IMPROVING SHIPBUILDING FROM THE METAVERSE

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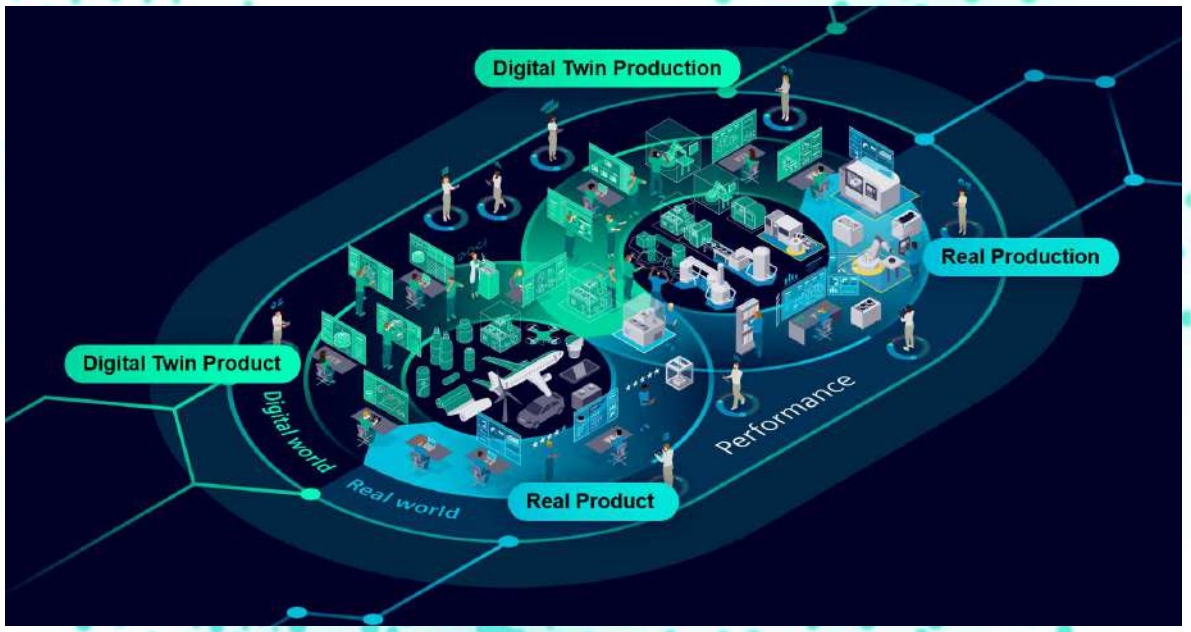
THE “INDUSTRIAL METAVERSE”

What is the Industrial Metaverse?

- The Industrial Metaverse is a world always on and full of real machines and factories, buildings and cities, grids, transportation, and defence systems that are mirrored in the virtual world.

And why is this so important?

- In a digital environment, problems can be found, analysed, and fixed quickly - or better yet, discovered before they arise.
- Enabling a new level of collaboration. Where people can break the barriers of distance and work together across countries and continents
- Where everyone can try out new ideas easily and quickly - and where innovation takes off.



The Metaverse is where Virtual Reality (VR) supports people who are working hands on, on site. A virtual realm where we can travel into the past and even into the future to understand problems and processes better and combining the real and digital worlds.

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DIGITAL TWINS

The digital twin is perhaps at the heart of the Industrial Metaverse.

- We are going to need many additional technologies and innovations.
- By the end of this decade the Metaverse is expected to be a multitrillion-dollar market with a significant share of industrial applications.
- it can be one of the greatest forces to drive both sustainability and the digital transformation
- It will make innovation easier, progress faster, time to market shorter, reduce waste and help us to use fewer natural resources.
- with Simulation driven design innovation. You can engineer out as many issues as possible as early as possible but validating every engineering decision.
- it will lead to the easy integration of recycling and circular economy principles into the design process and more efficient ways of production

NVIDIA Omniverse and Siemens Xcelerator Interconnected Platforms.

