

Real-World Application of Port Digital Twins

Stefan Van Hooydonck

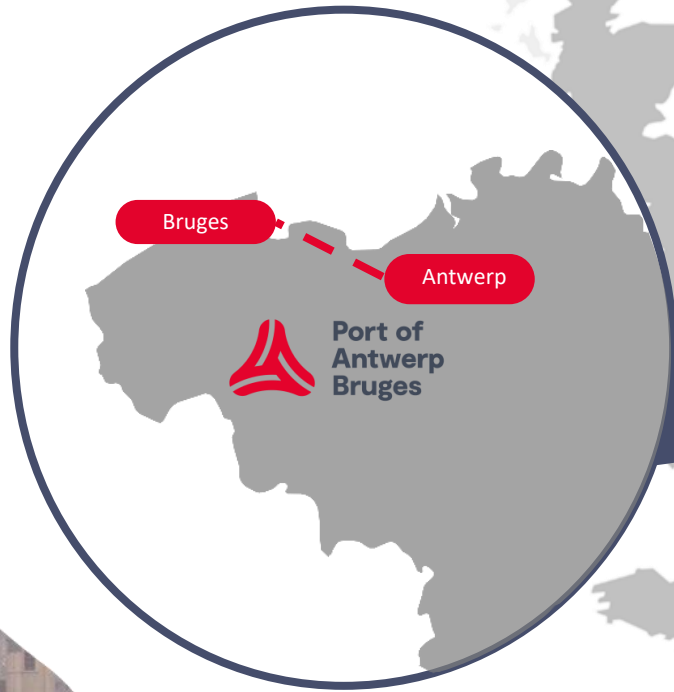
ORGANIZED BY:



NOT about 3D modelling of infrastructure

NOT about building infrastructure !

It is about a vision on how to use a Digital Twin to fulfill a specific purpose!



