An Independent Bot Economy for a Trusted AI Future

Everything Grows From SEED

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The Future of AI Relies on the Future of CUIs.

Conversational User Interfaces (CUIs) are rapidly proliferating, enabling new kinds of interactions (and generating new kinds of user data) across an increasing variety of industries and applications. They represent a paradigm shift in computing systems. Just like graphic user interfaces (GUIs) replaced command-line interfaces (CLIs) and ushered-in new users, services, and applications, so will CUIs impact the future or digital services and the economy, as a whole. All digital services will use conversational interfaces in the near future. AI technologies are advancing quickly, enabling these new interactions, and represent the back-end of these solutions. CUIs are the front-end portion of a complete solution, which are required for AI deployments to reach their potential with maximum impact.

CUIs are Difficult to Create.

The CUI market is already growing rapidly from $3B today to over $20B in the next four years. This growth is fueled by technological development on CUI the front end and back end. However, CUIs are difficult to create, manage and, for end users, trust. CUIs are also complex, taking many different forms, deploying in different channels, and using different services and technologies to perform naturally with users. There are also few standards or tools that combine various protocols, making CUIs even more difficult to share or collaborate between communities.

The SEED platform Enables the CUI Future.

The SEED Platform’s pioneering peer-to-peer ecosystem tools and marketplaces promise faster, easier publishing, sharing, and development of quality, multimodal CUIs, assistants, and digital agents. The SEED token makes it possible to monetize these components and to allow users to be compensated for the value of the data they share with these systems.

SEED allows CUI developers, end-users, publishers, and analysts to participate in the value created by interaction with CUIs. It decentralizes and democratizes data through an independent economy for AI and conversational interfaces.

The SEED Platform is comprised of many communities and companies that share Botanic Technologies’ vision from across the converging worlds of AI, VR, and blockchains. SEED will act as a shared currency to help unify these industries and the creation and exchange of valuable data, for the first time.

Imagine a Bot Marketplace as Usable as an App Store and Secured by Blockchain.

The SEED platform also allows the community to rate and review CUIs and CUI components (and their developers). This can reward good actors and reduce the influence of bad ones. We believe recording all these transactions via blockchain is the best way to establish trust through transparency of transactions to help the CUI economy grow as CUIs become the preferred way people interact with computing and AI systems.
Botanic Technologies™ is open-sourcing its CUI toolkit to create an open, independent platform.

Botanic Technologies (a company that boasts clients including Fortune 100s, startups and government agencies) is open-sourcing its otherwise proprietary IP to create an open-source CUI development platform with existing, best-in-class tools.

This includes its:
- Prized CUI frameworks
- Protocols
- Data structures
- Personality templates
- Key Patents
- Source code for tools
- Key middleware for managing APIs and services

Without SEED, the CUI and AI industries will grow slowly and be dominated by the biggest corporations.

Without a common medium of communication and value exchange, the industry’s growth will be slower and will make it so that only the biggest corporations can effectively create and deploy sophisticated CUIs at scale. For example, it this were the case for websites and HTML, back in the late 1990s, the Web and eCommerce would not have taken-off as rapidly as it did.

We believe SEED is the only way to create a more equitable, distributed, and democratic Internet in a future where AI is vastly more prevalent than today.
1.1 Conversational interfaces create easy and natural experiences for users, while generating valuable data for organizations

The learning curve to adopt new technologies has always been a drag on development, deployment, and use. From Command Line Interfaces (CLIs) to graphical user interfaces (GUIs), each evolution in computing enables ever more people, both users and developers, to use new technologies and systems. More users create a self-reinforcing loop of growth and innovation expanding the market and increasing its utility.

Conversational user interfaces (CUIs) represent the next jump in technological system interfaces, and are, perhaps, the most natural of all. Just like the CLIs and GUIs before them, CUIs are poised to transform how we use nearly all technologies in our lives, in every industry, including many systems and media yet to be imagined. In addition, they are, by nature, both more social and more personal and unlock new kinds of data about and during our interactions with systems and each other. Some of this data includes affect and sentiment (measurements of emotions, intonations, and actions prompted by feeling) that have never been a part of technological interactions before but are regularly a part of our person-to-person conversations. This new data brings with it increasing value to all stakeholders in this economy, from users to developers, network and service providers, and others.

We believe these developments are inevitable but hampered by a lack of trust, standards, cooperation, and strategic alignment within the current bot economy. Our team has been active in this economy for nearly two decades. Because conversations are so natural for us, while CUIs proliferate throughout markets and our lives, they seem obvious and invisible. Where some CUIs currently seem like toys, experiments, or even annoyances, many are already becoming indispensable to a variety of industries. For reasons of cost, consistency, complexity, and scale, we see CUIs very quickly becoming indispensable for user interactions of all type. What is called a CUI now will, very soon, simply be called a “system” or “service.” Commercially, not having a CUI-based interface to a service will become a liability and limitation, not just for novice consumers but also for expert users, producers of media, and owners of valuable brands. Just as we all, today, have a webpage about us (or several), in a few years we will all have at least one bot that represents us, too. CUIs will also take on tasks and act on our behalf, making trust imperative.

These trends in CUIs will fundamentally govern and inform the future of all industries: mobility, healthcare, finance, IOT, robotics, retail, entertainment, publishing, academia, etc. Economic structures and incentives create and govern markets and the outcomes of both human and technological activities and their interactions. All organizations will naturally try to optimize their value and impact in markets but it is the goal of the SEED Platform to create a more democratic, equitable, and distributed economy before small players and individuals are “locked-out” by the costs of these technologies and economies of scale.
1.2 Conversations are the most natural of human interfaces

Many of the first interfaces to technology were envisioned as conversations. As far back as Mary Shelley’s *Frankenstein* (1818) and Fritz Lang’s *Metropolis* (1927), creators and controllers of technology spoke to their creations, which in turn understood them. In fact, science fiction is rife with examples of conversational interfaces, followed by development in many industries of both prototypes and shipped products (such as Apple’s *Knowledge Navigator* from 1987 and *Siri* in 2011). This is because conversations are more natural interactions with social actors and technological systems as Stanford researchers, Bryon Reeves and Clifford Nass, explained in their foundational research (culminating in the book, *The Media Equation*). In fact, most technologies are already social actors, even if they don’t aspire to be.

Now that natural language processing (NLP), machine learning, and computational power have reached present capabilities, processed speech from both users and systems, when combined with knowledge bases and use flows, have made CUIs the natural choice for most interfaces.

1.3 Conversations have always been multi-modal

For as long as humans have been around, conversations have been multi-modal, meaning that the signals that carried information were never limited to mere words. Gesture, facial expressions, and intonations all carry critical information. Some studies, such as those by Albert Mehrabian, indicate that less than 10% of conversational data is conveyed in words alone with the vast majority of communication being facial expression and body language. Technological systems have been trying to catch-up with humans in processing and understanding these other modes for a long time, often making CUIs clunky and failure-prone. For example, detecting sarcasm or irony has long posed a challenge to natural language processing methods precisely because phrases such as “I love our president” rely on tone of voice or facial expression to relay sentiment such as sarcasm.

Current conversational user interfaces must integrate text, sounds, images, and metadata. Text-only chatbots, commonly used for messaging, offer only the thinnest of conversational data. Voice-based assistants (like Siri, Cortana, and Alexa) use voice recognition with other services where tone of voice and timing, among other vectors, help the system function accurately. Visually-embodied, 2-dimensional and 3-dimensional characters have been deployed in video chat (like Skype and Signal), virtual reality, and augmented reality (like Oculus Gear) as well as in gaming, and other 3D platforms. Increasingly, conversational avatars, are being deployed in customer service, healthcare, coaching, and entertainment contexts, creating unprecedented opportunity. Robots, appliances, vehicles, buildings, and other platforms benefit from these interfaces as well.
Soon, all CUIs will be intolerable (and, thus, ineffective) without multi-modal data, putting them at a distinct disadvantage, both in terms of ease and amount of use. Multi-modal interfaces also provide a more natural way to customize and train chatbots, assistants, and conversational avatars. Much like training another person via Skype or other video chat, a user may today train a conversational avatar in the same way.

1.4 Machine learning, AI, and Knowledge Bases supercharge conversational interfaces

While artificial general intelligence (AGI) does not yet exist (and may never), a suite of technologies now stand-in for “intelligence” in industry jargon, including: machine learning, knowledge bases, pattern recognition, neural networks, speech recognition, face recognition, gesture analysis, sentiment analysis, detailed evaluation of conversational data, etc. These technologies power conversational interfaces in order to make them respond, react, and gather data more naturally. Nass and Reeves have already documented the many ways that we expect systems to function like humans and these technologies enable these systems to rise to this challenge, introducing fields such as affective computing and social robotics.

The lexical content that drives these interfaces are stimulus/response-driven knowledge bases, much like a more sophisticated FAQ with Q&A pairs, in natural language. This is only the beginning, of course. Metadata and co-data about both the conversants and the conversation form the basis of what is analyzed and what, then, becomes valuable. Artificial intelligence, in all its forms, will continue to drive conversational interfaces, as has already been demonstrated and CUIs, as the preferred interface to AI, will, therefore, drive the adoption of these technologies moving forward.