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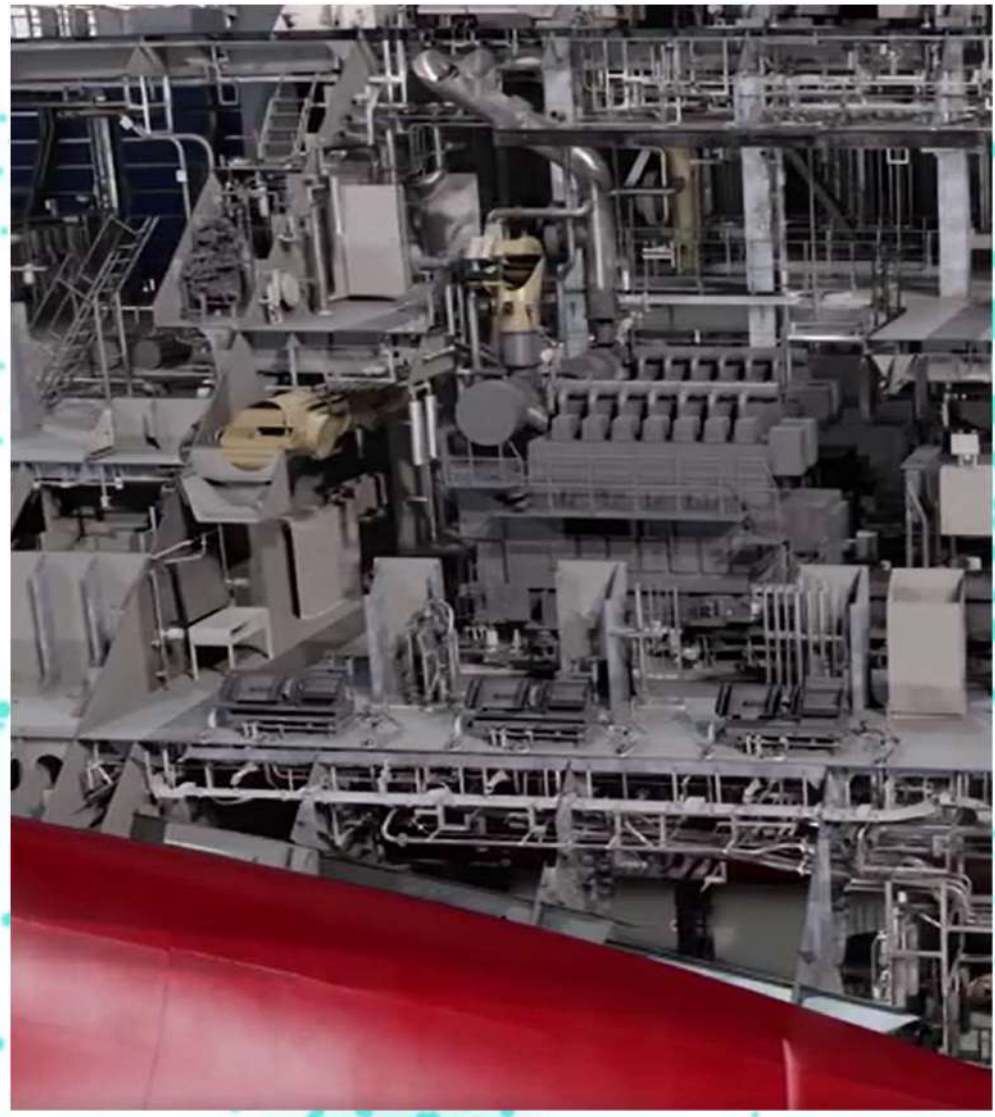
METAVERSE AND SHIPBUILDING

The Metaverse is the blend of the different technologies, some of them has a direct use in the Shipbuilding and Shipping Industry, some other would change completely the way we conceive and build and operate them, here are some:

- Connectivity & Comunications
- Digital Twin
- AR, VR, Simulations
- IoT
- Web3
- PERSISTENT, SYNCHRONOUS AND ACCESSIBLE
- AI
- MERGING OF VIRTUAL AND REAL WORLDS
- CYBERSECURITY
- PREDICTIVE MAINTENANCE



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CONNECTIVITY & COMMUNICATIONS

The Industrial Metaverse requires a hyper connectivity between virtual and real worlds,

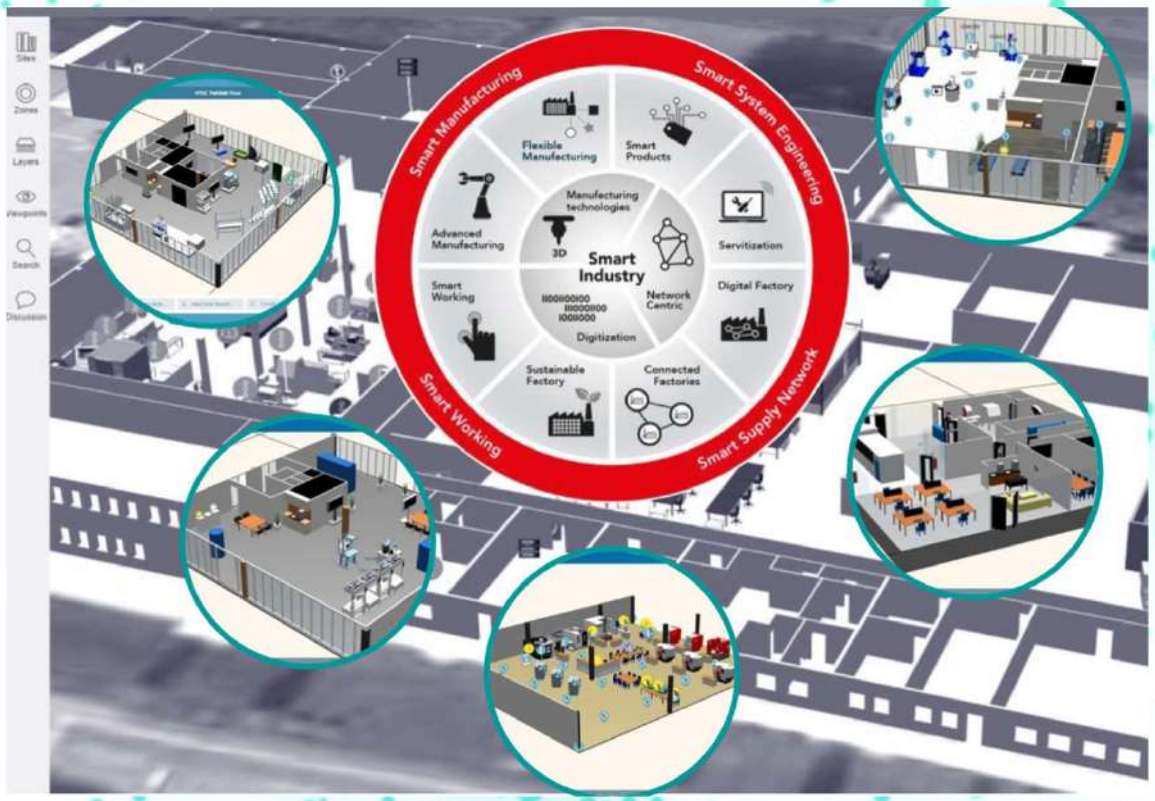
The Information Technology department is responsible for:

- infrastructure of an enterprise.
- control across the organization.
- protection of sensitive applications and confidential data

The Operational Technology department is responsible for:

- the equipment on industrial sites.
- production output and worker safety.
- maintenance of machinery.

