

SmartMesh

SmartMesh®

HyperMesh™ Ecosystem

Whitepaper

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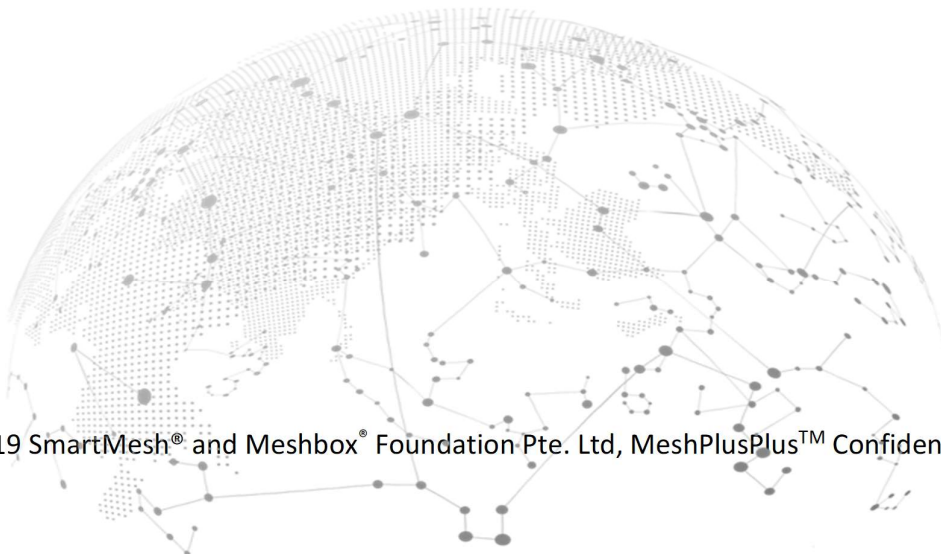


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1. Executive Summary

Our current Cyber-Physical Infrastructure is a technological marvel, gifting mankind with tools to innovate at an ever-increasing exponential rate. We depend on such innovation if we are to survive and thrive as a species.

However, the need for faster, ubiquitous, exchange of information and value continues to expand in scope, even bringing in everyday objects and machines. The current infrastructure, which was built by corporations focusing on maximizing share-holder profits, is flawed, due to the centralized nature of the business model, and by the resulting centralized networks which have been created.

In March, 2018, the world-wide-web turned 29 years old. In an open letter to mark the 29th anniversary of his invention, Berners-Lee made some sharp criticisms on how the technology has been deployed:

In recent years, we've seen conspiracy theories trend on social media platforms, fake Twitter and Facebook accounts stoke social tensions, external actors interfere in elections, and criminals steal troves of personal data.

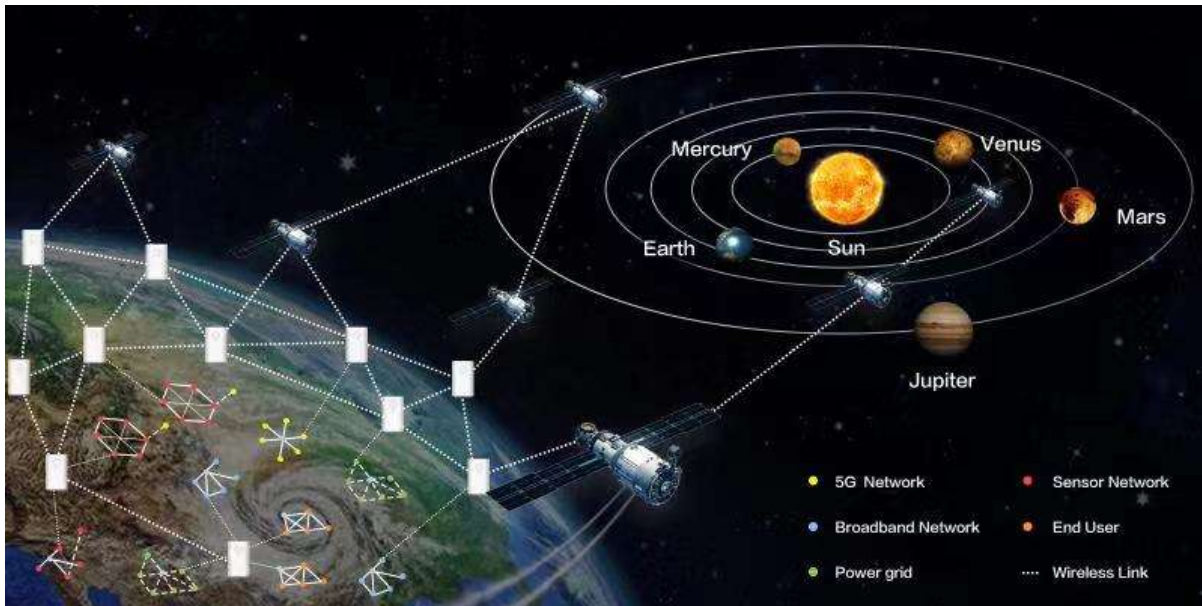
These problems have proliferated because of the concentration of power in the hands of a few platforms – including Facebook, Google, and Twitter – which control which ideas and opinions are seen and shared.

Furthermore, centralized data in the hands of a few corporations constitute single-points-of-failure and are susceptible to a myriad of internet attacks such as DDOS, malware, etc.

While many in the developed countries enjoy advanced technology, there is a growing divide with the rest of the world. There are currently 3.9 Billion people without internet access, 2 Billion people who are unbanked, and 1.2 Billion without access to electricity [Paygo]. The current system cannot effectively address such needs. A new paradigm is needed.

The next generation infrastructure will not be just another iteration on the previous architectures. Rather, it will be a **HyperMesh™** architecture, a **distributed**, synergized blend of networking, computing, content distribution, financial technology, and cyber-physical infrastructures.

The HyperMesh™ Infrastructure is being built from the ground-up, in a distributed fault-tolerant manner, incentivized by blockchain cryptocurrencies, powered by renewable transactive energy, and enabled by a world-wide Satellite Internet with local **peer-to-peer (P2P)** Meshed communication on the ground.



SmartMesh®, along with ecosystem partners such as Meshbox®, are in a unique position to speed up the realization of such a HyperMesh™ Infrastructure architecture. Rather than focus on maximizing share-holder profits and supporting the costly requirements associated with bleeding-edge applications, SmartMesh® strategy aims to achieve:

- **Inclusivity:** Provide basic cyber-physical infrastructure for all peoples, including those without access. Provide adequate performance for the most common applications: Support of Wifi communication (which is more prevalent than cellular connectivity); secured, fault-tolerant content and data storage; and low-latency, high-throughput payment network; and renewable energy resources.
- **Social Entrepreneurship:** Provide a means to bring dignity and a sustainable livelihood to the masses. Enables common people to earn a living by selling **Internet of Value (IoV)** services to neighbors and keeping the ROI within the community. People become service providers and have the freedom to deploy infrastructure as they wish.

