



DIGITAL TECHNOLOGY AT THE HEART OF THE LIFE CYCLE OF NAVAL SYSTEMS



Eric Papin

Chief Technical Officer and Chief Quality Officer

Director of innovation and technological expertise

A EUROPEAN LEADER IN NAVAL DEFENCE

A MAJOR PLAYER IN ENERGY



Now serving

50

Naval forces worldwide

Including Brasil, Australia, Egypt, India, Malaysia, Saudi Arabia, ...

13,429

Employees

40 000

direct, indirect and induced jobs

Industrial leader

in the marine renewable energy sector

Shareholders

Government shareholding agency	62,25 %
Thales	35,00 %
Naval Group personnel	1,80 %
Naval Group	0,95 %

Results 2017

Revenue	€3.69bn
International sales	35 %
Sales	€4.0bn
Product Backlog	€11.9bn
R&D	9% of revenue

PRODUCT LINES

Surface vessels

GOWIND* 2500

FREMM FRIGATE

BELHARRA* FRIGATE

BRAVE*

MISTRAL-CLASS LHD

AIRCRAFT CARRIER

SYSTEMS AND EQUIPMENT

- SETIS*
- POLARIS*
- SHIPMASTER*
- SYLVER*
- PROPULSION EQUIPMENT

UNDERWATER WEAPONS

- MU90
- CANTO*

Submarines

SCORPENE* 2000

BARRACUDA CONVENTIONAL

BARRACUDA SSN

NUCLEAR-POWERED BALLISTIC-MISSILE SUBMARINE (SSBN)

