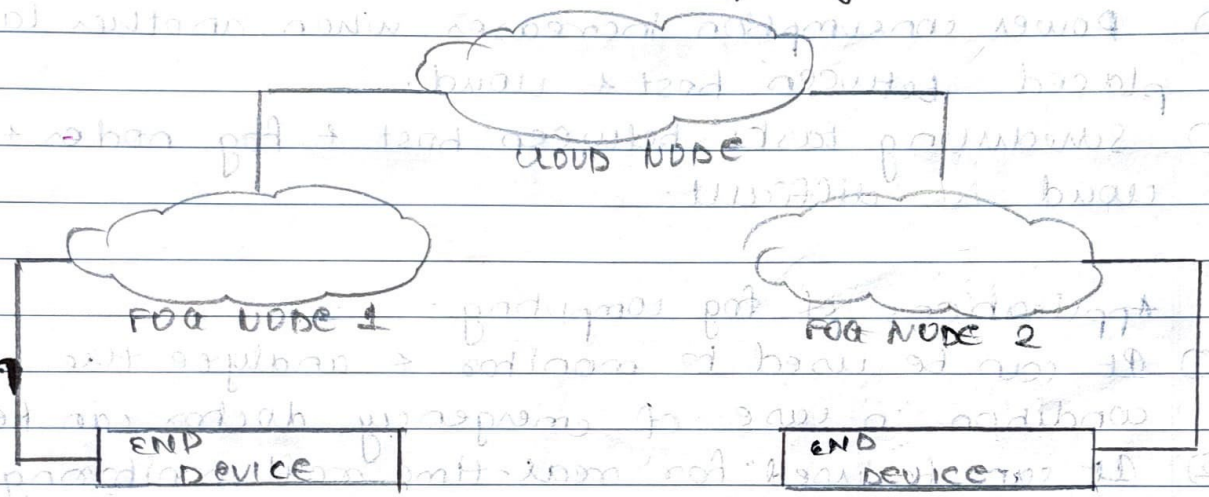
Written Assignment-1.

Q1. What is fog computing? Explain the need of fog computing.

Ans. Fog computing is the term coined by cisco that refers to extending cloud computing to an edge of the enterprises network. It is also known as edge computing or fogging. It facilitates the operation of computing, storage & networking services between end devices & computing data centers.



The devices comprising of fog infrastructure are known as fog nodes. In fog computing, all storage capabilities, computation capabilities, data along with the applications are placed between the cloud & physical host. All these functionalities are placed more towards the host. This makes processing faster as it is done almost at the place where data is created. It improves the efficiency of the system & is also used to ensure increased security.

- Advantages of fog computing.

(1) This approach reduces the amount of data that needs to be sent to the cloud.

(2) Reduces the response time of the system.

3. It improves the overall security of the system as the data resides close to the host.

Disadvantages of fog computing:

① Congestion may occur between the host & the fog node due to increased traffic.

② Power consumption increases when another layer is placed between host & cloud.

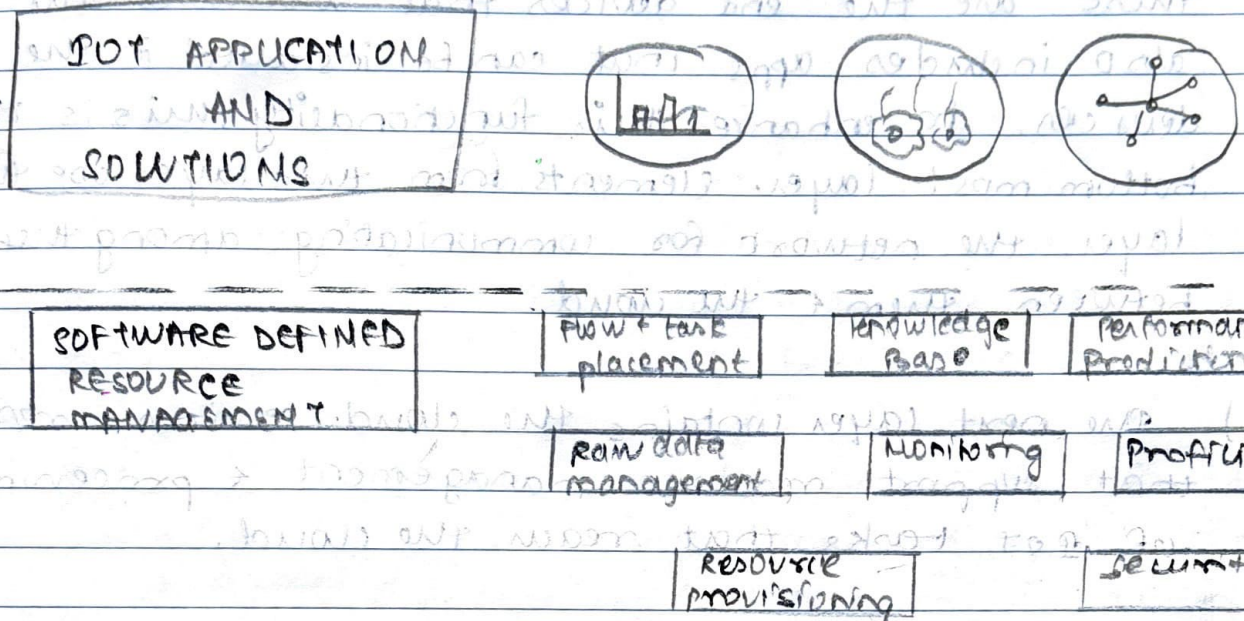
③ Scheduling tasks between host & fog nodes & the cloud is difficult.

