

Low Code & No Code

Modeling Instead of Programming



Preface

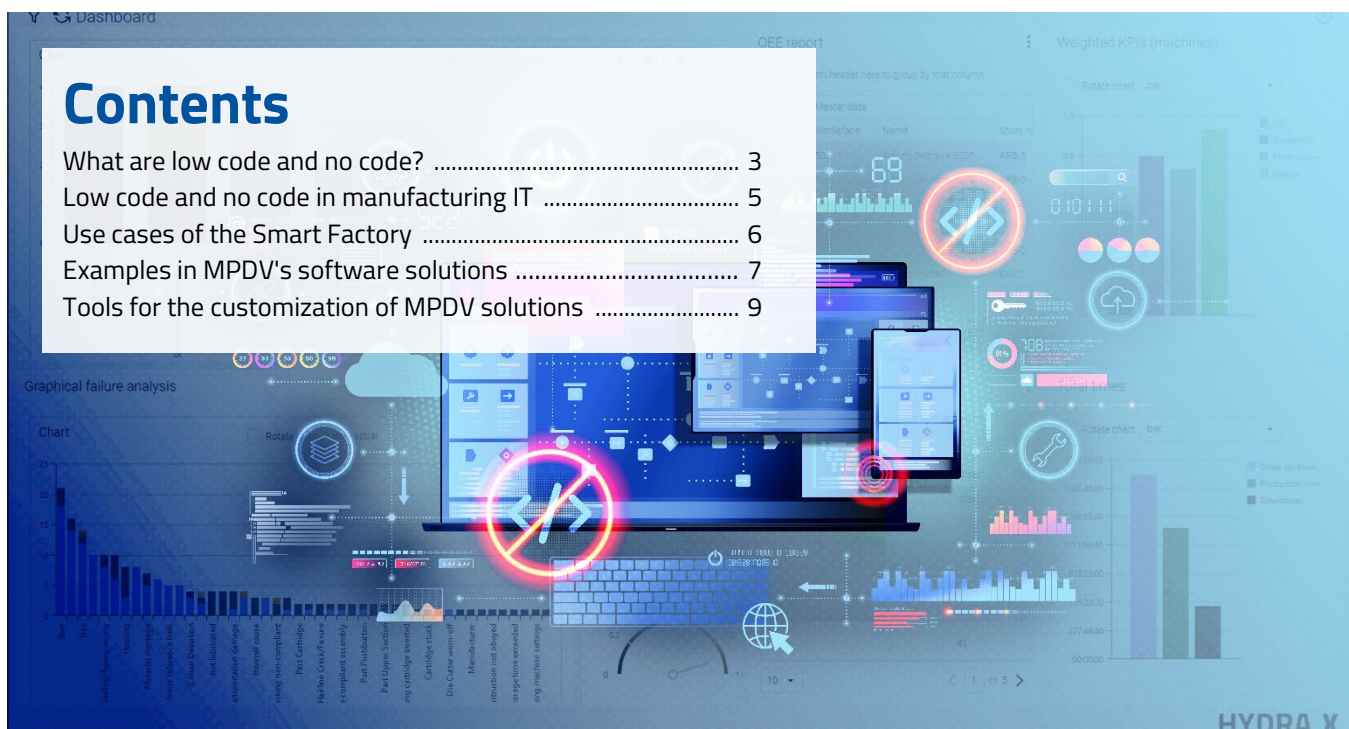
You are using business software and get stuck at the same point again and again: Does that sound familiar? It annoys you that the software just doesn't fit your processes. Or perhaps you have a clear idea of what your software should be able to do, but you cannot program it yourself, or you don't want to spend time and money on custom programming. If this situation is unknown to you, then maybe you should ask your employees in production.

Today, there are ways to easily change design and functions of software without having to program. You can even generate your own applications without any programming knowledge: keywords such as **Modeling**, **Low Code** and **No Code** describe this approach — and this is exactly what this white paper is about. As a provider of software solutions for the Smart Factory, this MPDV white paper focuses on use cases in manufacturing and describes examples from manufacturing IT.

