INDUSTRY 4.0 ENABLING TECHNOLOGY

Prepared for:
Automotive OEM

webgears

Analytical approach to 3D surface description that enables Industrial Synergy for CAD/CAE, PLM/ERP, Industrial IoT, AR/VR and Digital Twins via Interactive (Web) Applications

"Using sets of differential equations for 3D description we maintain the highest level of precision while requiring less storage and computational resources to save costs and enable industrial innovations"

February, 2019

https://webgears.app/industrial

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What it takes to manage complex interactive 3D graphics?

until today

- 3D-special software
- work station with powerful graphics card
- often only Windows
- very limited mobile use, only in apps

now with Webgears

Just any web-browser*
on any computer or <u>mobile</u>

8 years of R&D

breakthrough mathematics

modern web-browser tech

*** - web-based approach was chosen to reach out true cross-platform solutions covering wide range of devices.** However technology itself is not limited to web and can provide smooth integration of standalone application, cloud services and apps of integrated “on-board” \ embedded electronics.

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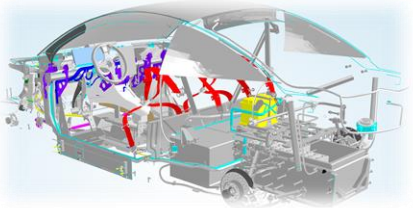
We optimize “heavy” engineering 3D to maximize its Value at every stage of a product Life Cycle:

Car OEM use cases examples

Collaborative Visualization Environment



Flawless collaboration of various Design, Analysis, Production and outside Supplier teams

(no expensive SW/HW needed)

Light but precise 3D for CNC and Robots

3D surface described using sets of differential equations is precise and requires less machine resources

(more precise and less time consuming)

Aftersales Fleet Support Portal

Easily accessible web-based unified solution to manage entire fleet support in dealerships across the globe

(enables interactive 3D, AR/VR)

High-end Car Sales Configurator

Same engineering data can be used in high quality Interactive 3D model for web-site car configurator

(Innovative cars deserve high-end sales tools)

Car Digital Twin

most efficient analytical surface description for both visualization and machine interpretation, incl. on-board real-time calculations and 3D mapping

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Technology makes difference

Webgears develops breakthrough technology of analytical description of 3D surface, that enables the most efficient interaction between physical and digital worlds.

All existing software and hardware solutions use either polygonal or parametric solid/surface-based approximations to manage 3D data. Exponential growth of engineering technologies keeps rising a level of precision and efficiency required from a CAD/CAM/CAE solutions. And traditional 3D approximation methods either fails or becomes extremally expensive trying to meet growing engineering demand.

Webgears analytical description uses sets of differential equations to describe 3D with the highest level of precision while requiring less storage and computational resources.

Achieved level of math optimization allows to manage complex interactive 3D even in the Web browser of a any device, including mobile.

Cost reduction in existing applications

- Less computational and storage resources needed to manage interactive collaborative environment during product definition, design and manufacturing;
- More efficient product visibility and spatial integration and design unification capabilities;
- Faster engineering analysis, while integrated as CAE pre/post processor;
- More efficient interaction with CNC and Robots while integrated in CAM;
- Interactive Web 3D for Sales and Aftersales Services;
- Seamless 2-way integration with cloud PLM/ERP

Industrial innovations

- On-board real-time calculations;
- AR/VR for design, production, trainings and maintenance;
- IoT data aggregation, analysis and interpretation;
- Smart manufacturing (Industry 4.0) implementations by linking design, manufacturing, sales and aftersales in one eco-system;
- Products and Processes Digital Twins.

Smart Manufacturing

Connected Products

E-commers & aftersales

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Fields of application:

- Aero and Space
- **Automotive**
- Shipbuilding
- Industrial machinery

Interactive Web3D Graphics Technology

General

Even at the first idea stage each industrial product appears as a 3D world object, that's why 3D visualization of it's digital twin is essential from the very beginning and becomes more and more value added throughout product lifecycle

Specific

- AR/VR-enabling visualization technology of a digital twin throughout product lifecycle
- Visualization at the product definition stage to refine needs of the market and make crucial decisions in product design
- Integrated visualization environment for controlled 2-way interaction with all engineering (CAD\CAE) and manufacturing (CAM) data enabling more efficient collaboration of different teams during development, production, tests and operations, efficient coordination with partners, suppliers and aftersales services
- Comprehensive monitoring and analyzing capability of the product during its operations and modifications
- Enables geometry-based real time "onboard" calculations

