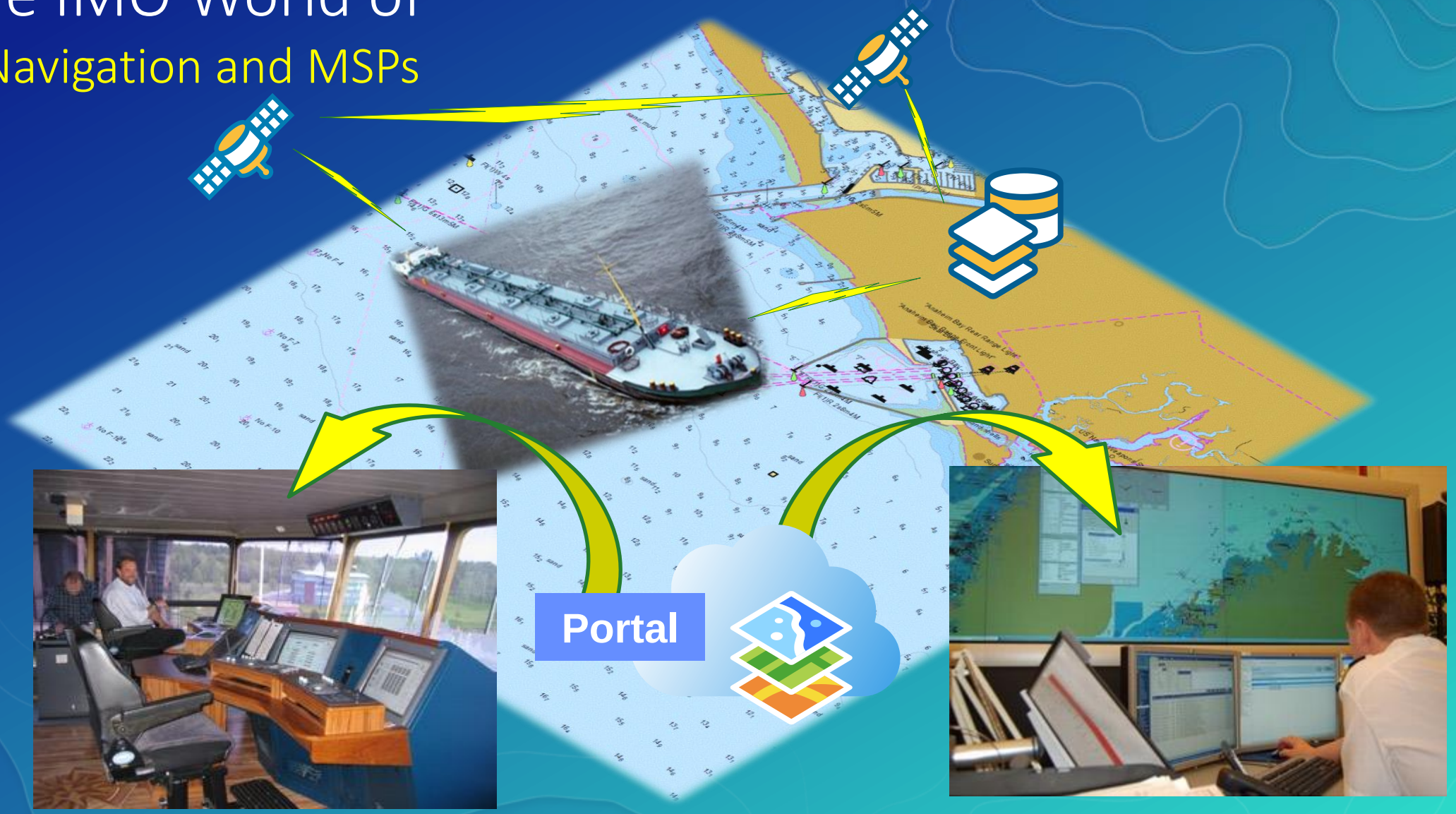
Smart Ports

More Automation!

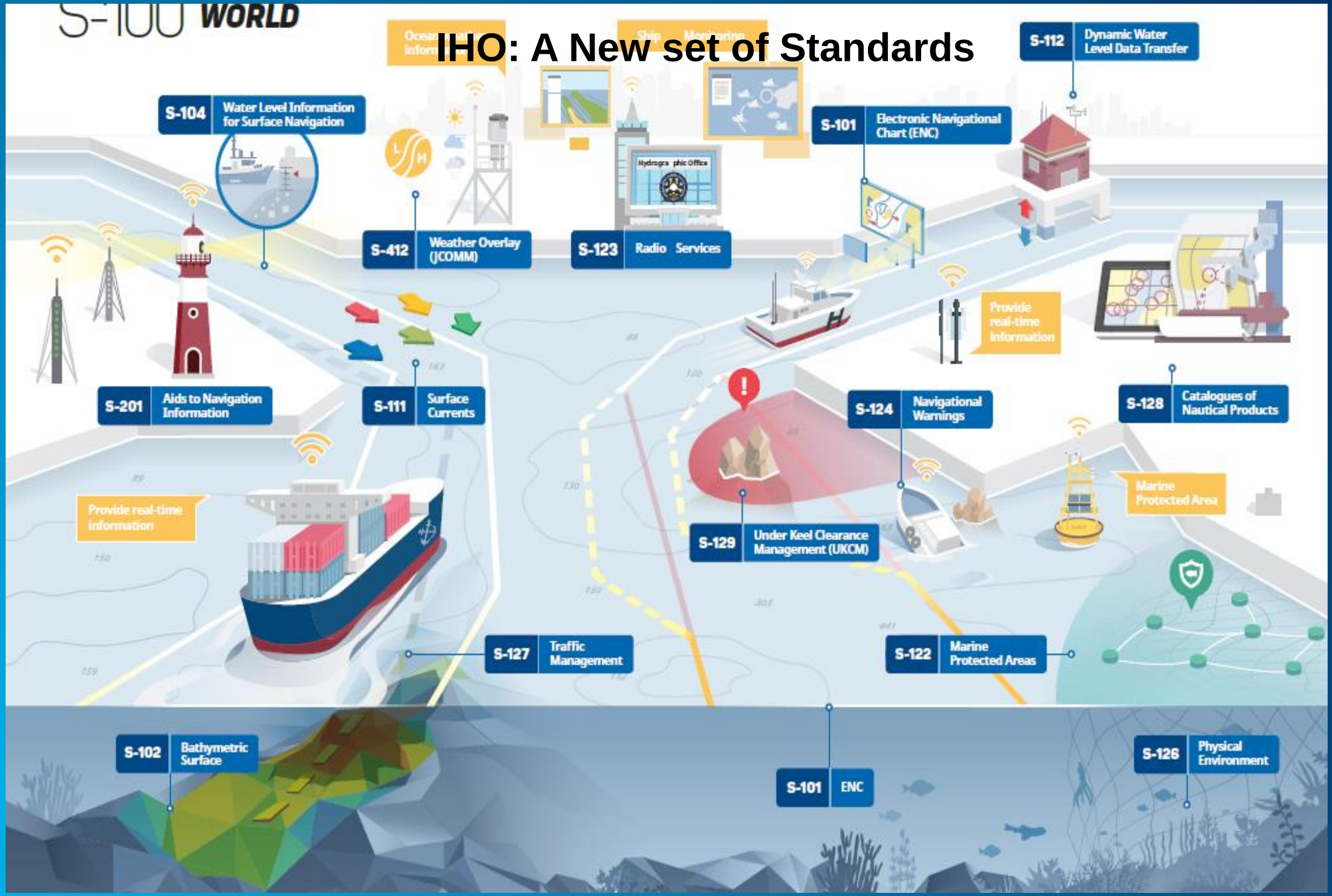
- Maasvlakte2 terminal in the Port of Rotterdam
- Unmanned electric Automated Guided Vehicles (AGVs)
- 80% of automated cranes
- The rest remotely operated