We also explain how low code and no code work with our solutions. If you want to find out more about the tools we offer to customize our solutions, then also read the White Paper Smart Factory Development Suite.

Have fun reading!

Thorsten Strebel
Chief Technical Officer at MPDV



What are low code and no code?

In the context of low code and no code, people often speak about low code or no code platforms. This is because some providers offer such tools in the form of a platform. However, this white paper is not about platforms, but deals with the actual low code and no code methods.

Low code means that very little programming is required to develop or customize an application. In other words, less source code needs to be generated or changed, because low code uses graphic editors or description languages. No code doesn't need any code at all. In both cases, it is quite easy to set up user interfaces or map processes and interrelationships by using methods such as drag-and-drop. In short, developing has become much simpler. This is why we speak of "Modeling Instead of Programming".

Why do we need modeling at all?

This question is easy to answer when it comes to low code and no code: Due to the shortage of software developers, other specialists must also be able to customize the software as needed. And even if software developers are available, the development process is much quicker through modeling, which also surmounts the barrier that might have existed between the IT department and the colleagues in the shop floor. Modeling helps to map processes in the digital world in a quick and easy way. For this to work, the process owner requires only little IT knowledge, and the IT specialist doesn't need to know everything about the process. Low code can therefore be seen as a bridge between worlds: the worlds of manufacturing specialists and IT experts are connecting.

Software development not only for developers

Developing and customizing applications is thus becoming a field of action that is no longer reserved for true software developers. Anyone who knows their way around their business and is ready to use simple design tools can do this today. You can use low code to change the sequence of input fields, for example, or to implement a check verifying if the entered value is greater than a specified number. A programmer is not needed here, provided that the solution in use does support low code.

From digital native to citizen developer

In times when virtually everyone owns a smartphone and uses it extensively, dealing with software has become commonplace. The young digital natives don't even know any different and a life without software is hardly conceivable for them. Thanks to low code and no code, normal people become so-called citizen developers, i.e. lay developers who can make the necessary software changes all by themselves. A missing function can quickly be created with just a few clicks. This description might be exaggerated, but it is certainly possible in theory.

Differences to classic programming

No code is frequently described as the highest form of low code, which means that even less or no code at all is required. On the one hand, this is true because you actually do not use code with no code methods, but on the other hand no code platforms and providers are extremely restrictive, and programming is just not possible then. Flexibility comes to its limits, which can sometimes be a hindrance.

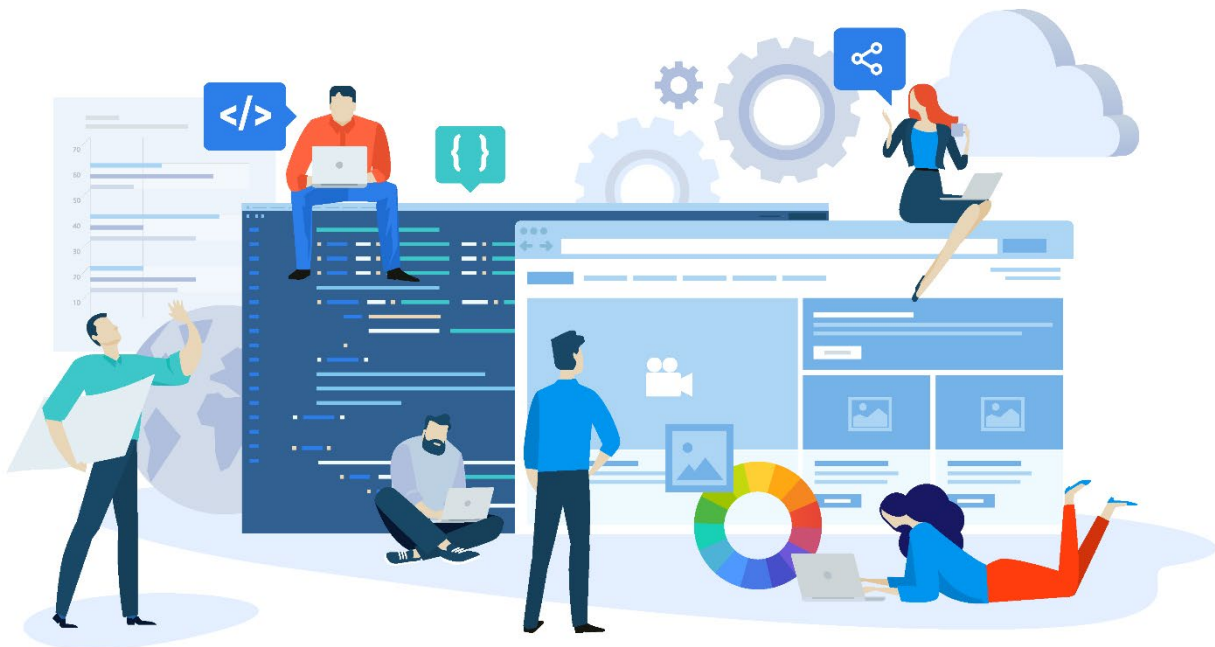
Besides classic programming, MPDV offers both and defines the terms low code and no code as follows:

No Code: Applications are customized and created with the help of wizards, graphic modeling, and templates without any programming. This method is suitable for simple use cases such as setting up a dashboard.

Low Code: Existing applications can be changed, and new applications can be created by using a simple description language without specific knowledge of a classic programming language and the technology behind it (e.g. HTML5). This method provides more flexibility, however basic technical skills are needed.

Classic programming (often called pro code or full code) with established languages, such as .net, Java or C++, offers maximum flexibility, but requires extensive IT knowledge. By means of user exits and scripting, you can implement almost any project.

The result is a triangle of tension between flexibility, complexity, and the dealing with side effects. The more flexibility is required, the more complexity must be accepted by the user customizing the software. Also side effects need to be considered. Classic programming is usually the method of choice if a high degree of flexibility is called for. If the user only needs few customization options and wants to avoid side effects, you should opt for no code. However, this only allows for very simple changes and complex tasks are not possible. You must therefore decide in each individual case which method suits you best.



Advantages of modeling

With the help of low code and no code, manufacturing experts are less dependent on IT experts. Implemented rules ensure that they cannot make unauthorized changes and that the general software structure continues to run smoothly. Thanks to predefined templates, the results fit well into the overall picture and requirements from the production environment can be implemented quickly, easily, and consistently. In times of global and steadily growing competition, low code and no code are excellent and indispensable tools, also in the Smart Factory.

Low code and no code in manufacturing IT

As the leading provider of products, services, and solutions for the Smart Factory, MPDV focuses on manufacturing IT. This software category offers many possibilities to use low code and no code beneficially.

The tougher the competition, the more important it is for companies to stand out from the crowd. This is usually realized by targeted process optimizations. To digitally map processes, you often require specific solutions and customizations. Many companies opt for individually programmed software solutions in this situation and forego the benefits of standard software. But at some point, they will certainly regret this decision.

Custom solution versus standard software

A custom solution is specially designed for a specific customer and precisely integrates their requirements. The alternative is standard software that does not cover every special use case, but it is operated by many users at the same time, usually runs very solidly, is constantly further developed, and well serviced, which in the end makes it cheaper in operation. It seems that one must decide between an expensive ideal solution and a cheaper less-than-ideal solution. Fortunately, this has changed today as many standard software solutions offer possibilities to customize applications to a certain extent. Self-defined user interfaces or changed processing sequences are only some examples of what is possible. The software providers decide about the tools and methods they offer for customization. An increasing number of software solutions not only offers classic programming, but also provides modeling options for user interfaces and program sequences through low code or no code.



