



ORBIS

BUSINESS & TECHNOLOGY WHITE PAPER

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Blueprint Design document shall provide the foundation for the solution construct. Upon acceptance, the solution as contained within the governing Blueprint Design document will become the baseline for the Infrastructure and the Software development documentation. Where and when applicable, examples of the screens shall be used to illustrate how to perform the respective functions.

Additional documentation will be provided in later phases of the implementation and provide the necessary detail technical information.



DOCUMENT HISTORY

Paper copies are valid only on the day they are printed. Contact the Orbis team if you are in any doubt about the accuracy of this document.

REVISION HISTORY

This document has been revised by:

Revision Number	Revision Date	Summary of Changes	Author
v1.03	1 -Dec-2017	Updated Whitepaper	Jason, Chao
v2.0	21-Feb-2018	Updated Whitepaper	Sasa A. Petrovic
v3.0	21-Feb-2018	Final Version Released	Orbis Team

REFERENCED DOCUMENTS

Please see the following documents for more information:

Document Name	Version	Author
Initial Draft Network and App Spec.	Draft v.1.0	Jason, Chao
Mesh Profile Bluetooth Specification	V1.0	Mesh Working Group
Mesh Model Bluetooth® Specification	V1.0	Mesh Working Group®
IEEE 802.11-2016 specification	2016	IEEE Standards Association

DISTRIBUTION LIST

This document has been distributed to:

Name	Position	Company	Action
Jason, Chao	Founder & CEO	Orbis Communications LLC	Accept
Tyler S. Ward	Marketing Manager	Orbis Communications LLC	Review
Sasa A. Petrovic	Lead Software Eng.	Orbis Communications LLC	Update
PUBLIC			



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EXECUTIVE SUMMARY

"There are 80 million (that is the number 80 followed by six zeros) power drills in America that are used an average of 13 minutes," Airbnb CEO Brian Chesky wrote in The New York Times:

"DOES EVERYONE REALLY NEED THEIR OWN DRILL?"

Along came blockchain technology and welcome to the tomorrow's distributed autonomous enterprise. (hereinafter DAE)

Incumbent and new entries alike can construct the new business architecture that can innovate, better, create better value at a lower cost, and shift and enable producers to share in the wealth they create.

Incorporated in January of 2018 Orbis Communications LLC (hereinafter 'Orbis') has moved into a new era in the digital revolution where we can program and share software that's distributed using peer production as a business model matters. Furthermore, with blockchain technology peers can develop more formal reputations for effective contributions to the community. Just as the blockchain protocol is distributed, a distributed applications or Decentralized Apps (hereinafter 'DApps') runs across many computing devices rather than on a single-server.

The Orbis mobile protocol aims to be lightweight and robust to allow for quick relay even in congested bandwidths while producing little interference. Our protocol utilizes Wi-Fi Direct and Bluetooth Low Energy (hereinafter BLE) requiring Android® 4 or greater to establish and deploy tolerant multihop mesh networks. Orbis powers distributed local networks, making them globally accessible while providing the incentive for both developers and consumers alike to participate. There are countless opportunities to construct openly networked enterprises that disrupt or rather displace traditional centralized models

ORBIS CORE PRINCIPLES

Thus, most fundamental to Orbis business benefits are the participants. Our business benefits are foundational to participants. Our foundation belief is achieving trust in the digital age based on Orbis core principles:

- 1. Honesty** – No lying through omission no obfuscation through complexity.
- 2. Consideration** – Fair exchange of benefits or detriments that parties will operate in good faith.
- 3. Accountability** – Clear commitments to stakeholders and abiding by them.
- 4. Transparency** – Operating out in the open, in the light of the day.



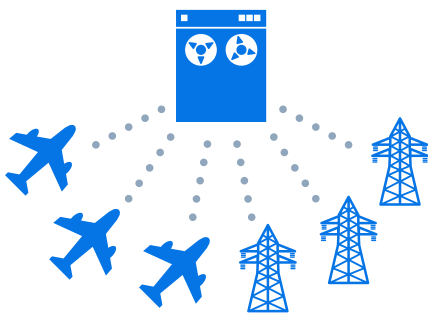
INTRODUCTION

Bluetooth® mesh networks have diverse applications ranging from its numerous commercial IoT applications such as smart manufacturing, smart homes, automation and peer networking.

As per 'Bluetooth® mesh networking' document: "Mesh is a new network topology option available for Bluetooth® Low Energy (LE) adopted in the summer of 2017. It represents a major advance which positions Bluetooth to be the dominant low power wireless communications technology in a wide variety of new sectors and use cases, including Smart Buildings and Industrial IoT."

Individual consumers and developers however have largely remained locked out of this lucrative market. Now, with blockchain technology, a world of new possibilities has opened up to reverse all these trends. We now have a true peer-to-peer platform that enables us to own our identities and our personal data. We can do transactions, creating and exchanging value without powerful intermediaries acting as the arbiters of money and information. Billions of excluded people can soon enter the global economy while at the same time we can protect our privacy and monetize our own information.

