

IUNGO.NETWORK Whitepaper

v 1.4

CRYP2NOVA

Archived copy: cryp2nova.com

TABLE OF CONTENTS

1. Executive summary 3
2. Market opportunity 5
   - 2.1. Regionally based providers 6
   - 2.2. Small and medium-sized business needs 6
   - 2.3. Network expansion and capacity 6
3. Business model 7
4. Marketing and Strategy 8
5. Competition 9
   - 5.1. FON Network 9
   - 5.2. Boingo 9
   - 5.3. Hotspot system 9
   - 5.4. Airfy 10
   - 5.5. Socify 10
6. Technical description 10
   - 6.1. Overview 10
   - 6.2. Wi-Fi deployment sites 11
   - 6.3. IUNGO mobile wallet 13
   - 6.4. IUNGO cloud wallet 14
   - 6.5. Payments 15
   - 6.6. Services 17
   - 6.7. Infrastructure entities 18
7. Notice and disclaimer 19
8. References 20

CRYP2NOVA

Archived copy · cryp2nova.com

1. EXECUTIVE SUMMARY

AT IUNGO WE BELIEVE THAT AFFORDABLE INTERNET ACCESS IS A BASIC HUMAN RIGHT!

The emergence of a plethora of powerful personal and business internet applications has transformed how businesses and consumers operate. Explosive growth in internet consumption is being propelled by rapid advances in internet-related infrastructure and services.

Despite the explosive growth, major problems still persist for users to get onto this information superhighway. One of the problems with local providers and local connectivity is that it limits on the go usage. Mobile data plans implement usage restrictions and relatively high fees.

WiFi connection problems range from annoying nuances such as localized captive portals and injected advertisement to dangerous issues such as malicious hotspots and open access points where more or less everyone can eavesdrop on your unencrypted traffic. Industry bodies and local providers fail to address the issues of seamless connectivity and roaming.

WHY CAN'T WIFI JUST WORK RELIABLY AND SECURELY?

IUNGO is a globally distributed wireless internet service provider built with the help of a worldwide community. We are bootstrapping a community where everyone can assume responsibilities and benefit from the associated rewards for running parts of the service delivery infrastructure. Members can contribute by installing Public Wi-Fi access points on their premises and/or running parts of the service infrastructure.

Our network will rely on the existing physical Internet infrastructure to carry end-user traffic and will form an overlay network with unified end-user identification, authentication and billing systems. We will use the Ethereum network to build trusted, transparent accounting and payment infrastructure. Our mobile applications will enable low granularity service usage accounting and compensation for services rendered. Additionally to the software solution, hardware will be offered as an option, with pre-setup routers available for those seeking a consumer friendly plug and play experience.

IUNGO will not limit itself to the technical research and development needed to deploy the network at global scale, but will also build worldwide recognition of the brand.

A TOKEN BASED ECONOMY POWERED BY A CLOSED LOOP OF INCENTIVES

Supply side participants in the IUNGO Network will be incentivized to provide internet access both in places with high traffic of smartphone users and remote workers (town centers, cafes, airports) but also in remote places in the developing world where there was no internet coverage before — imagine, for example, an enterprising citizen of a remote African village sharing his satellite based broadband with his community via IUNGO. The advantages for the consumers in the developed world are obvious; fast, secure, instantaneous WiFI internet access wherever they are in the world. No forms to fill in, no risk of personal data being stolen, no extortionate hidden roaming charges.

Archived copy · cryp2nova.com

WIRELESS INTERNET

USERS

CUSTOMERS

- Travelers
- Remote workers (hipsters or professionals working from coffee shops)
- Digital nomads
- Residents of countries where mobile data plans are expensive and/or poor coverage
- Heavy youtube users
- Hardcore gamers on the move

BENEFITS

- Instant, seamless, safe and automated connectivity with hassle-free payments
- Affordable and transparent accounting with single wallet globally
- Usage based on preferences (price, speed, quality, reviews)
- Global providers network with recognizable branding

WIRELESS INTERNET

SERVICE PROVIDERS

CUSTOMERS

- Small and medium-sized businesses (e.g. restaurants, cafes and bars)
- large enterprises and governments wishing to provide secure public / visitor internet access
- individuals who live in close proximity to crowded public spaces
- Airbnb hosts
- co-working spaces
- investors interested in providing wireless coverage in a selected area (street, square, block or whole city)
- MICE organizers (Meetings, Incentives, Conferences and Events/ Exhibitions)

BENEFITS

- Additional revenue stream for individuals and businesses
- Cost savings
- Access to a global user base
- Increased engagement, low entry barrier (cheap — free to use, small fee based on revenue)
- Powerful web based service management tools (network abuse prevention, reports, billing, alerts, captive portals, white label branding)
- Marketing tools
- Increased security
- Reduced legal liability for corporate “visitor” internet access

Archived copy · cryp2nova.com

- End users can review ratings of any particular Access Point (AP) and provide ratings by collecting quality metrics (latency, jitter, bandwidth) of connections (AP collected metrics are not enough)
- AP providers are placed on the map and businesses can provide descriptions
- AP providers can choose to redirect end-user traffic via third parties therefore limiting legal liability exposure
- AP owners can override the IUNGO recommended price for their location and set their preferred price for the service
- We are building a community where evangelists can provide introductions to installers and manage troubleshooting if problems involving local competences (distributed labour) arise
- Anyone competent enough to participate in running core infrastructure components, can take part and benefit from the incentives
- IUNGO provides complete marketing and brand recognition

On one side of the market we have the existing wireless internet companies operating in the field with closed, managed, walled garden proprietary technologies. On the other side we have small and medium businesses running unsecured networks without any controls and without any material marketing opportunities. With open protocols, an incentivized business model and the power of collaboration with blockchain payments, this market is ripe for disruption.

