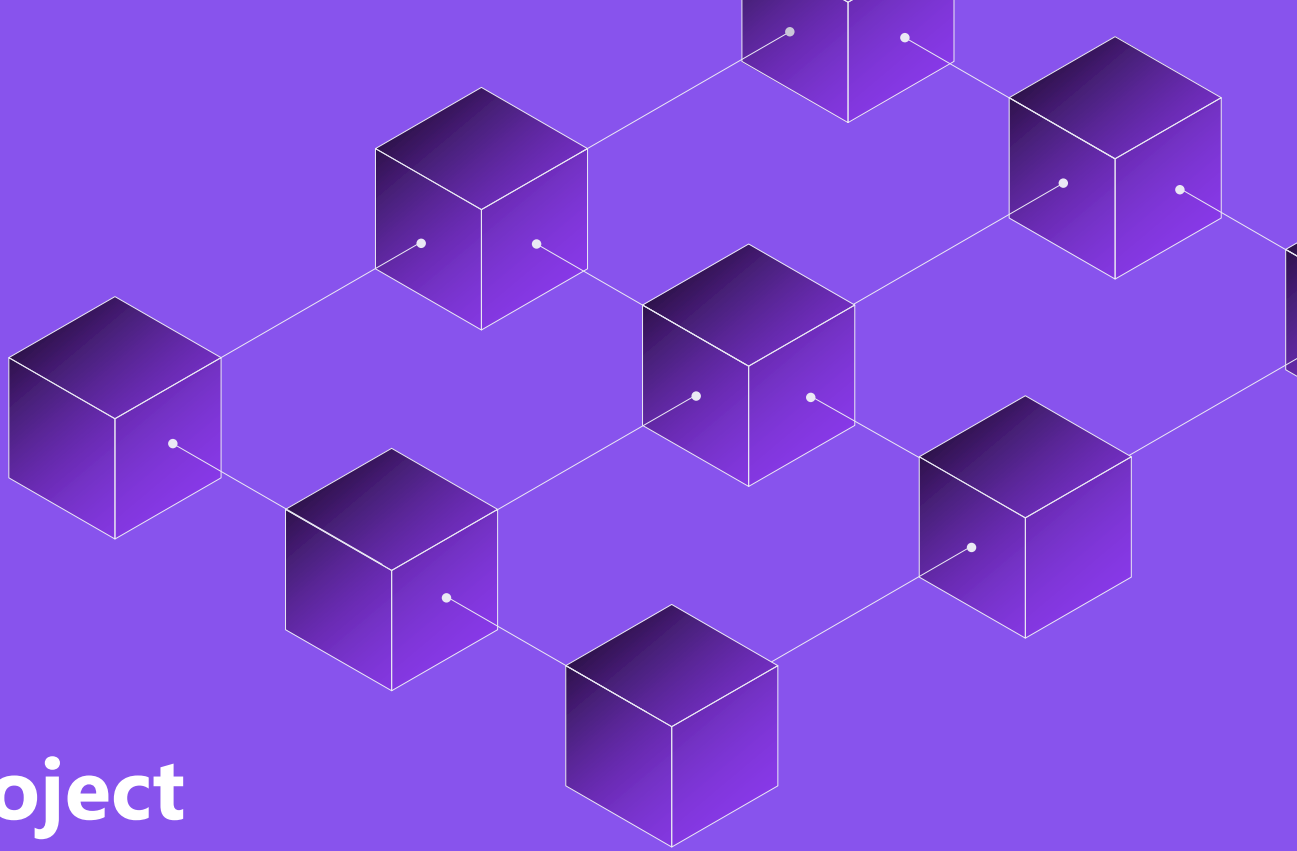# CS5594
Blockchain Project

BlockChain-as-a-Service(BaaS):