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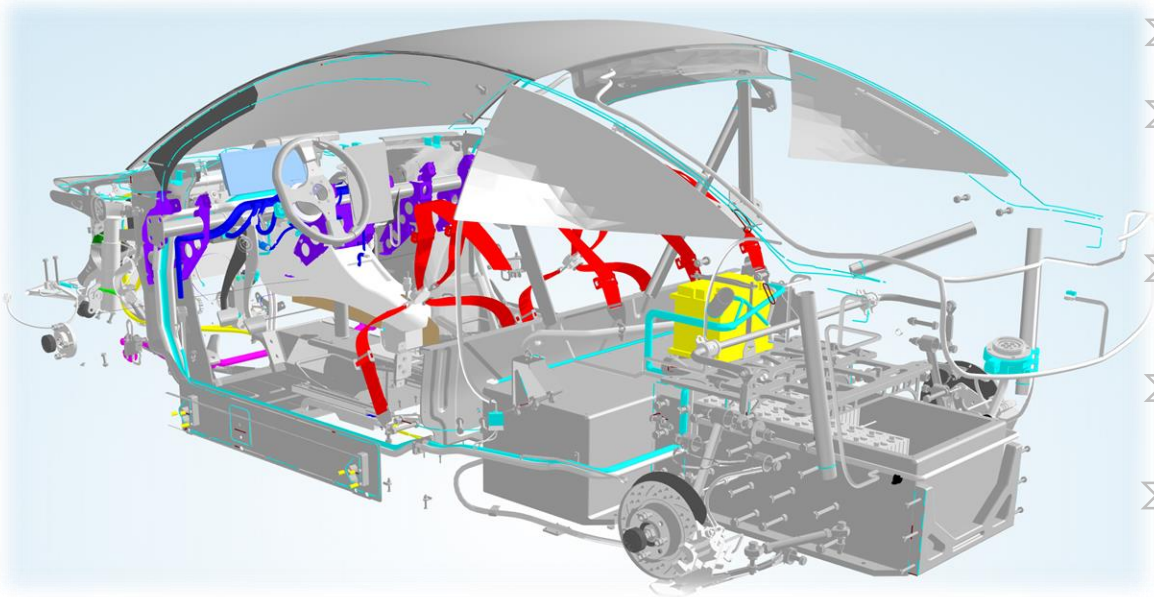
Industrial project example (in progress)

Integrated Visualization Environment - Car /Development and Production Stages*/*



- Linked to CATIA, SolidWorks and PDM
- Easily accessible up-to-date design and analysis data
- Common environment for logically and geographically diversified design, analysis, manufacturing and supplier management teams
- Spatial integration across entire product
- Pre-negotiations with the suppliers out side of organization (controlled access to required data only)
- All optimized engineering data will be used for interactive manufacturing instructions and after sales support applications, like manuals and spare part catalogues

Web-based "Integrated Visualization Environment " (for domestic Car OEM)

(accessible via web-browser on any device, incl. mobiles)

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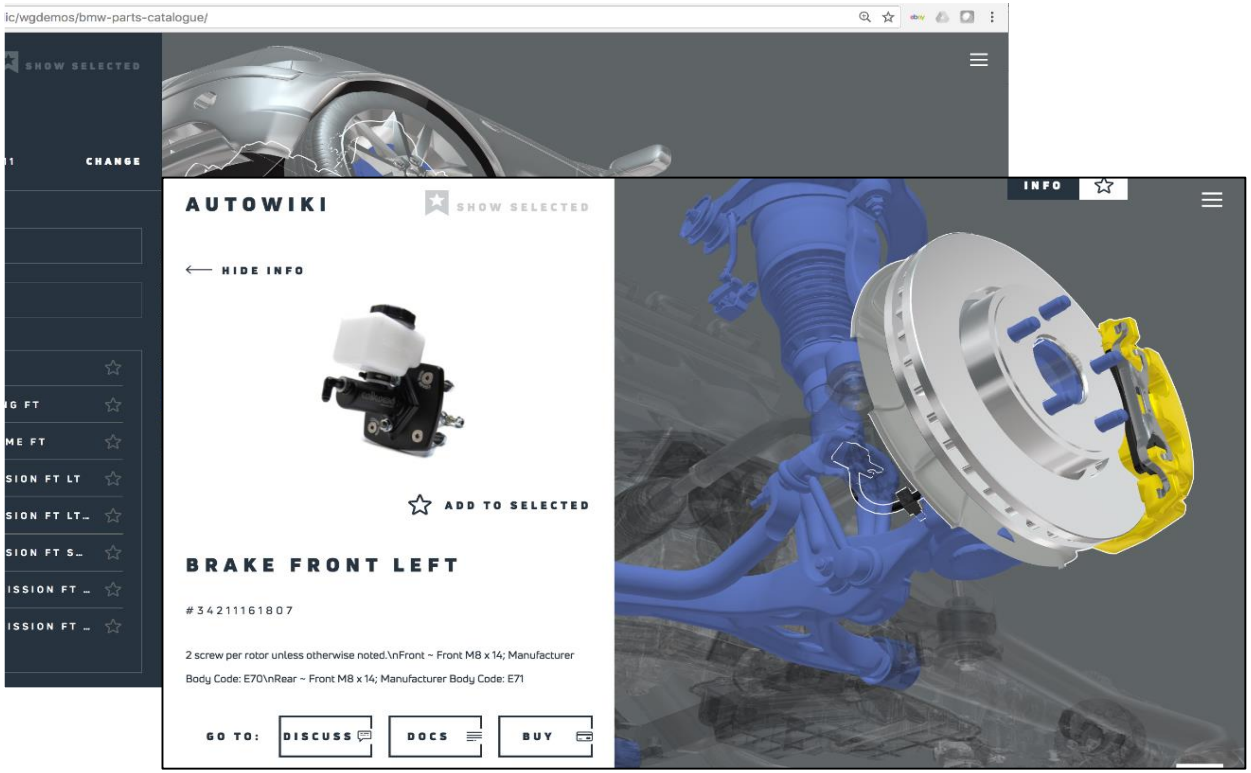
Pilot Project realization