SYSTEMS AND EQUIPMENT

- SUBTICS*
- HOISTING SYSTEMS
- LAUNCHING SYSTEMS
- PROPULSION EQUIPMENT

UNDERWATER WEAPONS

- F21 TORPEDO
- CANTO*

Marine renewable energy

OUR TECHNOLOGY SOLUTIONS

TIDAL TURBINES

FLOATING WIND TURBINES

OCEAN THERMAL ENERGY CONVERSION

NAVAL GROUP : MASTERSHIP OF THE WARSHIP LIFE CYCLE



**DESIGN &
PREPARE**



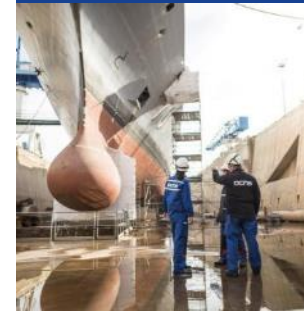
**PRODUCE &
INTEGRATE**



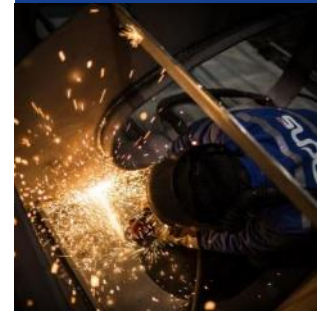
**TRAIN &
SUPPORT**



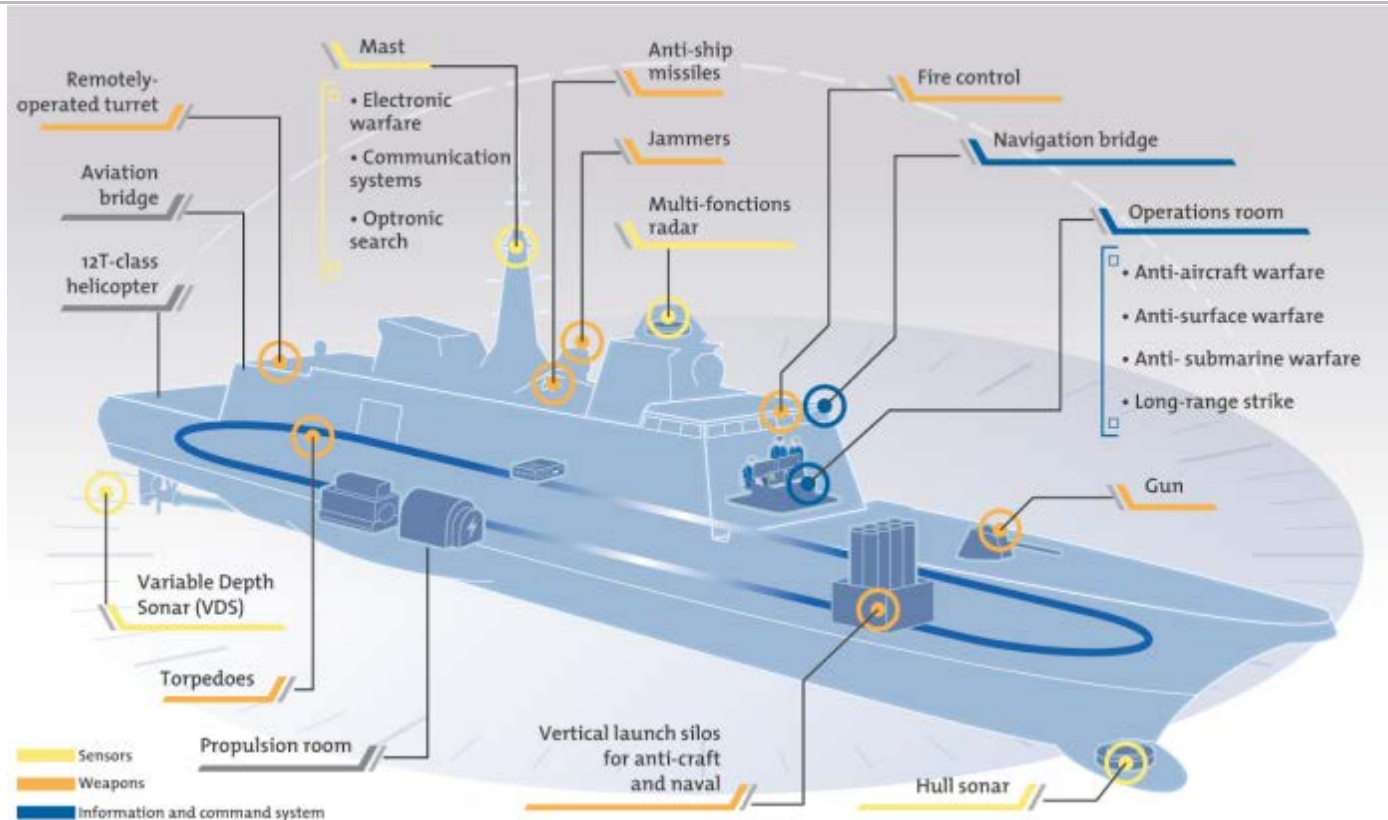
**MAINTAIN &
MODERNIZE**



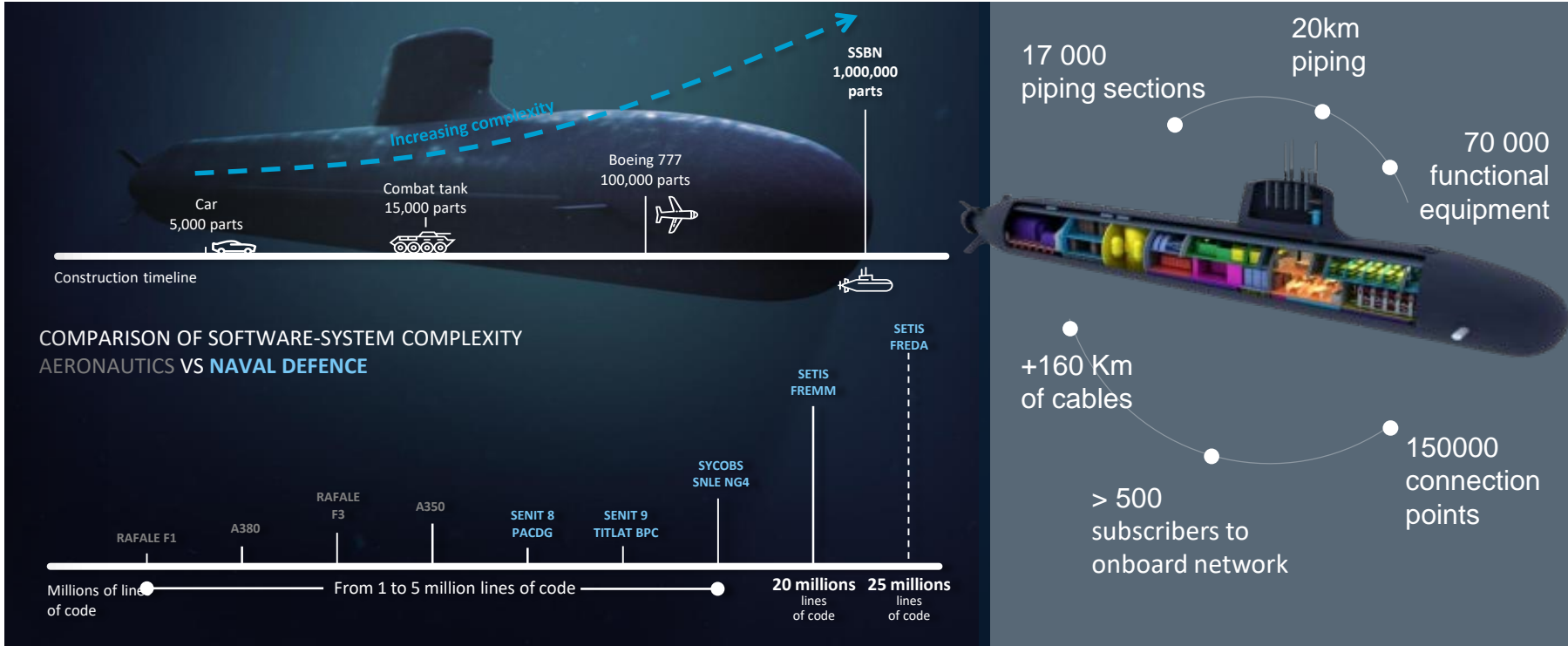
**DISMANTLE &
DECONSTRUCT**



COMPLEXITY OF WARSHIPS AND SYSTEMS



COMPLEXITY OF WARSHIPS AND SYSTEMS



TO ANTICIPATE THE OPERATIONAL NEEDS OF TOMORROW

**Information
dominance**



**Engagement
dominance**



**Capability to stay
operational at sea
several months**



Specificities of naval activities

Operational efficiency

Stealth

Invulnerability

Safety

Robustness

Advanced and reliable
systems

High performances

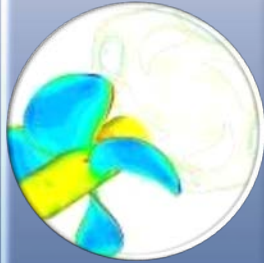
4TH INDUSTRIAL REVOLUTION... THE ERA OF DIGITAL



DIGITAL CONTINUITY TWIN SHIP



Warship and
equipment
functional
simulations



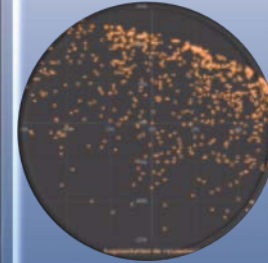
Multi-physics
and multi-
scales
simulations



