

# Cloud Storage

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# Storage

- On Site Storage
- Off-Site Storage / Cloud Storage

# Cloud Storage

- It allows to save data and files in an off-site location and access either through the public internet or a dedicated private network connection.
- Data storage becomes the responsibility of a third-party cloud provider.
- The providers hosts, secures, manages, and maintains the servers and associated infrastructure
- They ensures to access data whenever it needs.

# Cloud Storage- Characteristics

- Cost-effective and scalable.
- Cloud storage services provide elasticity- scale capacity as your data volumes increase or dial down capacity if necessary.
- No need for investing in the capital costs of building and maintaining in-house storage networks. You pay for only exactly the capacity you use.
- Costs might increase over time to account for higher data volumes

# Different Cloud Storage

## Cloud storage:

**a. Private**

**b. Public**

**c. Hybrid clouds.**

# Public storage clouds

- One can connect over the internet to a storage cloud that's maintained by a cloud provider and used by other companies.
- Providers typically make services accessible from just about any device, including smartphones and desktops
- It allows for scale up and down as needed.
- It does not reside in private network

# Private cloud storage

- It reside within your network, leveraging a physical server to create instances of virtual servers to increase capacity.
- You can choose to take full control of an on-premise private cloud
- Access with a private connection.
- Organizations that might prefer private cloud storage include banks or retail companies due to the private nature of the data they process and store.

# Hybrid cloud storage

- It model combines elements of private and public clouds, giving organizations a choice of which data to store in which cloud.
- More sensitive data goes to a private cloud environment; whereas less sensitive data such as email that doesn't contain business secrets etc. can be stored in the public cloud.
- Some organizations use hybrid clouds to supplement their internal storage networks with public cloud storage.



# Merits Cloud storage

- **Off-site management:** This frees your staff from tasks associated with storage, such as procurement, installation, administration, and maintenance.
- **Quick implementation:** you can provision the service and start using it within hours or days, depending on how much capacity is involved.
- **Cost-effective:** you pay for the capacity you use.
- **Scalability:** you can scale up as much as you need. Capacity is virtually unlimited.
- **Business continuity:** Storing data offsite supports business continuity in the event that a natural disaster or terrorist attack cuts access to your premises.

