MICRO-MOBILITY PROJECT

Summer internship 2017 @ Ericsson Garage

INTRODUCTION - WHAT IS THIS ABOUT?

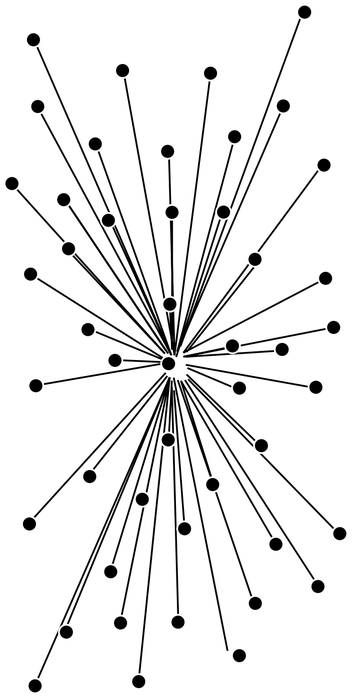
The United Nations Sustainable Development Goal #11 is to make cities “inclusive, safe, resilient and sustainable”. The New Urban Agenda compiled by UN-Habitat specifically highlights high quality public spaces as key for social inclusion and encourages the use of digital and civic technologies to ensure long-term integrated urban planning and design.

In most cities around the world trucks and lorries are the default means of transporting goods and while good logistics is a necessary part of any city the trucks are at the same time causing reduced quality of urban life; they cause significant air-pollution, make a lot of noise, block walkways and bicycle paths when they stop to unload, the streets must accommodate the large and heavy vehicles at the cost of space for people, etc.

Trucks in urban areas constitutes health and safety risks as well as reduced urban mobility and livability, which is why rethinking logistics is an important factor for increasing the prerequisites for inclusive, safe, resilient and sustainable urban design. Since city mayors across the world share a desire to be perceived as attractive for a global class of professionals and companies, many city municipalities and policymakers now work to reduce the number of cars and lorries in cities.

Logistics will however continue to be essential for cities in the foreseeable future. Therefore, we are interested in exploring how connectivity and digital technology could transform logistics in cities into something lighter and nimbler. One key opportunity lies in the very last part of the logistics chain: the last mile, where efficiency becomes a factor. Transporting goods long distances can be done far more cost efficiently than the delivery of the last few miles when goods arrive in congested metropolitan areas.

This concept is an attempt to show how a community-based system could reshape the last mile logistics by using technology and connectivity as means of a decentralized protocol.



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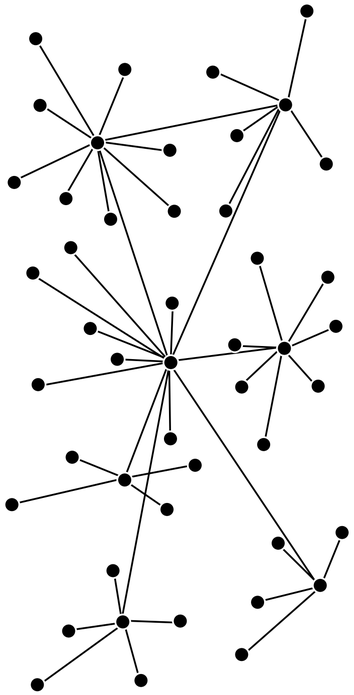

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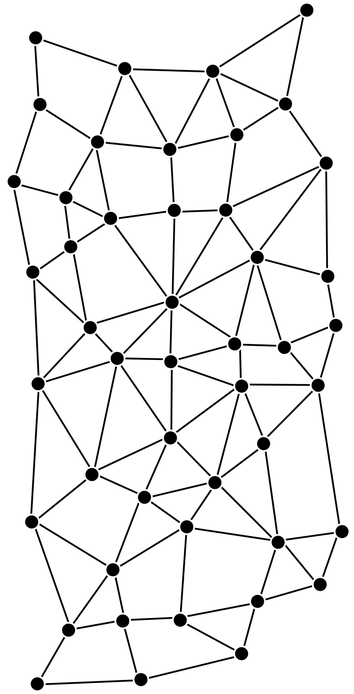


Distributed

SCENARIO

In a decade Stockholm has shifted focus into a city built around communities rather than business. With the goal of setting new standards for quality of life and sustainable living the municipality have introduced new alternative methods of transportation.

First no one was sure if it would work to cut away motorised transportation. Together with the local public transportation the municipality developed a people driven goods transportation system open for anyone to use.

