

CONSTRUSIM AVR

WHEEL LOADER SHOVEL,
BACKHOE LOADER AND BULLDOZER SIMULATOR



simumak

A COMPANY OF THE GROUP:

Aeroespacial
y Defensa



www.simumak.com



*Simumak is a Spanish company with an international presence belonging to **everis Aerospace and Defense**, which, in turn, is part of the **NTT DATA** group. Simumak has a long experience developing didactic simulation solutions for the Automotive, Construction, Mining, Logistics and Defense sectors.*

Simumak develops 100% of its solutions in an affordable way, focusing on the specific needs of customers, combining the use of new technologies with the real needs of its customers.

How to operate it?



Simumak Immersive Simulators is the division from which we develop the software and hardware of cockpit simulators specifically designed for students to learn how to operate vehicles or machines. Boost the performance of your operators or qualify more prepared students thanks to our training plans on board Simumak simulators.

How does it work?



From the **Simumak VR Training** division, we design training plans adapted to the needs of the client, with the aim that the students are able to assimilate theoretical-practical knowledge, functions, or processes, using, as hardware, high quality and very low cost commercial products (Oculus Go). Optimize the assimilation of your processes or improve the understanding of your students through our immersive training tools.

CONSTRUSIM AVR



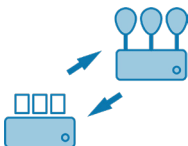
CONSTRUSIM AVR SIMULATOR

Our goal is to maximize your profit by increasing the safety and productivity of your equipment.

After **more than 15 years of designing virtual trainings tools**, we have developed a product adapted to your needs with which you will be able to achieve real, measurable results that will optimize the operation of your company.



Fewer accidents, higher productivity in the warehouse, more profitable work cycles, recruiting, creating and retaining talented operators through specific training programmes are just some of the examples where we can help you through our **virtual training tools**.



Simumak has developed **CONSTRUSIM AVR, a multi-machine simulator** specially designed to meet the needs of companies in the construction sector.

CONSTRUSIM AVR can be easily configured as a **wheel loader shovel, backhoe loader and bulldozer** from the same hardware. This will allow training to be given to different groups of professionals from a single simulation station, thus facilitating the rapid amortization of the investment made.



CONSTRUSIM AVR incorporates a revolutionary **AVR (Augmented Virtual Reality) vision system** that immerses the operator in a completely virtual environment, in which he has absolute freedom to modify his perspective, also allowing him to see his own hands and the controls of the cabin that surround him and with which he has to interact. Never before has a machine simulator come so close to reality.



CONSTRUSIM AVR can operate stand-alone, but it can also be integrated with the **INSTRUCTOR STATION**, the student and exercise management platform (**SOCRATES**) and the exercises generator (**Training Manager**), which will allow you to create training plans very quickly and at a very low cost.

We know that there are many different needs, even within the same company, so we have developed a product range with different models to suit different scenarios. From the CONSTRUSIM AVR PORTABLE, designed to be easily transported and deployed on the student's own table, to the CONSTRUSIM AVR GOLD, which with its set of real controls and its 3DOF motion platform has been designed to meet the most demanding immersion needs.

SIMUMAK SIMULATION ECOSYSTEM



SOCRATES

- Students and instructors management
- Exercises settings
- Sessions scheduling
- Results displaying



TRAINING MANAGER

- Exercises creation and edition
- Generation of specific situations
- Guided learning plan



SIMFLEET MANAGER

- Simulators management
- HW and SW updates
- Maintenance
- Remote issues management



OBSERVER STATION

- It may be located in another room.
- Learning extension
- It allows the students to observe the development of the practice carried out in the simulator

INSTRUCTOR STATION

- Formed by three screens, a computer and a printer
- Telemetry application
- Visualization and communication with the student
- Modification of simulation conditions in real time (events, breakdowns, modification of weather conditions...)
- Interaction in real time with another vehicle thanks to the cooperative driving mode

SIMULATION STATION

- High immersion: realistic HW and SW
- Customizable learning program
- 3DOF movement platform to guarantee a complete immersive feeling
- Several machines in one simulator

AVAILABLE VERSIONS

This simulator is highly configurable, and able to be adjusted to client's needs. This simulator offers three kinds of versions.



CONSTRUSIM OYD

The option OYD (On Your Desktop) consists on one notebook, VR headset and controls (joysticks, steering wheel and pedals). It offers an immersive solution, creative and economic, designed to be easily portable.

