Sharing Economy for Cloud Computing "Interchain"

1. Overview

Interchain is designed to democratize cloud computation. Interchain allows individuals to allocate their computer resources to run applications developed by others - in their language of choice - and get paid for it. You can think of Interchain as ***"AWS Cloud running on individual computers"*** or "***Airbnb of cloud computing***". Sharing computing power of individual devices and incentivizing their owner is at the core of Interchain. There are four major enablers of Interchain:

1. The "**business enabler**" is sharing economy or platform business models where asset owners share – or rent to be more precise – their assets when they are not using them entirely for themselves. When the property to be shared it highly differentiated, e.g. homes, the platform, e.g., Airbnb, acts as a passive market maker where it only connects asset owners and consumers and the owner becomes the price setter. However, if the asset is almost homogenous, e.g. cars, the platform owner, e.g. Uber, acts as an active market maker where is also becomes the price setter.

   In case of Interchain, assets to share are computers which are almost homogenous so Interchain initially will work as a price setter to establish the market. However, there is big difference between cars and computers in that, pricing contract – also known as smart contracts – can be used to create real-time markets where it is possible to pass price setting to the computer owner and still be able to run an efficient market. Interchain will gradually move toward this model to create a completely distributed platform – like Internet - with almost no intervention from the platform owner.

2. The "**financial enabler**" is blockchain as a distributed ledger making it possible to transfer funds from app owner's account to the device owner's account denominated in Interchain currency called NTC. The algorithm that generates a transaction runs on computers while they are running the program. It constantly measures resource consumption and translates that into a financial value which is in then recorded as a transaction on the blockchain. Interchain will use Ethereum to store transactions denominated in NTC. An application publisher will be able to buy NTC using traditional or crypto currency and depending on the price of computing resources – initially set by Interchain and later by computer owners as explained above – use it to pay for the resources consumed by the application.
3. The "**economic enabler**" is the fully competitive market that Interchain realizes allowing a much lower cost – the fair market clearing price - for computations compared to public cloud providers. While public cloud providers charge a high margin to maintain their datacenters, this cost becomes a sunk cost in case of individual computer owners in the sense that they are willing to

get paid for their otherwise idle devices. This is exactly why Uber can always be cheaper than traditional Taxi's. It is highly anticipated that individuals will buy computers solely for using them on Interchain and make money from renting them rather than using them – pretty similar to Uber drivers using their car just for making money or Bitcoin miners buying hardware just to mine coins.

4. The "**technological enabler**" is containerization making it possible to package apps that only depend on operating systems and also isolating apps to ensure they only have access to reserved resources. Interchain relies on Docker to ensure security, limit resource consumption, and measure the resources consumed by each app.

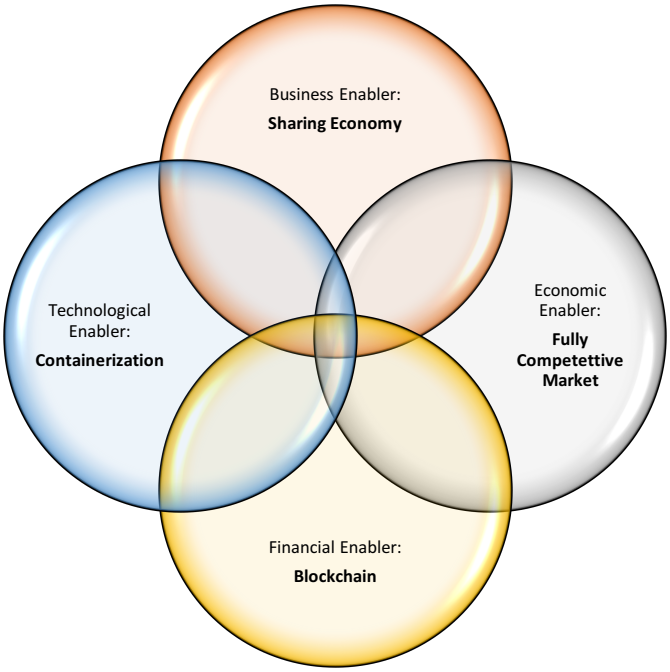

Figure 1. Interchain Enablers

Interchain is a disruptive concept realizing unique possibilities that did not exist in the past. Some of them include:

1. **Very hard to brought down**: Traditional applications running on Internet are prone to being blocked by malicious governments or even going down when natural disasters happen. This is due to reliance on one or multiple servers whose URL or IP addresses need to be known by clients. Interchain creates a peer-to-peer network where each device can work as a server whose IP address is not known in advance and thus it not easy to block them. If a censoring organization tries to find any of servers and block it, the Interchain protocol will automatically elect another device to act as the server the IP address of the newly elected server will be propagated back to client over the node Interchain.
2. **Highly affordable prices**: Using Interchain, individual hardware owners run the cloud at a fraction of cost of public clouds. This will push public cloud to open up their PaaS services to let them run on private hardware – Microsoft has already started providing its PaaS on hybrid cloud called Azure Stack.
3. **A Worldwide phenomenon**: Interchain creates a fair local market for computing resources where the rules of supply and demand will set the price rather than competetion among major public

providers. Therefore, the price the app publisher pays depends on each specific market and hence is absolutely affordable. A fair price and ubiquitous supply of hardware – individuals supplying the hardware - will make Interchain a worldwide phenomenon.

2. High-level Technical Explanation

Interchain is specifically designed to run applications. Once a user installs the "Interchain Node" app on its device, it allows that device to serve as an application server. Interchain app developers can write applications – in their language of choice - that will be transferred to servers elected by Interchain protocol and run on these devices in a sandboxed environment created using Docker containers.

It is very important not to put Interchain in the same category as Ethereum. Although Interchain uses blockchain as its payment system it completely solves a different problem: Ethereum code also known as smart contract can only execute within the context of blockchain resulting in transactions from one account to another. In order to verify these transactions, Ethereum depends on slow mining operations which make it very sluggish to be useful to run either heavy-duty applications like simulations or even much smaller ones like web servers. Also, Ethereum's Solidity is a new language with a few experts and huge programming limitations making it a misfit to build full-blown applications.

Interchain, on the other hand aims at letting applications run on individual devices. A developer who would pay AWS or Azure to host his apps can now use Interchain at a fraction of cost the cloud providers charge. Interchain allows code to be written any language. The reason that Ethereum cannot do this is that it stores smart contracts inside the blockchain whereas In Interchain, applications run inside a container totally separate from the blockchain.

3. Economic Viability

There are three players participating in Interchain market: individual hardware owner, application publisher, and Interchain Inc. Each of these parties has a specific economic incentive to participate in Interchain.

Individual hardware owners are incentivized to join Interchain and let their devices be consumed on Interchain by receiving the Interchain currency called "Intercoin" (NTC) depending on the level of computing resource consumption. For example, in a messaging application, each node acting as the server will receive a specific amount of NTC whenever it passes a message from the sender to the receiver. NTC is convertible to major currencies at the price which is initially set by Interchain Inc. until the market is establish, i.e., demand and supply are fairly matched[1]. Given that the number of NTC is the market is going to stay fixed at 25,000,000 – generated during three rounds of token sales plus the portions set aside for founders - once the market is established, the price of NTC will be solely specified by the market – higher usage of Interchain platform requires higher flow on NTC driving price of NTC higher.

[1] This is the same price the app publishers can buy NTC from Interchain to run their apps on Interchain and Interchain does not make any money from exchanging NTC to other types of currency.

Interchain app publishers are incentivized to deploy their apps to Interchain by paying a fraction of what they otherwise would have paid to deploy it to private hardware or on public clouds[2]. Therefore, Interchain will become a hostile rival – or even killer - for major public clouds including AWS, Azure, and GCP.

Interchain Inc. is incentivized to maintain and run its platform by charging the app publishers 10% of what they pay to hardware owners. This is on the lower range of what other major sharing economy platforms charge – Lyft and Uber for example take 20% of what is paid to drivers.