BEFORE 2005



Closed and centralized IoT networks

TODAY



Open access IoT networks, centralized clouds

2025 AND BEYOND



Open access IoT networks, distributed cloud

Courtesy of IBM® Blockchain document

The Orbis platform aims to establish a platform utilizing underlying development framework for both consumers and commercial developments by taking advantage of Bluetooth® mesh networking using pre-existing infrastructure and network for developers to deploy onto. The Orbis Token (hereinafter OBT) will also be used initially to reward developers for successful releases as well as consumers for simply participating.

Developers are minted new coins based on app usage to coin cap and consumers are minted coins for being active mobile nodes running the OrbisWeb mobile app.

OBT shall be used to purchase paid apps on the OrbiStore and purchase products.



VISION

Orbis powers distributed local networks, making them globally accessible while providing an incentive for both developers and consumers to participate. Utilizing local Bluetooth® connectivity to create secure many-to-many (m:m) data communities, Orbis has applications in IoT development, crowdsourced networking, and systems integrations. Orbis creates multi-purpose and flexible infrastructure for developers to build upon and consumers to utilize delivering this through three components: OrbiStore, OrbisWeb, and OrbisToken (OBT).

For a simple application example, we can use messaging. Messaging however only stands in for the general transmission of data over mesh networks.

The value of such decentralized messaging in the face of seemingly universal SMS service and Wi-Fi is that mesh networks are not susceptible to infrastructure damage such as in the wake of natural disasters nor do they require costly connectivity implementations in low-connectivity places such as subway tunnels, underpasses, or even rural areas.

Range extension is one of the primary arguments for mesh networks. In situations where wired access-point connectivity is too expensive to implement or impractical due to environmental conditions, the ability to deploy a node that can receive and forward traffic can make wireless mesh the only solution. Because wired infrastructure is not required, the mesh can be set up faster, cheaper and with less expertise. Mesh nodes can be deployed anywhere there is power, with the resulting network architecture providing better coverage.

* **Compatibility with 802.11 services.**

* **Interworking.**

* **Configuration and management.** The core functionality has been defined so vendors can design and deliver products and claim draft-level support. The pre-standard products usually leverage existing off-the-shelf hardware components and firmware, and modify and extend the standard 802.11 media-access-control layer to enable link establishment and management, path selection, data forwarding and security.

When high-definition multimedia needs to be moved between local devices for rendering, the current wireless hub-and-spoke model will experience limitations.

Wireless meshes offer the solution to this problem. Wireless devices are able to communicate directly without going through a central point (the access point). With mesh topology, traffic can flow via the most optimal path.

The Internet access device, which is commonly collocated with the access point, need not become the bottleneck. These networks can even be created without the need for an access point at all, where information will be kept local between the peer devices. Wireless mesh, as a replacement for the dysfunctional ad-hoc mode (one of two ways to currently approach mesh today, the other being wireless distribution system), also will enable personal area networking.

Devices such as smartphones can easily mesh with personal media players and video cameras without a dedicated intermediate device such as an access point. If the infrastructure is available, these meshed devices will be able to use it to access Internet-based resources as well. This will create opportunities for new types of devices and services.

Wireless mesh networks that use off-the-shelf hardware that is on the standards track is ideally suited. The



use cases include telematics, sensors, surveillance and security, process controls and robotics.

The ability for meshed devices to offload high-capacity data streams from the access point and distribute the data directly between nodes, and the network infrastructure benefits of the mesh topology, signal that the time is right for strong, marketable solutions. The combination of market needs, emerging trends and the demands for interoperability will finally make meshing a common feature of wireless networks after years of being “right around the corner.”

Our vision is motivated around distributed ledger (blockchain) and meshed topology coupled with the release of SDK, development and debugging tools including mesh visualization, network analytics, and an API.

Free developer keys will be available to access the APIs.



CHALLENGE

The main limitation with the pre-standard mesh implementations is the lack of product interoperability. But if the customer has a standard 802.11 access network, some mesh vendor's products will interoperate with the legacy access points transparently. This is particularly useful in the enterprise and consumer entertainment applications, where mesh offers much promise.

Others disadvantage worth mentioning while mostly due to the same core problem of 'poor network planning' are:

- **Complexity**
- **Network Planning**
- **Latency**
- **Power consumption**

Problem	Rationale
Complexity	Each node needs to both send messages as well as act as a router, which causes the complexity of each node to go up pretty significantly.
Network Planning	Poor planning can add unnecessary additions of nodes just to offset for example poor latency.
Latency	Based on the protocol we'll be using and the latency your application requires.
Power consumption	Because each node in a mesh has to act as an endpoint and a router, it has to draw more power to operate.

Problem	Solution
Complexity	Consider pros and cons of additional sensors to the mesh 'just to' benefit the range
Network Planning	Advanced proper solution and network planning
Latency	Consider carefully protocol we'll be using and the latency application requires.
Power consumption	Application being deployed with proper network topology planning to determine best power consumption scenario.



SOLUTION

After downloading the OrbisWeb app for your IOS or Android device click “connect” and your phone is now a part of a Bluetooth® network, a node in OrbisWeb. Then you can proceed to download an app, perhaps Bluetooth messaging from the OrbiStore.