**A global port
in the heart of Europe**

**One port
Two sites**





2nd largest port in **Europe**



Largest **car handling** port in Europe
3,507,461 million cars/year



Number one **export** port in Europe



20,675 **Seagoing vessels**/year



Total throughput
287 mio tons/year



Largest **chemical** hub in Europe



Important **cruise** port in Benelux
547,374 passenger movements



15% of EU **gas** market



Belgium's most important economic driver



14,322
Hectares



1,400
Companies



€ 20,8 billion
Added value



4.5%
GDP



164,000 **jobs**
Direct and indirect



Energy transition
frontrunner



Need for Twins

HUMAN SENSES

DIGITAL SENSORS

Touch

UI & IoT

Vision

Cameras

Hearing

VHF

Smell

iNoses

Taste

Sensors



Digital nervous system

5G

Drones

IoT
Sensors

Camera's

Digital
Applications



Port of
Antwerp
Bruges

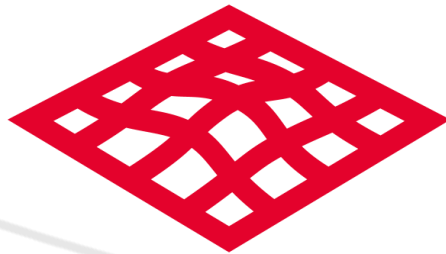


Digital nervous system

for efficient, safe and sustainable operations



Digital twin



Sensors



Drones



5G

Digital Twin is the capstone project



**Digital Twin as a vision
Not a single application**



A P I C A

Advanced Port Information & Control Assistant

Assets

Inspecties

Dokken en terminals

Bruggen

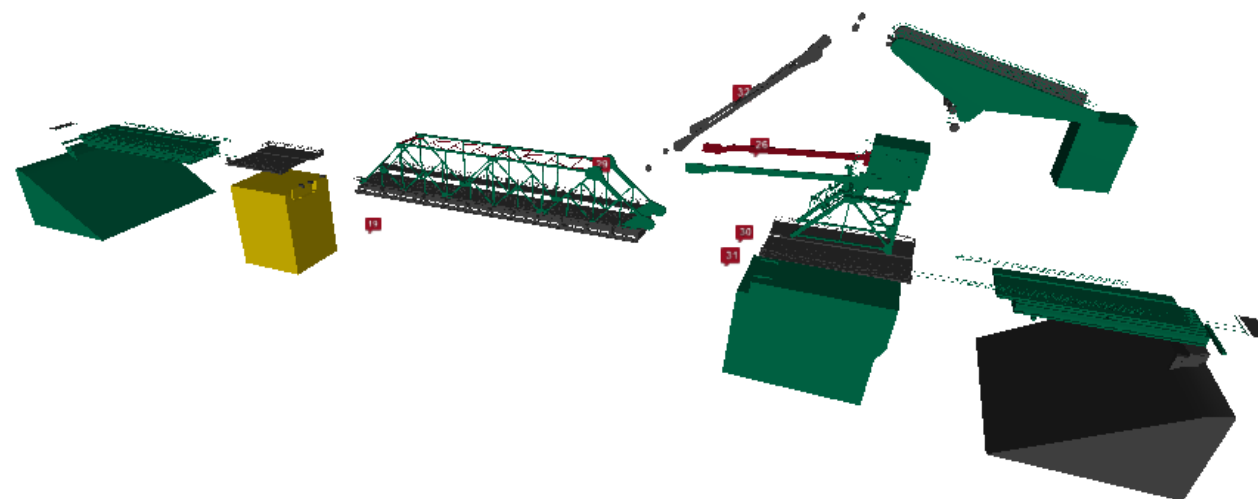
Rapporten

Instellingen

Inspectieronde van Van Cauwelaertbrug

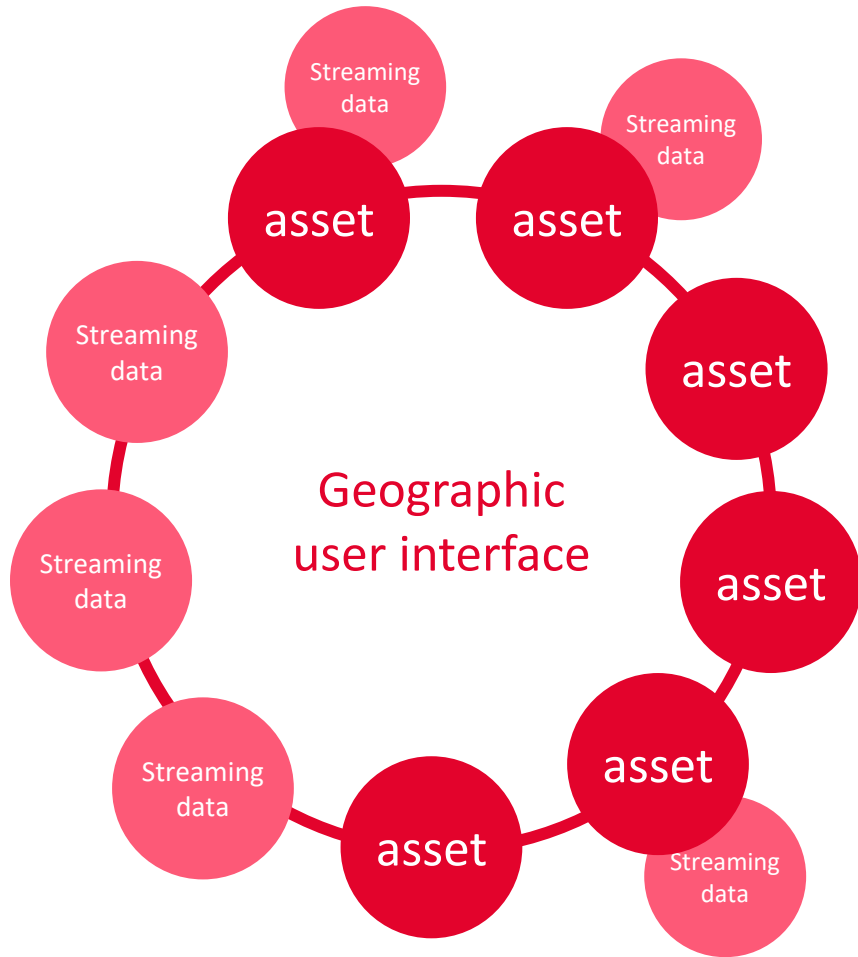


Brug		
Stoel (BRVCB12S)	<input checked="" type="checkbox"/>	>
Heugelbalken (BRVCB13H)	<input checked="" type="checkbox"/>	>
Vlucht (BRVCB14V)	<input checked="" type="checkbox"/>	>
Trekstangen (BRVCB15T)	<input checked="" type="checkbox"/>	>
Balans (BRVCB16B)	<input type="checkbox"/>	>
Brugpijler Noord (BRVCBBPN)	<input type="checkbox"/>	>
Brugpijler Zuid (BRVCBBPZ)	<input checked="" type="checkbox"/>	>
Vaste overspanning Noord (BRVCBLH08VN)	<input checked="" type="checkbox"/>	>
Vaste overspanning Zuid (BRVCBLH08VZ)	<input checked="" type="checkbox"/>	>
Landhoofd Noord (BRVCBLHN)	<input checked="" type="checkbox"/>	>
Wegdek landhoofd (BRVCBLHN06WD)	<input type="checkbox"/>	>
Landhoofd Zuid (BRVCBLHZ)	<input type="checkbox"/>	>
Wegdek landhoofd (BRVCBLHZ06WD)	<input type="checkbox"/>	>



Which is (or was) the target group?

