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物联网平台

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>	多级菜单递进。	设置 > 网络 > 设置网络类型
粗体	表示按键、菜单、页面名称等UI元素。	单击 **确定**。
`courier` 字体	命令。	执行 `cd /d C:/windows` 命令，进入Windows系统文件夹。
斜体	表示参数、变量。	`bae log list --instanceid` *`Instance_ID`*
[]或者[a|b]	表示可选项，至多选择一个。	`ipconfig` *`[-all|-t]`*
{}或者{a|b}	表示必选项，至多选择一个。	`swich` *`{stand | slave}`*

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1 What is IoT Platform?

IoT Platform is a device management platform on Alibaba Cloud that enables developers of IoT applications to implement two-way communications between end devices (such as sensors, final control elements, embedded devices, and smart household electrical appliances) and the cloud by creating data channels.

IoT Platform has the following benefits:

Device Connection

IoT platform provides device SDKs to help you connect devices to Alibaba Cloud.

- Provides various solutions for connecting network equipment that uses 2G/3G/4G, NB-IOT, or LoRa technology, to help streamline the management of devices connected over heterogeneous networks.
- Provides device SDKs that support various protocols, such as the MQTT and CoAP protocols. This achieves not only real-time synchronization capabilities by enabling persistent connections, but also energy efficient requirements by enabling transient connections.
- Supports various open-source programming languages and provides guides for embedding SDKs into different chips using your preferred programming languages. This allows enterprises to connect devices with various chips to IoT Platform.

Device Communication

Devices can use the IoT platform for two-way communication with the cloud through the IoT Hub. The platform enables upload and download channels between devices and the cloud to ensure that two-way communications between the devices and the cloud are smooth and reliable.

Device Management

IoT Platform manages the entire life cycle of devices, including device registration, function definition, script parsing, online debugging, remote configuration, firmware upgrade, remote maintenance, real-time monitoring, grouping, and device removal.

- Provides Thing Specification Language to simplify application development.
- Pushes notifications when a device changes status.
- Provides data storage capabilities, making it easy to read and write massive amounts of device data in real time.
- Supports the remote upgrade of devices based on Over-The-Air (OTA) technology.

- Provides a device shadow feature that decouples devices and applications to address scenarios with unstable wireless connections.

Security

A multi-layered security strategy is provided to ensure the security of devices connected to the cloud.

