botchain

The Platform for Identity & Audit of AI Systems

Project Whitepaper

https://botchain.network

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Disclaimer

The purpose of this white paper is to present the BotChain project to potential token holders in connection with the proposed project launch. The information set forth may not be exhaustive and does not imply any elements of a contractual relationship. Its sole purpose is to provide relevant and reasonable information to potential participants in order for them to determine whether to undertake further review of the network with the intent of acquiring BotCoin.

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This English-language white paper is the primary source of information about the BotChain business and token launch. The information contained herein may from time to time be translated into other languages or used in the course of written or verbal communications with existing and prospective customers, partners, etc. In the course of such translation or communication, some of the information contained herein may be lost, corrupted, or misrepresented. The accuracy of such alternative communications cannot be guaranteed. In the event of any conflicts or inconsistencies between such translations and communications and this official English-language white paper, the provisions of this English-language original document shall prevail.

About Talla

Talla is the company that originated the idea behind BotChain. Talla delivers an AI-powered knowledge base bringing enterprises into the future of automation and insight. The Talla platform uses machine learning to automate content management in IT or HR knowledge base contexts, keeping information up-to-date, relevant, organized, and accessible. Users access company knowledge bases through chat – providing rapid and easy means to find answers and maintain worker productivity.

Launched in 2015 by former Backupify.com co-founder (acquired by Datto) Rob May, Talla has raised over $12 million with 2,500 existing AI installations across the enterprise.

About BotChain

Developed in response to market opportunity surfaced in Talla's enterprise artificial intelligence business, BotChain is a decentralized bot registration, identification, collaboration, and audit platform built on the Ethereum blockchain.

Setting the standard for bot compliance, BotChain allows bot developers, enterprises, software companies, and system integrators to verify bot identity, audit interactions, and control the boundaries of bot autonomy. By driving developmental software standards and creating a marketplace of developers and users, BotChain incentivizes bot innovation and adoption through secure and powerful intelligent machine usage within a range of enterprise environments.

A Word from the Project Founders

In 2016, Microsoft unveiled "Tay", an artificial intelligence bot on Twitter described as an experiment in "conversational understanding". The company believed that as users engaged Tay through casual and playful conversation, the smarter it would become. As reported, however, the playfulness quickly wore off. Tay turned racist and misogynistic – repeating all sorts of foul sentiments back at users. Now, as AI starts to become more prevalent in enterprises of all types, what happens in those cases where an enterprise process follows the path of Tay and goes out of control?

In another example of AI gone bad, Boston University researchers trained a bot by exposing it to online stories collected via Google News. When asked to complete this sentence: *"Man is to computer programmer as woman is to 'X' "*, the AI replied, "*Homemaker*". In short order, these intelligent tools gleaned and spread culture's most repugnant biases.

Then, in late 2017, perhaps the largest online advertising scam ever was exposed, as bots created thousands of phony instances of publisher websites, including *The Financial Times*. This led major brands to purchase over $1 million dollars per day in advertising on fake sites, with views being driven by bots impersonating human consumers. In total, bot-enabled advertising fraud is estimated to have cost companies $16.4 billion last year.

As bot adoption and innovation accelerates, the mainstream failures are frightening. Software is becoming more intelligent; creating more powerful and less predictable bots. ***And yet, critical systems, standards, and means to validate, certify, and manage the millions of bots and billions of transactions powered by AI are effectively non-existent. Autonomous technology holds massive potential but is dangerously under-supported.***

BotChain's platform introduces new levels of bot management, and eases developmental burdens. Our solution establishes an environment of healthy control and security, meaning artificial intelligence – perhaps the most significant technological advancement since the Internet – can thrive.

The founding project team and early partners have launched companies and driven them through exit. We have a deep bench of engineering leaders with the aptitude to use blockchain to solve AI's thorniest problems. We have disrupted the enterprise, built consensus models, and know how to take software to market globally.

Thank you for your interest and partnership.

Rob May
Co-Founder & CEO – Talla,

Will Murphy
VP of Blockchain - Talla

Vision and Model Summary

At BotChain, our vision is to **create a first-of-its-kind solution, built on blockchain technology, that provides the platform *and* trust needed for AI-based systems to flourish.**

Tractica Research forecasts revenue from the application of AI software will grow from $643 million in 2016 to $36.8 billion by 2025, representing a remarkable CAGR of 56.8%. Research sponsored by Siemens suggests the market value of smart machine technology -- including intelligent agents, autonomous robots, and virtual reality assistants -- will eclipse $41 billion by 2024. And by 2020, customers will manage 85% of their relationship with the enterprise without interacting with a human at all.

The tantalizing promise of revenue gains and cost savings are compelling the growth of AI in the enterprise. *While AI adoption is effectively underway, in many ways its incorporation is disturbingly ill-advised.* Bots are being launched and asked to do more and more with growing levels of power and autonomy. All this is happening without means for healthy audit, compliance, or a standardizing structure in place to manage and verify the integrity of bots and their activity.

Our team recognizes that, *despite the growth of bots and machine intelligence software, a lack of transparency, trust, and standardization limit the ultimate potential for this transformative technology.* Autonomy and learned behaviors, and the risks this smart technology introduces, threatens the future of full and secure enterprise adoption. Frankly, both enterprise IT and society at large are scared of the evolution of artificial intelligence – and for legitimate reasons.

> *"As more organizations deploy intelligent robotic processes, the need for BotChain is only going to grow"*
>
> *Michael Maloney*
> *Former Blockchain CTO at EY*

BotChain solves the fundamental limiting issue of 'black box' opacity in how AIs make decisions and operate. The solution provides easy means to understand and improve bot responses and choices, while creating a vibrant ecosystem where bot software and service innovations are shared. This improves the quality and availability of autonomous agent technologies worldwide.

Literally billions of dollars across myriad industries and use cases still remain untouched by AI. These activities and processes are ripe for disruption, but unlocking the full potential of bots and similar machine intelligence depends on BotChain, its partners, and stakeholders. Together, we will validate or legitimize bots through an innovative identity-management system, issuing digital certificates -- stored on the blockchain -- to monitor bot behaviors.

By maintaining verifiable bot identities, storing activity, ensuring ethics, and creating a marketplace that spurs innovation in bot software, barriers to AI development and customer adoption will be lowered. This will ultimately benefit all ecosystem participants, ensuring new governance mechanisms to help the field grow in a scalable, principled, and profitable way.