Likewise, CUIs will drive both the collection and the context for affective data. Without these interfaces, AI technologies and data stores cannot collect and, therefore, act on this valuable data.
1.5 The CUI market will exceed $20B by 2021

Gartner is just one of many business groups forecasting the growing global market for conversational interfaces. From a recent and extensive report on Conversational AI Platforms (CAPs), also known as Virtual Conversational Assistants, Gartner estimates the current CUI market at US$2.8B, growing to more than US$20B by 2021 (not including entertainment use cases):

“Our first recommendation is to examine and begin using CAPs to create voice-driven experiences—now. Why do we believe this is an imperative? CAP technology appears to be at a point at which consumer knowledge and demand are meeting with technical strength and (enough) maturity for implementation and real user benefits. […] Sixty-five percent of smartphone owners already use voice assistants on their phone (see Conversational AI to Shake Up Your Technical and Business Worlds)."

Every aspect of business (sales, transactions, customer service, HR, training, support, market research, operations, etc.) will be augmented by CUIs, in every industry: education, shopping, financial services, coaching, healthcare, wellness, entertainment, branded character experiences, publishing, etc. Many are already implementing CUIs in various forms. Regardless of the industry, all share critical needs that are not yet standardized: authentication, security, trust, and interoperability. Without this foundation, growth in the CUI market will proceed slowly, causing a lag on development, deployment, and value.

In addition, CUIs will spawn new tools and services that don’t yet exist. For example, just as we all have various personal pages to represent us socially and professionally (via LinkedIn, Facebook, and many other services), we will each soon have bots that similarly represent our interests with various levels of agency (acting on our behalf) with the CUIs from our friends, family, and various organizations. Ultimately, this represents many billions of CUIs over the coming years. These CUIs will manage the creation, storage, and sharing of people’s data as well as their interactions with others. Organizations of all types will create and deploy many types of bots to interact with their customers, constituents, partners, and other stakeholders.

This proliferation of CUIs will create a proliferation of personal data and its use. One of the perils of contemporary life is the ever-present danger of breaches of private data (not to mention the use of our private data by the companies who collect it). Currently, CUIs pose grave security implications because there are no standards of authentication, reputation, and trust that balance the need for both privacy and public sharing. The SEED Platform creates these standards, now, before widespread breaches in the CUI space occur.
2.1 CUIs pose unique challenges and create new opportunities

CUI architectures (of all types) are complicated and difficult to create. To enable more developers to more quickly create and deploy CUIs, there needs to be open, modular architectures for API aggregation that also enable extensible functionality, secure transactions, and trusted relationships.

In addition, **CUI architectures must be prepared, from the beginning, to handle multi-modal data and interaction.** The underlying framework must first drive text-based chatbots for text-based input and output but also access the same knowledgebase to drive voice input and output methods via microphone and speakers. That same framework must also be able, for some uses and clients, to present a visual avatar that moves and responds naturally, sometimes coordinating user data from a camera and microphone with output for the avatar using words, voice, and animation in either real-time 3D or video, handling these transactions efficiently and quickly.

While tools are available for both automating and interpolating avatar movements there is still a need to hand-author specific avatar physiognomy, specifically non-humanoid movements and appearances, that require custom animation libraries. Mouth movements for conversational avatars also require phoneme/viseme pairs, and while Text-To-Speech (TTS) data can include phoneme/viseme pairing data, the broad range of animations leaves a need for hand-tuning to avoid uncanny valleys and other visual glitches. Most other sophisticated technologies being deployed in CUIs face similar challenges and the lack of both standards and APIs limit the development and deployment of these technologies.

**CUI architectures must also address context, socially-appropriate behaviors, context-awareness, and transparency** (including the escalation of the interaction to a human agent at appropriate times). Current technologies are already evolving quickly, requiring extensible network protocols that can evolve with them. In addition, these protocols need to interoperate with legacy business systems.

Yet, all of these difficulties create opportunities for a solution that creates standards across these data types and APIs to plug-into current and future processes. A meta framework, like the one Botanic Technologies has already created and uses, is exactly the kind of foundation that solves many of these issues and enables a larger economy to evolve from it (but only if it is open for all to use, as we intend).
2.0 CUls pose unique challenges...

2.2 Monetized conversational data creates both opportunity and concern

As technology rapidly develops, outcomes increasingly favor a handful of corporations and the consolidation of both data and revenues. Google, Facebook, Amazon, Palantir, and many others collect, process, and analyze large amounts of user data. Experts routinely state that the data these companies collect regarding their customers' preferences, behaviors, and transactions are worth more than the costs of the free services they offer in order to access this data (and their size and worth underscores this). As proven by Google, Facebook, and Amazon, this data is invaluable because it both influences personal behavior and can represent public trends. In fact, personal data is now, measurably, the world’s most valuable commodity.

Bots are impacting society itself. Studies show that people are more inclined to reveal personal information to a CUI than another person, due to a range of motivations including fear and embarrassment. Additionally, other studies show that people often obey the commands of CUls, believing their assertions are "objectively true." This raises both ethical and humanitarian questions as the data policies of hospitals, healthcare centers, nursing homes, businesses, schools, and government agencies are inadequate, often more similar to surveillance mechanisms of dictatorships.

CUls have influenced elections, changed group sentiment, and now outnumber people on the internet. These technologies create and track new kinds of personal and conversational data not previously collected, stored, or analyzed. CUls are able to gather both big data of groups and small data of individuals.

This also presents enormous opportunities for corporations and governments to perform analyses on interactions that generate metadata, triggering privacy and security concerns ranging from misdiagnosed intent, threats, and mental health to limitations of security, access, privilege, and suspicion. These technologies are often imperfect (“My TiVO thinks I’m gay” and “Amazon assumes I have cancer” to government agencies misidentifying terrorists) and their misuse and misapplication can cause mistakes that are life-threatening.

Simultaneously, most companies currently make it impossible (or nearly so) for people to examine the content entered into or amassed by these services, let alone copy, export, or use it for their own purposes. This comes at a time when the data collected about us is set to explode in new forms and unprecedented volumes. Of particular interest is affective data that identifies our emotions, values, and preferences through voice and facial data analysis.

Our relationships with digital systems are now as social as our relationships with other people. Researchers from the University of Cambridge and Stanford University released a study indicating that Facebook may be better at judging people’s personalities than their closest friends, their spouses, and in some cases, even themselves. Indeed, many of our interactions with people are mediated through digital systems. And, as technology evolves, conversational user interfaces, imagined in both science fiction and corporate visions for over a century now, are becoming a reality that will transform access and use of technologies. CUls make our interactions easier for more people, increasing use as well as revealing more about ourselves. This makes them critical to the future of human-computer interaction and even the future of human-human interaction as we grow-up learning to speak like those with whom we speak—even if they’re robots.
While privacy isn’t a feature of blockchain technology yet, pseudonymity is. This is one way to counter the fact that most organizations don’t allow users to control their own data. It’s possible for a blockchain-based solution to allow users to mediate specific data they share along the spectrum of public to private. It won’t apply in every case but it will be beneficial in some. Most people don’t yet realize the value of their personal data, nor the value of this new, affective data, and this requires us to build systems that use their data appropriately. Ideally, the framework would have built-in facilities to help solve both the issues of privacy and remuneration to users of the value of their data.

This is also a solution to the requirements of European (and other) standards of data privacy, like GDPR (Global Data Privacy Requirements). These are coming into effect across European and other countries.

Therefore, systems that manage this data must not only be secure but must guard against uses that violate our expectations of inappropriate use. CUIs amplify these issues with more data, new kinds of data, and a more pronounced social context that makes the data collected, collated, and analyzed in relationships more sensitive and provocative.

2.3 Trust is a critical opportunity

CUIs need to inspire trust in users as well as developers. Any lasting relationship requires trust to be developed and continuously reinforced. Person-CUI interactions are no different in this regard than person-person relationships (and, in fact, many of the cues and mechanisms are the same). Humans establish trust via multiple factors. As Bruce Schneier details in his book, *Liars and Outliers*, these factors include societal, reputational, institutional, and security pressures. In dealing with such a complicated system as a multi-modal CUI, establishing trust begins with the technology. CUI authentication to third-party services (such as OAuth or distributed systems such as Sovrin) help establish trust in the background, among the technological components. Authentication allows trust to develop for people, as well, building a reputation for that CUI (and it’s unique identifier), including both white-listing and black-listing, as well as reviews and recommendations. Engineering can cover the needs of reliability but only the interface and the CUI’s behavioral design can telegraph and fulfill the other social requirements. Any CUI network (and protocols transmitted over it) need to enable and support social expectations, as well, requiring reputation and ranking be, at least, optional for all CUIs. In addition, marketplaces on the network also need to enable trust and reputation in order to validate transactions, buyers, and sellers.

Not only will CUIs become more responsive to social behavior, they will orchestrate it. This requires users to trust CUIs to manage their time and relationships. Of course, disruption goes both ways. While some jobs will be eliminated, new opportunities will be created—jobs that are both more interesting and distribute knowledge that is scarce, today. Imagine the impact of a knowledgbase for the diagnosis and treatment of rare diseases that currently relies on 3-4 world experts. CUIs may not only make this data accessible to more people but allow more people (potentially that have this illness) to contribute to the data (and, eventually, a cure).

