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 DIGITPORTS

DT as a foundation concept - Nexus Project Perspective

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High Level Training on Digital Twin applications in Port
ecosystems, Venice 28th Jan 2025



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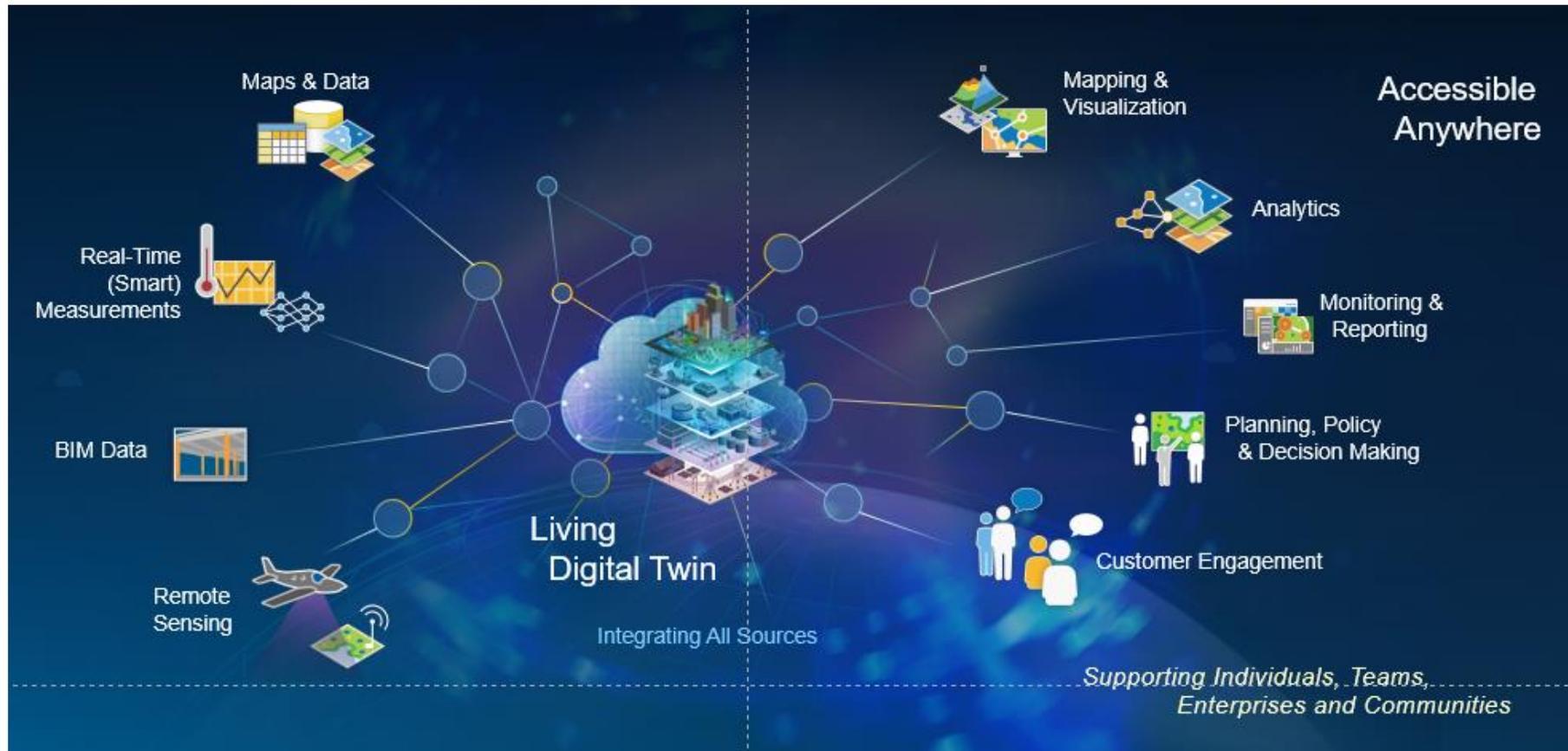
Digital twins are **powered by data** and **perpetually hungry** for more

What's the role of Geographic Information?

- **UN-GGIM*** - **80% of data** globally has geographic or spatial component
- **McKinsey Global Institute** emphasizes the **growing importance of geospatial data** due to the proliferation of location-based technologies (e.g., satellite, drones, IoT, and others).
- **IMO - 100% of maritime activities depend on geographic information**, from planning trade routes to navigating safely
- Studies in port management and logistics report that geospatial data forms the **backbone** of **80-90% of decision-making processes**, including port efficiency analysis, berth allocation, environment and security.

Why GIS?

