COMSATS UNIVERSITY ISLAMABAD, ABBOTABAD

Assignment: **SDA**

Task: **"TASK"**

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BSE4A

Netflix: Version History and Architecture

Jalal Khan (FA22-BSE-093) Contributions:

1. **Initial Launch (1997) and Online Streaming (2007):**
   - o Focus on monolithic architecture, DVD rentals, and transition to streaming.
   - o Create diagrams for the early monolithic system and streaming setup.
2. **Summary of Evolution Drivers (First Two Drivers):**
   - o Driver 1: Need for Scalability.
   - o Driver 2: Shift to Streaming.

Haider Rehman (FA22-BSE-064) Contributions:

3. **Move to Cloud (2010) and Shift to Microservices (2012):**
   - o Cover SOA to microservices transition and their features.
4. **Summary of Evolution Drivers (Last Three Drivers):**
   - o Driver 3: Competition.
   - o Driver 4: Globalization.
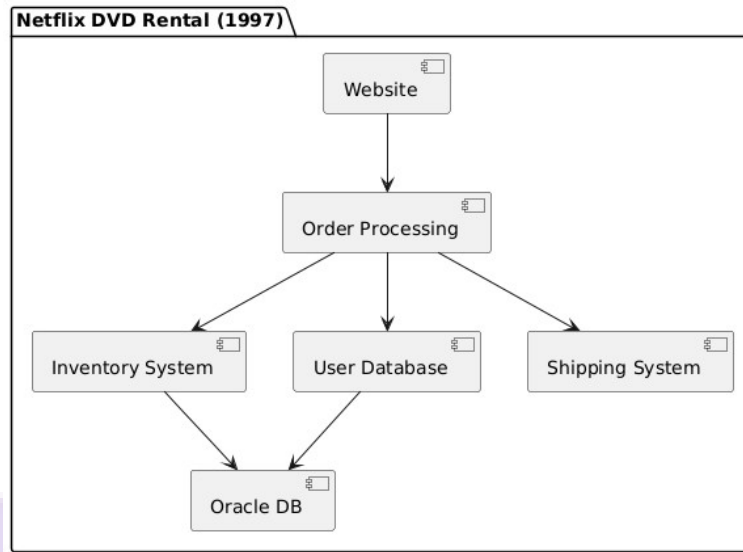   - o Driver 5: Technology Advancements.

Netflix: Version History and Architecture

Netflix doesn't use traditional version numbers (like 3.3.2) since it updates its system continuously. But if we imagine version numbers for its major changes, here's how it could look:

Netflix's Hypothetical Versions

1. Initial Launch (1997 – DVD Rental Service) Version 1.0 :

- **Architecture Used**:

  - o Initially based on a **monolithic architecture**. Netflix operated as an e-commerce platform for DVD rentals using a traditional web stack. The backend likely relied on a simple relational database (e.g., Oracle DB) to manage inventory, users, and orders.

- **Version Features**:

  - o Users could browse DVDs on the website, order them online, and receive them via mail.

- **Need**:

  - o Addressed the inconvenience of traditional video rental stores, offering a home delivery solution without late fees.

Diagram:

```
┌─ Netflix DVD Rental (1997) ─────────────────────────────────────┐
│                                                                  │
│                          ┌──────────────┐                        │
│                          │   Website    │                        │
│                          └──────────────┘                        │
│                                 │                                │
│                                 ▼                                │
│                         ┌──────────────────┐                     │
│                         │ Order Processing │                     │
│                         └──────────────────┘                     │
│                          │        │       │                      │
│              ┌───────────┘        │       └───────────┐          │
│              ▼                    ▼                    ▼          │
│     ┌──────────────────┐  ┌──────────────┐  ┌──────────────────┐ │
│     │ Inventory System │  │ User Database│  │ Shipping System  │ │
│     └──────────────────┘  └──────────────┘  └──────────────────┘ │
│              │                  │                                │
│              └──────┐    ┌──────┘                                │
│                     ▼    ▼                                       │
│               ┌──────────────┐                                   │
│               │  Oracle DB   │                                   │
│               └──────────────┘                                   │
└──────────────────────────────────────────────────────────────────┘
```

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2. Transition to Online Streaming (2007) Version 2.0 :

- **Architecture Used**:

  o Adopted a **monolithic architecture** but started to face scalability issues due to growing demand.

  o Hosted on **data centers** managed by Netflix itself.