Applications, Platforms & Challenges
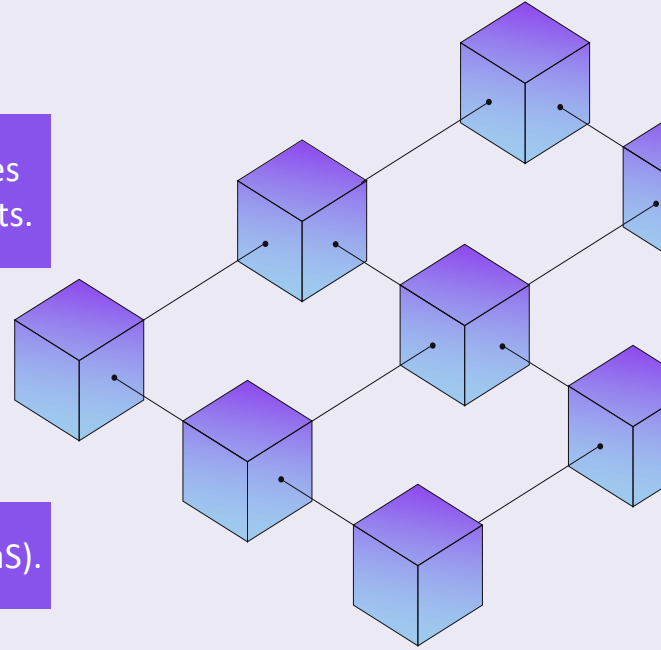
By -

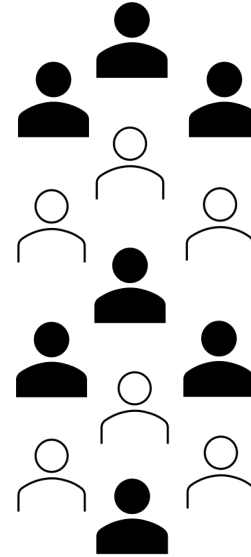Manasa Reddy Kandula

Prithvi Kota

Harsha Bhamidipati

What is BaaS
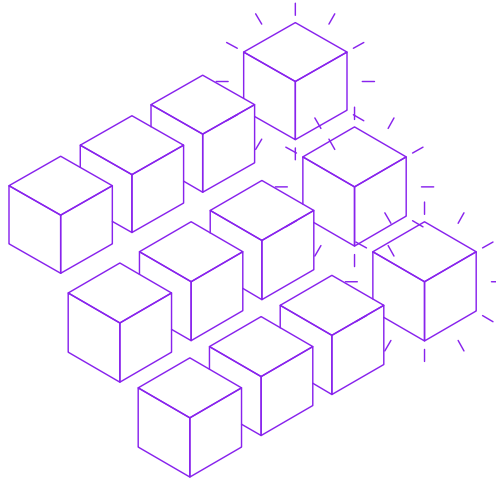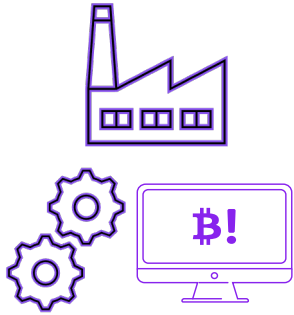
Blockchain service offering that allows customers to use cloud-based services to develop, use and host their blockchain apps, functions and smart contracts.

Based on engagement principles similar to that of Software as a Service (SaaS).

How BaaS works

Enterprises with Blockchain infrastructure

Provide Blockchain as a Service

Clients use Blockchain tools to their core applications

Need for BaaS

Implementation of Blockchain is complex and error-prone

Too many resources to build, maintain and monitor a blockchain system that supports a targeted application
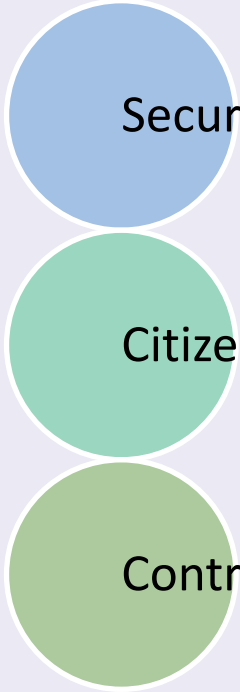
Elaborate development and testing required for P2P interconnection, file storage, smart contracts and consensus mechanisms

