

Problem statement

Our company is an engineering manufacturing company that manufactures solid state drives (SSDs) and hard disc drives (HDDs) with many HW and software components that constitute a shipping product. With the recent global supply shortage, the supply chain has become very unpredictable. This is impacting not just our vendors but also our customers. With the existing process in place, adapting to such dynamic supply environment is very inefficient and time-consuming resulting in lost revenue and reduced margins. There are many divisions with the company that have their own process to track orders/goods. Many times working between different systems is not seamless resulting in human intervention and hence delays. Things get a lot more interesting when we are dealing with vendors and customers. There the IT systems are totally independent and hence there is duplicated effort. This issue is similar to last mile problem both from supplier standpoint and also from customer standpoint. The logistics data needs to be entered in a data base that is specific to each customer/vendor. Another situation is somewhat unrelated to the global shortage. Customers can have sudden increase in demand, and we want to get that information passed to suppliers as soon as possible to meet that demand. Currently this process needs a lot of co-ordination across many teams (person months of overhead). If this can be streamlined and automated via smart contracts, this would really help coping with the demand seamlessly. Here is another related problem to deal with. As customers deploy our product in the field, it is possible that some critical issue can result in product failures resulting in loss of critical data or even HW damage. We want to detect such conditions super quickly so we can take necessary action to mitigate the impact. For instance, if a product fails at specific site, customers can quickly inform us via a smart contract that helps us figure out history of those part on immutable ledger on block chain while we trigger a pause on the future shipments and contain the damage. Lastly with the global pandemic, most of the work is remote and makes it harder to discuss in F2F meetings, Having an automated way to run the supply chain makes block chain a very attractive proposition to us.

Outline of vision

We believe that block chain will be able to solve these supply chain challenges very well. What does block chain provide - **Lower cost of networking and cost of verification**. Our line of business has higher cost of networking due to many parties involved in building and shipping the product. The block chain also solve the last mile problem as the customers and suppliers will be using the same permissioned block chain. As the parts flow from vendor through the manufacturing flow, there are transactions logged on distributed ledger at various steps of the way. We want to use a permissioned block chain approach within a subset of our own organization and remove any kinks from the process from technical and privacy viewpoint. We can't underplay the importance of privacy laws in this model. As we set smart contracts with various customers and suppliers, we have to be very careful that the smart contracts are in such a way that the contract is not fully transparent to all the folks on the block chain. This can be made by designing a smart contract that has access permissions. We could have standard information shared with all customers, but some specific confidential information is only shared with specific customers. Now, let us get to the tokens. We will be using Ethereum BC for storing transaction and smart contracts. As participants satisfy the smart contracts and take the needful step, we can use tokens to reward them. These tokens would have no monetary value but would provide them discount on pricing or can be early access partners to future engagements.

Blockchain technology solution

The four choices for entrepreneurial strategy:

1. CUSTOMERS

Customers here consist of internal and external customers. These would be incumbent customers who are currently using traditional methods of supply chain management. The Internal customers are manufacturing, NAND chip fab, head and media storage division, as well as suppliers like PCB manufactures, disc enclosures, HW component suppliers like DDR and discrete component suppliers as well as cloud customers that consume our devices and deploy them in storage racks in data centers as part of overall system solution. Since we are changing the supply chain from end to end this would take some time and might need to incrementally start deployment of this model while keeping the legacy system in place until the details of things like smart contracts are figured out and approved by legal department in both internal and external customers

2. TECHNOLOGY

The solution is based on Ethereum 2.0 decentralized **permissioned** block chain with smart contracts with appropriate permissions. In addition to the contracts, we would also have a non fungible token that will be used with external customers to promote strong collaboration and governance. Since there is no real hard money involved the token, there should be no implications to SEC regulations. The main challenge in this model is coming up with a smart contract that covers most of the scenarios that can occur. Note that notion of trust or relational contracts are hard to be written in a smart contract framework but we can cover most of the scenarios that can occur and have in the past. With many customers involved, we need higher transactional speed to reduce the overall time and hence Eth2.0 is the framework of choice for the block chain. For enterprise use, private or permissioned blockchains also offer greater scalability because they use consensus mechanisms that are computationally inexpensive compared to the computational power required by public blockchain to achieve consensus