The IMO World of

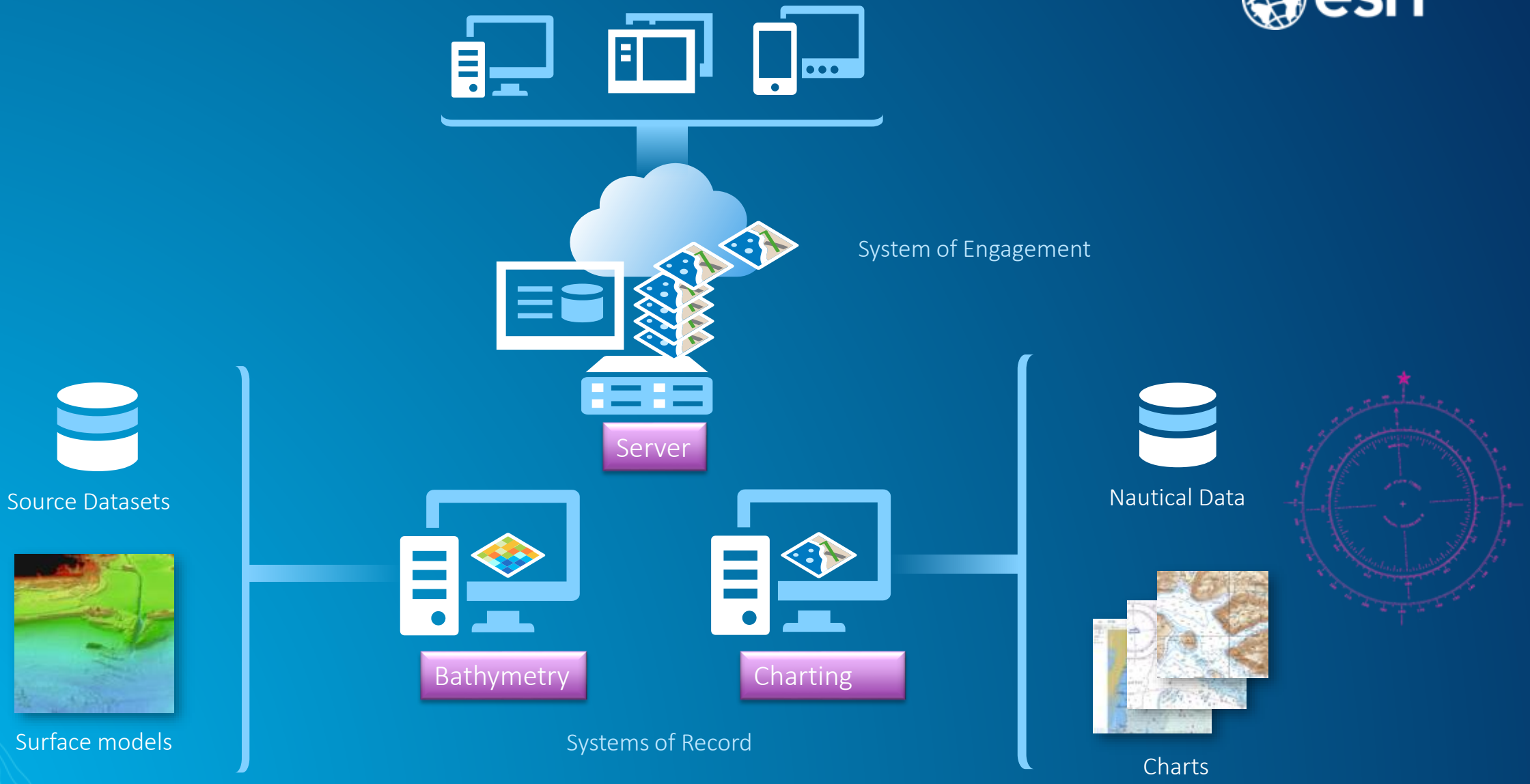
E-Navigation and MSPs



IHO: A New set of Standards

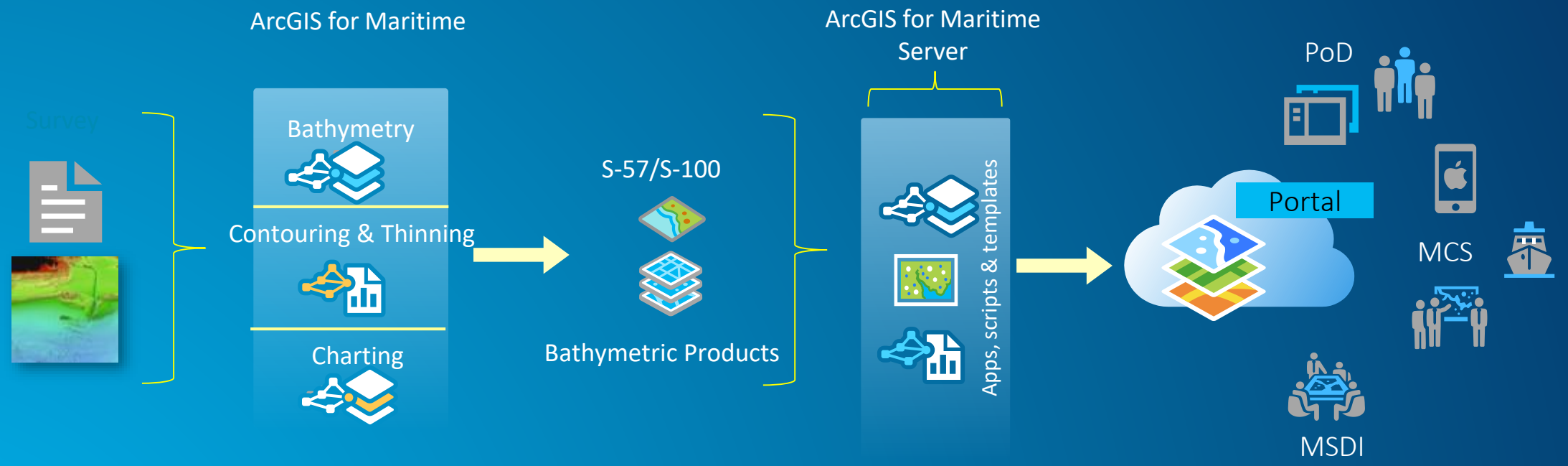


To be prepared with the right technology



The ArcGIS for Maritime Platform

A streamlined workflow



Automation

ArcGIS for Maritime: Charting

All the necessary Hydrographic Standards and more

- S-57
  - AML - 1.0, 2.1, 3.0
  - ENC
  - IENC 2.3 (2.4 in 2018)
- DNC
- TOD

- Raster
- S-4 (INT1 and INT2)
- S-52
- S-58 (v6.0.0)
- S-100 - ArcGIS Pro
- S-63

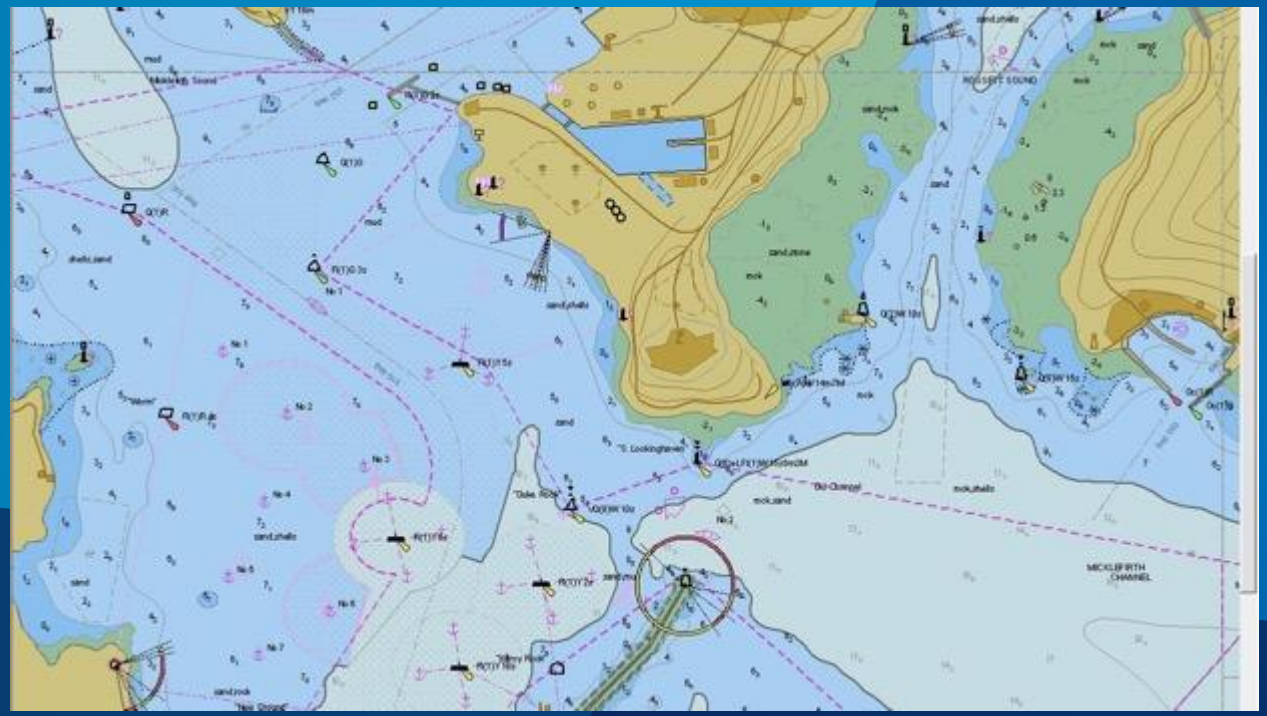
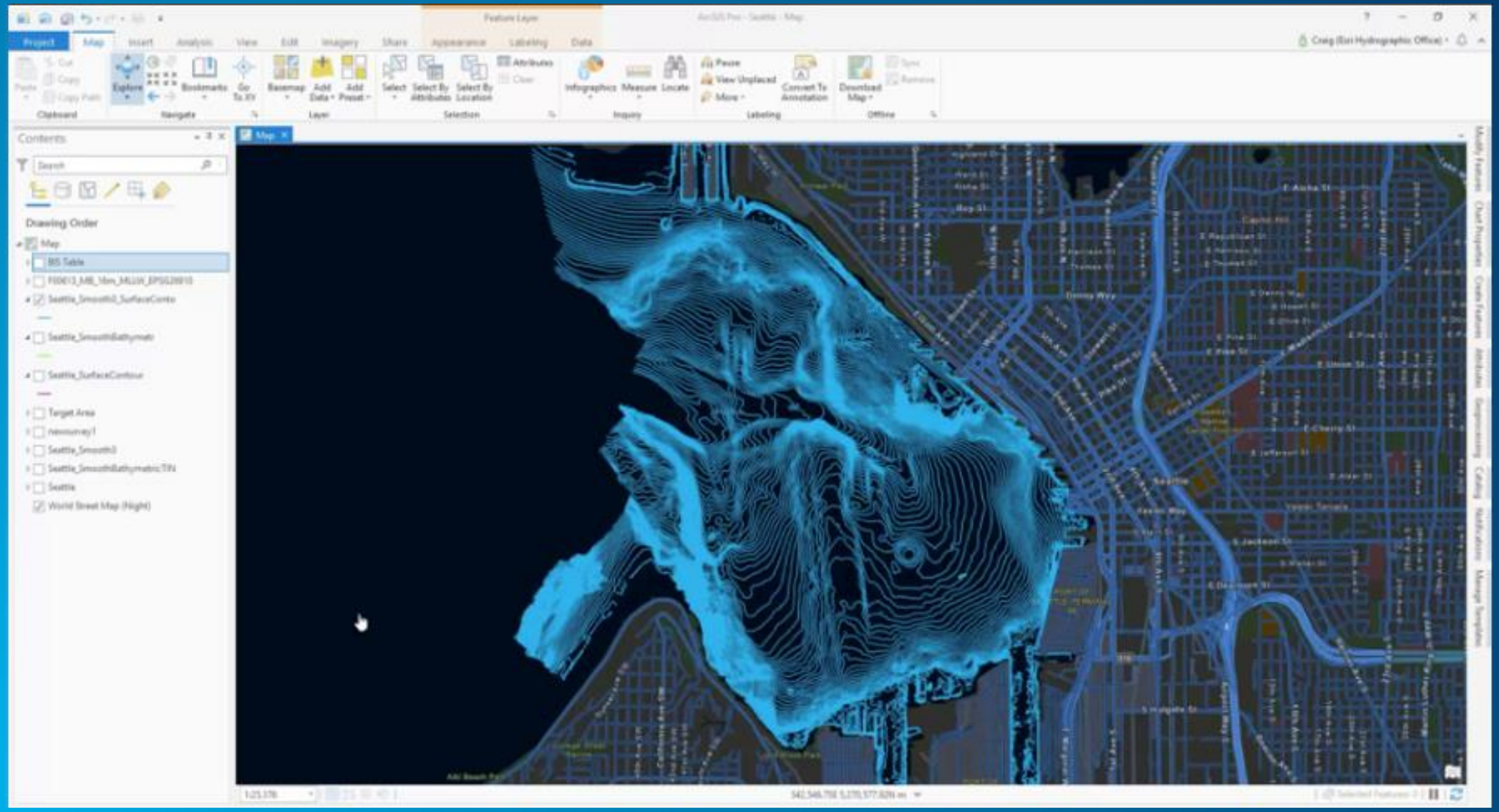


