
AUTONOMOUS CRAFTS

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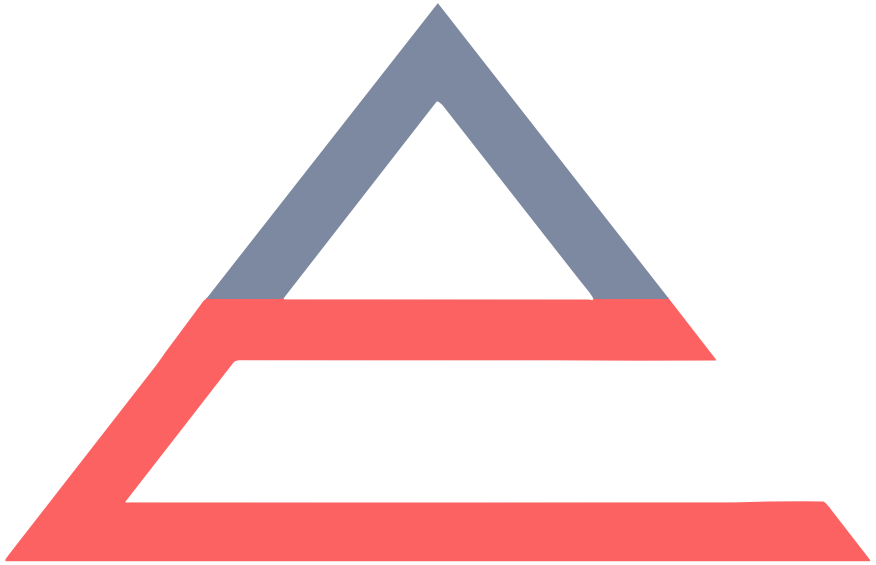


Benefits of Modularity, Connected Operations and MaaS on Seamless Mission Execution

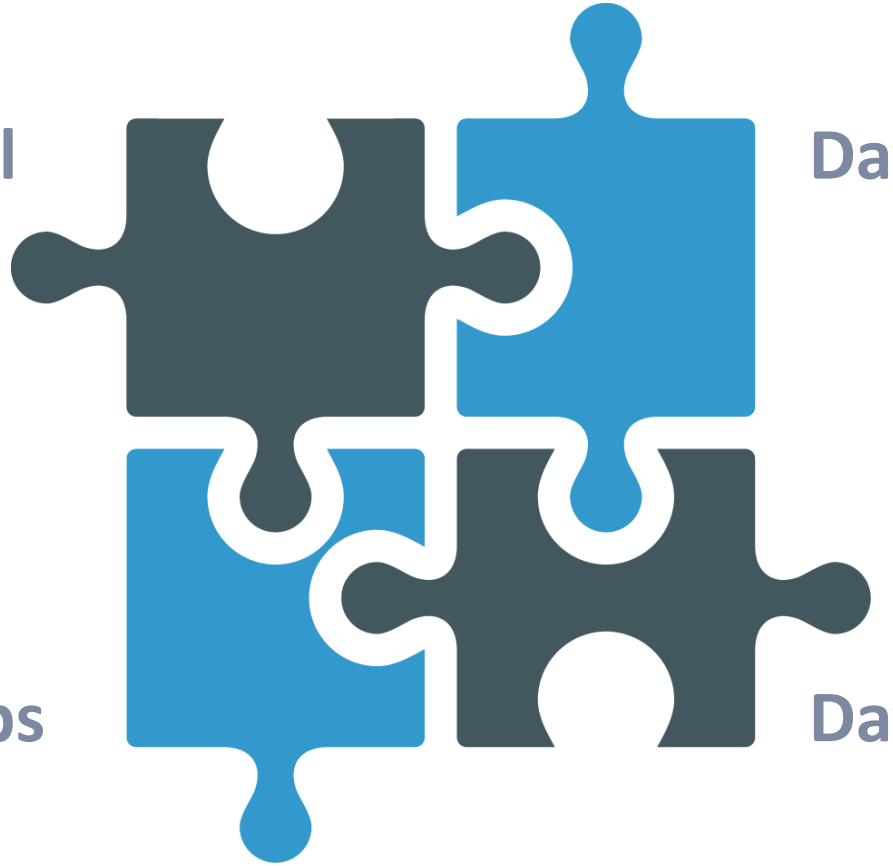
AGENDA

1. Vessel Modularity Requirements
2. Software&Data Modularity Requirements
3. Connected Operations
4. Mission as a Service
5. Data Driven Mission Enhancement

