M2MGate V

Features & Architecture
of the IoT-Platform

INSIDE M2M
SMART MACHINES

M2MGate V

M2MGate V is an IoT platform developed by INSIDE M2M to connect devices and services easily and securely. It is the result of 20 years of IoT experience from working with national and international customers and offers a high level of security and stability far above comparable solutions through continuous development and optimization. With M2MGate V, we are introducing the fifth generation of M2MGate.

The architecture of M2MGate V is characterized by its flexibility: Companies can comprehensively adapt the platform to their requirements and easily scale resources as needed. Thus, business processes and customer needs are served in the best possible way - even with high market dynamics.

M2MGate has proven itself in practice for many years. Worldwide, more than 750,000 devices are already networked via the IoT platform.

On the following pages, we present the most important features and benefits of the platform. We provide an overview of the special features of its architecture and use cases to show how users benefit from the respective components.

Advantages and special strengths at a glance

For large device fleets:
fast and secure distribution of configurations, updates and files, even to more than 100,000 devices

For companies of all sizes and industries:
versatile and easily adaptable to different solutions and business processes

Maximum scalability:
vertical and horizontal scalability provide flexibility and resource efficiency

Cost-effective hardware integration:
remote access by tunneling TCP connections or VPNs to devices not previously intended for IoT applications

Designed for individual requirements:
simplified integration of custom services and ERP systems

High security standards:
TLS encryption, access management and secure authentication protocols such as OIDC for optimal IT security

Bi-directional communication:
data transfer in each direction for efficient real-time data analysis and remote data transfer

In the cloud or on-premise:
All conceivable hosting options are feasible, from public cloud to private cloud to hosting in your own data center.

CONTENT

THE MOST IMPORTANT FEATURES

Device Management
With M2MGate V, device fleets of any size can be managed comfortably over their entire life cycle. Devices can be organized in tree structures via the web portal. This makes it easy for users to quickly get an overview of the status of the device fleet.

