Bitpost Whitepaper v1.0

1. Introduction

Bitpost is a fully decentralized system for global parcel delivery. It relies on unaffiliated individuals and businesses providing services in their local areas, such as transporting parcels with their own vehicles, running sorting hubs in their own facilities, or hosting parcel lockers on their own properties. The Bitpost decentralized application (dApp) incentivizes network participants for their honest work and penalizes behavior that violates the protocol, allowing unfamiliar parties to securely exchange parcels entrusted by customers in a trustless environment. By utilizing blockchain technology, smart contracts, and peer-to-peer communication, the system operates independently of any legal entity or centralized technical infrastructure, making it resistant to control or shutdown attempts.

2. Motivations

The Bitpost project was conceived to address the numerous inconveniences associated with traditional shipping companies that hinder the growth of the e-commerce sector. Below are some of the key issues associated with conventional delivery:

1. Long delivery times

Traditional delivery services rely on centralized sorting facilities, where packages are typically processed only once a day. Coupled with limited human resources, limited infrastructure and restricted business hours, customers experience long waiting periods for their deliveries. Same-day delivery is still in its infancy and remains an expensive service, often available only in large urban areas.

In today's fast-paced digital economy, consumers expect prompt delivery as a standard service. Bitpost addresses this demand by leveraging a community-driven logistics network organized in a mesh topology, where instead of relying on a central facility, sorting hubs exchange shipments with their neighbors. The network can dynamically scale, and where the shipment volume increases, drivers can earn more, attracting new participants and increasing the frequency of transport between hubs.
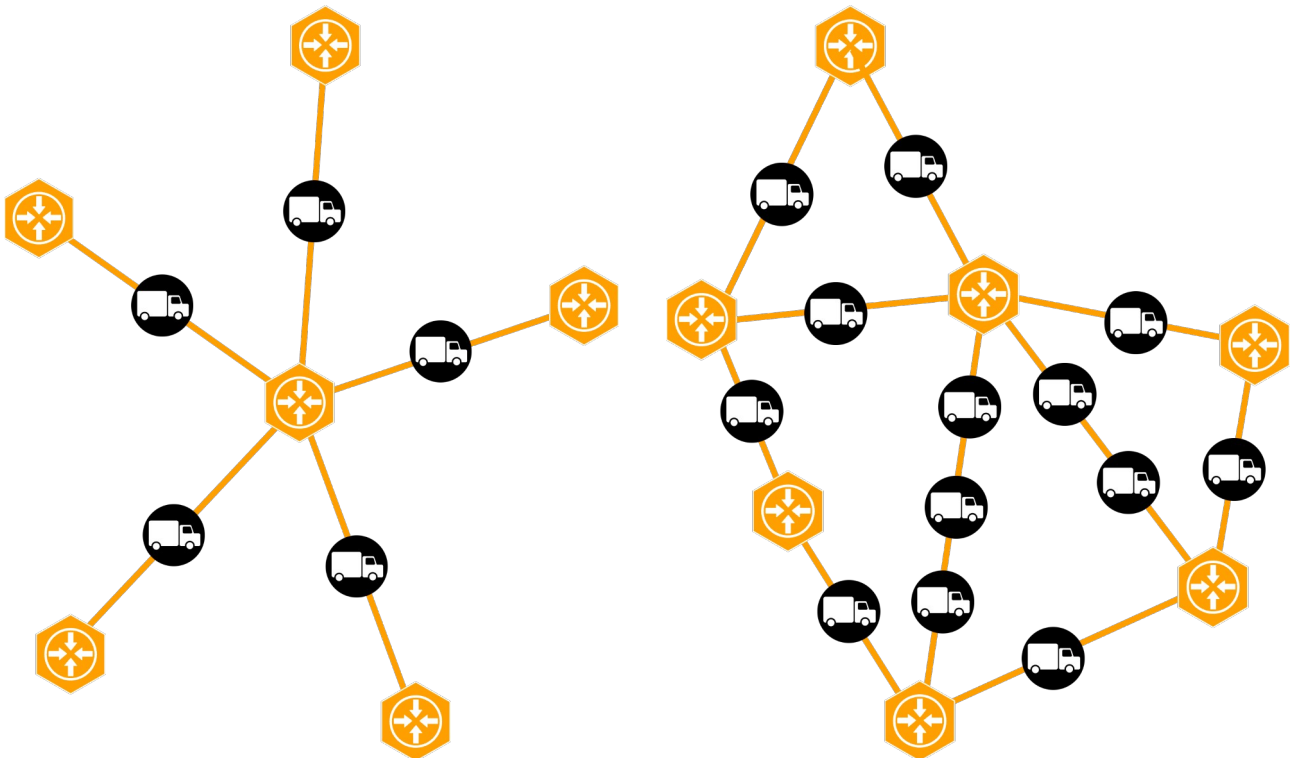
A hierarchical logistics network of a typical delivery company. At the end of each business day, couriers bring all shipments to the central sorting facility.

The decentralized Bitpost network. Couriers move shipments between closely located hubs, enabling more frequent transports.