To achieve this, BotChain will address three key challenges:

- ***Transparency*:** Currently, no system exists to map an auditable, decentralized trail that reflects the autonomous decisions made by bots. Nor does any system offer a clear path to retrain machine learning models to address bad machine behaviors. The example of "Tay" is a gross but reasonably benign example of why AI audit transparency is critical.

- ***Standardization*:** To reach maximum bot efficiency and return opportunity, there is a glaring need for standard protocols for autonomous systems which allow bots to communicate and, therefore, synchronize work across the network. This common AI management infrastructure does not currently exist.

- ***Open Commerce*:** As AI innovations progress and bot designs grow in complexity, the market remains fragmented. Developers, software companies, and enterprise consumers struggle to leverage advancements and capitalize on innovations from others, meaning the cycle of industry performance stalls. BotChain will establish the commercial environment for third parties to develop and acquire skill and knowledge modules to upgrade bot performance.

BotChain allows broad adoption of AI technology in a safe and secure way. Currently, beta deployment is underway and plans for intelligent agent auditing, compliance regulation development, and knowledge and skill sharing are in process. BotChain will create the platform and needed parameters to facilitate existing and emerging bot technology incorporation in every vein of the enterprise.

The time for BotChain is now.

As bots become more autonomous, they will sometimes make subpar decisions, much like humans do. Today, two applications communicate API to API, but what happens when these endpoints are suddenly intelligent and adaptive? What happens when bots negotiate with each other, and autonomously enter into smart contracts on behalf of a company?

Bot-to-human and bot-to-bot communication creates multiple problems with existing models of workflow- and agent-governance. For example, if a bot makes a simple decision on your behalf when talking to another bot, there is no independent, third-party, immutable trail of that conversation. What if you need to audit it? Re-training an agent is difficult when there is no record of its decision-making sequence.

BotChain solves these problems.

Just as humans require oversight and audits in the workplace to facilitate performance, compliance, knowledge-sharing, collaboration, and communication, bots also need a platform to secure these benefits, as well.

As societal fears rage about autonomous robot activity, enterprises forge ahead expanding the autonomous machine work use-cases. Quickly approaching is a world where hundreds of thousands of transactions will occur each minute. Some are human-to-bot; others are bot-to-bot, and some even involve a series of autonomous bots and humans in extended, complex sequences. Each transaction requires an immutable digital certificate to record what happened and why. Think of this as a digital receipt of each bot action.

BotChain reduces the fundamental, inhibiting frictions that will negatively impact this technology's return on investment. With the BotChain platform, AI-based enterprise business tools will enjoy breakthrough futures built on the principles of being decentralized, distributed, fast, reliable, rule-based, secure, transparent, and community ecosystem-driven.

Today, BotChain is well positioned for first-mover advantage. We have critical developmental processes already underway, with a developer partner beta release imminent. The impetus for BotChain comes from real challenges experienced in our AI work at Talla and similar peer AI companies. This problem identification and our vision and capabilities surrounding a solution are born from our industry leadership. Moreover, we have a promising community of developers, consumers and enterprises joining us. This shared, synergistic intelligence is a differentiator. Combined with blockchain architecture roots, we can quickly outpace and maintain sophistication over any competing platform, should one emerge.

In short, we are pioneering the infrastructure needed to deliver the following to the bot, or intelligent agent, ecosystem:

- Bots with trustworthy identities
- Bots with certifications of compliance to standards
- Bots that can be monitored for performance
- Bot actions via trusted audit trail
- Bots capable of effective communication, collaboration, and negotiation
- Bots that can index, or 'know' other bots
- Trusted knowledge-sharing amongst bots
- Trusted, standard workflows across bots
- Means for human involvement via data analysis to improve bots
- Means for task completion between multiple bots

Capabilities & Platform Fundamentals

Behavior Audit & Compliance

One of the primary problems of building network businesses, regardless of target market, is that there is little value to early participants when the network is small. Both eBay and Craigslist, for example, are valuable by virtue of the fact that so many buyers and sellers are already on eBay and Craigslist. As such, few network-dependent businesses can attract a critical mass of users needed to sustain a profitable business model. The biggest concern of any blockchain network is whether there is ever a path to scale. Can the network show any value before it is large, or is it only valuable once many people are using it?

One way around this is to develop a product or service where participation on the network has *both independent value* ***and*** *network value*. The network attracts participants with some valuable utility, even if they are the only participant. However, that value grows as well when more users or participants join. By solving the audit and compliance issue facing bot developers and enterprises deploying any intelligent machine software or tools, BotChain's platform provides both.

In this section we want to focus on BotChain's audit and compliance use case, which is a use case that leverages the immutability of a distributed ledger to provide that single use-case value proposition. We believe this will help us grow the BotChain network by providing value to participants even before the network is large.

Advances in bot development and design have given rise to a broad range of use cases and deployments. As industry adoption broadens and enterprise usage expands, compliance concerns and the resulting security and information vulnerabilities grow. Bots' deepening participation in workflows for entities that need to be HIPPA-, GDPR-, SOC2-, PCI-, or FINRA-compliant, for example, demands that companies or developers dependably confirm a bot's compliance.

In addition, since bots and autonomous agents are learning and adapting all the time, their behaviors are not entirely predictable. In a recent article for *Nautilus*, MIT professor Iyad Rahwan wrote, *"complex AI agents often exhibit inherent unpredictability: they demonstrate emergent behaviors that are impossible to predict with precision—even by their own programmers."* This type of software cannot be deployed in enterprises without audit and compliance requirements.

As machine learning techniques area already augmenting financial audits, the natural evolution is that the bots themselves will be audited to confirm the state of their compliance. However, today's challenge is this: *there is no standard or readily accessible way to audit bot or autonomous agent technology.*

BotChain allows for the creation and storing of digital certificates representing the state and activities of a bot at a given time. These digital certificates will be one-way cryptographic hashes of the state of the bot at that time. These certificates can be stored on the blockchain for immutability, ultimately validating the nature of bot activities to auditors or other parties interested in sampling and confirming compliance.

An example digital certificate may provide the following:

- Name or Version
- Authorized By
- Talking to
- Nature of Interaction
- Timestamp
- Model in Production:
- Training Set

Effectively, we have the version or type of bot, a record of who created or authorized its activity, who or what the bot was interacting with, and what it was doing at the time of digital recording. Rapid, efficient establishment of an unchangeable record of bot activity using digital certificates is of massive importance. This is particularly true as bot ecosystems grow and interactions advance with autonomous behavior via smart contracts and bot-to-bot communications.