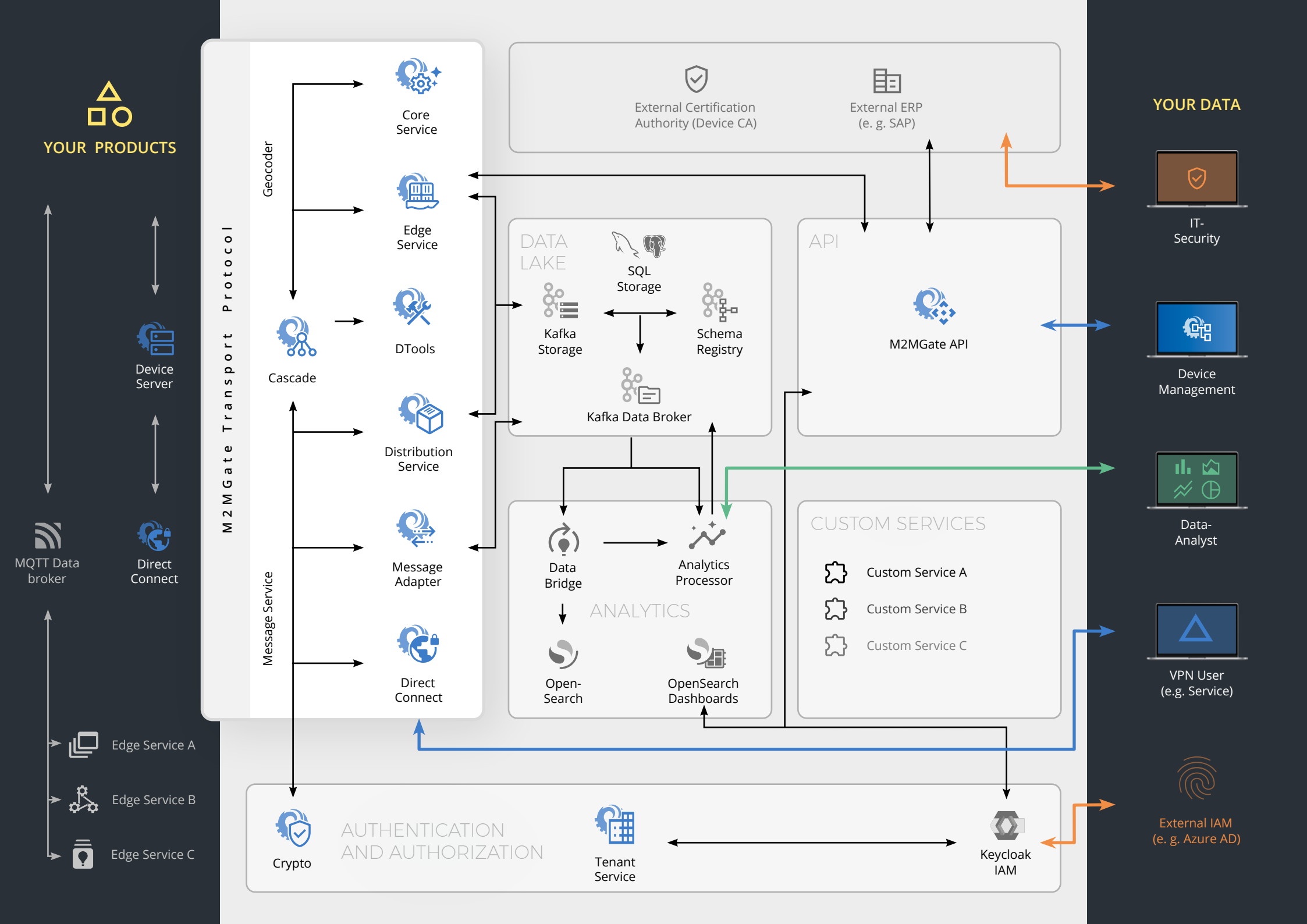
Security
M2MGate V uses current industry standards such as OAuth and OpenAPI to minimize security risks. Communication with and between devices is protected via TLS encryption. Integrated identification and access management (IAM) based on OpenID Connect also controls access to resources and IoT data. Users have the option to define individual identification attributes to further raise the security level.

The INSIDE M2M development process includes continuous testing and analysis of the platform for Common Vulnerabilities and Exposures (CVE) and is optimized for rapid deployments, even on the device side. This ensures that all software components used are always up to date and newly discovered security vulnerabilities can be closed quickly.

Deployment & Distribution
Configurations, firmware or software updates and files can be rolled out remotely by users. Thanks to a centralized trigger, the workload of the roll out is automatically distributed so that uploads and downloads are completed as quickly as possible.

Data Streaming & Analytics
M2MGate V allows real-time processing and analysis of data. The platform supports the integration of new data sources in the cloud and on end devices. Users can connect their own services, for example ERP systems or individual services, via open interfaces.

Direct Connect
Existing devices and systems can be connected to M2MGate. M2MGate provides the „Direct Connect“ app for this purpose, which is available for both Windows and Apple operating systems. Data is exchanged securely via VPN or encrypted TCP connections.


YOUR PRODUCTS
Device Server
MQTT Data broker
Direct Connect
Edge Service A
Edge Service B
Edge Service C
M2MGate Transport Protocol
Message Service
Geocoder
Core Service
Edge Service
DTools
Cascade
Distribution Service
Message Adapter
Direct Connect
External Certification Authority (Device CA)
External ERP (e. g. SAP)
DATA LAKE
SQL Storage
Kafka Storage
Schema Registry
Kafka Data Broker
API
M2MGate API
Data Bridge
Analytics Processor
ANALYTICS
Open-Search
OpenSearch Dashboards
CUSTOM SERVICES
Custom Service A
Custom Service B
Custom Service C
Crypto
AUTHENTICATION AND AUTHORIZATION
Tenant Service
Keycloak IAM
YOUR DATA
IT-Security
Device Management
Data-Analyst
VPN User (e.g. Service)
External IAM (e. g. Azure AD)

SERVICES AND COMPONENTS

M2MGate Device Server

The M2MGate Device Server is an intelligent software for IoT gateways. It enables reliable and secure bidirectional communication between devices and IoT platform.