The key value-propositions being offered are.

- SmartMesh® has deployed a Public Blockchain and Applications
 - **Spectrum Blockchain** solution running with SmartMesh® Token (SMT) coin.
 - High throughput, low latency **Photon Payment Network** with secured backing on Spectrum.
 - SmartMesh® Wallet and Distributed-Applications for monetized Wifi, Internet, Storage, and Payments.

- Meshbox® has built **MeshBox®** Wifi Routers
 - Indoor and Outdoor MeshBox®es, communicating through Mesh networking to seamlessly cover any application area.
 - Global connectivity with interfaces to various Wide-Area-Networks (WAN)
 - Disk Space for data storage, content delivery, and offline-data access.
- SmartMesh® and Meshbox® are optimized to deliver
 - First Blockchain-enabled Communication Infrastructure
 - Offline payments and Content Delivery, via Wifi Mesh Network, with or without Internet connection.
 - Low-cost MeshBox® hardware, plug-and-play operation, unlicensed spectrum, and a blockchain-based monetization mechanism.

The MeshBox® product is an implementation of the above key value-propositions and is an essential building block of the HyperMesh™ Infrastructure.

In the following, key attributes of SmartMesh® and differentiation from other technologies are described, with the following interpretation of the various font colors.

- **Expensive, Heavy Technologies**
- Traditional (outdated) Technologies
- **Cost-Effective, Lightweight Technologies (using SmartMesh®)**

Content and Data Storage

PC Hard-Disk SAN
Network-File-System Content Delivery Networks

Cyber-Physical Infrastructure Services Monetization

Customers paying Service Providers : Internet, Cloud, Storage
Fiat Currency Transfers with high fees: SWIFT ACH Remittance
Banking Infrastructure with high fees: Credit/Debit/Gift Cards

Customers paying Utilities

Hyper-Mesh™ Ecosystem:
SmartMesh®

Inter-Galactic-File-System™

Social Entrepreneurship
Spectrum Blockchain
Photon™ Payment Network
SMT / MESH Token Transfers
Wormhole Universal Channels™
Token-Switching™
Atmosphere™
Peer-to-Peer Transactive Energy

The terms above are described in this whitepaper in more detail.

2. SmartMesh® and Meshbox® Introduction

Meshbox® Foundation has been partnering with SmartMesh® Foundation from the beginning to realize the HyperMesh™ Infrastructure. SmartMesh® blockchain technology has been optimized to run on MeshBox®es.

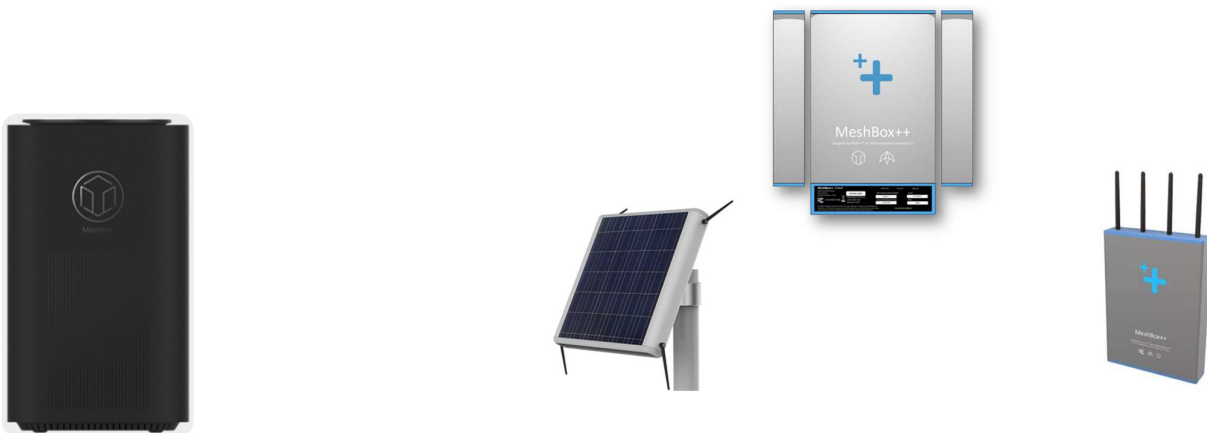
SmartMesh® has deployed the Spectrum public blockchain, which supports the following coins and tokens.

- SmartMesh® Token coin, listed on Huobi.pro and Gate.io, and used for Spectrum blockchain.
- MESH tokens, listed on FCoin.com and HitBTC, and used for the Content Delivery Networks, supporting video streaming.

Meshbox® and SmartMesh® bring about a paradigm shift to enable Infrastructure deployment which is highly robust, yet flexible, due to the ability to operate

- With or without the Internet (or Intermittent Internet)
- With or without a blockchain; with Photon high-throughput Payment Network,
- With or without an electrical grid; with renewable battery and solar technology.

MeshBox®es are used to form large, highly-scalable Wifi Mesh Networks spanning both indoors, and outdoors, over which SmartMesh®'s blockchain technology is layered.



Indoor MeshBox®

Outdoor MeshBox++™ [MB++]

Hereafter, “MeshBox®” refers to both the Indoor MeshBox® and outdoor MeshBox++™ versions, “Indoor MeshBox®” refers to the indoor version, and “MeshBox++™” refers to the outdoor version.

MeshBox®, as a key component of the HyperMesh™ architecture, works well with several key market trends:

- Wireless communications. MeshBox® provides dense (many users per area), high data-rate coverage, much like Small Cells in 5G Cellular Networks.
- **Meshed-Networking** uses distributed, ad-hoc networking to provide fault tolerance to failures, and can be deployed automatically without complicated network configuration tools
- **Edge-computing, Edge Storage.** MeshBox® supports distributed Data storage through Inter-Galactic-File-System (IGFS). Keeping computations and data local reduces traffic, latency, and energy.
- Peer-to-peer communications (e.g Device-to-Device) through Mesh networking
- **Transactive-IoT** with Energy efficient computing and communication. Multi-Core CPUs are used to process both data-routing, data-storage, content delivery, and blockchain-based payment networks. MeshBox® provides a control point for Transactive IoT networks (interfacing to LoRa technology).
- **Transactive Energy.** The outdoor MeshBox++™ integrates solar panels and batteries for self-sufficient operation. MeshBox® acts as a control point for managing the flow and payment of electricity between Distributed-Energy-Resources.
- Monetization of Infrastructure services with Blockchain and Crypto-currency: Spectrum blockchain and Photon secondary architecture supports peer-to-peer payments. **Wormhole Universal Channels™** enable interoperability between various third-party blockchains, using the **Atmosphere™** architecture.
- AI and Big Data Services: Applications and services built on MeshBox® support Shared-ROI and double-auction buying and selling of products and services, on behalf of the user.