As conventional business uses of bots change, the limits of existing regulatory and security frameworks will expand. BotChain provides the critical compliance and audit-test step that, by itself, is of inherent value. Additionally, as the compliance standard is set, the appeal of the network to bot developers and enterprise customers grows. This move toward shared standards and platform-network benefits will consistently reinforce and then boost BotChain's value.

Consider the pressing need for a framework for compliance and audit capabilities in light of this perspective from the aforementioned MIT Media Lab Nautilus article:

[emphasis ours]

> *… Substantial economic value can be unlocked by studying machine behavior. For example,* ***if we can certify that a given algorithm satisfies certain ethical, cultural, or economic standards of behavior, we may be able to market it as such. Consequently, consumers and responsible corporations may start demanding such certification.*** *This is akin to the way consumers have started demanding certain ethical and environmental standards be met in the supply chains that produce the goods and services they consume. A science of machine behavior can lay the foundation for such objective certification for AI agents.*

Artificially intelligent machines increasingly mediate our social, economic, and political interactions: Credit scoring algorithms determine who can get a loan; algorithmic trading programs buy and sell financial assets on the stock market; algorithms optimize dispatch in local policing; programs for algorithmic sentencing now influence who is given parole; autonomous cars drive multi-ton boxes of metal in our urban environments; robots map our homes and perform regular household cleaning; algorithms influence who gets matched with whom in online dating […] In the near future, software and hardware agents driven by artificial intelligence (AI) will permeate every aspect of society.

Registry and Identify Validation

As autonomous agents take on more responsibility and increasingly deliver process and service functions, users run into a problem: *how do they know a bot is who it says it is, can do what it is asking permission to do, and is owned by who it claims to be owned or managed by?*

Akin to the email or website spoofing ("falsifying") scams common today, bot spoofing is becoming a real threat. As bot interactions with average consumers become more common (think: chat popups with a cable television provider or SMS messages confirming credit card or bank activity), validating bot identity to ascertain its legitimacy is critical.

The perils of bot impersonation are significant. Every day, data breaches and scam stories mar the news landscape. These seed further skepticism around the looming effects of intelligent-machine activity in society's collective psyche. Users *need* to be able to determine bot trustworthiness.

As an example, when you visit starbucks.com today, a small green bar in your browser shows you it has a digital certificate that proves it is owned by Starbucks. But if you suddenly received a text, Telegram, or other bot-related message from an AI claiming to be the Starbucks bot and asking you to enter your credit card for payment, you have no idea if that bot is really owned by Starbucks.

BotChain solves this problem through a universal tokenized decentralized bot registry which can provide reliable identify validation. This platform service means that bot developers or enterprises deploying bot technology can register their bots and receive a unique bot-identifying code. When a bot presents itself, makes a user inquiry, or seeks permission to perform a task – automated or otherwise – the other party can verify the bot's identity using a public/private key combination.

BotChain effectively becomes the ledger of bot instances that allows for validation during conversations, requests, and interactions with other bots. Leveraging blockchain technology via BotChain provides both the validating means for bot identification while *also* creating a ledger of activity so that all interactions and corresponding actions are tracked. Bad behavior, dishonest activity manipulation, and spoofing are all effectively addressed with registry and validation functionality.

In a recent article on faulty reward and malfunctioning smart behaviors in AI, leading industry research company OpenAI calls out an important issue around reinforcement learning, or the process by which bots and other intelligent machines automatically determine, iteratively, the ideal behavior within a specific context to maximize performance.

Their findings lend credence to BotChain and substantiate the need for an auditable trail of bot activity to course-correct bot decision-making and improve future behavior.

> *One of the games we've been training on is CoastRunners. The goal of the game - as understood by most humans - is to finish the boat race quickly and (preferably) ahead of other players. CoastRunners does not directly reward the player's progression around the course, instead the player earns higher scores by hitting targets laid out along the route.*
>
> *We assumed the score the player earned would reflect the informal goal of finishing the race, so we included the game in an internal benchmark designed to measure the performance of reinforcement learning systems on racing games. However, it turned out that the targets were laid out in such a way that the reinforcement learning agent could gain a high score without having to finish the course. This led to some unexpected behavior when we trained an RL agent to play the game.*
>
> *The agent finds an isolated lagoon where it can turn in a large circle and repeatedly knock over three targets, timing its movement so as to always knock over the targets just as they repopulate. Despite repeatedly catching on fire, crashing into other boats, and going the wrong way on the track, our agent manages to achieve a higher score using this strategy than is possible by completing the course in the normal way.*
>
> *While harmless and amusing in the context of a video game, this kind of behavior points to a more general issue with reinforcement learning: it is often difficult or infeasible to capture exactly what we want an agent to do, and as a result we frequently end up using imperfect but easily measured proxies…. Often this works well, but sometimes it leads to undesired or even dangerous actions. More broadly it contravenes the basic engineering principle that systems should be reliable and predictable.*

OpenAI's research point is this: **to establish the right AI behavior that imitates the ideal or appropriate human response, human feedback and evaluation opportunities are critical.** But as bot activity grows increasingly autonomous, in particular with bot-to-bot engagement in lower skill service and transactional activity, a record of activities must be unalterably kept to train, monitor, revise, and improve future behavior. Activity hashing to a blockchain ledger delivers this.

Marketplace & Ecosystem Exchange

Today, the SaaS playbook suggests that, when a company hits a certain size, they launch an API and a marketplace to allow third-party developers to build, develop, and integrate with the platform. The company gate-keeps the marketplace and carves out a substantial cut of any revenue generated from marketplace commerce. While to a degree profitable, this is not an optimal outcome for the ecosystem.
The conventional app marketplace model it reinforces a winner-take-most game, as third parties decide who to build for (i.e. – build for Salesforce.com first and smaller CRMs later) and they usually settle on the tech giants. It puts too much control in the hands of a dominant platform or marketplace provider who can effectively manipulate the marketplace or app store.

BotChain believes that a blockchain-based option could improve the existing marketplace approach. By forming a consortium of participants in agreement on interoperability standards, a powerful marketplace solution that equitably and generously incentivizes developers, software providers, and enterprise customers can be formed. By incorporating blockchain, every major B2B company could participate on the network, but no one company would exert ultimate control. The rules would be set by consensus and voting, and the blockchain could be designed to enforce the rules built into the protocol.

