T12: Emerging Network Technology

Q1: What are the "things" in IoT? Give a couple of examples on the applications of IoT.

Answer

The things in ioT are physical objects that are embedded with sensors, software and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. These devices range from ordinary household objects to sophisticated and complex industrial systems.

Examples includes household appliances, wearable monitoring equipment, smart manufacturing devices, etc.

Q2: What is software defined networks? List 4 major differences between SDNs and traditional networks.

Answer

Software defined network (SDN) is an approach to network management that enables dynamic, programmatically efficient network configuration. SDN attempts to centralize network intelligence in one network component by disassociating the forwarding process of network packets (data plane) from the routing process (control plane). The control plane consists of one or more controllers, which are considered the brain of the SDN network where the whole intelligence is incorporated.

SDNs vs. traditional networks:

centralized control vs. distributed control.
data plane and control plane are decoupled by software vs. data plane and control plane are mounted on same plane
automatic configuration so it takes less time vs. static/manual configuration so it takes more time
structural complexity is low vs. high
easy to troubleshoot and report as it is centralized controlled vs. difficult to troubleshoot and report as it is distributed controlled
maintenance cost of SDN is lower than traditional network

Q3: How does Blockchain handle block tampering? Explain with details.

Answer

Creation of blocks is not easy and cannot be done instantly. Blockchain follows a mechanism to slow down the creation of new blocks (PoW – Proof Of Work). Tampering a block requires recalculating the hash values of all the blocks ahead of the tampered block which will require a considerable amount of time. Furthermore, blockchain being distributed let everyone (nodes) keep a copy of the ledger (blockchain) and makes it impossible for one to alter the content of a block (Distributed Consensus).

Q4: In a Bitcoin Ledger, why is it important to have a unique ID and the digital signature for each transaction recorded?

Answer

Digital Signature helps to verify the transaction by the money sender. UniqueID prevents duplicating the ledge entries including the digital signatures.

Q5: What are the key features of Bitcoin protocol?

Answer

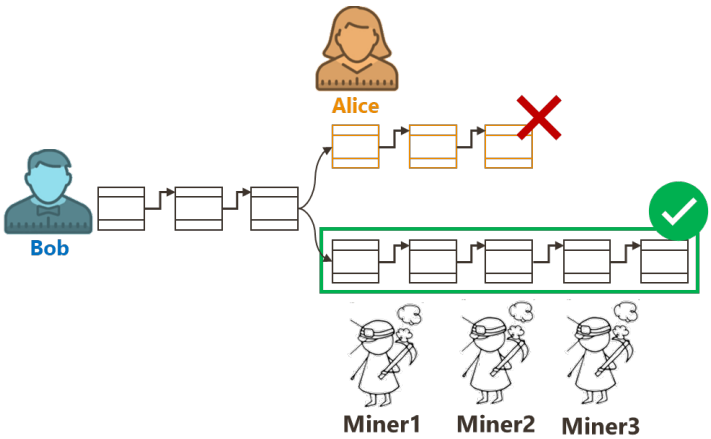
- Broadcast Transactions
- Only Accept Signed Transactions
- No Overspending
- Distributed Consensuses
- Mechanism to Prove Work (PoW, PoS)

Q6: Why is it extremely difficult for someone to fool someone else with fraudulent blocks of transactions in Bitcoin?

Answer

Let's say an intruder (Alice) managed to win the lottery in PoW for a few times against all the other miners competing, and send a fraud block to a node (Bob). But to be the longest chain (ledger that has the most work put on) the intruder (Alice) must have at least >50% of the computing resources among all miners **(which is impossible)** so that she can always win the lottery in PoW with high probability.

Note that the node (Bob) will eventually reject the intruder's (Alice's) chain in favor of the longer chain if the intruder fails to be the longest chain.



Q7: How does "**Proof of Work**" differ from "**Proof of Stake**"?

Answer

Proof of stake holds a stake (security deposit) from a validator to ensure the integrity of the minting /forging (similar mining in PoW). This can help to mitigate the biggest problem of PoW which is the high energy usage for mining.

Q8: What are smart contracts?

Answer

Digital Contracts, tiny computer program stored in Blockchain (immutable, distributed)

- Once smart contract is created, can never be changed.
- Output of the contract is validated by everyone in the network.
- A single person cannot force the contract to release the funds!