Each participant works on their own behalf, free from traditional employment restrictions, which provides the flexibility to choose their working hours, including the option to work during holidays and at night. Members who work when most are off, take on the entire network load, allowing them to earn more than usual. This incentivizes working during unconventional days and hours, keeping the Bitpost network active all the time. By utilizing this innovative approaches, Bitpost has the potential to become the fastest delivery service in the world, as building a vast community can reduce delivery times to just the time it takes to physically traverse the route between the sender and the recipient.

2. High costs

Traditional delivery companies face high operational costs associated with running large corporations, which significantly impact the prices of their services. These costs arise from multiple sources, such as maintaining a large fleet of vehicles, investing in real estate for logistic centers, offices and pickup points, administrative expenses, accounting, taxes, insurances, and marketing initiatives. Additionally, the market is dominated by a few major players, resulting in limited competition.

Bitpost offers a revolutionary solution by harnessing the existing resources of its community, including buildings and vehicles that are already owned and utilized for other purposes. As a decentralized organization rather than a traditional company, Bitpost incurs no administrative costs. Consequently, 100% of the fees paid by customers for shipping are distributed among the project's community—specifically, the actual service providers and token holders.

Moreover, Bitpost does not have any fixed price for sending a parcel. Instead it operates on a flexible, market-driven pricing model. Customers propose a fee, and drivers choose to accept only the jobs they find profitable. This decentralized approach creates a competitive environment within the network. A job rejected by one driver due to insufficient compensation might be accepted by another driver who has a more fuel-efficient vehicle or is already heading in the direction of the delivery, allowing them to take the order by the way, as part of existing route. This internal competition encourages continuous cost optimization among service providers. Couriers are motivated to discover more efficient methods for completing deliveries, ensuring that the Bitpost network remains both affordable and highly responsive to the dynamic needs of its users.

3. Dependence on traditional financial system

Reliance on banking system and government-controlled currencies hinders the adoption of new Web3 technologies. This dependence can already be eliminated in many areas of online business by utilizing cryptocurrencies for customer payments and supplier settlements. Despite these advancements, current delivery and logistics processes remain heavily formalized and reliant on the traditional financial system. The lack of decentralized solutions in this sector leads to the Web3 revolution completely bypassing industries that deal with physical goods, focusing only on virtual assets.

The emergence of a fully decentralized, Web3-compatible logistics system opens up numerous new possibilities for individuals, businesses and decentralized projects. Bitpost completely eliminates dependence on the banking system from all e-commerce processed, from payment to order delivery. Unbanked people will gain access to the global market, allowing them to engage in small-scale trading or sell handmade goods. Previously unattainable models, such as decentralized marketplaces, storage, rental services, and cryptocurrency loans secured by physical items, will be able to thrive.

Third-party smart contracts can interact with Bitpost's smart contracts to manage shipments, monitor their status, and take automated actions. For instance, they can release funds to the specified wallet upon delivery of the package to the customer is confirmed.

4. Transparency and trust

Customers must place trust in centralized entities to handle their parcels securely and efficiently. This can lead to issues such as delayed deliveries, lost parcels or inaccurate tracking information. The resolution of complaints often relies on the judgment of the single individual handling the case.

The architecture of the Bitpost network is designed to ensure that any delays experienced by one participant can be immediately mitigated by other participants. Compensation for lost or damaged parcels is guaranteed by a security deposit locked in a smart contract by the party currently handling the package. This contract outlines clear conditions and timelines for releasing funds to the affected customer. Each member of the Bitpost network is motivated to safeguard the parcels entrusted to them, as their capital is at stake. The status of a shipment is an immutable record on the blockchain, automatically generated during the handoff and confirmed by cryptographic signatures from both parties, making it impossible to be manipulated or faked in any way. Through these mechanisms, Bitpost fosters a transparent and trustworthy logistics environment, ensuring that customers can rely on the integrity of the service.

5. Privacy protection

Traditional delivery companies collect information about every shipment they handle, and store it for many years on their servers, including sensitive data such as all senders and recipients addresses. This practice increases the risk of data breaches,

and sharing this data with government entities can expose the purchasing habits of all citizens, posing a significant threat of total surveillance.

Bitpost places the highest emphasis on privacy protection. None of the system's components collect or verify even the most basic personal data of customers or network participants. Rather than relying on government-issued IDs, users are identified solely by the cryptographic keys associated with their connected wallets. The sender's and recipient's addresses are shared only with the couriers responsible for collecting and delivering the package and are promptly deleted after the service is completed.

2. Network architecture

The Bitpost network is open for everyone, enabling participants from around the world to build logistics infrastructure in areas where they live, thereby expanding service reach to new locations until it covers the entire globe. Anyone can join the Bitpost community and start providing any of the services listed below within minutes of registering in the app, without any agreements or formalities.

1. Hubs

Hubs are physical facilities for sorting and exchanging parcels. Operating a hub involves scanning shipments dropped off by couriers, sorting them into separate stacks based on the next destination on the route, and handing them over to the couriers who arrive for pickup. While there are no restrictions and hubs can even be established in private homes by individuals, it is advisable to set them up by existing businesses, ideally those operating 24/7 or with extended hours, such as gas stations, hotels, etc., as they typically already have the necessary space, equipment, and staff in place.


The symbol of Bitpost hub used in official software and documentation.