To reduce costs and overheads

Applications of BaaS
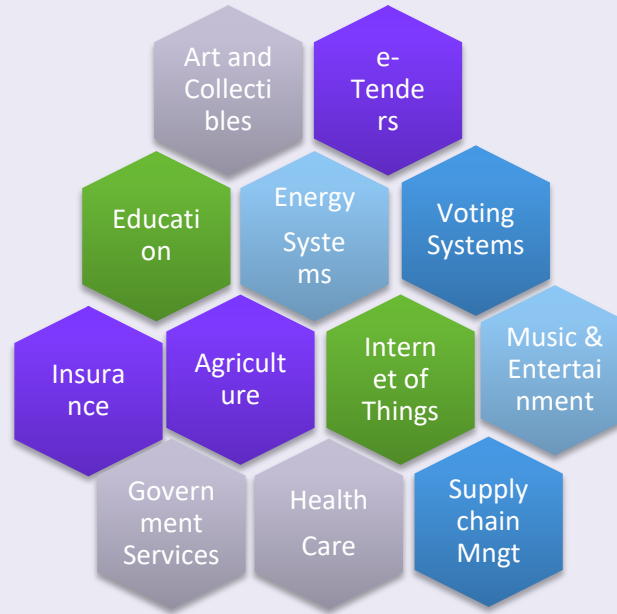
BaaS for E-Tendering - Motivation

Secure Bidding & Easy to Use Platform

Citizens can rate the work of the government

Contractor can receive payments on time

BaaS for E-Tendering - Architecture

Tendering Organization

Blockchain Network

Bidder

Citizen
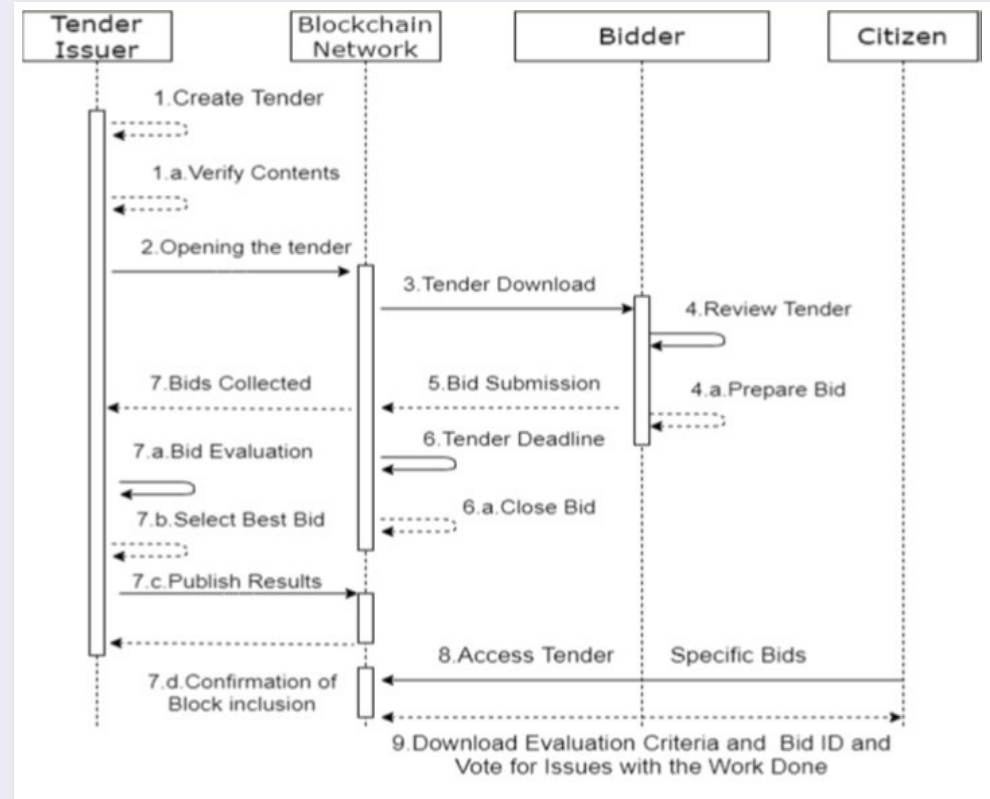
BaaS for Battery Energy Storage Systems - Motivation