With the open marketplace and an API-like standard in place, developers could write once and register their tool on a blockchain that is effectively a shared B2B environment across automated agents or bot apps. Their app is would be instantly discoverable, with near plug-and-play compatibility in a variety of applications, rather than just the one or two app platforms they built for. This puts the onus of supporting the shared standard on the large B2B company that wants the app ecosystem, not the smaller developer trying to build an add-on.

By incorporating a shared currency -- BotCoin -- these transactions can work across companies, globally, in an elegant and unified way. It circumvents the payment remittance and processing challenges that keep certain geographies excluded from marketplace participation. It also reduces barriers to development and customer adoption of third party applications. By sharing value, *more* value will actually accrue to the third-party developers and other ecosystem participants.

Partnership Development

A critical component of healthy marketplace and AI ecosystem is the development of a rich, collaborative partner environment. Before launching its beta, BotChain has already secured a critical mass of aligned partners who together comprise:

- 50,000 developers
- 150,000+ enterprise- and consumer-facing bots
- 400 million end users
- 4 billion monthly interactions

Mutually beneficial partnership and healthy incentives are critical to overcoming the remaining hurdles to widespread, trusted deployments of AI across the enterprise worldwide. BotChain's

open-sourced code allows for development of new services and transparent crypto-earning, benefiting everyone on the network.

The vision to build a partner-centric blockchain ecosystem is based on four key components:

1. Decentralized governance
2. Open-sourced and collaborative software
3. Partner-motivating token incentive structure
4. Ecosystem relationship development and communication

Early on, BotChain is setting aside a percentage of generated tokens to incentivize and reward partner participation. Initially, we will fund partners to perform platform work like bot registration or decision-hashing to create network value. Thereafter, we will deliver token rewards for other contributory value such as node hosting or identity validation on the blockchain. Clear paths of earning and spending will remain in our purview, while governance practices will maintain the inherent health and fairness of the platform.

Currently, our early partners are actively involved in testing, development, and feature feedback. BotChain's partnership team is prioritizing Github, a developer page, API documentation, conferences, and a team of dedicated developer evangelists -- all to encourage and support the fast organic growth of the BotChain partner network.

The Role of Blockchain

Critical Technology for BotChain

The emergence of blockchain technology means a solution for the age-old problem of ensuring verifiability, authenticity, and auditability in a transaction. This is not one unique to AI, bots, autonomous agents, or any intelligent technology interaction, but is central to establishing trust – an integral element of any transaction.

The benefits of blockchain technology have been long advocated for by those in the cryptocurrency space. **Notably, bots and digital currencies share similar security issues, making an Ethereum-based blockchain solution particularly useful.**

BotChain builds on the Ethereum blockchain and, employing a distributed resource on the internet, posts a record of all bot activities on a common, shared, widely-viewable, and secure ledger. BotChain creates the means by which bot-based transactions are viewed and audited, which means that users, businesses, and consumers can ensure bot actions are being performed appropriately by legitimate agents. And, should bad behavior be recognized, the activity trail is traceable to drive an appropriate resolution -- including manual improvement of the agent or the structured re-learning of appropriate activity by an AI system. This creates improved future behaviors and keeps bots operating within the scope of their rights and design.

To summarize blockchain's critical role in BotChain's solution, we believe the use of technology delivers:

- *Trustworthiness:* The blockchain can become a trustworthy networked supplier of services among many organizations building and operating bots
- *Transactional Guarantee*: A key characteristic of a blockchain technology is the ability to solidify a transaction among one or many parties. Once a transaction is submitted within the blockchain environment, it has a high probability of execution.
- *Immutability*: Records of what a bot did and why can be stored safely by a networked, trustworthy blockchain standard, making it ideal for single-bot solutions, or workflows involving many bots that may be owned by different entities.
- *Shared Economic Value*: The work of maintaining a blockchain solution is done by multiple nodes that get paid fees for completing work. This creates an ecosystem that can maintain a fair cost structure for all parties.
- *Community Involvement*: Companies that create bots and associated applications also have an incentive to create and maintain a blockchain solution to serve their needs as a community

Ecosystem Token

Introducing BotCoin (BOTC)

BotCoin (BOTC) is a digital asset based on the ERC20 standard on the Ethereum blockchain. The BOTC token powers the BotChain protocol, by acting as a means of value exchange and incentivizing the nodes in the BotChain network to perform specialized tasks. The token is inseparable (the oil that powers the motor) from the protocol and network.

BOTC will be issued in a limited supply over an period of time. {refer token sale specifics}

BOTC - An ERC20 Token

BOTC token uses the prominent ERC20 standard, which ensures compatibility with popular wallets. Ethereum-based tokens rely on an established infrastructure, benefiting from the following properties:

- Security - The Ethereum Network is currently secured by miners providing over 250,000 GH/s. This ensures the immutability of data on the network.
- Predictability - Hundreds of ICOs have been launched using the ERC20 template.
- Robust Clients - ERC20 tokens can be managed with official Ethereum clients and wallets that have a large development community supporting them.
- Simplified Integration - Tokens are easily exchanged with other Ethereum-based tokens, and exchanges already have infrastructure in place to facilitate integration.
- Adaptability - Ethereum smart contracts provide a transparent and secure way of transmitting payment, providing platform access and facilitating work done to build blocks on Ethereum network

Why BOTC?

By using a dedicated token (BOTC), to facilitate all transactions in the BotChain network, we are building a truly global distributed network that can be used across any number of jurisdictions, retaining a single uniform method of settlement. Also, using a specialized token that is tied to the BotChain ecosystem shields the ecosystem from extraneous considerations regarding the volatility of other cryptocurrencies.

The other major reason is that BOTC can help manage incentives that drive ecosystem adoption and growth. Network service providers who provide value added services will earn BOTC for the services that they provide. Additionally, members of the BotChain Core system will be able to earn BOTC as part of the protocol by providing governance actions that help to enhance the network and aid in ecosystem growth.

Role of BotCoin

BOTC serves as the internal currency and provides the incentive mechanisms for decentralized, independent actors to work together to provide the BotChain network service.