Standard software has many benefits, but sometimes custom solutions are needed. (Source: MPDV)

Use cases of the Smart Factory

The following use cases are examples of how low code and no code can be used in manufacturing IT and what challenges can be met. Specific solutions by MPDV are used to illustrate the use cases.

Individual dashboard

Transparency is one of the most important success factors of the Smart Factory. Dashboards are perfect to create such transparency. They show KPIs, evaluations, lists, and graphics of all kinds. A truly useful dashboard displays exactly the information the employee requires. Through modeling, which means by using templates and modular building blocks, each employee can set up a completely individual dashboard meeting their precise requirements.

Manual input on the shop floor

The manual input of data on the shop floor must be adapted to production processes. For example, in some companies, the system must check with order logon whether pallets for the finished products are available. Or specific information on the tools in use must be entered. If the standard functions of the manufacturing IT do not support this kind of input, the relevant fields can be added using low code. The sequence to enter data might also be different and specific to each company. This kind of change is very simple by using low code or no code.

Booking and processing data

The data collected and stored in the system must be processed and used purposefully. Booking data can be complex in the Smart Factory. Let us look at the production of metal parts, for example, where only the number of pieces is recorded, but the ERP system requires the number of boxes or crates. A simple conversion can be the solution. But if the boxes or crates have different sizes, an additional input dialog might be useful. Both can be implemented via modeling, and the system can even notify an expert if the data posted does not fit in. Ideally, a custom action can be added to each of the processing steps.



Complex assembly processes

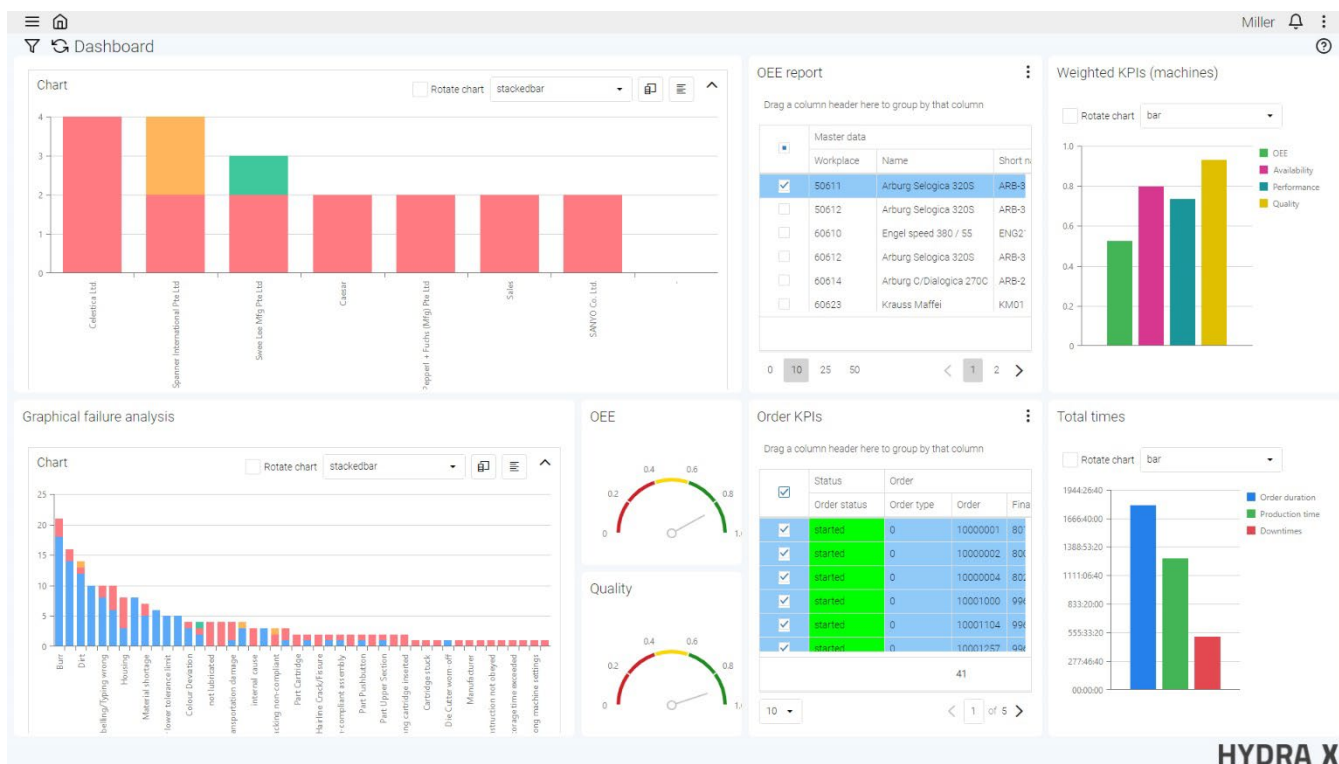
In series production with multiple variants, complex assembly processes are the order of the day. The usual mapping of workplaces and operations is not enough in this case and a further detailing is needed. Workstations, work steps, and workpieces are objects allowing for a modeling of assembly processes in greater detail. You can even integrate connected peripherals such as intelligent screwdrivers, bar code readers, or pick-by-light systems. Ultimately, the system must provide step-by-step instructions and monitor their execution. Up to now, assembly lines used to be monitored and controlled by so-called head controls based on PLCs. For this to work, each process step had to be coded in a usually complex programming language. With modeling and low code or no code, assembly processes become much more flexible.