2. Drivers

Bitpost drivers receive real-time notifications about available transport orders within their designated area. Each driver is free to accept assignments that suit their preferences and availability. They have full autonomy, with no contractual obligations or fixed schedules. This flexible approach enables drivers to seamlessly integrate Bitpost assignments into their daily activities while maintaining control over their workload. Bitpost drivers register their coverage areas and routes in a public registry, enabling efficient route planning and matching of transport needs with available drivers:

- **Coverage**

  Drivers define a circular zone with a minimum radius of 1 km where they wish to pick up packages from senders and deliver them to recipients. These zones enable the entire system to determine whether any services can be carried out in a given area and how many drivers are available.
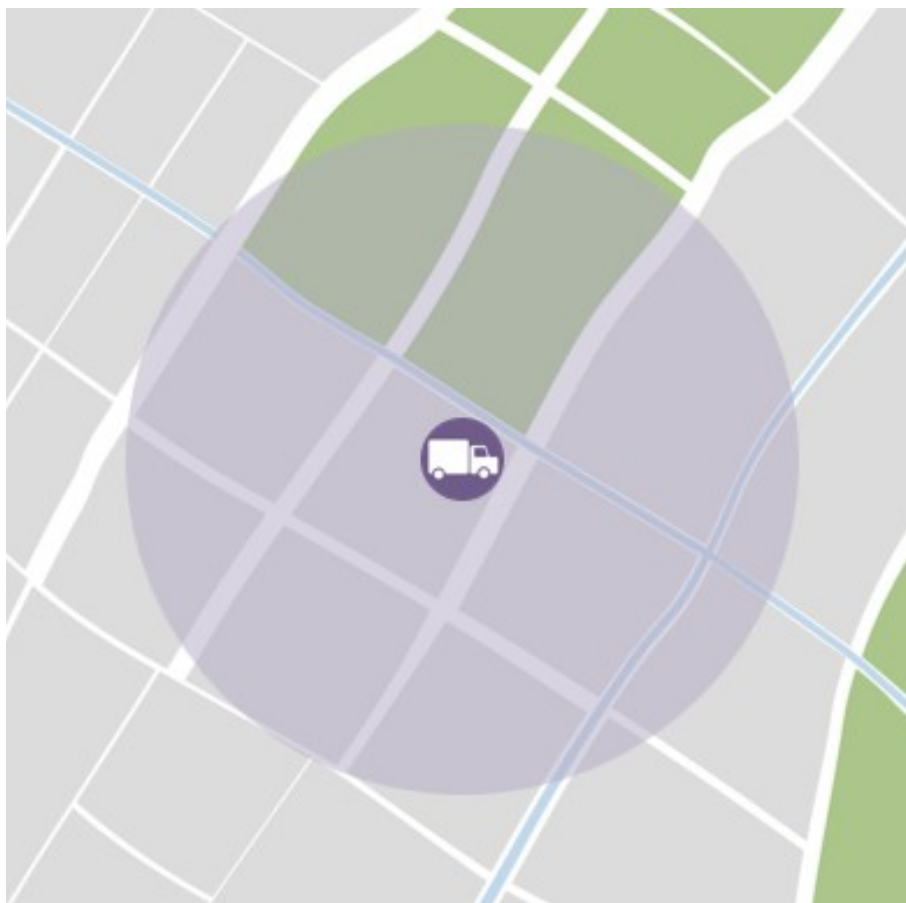
- **Connections**

  Drivers can also declare routes they wish to serve between hubs and parcel lockers, facilitating the movement of shipments between key distribution points. The overview of available connections is crucial for the shipment routing process.
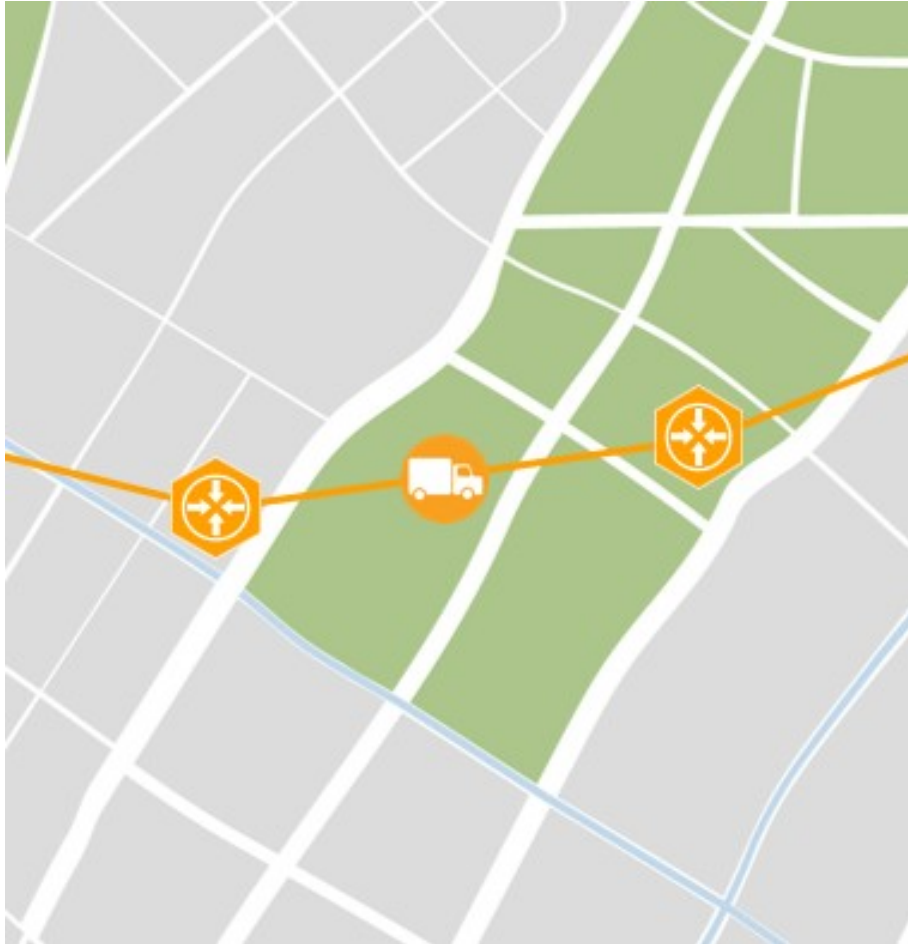

