

A dark blue background filled with various IoT-related icons and symbols. These include a car, a smartwatch, a camera, a potted plant, a laptop with a Wi-Fi signal, a game controller, a printer, a router, a padlock, a thermometer, a light bulb, a speaker, a refrigerator, a microwave, a smartphone with a globe icon, a cloud with a network diagram, and various cables and connectors. The icons are interconnected by dotted lines, suggesting a networked environment.

# IoT Platforms

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# What is the Cloud?



## Before the Cloud

Companies managed their own data centers. They handled everything from hardware to security.

Data centers manage buying computers, hardware maintenance, power and cooling, networking, security, and software installation.

## Expensive and Slow

This was costly and required specialized staff. Scaling resources was slow and challenging.



# Someone Else's Computer

1

## Cloud Computing

Rent computing power instead of buying hardware. Cloud providers manage the data centers.

2

## Global Data Centers

Cloud data centers are located worldwide. They are managed by cloud computing providers.

3

## Cost Effective

Pay for what you use, scaling resources as needed. This lowers costs and increases efficiency.

# What are IoT platforms

- IoT applications combine sensors, devices, data, analytics and integrations in a seamless and unified way
  - e.g. your project!
- IoT Platforms provide software tools and components to:
  - connect sensors, devices, and data networks
  - Analyse and store data
  - Integrate with other apps
- So what? We know the tech for that now (I2C, SPI, BLE, MQTT, Python...)
- Main selling point of an IoT platform is software that it
  - accelerates the IoT development process
  - Focuses on IoT: brings in best of breed features
  - Provides initial scaffolding for IoT projects