In today's Shipyards, workshops and ships, the number of connected devices is booming.



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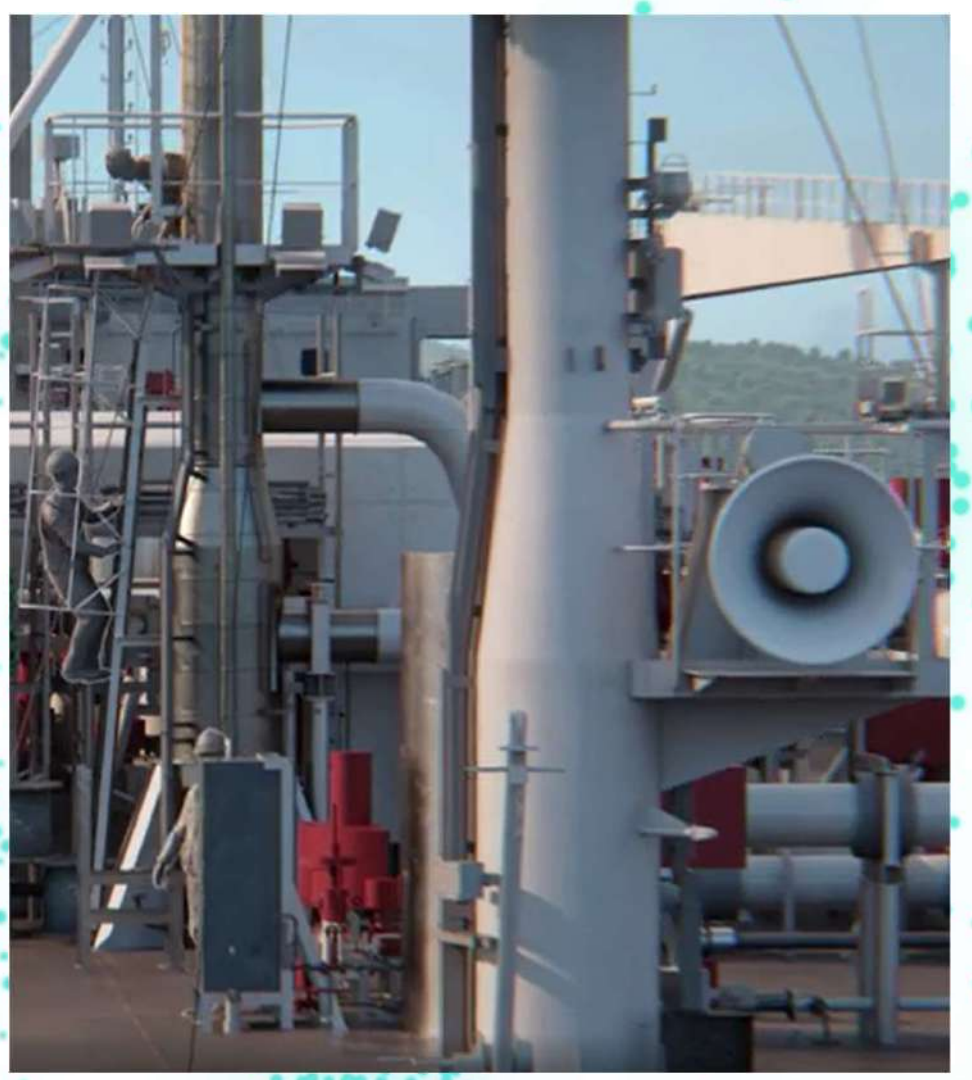
CAD/CAE/CAM AND DIGITAL TWIN

Shipbuilding and Shipping industries may take advantage of the latest developments such as the digital 3D printing technologies and generate its own supply of spare parts as required.

Ships most probably would become more self-sufficient operational platforms that will handle small fleet of drones and special forces that will require maintenance if they would have to stay longer time on patrol as is being forecast.