2. MARKET OPPORTUNITY

The Global Internet Service Providers industry is one of the fastest-growing industries in the global economy. Explosive growth is being propelled by rapid advancements in internet-related infrastructure and services, as the emergence of a plethora of powerful personal and business internet applications has transformed how businesses and consumers operate. Rapidly rising demand for broadband internet access and continued investment in wired internet infrastructure have helped propel the industry forward.

According to IBIS World research, the annual growth rate between 2012 and 2017 was 8.8%. The majority of Internet service providers are multi billion dollar Telecommunications companies like AT&T, Verizon and China mobile.

Archived copy · cryp2nova.com



2.1. REGIONALLY BASED PROVIDERS

Most of these Telcos and ISP's are regionally based with no convenient services for today's new generation of freelance workers, digital nomads, travelers, vloggers, etc. It is a significant problem for them to access reliable and sufficient internet services outside of their home country. Wi-Fi password hunting, filling forms in airports and public spaces, unknown security or payment options, poor download and upload speeds and data usage restrictions causing not just inconvenience but a measurable and material waste of time, energy and money.

2.2. SMALL AND MEDIUM-SIZED BUSINESS NEEDS

WiFi is now a must have amenity for every consumer-facing business, but for venue owners, providing a reliable WiFi service is difficult. Today's market offers a wide range of guest WiFi solutions, but they are neither cheap nor simple for a small business to use. Hotspot management tools suffer from usage complexity, user base disparity and zero brand recognition. The WiFi experience and monetization models are subpar solutions at best lacking centralized management, operational tools and usage stats. There is no existing service which provides easy Plug & Play usage and marketing tools.

2.3. NETWORK EXPANSION AND CAPACITY

As the demand for mobile broadband services continues to explode, mobile wireless networks must greatly expand their capacities. Simultaneously, the revenues generated from data traffic are falling. In this context, service providers are calling for network strategies that alleviate the CAPEX burden of satisfying this demand. One effective method of spectrum reuse by which mobile networks may be able to accommodate this exponential growth in demand is to offload certain segments of their traffic onto Wi-Fi networks — which are connected by fixed broadband access

Archived copy · cryp2nova.com

lines directly to the Internet. By migrating data traffic from expensive cellular networks to WiFi infrastructure, WiFi Offload implies dramatic savings on infrastructural costs and also enhances the user connectivity experience while providing value-added WiFi services.

Wi-Fi offload allows the portion of data traffic emanating from the mobile device that is destined directly for the Internet to be injected immediately into the Internet for routing to its final destination. This traffic never touches the mobile operator's core network. Also Wi-Fi offload uses unlicensed spectra. Further, Wi-Fi has access to a very substantial amount of spectrum — with allocations of several hundred MHz in the 2400 MHz and 5000 MHz bands. Because of the low permitted power of Wi-Fi signals, it is possible to make very substantial reuse of these frequencies. To take advantage of this, many mobile wireless devices are capable of connecting to local Wi-Fi networks in addition to signals from cell towers.

WiFi is now a must have amenity for every consumer-facing business, but for venue owners, providing a WiFi service that adds value beyond connectivity while complying with regulations is difficult. Complete WiFi service packages offer centralized management, and operation from the cloud, easy integration into the service portfolio, compliance with security and regulatory obligations and increased revenue. Revenue could be increased directly by selling WiFi access or upselling it as a part of package.

Alternatively, additional charges for WiFi are not applicable in some markets due to the broad availability and competitive prices for LTE. But even in these situations, small and medium companies would benefit from a complete managed WiFi services toolkit for marketing purposes.

3. BUSINESS MODEL

IUNGO will operate initially with a freemium concept. We are used to having free WiFi (in the developed world), but instead of standard security for providers and users, some premium services will come at a cost. For users premium services will include VPN for Total Privacy, Enterprise grade security for traveling professionals and extreme high speed. For businesses the premium services will include Marketing tools like user emailing services and in app advertising. Premium services will be paid for in IUNGO tokens by both users and providers via the IUNGO wallet.

Additionally, our software will allow us to integrate third party apps and services for both users and business. These third party services will also leverage IUNGO tokens for payment, therefore creating an ecosystem of applications operating on top of the core IUNGO protocol framework.

IUNGO will charge a 3% transaction fee from WiFi service providers, or Third party services. Additionally 1% will go to the Service Gateway operator (anyone can operate service gateways). This one percent will be distributed equally between all service gateways in a situation where multiple gateways are involved in the transaction chain. Additionally, 1% may go to local evangelists as a referral bonus. The remaining 95% (or 96% in cases when there is no referrer) of the end user payment will go to the WiFi service provider.

Archived copy · cryp2nova.com

FREEMIUM BUSINESS MODEL

FOR USERS

FREE	PREMIUM
Millions of hotspots	Millions of hotspots
Security	Security
Statistics	Statistics
Map	Map
Android iOS app	Android iOS app
VPN	VPN
No ads	No ads
Super speed	Super speed
Unlimited bandwidth	Unlimited bandwidth

FOR PROVIDERS

FREE	PREMIUM
PLUG & Play software	PLUG & Play software
Millions of global customers	Millions of global customers
Ready for e-commerce	Ready for e-commerce
Security	Security
No IT personnel needed	No IT personnel needed
Revenue sharing	Revenue sharing
Email marketing	Email marketing
In-app ads	In-app ads
Support	Support
User statistics	User statistics

4. MARKETING AND STRATEGY

Local evangelists, tech support program (Geographically based IUNGO ambassadors affiliate program) will receive 1% of transactions they are involved with.