Using the app, your message is broadcasted to all nodes in range that then, unbeknownst to other users, is in kind repeated and relayed. This occurs until your recipient has received your message. And all the while, as your phone too is relaying others’ data, your wallet will be credited OBTs simply for being part of the network which can then be used to purchase paid apps in the OrbiStore.

Orbis creates multi-purpose and flexible infrastructure for developers to build upon and consumers (that is to our participants) to utilize delivering this through three core components OrbiStore, OrbisWeb and Orbis Token (OBT) utilizing core principles

WHAT IS ORBIS

BLOCKCHAIN BLUETOOTH COMMUNITY?

ORBIS TOKEN (OBT)

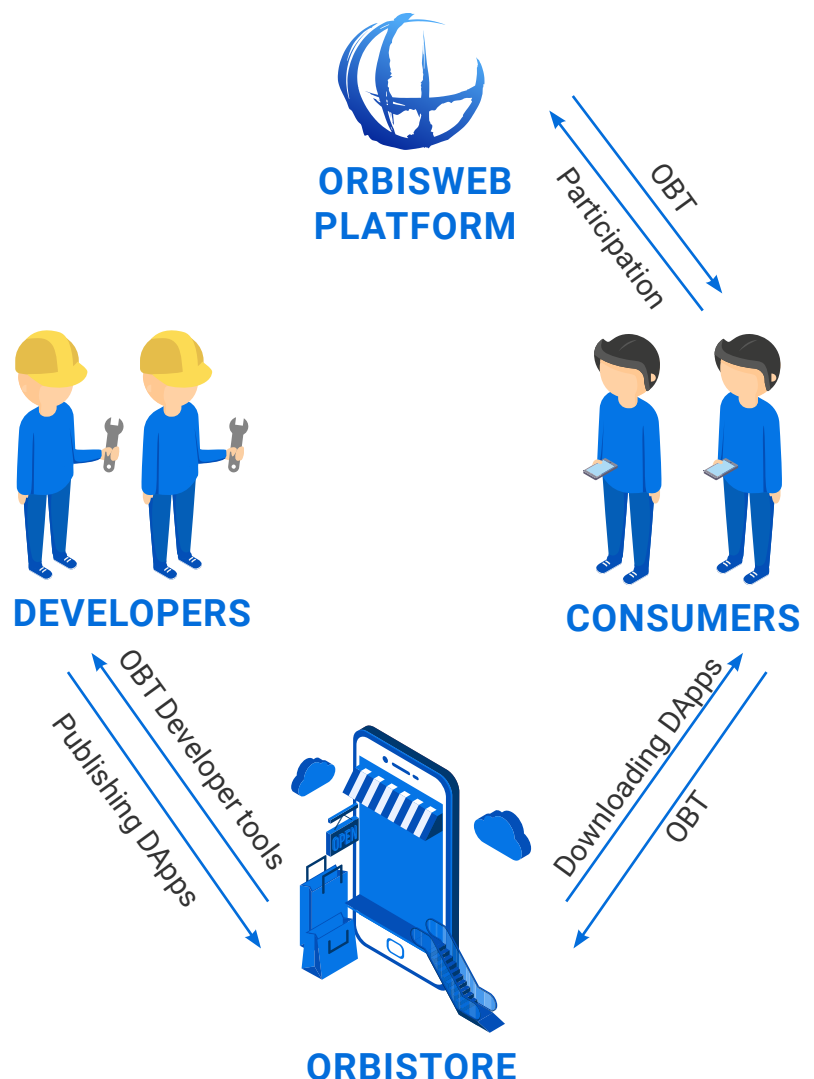
Developers are minted new coins based on app usage to coin cap and consumers are minted coins for being active mobile nodes running the OrbisWeb mobile app. OBT is used to purchase paid apps on the OrbiRepo and purchase OrbiProducts.

ORBIS WEB

Secure BLE connections from local networks connected globally via internet. Developers will be able to utilize this network in creating apps such implementing IoT, replacing digital infrastructure, and utilizing crowdgathered data.

ORBISTORE

OrbisRepo is an application platform open to third-party development, whether utilizing BLE network infrastructure or not. App usage/downloads are implemented via NEO smart contract.





Mesh Networking relies upon the presence of nodes and user's mobile devices with the help of an Android/IOS app will form the mobile nodes of **OrbisWeb**. Other nodes whether mobile or stationary will be automatically connected and data relayed.

To avoid data congestion, packets sent over mobile nodes will require relay counters ticking down each time the packet is relayed. At zero, the packet will no longer be relayed. Stationary nodes may be programmed to relay without modifying the relay counter at the developer's discretion. Also to avoid data congestion, node devices will hold small message caches to avoid relaying duplicate messages.

In addition to synchronizing data with the mesh network, the OrbisWeb mobile apps will be the place where users can utilize their own downloaded DApps as well as being the home to a native token wallet. The app will track node uptime and tokens will be minted to reward active participants

HOW ARE THIRD-PARTY APPLICATIONS TO BE LAUNCHED?

A close comparison in terms of UI and app integration is WeChat. WeChat has implemented add-ons or extensions that enable users to process monetary transactions, call for a taxi, review a restaurant, etc. OrbisWeb will have much the same integration functionality for its approved third-party applications.

