

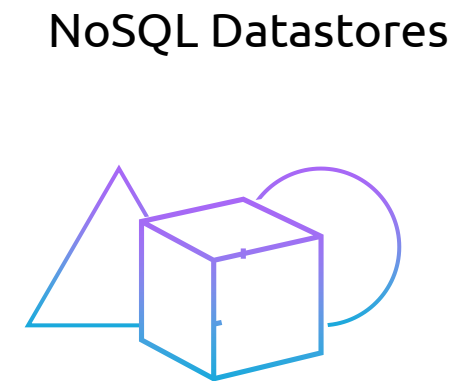
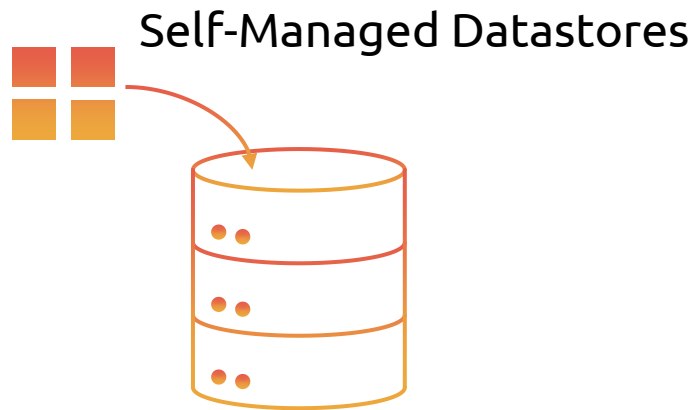


KodeKloud

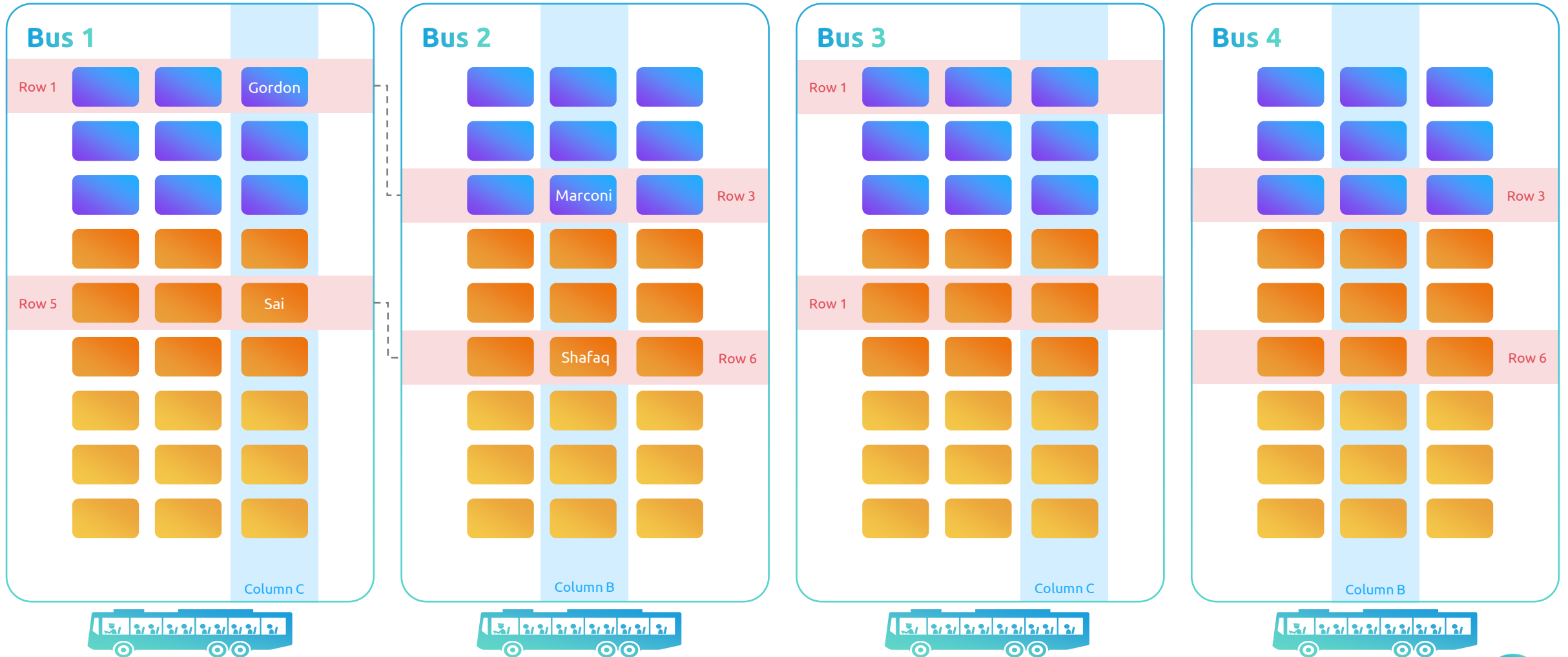
Core AWS Services: Databases



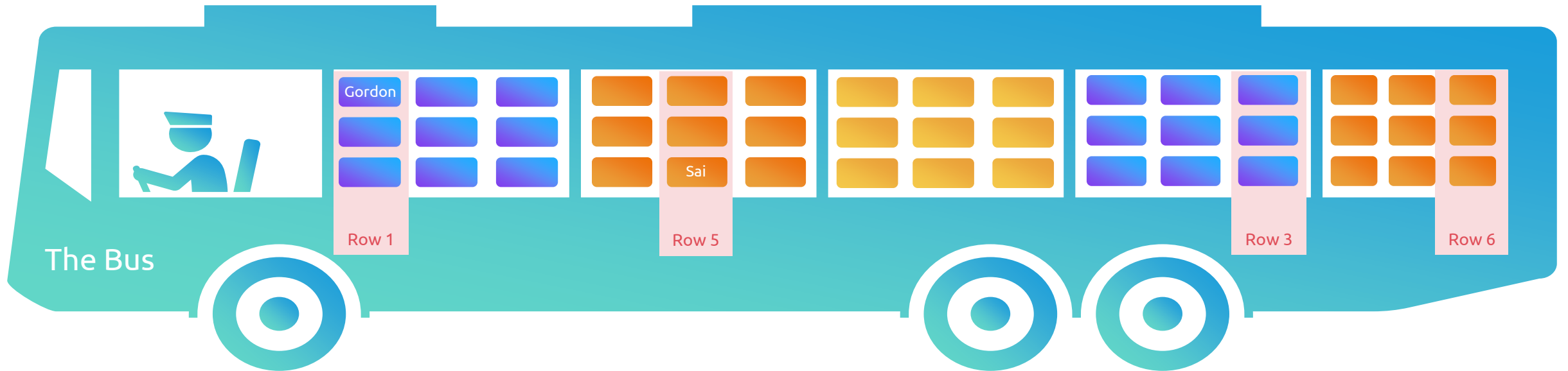
Types of Databases (Datastores)



A Short Sidebar – Structured Data vs Unstructured Data



A Short Sidebar – Structured Data vs Unstructured Data



A Short Sidebar – SQL Databases



SQL databases

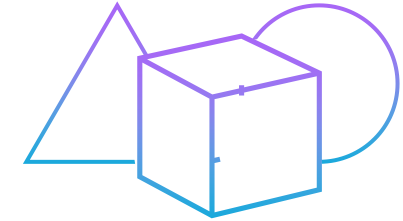
Employee-Department Mapping Table

EmpID			DeptID			Joined On
01			01			20150101
02			02			20150102
↑			↑			
EmpID	Name	Address	DeptID	Name	Location	
01	Emp01	A	01	DeptA	LocA	
02	Emp02	B	02	DeptB	LocB	
Employee Table			Department Table			



A Short Sidebar – NoSQL Databases

- Means “Not Only SQL”
- Different Data Relationships
- Used when you have simple but specific needs for data
- Think Search, High Performance, Documents, Relationship use cases

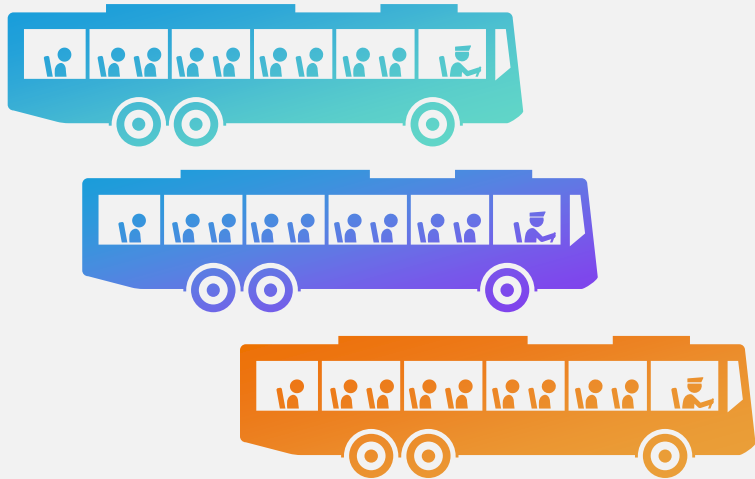


Partition Key	Sort Key	Attributes		
Product ID	Type			
1	Book ID	Odyssey	Homer	1871
2	Album ID	6 Partitas	Bach	
3	Album ID: Track ID	Partita No. 1		
4	Movie ID	The Kid	Drama Comedy	Chaplin
Primary Key		Products		



A Short Sidebar – SQL Datastores Versus NoSQL Datastores

SQL Datastores



NoSQL Datastores



A Short Sidebar – SQL Datastores Versus NoSQL Datastores



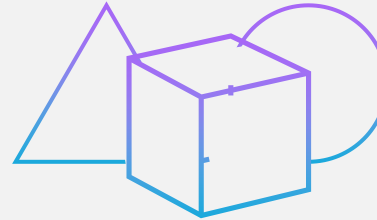
SQL datastores

Structured Data into Tables

Relationships with the Tables

Used primarily when you have complex relationships with your data

Think Transactional (like Banking) or Reporting use cases for these data stores.



NoSQL Datastores

Means “Not Only SQL”

Different Data Relationships from SQL

Used when you have simple but specific needs for data

Think Search, High Performance, Documents, Relationship use cases



Self-Managed Datastores



I want full control over my car (database)

01



Own the car
entirely

02



Drive the car

03



Repair the car

04



Customize the
Car

05



Fully Responsible
for the Car



Database Running on an EC2 Virtual machine or ECS or EKS



EC2 instance contents

- Most “unmanaged” option
- More control
- More responsibility
- Cost less in service dollars
- Cost more in Operational Overhead



Amazon Elastic Kubernetes Service (Amazon EKS)

- Most “unmanaged” option
- More control
- More Responsibility
- Cost less in service dollars
- Cost more in Operational Overhead
- Can mitigate that with Fargate instead of EC2 cluster



Self-Managed Database Summary

- ✓ Can run your own database software on EC2 or any container services (ECS or EKS)
- ✓ Increased Control and Flexibility (yay!)
- ✓ Increased Operational overhead and Responsibility (boo!)
- ✓ Mainly used when you need have specific software or security requirements



A moment of Preparation – There are many database services on AWS

- You do not need to know each database service in detail!
- Please make sure you have an idea of what each one does!
- One sentence or less!

Summary will be provided at the end!



SQL Datastores (structured)



I want to lease a dedicated car with a driver (database)

01



Lease the car;
dedicated to you
24/7

02



Car has a driver

03



Responsible for
the backseat of
the car, but not
the car itself.

04



Comes in five
flavors of car

05



Each Passenger
(data) is assigned
seats



SQL Datastores – Relational Database Service or RDS



MySQL
instance



MariaDB
instance



PostgreSQL
instance



Oracle
instance



01

Managed Service for Databases



02

Transactional Processing (Think E-commerce not Reporting)



03

Hard to grow in size and performance



I want to lease a dedicated fast Luxury car with a driver (database)

01



Lease the car;
dedicated to you 24/7

02



Car has a driver

03



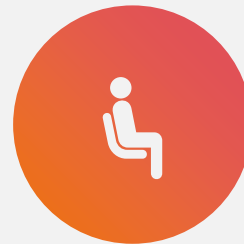
Responsible for the backseat of
the car, but not the car itself.

04



Comes in two flavors of car

05



Each Passenger (data)
is assigned seats

06



Super Fast Luxury Car!!!



SQL Datastores – Aurora (really RDS Aurora)



Amazon Aurora



MySQL instance



PostgreSQL instance



01

Managed Service for Databases



02

Cloud Native



03

Higher Capacity and Higher Performance



04

Grows more easily than the main RDS service.



I want to ride-share with a driver (database)

01



Rent the car/driver for a task

02



Car has a driver

03



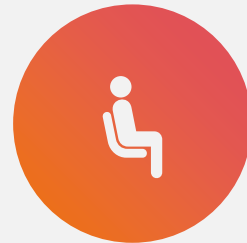
Responsible for the backseat of the car, but not the car itself.

04



Comes in two flavors of car

05



Each Passenger (data) is assigned seats

06



Just like a Ride Share Service



SQL Datastores – Aurora Serverless v2



Amazon Aurora



MySQL instance



PostgreSQL instance



01

Managed Service for Databases



02

Cloud Native



03

Higher Capacity and Higher Performance



04

Capacity can go up and down much easier than other RDS services



05

Pay a little for storage, but not compute when you are not using it



I want to lease a dedicated bus with a driver (database)

01



Lease the bus;
dedicated to you
24/7

02



Bus has a driver

03



Responsible for
the inside of the
bus, but not the
bus itself.

04



Comes one flavor

05



Each Passenger
(data) is assigned
seats



SQL Datastores – RedShift



Amazon Redshift



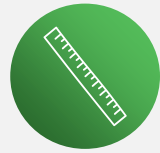
01

What if you need a data warehouse, not a transactional data store?



02

RedShift is the SQL data warehouse in AWS.



03

Petabyte scale



04

Serverless and “Server” ed versions



05

Think Reporting and not E-commerce or Web traffic



SQL Database Services - Summary



RDS is the RDBMS SQL database service in AWS



Aurora is a sub-service of RDS that supports PostgreSQL and MySQL cloud-natively



Aurora Serverless v2 is an Aurora variation, but without any VM management + Autoscaling



All of the RDS services feature encryption, replication, some type of scaling, and more



RedShift is unlike the others in that is it for reporting (OLAP)



RedShift has a serverless version and can handle Petabytes of data



NoSQL DataStores (unstructured)



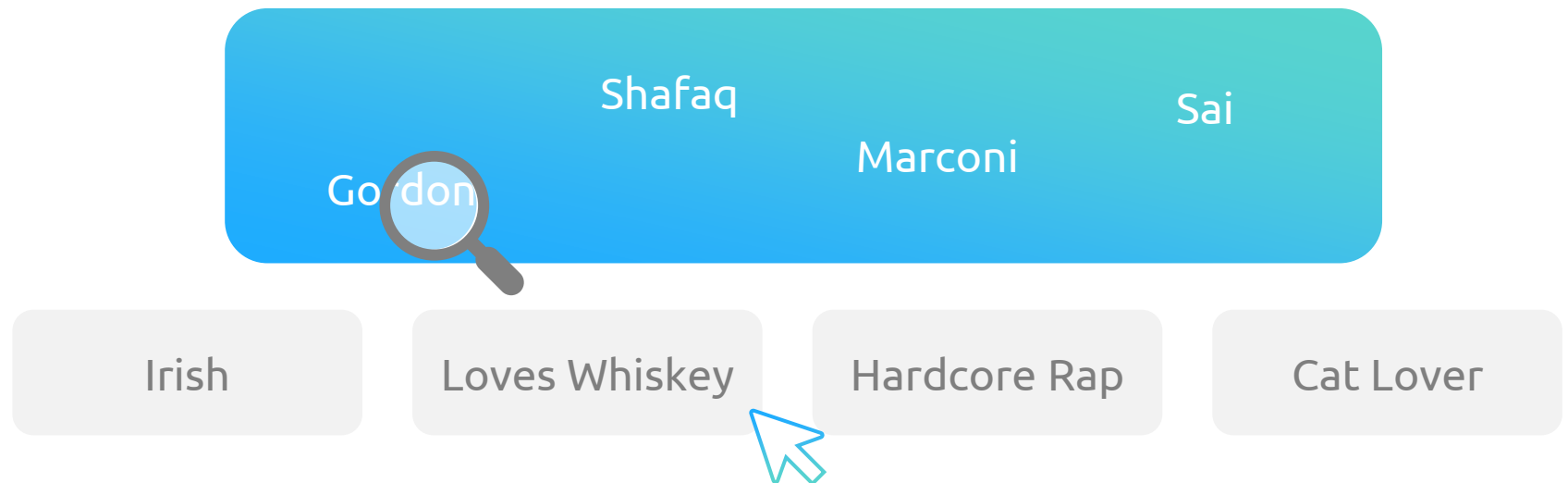
NoSQL Datastore Services - DynamoDB



Amazon DynamoDB

“The lightning-fast king of Key-Value at AWS”

I want to create blobs of data that I search for with a single keyword or phrase.

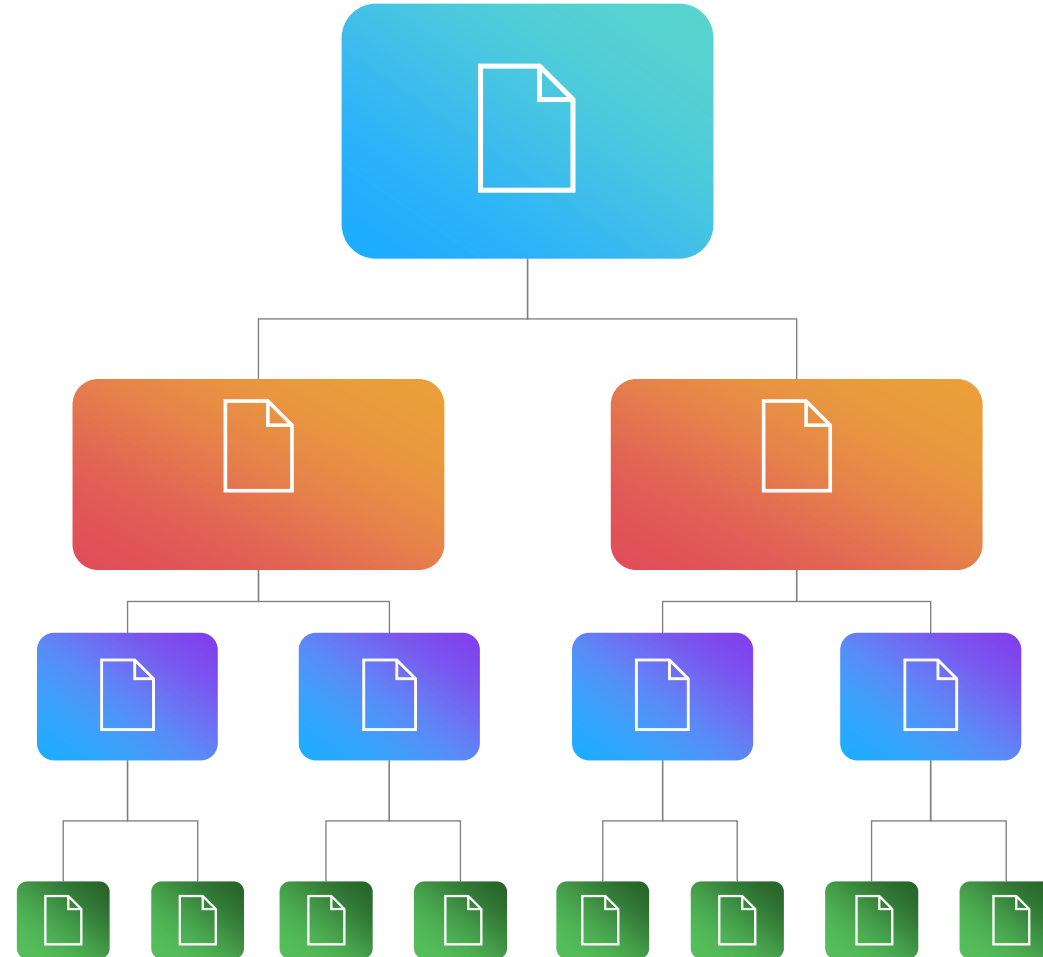


NoSQL Datastore Services – DocumentDB (with MongoDB compatibility)



Amazon DocumentDB
(with MongoDB compatibility)

I want to store data and retrieve documents like essays, profiles, and more that are more like collections of data.