- **Version Features**:

  o Users could stream select movies and TV shows directly on their computers via the internet.

  o Introduced **recommendation algorithms** to improve user experience.

- **Why This Version?**

  o The rise of broadband internet created an opportunity to shift from physical media to digital content delivery.

DAIgram:

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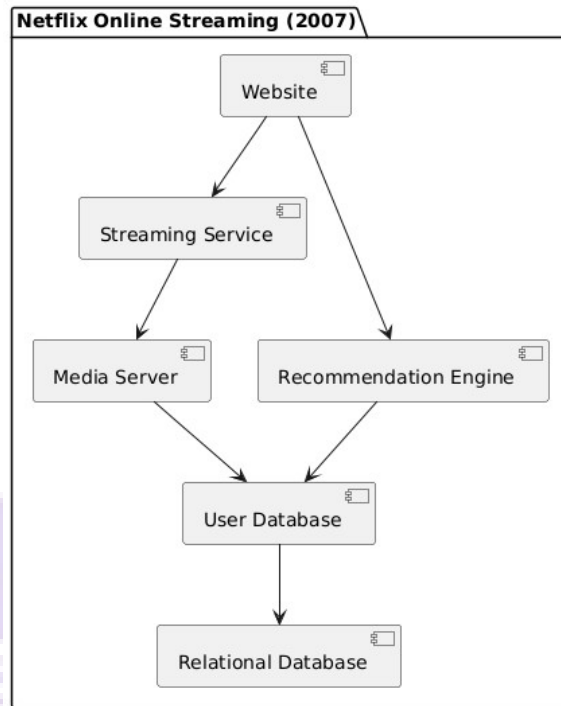
3. Move to Cloud (2010 – International Expansion) Version 3.0:

- **Architecture Used**:

  o Transitioned from monolithic to a **service-oriented architecture (SOA)** and moved to **Amazon Web Services (AWS)**.

  o Netflix began using the **cloud** to improve scalability, reliability, and reduce dependency on physical data centers.

- **Version Features**:

  o International streaming launched, starting with Canada.

  o Enhanced user interface to handle global audiences.

- **Why This Update?**

  o Rapid growth in users and global demand required scalable and cost-effective solutions.

