White Paper | January 2023

mpdv
WE CREATE SMART FACTORIES

Easily customize MPDV solutions

Smart Factory Development Suite

Preface

Standard applications need to be customized as production IT has to cope with increasingly complex and individual requirements. Ideally, such customizations are achieved by way of modeling and not by changing the source code (programming). Modeling is also referred to as low code or no code. In this case, either no code at all is required or only little, simple code has to be generated or changed by means of a description language. Learn more about low code and no code in our **White Paper Modeling instead of Programming.** Click here whitepaper-en.mpdv.com to request the white paper.

MPDV has developed the Smart Factory Development Suite to make customizations even simpler. The Smart Factory Development Suite combines all tools required to customize existing applications and to develop new ones. It is part of MPDV's product portfolio. The Development Suite includes the following four components that are described in more detail in this white paper:

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

Learn more about the four components and how they work on the following pages.

Have fun reading!

Thorsten Strebel
Chief Technical Officer at MPDV

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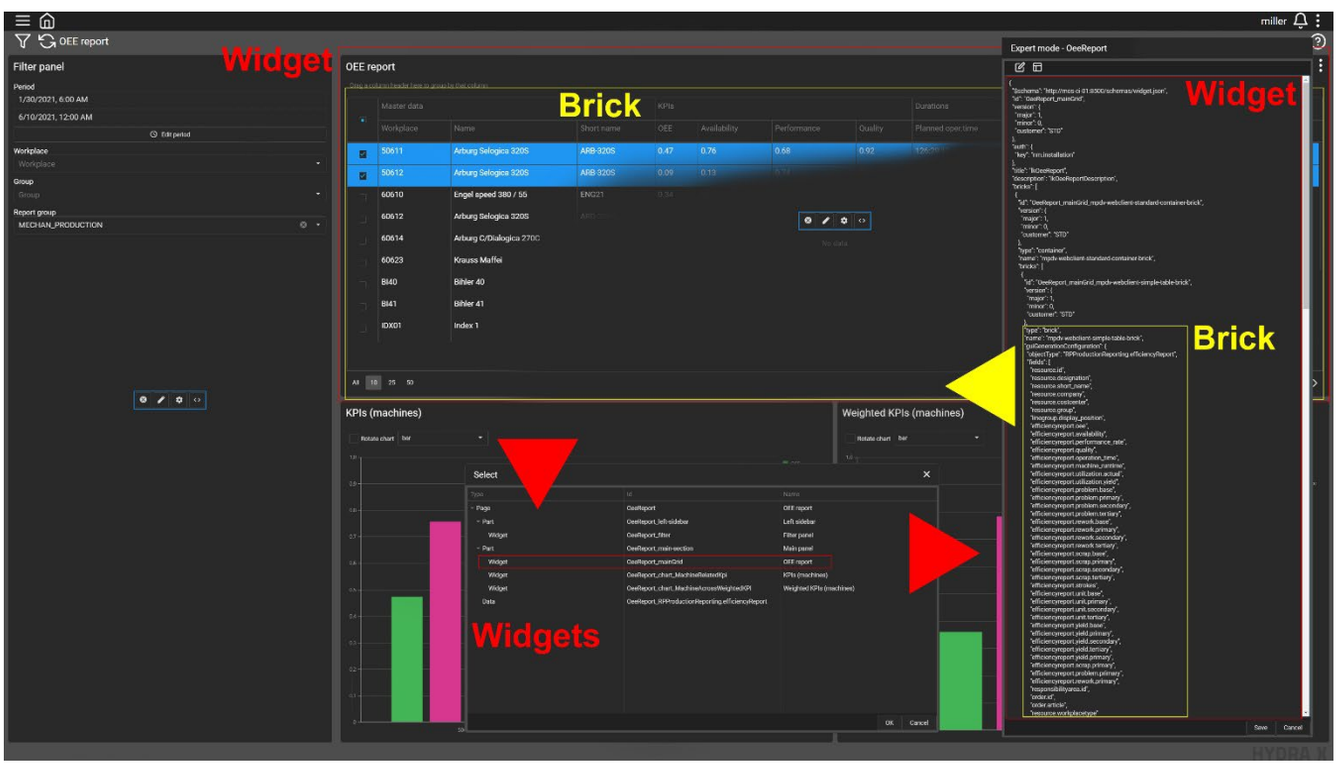
UI Development Suite

User interfaces of mApps on the Manufacturing Integration Platform (MIP) can be customized to meet each company's and user's requirements. The integrated UI Designer offers many easy-to-use options based on no code methods. The evaluations/reports that are provided as widgets by MPDV can be arranged and resized as desired. Just click and drag elements to change the layout and/or size. You can easily add further widgets or remove widgets that are not needed. Enter simple parameters to specify the objects of the Smart Factory that are referenced by the widget.