NoSQL Datastore Services – Keyspaces (Cassandra Compatibility)



Amazon Keyspaces
(for Apache Cassandra)

I need a database that I can run in many different locations across the planet, and I need large-scale unstructured data that has more structure to it.

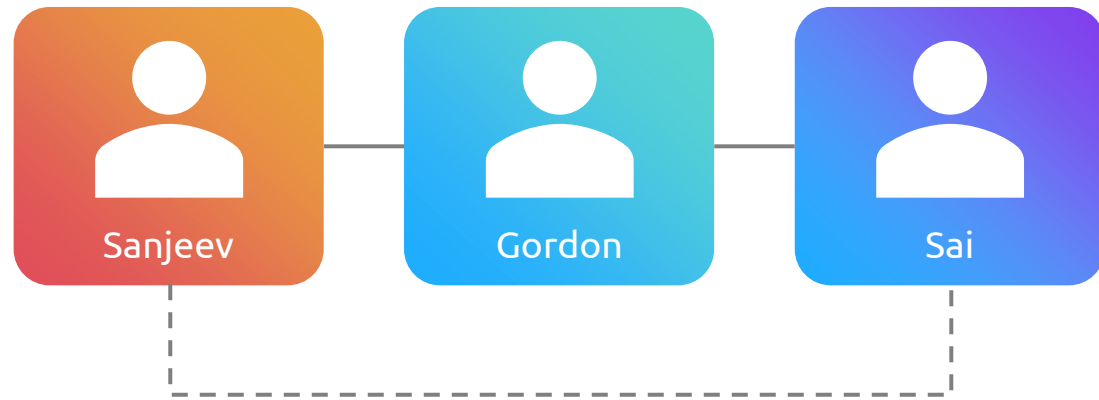


NoSQL Datastore Services – Neptune



Amazon Neptune

I need a database that will detect relationships between data like fraud detection or social network relationships.



NoSQL Datastore Services – ElastiCache



Amazon ElastiCache

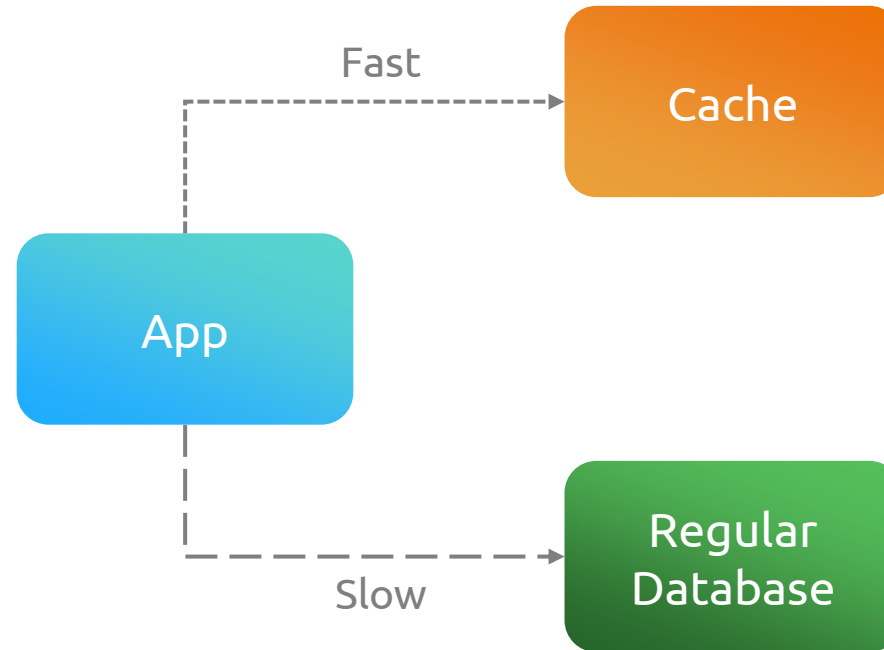


ElastiCache for Memcached



ElastiCache for Redis

I need to store data in a location that is faster than my regular database or I need to store a user's cart or session data.



NoSQL Datastore Services – OpenSearch Service (Formerly Elasticsearch)



Amazon OpenSearch
Service

I want to search through a bunch of information like a google search that give me relevant or related results.

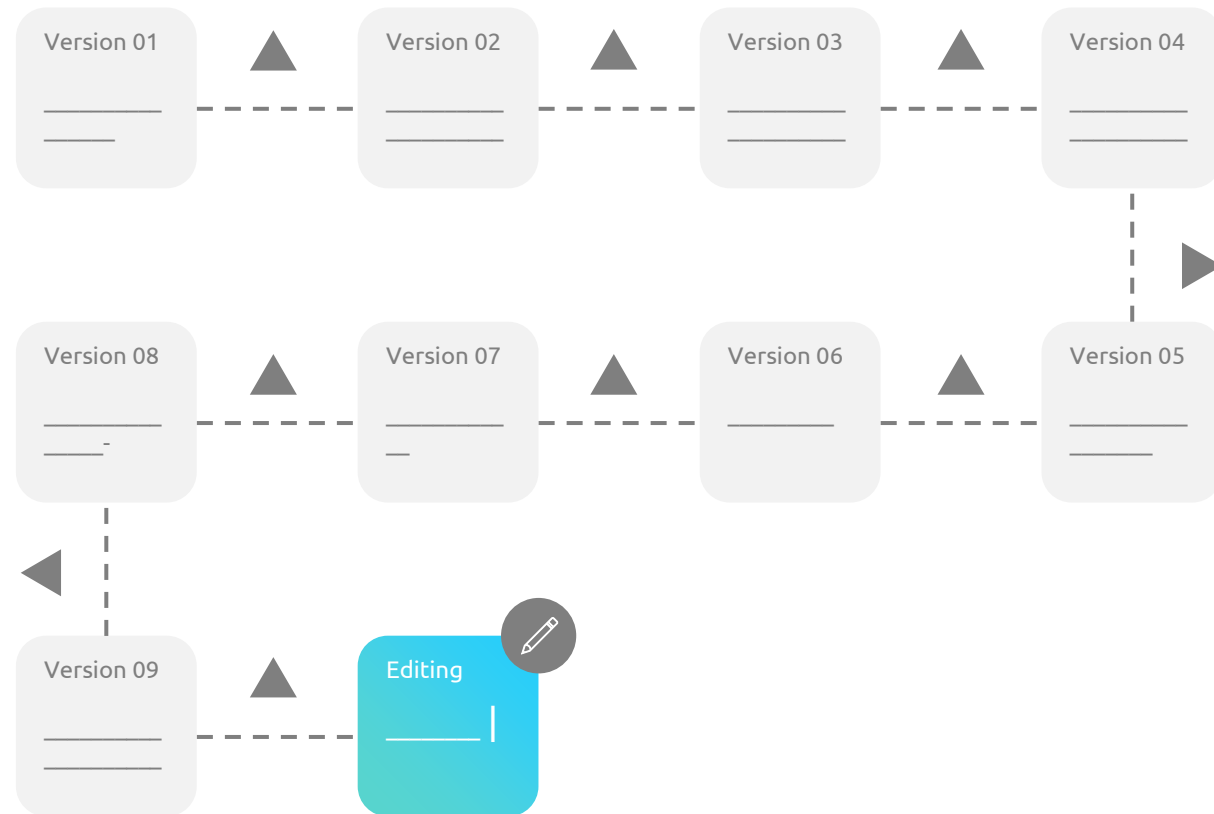
A screenshot of a search interface with a light blue background. At the top, a search bar contains the text 'Ava' and a magnifying glass icon. Below the search bar, there are five white rectangular boxes, each containing a search result. The results are: 'Avatar', 'Avatar 2', 'Avatar 3', 'Availability Zones', and 'Availability'. Each result box has a solid top line and a dashed bottom line, suggesting a list of items or a scrollable view.

NoSQL Datastore Services – Amazon Quantum Ledger Database (QLDB)



Amazon Quantum Ledger Database (Amazon QLDB)

I want a database with an immutable record of every change in the database.



NoSQL Datastore Services – Timestream

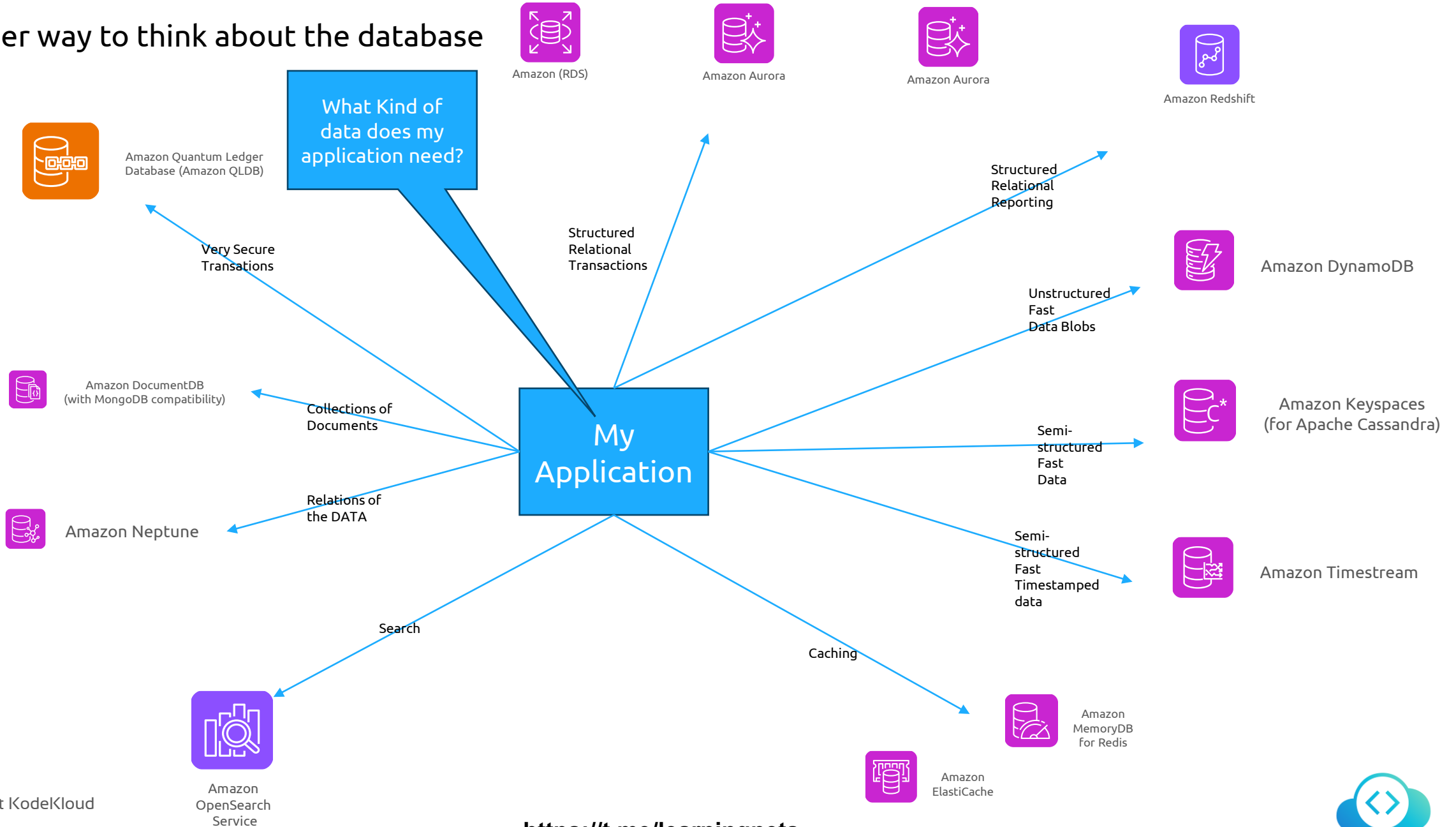


Amazon Timestream

I need a database that captures data from various sources at high scale and maintains the timestamp.



Another way to think about the database



Another way to think about the database

My Applications

What Kind of data does my application need?

Structured
Relational
Transactions



Amazon (RDS)



Amazon Aurora

Structured
Relational Reporting



Amazon Redshift

Unstructured Fast
Data Blobs



Amazon DynamoDB

Semi-structured
Fast Data



Amazon Keyspaces
(for Apache Cassandra)

Semi-structured
Fast Timestamped
data



Amazon Timestream

Caching



Amazon
ElastiCache



Amazon
MemoryDB for
Redis

Search



Amazon OpenSearch
Service

Relationships of the
Data



Amazon Neptune

Collections of
Documents



Amazon DocumentDB
(with MongoDB compatibility)

Very Secure
Transactions



Amazon Quantum Ledger
Database (Amazon QLDB)



Structured
Relational
Transactions



Amazon (RDS)



Amazon Aurora

Structured
Relational Reporting



Amazon Redshift

Unstructured Fast
Data Blobs



Amazon DynamoDB

Semi-structured
Fast Data



Amazon Keyspaces
(for Apache Cassandra)

Semi-structured
Fast Timestamped
data



Amazon Timestream

Caching



Amazon
ElastiCache



Amazon
MemoryDB for
Redis

Search



Amazon OpenSearch
Service

Relations of the
DATA



Amazon Neptune

Collections of
Documents



Amazon DocumentDB
(with MongoDB compatibility)

Very Secure
Transactions



Amazon Quantum Ledger
Database (Amazon QLDB)



Database Service - Summary



Self-Managed is an option if you need management and control



RDS and RedShift are the primary SQL database systems



RDS has five engines it supports: Oracle, MySQL, MariaDB, MS SQL, and PostgreSQL



DynamoDB, DocumentDB, and others are NoSQL services that are fully managed



Make sure you look at the previous slide for use cases for each service

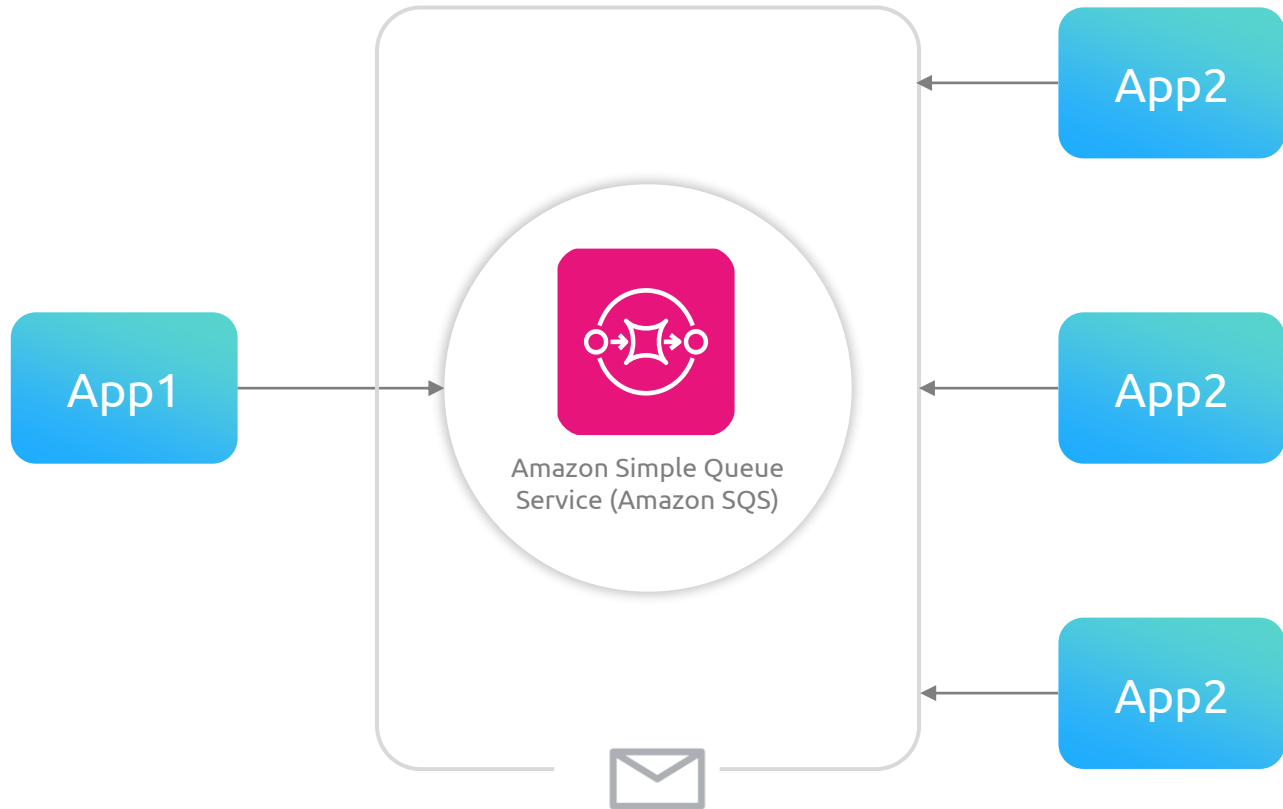


Core AWS Services: Application Integration


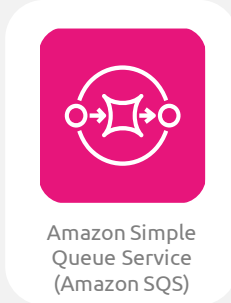

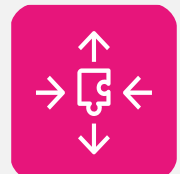


Application Integration – What do we mean?