By introducing portable containers in connection with the public transportation grid, the city could ask its inhabitants to send goods with the help of each other's daily commutes. A economic layer was necessary to motivate people to participate but it also allowed small businesses or entrepreneurs to use the system and develop new services.

Stockholm's high level of digital infrastructure allowed every part of the system to keep track of itself, minimising the loss of goods and keeping the system secure. Though the technical security layer of the containers were high it took a long time for people to trust the system. A lack of transparency made many mistrust the containers and few were willing to transport unknown goods for other people.

But as the system got more and more common throughout the city and the usefulness of it became clear that it was here to stay. It did however work best on short distances, making it a common way for either borrowing things from each other or get groceries.

PRINCIPLES

Community

This is made for local communities, where trust, shorter distances and a feeling of belonging are important part of the concept. It is also where the “last mile” takes over in the logistics chain, and where any change will create the biggest impact in inner city logistics, traffic and sustainability.

There is no limit in the physical extension of the community. We refer to community as a group of people that share values and trust each other. It refers to a community-driven system rather than a location. The concept benefits from close knitted communities, as the feeling of belonging and the trust between the citizens increases the chances of successful implementation.

This principle also shifts the power balance of the logistics chain by giving more responsibility, accountability and rewards to the normal citizens rather than specialized companies. In this concept, those companies will still be present as part of the long-distance transport of goods, and even as agents in the system, but the aim is to make normal citizens part of the logistics chain.

Peer to peer network

The concept is based on people. Peers as agents in the system that will do, and oversee, the transport of the goods and transactions in the system.

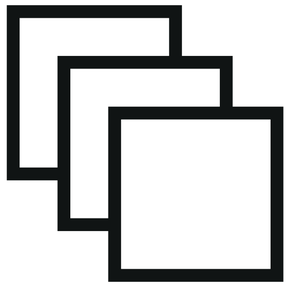
Rather than create autonomous technology, like drones, the concept relies in the engagement of the citizens, with these technological tools as the last part of the chain, closing the gaps between people. The more citizens are using the system, the less drones are needed

This is a key principle to allow the disruption of the logistic chain and the shift in responsibility and reward of it.

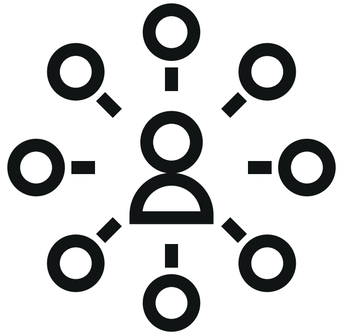
Decentralization

This is a decentralized system. Using the power of the Blockchain, the concept tries to disrupt how the logistics business is done nowadays. In this concept, there is no responsible company or agency that controls what is happening. Every transaction, and every action (sharing, transporting, requesting and offering goods) is managed and taken care of by the agents of the systems. These agents may be citizens, drones, or companies.

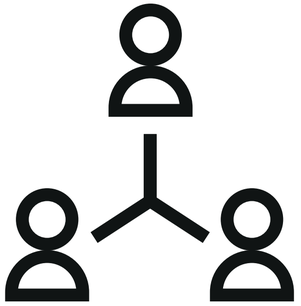
Using smart contracts, every transaction is controlled, creating trust between the agents and facilitating the use of the system. Also, every payment (using cryptocurrencies) will get directly to the ones doing the service, taking the middle man out of the equation, while empowering common citizens to be part of the system and be rewarded by the common daily commute.



Powered by blockchain



Closed community



Multiple agents as peers in system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HOW IT WORKS

This system is based on multiple different parts. It is there to facilitate transportation of goods within a local community. However, anyone is welcome to participate and use it freely.

The hope is that this goods-transport system will encourage regular citizens to leave their cars at home and instead help each other to move things throughout their community. People will have different roles and some infrastructure elements will be needed.

ROLES | SENDER

Anyone that wants to send something within a limited range. This range is generally confined to the local public transport grid. To become a sender and user of the system you have to create a system account. By doing so you agree to certain information collection plans: Your addresses, movement pattern and contact information is monitored. You have to identify yourself and prove your identity to access the system. You pay for the service by investing in tokens used for transactions.

By creating an account you get keys that you can use for unlocking and accessing containers and locks but also to authorise transactions. These keys can be in the form of RFID-tags, bank-cards, PIN-codes or any digital form connected to your personal account.