4. Intercoin Private Sales

In order to raise funds to develop Interchain, Interchain Inc. has a goal to raise 20 million Intercoins (NTC) in three rounds. Table 1 shows the volume and timeline for selling Intercoin token. In addition, 5 million NTCs are reserved for founders making the total NTC is the market 25 million. Interchain will not introduce any more NTCs beyond this and therefore, as Interchain is used more, the demand for NTC goes up driving its price higher making it a very profitable investment to participate in three rounds of token sales. In addition, the founder will not sell their NTCs until one of the following conditions happens: 1. Price of NTC becomes 10 times as expensive as of the third round. 2) 3 years after the last round of token sales. Therefore, the investors can assure that the extra NTC held by founders will not be in circulation until they have had enough time to benefit from their investment in NTC. The price at which NTC will be sold will be specified at the beginning of sales and will be at most 3 times higher in each subsequent round.

Round	Target Sales Volume (#NTC)	Token Sales Trigger	Sales Date
1	10,000,000	Interchain Demo-able	12/15/2017
2	3,000,000	Interchain Alpha out	06/15/2018
3	7,000,000	Interchain Beta out	12/15/2018
Total	20,000,000	-	

Table 1. Schedule to raise funds for Interchain.

Chart 1 shows the allocation of capital to various operations of executing Interchain. The exact definition of timeline and the breakdown of costs in provided in table 2.

[2] The reason Interchain is cheaper than public clouds is clear since public cloud providers set the price just to be competitive against rivals. In oligopolistic competitions that currently exists, these price is much higher than a complete market. The price of deploying to own hardware is higher compared to Interchain due to two reasons: 1. Hardware maintenance costs 2. Cost of acquiring static IP addresses that is essential to set up an application server.

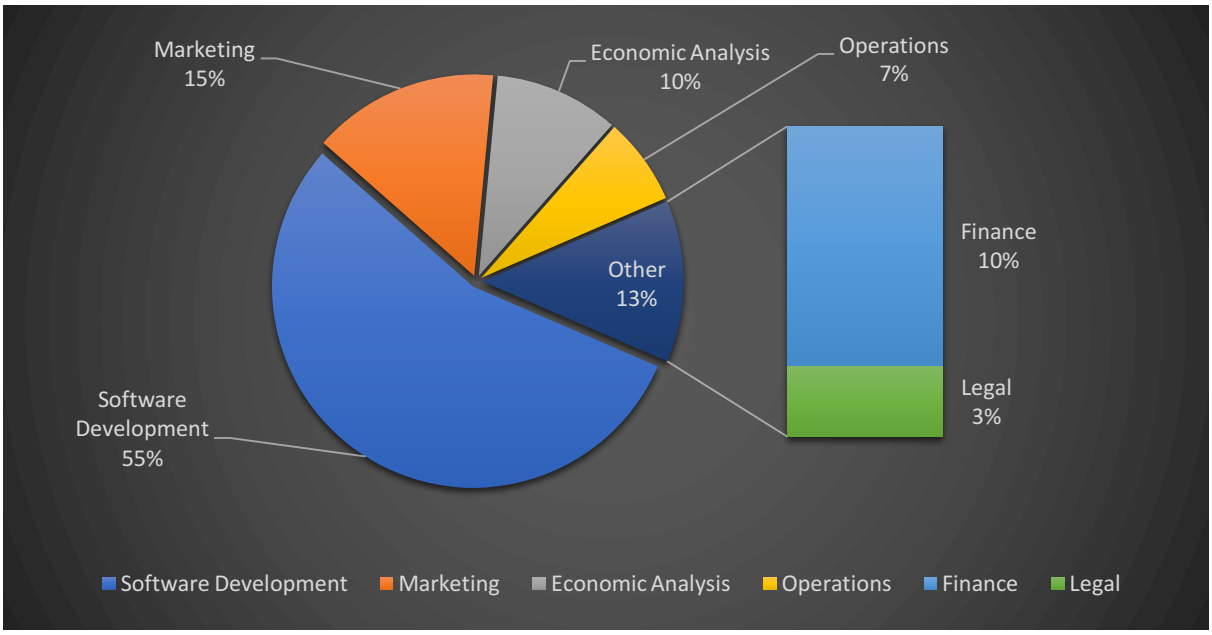

Figure1, Allocation of NTC to Execute Interchain.