The UI Designer is part of HYDRA and can be used to align existing **widgets** (no code). To create new widgets or change existing ones, you can use the UI Development Suite. This requires a simple description language and can therefore be classified as a low code method. Widgets consist of single components (i.e. **bricks**) like input fields, tables, charts, or graphics. You need low code methods to model the look/appearance of the bricks and how they are aligned within the widget. A simple description language is used in this case as well.



UI Development Suite in use: widgets (red) consist of configurable bricks (yellow). (Source: MPDV)

A common data binding is modeled to allow for the several widgets to interact with each other. This data binding provides the data selected for the application. You can select machines in one widget and another widget of the same application shows the KPIs of these machines. The widgets are not linked with each other. The connection is established via the basic data source. This two-level approach facilitates data modeling and reduces unwanted side effects.

MPDV provides the bricks, but you can also develop bricks for yourself by way of programming, e.g. to integrate a new kind of diagram.

When it comes to designing user interfaces, it becomes apparent that different development methods are beneficial:

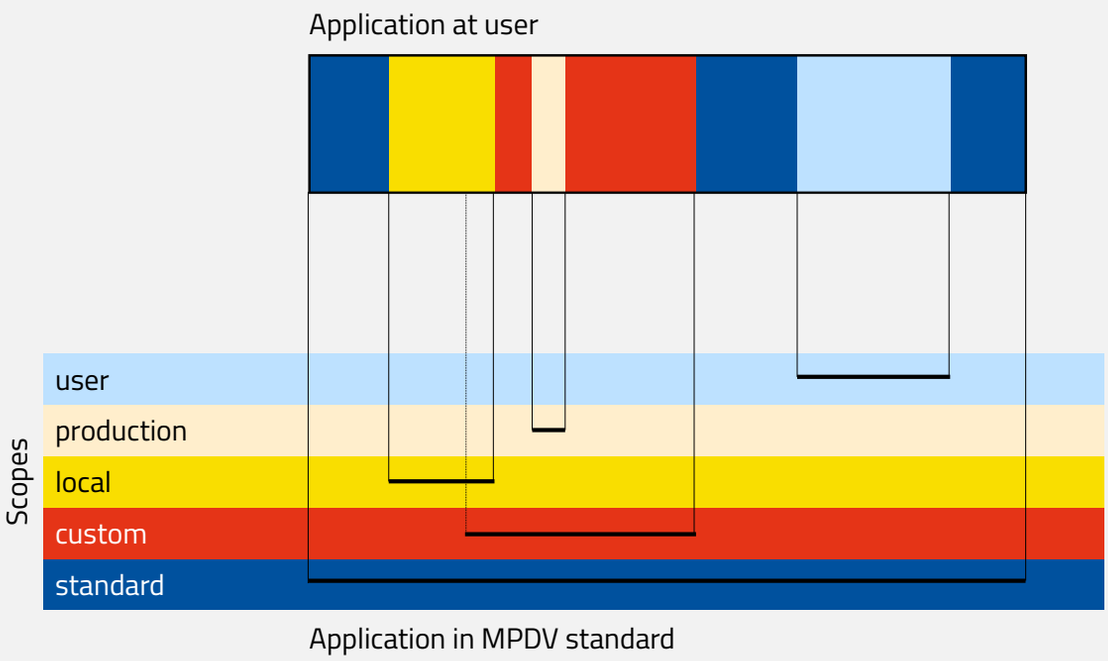
- No code: to **align** widgets within an application
- Low code: to design and configure **widgets** by means of bricks
- Programming: to create and customize **bricks**

Background information: scopes

MPDV has developed the principle of scopes to prevent customizations from immediately changing the standard version delivered. This principle makes sure that customizations are highly granular and do not completely overwrite the standard but only the required spots. So-called patches include the required modifications and are applied to standard modeling. First of all, there are four scopes. If necessary, you can add further ones:

- **standard**: This scope includes all applications and MPDV's specifications applicable to everyone using this product.
- **custom**: This scope includes the customizations for a specific customer.
- **local**: The customer can use this scope to store their individual customizations where MPDV is not involved.
- **user**: In particular for user interfaces, each user can store their specific and user-defined changes in this scope. These changes only apply to this specific user.

