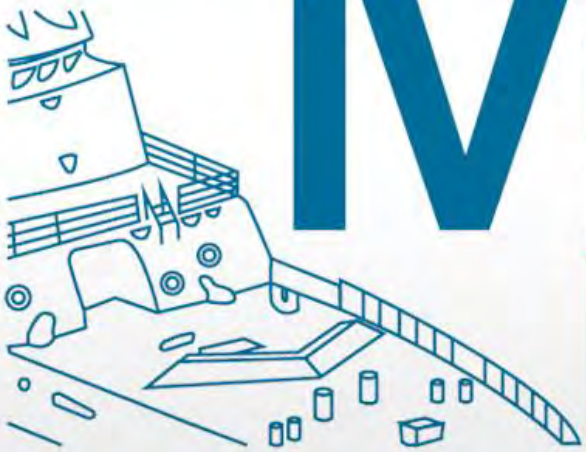


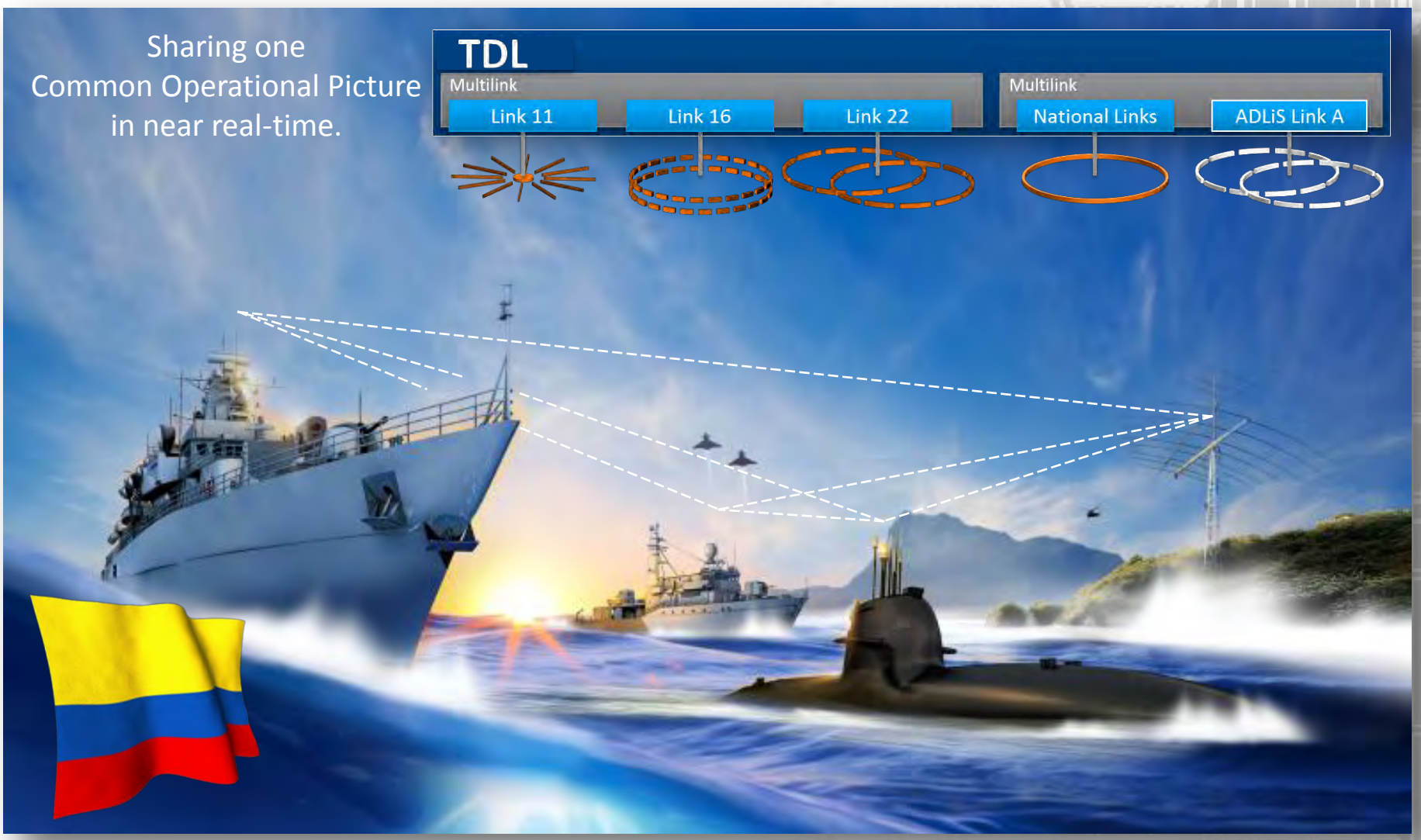
IV CONGRESO INTERNACIONAL DE DISEÑO E INGENIERÍA NAVAL

11 - 13 DE MARZO DE 2015

Modern Tactical Data Link Systems

Network capability for all nations

Sharing one
Common Operational Picture
in near real-time.