- **Single-shot connections**

  Drivers who are already traveling longer distances for other reasons (such as vacations or business trips) can occasionally take some Bitpost parcels with them and transport them directly to their destinations, or very close to their destination, bypassing complicated multi-stage routes with multiple handoffs along the way. In return, they can reduce their travel costs.

3. Parcel lockers

Electronic parcel lockers allow Bitpost customers to conveniently collect and send parcels 24 hours a day, 7 days a week. Parcel lockers should be placed in easily accessible locations, such as shopping malls, gas stations and residential neighborhoods. By utilizing a standard PC computer with open-source software in the parcel locker architecture, the Bitpost network can integrate most commercially available devices, as well as DIY devices built by community members. Manufacturers from around the world can design their own models of ready-made lockers and offer them to Bitpost community members interested in hosting them.
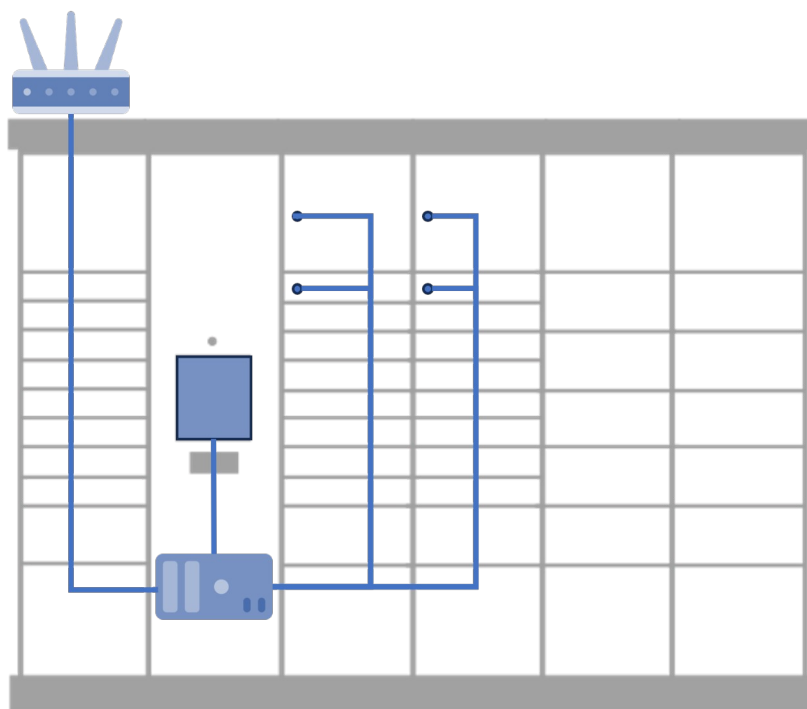
*The heart of the parcel locker is an embedded PC computer
connected to the Internet. It is also equipped with a touch screen
and multiple electronic locks that open individual compartments.*

3. Technical implementation

Bitpost is designed to operate without any central authority or server infrastructure, leveraging a fully decentralized technology stack that ensures security, transparency, and privacy for all participants, remaining resilient against control by any private or state-sponsored entity. The platform's architecture is built on three core components:

- **Blockchain**

  Bitpost leverages blockchain technology to create a transparent and immutable record of all transactions and interactions on the platform. This ensures that users can trust the data and services provided by the platform without fear of manipulation. Smart contracts developed in Solidity and deployed on the Ethereum Virtual Machine (EVM)-compatible blockchain, implement most of Bitpost's business logic and enforce all participants and customers to adhere to the protocol rules.

- **Peer-to-peer network**

  Bitpost utilizes a separate peer-to-peer (P2P) network for off-chain private communication between users, ensuring that sensitive data, such as sender and recipient addresses, does not need to be permanently recorded on the blockchain. Instead, this information is securely transmitted only to the parties that actually require it to perform the service.

