

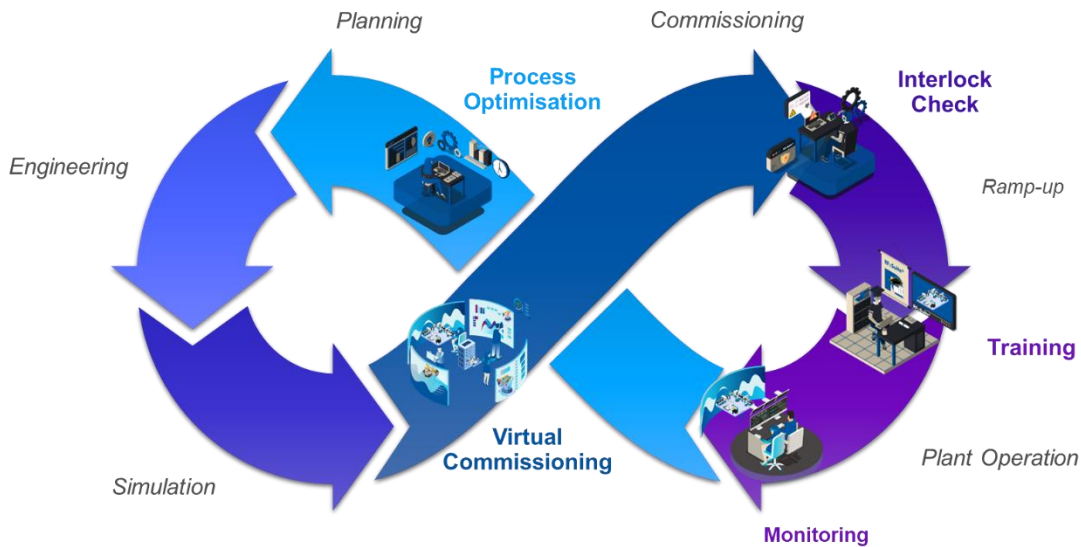
The background of the entire image is a complex, abstract design. It features a large, central gear with a blue 'R' inside it, surrounded by several other smaller gears of various sizes. The gears are white and set against a dark blue background with a grid pattern. A large, glowing orange and yellow light source is positioned behind the central gear, creating a strong lens flare effect. The overall color palette is dominated by blue, orange, and white.

RF::Suite®

TOOLS FOR THE VIRTUAL PLANT

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RF::SUITE TOOLS FOR THE VIRTUAL PLANT



The **RF::Suite** supports the production throughout its product lifecycle. It provides a digital twin that offers value in almost all lifecycle phases.

VIRTUAL COMMISSIONING



With the **RF::Suite** software modules, the digital twin serves as a quality gate for the plant development process. Real systems can be put into virtual operation. The **RF::Suite** allows a realistic behaviour of the system, connected with real PLC and robot programs.

INTERLOCK CHECK



The analysis tool **RF::SCOUT** detects robot-robot collisions and analyses the robot-robot interlocks in the robot programs – even the unexpected ones. It works both with data from virtual as well as from real robot controllers. Therefore, **RF::SCOUT** forms a continuous quality gate throughout virtual and real commissioning.