Examples in MPDV's software solutions

The above-described use cases are outlined in more detail below and illustrated with the help of software solutions by MPDV.

Dashboards in HYDRA X

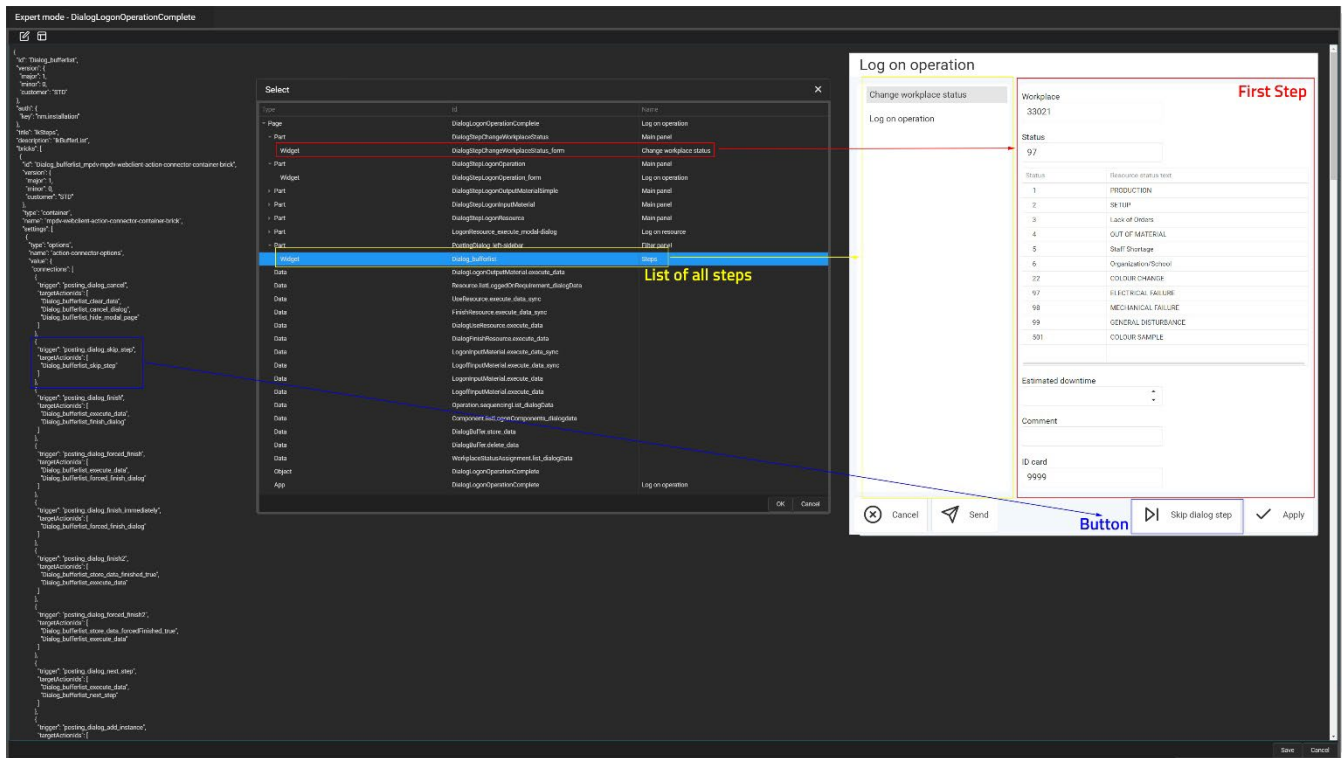
MPDV's Manufacturing Execution System (MES) HYDRA X includes a series of so-called mApps. One of these mApps provides predefined dashboards. The dashboards can be customized according to the company's or the user's individual requirements. An integrated UI Designer offers many easy-to-use options based on no code methods. The different evaluations provided as widgets by MPDV can be arranged and resized as desired. You just have to click and drag elements to change the layout and/or contents. Easily add further widgets or remove widgets that are not needed. Enter simple parameters to specify the objects in the Smart Factory that are referenced by the widget. Creativity knows no bounds here as the iFrame widget can be used to easily integrate even external contents from the intranet, for example. The saved dashboard can be made available to other users and will remain unchanged even in case of a software update.



