



Autonomous Ships/Vehicles: Classification Society Perspective



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Agenda

- Trends
- Regulatory Development
- ABS Activities
 - Building Blocks – Cyber, Software, Data
 - Smart to Autonomous



Trends in Autonomy in Commercial Shipping

- Increasing application of technology to augment and replace personnel
- Significant industry activity focused on navigation and bridge level crew augmentation
- Dedicated routes/short shipping routes (repeatable operational profile) allowing actual autonomous operations with human oversight

IMO Regulatory Scoping Exercises

- IMO Scoping Exercise

MARITIME SAFETY COMMITTEE

Maritime Autonomous Surface Ships (MASS) – Proposal for a regulatory scoping exercise

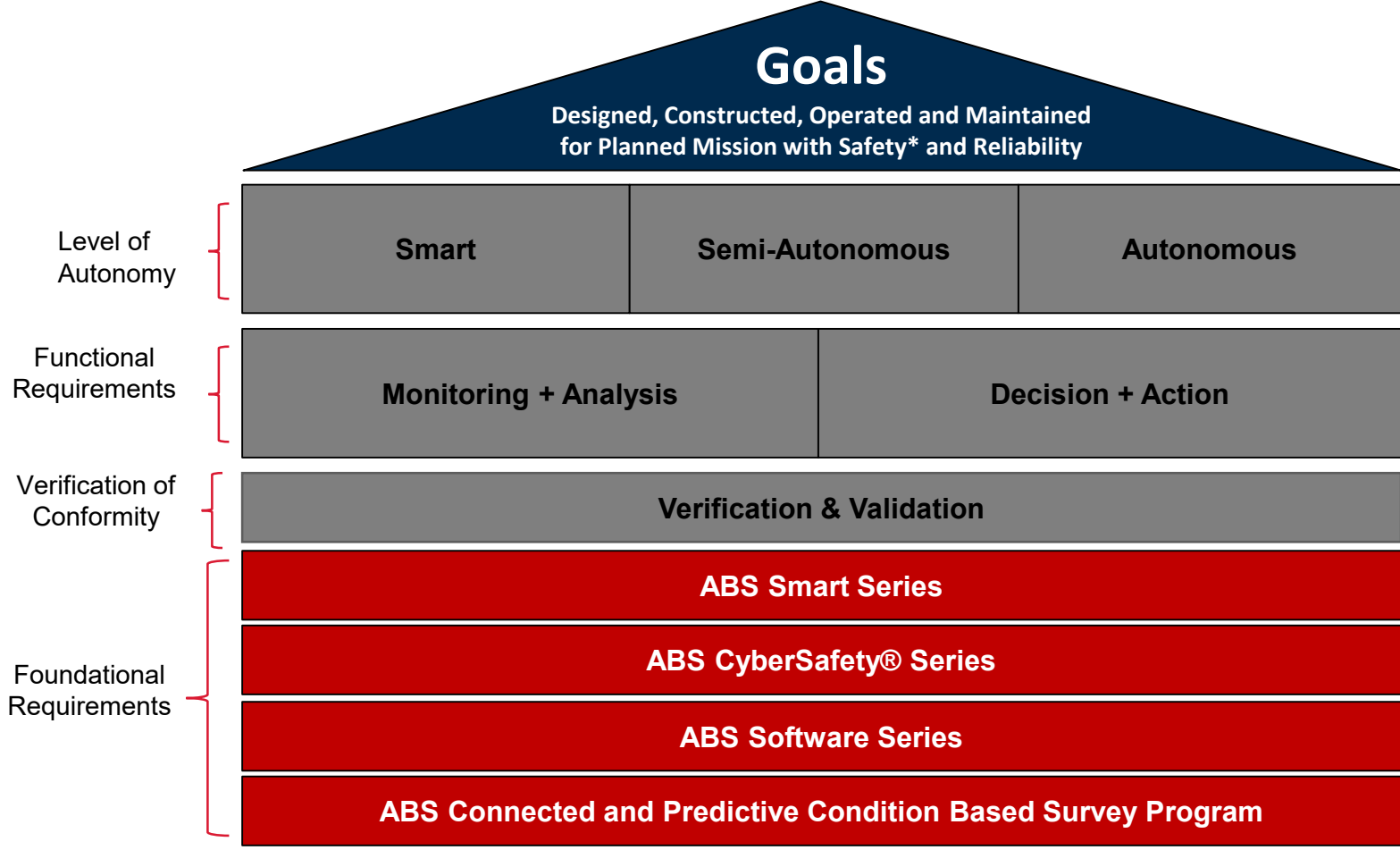
Degrees of Autonomy

- Ship with automated processes and decision support
- Remotely controlled ship with seafarers on board
- Remotely controlled ship without seafarers on board
- Fully autonomous ship