Operational
simulations



Design
supervision
with coherent
models



Multi-
objective
optimization



Artificial
intelligence
and Big Data

Warship life cycle

DIGITAL CONTINUITY TWIN YARD

Scan 3D

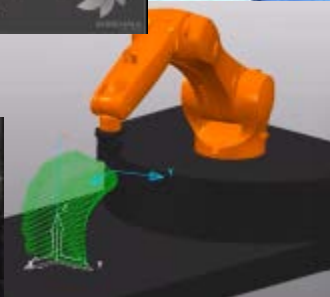
As Designed



As built



Additive Layer Manufacturing



Cognitive and physical assistance



Augmented operator



DIGITAL CONTINUITY NEW SERVICES OFFERING

Predictive maintenance



Tele assistance



Cybersecurity



Training



SCIENTIFIC COMPUTATION ACTIVITIES

Reduced scale and full scale trials

Solids mechanics and thermics

Fluids mechanics

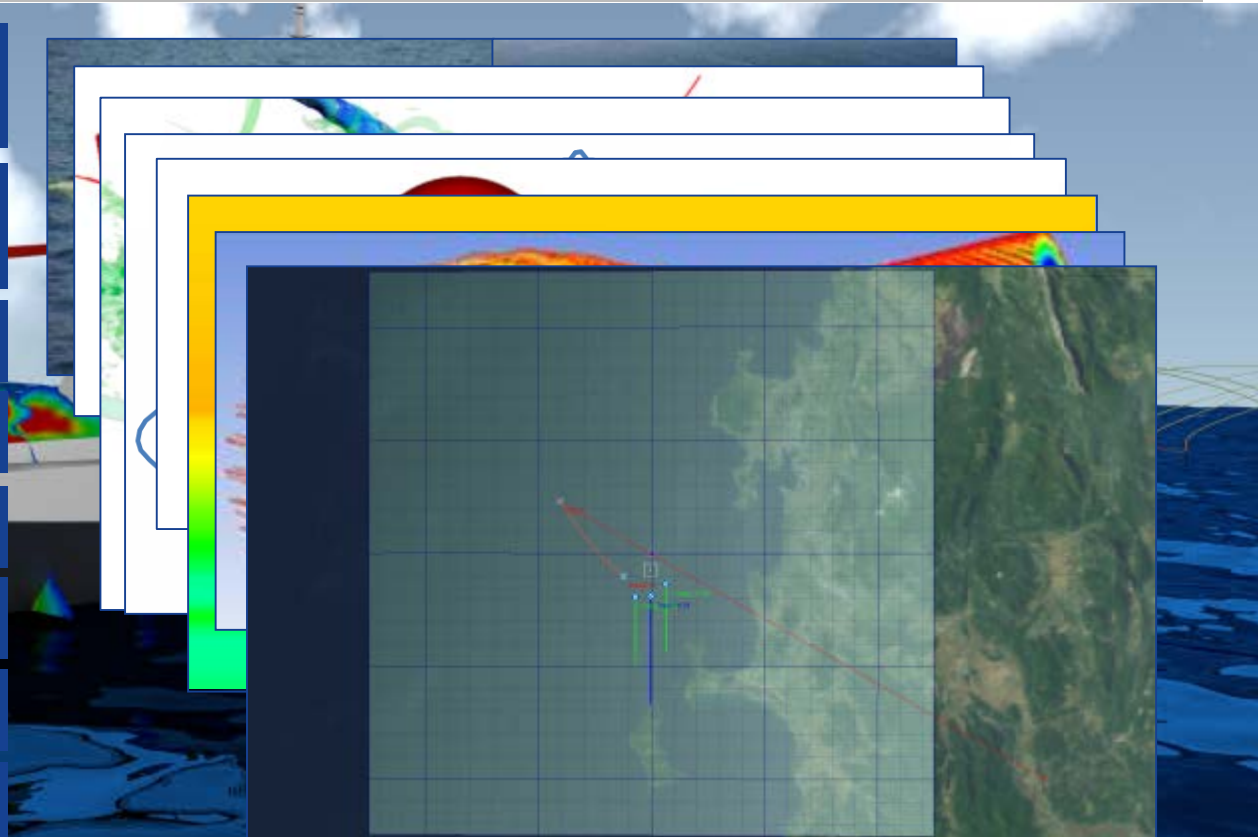