A System For Managing, Sharing And Applying Geographic Information



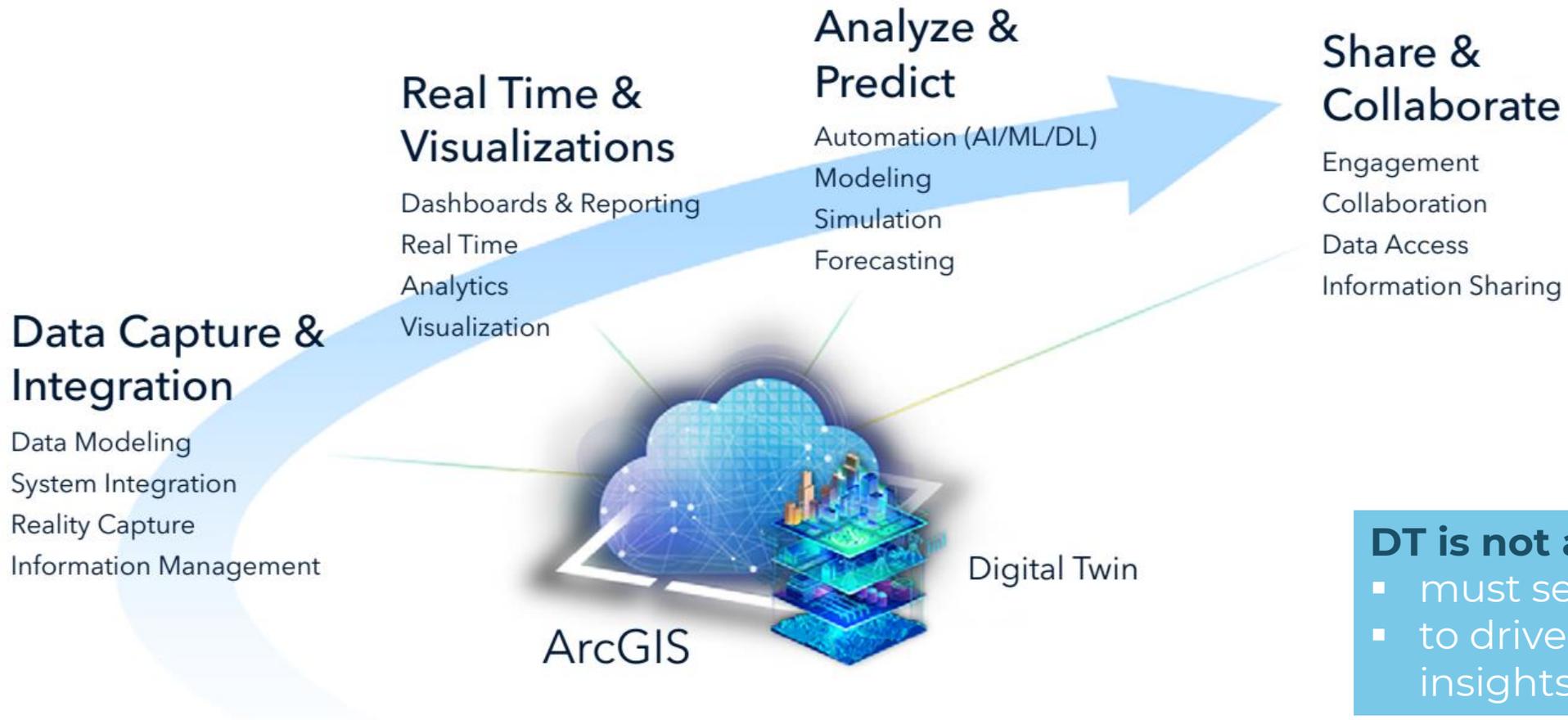
What Is a Digital Twin?