A substantial amount of budget will be allocated for public awareness, consumer marketing and B2B sales and marketing. The HORECA and MICE industries (events, exhibitions) will be a particular area of focus for these campaigns.

We are establishing ongoing cooperation with router manufacturers and firmware developers. With a goal of custom hardware creation after the second funding phase.

A bounty program will be established with funds for coverage. Initial coverage on demand.

Different geographical areas will have regional pricing suggested by the IUNGO service gateway, but each provider will be able to overwrite this price creating marketplace dynamics.

WiFi providers who choose IUNGO will be provided with industry leading tools to generate metrics

Archived copy · cryp2nova.com

for the business owner — retention, returning customers, usage stats, abuse counter measurements (web, https, email), bandwidth limitation.

5. COMPETITION

Local evangelists, tech support program (Geographically based IUNGO ambassadors affiliate program) will receive 1% of transactions they are involved with.

5.1. FON NETWORK

Fon is a carrier WiFi provider and are pioneers of residential WiFi sharing. Fon Solutions offers WiFi products and services. Their management solutions enable service providers to configure, deliver and operate their own WiFi services. Fon Network aggregates residential and premium carrier WiFi footprints creating one coherent global WiFi network. Fon facilitates WiFi interconnection between carriers, provide access deals to interested parties, and enable seamless user roaming. Fon´s global clients include British Telecom, the Deutsche Telekom Group, SFR, Proximus, KPN, Cosmote, MWEB, SoftBank, Telstra, and Vodafone.

5.2. BOINGO

Boingo Wireless, Inc. is a Wi-Fi software and services provider that makes it easy, convenient and cost-effective for people to enjoy Wi-Fi access on their laptop or mobile device at more than 325,000 hotspots worldwide. With a single account, Boingo users can access the mobile Internet via Boingo Network locations that include the top airports around the world, major hotel chains and coffee shops, restaurants, convention centers and metropolitan hot zones. Boingo and its Concourse Communications Group subsidiary operate wired and wireless networks at large-scale venues worldwide such as airports, major sporting arenas, malls, and convention centers, as well as quick serve restaurants. Price for the service is 39 USD per month for global plan and 9 USD per month for US only plan.

5.3. HOTSPOT SYSTEM

HotspotSystem provides hotspot management and billing services for businesses or individuals who want to provide internet access for their customers. Their Cloud-Based Hotspot Management allows customers to manage unlimited hotspot locations from a Control Center. All changes are available in remote locations in real time. The Router Alert feature will alert you if a device goes down. All user activity can be seen when it happens and can also be exported or can be accessed remotely via our API. Features: unlimited locations, customizations, network abuse prevention, router alerts, user management, logs, reports, billing, etc. Pricing: 15% — 25% transaction fee for accepting payment in hotspot. Payout once a month. Plans without payments limited by sessions and costs 5 USD per location per month for 3000 sessions.

Archived copy · cryp2nova.com

5.4. AIRFY

This is a public WiFi for business solutions. When providing WiFi to your guests without Airfy, you are liable for the actions of your guests. Airfy is an internet service provider, therefore not liable for those actions. As soon as you use airfy, you are safe from legal threat. All your guests' data traffic is securely channeled to the internet through the airfy cloud VPN server. Thanks to this technology, you as a WiFi provider are safe. The guests are using the internet as airfy users, so that you are not liable for their actions. All you need to set up is electricity and an internet provider. Cloud-based support. Price for the service is 19 EUR per month for Starter package and 39 EUR per month for Marketing plan with Facebook page promotion features.

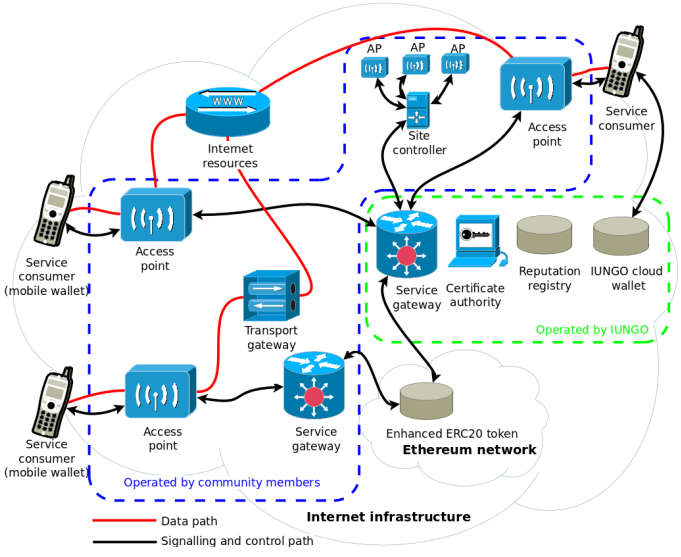
5.5. SOCIFY

SOCIFI is a cloud-based platform designed for Wireless Providers to enable the monetization of their networks. In large scale or custom deployments, SOCIFI is capable of also providing a local hosting solution for enterprise infrastructure. A plan with all features for 15000 sessions a month costs 195 USD.