In regards to security and privacy of data, OrbisWeb devices will be provisioned using 256-bit elliptic-curve cryptography (ECC) and out-of-band authentication while inter-nodal communications are served with AES-CCM 128-bit-encryption. Identifying data in mesh packets are also obfuscated thus ensuring data is private. End to end data sharing, such as messaging, will be protected with private pre-shared-keys (PPSK)

The Bluetooth® mesh is currently specified to support up to 32,000 nodes per network. Orbis intends to virtually exceed that with conventional data hubs storing automatically uploaded data from each network and making the data accessible to its intended recipients(s) via the conventional internet.

HOW IS THIS LOCALIZED DATA TO BE ACCESSIBLE GLOBALLY?

For DApps requesting global usage such as in the case of crowd-gathered data, relevant data will be temporarily stored until the user connects to an internet source. On an internet connection, the OrbisWeb mobile app will upload the relevant data to globally accessible servers.

The OrbiStore will provide a platform for developers and consumers to publish and download DApps utilizing OrbisWeb. Submitted DApps will be vetted through both automated and manual process to ensure the absence of malicious software. Initially, the Orbis team will vet initial software, however, we wish to transition to a community vetting system, where certified and trusted members of the community will approve submissions and be rewarded with Orbis Tokens.



BENEFITS AND SAMPLE USE CASES

Besides scalability and robustness every mesh node is equivalent to the others, which makes the network independent with a self-forming (and self-healing) capability. After an initial setup, the device can be located wherever it's needed; it can act as an endpoint, a range extender and even a gateway to an external network. A mesh network can rearrange itself using a self-healing mechanism, to support cases in which some nodes have changed their position or have been turned off. With such capabilities, new use cases and topologies for Wi-Fi technology usage have been opened. There is no doubt that mesh networks are going to disrupt the way we think about Wi-Fi connectivity. Its extended range, flexibility and better network utilization is opening the door for a wide range of new applications and an improved user experience ranging from reliability of digital infrastructure to Logistics and Complex or Simple System Monitoring.

A mesh network can be used for a wide variety of scenarios, outside of the basic capability to transfer data over a distributed deployment. There are several advanced capabilities that might be required from mesh devices in order to support most of the use cases besides being less expensive to deploy, being adaptable and expandable with ability to support wireless connectivity high demand.

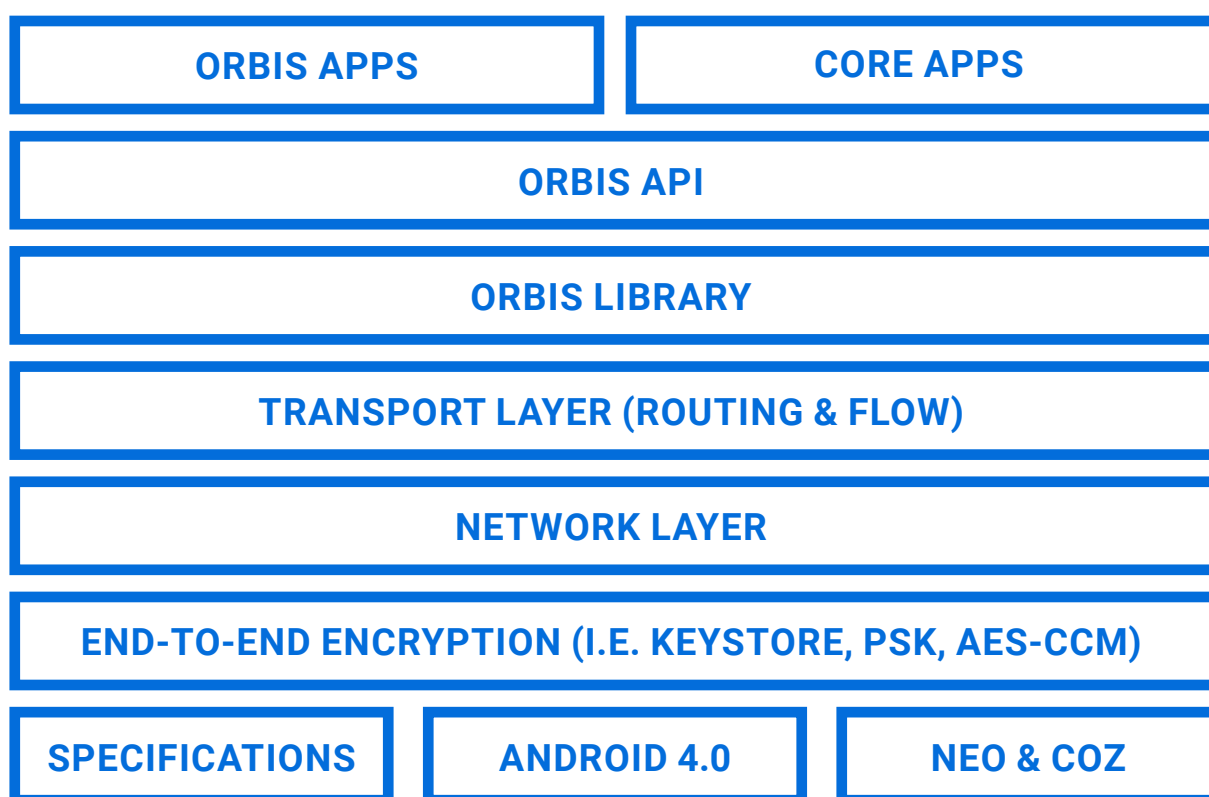
Example Use Cases	Rationale
Range Extension	One of the major benefits of mesh deployment is the possibility to pass data between two devices that are not in range of each other. Devices can be connected in a row, one after the other, forming a chain of nodes.
AP Offloading	Using a smart mesh deployment can actually offload some of the load from the legacy AP device by enabling a direct data transfer between the devices.
Better Network Utilization	Beside extensive coverage and Instead of having a single point of access (and the single point of failure) for devices, a mesh network can consist of multiple relays that connect with one another and can quickly direct traffic between devices.
Social Networking and Crowd-Gathered Data	From Messaging to 'lost your keys' and 'line waiting' scenarios using Bluetooth network, a node in OribisWeb.
Various Events	Sport and Music Events, Ceremonies, Festivals, Conferences and so forth.
Disaster Recovery	Without the single point of failure when and where it is most needed, Disaster Recovery is one of the commonly cited benefits of using mesh networking.