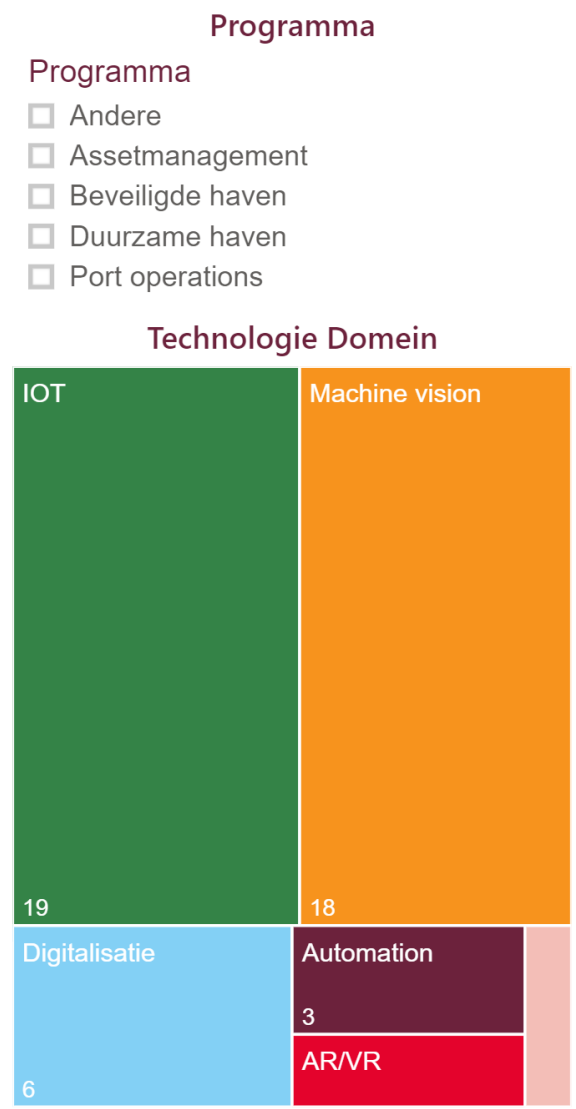
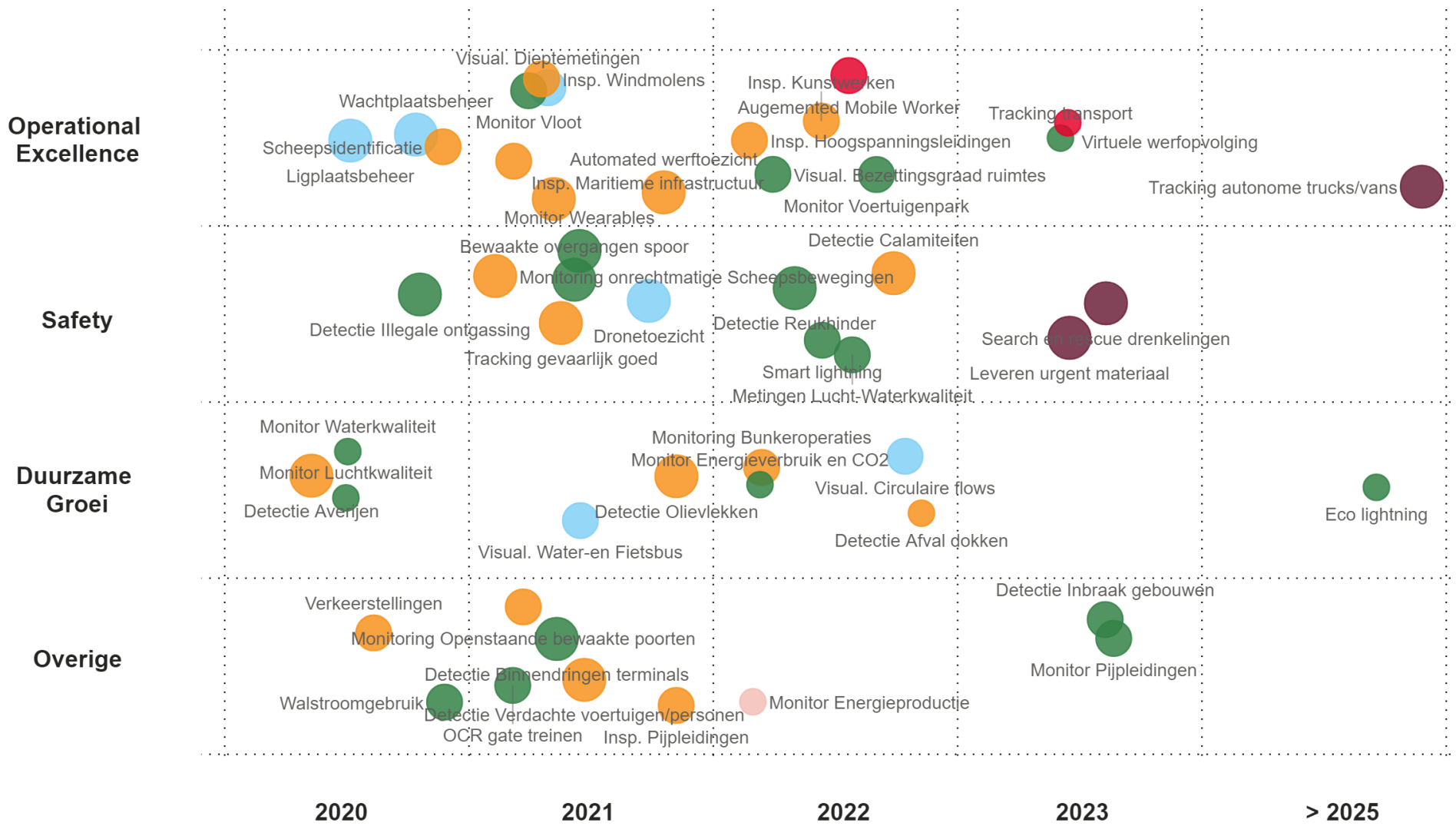