Modularity Platform

Vessel

Data Acquisition



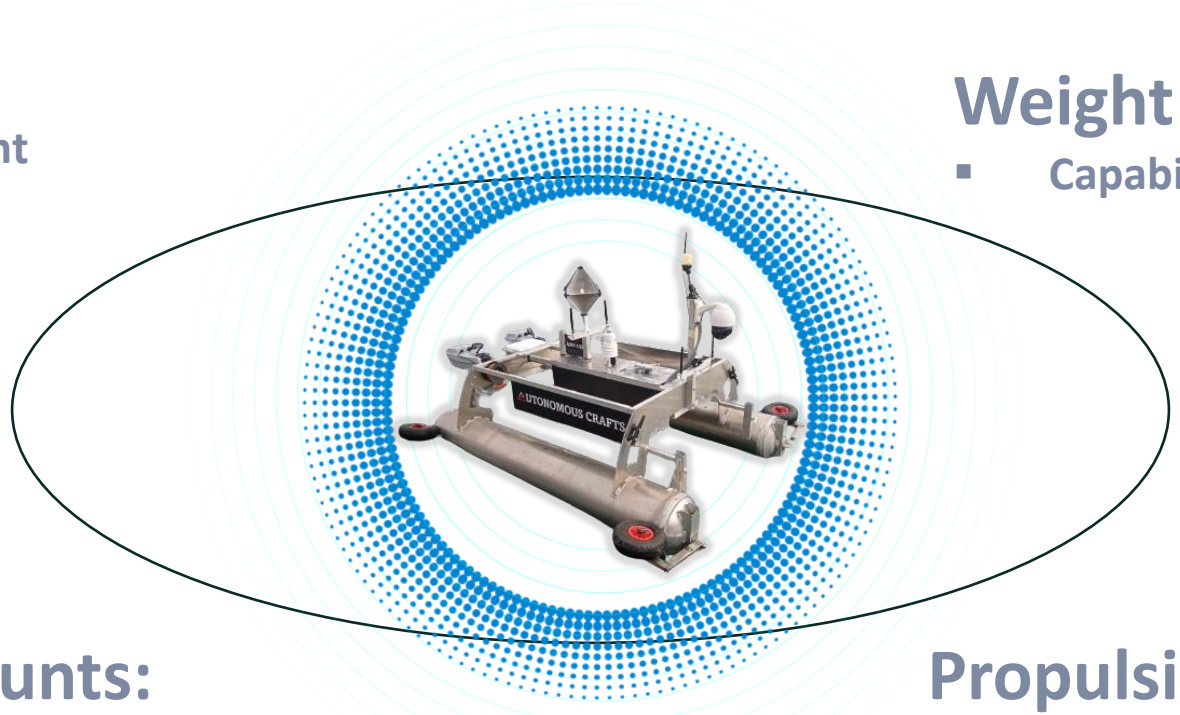
Connected Ops

Data Analytics

1. Vessel Modularity Requirements

High Payload:

- Carry capability for different types of instrumentation



Weight Distribution:

- Capability to hold seakeeping abilities

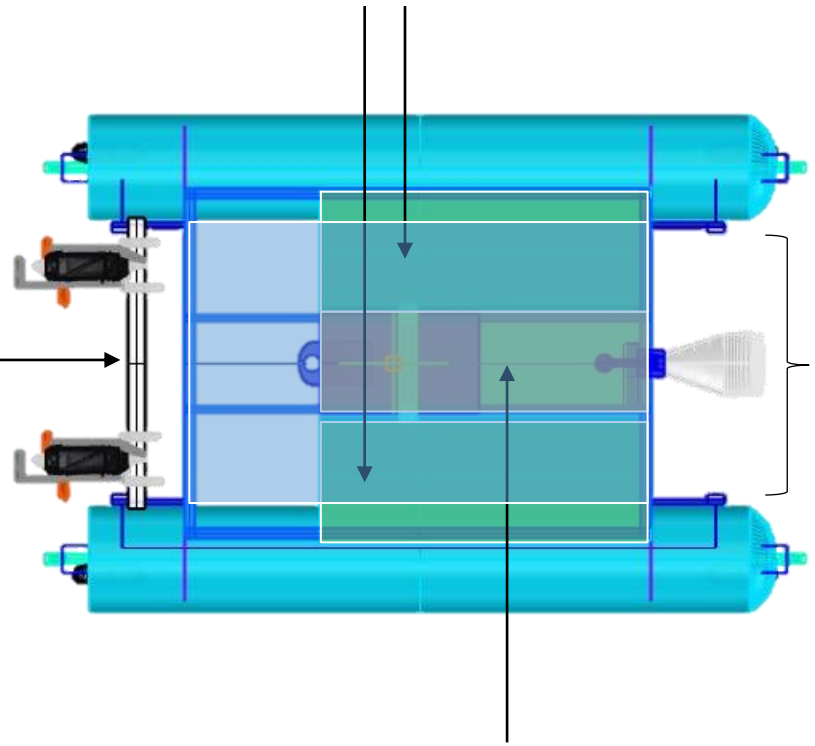
Instrumentation Mounts:

- Flexibility to attach different type of equipment
- Wide area of attachment possibilities for optimizing weight distribution

Propulsion Exchange:

- Possibility for different types of propulsion installation
- Adequate for short precise and long range missions

1. Vessel Modularity Requirements



2. Software&Data Modularity Requirements

Distributed Data Sources

Why is it important?

- The mission data comes from different collection layers (instrumentation, propulsion, navigation, cameras, satellites, public entities, etc.)
- The data comes in different forms and sizes
- The data can be lost due to connection losses
- Real-time monitoring and data analytics require unified SW experience

How to ensure it:

- Usage of central data acquisition device with processing options and modular interfaces
- Unification of data transmission protocol
- Data parsing and syncing
- Single SW interface for all real-time and data analytics on vessel and fleet level

3. Connected Operations

Key connected mission enablers

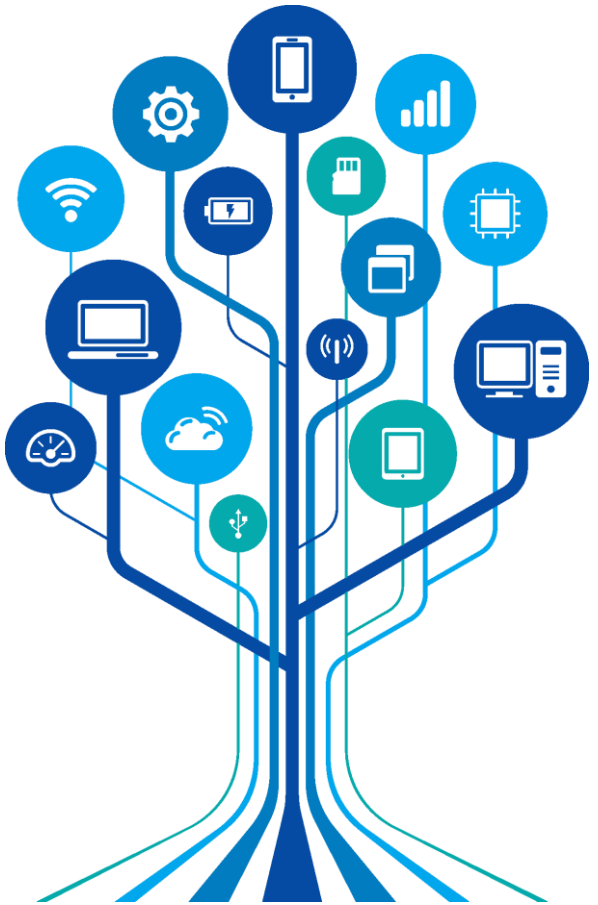
- All relevant data impacting the mission existing at glance
- Data is presented in refined manner for prompt decision making (visual and informative)
- The operations need to be backed up with all data artefacts covering propulsion, energy storage, navigation, controls and instrumentation
- If going to tactically distributed missions, the mission vision needs to enable the fleet insights and swarm behavior
- Collaborative missions (underwater, surface, aerial) the master to slave operational guidance