Source: MSC 100

Photo: UK Hydrographic Office

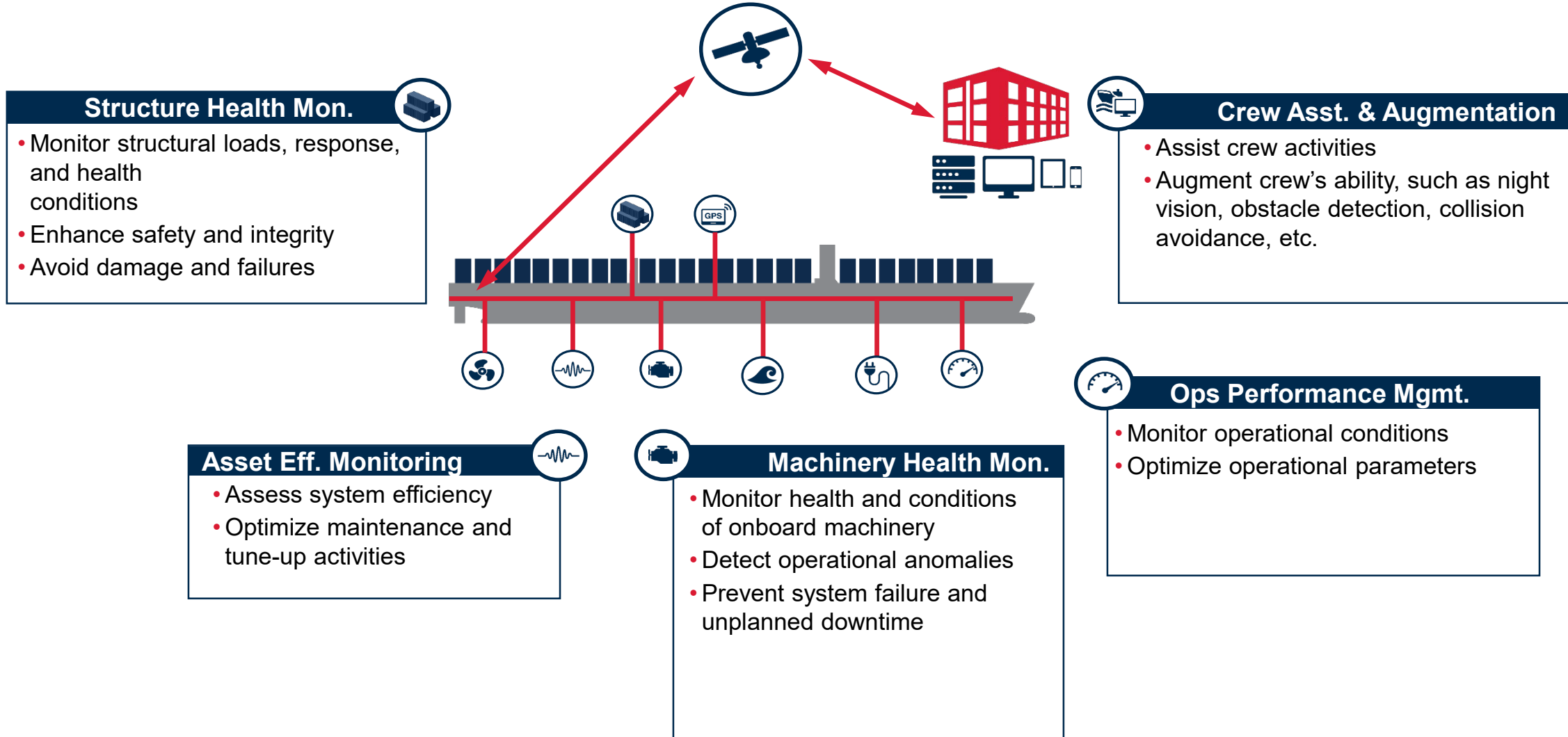
Smart to Autonomous Framework