When smart products work with real-time data, this often leads to a constant exchange of high data volumes in the background - a costly, error-prone and resource-intensive process for companies. Therefore, unlike many other IoT gateways, the M2MGate Device Server runs a smart object serialization that optimizes data transfer. Data is also retained on the device side so that it is available again after operational interruptions.

The M2MGate Device Server is also a key element for bidirectional communication. It not only transmits data from the end devices to the IoT platform, but also forwards commands from the platform to the end devices. Thanks to the Device Server, M2MGate V is also suitable for complex IoT use cases that support real-time monitoring of industrial processes or remote control of factories, for example.

M2MGate Cascade

As middleware, the M2MGate Cascade Server coordinates the transmission of data from end devices to the cloud services on the IoT platform. It provides an abstraction layer for bidirectional communication so that data is transmitted much more efficiently than would be the case without middleware. At the same time, the M2MGate Cascade Server is characterized by its easy scalability, allowing device fleets to grow efficiently and reliably without investing in additional hardware.

M2MGate Core Service

The M2MGate Core Service is the central software component of the IoT platform that enables the management and monitoring of all connected devices. Its architecture aims at efficient device provisioning and maintenance and is optimized for rapidly growing device fleets.

In combination with the M2MGate Cascade Server, the Core Service enables real-time monitoring, which is the prerequisite for quickly analyzing and rectifying faults on end devices. The Core Service also provides detailed key figures and configuration options, enabling the user to optimize the performance and uptime of the end devices.

M2MGate Edge Service

Using the M2MGate Edge Service, developers can implement additional application logic for the M2MGate Device Server, for example to customize data collection and analysis. These extensions are deployed in software containers on the end devices and can thus be executed directly on the Device Server instead of processing the data downstream in the cloud. The result: low data consumption and low latency.

The EdgeService also supports remote management of containerized applications, so the latest software versions or changes can be rolled out with minimal effort.

M2MGate DTools

M2MGate DTools give developers direct access to the IoT gateway. They can retrieve log files, trigger device restarts and configure endpoints, among other things, in just a few steps. Management from a central dashboard optimizes the development process and also speeds up testing and debugging.

M2MGate Distribution Service

M2MGate Distribution Service enables a high roll out speed, distributing M2MGate V resources such as files, configurations and firmware updates to even the largest device fleets. Whether displaying media on device displays or distributing and installing security patches, M2MGate Distribution Service simplifies and accelerates the workflow for IoT users. In the process, the current status of the respective roll out is displayed in real time in the M2MGate portal.

M2MGate Message Adapter

Message brokers enable a standardized and easy data transfer between IoT platform and end devices. For this purpose, M2MGate V uses an Apache Kafka Data Broker on the server side. This is because Kafka offers the necessary performance on the server side to process high data loads in real time. On the device side, MQTT is usually used because the protocol is lightweight and thus predestined for the limited computing power and bandwidth of IoT end devices. The M2MGate message adapter ensures error-free communication between the two brokers.

M2MGate Direct Connect

M2MGate V offers users various options to access devices in the field running their own local applications. For example, connections can be made via OpenVPN tunnels or direct TCP tunneling can be used for protocols such as VNC or SSH. Both ways enable secure and stable communication with end devices, even if they are not yet IoT-enabled. M2MGate Direct Connect opens up new uses for older devices and saves companies from purchasing new machines or costly upgrades.

M2MGate Tenant Service

M2MGate Tenant Service manages tenants as well as their users and controls access to endpoints or IoT data. The component uses standards such as OIDC (OpenID Connect) and OAuth (Open Authorization) to grant only authorized users and devices access to potentially mission-critical data.