3. HyperMesh™ versus Traditional Communications

MeshBox®es are used to build a HyperMesh™ed Infrastructure, which incorporates a newly emerging networking paradigm.

In First-generation Circuit-Switching, each connection between communicating parties receives dedicated (reserved) Bandwidth, even when not being used. Examples include Plain-Old-Telephone System (POTS), SONET/SDH, and DWDM for fiber communications.

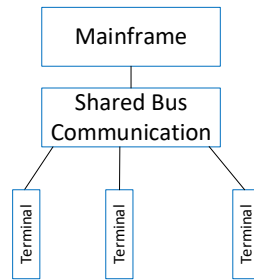
Second-generation Packet Switching is comprised of storing-and-forwarding of message-segments (packets) in routers, which dynamically arbitrate/schedule which packets are transmitted on shared transmission lines. This sharing provides better resource sharing of shared resources and makes use of buffers (memory) to temporarily store packets, thus greatly improving the utilization and efficiency of networking resources. Examples are Switched Ethernet, Internet Routers, and Voice-over-IP.

The newly emerging Third-generation is called **Token-Switching™** and is enabled by Blockchain. In this new paradigm the scope is greatly expanded from information exchange to a self-sustainable Internet of Value (IoV), represented by the exchange of tokens. Tokens can represent not only monetary value (e.g. Ethers, SMT, MESH), but also non-monetary entities such as a car or house title, personal identity, medical records, a vote in an election, and can even be linked to physical objects in a supply chain.

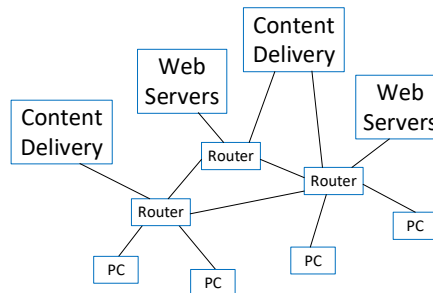
The following shows the progression of networking and computer architecture from the mainframe era to today's HyperMesh™ infrastructure, which supports the Internet of Value.

Mainframe Computers and Voice-Communications

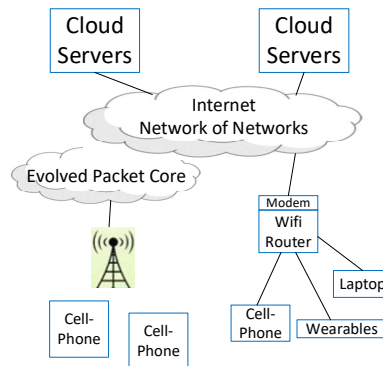
Centralized
 Circuit-Switched
 Cellular 1G 1980s ; 2G 1990s

**Internet : Personal-Computers, Data-Communications**

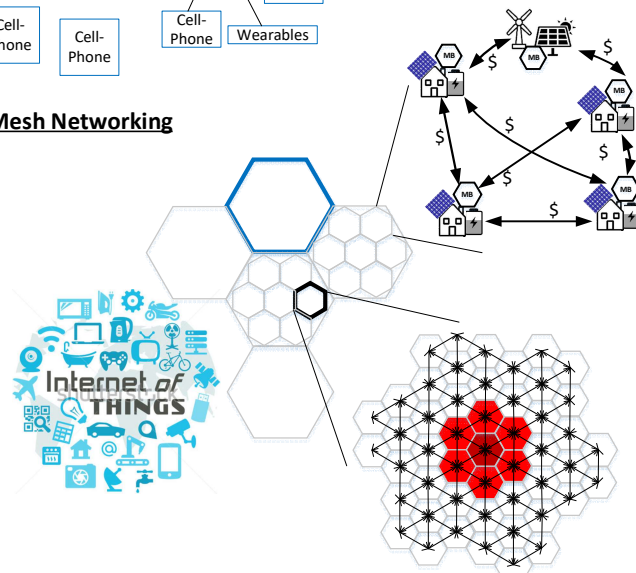
Centralized
 Cellular 3G 2000s
 Circuit-Switched Voice
 Packet-Switched Data

**Cloud : Software defined Networking/Computing/Storage**

De-Centralized
 Cellular 4G 2010s
 Packet-Switched Voice
 Packet-Switched Data

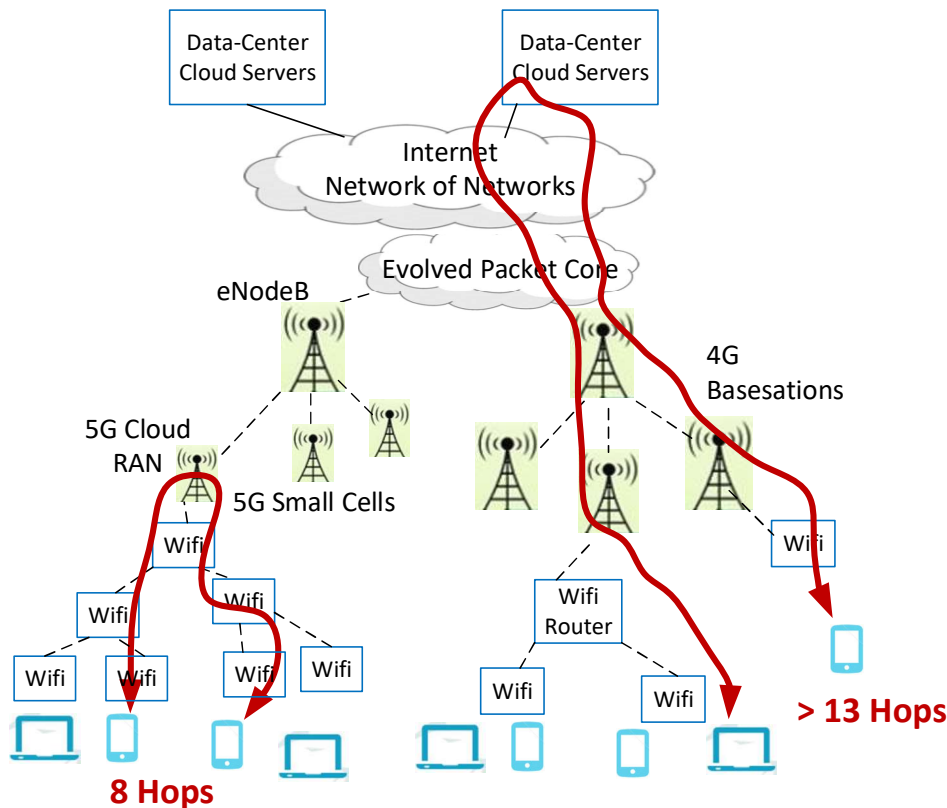
**Hyper-Mesh : Internet of Value with Mesh Networking**