Modern Tactical Data Link Systems

Link 11 | Link 16 | Link 22 | National Link | Link Colombia

Multilink | Multilink

TDL

Common Host Interface

Integrated Naval Combat System

Either
Or

autonomous
Stand-Alone Console

Modern Tactical Data Link Systems

Examples for existing TDL configurations

- Configuration for German frigate class F125
  - Multi-Link (Link 11, 16, 22) system for
    - parallel
    - single
    - or joint (via forwarding) operation

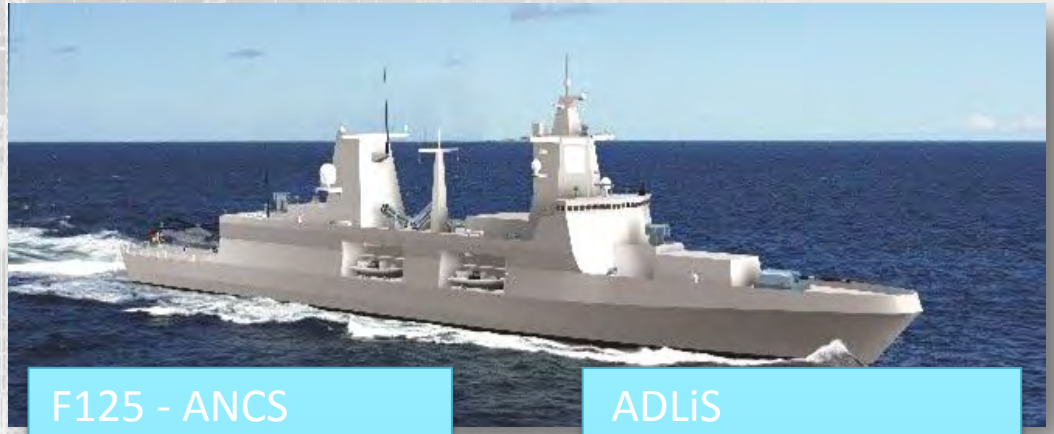
    of the different link channels

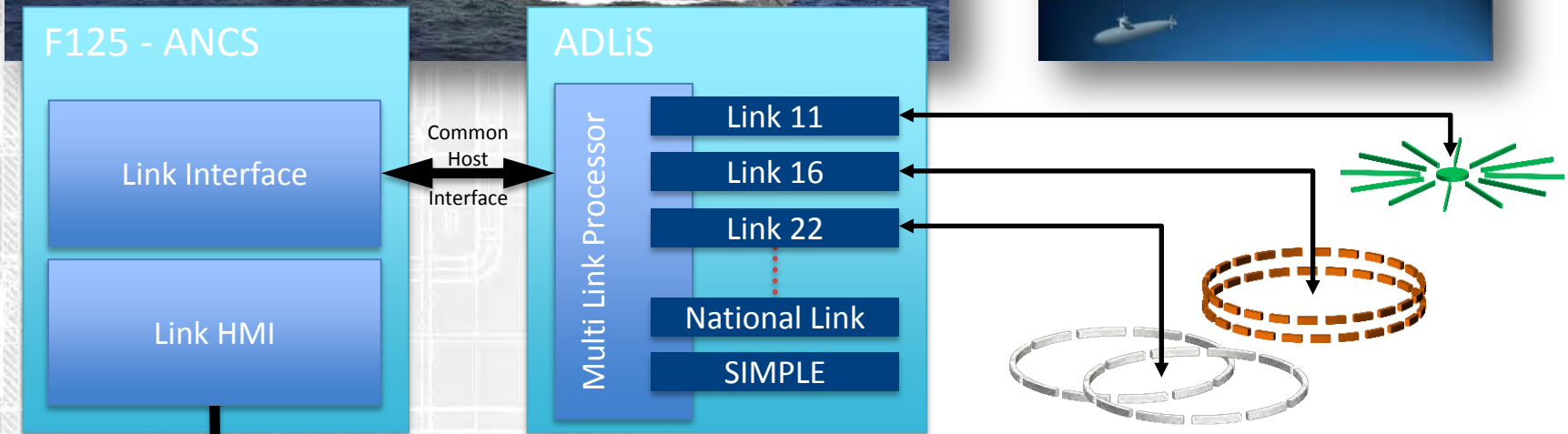
- Configuration for non-NATO countries using proprietary National Link solution
  - Single National Link operation; full integration of National Link into Combat Management System

- Stand-alone configuration for non-NATO countries using existing National Link and future Link Colombia in parallel
  - single national Link operation
  - single Link Colombia operation
  - joint operation