When someone wants to send something they either request pick-up or go to the nearest strategic point to drop of their goods. They are placed in a lockable container and through an app a destination and receiver is declared. The sender have the possibility set a price for the delivery (standard fees based on distance + extra). There is also the possibility to describe what you are sending.

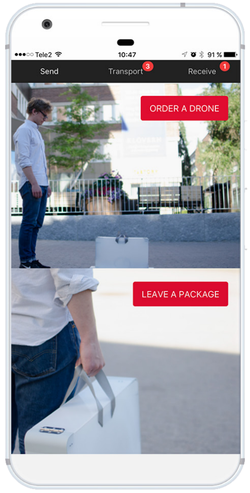
As soon as someone want to send something through the system you have to create and account and prove your identity. Security and trust becomes something very important and there was no anonymity while using the containers. As soon as you accessed one you were personally responsible for its content.

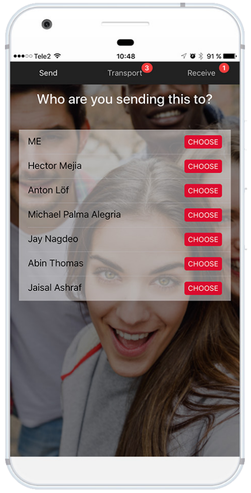
You prove your identity through digital BankID and must unlock the container through your account.

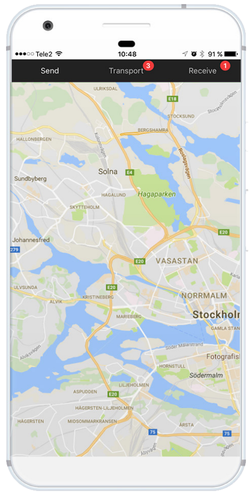
When someone wants to send something they either request pick-up or go to the nearest strategic point to drop of their goods. They need to find and unlock a container.

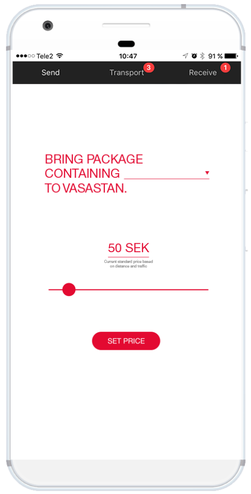
While unlocking the container a contract is set up. This contract is bound to you and are shared with the blockchain. You place whatever you want to send inside the container and close the container again.

You can as a sender track your delivery. The container has a constant GPS location and you are free to follow it as you wish.