App to App



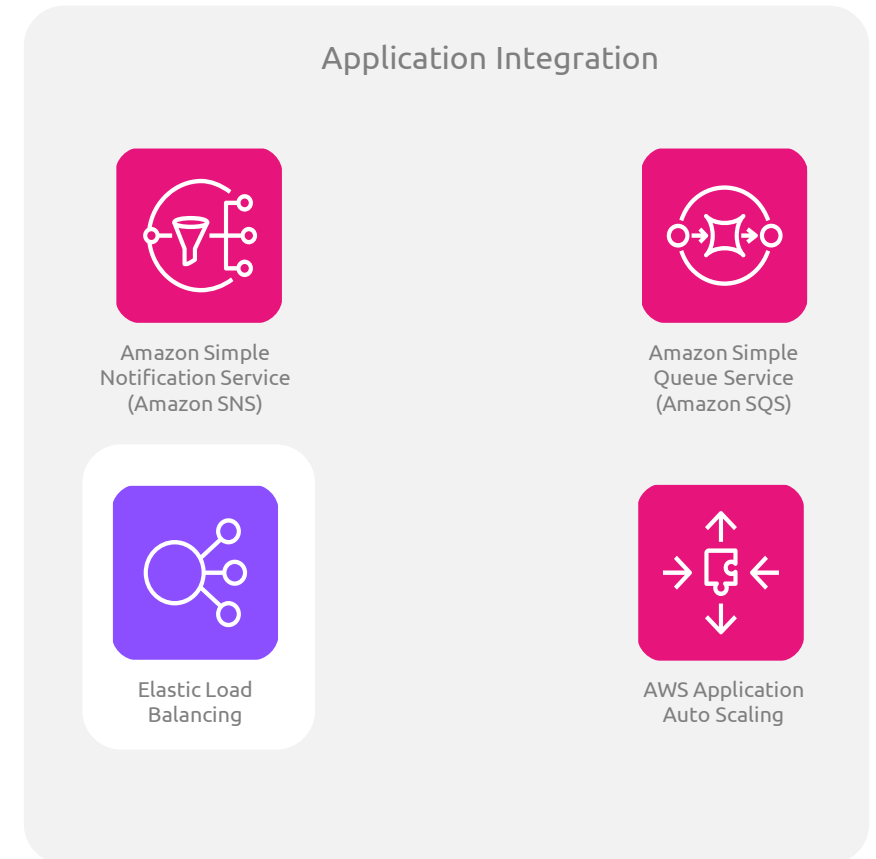
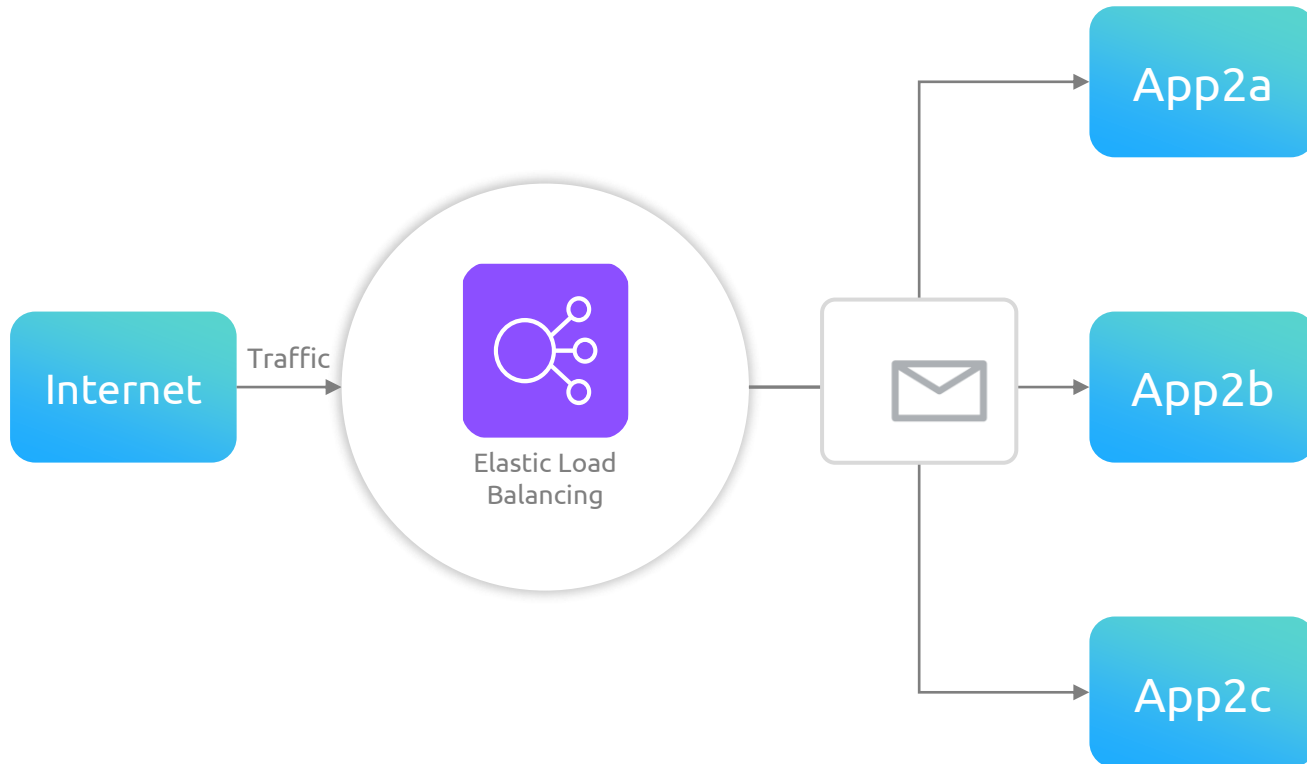
Application Integration

- 
Amazon Simple Notification Service (Amazon SNS)
- 
Amazon Simple Queue Service (Amazon SQS)
- 
Elastic Load Balancing
- 
AWS Application Auto Scaling



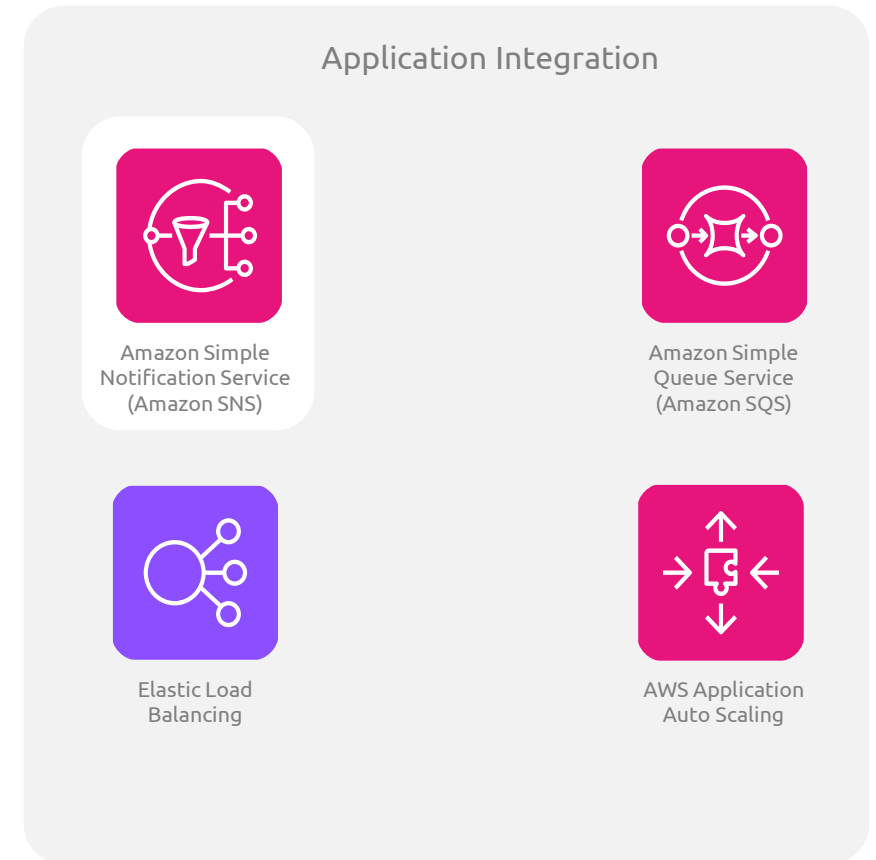
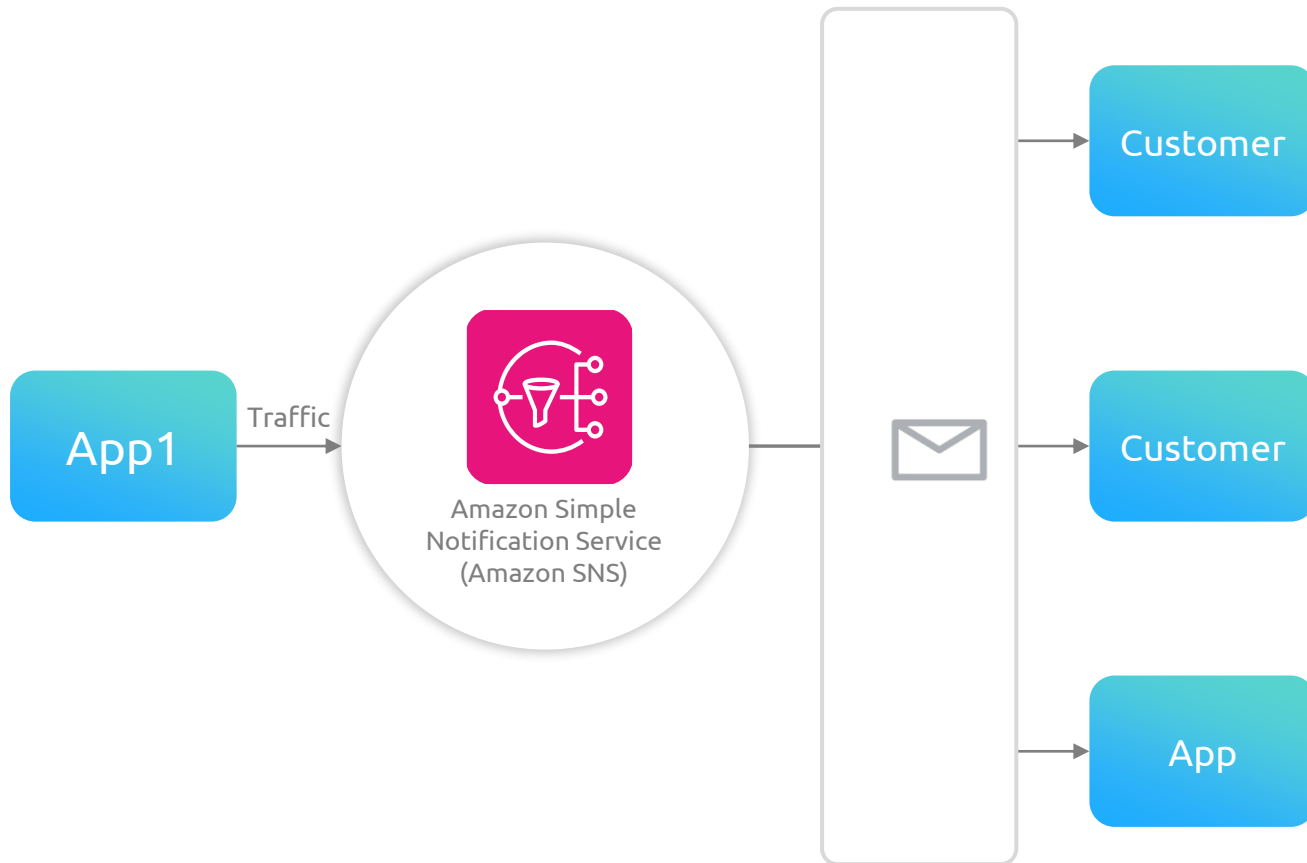
Application Integration – What do we mean?

Internet to App

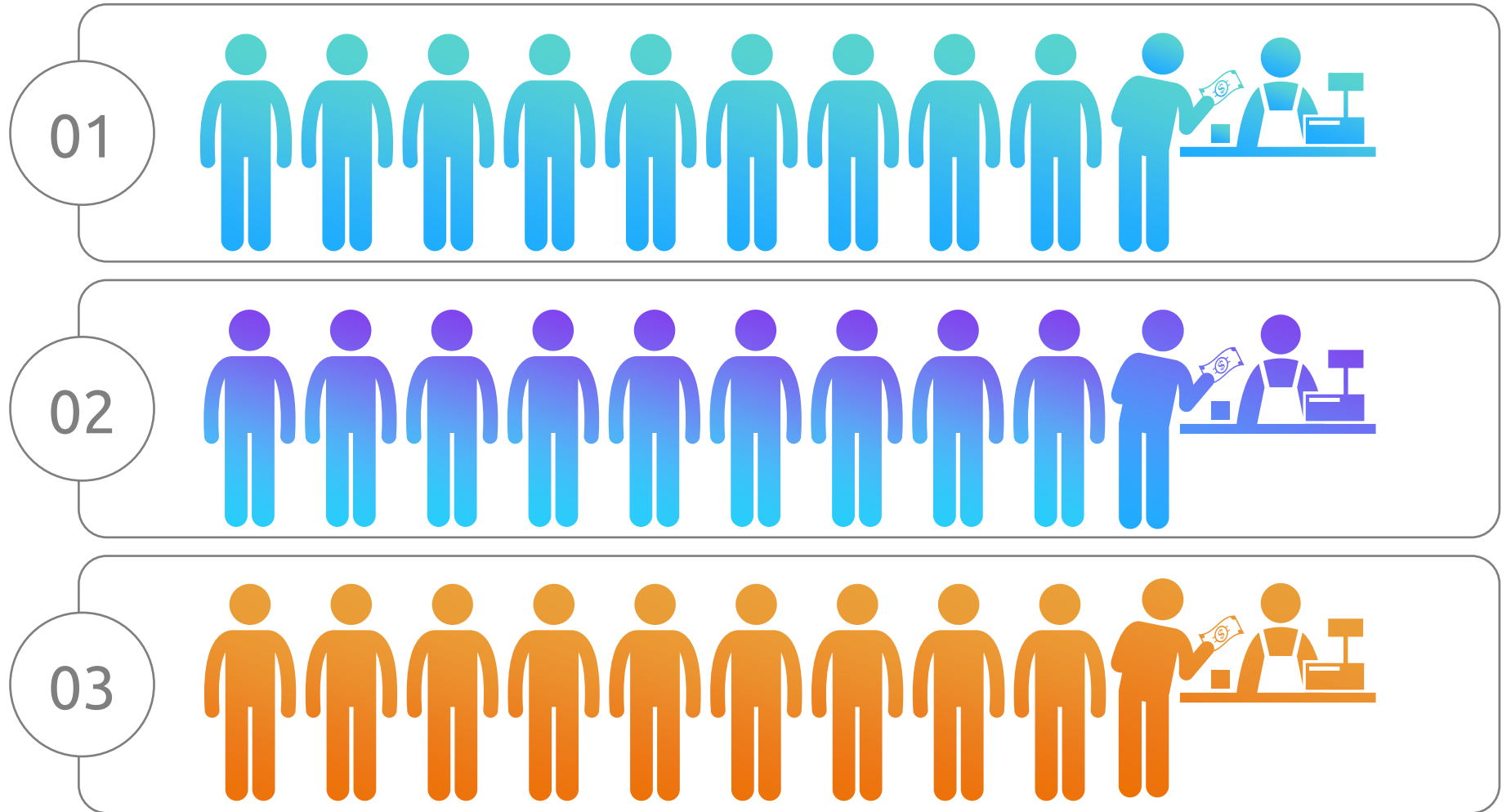


Application Integration – What do we mean?

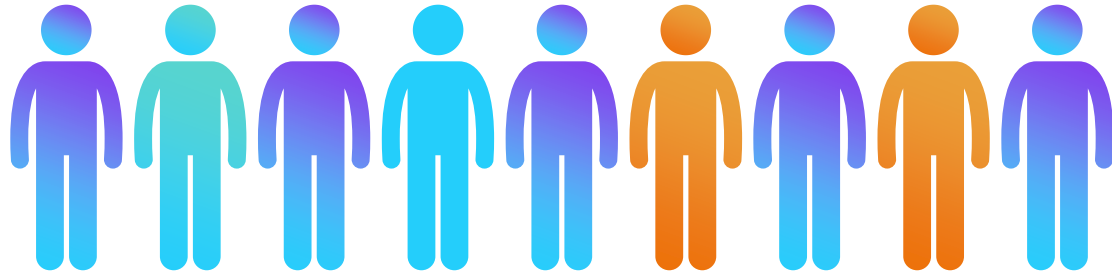
App to Customer/App



Application Integration – Managing Flow



Application Integration – Amazon Simple Notification Service



01



Drinks

02



Main Meal

03



Sides

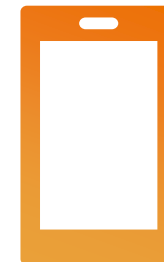
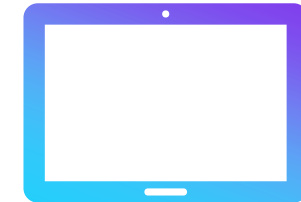
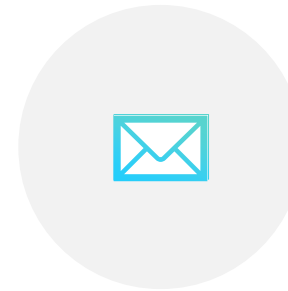


Application Integration – Amazon Simple Notification Service

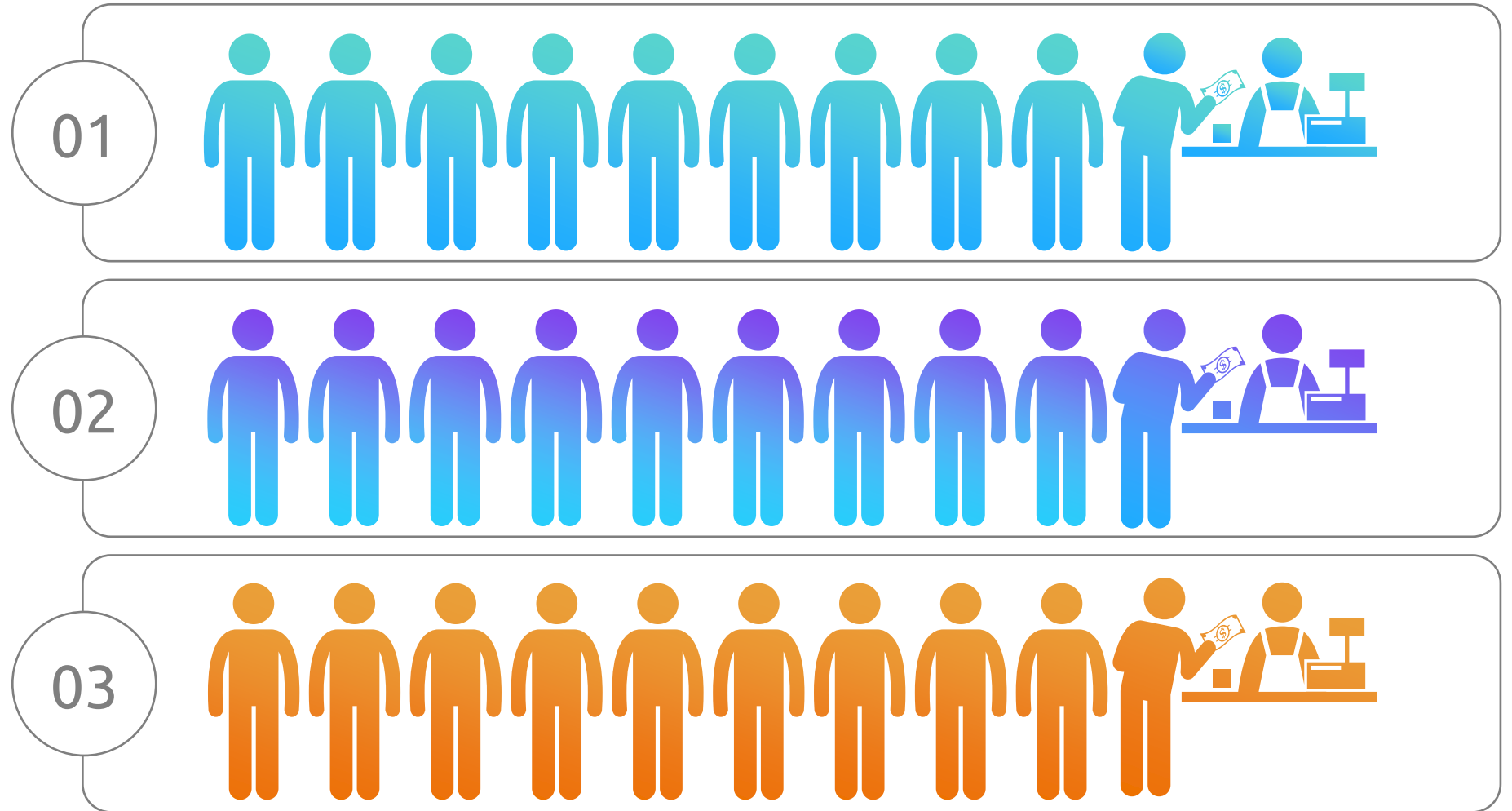


Amazon Simple Notification Service (Amazon SNS)

SNS is used when you want an application to send messages to customers via text, email, or mobile push OR when you want to copy a single message to multiple applications



Application Integration – Amazon Simple Queue Service

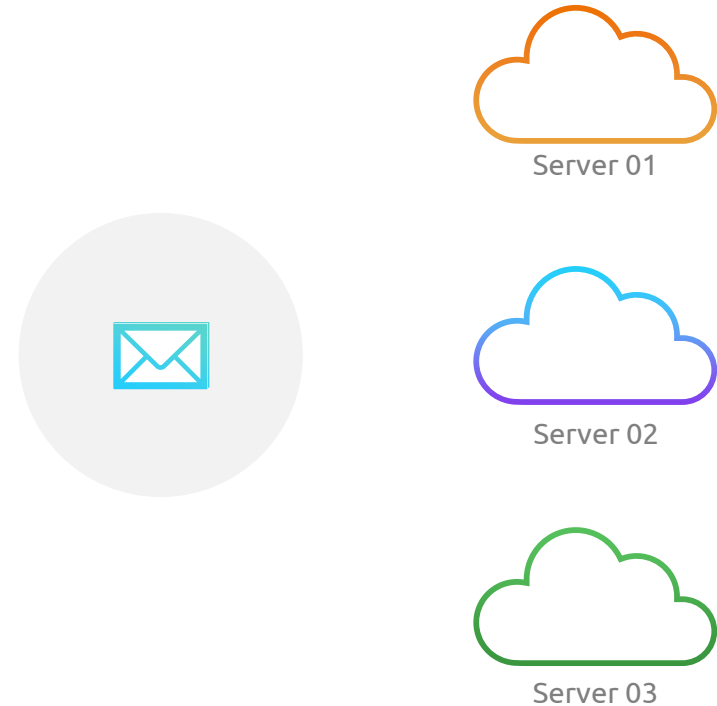


Application Integration – Amazon Simple Queue Service

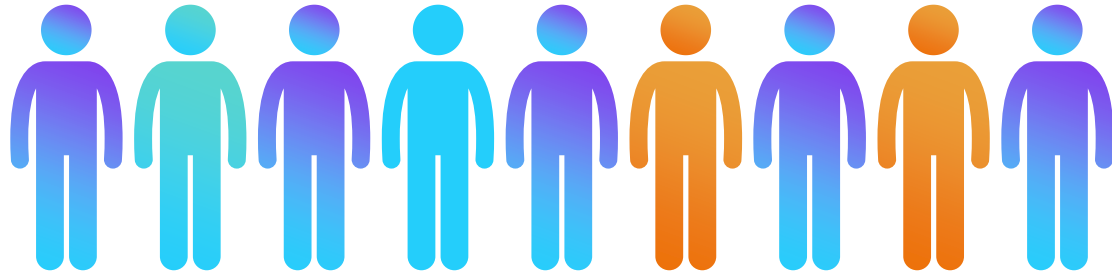


Amazon Simple Queue Service
(Amazon SQS)

- SQS is used when you want to send a message to another application, but there is a chance that a sudden increase in user traffic could generate a large amount of message
- The orders will just queue until your backend can process them.