Users can control authorizations in detail using the M2MGate Tenant Service, for example by setting up roles and user groups and assigning users accordingly. In this way, both simple and complex authorization structures can be mapped to meet high compliance and security standards.

M2MGate Geocoder

M2MGate V supports location based services, for example in fleet management or asset tracking. For this purpose, the M2MGate Geocoder was integrated, which retrieves location and geo-coordinates from the end devices and provides them to the M2MGate Core Service or Customer Services for further processing. Real-time access or tracking is possible via the geocoding API. Logistics companies can use the M2MGate Geocoder, for example, to track the location of delivery vehicles live and thus identify process obstacles.

M2MGate Notification Service

When limit values of machines are exceeded, errors stop their operation or unauthorized access takes place, smart devices can report this in real time. M2MGate V uses the M2MGate Notification Service for this purpose.

The component has an internal API that can be used by M2MGate or user-defined services. In the case of previously defined events, the M2MGate Notification Service sends notifications via external systems, for example via e-mail, SMS or app push. The function is not only useful to intervene more quickly in the event of technical faults, but can also be used for marketing purposes. Sales promotions or information to specific customer groups can be transmitted in a targeted manner with the Notification Service.

Data Lake and Analytics

M2MGateV can also use Apache Kafka as a data lake where all captured data is stored. Apache Kafka streams the data in near real-time to any analytics solution. For example, data can be passed from the data lake to a NoSQL database, such as OpenSearch, a search and analytics engine designed to handle large amounts of data. There, historical data from the end devices can be stored so that users can not only evaluate the latest data, but also determine trends and tendencies over time and visualize them on individual dashboards.

A typical use case is the monitoring of customer preferences and product stocks. If, for example, an operator wants to optimize the filling of his vending machines, all information on the sale of goods can be accessed via the M2MGate V analytics function. Dashboards visualize which products were purchased when and how often, so that purchasing can adjust its order quantities.

The analytics component can also be used for predictive maintenance: Companies can retrieve performance data from machines to determine the optimal time for their next maintenance. In this way, downtimes are avoided and the lifetime of the machines is extended. .

M2MGate BLUEPRINT

Creating individual IoT applications

M2MGate Blueprint is a carefully tuned set of predefined services specifically designed for the seamless implementation of different IoT use cases.

This set is not only characterized by its adaptation to the specific requirements, but also enables automated provisioning in cloud systems and thus ensures permanent and effortless updatability of the systems.

M2MGate Blueprint consists of a combination of the M2MGate components described above and proven open source tools such as Apache Kafka, Grafana, OpenSearch, Keycloak and Portainer.

We use M2MGate Blueprint to quickly develop scalable and interoperable IoT applications for our customers. Benefit from our experience and proven best practices by using M2MGate Blueprint in your IoT solution.