Automotive interactive spare parts catalog and instructions



- Interactive 3D catalog remains connected to ERP, PLM and Aftersales support system
- Cross-platform Web solution easily accessible from any dealership worldwide with no extra cost of IT infrastructure
- Allows to monitor market demand and parts traffic
- Enables Web AR solutions for aftersales services and manuals
- Integration with Sales Configurator using same engineering 3D data

PLM\ERP connected aftersales parts catalogue (in cooperation with AutoWiki, EU)

demo part of the project: https://webgears.app/industrial#Spareparts

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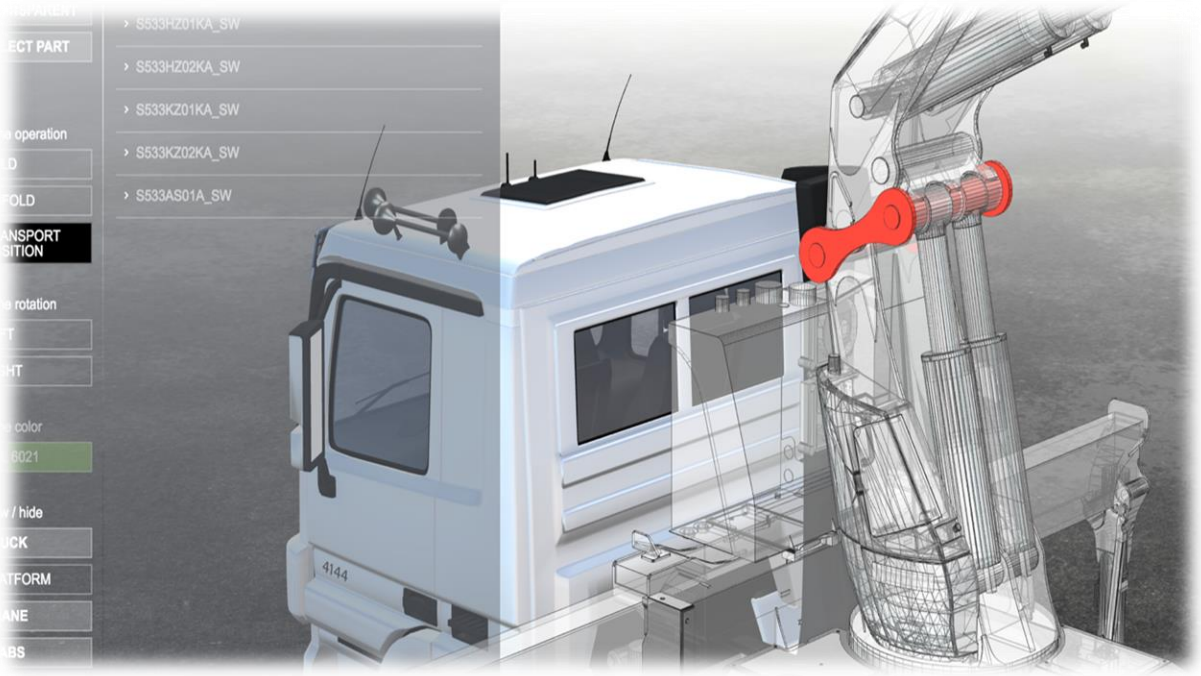
Pilot Project realization