The installation is very simple and takes up very little space, allowing its use in conventional training classroom that in a few minutes become advanced simulation centers where all students can practice on board a simulator.

When the VR headset is put on, the students sit on a machine thanks to the AVR system.



CONSTRUSIM AVR SILVER

CONSTRUSIM AVR Silver offers a very realistic immersion thanks to the machine control system, which imitates the real controls. This system allows the configuration as a wheel loader shovel, backhoe loader and bulldozer, by mean of a simple change of controls that can be carried out by the instructor himself.

Under the seat it is possible to install a 2DOF motion platform that will move the operator slightly, giving him a sensation of immersion and almost absolute realism.



CONSTRUSIM AVR GOLD

The main difference between CONSTRUSIM AVR Silver and **CONSTRUSIM AVR Gold** is that the latter mounts under its cockpit (not just under the seat) a 3DOF platform (3 degrees of freedom: heave / roll / pitch) that represents with great fidelity the inertial experience on board the machine.

In a few seconds the operator will forget that he is on a simulator and will focus on carrying out the work or exercise that has been entrusted to him. The immersion is very complete and this allows students to spend a lot of time on board the simulator without feeling fatigue or discomfort.

CONSTRUSIM AVR

PEDALS

Accelerator pedal and service brake for the wheel loader shovel and the backhoe loader. Decelerator pedal and brake for the bulldozer.

STEERING WHEEL COLUMN

To handle the wheel loader shovel and the backhoe loader.

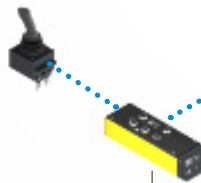
DASHBOARD

Biometric identification system, navigation through the simulator menus, and emergency stop device.



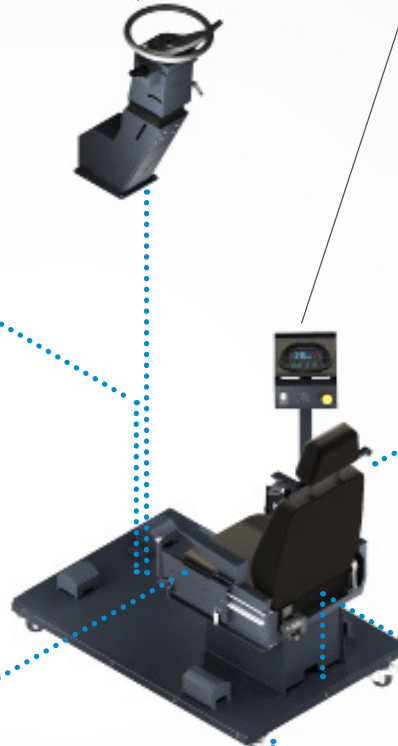
CONTROL TOWER AND CONTROL SYSTEM SCREEN DISPLAY AND SOUND

This module contains the simulator computer as well as the main electronics. It also serves as a support system for the 50" (silver) and 60" (gold) and the 2.1. sound system.



LEFT CONTROL THRONE

Includes servo control for the operation of the wheel loader shovel, the backhoe loader and the bulldozer.



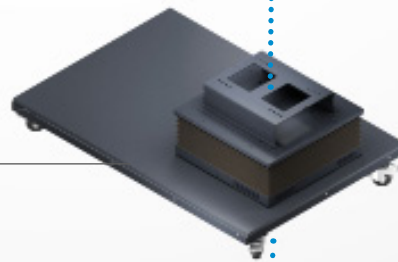
RIGHT CONTROL THRONE

Includes servo control for the handling of the wheel loader shovel, the backhoe loader and the bulldozer.



REAR SPEAKERS

Optional surround sound system.

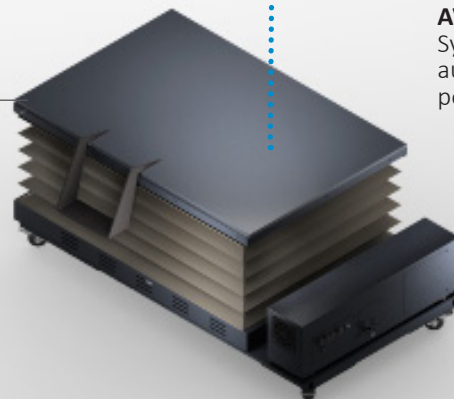


2DOF MOTION PLATFORM

(TWO DEGREE OF FREEDOM)

Optional 2DOF platform under the seat.