Why we integrate open source software

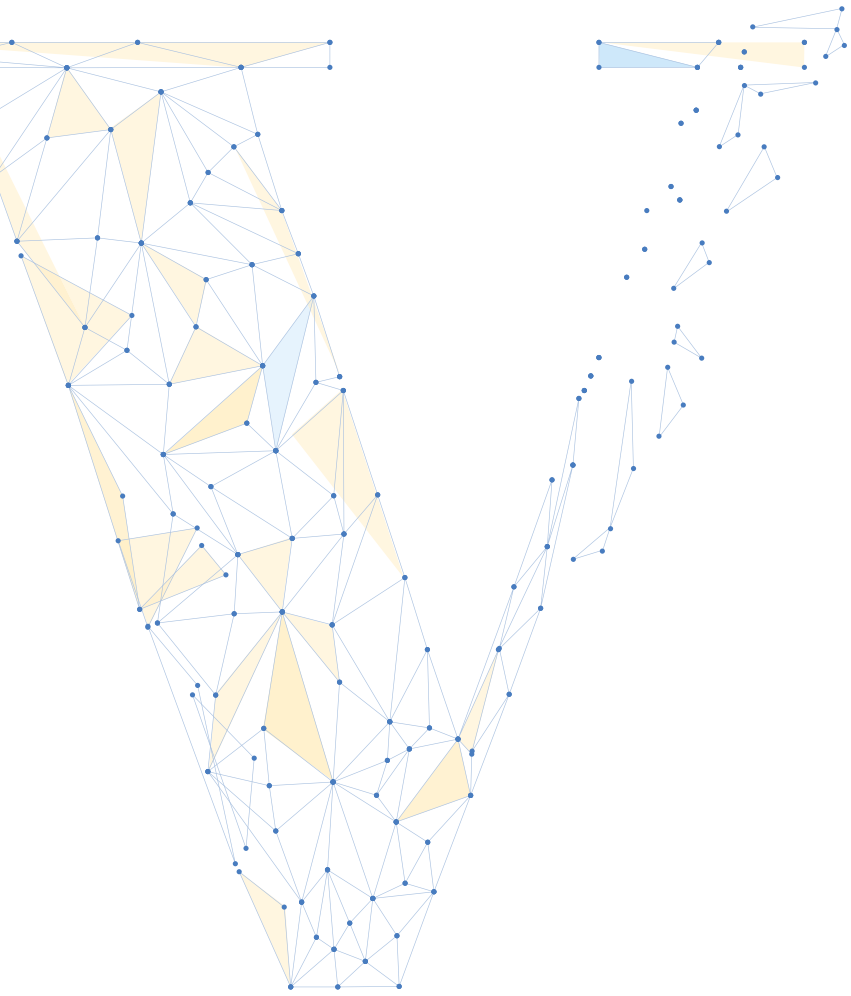
Open source software uses publicly accessible source code that can be used and modified as desired.

Its use in the IoT environment offers several advantages: In addition to cost savings, companies benefit from the very active developer community. This community continuously drives the optimisation and expansion of the software and ensures that patches are published promptly. In addition, the transparency of the source code allows a well-founded assessment of the quality of the software.

M2MGate Blueprint combines the strength of the specialised INSIDE M2M components with the flexibility and topicality of the open source elements.

With M2MGate V as the underlying IoT platform, customised applications can be developed in a fraction of the previous time. If customer requirements change or new services are to be offered, this can be implemented quickly with M2MGate Blueprint - an advantage in the competition for innovation and market power.

OUTLOOK



M2MGate V is a sophisticated, stable IoT platform with the flexibility to be configured for any use case. Its scalable architecture and bidirectional communication make it an ideal choice for enterprises and users looking to implement current IoT use cases for their internal processes or customer business.

Due to its modular design, M2MGate V can be used not only for new entrants into IoT technology, but also for modernization and expansion of existing architectures.

Through the worldwide use of M2MGate V in numerous industries and solutions, the platform has been and will be continuously improved and further developed. This ensures that building an IoT platform with M2MGate V is a sustainable and future-proof investment.

Do you have individual questions about M2MGate V or would you like to discuss its use in your planned IoT project? Please feel free to arrange a non-binding consultation appointment. We are happy to advise you in an open-ended manner.

M2MGATE CONVINCES!

Proven in the industry for 20 years:
Our customers value M2MGate as a reliable and trusted IoT platform that meets demanding requirements.

Trusted by industry leaders:
M2MGate is used by companies of all sizes, including industry giants such as Melitta, Konica Minolta, Liebherr and Deutsche Bahn. Currently, the platform connects more than 750,000 devices worldwide.

Future-proof:
We continuously develop M2MGate so that the platform exploits what is technologically possible and meets changing customer requirements.

INSIDE M2M is a provider of business solutions in the environment of IoT and machine-to-machine communication. Founded in 2004 by Derek Uhlig, Fred Könemann and Ingo Haase, the team now offers consulting, hosting and development of IoT solutions from a single source. Its flagship product is the M2MGate IoT platform.

Headquartered in Garbsen, Lower Saxony, the company employs over 50 people and is one of the leading providers of IoT platforms in German-speaking countries.

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