The scopes only store the changes made compared to the standard. These changes then overwrite the underlying scope.



The principle of scopes makes customizations independent of releases. (Source: MPDV)

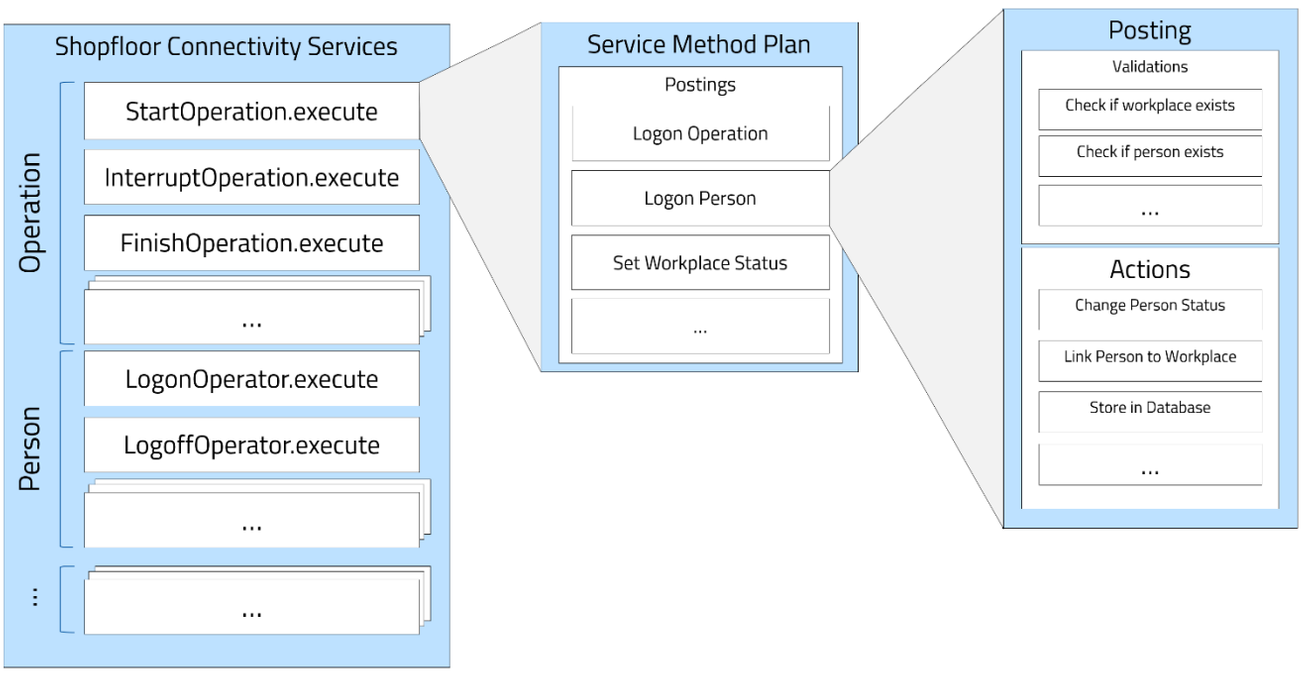
Example: MPDV delivers an application that includes a table and two diagrams (standard). The colors used in the diagrams have been changed for a specific customer. The diagrams now only show the colors blue and yellow (custom). The customer specified that some columns are not displayed in the table (local). One of the users has switched positions for the two diagrams (user). If MPDV now changes the application and adds another diagram, the above-mentioned customer also receives this modification (standard). The changed colors are not affected and are still active (custom). The changed columns also remain the same (local). The swapped diagrams are still displayed as specified by the user, but repositioning might be necessary due to the added diagram (user). If the customer does not want all production sectors to view this new diagram, they can use a separate scope (e.g. production) and distribute this scope to the employees concerned. Usually, this scope is above the *local* scope and overwrites all changes made by MPDV and the customer's changes. User settings are not overwritten (user).

The principle of scopes makes sure you still have access to MPDV's innovations although you have developed customizations for yourself.