All of this means that we need to create new systems for people to earn a living through their knowledge, experience, and personal contributions in the light of this reality. A fair system, that not only facilitates the faster, easier development and distribution of CUIs can also allow users and developers to control their personal data and remunerate them for sharing it. This is what we propose to create.
2.4 Proprietary systems inhibit growth

Developers who architect, author, edit, deploy, and manage these solutions commonly build their own tools, backends, and networks to run them upon, creating separate, siloed systems that aren’t interoperable. Thereby, these solutions are optimized only for those who own them. Proprietary systems favor corporations, not people—or even other corporations.

For example, Amazon’s Alexa is the market leader of conversational interfaces. This voice-based assistant provides access to the Alexa API, the Lex natural language processing system, and developers may author Alexa Skills, which are then exchanged in the Alexa skills store. However, there are four problems with this model that exist for companies, individuals, and developers:

1. **Companies are not able to maintain their brand identity.** In exchange for use of Amazon’s tools, the Alexa voice overshadows any client company’s brand voice (and the customer relationship).

2. **Developers lack full insight into the data of the end-user with which they are interacting** (audio recordings of conversation as well as the transcripts). These specifics of user interaction are valuable to both the company and the developer but aren’t fully shared with them (if at all).

3. **People (users) are not able to set their own privacy policies or access the value of their data.** End-users realize no remuneration for their valuable personal data and, in fact, pay to purchase access to Alexa through the hardware device.

4. **Developers are unable to export content or code others have contributed nor are they able to easily share their work outside of the Alexa ecosystem.**

In summary, the value of these various forms of data is centralized with Amazon leaving the companies, developers, and users with less than they contributed.

To be most effective, CUIs need to run reliably on an open, accessible network with a standard economic and technical protocol designed for these unique data and interactions. Companies are already deploying their own CUI frameworks but the proprietary nature of these deter collaborators or force unreasonable or inequitable concessions from partners. Large corporations making their CUI frameworks available to smaller players puts these partners at a distinct disadvantage. This creates powerful implications not only for privacy but for citizenship and democracy, itself. Competition is important but collaboration is the foundation on which sophisticated ecosystems develop and thrive (enabling competition on top of these foundations). Therefore, most stakeholders benefit from non-proprietary systems and more open networks. In addition, open systems allow for more extensible and powerful marketplaces for components that accelerate development.
There are dozens of platforms for building conversational interfaces but they do not address these core problems:

- Standard, sharable, open, and scalable architecture
- Multi-modal implementation model
- Complete description of possible components
- Open APIs to other services (such as voice processing or analysis)
- Marketplaces for sharing and remunerated value for development code
- Authentication and end-to-end encryption
- Protection of personal information (privacy settings)
- Applicability to people and bots of all types—not only CUI-to-person but CUI-to-CUI and people-to-people interactions, as well
- Components that create user trust in these interactions
- Opportunities for people to control the sharing of their personal data

To date, no existing platform satisfies all of these requirements. All current platforms are proprietary and centralize user data without allowing users access to their data (or control over it) nor any mechanism to be potentially paid for contributing it.

This is why we’ve created SEED and the SEED Platform.
3.0 These challenges can be solved

3.1 Many challenges are solved by trusted, multimodal systems.

CUIs, like some websites and online communities, are able to facilitate social coordination and uncover a “double coincidence of wants.” At it’s heart, the SEED token allows the transfer of data between individuals, companies, and networks in a mediated dialog. In effect, the underlying blockchain or DLT is the social media exchange register, the SEED token is the instrument used to incentivize that dialogue.

While the interaction with CUIs can be multi-modal today, the vast majority of the CUI interaction is currently based on text. Text output from a Natural Language Processing (NLP) system then drives any associated audio and visuals. To provide believable social interaction, CUI production focuses on the writing of the lexical content (text) first. Top-down machine-trained natural language systems (such as Microsoft’s LUIS, Amazon’s Lex, Nuance’s Mix, etc), may be multiplexed with top-down pre-scripted natural language systems (such as ChatScript, AIML, RiveScript, etc). Therefore, we observe that NLP systems can be categorized in two ways:

1. bottom-up learning models which are strong at intent recognition but weak for tailored responses, and
2. top-down scripting models which are strong at tailored responses but weaker at intent recognition.

The obvious solution, therefore, is to use an API aggregation method that allows not only for the multiplexing of various NLP systems but also the connection of services. The aggregation of various services for voice recognition, map data, affect detection, or other services opens new avenues as it means that we can apply visual (and other) data to drive conversations. This integration allows affect, emotion, and other new forms of data to assist in training bot interaction models, just like text and other data (both in terms of user input and bot output). This multi-modal data adds context to conversations, including meaning, improving them and generating a richer interaction, as well as increasing the potential for training and use as a social medium.
3.2 All conversations are two-way.

These conversations are social, at their core, and must be built to be entirely two-way, transferring multi-modal data (text, audio, music, image, video, RT3D, diagrams, instructions, user behavior, etc.) between each party and enabling the transfer of tokens in exchange. While we can think of one party as an “Author” and the other as a “Reader,” in truth, both parties can be either—even simultaneously.

It’s worth reiterating that there is no real producer/consumer dichotomy as all interactors in the system can be one, the other, or both, as in a video chat. All of the above references are dialogs in which both (or all) parties are active and passive. Also, in this model, data can be of any kind but those most fundamental to multi-modal bots include:

**Text:**
- lexical content
- natural language
- screenplays
- first-person dialogue sets
- programmatic instructions
- user data
- markups and tags (SSML, NL scripting, ACTR animation, etc)
- metadata (confidence rankings, affect or sentiment data, etc)

**Sound:**
- pre-recorded voice of sentence recordings
- pre-recorded voice of phonemes (for constructed voice)
- music
- sound effects
- interface earcons
- other audio

**Image:**
- pre-rendered video clips
- concatenated video clips
- streamed 3D renderings
- real-time 3D renderings (OpenGL, WebGL, Unity)
- interpolation of RT3D
3.3 CUIs must integrate many types of data

Data can be any combination of these basic types. The type, quantity and quality of information provided varies according to the use case and/or client of the deployment.

Dialogs also include other meta-data, which increase the need for bot-specific architectures:

- **Knowledge Base**: This is an accumulation of natural language data. It is used by the CUI at various levels and commonly grouped according to categories, topics, expressions, etc. This is manually input by either developers or through user responses and automatically output by the CUI to generate a reply. It improves, specifically with use of pre-built dialogue models and can provide a secondary function of social graph mapping, much like Facebook’s social graph or Google’s knowledgegraph.

- **User State**: Sometimes called “user data,” this is a record of the user’s behavior, including not only chat logs and preferences but also include vocal, facial, affect, and other data associated with responses and topics, as well as timestamps of unique information, and hundreds of other elements. This is data that is automatically (and passively) added by the user, then processed by the CUI to customize replies.

- **Personality Template**: These are coupled datasets that include (1) use-flows which determine the function of the bot’s response and (2) character traits which determine how those responses are delivered. Personality templates are pre-built but may be generated automatically. Personality templates will commonly reference a knowledge base to generate responses and the knowledge base and templates may be automatically extended, journaled, detailed and trained based on dialogue with the user.

- **Visual cues**: CUIs, embodied as avatars can be animated with foundational and iconic gestures via Botanic’s animation protocol, ACTR, or another parties’ animation libraries. ACTR is designed for realtime 3D characters in virtual reality (VR) and augmented reality (AR) applications or in video conversations. This may also trigger other changes of the character (such as camera cuts, background changes, architecture and accessory animations, etc.).

- **Other Data**: For the sake of this economic model we’ll lump together other data that facilitates conversation which ranges from audio intonations, privacy settings, and a range of tools for authoring, editing, analyzing and deploying bots.

3.0 These challenges can be solved
All of these are valuable because what the CUI says and does and how it says and does it is the “why,” “when,” and “what” of a CUI and also determines what kind of data will be collected from users (via user state). Ultimately, this data is valuable not only to the CUI interaction but to other parties as expressions of users’ needs, preferences, conditions, and interests. Just a short list of these other parties includes:

- **CUI Publisher/Deployer**: Authors will be able to deploy CUIs in various channels (Slack, FB, Kik, etc.).
- **CUI Developers**: A variety of developers will be able to introduce technical value and improve functionality based on the user data that is collected.
- **Analysts**: Approximately 40% of Twitter’s revenues comes from the Garden Hose and Fire Hose analytics models. Analysts of all types are deeply interested in the data generated from user interactions.
- **Advertisers**: In traditional models used today, advertisers are sold user data to target ads. In our model, that is possible, as well. However, we may also allow advertisers to become a kind of author in that they have content to contribute just as an expert author might.

It becomes critical, then, that any interactor in the system needs to be able to set their own, varying levels of value on their data and that reputation and ranking systems are facilitated. Also, both public and private data have value so users of all types need to be able to control access to their data along a spectrum of fully private to fully public.

In an ideal world, and because this data is so valuable, interactors who share their personal data and metadata would get compensated for part of this value, creating a benefit for sharing it in the first place, as well as sharing more in the future. This is one of the principles behind the SEED Platform. Now, end-users’ contributions are no different in the system from any other kind (such as CUI component code) and they can elect to earn SEED token as remuneration when others use their data for a range of purposes, from analytics to dialogue pair training. The importance of this aspect of the economic model can’t be understated as companies like Google and Facebook have proven user data “as the most valuable commodity in the world.”

Mapping all of these aspects into a cohesive architecture creates an API designed to handle all of these needs in an ecosystem of various stakeholders, each of them capable of paying and being paid.