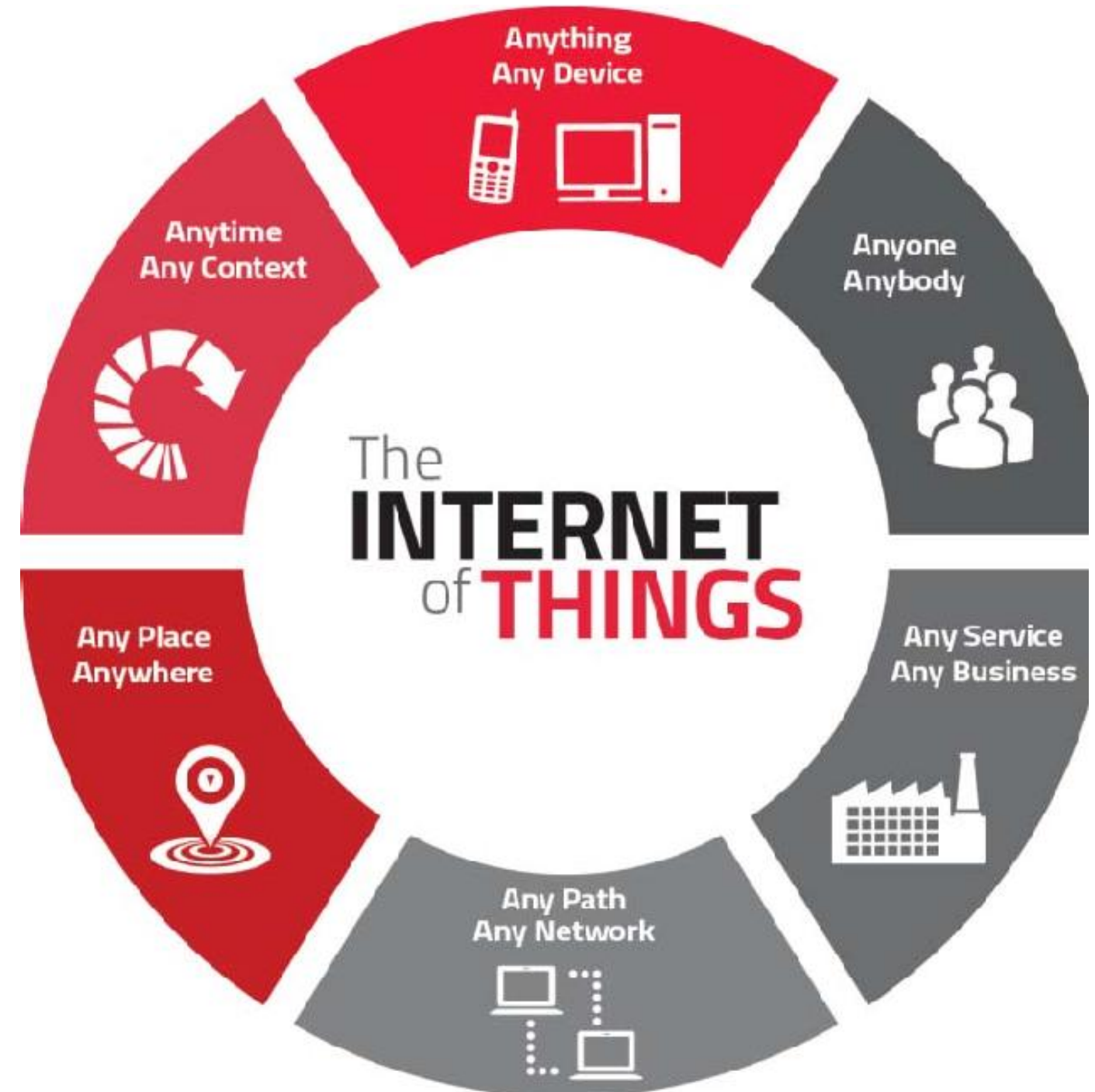
# What are IoT Platform

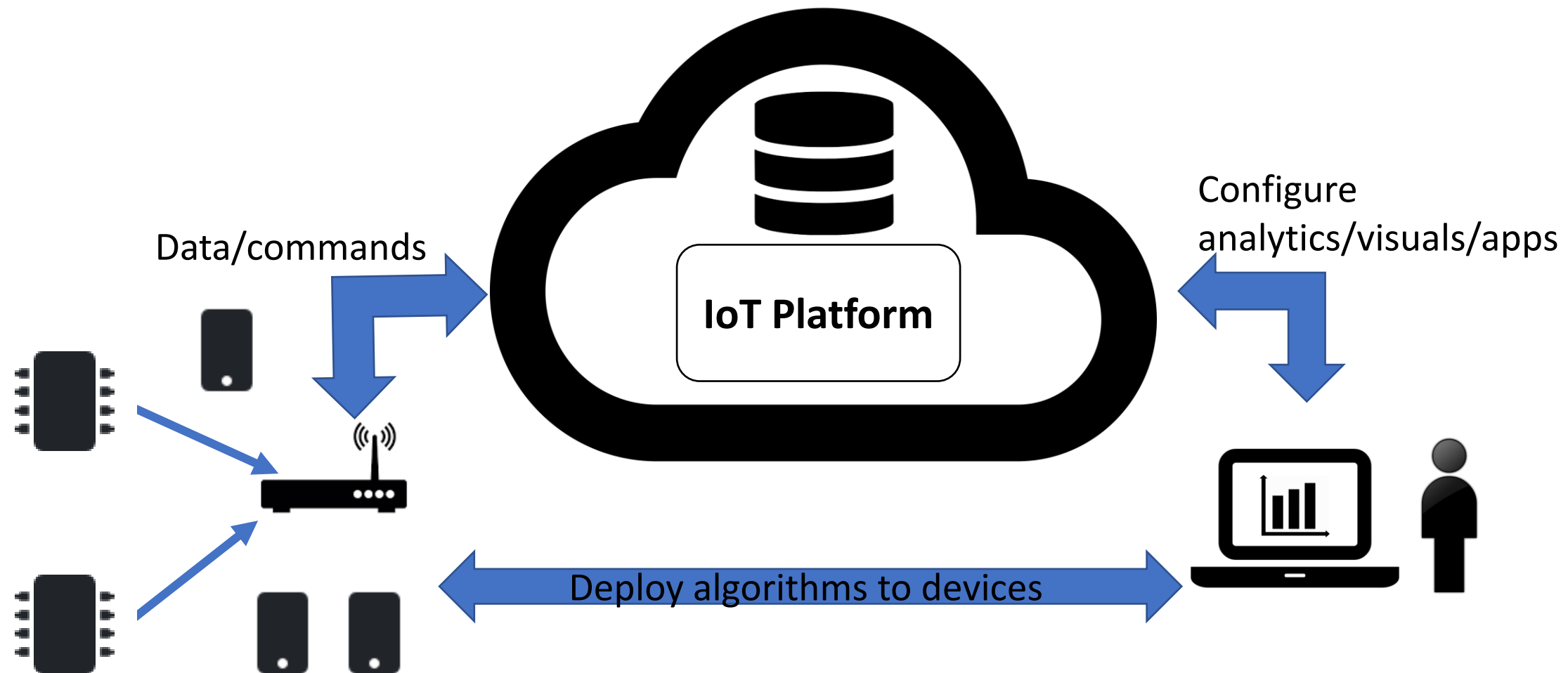
- Many(not all) are cloud-based platforms that require subscription
- Provide device/language agnostic set of Software Development kits
  - Arduino/RPi/beagleboard
- IoT development is generally iterative:
  - Starts with initial simple use case
  - Once operational, data/insights result in new usecases
- IoT platforms should promote scalable, iterative development
  - Allow for quick app development
  - Ability to adapt/optimize apps quickly