- **Diagram:**

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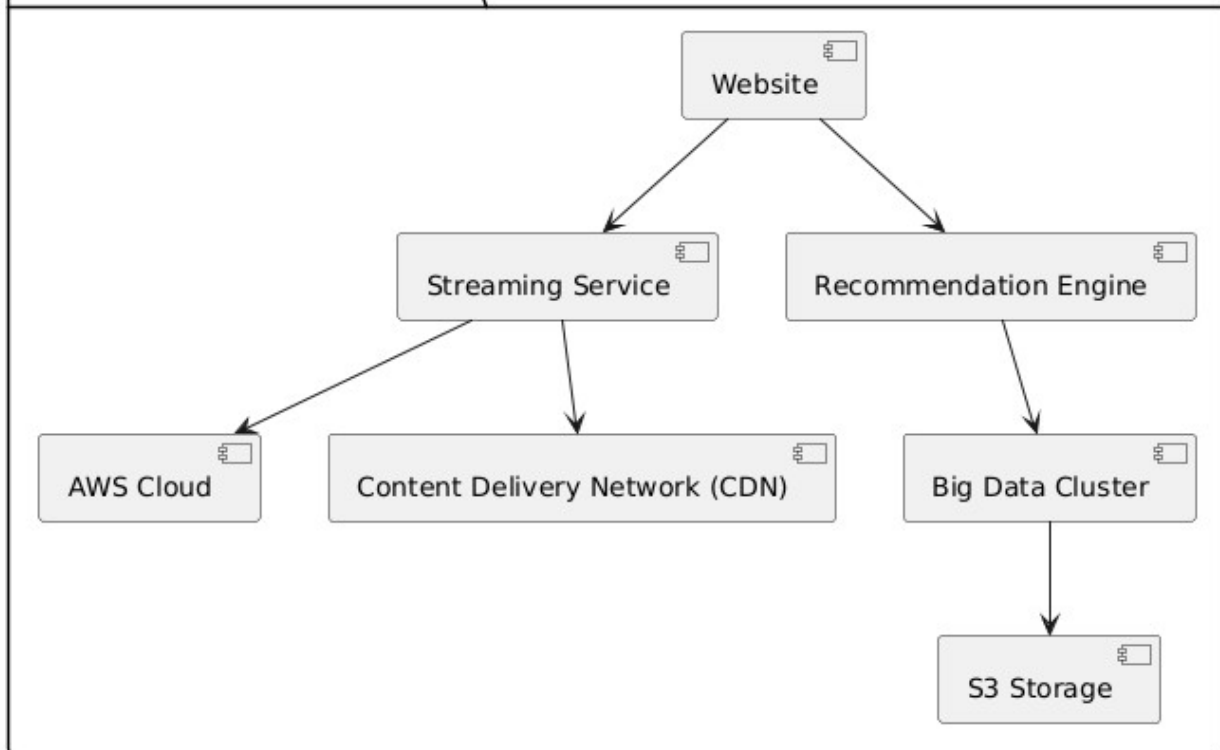
4. Shift to Microservices (2012 – Improved Scalability) Version 3.1

- **Architecture Used**:

    o Migrated to a **microservices architecture** to address issues with scaling a large user base.

    o Used APIs for communication between independent services (e.g., user data, recommendations, playback).

    o Introduced tools like **Chaos Monkey** to ensure system resilience.

- **Version Features**:

    o Personalized recommendations powered by machine learning.

    o Support for multiple devices (smart TVs, smartphones, tablets).

- **Why This Version?**

- o The monolithic approach couldn't handle the increasing complexity of a global streaming platform.

- **DAIGRAM:**

  - o

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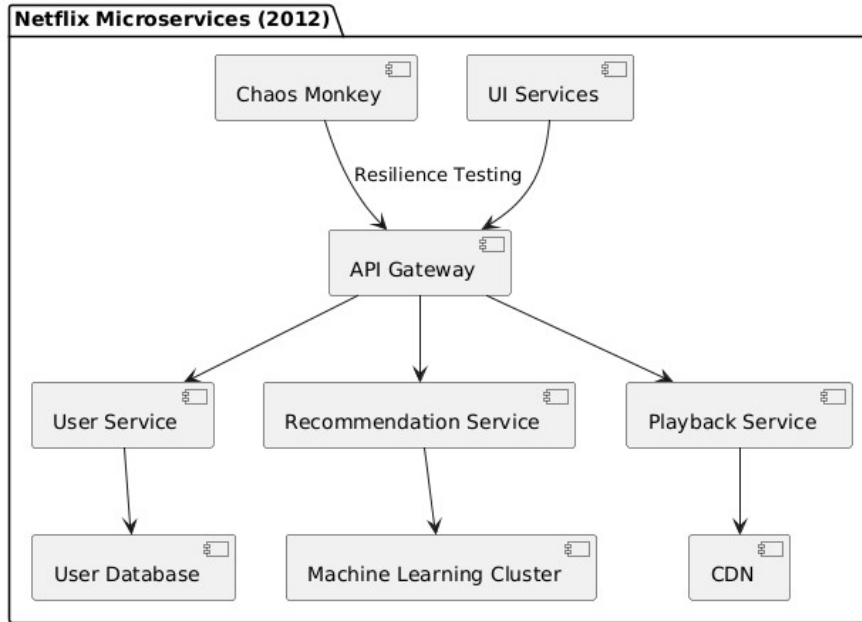
5. Introduction of Original Content (2013 – House of Cards) Version 3.2:

- **Architecture Used**:

  - o Continued refining the microservices approach, leveraging big data for decision-making.