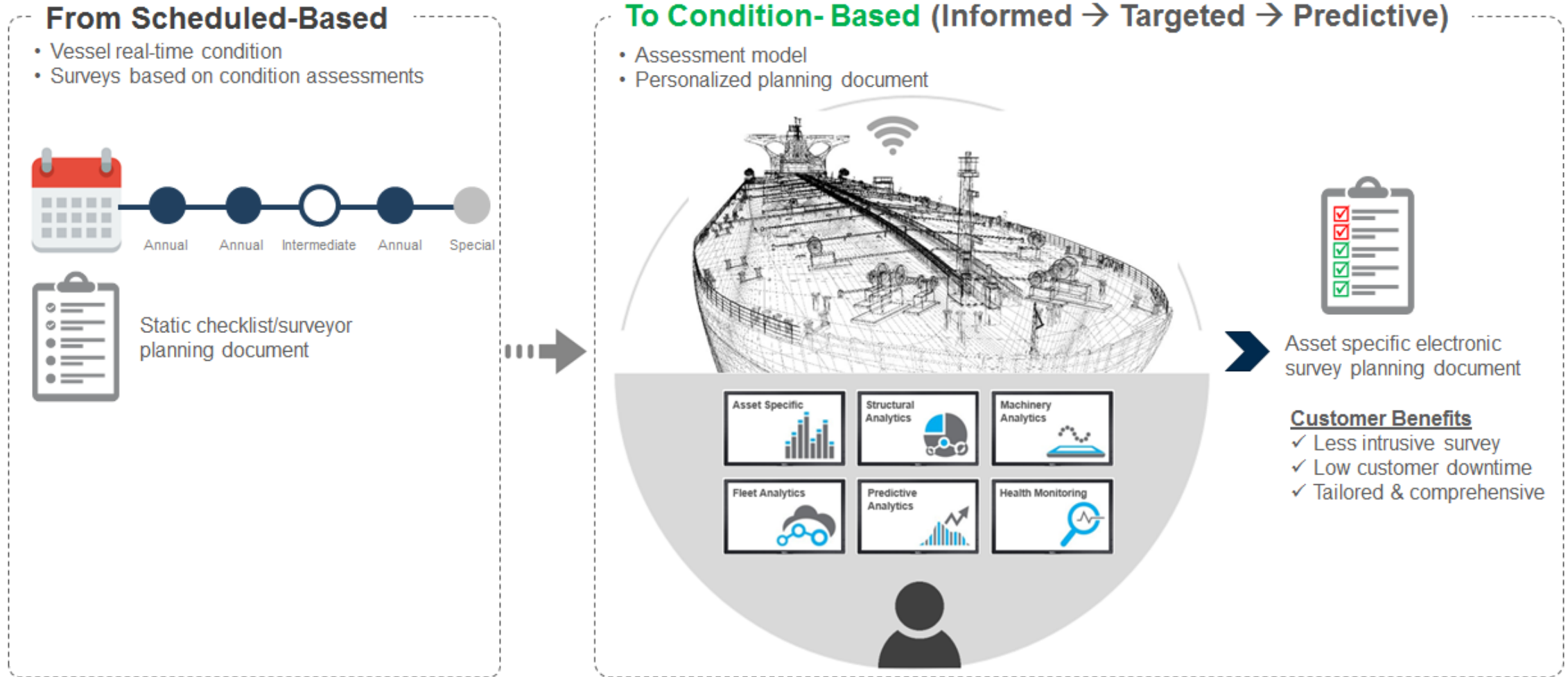
*Safe execution of mission has to consider the impact on/consequences to people, environment and the vessel