Business Logic Development Suite

The Business Logic Development Suite focuses on the development and customization of processes to collect and process data. Here, a description language is also used (low code). On the one hand, the processes of MPDV solutions include a variety of configuration options that enable or disable specific steps. And on the other, users can insert their own steps. Such additional steps can be validation checks or a conversion of values. Likewise, data can be aggregated. Low code is required to develop individual processing steps. More complex processes can be programmed via scripting.

This becomes more apparent if we look at the Shop Floor Connectivity Services of the Manufacturing Integration Platform (MIP). When logging on an operation, further data is requested in the posting dialog. This data might lead to further activities: e.g. *log on person, set status or log on tool.* In this connection, the system should check if the person to be logged on is present or authorized at all. Such validation checks can be disabled deliberately if personnel data is not collected. You can use low code in a clear description language to implement such behavior.



Nested structure of Shop Floor Connectivity Services: Along with logging on the operation, a person is logged on and the workplace status is set. (Source: MPDV)

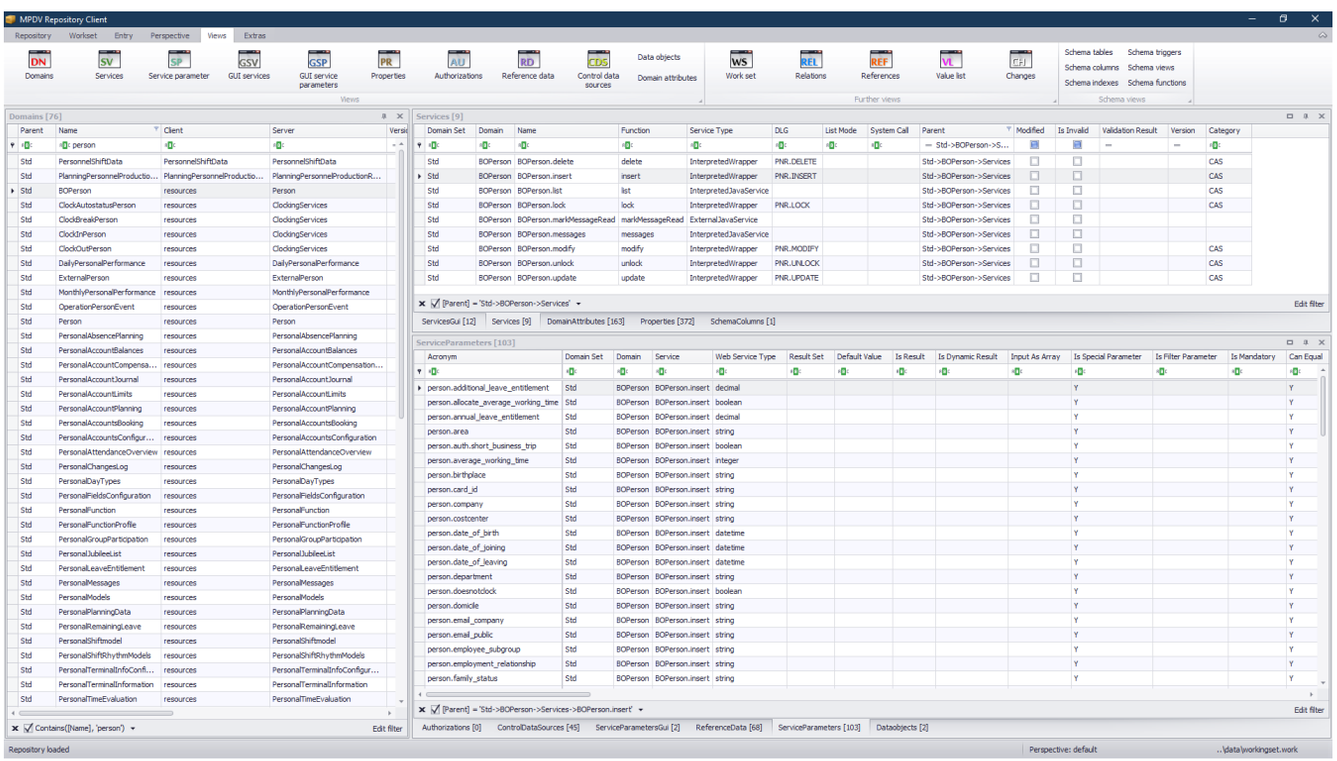
Background information: namespaces

Defining namespaces is another method to avoid conflicts if several parties work on a solution. It's quite simple: all objects and services are assigned a prefix. Customer ABC gets the namespace *abc_*. All object names the customer ABC creates start with *abc_*, e.g. *abc_pallet* if the customer wants to create a pallet object. This process avoids any conflict, in case MPDV also creates an object with the name *pallet*. MPDV can assign separate namespaces to partners and customers.