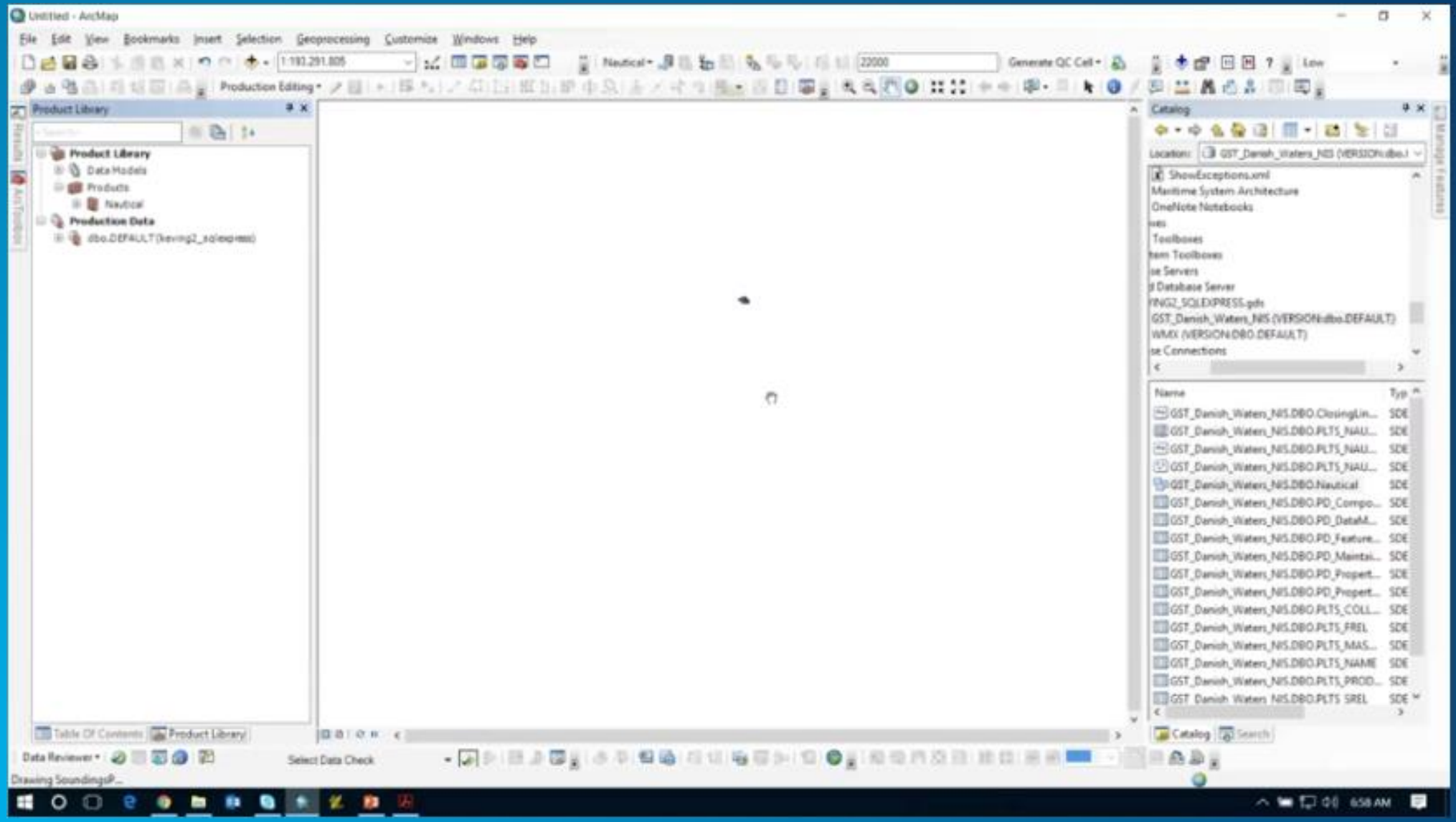
Chart Production

Manual work is a thing of the past

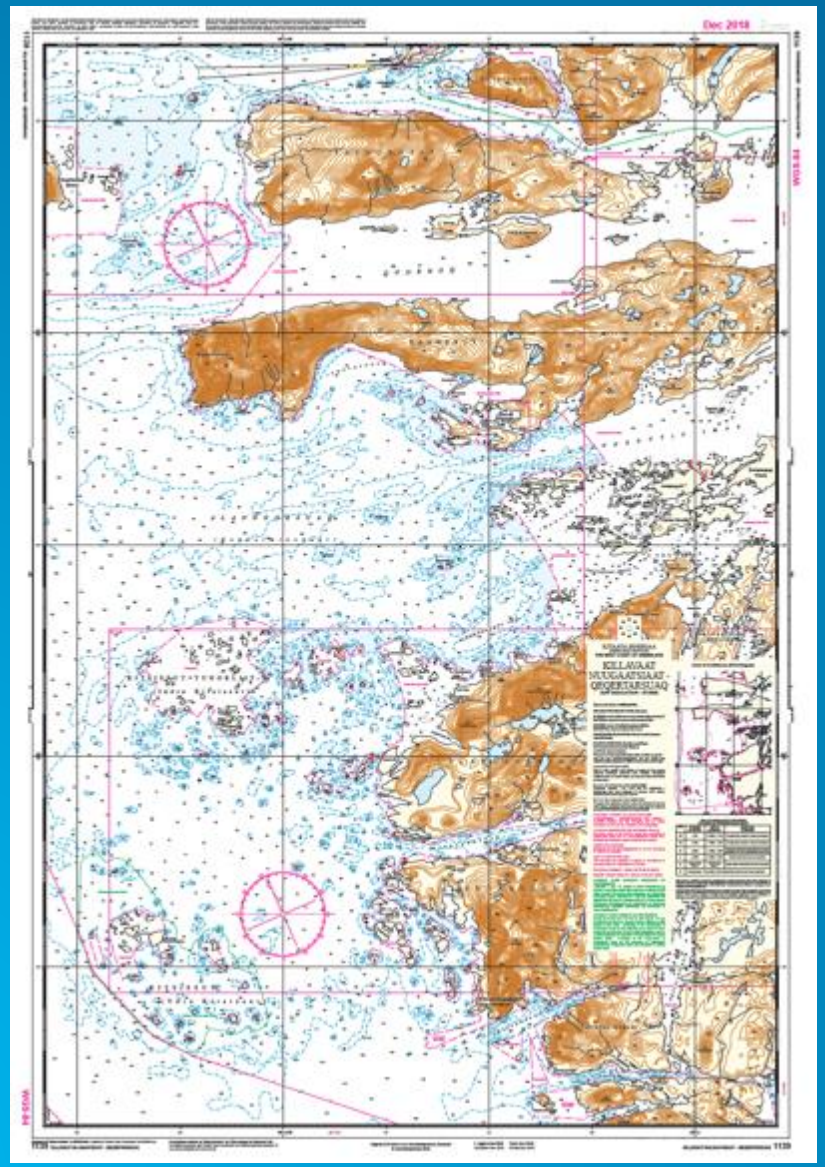
Automated Smoothing and Contouring

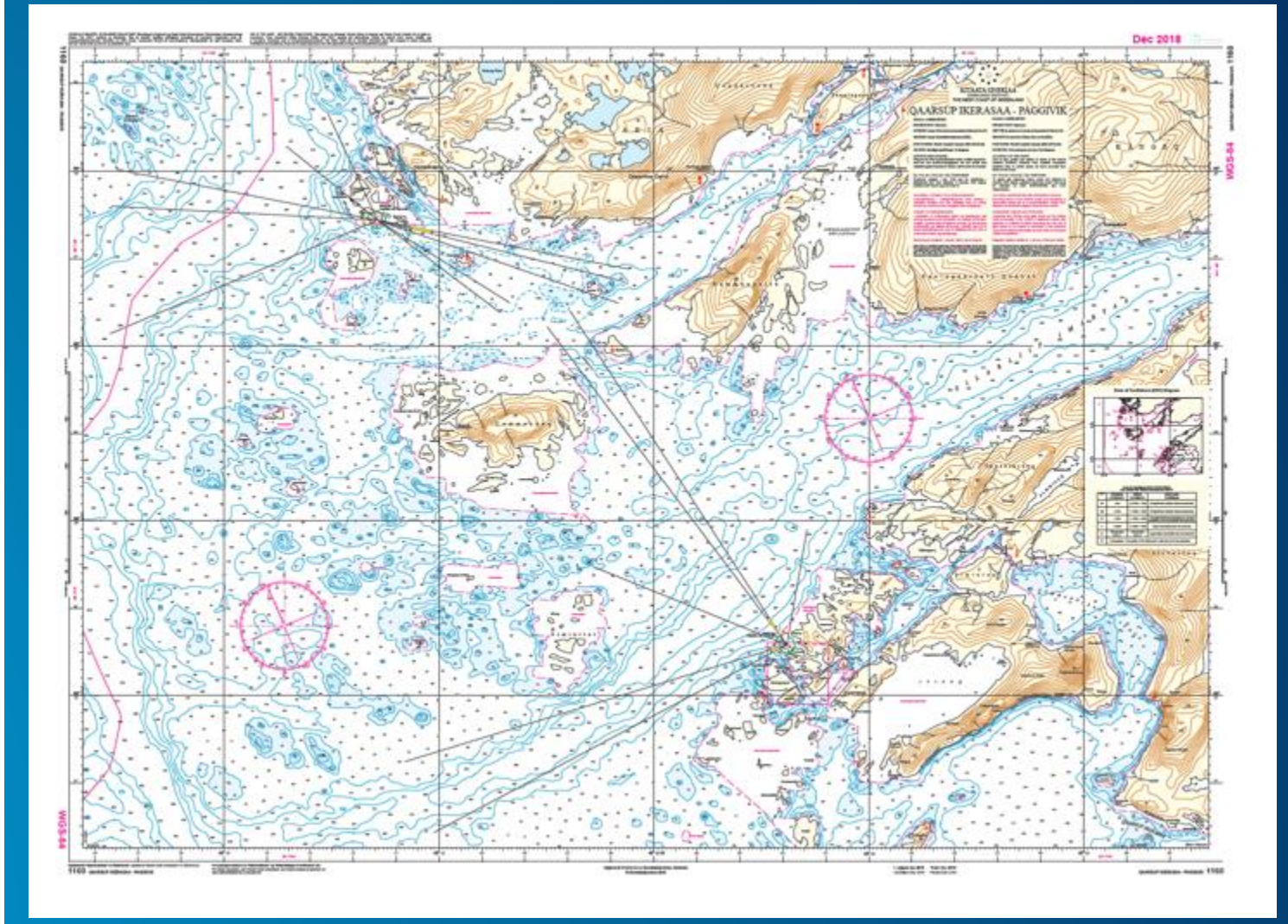