MONITORING & PROCESS OPTIMISATION



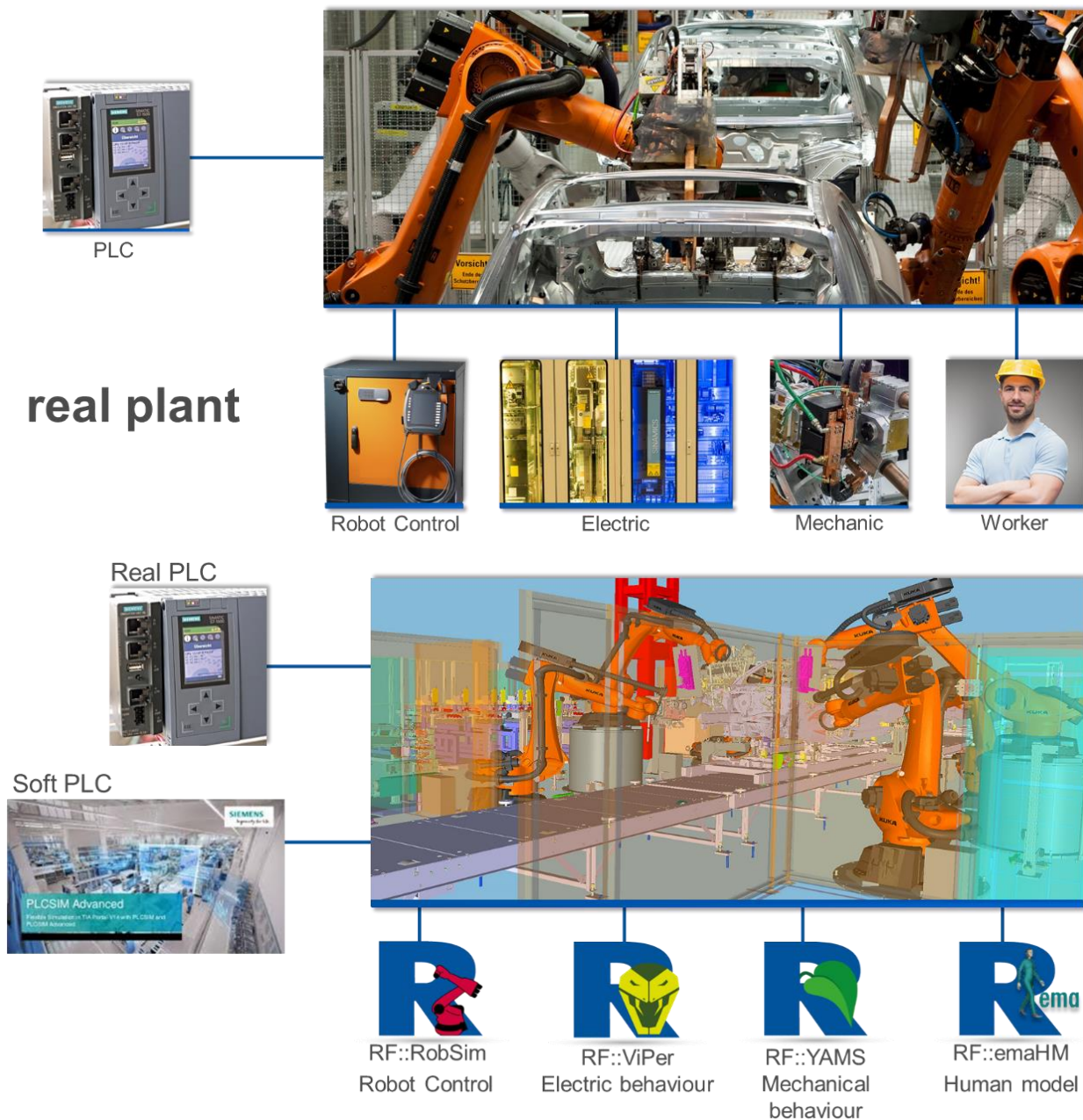
Connect the **RF::Suite** digital twin to your real production – and make it a digital shadow. Observe your production from anywhere you like with the 3D visualisation and the display of messages or errors from the PLC. Collect the production data to create the basis for process analysis with **RF::SCOUT**. Find bottlenecks, evaluate device workloads and understand dependencies to improve your production and get the most out of it.