Creating custom services

The MIP uses a modeled service interface as semantic basis for all MPDV solutions and the mApps of various MIP partners. This service interface can easily be extended and customized. If you want to insert a new object into the MIP information model, you can choose a combination of no code and low code to do so. For this purpose, MPDV offers the Repository Client as part of the Business Logic Development Suite.

Objects can be modeled using no code in the Repository Client. Associated access services can also be created. These are also referred to as CRUD services. CRUD stands for *Create, Read, Update* and *Delete.* The parameters of access services usually correlate with the database fields of a relational database as used for classic programming.



The MPDV Repository Client lists all available objects and services. Custom objects can also be created. (Source: MPDV)

Apart from access services, the Repository Client also allows the modeling of evaluation services and, of course, you only need low code and a description language. The description language is interpreted at runtime, which facilitates the testing and optimization of services. The evaluated data is then displayed in the graphical user interface you can model with the UI Development Suite.

Testing services

The Business Logic Development Suite also includes the Service Tester that can be used for testing if a service works. To do so, the Service Tester must be connected to the MIP. First the application queries all available MIP services and checks which services match the current authorizations and can be executed. Then the user selects a service and enters the required parameters. The result is displayed after executing the service. The syntax of the service call can also be copied and transferred to a self-developed mApp. So, the Service Tester is another useful tool to develop custom applications for the MIP and other MPDV solutions.

The Package Creator to distribute software completes the portfolio of the Business Logic Development Suite. You can use the Package Creator to combine several modifications in one package and distribute these modifications easily to multiple systems.

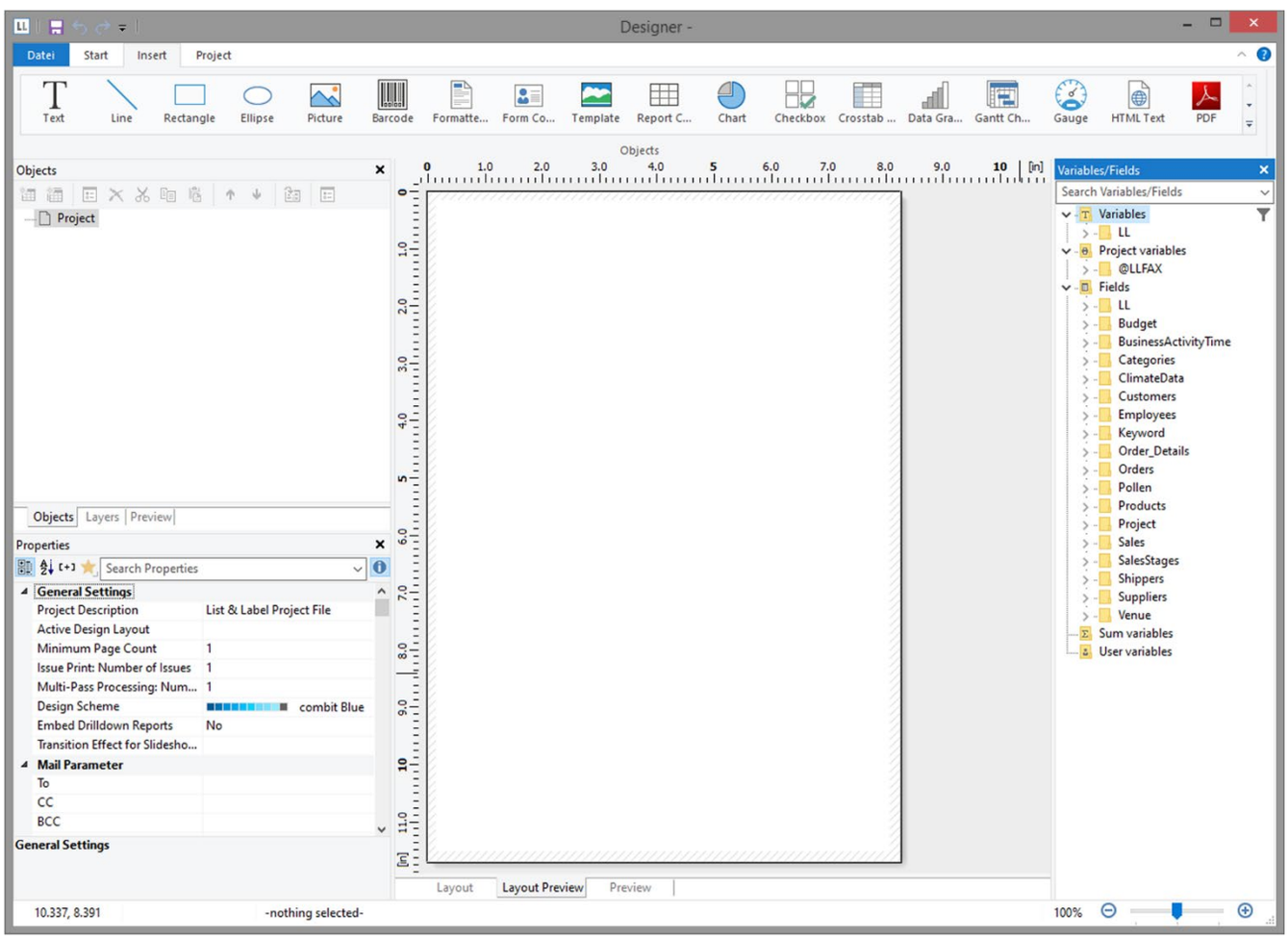
Enterprise Connectivity Development Suite