Challenges:

- Unified SW creation
- Communication redundancy concepts
- Cybersecurity (point2point, multipoint and host level)

Benefits:

- Optimized and informed decision making
- Full mission tracking
- High mission efficiency



Mission

4. Mission as a Service

Managing complexity together

Technology impact to end users

- **Operational Burden**: The end user must be proficient in array of technical domains to effectively deploy and manage USVs, which can be complex for organizations without extensive technical expertise.
- **Learning Curve**: There is a steep learning curve associated with operating USVs due to the technical complexities involved, which can be a barrier for end users to fully leverage the technology.
- **Mission Planning and Execution**: End users must engage in detailed mission planning, accounting the factors that affect USV operations, from environmental considerations to mission objectives and system redundancies.

How to overcome them:

1.**Expert Support**: that converges operational know-how and technical assistance, thus relieving end users from the need to develop in-depth expertise in USV technology.

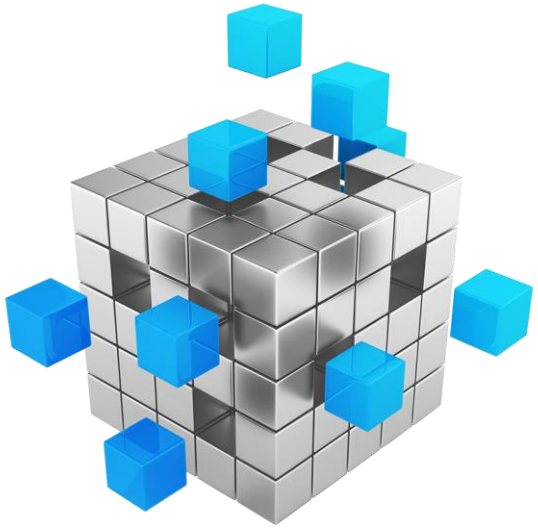
2.**Streamlined Operations**: the end users can access pre-configured missions and turnkey solutions that streamline the operational process, reducing the complexity involved in mission execution with real-time assistance

3.**Operational Focus**: MaaS allows end users to focus on the mission outcomes by outsourcing the operational complexities to the service provider.

4.**Continuous Improvement**: MaaS often includes a feedback loop where operational data is analyzed to improve mission efficiency, enabling end users to benefit from ongoing enhancements.

5. Data Driven Mission Enhancement

Methodology for future mission improvements



Data Extraction

- Target mission history sets

Data Mining

- Events Isolation
- Trends Detection
- KPI calculation

Forecasting

- Data-driven ML/AI model creation
- Mission parameters optimization
- Digital Twin integration
- Mission simulation

Summary

Modular Vessel Design: Essential for diverse mission requirements, allowing:

High payload adaptability for various instrumentation.

Flexible weight distribution maintaining seakeeping abilities.

Propulsion systems interchangeable for mission-specific range and precision.

Versatile equipment mounting for optimal performance.

Software & Data Modularity:

Critical for handling multiplex data from different collection layers.

Ensures data integrity in various forms and sizes, with safeguards against loss.

Unified software (SW) interface required for cohesive real-time monitoring and analytics.

Connected Operations:

Enable comprehensive mission data visualization for informed decision-making.

Provide robust data backup and collaborative mission capabilities, supporting fleet-wide insights and swarm behavior.

Mission as a Service (MaaS):

Offers expert support to navigate the complexity of USV technology.

Delivers pre-configured missions and solutions, enhancing operational efficiency with real-time support.

Allows clients to concentrate on mission objectives rather than operational details.

Data-Driven Mission Enhancement:

Utilizes data mining and forecasting for continuous mission improvement.

Integrates machine learning (ML) and artificial intelligence (AI) for predictive analytics and digital twin simulations.

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Thank You!