Application Integration – Amazon Elastic Load Balancing



01



Drinks

02



Main Meal

03

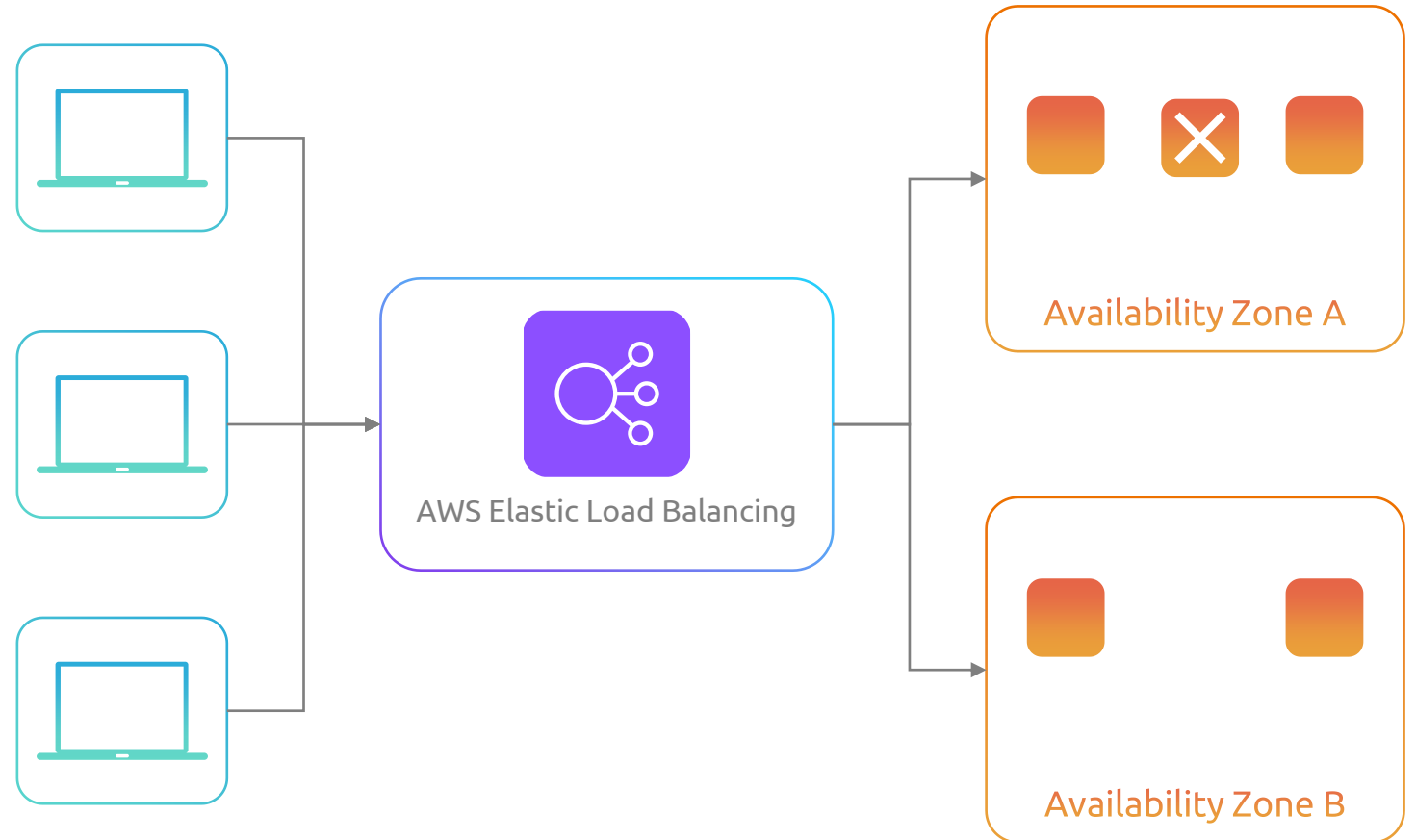


Sides

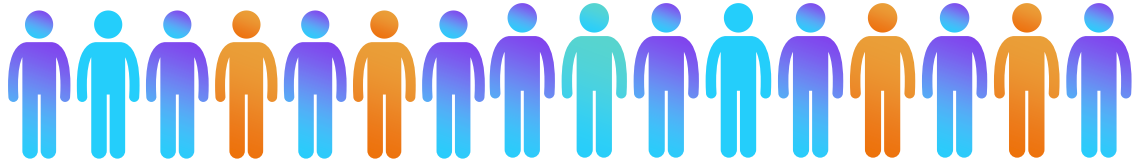



Application Integration – Elastic Load Balancing


- Used to direct traffic to backend servers
- Distributes workloads across servers
- Unhealthy servers are not available if failing
- Can be used with EC2, ECS, EKS, and Lambda along with others




Application Integration – Amazon Autoscaling





01  Drinks

04  Drinks

02  Main Meal

05  Main Meal

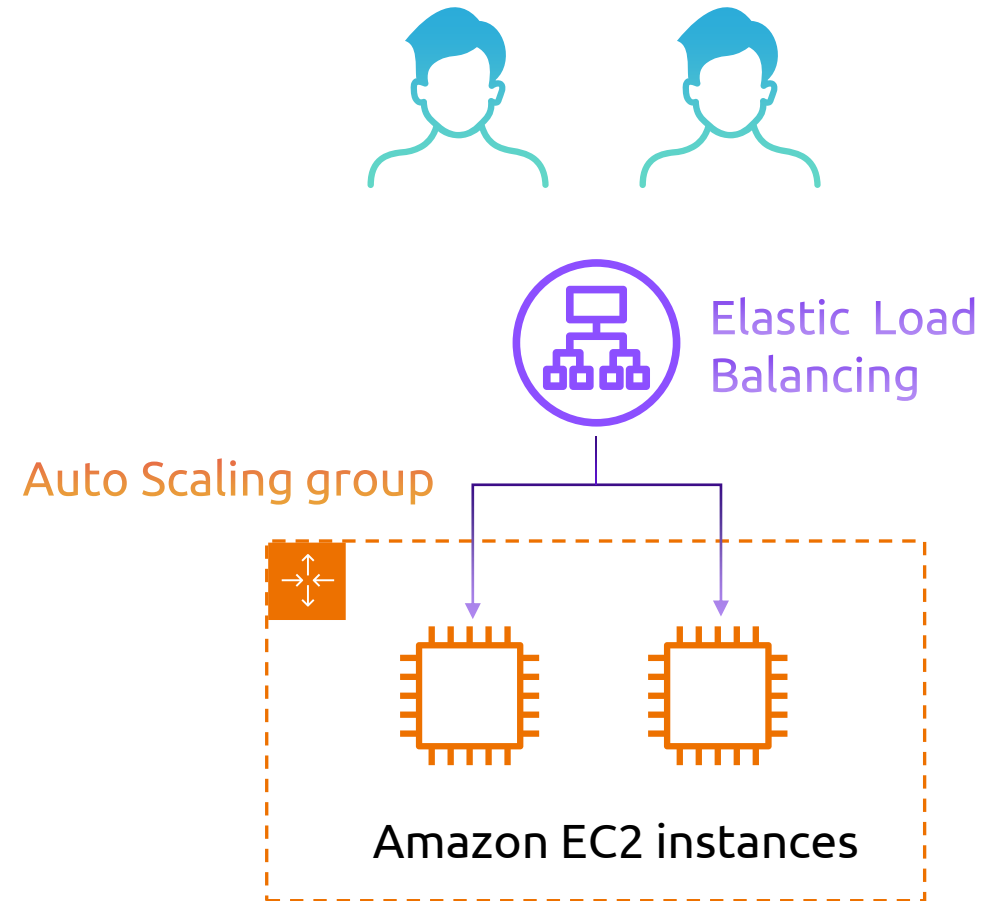
03  Sides

06  Sides



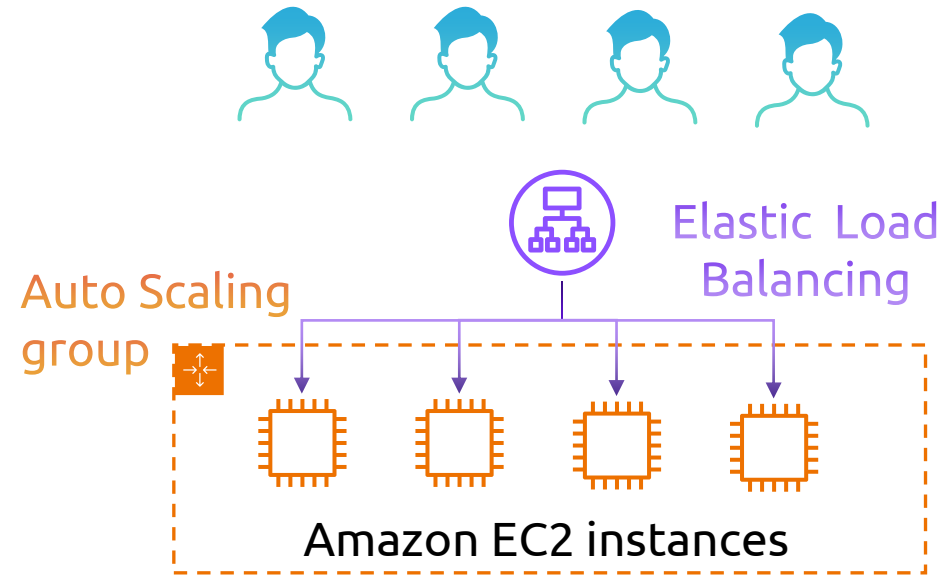
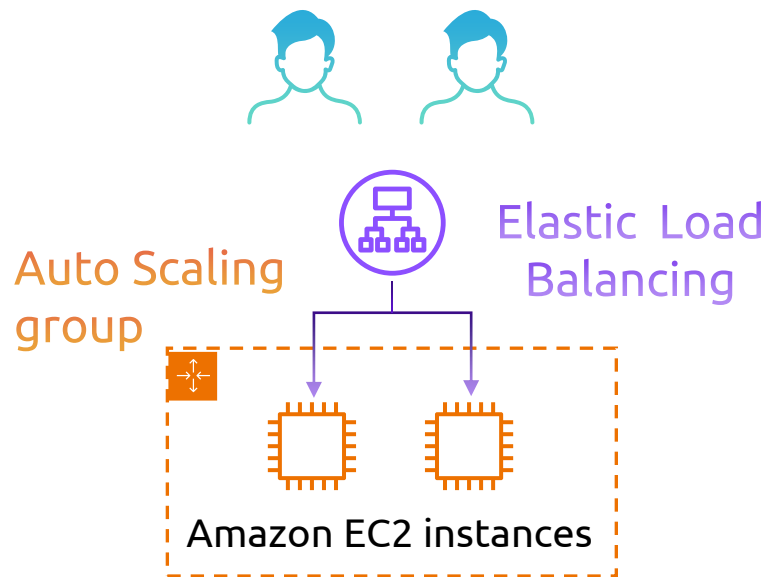
Application Integration – Amazon Autoscaling

- Many applications have Autoscaling like DynamoDB and EC2
- Allows for scale up and down to numbers you specify
- Like 2 instances minimum and 4 instances maximum (shown below)
- Scale as you need to within your limits



Application Integration – Amazon Autoscaling

- Many applications have Autoscaling like DynamoDB and EC2
- Allows for scale up and down to numbers you specify
- Like 2 instances minimum and 4 instances maximum (shown below)
- Scale as you need to within your limits



Application Integration – Other services

There are many other services that don't need deep coverage



Amazon AppFlow

Solves the problem of copying data from 3rd parties like Salesforce into AWS.



Amazon EventBridge

Acts like a post office for coordinating events across applications



Amazon MQ

Managed Queue is exactly like SQS, but using open-source software instead of AWS proprietary



Amazon Step Functions

Solves the problem of how do I organize my serverless functions so they can work like a full application



Application Integration – Summary



Simple Notification Service duplicates multiple messages to many different sources like email, text, other applications, etc



Simple Queue system is built to receive messages and hold them for processing



Elastic Load Balancing is a network traffic distributor



Autoscaling handles add and removing capacity whether servers or read/write units



A variety of other services will be covered in the practice exams

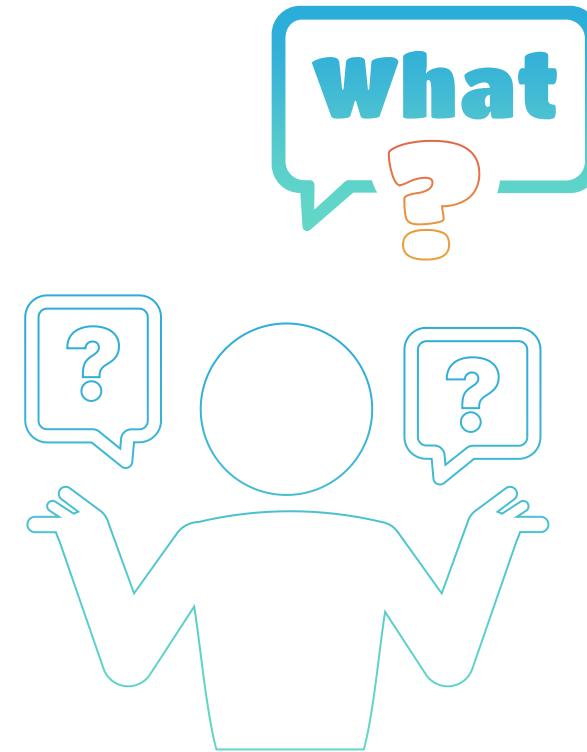


Core AWS Services: Management



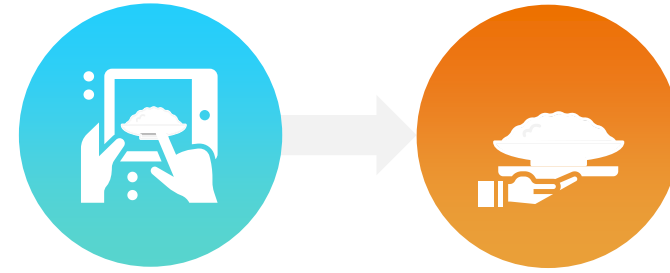
Management Services – What do we mean?

- These are services that help manage other services.
- These services either provision other AWS services or optimize other AWS services.
- There are many of these, so you need to just learn the one-liner on each page.

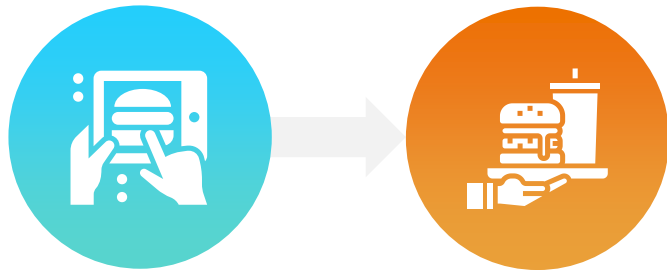


Management Services – How do we create AWS Services

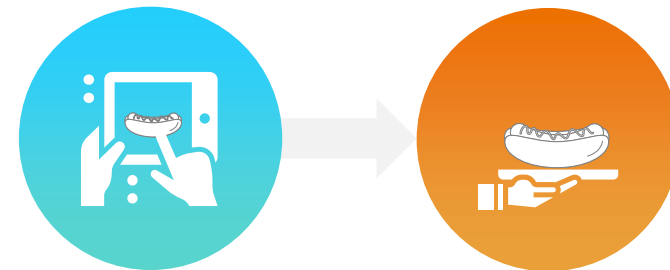
- Imagine you want to create AWS services... but you need 1000 of them.
- What if you could write them into a file like a food order



Plates of Basmati Rice



cheeseburgers



hot dogs



Management Services – CloudFormation

CloudFormation creates other services using files



Amazon Cloud Formation

01



Amazon Dynamo DB

02



Amazon EC2

03



Amazon SNS

04



AWS CodePipeline

05



Amazon VPC

06



Amazon S3

07



Amazon RDS

08



Amazon API Gateway

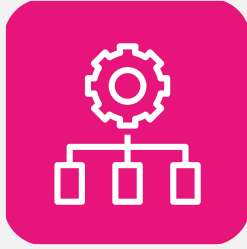


Management Services – How do we create AWS Services and install software on them?

- So, what if you need specific applications like a web server, an application server, and a database?
- What if you need to install SPECIFIC software like Nginx webserver, a Java server, and a specific database like Microsoft's SQL server?



Management Services – OpsWorks



AWS OpsWorks

OpsWorks solves the problem of installing specific software into your servers.



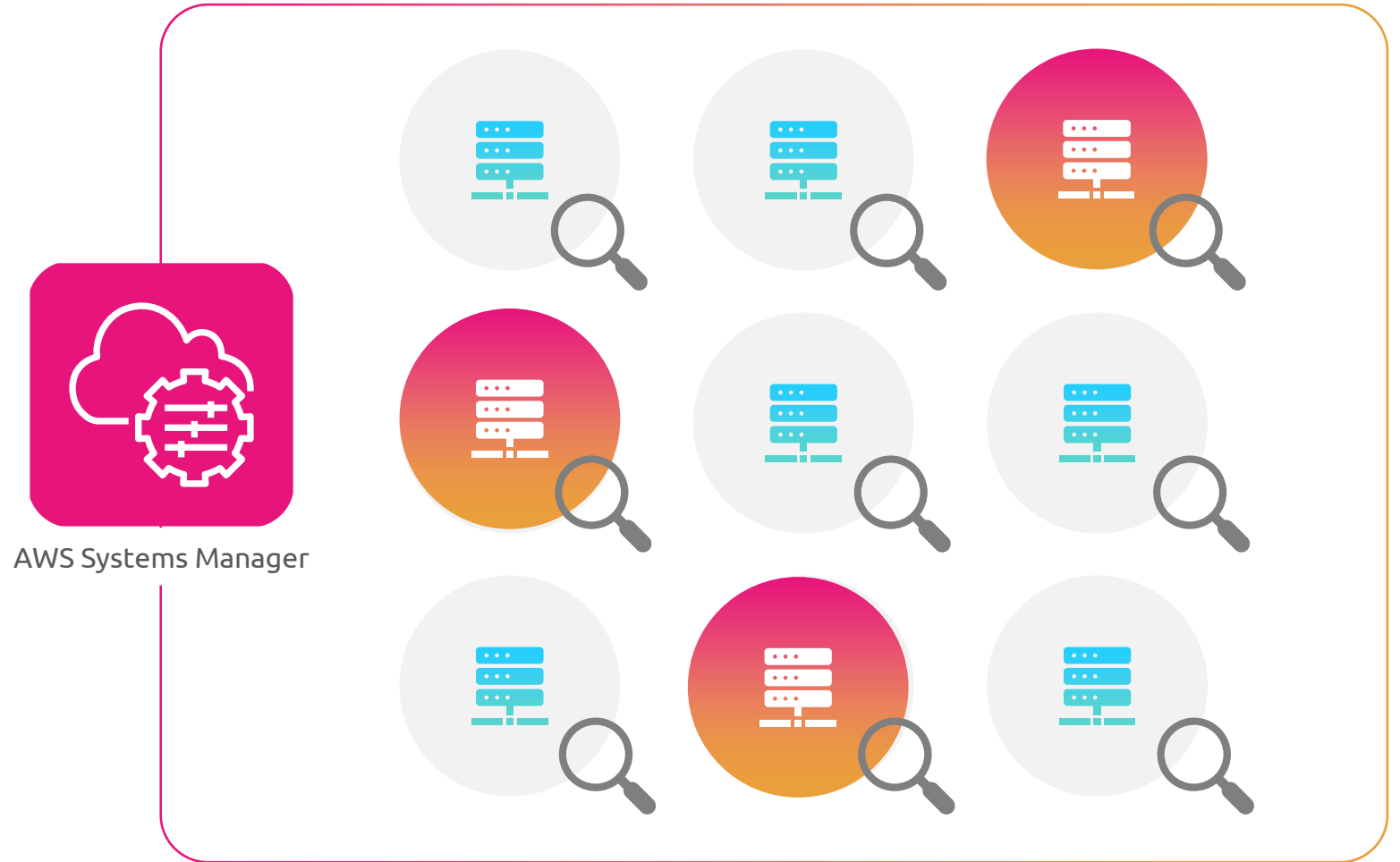
Management Services – How do I manage all of these servers and all these services?