Distributed
 Cellular 5G 2020s Interoperability
 Packet-Switching
 Peer-to-Peer Communications
 Token-Switching and Blockchain
 Transactive IoT
 Transactive Energy



3.1 HyperMesh™ Infrastructure and 5G Cellular Interworking

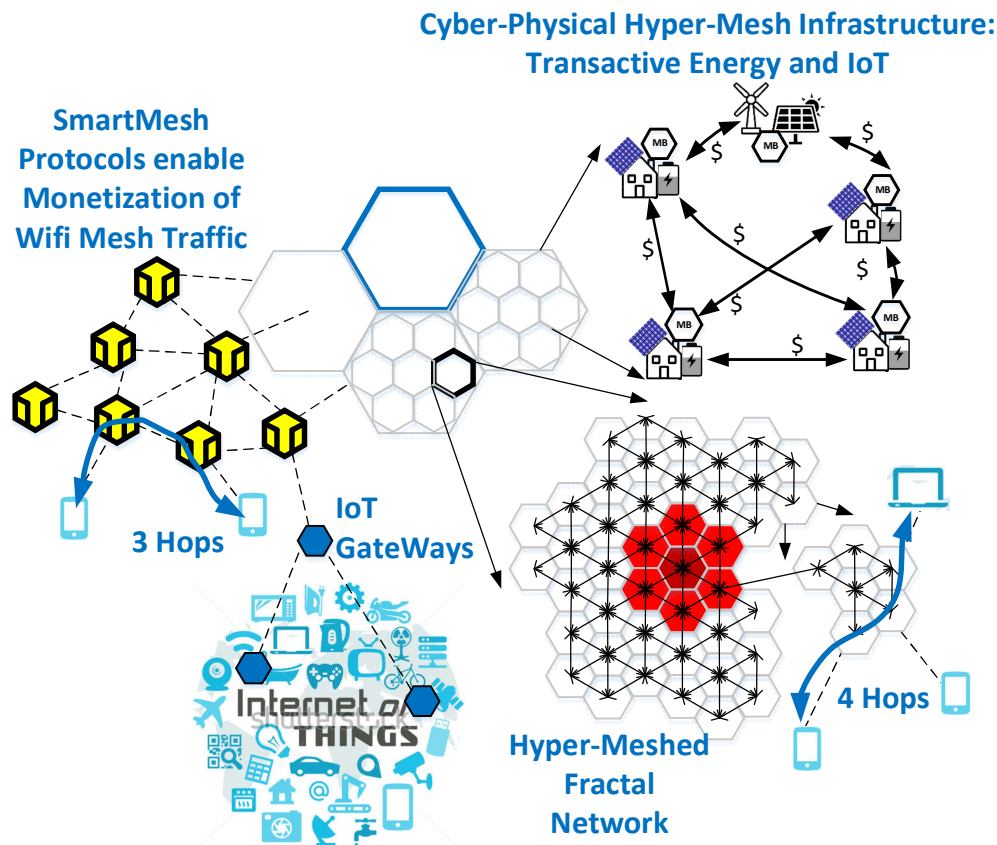
In a traditional networks with 4G cellular communications, all traffic goes to Data Center Cloud Servers for Economy-of-Scale of compute and storage resources. However, this requires many hops (at least 13) between terminals, even those which are physically close to each other, and thus suffers from high energy and latency requirements. In Cellular 5G's Cloud RAN architecture, traffic from Wifi networks only needs to go to the Cloud RAN, which is located close to Base-Station. Value-add for Over-the-Top applications are moved to the Cloud RAN in an effort to support Edge-Intelligence. This results in fewer hops, (at least 8), but is still expensive. In both 4G and 5G scenarios, while Wifi is an essential part of the architecture, a Wifi Mesh is *not desirable* since such mesh traffic cannot be seen, and thus cannot be monetized or analyzed for value-add to Over-the-Top Applications (Facebook, Baidu, etc).



SmartMesh and Meshbox are differentiated from the convention 4G/5G network architecture by supporting billing, analytics, and value-added services *within the Mesh* network. Thus, network operators can deploy Wifi equipment for the Access network, and support many of the functions which were previously supported only in the Cloud RAN

or Data-Center Cloud servers. This allows the operator to dramatically reduce costs for access networks, reduce the number of hops (3 or 4) and still retain the capability to monetize value-added services.

For inclusiveness, members of a community are not dependent on Operators, and can setup and run their own HyperMesh Infrastructure. Thus, wealth is re-circulated within the community through Peer-to-Peer payments for Wifi, Content delivery, Banking, and E-Commerce.



Deployment of MeshBox is incentivized through a Return-on-Investment model in which MeshBox Owners (e.g. home-owners, shop-keepers) or Investors of MeshBoxes receive the following revenue, in the form of SmartMesh Tokens (SMT) or MESH Tokens, for sharing various services to community members.

- MeshBox Wifi network and Internet.
- Photon payment network Fees for exchanging of payments and tokens between people and machines.
- Storage of audio/video content, websites, and community data, on the MeshBoxes' internal Disk Storage.
- IoT Sensor and Actuator networks using MeshBoxes as a control and data logging node.
- Gas fees for signing blocks on the Spectrum blockchain
- Targeted advertisement and location based services

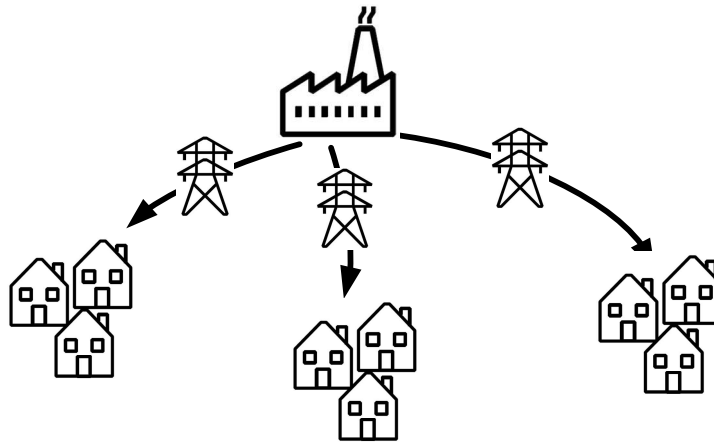
4. Smart Grid Transactive Energy

Consider the traditional Electric Power System (EPS) which is composed of centralized Utility Plants (coal, gas, nuclear) and a transmission and distribution network to the end customers.

Such a system is designed for the peak energy needed and is thus over-engineered for the worst-case. The energy transmission is one-way and is delivered just-in-time with no storage of energy along the path (no buffering) from utility to consumers. Due to this Just-in-time nature, all the energy produced must match the energy consumed, on microsecond timescales.

The EPS is one massive machine such that small variations in frequency and voltage can easily occur, causing the entire system to crash, leading to black-outs.