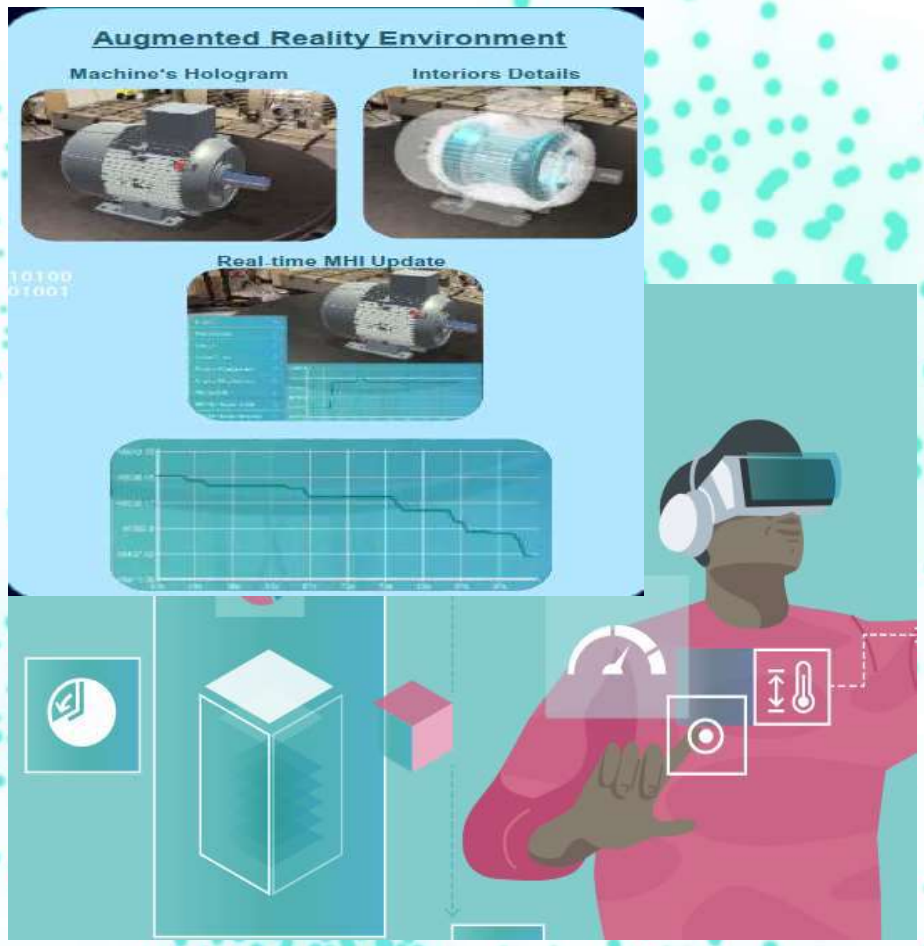
Digital twin is essential part of the metaverse, It would predict maintenance of every component, would prevent possible failures attending diverse sensor data, would train personnel and most importantly, would train the AI of the ship itself in simulated operational scenarios



AUGMENTED REALITY

AR would facilitate the daily activities of the crew, fast identification of any systems, guided maintenance services, interact and collaborate with intelligent robots, assisting in rutinary and critical missions. In the future the AR will be the ideal tool for humans to interact with the intelligent machines, including the ship main systems.

Taking into account that the machines and systems would be far more intelligent than many humans, the way to leverage the situation would be by enhancing the human capabilities with the AR.



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VIRTUAL REALITY AND SIMULATIONS

- key to training the personnel
- facilitate life on board and interactions with other humans
- train the ship's AI within different scenarios including war situations and interact virtually with real humans.
  - These simulated exercises would be more relevant than ever due the disruption that the AI would bring to the warfare and the new roles that AI and Humans would play in the future warfare.
- VR and Simulations will also be essential part of the training of the Smart Shipyard, where we will see more AI apply to the different shipyard processes: heavy transport, automated store houses, quality control, welding, etc.and were robots and machines would also be trained to optimize and enhance the quality of may processes.

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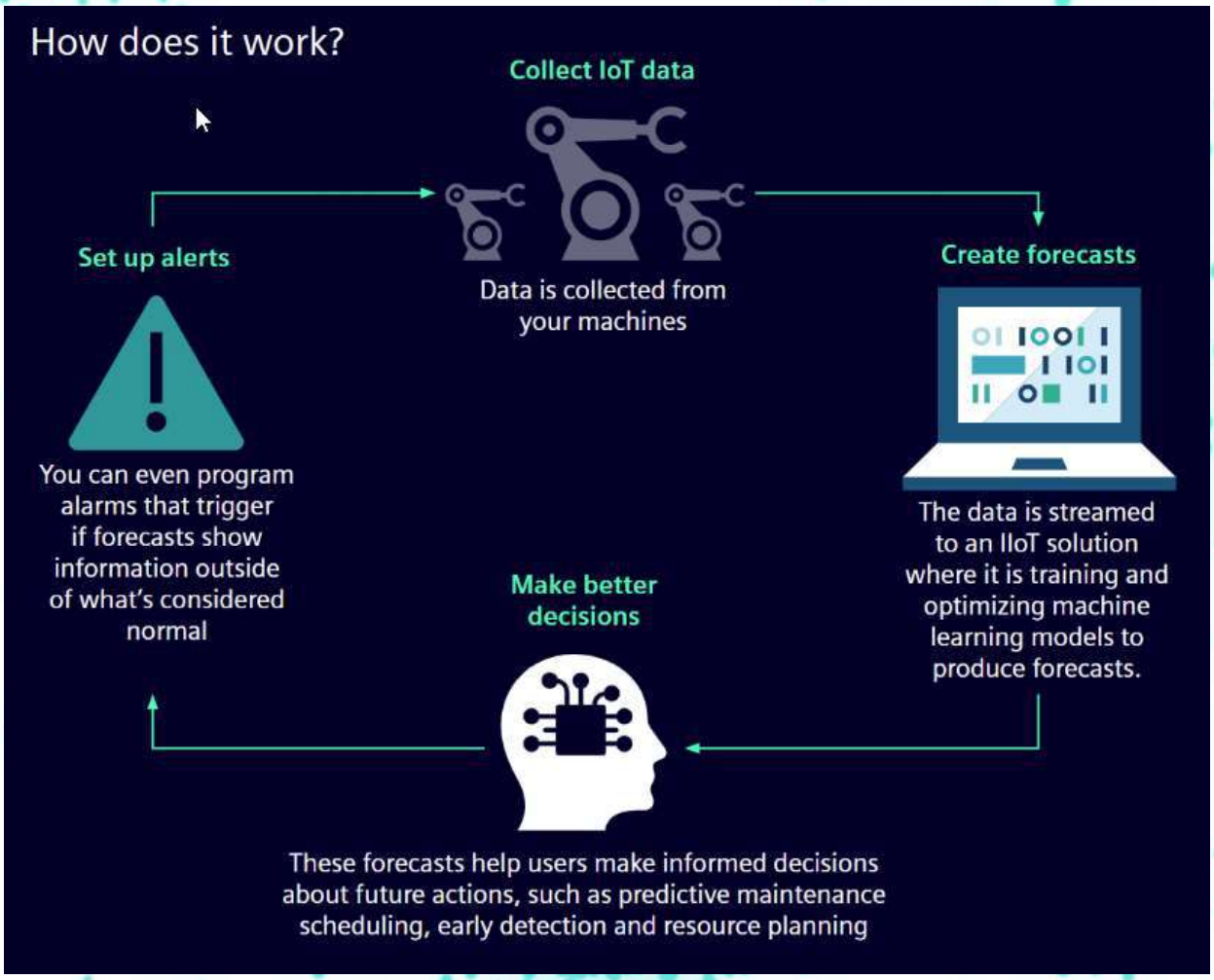
INTERNET OF THINGS, WEB3