TRAINING



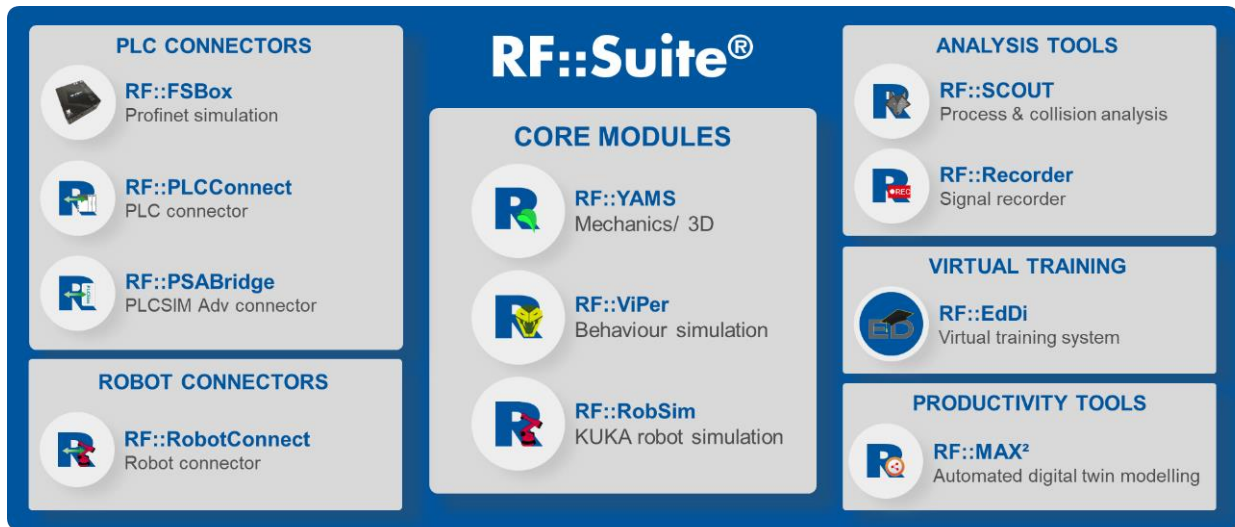
Use the digital twin as a training environment for PLC programmers, operators, maintenance staff and even for robot programming standard trainings. **RF::EdDi** provides an intuitive and realistic digital twin. With its indestructible nature, the trainee can test freely. **RF::EdDi** allows a challenging error simulation to prepare the trainee for the future work.

RF::SUITE REAL & VIRTUAL PLANT



The core modules of the **RF::Suite**, **RF::RobSim**, **RF::ViPer**, **RF::YAMS** and **RF::emaHM**, represent the full automation line in the digital twin. They represent the robot control, electric as well as mechanic components and the worker. The tools allow simulation both in hardware-in-the-loop as well as software-in-the-loop.

RF::SUITE MODULES



RF::Suite – Core Modules

More than just new possibilities. With the **RF::Suite** software modules, real systems can be put into virtual operation. With the virtual system through the **RF::Suite** it is possible to depict a realistic behaviour of the system and to control it with real PLC and robot programs. The virtual plant serves as a quality gate for the plant development process.

RF::YAMS – 3D simulation



RF::YAMS is the dynamic 3D visualization of the **RF::Suite** and is used for the representation of complex 3D geometries.

RF::YAMS is the successor of the previous 3D visualization **RF::SGView** and is even more flexible and performant. With **RF::YAMS** complete production plants can be visualized. In addition, a numerical kinematics simulation is integrated in **RF::YAMS**, allowing the mechanical behaviour of complex production systems to be perfectly simulated. Due to the volume collision detection, even minimal collisions between the displayed volume bodies can be detected and displayed.

Using the action script integrated in **RF::YAMS**, sensors and even a complex material flow can be mapped without problems. **RF::MAX²** (the successor of **RF::MAX**) is used to easily implement the action script. The signal exchange with other software products takes place via Shared Memory.

Thus, **RF::YAMS** is perfectly integrated into the **RF::Suite** and is ideal for use in virtual commissioning. **RF::YAMS** can also be used as 3D visualization for the digital shadow.

RF::ViPer – behaviour simulation



RF::ViPer is the modern peripheral simulation of the **RF::Suite**. **RF::ViPer** is especially used in virtual commissioning for the simulation of peripheral elements in virtual systems.

Individual program blocks can be developed and combined in libraries. Once programmed, standard elements can be used again and again. A **RF::ViPer** project usually consists of special programs and a multitude of library elements, which can come from different libraries. Projects can be made executable in the form of virtual devices. It is possible to use not only one, but several devices in a project.

Programming in **RF::ViPer** is possible in different programming languages. All programming languages known from IEC 61131 are available.

2D visualizations can be set up to operate the programs. Several standard elements are available for this purpose. However, you can also create your own visualization elements for special tasks. In addition, higher-level visualizations can be created with which complete projects can be operated.

An integrated, freely configurable ShM interface is available for exchanging I/O signals with other programs. This makes **RF::ViPer** perfectly integrated into the **RF::Suite** and serves as a central element for virtual commissioning.