6. TECHNICAL DESCRIPTION

6.1. OVERVIEW

The IUNGO will provide public Wi-Fi access. Service providers will be deploying Wi-Fi sites by installing and registering access points for public use. Service consumers will be able to use the IUNGO mobile wallet application or the IUNGO website to locate sites providing access to the IUNGO network. When in radio proximity to an active access point, a consumer's device will access internet services and pay for services used. There will be two levels of access security and two payment methods available. High communication security and more flexible payment terms will be available to end users willing to install a IUNGO mobile wallet application. A fallback browser based authentication and payment method will be available via IUNGO cloud wallet for those without the mobile application installed. All payments will be Token based and cleared on the public Ethereum network.



Wi-Fi access will be delivered by Wi-Fi access points installed and operated by

Archived copy · cryp2nova.com

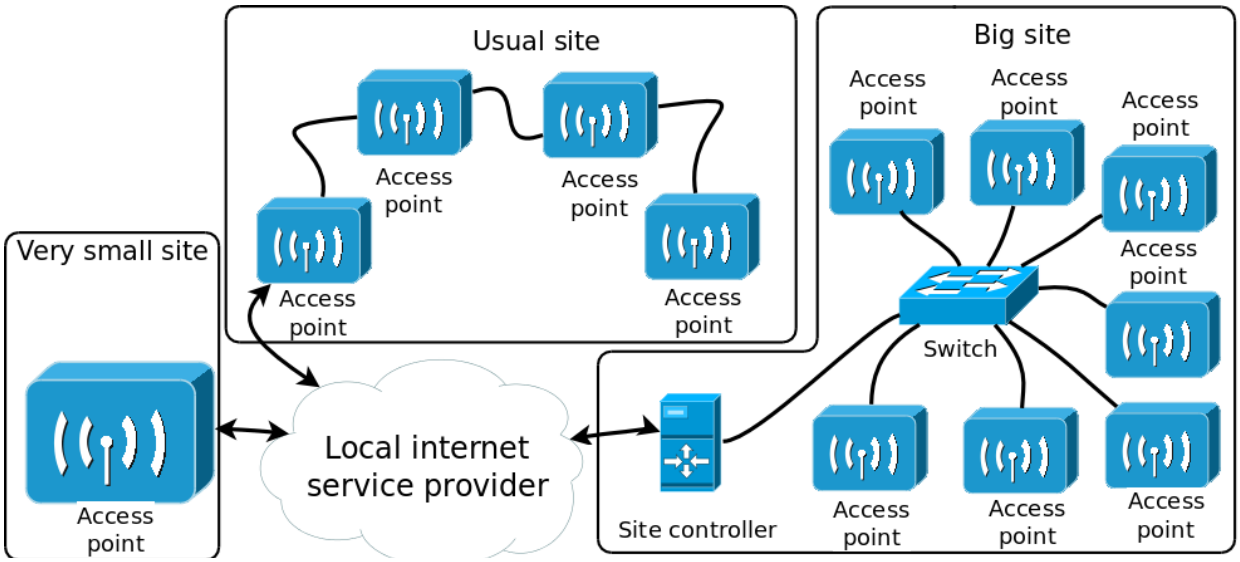
service providers (IUNGO community members). Access points will provide customer devices with physical access to the Internet directly, via existing connections to Internet Service Providers or indirectly via transport gateways operated by service providers having carrier status (with legal immunity from liability in respect to content transferred). Due to limited hardware resources, access points will offload all end-user identity verification and payment transaction to service gateways.

Anyone conforming to the qualification requirements and IUNGO operations rules will be able to operate service gateways and reap the associated rewards. Service gateway operators will be able to define their own schemes for how they compensate service providers for services rendered. IUNGO ORG will be operating the service gateways taking fixed commission from actual payments received from consumers. There is a trust based relationship between the service provider and service gateway operator. Service providers can freely choose which service gateway to pair with. Payments from wallets to service gateways will use zero trust state channel based payments. Payments from service gateways to service providers will rely on trust between them.

You would not be mistaken if the IUNGO service gateway operations looks to you very similar to the Ethereum mining pool operations: you have miners (providers) running mining rigs (access points) contributing work (giving access to internet) to a benefit of a pool (service gateway). The pool (service gateway) operator reaps reward for a block mined (services provided), keeps the commission and distribute rewards to miner(s) (provider(s)). This model enables creative and competitive reward distribution schemes to flourish.

6.2. WI-FI DEPLOYMENT SITES

The deployment site is a physical location where access points will be installed by, or on behalf of the site operator. Access points will provide a physical connectivity layer to the internet. Depending on the size of deployment site, it may take one to many access points to provide a good quality service. To address different deployment site scale requirements, three deployment strategies will be pursued.



Archived copy · cryp2nova.com

In very small sites off the shelf wireless routers running IUNGO provided custom firmware will be directly connected to local internet service provider. A selected set of the wireless router models will be supported by custom firmware to act as IUNGO network compatible access points. For average sized sites up to 8 access points can be daisy chained to cover a larger area. The access points will be able to detect daisy chained neighbors and auto-configure the bridging mode to relay traffic to the next neighbor while the nearest one to the ISP will function as site controller. Small and normal sized site access points will have a dedicated port to connect the site owner's network devices (like Point of Sale equipment, video cameras, etc.) which will be completely isolated from the wireless network. For bigger sites (hotels, exhibition venues) with many access points installed a dedicated IUNGO site controller will be used to manage the site. Only enterprise class access points with original vendor supplied firmware and sufficient capabilities or IUNGO partner provided IUNGO network compatible access points will be supported in big sites to reduce the chances of hard to debug problems. Additionally — subject to compatibility of existing access points/switches in an existing Wi-Fi deployment site — a IUNGO site controller may be installed to add IUNGO network capability to an existing Wi-Fi deployment site. IUNGO network compatible access points and site controllers will be made available for purchase from IUNGO ORG partners. Very small sites will have a single access point paired with a service gateway. Average size sites will have only the access point directly connected to internet service provider and acting as site controller paired with service gateway. On bigger sites only the site controller will be paired.