The information coming from al the onboard sensors will be handled by the Ship AI itself and would provide key information to engineers and commandants that will improve simulations, predictions, and future Ship development.

The integration of the IoT and the Metaverse will unlock an effortless experience in complex environments with a minimum training. This will support the necessary superhuman powers that we will require to interact with the new generation of intelligent machines to come.

WEB3: If WEB1 was able to read and present document online, current WEB2 can read and write information with some level of interaction, WEB3 will be able to enhance all these and, most importantly, will handle and protect the “intellectual property.



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PERSISTENT, SYNCHRONOUS AND ACCESSIBLE

Metaverse shall be persistent:

- it cannot be unplugged, restarted, or reset.
- must be in real time as every mission itself

Metaverse is inherently synchronous:

- Even in the case that some events can be programmed and occur autonomously.

Metaverse eliminates all types of barriers, physical or otherwise. It is an endless space where there is no limit to the number of synchronous users, the types of activities taking place, the participating industries, etc.

And finally it shall be more accessible than the current Internet platforms available.

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ARTIFICIAL INTELLIGENCE

AI is the most important part of the metaverse

AI will enhance by far our capabilities to understand and improve our world while can be at the same time the most dangerous tools made by the humans.

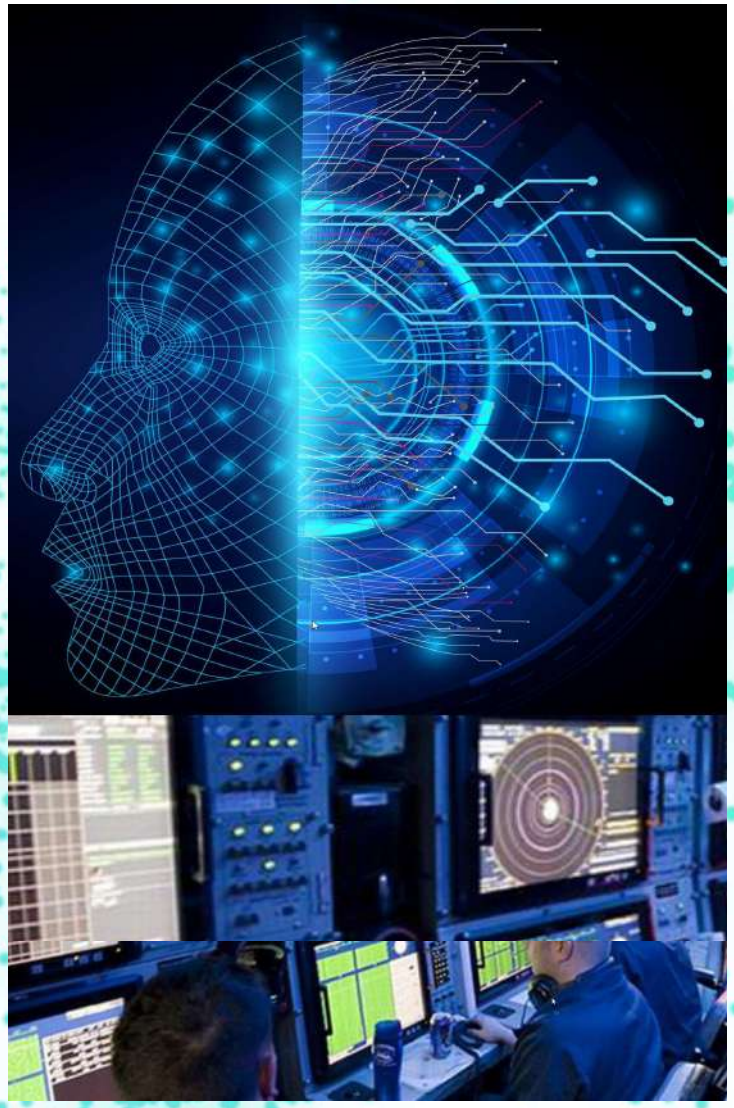
The metaverse is the best training ground for the AI.

AI would power operation, design, and smart production in the metaverse prior to the real world and will speed up the future with new and more efficient ships and fabrication methods.

It is critical to access the information of previous designs and train correctly the AI therefore is immensely important the role that PLM tools will assume to transfer the know-how to the Machines.

AI would take care of many services onboard like including crew healthcare, pharmaceutical prescriptions, basic treatments and will constantly monitoring of the stress and health ahead of developing any symptoms extending the effectivity of the missions.

Considering the huge “drone fleet” that would probably escort the Ship, the most probable scenario will be a combination of self AI driven drones protecting and supporting the Ship.