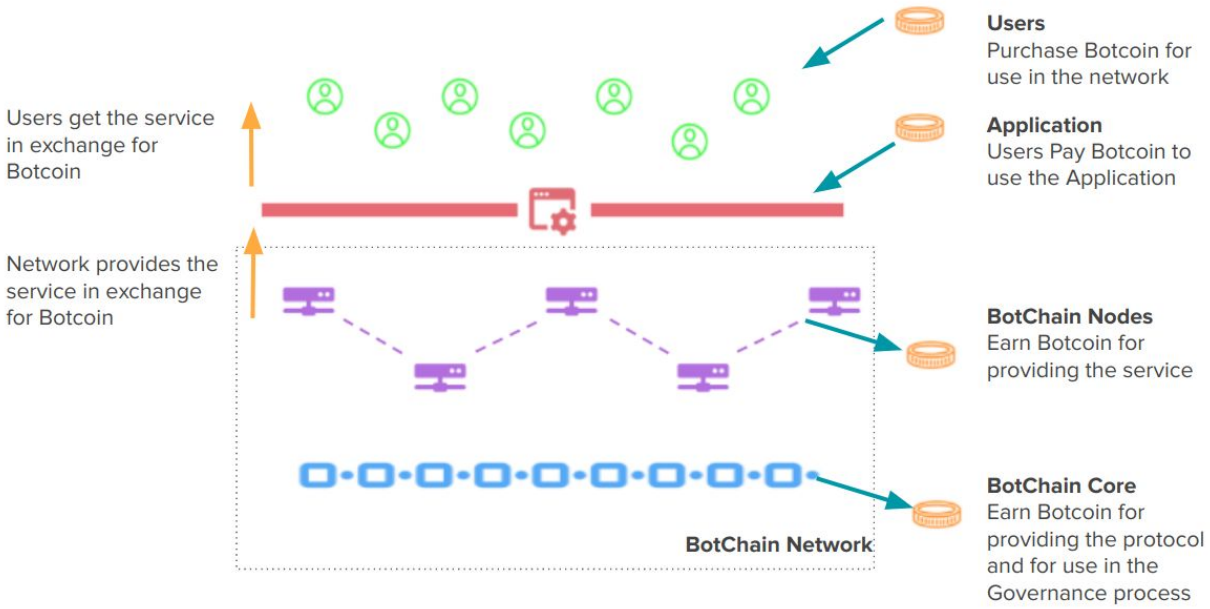
On a high level, there are 4 distinct actors in the BotChain network.

1. BotChain Core - Blockchain that stores data & provides governance

2. BotChain Nodes - Independent nodes or miners who provide the services
3. Application - A digital service that runs on top of BotChain Network
4. Users - Enterprises / Small Businesses / Individuals

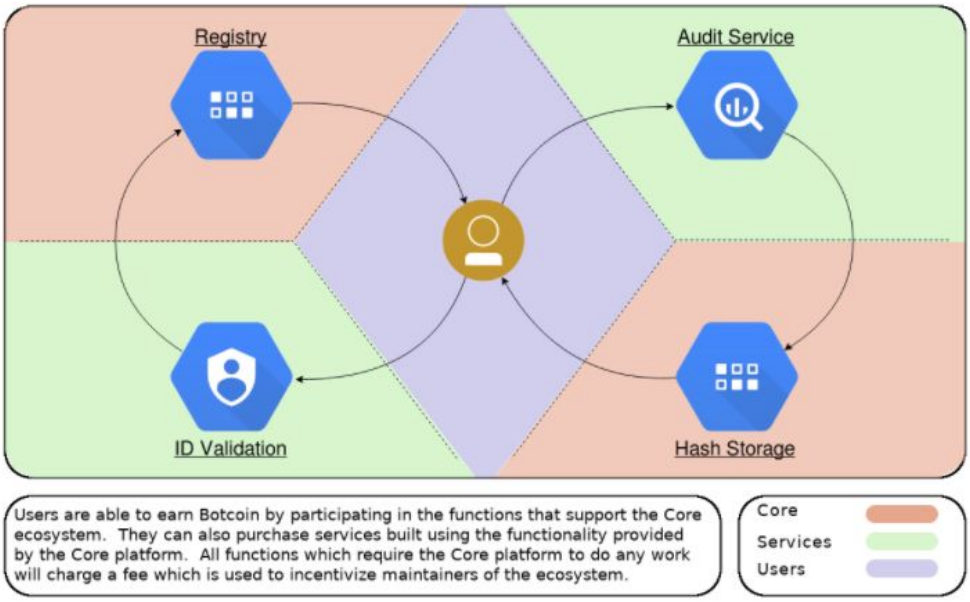
BOTC plays multiple roles across the BotChain network.

- It plays an important role in the governance and setting up network security at the BotChain core
- It provides incentive to the supply side to provide a BotChain service
- It helps connect the BotChain network with the users by providing high quality applications
- It provides an standard and an easy way to pay for services



BotCoin Usage

BOTC incentivizes all participants to contribute to the ecosystem. The ecosystem is expected to develop such that BotChain and third party service providers will provide applications and services in exchange for BOTC.



Users interact with applications built on top of the BotChain network. These application solve use cases like Identity, Audit & Compliance that directly impact the users. The BotChain nodes provide these application and in turn earn BOTC for its usage. BotChain Core provides an immutable data storage layer. In essence BOTC acts to bind all this functionality together.

As specified in the roadmap, BOTC network will launch with a set of services that provide Identification, Audit and Compliance functions that can be purchased in exchange for BOTC. BotChain Network incentivizes third party bot developers to build additional value added services to their customers on top of the BotChain network. These services will be available in exchange for BOTC.

Sample Industry Applications

Robotic Process Automation (RPA)

Robotic process automation, or RPA, is technology designed to automate business processes. By using RPA, “a company can configure software, or a 'robot,' to capture and interpret applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems.”

RPA is ideal for repetitive, mundane, rules-based businesses processes where accuracy and speed matter, but where reasoning and emotional intelligence are not essential. One common use case is for insurance companies using RPA to move policy management data into a claims processing application, rather than being encumbered with the costs and error liabilities of using low-skilled human help. Industry news leader CIO.com writes that, with RPA, companies

can complete in "…days or weeks manual processes that previously took months or years, and at a fraction of the cost." Their report continues, suggesting that spending on RPA software will reach $1 billion by 2020, at a 41% CAGR from 2015 to 2020. They expect 40% of large enterprises to have adopted a RPA tool by 2020, up from 10% today.

But as RPA and its automation use cases expand in the enterprise, software vulnerabilities and security risks will grow. BotChain establishes the means for autonomous bot activity to be securely captured and reviewed. By supporting a broad credential-management effort, developers or IT teams can review and reconstruct the automation's activity via an auditable log. Moreover, in light of data restrictions and geographical nuances (e.g. – from GDPR) during bot registration, companies can assign and implement restrictions to specific instances or groups of bots or establish rules-governing behaviors.