- Improved asset management

- Enhanced energy trading

- Regulatory compliance

- Improved customer engagement

- Prevention of energy theft

BaaS for Battery Energy Storage Systems
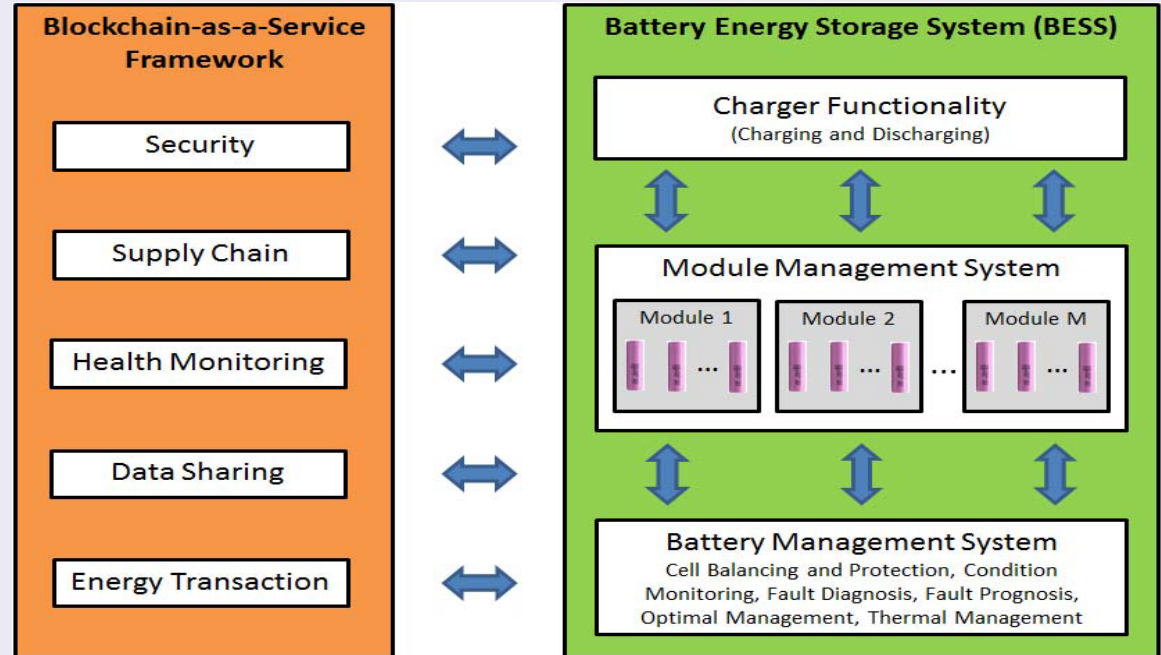
BaaS for Battery Energy Storage Systems – Security aspects

- Network Security
- Data Storage Security
- Firmware Security
- On-board Interface Security
- Hardware Security

BaaS hosting for IoT :

Fog	Cloud
Low Latency	High Latency
Decentralized	Centralized
Limited by Nodes	Scalable
Secure	Vulnerable
Less expensive	Expensive

BaaS as a Platform
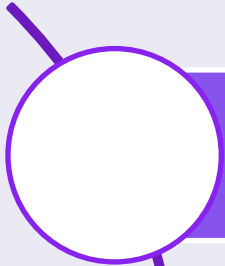
Integrating cloud computing, Internet of Things (IoT) and edge computing.
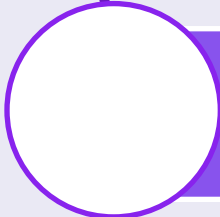
Blockchain consensus, forking, node validity, commodity exchange, backup, off-chain & on-chain synchronization

Manages Resources, Bandwidth, Internet connection and other associated services similar to cloud services

Blockchain as a Service Platforms

BaaS Architecture

Different Commercial Platforms- Comparison

Alibaba BaaS

Mid-layer application
Hyperledger Fabric, Ant blockchain, etc.

Platform services layer
auto config & deployment, consortium management, etc.

Cloud resource layer
security, monitoring, etc.