Modern Tactical Data Link Systems

Configuration for German frigate class F125 – Link 11, 16, 22





Combat Management System

Modern Tactical Data Link Systems

Examples for existing F125 TDL configurations

Link 11

Link 16

Link 22

Evolution of Data Link Systems

from existing National TDL to Link Colombia

National Link

Existing Combat System

Evolution of Data Link Systems

from existing National TDL to Link Colombia

National Link

Link Colombia

Multilink

TDL

Common Host Interface

Existing Combat System

Either
Or

autonomous
Stand-Alone Console

Evolution of Data Link Systems

from existing National TDL to Link Colombia

National Link

Link Colombia

Multilink

TDL

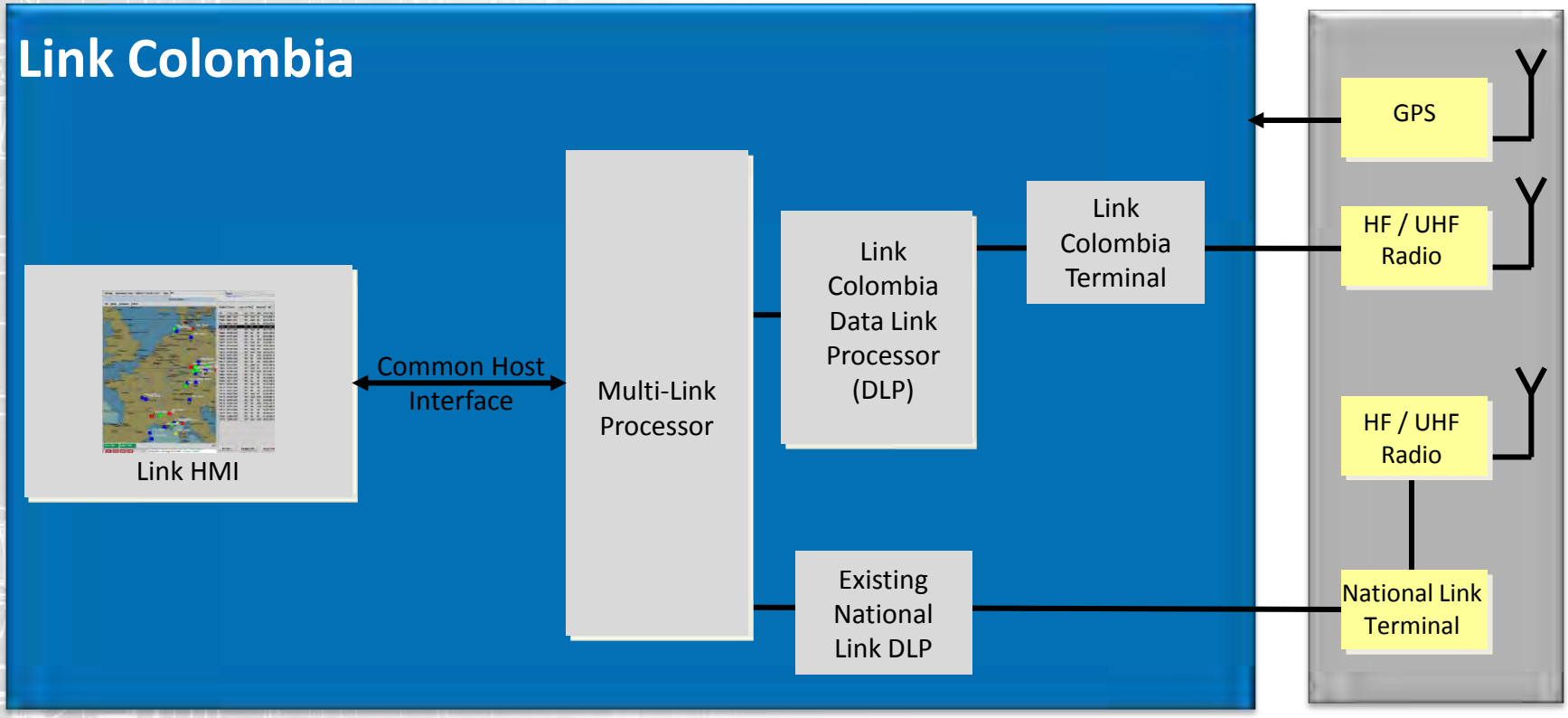
Common Host Interface

Future
Naval Combat System

Either
Or

autonomous
Stand-Alone Console

Future Link Colombia

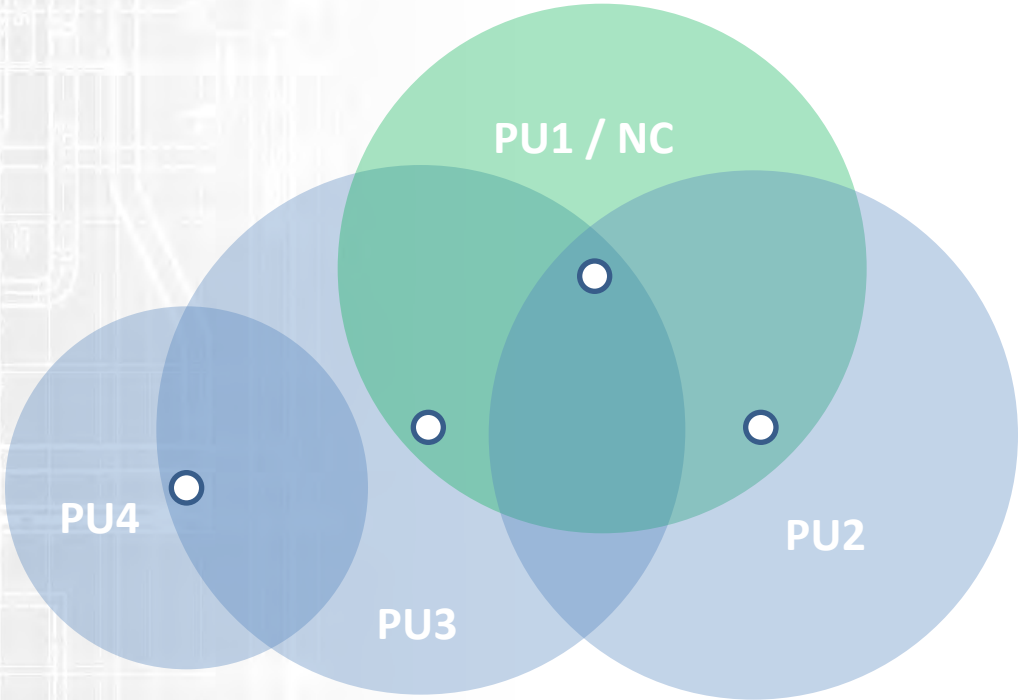


Link 22 based Data Link Systems

Link 22 Network Stabiliy

Enable network redundancy to maintain link connection

- Built-in network redundancy by avoiding needing a dedicated Network Control (NC) station
- Automatic Routing and Relay by each unit / connection between Participating Unit 1 (PU1) and PU4



Link 22 based Data Link Systems

Link 22 Position Accuracy

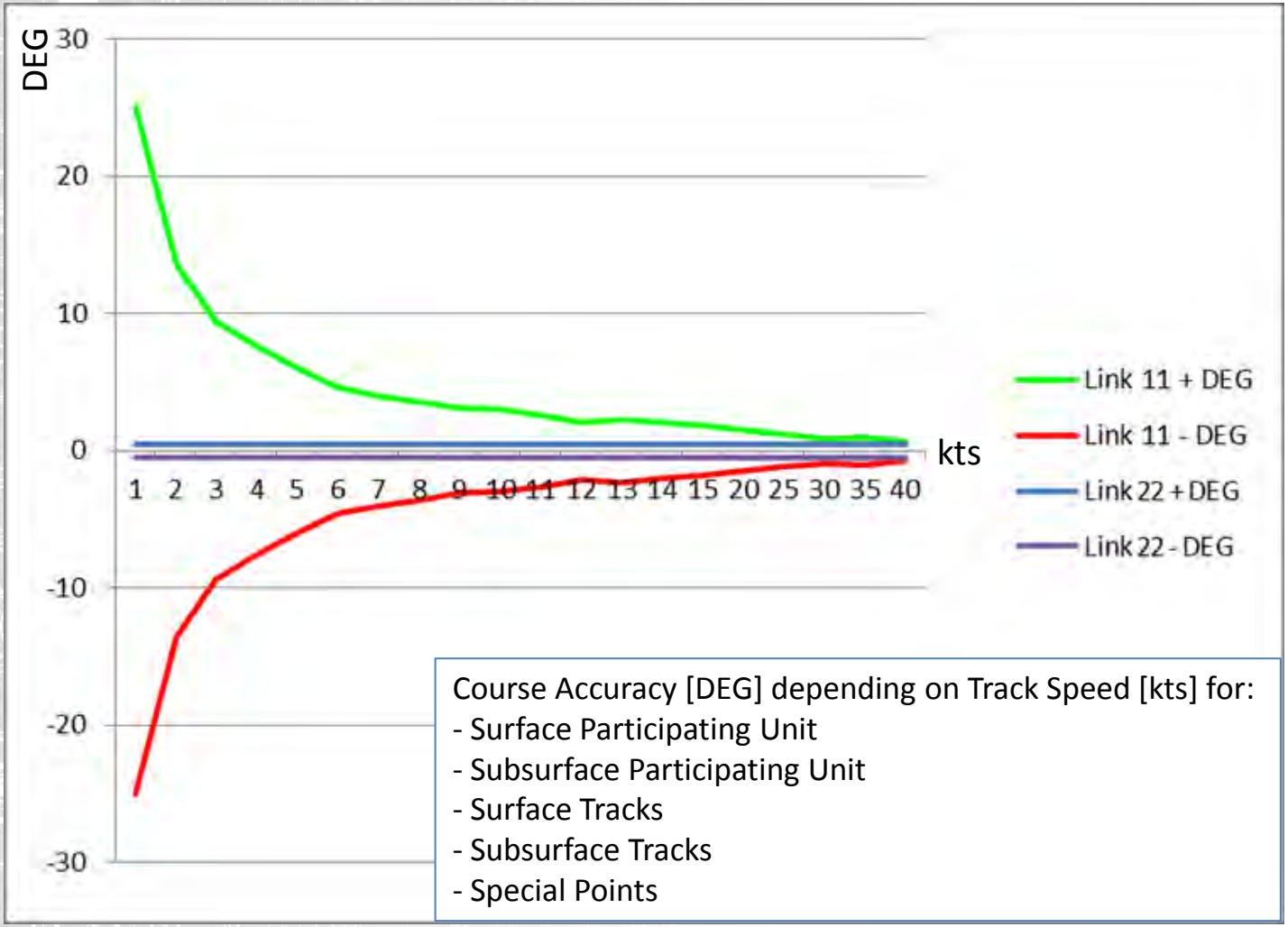
State-of-the –art (Link 22 based) TDL systems providing:

- precise position (accuracy +/- 25 m) and worldwide position reporting capability
- position (accuracy independent of the distance between reporting sensor units and observed target positions.

  allowing weapons engagements even for over-the-horizon targets.
- The state-of-the-art TDL network is able to transmit precise course (accuracy +/- 1 deg) and speed (accuracy +/- 1 kts) values for each target independent of target speed.

Link 22 based Data Link Systems

Link 22 Course Precision
(compared with Link 11 based tactical data links)



Course Accuracy [DEG] depending on Track Speed [kts] for:
- Surface Participating Unit
- Subsurface Participating Unit
- Surface Tracks
- Subsurface Tracks
- Special Points

Link 22 based Data Link Systems

Link 22 Course Precision
(compared with Link 11 based tactical data links)

Positional Accuracy of Link Tracks	**Link 11 [m]**	**Link 22 [m]**
Participating Unit	29	19
Air track (close distance)	58	19
Air track (far distance)*	486	19
Surface track (close distance)	58	19
Surface track (far distance)*	486	19
Subsurface track (close distance)	58	19
Subsurface track (far distance)*	486	19

*) for tracks in a distance of more than 32nm to Reporting Unit

State-of-the-Art Link TDL Systems

Highlights

- Distribution of tactical information to all forces
- Link 11, 16, 22 and national channels
- Solution for NATO (11, 16, 22) and non-NATO (national Links)
- High accuracy in course and position enabling targeting
- Forwarding between Link channels
- Exchange of addtitional information (free text, images)
- Available as stand-alone system
- Connectable to all C^2 systems

