LOGISTICS & MARITIME FORUM

The sustainable, connected and resilient road to 2030

16-17 October 2019, La Spezia Expo

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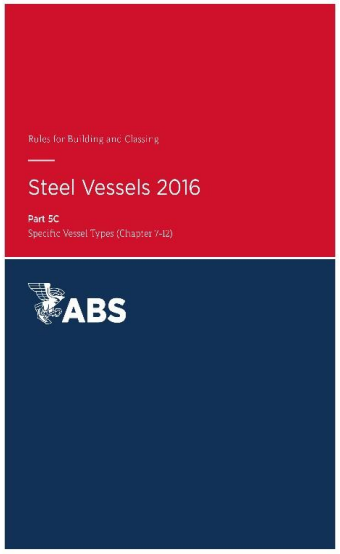
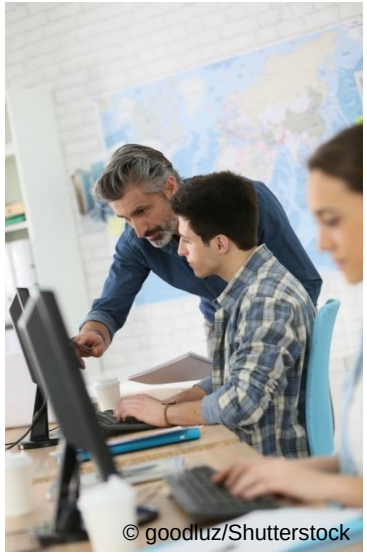
AMERICAN BUREAU OF SHIPPING

ABS Approach

Establish recognized technical standards



Review designs against Rules and standards



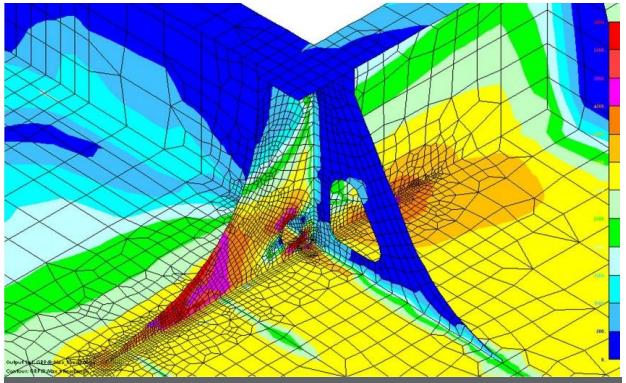
Confirm the vessel is built in accordance with approved plans

Verify the vessel is maintained to the accepted standards

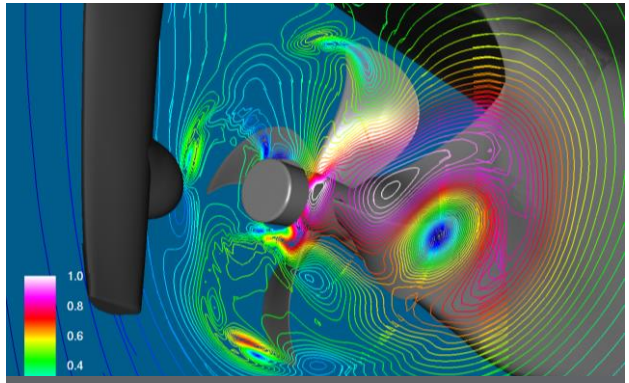
Where Technology Brings the Ships of Today

Safer, Greener, More Efficient, and More Economical

Safe shipping (1990's)	Green shipping (2010's)	Sustainable shipping (2030's)



Computational Technologies



Pollution Reduction

Digitalization, Smart and Autonomy

Driven by more data and data analytics capabilities

Today's Ships Are Ready

0.05
Seconds between each motion measured on a ship

2,800
Sensors hardwired into the Triple E vessel's main control system

7,000
Channels monitored on the Triple E for situational awareness and alarms

2GB
Data stored every day from the main control system of a Triple E vessel

© Slavos / Wikipedia
Source: Maersk

From Smart to Autonomy

Manual

1. The computer offers no assistance: human must make all decisions and take all actions

Smart

2. The computer offers a complete set of decision/action alternatives
3. The computer narrows the selection of decision/actions to a few alternatives
4. The computer suggests one alternative
5. The computer executes the suggestion if the human approves

