

# IoT Cloud Infrastructure

Building Blocks

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# IoT Cloud Infrastructure

## Introduction



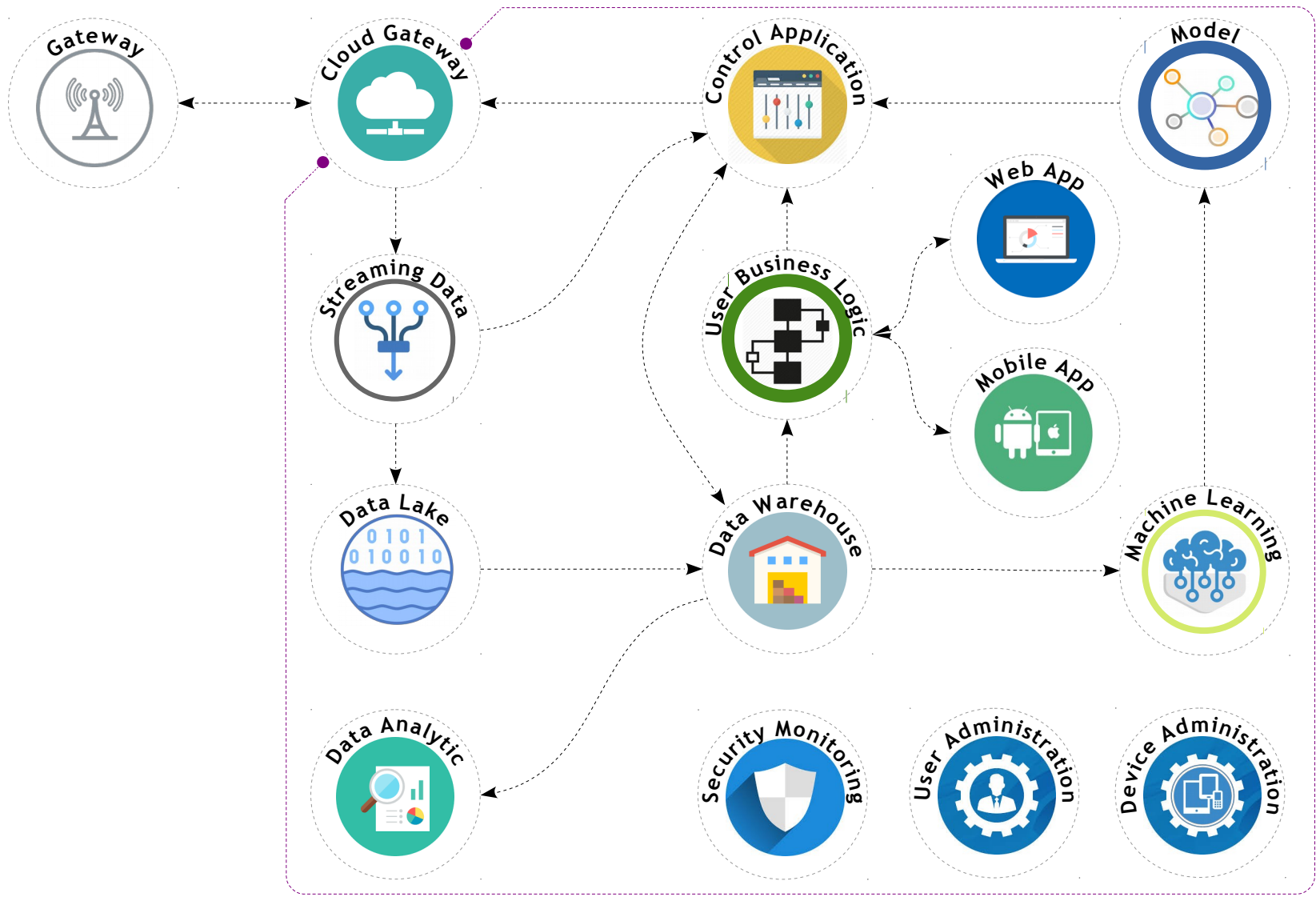
- Every 'Thing' connected to the Internet would send some data to the cloud for further processing based on the requirement we have
- So, it becomes important to understand the major block involved in the cloud, which provides the facilities to store, analyze the data with respect to the business needs
- The next slide shows the major block you may see in cloud