- **Decentralized application (dApp)**

  The browser-based frontend application enables users to send and receive shipments, and network participants to perform their jobs. The Bitpost dApp is designed with an intuitive graphical user interface (GUI) that is easy to use, even for non-technical users who may not understand the underlying principles of the entire system.

4. Delivery flow

The typical flow of the parcel handling process in Bitpost is as follows:
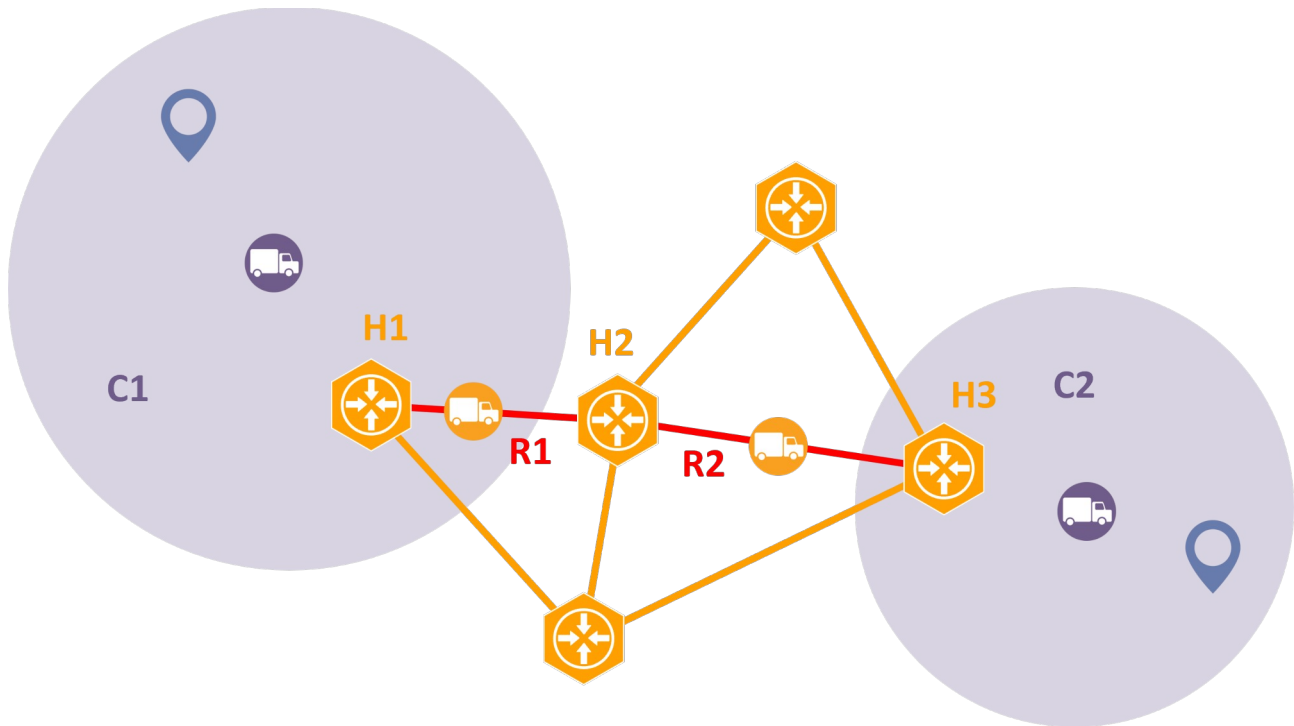
1. The sender creates a shipment in the Bitpost dApp. Information about the parcel ready for pickup is broadcast to all drivers operating in the area C1. Any driver can accept the transport order or wait for more parcels to accumulate nearby.

2. Once the first driver accepts the order, the parcel is reserved for them for a specified time and removed from the list of available jobs for other drivers. The driver proceeds to pick up the shipment and drops it off at the nearest hub H1.

3. The routing system determines that the next point on the parcel's route will be hub H2. Information about the new transport order is broadcast to all drivers servicing route R1. Any driver can accept the transport order or wait for more parcels for this route to accumulate.

4. The driver accepts the order and proceeds to transport the shipment from hub H1 to hub H2.

5. The routing system determines that the next point on the parcel's route will be hub H3. Information about the new transport order is broadcast to all drivers

servicing route R2. Any driver can accept the transport order or wait for more parcels for this route to accumulate.

6. The driver accepts the order and proceeds to transport the shipment from hub H2 to hub H3.

7. The routing system determines that the shipment can be delivered directly to the recipient from the current hub. Information about the parcel ready for delivery is broadcast to all drivers operating in the area C2. Any driver can accept the transport order or wait for more parcels to accumulate in hub H3.

8. The driver accepts the order and proceeds to collect the shipment from hub H3 and deliver it to the recipient.

5. Public registry

The Bitpost smart contracts manage a public registry of all hubs, couriers, and parcel lockers, along with their coordinates, driving directions, operating hours, available connections between them and their respective service areas.

Information from this registry is essential for determining routes for shipments and establishing encrypted channels of private communication between network participants devices.