This cryptoeconomic and technical model solves the challenges described above by:

- Technically and societally providing trusted CUIs to engage in a relationship.
- Allowing a balance of private/public data.
- Integrating automated knowledge workers with human knowledge workers via models of augmented intelligence and manual user training.
- This is coupled with a CUI architecture that:
  - Allows developers and users to both pay and be paid for contributions
  - Allows standardized and scalable data model and frameworks
  - Allows multi-modal data implementation
  - Provides description of possible components
  - Provides open APIs to other services
  - Provides remuneration of shared development code
  - Provides authenticated and encrypted communication with CUIs
  - Offers extendability for future scenarios for people and CUIs

3.0 These challenges can be solved
Seed Vault Limited, the entity behind the SEED token and platform, proposes to solve the challenges described by deploying a token designed specifically for conversational user interfaces on a network that enables open, secure, trusted CUI creation, editing, authentication, use, deployment and profitable CUI trading. This network creates multiple marketplaces that allow the selling and trading of CUIs and bot components. This rewards creators when their components are used and interactors when they interact. Import and export capabilities across a range of open-source platforms will increase the usefulness of the marketplaces and build upon past available work.

3.4 Use Case: Carbots

Consider current solutions to customer service. For example, you’re driving on the highway when you hit a piece of debris in the road. Your car starts to shake and you pull-over to the side of the road. Most people don’t know how to diagnose what’s wrong with the car and whether or not it’s safe to continue driving—even just to the closest mechanic.

In a world of CUIs, a driver could call the manufacturer’s customer service department and the customer service CUI for the manufacturer would engage in dialog to help the driver determine the best course of action. Currently, the solution involves finding and making a phone call or touching a call button somewhere in the car’s control. However, in the very near future, the car, itself, may initiate the call or the car may be it’s own conversational interface. Drivers will talk with their cars and the car will perform diagnostics and communicate with other CUIs on the network (some being partner CUIs) to advise the driver what to do. The car CUI will automatically share data from the car with the manufacturer’s diagnostic center and its interaction with the driver will determine any distress in the driver’s state.

If the damage isn’t severe, the car could automatically diagnose and log the incident, direct the driver to the nearest repair site, and negotiate the repair between the manufacturer and the mechanic (based on the current warranty). All of this would be done through authenticated communications. If the damage is too severe to continue to drive the car, the car could automatically call for roadside assistance, negotiating time, rates, and location and then alerting the driver.

In the case of autonomous vehicles, all of the CUIs’ communications would be automatic, while keeping passengers informed and, possibly, calling another car to pick them up to complete their journey before repairs are made. Even without autonomous cars, users or manufacturers could elect for this communication to be autonomous, too.

In all of these cases, these CUIs not only share valuable information (and, therefore, need to be secure and trusted) but they must interact appropriately with a range of systems, not the least of which are the drivers or passengers. Many of these bots will live “behind the scenes,” in the backend of these systems, but several will interact directly with people and many of these companies will design their CUIs with social behaviors, as well as character and appearance characteristics, that embody their brands and desired customer relationships.

In addition, developers of many kinds will solve challenges at many levels that are universally applicable to other developers and bot-owners. The same social behavior that BMW uses in its 3-series car CUI could be used across their many brands, changing only
3.0 These challenges can be solved

the appearance so that their Mini and Rolls-Royce bots function reliably (allowing for the specific differences in these cars) but with different personalities. Rather than create each CUI from scratch, all of the components and elements of any CUI's personality template can be used in the creation of others. This CUI description framework allows more rapid creation of sophisticated CUIs.

Any developer can then sell the various components they've created to any other developer and earn value for each use. While companies like Apple and BMW may want to create custom and proprietary CUI components that only they can use, an enterprising developer can solve these challenges and offer them to the entire marketplace of companies building and deploying CUIs within the same framework. This creates an easy, reliable market for valuable work.

Just like text written in books or available online at places like Wikipedia, or music available through a variety of sources, many of the components needed for sophisticated bots can be used, shared, reused, and recombined from various elements (from specific CUIs to whole bots), repaying the authors of all components for their work. While some authors may share CUI code for free (open-sourcing it to anyone), others may share it via a variety of Creative Commons levels or charge (and be compensated) every time their code is used.

Because the CUI framework is universal, CUI code for behaviors, social interactions, use flows, and appearance attributes can freely move between industries and applications. The same analysis routine used in a customer service CUI could be used in any customer service CUI—or even parts of a healthcare CUI.

Lastly, the drivers (or passengers) using these CUI-enabled cars are generating data and metadata about their purchases, driving habits, preferences, emotions, and many other attributes. Without a system for protecting their privacy and/or fairly compensating them for sharing this data, the system continues to be an unbalanced and exploitive one, putting people and customers at a disadvantage. This is, of course, extendable to any data and metadata generated by people's interaction with systems, across all uses and industries. The SEED Platform aims to form the backbone of a transaction system that authenticates, shares (or not, as users define), enables, and fairly compensates people for their interaction with CUIs (and other) systems.

While there have been technologies deployed similarly to this use case in a few cars currently, there is no network, or marketplace for these components or interactions, making bot development and deployment costly and slow. In this way, these elements democratise and accelerate the CUI market and the SEED token becomes the transactional fuel for the market.

It's worth noting that the above example is already in development by some automobile companies, but using proprietary frameworks and behind non-interoperable systems. And, it is not only automobiles and transportation systems that are evolving to support (and be supported by) CUI implementations. Every industry—globally—holds opportunity and interest for CUI technology.
The SEED Token

SEED is a digital utility token created for the purpose of authenticating CUIs (conversational user interfaces) and enhancing digital transactions among CUIs using the SEED Platform. The SEED token will be the recognized currency for the SEED Platform and its marketplace and wallet applications.

When CUI developers of all kinds upload code, content, or other components of CUIs to a SEED marketplace, they will designate, in units of SEED, the licensing terms for the use of these components. Correspondingly, other developers or deployers of CUIs can license any components, regardless of the license type, and compensate the creator of these components in SEED tokens in the amounts stipulated in the license.

In addition, any end-user of a partnering, SEED-compatible online service or tool can earn SEED, in exchange for sharing data about themselves and their interactions with that service.

SEED tokens are not mined (unlike Bitcoin, which relies on “proof-of-work”). Instead, the entire allocation of tokens are created at the beginning of the service and assigned unique identifiers. SEED uses “proof-of-stake” as its method of managing tokens.

4.1 We will supercharge CUI development with the first CUI-based protocol, network, and token.

The SEED token and platform describe and enable an extensible, open, open-source, and trusted peer-to-peer architecture for creating, distributing, sharing, and selling CUIs, chatbots, assistants, conversational avatars, automated personalities, and all of the various assets these require. Built on Botanic Technologies’ state-of-the-art description system and middleware, the SEED token and platform specifically enable markets for the configuration and code needed to run a CUI deployment based initially on three component categories of these digital entities:

- **Use flows:** Multiple flows, system maps, data flows, and dialogue management.
- **Personality Type:** Determined by brand objectives, these are a character’s behavioral traits.
- **Characteristics:** A personality type applied as textual, vocal, and visual assets to create a full character profile for a given use case.

Each of these categories include numerous components within them, any of which can be created, shared, and exchanged separately in a marketplace, in whole or in part, described by the shape of the data in question. Whole digital agents and avatars can also be shared, sold, and modified within these marketplaces and networks. Because the APIs and abstraction layers are open, others can transform layers of data into object models, creating new products and services for new uses, importing, exporting, and otherwise translating this open platform.
To accomplish this, we create a licensed market in (algebraic) data and co-data which can be combined together using the SEED virtual machine to create and deploy CUIs, with associated metadata around the qualities of the data and code for licensing, and a secondary market of related data. We will provide a mechanism for using this associated metadata to calculate and share reputation scores, whitelists, and blacklists.

This section of the white paper describes the technical characteristics of:

- **SEED Token** (the unit of currency that fuels the CUI economy)
- **SEED Platform** (the protocols that SEED interact with that enable the CUI markets and ecosystems)

### 4.2 SEED is the first data exchange mechanism for CUIs.

SEED is designed, from the beginning, to enable CUIs. It’s structure provides the infrastructure missing for publishing, licensing, and authenticating CUIs globally over open networks. In detail, the integrated development environment (IDE) includes:

- Use flow authoring tools
- Dialogue management interfaces
- Personality identifier tool
- Character design tool
- Use flow wizard
- Publishing tool
- API aggregation system
- Real-time animation libraries and methods to drive software (and hardware) robots
- While the token doesn’t require bots to use artificial intelligence (AI), it is ready—from the start—for CUIs which do.

Key to SEED’s value is the creation of upstream licensing for developers to share, buy, and sell CUI components in SEED-enabled marketplaces. This allows remuneration for developers in this community. In addition, related patents and applications (voice-to-blockchain bridges, personality training methods, blockchain social network systems, etc) will be open-sourced to ensure ongoing legal integrity as part of the token development (see below).

This remuneration works in three ways:

- Developers who place CUI components into SEED marketplaces to license earn SEED whenever their components are used by others in this patronage model.
- Users (conversants) of SEED-enabled CUIs can earn SEED tokens for sharing personal information, at their designation.
- CUI deployers earn SEED tokens for the value of publicizing a CUI and attracting users.
Other functionalities include:

• Buying SEED: The SEED interface app allows anyone access to the network of CUIs and authors. In addition, it allows any end-user to set privacy levels and be remunerated for SEED-enabled interactions.