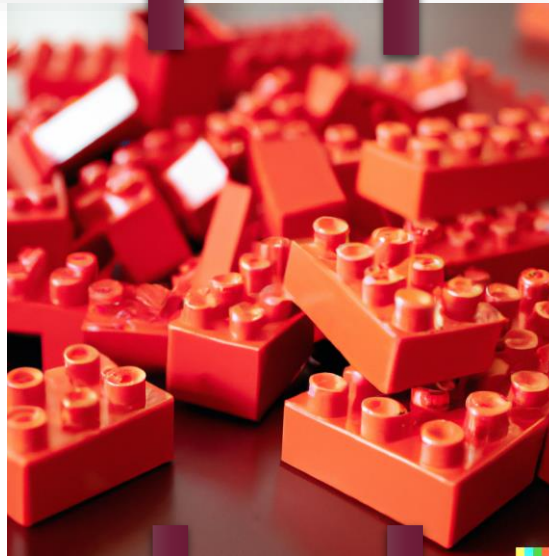
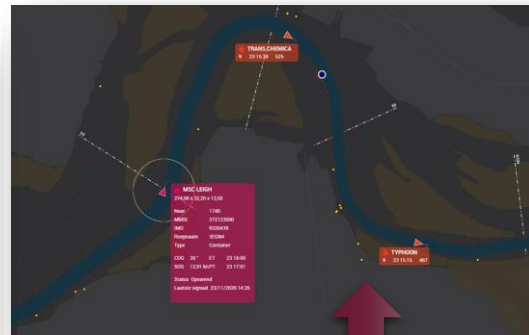
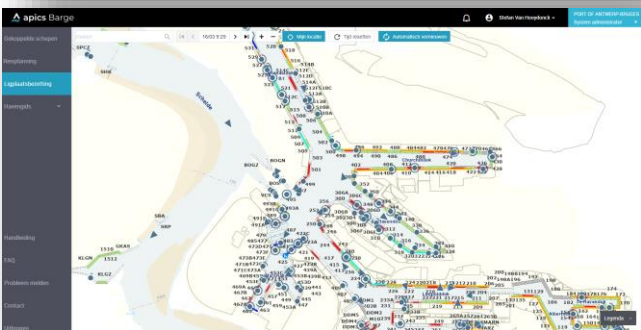
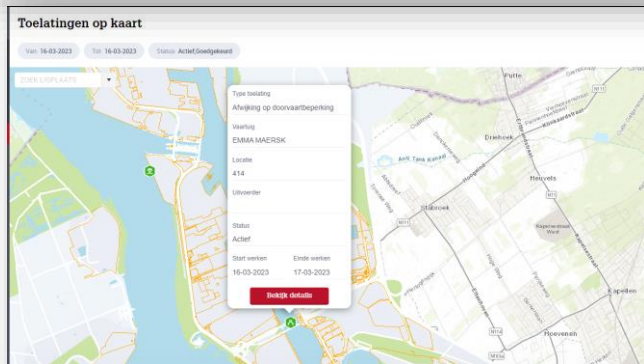


Situational awareness

Digital Twin of a territory

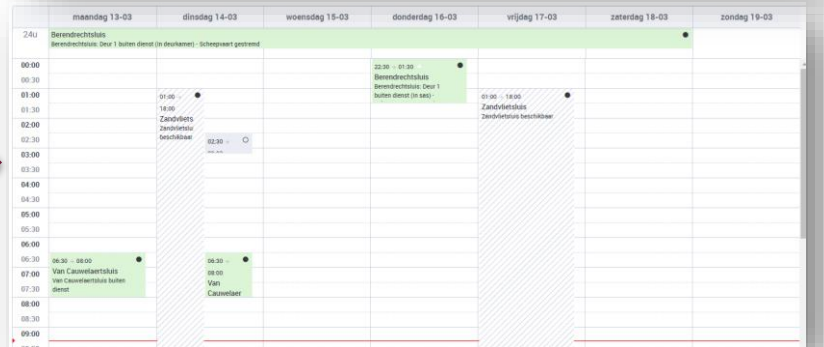
Digital Twin Roadmap





Actieve

Actieve	Bevoegd	Locatie	Bevoegd	Status	Verwijding
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	0	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL
00000000	Hersaan	1 000000	000000	Deugdenis	OPERATIONEL