With HYDRA X, you can easily design custom dashboards. (Source: MPDV)

Customize posting dialogs

All posting dialogs in HYDRA X include one or more posting steps. You can change the sequence of posting steps, modify their content, or add further steps. In each posting step, user interfaces can be customized and parameterized as widgets. A simple description language is used to do so, which means that a low code method is applied. It is then possible to display data and request information in the posting steps. Each element can be arranged as required. You can also easily add and configure buttons. Let us look at the example *Log on operation*. This posting dialog includes several posting steps, two of which are actively used: *Change workplace status* and *Log on operation*. Further possible posting steps are *Log on input material* or *Log on resource*. The system includes a description for each element of the posting dialog that is interpreted at runtime.



Posting dialogs can be modeled in HYDRA X by using low code. (Source: MPDV)

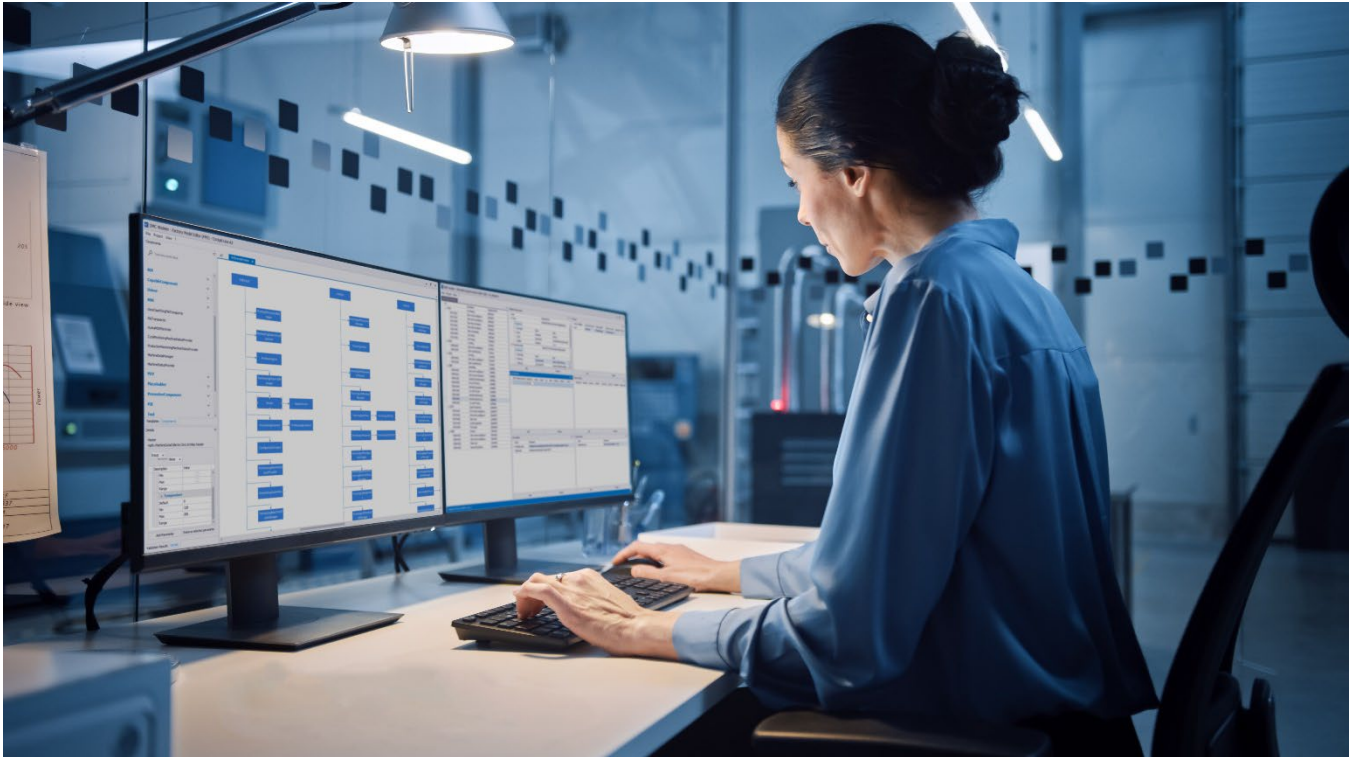
Descriptive modeling of data processing

The current versions of HYDRA and the integration platform MIP do not require classic programming to implement data collection and booking processes. Instead, these processes can be modeled descriptively on meta level. MPDV offers various options for this. On the one hand, the software provides preconceived configuration options. A specific plausibility check can then be activated or deactivated, for example. You can also define the data range checked. On the other hand, processing includes defined points where self-developed processing steps can be integrated. Such steps are modeled via description language (low code). You can also implement your own logics at specific points in data collection and total collected values, for example. Even logical operations are possible, e.g. if signal Y and signal X are equal, then the system writes 1 in data field A.