# IoT Platform Characteristics

- Manage many concurrent device connections
- Connectivity across several connection types
- "Off-the-peg" IoT protocol stack
- Manage/analyse/visualise data
- Integrations to other services/apps
- App Development





# IoT Platform Advantages

- Use software component that has been pre-built and pre-tested. This increases the reliability of your application and reduces development effort.
- IoT frameworks constantly evolve, providing new features, integrations etc.
- Encourages better "design pattern" for your IoT app.
- Predefined APIs and docs
  - Great for collaboration
- "Baked-in" standards and features:
  - Security, authentication, scalability...

# Which one?

- Connectivity
  - Does the platform provide suitable capability and integrations (WiFi/Cellular/LPWan-Sigfox)
- Maturity
  - In business for long? Critical mass in developer community?
- Free
  - Is there a free tier (handy for evaluation)?
- Service type
  - Platforms try to distinguish themselves – what specialisms/USP does it have?
- Security
  - What security model do they use? Is there security issues reported in past?
- Geographic area
  - Does it operate well at your location (can you select edges/data centres)



# Microsoft Azure

- 1 Azure

Azure is Microsoft's cloud platform
- 2 Azure for Students

Students get \$100 credit and free IoT services. No credit card is needed.
- 3 Azure Free Subscription

Free tiers of services. A credit card is required.





# Azure IoT Services



## Security

Security is baked-in to prevent data breaches and rogue commands.



## Performance

High performance with the ability to handle millions of messages.



## Device SDK

Connect using a device SDK or communication protocol like MQTT.

Cloud IoT services solve reliability, security, performance, and discovery issues. Cloud providers offer free versions for development.



# What is Serverless?

1

Small Code Blocks

Run small blocks of code in response to events.