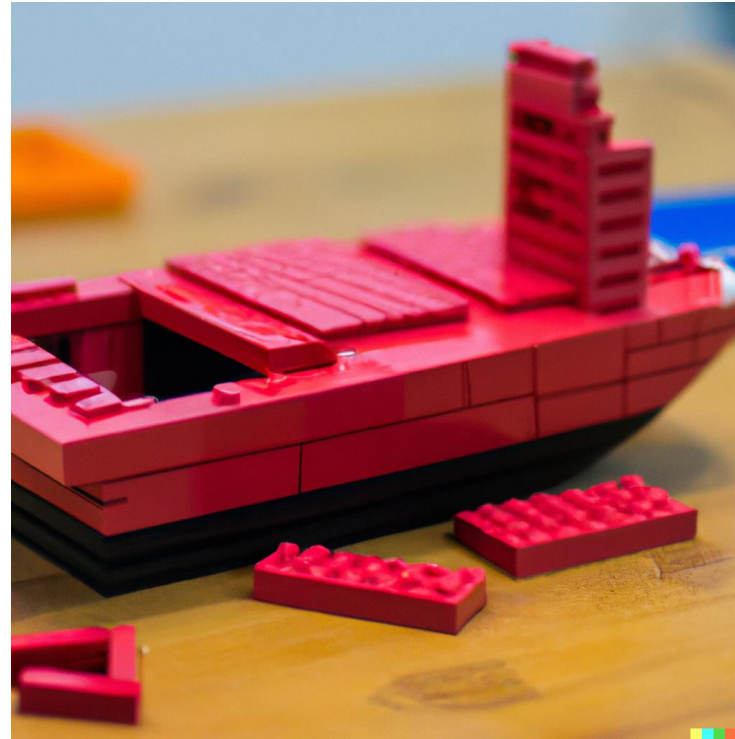
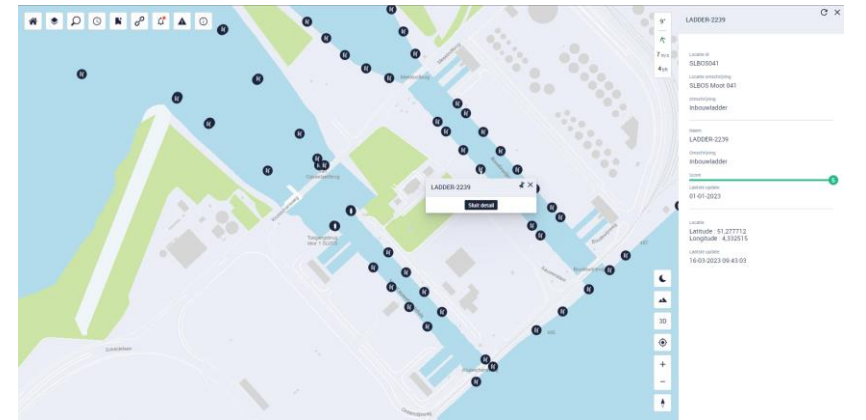
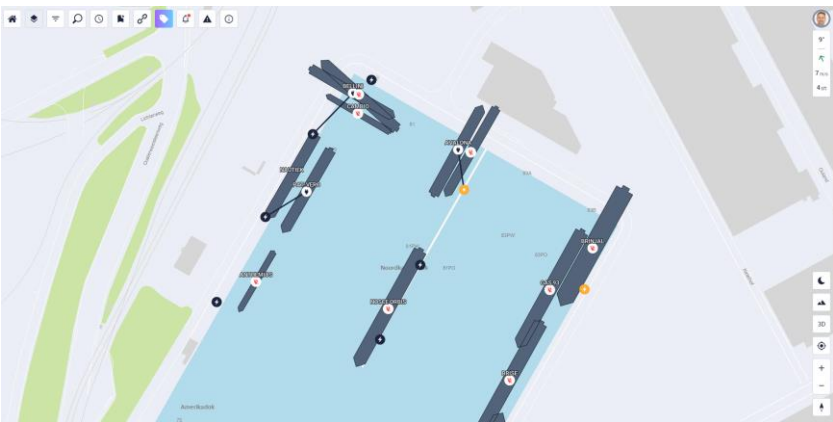
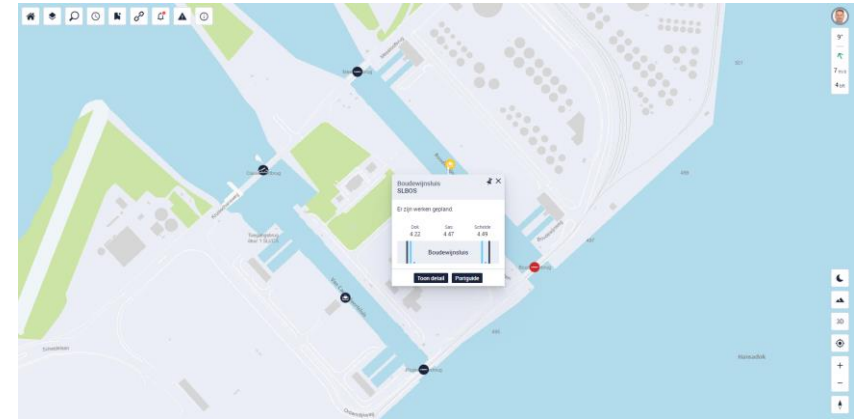
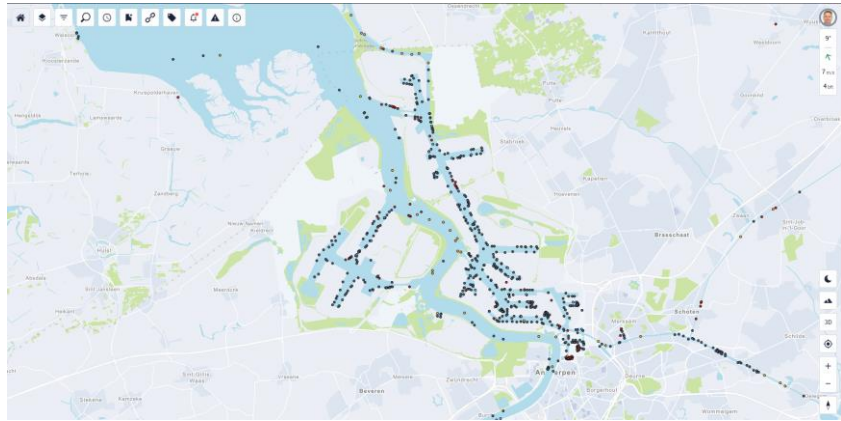