Reliable interfaces are always indispensable if you want to connect an ERP system or another software solution transferring data. Many ERP systems can be connected to MPDV solutions via standard interfaces – but not all. The Enterprise Connectivity Development Suite provides simple tools to assign data for all connections that cannot be established via standard interfaces. This procedure is also referred to as data mapping and can be implemented via no code. You just assign the data fields of the third-party system to the data fields of the MPDV solution. If it is not sufficient to just assign the data or in case the transferred data must be converted, you can still use a description language (low code) to model the interface. Data can be converted, or multiple data fields can be linked logically.

Label & Report Designer

A Smart Factory also requires reports and labels. Reports can be used for evaluations in the defined layout and labels can identify material. Both types of documents require a layout and specifications about the positioning of information. If one of the templates delivered along with MPDV's solutions does not match your requirements, you can use the Label & Report Designer to adjust it or to create a completely new template. Programming is not required. The Label & Report Designer is similar to an office application and intuitive to use. Placeholders are used at the spots where data from the system is to be displayed. It is a graphic editor, and no programming is necessary. That is why, the tool can be classified as a no code method.

The templates can be used to generate and distribute automatic reports. If necessary, low code can be used to change the creation process.



Data and any other elements can be aligned as required in the Label & Report Designer. (Source: combit GmbH)