Machinery Sales Configurator and Aftersales Portal



- Crane configurator is a graphic platform connecting in real time 3D from PTC Creo and Solidworks, Internal PDM and ERP: SAP
- With 4K graphics, real time animation of interactive 3D model size remains ultralight (lower than 37 Mbs)
- Web-based solution allows significant cost-savings on wide-spread IT infrastructure of dealerships and shops

PLM connected machine crane configurator \ portal (for Machinery OEM, EU)

(unified web-based works cross-platform world-wide)

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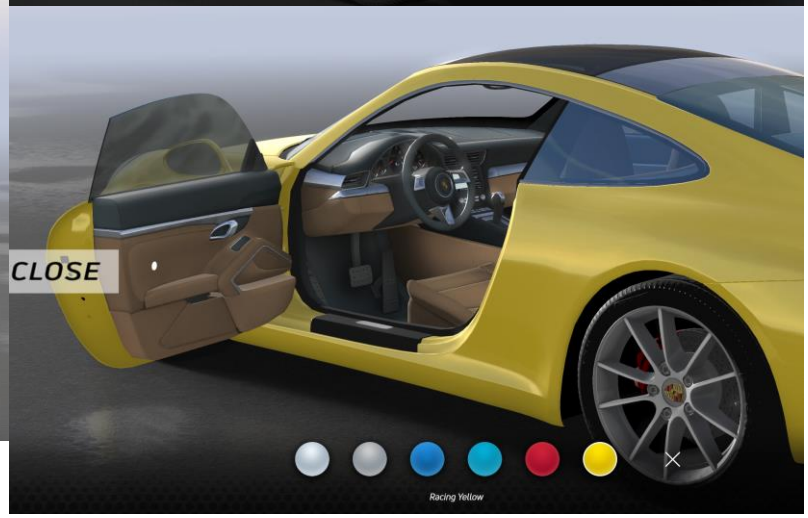
Proof of Concept

High-end Car Sales Configurator



Web-based interactive 3D Car Configurator (*Ultra High Quality Graphics in a web browser, on any device, no plugins or other redundant SW needed***)**

demo part of the project: https://b3.webgears3d.com/car-wgv2-full

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Pilot project (in progress)

Aircraft aftersales support – cross platform MRO solution

- Web-based 3D “Dent&Buckle” solution enables new way of efficiency in daily routing maintenance and operations, comparing to existing 2D “flat” approach.
- Thanks to lightweight interactive 3D model of an aircraft all the operational damages are mapped in the most accurate and convenient way (using a tablet or AR device) and smoothly integrated with the fleet database and maintenance management system.
- Beyond a damage mapping, an interactive digital twin can be used as an analytical model for strength and reliability calculation for predicative maintenance purposes.

Web-based 3D “Dent&Buckle” solution (for MRO Software Company, EU)

demo part of the project: https://webgears.app/industrial#AircraftDigitalTwin

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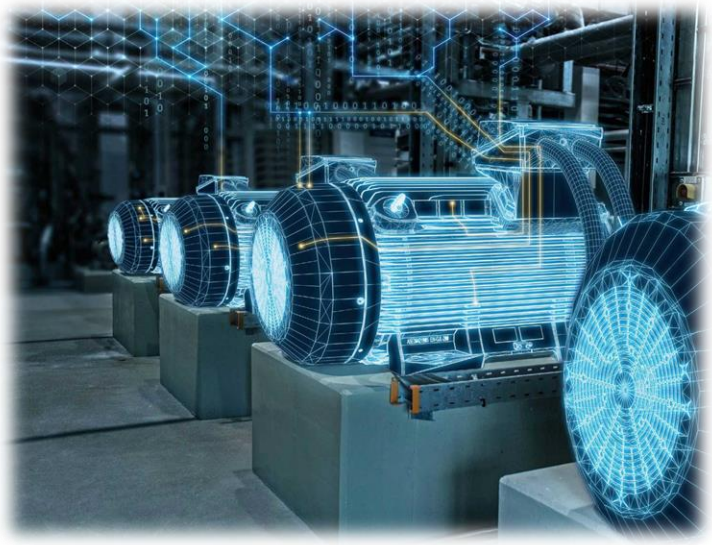
Beyond of Product Lifecycle applications,
We enable Interactive Digital Twin of Entire Industrial Asset
To become end-to-end 3D technology for Industry 4.0 ecosystem

Fields of application:

- Marine Platforms
- **Production plants**
- Mining
- Energy plants

Primary

Rich visualization of Digital Twin of entire Industrial Asset, like a production plant or an offshore oil rig, accessible elsewhere at any device. It shares data beyond CAD and Dashboards to Integrated Collaborative Visualization Environment enabling new level of industrial operations excellence.