ArcGIS for Maritime: Chart Automation Tool (CAT)



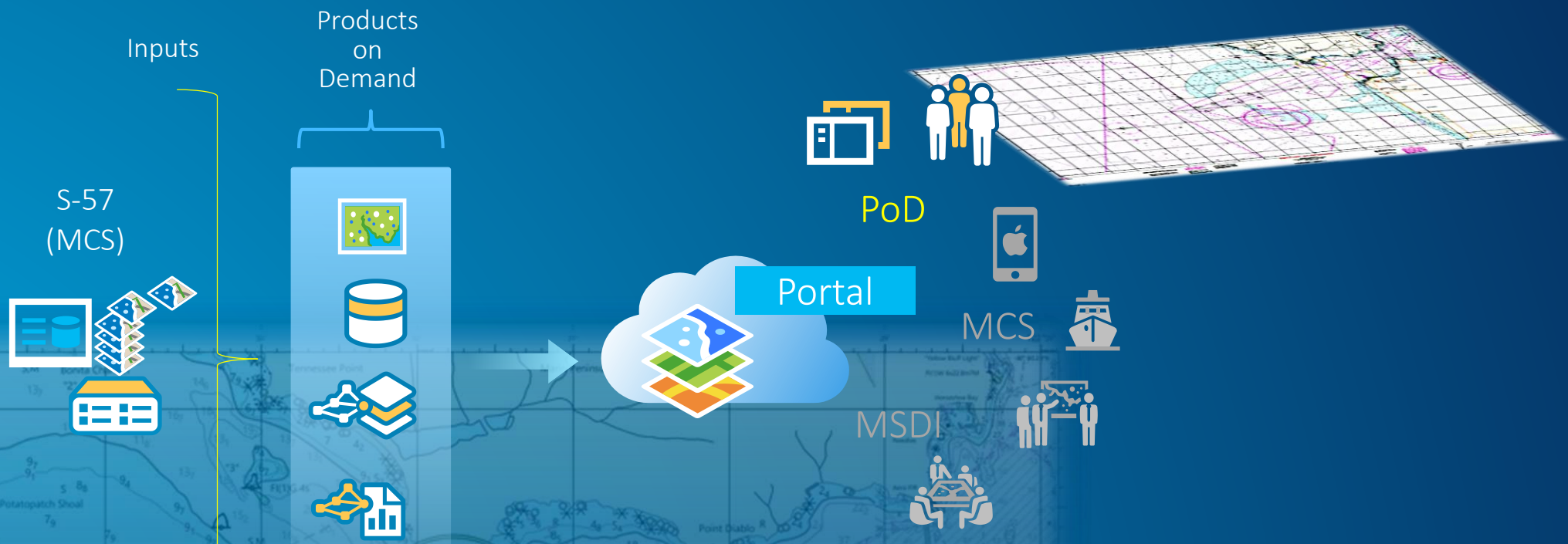
Examples of 70% Automation at GST in Denmark





Thinking outside the box: Products on Demand (not printing on demand)