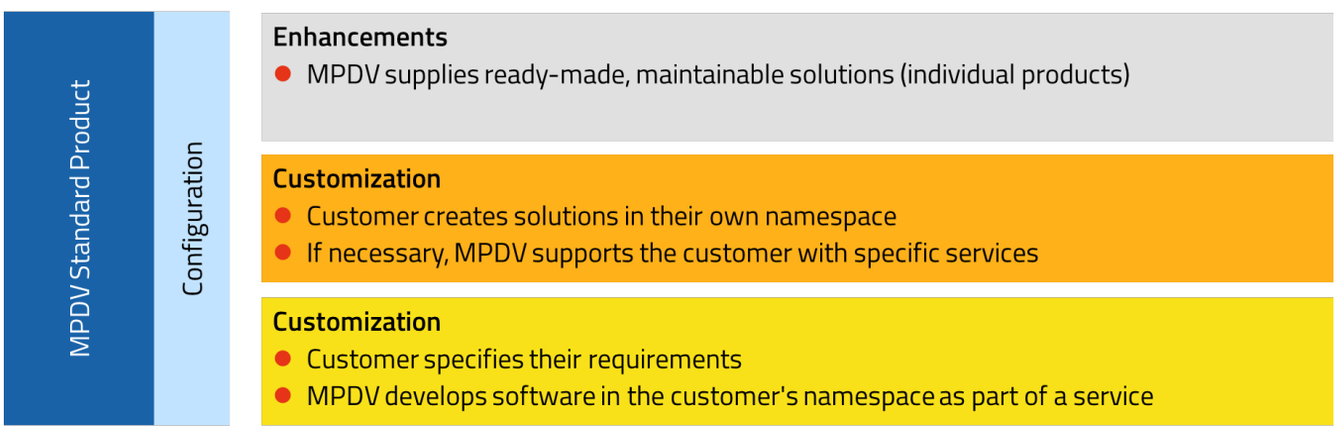
Alternative solutions

Not every manufacturing company has enough capacities to customize the used applications or to develop new ones. In particular, small- and medium-sized companies focus on their core competence, i.e. manufacturing, and outsource any IT tasks to external service providers. That is why, MPDV offers different options to support such companies.

MPDV services

MPDV uses the tools offered by the Smart Factory Development Suite to fulfill customer requirements at the lowest possible expense. This also ensures consistent interoperability. If a customer wants to make use of MPDV's development services, they still decide on how this is done and how much they want to do themselves. You can choose from the following three options:

- MPDV supplies a maintainable solution.
- The customer creates the solution in their namespace and MPDV supports and/or advises the customer.
- The customer specifies their requirements and MPDV develops the solution in the customer's namespace.