ARCHITECTURE AND CORE SPECIFICATIONS

The Orbis mobile protocol aims to be lightweight and robust to allow for quick data relay even in congested bandwidths while producing little interference. Our protocol utilizes Wi-Fi Direct and BLE requiring Android 4.0 or greater to establish deploy-tolerant multihop mesh networks.

Our system utilizes Wi-Fi protocols for discoverability and Bluetooth for data transfer. Wi-Fi direct discoverability is autonomous however data transfers requires user input. Bluetooth conversely requires user input for discoverability but enables broadcasting.



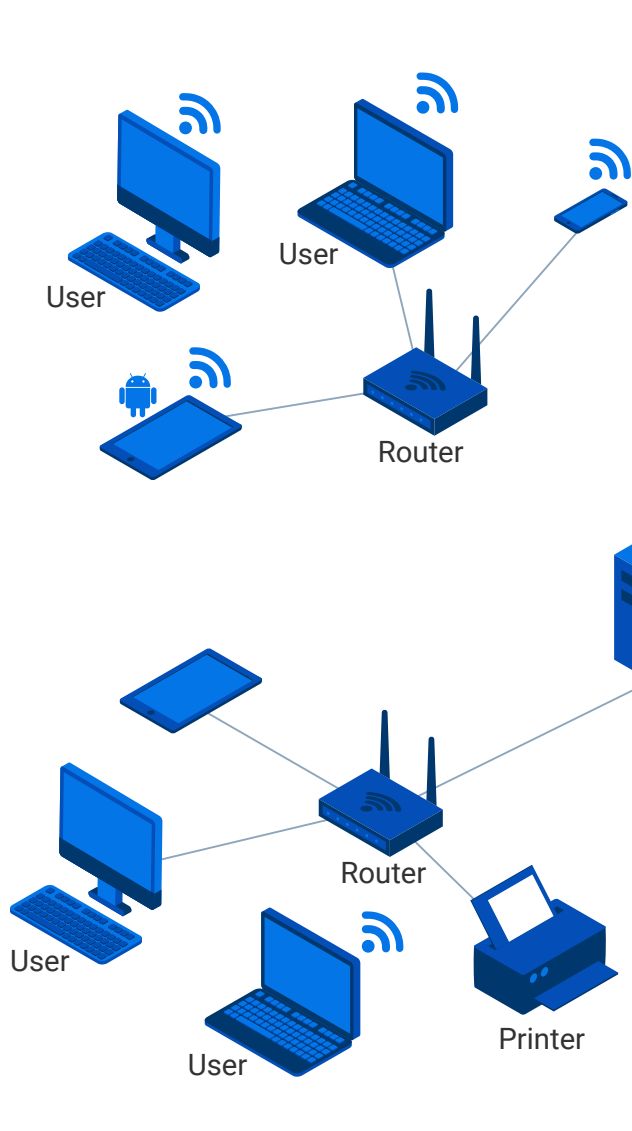
For developers Orbis plans to release a suite of development and debugging tools including mesh visualization, network analytics, and an API. Free developer keys will be available to access the API. When compiling, a signed license key linked to the developer key will be generated for the app and allow access to the Orbis library.

Orbis will be auditing apps before approved deployment however users/developers may set their mobile apps to support unaudited apps should they wish to do so i.e. for testing. Orbis plans to develop a set of native apps currently including a wallet facilitating offline transactions and a messaging app.