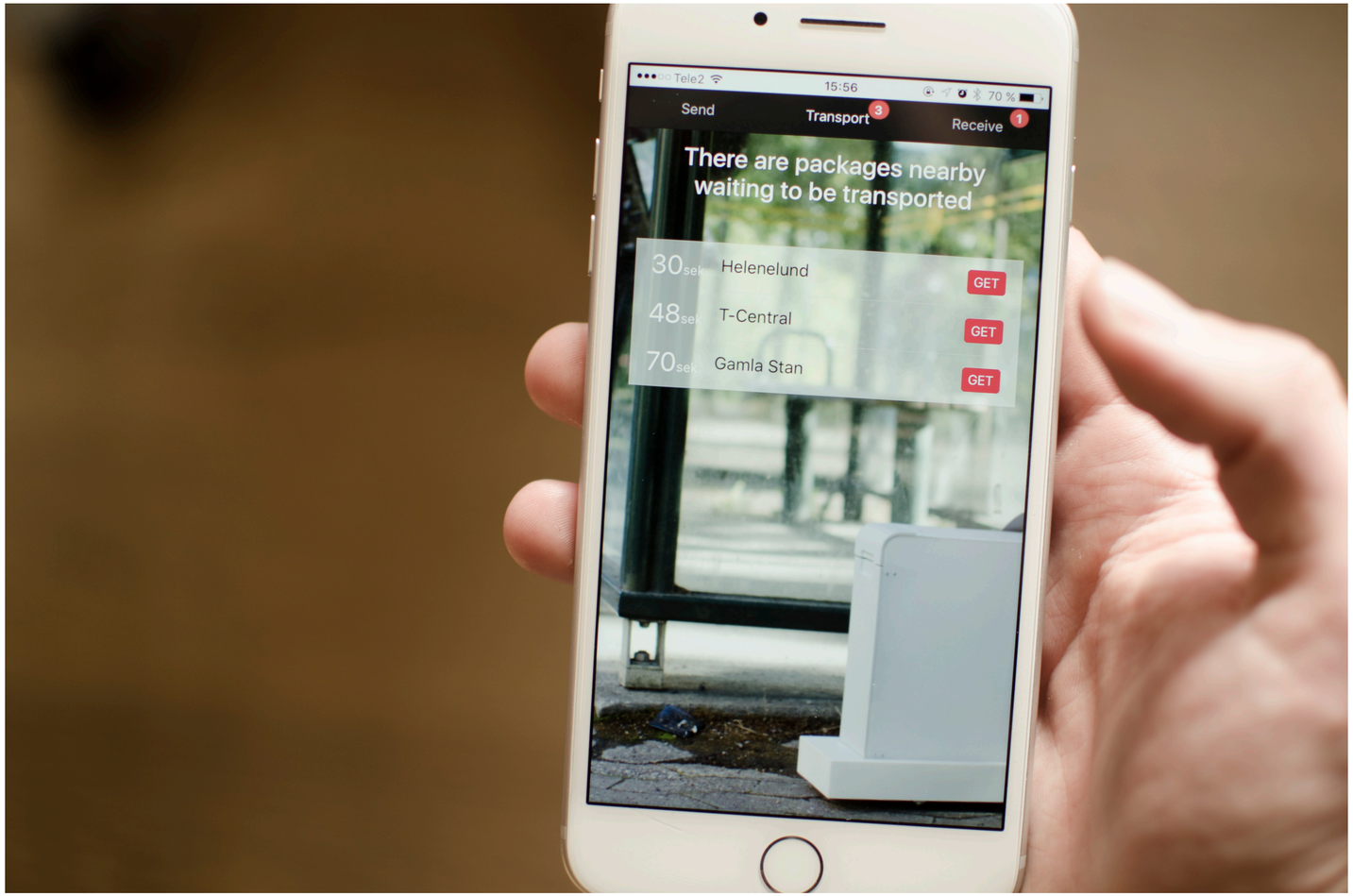
ROLES | RECIVER

To receive something is different depending on if you have a system account or not. If you are already are a part of the system you simply gets notified that a delivery is on its way, where it is and who sent it. As soon as you get hold of the box the system automatically knows who you are and that you are allowed to access to content. If you don't have an account connected the sender has to remotely give you access either by authorising access or sending the receiver a one time access code.

ROLES | TRANSPORTER

Anyone that have an account is a potential transporter. Sign up process is the same as for the sender. Drones can take care of shorter transports following walkways, bike paths and roads. Humans or third party delivering firms have to move containers longer distances alternatively containers move between fixed points within the public transport grid.

If you want to transport something you can manually look for deliveries in your surrounding. But being part of the system also means that it tracks your daily routines and movements around the city. It can predict your movement suggest certain deliveries that fits your path.



INFRASTRUCTURE

For this system to work there needs to be a certain basic level of infrastructure. We imagine a combination of fixed drop off points where goods can be placed in lockable and movable containers. These containers can be locked by the sender and only opened by the receiver. The transporter agent can however unlock the container from its fixed point and move it without having access to the content.

Drop-off points

Points with either containers for transport or drones that can handle last delivery and bring back empty containers. These point should be placed in strategic places based on peoples movement and accessibility. That is probably around the public transportation stations and hubs but could potentially be anywhere.

Container

The container serves multiple purposes. It locks the content inside and keeps it secure making it only accessible for sender and receiver. It keeps track of its whereabouts giving people information about time, progress and delivery status. It also locks itself to fixed points only allowing transporters in the system to lift it and bring it along on their journey.

Drones

To increase service local drop off points might have a small fleet of platform drones. These can bridge the gaps between people and help with small distances where less people move around.

Public transport

This system focuses on people using sustainable means for transportation. That means less cars and more bikes, pedestrians, busses and trains. At the same time it’s a system based on people transporting goods for each other. This makes it closely linked to the public transport system. Maybe it’s even a part of it? It’s a infrastructure and system already in place that can be built upon.