Two Wi-Fi networks (SSIDs) will be served by each access point: one open/unencrypted network and one authenticated/encrypted network. Only open/unencrypted network announcement beacons will be broadcasted. No network advertisement beacons will be broadcasted by access points until the control channel to service gateway is established to reduce waste of time / battery charge of consumers connecting to an access point without access to internet. Unencrypted wireless network will greet users with a captive portal and will offer users to choose either to install a mobile wallet application (to become able to connect to the secured network) or to connect to a secured IUNGO cloud wallet to pay and continue using unsecured Wi-Fi network service. Authenticated and encrypted network will only serve customers who have a mobile wallet installed.

A custom firmware for wireless routers will run a Linux based environment build on top of OpenWrt project. Wireless interfaces will be managed by hostapd daemon. The IUNGO developed local RADIUS daemon will serve hostapd to authenticate mobile wallet users using an EAP-TLS authentication scheme and will derive encryption keys for each Wi-Fi client session. Each RADIUS server (running in access point or site controller) will have a security certificate installed. A captive portal agent will take over DNS/HTTP traffic on unencrypted wireless network interface and will redirect consumers to the IUNGO wallet page until network access restrictions are lifted. API daemon will expose HTTPS based API used by mobile wallet and cloud wallet to communicate with service gateway serving a site and all other IUNGO services. A control agent will keep live connection to a service gateway and will control user access to the internet based on commands

Archived copy · cryp2nova.com

received from the service gateway. A similar set of software will be deployed on the site controller.

SERVICE PROVIDER RISKS:

- Monthly payments;
- Cheating/attacks by users (no payment for usage from IUNGO) — solution: constant network improvements, monitoring tools, client support (investigate reported issues);
- Single payment gateway for initial V1;
- Service gateway takes risks (places customer money into blockchain).

6.3. IUNGO MOBILE WALLET

The IUNGO mobile wallet is a dedicated software application which enables seamless connectivity to the IUNGO network. When permitted by the consumer, it will connect to any IUNGO access point or public IUNGO web-service and will download the dataset of any IUNGO Wi-Fi sites available nearby. The downloaded dataset will be cached by the application for later use. The application user will be able to see all IUNGO enabled Wi-Fi sites and associated information on the map. The IUNGO mobile wallet will be able to login to existing IUNGO cloud wallet accounts using a remote identity or create and use a locally generated identity. The cloud wallet account can also be used to backup/restore encrypted locally generated identities. When use of a local identity is preferred, the application will generate a cryptographically secure pair of keys and will create a self-signed X.509 standard based certificate to represent end-user client identity to TLS servers.

When enabled, the wallet application will start monitoring signal levels of all available IUNGO access points. Wallet users will be able to define automatic connection policies with parameters such as the highest acceptable price per MB/per minute, lowest acceptable bandwidth, whether to give away your verified personal information (like name/surname, e-mail address, age, phone number) in exchange for internet access subsidized by access point operator or to disable automatic connections altogether. When in automatic connection mode the application will track the quality of the currently connected session and the quality of beacons received from other available access points. It will automatically switch over to other access points with better signal/noise ratio and matching connectivity policy when such an access point becomes available within radio reach. After associating with the preferred access point, the wallet application requests provisioning of internet access by negotiating service/payment terms with service gateway via an API reachable via the access point and by paying each time the previously paid amount is used-up. The mobile wallet tracks session length and the amount of information transferred to share service usage information with the reputation service. When in manual mode, the wallet will present the user with all connectivity choices available and will connect only with the user's consent.

This application will gradually be made available on the majority of popular operating systems and platforms like android, iOS, Mac OS X, Microsoft Windows and GNU/Linux.

Archived copy · cryp2nova.com

6.4. IUNGO CLOUD WALLET

The IUNGO cloud wallet is a web service created and operated by IUNGO ORG. The cloud wallet service enables access to the IUNGO powered network when the mobile wallet application is not installed on the consumer's device or mobile wallet application is not available on device's platform. The cloud wallet service will be freely accessible via public internet and via any IUNGO access point. When accessing a service site a consumer will be given the choice to either use an existing wallet account or create a new one by filling in the account registration form. After logging in to an existing or new account, a single page JavaScript app will be loaded to present a graphical user interface. It enables consumers to create additional identities, top-up their Token accounts tied to identities, transfer Tokens between accounts and to pay for access on IUNGO enabled Wi-Fi sites. Users will be able to use this interface to top-up their Token account by purchasing tokens with their credit card and possibly other integrated payment methods. Additionally, a criteria based searchable map of all other IUNGO powered Wi-Fi deployment sites will be available in the web app.