Semi-Autonomy

6. The computer allows the human a restricted amount of time to veto the suggestion, and then executes
7. The computer executes automatically, then necessarily informs the human

Autonomy

8. The computer informs the human, but only if queried by the human
9. The computer informs the human, but only if the computer decides to do so
10. The computer makes all decisions, acts autonomously, and ignore the human

Sheridan's Level of Automation (1978)

Manual
No machine augmentation of human function

Passive Decision Support
Machine augmentation of human function

Human in the Loop
Human augmentation of machine function

Autonomy
No human augmentation of machine function
Human out of the loop (informed as request)

Level	Features	Data Handling	Decision Making	Execution of Action
Manual	No system augmentation	System and Human	Human	Human
Smart	System augmentation of human functions	System and Human	Human with System support	Human
Semi-Autonomy	Human augmentation of system functions	System	System with Human supervision	System with Human supervision
Autonomy	No human augmentation	System	System	System

Sheridan's Level of Automation (1978)

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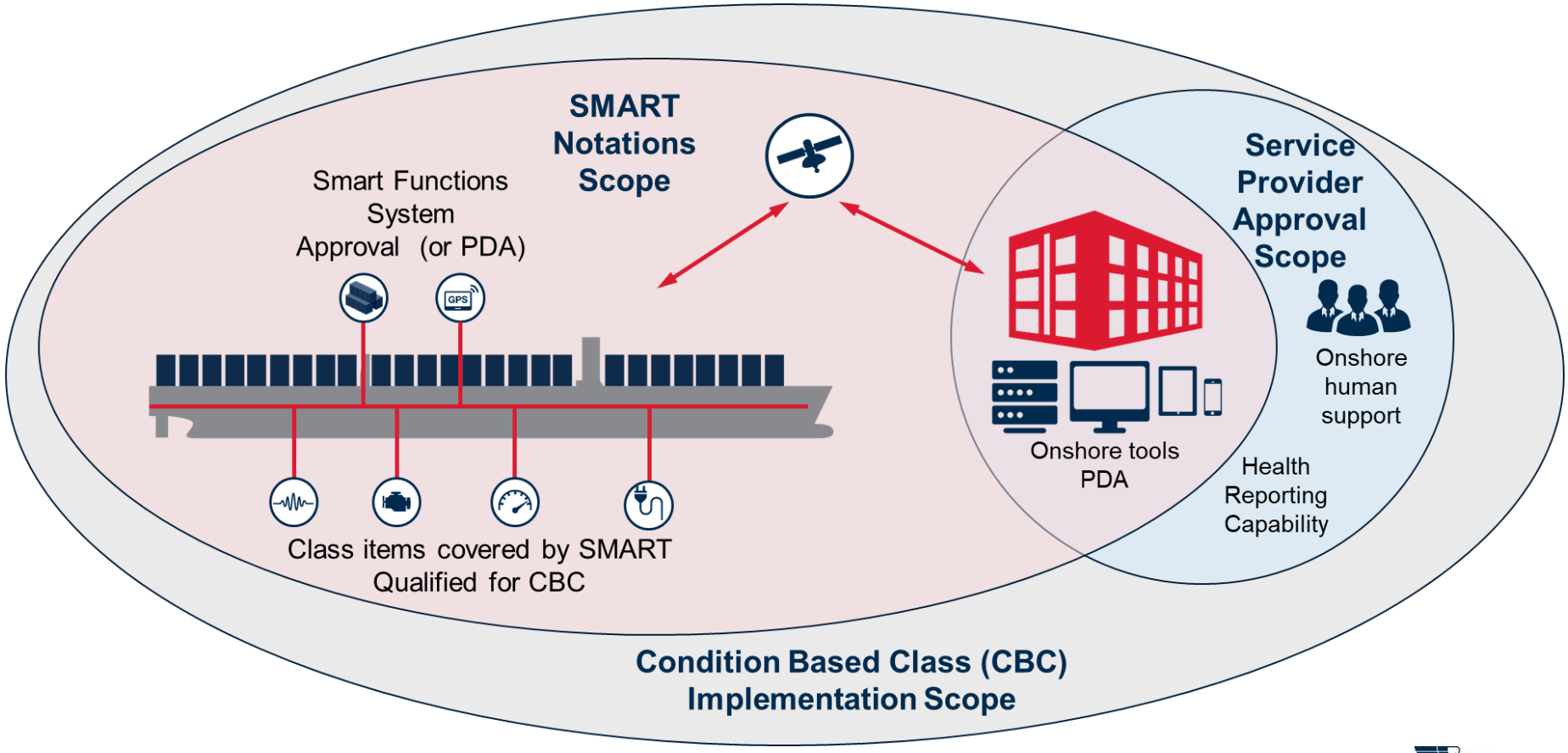
ABS Value