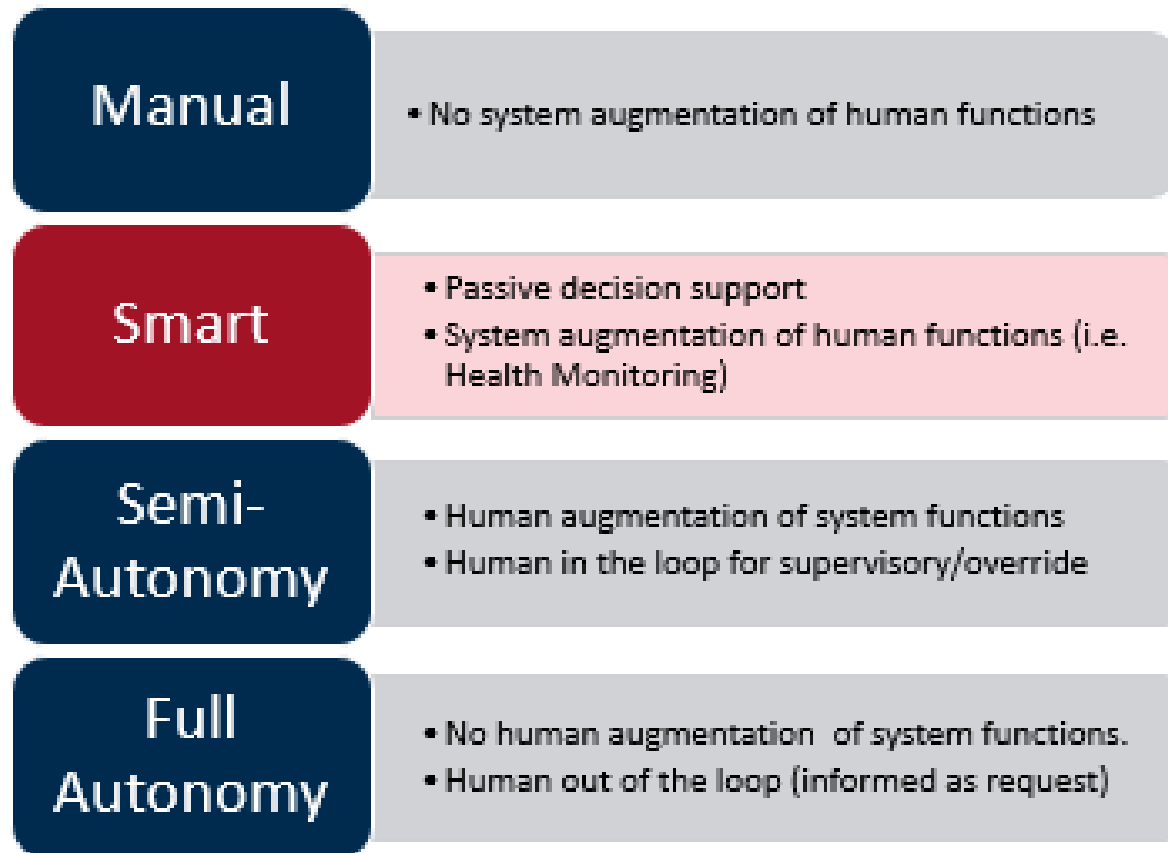
Functions of a Smart Vessel



Shift to Condition-Based Class



Maturity Levels



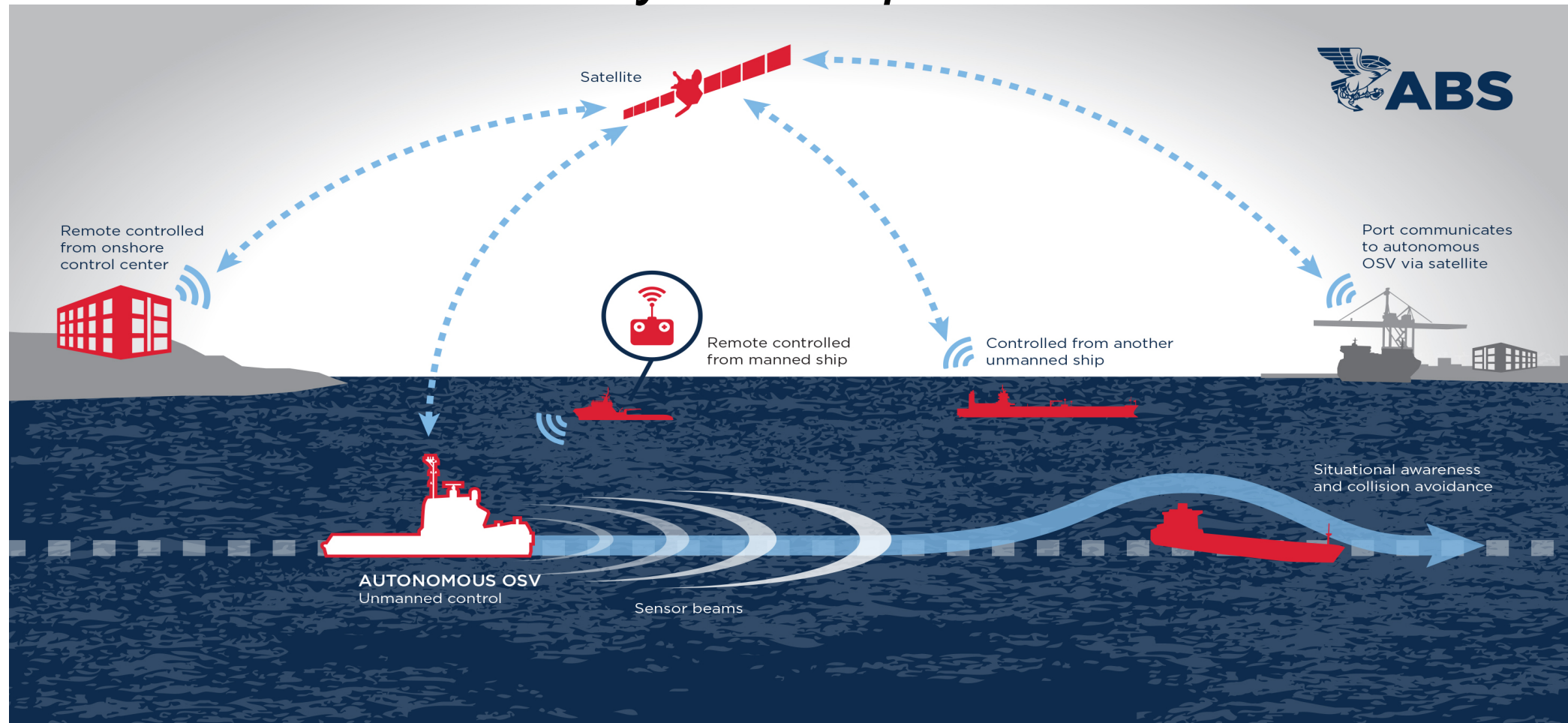
ABS System Autonomy Levels

ABS System Level of Autonomy		Integration and Application to Decision Loop			
		Monitoring	Analysis	Decision	Action
1	Smart	M	M	H	H
2	Semi-Autonomous	M	M	H/M	H/M
3	Autonomous	M	M	M	M