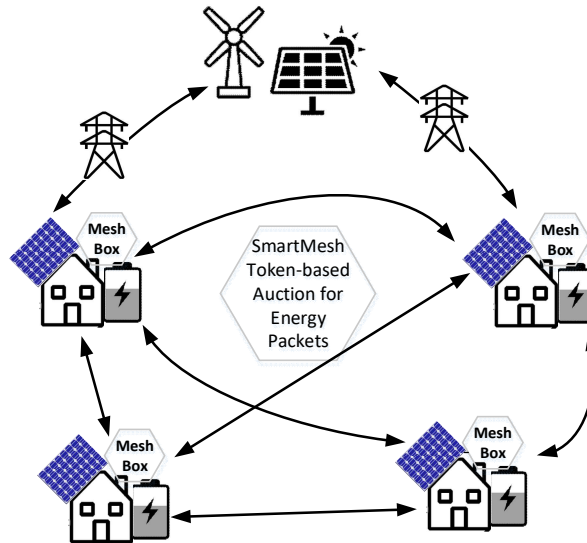
Traditional Electric Power System :
Centralized, one-way, just-in-time Energy delivery



Recently, the penetration of Distributed Energy Resources (DER) such as solar, batteries, and wind is intensifying due to an exponential decrease in cost; while the cost of traditional energy sources continues to rise. Rooftop solar will soon become cheaper than the transmission of electricity from Centralized Utilities. So, even if the generation of energy is *free* at the centralized utility, just the cost of transmitting that energy to customers will be more than the cost of solar panel systems at each customer's house [Seba].

Thus, consumers of electricity will also be producers of energy, and are treated as Prosumers. This in turn enables the future Smart Grid, which supports peer-to-peer exchange of Energy between Prosumers, which is cheaper, fault-tolerant, and can be controlled by the people (versus a centralized authority, the Utility).

Transactive Energy Electric Power System : Distributed, Peer-to-Peer Energy Auction with SmartMesh/MESH Tokens as payment system



The US Department of Energy (DOE) Gridwise Alliance proposes a Transactive Energy architecture for such a future Smart Grid [Gridwise]. Such systems have been implemented at several test-sites [Powermatcher] [TeMix]. Transactive-Energy enables the next generation EPS revolution to an Energy Internet (Enernet).

A Transactive Energy system requires optimizing an Ultra-Large-Scale System-of-Systems, the most complex machine in the world (the Electric Grid)

Transactive Energy is composed of

1. Electric Power System (EPS)
2. Distributed, Meshed Communications Network
3. Realtime Control
4. Blockchain

The Electrical Network (IEEE 1547, 2030) must evolve from supporting Centralized one-way flows to that of Decentralized and Distributed two-way flows. This network enables efficient energy sharing between DERs, traditional generators, and prosumers. This architecture is likely to be a Mesh architecture due to its distributed, fault tolerant nature.

As such, a Distributed, Meshed Communications Network is needed for Prosumers (IoT devices and DERs) to communicate to each other to determine when and how to exchange Energy. A MeshBox® network, using P2P communication is leveraged for communication between Prosumers.

Real-time control is needed in order to schedule Energy transfers between Prosumers. Such an exchange of Energy can leverage Double-Auction Applications, with the help of AI, and implemented in MeshBox®es, in order to support a distributed online or offline auction between prosumers.

Blockchain is needed to support trusted peer-to-peer payment system between prosumers with high Transactions-per-Second (TPS) throughput needed for such machine-to-machine type communications and micro-payments. Only Blockchain provides the low-latency, high throughput, and low-cost transaction fee performance which is required by Transactive-Energy. Traditional fintech technologies are not suitable.

In a SmartMesh® and Meshbox® enabled Transactive Energy system, both Critical (hospitals) and Flexible (Household appliances) Loads represent Application Tasks, each with Energy Service-Level-Agreements (SLAs: deadline, max power, energy, etc). Each Prosumer can thus run an optimization algorithm based on an utility function such as Benefits minus Cost (primal-dual optimization). Benefits include meeting Energy requirements, such as charging an Electric Vehicle by 7am deadline; and Cost is measured as LCOE (Levelized Cost of Energy).

The **Fractals Realtime Autonomic Control Transactive Anti-fragile Layered System (FRACTALS™)** [FRACTALS] is proposed for Transactive Energy, with the following benefits.

- During natural disasters, there is often a lack of both power and communications. It makes sense to address both of these issues with a single, optimized solution.
- SmartMesh® and Meshbox® enables off-internet communication between P2P User Equipment, much like FRACTALS enables off-grid energy exchange between P2P Distributed Energy Resources and Prosumers. That is, SmartMesh® and Meshbox® can work without the Internet and FRACTALS constructs an Islanded Microgrid which can work without the EPS Grid.
- SmartMesh®/Meshbox® needs the energy provided by FRACTALS in order to operate, while FRACTALS needs the communication and real-time control provided by SmartMesh®/Meshbox® in order to implement the P2P auction between the energy prosumers.

5. Cyber-Physical Infrastructure Services Monetization

Together, SmartMesh® and Meshbox® support an Shared-ROI architecture, which is a sophisticated monetization architecture, implemented on MeshBox®es.

The figure below illustrates the key differences between a Traditional Infrastructure and the HyperMesh™ Infrastructure in terms of technology and monetization.

Technology Comparison

Traditional Infrastructure	Hyper-Mesh Infrastructure
WAN Technologies Wired and Wireless technologies 5G Cellular (\$\$\$\$) Macro Basestations for Wide Area (10's km) coverage Small Cells (Pico and Femto Basestations) ~300 meters coverage Data-rates 1 to 10 Gbps Millimeter wave (up to 60 GHz) licensed Spectrum Beamforming and Massive MIMO (100s of Antennas) Internet of Things NB-IoT	WAN Technologies (optimized with MeshBox) <ul style="list-style-type: none"> • Satellite Internet • TV Whitespace Wifi Mesh Network (\$) <ul style="list-style-type: none"> • Meshed Wifi networks with ~200 meters coverage • Data-rates ~100s Mbps to 1 Gbps • Wifi 2.4 GHz and 5 GHz Unlicensed Spectrum • 4 Omni-directional or Directional Antennas (up to 4x4 MIMO) Internet of Things <ul style="list-style-type: none"> • Wifi and Bluetooth • LoRa Technology

Cost and Monetization (ROI) Comparison

Traditional Infrastructure	Hyper-Mesh Infrastructure
Users pay Centralized Entities <ul style="list-style-type: none"> • Network Operators monetize Data-usage (Verizon, China Mobile) • Cloud services monetize Data Storage (Google, Amazon, Baidu) • Content Delivery Networks monetize streaming of content (Netflix, Youku) • Payment networks monetize Payments (Paypal, Wechat Pay) Requires internet connectivity to work Sophisticated QoS and Ultra-Low-Latency Reliable Communications (ULLRC): Virtual Reality, Remote Robotic Surgery, Autonomus vehicle control are very expensive to implement and are targeted for high-end, bleeding edge applications.	Share-ROI Blockchain Based Billing System <ul style="list-style-type: none"> • MeshBox supports multiple services with built in Monetization using Smartmesh Blockchain • MeshBox owners, advertisers, investors earn tokens for providing services. Can work even with intermittent Internet connectivity <ul style="list-style-type: none"> • Wifi network and Internet Access • Data-Storage via IPFS and Content Delivery • Payment network via Smartmesh Blockchain • Transactive IoT payments and Transactive Energy Adequate QoS and high data-rates suitable for Web access, Streaming-Media, Transactive Energy, and blockchain fintech.