RF::RobSim – robot simulation



RF::RobSim is the flexible robot compiler of **RF::Suite**. This allows new robot programs to be simulated and tested even before actual commissioning. Existing robot programs can also be loaded and executed.

It is possible to load kinematics models and programs of all known manufacturers of industrial robots or to create new kinematics. The most frequently used robot kinematics are already stored in **RF::RobSim**. The integrated syntax check of **RF::RobSim** makes it easy to correct syntax errors. In addition, all movements are calculated exactly and thus the accessibility of all points called up in the program is ensured.

Through the ShM interface, **RF::RobSim** can communicate externally with various programs. This enables the virtual robots to interact with real or virtual logic controllers (PLC) and the signal exchange between the systems can be optimized. **RF::RobSim** is the perfect tool for virtual commissioning of robot programs.

A variety of tools are available during program processing to facilitate debugging of the robot programs. The intuitive user interface of **RF::RobSim** allows the program to be operated by any user.

RF::MAX² – productivity tools



RF::MAX² is the flexible assistant tool for efficient creation and management of projects for virtual commissioning and digital shadows.

With **RF::MAX²** projects for 3D visualization **RF::YAMS**, robot simulation **RF::RobSim** and peripheral simulation **RF::ViPer** can be generated at the push of a button.

RF::MAX² can be adapted to any PLC and robot standard with the help of import and control files. Projects can also be set up across manufacturers.

RF::Suite – connect modules

Easy to connect. The **RF::Suite** connect tools close the gap between the virtual and the real system. This results in new benefits for the virtual system. The connect tools allow a connection to the system at any time. The current system status is transferred to the virtual twin or digital shadow.

RF::FSBox – the Profinet and Profibus simulation



RF::FSBox (Fast Simulation Box) is **the** solution for Profinet and Profibus simulation of the **RF::Suite**.

With the **RF::FSBox**, Profinet/ Profibus participants can be simulated easily. The participants are realistically simulated so that the connected controller cannot detect any difference between the simulated or real participants.

The **RF::FSBox** is thus the perfect simulation box for use in virtual commissioning. The configuration of the **RF::FSBox** can be easily determined from the hardware configuration of the PLC. This keeps the effort for the simulation of the Profinet/ Profibus participants very low.

In addition, several simulation projects can be loaded simultaneously on one **RF::FSBox**. This enables the virtual commissioning of several PLC controls with only one **RF::FSBox** in parallel.

RF::PLCConnect



RF::PLCConnect is the connection to virtual or real PLC controllers of the **RF::Suite**.

RF::PLCConnect makes it easy to connect to real or virtual PLCs. This enables the integration of real or virtual PLC controls into the virtual commissioning.

RF::PLCConnect can also be used to read signals from real PLC controllers. This function is used for use in the digital shadow.

RF::PLCConnect provides an interface to Allen-Bradley controllers, Phoenix controllers, Siemens hardware controllers, and Siemens software controllers.

RF::RobotConnect



RF::RobotConnect is the connection to virtual or real robot controllers of the **RF::Suite**. **RF::RobotConnect** makes it easy to connect to real or virtual robot controllers.

This enables the integration of virtual robot controllers into the virtual commissioning. **RF::RobotConnect** can also be used to read signals from real robot controllers. This function is used for use in the digital shadow.

RF::RobotConnect provides an interface to numerous robot controllers of the original manufacturers (e.g. ABB, FANUC, KUKA, Kawasaki, ...). The interface to the virtual system is ensured via a shared memory image. This enables easy communication with the various robot controllers.

RF::Suite – analysis tools

With increased expectations regarding output and production costs, automation systems become more and more complex. Ensuring cycle time and preventing downtimes is a great challenge. The **RF::Suite** gives you the tools to analyse and optimise your production.

RF::SCOUT – the analysis tool for validations



Detect collisions and analyse robot-robot interlocks with the **Interlock Check**, based on the digital twin and your production data from the real world. By comparing all robot paths in all possible combinations, it even finds collisions that would appear after years of production.

Analyse the **cycle time** of your production, based on the component behaviour in the real world. Create full cycle time diagrams of the real process and compare to the planned process. Feedback process times to your cycle time libraries for future planning.