Specific

- Visualization of entire asset management
- Industrial asset Digital Transformation via 2D->3D capabilities
- Improved search, spatial analysis and troubleshooting capabilities, involving remote geographically spread experts.
- Visibility of all processes for logistics optimization, LEAN production and continuous improvements
- Enhanced capabilities to model different scenarios, changes and assess an impact on entire asset, before making critical decisions
- Intuitive learning, navigation and maintenance using AR/VR

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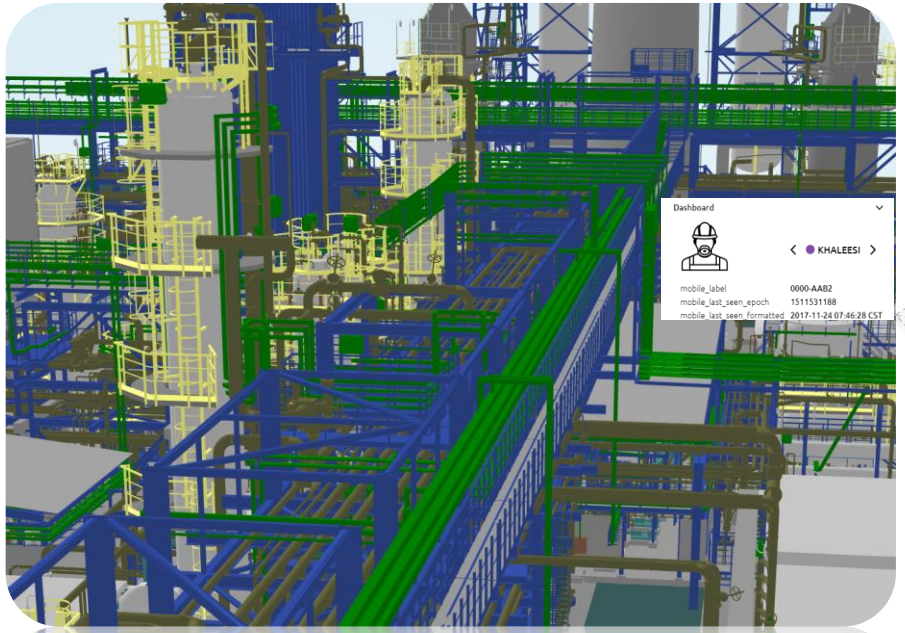
Industrial Project (in progress)

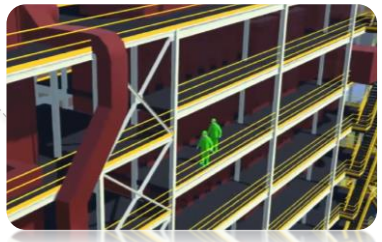
Industrial plant – Maintenance and Repairs Web Portal



- Integrated environment for all of the operational (incl. IIoT) data, MRO planning and control
- Managed access of all parties, incl. external suppliers from any device («weak» PC and mobiles)
- Object-oriented approach to manage responsibilities in the frame of Reliability Centered Maintenance