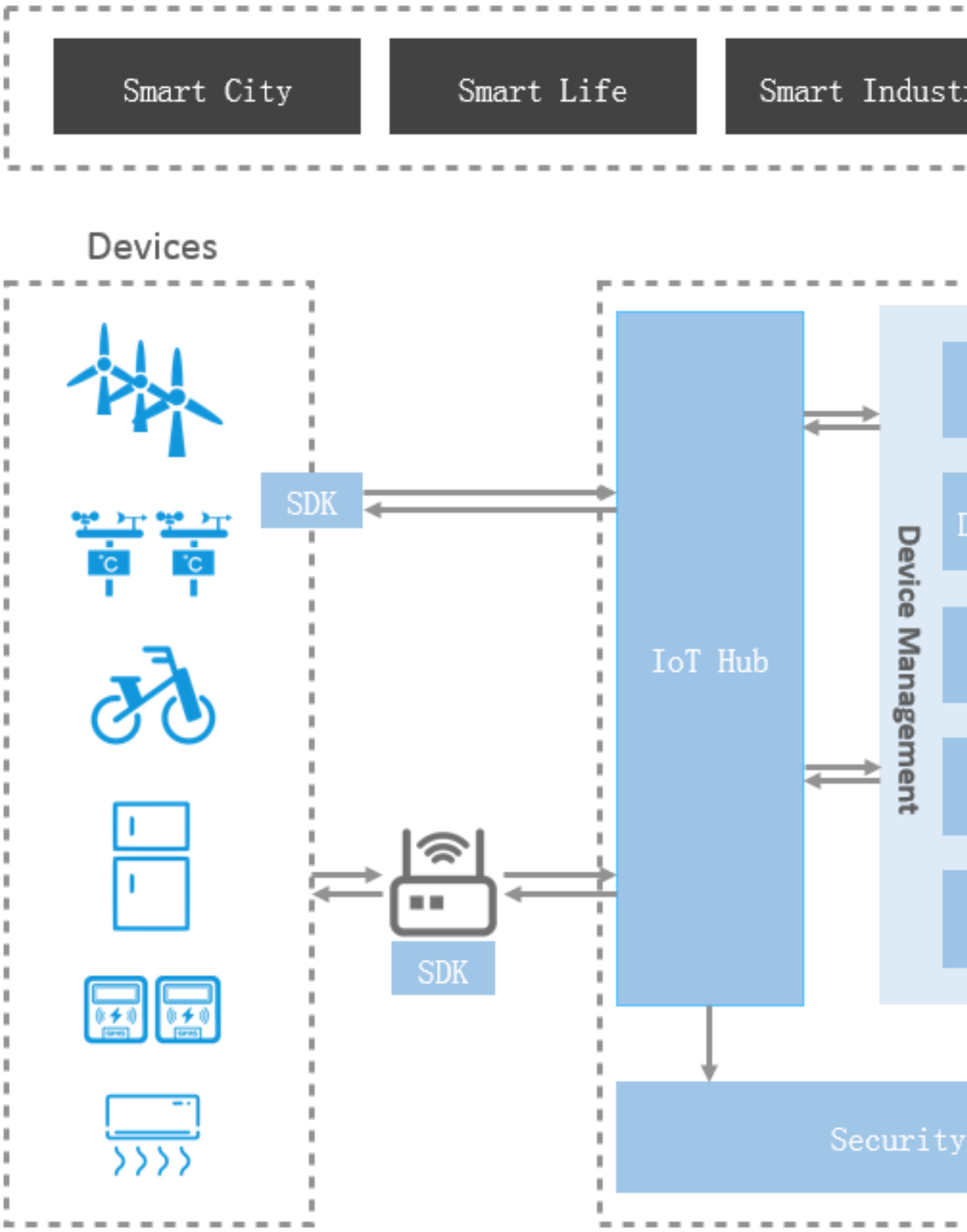
- Authentication
  - Chip-level security solutions (ID²) and the DeviceSecret mechanism are provided to prevent DeviceSecret being cracked. **Security level: high.**
  - The Unique Certificate per Device authentication mechanism is provided to prevent devices from being attacked. This mechanism applies to scenarios where pools of device certificates (consisting of ProductKey, DeviceName, and DeviceSecret) can be installed into device chips in mass production. **Security level: high.**
  - The Unique Certificate per Product authentication mechanism is provided to reduce the attack risk of devices. This mechanism applies to scenarios where pools of device certificates (consisting of ProductKey, DeviceName, and DeviceSecret) cannot be installed into device chips in mass production. **Security level: medium.**
- Communication Security
  - Supports various data channels that use TLS (for example, MQTT and HTTP) and DTSL (for example, CoAP) protocols to ensure the privacy and integrity of data. This applies to scenarios where hardware resources are sufficient, and devices are not sensitive to power consumption. **Security level: high.**
  - Supports custom data symmetric encryption channels that use TCP (for example, MQTT) and UDP (for example, CoAP) protocols. This applies to scenarios where hardware resources are insufficient, and devices are sensitive to power consumption. **Security level: medium.**
  - Permission management is provided to ensure that communications between the devices and the cloud are secure.
  - Device-level isolation of communication resources (such as Topic) is provided to prevent unauthorized operations on devices.

SQL parsing and data forwarding using the Rule Engine

IoT Platform can integrate with other Alibaba Cloud services by using the Rule Engine. You can set simple rules to transfer device data to Alibaba Cloud services for data storage and computing. The Rule Engine has the following features:

- Establishes M2M communications between devices using rules.
- Transfers data to Message Queue (MQ), ensuring that applications can access device data reliably.
- Transfers data to Table Store, supporting the integration of data acquisition and structured storage.
- Transfers data to Function Compute, supporting the integration of data acquisition and event-triggered processing.