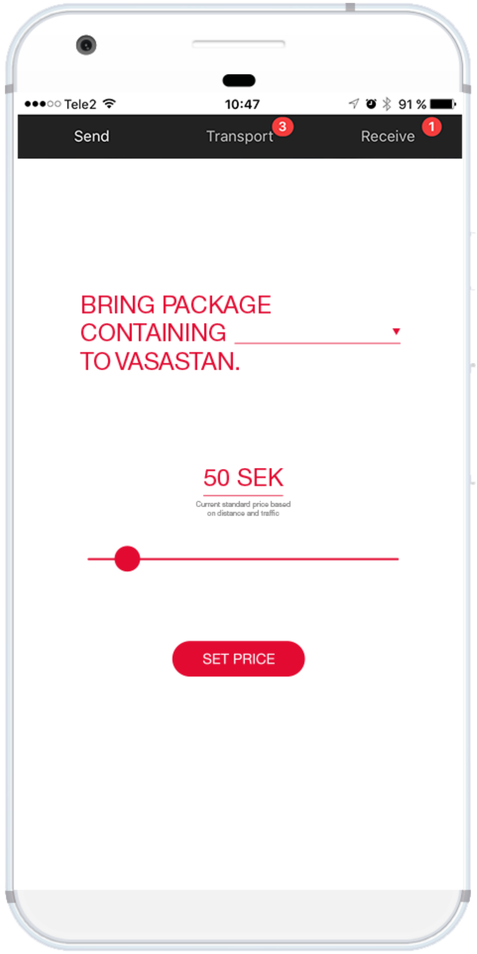
MONEY

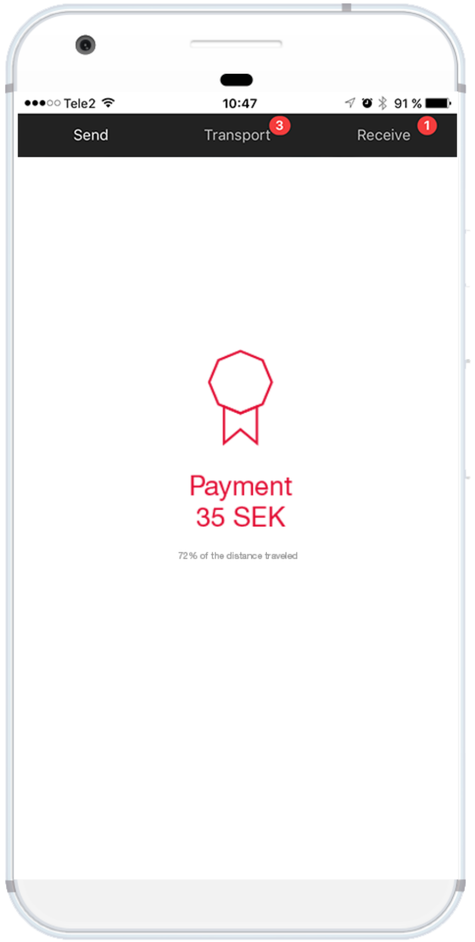
Price

When you want to send something you have to set a price. This price can be anything but there will probably be a minimum fee based on distance (one alternative is to have the same fee as a ticket for a person). If you are willing to pay more, the likelihood that someone actually picks up your delivery will increase.

Payment

Once a price is set and someone picks up a delivery they will enter a contract giving them a percentage of the distance traveled. Eg. If someone takes a delivery all the way from point A to B they receive 100% of the price set by the sender. If they bring it 80% of the way they get 80% of the price. Even the receiver can go and pick up the delivery at closest drop point and receive the last % of the price.





KEY MOMENTS

Getting into the system

Signup gives you an user ID and keys to the system

Requests

Ask for something to be delivered or ask for something to be picked up

Negotiation

You declare that you want to send something through this system.

Potential transporters gets notified.

Data gathering

For the system to function we need information, where are you and where do you usually travel. Predictions can help us plan ahead an make a system that can figure out good potential routs for each container and transporter moving throughout the community.

Transport

It has to be easy to bring containers along while you travel. A standardised system with quick access and reasonable compensation to motivate people to actually participate or go out of their way to help others.