Overview



ArcGIS for Maritime: Charting

Old vs New way of Chart Production

Traditional Paper Chart production

Modern Chart production

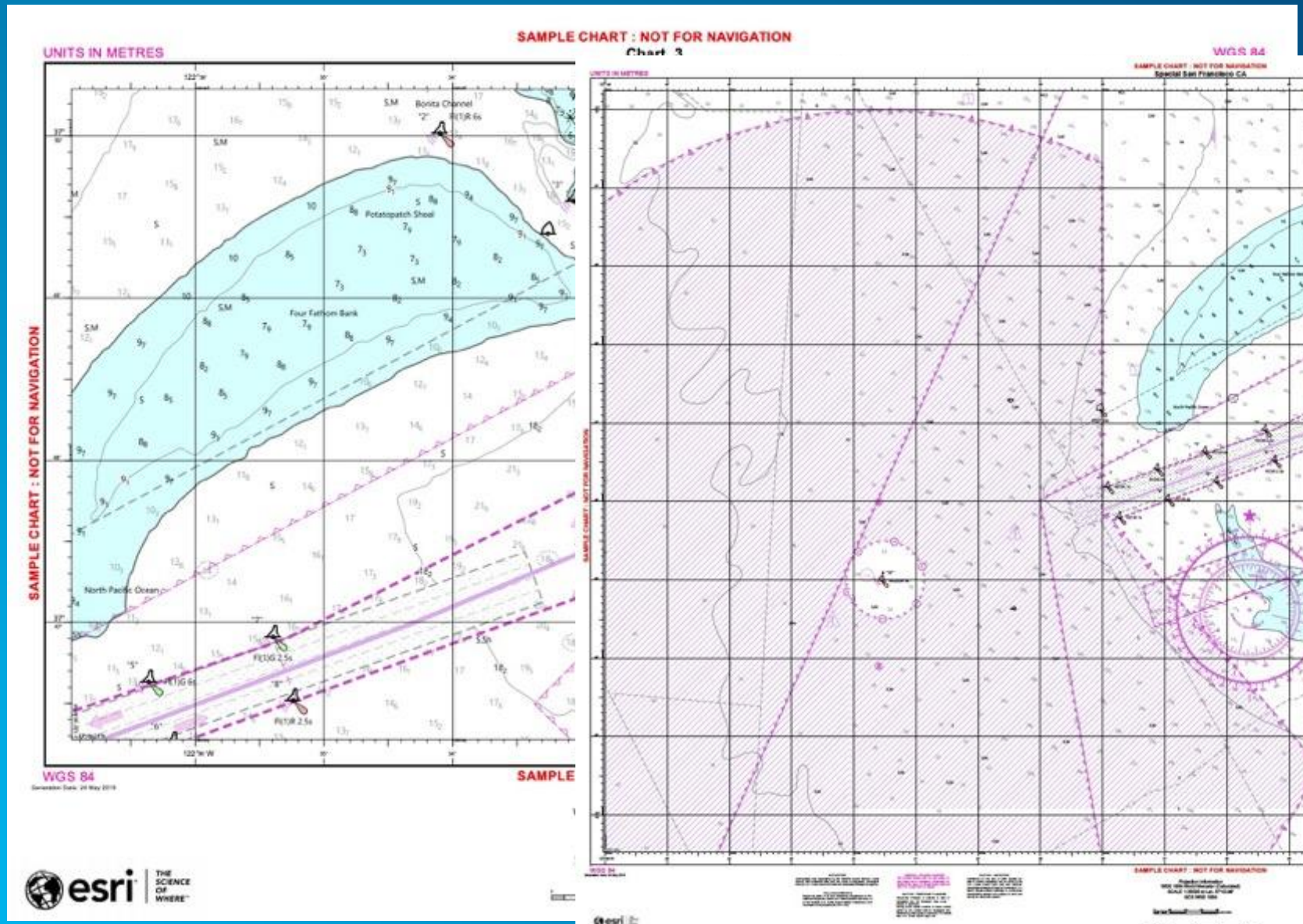
The esri way: POD

Production on Demand

The F1 of Chart making

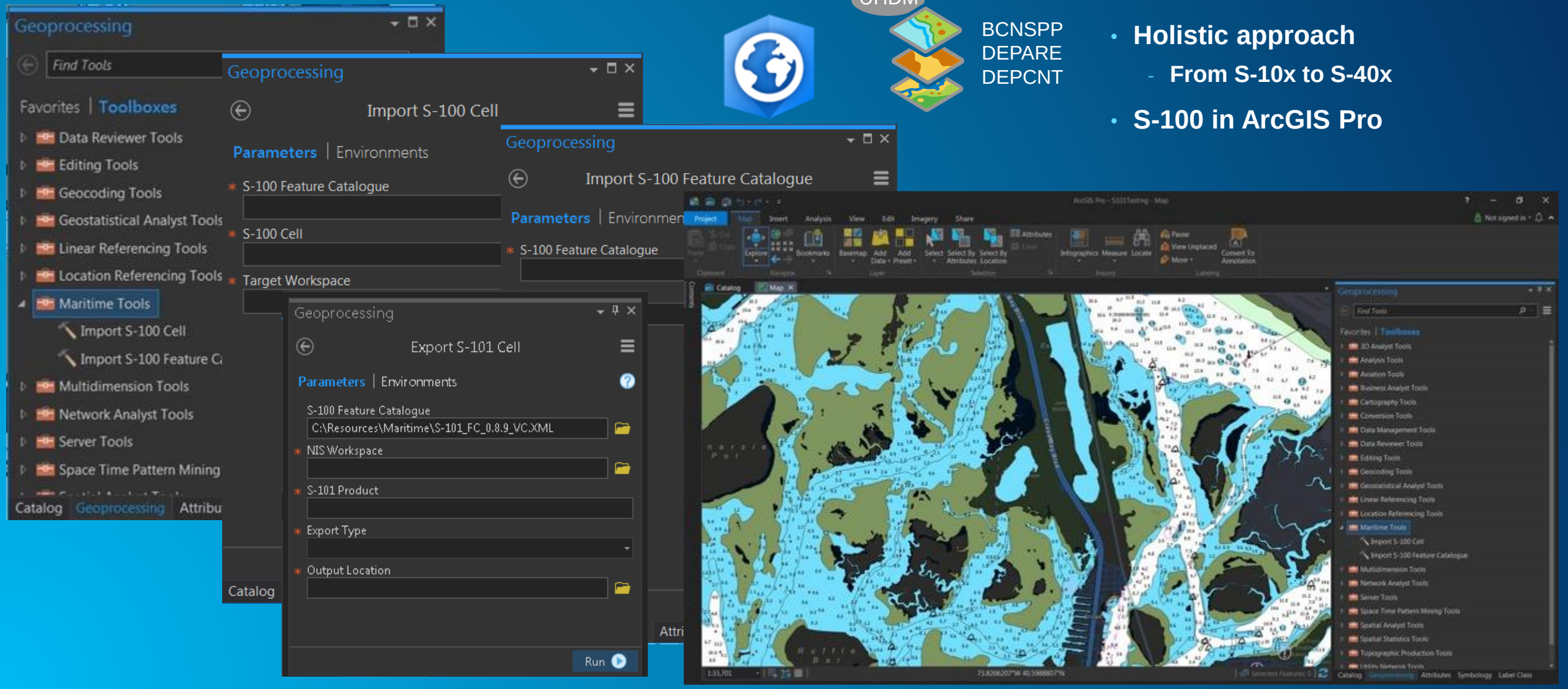
http://chartondemand.esri.com/ipod/#

100% Automation with POD



The Future

The Universal Hydrographic Data Model S-100

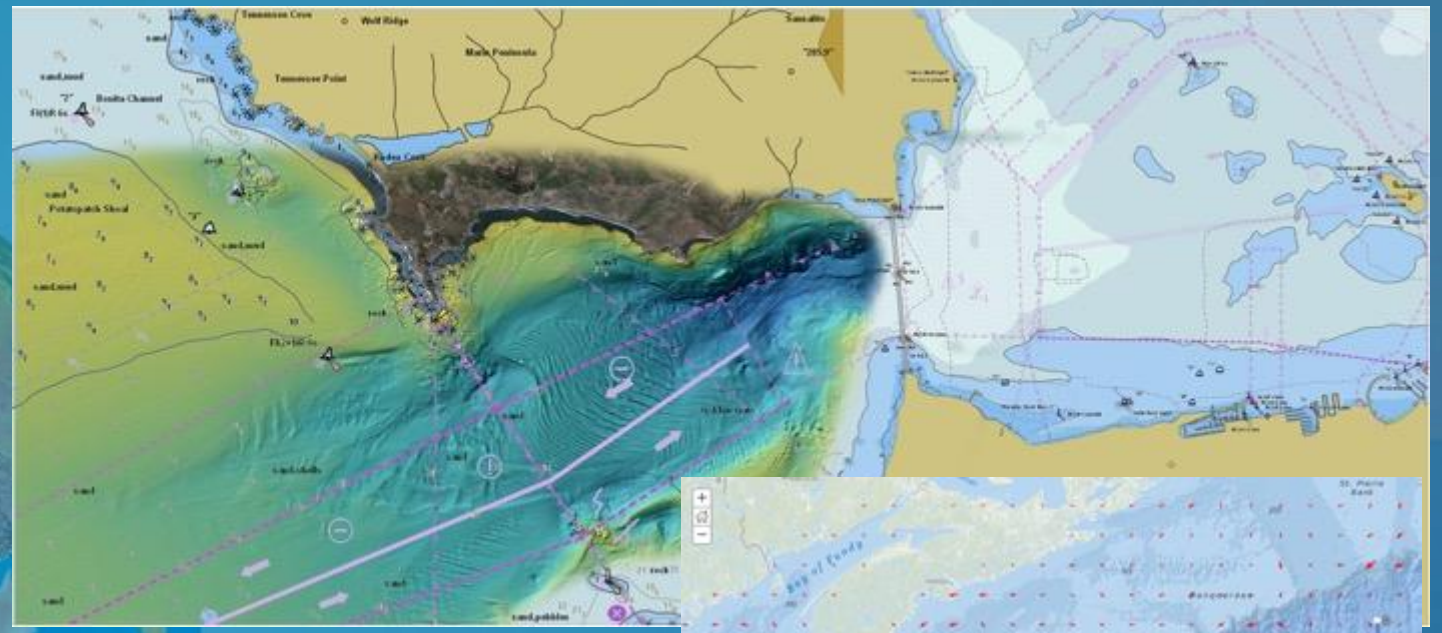


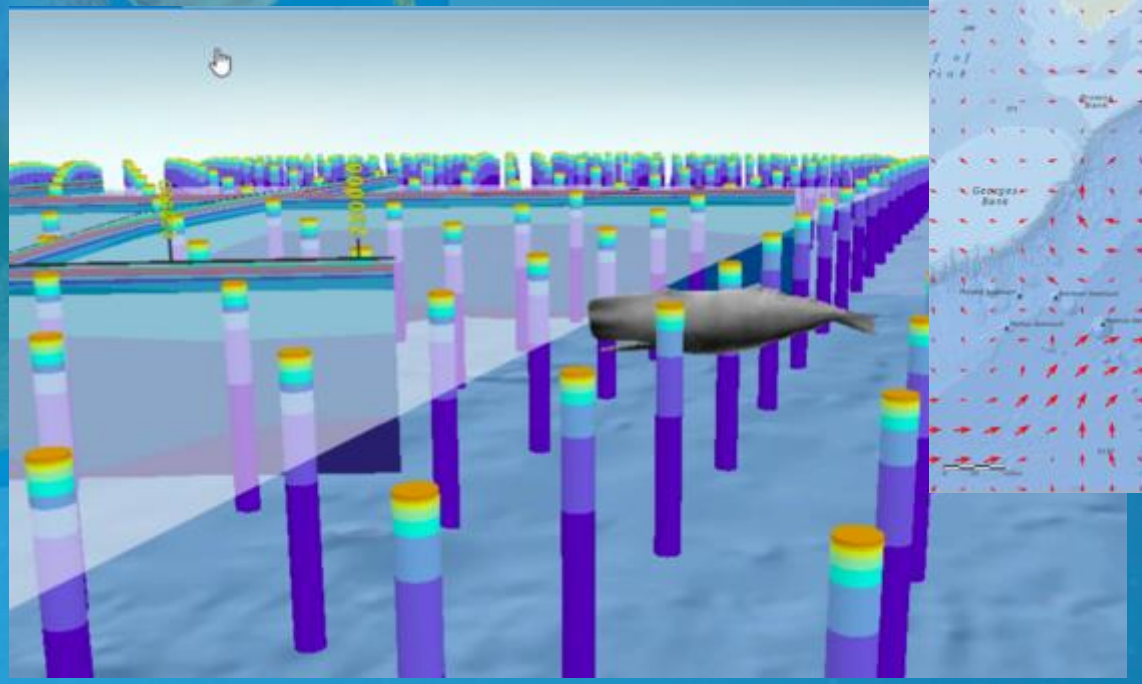
- New set of standards
- From S-57 to S-101
- Holistic approach
  - From S-10x to S-40x
- S-100 in ArcGIS Pro

The ArcGIS platform

Technology beyond Charting

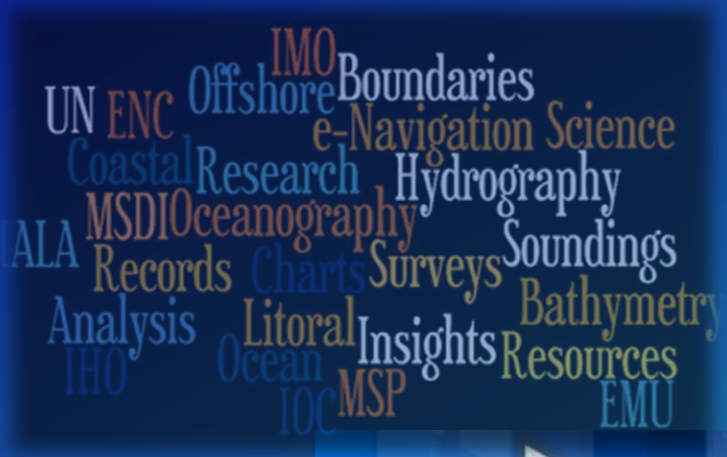
- Oceanographic Information at you fingertips
  - ArcGIS Living Atlas of the World
- HYCOOM – Ocean Currents
- EMUs
- A Universe of Data

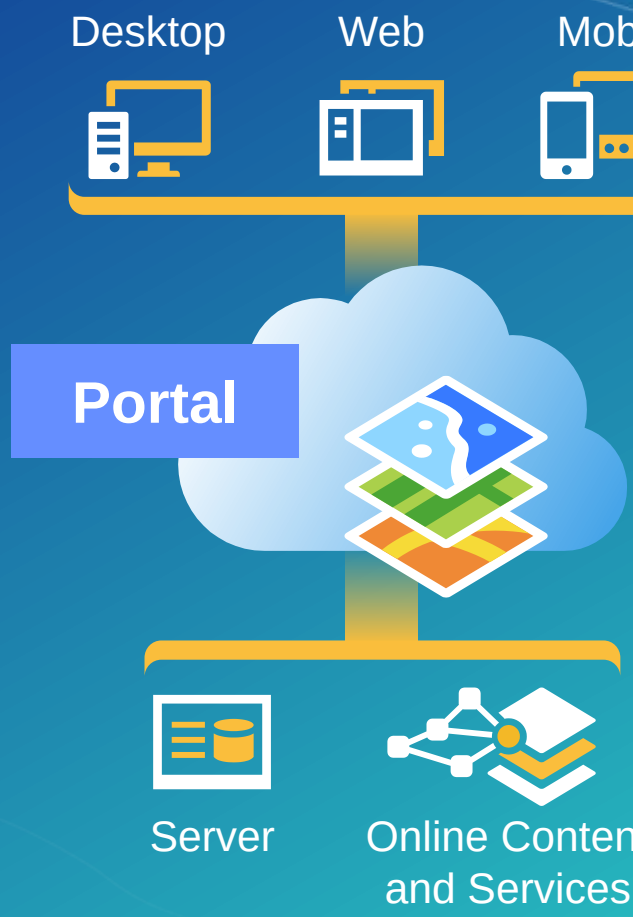




The Esri's Geospatial Cloud

Geospatial technology at the foundation of MSDI





- System of Records
- System of Engagement
- System of Insights

Services
- Historical
- Now cast
- Forecast

At all levels of the organization

Apps

Internal

Desktop

APIs

Geospatial Cloud

External

Sharing and Collaboration (Hybrid)

System of Insights

System of Engagement

Management, Production and Publishing

Hydrography

Oceanography

Meteorology

System of Records

From Production to a Dissemination Strategy

The Concept in action:
NOAA PORTS: Physical Oceanographic Real-Time System

NOAA CO-OPS PORTS

Physical Oceanographic Real-Time System®

Have you ever wondered how that new pair of tennis shoes arrived at your door? Or how those bananas got to your grocery store? Maybe you just bought a brand new car. How did it get here?

The U.S. marine transportation system consists of more than 25,000 miles of navigable waters and is the backbone for the movement of goods, services, and people throughout the nation and abroad. Huge cargo ships transport goods through different ports across the country, but how do ship operators know if they can fit under bridges or through narrow channels safely? These ships use real time information provided by NOAA's Physical Oceanographic Real-Time System® (PORTS®) to make it happen! Find out more about how water level and other oceanographic data are critical for maritime commerce, economic efficiency, and coastal resource protection below.

PORTS® is an Information System

To assist mariners, NOAA's Center for Operational Oceanographic Products and Services (CO-OPS), part of the National Ocean Service, developed the Physical Oceanographic Real-Time System (PORTS®), a robust integrated real-time information system that provides them with a comprehensive situational awareness of the operating environment, enabling the best safety and operational decisions. Through a partnership with CO-OPS and it's users, PORTS® delivers accurate and reliable environmental observations to users in over 25 of the nation's major ports and is a critical decision support tool for maritime commerce and coastal resource management.