2 Architecture



IoT Hub

The IoT Hub helps devices connect to the Alibaba Cloud IoT Platform service. The IoT Hub is considered as a data channel for secure communications between devices and the cloud. The IoT Hub supports both the Pub/Sub and Revert-RPC communication modes. The Pub/Sub mode is a message routing mode based on topics.

The IoT Hub has the following features:

- High scalability: supports linear dynamic scaling, and allows one billion devices to be connected simultaneously.
- End-to-end encryption: The entire communication link is encrypted with RSA and AES to ensure that the data transmission is secure.
- Real-time messages: After a data channel is successfully established between the device and the IoT Hub, it becomes a persistent connection to reduce handshake time and to ensure that messages arrive in real time.
- Data passthrough support: The IoT Hub supports binary format data passthrough to the server. To keep data secure and controllable, the IoT Hub does not store device data.
- Various communication modes: The IoT Hub supports both the Pub/Sub and Revert-RPC communication modes in order to meet your communication needs in various scenarios.
- Support for multiple protocols: supports connecting devices to IoT Platform using the CoAP, MQTT, and HTTPS protocols.

Device management

IoT Platform offers various features to manage devices. These features manage the lifecycle, device groups, device shadows, firmware upgrade, Thing Special Language (TSL), data parsing, online debugging, remote maintenance, and real-time monitoring. Device management in different versions of IoT Platform has different features, see *Specifications* for details .

Rules engine

When a device communicates with IoT Platform using a topic, you can write an SQL expression to process the data in the topic. You can then configure rules to transfer data to other topics or Alibaba Cloud services. For example:

- You can transfer and store data to RDS, Table Store, and HiTSDB.

- You can transfer data to the DataHub and then use StreamCompute for stream computing or MaxCompute for large dataset offline computing. You can also transfer data to Function Compute for event-triggered processing.
- You can transfer data to Message Queue (MQ) for highly reliable data consumption.
- You can transfer data in one topic to another topic to establish M2M communication between devices.

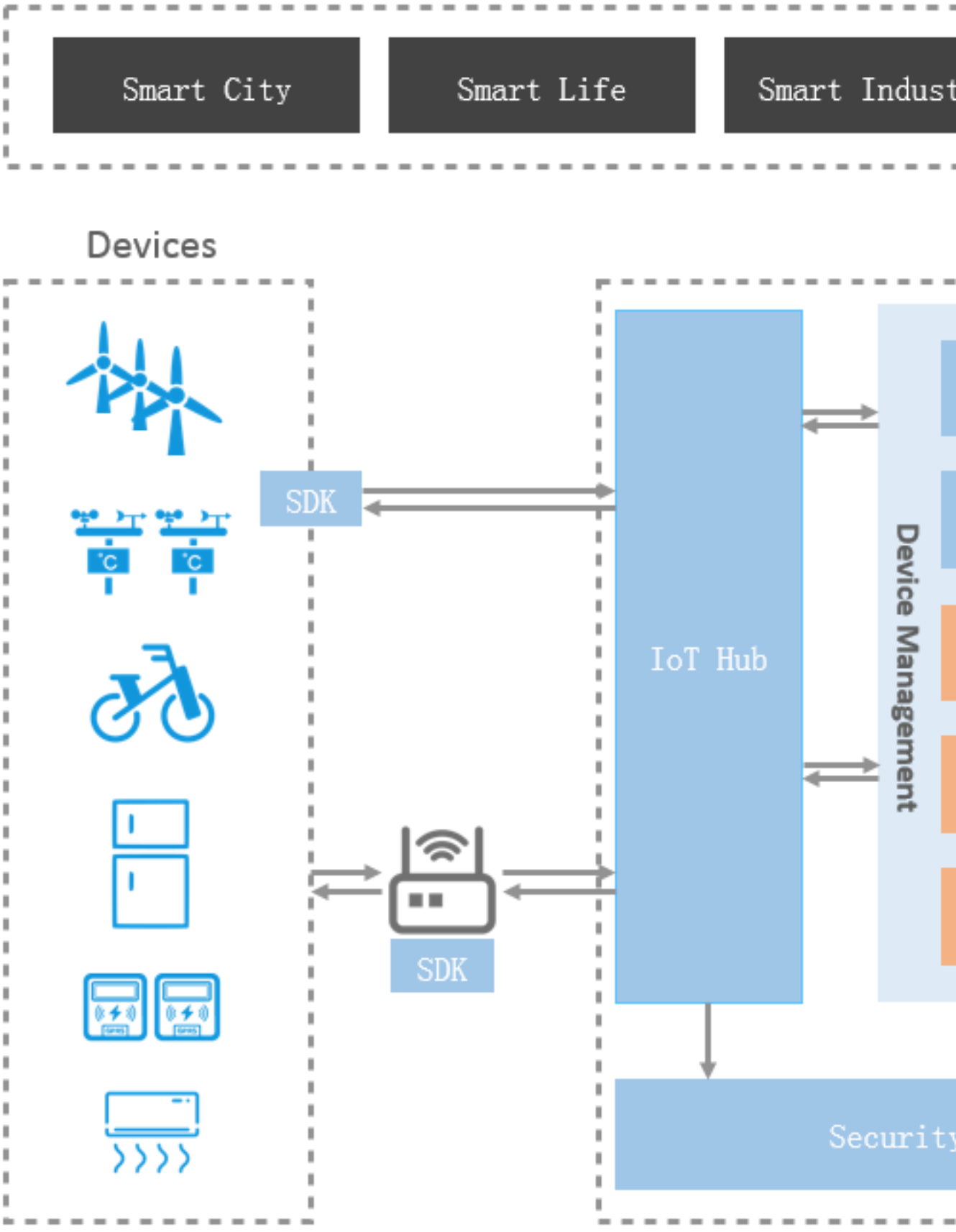
Security authentication and authorization policies