  - o Used **Apache Cassandra** for handling large-scale data storage and **Apache Kafka** for real-time data streaming.
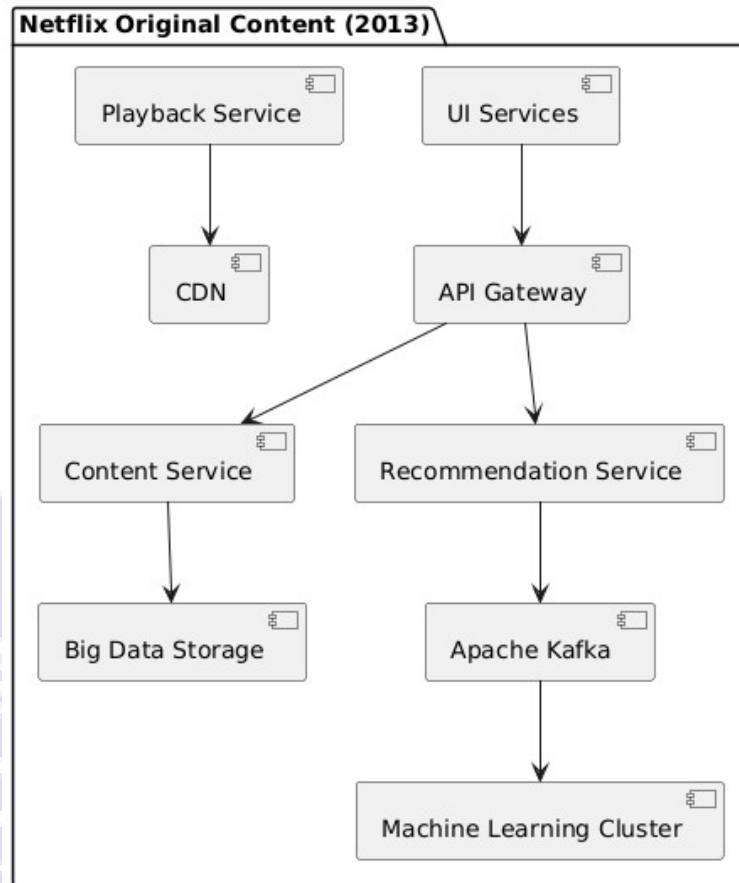
- **Version Features**:

  - o Launched Netflix Originals, starting with *House of Cards*.

  - o Improved algorithms to tailor recommendations for new content.

- **Why This Version?**

 - o Original content reduced reliance on third-party licensing and attracted more subscribers.

-

- **DAIGRAM:**

Netflix Original Content (2013)

Playback Service

UI Services

CDN

API Gateway

Content Service

Recommendation Service

Big Data Storage

Apache Kafka

Machine Learning Cluster

o

**6. Global Expansion (2016 – Worldwide Streaming) Version 3.3:**

- **Architecture Used**:

  o Full microservices deployment, powered by AWS and advanced content delivery networks (CDNs).

  o Developed its own **Open Connect** system to efficiently deliver content globally.

- **Version Features**:

  o Expanded streaming to 190+ countries.

  o Optimized streaming quality for low-bandwidth regions.

- **Why This Version?**

  o To capture a global audience and compete with regional streaming platforms.