Furthermore, the public registry provides a comprehensive overview of the availability and coverage of services within specific areas, which can be visualized as a map through the Bitpost Explorer web application.
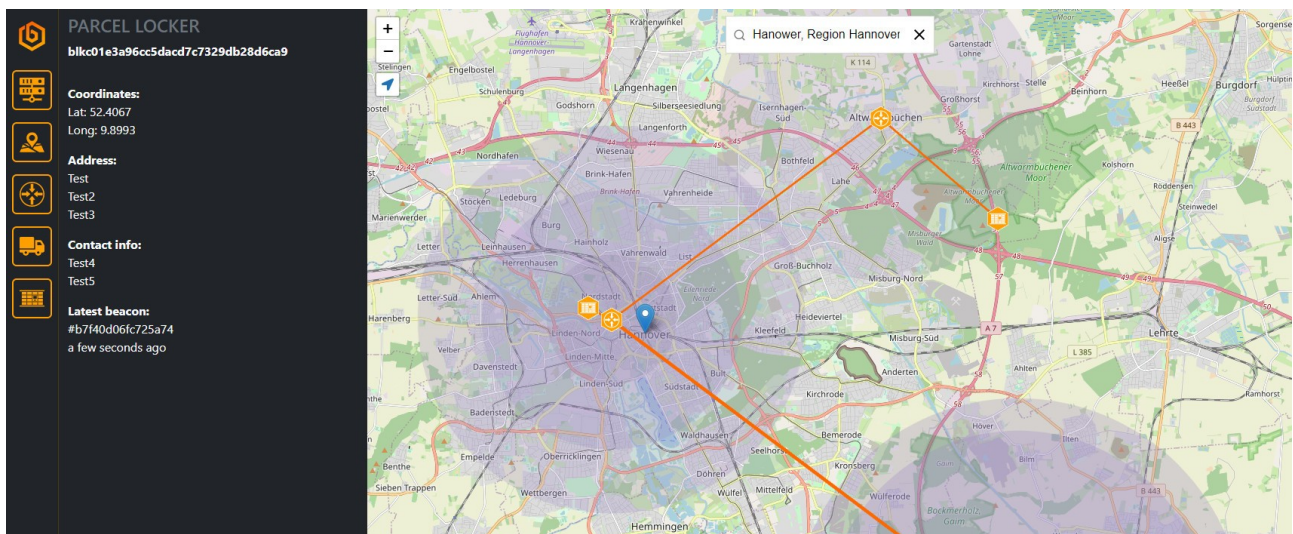
*The Bitpost Explorer proof of concept application.*