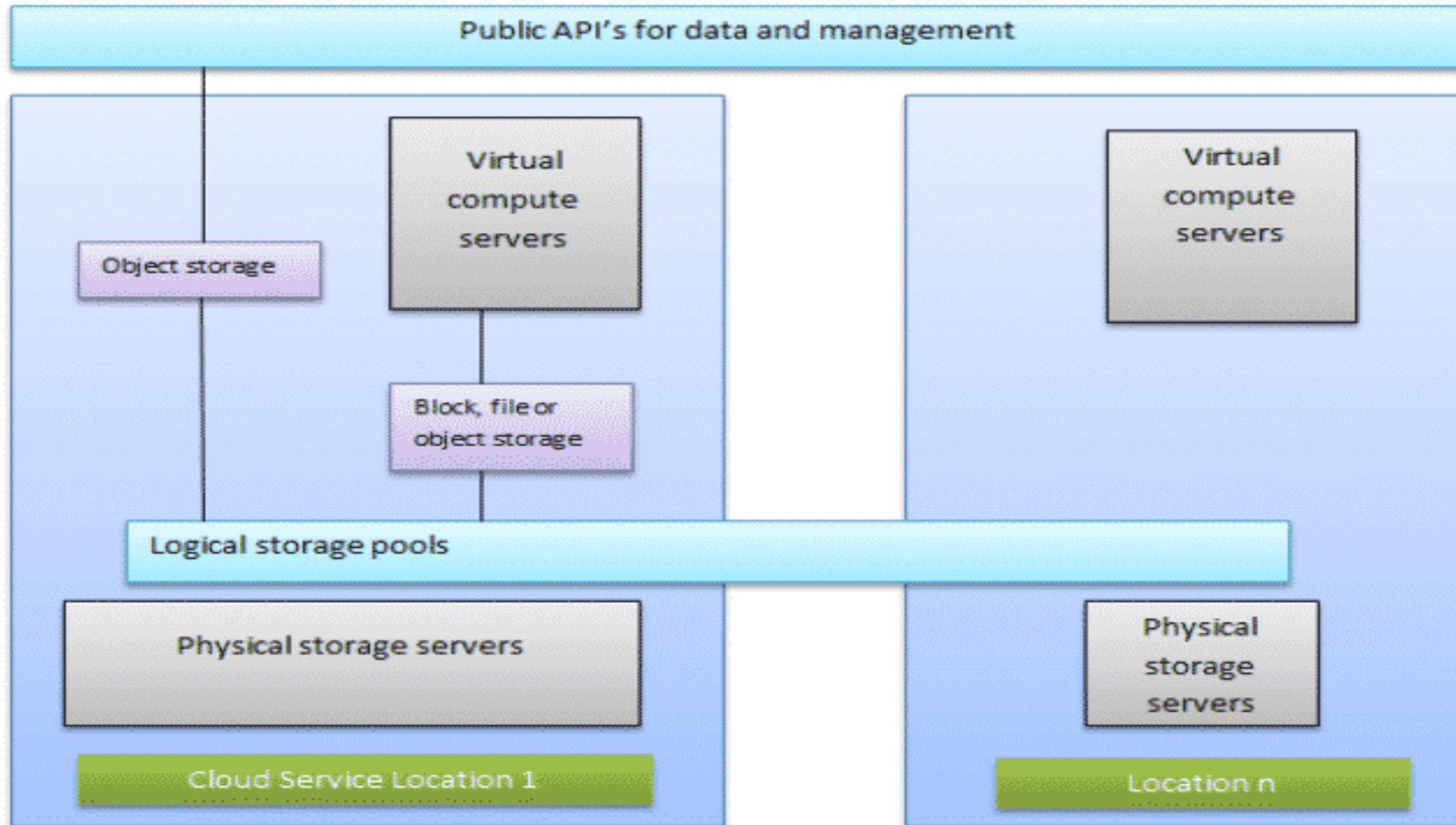
# De-merits

- **Security:** Security concerns are common with cloud-based services.
- **Administrative control:** Being able to view your data, access it, and move it at will is another common concern with cloud resources.
- **Latency:** Delays in data transmission to and from the cloud can occur as a result of traffic congestion, especially when you use shared public internet connections.
- **Regulatory compliance:** Certain industries, such as healthcare and finance, have to comply with strict data privacy and archival regulations, which may prevent companies from using cloud storage for certain types of files, such as medical and investment records.

# Cloud Storage Organization Methods

- **Block based**
- **File based**
- **Object based**

# Cloud Storage Architecture[2]



# Block Storage

- It is also common in cloud storage environments.
- Data is organized into large volumes called “blocks.”
- Each block represents a separate hard drive.
- It provides better performance over a network
- Useful for large databases and applications.
- Scales easily to support the growth of your organization’s databases and applications.
- Useful if your website captures large amounts data

# File storage

- Data saves in the hierarchical file and folder structure
- The data retains its format, whether residing in the storage system or in the client where it originates
- Hierarchy makes it easier and more intuitive to find and retrieve files when needed.
- File storage is commonly used for development platforms, home directories, and repositories for video, audio, and other files.

# Object storage

- Manages data as objects.
- Each object includes the data in a file, its associated metadata, and an identifier.
- Easier to access and analyze.
- Objects are kept in repositories that deliver virtually unlimited scalability.
- Metadata is customizable, object storage allows you to optimize storage resources in a cost-effective way.