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MERGING OF VIRTUAL AND REAL WORLDS

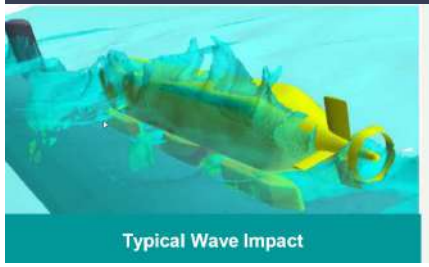
The metaverse is a world where we would test and train humans, robots and their AI

We need to simulate as realistically as possible every single detail behaviour with their metaphysics.

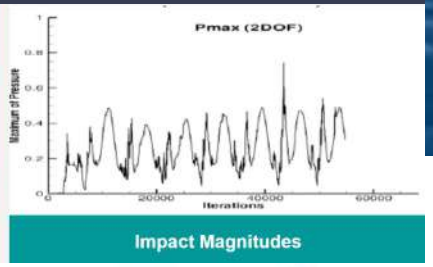
It will be an environment where we will be commissioning complex software and hardware ahead of is real development.

This process will accelerate the development of products, beside the impossibility to recreate some scenarios in the real world, don’t forget that the most important mission of a Ship is to deter and avoid those missions for which they will be build.

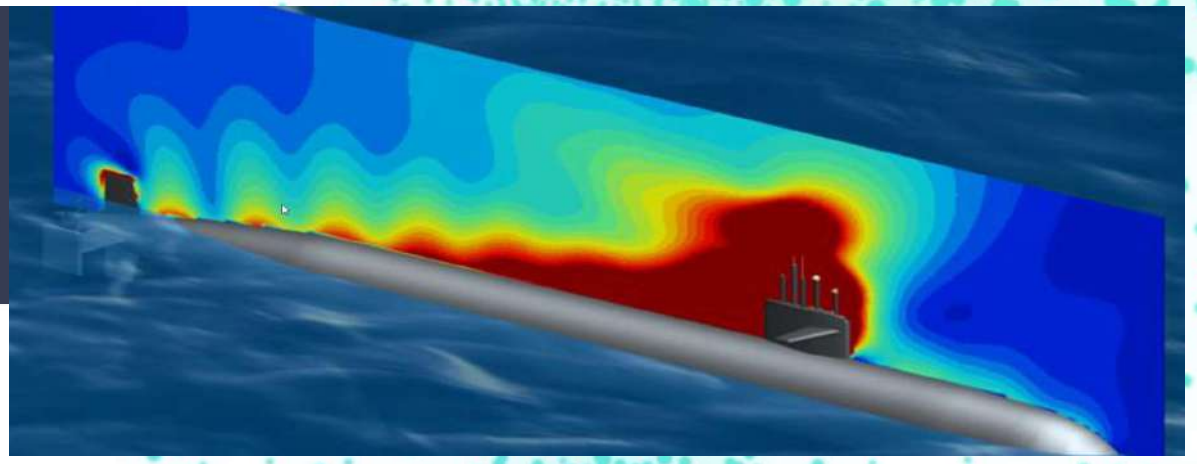
Siemens Xcelerator is an open digital business platform that empowers customers to achieve their desired business outcomes, including growth, increased efficiency, and fast time-to-market through one go-to-place for digital and sustainability transformation - faster, easier and at scale.



Typical Wave Impact



Impact Magnitudes



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CYBERSECURITY

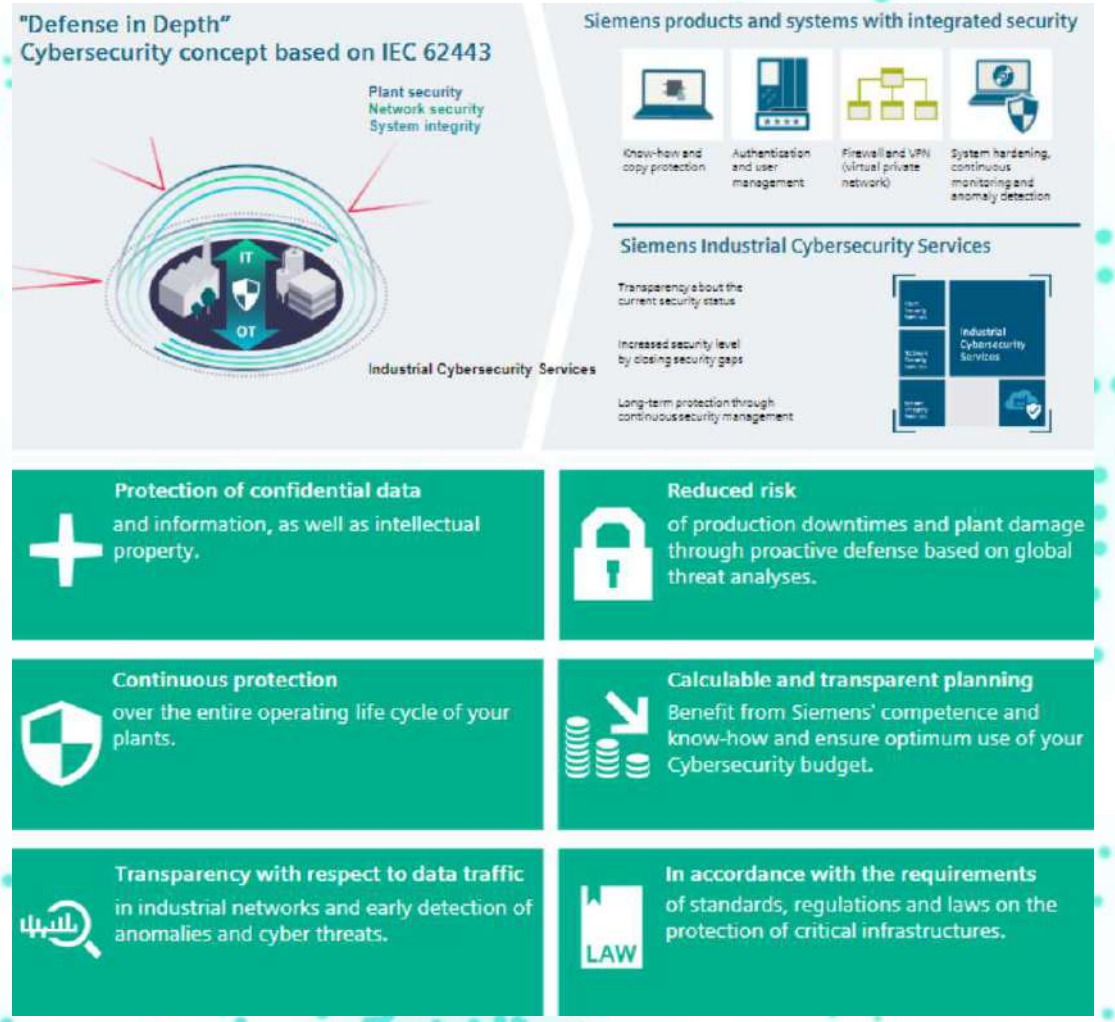
Increasingly connected world come at a price: Cyberattacks have become a serious threat.