• Creating and editing CUI assets. Using Botanic Technologies’ IDE, developers can create and edit CUI content.

• Publishing CUI assets. When developers publish content, others can examine the licensing terms in the bot store. This content is automatically interoperable with other SEED components.

• Earning SEED. When your content or CUI is used, you can be remunerated for it.

• Rating and recommending bots and components. Users of any components can rate their experience and potential buyers can see these ratings before they buy.

• Rating and recommending developers. Users of any components can rate their authors and help them build their reputations.

4.3 SEED Token Architecture

The SEED Platform contains four main types of resources. These resources can be monetized through SEED tokens, either by patronage (remuneration for use), purchase, or trade. These links point to the following content (see illustration to right).

CUIs and users can communicate with the SEED Platform to retrieve any appropriate data and communicate with necessary smart contracts to transfer value among bots and between bots and users.

The token provides conditions and directions for access to the data and code (co-data) for CUIs, components (use flows, personalities, and characteristics), and services.

4.4 The SEED Token is designed as a smart contract containing four functions.

There are four main functions within the SEED token:

• Unique Identifier
• Licensing Terms
• Location Identifier
• Current Balance

The SEED token is processed on the Ethereum (ETH) blockchain. We may partner with other technologies (such as Sovrin) to enhance portions of the token or to create interoperability with other tokens through ABIs (Application Binary Interfaces). Some of these ABIs may be used for storage of data and resources, which will be kept off the blockchain for maximum reliability and scalability.
4.5 SEED Differentiators

Existing distributed ledgers, such as Bitcoin and Ethereum, aren’t built for the needs of CUI-oriented transactions. SEED is an appropriate response to the existing chaos in the CUI community. Existing digital currencies can’t be used to remunerate developers and users or authenticate bots because they lack the needed SEED token characteristics (described above) and interoperability on the SEED Platform (described below). This is an entirely new and CUI-centric approach. In addition, any “bot-coin” must work for the future of CUIs, not merely the features currently popular (which mostly favor text-based “chat-bots” or simple interfaces for human agents fronted by avatars). While existing coins aren’t appropriate for use with CUIs, some may be appropriate as partners for specific services (such as data storage or processing) through APIs.

SEED are different from other digital tokens in that...

- Authentication. **SEED allows CUIs to be authenticated** both through third-party authentication methods (such as OAuth or OpenId) or self-sovereign methods used on blockchain today.
- The token applies—and may be expanded to work with—vertical markets that are already in operation and entirely unrelated to blockchain (assistant-based ticket sales, healthcare medical record management, education and training, etc.).
- Dialogue markets provide libraries for training of two-party conversational interactions.
- The token allows access to tools that facilitate the normalization of input and output for various CUI and natural language systems such as LUIS, Lex, AIML, Chatscript etc.
- **SEED enables CUI data exchange rather than an application-specific data exchange. Therefore, it allows platform deployment for a broad variety of clients.**
- **SEED reduces friction in CUI and other conversations (Dialog Markets) and makes developing and using CUIs easier.**

SEED is designed to be largely invisible to those interacting with CUIs, though it will be a necessary component for developer and publisher interactions. No one interacting with a CUI should ever need to “see” or understand these technologies. However, the SEED token balance is listed in a wallet as part of the peer-to-peer network application.

4.5 The SEED Platform Architecture

A useful analogy for the structure of the SEED Platform comes from Nature, itself. Though there isn’t a one-to-one correspondence between technology and Nature, many of the concepts and components are similar (and represent an analogous robustness). However, this doesn’t represent a literal naming structure for the SEED components.

Imagine a tree that grows from a simple SEED.

That tree has roots, branches, leaves, and methods of transporting resources within it. It is constructed of components connected via a transaction medium (sap) and forms a strong structure that represents its history (transactions on the blockchain) as well as offering space for new growth (new components posted to the marketplaces). In this network, however, there are no limitations of the number of components (leaves) that can be
4.0 Introducing the SEED Token & Platform

added to the tree nor on the number of transactions or developers who can share, buy, and sell them.

Added to the structure of this ecosystem is a small amount of purposeful friction that will appear as optional user rating components. Additional reviews, flags, blacklists, whitenlists, and hashtagging creates a more trustworthy community among participants in order to facilitate quality transactions that are beneficial to both buyers and sellers.

The network provides a virtual machine to run applications from other developers to make it as extensible and as serviceable as possible.

4.7 The SEED network is designed to facilitate a healthy ecosystem of data and tokens between five categories of stakeholders.

There are five categories of stakeholders that the SEED network is designed to include:

- End-Users
- Deployers
- Developers
- Advertisers
- Analysts

These are defined in more detail on page 4 of this document as well as in the SEED White Paper.

For all purposes, end-users see CUIs and their deployments as interchangeable. For example, a CUI deployed by Nike, would be understood as an interface with the company. In this way, CUIs can enhance a company’s brand as well as its relationships with customers with an appropriate and custom personality to reflect brand values. To do this, however, CUIs must be distinct from the services they use (unlike common CUI services today). Instead of a CUI appearing as a third-party (like Alexa), a Nike CUI would appear to users as Nike.

Unlimited Layers

There is no technical reason that would prevent an unlimited number of CUI components and services to be used in the development and deployment of a CUI, occurring within many layers. For example, component developers may create and make available in the CUI store, CUI components and assemblies that include other developers’ CUI components. The SEED backlicensing system will keep track of these components and their licenses because any nesting is “flattened” when a new component is created, apportioning all licensing into one level, regardless of how many components are used. In this way, any CUI or component only has one set of licenses to transact, regardless of how many licenses are involved. In practice, we expect CUIs with under one hundred components. See the Licensing section for more detail.

Transaction Processing

To improve blockchain performance and scale, calculation and settling of all SEED accounts from CUI interactions (CUI component use and user data sharing) will be batched once per day. These will occur at a randomized time each day (to thwart potential gaming of the system).

Definitions:

AI: A host in the background of many (and growing) digital services use a range of engineering services and techniques to enhance their “understanding” or user requests and present a “natural,” conversational interface to these services. These technologies can include: machine learning, pattern recognition, speech recognition, voice synthesis, knowledgebases, neural networks, face recognition, gesture analysis, sentiment analysis, detailed evaluation of conversational data, etc. “AI” is not intended to mean an artificial “intelligence” in the human sense of the word (which is now referred to as “artificial general intelligence.”

Bot: A “bot” is a nickname for any digital service presenting a CUI (see below) to users of digital services.

CUI: Conversational User Interface: a software service that uses conversation al in any form, whether through writing, spoken words, or video avatars as the primary mechanism for interacting with a digital service of any kind. CUIs rely on a range of background digital services, classified as “AI.”

Deployer: Any individual or organization that offers a CUI interface or service under its own person, brand, or organization. These CUIs are understood by users as the entity represented by the CUI, regardless of who built, hosts, or administers it. Developers generate CUIs, often for developers. For example, Ferrari would be seen as the deployer for a CUI on its website or within its telephone response system even if the CUI was built by a different developer, hosted at an ISP, and managed by that or another developer.

Developer: Any person or company that creates components that could be used in a CUI or conversational user interface (CUI). These could include small components like personality templates, behavioral descriptions, or code or large components like fully functioning CUIs. Some developers may assemble and host CUIs for others (individual, governmental, or corporate developers) while others may assemble and complete CUIs for others to host. Classes of developers could include writers, authors, illustrators, artists, modelers, programmers, coders, writers, hosting services, management services, etc.

User: Any individual that interacts with a CUI-based service. Organizations interacting with CUIs (as opposed to deploying them can be users, as well). Users potentially generate content in the form of text, images, personal and affective data, etc. Users can, in addition, be or become developers should they post components to a SEED marketplace, as well as a SEED token as stake for that content.
SEED token, ratings, and data are exchanged between various pairs of stakeholders:

**SEED Ecosystem**

**Data Markets**

- **Developer 1**
  - “We create and may host CUIs for others.”

- **Analysts**
  - “We evaluate data trends and publish them. We pay for data and get paid for analysis.”

- **Developer 2**
  - “We create a variety of CUI components that others use in CUIs.”

- **Deployers**
  - “We deploy CUIs to provide services, for ourselves and others. We pay developers and get paid for services.”

- **Authors**
  - “I create assets for CUIs that could include text, imagery, animations, and personality elements.”

- **Advertisers**
  - “We pay to submit ranked content.”

**Social Media & External Data**

- **User 1**
  - “I trust CUIs and collect money in exchange for sharing most of my data.”

- **User 2**
  - “I use CUI services for free in exchange for sharing some of my data.”

- **User 3**
  - “I don’t want to share any data so I pay for CUI services”

Note: while user data is designed to be shared within the system, it is under the control of users. The system is designed so that users can set their own levels of private vs. public data, and for which kinds of services. The intent is to allow users to be rewarded for sharing only the data they are comfortable sharing.
4.8 Token Economics

Money Supply
The supply of SEED tokens is fixed at 10 Billion tokens (10,000,000,000) and will neither be increased by minting new tokens or decreased by “burning” or destroying them.

Token Velocity
By partnering with existing global CUI developers and introducing supporting customers, we intend to create an economy that grows symmetrically and with stability. Use of the system requires developers and deployers to buy and exchange SEED tokens. The purpose of making the token available on multiple exchanges is so that developers and deployers can easily gain access to tokens for their CUI development.