In case no mobile wallet has been installed on the mobile device, the consumers must explicitly direct their device to connect to the open IUNGO network. When connected a captive portal software running on the access point will redirect all attempts to visit http sites to IUNGO's cloud wallet webpage. After logging in to the secure cloud wallet, the user will be presented with services available on the currently used access point and respective service prices. The consumer will be able to choose their preferred service type (subsidized/paid per time/paid per amount of data transferred) and optionally set a comfortable amount to spend (which automatically limits time available or enforces a data transfer quota). The session duration and data amount transferred will be displayed during the active session. Consumers will be able to stop the service delivery and additional payments at any time with the push of the button.

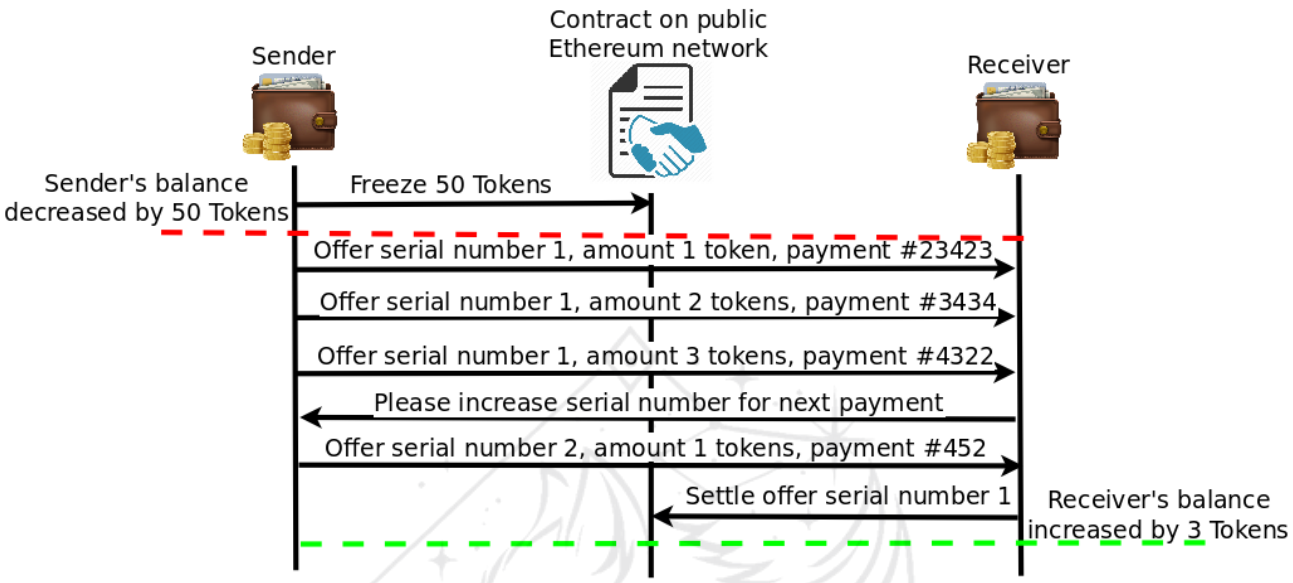
In the background, the web application running in the browser will establish (Cross Origin Resource Sharing) connections to both the Access point API and to the Cloud wallet API. It then will start forwarding encrypted communication messages between the Access Point and Cloud Wallet establishing a relayed communication channel between the two. The cloud wallet will use this communication channel to emulate a mobile wallet and will use the same API on access point to identify and authenticate the deployment site, learn services available, negotiate and pay for services rendered. After all parties are identified and authenticated a direct channel between cloud wallet service and service gateway serving access point may be established to reduce latency overhead of indirect communications.

Archived copy · cryp2nova.com

6.5. PAYMENTS

PAYMENT CHANNELS

Payments in IUNGO network will be token or fiat currency based.



To open a payment channel one party will freeze a selected amount of tokens for the benefit of a receiving party. A selected amount can also be equal to zero. This frozen amount can be increased on-chain by the sending party at any time. However, there will be no way to return frozen tokens back to the sender's account. By monitoring events emitted by the Token contract, the receiver can detect payment channel creation events and track the amount of Tokens frozen. When the sending party decides to send an amount to the receiving party, it generates a signed offer confirming an un-revocable intend to part with specified amount of Tokens to the benefit of the receiver and sends this message off-chain to the receiver. The message contains the sender's address, the receiver's address, the per sender-receiver pair tracked serial number of the offer, the amount sent, a hash of previous attributes, the sender's digital signature over hash and an opaque, unsigned bytestring to carry the reason for payment. By reusing a serial number, the sender can increase the amount sent and update the reason for sending until actively requested by the receiver to use new serial number for further payments. To settle the state on-chain the receiver must sign the best offer received from the sender and invoke the Token contract with the countersigned offer as an argument.

When invoked to settle the offer the Token contract will check if the settlement should be processed. First, both signatures are checked for validity and the signers match sender and receiver. Then the offer serial number is checked to determine if it is greater than the last offer processed by the contract to reject repeated attempts to settle the same offer. Subsequently, the

Archived copy · cryp2nova.com

frozen plus balance amount of the sender's account is checked to verify it is greater than amount offered. If all checks are passed, the serial number of the offer is saved in the state memory of the Token contract, the commission for IUNGO ORG is calculated, the amount promised is deducted from sender's account and the amount minus commission is deposited to receiver's account. The commission amount is deposited to the benefit of IUNGO ORG. It should be noted that an offer and all signatures are passed as input to settlement function so that the contract can be invoked by any 3rd party willing to pay for the gas used and still produce expected results. Service gateways will act as an intermediary between wallets and the blockchain and will cover transaction gas costs.