A hacker attack knocks a local hospital out of action, brings industrial factories and machinery to their knees or sabotages the local public transportation network.

Integrated cybersecurity is the backbone of complex and distributed IoT systems.

It is essential for the operation and continued performance of critical infrastructures, production facilities as well as municipalities and communities.

When it comes to things like trains, smart buildings, factories or power grids, there is hardly another company in the world that has set up so many highly sensitive infrastructure projects as Siemens.



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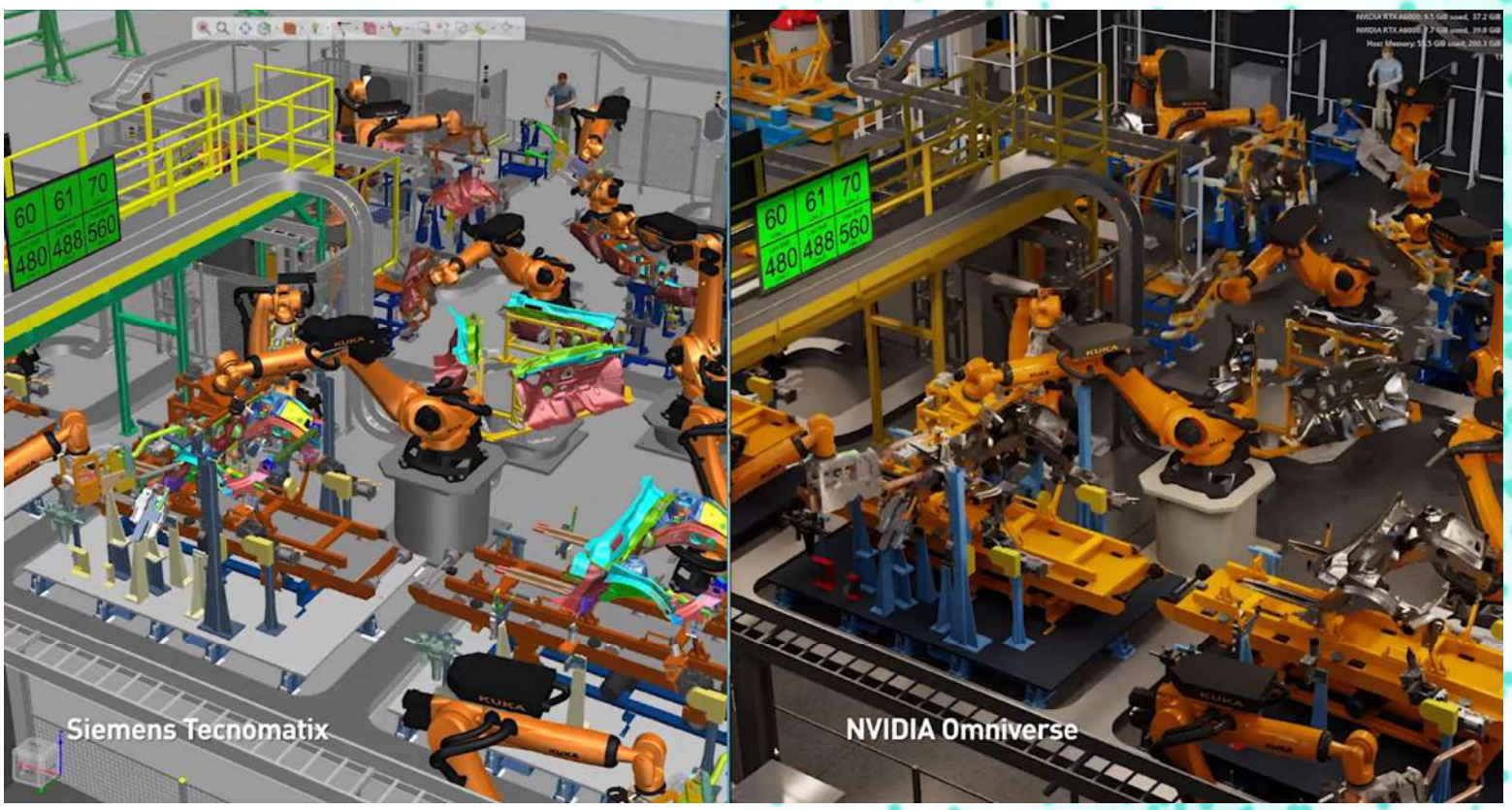
RENDERING: NVIDIA OMNIVERSE

NVIDIA Omniverse™ is an extensible platform based on Universal Scene Description (USD), is helping make it happen by enabling individuals and teams to build custom 3D pipelines and simulate large-scale virtual worlds faster than ever.