GIS

The foundation of the Digital Twin

Digital Twin:: Life Cycle



DT is not an end in itself

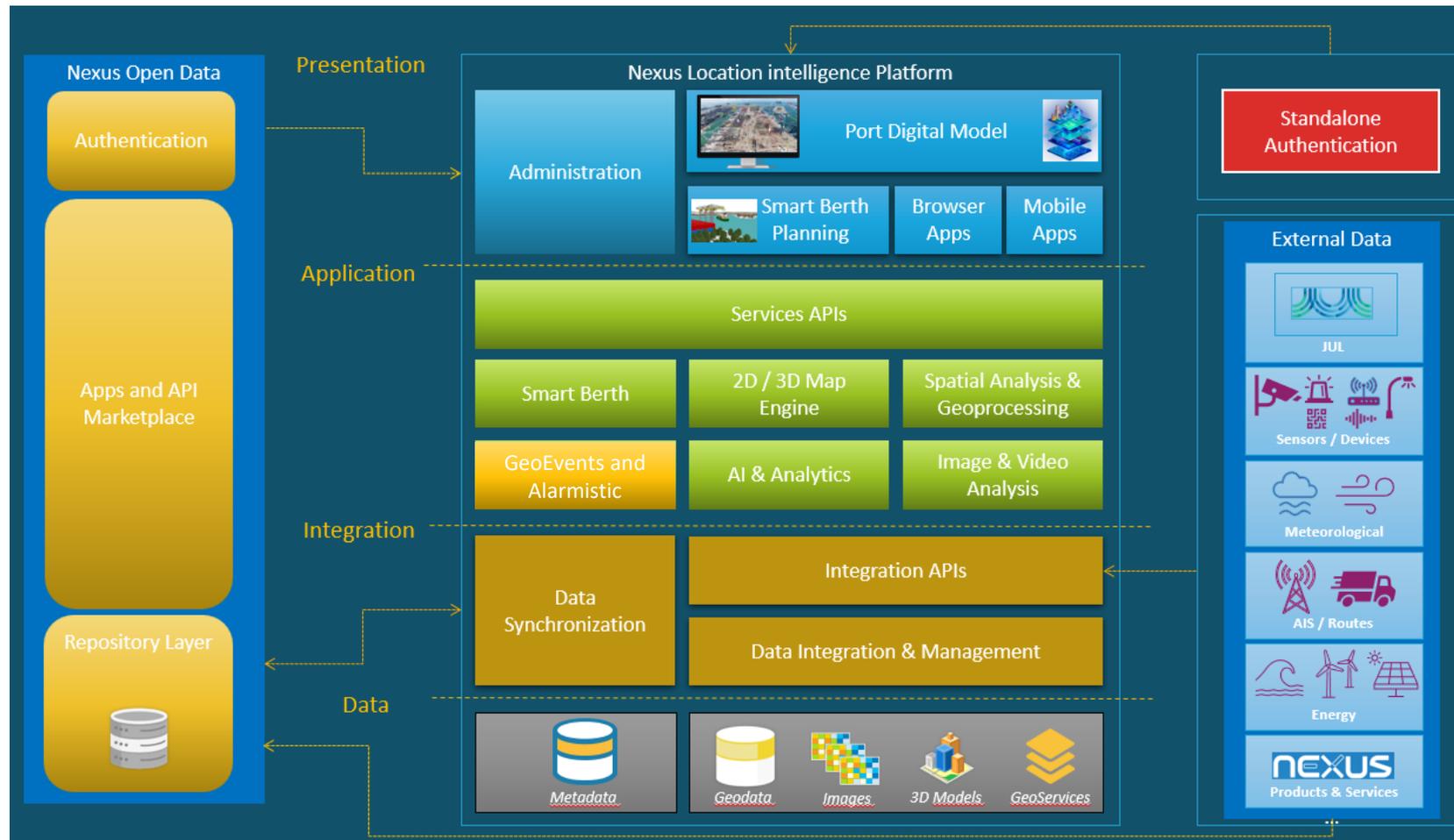
- must serve a purpose
- to drive meaningful insights and decisions