Security is very important to IoT. Alibaba Cloud IoT Platform offers a multi-layered security strategy to ensure that the connection between devices and the cloud is secure.

- Iot Platform issues a unique certificate for each device, and each device will use its unique certificate for authentication while connecting to the IoT Hub.
- IoT Platform provides various device authentication methods for developers to address different security needs and production line requirements.
- Authorization is provided at the device level. A device can only publish or subscribe to topics associated with that particular device. The server handles data through topics under the Alibaba Cloud account using the AccessKey.

3 Specifications

Two editions of IoT Platform are provided, IoT Platform Basic and IoT Platform Pro. The yellow modules in the following figure are features exclusive to the Pro Edition.


Smart City
Smart Life
Smart Indust
Devices
SDK
SDK
IoT Hub
Device Management
Security

IoT Platform Basic

- Description: IoT Platform Basic provides secure and reliable connectivity between several hundred million devices along with basic device management and firmware upgrade capabilities. The Basic Edition also supports data streaming using the rule engine. The Basic Edition does not support data parsing or data storage. If you need other Alibaba Cloud services such as storage services and Message Service, you will need to purchase these services separately.
- Scenario: The Basic Edition is suitable for developers who have well-developed hardware and software resources, and want to build business systems by flexibly combining Alibaba Cloud services.

IoT Platform Pro

- Description: In addition to all the features included with IoT Platform Basic, IoT Platform Pro also supports the Alink protocol, device model definition, data parsing, online debugging, and remote management. The Pro Edition also provides comprehensive lifecycle management, data storage, real-time device running status, and historical device data.
- The Pro Edition is ideal for developers who have a short development timeline for smart devices that deliver actionable intelligence. The Pro Edition is also ideal for solving issues concerning device data formats and storage. It is the best option when establishing vertical business systems, or when a fast approach to digital transformation is required.