Phase	Definition of Done
Demo-ready First round of token sales happens at this point.	Demo includes a smaller version of Interchain containing its major components. We show how Interchain running on several devices to build a network, publish apps, and to measure and translate consumption to token reimbursement. We also demo several apps running on Interchain.
Alpha Release Second round of token sales happens at this point.	At the end of alpha release coding will be completed for all components. Time is spent to identify and fix major defects. However, defects causing crashes, performance degradation, or other minor malfunctions are expected. Interchain will be deployed and tested internally.
Beta Release Third round of token sales happens at this point.	At the end of beta release, feature development is locked. We aim to fix all major defects. Interchain will be offered to a selected number of external users.
Public Release	All the defects are fixed. Interchain will be available to offered to public.

Table 2. Interchain Development Phase Description

5. Price of Computing Resources

As mentioned earlier, Interchain Inc. will specify the price of computing resources until there is enough hardware provider and app publishers to establish a competitive market where the price is automatically adjusted based on supply and demand. Table 3, specifies the target revenue for each type of activity in terms of USD within the first year after Interchain is offered in the US market. Similar values for other regions will be specified as Interchain is expanded in those regions. These values depend on the local price of internet and will be further adjusted once Interchain becomes operational.

Type of Activity	Cost for developer/Revenue for device owner (USD)
Bandwidth Consumption	$0.01 per GB data transmitted
Memory Consumption	$1 per GB per day
CPU Consumption	$0.1 per million instructions executed
Uptime	$0.1 per hour
App Development	$0.1 per each active user

Table 3. USD value of NTC paid for Interchain Activity in the US.

6. Fraud Prevention Mechanisms

We divide fraud into two categories: financial and technical. Financial fraud is defined as "not paying the cost of consumed computing resources". Technical fraud entails activities like hacking, finding and using security holes in Interchain protocol, or trying to get access to Interchain app's data by device owners or to the device owner's data by Interchain app publishers.

In order to prevent from financial fraud, Interchain uses blockchain to record transactions and distribute the payments. This means that there is no concept of explicit payment with credit cards. The balance of NTC each user owns is readily stored in Interchain and will be used in real-time fashion for resource consumption. As soon as app owner's account balance reaches zero, the associated apps stop running and the owner is notified. The owner is given a grace period to add NTC to its account before the apps are completely removed from Interchain and the saved data is wiped out.

Technical fraud includes but not limited to tampering with Interchain protocol code to receive token and getting access to the devices private data – not part of the Interchain. To protect against such activities, each version of the Interchain protocol goes through multiple rounds of security analysis to discover vulnerabilities. A large portion of development capital is allocated to conduct preventive protection. In addition, Interchain protocol's reimbursement subsystem contains AI modules that detect unusual token payment and forfeit the tokens if such activity is detected. In order to avoid access to device owner's private data, Interchain uses a sandboxed environment based on Docker. A dockerized app can only access resources specified when the container is created. The only connection exposed by the containers to the outside world is a single port explicitly opened by Interchain to let Interchain clients communicate with the Interchain apps.

7. Capital Expenditure

Table 4 lists major activities for each category shown in Chart 1 with the corresponding allocation of capital.

Work Items	Allocated Capital %
Software Development	55
Interchain Protocol Development	50
Application Manager	15
Application Publisher	5
Reimbursement Manager (Blockchain)	20
Networking	5
Security	5
Interapp Development	5
Economic Analysis	10
NTC payment algorithms	7
Fraud Detection AI Algorithms	3
Finance	10
Token release strategy	4
Token pricing strategy	4
Investment and capital spending strategy	2
Marketing	15
Advertisement	10
Interapp Market Development	2
Expansion strategy	3
Operations	7
HR	5
Other	2
Legal	3
ICO Analysis and Counseling	2
Other	1

Table 3. Capital Allocation