Nexus Location Intelligence Platform

Common Ground for a Digital Twin

Logical Architecture



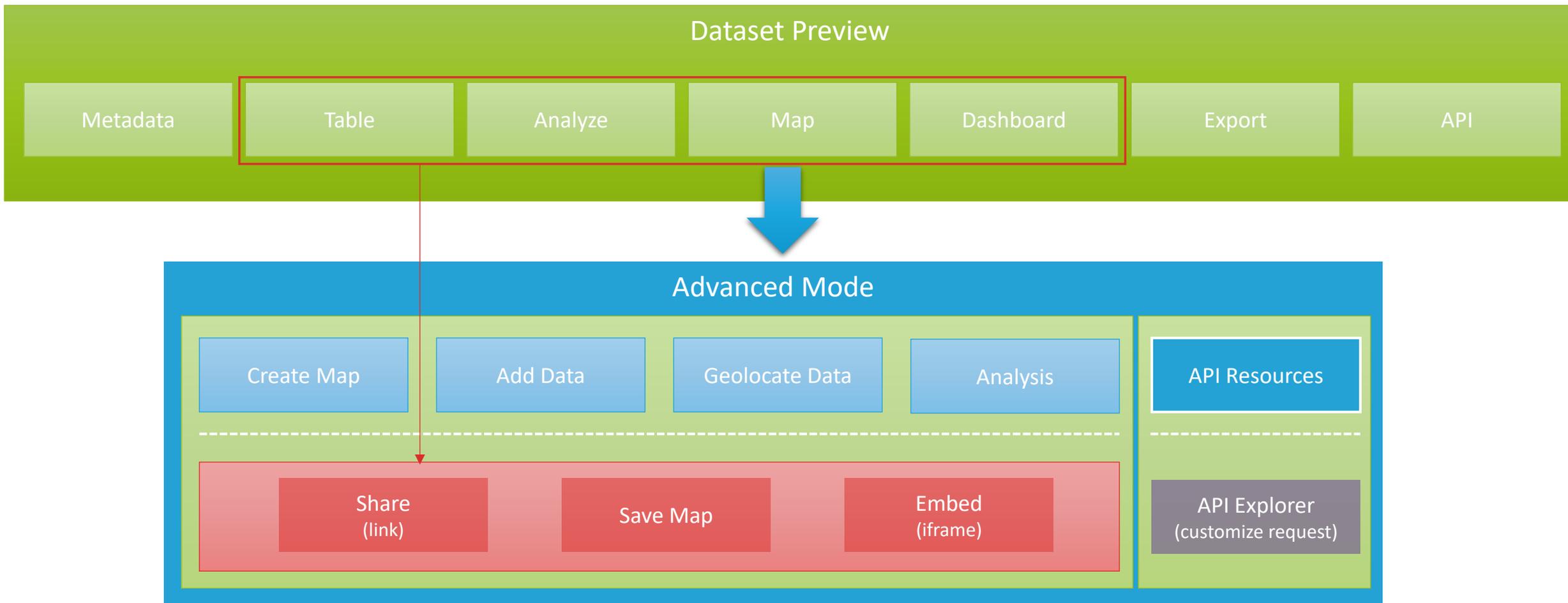
Nexus Location Intelligence Platform

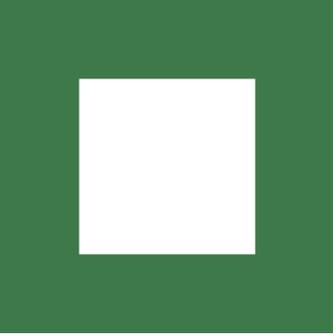
Common Ground for a Digital Twin

Open Data Visualization



Visualization Approach





Nexus Location Intelligence Platform

Common Ground for a Digital Twin

Digital Model

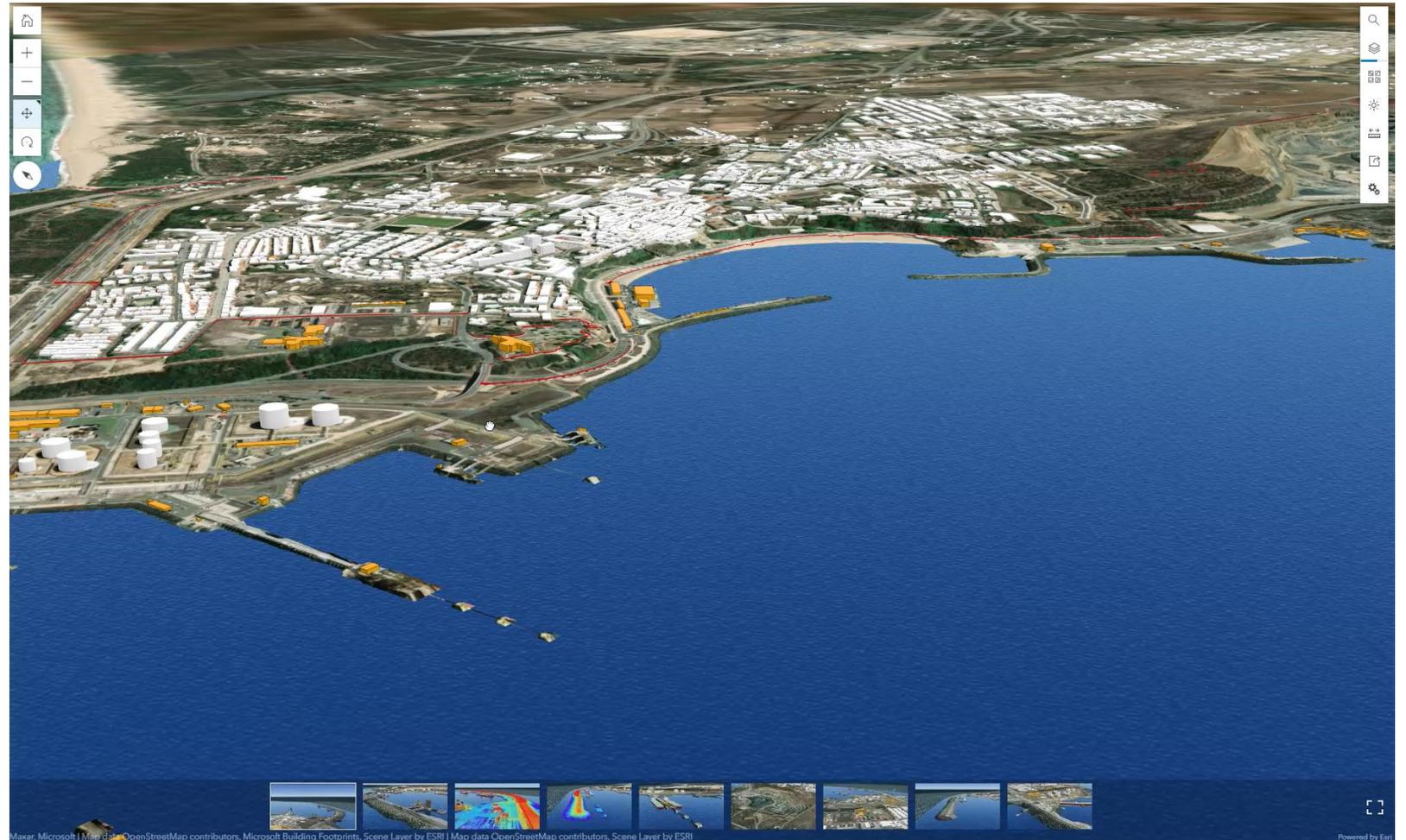
Accurate Digital Representation
Maps and 3D Models