Once the CUI marketplaces are completed and delivered, a true market for the SEED token will exist. Seed Vault Ltd, the foundation overseeing the development and management of the platform, will calculate and suggest pricing for different kinds of components and licensing contracts but these will, ultimately, be under the control of the developers, deployers, and others within the system. With greater size of the ecosystem, through increase in number of users, developers, and CUIs, velocity will increase as more and more tokens are required to interact with more and more CUIs.

4.9 Licensing

Developers can set their own licensing terms when they upload components into the bot store. However, there are only three types of licenses allowed:

- **Free Use** (no SEED tokens for use)
- **Per Use Fee** (a set, fractional amount of SEED tokens for each use)
- **Unlimited One-Time Fee** (a one-time payment SEED with free continual use)

Note that only the second licensing type (Per Use Fee) requires tracking and remunerating SEED token to developers since most developers will look to the SEED platform to compensate their efforts in a way commensurate with the popularity of their use. We expect this to be the dominant option from developers. In the case of the Unlimited One-Time Fee, this payment will actually be handled off-chain, via the CUI store regardless of how many uses that component numbers (including no use at all).

In addition, from day one, Botanic (through Seed Vault Ltd.) will ‘seed’ the network with free to use IP and work to compensate existing open source CUI communities to do the same in order to grow the platform’s usefullness. The foundation will also fund development projects that further enhance the tools available to the community. One aim of this project is to create a platform with the best tools and the least barriers to CUI creation (in both engineering and business terms), for developers.

We plan to offer clear templates for setting licensing fees and types when developers upload components into the CUI store. In addition, based on models of current CUI creation and the number and kinds of components required, we will calculate and suggest starter prices for different kinds of components to help the market quickly get to a rational and equitable efficiency. As the platform grows, we may calculate new suggested prices in order to optimize the CUI economics, based on realtime performance data. However, developers are able to make whatever licensing decisions they prefer.
4.0 Introducing the SEED Token & Platform

SEED Stakeholders

<table>
<thead>
<tr>
<th>Stakeholder:</th>
<th>User</th>
<th>Deployer</th>
<th>Developer</th>
<th>Advertiser</th>
<th>Analyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>Users earn SEED in exchange for sharing data. Users rate Deployers (CUIs).</td>
<td>Deployers pay SEED to Users in exchange for Data</td>
<td>Developers get paid by Deployers for bots they’ve created or hosted. Developers rate Deployers (CUIs).</td>
<td>Advertisers are rated by Users.</td>
<td>Analysts pay SEED to Deployers in exchange for user data. Analysts may sell enhanced data back to Deployers.</td>
</tr>
<tr>
<td>Deployer</td>
<td></td>
<td>Note: Deployers (CUIs) may interact with other Deployers (CUIs).</td>
<td></td>
<td>Advertisers pay SEED to Deployers to place ads and to buy data.</td>
<td></td>
</tr>
<tr>
<td>Developer</td>
<td></td>
<td>Deployers pay SEED to Developers for CUI building, components, or hosting and rate them.</td>
<td>Developers pay other Developers for components (and rate them on the components they’ve used.</td>
<td></td>
<td>Analysts pay SEED to Developers in exchange for data. Analysts may sell enhanced data back to Developers.</td>
</tr>
<tr>
<td>Advertiser</td>
<td>Users rate Advertisers.</td>
<td>Deployers may share data with Advertisers in exchange for SEED. Advertisers pay to show ads within CUIs.</td>
<td>Developers may share data with Analysts or buy data from them.</td>
<td>Advertisers may buy data from Analysts.</td>
<td></td>
</tr>
<tr>
<td>Analyst</td>
<td></td>
<td></td>
<td>Developers may share data with Analysts in exchange for SEED.</td>
<td></td>
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</tr>
</tbody>
</table>

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When developer components contain components from other developers, these licensing fees are automatically included. In fact, all licensing fees, at any level within a component are automatically calculated and “flattened” at the time of upload. This means that any nesting of licenses are resolved into one level of varying weights, calculated on a per-use percentage. Note: non-payment (free and unlimited) components are included in the tracking of use even though they don’t encumber costs.

Once components are uploaded into the bot store, their licensing agreement can only be changed for future CUIs. Changes to per use fees are allowed but only for future use of those components. Current and past CUIs and components that use any component will continue to do so for the life of that component. Therefore, changes in fees or licensing terms don’t affect past CUI builds and interactions.

Staking
As discussed earlier in this document (section 1), developers must stake a nominal amount to SEED (to be determined later) in order to post components or data into the CUI store. In addition, any rating of developers, deployers, etc. also require a stake (described below). Forfeited stakes (for example, if a component is found to be in violation of its own or Seed Vault’s licensing terms), will go to Seed Vault for use toward further development of the platform.

4.10 Ratings & Reputation

Part of our solution for a healthy economy involves allowing developers, deployers, and other stakeholders to rate each others’ transactions. However, ratings always introduce dangers of nefarious use. To combat this and keep the economy as efficient as possible, we plan to use several kinds of ratings, simultaneously, including:

- Three "quality" ratings (1-5 stars, 5 being best): Function, Worth, and Quality
- Use Requirement (ratings are only accepted by raters who have not only purchased but used a component, except if the user is the same as the developer)
- Rater’s Rating (ratings from raters who are rated highly are weighted higher in rating calculations)

In the future, we may introduce other ratings or details, such as a mechanism to detect and deter “numbness” (when raters simple rate everything neutrally: 3), to prevent the downvoting of competitors, or other issues that might arise from “bad actors.” Evolution of the rating system will be driven by the Seed Vault foundation, with input and feedback from the SEED community, along with performance data on key community metrics. The foundation is responsible for developing and evolving a healthy community but listening to that community is a key part of those decisions.

As with the transactions of CUI interactions (and the remuneration of SEED tokens across all contributors), ratings will also only be calculated once per day (at a randomized time during the day), in order to thwart those who might “game” the ratings. However, these ratings are not on the blockchain so they will have no impact on processing speed.

The CUI store will include a function to report a “bad” CUI or component within the system. In the short term, Seed Vault will perform the reviewing these instances while it builds decentralized tools to fulfill this need. CUIs or components found to be in violation of its own or Seed Vault’s licensing terms will be deactivated in the CUI store and the SEED staked for it forfeited to Seed Vault. Violations can include: collecting user data without approval, including intellectual property belonging to others, behaving differently...
than claimed, etc. Developers sign a licensing agreement when uploading components to the CUI store that assure original content, IP ownership, etc. The foundation will, in further development, look to further decentralise this function.

The purpose of the SEED token and network is to create a thriving economy around CUI interactions, CUI for developers, deployers, and service providers, as well as for end-users who are the target for these services. This economy will function best when it is independent and all developers and users have access to it with low barriers and no prejudice.

### 4.11.1 Network Components

Our initial market is aimed at producers of CUIs, rather than consumers (end users), who have a number of things they need to upload (including data, metadata, code, tags, bundles, etc.) while at the same time mitigating spam, search, and scarcity issues. Upon initial deployment of the SEED Platform, everything hosted requires a set, minimal SEED value (cost) and, preferably, should have a corresponding reward for maintaining. This creates a first layer of friction for spam as it requires the person(s) responsible for any transaction or component to shoulder the burden of paying for the hosting. They may choose to bear this cost (as well as the fruits of any rewards) by themselves, or request or offer others the opportunity to help defer the cost in exchange for some agreed-upon return. These may be manually done, or automatically via pre-listed terms. This forms the basis for an economy on the network, using SEED as the medium.

Later, it will be possible for anyone to publish content and, when that content is used and rated, receive remuneration. This allows a broad and free distribution of the ecosystem for open availability and production.

Smart contracts are used to govern the terms or license, transfer, subscription, revenue sharing, and pledging to sponsor others. This includes a built-in mechanism for interfacing with external APIs so that external-to-the-system conditions may be used to trigger clauses.

Metadata, in the form of reviews, ratings, tags and counter-tags, flags, bounties for questions/issues, complementary and supplementary goods, redirects and other references require that the person posting has either authored or licensed the item and pays the cost to maintain it on the network. Like any other component costs, this could be borne by others, given specific situations. For example, if someone decides a review is worth keeping so that others might see its value, even if the original reviewer doesn’t want to continue to pay for it, they can sponsor the content and it will remain on the network. It also mediates malicious negative reviews and it creates a cost to mark something as “misleading or “unhelpful.”

Every item in the system can be leased, sold, exchanged, or referenced under the appropriate terms, including the blacklist/whitelist and reputation functions.
4.11.2 Processing

Processing of network transactions can take many forms. **The initial version of the SEED token will be deployed as ERC20 smart contracts on the public Ethereum network.** These will govern the transactions, value, and dispersal of resulting SEED. The data and co-data within the SEED Platform will be processed by SEED's private blockchain, keeping the many transactions required to track the licenses off the ETH public blockchain. **User data will never be placed on a public blockchain.** In the future, this may be outsourced to other services via APIs if the cost of transactions is less elsewhere. Likewise, this hybrid architecture allows SEED to move off ETH if the price to process transactions gets too high, there is overloaded capacity, need for privacy features, different encryption, etc. In considering a migration to a dedicated distributed ledger, we foresee that newer security models for distributed ledgers may mature and become better understood, and technologies, like Plasma and Polkadot, are proven in practice. These evolutions are a community process and will be engaged in democratic, open, and iterative dialogue with collaboration always ceding competition. This is one of the obvious projects that will be explored by SEED Vault, during development.