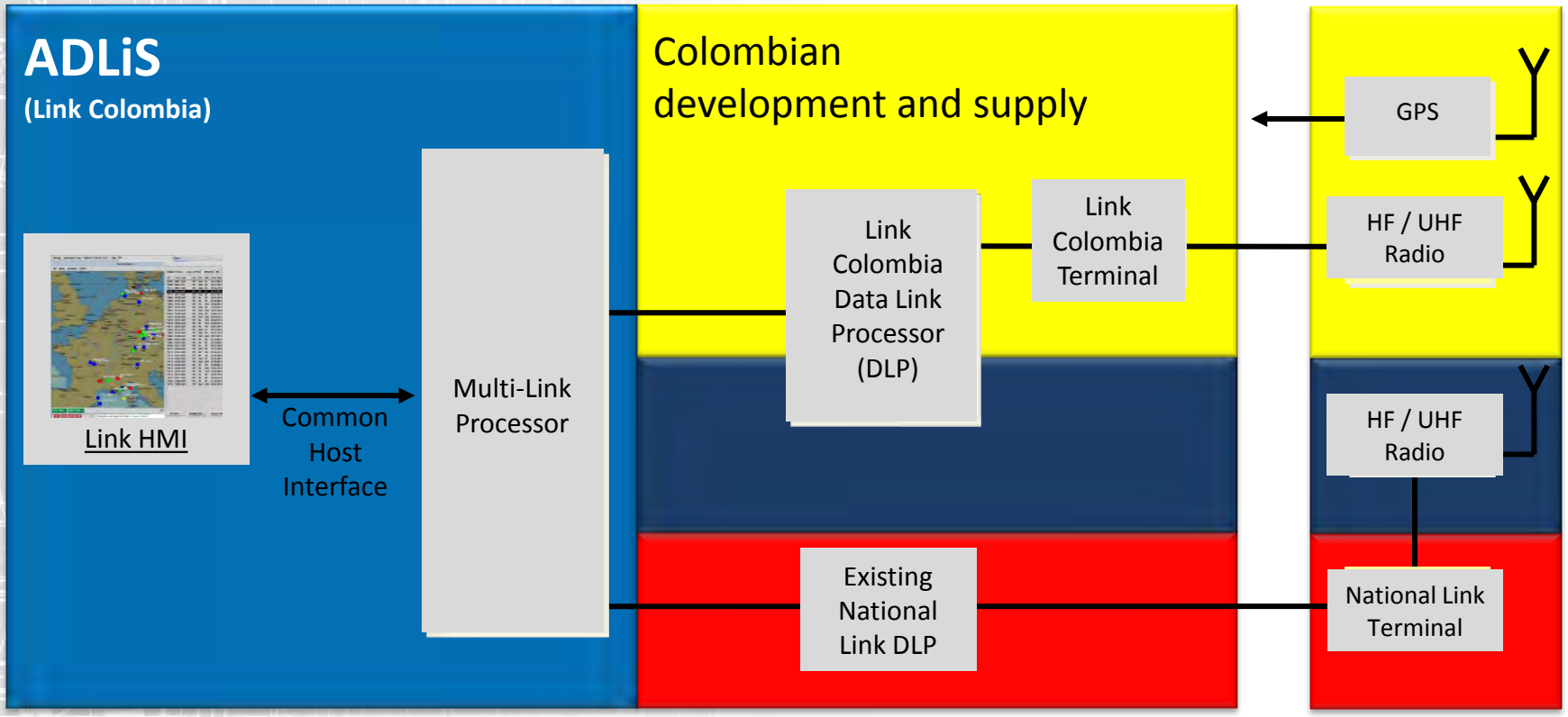
Link 11 TDL Systems vs Link 22

Technical Data Summary

LINK 11 Based	LINK 22 Based
Polling Network managed by Network Control Station (NCS)	Self-configuring TDMA which provides deterministic access to the network
Dedicated Network Control Station (NCS) required (single point of failure)	No dedicated Network Control station required (self organized network - **no** single point of failure).
No relay possible	Relay possible by any participating unit
Limited range (due to direct radio connection)	Extended range by automatic relay
No network redundancy	Built in network redundancy
Each unit can handle only 150 Tracks/points	Practically no limit on number of tracks/points per unit (>500.000 and only limited by hardware/processing power)
Poor course accuracy for slow moving objects	Precise course accuracy independent of object speed
Sufficient precision of position reporting **only** for objects in the neighborhood of the reporting unit. For Long range distance targets only **poor** precision of position reporting available.	High precision position reporting independent of distance to reporting unit (worldwide)
Data Rates up to 4800 bps	Data Rate up to 9,600 bps over HF channel Data Rate up to 32,000 bps over 8.33 kHz VHF/UHF radio Data Rate up to 153,600 bps over a single wideband 40 kHz VHF/UHF radio
Supports up to 62 Participating Units	Addressing scheme supports up to 125 units per super-network.
Track number scheme limited to 12 bit (max. 4092 link objects)	19 bit track number scheme (max. 524.281 link objects)

Joint Development with Cotecmar

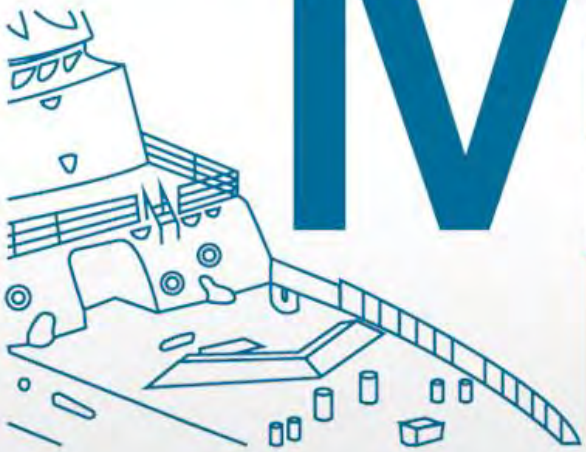
for future Link Colombia



Joint Development with Cotecmar

Transfer of Technology and Knowledge for future Link Colombia

- Partnership with local industry
- Transfer of source code and intellectual properties
- Provision of development environment
- Training of operators, maintainers and developers
- Support of local development plans