Enterprise Productivity Suite

Artificial intelligence tools often enter the workplace via IT, delivering deeply technical support. The technology is being rapidly adopted by the back office, offering rich individual employee benefits, too.

Consider BotChain partner Zoom.AI: the company offers a chat-based productivity solution that helps employees offload and automate everyday tasks. With a goal to minimize distractions from operational tasks that erode productivity, the company offers users their own automated assistant to ensure focus on higher-value activities. Zoom handles tasks ranging from meeting scheduling to travel booking to searching enterprise knowledge bases to making warm introductions for meeting preparation. With a recently announced Microsoft Office 365 integration, users will now have access to AI-powered productivity, data, and collaboration tools from a single interface.

The availability and integration advancements from Zoom create immediate value for the rest of the BotChain ecosystem. First, vanguard developers like Zoom help flesh out the technical particulars and operational best practices for partners and participants in the Botchain network. Everyone wants to be an early adopter, but perhaps not the *earliest*. Zoom has already broken the new ground, leaving new developers a known trail to follow.

Second, if one of the goals of BotChain is to coordinate highly competent, highly specialized AI agents into bespoke, composite solutions, the presence of Zoom bots in the BotChain network offers immediate opportunities for follow-on developers. New BotChain participants will already have tools to use, models to follow, and possible iterative solutions to build. Also, they'll have BotChain access to Zoom.ai.

e-Healthcare

Given levels of bot independence and the extent of their communication and transaction capabilities, standard ways to manage the integrity of transactions declines. This reality is of

particular concern for AI within healthcare, where, as Global Market Insights estimates, the virtual health assistant market is expected to exceed $1.5 billion by 2024.

Conversational e-healthcare, or the humanized, user-led and personalized approach to getting health information is growing in popularity. Healthcare providers appreciate the efficiency and intimacy AI can deliver in this context. Concerns persist however; particularly around data exchanging and HIPAA compliance.

Managing bot behavior; including understanding what or who the bot is talking to, where it is disseminating information and what processes it is authorizing, is particularly critical when privacy and confidential data has the likelihood of being shared. Bot inquiry, response and use of potentially confidential data needs to be managed to reduce instances of HIPAA violations. Understandably, the algorithms these technologies use and the way their capabilities are deployed need to be very precise (and thus, auditable) as medical decisions will stem from their advice and assessments.

With BotChain, healthcare providers and developers creating healthcare servicing bots benefit from the existence of an immutable, transparent method to audit bot interaction and create real-time awareness of what agents are doing, with whom and why.

Team

Rob May

Rob is a repeat venture-backed entrepreneur and angel investor in 45+ AI and blockchain companies. Previously he was the CEO & Co-Founder of Backupify (Acquired by Datto). He is the author of *Inside AI*.

Byron Galbraith

Byron has a PhD in Cognitive and Neural Systems from Boston University and an MS in Bioinformatics from Marquette University.

Jon Klein

Jon has run engineering teams from early stage to large scale. Most recently, he was Director of Engineering at Drync, and lead the Ad Products Team at Tapjoy. He has a M.Sc. in Complex Adaptive Systems from Chalmers University.

Tara Hendricks

Tara has more than 15 years of financial experience in developing, implementing and managing large, diverse teams. Previous roles include VP of Finance at Kinvey, and the Corporate Controller at Viable Measures, among others. Tara has a BA from Susquehanna University.

Will Murphy

Will was previously a Principal and corporate entrepreneur within FedEx Innovation, where he led emerging tech venture development initiatives involving technologies like IoT, big data, AI, blockchain, cleantech, and drones.

Catharina Lavers Mallet

Previously, she served as the London Studio General Manager at King Digital Entertainment and held leadership roles at Playfish and Algorithmics, among others. Cat has an MBA from MIT Sloan and a BA from Harvard.

Anthony Habayeb

Most recently, Anthony lead strategy and development for Propel Marketing, now Thrivehive, during its growth from $6 to $50M. He previously held partnership and revenue leadership roles at Monster and Yahoo! after starting his career as a strategy consultant with Accenture.

Henry Wagner

Henry most recently served as a Sr. Software Engineer at Akamai Technologies, where he developed configuration management systems, content distribution systems, and enterprise on-ramp technologies. He has a BA from Auburn University and pursued graduate studies in Distributed Systems at the University of Connecticut.

Brooke Torres

Brooke joined Talla Inc in 2015 after advising early stage companies on customer acquisition and go-to-market strategy in the London consumer products market. Before that, she lead social media at The Muse. She holds a BA from Smith College.

Token Sale & Structure

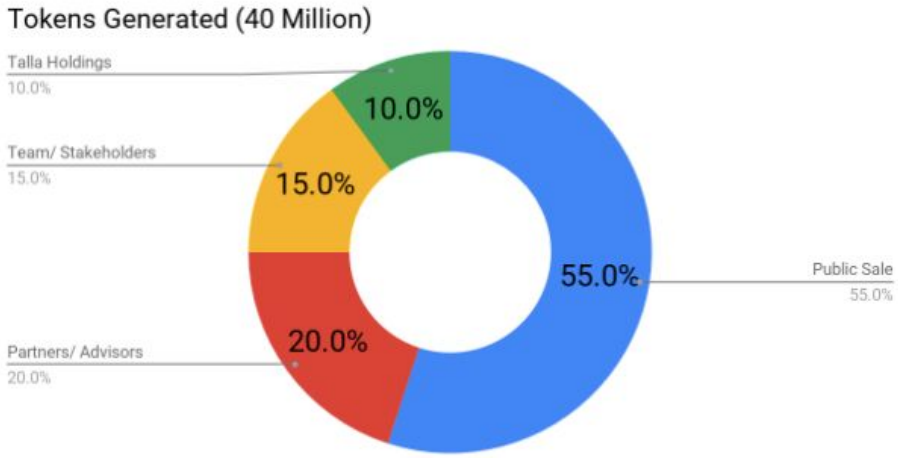
The BotChain token sale schedule will be available on the BotChain website located at https://botchain.network

BOTC tokens will be available by exchanging either Bitcoin (BTC) or Ether (ETH). Any unsold tokens during the sale that were not retained or allocated for sale will be burned.