Infrastructure layer
public cloud, dedicated cloud

IBM BaaS

Top Layer
Hyperledger composer

Development | Deployment

Middle layer
Hyperledger Fabric

Infrastructure layer
IBM cloud

IBM cloud services | LinuxONE

Microsoft BaaS

Industry Solutions

Smart contract marketplace | SaaS solutions

Middleware Tier

Cryptlet architecture | Distribute ledger gateway services, etc.
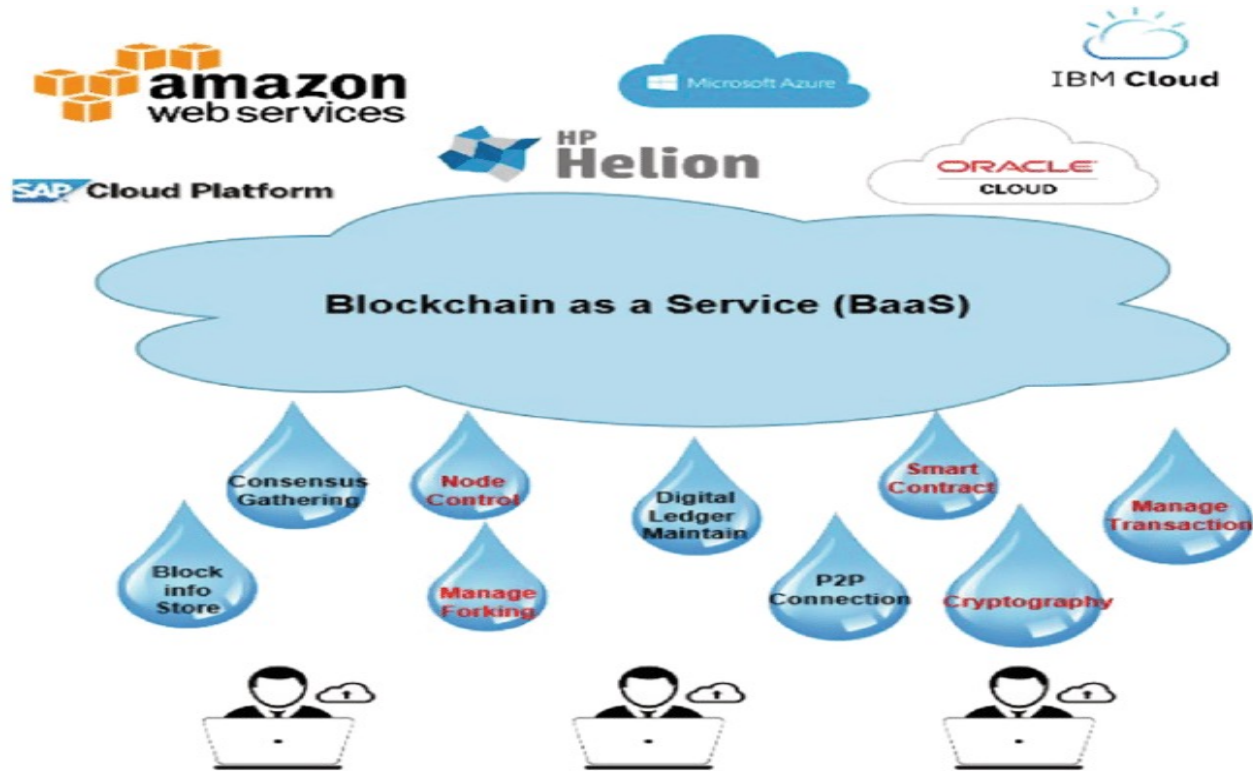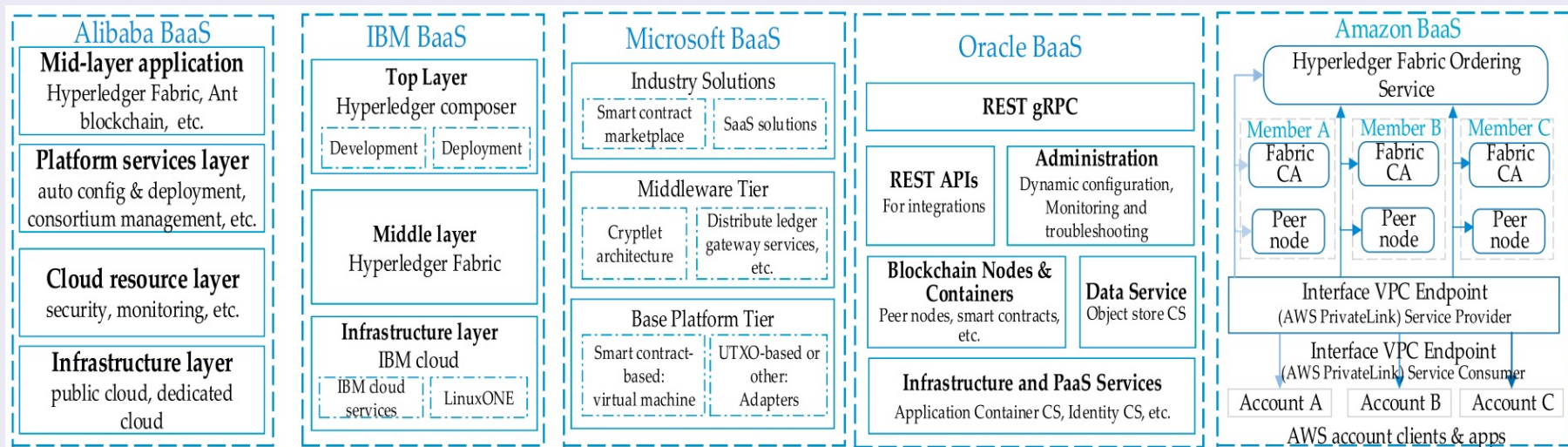
Base Platform Tier