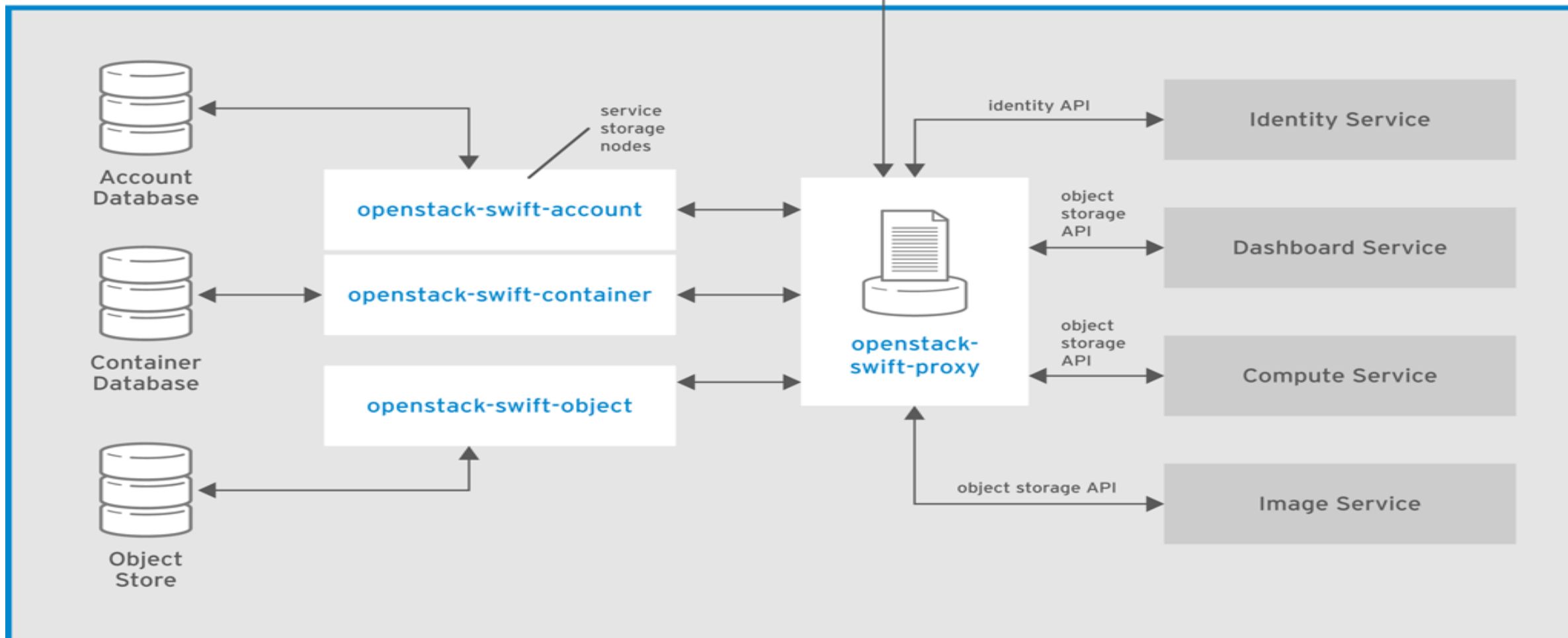
# Object vs. file vs. block storage

	OBJECT STORAGE	FILE-BASED STORAGE	BLOCK-BASED STORAGE
<b>Transaction units</b>	Objects, that is, files with custom metadata	Files	Blocks
<b>Supported type of update</b>	No in-place update support; updates create new object versions	Supports in-place updates	Supports in-place updates
<b>Protocols</b>	REST and SOAP over HTTP	CIFS and NFS	SCSI, Fibre Channel, SATA
<b>Metadata support</b>	Support of custom metadata	Fixed file-system attributes	Fixed system attributes
<b>Best suited for</b>	Relatively static file data and as cloud storage	Shared file data	Transactional data and frequently changing data
<b>Biggest strength</b>	Scalability and distributed access	Simplified access and management of shared files	High performance
<b>Limitations</b>	Ill-suited for frequently changing transactional data; doesn't provide a sharing protocol with a locking mechanism	Difficult to extend beyond the data center	Difficult to extend beyond the data center





http(s)



## OPENSTACK OBJECT STORAGE SERVICE

# Cloud Service Provider Elements

- IoT Transformation and Connectivity
- Application Logic
- Visualization
- Analytics
- Process Management
- Device Data Store
- API Management
- Device Management
- Device Registry
- Device Identity Service
- Transformation and Connectivity

# IoT Transformation and Connectivity

- It enables secure connectivity to and from IoT devices. This component must be able to handle high volumes of messages and quickly route them to the right components in the IoT solution.
- Transformation and Connectivity component includes the following capabilities:
  - Secure Connectivity
  - Scalable Messaging
  - Scalable Transformation

# Application Logic

- It coordinating the handling of IoT device data, the execution of other services and supporting end user applications.
- An Event based programming model with trigger, action and rules is used to write IoT application logic.
- Application logic can include workflow, control logic

# Visualization

- It enables users to explore and interact with data from the data repositories, actionable insight applications, or enterprise applications.
- Visualization capabilities include End user UI, Admin UI & dashboard.
  - End User UI** - allows users to communicate and interact with Enterprise applications, analytics results, etc. This also includes internal or customer facing mobile user interfaces.
  - Admin UI** - enables administrators to access metrics, operation data, and various logs.
  - Dashboard** - allows users to view various reports. Admin UI and Dashboard are internal facing user interfaces.

# Analytics

- **Analytics Data repository** - supports legacy, new and streaming sources, enterprise applications, enterprise data, cleansed data and reference data, as well as output from streaming analytics.
- **Cognitive** - intelligent system that learns at scale, reasons with purpose, analyses to predict.
- **Actionable Insight** - insights that ultimately drive actions that may be used by business applications from data collected, processed and stored in the data repositories. Capabilities include: Decision Management; Discovery & Exploration; Predictive Analytics etc.
- **Streaming Computing** - accepts and processes in real time large volumes of highly dynamic, time-sensitive continuous data streams from sensor-based monitoring devices, messaging systems and financial market feeds.