2

Event-Driven

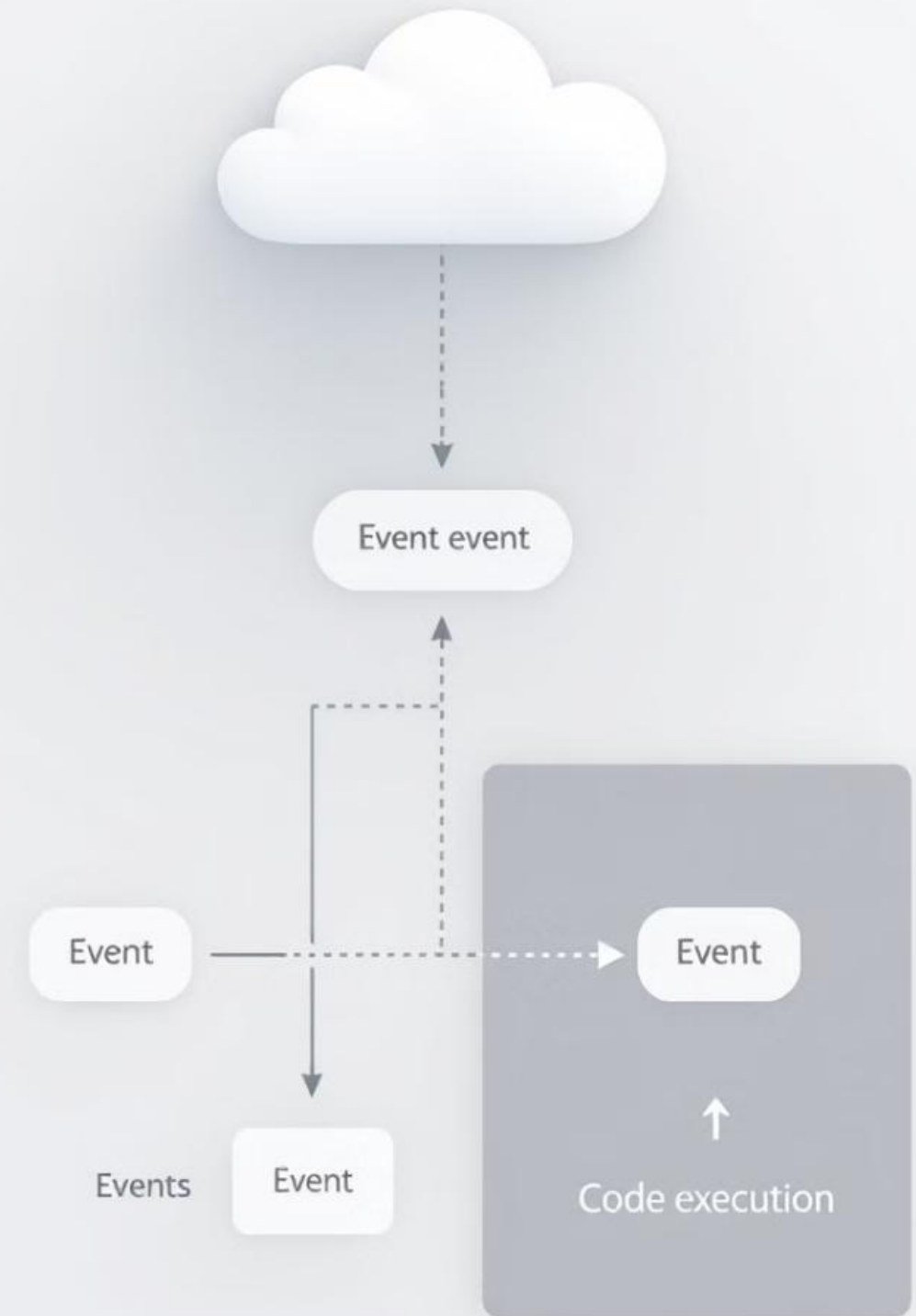
Code runs when an event happens, triggered by data changes.