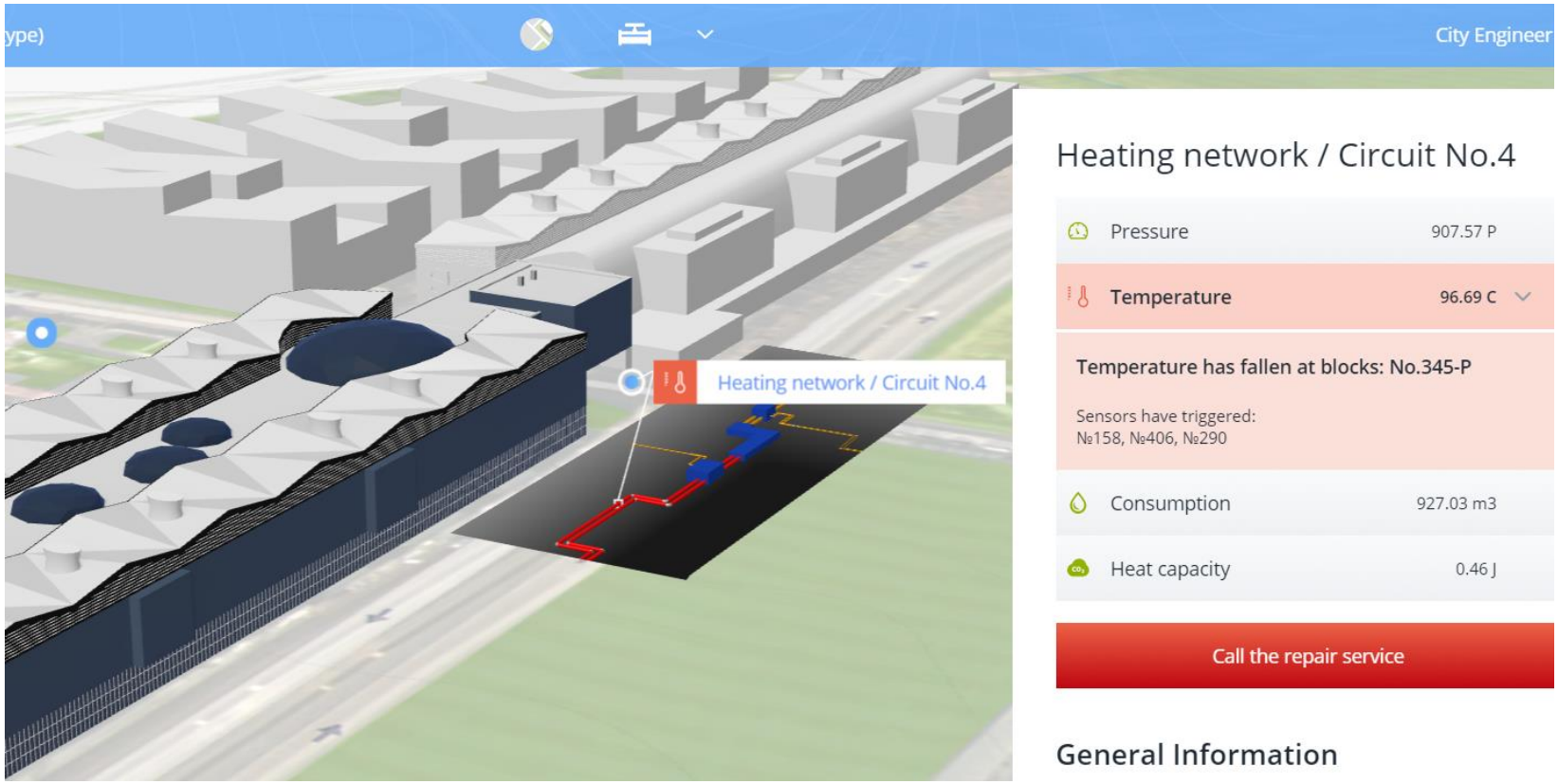
Training and Education (incl. VR)

Maintenance and Repairs (incl. AR)



Tracking of staff and equipment, optimization of operational logistics

Engineering networks management portal



Smart Facility – Interactive 3D Digital Twin

demo part of the project: https://webgears.app/industrial#SmartCityNetworks

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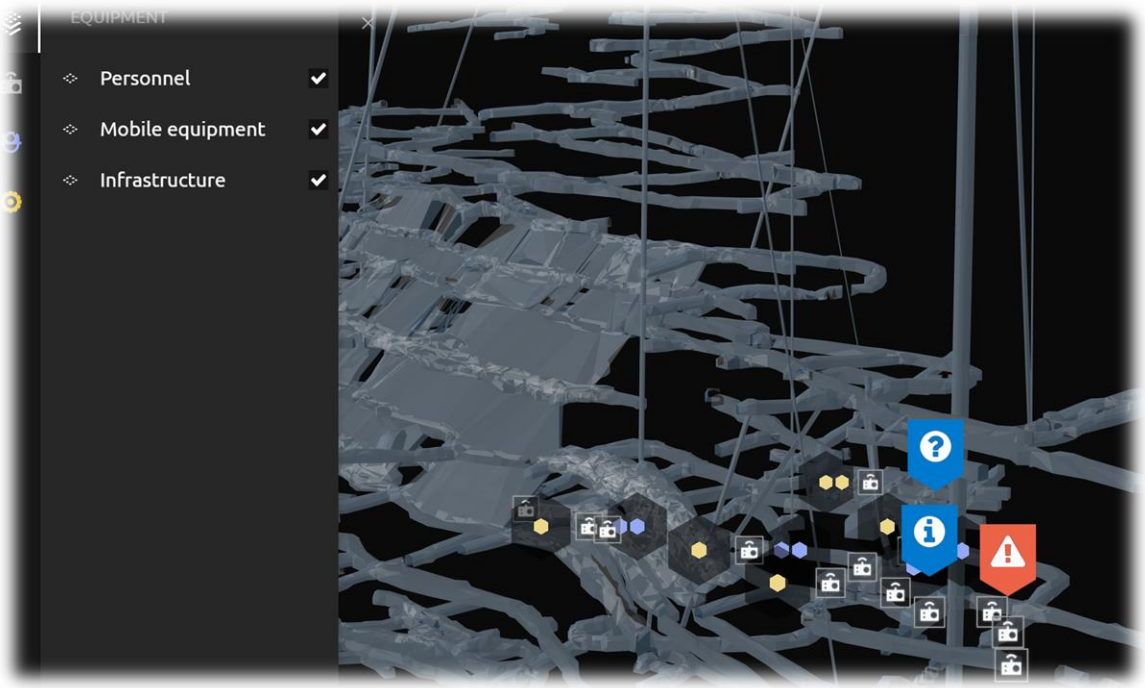
Project realization (in progress)