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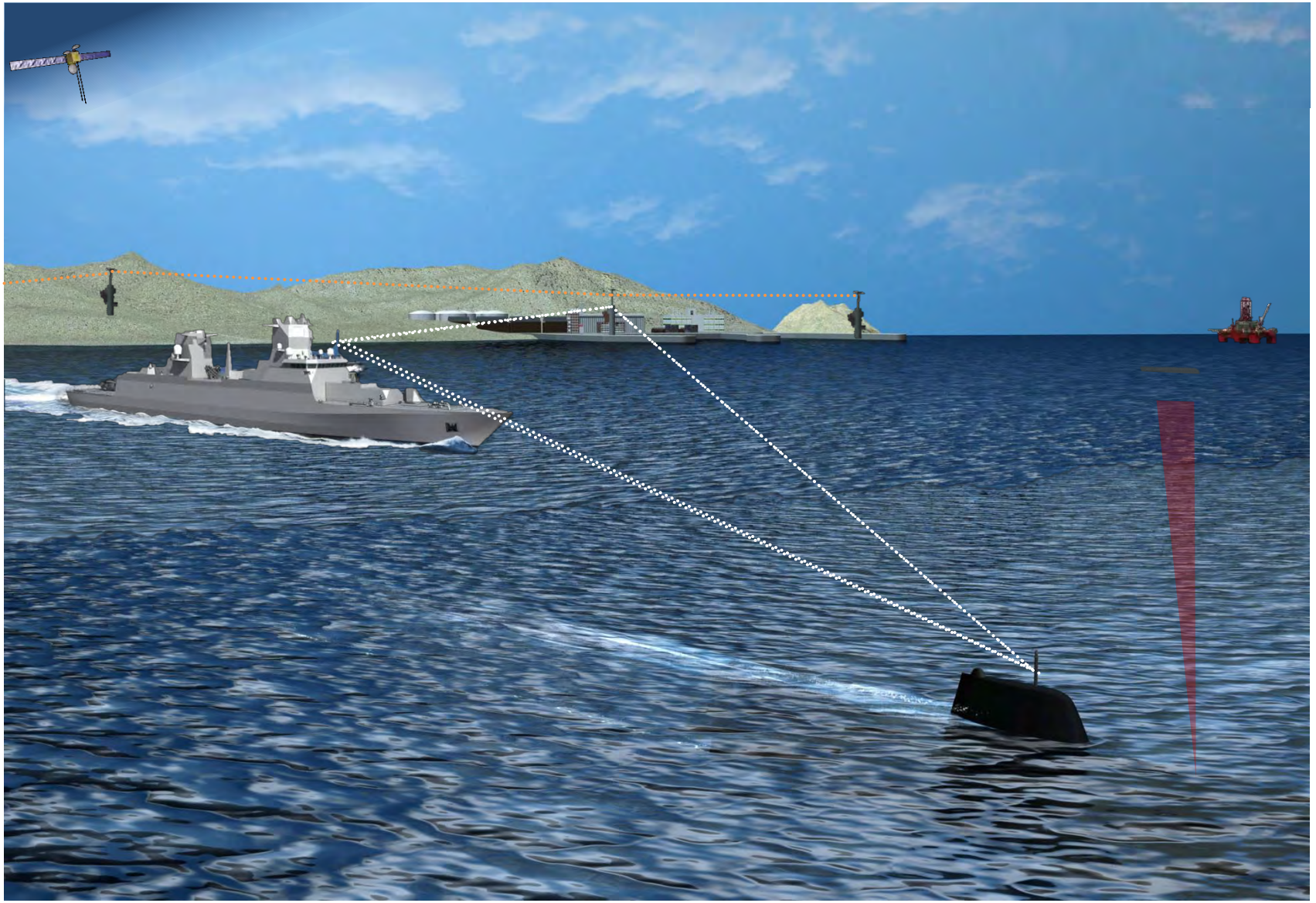