Acoustics

Electromagnetism

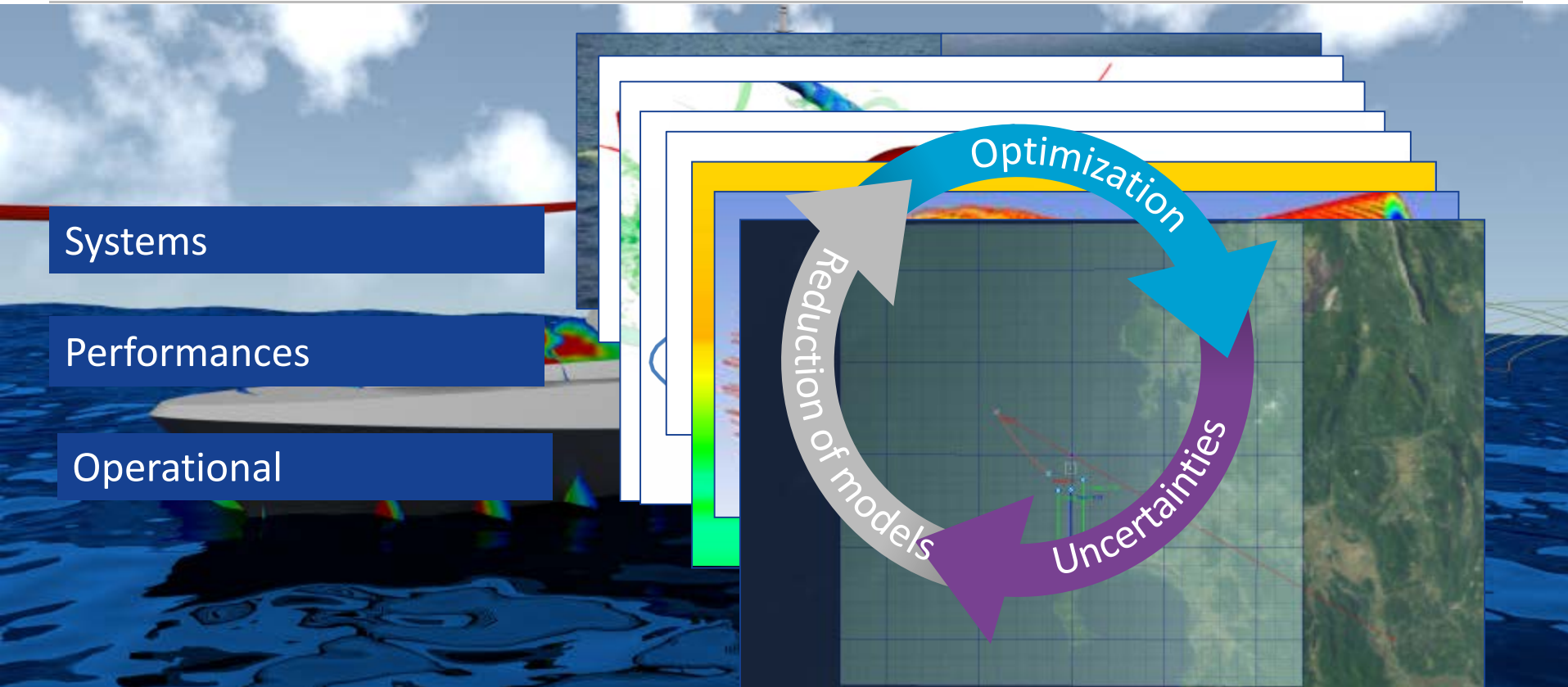
Infrared

Chemistry

Operational



SCIENTIFIC COMPUTATION IN DESIGN



SCIENTIFIC COMPUTATION IN OPERATIONS

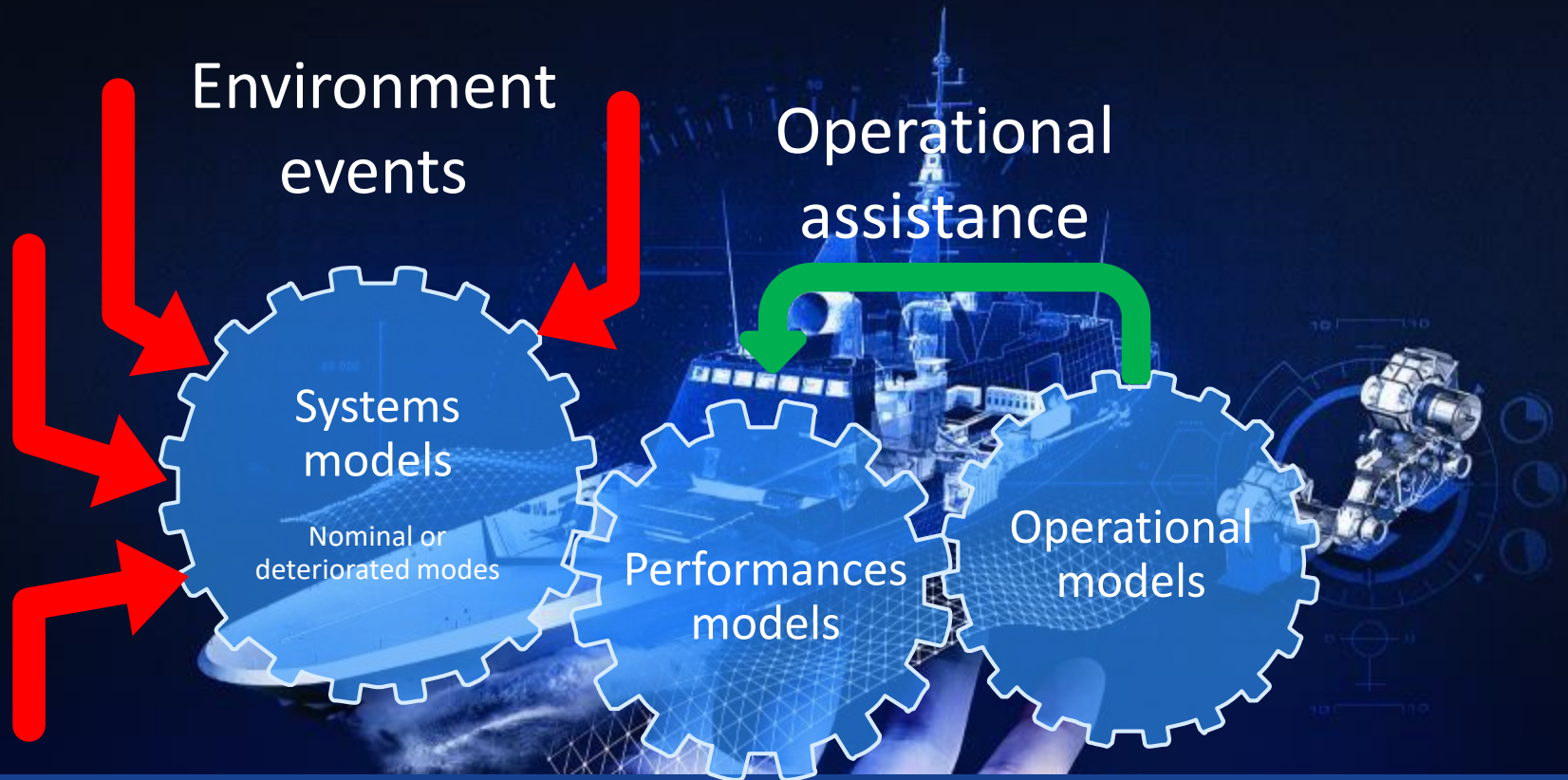
Systems

Performances

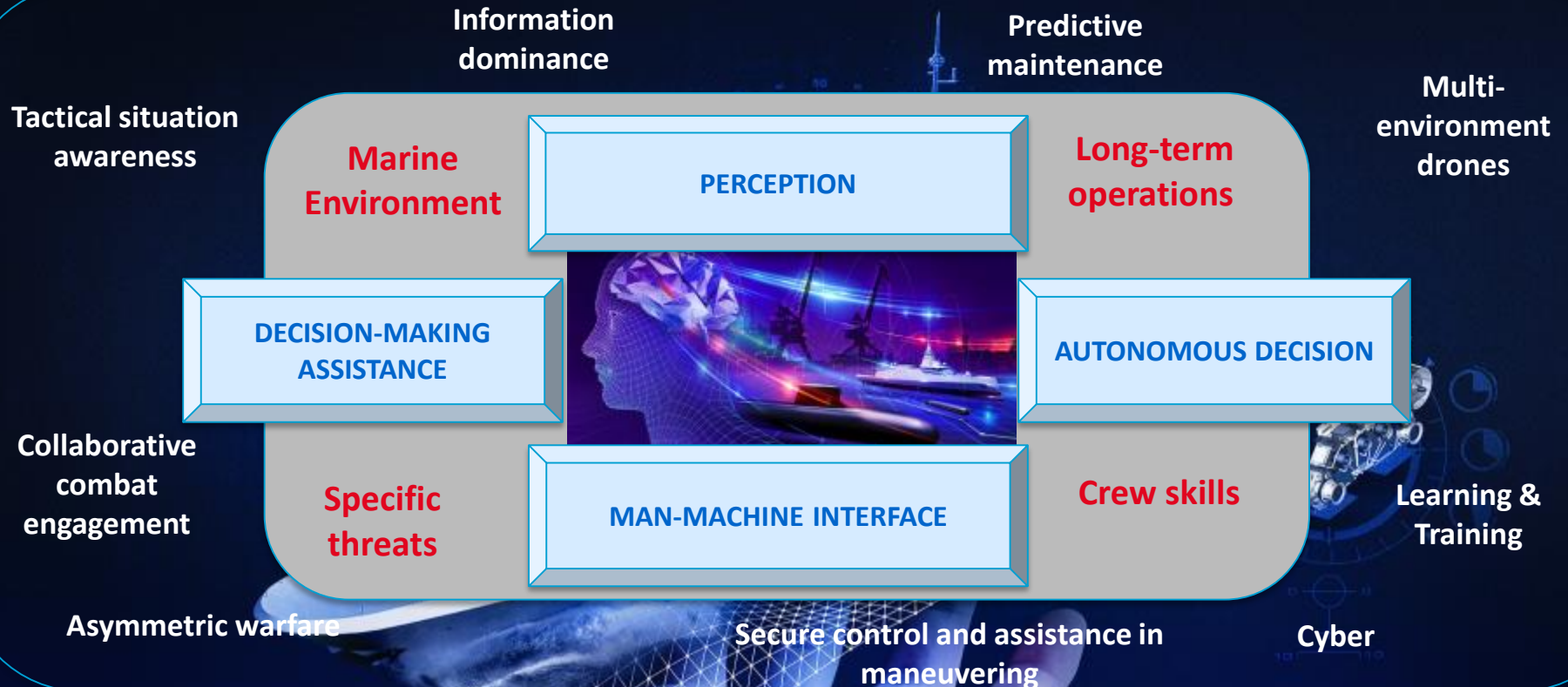
Operational