- How do you patch all of your virtual machines whether they are on *AWS* or in your Data center?
- What if you need an inventory of all your services, servers, and applications installed on them?



Management Services – Systems Manager

AWS Systems Manager is a secure end-to-end management solution for resources (services) on AWS and on-premise environments.



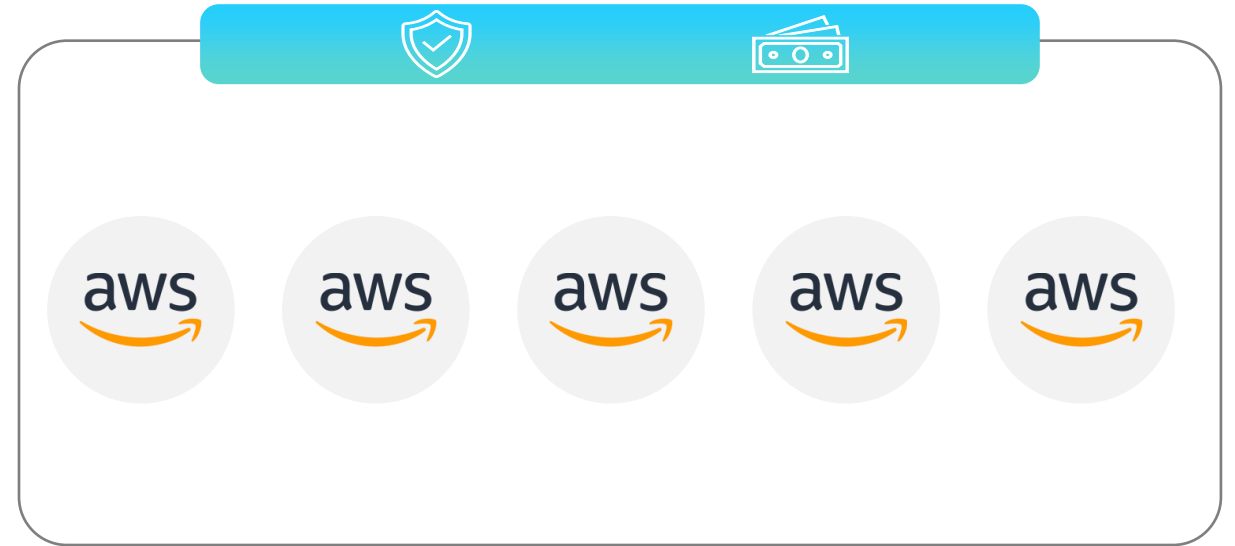
Management Services – How do I manage all of my AWS accounts as if they are one account?

- What if you have 100s of AWS accounts?
- How do you pay the bills of all of them as one company?
- How do you make sure that Security and Governance is happening across all these accounts?

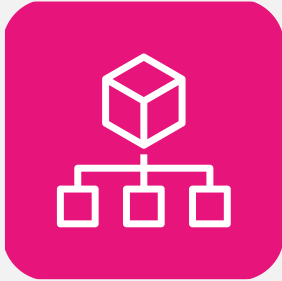


Management Services – How do I manage all of my AWS accounts as if they are one account?

- What if you have 100s of AWS accounts?
- How do you pay the bills of all of them as one company?
- How do you make sure that Security and Governance is happening across all these accounts?



Management Services – AWS Organizations

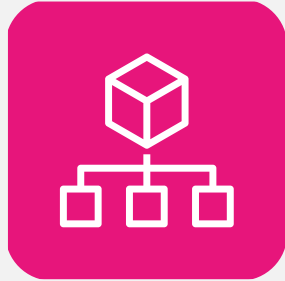


AWS Organizations

AWS Organizations is used to centrally govern and manage multiple AWS accounts.

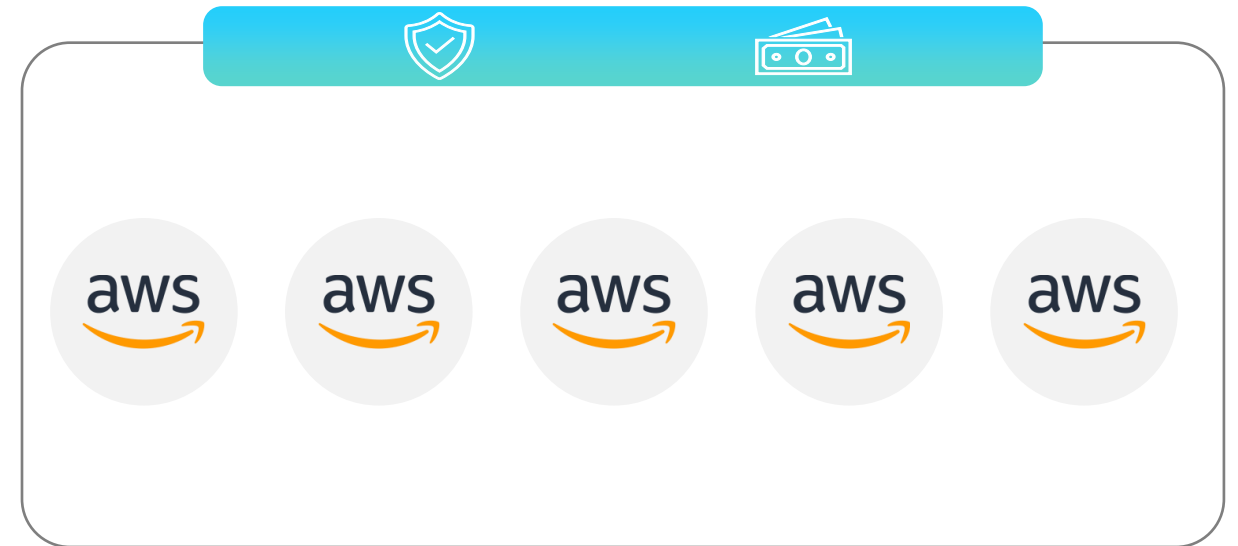


Management Services – AWS Organizations



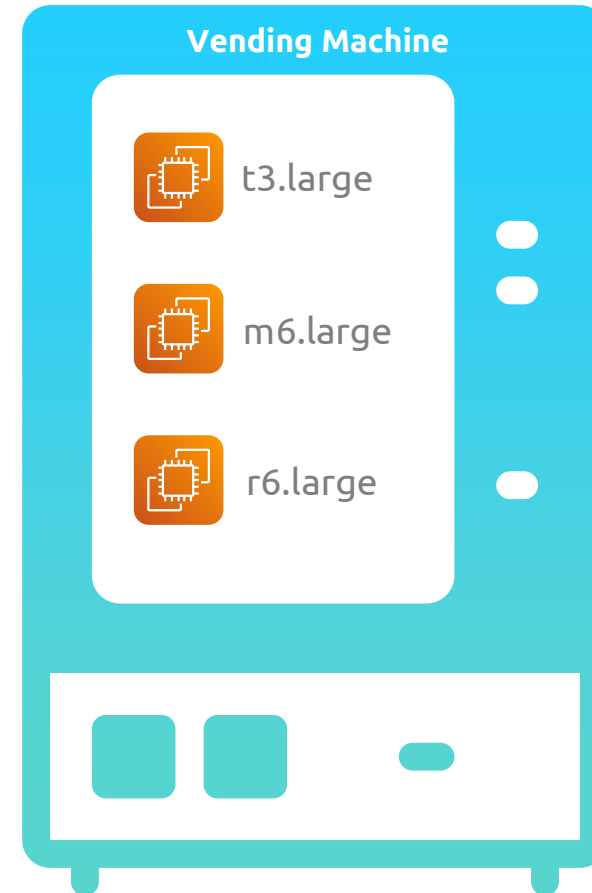
AWS Organizations

AWS Organizations is used to centrally govern and manage multiple AWS accounts.



Management Services – How do I offer my AWS services to my employees like AWS was a vending machine!?

- What if you only want employees to use certain services, but you want them to order them themselves?
- How do you make it so employees can order what they want, but within your company guidelines?



Management Services – Service Catalog



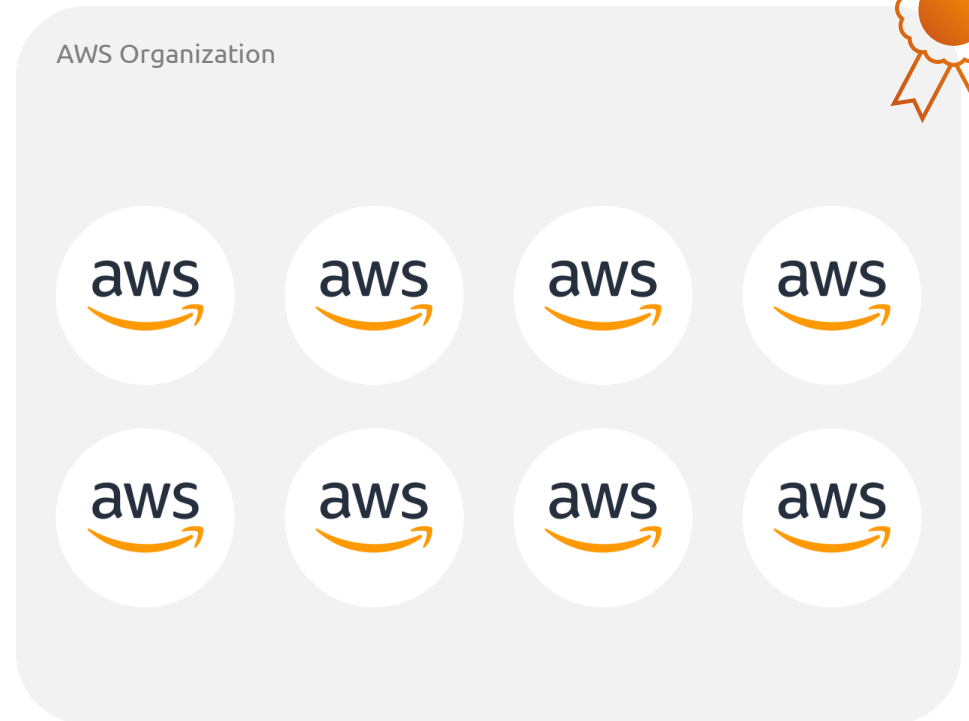
AWS Service Catalog

AWS Service Catalog allows you to take your CloudFormation and Terraform creation templates and turn them into a vending machine for your users on AWS.



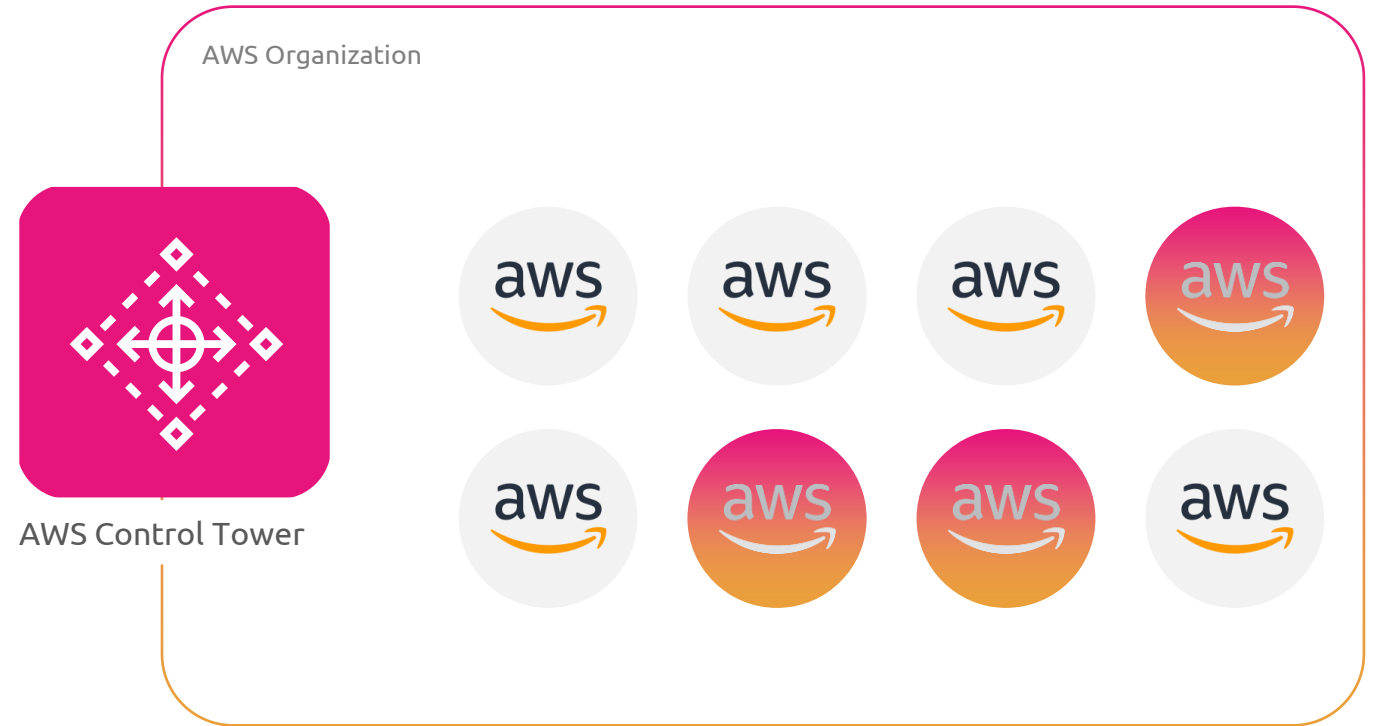
Management Services – How do I manage multiple accounts using Organizations in a Best Practice way?

- What if you want to use AWS Organizations the best way possible to manage multiple accounts?
- But you are new to AWS and want to set it up the best way that AWS recommends.



Management Services – AWS Control Tower

AWS Control Tower is a service that helps you set up AWS Organizations in a secure best practice way, with auditing, logging, and compliance rules in place.

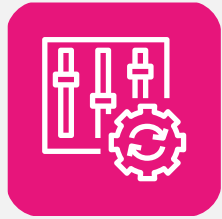


Management Services – How do I manage and audit my accounts for malicious activity and track changes?

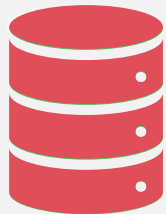
- What if you need to see who logged in as the Root User and deleted all of your non-production services?
- What if you want to make sure no one opens up any firewalls to the Internet causing a security breach?



Management Services – AWS Config and AWS CloudTrail



AWS Config is used to record and evaluate all configuration changes in your AWS services



AWS CloudTrail is a service that tracks and records all user and API activity in your AWS account



Management Services – A few other services of note



Launch Wizard

What if you needed a guide for installing non-AWS apps like SAP?



Trusted Advisor

A best practice advisor tells you when you are NOT following best practices



License Manager

Allows you to track your licenses in AWS (from other companies)



Resource Explorer

Allows you to search and discover your resources on AWS



Computer Optimizer

Tells you when you are being inefficient in AWS with Compute.



Resource Group and Tag Editor

A way to group, tag, and manage your services



Management – Summary



Many Management Services used to manage AWS services



CloudFormation and OpsWorks are used to create AWS service objects, while Systems Manager is configuration



Organizations and Control Tower are all about multi-account management and setup



AWS Config and AWS CloudTrail are configuration tracking and API tracking



Other management services also exist, but these are the main ones



Core AWS Services Migration Services



Migration and Transfer on AWS – Overview

01

AWS Cloud Adoption
Framework and Migration Hub

03

- Snow Family (snowball)
- Transfer Family (sftp)

02

Six Common Strategies for
Migration

04

- Application Discovery Service
- Application Migration Service
- Database Migration Service
- Elastic Disaster Recovery Service (formerly CloudEndure)
- Mainframe Modernization



Migration and Transfer on AWS – The Cloud Adoption Framework

01 | Business



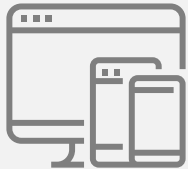
02 | People



03 | Governance



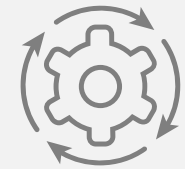
04 | Platform



05 | Security



06 | Operations



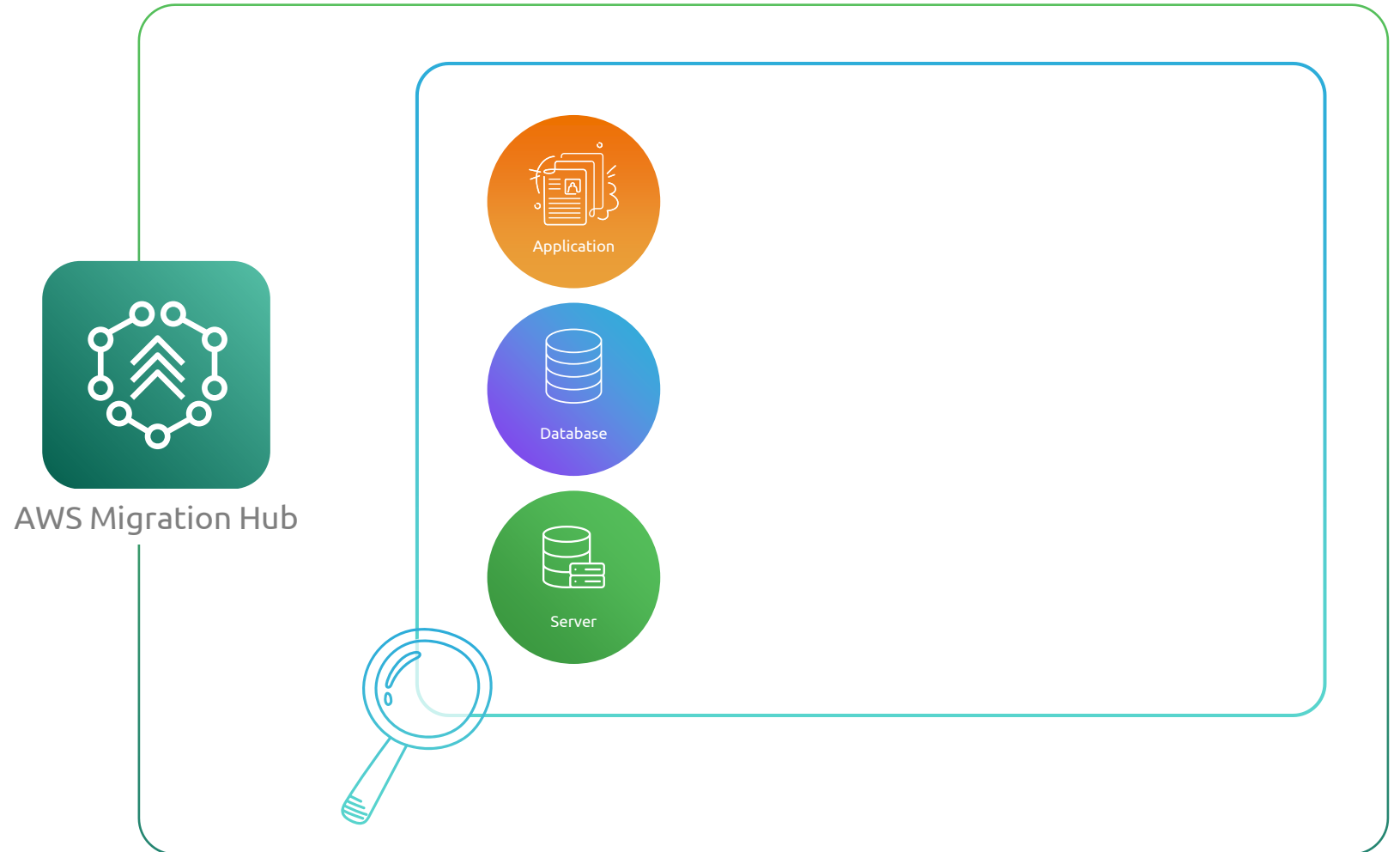
Migration and Transfer on AWS – Tracking your Migrations!