3. IDENTITY

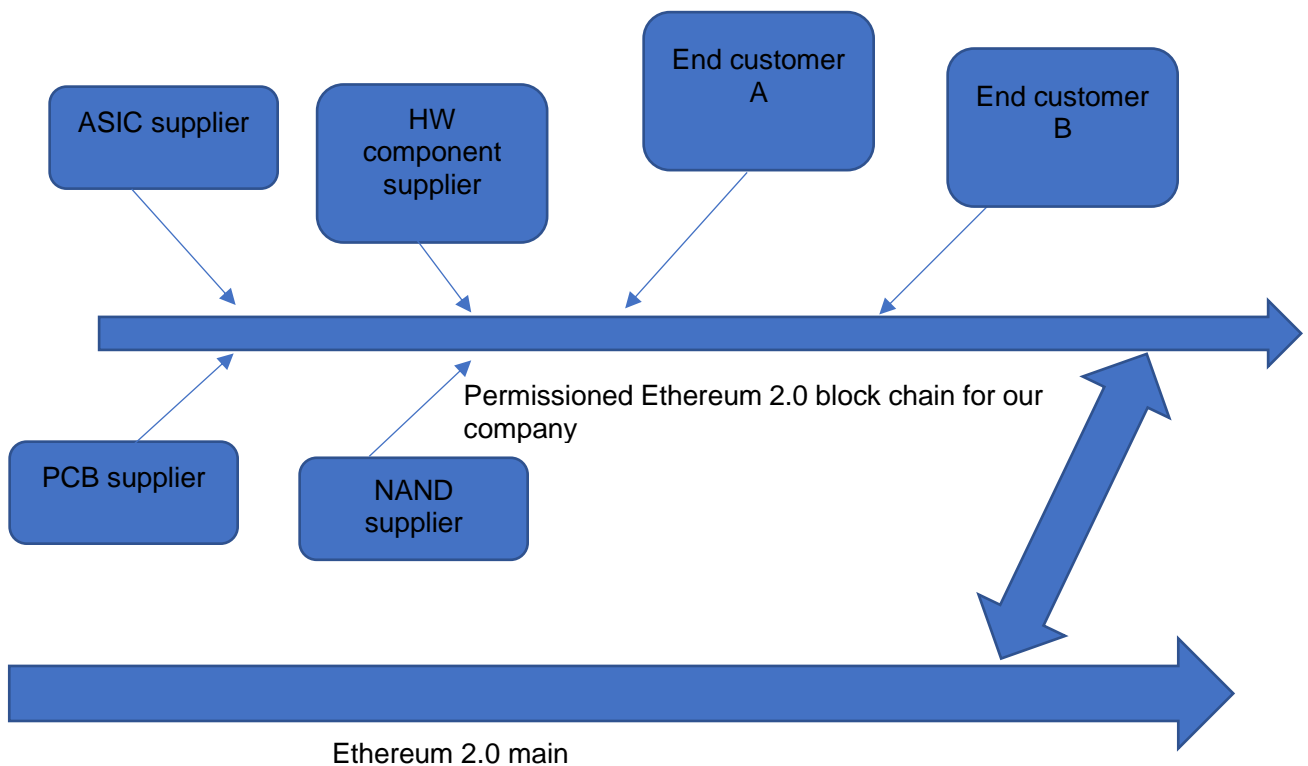
Every transaction on block chain is authenticated and validated. Identity is the main advantage of using the block chain. The ledger is immutable and has all details of how the entry was logged in block chain. Blockchain helps consumers confirm that the product they buy is indeed manufactured by the brand and companies can track these parameters to ensure the authenticity at procurement stage, and not just at the final stage. What is shared or not shared is dependent on the smart contract agreed to between various parties. For instance, customer A is a large OEM customer and wants more insight in the manufacturing process than a

customer B who is a tier-3 customer.

4. COMPETITION

The competition here is mainly the existing legacy framework. But as we noticed in the 2x2 matrix of “cost of networking” vs “cost of validation/last mile problem”, we believe that cost of networking is high and last mile problem is also high. So, switching to block chain is the right approach here. There are certainly incumbents in the supply chain who are doubtful of the benefit of block chain and to address their concerns, we will be doing the deployment in phase where we will start with internal and external suppliers first and figure out the smart contracts before we move to external customers. Note that Foxconn added blockchain to their suppliers first since it was easier to persuade them to engage in the smart contract.

Digital ecosystem and token distribution:



Smart contracts are defined between each of the party and our company. Players who are engaged in the smart contracts and honor them are rewarded by non fungible tokens that are specific to our permissioned blockchain. These tokens can be used to negotiate the price of commodities or better contract deals for early access to newer technologies.

The last mile:

The last mile problem in this case is the external customers. As goods are shipped from our warehouse to end customer, they need to update block chain once the drives are received which would solve the last mile problem. Currently, as the drives are shipped, there is a separate data base for each customer, and they update in their data base before they notify us and send us the PO. With the block chain, they can see the drives shipped from our factory on the block chain and get the PO ready and update the smart contract at that time itself. Once the drives are received by them, they can fulfil and release the smart contract. We are not including the money aspect as part of the block chain, but it can be done in phase 2 of block chain deployment where we introduce a stable coin like USDC in the transactions. Customers can also see the various parties involved in the manufacturing of the goods shipped which provides additional confidence and trust in the product. Similarly this last mile problem also address the issue on supplier side whereby we can see the status of our orders on the sourcing side.

Special considerations/concluding remarks:

In the end, I would like to conclude by saying that Ethereum 2.0 permissioned block chain with smart contracts and a utility token is the model we will be using in our supply chain. The smart contracts will be between our company and our suppliers as well as our company and the end customers. The most challenging part is the engage our customers to move to this model. We are seeing many companies like Google and Apple moving to block chain which would help us to move in this space as well. We should start with engaging our suppliers to move to block chain and sort out the details of smart contract before we engage our end customers. The use of utility token simplifies the block chain and keep the SEC at bay. Once we get the model working, we can introduce a stable coin for secure payments using blockchain. The block chain will be in a staged approach where we engage with suppliers one at a time to minimize the impact to existing supply chain.