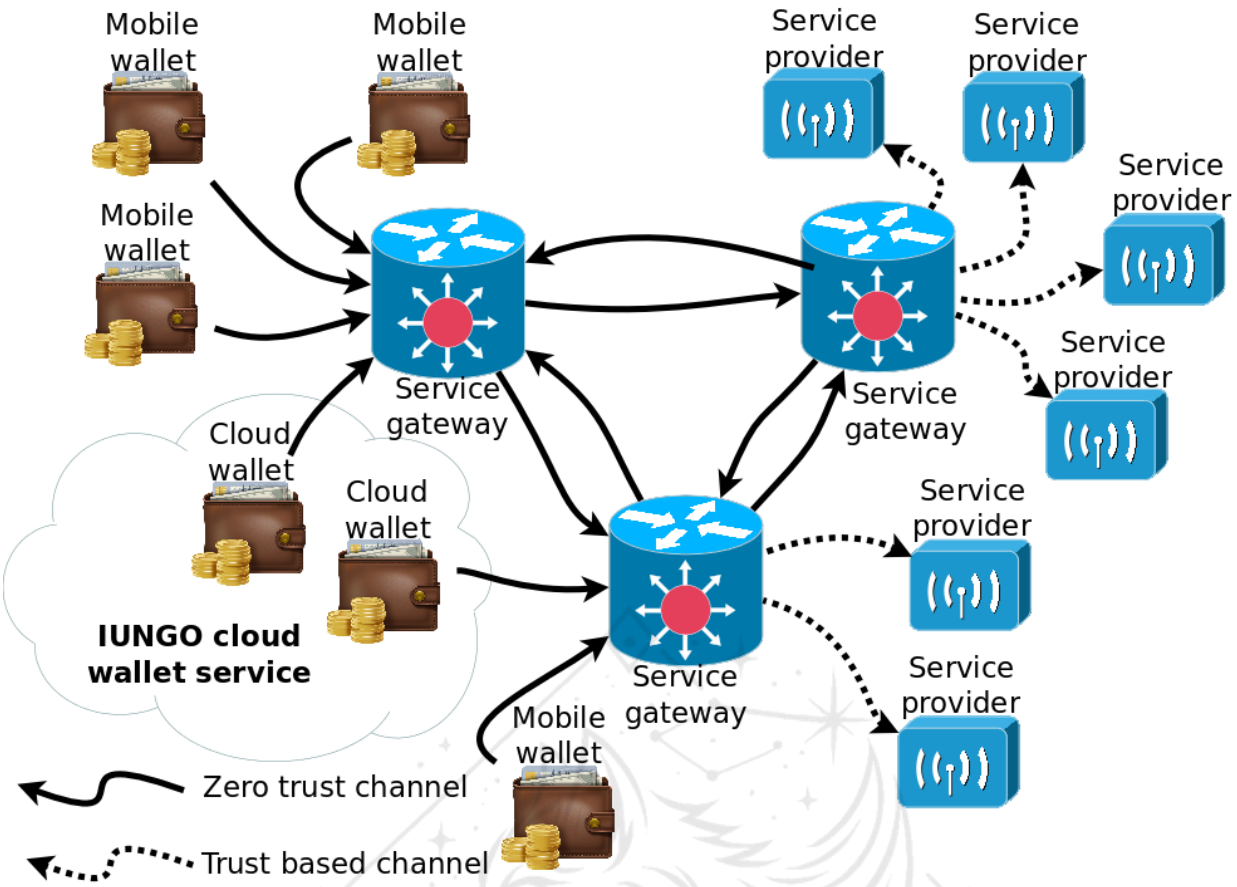
The zero risk guarantee does not come without some responsibilities on the receiving side. The receiver should always track the amounts frozen and offered by the sender and refuse to accept payment offers not covered by the frozen amount if it expects zero risk of not being payed. The zero risk payment scheme allows the sender to trade the costs of updating the frozen amount (by invoking the contract) on-chain more often for less risk of leaving unused tokens frozen. It also helps to reduce the contract invocation gas costs covered by the receiver by being more time tolerant. The receiver can trade a lower gas price for a longer wait time that the transaction will spend in pending transaction pool without increasing the risk of not being paid.

The same payment mechanism can be reused for payment channels based on trust. In a trust based payment channel case the sender does not freeze any tokens. The sender sends signed payment offers in the same way it would be done in the zero trust scheme. It is up to the receiver to track the amount left in the sender's account and select the best time to settle on-chain. In this use case, the receiver is never guaranteed that the sent amount will be available for settlement.

PAYMENT CHANNEL NETWORK

We anticipate that a limited number of parties will be willing to operate service gateway serving a more significant number of deployment sites used by a substantial amount of consumers. The chances of the same consumer consuming services provided by the same provider are too slim to require a direct payment channel between the consumer and the service provider. To reduce the total number of payment channels it takes to pay for the services, it makes sense for consumers to open zero risk payment channels only to the benefit of service gateways. Service gateways will create a zero risk payment channel mesh between themselves to facilitate expedited payments for their users. Service gateways will open trust based payment channels to process these payments to service providers.

Archived copy · cryp2nova.com



Two payment scenarios become possible: direct and transitive. In the direct payment scenario a single gateway has a payment channel to both the consumer's account and the service provider's account open. In case a direct payment is possible it is up to service gateway to decide how the reward will be divided between the service gateway and service provider. In the transitive payment scenario, a serving gateway only has a channel to the service provider and payments from the consumer's account can only be organized with some assistance from the service gateway who has a payment channel with the consumer. The implementation of transitive payments will be based on hashed time lock concept. In case of a transitive payment scenario, a service gateway on the consumer's end can keep a protocol fixed 0.5% commission for assisting payments to come through.