So far, data collection processes and processing have been modeled in low code. In future, MPDV will introduce more graphic editors (no code) and altogether reduce the importance of description language.

Assembly Management

HYDRA X Assembly Management digitally maps complex assembly processes in the MES. MPDV provides the graphic Factory Model Editor (FME) to model the different workstations by using no code and low code. The Manufacturing Instruction Editor (MIE) is used to digitally map work steps with the help of low code principles. By combining the factory model and the manufacturing instructions, HYDRA generates at runtime a context-related operator guidance and documents all planned work steps. The Assembly Management can therefore map both, fully automated assembly lines and loosely linked, manual assembly workplaces. Even the Industry 4.0 principle of "material finding its own way through production" can be realized — all in low code. No expensive and sought-after PLC programmers are needed to this end.



*Use the HYDRA X Assembly Management to easily model assembly processes.
(Source: MPDV, Adobe Stock, Gorodenkoff)*

Tools for the customization of MPDV solutions

The Smart Factory Development Suite combines all tools required to customize existing applications and to develop new ones. It is part of the MPDV product portfolio. The Development Suite includes the following four components:

- UI Development Suite
- Business Logic Development Suite
- Enterprise Connectivity Development Suite
- Label & Report Designer

For further information, refer to our **White Paper Smart Factory Development Suite**.