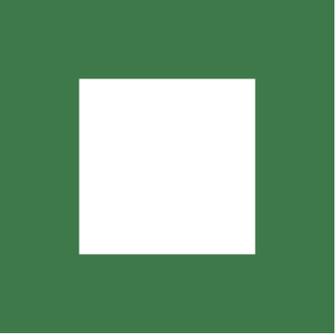


Digital Model Prototype

3D Web Scene App with

- aerial surveys done by drone
- vectorial 2D existing data
- Esri satellite base map



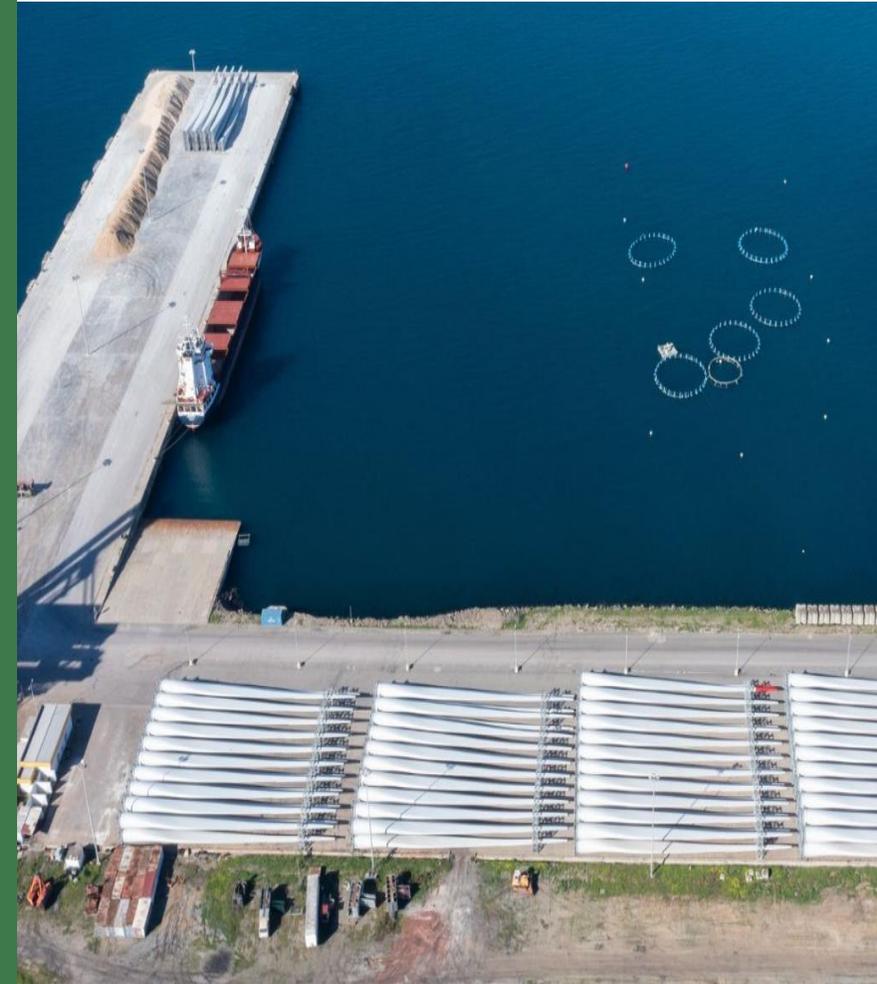


Nexus Location Intelligence Platform

Common Ground for a Digital Twin

Digital Shadow

Integrate Real-Time /IoT Data

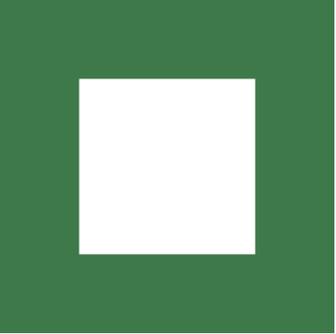


Digital Shadow Prototype

3D Web Scene App with

- Real-time vessels' position and info



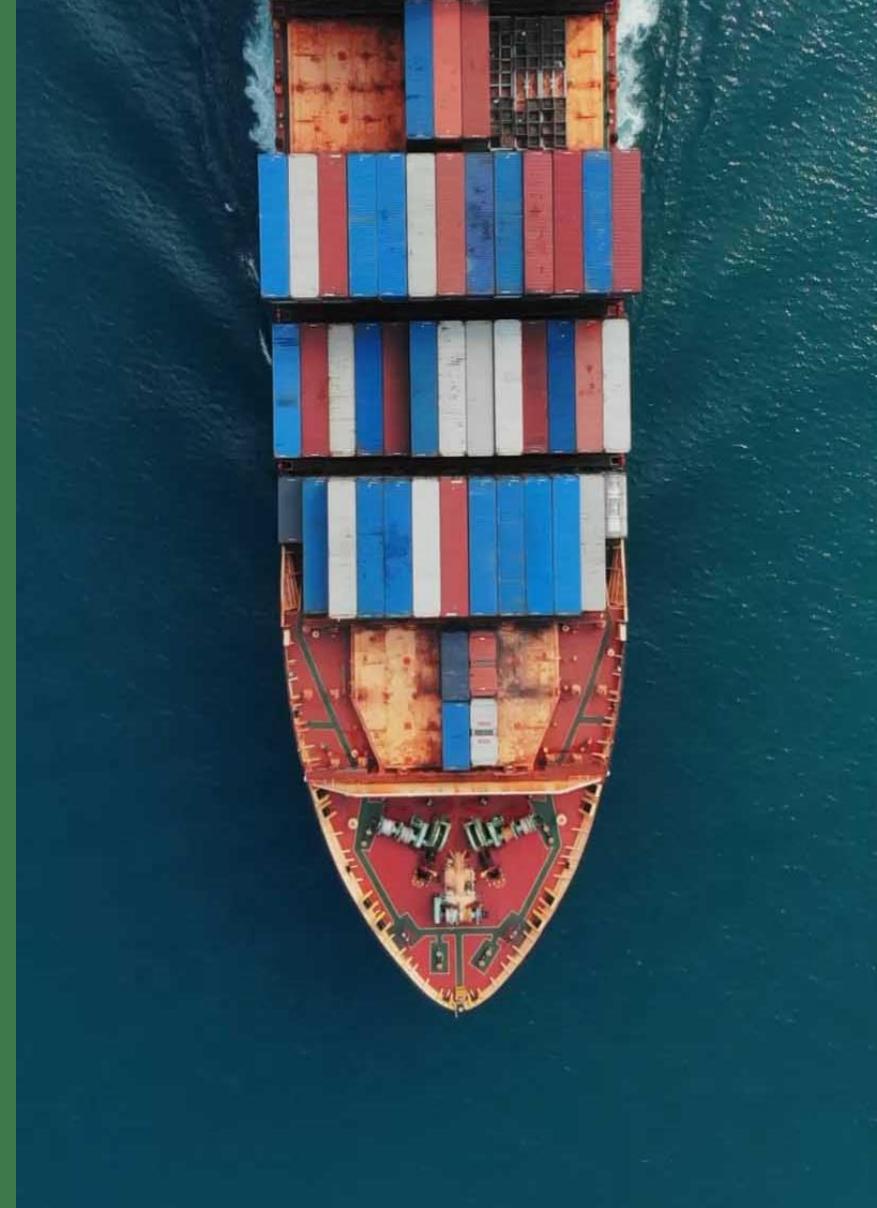


Nexus Location Intelligence Platform

Common Ground for a Digital Twin

Digital Twin

Interaction Smart Berth Planning - PCS (Single Window) – AIS – IoT - Bathymetry



What is the Smart Berth Planning?

- Solution to provide port authorities an environment to **validate vessels berth** in the different types of terminal
- Several **business rules** as cargo type, priority contracts, daylight constraints, depth constraints and others are used to help port authorities to take decisions
- **Clear picture of the port calls** (list and table)
- Do plans and **scenarios simulations**
- **Timeline view** of the recent operations

	MMSI	Nome	Tipo	ATA	ETD	CFF	Boca	Calado	Estado	Ações
<input type="checkbox"/>	210585000	FLORVIK	Carga	15-10-2024 19:20:00	16-10-2024 21:00:00	90	13	6	ATRACADO	
<input type="checkbox"/>	210072000	WEC VAN EYCK	Carga	15-10-2024 12:12:00	17-10-2024 04:00:00	142	21	8,5	ATRACADO	