6.6. SERVICES

The IUNGO network's functionality relies on several services. When connected to any of the IUNGO network's access points, the customer's mobile device can interact with some of these services even when internet access is administratively prohibited. The freely available services include site location discovery and mobile wallet.

SITE REGISTRY SERVICE. All access points/site controllers will be paired with SGW's. When an access point or site controller is paired with a service gateway the (geographical WGS84 and street

Archived copy · cryp2nova.com

address based) location information of the deployment site and a list of all BSSIDs of each access point in the deployment site is provided by the service provider. Additionally, all available services and service pricing information is recorded after the pairing procedure is complete. The service provider will be allowed to change service list and pricing information no more often than once in 24 hours. Each service gateway will collect and share site registration data with other service gateways. Every service gateway will collect site registration data from all other service gateways to render a complete list of all deployment sites available around the world. This data will be made available to consumers via site locator service.

REPUTATION REGISTRY. Access points will record user session details like start/end timestamps of each session, the amount of data transferred and will report it to service gateways. The mobile wallet service will also gather same session details and will send it to service gateways for comparison. Service gateways will collect and relay session data collected from deployment sites and mobile wallet users to the IUNGO reputation registry. The reputation registry will run mediation process and will use complete event detection on gathered information to detect and filter out possible reputation fraud. It then will calculate a reputation score (including reputation score error range) for each site. The reputation score for each site will be made available to service gateways.

The SITE LOCATOR SERVICE provides access to the site registry database. It will share detailed information of nearby sites with IUNGO consumers using the mobile wallet or visiting the IUNGO public internet site. Site information includes physical geo location, street address, services available (subsidized, paid per time, paid per MB) and their respective prices, IUNGO reputation score value with error range and a site description supplied by the service provider.

CERTIFICATE AUTHORITY. IUNGO ORG will manage Public Key Infrastructure used to secure access to the network. IUNGO ORG operated Network CA will act as a trust anchor to wallets and mobile device Wi-Fi WPA supplicants to ensure consumer's device is connecting to a legitimate access point (participating in IUNGO network). The Network CA will sub-delegate certification rights to service gateways to issue certificates to access points/site controllers. The certificate lifetime will be limited to one month for access points/site controllers and 6 months for service gateways. Certificate revocation published by Network CA will describe all revoked service gateway certificates.

6.7. INFRASTRUCTURE ENTITIES

TRANSPORT GATEWAY. Service providers may be limited by service agreements with their internet service providers to not provide service to unknown 3rd parties and also can be held legally responsible for behavior of their end users. To limit exposure to legal risk, service providers may choose to redirect all end user internet traffic through a transport gateway operated by other parties and/or other countries. There are many options with different tradeoffs of what kind of transport protocols should be used and what legal risk types need to be avoided. We will conduct

Archived copy · cryp2nova.com

further research on needs and options related to how transport gateways will be integrated into the IUNGO network during the MVP phase.

SERVICE GATEWAYS. The service gateway is actually a collection of services acting in concert with deployment site hardware and other service gateways to enable a unified global user experience. It plays a major role in the IUNGO network as a middle ground solution where most of the cost reduction and performance scaling benefits of a centralized service can be had without sacrificing diversity and service availability. Each qualified service gateway operator will have a chance to come up with creative approaches to user onboarding to stay competitive. Running a service gateway comes with it's costs: operators will need hardware resources to run the software, low latency high bandwidth connection to internet. Strict adherence to IUNGO operations rules covering allowed and disallowed operational practices will be enforced by IUNGO ORG in order to protect the legitimate interests of the service consumers.

The service gateway will at least run a node of distributed site registry, reputation data collection agent, one to many instances of site-locator service, an intermediate certificate authority, a web based management site for service providers and an Ethereum node. IUNGO will provide open protocol descriptions for all interfaces used and a dual licensed reference implementation of all software needed to run basic functioning service gateway. A commercial license will be available for those seeking to create closed derivatives.

7. NOTICE AND DISCLAIMER

This Whitepaper is important and should be read in its entirety. To the best knowledge of the authors, this Whitepaper contains information that is provided only in compliance with the requirements of applicable laws, rules and regulations.

CRYP2NOVA

All product and company names are trademarks™ or registered® trademarks of their respective holders. Use of them does not imply any affiliation with or endorsement by them.

The content of this document includes forward looking statements with respect to IUNGO.network financial and technical viability. The effects of regulation by the governments of countries in which it may wish to operate. Expectations regarding the operating environment and market conditions. Forward-looking statements are sometimes, but not always, identified by their use of a date in the future. Forward looking statements are predictive and involve risk and uncertainty. Forward-looking statements are not guarantees of future performance and are based on assumptions.

ING TOKENS issued by IUNGO do not have any rights, uses, purpose, attributes, functionalities or features, expressed or implied. Although ING TOKENS may be tradable, they are not an investment, currency, security, commodity, a swap on a currency, security, or commodity or any kind of financial instrument.

Archived copy · cryp2nova.com

Provided definitions apply throughout the document, unless indicated otherwise.

8. REFERENCES

SCIENCEDIRECT

Expanding mobile wireless capacity: The challenges presented by technology and economics

IBISWORLD

Global Internet Service Providers: Market Research Report

CRYP2NOVA

Archived copy · cryp2nova.com