Reinforces the immersion and realism of the simulation by recreating the accelerations and inclinations suffered on board the machine.



3DOF MOTION PLATFORM

(THREE DEGREES OF FREEDOM)

3DOF platform under the cockpit. Reinforces immersion and realism of the simulation by recreating the accelerations and inclinations suffered on board the machine. Thanks to its high-frequency movement system, it is capable of reproducing engine vibrations or terrain imperfections.



AVR HEADSET

System of visualization of augmented virtual reality with positioning system 6DOF.

TECHNOLOGY AT YOUR SERVICE

MINESIM AVR is equipped with the most advanced technologies that turn this simulation experience into a realistic and useful learning one, making this product an essential tool for training.



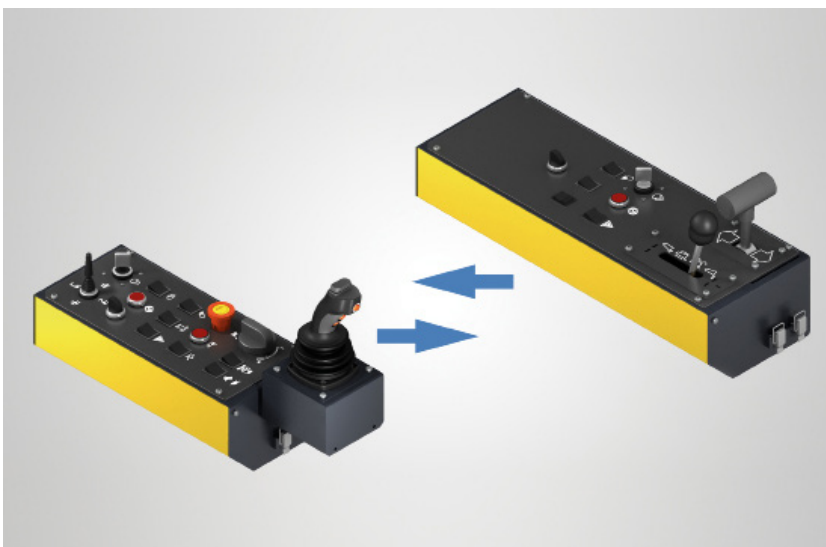
HIGH IMMERSION AVR

No more seeing reality through a screen. Thank to **Augmented Virtual Reality (AVR)**, looking in any direction, changing the perspective and being able to interact with the cockpit that surrounds us is possible. The sensation of immersion cannot be greater.



EARTH PHYSICS SYSTEM EAPS

Thanks to the “**Earth Advanced Physics System**” and its multithreaded technology, the feel of digging and the behaviour of the earth become fluid and absolutely realistic. Evaluate the dexterity of your operators thanks to exercises in which EAPS allows you to work with a high level of precision.



MODULAR HARDWARE

The simulator's modular architecture allows the equipment to be quickly configured in **wheel loader shovel, backhoe loader and bulldozer**.

This multi-machine function makes the simulator a versatile tool that can be adapted to several types of simultaneous training on the same hardware, thanks to which space can be saved and the amortization of the simulation equipment maximized.

SIMUMAK emphasizes not only in maximizing the feeling of realism and immersion in its designs, but also in their robustness. We guarantee the optimization of maintenance cycles.

HARDWARE FEATURES

MINESIM AVR has **interchangeable modules** that make it customizable and adaptable to the configuration needs of each customer to suit the driving of **wheel loader shovel, backhoe loader and bulldozer**.



WHEEL LOADER SHOVEL

This configuration is made up of a right throne with an electronic hall effect servo control, pedals and a steering column.

The **servo-control** that allows the movement of the bucket and the arm.

It includes the **brake and accelerator pedals** to control the speed of the machine and the **steering column** to control the directions of driving.



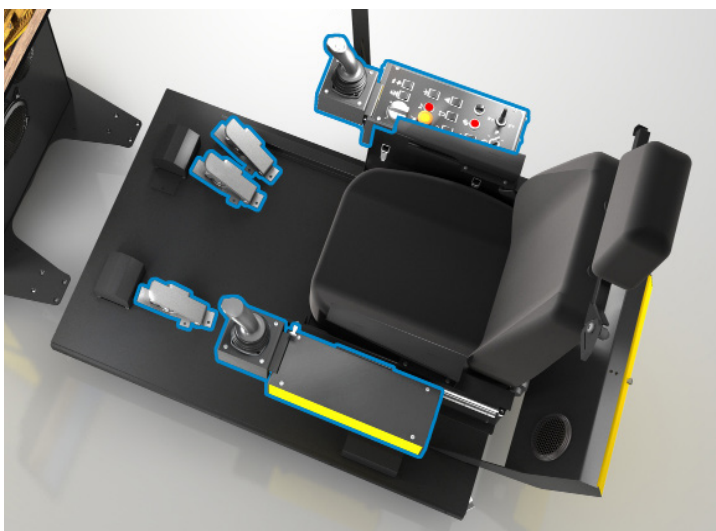
BACKHOE LOADER

This configuration consists of two thrones with hall-effect electronic servo-controls (right and left), pedals and a steering column.