<input type="checkbox"/>	210283000	WEC DE HOOGH	Carga	15-10-2024 11:28:00	17-10-2024 04:00:00	150	22	8,7	FUNDEADO	
<input type="checkbox"/>	246303000	PROGRESS	Carga	15-10-2024 09:48:00	17-10-2024 23:59:00	118	13	6,1	ATRACADO	
<input type="checkbox"/>	211341960	BOLDWIND	Carga	15-10-2024 09:41:00	19-10-2024 18:00:00	149	26	5,2	FUNDEADO	

Components

Port Viewer

The Port Viewer interface displays a map of the port area with various vessels and a detailed table of ship arrivals and departures. The table includes columns for ship name, MMSI, IMO, type, ETA, ETD, CFF, Boca, Calado, and Local. The table shows 17 records.

Escola	MMSI	Nome	Tipo	ATA	ETD	CFF	Boca	Calado	Local
	538010485	VENTO DI BORA	Carga	09-09-2024 06:25:00	10-09-2024 18:00:00	172	28	8.2	TMS-2
	250006549	ARKLOW CLOUD	Carga	08-09-2024 09:22:00	10-09-2024 13:00:00	84	15	5.8	SAPEC - GRANES SÓLIDOS
	374519000	TS DELTA	Carga	07-09-2024 16:35:00	10-09-2024 20:00:00	182	30	9.9	TMS-1
	255 805 781	AMALTHEA	Carga	06-09-2024 16:31:00	04-10-2024 12:00:00	268	32	0	USNAVI - D
	314823000	WILSON DUSAVIK	Carga	06-09-2024 13:37:00	10-09-2024 01:00:00	88	12	5.5	TMS-2

Planner

The Planner interface displays a Gantt chart of vessel schedules and a detailed table of ship arrivals and departures. The table includes columns for ship name, MMSI, IMO, type, ETA, ETD, CFF, Boca, Calado, and Destino. The table shows 39 records.

