HUMAN Protocol Lightpaper

Version 1.2 DRAFT
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HUMAN Protocol is designed to enable the creation of distributed marketplaces for tasks across a global network, harnessing human reasoning, skills and knowledge to provide the foundation for decentralized data science.

The Basics

HUMAN Protocol is an open source protocol that powers a marketplace using cryptocurrency.

Nodes running HUMAN Protocol form the HUMAN Network, where the native medium of exchange is HMT.

Together, these components form the basis for applying decentralized machine learning to some of humanity's most important problems.

In HUMAN Protocol, there are two main users: (i) Requesters of work who pay a fee in HMT to launch jobs on the blockchain (humans or machines) and (ii) workers who are compensated in HMT for responding to and completing those jobs (typically humans).

Requesters of Work - launch new bounties on the blockchain, specifying their question and the prescribed tasks.
Workers - individuals who perform tasks.

HUMAN Exchanges maintain an order book of job requests & match labor with demand. Exchanges pick up jobs, manage bidding, and serve tasks to workers.
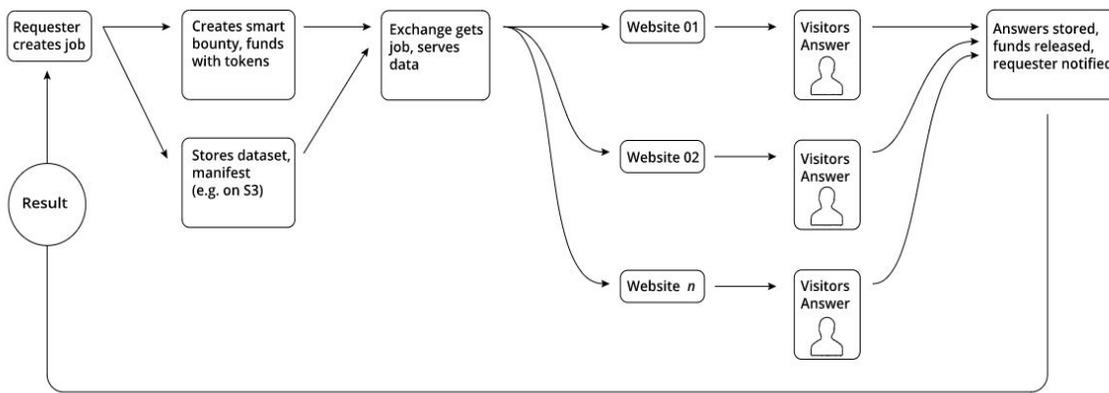
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Key Information

On platforms, such as Reddit and Quora, millions of humans participate in the asking and answering of questions. HUMAN Protocol seeks to facilitate an open source, decentralized market for the asking and answering of questions. It is built using blockchain technology in order to facilitate the organization and compensation of this work. Smart contracts ensure fairness, more efficient transactions, and allow participants to be confident all parties will meet their obligations.

A blockchain is a specific implementation of a database, where data can only be added, and it is very difficult for data to be changed. Each entry is linked to the last entry through a digital fingerprint, where each block points to the last block, creating a chain.

Blockchains are distributed systems composed of a network of nodes. Any computer or device that connects to a protocol may be considered a node in that they transmit information about transactions and blocks of the protocol within the protocol's distributed network of computers. This makes it possible for a blockchain to facilitate a decentralized, peer-to-peer digital currency. By design, transactions recorded on a blockchain do not require a middle-man to transact from user to user, even internationally.

HUMAN Protocol contains built-in fee settlement via smart contracts to ensure that tasks are served, completed, and compensated reliably and fairly, preventing collusion and other kinds of attacks.

> *A **smart contract** is an application or program that runs on a blockchain - typically a digital agreement which is enforced by a specific set of rules. The rules are predefined and replicated across all nodes within the network. This allows for "trustless protocols" - meaning that two parties can make commitments, such as paying for a unit of work, without having to know or trust each other. If the conditions are fulfilled, the contract is executed. If the conditions are not fulfilled, the contract is not executed. The use of smart contracts removes the need for intermediaries, reduces operational costs, and ensures that transactions are completed as anticipated by participants. The contract cannot be changed once it has been deployed — smart contracts are, therefore, tamper-proof.*

HUMAN Protocol market capacity and pricing is facilitated through open markets that anyone can participate in.

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A Hybrid Approach: The 3 Oracles

Blockchains and smart contracts cannot in themselves access data outside the network, or **"off-chain"** data.

Blockchain oracles provide a link between off-chain and on-chain data. Oracles are third-party services that form bridges between information stored blockchains and information produced in the outside world. They can not only relay information to the smart contract, but can also send data back to external sources.

An oracle is not the data source itself — it is the layer that queries, verifies, and authenticates external data sources and relays that information to the smart contract. For HUMAN Protocol to function, it is essential to provide information from the outside (off-chain) world to execute an on-chain agreement.

HUMAN Protocol has three core actors.