Ligplaatscontrole

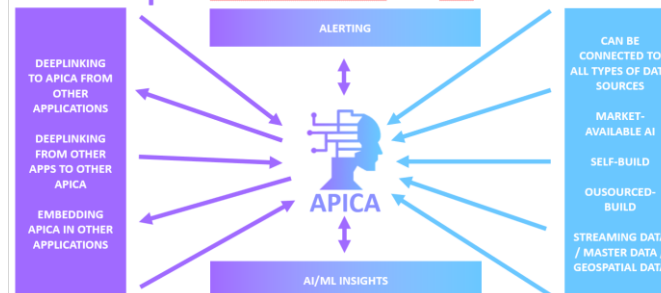
Verkeerde schone	ETA	ATA	Naam schip	ETA	ETA	LTA	LTA	LTA	LTA	LTA	LTA	LTA	LTA	LTA	LTA	LTA	LTA	LTA
● SLS	11 13 30		AEGR	651	3,0	420	--	1333	1335	Deugdenis								
● ACC	20 38 00		AFRICA KOOKABURRA	190,0	2,3	602	--	1716		Deugdenis								
● TVV	13 16 00	LOS	13 24 21	ARES	88,0	3,0	585	--	13 17 21	IFR								
● SLS	15 18 00	LOS	15 17 15	OOCL KAOHSUNG	280,5	12,0	1742	--	420	15 20 05	IFR							
▲ TVV	03 17 00	LOS	24 10 30	ABAI	149,4	7,0	210	--	730									
● SLS	11 13 15	LE	02 03 44	ANTWERP	88,2	2,0	702	--	1203	11 13 15								
● SLS	11 15 40	ZAKO	11 15 45	MSC AGADIR	299,2	2,0	490	--	1231									
▲ TVV	03 15 20	VLAM	23 18 14	ARCTIC ROCK	92,2	2,0	420	--	420									
▲ TVV	03 15 20	LOS	03 15 21	ARCTIC PEARL	199,9	2,0	166	--	166									
▲ TVV	03 15 20	LOS	03 15 21	ARCTIC STREAM	80,2	2,0	730	--	728									
▲ TVV	04 11 15	LOS	04 11 08	BALTIC STEAMER	107,0	2,0	545	--	345									



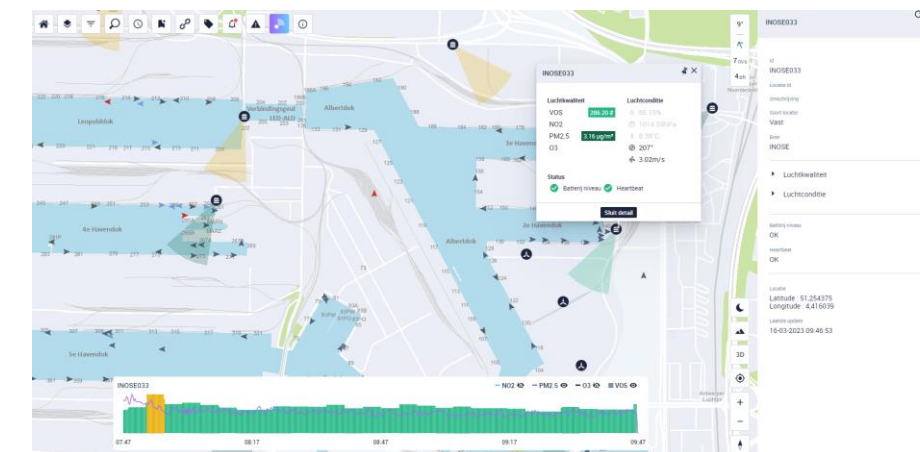
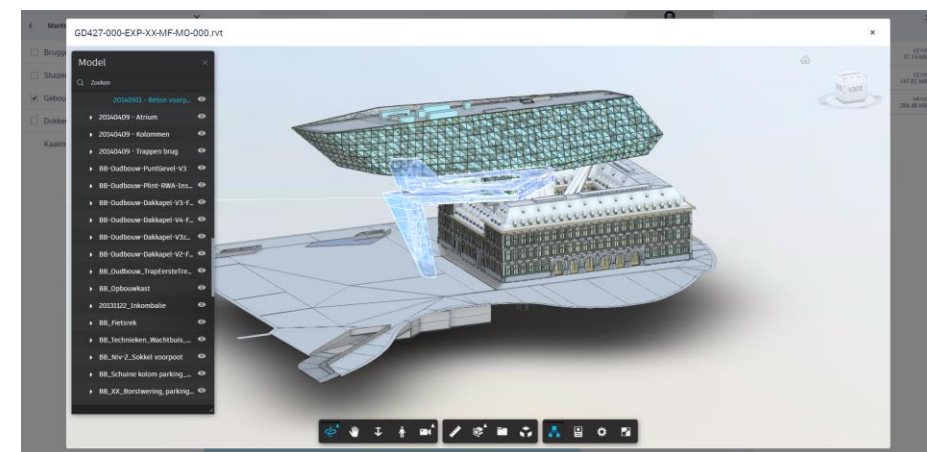
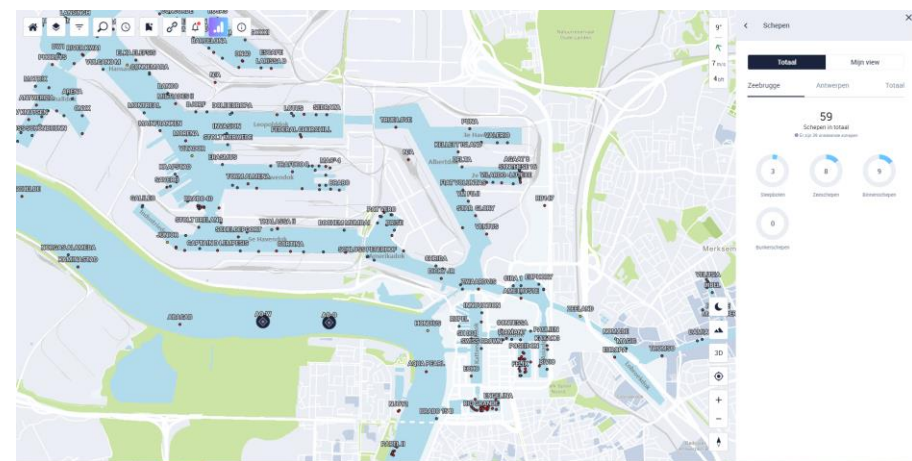
And Many More...