3

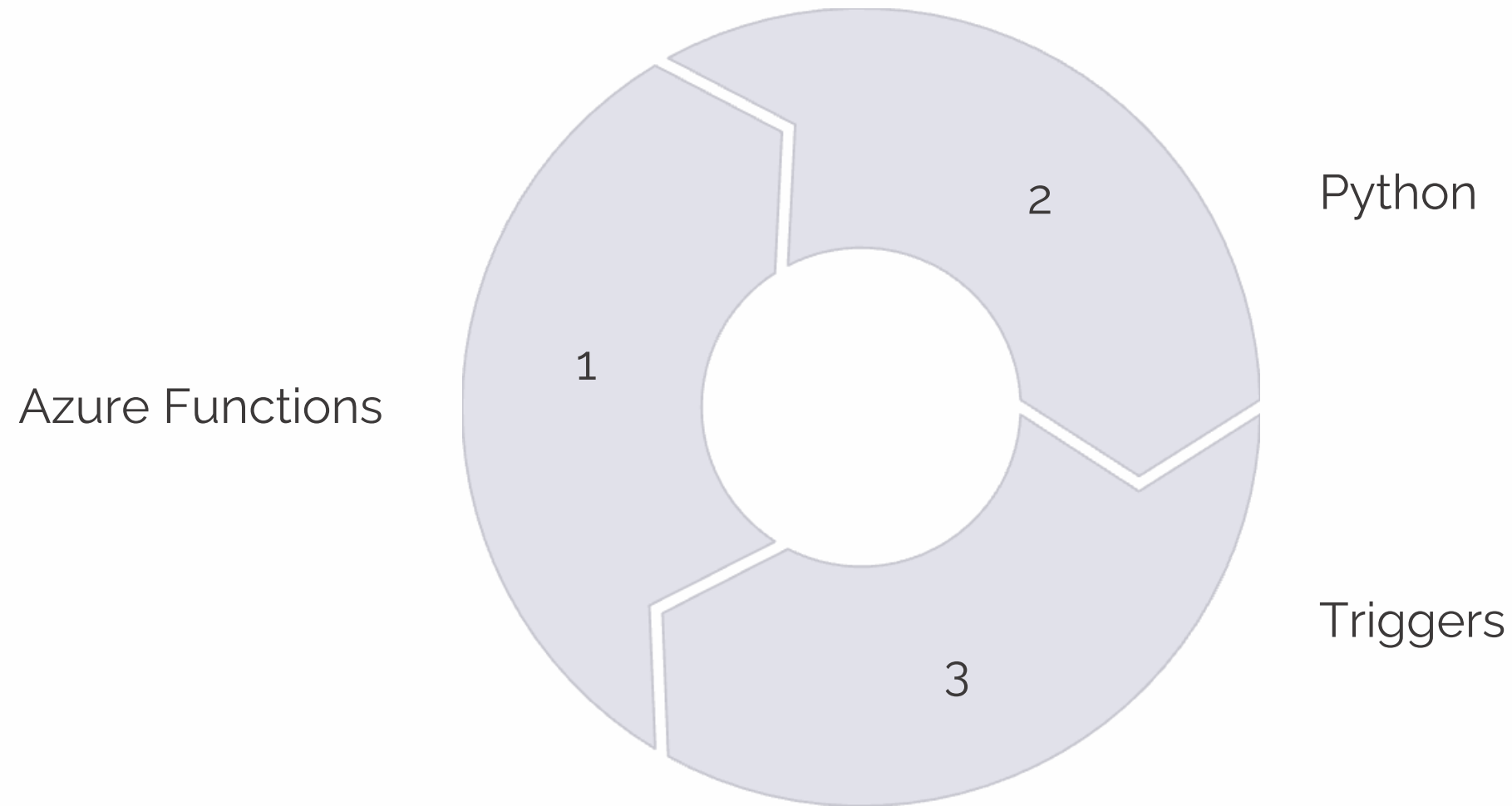
Scalable

Cloud provider runs the function as needed.

Serverless computing creates small code blocks that run in the cloud in response to events. You pay for the time your code is running and the memory used.



# Create a Serverless Application



Azure Functions is the serverless computing service from Microsoft. Write functions in Python, JavaScript, C#, or other languages.

# Create an IoT Hub Event Trigger

1

Functions App

---

2

IoT Hub Trigger

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3

Event Hub

Add an IoT Hub trigger to respond to IoT Hub events. Connect to the event hub compatible endpoint.

# Send Direct Method Requests

## Registry Manager

Send commands to IoT devices.

## Cloud to Device

Communicate with devices via messages.

## Connection String

Connect with the Registry Manager.

Use the Registry Manager to send cloud to device messages. This allows commands to be sent to the IoT device.