- **DAIGRAM:**

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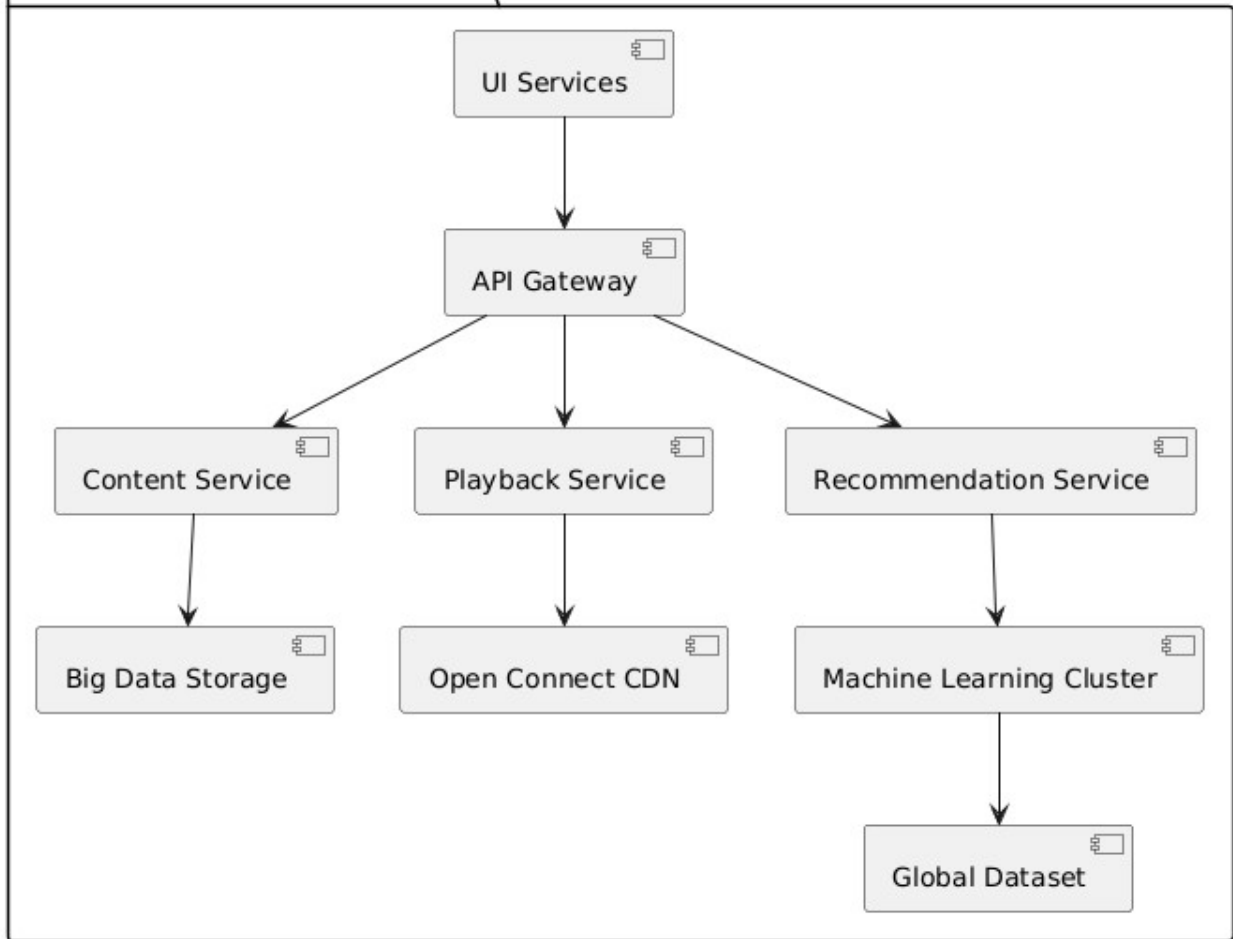
7. Diversification (2021 – Netflix Games) Version 3.4: `

- **Architecture Used**:

  - Continued leveraging microservices for scalability and introduced infrastructure to support gaming.

  - Integrated AI-powered recommendation systems for gaming content.