6. Parcel routing

Determining the most efficient route for a Bitpost shipment is a crucial aspect of the delivery process. Rather than relying on a single, uniform algorithm, Bitpost employs Routing Protocols — standalone modules that can be dynamically loaded by the Bitpost dApp and utilized individually for each shipment, according to the sender's preferences. These protocols can be further improved, replaced with more efficient ones, and new ones created by third-party developers.
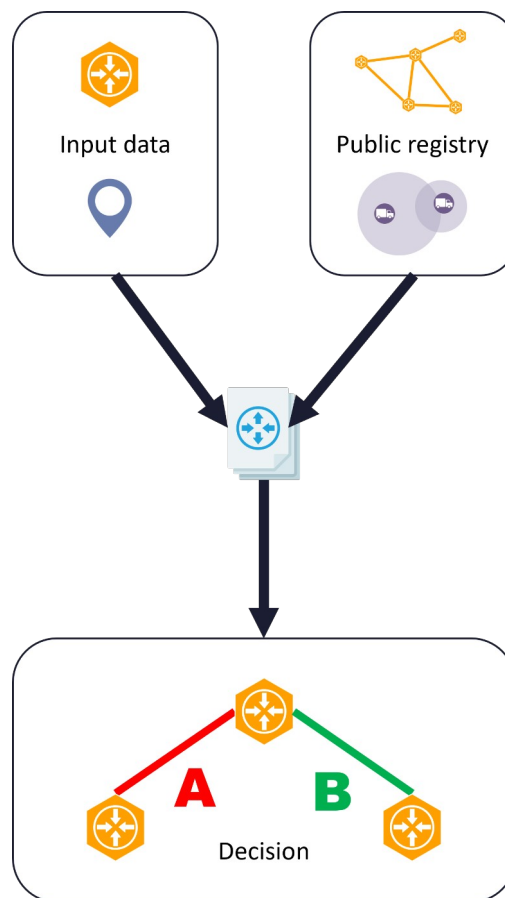
Routing Protocols receive essential input data, like the shipment's current location and the recipient's address. Utilizing the standardized API they can query the Bitpost public registry for information on hubs and their interconnections, available couriers and their operating hours, etc. After analyzing the relevant data and performing the necessary calculations, the Routing Protocol returns the next point to which the shipment should be forwarded. Each routing protocol can use different algorithms and consider various factors when selecting the optimal route, limited only by the creativity of its developer.
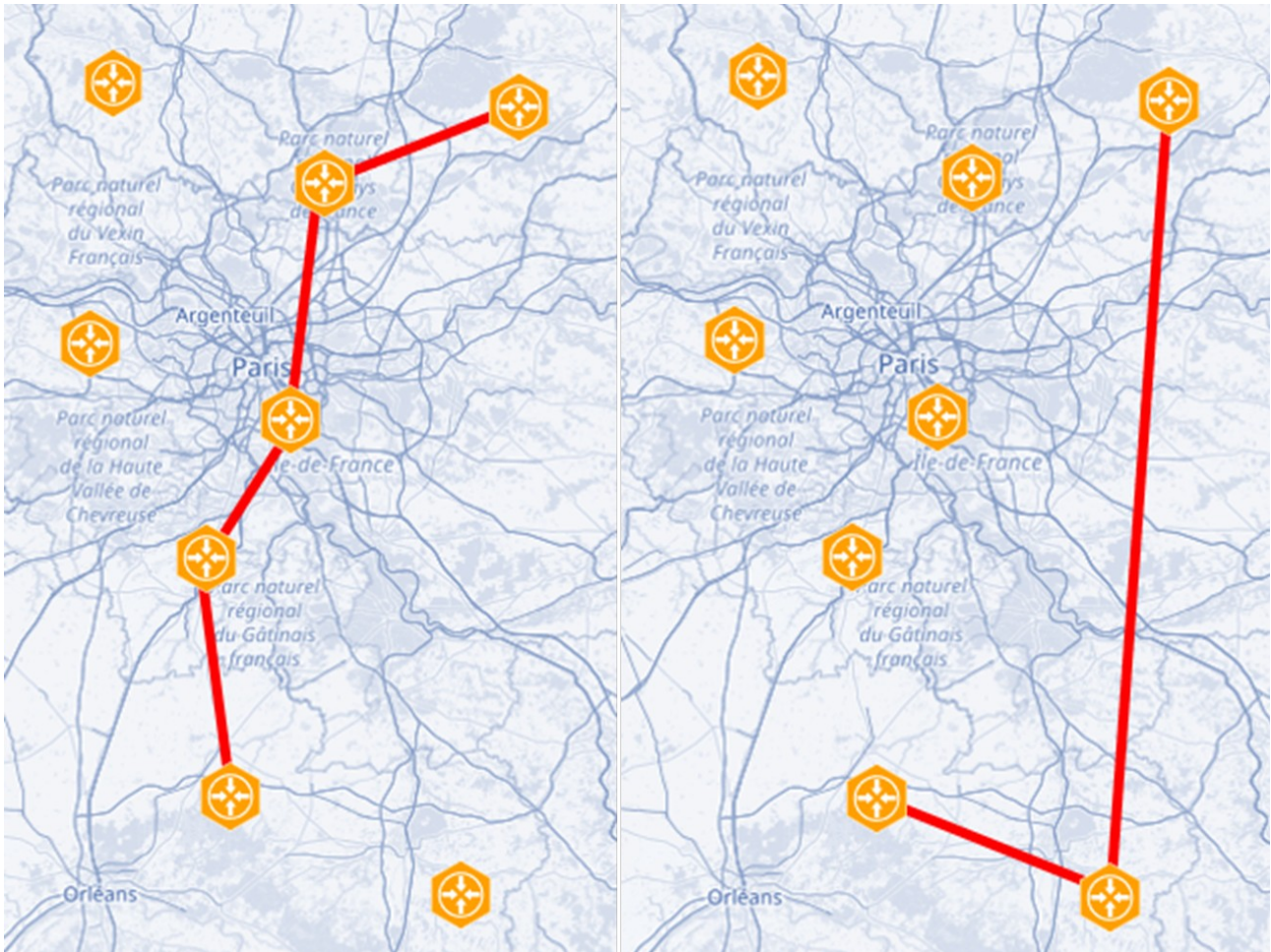
Routes for the same shipment determined using different routing protocols: optimizing for the shortest distance (on the left) and minimizing the number of hops (on the right).

7. Tracking system

Due to the nature of decentralized applications, Bitpost package tracking capabilities had to be divided into two distinct subsystems to provide a top-tier tracking system while simultaneously maximizing user privacy.

Smart contracts running on the blockchain record only anonymized basic status updates, such as pickup, handoff or delivery, that cannot be associated with any personal data, physical location or corresponding Bitpost participant. This information is publicly available and can be accessed by third-party smart contracts or viewed in the Bitpost Explorer.

Extended statuses that enable a feature-rich parcel tracking system, including the current location of the shipment and unique identifier of the hub or driver currently handling it, are processed off chain. Devices of involved parties report them using encrypted private communication channels, directly to the tracking application instance specified by the shipper.

This approach gives users full control over access to shipment traces, allowing them to choose the appropriate tracking solution depending on situation:

- Public, free to use instances of the official tracking application maintained by Bitpost community,

- Private instances of the official tracking application hosted by online stores and marketplaces exclusively for their customers, integrated with their own systems,

- Self-hosted instance of the official tracking application that stores all data locally,

- Custom tracking applications developed by third-party developers,

- Completely opt out of detailed tracking.

The official tracking application is implemented as an interactive map that displays the real-time location of the shipment, accurate to within a few meters. This is made possible by the simple assumption that the location of a parcel handled at a hub corresponds to the hub's fixed and well-known coordinates, while the location of a parcel being transported by a courier aligns with the GPS reading from their mobile device running the Bitpost app. The application tracks the route already traveled and forecasts the upcoming stages, visualizing this as a marker moving along the path and a delivery process progress bar.