5.1 SmartMesh® Adds a New Dimension to Blockchain Technology

Similar to the progression of networking technology to the Internet of Value, Blockchain technologies are also progressing from 1st generation Bitcoin; 2nd generation Ethereum with the addition of Smart Contracts; to the 3rd generation of Programmable Societies.

SmartMesh® has added a 4th dimension, with a HyperMesh™ Blockchain, layering blockchain-based applications onto the MeshBox® Mesh network, and the ability to operate with **intermittent connection the Internet.**

5.2 Shared-ROI

Owners (e.g. farmers, shop keepers) or Investors of MeshBox®es receive ROI through

- Revenue from other Customers/Owners/Investors accessing the MeshBox® Wifi network and Internet.
- Revenue from storage of audio/video content, websites, and community data, on the MeshBox®es' internal SSD Storage.
- Targeted advertisement and location based services
- IoT Sensor and Actuator networks using MeshBox®es as a control and data logging node.
- Fees for exchanging of payments and value tokens between people and machines.
- Gas fees for signing block on the Spectrum blockchain
- Direct rewards from SmartMesh® and Meshbox®, which are distributed to each MeshBox® owner whenever the total number of MeshBox®es sold reaches certain milestones.

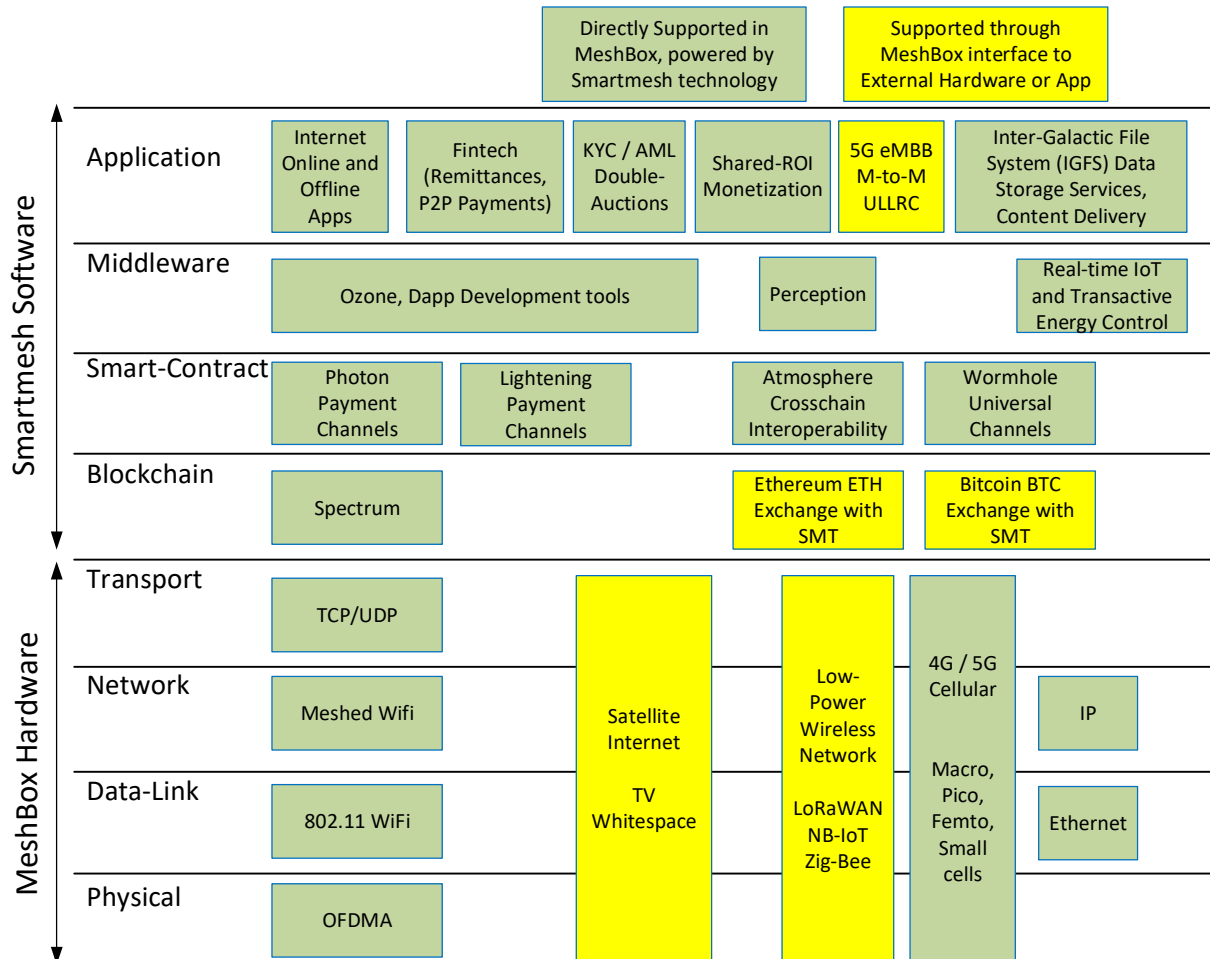
The time-frame for ROI is expected to be 3 to 12 months depending on the volume of the above transactions using the deployed MeshBox®es.