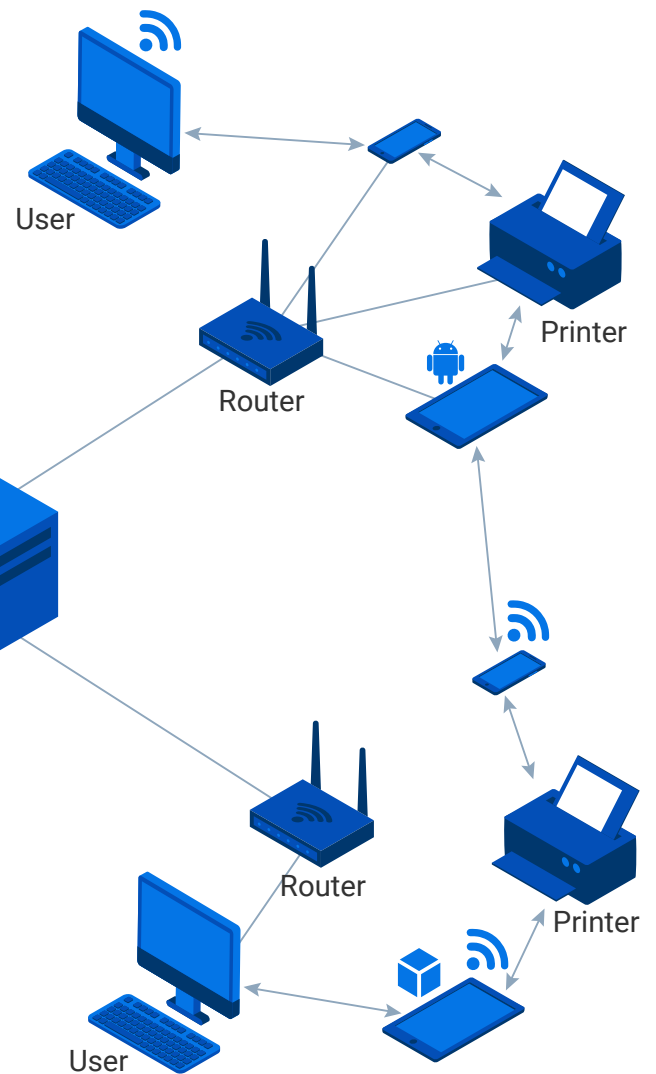
The Orbis library facilitates the mobile connections, the transport layer regulates connections, the network layer connects the mesh communities to internet, the encryption layer is described in 'Security' paragraph, and finally Orbis networks will rely upon the underlying technologies of BLE, Wi-Fi Direct, and the NEO blockchain.



MODERN INTERNET



MESH NETWORKS



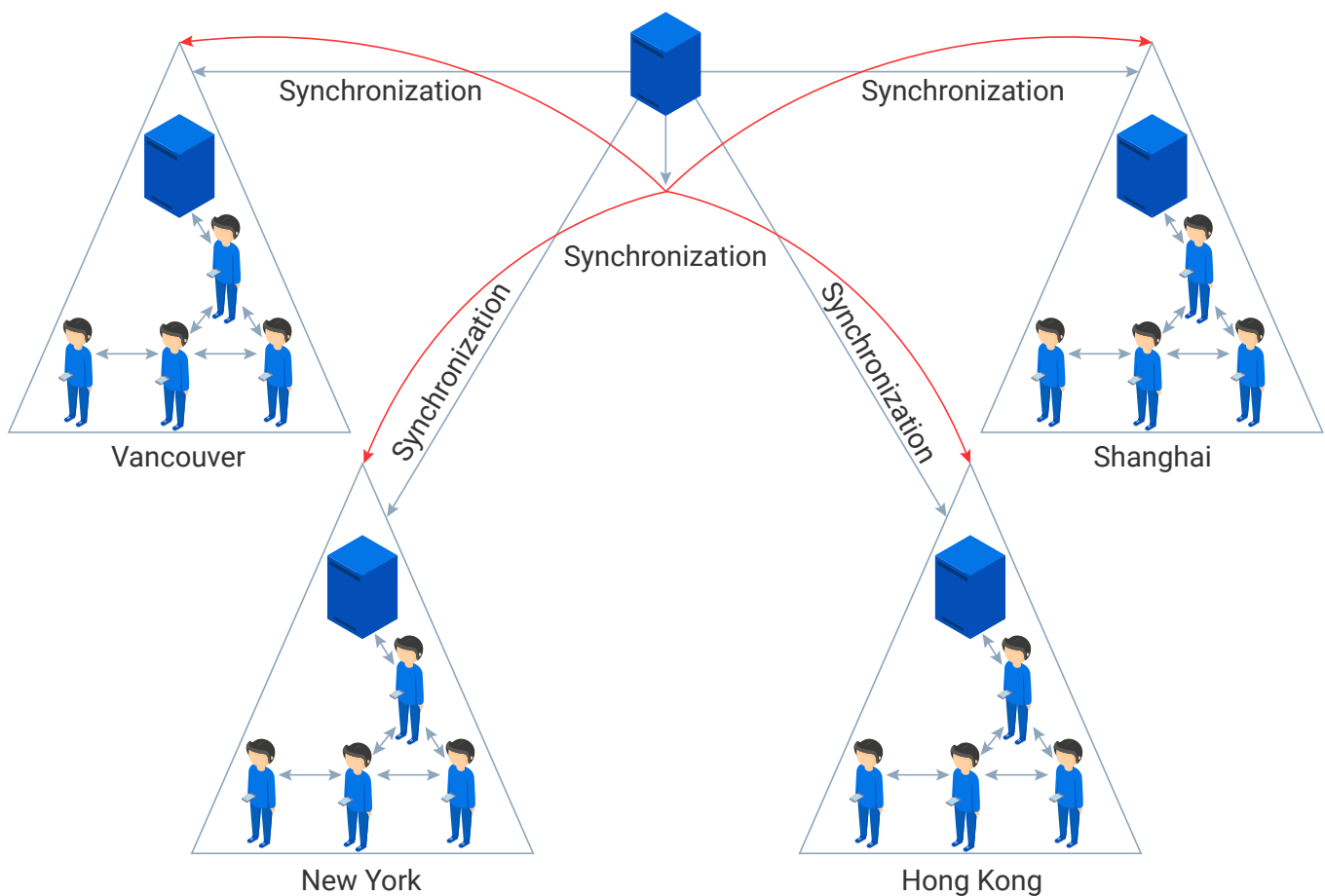
Wireless transmissions including Wi-Fi and Bluetooth are not inherently route based but rather broadcasted. Mesh takes advantage of this to propagate data which at its most basic utilizes flooding. Any devices in range of the broadcast receive the transmission and in a mesh network relay the message - so on and so forth. Orbis will utilize managed flooding and establish “time-to-live” (TTL) and message caching for delay-tolerant networks. TTL ensures the messages will only be relayed a set amount of time while caching ensures nodes will not relay duplicate data and be able to retain messages for later opportunistic sending.