Applications of fog computing:

① It can be used to monitor & analyse the patients condition in case of emergency, doctors can be altered.

② It can be used for real-time rail monitoring as for high-speed trains we want as little latency as possible.

Q2. Explain the architecture of fog computing.



a) Sensors, edge, gateways, etc.
These are the end devices that user uses. This layer also includes apps that can be installed in the end devices, to enhance their functionality. This is the bottom-most layer. Elements from this layer use the next layer, the network for communicating among themselves, between them & the cloud.

b) The next layer contains the cloud services & resources that support resource management & processing of IoT tasks that reach the cloud.

c) On top of the cloud layer, lays the resource management software that manages the whole infrastructure & enables quality of service to fog computing application.
Flow & task placement, Knowledge Base, Performance prediction, Raw data management, Monitoring, Profiling, Resource provisoning, Security.

d) Finally, the topmost layer contains the applications that leverage fog computing to deliver innovative & intelligent applications to end users.

Q3. Explain the applications of fog computing.

Ans. There are variety of applications benefitting from fog computing.

1. Healthcare: a) To monitor fall for stroke patients, a fog computing assisted distributed analytics system is there known as FAST. They designed a real-time fall detection system based on fog computing that divides the fall detection task between edge devices & the cloud.

b) They proposed a three-tier architecture for a smart health care infrastructure, comprised of a role model, layered cloud architecture & a fog computing layer in order to provide an efficient architecture for healthcare & elderly care application.

2. Augmented Reality: a) These applications are highly latency intolerant, as even very small delays in response can damage the UX. The system employs both fog & cloud severs, a combination that enables the system to perform continuous real-time classification at fog servers.

b) Because of the nature of cognitive devices with constrained resources, the computer intensive workloads of an application need to be offloaded to an external server. This offloading provides resp. real time responses, these devices may communicate with the cloud for delay-tolerant jobs like error reporting & logging. Thus fog is used as an extension of cloud.

Q4b Explain Fog, Edge & cloud computing.

Ans.

	FOG	EDGE	CLOUD
1.	Data is processed within the fog nodes in the LAN.	Data is processed on the device or sensor itself.	Data is processed on a central cloud server.
2.	Provides limited procesing power	Provides least procesing power as compared to other two	Provides for more advanced & better procesing tech.
3.	It's framework is suitable for busines application that require quick response.	It's framework is best suited for busines application that require quick response	It's framework is most suitable for long term in depth analysis
4.	It can operate without internet accers	It is suited for cases where IoT sensors may not have best internet speed.	It needs 24*7 internet accers for its operations.
5.	In this, information is distributed among nodes.	In this, data stays on the device, making it highly secured.	Using it would require a security system to safegaurd data from cyber threats.

Q5. Case study of fog computing.

→ Fog computing as privacy enabler.

Fog computing fosters data privacy & security of business secrets, complementing existing cryptographic approaches.