Escola	MMSI	Nome	Tipo	ETA	ETD	CFF	Boca	Calado	Destinc
	255806261	LOLA B	Carga	09-09-2024 12:00:00	09-09-2024 20:00:00	155	22	6	TMS-2
	244650331	TRADE NAVIGATOR	Carga	09-09-2024 15:00:00	13-09-2024 21:00:00	118	16	7.2	SAPEC
	309497000	CONAKRY PEARL	Carga	09-09-2024 15:00:00	08-10-2024 23:30:00	200	32	6.5	USNAVI
	370819000	CATTLEYA	Carga	09-09-2024 17:30:00	17-09-2024 17:00:00	200	32	10.4	TMS-1
	255802680	WEC BOUWMEESTER	Carga	09-09-2024 19:00:00	10-09-2024 17:00:00	132	20	6	TMS-2

Simulador

The Simulator interface displays a map of the port area with various vessels and a detailed table of ship arrivals and departures. The table includes columns for ship name, Plano, Inicio, Fim, Nº Versões, Versão Ativa, Local, Data criação, Data atualização, and Ações. The table shows 45 records.

Código	Plano	Inicio	Fim	Nº Versões	Versão Ativa	Local	Data criação	Data atualização	Ações
PTSET20240826001	27082024	26-08-2024	27-08-2024	1	1	TMS-2	26-08-2024 11:35:25	26-08-2024 11:36:07	
PTSET20240823001	26082024	23-08-2024	26-08-2024	1	1	TMS-1	23-08-2024 17:05:25	23-08-2024 17:05:25	
PTSET20240822001	23082024	22-08-2024	23-08-2024	2	2	TERMINAL RO-RO	22-08-2024 09:23:05	22-08-2024 09:23:05	
PTSET20240723001	24072024	23-07-2024	24-07-2024	4	4		23-07-2024 11:27:51	23-07-2024 15:27:57	
PTSET20240719001	22072024	19-07-2024	22-07-2024	1	1	TMS-2	19-07-2024 15:50:31	19-07-2024 15:50:31	

Historic

The Historic interface displays a map of the port area with various vessels and a detailed table of ship arrivals and departures. The table includes columns for ship name, MMSI, IMO, SOG, COG, and Porto de Setúbal. The table shows 6 records.

Nome	MMSI	IMO	SOG	COG	Porto de Setúbal
PATRICK BLACKETT	232040743	IMO: 9762302	0.0	125.0	06/09/2024 0:00:56
PORTUGUS USBOA	263023000	IMO: 8117495	0.0	132.0	06/09/2024 0:00:56
RESISTENTE	263002550	IMO: 6803404	0.0	199.0	06/09/2024 0:00:56
FLORVIK	20585000	IMO: 9956331	0.0	39.0	06/09/2024 0:00:56
MUSA	877062900	IMO: 8117507	0.0	303.0	06/09/2024 0:00:56
SATURN MOON					

Value Proposition

- **Decision support and validation system**

- **Real-time awareness** of the situation and movements in port
- **Berth plans and maneuvers creation** with advanced simulation capabilities
- Anticipate changes and **adapt to new scenarios** (alerts for operational adjustments)
- Permanent evaluation of security thresholds