- What if you needed to track all the migrations you had going on at once?
- Application? Database? Datacenter? How do you see it all in one place?



Migration and Transfer on AWS – AWS Migration Hub (service)

Migration Hub allows you to centralize and see all migration you have in place via AWS services.



Migration Strategies – What method would you use to migrate?

- AWS has six methods or patterns for migration
- Which one you use depends on your business, time, money, effort, or other factors important to your business



Migration Strategies – Rehosting (Lift-and-Shift)



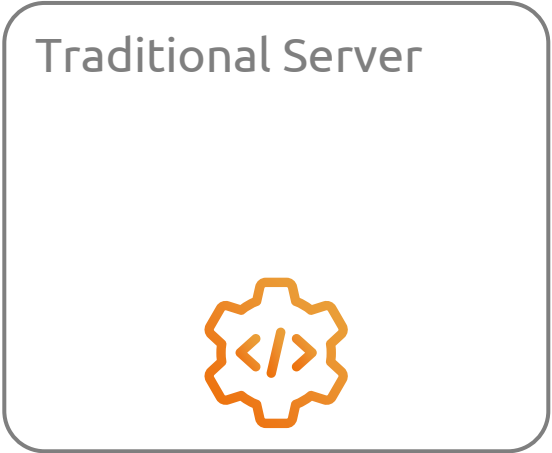
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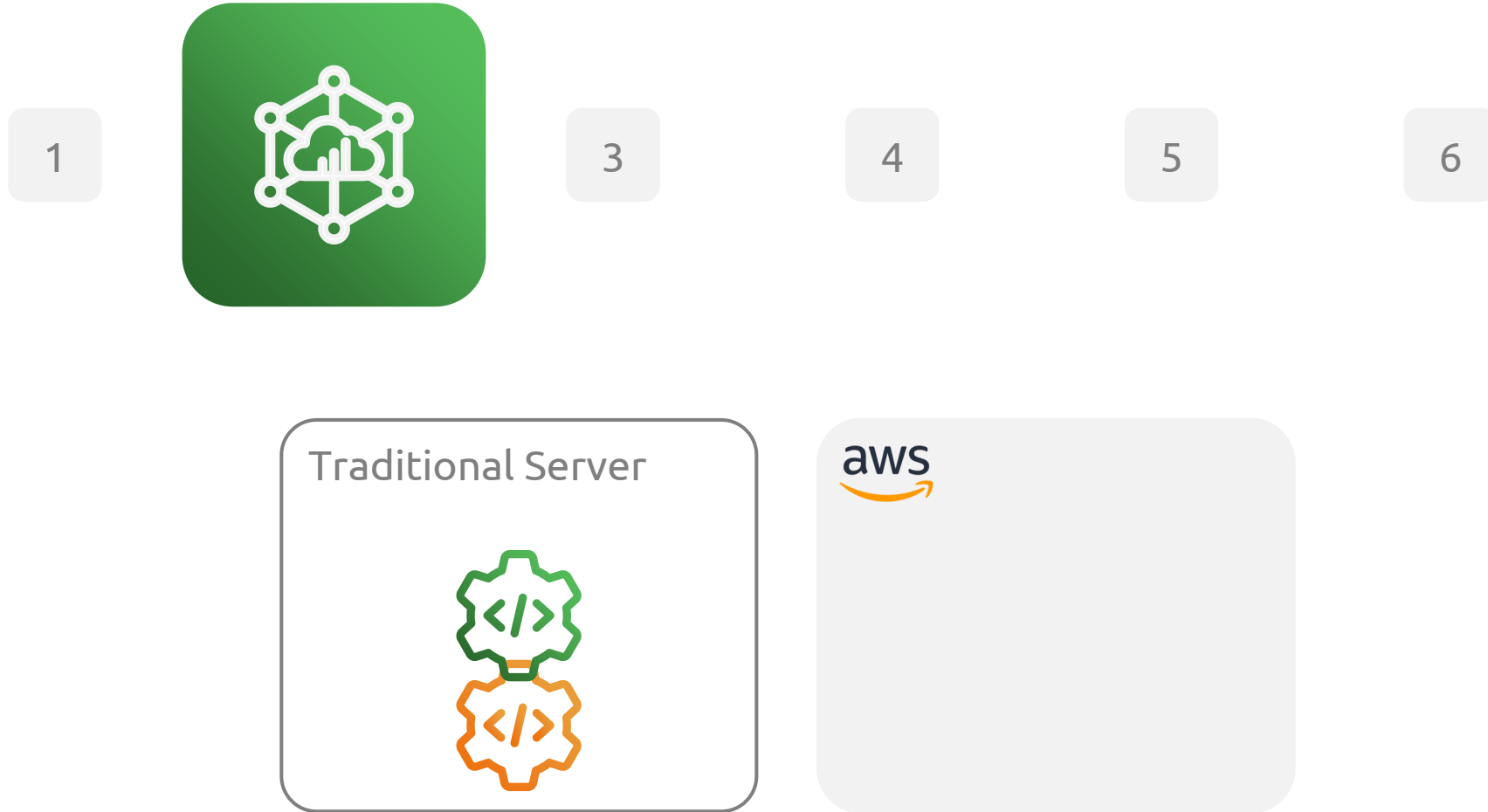
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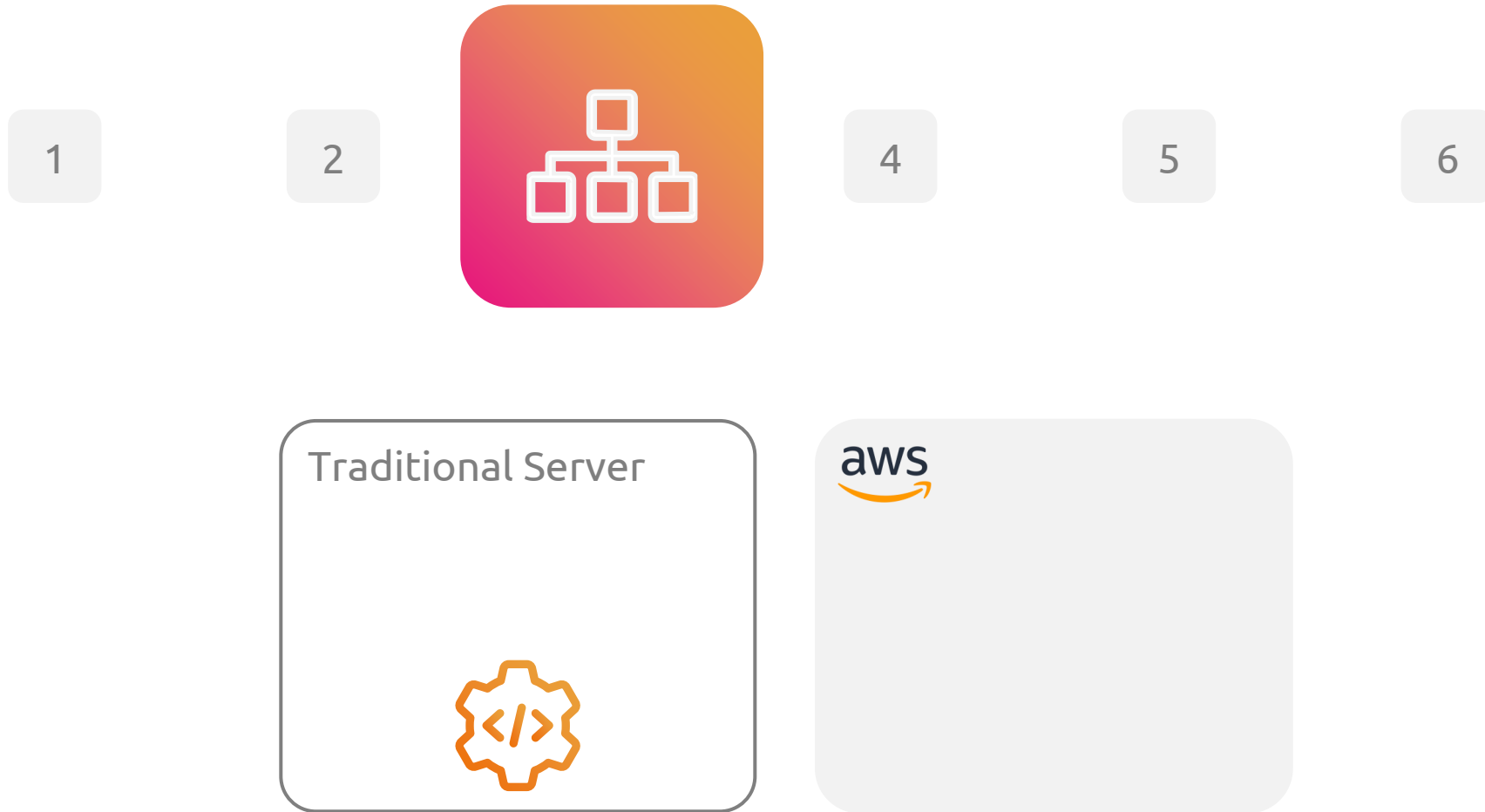
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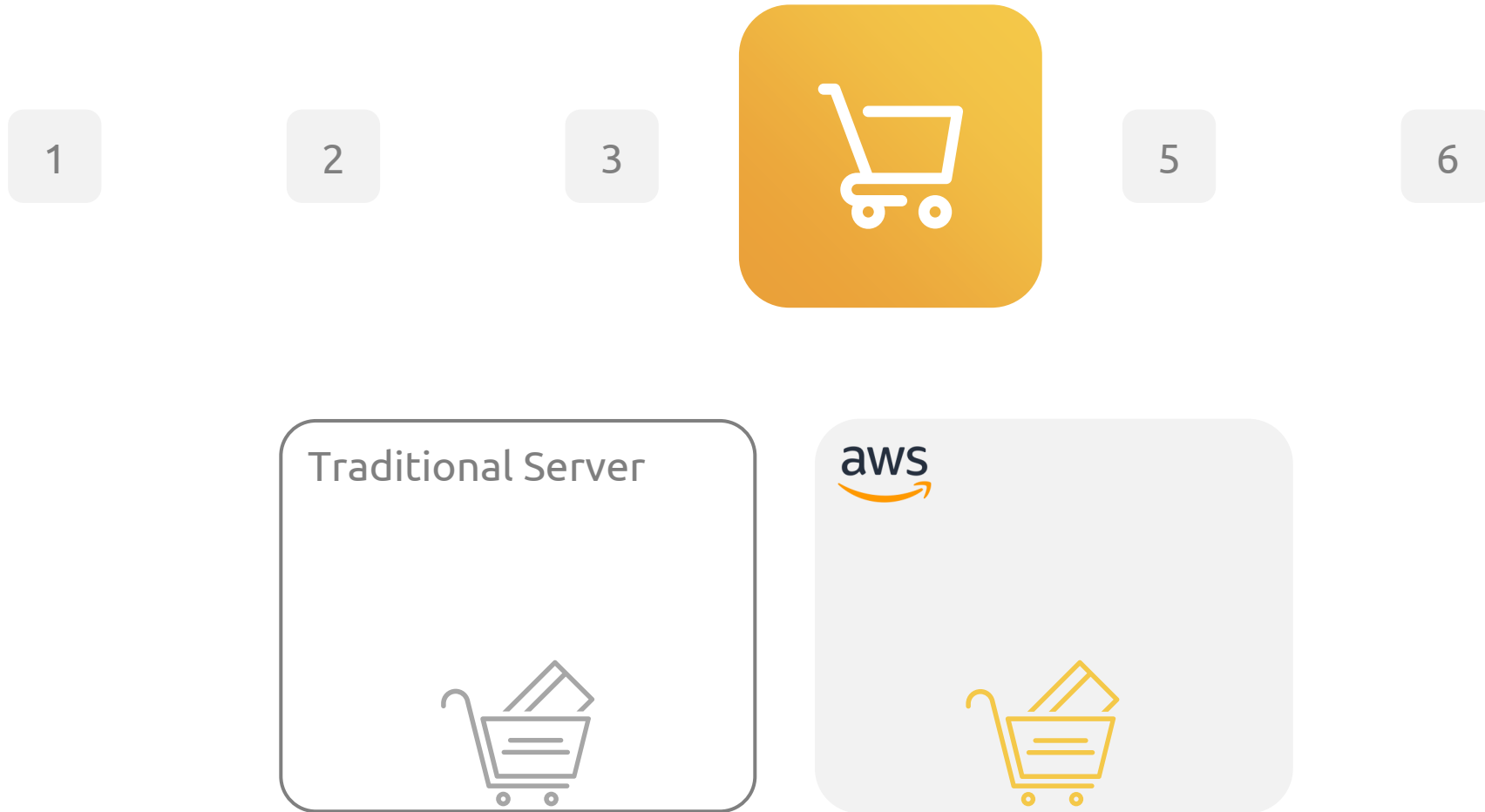
Migration Strategies – Replatforming (Lift, Tinker, and Shift)



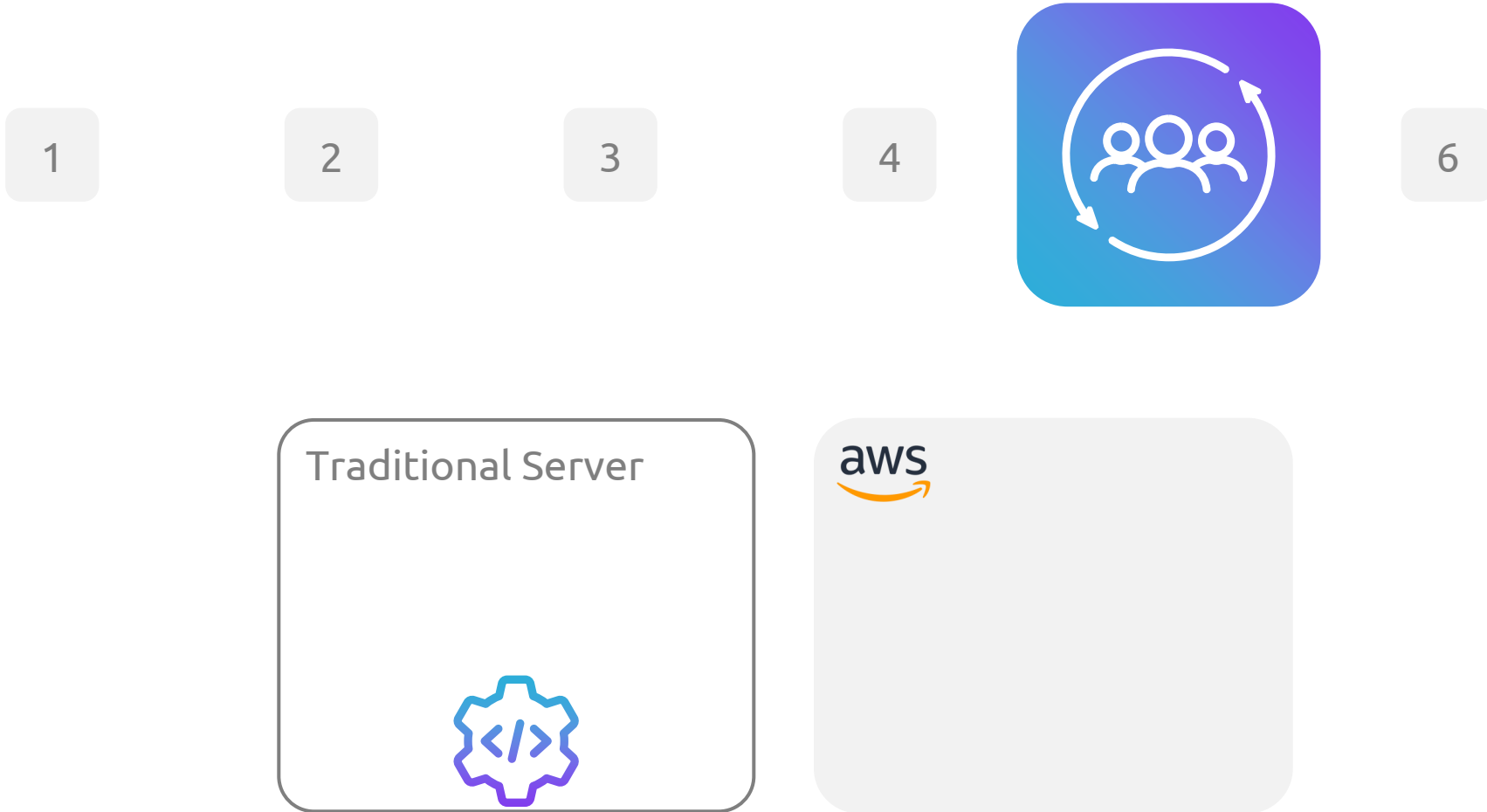
Migration Strategies – Refactoring (or Rearchitecting)