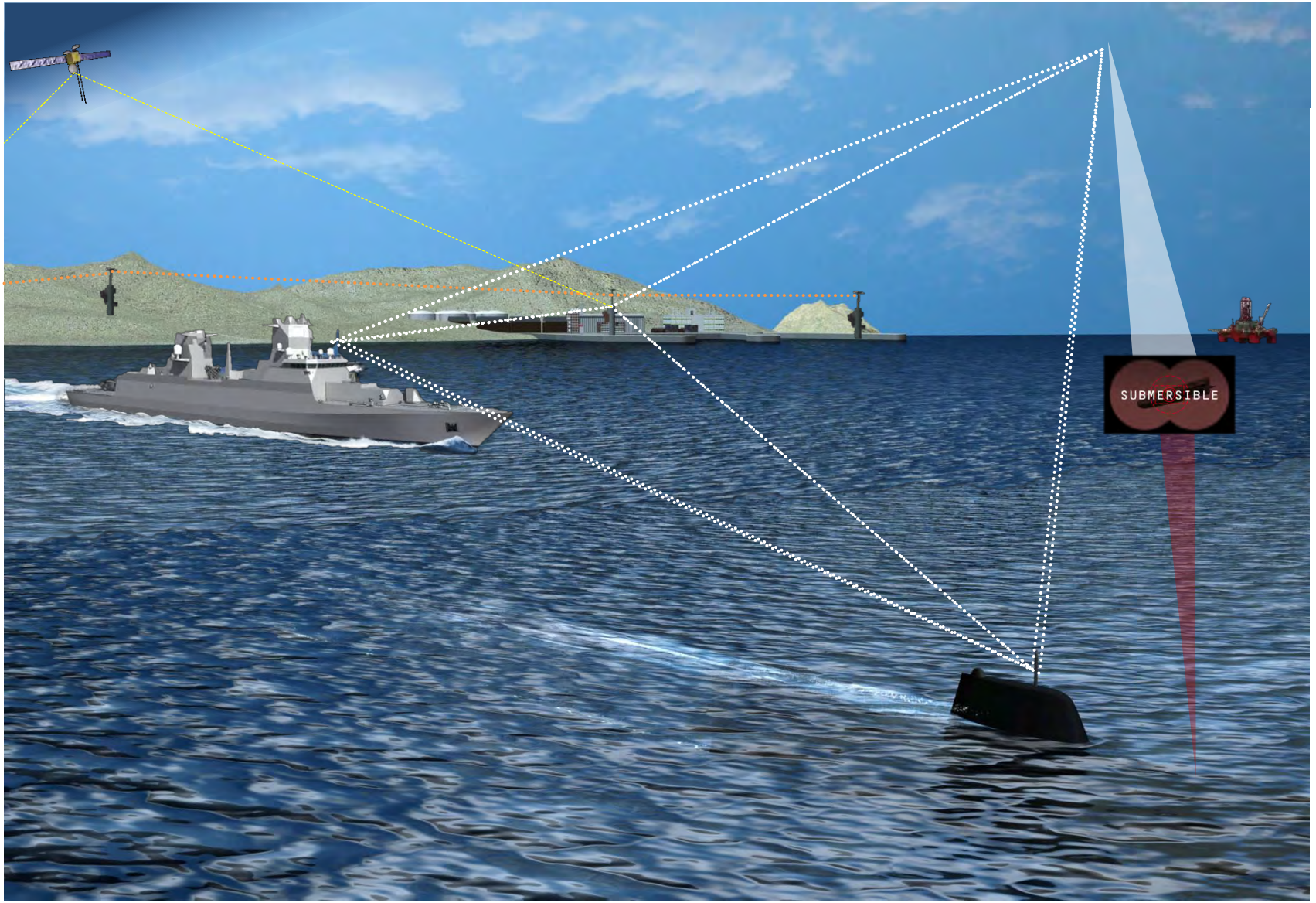
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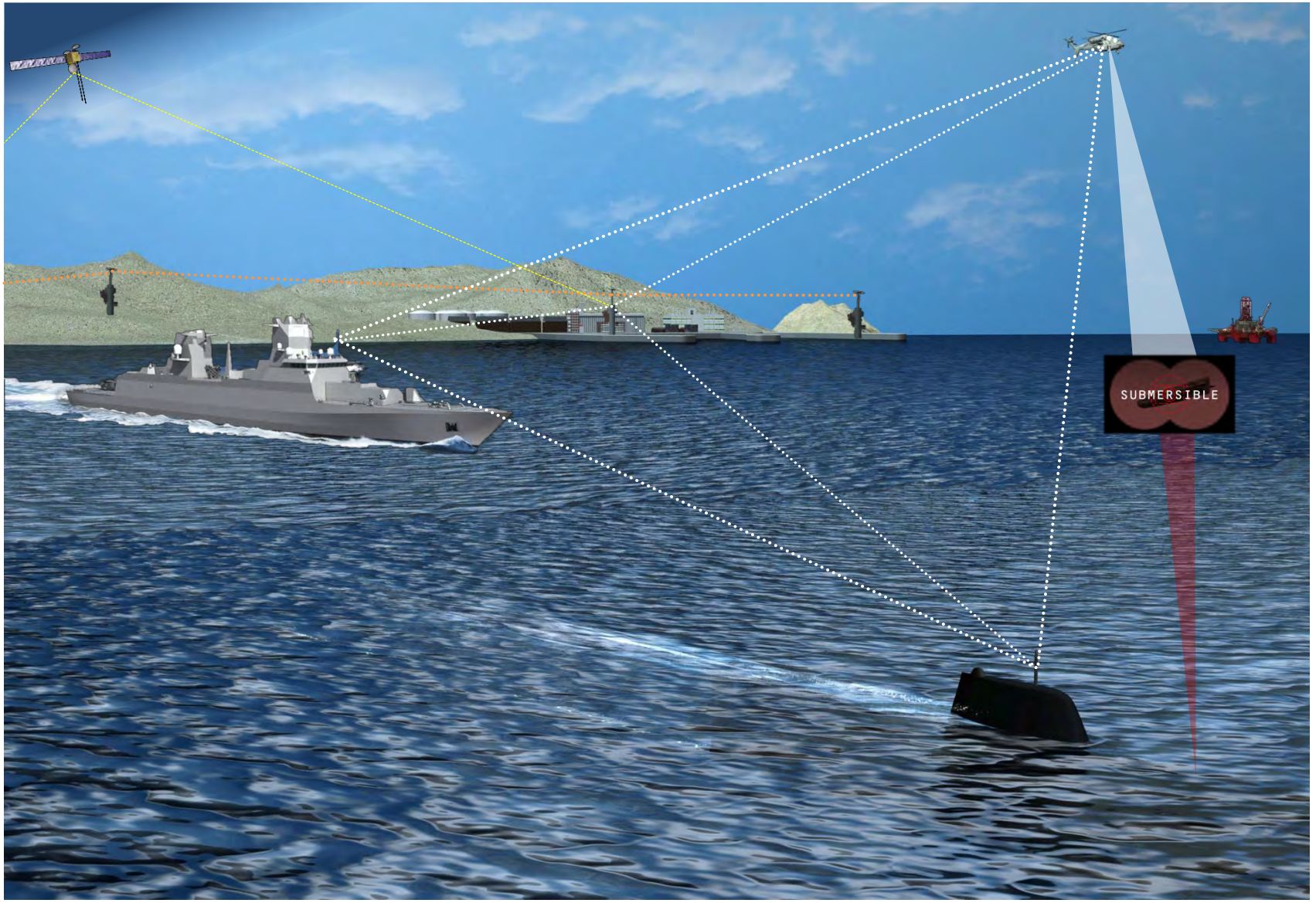
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