Friendship nodes requiring low energy consumption may be paired with a neighbouring “friend” node. When established the friend node caches all data bound for the low power node (LPN) for transmission after the LPN at its set interval. “Heartbeat” messages indicate to other nodes the status of a node and can be used to determine distance in terms of hops. These functions primarily have commercial applications such as in IoT smart homes and building automation.



In our mobile networks message priority is determined by a hierarchy in order of router nodes, mutual friends, and popularity. Router nodes are likely to be run by Orbis during initial deployment and will be long range relayers also connected to Orbis servers. The amount of friends and mutual friends of a sender will also influence message prioritization by a relayers. Finally popularity has implementations such as in messaging where the upvotes of a thread or comment will result in prioritization.

NEO BLOCKCHAIN & ORBISWEB



SECURITY IN BLUETOOTH® MESH NETWORKING IS MANDATORY

AES-CCM is the standard authenticated encryption algorithm utilized by the Bluetooth mesh specification. It utilizes a 128-bit key with a generated 104-bit 'nonce' to encrypt all payloads while generating a new IV. In addition, the nonce is a one-use key which thus also protects against replay attacks critical for protecting devices such as electronic locks as each message cannot be replicated without detection. In cipher text its use follows $MIC = AES-CCMk(n,m,a)$.

PSKs exchanged by NFC or QR code is also a protocol we wish to implement to deploy on mobile networks. PSKs may also be used to facilitate communication with the server and for commercial fixed applications a network-wide PSK may also be shared to create subnetworks.



Sensitive data such as the private keys will optimally be stored in the KeyStore Provider as introduced in Android 4.3. KeyStore data is handled by the OS and thus won't be saved in backups of the application and is able to perform signing operations while hiding the key to a corrupted application. Furthermore, the OS handled data will not be vulnerable to directory traversal attacks. Facebook's lightweight conceal Java algorithm drawing from OpenSSL will be implemented to secure app data on SD cards.

Further protecting bandwidth attacks a 50 message limitation is implemented in each transaction unless an exemption is required and applied for. Data exchanged is capped at 1MB per exchange again unless exempted as required. A connection will be closed after the message limitation is reached and additional messages will not be added to the cache and not relayed. Data length will also be checked before caching, a limitation will be placed. Recognized nodes will be prioritized over new nodes in congested environments to combat MITM attacks and a connection time limit will be initiated. A node that takes too long to connect will be dropped in favor of another node.

Offline transactions are the critical next step for blockchain-based currencies and through mesh Orbis aims to facilitate such payments. After a connection is established, signed transaction data is exchanged and stored by each participant. Only when both participants are online and upload their matching transaction data will the transaction be approved. The first connected participant's assets will be in a holding state pending the second transaction data. If the uploaded transaction data fails to match as validated by the NEO blockchain then the transaction will be rejected and assets returned.

THE ORBIS TEAM HAS CHOSEN TO DEVELOP ON THE NEO SMART ECONOMY.

'NEO is a non-profit community-based blockchain project that utilizes blockchain technology and digital identity to digitize assets, to automate the management of digital assets using smart contracts, and to realize a "smart economy" with a distributed network.

Digital Assets + Digital Identity + Smart Contract = Smart Economy*

**Courtesy of NEO Smart Economy cited from <https://neo.org/>*

NEO's integration of common compilers and IDEs including C#, Java, C, C++, JavaScript, and Python for coding smart contracts allow for a much lower barrier to entry to Orbis' repository. The NEO team's commitment to government compliance, anti-quantum cryptography NeoQS and community-based governance as well as the fundamental alignment in the goal of a smart, connected, and digital economy are why Orbis will be developed on the NEO platform.

To conclude, Orbis Architecture, Orbis Network Topology, and App/DApps development will be enfolded in 'Orbis Blueprint Design Document', 'Orbis Infrastructure Document', 'Orbis Software Development Document', and subsequently Orbis SDK utilizing NEO Smart Economy blockchain technology found on Orbis core principles as defined in 'Executive Summary' chapter.