The following table compares the features supported the by Basic Edition and the Pro Edition:

Features	IoT Platform Basic	IoT Platform Pro
Device authentication	√	√
Device connection	√	√
Device data uploading	√	√
Remote device control	√	√
Remote device disabling	√	√
Device topological relationship maintenance	√	√
Device shadow	√	-
Device model definition	-	√
Data parsing scripts	-	√
Device data storage	-	√

Features	IoT Platform Basic	IoT Platform Pro
Query of real-time device status	√	√
Query of historical device data	-	√
Device service call	-	√
Reporting of device events	-	√
Online device debugging	-	√
Device location tracking	-	√
Remote configuration of devices	-	√
Firmware upgrade for devices	√	√
Log analysis	√	√
Rule engine	√	√

4 IoT Platform terms

The section describes the terms that are used in Alibaba Cloud IoT Platform.

Terms

Term	Description
Product	A product is a set of devices that have the same features. IoT Platform issues a unique ProductKey for each product. One product may consist of thousands of devices.
Device	A physical device that constitutes a product. IoT Platform issues a DeviceName that is unique under the same product for each device. Devices can connect directly to IoT Platform, or be mounted as sub-devices to a gateway that is connected to IoT Platform.
Gateway	A gateway can connect directly to IoT Platform and provide sub-device management features. Sub-devices can only communicate with IoT Platform through a gateway.
Sub-device	A sub-device is essentially a device. Sub-devices cannot connect directly to IoT Platform and can only get connected through a gateway.
Three key fields	The three key fields are **`ProductKey`**, **`DeviceName`**, and **`DeviceSecret`**. • **`ProductKey`** is the unique identifier of a product in IoT Platform. This parameter is very important and used in device authentication and communication. You should keep this parameter safe. • **`DeviceName`** is the device name that is automatically generated or defined by the user during device registration. Each device has a unique DeviceName under the same product. This parameter is very important and used in device authentication and communication. You must keep this parameter safe. • **`DeviceSecret`** is the private key issued by IoT Platform for each device. DeviceSecret is used in pair with DeviceName. This parameter is very important and used in device authentication. You must keep this parameter safe and never disclose this parameter.
ProductSecret	ProductSecret is the private key issued by IoT Platform for each product. ProductSecret is usually used in pair with ProductKey for unique-certificate-per-product authentication. This parameter is very important. You must keep this parameter safe and never disclose this parameter.
Topic	A topic is a UTF-8 character string that is used as a transmission medium during Pub/Sub communication. A device can publish messages to a topic or subscribe to messages from a topic.

Term	Description
Topic category	A topic category is a set of topics associated with different devices under the same product. ${productKey} and ${deviceName} can be combined to specify a unique device. A topic category is applicable to all devices under the same product.
Publish	The operation permission that allows a device to publish messages to a topic .
Subscribe	The operation permission that allows a device to subscribe to messages from a topic.
RRPC	RRPC is short for Revert-RPC. RRPC allows you to send a request to a specified device and receive a response from the device.
Tag	Tags consist of product tags and device tags. • Product tags describe the information that is common to all devices under the same product. • Device tags describe the unique features of devices. You can add custom tags based on your needs.
Alink	The protocol for communication between the devices and IoT Platform.
TSL model	IoT Platform uses the Thing Specification Language (TSL) to describe devices. A TSL model includes properties, services and events. TSL models use JSON format. You can organize data based on TSL and report data to the Cloud.
Property	A feature that describes the running status of a device, such as the temperature information collected by an environmental monitoring equipment . Properties support GET and SET request methods. Application systems can send requests to retrieve and set properties.
Service	A feature that describes the capabilities or methods provided by a device that can be used by external requesters. You can specify the input and output parameters. Compared with properties, services can use one command to implement more complex business logic, such as performing a specific task.
Event	A feature that describes the events that are generated when a device is running. Events usually contain notifications that require action or attention, and may contain multiple output parameters. For example, an event may be a notification that a task is completed, a device fault that has occurred, or a temperature alert. You can subscribe to or push events.
Data parsing script	For devices under a product created in IoT Platform Pro, if the passthrough or custom mode is used to send data to IoT Platform, you need to write data parsing scripts to convert the binary data or custom JSON data that is sent by the device to Alink JSON data.