Mining Safety and Operational Efficiency (IIoT-based)



- Entire mining asset visualization (stays up to date as heading goes)
- Real time location of staff, equipment and ongoing monitoring of mine conditions (pressure, temperature, CO2, etc.)
- Ultra-heavy 3D scanned geometry (3,5 million polygons) optimized to 83 Mb and runs smooth even in web browser of mobile phone

Web3D IoT Visualization Platform of entire mining asset (in cooperation Safety Integrator, Canada)

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“ future is web-based “

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Back Up Slides

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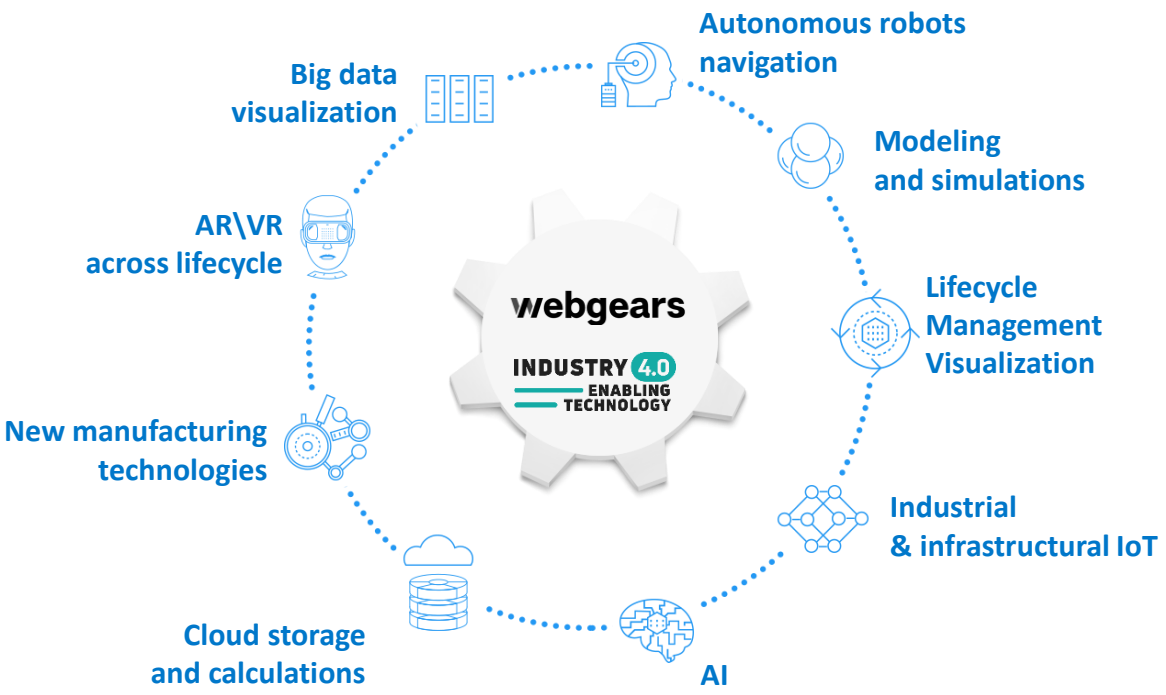
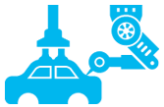
Fields of technology and industrial applications