Request now at whitepaper-en.mpdv.com!

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Smart Factory Development Suite

Smart Factory Elements

The Functionally Networked Factory

The Autonomous Factory

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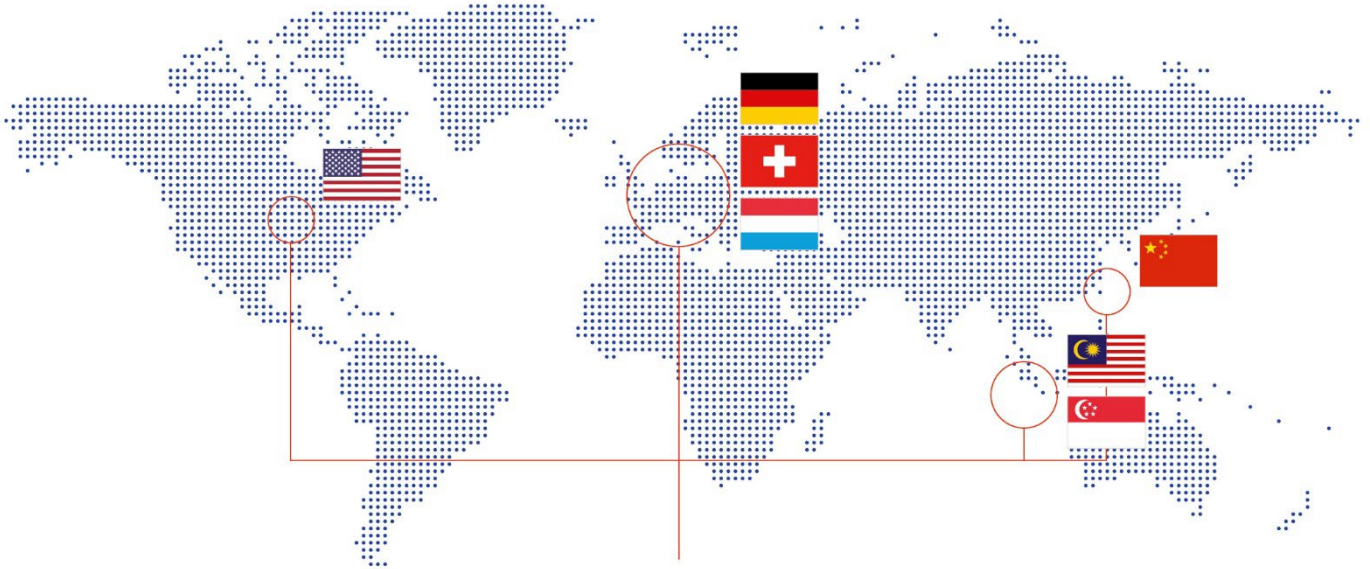


MPDV Mikrolab GmbH

headquartered in Mosbach/Germany, is the market leader for IT solutions in the manufacturing sector. With more than 45 years of project experience in the manufacturing environment, MPDV has extensive expertise and supports companies of all sizes on their way to the Smart Factory.

MPDV products such as the Manufacturing Execution System (MES) HYDRA, the Advanced Planning and Scheduling System (APS) FEDRA or the Manufacturing Integration Platform (MIP) enable manufacturing companies to streamline their production processes and stay one step ahead of the competition. The systems can be used to collect and evaluate production-related data along the entire value chain in real time. If the production process is delayed, employees detect it immediately and can initiate targeted measures.

More than 1,100,000 people in over 1,750 manufacturing companies worldwide use MPDV's innovative software solutions every day. This includes well-known companies from all sectors. The MPDV group employs around 520 people at 13 locations in China, Germany, Luxembourg, Malaysia, Singapore, Switzerland and the USA.



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