Term	Description
Device shadow	A device shadow is a JSON file that is used to store the status information for a device or application. Each device has a unique device shadow in IoT Platform. Regardless of whether the device is connected to the Internet, you can use the device shadow to retrieve and set the device status through MQTT or HTTP.
Rules engine	Rules engine provides a SQL-based language that enables you to filter the data from topics and send processed data to other Alibaba Cloud services, such as Message Service and Table Store.

5 Benefits

More and more enterprises are employing Internet of Things (IoT) solutions to collect and manage data from devices and increase returns. However, transforming the IoT eco-system and building a powerful IoT platform is facing challenges. Alibaba Cloud IoT Platform offers the solutions to these issues.

The following table describes the differences between traditional IoT development and IoT development based on Alibaba Cloud IoT Platform:

	Traditional IoT development	**Development based on Alibaba Cloud IoT Platform**
Connect devices to IoT Platform	Requires infrastructure and support from embedded system developers and cloud developers. The development is heavy and inefficient.	Provides Software Development Kits (SDKs) for quick connections between devices and the cloud. IoT Platform supports connections to worldwide devices, devices in heterogeneous networks, devices running in multiple environments, and devices operating based on multiple protocols.
Performance	Requires manual architecture scaling. This results in difficulties in dispatching servers, load balancers, and other infrastructure at device level.	Supports persistent connections with more than 100 million devices and millions of concurrent connections, and allows horizontal architecture scaling.
Security	Requires the development and deployment of additional security measures. Securing device data can be challenging.	Provides multiple measures to secure data in the cloud: • Device authentication to guarantee the security and uniqueness of devices • Transmission encryption to prevent data tampering • Alibaba Cloud Security and authorization checks to secure the cloud
Stability	Requires manual detection of server faults and migrates services, and interrupts services during migration, resulting in service instability.	Ensures the service availability of up to 99.9%, and allows auto migration in a single point of failure.

	Traditional IoT development	Development based on Alibaba Cloud IoT Platform
Ease of use	Demands extra servers to build distributed architecture for load balancing, and requires costly development of a complete IoT system that handles connections, computing, and storage.	Supports device management on the same platform, real-time monitoring of devices, and seamless connections to Alibaba Cloud services, and enables flexible and easy implementation of complex IoT applications.

6 Limits

The following table shows the limits for the IoT Platform:

Limit	Description
Total products	Each account can create up to 1,000 products.
Total devices	Each product can include up to 0.5 million devices.
Parsing scripts	The size of the parsing script cannot exceed 48 KB.
Remote configuration	The remote configuration file only supports the JSON format and cannot exceed 64 KB.
Features (IoT Platform Pro products only)	Each product can add up to 100 features.
	When you define a property, the number of parameters for the struct data cannot exceed 10.
	If the feature data type is: • enum, the number of enumeration items cannot exceed 25. • text, the data cannot exceed 1024 bytes. • array, the number of elements in an array cannot exceed 128.
	Each service can have a maximum of 10 input parameters and 10 output parameters.
	Each event can have a maximum of 10 output parameters.
Topic categories	A product can define a maximum of 50 topic categories.
Broadcast topic	The same broadcast topic can be subscribed by a maximum of 1000 devices. The SDKs in the server can only send one broadcast per second.
Topic length	Cannot exceed 128 bytes.
Protocol package size	The CoAP protocol package cannot exceed 1 KB.
	The MQTT protocol package cannot exceed 256 KB.
Communications	The device can only publish and subscribe to its own topic.
Topic subscription	After you subscribe to or unsubscribe from a topic, the change will take effect in 10 seconds. Subscriptions remain in effect until you unsubscribe from the topic. We recommend that you subscribe to Topics in advance to avoid missing information. Example: The device sends a SUB request to topic A. After 10 seconds, the subscription takes effect and the device starts to receive messages in real time. The device will continue receiving messages for topic A until you unsubscribe from it.

Limit	Description
Rule Engine	Each account can set up to 1000 rules.
	Each rule can include a maximum of 10 actions related to data transfer.
Throttling	Data per device: • The upload speed: 30 messages/second in QoS0 level, 10 messages/second in QoS1 level. • The download speed: 50 messages/second.