Energy & resources


Smart Manufacturing


Smart Buildings


E-commers & aftersales


Connected Products


Smart City

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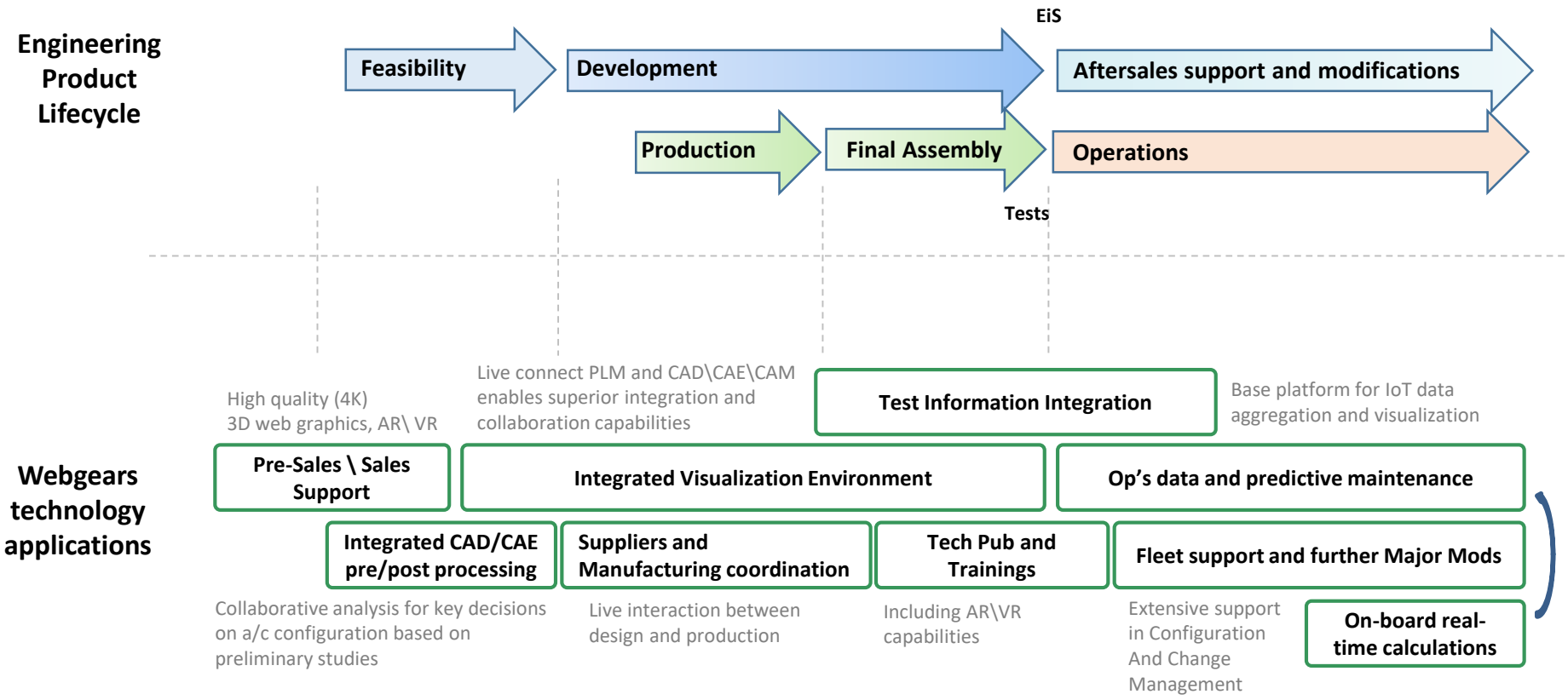
Webgears keeps high quality and level of detail of complex 3D while eliminating HW Requirements, acts as a single 3D description technology
enabling true Digital Twin and bringing Added Value at every stage of Life Cycle



Company Summary

About Webgears

Webgears is an international IT technology company focusing on novel analytical approach to industrial 3D graphics. We let our clients extract significantly more value from interactive 3D graphics by almost eliminating hardware requirements and moving interactive 3D content to the cloud, which creates new and optimizes existing use-cases.

Technology

Analytical approach to 3D graphics is built around a mix of proprietary novel mathematics behind 3D model geometry, web-native 3D graphics engine, hybrid cloud-local 3D rendering, WebGL and software know-how.

- ✓ **rich interactive 3D runs in a web-browser over WebGL**
- ✓ **up to x100 size and CPU/GPU load reduction of 3D models, lossless**
- ✓ **GPU/CPU hardware requirements eliminated or materially decreased (multi-Gb 3D models rendered in-browser even on mobile phones, without apps or plug-ins)**

Solutions/web-3D apps based on Webgears

- ✓ **PLM/IoT**: industrial product digitalization through web-based 3D “digital twins“ integrated with industrial IoT platforms
- ✓ **PLM/Sales**: product configurators
- ✓ **PLM/Training**: interactive assembly and service 3D manuals
- ✓ **Smart Manufacturing:** enables “Industry 4.0” conception

Target clients

Target clients are all industrial manufacturers, technology integrators and architecture\construction companies that now use 3D graphics in CAD\CAE, PLM or BIM systems. Initial focus is on mid-size manufacturers with rapid new product development needs.

Team

Webgears technology relies on the unique mix of its team members’ scientific achievements in novel mathematics science and hands-on expertise in cloud IT systems, web and discrete industries.