The **right hall-effect servo-control** allows the movement of the arm and the bucket.

The **left servo-control** allows the turning control and movement of the backhoe bucket.

It includes the **brake and accelerator pedals** to control the machine's speed and the steering column to control the directions of driving.



BULLDOZER

This configuration consists of two thrones with hall-effect electronic servo controls (right and left) and pedals.

The **right servo-control** allows the control of the movement of the blade of the machine.

The **left servo-control** allows control of the direction of driving and gear shifting.

Includes **brake and decelerator pedals** to control the speed of the machine.

SOFTWARE FEATURES

MINESIM AVR allows four machines to be driven: **wheel loader shovel**, **backhoe loader** and **bulldozer**. Each machine has an adapted training plan, which enables the student to gradually assimilate the knowledge.



The training plan developed for the **wheel loader shovel** allows your students to practice doing a multitude of exercises:

- Knowledge of the machine's controls
- Driving through the work area
- Loading and unloading of basic level material
- Loading and unloading of advanced level material
- Critical operations (obstacles, adverse weather and visibility conditions)



The training plan developed for the **backhoe loader** allows its students to practice with different types of activities

- Knowledge of the machine's controls
- Driving through the work area
- Loading and unloading of basic level material
- Loading and unloading of advanced level material
- Basic level of excavation/digging
- Digging trench
- Pipeline unearthing
- Critical operations (obstacles, adverse weather and visibility conditions)



The training plan developed for the **bulldozer** allows students to practice different aspects:

- Knowledge of the machine's controls
- Driving through the work area
- Land grading in 1 go
- Land grading in many goes
- Layered scalling
- Using of the scarifier
- Critical operations (obstacles, adverse weather and visibility conditions)



Our simulator allows both to carry out the training plans already developed and to design and implement new training plans. Our **Training Manager** exercise creation tool allows you to create and edit specific exercises adapted to the needs of each client. The results of the exercises are available for consultation on the Socrates management platform.

INSTRUCTOR STATION AND SOCRATES

While the student is doing the practice, the instructor can observe him from different cameras, check the telemetry or interfere with it through the command sending system of the **instructor station**.

- Triggering malfunctions
- Modification of time of day / weather conditions
- Inclusion of risk situations or special conditions (traffic/pedestrians)
- Co-operative driving



The screenshot displays the instructor station interface with several panels:

- ENTORNO:** Environmental settings like 'Tiempo' (Weather) and 'Paisaje' (Landscape).
- EVENTOS:** Event triggers such as 'Bata de mantenimiento', 'Cambio de combustible', etc.
- VEHICULO INSTRUCTOR:** Controls for the instructor's vehicle, including 'PUNTO PARTIDA INSTRUCTOR' and 'COLISIONES'.
- VEHICULO ALUMNO:** Controls for the student's vehicle, including 'PUNTO PARTIDA ALUMNO' and 'NIVEL DE CARGA'.
- COMANDOS DEL VEHICULO:** Vehicle command panel with 'Genero de Giro' and 'Velocidad' sliders.
- TELEMETRIA DEL VEHICULO:** Telemetry data showing 'Información de consumo / rendimiento' with line graphs for fuel, engine, and gear.
- Cameras:** A list of camera views for the instructor and observer points.

The simulator recognizes the student through a biometric identification system and stores its result in **SOCRATES**, generating a report of each practice carried out for later analysis.

At all times, the simulator supervises the student's practice, monitoring the correct handling of the machine and sending messages when it detects that incorrect maneuvers are being carried out. This automatic supervision system can be used to compute the note of the exercise, indicating in the design of the exercise which infraction or errors will subtract points from the student's grade.