Evaluate the **workload** of devices in your production. Detect **bottlenecks** to quickly give direction for improvements.

Optimise your process using both **Interlock Check** and **Process Analysis**. Identify optimisation potential in the cycle time diagram and the robot-robot interlock sequences. Simulate improvements on the digital twin – without risking downtimes in the real world.

Use **RF::SCOUT** to safeguard (virtual) commissioning and optimisation activities before they are implemented in the real world, fully independent on the digital twin.

RF::Recorder – the recording tool for signal progressions



RF::Recorder is the recording tool for the **RF::Suite**. It allows any number of interprocess communications (IPCs) to be recorded and replayed later.

This allows a simple analysis of the signal characteristics. The **RF::Recorder** is a useful tool for optimizing plant processes.

In addition, recorder files can be used as documentation of intermediate or final states during virtual commissioning.

RF::Suite – virtual training system

The virtual training system for PLC, robotics, commissioning, and maintenance. The training requirements for your skilled personnel increase with the complexity of the production plant and the process flow. **RF::EdDi** provides you with all the functions you need to master this challenge – using the Digital Twin in your training environment.

RF::EdDi – the virtual training system



Thanks to the exact simulation of the components, the trainee gets realistic feedback. Here, the complexity is just as present in the virtual world as it is in reality. The break to the real world is gone.

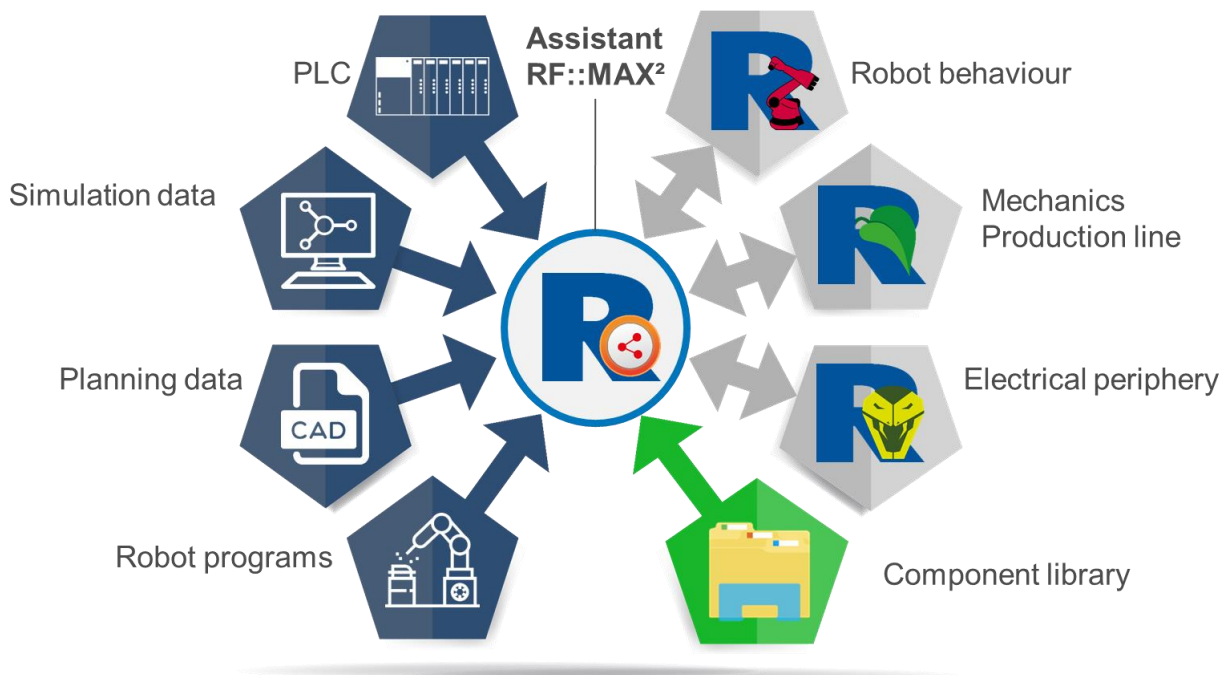
RF::EdDi is intuitive – no special software knowledge is required to operate the model. The focus is on the transfer of knowledge and training content, not on creation of a digital plant model.