# IoT Cloud Infrastructure Blocks



Things sensing and controlling various factors



# IoT Cloud Infrastructure

## Blocks - Things



- A thing is a device which would be based on microcontroller or SOC depending on the complexity of the requirements
- The duty of the thing is to monitor (using sensors) the surrounding environment and take action (using actuators) based on the situation and send the latest report to the cloud gateway directly or field gateway to cloud
- It may even work based on the commands obtained from the cloud



Things sensing and controlling various factors



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## Blocks - Gateway



- A thing usually transfers the data to and fro the cloud via field gateway
- Some device can directly connect to cloud and some wouldn't have the capability to do so, hence the need of gateway arises
- Its is also possible, that gateway does some pre processing before the data is sent cloud, like reducing its size, filtering duplicate data and so on

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## Blocks - Cloud Gateway



- Allow us to achieve secure data transmission between field gateways and cloud IoT servers
- Ensures compatibility with various protocols
- Communicates with field gateways using different protocols supported by it

# IoT Cloud Infrastructure

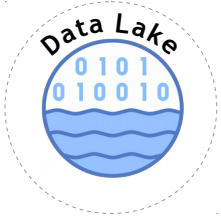
## Blocks - Stream Data Controller



- Provides effective transition of input data to a data lake and control applications.
- Should make sure no data is lost or corrupted

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## Blocks - Data Lake



- Store the data generated by connected devices in its natural format
- When the data is needed for meaningful insights it's extracted from a data lake and loaded to a data warehouse.



# IoT Cloud Infrastructure

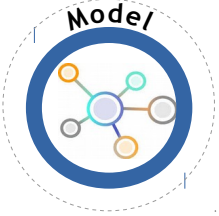
## Blocks - Data Warehouse



- Central repository of information that can be analyzed to make better informed decisions
- Filtered and pre processed data needed for meaningful insights is extracted from a data lake to a data warehouse
- Contains only cleaned, structured and matched data (compared to a data lake which contains all sorts of data generated by sensors)
- Also, data warehouse stores context information about things and sensors (for example, where sensors are installed) and the commands control applications send to things

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## Blocks - Machine Learning



- Helps to create more precise and more efficient models for control applications
- Models are regularly updated based on the historical data accumulated in a data warehouse
- When the applicability and efficiency of new models are tested and approved by data analysts, new models are used by control applications

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## Blocks - Data Analytic



- A layer which should help to find trends and gain actionable insights
- Should help to identify inefficiencies and work out the ways to improve an IoT system (make it more reliable, more customer-oriented)
- Also, the correlations and patterns found manually can further contribute to creating algorithms for control applications

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## Blocks - Control Application



- A Layer, that facilitate to send automatic commands and alerts to the device
- These commands in turn could be stored in data warehouse just to do error handling, for example the command is sent to device but it did not execute it!, may be there is a issue in connectivity, gateways or actuators
- On the other side, storing commands from control apps may contribute to security, as an IoT system can identify that some commands are too strange or come in too big amounts which may evidence security breaches

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## Blocks - Control Application



- Control applications can be either based on rules or machine-learning.
  - Rule: Work according to the rules stated by specialists.
  - ML: Works using models which are regularly updated with the historical data stored in a data warehouse.
- This block may provide a better automation feature, but a override option always necessary to influence the behavior of the device through it!

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## Blocks - Business Logic



- Every business logic is different, this block should be independent of the management, maintenance, and scale "state machinery" factors
- Should allow us to monitor and control the devices
- With a mobile or web app, users can monitor the state of their things, send commands to control applications, set the options of automatic behavior

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## Blocks - Security Monitoring



- The top concerns in the internet of things
- Connected devices produce huge volumes of data, which need to be securely transmitted and protected from hackers
- Most importantly, the thing is to be secured enough that, the hackers don't get it and control the entire IoT subsystem!!
- To prevent such problems, it makes sense to log and analyze the commands sent by control applications to things, monitor the actions of users and store all these data in the cloud

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## Blocks - Device Administration



- Just installing the devices doesn't mean that it's the end scope
- Some actions are required to manage the performance of connected devices like
  - Device management
  - Configuration and control
  - Monitoring and diagnostics
  - Software updates and maintenance



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## Blocks - User Administration



- To provide control over the users having access to an IoT system
- Involves identifying users, their roles, access levels and ownership in a system and provide options to
  - Adding and removing users
  - Managing user settings
  - Controlling access of various users to certain information
  - Permission to perform certain operations within a system, controlling and recording user activities and more.

Thank You