# The Complete Picture

Figure 3 provides a more detailed view of components, subcomponents and relationships for a cloud-based IoT solution architecture.

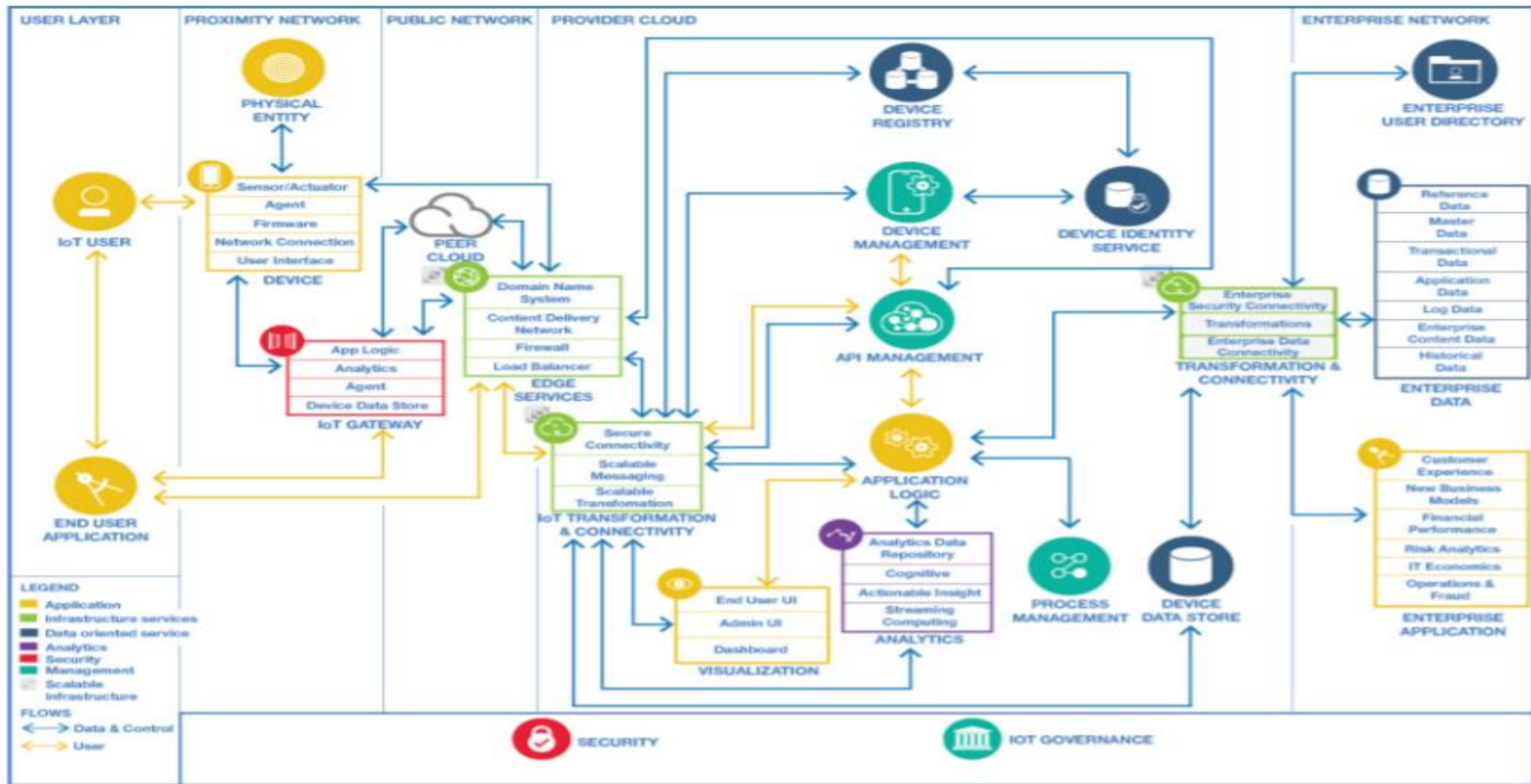


Figure 3: Detailed Components Diagram

# References

1. [https://www.ibm.com/cloud/learn/cloud-storage?mhsrc=ibmsearch\\_a&mhq=Storage%20](https://www.ibm.com/cloud/learn/cloud-storage?mhsrc=ibmsearch_a&mhq=Storage%20)
2. <https://electricalfundablog.com/cloud-storage-architecture-types/>
3. <https://www.omg.org/cloud/deliverables/CSCC-Cloud-Customer-Architecture-for-IoT.pdf>