**Synchronous and Asynchronous AWS Decoupling Solutions**

Coupling is a measure of how closely connected two functions, modules or applications are. Low coupling is often a good sign of a well architected system and good design practice, since it allows you to lower cost of maintenance and high readability of code.

In this article, I will highlight two approaches to achieve decoupling using Amazon Web Services (AWS): synchronous and asynchronous. With synchronous decoupling it requires both sides to be always available, however, they don’t need to ‘know’ each other. Meanwhile, with asynchronous decoupling, communication is achieved even if the receiver is not available.

**Synchronous**

In order to achieve synchronous decoupling, an Elastic Load Balancing (ELB) could be used. An ELB distributes incoming application traffic across multiple EC2 instances, in multiple Availability Zones. You can add and remove instances from your load balancer as your needs change, without disrupting the overall flow of requests to your application.

**Asynchronous**

For asynchronous decoupling, AWS offers a Simple Queue Service (SQS) that provides a messaging queue infrastructure. By using Amazon SQS, you can move data between distributed components of your applications that perform different tasks without losing messages or requiring each component to be always available.

There is a wealth of literature around messaging, so I will not dive into the details. The important concept is that SQS allows you to decouple the production from the consumption of messages. One book I can recommend covering this topic is **Amazon Web Services in Action.**

**Use Cases of Database**

**Relational** - Traditional applications refer to software programs or systems that have been commonly used in the past. Examples of traditional applications include enterprise resource planning (ERP), customer relationship management (CRM), and ecommerce.

Enterprise resource planning (ERP) is a type of software used by businesses to manage various aspects of their operations, such as inventory, finances, and human resources.

Customer relationship management (CRM) is a software system that helps businesses track and manage their interactions with customers. It is used to store customer information, track sales leads, and improve customer service.

Ecommerce refers to online buying and selling. It involves using websites or platforms to conduct business transactions, such as purchasing products or services over the internet.

In simple words, traditional applications are common software programs used in the past, including ERP, CRM, and ecommerce. ERP helps businesses manage different parts of their operations, CRM assists in handling customer interactions, and ecommerce involves buying and selling online.

**Key-value** - Key-value databases are commonly used in high-traffic web applications, ecommerce systems, and gaming applications.

High-traffic web applications are websites or online platforms that experience a large number of visitors and interactions. Key-value databases are used in these applications to store and retrieve data quickly and efficiently.

Ecommerce systems are online platforms that facilitate buying and selling products or services. Key-value databases are utilized to handle product catalogs, customer information, and order processing in these systems.

**In-memory** - In-memory databases are commonly used for caching, session management, gaming leaderboards, and geospatial applications.

Caching refers to storing frequently accessed data in a fast-access memory for quicker retrieval. In-memory databases are often employed for caching purposes, allowing applications to retrieve data faster and improve overall performance.

Session management involves keeping track of user sessions in web applications. In-memory databases can be used to store session data temporarily, allowing quick access and efficient management of user sessions.

Gaming leaderboards require real-time updates of scores and rankings. In-memory databases are used to store and update leaderboard data rapidly, ensuring accurate and up-to-date rankings for players.

**Document** - Content management, catalogs, user profiles

**Wide column** - Wide column databases are commonly used in high-scale industrial applications for equipment maintenance, fleet management, and route optimization.

In high-scale industrial applications, such as equipment maintenance, wide column databases are used to store and manage large amounts of data associated with various equipment and machinery. These databases can handle vast quantities of information and allow for efficient retrieval and analysis of data related to maintenance schedules, repair history, and performance metrics.

Fleet management involves overseeing and optimizing a fleet of vehicles or assets. Wide column databases are utilized to store data about each vehicle, including maintenance records, fuel consumption, driver information, and location tracking. These databases can efficiently handle the vast amount of data generated by fleet operations.

Route optimization refers to finding the most efficient routes for transportation or delivery purposes. Wide column databases are employed to store and process data related to maps, traffic conditions, vehicle capacities, and delivery schedules. By utilizing these databases, route optimization algorithms can quickly access and analyze data to determine the optimal routes for maximizing efficiency and reducing costs.

Wide column databases are used in industrial applications for equipment maintenance, fleet management, and route optimization. They can handle large amounts of data associated with equipment, vehicles, and routes, allowing for efficient storage, retrieval, and analysis of relevant information.

**Graph** - Fraud detection, social networking, recommendation engines

**Time series** - Internet of Things (IoT) applications, DevOps, industrial telemetry

**Ledger** - Systems of record, supply chain, registrations, banking transactions