- The <u>Exchange</u> — The Exchange is the interface that asks questions of a human, or breaks down questions into smaller pieces - it is the user interface workers interact with to provide a response to a Requester's question.
- The <u>Recording Oracle</u> — Recording Oracles collect answers and provide a rolling evaluation of answer quality. Recording Oracles then pass their data ("intermediate results") to Reputation Oracles.
- The <u>Reputation Oracle</u> — Reputation Oracles oversee the full job and have access to the comprehensive dataset from a Requester of Work. Reputation Oracles make the final evaluation of answer quality and reputation score for a job, taking advantage of hidden data from the Requester in order to prevent collusion, and pay out bounties based on their analysis.

Timely, Reliable, Global Contracts & Payments

After a worker completes a Requester's task, the Reputation Oracle makes the final determination of answer quality and the reputation score for the job (including both the task and worker. The smart contract is completed, the worker is paid from the fees provided by the Requester, and the requester receives their results.

Pursuant to all applicable regulations, Human Protocol transactions can be made across the globe, and will generally be executed within seconds at a fraction of the cost of an international wire transfer, and with reliable fidelity to the terms of the contract — this ensures timely, reliable, global payments for work performed.

HUMAN Protocol thus facilitates a global marketplace for active machine learning task completion and settlement around the world.

Practical Applications

Practical applications map cleanly onto HUMAN Protocol: The protocol defines standard job types that serve as building blocks for a multitude of tasks — anyone [holding HMT] can publish a new job type.

For example, consider an area of active research and technology development today, **factored cognition** — decomposing complicated work into simple components.

Applications using factored cognition can offer a high level job type ("scan a page") and then factor this into smaller tasks ("type in these letters or numbers").

The Protocol infrastructure provides the building blocks to enable fully automated factored cognition at scale, allowing Exchanges to publish high level job types that they may then decompose into simpler tasks.

The Platform Pipeline

Network Utility, Capacity and HMT

The utility of the HUMAN Network is in part proportional to the amount of work capacity available to users at affordable prices.

For example, many thousands of publishers sign up each month on hCaptcha.com, the first node on the HUMAN Network. The annotation capacity they provide is then made available through a HUMAN Exchange that can accept on-chain jobs in the form of Smart Bounties. This Exchange manages bidding on the types of tasks offered for purchase.

However, hCaptcha is simply the first HUMAN Exchange. The types of tasks are ultimately limited only by the imagination of Exchange operators.

Job requests can be made and suppliers of answers can then be paid directly in HMT. The design of the HUMAN Network means that every transaction is conducted using HMT.

As volume across the network increases, the volume of tokens tied up in transactions becomes larger and larger. Because smart bounties may be long-lived, tokens are locked up in proportion to use of the network.

Finally, external payment cycles may be much longer than internal payment cycles in some cases. This means that large amounts of HMT may be locked up on e.g. a quarterly cycle, as is

the case with the hCaptcha Exchange, where an interim step occurs prior to final settlement. For example, a side chain could make final terms quarterly on a 60 day trailing basis.

Network Launch

With the launch of the mainnet, the HUMAN Network will become a vast permissionless system allowing people around the world to offer or gain access to labor.

At launch, it is expected that jobs will immediately be available, and workers will be able to complete those jobs and be compensated in HMT.

This will advance civilization in many ways, including through the unprecedented artificial intelligence training capabilities of the network, which will continue to expand and which are much larger than these initial applications.

In short, at launch, it is expected that HMT holders can spend HMT to schedule jobs on participating HUMAN Exchanges, including participating publishers on hCaptcha. Over the last year, hCaptcha has run at scale on a 'test' network, and has already had many requests for this permissionless, self-serve approach.

For purposes of comparison, the HUMAN Network executed more tasks and transfers of value on the testnet in 2020 than MakerDAO has executed in the past five years.

Staking

In simple terms, **staking** typically means that you are holding tokens to verify transactions and support the network. Those who stake tokens are often compensated for this work.

There are several categories of staking on the network — we address each, briefly, below:

Proof of Balance & Value - Priority

A synthesis of wallet balance and total value of past transactions helps to determine priority

Data Labeling Workers: The current HMT balance of the task receiver's ETH address helps determine their priority level for tasks served to them from the Exchange Order Book. Higher balances of HMT have higher priority as the Exchange selects which job tasks to distribute.

- Example: If worker A has 400 HMT in their wallet and worker B has 50 HMT, worker A gets first pick of jobs if A and B are otherwise similar.

Job Requests: On the other side of the transactions, Proof of Balance is designed to prioritize equal bids from Requesters in the Order Book on the basis of balance of HMT held by the requester's address.

- Example: If two requests offer 3 HMT for a job, and requestor A's wallet has 2000 HMT while requestor B's wallet holds 10,000 HMT, requestor B's job will take priority.

Participation Staking & Protecting Network Content

Some use of the HUMAN network may require not only payment in HMT, but also an additional amount of HMT that is staked depending on the job size, complexity and features.

Jobs may have different tiers of fees based on the job's risk profile, value, and features (for example, fees may be higher to request labeling and tagging for tasks such as filtering out 'adult' content for search results) where staked HMT are required to request or complete a job.

This staked participation is one of the safeguards that can help to ensure the requester will not leverage the network to launch anything not approved by the recipient Exchange (for example, to label images containing inappropriate content to an Exchange that has banned this kind of content).

A Reputation Agent can also be nominated in smart bounties if required by an Exchange, and is responsible for performing validation of input data and maintaining its own stake in HMT for the duration of a job in order to align its incentives in case it is determined to have failed at its job.