About PORTS®

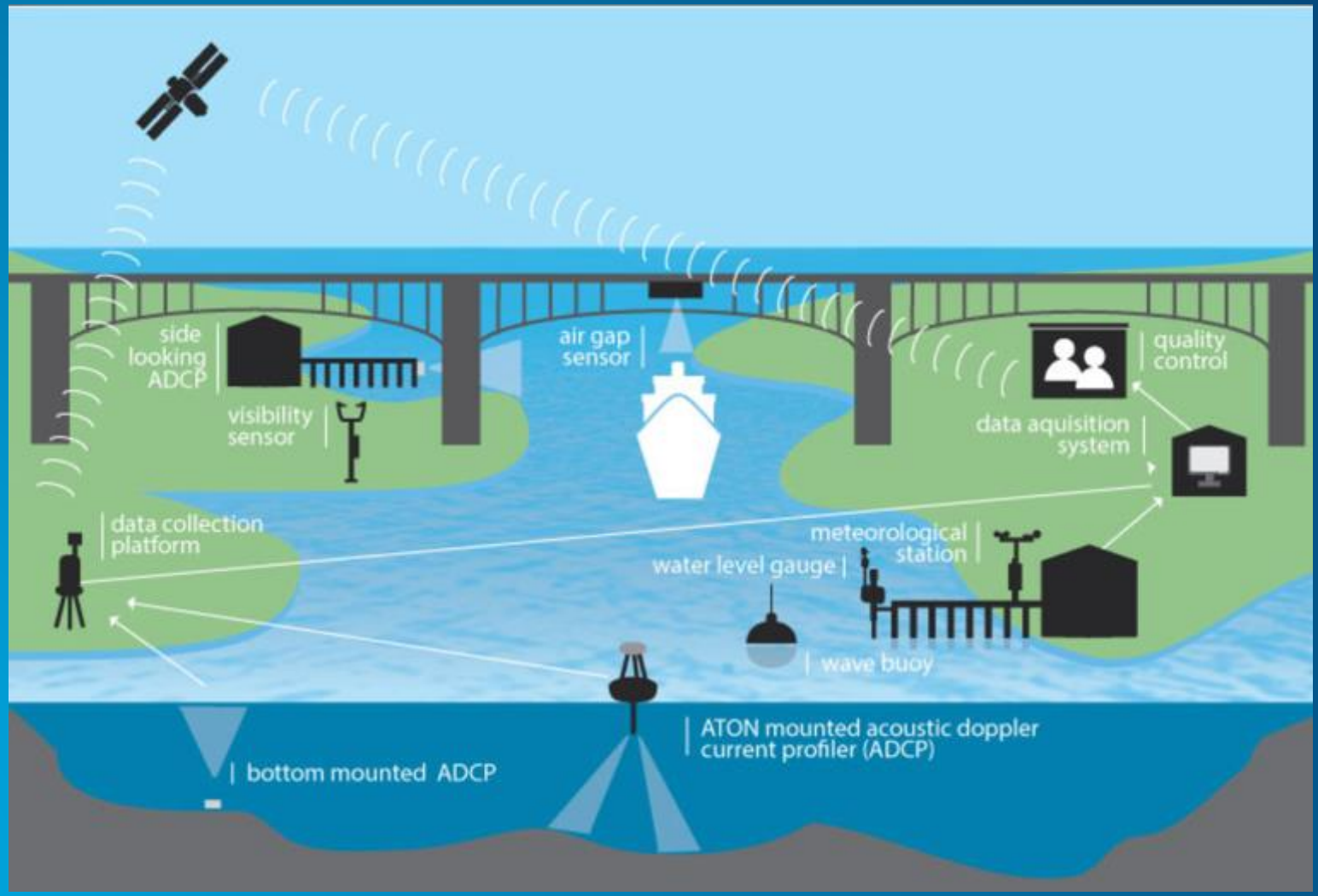
PORTS® sensors measure oceanographic and meteorological conditions, such as water levels, currents, salinity, wind, and bridge clearance. Each integrated system of sensors, concentrated in seaports, is tailored to the specific needs of the local community. PORTS® systems come in a variety of sizes and configurations, each specifically designed to meet local user requirements. The largest of the existing PORTS® installations is comprised of over 50 separate sensors; the smallest consists of a single water level gauge and meteorological instruments to measure winds, air temperature, barometric pressure, etc.

Navigation

PORTS® offers local communities and pilots multiple ways to successfully guide ships into and out of the nation's ports to ensure safe navigation. PORTS® measures water

https://arcg.is/1v14Dn

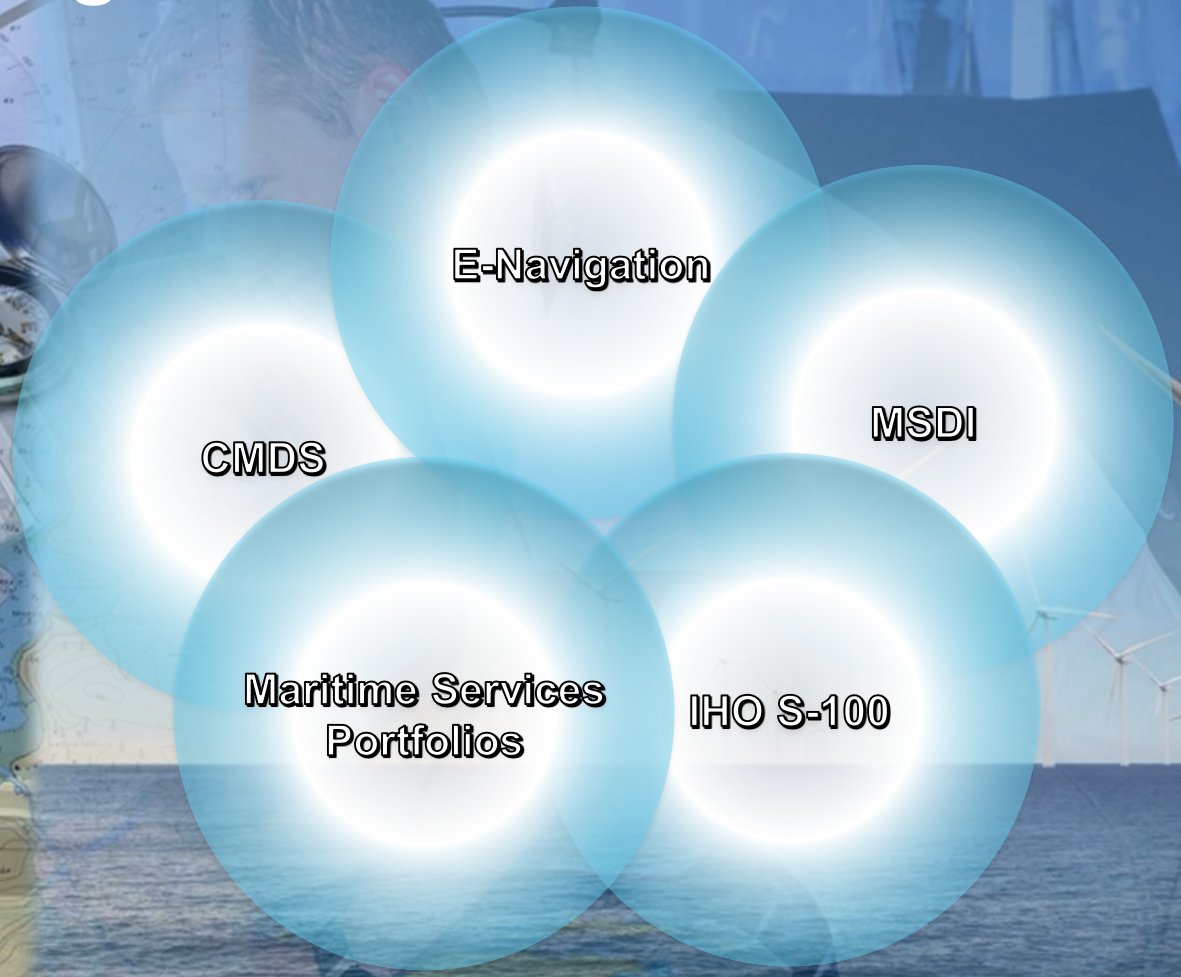
NOAA CO-OPS PORTS



Air Gap technology

Image by Korea Hydrographic and Oceanographic Agency (KHOA)