- The ABS Smart Guide defines a framework for equipment manufacturers to validate and certify smart functionality for products and services

- Spurred by increases in connectivity, sensor technology and data processing, the marine and offshore industries are evolving digitally
- Owners and operators are looking for validation of new technology that leverages data to improve:
  - Reliability and availability
  - Spares and inventory management
  - OPEX efficiency
  - Regulatory compliance

Smart Overview



Definition of Smart Functionality

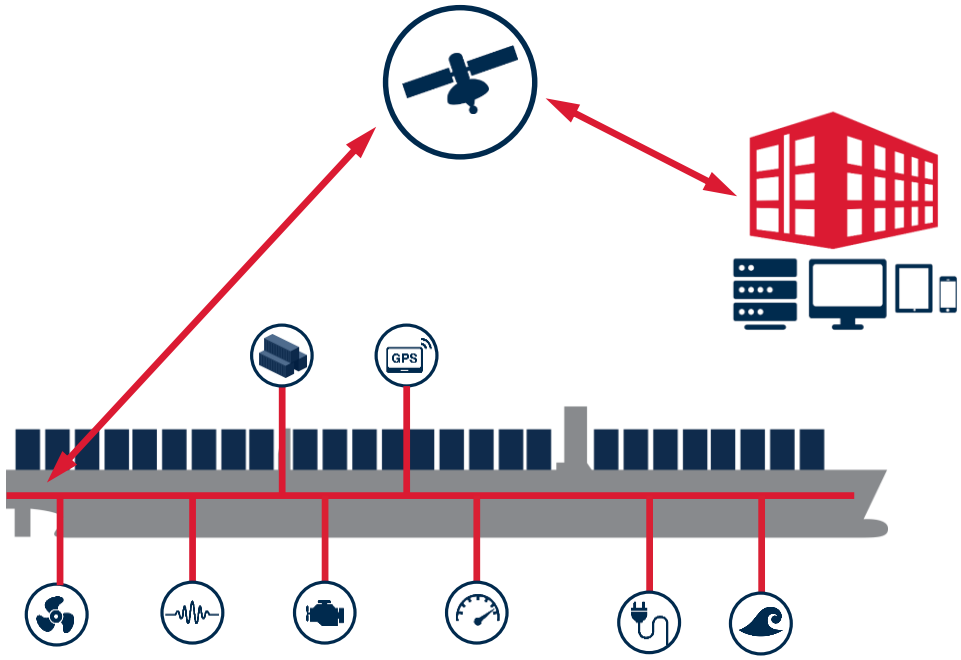
Systems installed and services deployed to continuously collect, transmit, manage, analyze, and report data for enhanced health and condition awareness, operational assistance, operational optimization, and decision-making support

Operational and Supporting Data

Physics-Based or Data-Driven Algorithms

Enables Alternate Survey Execution

Characteristics of a Smart Vessel



A Data-Centric Asset

Data infrastructure supporting data collection, transition, management, analysis, and reporting

A Connected Asset

Connected both onboard and onshore for continuous data and knowledge sharing among systems, fleet, and stakeholders