- **Version Features**:

  - Added mobile games to the platform, targeting younger audiences.

- **Why This Version?**

  - To compete with gaming platforms and offer diversified entertainment options.

- **DAIGRAM:**
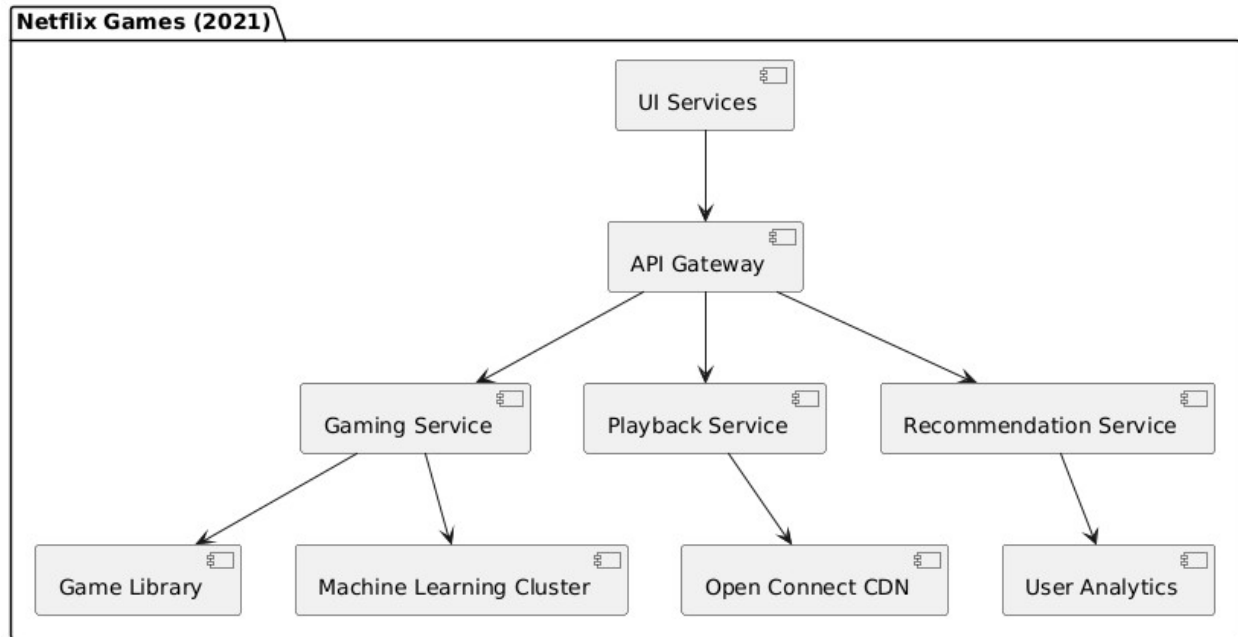
Netflix Architecture Timeline

Year	Architecture	Key Features
1997	Monolithic	DVD rentals, basic database system.
2007	Monolithic	Online streaming, basic scalability.
2010	Service-Oriented Architecture (SOA)	Cloud migration to AWS, international expansion.
2012	Microservices Architecture	Scalability, resilience (Chaos Monkey), personalized recommendations.
2013	Advanced Microservices	Original content production, real-time data streaming with Kafka.
2016	Optimized Microservices	Global reach, Open Connect CDN for efficient content delivery.
2021	Microservices + Gaming Infrastructure	Introduction of Netflix Games, AI-driven personalization.

Summary of Evolution Drivers

1. **Need for Scalability**: The rapid increase in users made monolithic systems insufficient.

2. **Shift to Streaming**: Consumer behavior shifted from physical rentals to on-demand content.

3. **Competition**: Emergence of Amazon Prime, Hulu, and Disney+ required innovation and diversification.

4. **Globalization**: Expanding to international markets required new solutions like Open Connect CDN.

5. **Technology Advancements**: Cloud computing, AI, and big data drove the evolution of Netflix's architecture.