4.11.3 Storage

There are a variety of storage needs on the network, depending on the type of data, co-data, and CUI components. SEED will build on decentralized storage and processing technologies to allow participants to process trust ratings, marketplace indexes, meta-data, tags, and store running CUIs and clients. The SEED Foundation will initially provide server capacity for this in order to seed the community. In time, however, SEED will look to offload the storage and processing of these components to more efficient partners running the open protocols. The SEED Platform will include APIs for partner services. However, those posting data, code, and other components will eventually be responsible for paying for the storage of these elements (unless SEED decides to specifically sponsor some elements in order to promote them).

4.11.4 Marketplaces and Remuneration

The network is designed to support multiple, decentralized marketplaces for sharing and selling CUI components and execution frameworks. These are self-governed with their own terms-of-use, listings, etc. and even enable the forming of limited ventures for specific causes under the smart contract. This is in anticipation of new, incorporated or certified entities such as certified bots (as a CPA) or other unforeseen entities. Marketplaces can be created for any of these components including any node, branch, or tree of a user flow, personalities or any combination of personality components, characters composed of any combination of text, audio, visual or instructional characteristics, or fully-formed conversational avatars (made from all of these).

For example, a marketplace specifically focused on CUI appearance components could be built. In such a marketplace, there could be wholly constructed avatars (2D, 3D, video, animation, etc.) as well as the myriad components that make-up appearance. This marketplace could also contain customizable code for changing avatar genders, accessories, backgrounds, expressions, movements, and code to link them to external processing for AR, VR, celebrity voices, intonation algorithms, emotion simulations for facial expressions or vocal gestures, etc. We expect these marketplaces to become significantly large and diverse. Some marketplaces may focus on industry-specific components, such as
healthcare, built to interface with industry standard data, processing, storage, or security protocols. All of this is possible because the overall Botanic Technologies CUI Framework describes a flexible, extensive, and extensible space for CUI components.

The retrieval and serving of components necessitates a clear method of searching for, finding, and having access to manipulate assets such that a CUI may be published. This publishing may be commercial or not-for-profit, as the author determines, and as the use permissions of the assets allow. This implies the creation and development of a Bot Store and various tools and interfaces for authoring and using CUI.

The client application and IDE will include all of the core functionality for authoring, editing, and licensing CUIs. It will provide an asset repository for CUIs, a messaging function for collaboration, a list of deployments for debugging and monitoring, personal settings and a personal ID that includes the wallet and preferences for being paid.

Wherever possible and compatible with the SEED mission and vision, we look to use existing marketplace frameworks, such as Open Bazaar, or the above-illustrated derivative of Keybase, to meet the needs of CUI developers.

The bot store will be established to facilitate the searching, ranking, trading, selling and other exchanges of reputation, quality, and functional assets. An associated assets functionality will enable the management and specific configurations related to licensing and sub-licensing. Markets can be built with a variety of “discovery” functions, depending on the needs of particular components or a specific community, including search interfaces, browse interfaces, collaborative filters, paid and unpaid promotion, and ranking scoreboards of a variety of attributes (popularity, sales, ratings, history, updates, etc.). These might be centralized or not, controlled by the market owner or by the buyers and sellers in the market. SEED’s network will index CUI components and other items that belong in specific channels in order to enhance their discoverability. The store also allows the creation and management of, and connecting to, SEED wallets.

4.11.5 Reputation and Trust

In an open, peer-to-peer network, the issues of quality control, mistagging and misrepresentation, malicious behavior, spam, inappropriate content, and coordinated attacks must be managed. The most effective method for this is to align incentives so that the natural gravity of the system pulls towards good behavior. Quality control is partially instilled through type-checking of the data being uploaded to the network, and partly through reviews from people who have verifiably licensed content, as well as through flagging. These reviews and ‘flags’ can also be counter-flagged, and so on, with increasingly escalating costs to deter spammers.

Developers can tag their own components, and can receive SEED “revenue” from others who tag those components. Likewise, some number of first taggers might receive shares of revenue flowing from purchases, though anyone who tag something in error (as determined from flagging by others who have successfully applied that tag enough, as reinforcement) may have to cede the “bond” they put-up to create the tag in the first place. Mis-flagging, itself, could be costly (and could be meta-flagged). Therefore, flagging becomes the equivalent of putting-up a bond that is a multiple of the cost of tagging in the first place.
4.0 Introducing the SEED Token & Platform

Curated white- and black-lists are also algebraic data types buyable and sellable on the data markets, allowing further workarounds in the case of abuse by wealthy or coordinated attackers. Reputation score filters, are freely exchangeable and user-configurable. Since all meta-data has a maintenance cost, in order to prevent valuable metadata from fading away, users can mark a review or flag as helpful—essentially pledging to help pay the maintenance fee and allowing the cost to be defrayed. Meta-data networks can be run independently, but we will provide an initial protocol and indexing services, and maintain a blacklist of content and users that will be distributed with the default client, and a method for calculating reputation scores from the available metadata. Should an individual decide to, they may bypass this and use their own, but at their own risk. Although a default will be provided to protect the average user, power users will always be able to use a client that does not implement said filters.

4.12 Security

Risks must be mitigated continuously, regardless of the details or methods of attacks and this will be some of the future activities of Seed Vault, Ltd. Some will include:

- The network becomes centralized because a handful of large parties increasingly gain disproportionate control (mitigation: design cryptoeconomics so that decentralisation is encouraged, make governance structure highly decentralised, encourage adoption by many distinct parties)
- Privacy controls are breached such that the network can’t live up to its privacy guarantees (mitigation: sound technical architecture and cryptography, data storage strategy with sharding)
4.13 SEED Greenhouse Application

There will be two main interfaces to the SEED token on the SEED wallet, represented in two different applications:

- SEED Greenhouse
- SEED Wallet

The SEED Greenhouse distributed application will be a complete developer environment that allows CUI developers, deployers, and authors to upload components to marketplaces, set licensing terms, rate components and developers, connect CUIs to third-party services (such as natural language processing or other AI services), activate and deactivate CUIs, and collect and transfer SEED tokens. SEED Greenhouse will also include social media functions (such as chat) to support the developer community.

4.14 SEED Wallet Application

The SEED Wallet application is much smaller and meant only for end users to access SEED token collection and transfer. It will allow users to connect to SEED-compatible services, view their balance, and transfer SEED to SEED-compatible exchanges.
4.15.1 Use Case: Buying and Selling CUI Data

Jason is a bot developer, working on building the use flow for his company, an insurance provider in the commercial real estate market. This is a large, complex use flow that integrates real estate law with insurance prediction models and appropriately social interfaces. In the bot store, he's found a use flow for a real estate insurance case and licensed it as a template to build on top of. He's customized the use flow for the commercial space and integrated it with his company's API to their proprietary prediction system. He's also found a set of use flows for basic social responses (greetings, escalation, etc.) and licensed these to integrate into his CUI. He must add use flows for some major clients with specific needs, but he's considerably further than if he had to start from scratch. He's also more confident in the sections he's built, since they came from highly-rated sources.

His CUI also connects to a language translation interface he found in the bot store to handle the many customers his firm has in Mexico and Quebec. While he doesn't need a visual appearance for this CUI, it's specified to speak to customers so he's able to find a variety of voices that fit his company's customers, brand, and needs. The voice-to-blockchain functionality automatically available from the SEED network allows his CUI to take direction and complete actions with agency and go beyond the simple advice chatbots that their competitors have deployed.

The developers of the components Jason has assembled his CUI from are automatically compensated for their uploads according to the prices and licensing terms they specified. Jason likes one component so much that he leaves a glowing review about the ease of integration and his company is charged a small amount to host the review.

4.15.2 Use Case: Customer Service

Tran just got home to discover the new flat panel television she just purchased from Luscious Electronics has been delivered via UPS but the box is pretty dented and when she opens it, sure enough, there's a crack on the corner of the screen. She's disappointed but, "these things happen," and she calls Luscious customer service. Luscious' automated voice system answers and asks her how it can help. She describes the problem and through keyword identification the customer service bot identifies her account, with all of the associated purchase and tracking data, and, because it is authenticated, has rights to log the problem.

The conversation is pretty easy and the system authorizes a return as well as starts the process for delivering another one. In this case, UPS will not only deliver the replacement but pick-up the broken one. A specific note within the instructions tells the UPS driver that there was a problem the first time. This is all possible because Luscious' service CUI is authenticated, during the transaction, on UPS' system (and to a service CUI on its side). Both CUIs are verified via the SEED Network since they share the same protocols.

This creates an outline for the decentralization of AI via conversation markets as well as enables participation by smaller developers within an industry increasingly dominated by large corporations.
4.0 Introducing the SEED Token & Platform

4.15.3 Use Case: Branded Personality CUI

Di-an is finally able to plan a vacation for her, her husband, and her young daughter. She’s never been to Australia but she and her husband have always discussed it. She wants this trip to be special, as it’s the first one in several years, so she wants to be sure it’s fun and anything but ordinary. She’s always admired the Virgin brand and she knows that Virgin flies out of Shenzhen, where she lives. She has no idea what to do in Australia but she doesn’t want to do the same things her friends have done on their trips (none of whom have traveled to Australia).

