1. **What was the impetus for developing Ether and the Ethereum Network, especially relative to Bitcoin?**

The creators of Ethereum were inspired by Bitcoin’s ability to offer an ordered ledger of transactions that does not require trust in a central entity – but instead incentivizes a decentralized network of individuals to use their computers to maintain a verifiable, true record of transactions. However, the creators of Ethereum saw the potential for the technology behind Bitcoin – blockchain – to facilitate more advanced applications, such as smart contracts. Smart contracts are self-executing code contracts that operate according to arbitrary programmed specifications, allowing for the automation of certain processes. For example, a smart contract could be programmed to transfer ownership of assets between parties on a specified date, or upon being triggered by whatever catalyst it is programmed to respond to. A blockchain enables trustworthy execution of these processes, because if the smart contract is programmed to respond to information stored on the blockchain, then users interacting with that contract can guarantee the validity of the execution-triggering data.

Smart contracts can be programmed such that many of them interact with each other to facilitate complex applications, which means that a blockchain capable of supporting smart contracts is also capable of supporting complex applications. It should also be noted that complex applications require Turing completeness, and This was the vision for Ethereum: a blockchain capable of facilitating trustless applications which are stored across a network of computers. This is sometimes called the “world computer,” because instead of storing information related to an application on a central server which individual computers access remotely, in the Ethereum network, that information would be stored across a worldwide network of computers, all coming together to form a sort of “world computer,” which is collectively owned and maintained by the network participants.

But there must be a way to incentivize honesty of the participating computers in maintaining a true ledger of transactions. In Bitcoin, this is done using bitcoin – a digital currency which is produced and issued to participating computers to reward their honest collaboration. In Ethereum, that incentivizing mechanism is Ether. While for the Bitcoin blockchain, bitcoin is also primarily a currency and so also derives its value because it functions as a medium of exchange, for Ethereum, it is only necessary that Ether has enough value that it incentivizes people to use their computers to support the network. Ether, then, while it is often used by individuals as a medium of exchange – and in fact must have value to incentivize honest behavior of network participants – is primarily a way for users of Ethereum applications to pay those running the network (also known as miners or nodes) for transaction costs within the network.

**2. What are the current functionalities and capabilities of Ether and the Ethereum Network as compared to the functionalities and capabilities of Bitcoin?**

The most obvious differentiation is that Ethereum is host to smart contract-based applications, whereas Bitcoin continues to be only a digital currency. Using smart contracts, Ethereum hosts video games, blockchain-native businesses (called DAOs, or decentralized autonomous organizations), digital currency exchanges, social media platforms, and a range of other applications.

Further, these applications are capable of issuing their own digital tokens, which are used for an incredibly wide range of functions. Some uses of these DApp-specific tokens include: game tokens, currency, shares of an asset, unique digital collectibles, tools for voting, and other governance-related functions.

Ethereum has a virtual machine (the Ethereum Virtual Machine, or EVM), which is Turing complete (or at least quasi-Turing complete), while Bitcoin does not have a virtual machine and is not Turing-complete. Turing completeness allows for much greater functionality and flexibility, which Bitcoin does not need because it is only a digital currency. Turing completeness allows for the computation of any imaginable algorithm (given the necessary memory resources), making it almost infinitely flexible to new applications.

The Bitcoin networks takes much longer to create new blocks, and there is a maximum possible size for every block. Ethereum has no block size limit, and blocks are created much faster. It is also generally true that Ethereum can process more transactions per second than Bitcoin. However, the particulars of how long it takes to create a new block, and how many transactions can be processed per second by each network varies considerably. It is generally quoted that Bitcoin has 10 minute block times, and that it can process roughly 3-7 transactions per second, but sometimes blocks are created much faster. With Ethereum, generally blocks are created roughly every 13 seconds, but it varies, and transactions per second range between 4-20.

**3. How is the developer community currently utilizing the Ethereum Network? More specifically, what are prominent use cases or examples that demonstrate the functionalities and capabilities of the Ethereum Network?**

There is not necessarily a clear relationship between what the developer community is building on Ethereum and what end users are using Ethereum for. A significant amount of developer talent is currently being utilized to build the base level protocol of Ethereum, and on what are called “layer two scalability solutions.” All of this development is focused on improving the capacity of the Ethereum network such that it might be capable of more widespread adoption, and use for applications with heavy traffic. Much improvement is needed to the base level protocol before many applications built on Ethereum will be particularly attractive to end users, though there are some existing DApps with fairly significant (though still very limited) user interest. For the most part, the most used DApps are games and financial services applications, though there are some DApps that do not necessarily have a high level of traffic, but which are more respected, talked about, or which have more Ether (or DApp-specific tokens) locked in their smart contracts. Another use case that gets a lot of attention are DAOs, or blockchain-native organizations: These organizations can allow people who do not know or trust each other to coordinate around a common purpose, across borders and time zones.

Financial applications, like decentralized currency exchanges, loan issuers, securities issuers, and companies tokenizing real world assets currently represent a significant amount of use cases. One well-respected DApp is MakerDAO, a platform which allows people to use smart contracts developed by MakerDAO issues Ether-collateralized loans in a stable coin called Dai, which is pegged to the price of the US dollar. MakerDAO represents a significant feat of engineering, as the price of Dai has remained very close the Dollar, despite drastic volatility in the price of Ether. Further, Maker accomplishes all of this through a combination of complex programmed mechanisms and participation by MakerDAO community members. MakerDAO is innovative not just for its ability to offer cryptocurrency-backed stable coin loans, but also in its governance structure, which is increasingly decentralized. It is MakerDAO token holders who govern the loan interest rates and help control price volatility.

Other financial service applications include platforms to fractionalize ownership of assets, like art or housing. Sometimes this is used simply to sell these assets to multiple people, but sometimes it’s more about governing the use of objects or resources. For example, one company, Mattereum, is fractionalizing ownership of a very old and expensive violin. The original owner of the violin is able to fractionalize ownership of the violin and sell it to investors so that she can gain liquidity, but she is able to maintain a share of the violin and stipulate the rules of use: She can stipulate that the violin remain unaltered, and that it be played some minimum or maximum number of times per year.

Games are another popular use case. Ethereum allows for the creation of non fungible assets, which are often used in games as characters or in-game purchases. For example, one of the most popular games (still less than 500 users per day) is called HyperDragons, where people buy unique digital tokens associated with a correspondingly unique digital image of a dragon. Each dragon is encoded with certain traits and capabilities, and then the dragons can battle each other. This works essentially in the same way as Pokemon or other game cards, except that every dragon is perfectly unique and owned by the person who possesses it.

DAOs are another big potential use case. DAOs are blockchain-native organizations that allow some significant portion of operations to be completed on-chain. This allows for anonymous individuals in a global community to coordinate to complete tasks. Some platforms, like DAOstack and Aragon, allow organizations to facilitate payroll and fund management on-chain, and have DAO members participate in decision making through on-chain voting. This voting can even be used to trigger smart contracts to automatically execute based on member votes. DAOs do not require any one individual make any decisions, but instead rely upon participation and coordination between members. Further, because of their basis in smart contracts, DAO members can trust that outcomes will execute exactly as coded.