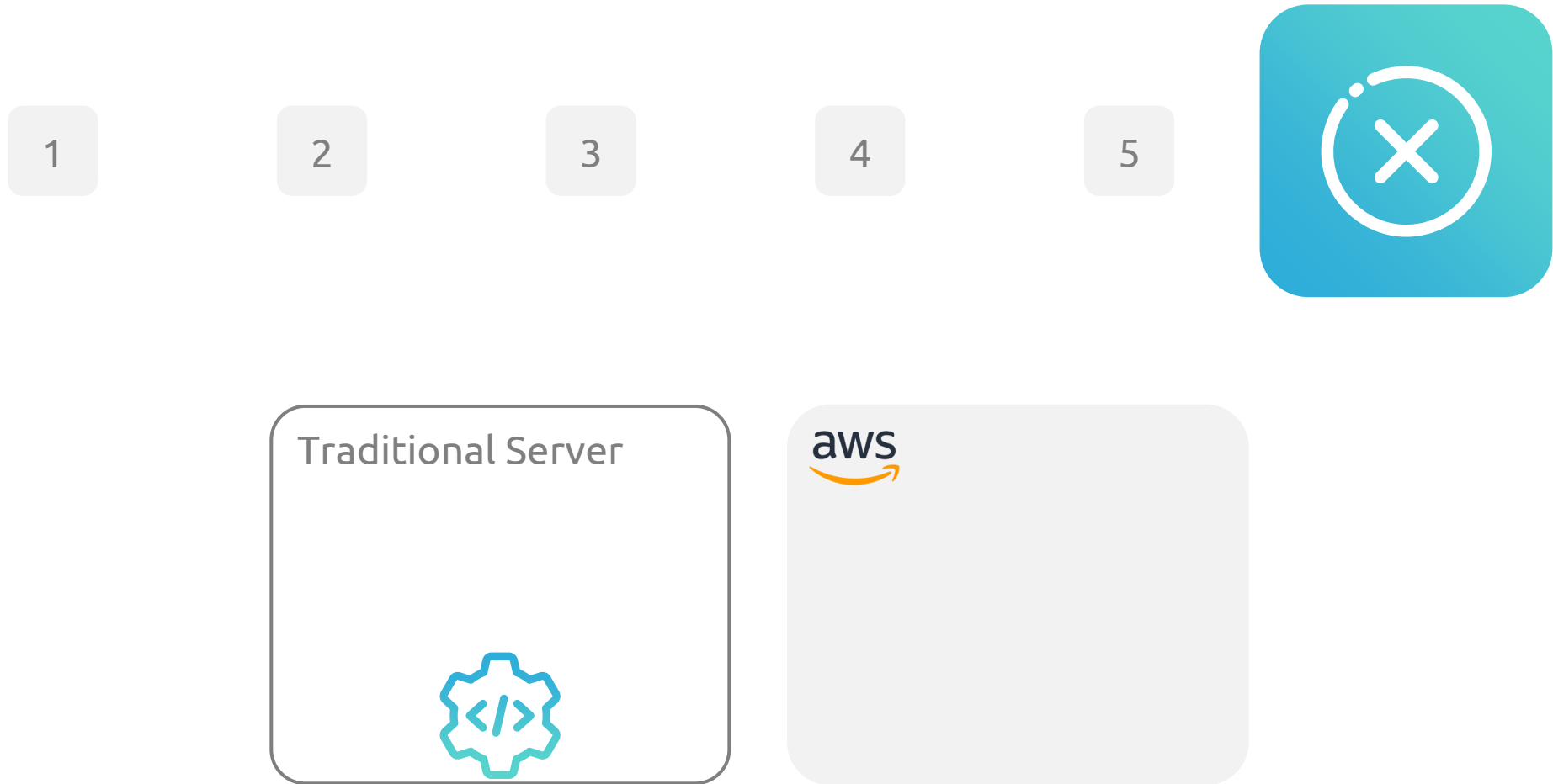
Migration Strategies – Repurchasing



Migration Strategies – Retaining (Do Nothing)

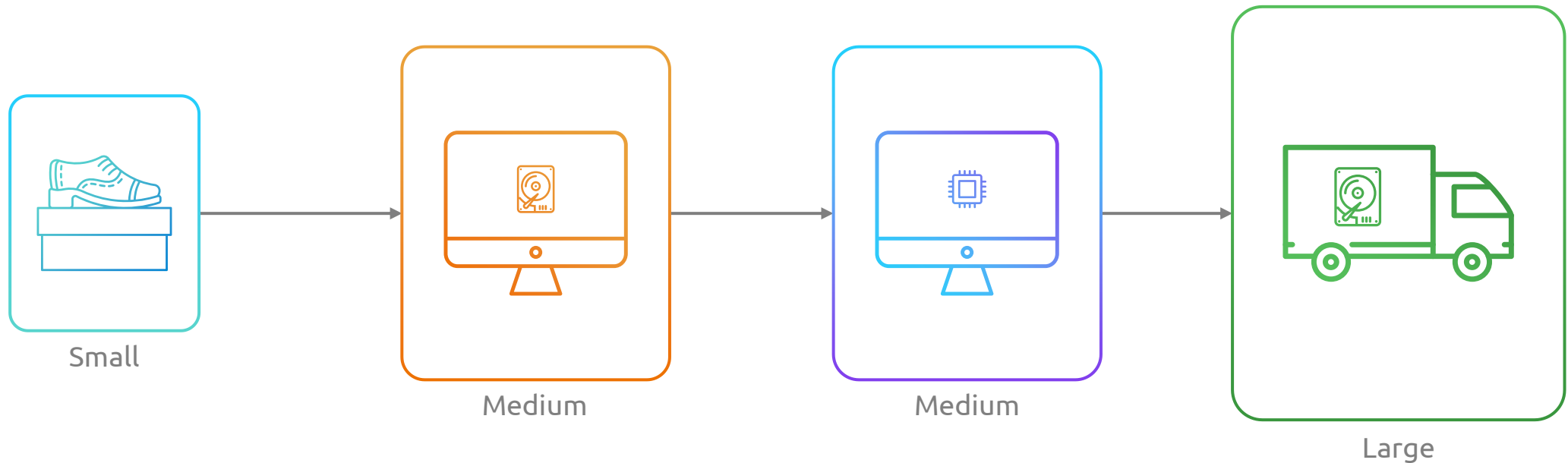


Migration Strategies – Retiring



Migration Services – What if you needed to move data to the AWS offline?

- What if you needed a device that could plug into your network?
- What if you could send that device to AWS once it was full and have them upload it for you?



AWS Services for Transfer – The Snow Family



Snowcone

- Small compute
- Small storage
- Portable Compute



Snowball Edge Storage Optimized

- Small compute
- Medium data
- Data transfer 80TB



Snowball Edge Compute Optimized

- Medium compute
- Small data
- Portable Compute



Snowmobile

- No compute
- Large data
- 100PB of data

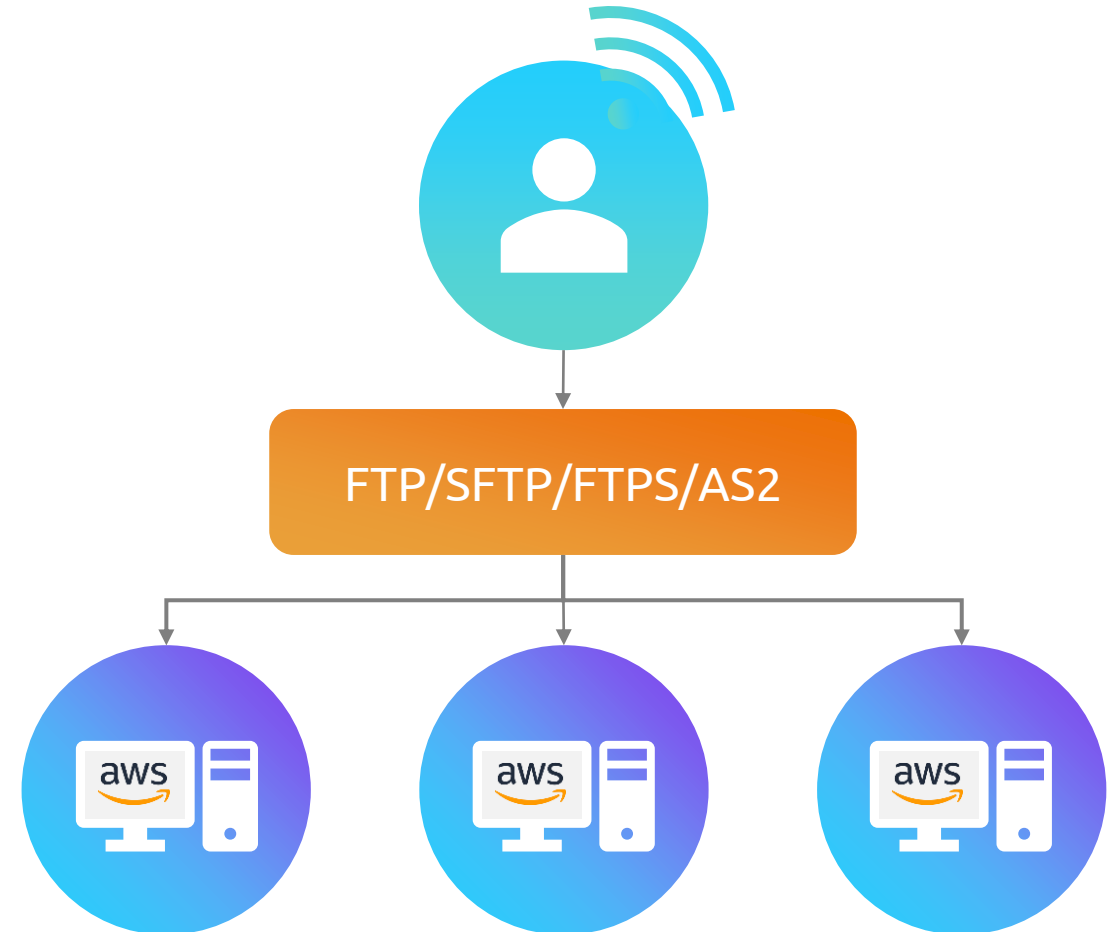


AWS Services for Transfer – The Snow Family



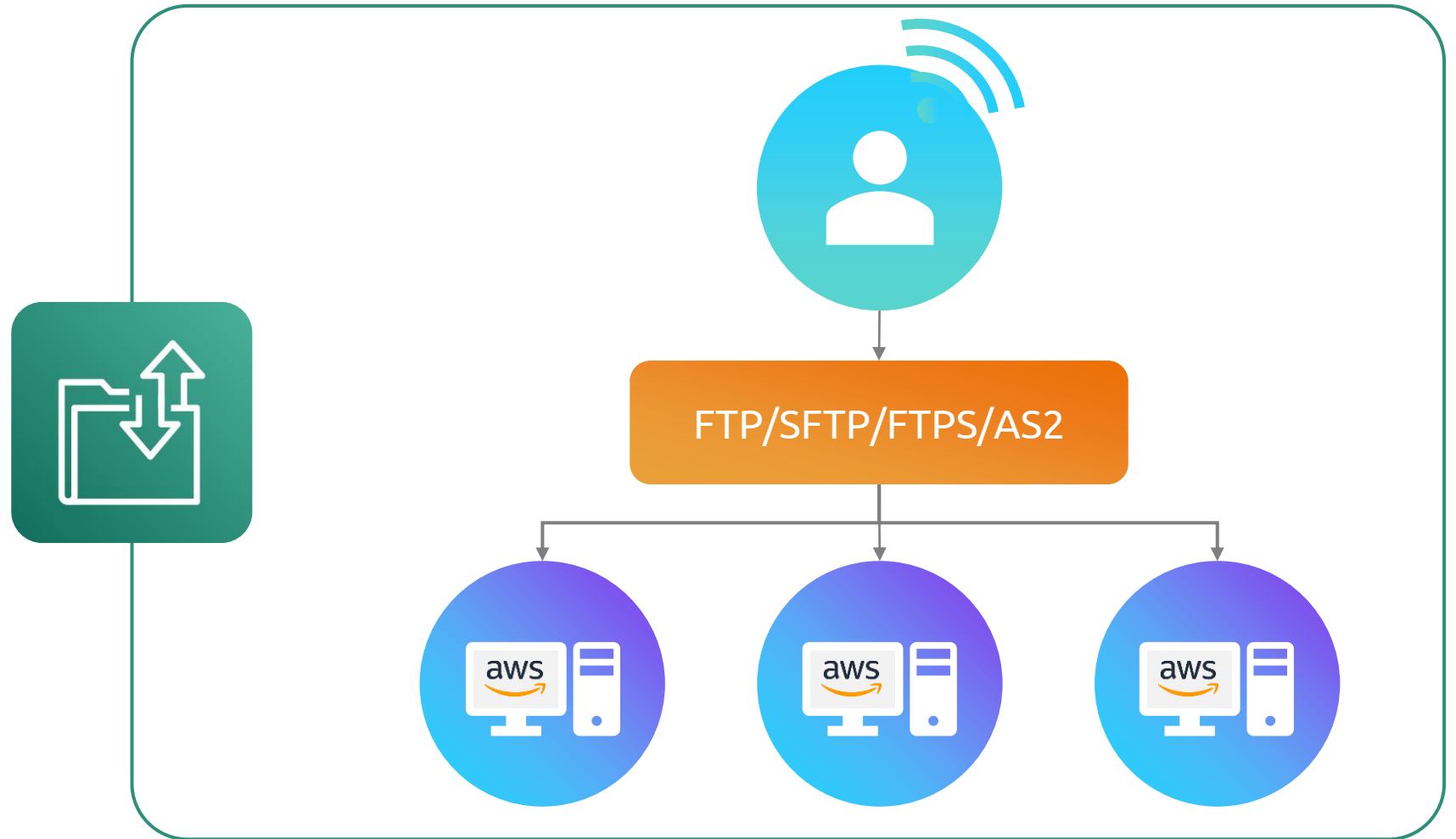
Migration Services – What if you needed to move data to the AWS online?

- What options exist if you just want to transfer data over FTP/SFTP or some other protocol?
- What software can I use to transfer from my datacenter to AWS other than FTP?



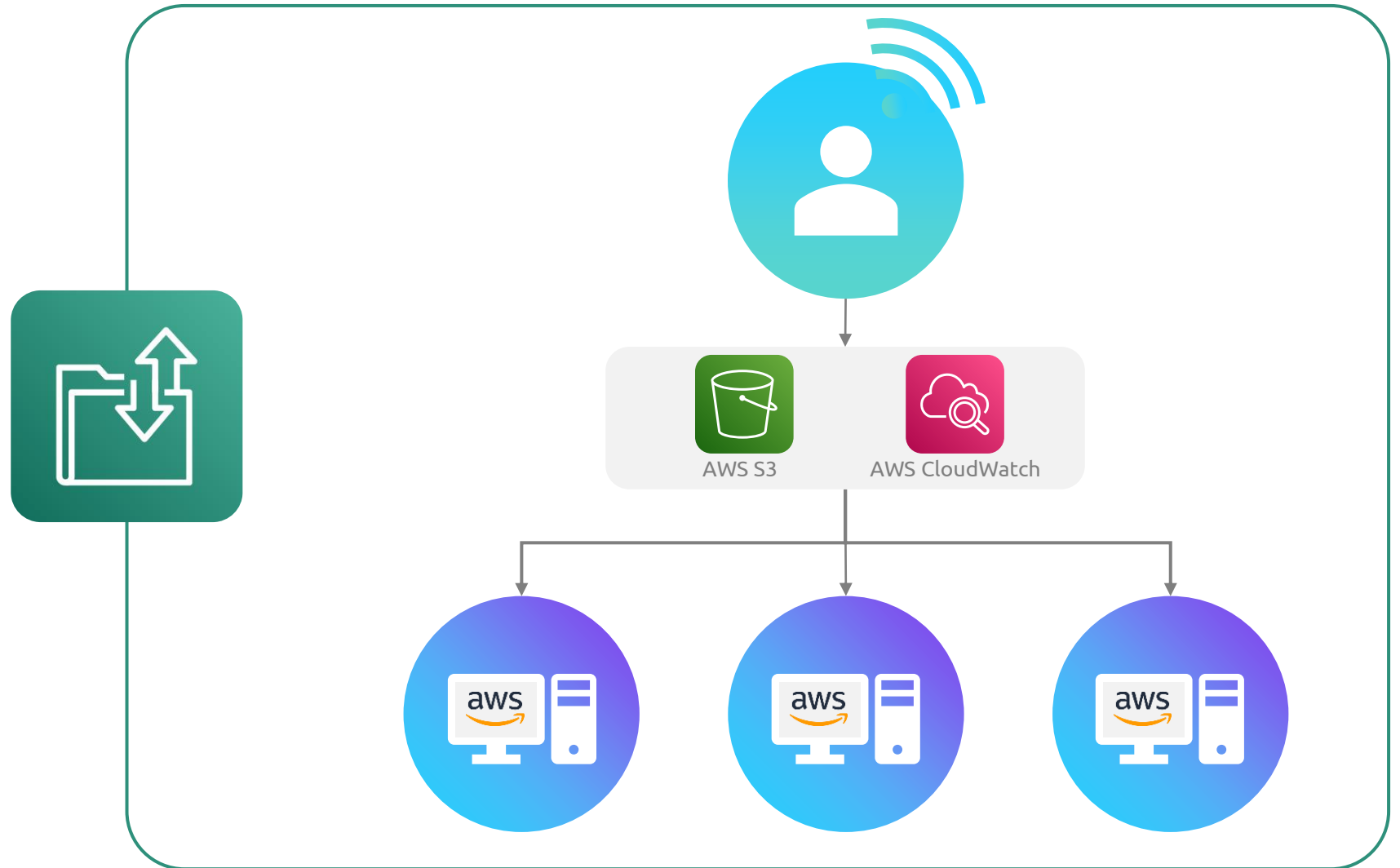
AWS Services for Transfer – The Transfer Family – FTP Version

Transfer Family for FTP supports FTPS, SFTP, and more for secure transfer to S3 or EFS.



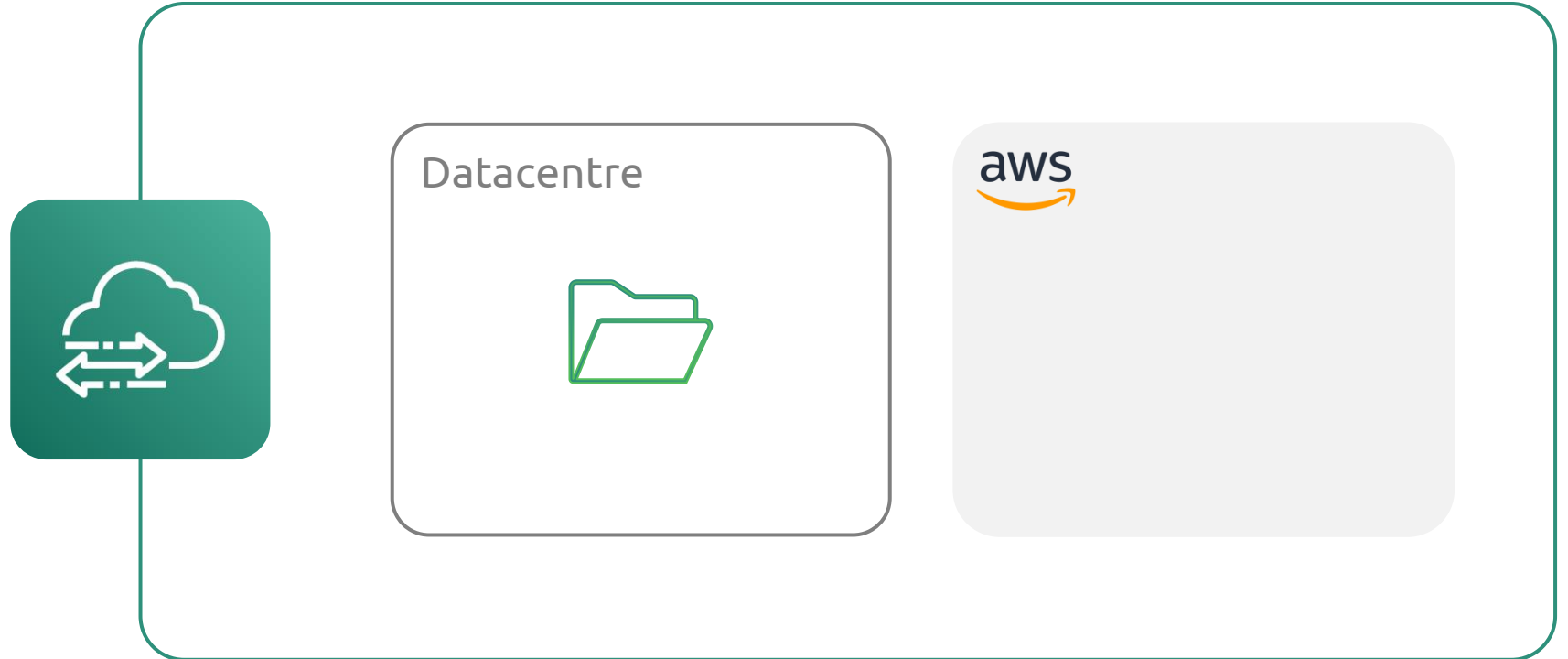
AWS Services for Transfer – The Transfer Family – AS2 Version

Transfer Family for AS2 supports using AS2 to send and receive messages using S3 as a backend.