Smart contract-based: virtual machine | UTXO-based or other: Adapters

Oracle BaaS

REST gRPC

REST APIs
For integrations

Administration
Dynamic configuration, Monitoring and troubleshooting

Blockchain Nodes & Containers
Peer nodes, smart contracts, etc.

Data Service
Object store CS

Infrastructure and PaaS Services
Application Container CS, Identity CS, etc.

Amazon BaaS

Hyperledger Fabric Ordering Service

Member A
Fabric CA
Peer node

Member B
Fabric CA
Peer node

Member C
Fabric CA
Peer node

Interface VPC Endpoint
(AWS PrivateLink) Service Provider

Interface VPC Endpoint
(AWS PrivateLink) Service Consumer

Account A | Account B | Account C

AWS account clients & apps

Trust with Providers

- What is trust?
- Types of BaaS offerings
- Trust between tenants and providers
- Governance

Unified BaaS

"Unified Blockchain as a Service (UBaaS) is a cloud-based blockchain service that provides a comprehensive and integrated blockchain platform for enterprises and developers to build, deploy, and manage blockchain-based applications and services. UBaaS offers a set of tools and APIs that abstract away the underlying complexity of blockchain technology and provide a simplified and streamlined experience for developing and deploying blockchain applications."
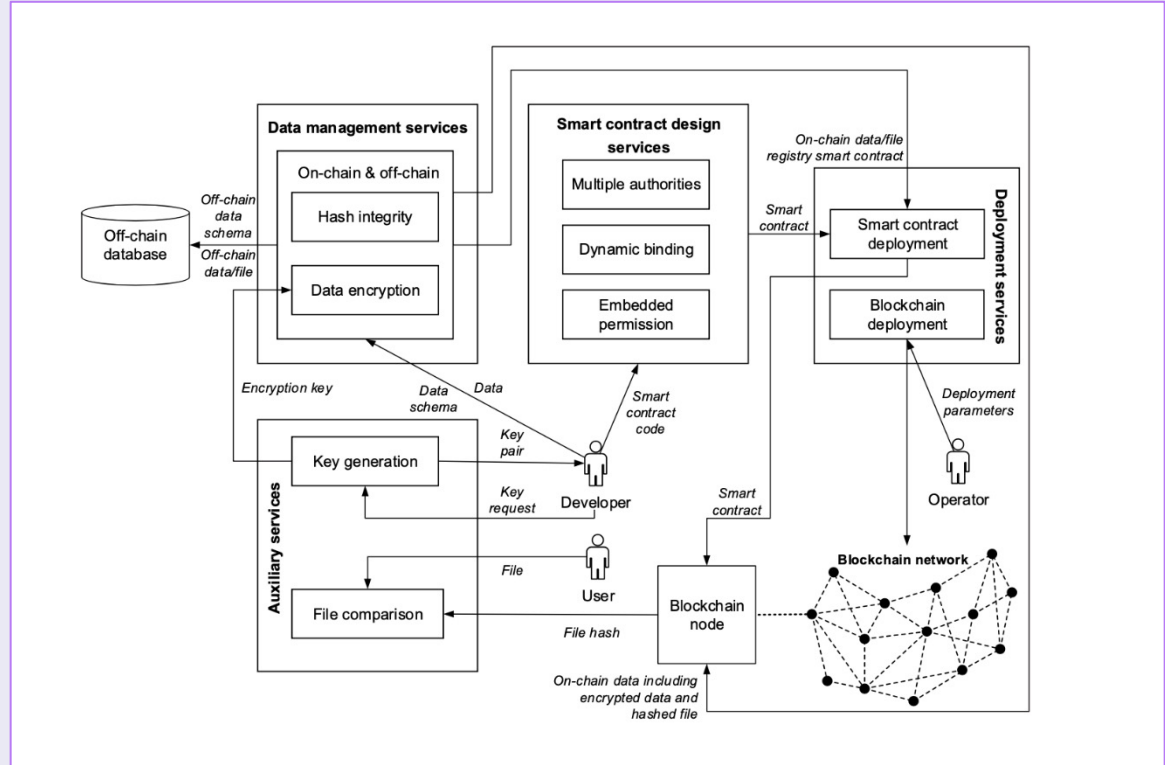
Approach of uBaas