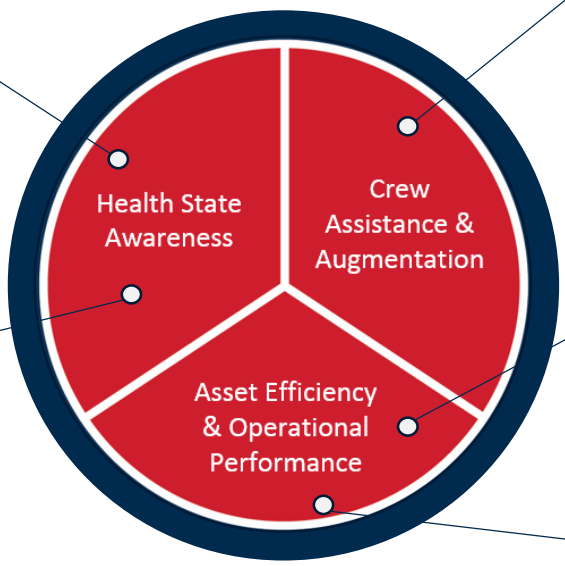
Aid in Response & Action

Health and performance awareness and decision support for optimized actions

Safer and More Efficient Operations

Operational optimization and crew assistance and augmentation

Smart Function Goals and Function Categories



Structural Health Monitoring

- Monitor structural loads, response, and health conditions
- Enhance safety and integrity
- Avoid potential damage and failures

Crew Assistance & Augmentation

- Assist crew activities
- Augment crew's ability, such as night vision, obstacle detection, collision avoidance, etc.

Machinery Health Monitoring

- Monitor health and conditions of onboard machinery
- Detect operational anomalies
- Prevent system failure and unplanned downtime

Asset Efficiency Monitoring

- Assess system efficiency
- Optimize maintenance and tune-up activities

Operational Performance Monitoring

- Monitor operational conditions
- Optimize operational parameters

Smart Guide Series

- Goal Based Framework using a Risk-based Approach
- **PDA for Smart Function hardware/software**
- **Service Provider Approval**
- Optional Notations
  - **SMART (INF)** Data **Infrastructure**
  - **SMART (SHM)** **S**tructural **H**ealth **M**onitoring
  - **SMART (MHM)** **M**achinery **H**ealth **M**onitoring
- Optional Class Record Comments
  - **SMART (AEM)** **A**sset **E**fficiency **M**onitoring
  - **SMART (OPM)** **O**perational **P**erformance **M**anagement
  - **SMART (CAA)** **C**rew **A**ssistance and **A**rgumentation
- New Technology Qualification
  - Qualifying innovative solutions

Smart Service Provider (SP) Approval

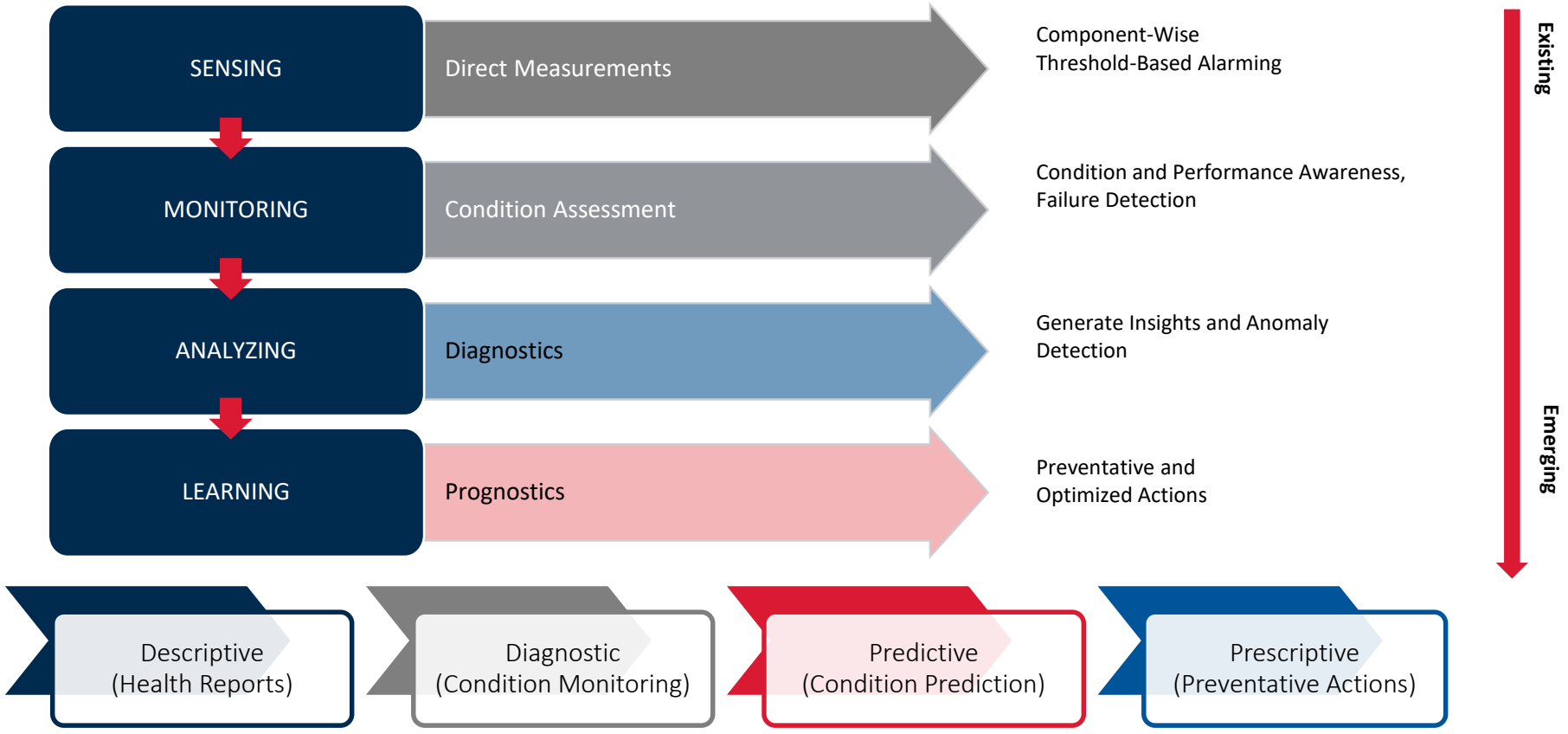
- Issued to OEMs, independent 3rd party vendors, shipyards, and operators
- Approval for providing MHM/SHM relevant data handling and data analytics services
- Revalidation & Renewal at end of 2 year term