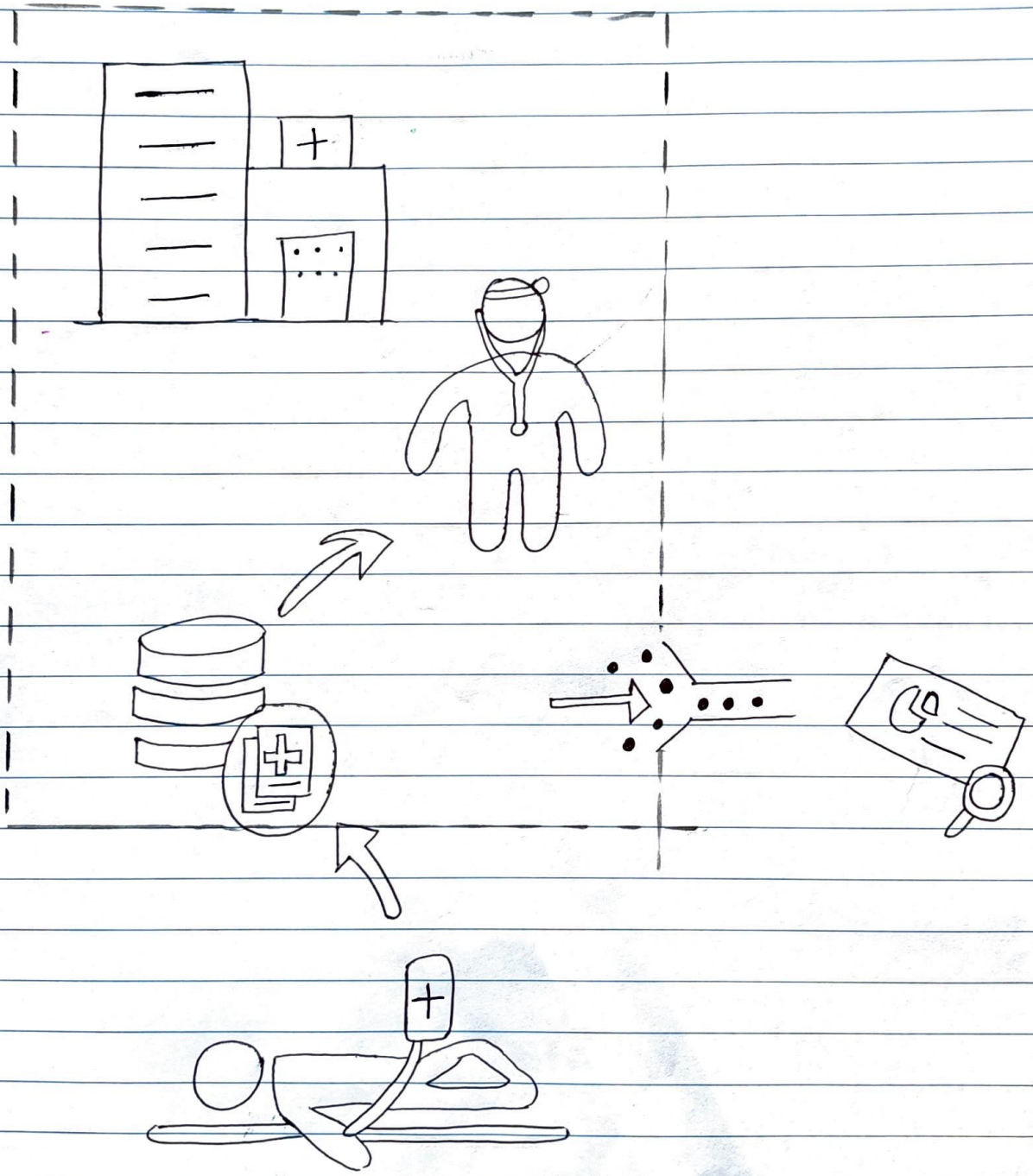
- e-Health & data sharing

The use of health related data for different actors is one of the main principles driving e-Health adoption. In particular, this provides benefits when multiple parties are involved in the treatment of a single patient & can easily access existing examination data. However, regulations applicable to the health sector often raise strict concern on where health related data may be stored.

As opposed to established models of cloud based data sharing, compliance with such regulations can be significantly streamlined with fog computing's inherent capabilities for data placement control. Another often mentioned use case for health relate data regards the reuse of examination data. In this case, regulations strictly require respective data to be pseudonymized depending on the party conducting the research.

for the automated application of such data minimization measures, Implementing the model together with a nation-wide hospital group. Early results are promising & already confirm the expected benefits in matters of easing the collaboration between different parties in line with existing regulations.

Diagram:-



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