Deployment as a service

Design pattern as a service
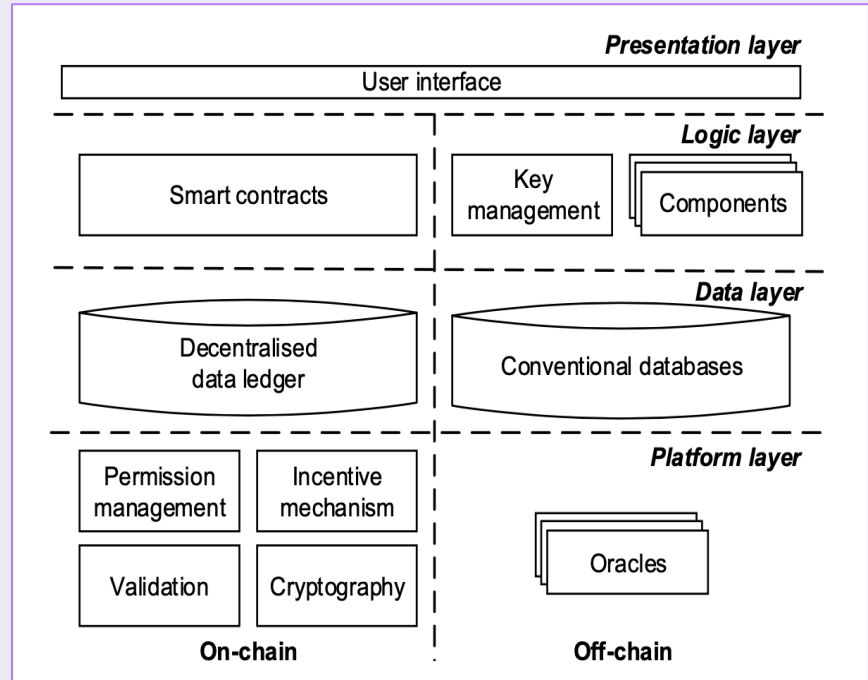
Architecture of uBaaS

- Data Management services
  - On chain and off chain
  - Hash Integrity
  - Data Encryption
- Smart contract design services
  - Multiple Authorities
  - Dynamic Binding
  - Embedded permissions
- Auxiliary services
  - Key generation
  - File Comparison

Other type of Baas

- Function BaaS -

    Functional Blockchain as a Service (FBaaS) is a cloud-based blockchain service that focuses on providing functional, ready-to-use blockchain components and applications that can be easily integrated into an organization's existing infrastructure.

- BaaS for HPC(BaaSH) -

    Blockchain as a Service for High-Performance Computing (BaaS for HPC) is a cloud-based blockchain service that is optimized for high-performance computing workloads. BaaS for HPC is designed to provide a secure, scalable, and distributed platform for running complex computational tasks that require massive amounts of processing power.

Challenges of Blockchain Application Development

Decentralization
- Deployment
- Transparency Vs Customization

Security
- Data Privacy
- Key Management
- Permission Control
- Trustability Vs Privacy

Scalability
- Lack of Standardization
- Interoperability

Conclusion

- Blockchain as a Service is still in its nascent phase.

- Standardization of Blockchain as a Service is essential for sustainability.

- More research into the applications of BaaS

Key Takeways

01   BaaS Novel Applications

02   BaaS platforms - Analysis

03   Key Challenges

References:

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- FBaaS: Functional Blockchain as a Service [2018 International Conference of Blockchain]
- uBaas : Unified Blockchain as a Service [2018 Future Generation Computer Science: Volume 101]
- BAASH: Enabling Blockchain-as-a-Service on High-Performance Computing Systems [Abdullah Al-Mamun , Dongfang Zhao]

Thank You