There are no expensive repercussions for mistakes in the virtual training world – it is indestructible. The trainees move in a safe area. However, if a task seems unsolvable, one simple mouse click is all it takes to reset the production plant.

For maximum spatial and temporal flexibility, the model can also be operated remotely in the cloud. You only need a web browser!

Your flexible training system is quickly and easily modified, for example, if a new technology or a new procedure is to be integrated.

RF::SUITE WORKFLOW



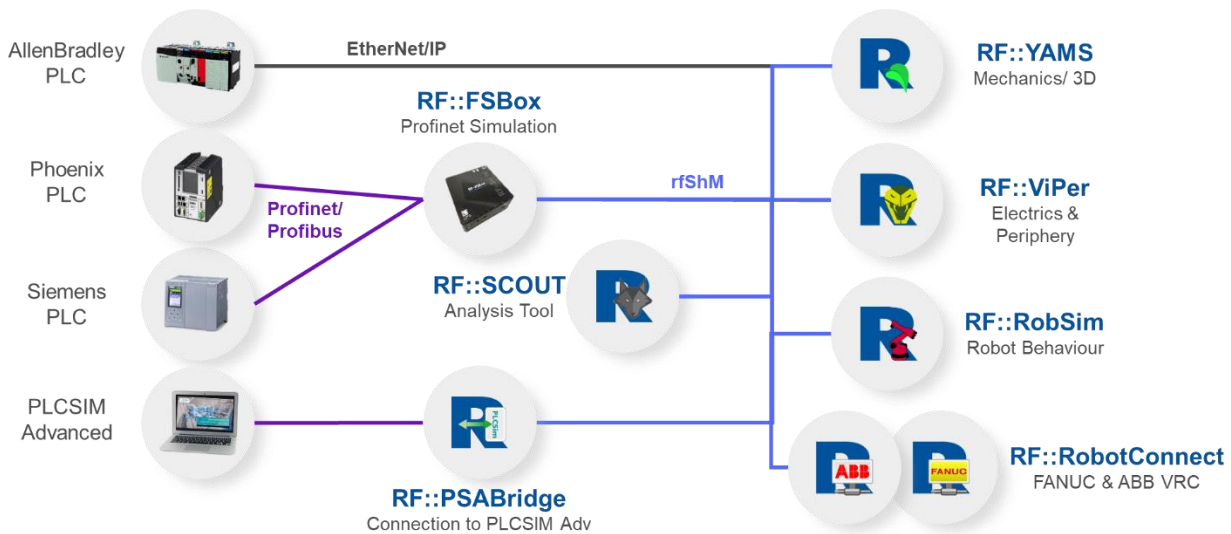
Virtual commissioning and digital twins or shadows can only be as beneficial as the productivity of the modelling workflow. For this reason, the **RF::Suite** offers strong tools for automatic project generation and easy-to-use configuration in **RF::MAX²**.

The core for this workflow is the component libraries. They contain the behaviour models as well as 3D components, ready for simulation. Additionally, **RF::MAX²** uses rules to describe their connectivity level.

Engineering and planning data serve as the main input for **RF::MAX²**. Using the rules from the libraries, **RF::MAX²** automatically detects the hardware used in the project and connects them according to the programming standards.

RF::MAX² works with two kinds of robot programs: original backups, and offline programs (OLP). Original backups can be directly imported and simulated. For OLPs, **RF::MAX²** uses additional templates for **RF::RobSim**, according to the robot programming standard.