5.3 MeshBox® Requirements for Integrated Blockchain Technology

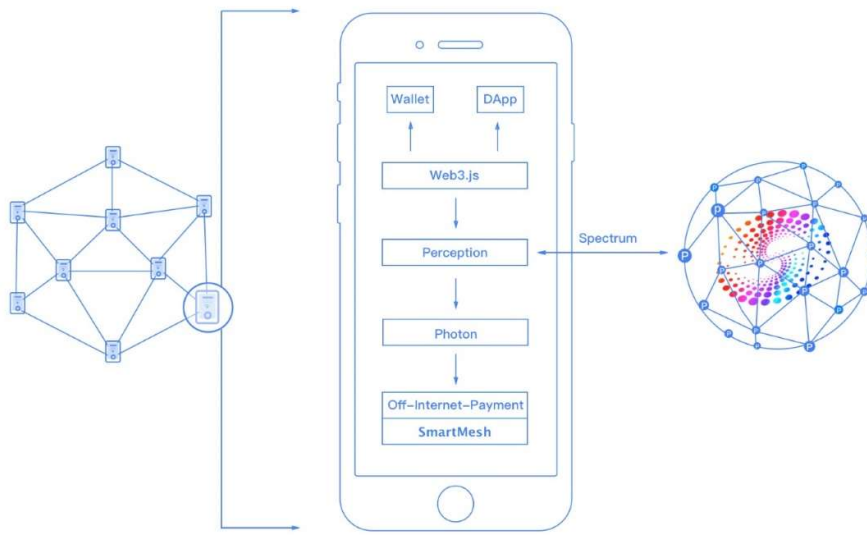
The ROI is paid in terms of SMT and MESH tokens, which are exchanged on the SmartMesh® public blockchain, Spectrum. SmartMesh® blockchain technology has been co-optimized with the MeshBox® architecture.

The following illustrates the hardware (MeshBox®) and software (SmartMesh®) protocol stack.

Smartmesh and Meshbox Protocol Stack



The following shows the protocol stack's relationship with a Smartphone, which runs the SmartMesh application. The network on the left is a network formed from Smartphones. The network on the right is the public Spectrum Blockchain, with peer-to-peer nodes. Perception allows for a Smartphone to run a light client to access and control full nodes such as Spectrum blockchain node and IGFS.



In order to minimize the cost of MeshBox®, the requirements on the blockchain technology to be integrated into MeshBox® are very stringent.

- **Light-footprint CPU and Storage:** The blockchain must be very light, able to run on a low-cost embedded CPU, and requiring very low Disk space requirements.
- **High TPS:** The blockchain and associated Smart-Contracts must be able to support 100,000s and millions of Transactions-per-Second to scale to a world-wide payment system between people, as well as between IoT devices.
- **Scalable TPS:** As the number of MeshBox®es grows, the TPS must scale well. Some consensus protocols, such as voting protocols require more consensus time as the number of nodes increases, which is the opposite of what is needed.
- **Multi-blockchain and tokens :** Support multiple blockchain ecosystems and associated **Token-switching™** between such blockchains, since different applications may make use of different blockchains and tokens.

5.4 Spectrum and Photon Architecture

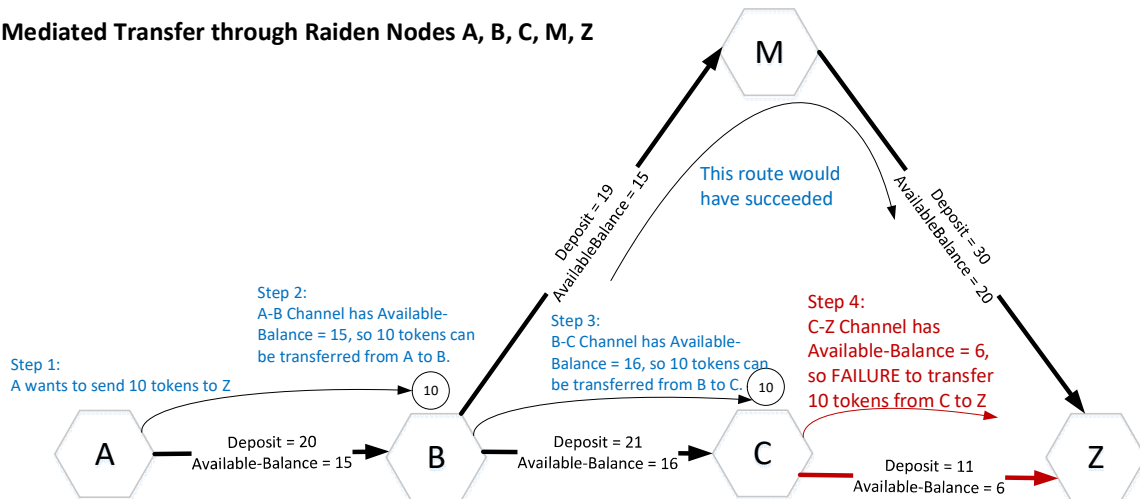
The following illustrates how Spectrum and Photon work. Spectrum was forked from the Ethereum blockchain, and is now a public blockchain.

Ethereum Raiden

Before discussing Photon, a basic State-Channel architecture, such as Ethereum Raiden is first described. The following shows an arbitrary Raiden network (which SmartMesh® has also

implemented as “Smart-Raiden”), composed of an interconnection of State-Channels (Channels) between Raiden nodes, which are required to be connected to the Internet.

Mediated Transfer through Raiden Nodes A, B, C, M, Z



A transfer is successful when a Route can be found from Initiator (A, the payer) to Target (Z, the payee). Raiden payment (Transfers) can be either Direct-Transfers, which take place directly between two Photon nodes, or Mediated-Transfers, which are routed through intermediate Raiden nodes.

One issue is that, since Channels are setup by users, the associated Deposits (tokens which users must lock into the system) will be minimal, and sometimes, routes cannot be found between Initiator and Target. Also, the Raiden network cannot work without continuous connection to the Internet.

SmartMesh® Photon

To solve the above limitations with Raiden, SmartMesh® has developed Photon, which is similar to Raiden, but which is optimized to work on MeshBox®es, which, in-turn, do not require continuous Internet connectivity. Also, using statistical multiplexing techniques and economy of scale principles, high-deposit Core Channels are established between MeshBox® Photon nodes, which ensures that routes are quickly found between payer and payee.

5.5 Spectrum and Photon Meets and Exceeds Blockchain Requirements

From the beginning of the partnership SmartMesh® blockchain technology, consisting of the Spectrum blockchain, and Photon Payment Network (Secondary layer, Smart-Contract) has been carefully crafted in order to meet the above requirements.

Light-footprint CPU and Storage

Spectrum is very light-weight, running on low-cost mobile CPUs in MeshBox®. This is due to Spectrum's Proof-of-Capability consensus algorithm which securely, and fairly gives all Spectrum nodes an opportunity to Sign blocks. Since Spectrum is deployed with Photon from the beginning, most transactions take place on Photon, which minimizes the transactions which need to go on the Spectrum blockchain, therefore minimizing the disk-space storage requirements of Spectrum.

Thus, Spectrum is much lighter than other blockchains, such as Bitcoin and Ethereum, which require hundreds of GBytes of storage in order to run the corresponding blockchains. With such a low storage foot-print, MeshBox® Disk Space can be primarily used to store Data and Content, rather than being used to support the Spectrum blockchain.

The Photon network offloads most of the transactions from Spectrum by establishing State-Channels between Photon nodes and allowing for an unlimited number of peer-to-peer transactions to take place between two Photon nodes, without needing to be recorded on the Spectrum blockchain.