They all come together for the future of Maritime…



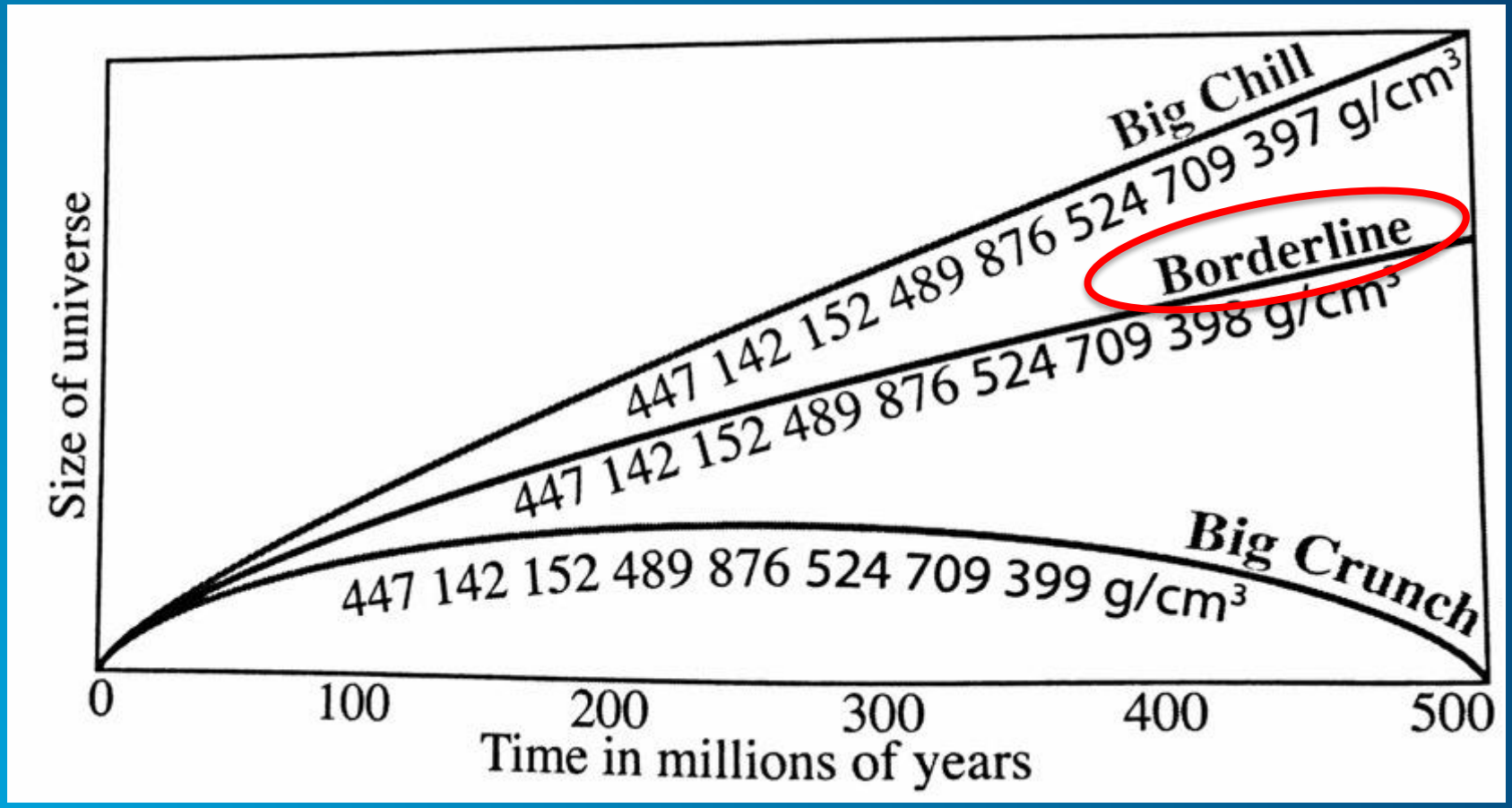
…and the future is here

THE SCIENCE OF WHERE

A Framework and Process

Driving Digital Transformation

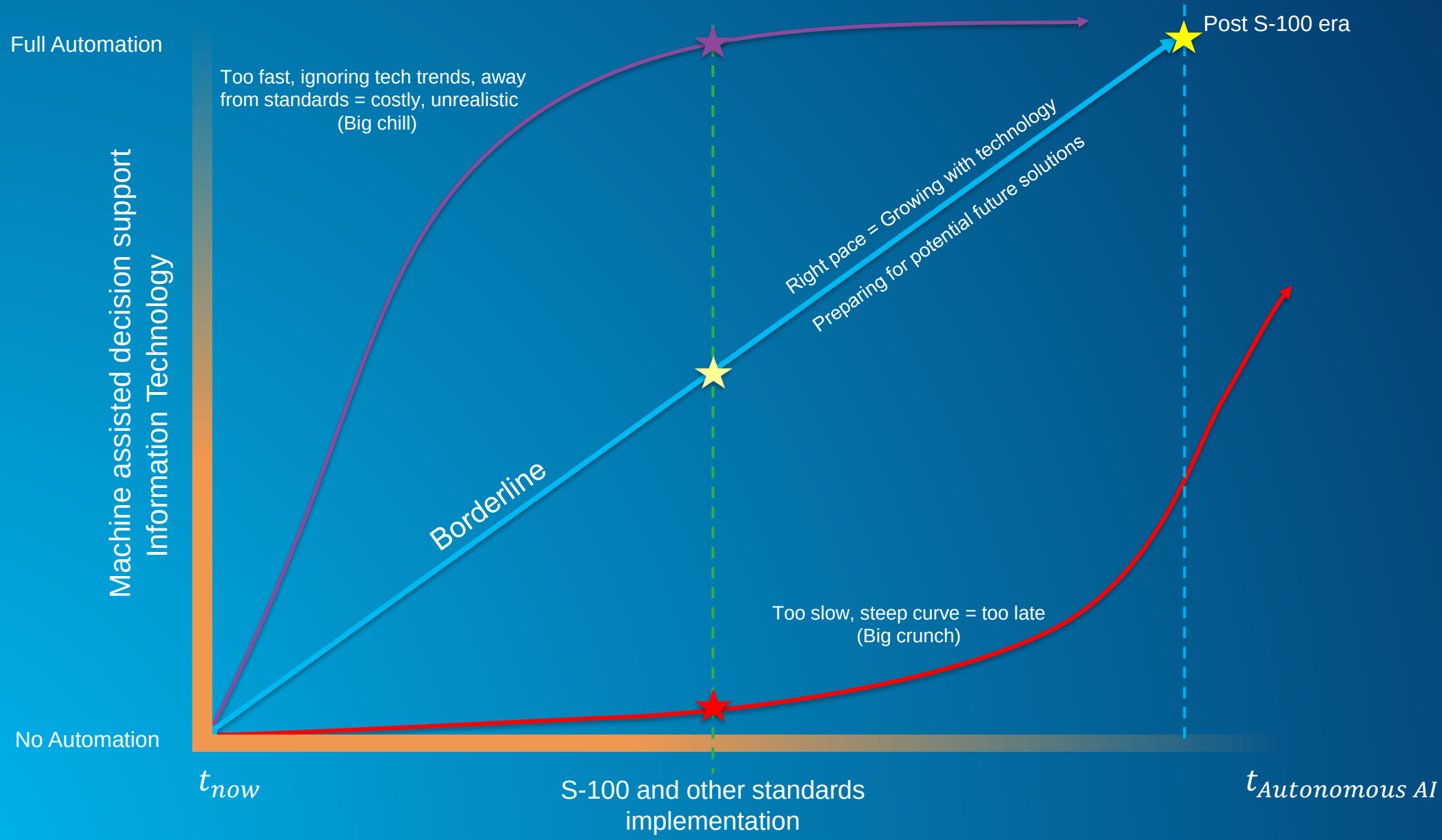
So how to harmonize Technology – Standards – Usage ?



Density of our Universe when it was a billionth of a second old
Highly unstable Borderline
Balance between Gravity and Pulling forces

Graphic from “Our Mathematical Universe” book by Max Tegmark

Evolve with Technology (The Maritime Universe expansion)



Graph not at scale, conceptual only

Evolve to the Next Level

Embrace Digital Transformation . . .

. . . and Leverage The Science of Where

Envision a Better Organization

Innovate

Create Solutions

Participate & Take Action

Take the Initiative

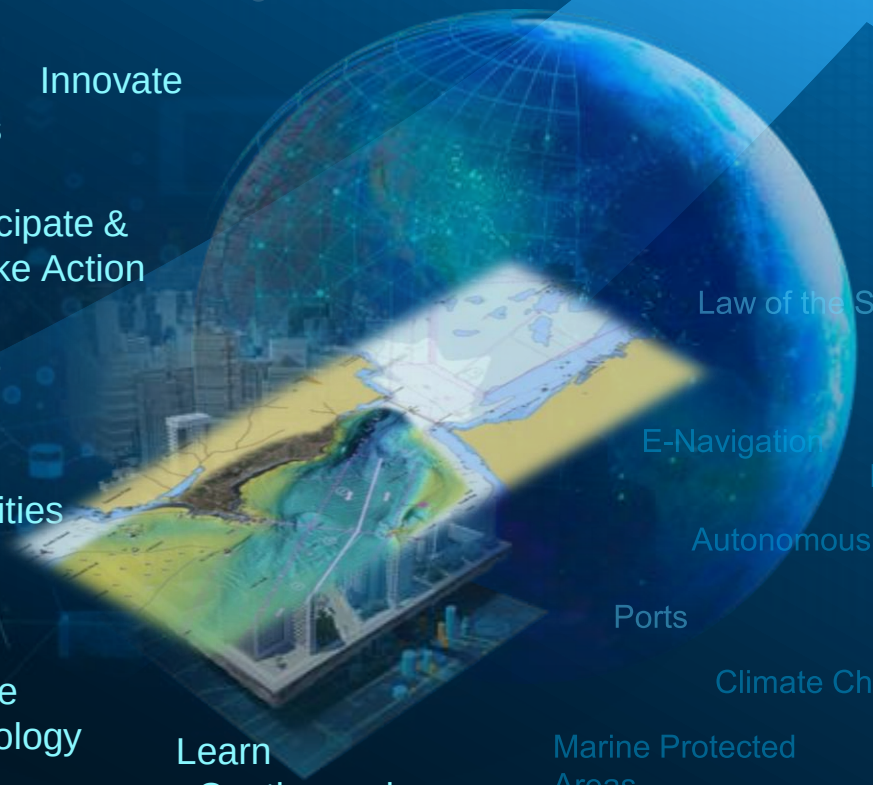
Work Together

Understand the Possibilities

Inform & Educate

Embrace Technology

Learn Continuously



"Hydrospatial"

Law of the Sea

E-Navigation

MSDI

Autonomous Ships

S-100

Ports

Climate Change

Marine Protected Areas

. . . Create your Digital Twin

Thank you!

rponce@esri.com