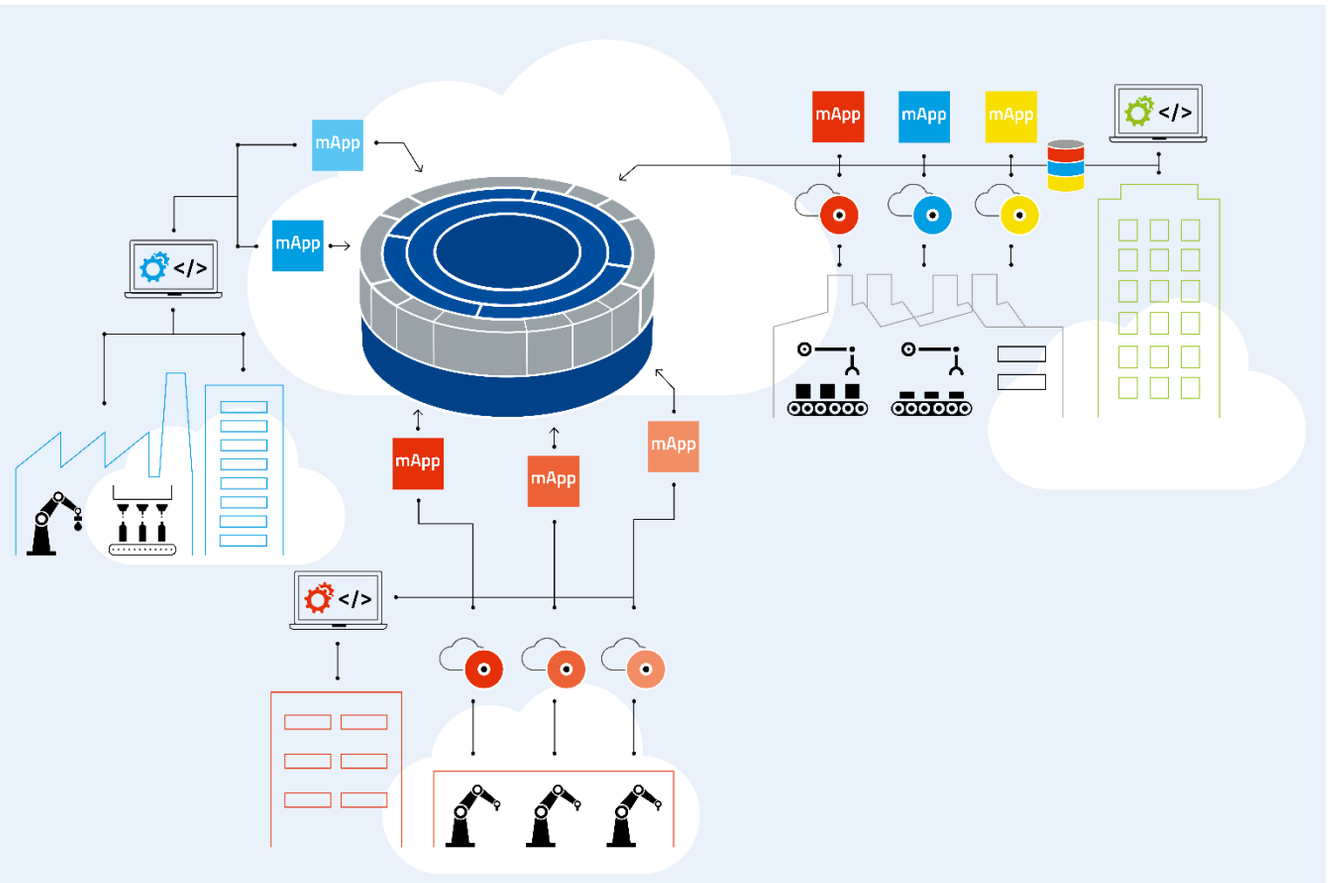


Each customer is free to decide how much they want to contribute themselves and where they need MPDV's support. (Source: MPDV)

In particular, the last method provides countless customization options. MPDV can support the customer with the actual development process, i.e. with using the Smart Factory Development Suite and also with deceiving the solution. MPDV's developers and consultants are characterized by many years of expertise and profound domain knowledge. They have been dealing with such challenges for a long time and are in close contact with standard developers exchanging views on MPDV's solutions.

Development services from the MIP ecosystem

MIP partners also assist you in developing and customizing mApps for the Smart Factory. Depending on their expertise, some MIP partners also develop mApps themselves. These mApps can be purchased as standard applications via the MIP marketplace. Other MIP partners consider themselves to be mere service providers and refer to their employees' experience in software development. Both types of MIP partners offer their services via the **MIP Marketplace**: mip-marketplace-en.mpdv.com



The MIP ecosystem is the place where vendors, users and service providers meet. (Source: MPDV)

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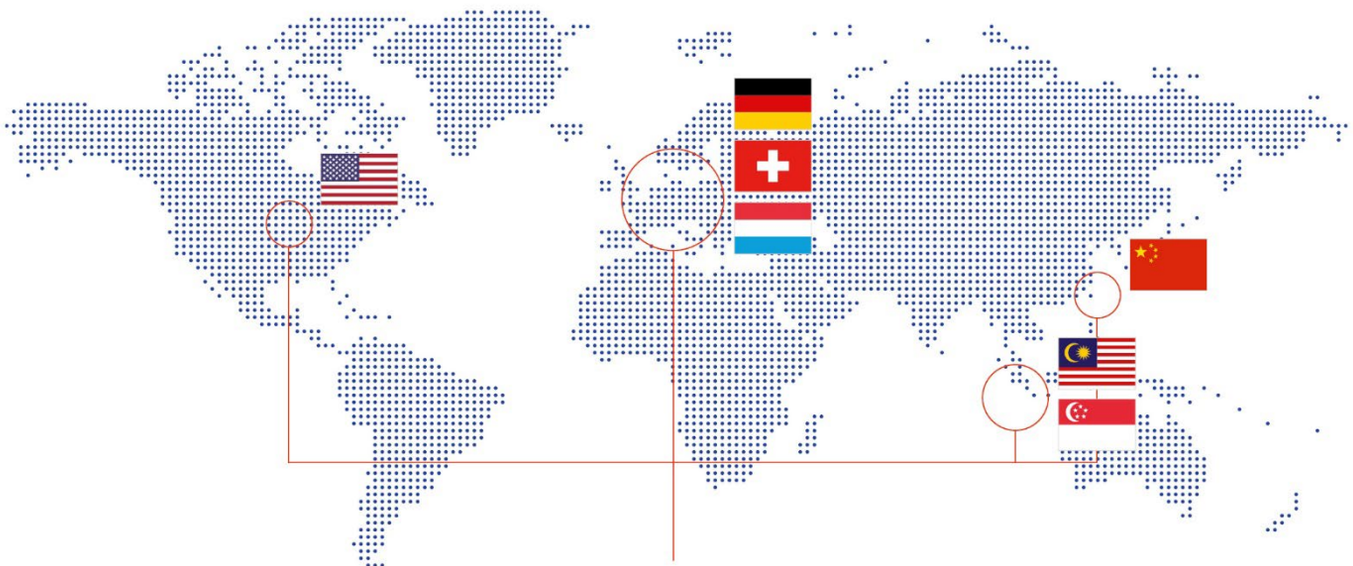
About us

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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