When she gets to the Virgin Australia website, it automatically serves her pages in Chinese, seeing her IP address (as well as English, just in case). However, the text and images are immediately funny, interesting, and exotic. A pop-up message with a character named Veronica gets her attention by winking with a short whistle. She clicks on it and it launches a conversational character that is just enough respectful, just enough sassy, and even more hip than the students who hang-out at the nearby mall. It asks her about her dream trip and suggests a flight to Brisbane for a few days and then on to Alice Springs for a memorable family trip. It asks her many questions, remembering and referring later to her answers all with an easy, fun personality. It’s everything she has come to expect from Virgin from their television ads—and more (easier to use, more informative, more personable, and more customized)!

Before she knows it, she’s booked an affordable, unique trip, complete with lodgings, flights, and a tour package of Alice Springs as if she’s been talking to her younger sister—is her sister were a travel agent. For once, she feels like the one “in the know” (as opposed to her sister always being “up” on the latest trends). The itinerary, preferences, and even transactions are all handled within the conversation and she quickly receives a notice on her phone with links to all of the details, as well as introductions to other Virgin CUIs to help her once they arrive in Australia. She feels an excitement she knows she wouldn’t have felt if she were flying China Airlines and feels like this is the right trip for her family, as opposed to something more utilitarian that she’s sure she would have been suggested to her by a travel agent or customer service agent at any of the other airlines serving Shenzhen.
5.0 Seed Vault Limited

Seed Vault Ltd.

Seed Vault Limited™ is a “company limited by guarantee” (similar to a not-for-profit), based in Singapore, dedicated to transparently supporting and extending these CUI protocols, tools, and marketplaces via the SEED digital token and its communities of developers and partner companies. Seed Vault Ltd. purposely has this structure so that the SEED token and platform can be resistant to offers of purchasing the technology and platform by a for-profit company in order to control the network, protocols, tokens, or CUI communications. In this way, we’re committing the foundation to a focus on transparency, openness, and value creation for all who own and use SEED.

5.1 Seed Vault Activities

In addition to creating the SEED token and platform, Seed Vault Ltd. provides current development tools, patents, and other intellectual property and will fund the creation of more development tools, research efforts, and data model development as well as import/export capabilities to enrich the CUI development community and the SEED protocol. These tools allow for the creation, editing, and management of CUIs and the open nature of the network allows any developer to be remunerated for the reuse of their work. These activities include the sponsoring of competitions to develop such tools, the creation of specialized networks to run them on, the creation of input/output tools and APIs to other knowledge bases, and excellent examples of these technologies. It will hold open-source licenses to patents and source code for tools and critical technology from Botanic Technologies (and potentially others). This IP is for use by the SEED community (and beyond). Seed Vault Limited also establishes new partnerships that enhance these tools, the network, and SEED value and democratizing access and deployment of these technologies.

5.2 Seed Vault Structure

Seed Vault Limited is governed, currently, by a board of six trustees, plus the executive director, who oversee its mission.

Board of Trustees: 6 Elected trustees (plus the Executive Director)
The board will have the authority to appoint the Executive Director, set executive compensation, and elect replacement trustees. Trustees will serve for 3-year appointments, which can be repeated, on a staggered three-year cycle (no more than 2 trustees are up for appointment in any year). This ensures some continuity within the board. When the network and marketplaces are active, new trustees will be nominated by the board and voted upon by the SEED community via proof-of-stake. SEED token holders will be able to vote in relation to their SEED holdings (similar to shares in a company). Until the platform is complete, trustees will be appointed by Seed Vault Ltd. Some of the current trustees include:

- Mark Stephen Meadows, co-founder and trustee
- Michelle Katz, co-founder and trustee
- John Porter, trustee
- Danit Gal, trustee

The rest of the trustees will be appointed before any token generation event.
Seed Vault Employees: The Executive Director and other Seed Vault employees will be responsible for developing and growing the SEED Community, including the token, network, and marketplaces development, as well as its policies. The day-to-day functioning of the foundation and community is under the control of these employees.

SEED Community: all token-holders are members of the SEED community. As such, they will vote for new trustees. In the future, they may be given the power to vote for significant development projects or policy changes. A voting system based on proof-of-stake token holdings will be created by the foundation to make this possible.

For more details on the SEED community governance, please contact SEED through its website: seedtoken.io

The intent is to increase the influence of the SEED community (token holders) as the technology is developed. Our intent once the platform has shipped, is to implement a structure of governance that includes annual community reports and elections of trustees by token-holders. New trustees will bring more specialized experience in security, ethics, law, and CUI development.
5.3 The SEED Product Roadmap

Once funded, Seed Vault Ltd. will complete the token development and roll-out, the network development and roll-out (both alpha and beta versions), the bot store marketplace, as well as several other projects designed to establish the necessary tools for SEED to succeed as well as enhanced tools for CUI developers to use to create better and more sophisticated CUIs, more quickly:

Following funding, Seed Vault Ltd will:

Month 1:
• Make pledged IP available as open-source (both source code and patents)

Months 4-6:
• Release beta of Bot Store marketplaces for all CUI components
• Release implementation of SEED Platform

Months 7-9:
• Release final release of Bot Store marketplaces
• Promote CUI marketplaces and tools to developers
• Sponsor challenges (contests) for the creation of other CUI tools and enhancements to the network, marketplaces, and community

Phase 1: Develop Technologies

June:
• Launch SEED Token & blockchain demo
• Launch blockchain remuneration visualizer
• Upload code for standards initiatives to GitHub: (.BOT, .FLOW, ACTR, & Hadron)

July:
• Engage bot communities in co-developing standards (.BOT, .FLOW, ACTR, & Hadron)
• Audit SEED smart contracts
• Enhance SEED Token & blockchain demo with new functionality
• Launch SEED Wallet

Phase 2: Develop Platform

Transfer & release middleware, tool, and patent IP
• Development & integration of SEED Greenhouse
• Develop community tools

Phase 3: Growth

Developer & service provider preview
• Beta testing of Greenhouse
• Data privacy integration in SEED Wallet

Launch GreenHouse marketplace (Bot Store)
• Begin 2nd generation middleware evolution

Partner with developers to launch additional stores and services
• Sponsor further tool & IP development

(Q1 2018)

(Q2 2019)

(Q3 2018)
5.0 Seed Vault Token Generation Event

5.4 SEED Intellectual Property

In addition to the SEED token, itself, the SEED Platform includes an open-source license from Botanic Technologies to Seed Vault Ltd. for CUI-related frameworks, patents, source code, content and other IP. These resources are critical to the creation of a successful CUI community and Botanic Technologies has elected to make these available under a perpetual Creative Commons license for use by developers and users of the SEED token and platform. This includes Botanic’s patent covering voice-to-blockchain bridges. This ensures the maximum amount of value for the SEED community as well as demonstrates Seed Vault’s commitment to enabling the SEED-based CUI community. Other IP includes:

**Patents:**
- Systems For Executing Cryptographically Secure Transactions Using Voice And Natural Language Processing (Filed March 25, 2015)
- Methods for Developing A Bot-Sourced Knowledgebank Via Social Expert-Learner Interaction (Filed 2017)
- Systems for Securing Conversations Via Authenticated Bot And Dual-Key Encryption (Filed July 22, 2017)
- Autonomous Bot Personality Generation And Relationship Management (#125128-8006)
- Systems and Methods For Vetting And Authenticating The Identity Of An Avatar (#9,253,183 B2)
- Systems And Methods For An Autonomous Avatar Driver (#11960507)
- Systems And Methods For Managing a Persistent Virtual Avatar With Migrational Ability (Filed November 11 2014)

**Source Code:**
- Middleware source & API adapters
- 4 clients source (including Skype, Signal, Messenger, Slack, Kik, etc. and others for iOS and Android)
- 3 servers source
- Authoring tools source
- 3 ACTR animation libraries (M,F,N of humanoid proportions)
- 2 ACTR animation libraries (M,F,N5665 of humanoid proportions)
- 5 personality templates

More details on this IP will be posted in the coming months.

5.5 The SEED Token Generation Event

The SEED token generation event will commence when market conditions allow for a duration of approximately 21 days. During this time, SEED tokens, will be available through partner exchanges. Details of the sale structure will be posted to the seedtoken.io website well in advance of the sale.
In this paper, we’ve described a plan to create an open, global, and trusted peer-to-peer architecture for creating, distributing, sharing, and licensing CUIs (including chatbots, assistants, conversational avatars, and personalities). CUIs are critical to the next wave of computing systems and will drive more users interacting in completely new ways—in every industry. We’ve already put this plan into action, by creating Seed Vault to oversee the development and deployment of the SEED token, SEED Network, and the open-sourced IP from Botanic Technologies and other partners.

We do this in order to create a community of CUI developers, users, and interactors that will quickly evolve the use and deployment of CUIs that are secure, social, and effective throughout a large number of industries and to serve a great number of people in the world. We believe we’ve solved the most pressing challenges to bot creation and that the token and network, described above, namely:

- Clear ownership and control of CUIs we interact with
- Control over how public or private our data is
- An ecosystem to facilitate new jobs and licensing of human knowledge

SEED can build a sustainable mechanism for people to be compensated for the information they own, what they choose to share with others, as well as provide interesting and creative work avenues interoperable with the bots of the future.

Simply stated, SEED creates an equitable exchange between people and the emerging future of AI.