This block illustrates the student identification and reporting process:

- Biometric Scanner:** A hand is shown placing a finger on a scanner. Text below reads: "Pon el dedo sobre el lector (alumno)".
- EVALUACION Form:** A form for recording student performance. It includes fields for 'PUNTO INICIAL' and 'TIPO DE INFRACCION'. A table lists infractions and their corresponding point deductions:

INFRACCION	PUNTO	MODIFICAR	NOTAR
Distancia o velocidad no respetada	1	✓	✓
Descarga incorrecta	2	✓	✓
No respetar prioridad	3	✓	✓
Conducción con la capa visible	3	✓	✓
Colisión	5	✓	✓
- Reporte de Rendimiento:** A graph titled 'Información de los pedales' showing 'Información manejo implementos / rendimiento' over time. The graph plots 'Fuerza', 'RPM', 'Cambio correcto', and 'Cambio incorrecto'.

SIMULATED MACHINES



WHEEL LOADER SHOVEL

CONSTRUSIM AVR wheel loader shovel allows to work with sand in a worksite. It has an exercises plan designed to raise the worker's productivity in real situations, such as loading and unloading of trucks in different weather situations and times of day.

HARDWARE FEATURES	
RIGHT SERVO CONTROL	elevation / lowering of the gable
	opening / closure of bucket
PEDALS	accelerator pedal
	service brake pedal
RIGHT THRONE	engine accelerator
	tick over system
	selection of propulsion mode
	pilot cut off
	floating mode
	horn
	warning
	working lights
	windscreen wipers
	ignition key
STEERING COLUMN	1100° turning steering wheel
	turning lights lever, lights and windscreen wipers
CONTROL PANEL	screen, level indicators
	indicators
	clocks
	navigation arrows
	emergency stop button
	biometric identification system

DYNAMIC FEATURES	GENERIC	model	JCB 409
		fuel	diesel
		operating weight	6.031 kg
		bucket capacity	1 m ³
	DIMENSIONS	total width	1.898 mm
		total height	2.643 mm
		total length	5.465 mm
		turning radio	3.979 mm
		unloading height	2.619 mm
	PERFORMANCE	maximum speed	20 km/h
		maximum par / rpm	300 Nm / 1500 rpm
		engine power	55,4 kW



BACKHOE LOADER

CONSTRUSIM AVR backhoe loader allows to work in a construction environment. The worker could practice the tasks of this machine such as loading and unloading with the front bucket, and digging with the backhoe bucket in different weather conditions and different times of day.

HARDWARE FEATURES			
STEERING COLUMN		steering wheel with 1100° rotation	
		turning indicators, lights and windshield wipers lever	
PEDALS		gas pedal	
		service brake pedal	
RIGHT THRONE		engine accelerator	
		tick over system	
		selection of propulsion mode	
		pilot cut off	
		floating mode	
		warning	
		horn	
		working lights	
		windscreen wipers	
		ignition key	
LEFT THRONE		front mode / back	
		side shifting backhoe arm	
		teleopic shifting backhoe arm	
		extension / rolling up telescopic backhoe arm	
		stabilizer bars control	
CONTROL PANEL		screen, level indicators	
		indicators	
		clocks	
		navigation arrows	
		emergency stop button	
		biometric identification system	
DYNAMIC FEATURES	GENERIC	model	JCB 3XC
		fuel	diesel
		operating weight	8.178 kg
		front bucket capacity	1,3 m3
	DIMENSIONS	total width	2.350 mm
		total height	3.030 mm
		total length	5.620 mm
		max. unloading height (front)	2740 mm
		max. unloading height (back)	3840 mm
	PERF.	maximum speed	20 km/h
		engine power	55 kW

CONSTRUSIM AVR



BULLDOZER

CONSTRUSIM AVR bulldozer allows the grading of terrains in a work site. The worker could practice the tasks of this type of machine, as grading terrains in one or many layers in different weather conditions and different times of day.

HARDWARE FEATURES	
LEFT SERVO CONTROL	direction of driving the machine/Gear change
RIGHT SERVO CONTROL	elevation/ resting of the blade
	tilt of the blade
PEDALS	brake
	decelerator
RIGHT THRONE	engine accelerator
	beacon light
	scarifier control
	horn, working lights, windscreen wipers
	ignition key
LEFT THRONE	left servo control soporte servomando izquierdo
CONTROL PANEL	screen, level indicators
	indicators
	clocks
	navigation arrows
	emergency stop button
	biometric identification system