High TPS

Spectrum blockchain takes care of securely Allocating and Settling State-Channels, and then allows Photon to manage all transactions between Photon nodes. Since only the allocation and settling of Channels requires Spectrum consensus, and an unlimited number of transactions can flow between the Photon nodes which use the State-Channels, much of the burden is removed from Spectrum and results in the entire Spectrum + Photon architecture being able support millions of TPS.

Scalable TPS

As the number of MeshBox®es grows, the Spectrum+Photon TPS scales very well. This is because the peer-to-peer transactions between Photon nodes can all take place concurrently, and are thus highly parallelizable. Thus, the more Photon nodes there are, the higher the TPS scales.

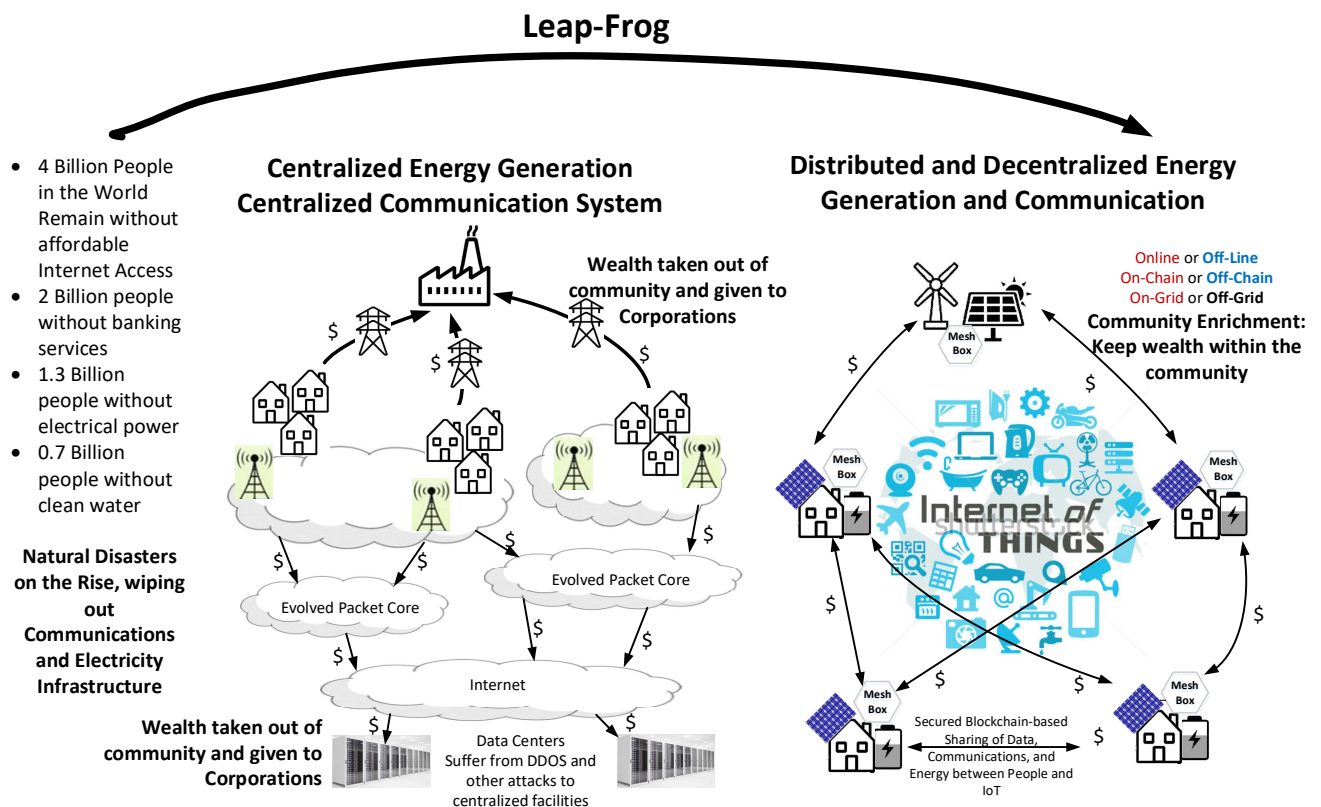
Multi-blockchain and tokens

Not only does the SmartMesh® blockchain support the SMT (SmartMesh® Token) coin and MESH token, but other blockchain tokens are supported as well, including ERC-20 tokens from Ethereum and BTC from Bitcoin. This is done with Wormhole Universal Channel technology and the Atmosphere architecture being developed by SmartMesh®.

6. Conclusion

The human race is at a fork in the road in which existential threats loom, even while innovation provides us with the key to avoid extinction level events and strive towards a prosperous utopia. Everything we do has the potential to move us toward either a Utopian or Dystopian world.

A HyperMesh™ Infrastructure leapfrogs that found in developed countries, through a social-economic paradigm shift.



In conventional infrastructure economics, consumers pay the service provider (internet, electricity, etc) for the service. The service provider decides when and where to deploy services (e.g. whether to install new cellular base-stations and where) and how much to charge for such services.

A HyperMesh™ Infrastructure enables a **Shared-ROI** paradigm shift to enable social well-being with grassroots Infrastructure deployment.

- Instead of the service provider determining when and where to roll out service, the residents of a community decide when and where to deploy infrastructure such as MeshBox® routers.

- Residents earn tokens (money) by providing services (communication, content storage, video streaming, and transactive energy) to their community neighbors.
- This keeps the money within the community and keeps all of the autonomy for the infrastructure deployment in the hands of the people who use the services. The community, and residents, and guests help each other in a synergistic relationship in order to bring prosperity to the entire community.

SmartMesh®, Meshbox®, and our ecosystem partners aim to move society in the right direction, by providing a highly advanced Wifi Mesh Network solution with the Spectrum blockchain to enable an Internet of Value. Such a HyperMesh™ infrastructure will soon be extended with Transactive Energy using renewable energy and battery systems to provide highly robust energy sources for remote areas.

The proposed solution enables blockchain based Fin-tech, high-throughput wifi-communications, and a distributed content storage system, while operating

- with or without the Internet
- with or without a blockchain; with Photon state-channel secondary architecture,
- with or without an electrical grid; with renewable battery and solar technology.

Together, with partners such as Satellite operators, LoRa technology providers, and SmartMesh®, Meshbox® brings about a paradigm shift to enable Infrastructure deployment with Shared-ROI. Instead of the service provider determining when and where to roll out service, the residents of a community decide when and where to deploy infrastructure such as MeshBox® routers.

This whitepaper highlights how a HyperMesh™ Infrastructure, enabled with SmartMesh® and Meshbox® technology can speed up the realization of an IoV Infrastructure, to bring dignity and a sustainable livelihood for the 3.9 Billion people without internet access, 2 Billion people who are unbanked, and 1.2 Billion without access to electricity [Paygo].

7. References

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