8. Shipping fee

Bitpost utilizes a flexible market-driven pricing model without any fixed rates. Shippers can propose any price they wish to pay for shipping, and the system calculates the estimated distribution of that amount among all participants involved in handling the package.

Drivers compete to carry out the most profitable transport orders, while those with insufficient compensation may be accepted by the way of more profitable assignments or completely ignored. Too low fee may also result in a parcel getting stuck at some point of its route, however the fee can be increased by paying extra funds to the shipment smart contract at any stage of the delivery. The fee amount ensuring fast and efficient delivery may vary based on geographic location, the season, or the time of day.

The platform analyzes previous transactions on the blockchain and offers guidance in setting the optimal fee for a given shipment. It suggests several default options, such as economy, standard, and priority, and alerts users if the manually set fee is out of commonly acceptable range.

The shipping fee is distributed among all network participants involved in processing the parcel, with 60% allocated to couriers and 35% to hubs and parcel lockers. The remaining 5% is distributed among all holders of the Bitpost Governance Token. These ratios may be adjusted in the future. The fee distribution is automatically triggered by the transaction confirming successful parcel delivery by its final recipient.

9. Security deposit

Each member of the Bitpost network taking custody of a customer's parcel must lock their own funds in the amount specified by the sender in the Bitpost smart contract. Any further handoff of the parcel between network participants atomically releases the previous security deposit and secures an equal amount from the next party. Only the confirmation of final delivery allows the deposit made by the last-mile courier to be released without requiring a new deposit. No further movement of the parcel within specified time frames indicates that the current possesor has either lost or damaged it, enabling the sender to claim their security deposit as compensation.

This mechanism creates a financial incentive for all parties to act with integrity and effectively discourages malicious behavior within the Bitpost network. While it is technically possible to steal a shipment and pursuing legal consequences against an anonymous member of the global community is nearly impossible, the immediate consequence would be the forfeiture of their deposit. Network members should take special care not to confirm handoffs of shipments they haven't physically received or that appear damaged, to avoid being unfairly penalized for dishonest actions of previous parties.

The required deposit amount is driven by free market mechanisms. It is advisable to set the deposit slightly above the actual value of the items contained within the parcel. However, if the deposit is too high, the shipment may be perceived as too risky for network participants, and many of them may not have sufficient funds to establish the deposit, leading to delayed deliveries. Conversely, lowering required deposit or completely eliminating it can increase the availability of the shipment to a larger number of participants, speeding up the delivery process.

10. Delivery code

Bitpost services require a certain level of technical knowledge and familiarity with Web3 technologies. On the sender's side, using cryptocurrencies, digital wallet and decentralized application is unavoidable. However, it's estimated that the majority of parcels will be shipped by professional entities, for whom adopting new technology should not present a major challenge, as long as it provides clear benefits.

More attention is needed for the parcel collection process, which should not pose a barrier for crypto-disabled people that would prevent them from choosing Bitpost as their preferred delivery method.

To facilitate this, Bitpost provides a simplified delivery confirmation method using an alphanumeric code received from the sender, which the recipient can easily share with the delivery driver. In this scenario, the courier initiates the confirmation transaction themself, and upon verifying the delivery code against its known hash, the Bitpost dApp considers this confirmation equivalent to a direct confirmation from the recipient's wallet, even if the recipient does not have one.

11. Governance

The decentralized governance system utilizes on-chain voting by the community of token holders to implement any changes in the original Bitpost protocol. This approach makes Bitpost a common property of the entire community, which actively participates in the decision-making process, aligning with the collective interests of its users.
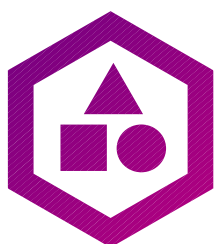
Token holders can propose changes, enhancements, or new features, which are then subjected to a voting process. Approved changes are automatically implemented by smart contracts, without the involvement of any intermediaries. Each token holder's voting power is proportional to the number of tokens they hold, fostering a fair and democratic decision-making process.

Decentralized governance framework enhances the resilience of the Bitpost network. By distributing decision-making power among a diverse group of token holders, the project eliminates the risks associated with a centralized controlling authority that could be forced to take specific actions.

12. Decentralized Logistics

While Bitpost focuses exclusively on the delivery process, Bitpost Decentralized Logistics is a Layer 2 solution operating on top of the Bitpost ecosystem, introducing additional logistics services.

Decentralized Logistics allows all community members to earn money by storing goods in their facilities for longer durations, thereby creating a network of small warehouses distributed across the entire world. From the Decentralized Logistics app, users can rent space in a selected warehouse for a specified duration, order a Bitpost courier to deliver their items to the warehouse, or request the retrieval of items to the given address.

Advanced algorithms can automatically distribute a merchant's inventory across multiple warehouses within a specified geographic area and budget, ensuring that goods are always stored close to potential customers, and once an order is received, can be delivered in minutes rather than days. The platform provides a seamless experience for merchants by adding a layer of abstraction between numerous physical warehouses and a single virtual decentralized warehouse visible in the customer interface. With just a few clicks, merchants can retrieve all inventory to their headquarters, relocate it to a different geographic area, or order a courier to collect next batch of goods.