DYNAMIC FEATURES	GENERIC	model	CATERPILLAR D11
		fuel	diésel
		weigth	104.257 kg
		steering wheel power	634 kW
		capacity of blade	27 m3
	DIMENSIONS	width (standard brake shoe)	3.782 mm
		cabin height	4.698 mm
		total length (including blade and scarifier)	10.525mm
		gauge	2.896 mm
	tractor total length	6160 mm	
	PERF.	advance maximum speed	11,8 km/h
		recoil maximum speed	14 km/h
		penetration maximum force	288 kN



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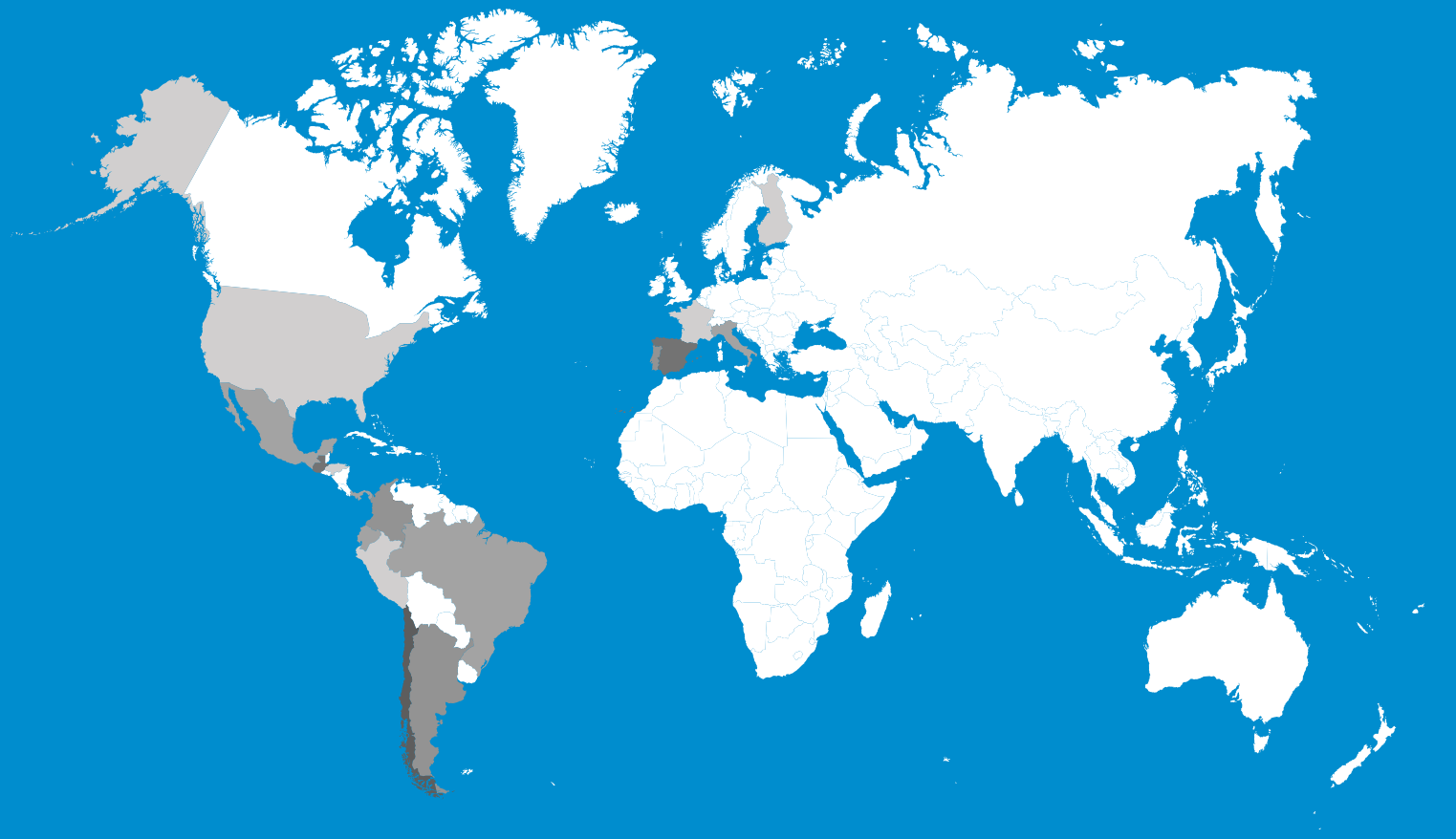
simulators
manufactured

+ 15

countries with
installed base

+ 20.000.000

performed
sessions



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