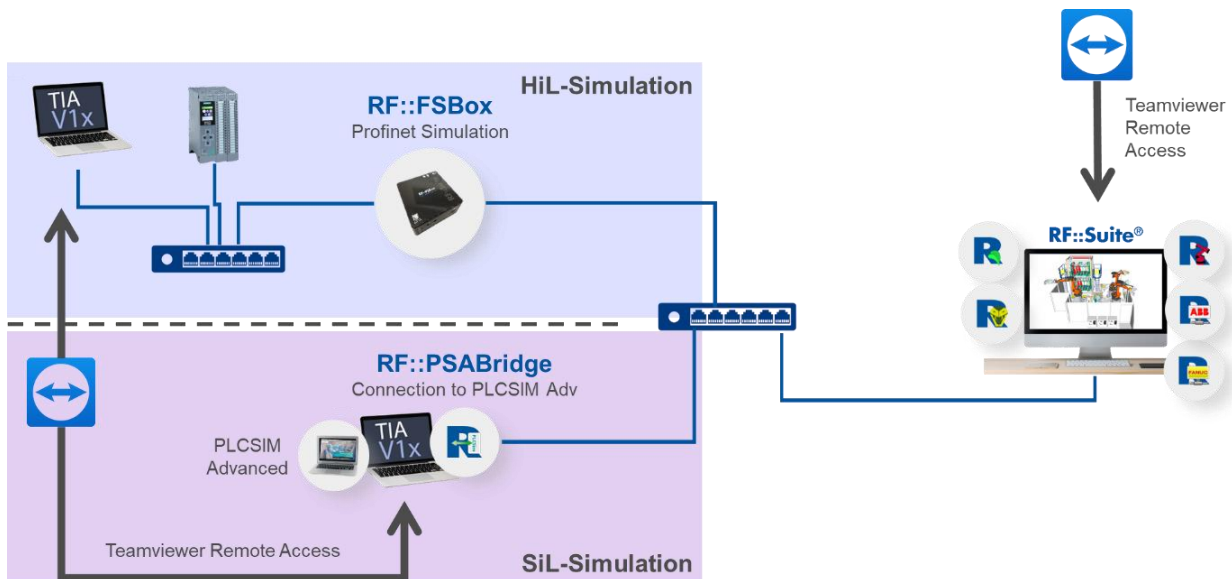
RF::SUITE CONNECTIVITY



The **RF::Suite** tools communicate via Shared Memory (ShM). The ShM setup is automatically created by **RF::MAX²** during project generation. **RF::PLCConnect** and **RF::RobotConnect** enable the communication with external software and hardware.

RF::PLCConnect establishes the connection to either software PLCs for software-in-the-loop simulation, or hardware PLCs via the **RF::FSBox**. AllenBradley/ Rockwell PLCs do not even require the **RF::FSBox** – the communication is established directly via EtherNet/ IP protocol.

Using the original APIs from the robot vendors, **RF::RobotConnect** exchanges signals between the **RF::Suite** and the virtual robot controllers of the original robot manufacturer. For digital shadows, even a read-only-connection can be established with the real robot controller.



The typical **RF::Suite** workspace setup uses at least two PCs: one PC for the **RF::Suite** software and another PC for the PLC programming environment. Thanks to its high flexibility, the **RF::Suite** simulation can be distributed to several PCs, e.g. to allow several engineers to work on the project simultaneously. Remote access is possible with tools such as Teamviewer – simply bring your team together online.

STANDARD 12 CORES			
	GENERAL	RF::YAMS	
CPU	AMD Ryzen 9 3900X/XT		Sufficient for small projects
RAM	64 GB DDR4 3600 MHz		
GPU	3x DisplayPort	Nvidia GeForce RTX 20xx 8 GB	
Network	2-3x Gigabit LAN		
Disk	> 512 GB SSD / M.2		
STANDARD 12 CORES / 16 CORES			
	GENERAL	RF::YAMS	
CPU	12C AMD Ryzen 9 5900X 16C AMD Ryzen 9 5950X		Sufficient for medium sized projects
RAM	64 GB DDR4 3600 MHz		
GPU	3x DisplayPort	Nvidia GeForce RTX 30xx 8 GB	
Network	2-3x Gigabit LAN		
Disk	> 512 GB SSD / M.2		
HIGH END 24 CORES			
	GENERAL	RF::YAMS	
CPU	AMD Ryzen TR 3960X		Sufficient for large projects and line simulation of multiple PLC areas
RAM	128 GB DDR4 3600 MHz		
GPU	3x DisplayPort	Nvidia GeForce RTX 30xx 8 GB	
Network	2-3x Gigabit LAN		
Disk	> 512 GB SSD / M.2		



The **RF::Suite** requires state-of-the-art simulation computers. The table shows our recommended PC configurations.



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