ORBIS HIGH-LEVEL COMPANY AND DEVELOPMENT ROADMAP

**Subject to change and for informational purposes only*

<https://app.smartsheet.com/b/publish?EQBCT=09b31b71af2c4a9d9cd459989e73d6e9>

ORBIS TOKENS

OrbisToken (OBT) will be integral to the use of Orbis and provides benefits to the company, developers, and consumers alike. OrbisToken will be minted to reward both developers for consumer usage of their apps as well as consumers for participation in OrbisWeb. OBT can then be used by consumers to purchase apps on the OrbiStore and likely eventually Orbis products such as stationary nodes.

Private presale:

Raised: 9827 NEO ~ 1,300,000 USD equivalent

Public Token Sale: March 3, 2018 – March 31, 2018

Tokens to sell: 40,000,000 OBT

Hardcap: \$12,000,000 USD

Bonus program: 5%, 15%, 25% determined by whitelist position

Blockchain: NEO

The NEO team's commitment to government compliance, anti-quantum cryptography NeoQS, and community-based governance as well as the fundamental alignment in the goal of a smart, connected, and digital economy are why Orbis will be developed on the NEO platform.

Initial Price: 1 OBT = \$0.24 USD

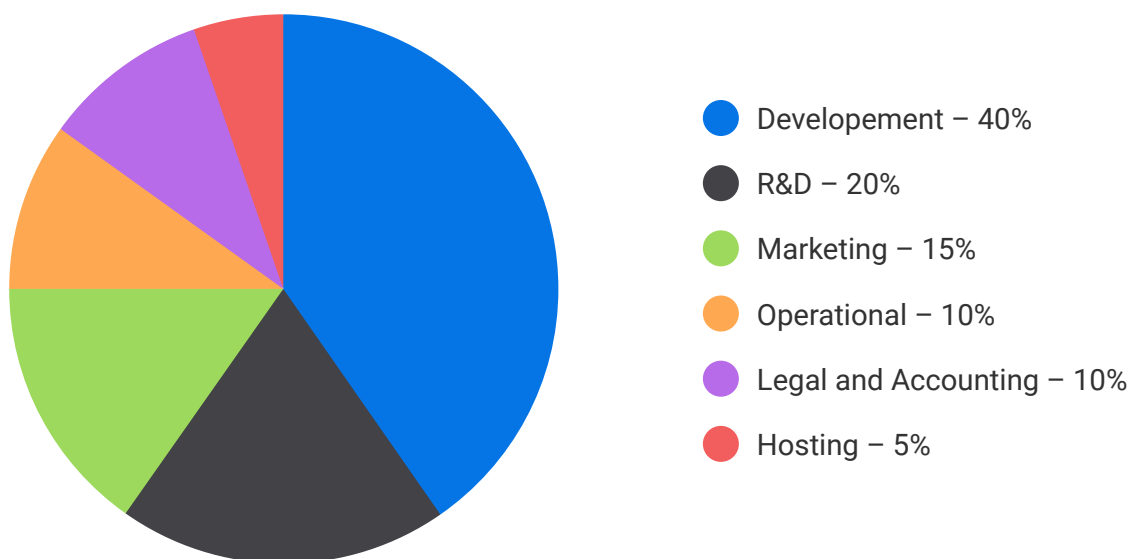
All tokens not sold through the token sale will be burned

Neo exchange rate:

The exact neo: OBT exchange rate will be announced a week prior to the sale and XRT will be determined and announced three hours prior to the sale as follows with the goal of achieving a starting supply of 100,000,000 and raising \$12 million USD



PROJECTED TOKEN SALE FUND USAGE



TOKEN DISTRIBUTION

Token Sale:

40,000,000 OBT (40%)

Company Reserve:

35,000,000 OBT (35%)

Community:

15,000,000 OBT (15%)

Shareholder and employee:

10,000,000 OBT (10%)

Company fund withdrawal over 10% per quarter requires two week's official public notice.

Employee funds will have a vesting period of six months with a maximum withdrawal of 10% per quarter.



APPENDIX A:

Initial Methodologies and Frameworks to be used and the standards applied to Orbis implementation in IoT shall be (subject to change): ANSI/IEEE Standard for Software User Documentation, Agile Manifesto, SCRUM, PMBOK, ITIL, etc.

ACRONYMS AND ABBREVIATIONS

Term	Meaning
AES-CCM	Advanced Encryption Standard- Counter with CBC-MAC
AP	Access Point
Apps	Applications
API	Application Programming Interface
BLE	Bluetooth Low Energy
DAE	Distributed Autonomous Enterprise
DApps	Decentralized Application
ECC	Elliptic Curve Cryptography
LPN	Low Power Node
MITM	Man in the Middle
IoT	Internet of Things
OBT	Orbis Token
OS	Operating System
PSK	Pre-shared Key
SD (Card)	Security Disk (Card)
SDK	Software Development Kit
SMS	Short Message Service
TTL	Time to Live
UI	User Interface



This is a note.

Note: For Public release granted on 21st of February 2018