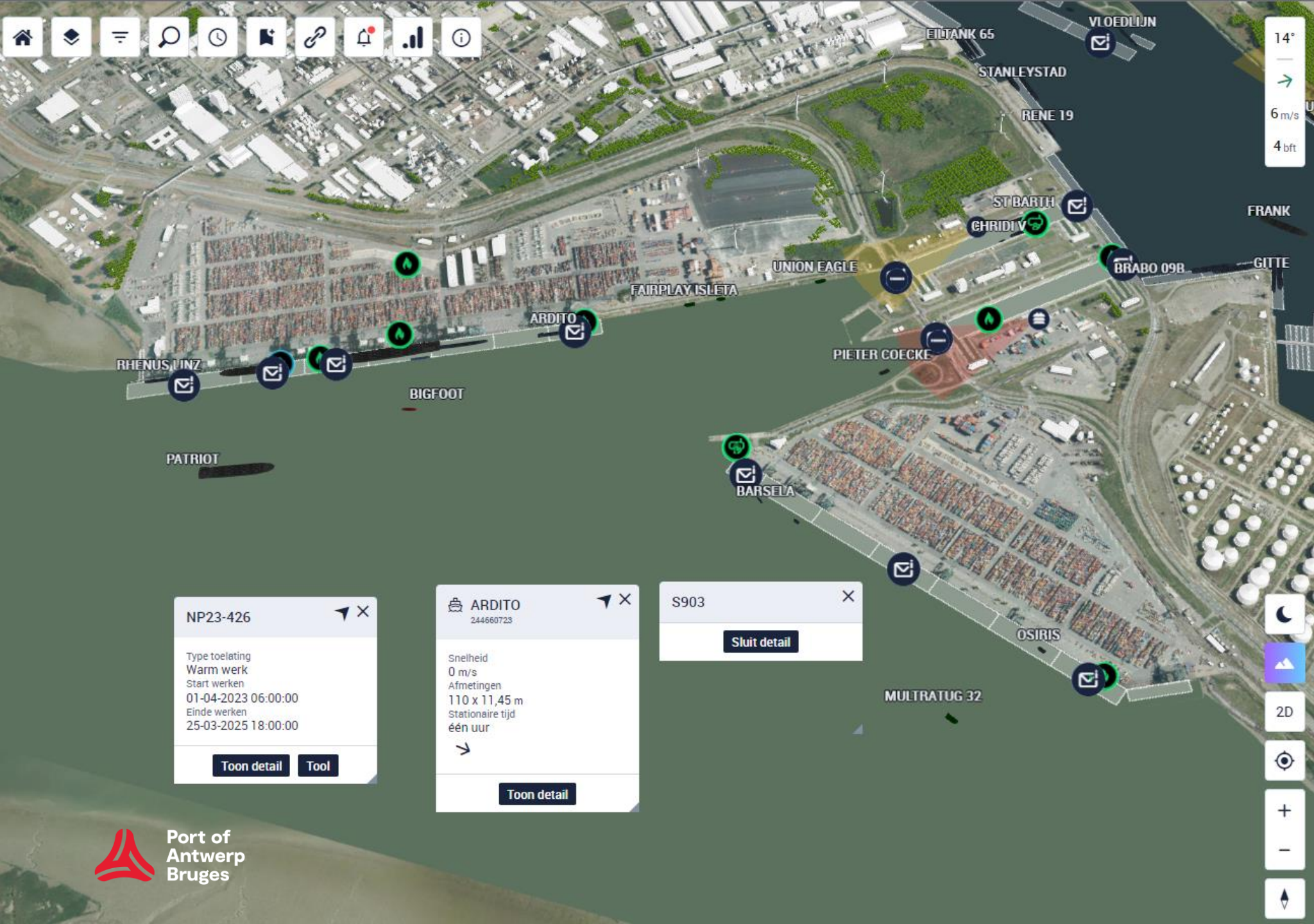
Open architecture on all sides.



Building the skeleton...



“Evolution by inspiration and iteration”



14°
→
6 m/s
4 bft

S903

Soort ligplaats
Container terminal

Code vorige ligplaats
S901

Code volgende ligplaats
S905

Totale lengte
150.5m

Beschikbare lengte
150.5m

Gepeilde diepte
-15.2m

Theoretische diepte
-99.99m

Maximum toegelaten diepgang
14.5m

Clearance
0.7 m

Locatie
Latitude : 51,349751
Longitude : 4,267527

Laatste update
28-04-2023 11:01:49

NP23-426

Type toelating
Warm werk
Start werken
01-04-2023 06:00:00
Einde werken
25-03-2025 18:00:00

Toon detail Tool

ARDITO
244660723

Snelheid
0 m/s
Afmetingen
110 x 11,45 m
Stationaire tijd
één uur

Toon detail

S903

Sluit detail



☾
📶
2D
📍
+
-
📏



Open on all sides & Product approach

“Not limited to a specific area”

9°
 ↗
 5 m/s
 3 bft

MMSI nummer
255806303

Snelheid
0 m/s

Heading
308.996124°

Berekende heading
308°

Koers over de grond
0,1°

Bestemming
227

Haven van herkomst
Porvoo (Borga)