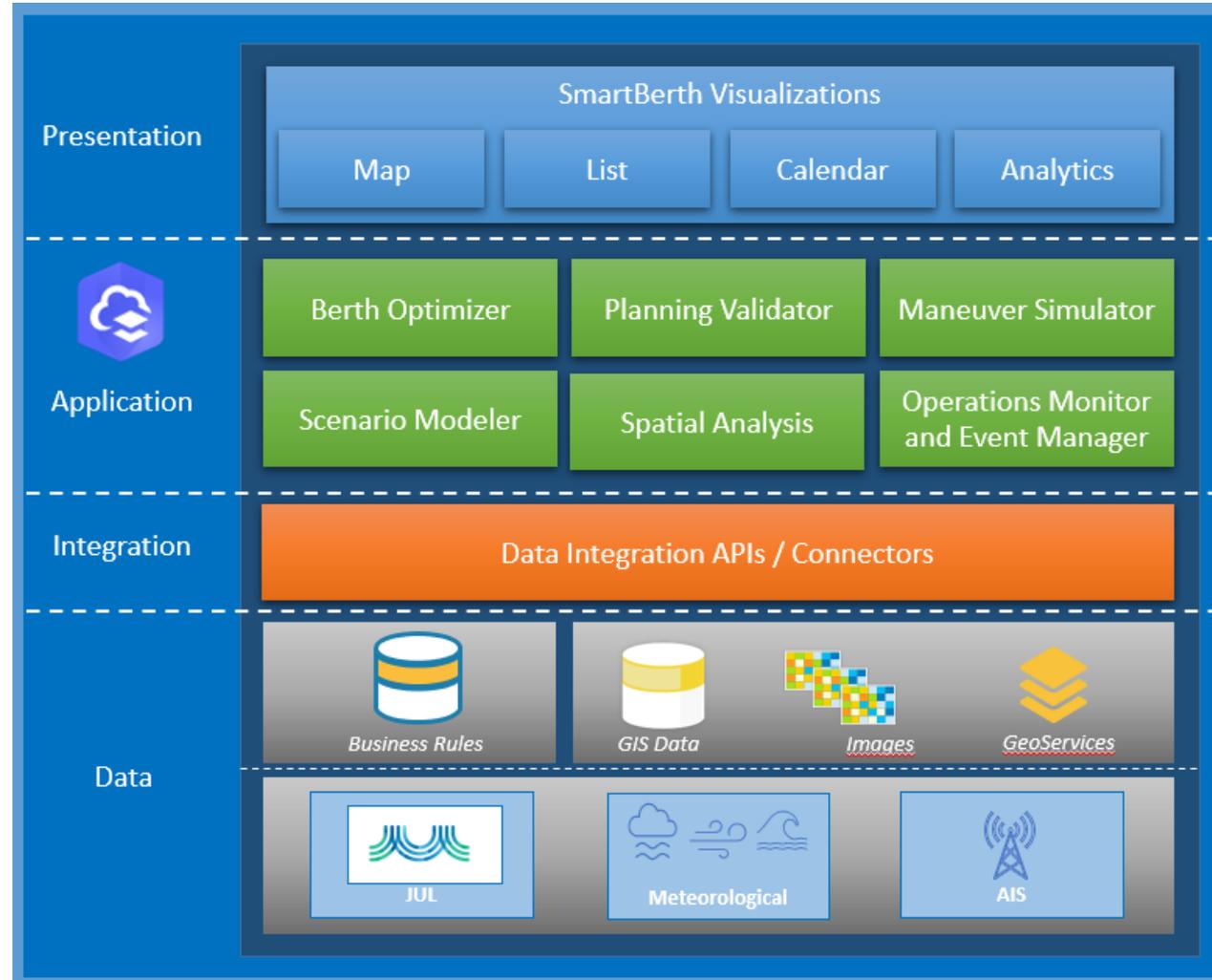
- **Collaborative environment**

- Integration of data from **different sources and processes** (Port calls, business rules, operational and natural constraints)
- **Automate data collection**
- Stakeholders and systems **information sharing** at the time when its needed

Value Proposition

- **Optimization**
 - **Optimize** the usage of berths and **operational resources**
 - Use of **historical data** to automate decisions and give suggestions
 - **Measure and analyze** the efficiency of the process

Logical Architecture



Functionalities

The screenshot displays a port management system interface. At the top, a navigation bar includes 'Mapa Porto' (highlighted with a red circle), 'Planeamento', 'Simulador', and 'Histórico'. The 'esri Portugal' logo is on the right. The main area features a map of the Setúbal harbor with several berths marked. On the left, a sidebar lists ship arrivals with details like ship name, MMSI, IMO, ATA, ETD, and TMS. Below the map is a data table with columns for search, sorting, and filtering. The table lists 6 records of ship arrivals, all marked as 'ATRACADO' (Berthed). The bottom of the interface shows pagination controls and a timestamp: 'Última atualização em 13-12-2024 16:41:06'.

<input type="checkbox"/>	Escala ↑↓ ▾	MMSI ↑↓ ▾	Nome ↑↓ ▾	Tipo ↑↓ ▾	ATA ↕	ETD ↑↓	CFF ↑↓ ▾	Boca ▾	Calado ↑↓ ▾	Local ↑↓ ▾	Estado ↑↓ ▾	Acções
<input type="checkbox"/>	PTSET124001619	255915664	ELBTOWER	Carga	13-12-2024 11:05:00	14-12-2024 13:00:00	170	28	7.8	TMS-2	ATRACADO	i 📍 📄 📑
<input type="checkbox"/>	PTSET124001600	255802680	WEC BOUMEESTER	Carga	13-12-2024 09:54:00	13-12-2024 17:00:00	132	20	6	TMS-2	ATRACADO	i 📍 📄 📑
<input type="checkbox"/>	PTSET124001628	210585000	FLORVIK	Carga	13-12-2024 06:59:00	13-12-2024 23:00:00	90	13	6.2	SECIL - ESTE	ATRACADO	i 📍 📄 📑
<input type="checkbox"/>	PTSET124001669	255806316	TITLIS	Carga	12-12-2024 17:28:00	14-12-2024 15:00:00	118	15	7.5	TMS-2	ATRACADO	i 📍 📄 📑
<input type="checkbox"/>	PTSET124001637	255915755	ARAMIS	Carga	12-12-2024 14:58:00	15-12-2024 02:00:00	90	15	6.2	SAPEC - GRANÉIS SÓLIDOS	ATRACADO	i 📍 📄 📑

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