Notes: 1. H-Human, M-Machine

Autonomous Operations

Beyond Ship Itself

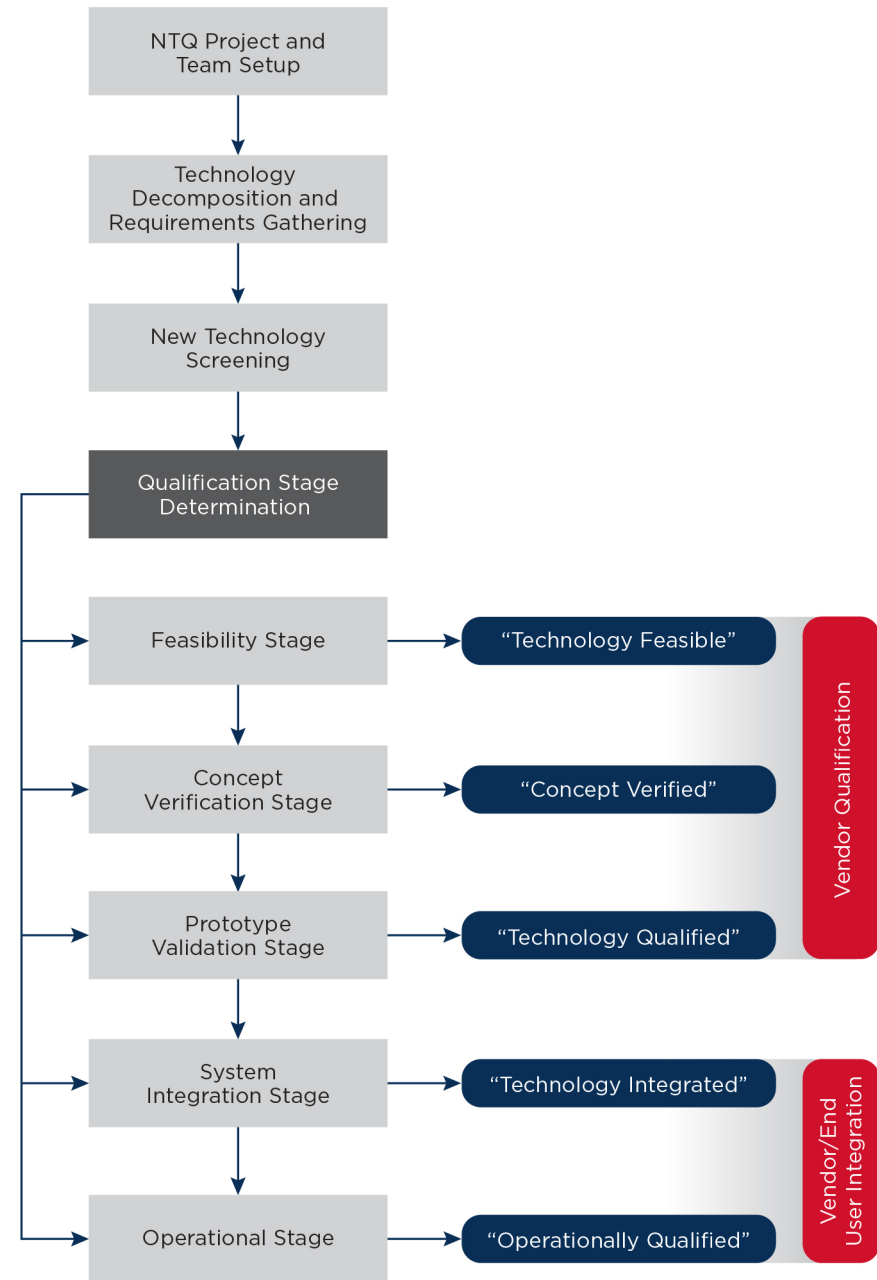


Supporting the Journey to Autonomy

- Industry collaboration via MASS projects
- Refining foundational requirements: cyber, software, data
- Defining autonomy requirements
- Utilizing Novel Concept Approach: risk assessment and system engineering-based verification

New Technology Qualification

- Five stage process compatible with API RP 17N/Q, ISO 16290 and US DoD
- Tailored for new/unproven vendor applications
 - System, Sub-system, Equipment, Component or materials
- Autonomous Review is aligned to a Goal Based Framework.





Challenges

- Technology
- Human factors
- Regulatory Framework





Thank You

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