Smart Product Design Assessment (PDA)

- May accompany ABS type approved equipment or designs as an added feature
- For hardware and software installed that enables MHM/SHM capability
- Revalidation & Renewal at end of the 5 year term, subject to annual confirmation

Applications for both are available at www.eagle.org

Decision Making Support using Smart Functionality

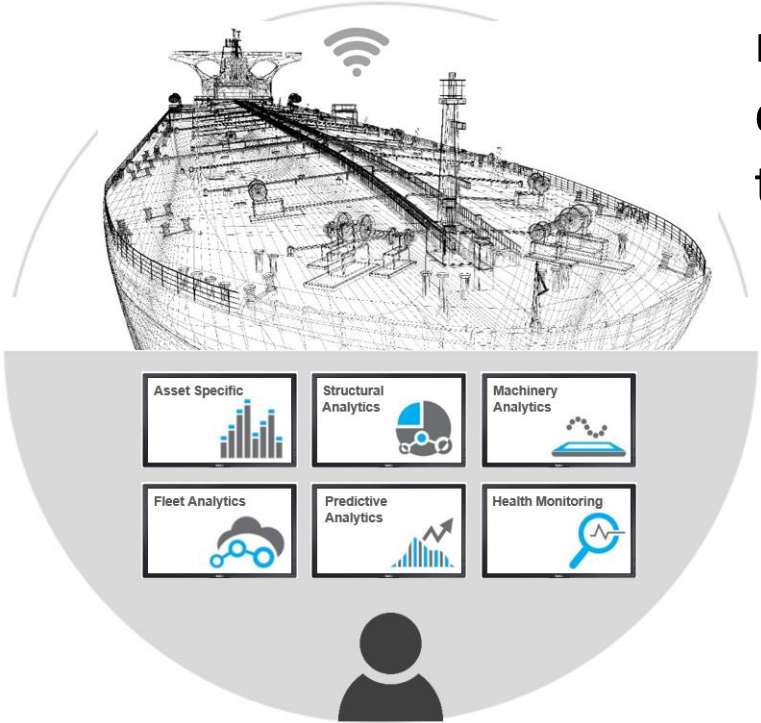


Success Factors
Data + Data Driven Models + Physics Models + Traditional CM Techniques

Conclusions

SMART Parameters

- Identify and define equipment and parameters to be taken into consideration for a vessel to be considered as SMART



Data Quality

- Identify and manage the data that can do the difference

Thank You

www.eagle.org

ABS