AWS Services for Transfer – AWS DataSync

Data Sync is a secure, online service that automates and accelerates moving data between on premises and AWS Storage services



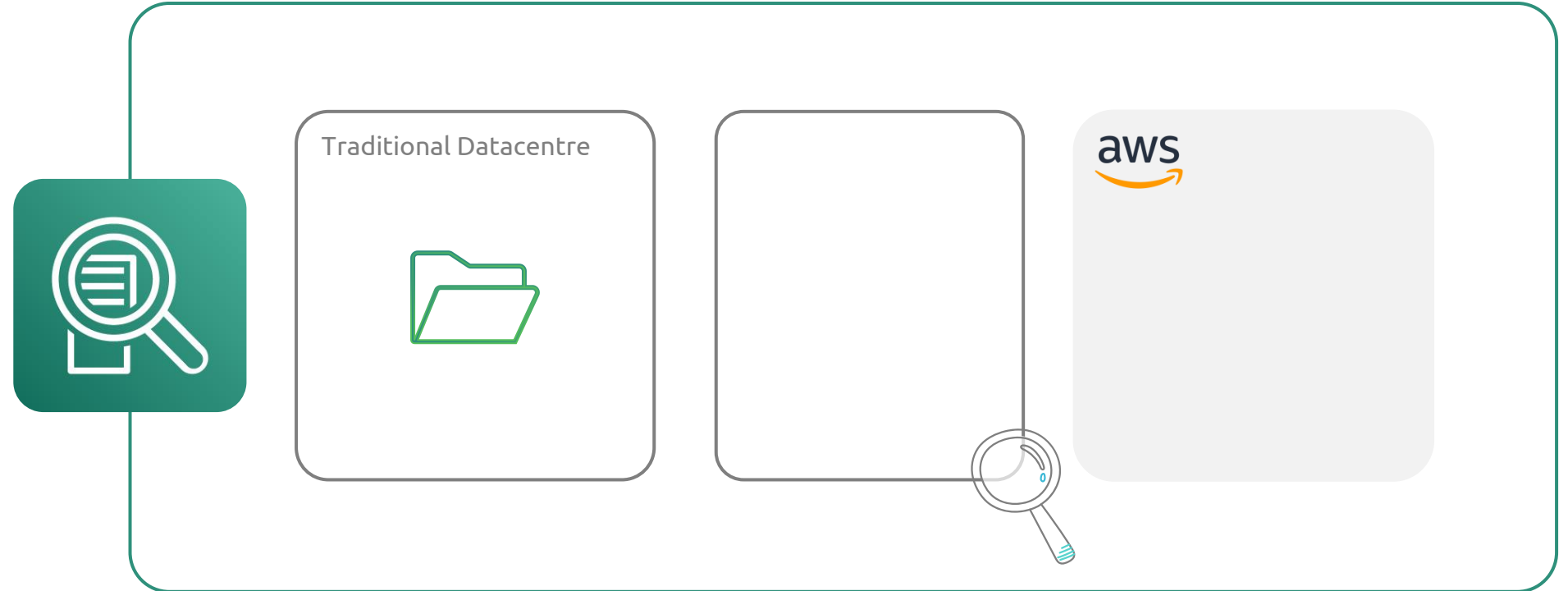
Migration Services – What I need to move Applications, Databases and whole racks of Servers to AWS?

- What services solve my need for discovery? I don't know what software I have.
- Is there an AWS service that will transfer my app/database/server to AWS for me?
- Do we have a full data center to AWS software?



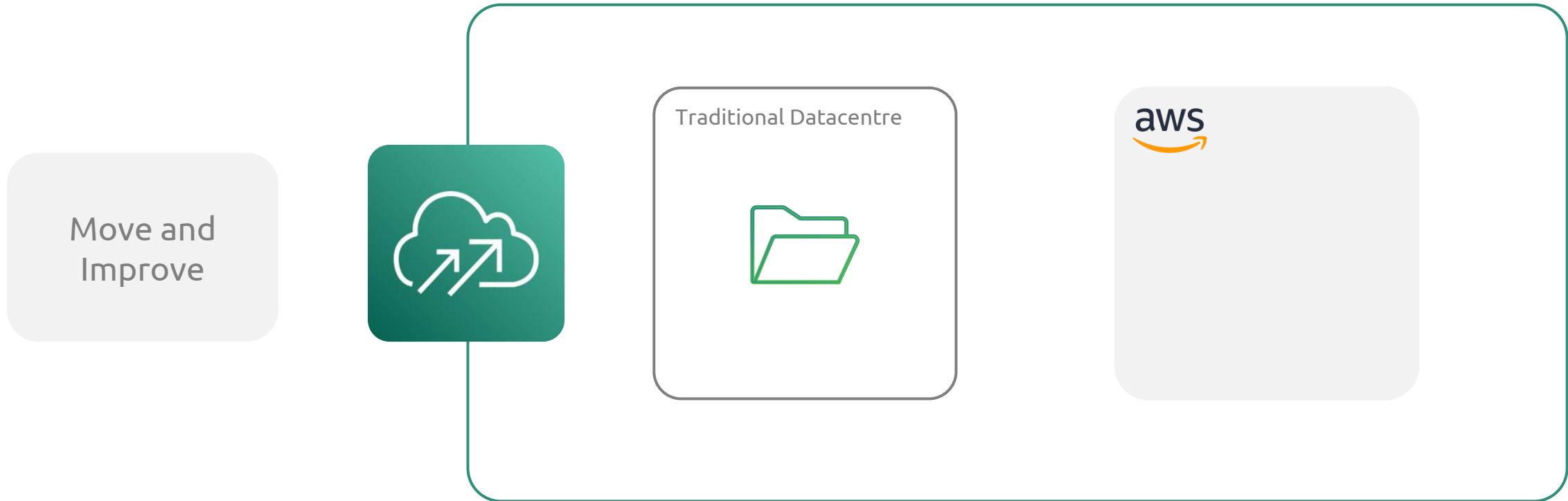
AWS Services for Migration – Application Discovery Service

What can I use to discover information about apps I am migrating?



AWS Services for Migration – Application Migration Service

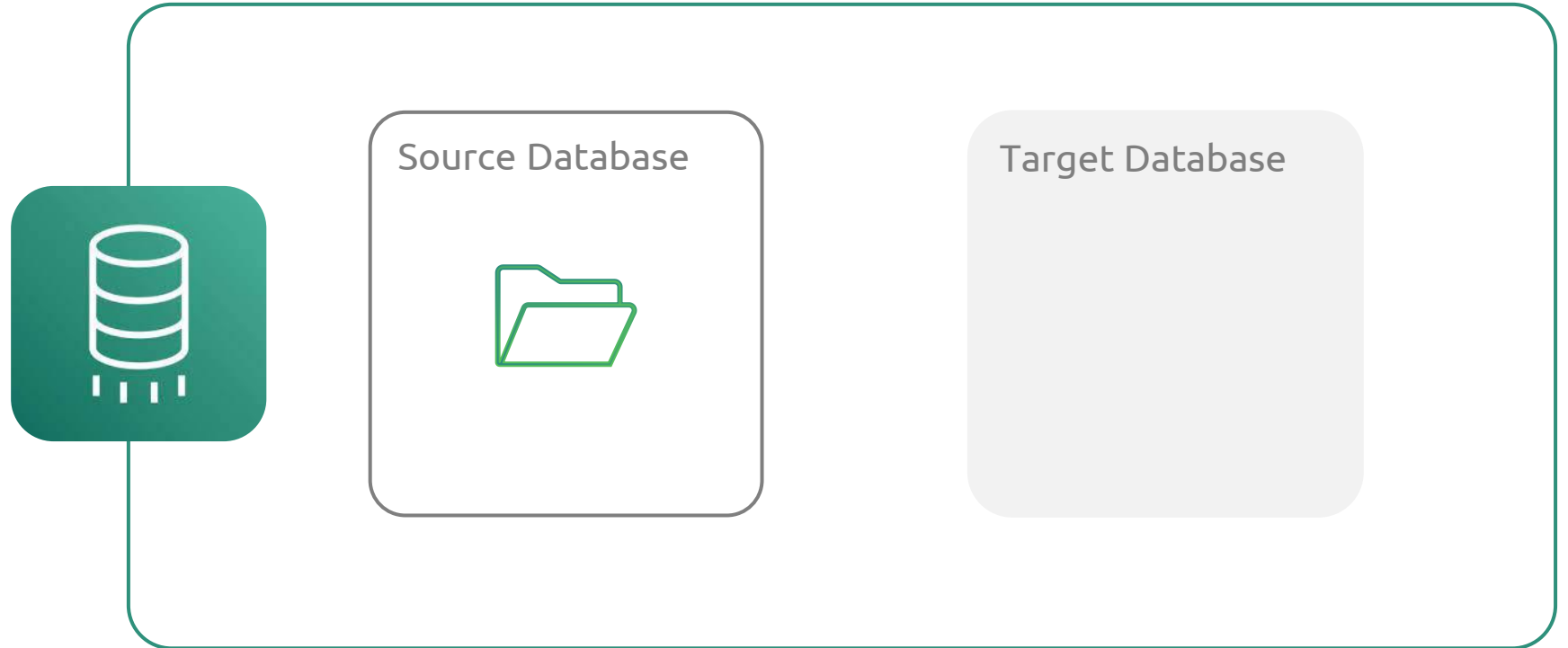
What can I use to migrate applications to AWS?



AWS Services for Migration – Database Migration Service

What can I use to migrate databases to AWS?

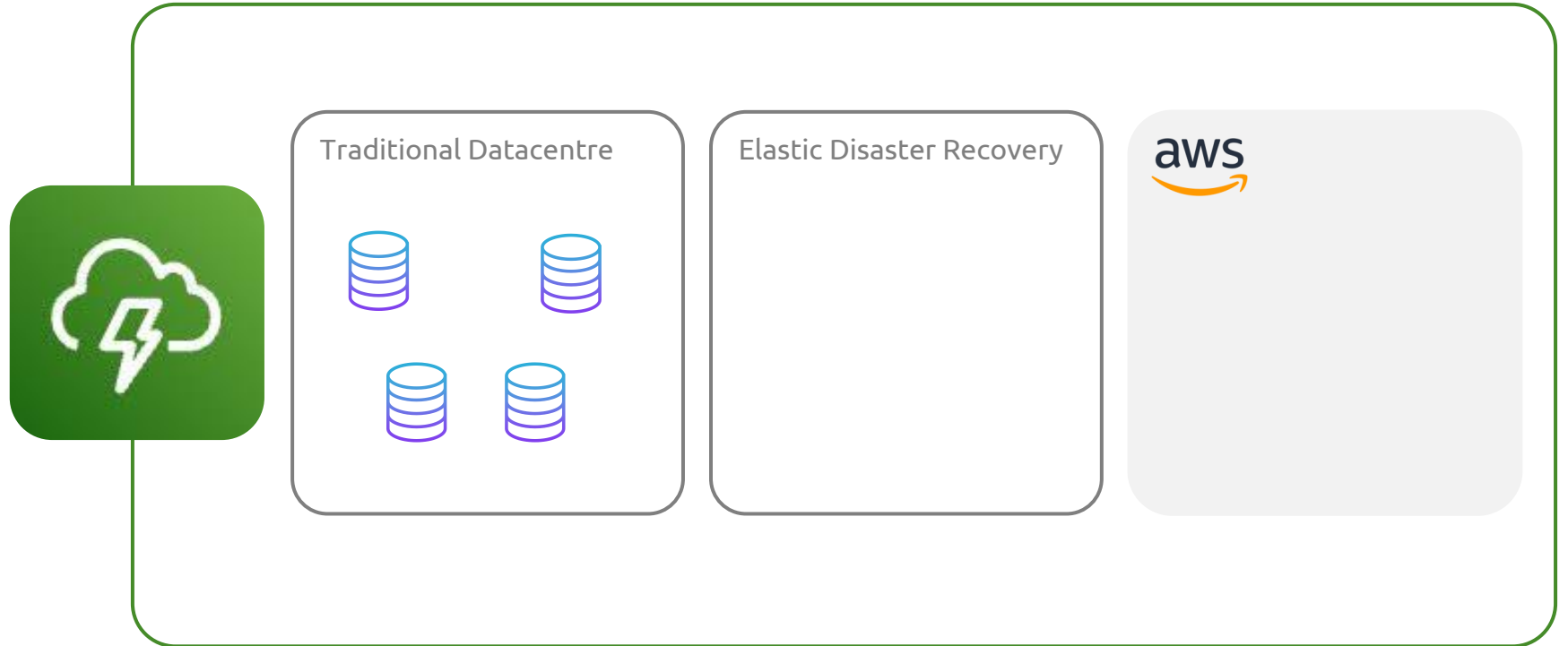
Quick, Secure with
Minimal Downtime



AWS Services for Migration – Elastic Disaster Recovery

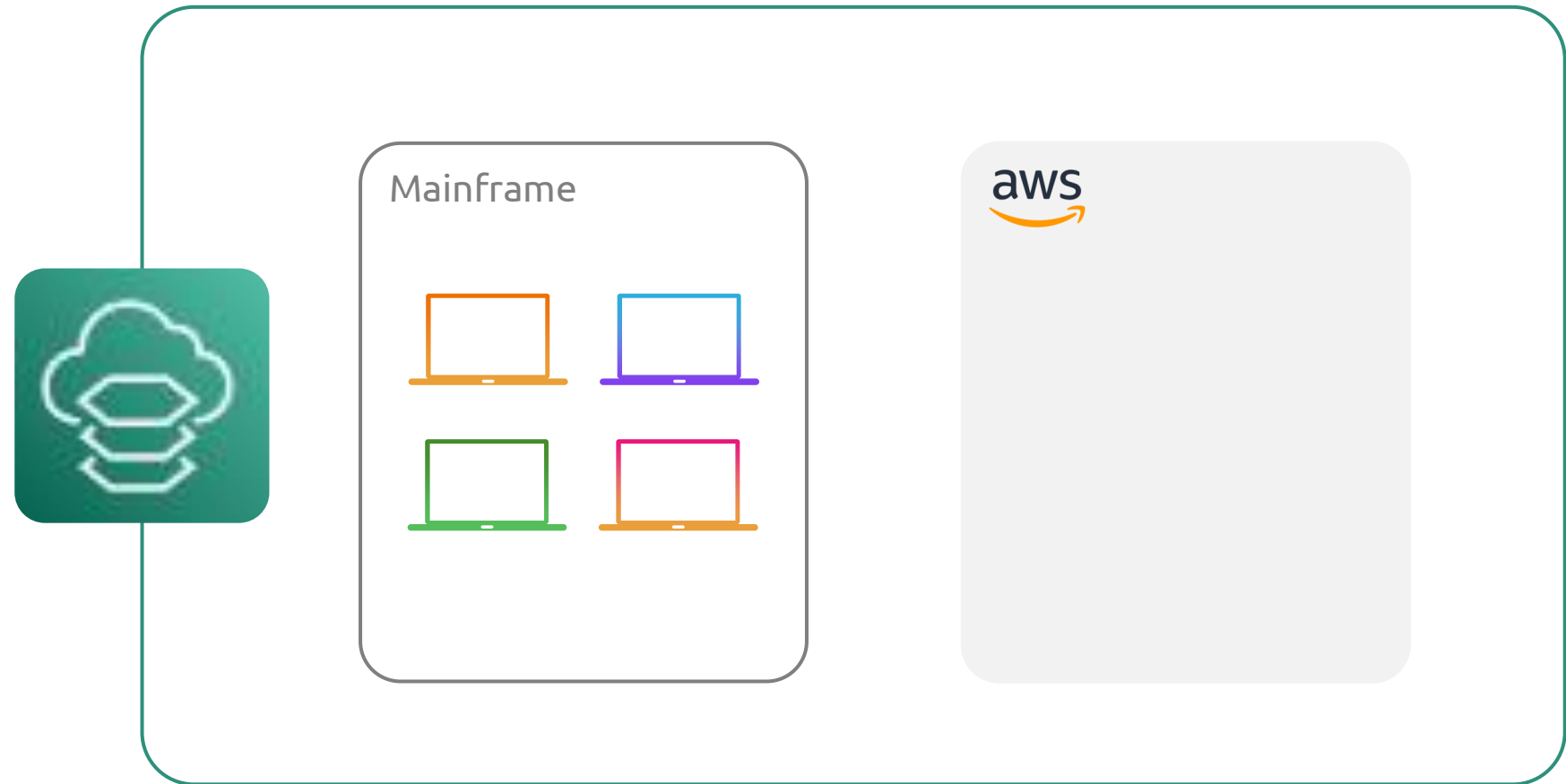
What can I use to migrate whole datacenters to AWS?

Fast, Reliable Recovery

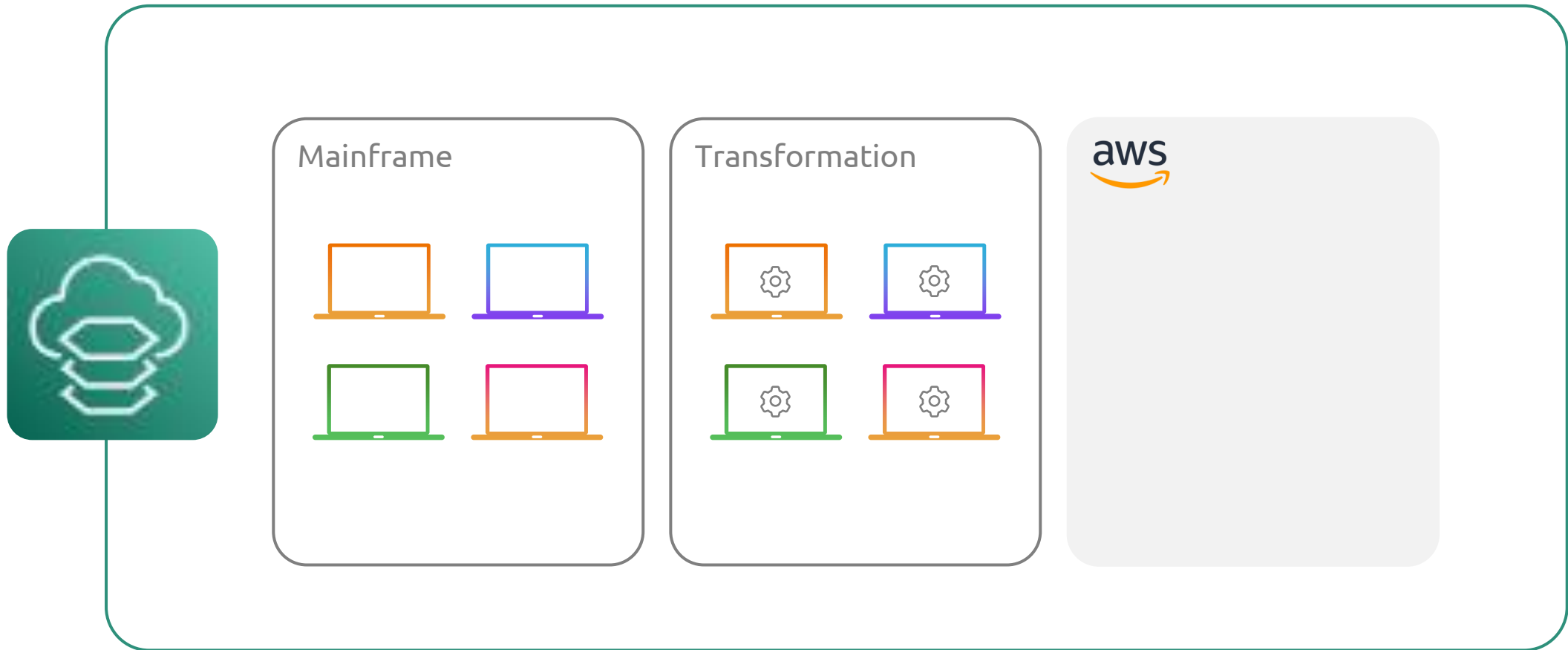


AWS Services for Migration – Mainframe Modernization

What can I use to migrate mainframe components to modern AWS Services?



AWS Services for Migration – Mainframe Modernization



Migration Services – Summary



Migration starts with a good plan; remember the Cloud Adoption Framework



Migration Hub allows you to centralize your migration tools and plans on AWS



Data transfer happens with the Snowcone, Snowball (edge), or SnowMobile



AWS supports FTPS, SFTP, FTP, and AS2 for transfer as well



Application discovery is used for scanning inventory of migratable servers/apps



Application/Database/Data Center all have Migration services available on AWS



Mainframe Modernization is a service/framework for engineering Mainframe migration





KodeKloud