Sale Specifics

- Forty million (40,000,000) BOTC tokens will be generated
- Tokens will be created and distributed in a one-time Token Generation Event (TGE) following the completion of the sale. After this, no BOTC tokens will be minted

- Up to 55% (22 million) BOTC will be available for public sale, and distributed 30 days after the close of the public crowdsale. Tokens sold during the private sale will have a six month lockup.
- 20% will be allocated for network advisors and partners and to support building the ecosystem. These will be immediately usable after the platform launch, to allow developers to provide identity and audit solutions for their customers.
- 25% of tokens are retained to support current and future development efforts and operations and to compensate team members and stakeholders. These tokens have a 12 month lockup.



Timeline

Date	Event	Detail
April 2018	**Test Network Launch**	BotChain Registry BotChain Services - Search (beta) - ID Validation (beta)
May 2018	**Live / Main Network Launch**	BotChain Services - Service Discovery - Refined Search - Audit Service (beta)
Nov 2018	**Identity & Audit Services**	BotChain Services - Audit Service - Identity - Service
April 2019	**Skills Marketplace**	Skills Marketplace (beta) Marketplace Payments Audit Payment Channels
Nov 2019	**Communication & Sharing Protocol**	Bot-to-Bot Communication Protocols - Payment - Negotiation - Scripting

Appendix

Technical Platform Overview

The proposed development path for BotChain's shared infrastructure, which is of course subject to change and evolution based on the needs of the community, will begin with a Service Layer to provide a base level of functionality and shared infrastructure for all users. This will include a number of applications and developer support products that will face the BotChain blockchain services. These services will be initially developed by BotChain, but will be left purposely open to 3rd party developers to develop on the shared layer.

While the ultimate goal of the BotChain is a shared blockchain infrastructure layer where all services are completed on a public blockchain, this sort of robust and flexible platform does not yet exist. Recognizing this, BotChain has developed a hybrid public/private blockchain solution that will allow users and developers alike to harness the power of blockchain. The community of developers contributing to the project may also provide other options.

The private blockchain solution will be a federated Ethereum fork, supported by verified developers and other verified agencies. For this service, small amounts of BotCoin spent for BotChain services is reserved for partners on the private fork. By using an Ethereum fork, we can leverage the same key addresses as the public network, minimizing code changes and keeping the audit log streamlined. Since contracts deployed on the private network will have different addresses, a Bot Name Service (BNS) will be deployed on the private chain to provide a simple link between the public and private chain.

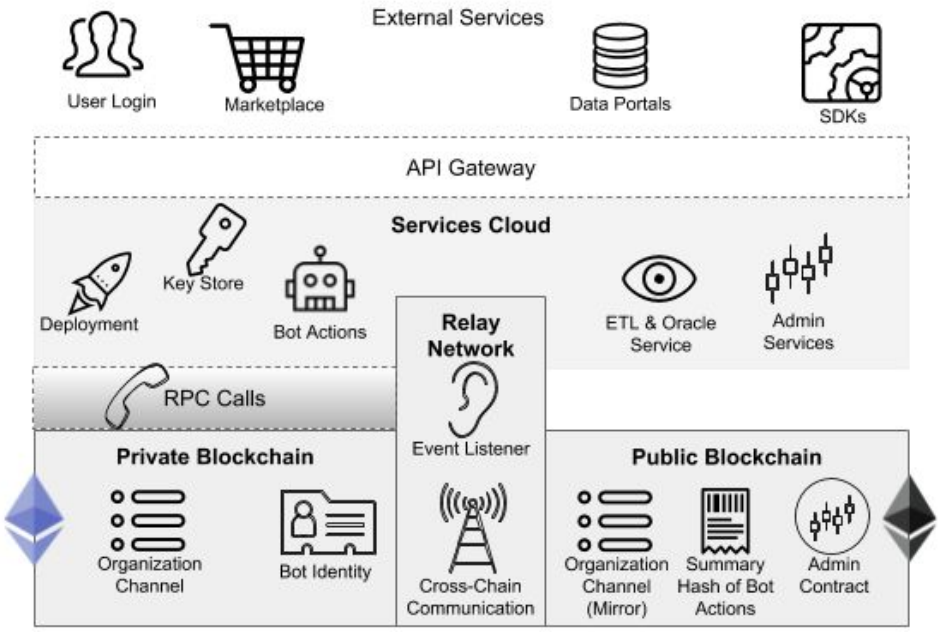
To maximize security, hashes of bot activities and certain actions will be periodically published to the public Ethereum network through a relay network. This will serve as a public hash stamp of all records recorded on the private chain, preventing any alteration of those records. In addition, as the public network evolves, BotChain will continue to develop and move services to the public network.

The BotChain team is also developing a number of blockchain smart contracts to support chatbots and other intelligent agents' use of the blockchain. First to be developed are bot identity and activity summary contracts. The identity contract will allow bots to be quickly deployed to BotChain and easily discovered by other bots. Smart, activity contracts will record

each bot action in a provable transaction log and publish summaries of these actions from the private chain to the public ledger.

The BotChain platform is designed to meet the needs of business bot developers and business users alike. The BotCoin token allows for users to pay for the services of bots instantly over a blockchain network and incentivizes developers to accept, and develop, more applications for BotCoin as more agents are deployed on the network.

High-Level Architecture



External Services

BotChain provides a host of external services that provide easy access to users of all types to the platform. While these are standard to most applications, BotChain will provide robust support to users of its infrastructure.

User Login

User onboarding and login features will provide secure access to the BotChain infrastructure. Users can establish two-factor authentication to provide additional security. Developers may also request API access keys, which will be securely tied to their user accounts.

Marketplace

Developers may list their intelligent agent services in BotChain's marketplace. This creates a multi-developer store for customers to compare and shop for services.

Data Portals

Intelligent agents use varied sources of data to accomplish their tasks, and therefore must have streamlined access to external sources. BotChain provides a simple data portal service to provide access to deployed bots. This makes connecting external data to your chatbots easier than ever before. Simultaneously, by imposing a standard data validation and security controls we can greatly reduce cyber risks.

SDK

As BotChain aims to be the infrastructure for all autonomous and intelligent agents, we are providing a comprehensive software development kit for free. The SDK provides complete documentation, simple recipes, and guidance for making BotChain-compatible bots. Through this, developers completely unfamiliar with distributed ledgers will have their chatbots up and running on the blockchain in a matter of minutes.

Services Cloud

To fully utilize BotChain's blockchain solution, additional services have been developed to support bots. These services are provided to partners seeking to deploy their bots on the BotChain.