SCIENTIFIC COMPUTATION IN OPERATIONS



ARTIFICIAL INTELLIGENCE / BIG DATA

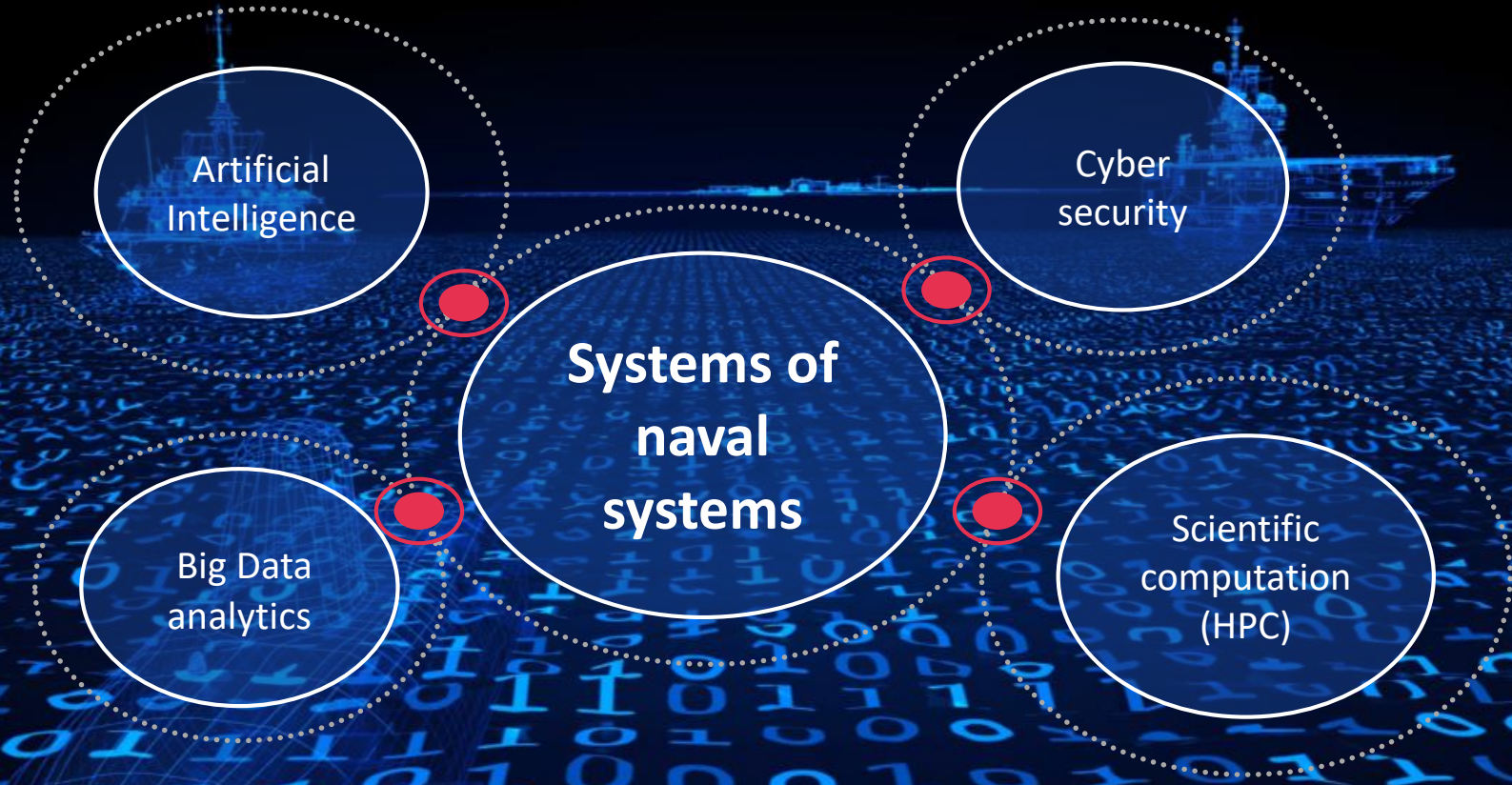


DESIGNING AND BUILDING WARSHIPS IN 2020



- Coordinating **collaborative engineering and production** throughout the life cycle of the ship
- Integrating **embedded software, data centers and computing capability** onboard ships as well as in design offices, workshops and shipyards
- Managing complexity with the help of **Artificial Intelligence and Big Data** technologies, to enhance crew and industrial teams capabilities

DIGITAL TECHNOLOGIES AT THE HEART OF THE LIFE CYCLE OF NAVAL SYSTEMS



NAVAL
GROUP