“The next evolution of the internet, is the internet in 3D, a network of connected, persistent, virtual worlds”
NVIDIA CEO, Jensen Huang

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PREDICTIVE MAINTENANCE WITH THE XDT

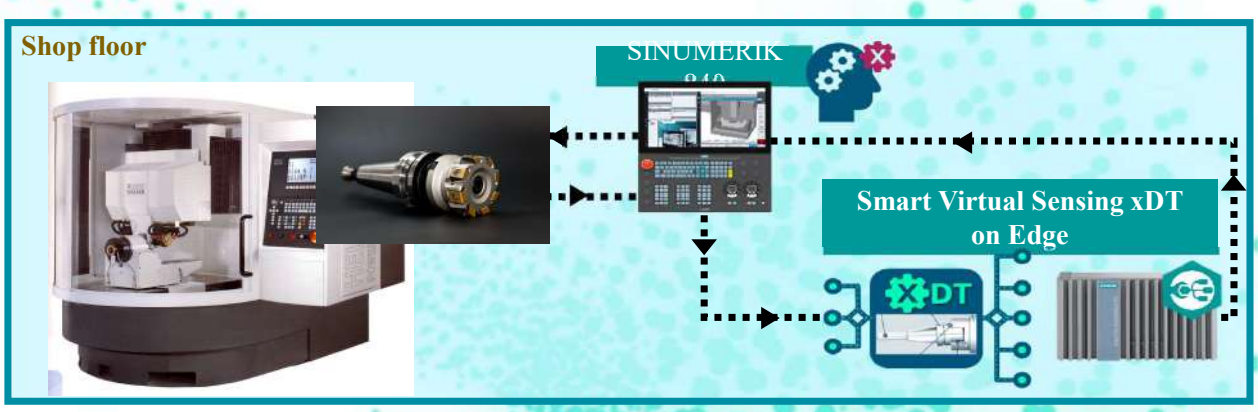
One example of what can be archive is the following successful business case, Leverage the eXecutable Digital Twin (xDT) of a vehicle dynamics model to AV performance with the Omniverse technology.

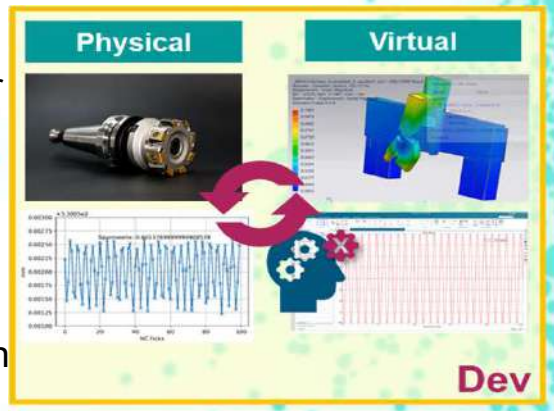
xDT technology creates a reduced order dynamics model that is self/calibrating and can create virtual sensors. Which reduce their setup time from 3 days to 4h, eliminates expensive sensors, from 40 to 2 gyroscopes while providing the same quality of data.

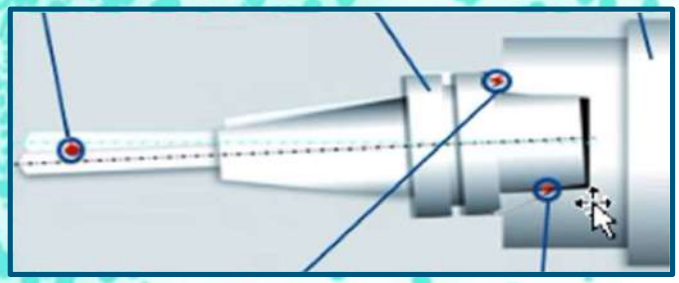
Another successful example was to predict the need for cleaning in industrial Computer Numerical Control (CNC) machines.

The main challenge facing this customer is that, when the spindle starts vibrating, they cannot confidently define the root cause. In fact, this can be due to chips in the clamping mechanism but also due to suboptimal clamping force on the tool.

In real model there are place that is imposible to settle the necessary sensors meanshile there are infinity possibilities in the Virtual world.







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CONCLUSIONS

- The Metaverse would transform the future of Ships, they will become more an underwater platform full of unmanned vehicles with a wider scope of missions; recognition, attack, mine hunter, command a small underwater and aerial fleet of drones, special forces, etc.
- The future mission will be a strong collaboration between human and intelligent machines, in this complex world the Metaverse shall be the optimal operational platform.
- It will create a more cohesive and collaborative environment.
- Ship crew will work in a VR environment beyond the physical compartments, collaborating with vehicles and robots.
- Future Ships would also support this fleet with spare parts mostly fabricated onboard with 3d printers and will stand patrolling instead of moths, maybe by years and behaving like a semipermanent mobile undetected base in the deep of the oceans.
- This new marvel of the technology will require previously a fast evolution of the way we design and build Ships that of course shall be integrated in the Ship Metaverse as a first step.
- This huge step will require change to the way we see the future and shall be integrate into current platforms and solutions to ensure they fit into the shipbuilding workflows.

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