Deployment

Bots selected from the marketplace will be configured and deployed from the services cloud. Before each bot is deployed, a variety of actions must be completed: a public and private blockchain address must be assigned, the address is registered to an Organization Channel contract, additional smart contracts may be transacted or be registered against. The BotChain deployment services solution streamlines this activity.

Key Store

Blockchain transactions require a private key to sign and commit transactions. A managed key store and wallet service is provided to allow bots to easily transact on the blockchain solution while minimizing the risk of lost or compromised keys. With these addresses bots can securely record their actions, be identified by users as authenticated, and even pay for secondary services on BotChain. Addresses will be generated using Hierarchically Derived Keys, allowing for the Organization Channel to quickly identify all associated bots.

Bot Actions

BotChain provides a simple bot action interface, where bots can request services and actions from either BotChain or other bots deployed on the network. This

service provides a simple query feature for bots to discover other intelligent agents and services. Bots will be able to query the BotChain to discover other bots based on characteristics such as name, capabilities, etc., or those needed to complete a secondary action through the Organization Channel.

ETL & Oracle Service

An extension of the Data Portals, BotChain provides a simple Extract, Transform, and Load service layer. Various data feeds, including bot actions and external data sources, can be transformed through the service. In addition, the hashes of raw and transformed data can be published to the BotChain, creating an immutable record of the changes that occurred to the data.

Once a data portal and ETL layer has been established, the BotChain treats these as an oracle service. Users may choose to publish information to the blockchain with a low-cost publishing service. This will allow BotChain intelligent agents to interact with non-BotChain applications, and will also allow developers more flexibility in how they source and report data.

Admin Services

Each user will have an admin service feature based on their user role. While the admin service layer provides typical user functionality, it also doubles as a user interface for control contracts issued on the blockchain. In a simple GUI, users can view the Organization Channel contract for both private and public blockchains, alter the time between cross-chain and summary hash publishing, deploy more or kill existing bot services, add additional registered users or contracts, etc.

Relay Network

To facilitate communication on the Hybrid Blockchain implemented by BotChain, a cross-chain relay and tools will be developed to ensure the unaltered and easy transaction between chains. This is not a full bridge between networks, but rather a communication channel that seeks to enforce message formats between the private and public Ethereum blockchain implementations.

Event Listeners

Event listeners monitor a smart contract or address for certain transactions and calls an action in return. This can be used for reporting activities across the Hybrid Blockchain, or triggering functions in response to certain activities. BotChain's event listeners will monitor both the public and private chains, allowing for reporting actions across both.

Cross-Chain Communication

Communication between the two blockchains of the hybrid blockchain is coordinated through a cross-chain communication channel. This channel enforces that all activities on the private blockchain are recorded via a hash to the public blockchain, including both the individual bot's activities and a snapshot of the entire blockchain.

Hybrid Blockchain

The Ethereum network cannot yet support the high volume of transactions necessary to record all activities a bot performs. To meet these needs, BotChain will implement a hybrid blockchain solution, consisting of a private Ethereum instance with periodic publishing to the public Ethereum. This allows BotChain to transact at the volume necessary with the same signatures and transaction formats as the public network, while maintaining auditable records for a fraction of the transaction cost.

Private Blockchain

The private Ethereum blockchain deployed by BotChain will require no fees for transactions and will use a federated consensus algorithm. Partners will have the option to be a confirming node. For this service, they will receive a small amount of BotCoin from transactions occurring on the Ethereum public network.

This solution allows BotChain to run a higher number of transactions that would otherwise be infeasible on the public Ethereum network. In addition the private blockchain will be needed in order to create and manage platform specific "bot contracts".

Organization Channel Contract

Organization Channel (OC) contracts aggregate the activities of numerous bots deployed by a user. This consolidates all of a user's bots to a singular contract, while allowing for complex bot activities and smart contracts to run without interference from the platform. The OC contract also allows for BotChain to load balance the activities of bots via blockchain—as each bot records their activities, the BotChain can assign new tasks to underused bots.

Bots will be deployed and registered to an OC contract, locking them to the registered user. This provides immediate tracking of a bot once deployed, while also maintaining an auditable record of the bots' activities. Bots report to the OC contract by signing transactions containing the Merkle hash of their information.

Bot Identity

Bots will be assigned a child key of an HD parent key, allowing for bots to be provably associated with an organization and recovered without needlessly complex key stores.

Upon deployment, Bots are immediately registered and authenticated on the BotChain. While the address assigned to the bot provides a simple reference, additional identifying details are recorded. The bot type, deployment manager, user, publisher, and any access credentials necessary to access data feeds are organized into the bots Merkle hash (also called a "root hash"). Through this structure bots can not be easily traced to a single activity or use case unless the user is provided the proper nonce and child leaf node.

This allows the bot to remain pseudonymous on the network but also able to seek out and positively identify other bots once it has been provided the correct information.

Merkle Roots

BotChain encodes bot information on both the public and private network into a Merkle Root. This process is similar for both Bot Identity and Summary Hash functions, though Summary Hash does not require an additional nonce for obfuscation.

This allows the BotChain to commit a verifiable information to the blockchain in a low-cost and highly structured way. By knowing the proper leaf node to review, bots can quickly identify other bots for a task, confirm the activities of another service, or accept trusted input from a previously unknown actor.

Public Blockchain

BotChain will periodically publish information to the public Ethereum blockchain, leveraging the collective security of the network.

Organization Channel Contract Mirror

On the public Ethereum blockchain, an Organization Channel contract will be published at the same time as the deployment of the private Organization Channel contract. Each will have their counterpart's address registered to them in a private variable, creating a known association between these accounts.

Summary Hash of Bot Actions

Summary transactions of bot actions on the private Ethereum network will be collectively hashed and published to the Organization Channel contract on the public Ethereum network. This will create a permanent and unchangeable record of the actions committed on the private chain.

The hash will be structured in a Merkle Tree, with a designated leaf node for the bots actions and another leaf node for a hash of the entire private blockchain. Since these hashes can be verified on the private blockchain, this creates an immutable record of the private blockchain on the public blockchain.

Bot Registration Contract (Token Sale Admin Contract)

To support token sales, BotChain will provide simple Bot Registration (BR) contracts that can be extended to existing distributed applications. This provides a simple template to allow a user's bots to be easily identified, secure permissions, and report on the events of a smart contract.

One of the first BRs developed by BotChain is a Token Sale Admin Contract. This will include information on who is approved to update a contract, as well as dates of the token sale and volume availability.