Haven eindbestemming
Naantali (Nadendal)

Geschatte tijd
Berekende tijd

Type schip
Zeeschip

Code
CHTAN

Lengte
126,2m

Breedte
19,02m

Diepgang
6,5m

Stationair sinds
20-03-2023 03:41:08

PENELOP
 309924000

Snelheid
3 m/s
 Afmetingen
253,5 x 44,04 m

↘

Toon detail

ANNETTE ESSBERGER
 255806303

Snelheid
0 m/s
 Afmetingen
126,2 x 19,02 m
 Stationaire tijd
8 hours

Sluit detail

2D

 +
 -



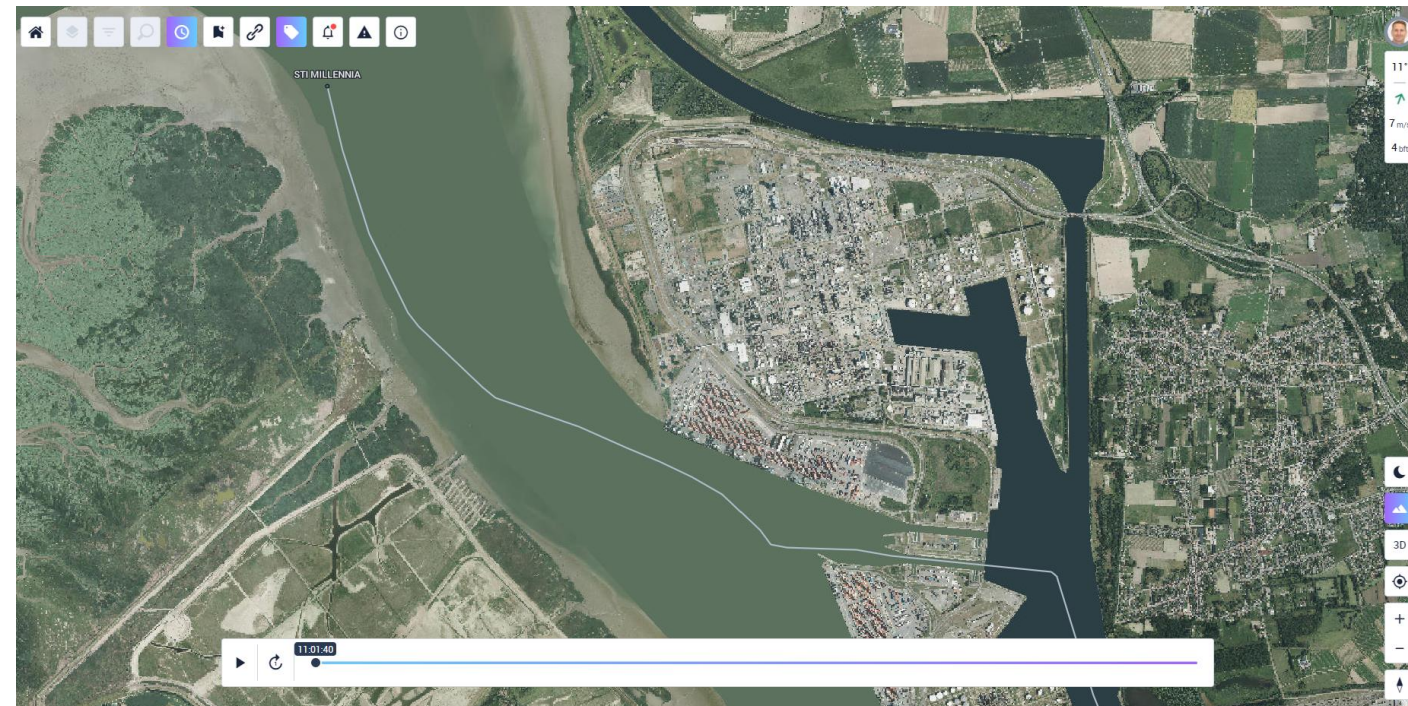
Traffic Management

Ongoing use case

- Forecast of traffic simulation to 30min
- Based on historic traffic flow, lock planning, tidal windows, current and predicted traffic situation, vessel destinations,..
- Goal: to provide additional insights into predicted situation, possible dangerous situation
- Additionally, provide insights into the emission effect of the simulated situation

PIONEERS

(<https://pioneers-ports.eu/>)



An aerial photograph of a port at sunset, showing a large container yard with many stacks of colorful containers, several cargo ships docked at piers, and industrial buildings in the background. A network of white lines connects various points across the image, with several circular icons overlaid: a circular arrow, a magnifying glass over a person, a camera eye, a speech bubble, and a grid pattern. The title 'A (Port) Digital Twin' is written in red text in the upper left corner.

A (Port) Digital Twin

- ✓ Creating a new additional application is NOT the goal, creating a digital twin is a vision
- ✓ Define clear vision, scope, target group(s), goal when starting, BUT... don't be reluctant to change or evolve!
- ✓ Building step by step provides focus and tangibility. By evolution, it inspires and brings new insights
- ✓ Open architecture lowers the integration effort for new use cases
- ✓ Strong data management & integration platform is key



“We must dare to pioneer”

Jacques Vandermeiren,

CEO Port of Antwerp-Bruges





3rd BUILDING DIGITAL TWIN
International Congress

ORGANIZED BY:



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