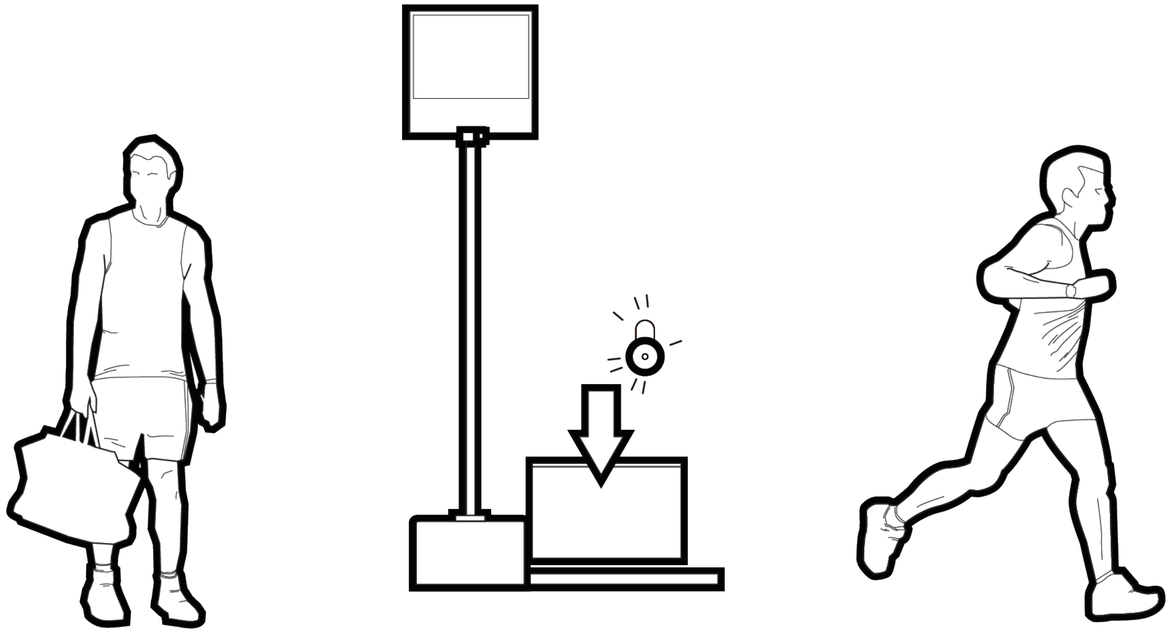
FLOW

	Sign up	Sending	Information	Transport	Negotiation	Pick up	Information	Pre-Dilivery	Delivery
Sender	Log in Identify yourself Generate unique electronic Identification Accept terms and conditions Configure settings	1. Find nearest POI and leave Package there. • ID (touch container with device) • Find empty container (small LED) • Unlock container (happens when simultaneously with ID check) • Put goods inside and secure • Lock container (close) • Choose destination (App prompt, map and contact list) • Propose compensation (suggested distance base fare + extra) • Information options 2. Request drone pick up (From nearest POI) • Make request • Wait • Go to 1 and jump to ID	Confirmation • Delivery in progress	2. If drone requested Drone returns to nearest POI	Receives proposal from transporter A) Rejects B) Accepts C) Counter proposal		Gets transporter information (who, where, when...)		Notification
Transporter	Log in Identify yourself Generate unique electronic Identification Accept terms and conditions Configure settings		Notification/information • Nearby deliveries		Receives information with delivery information A) Ignores B) Accepts C) Counter proposal	Locates container • ID • Unlock (from platform) • Lift			Delivers to final destination • ID • Unlock • Lock
Receiver			Notification • New delivery					Request drone option	ID Open Retrive goods
All					Information Accessed through application				

USE CASE | ME2ME

Anders wants to run home from work and brought some extra gear with him. He can't run with his backpack so he decides to ship it home after work.

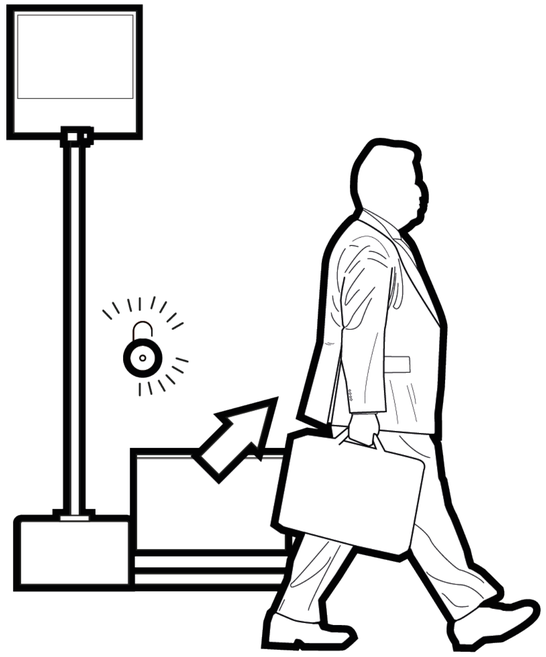
He goes to the bus stop just outside the office and drop his backpack in one of the containers there. He tells the system to send it to his home address and he sets the price to 45 SEK. He then starts jogging homewards.



USE CASE | ME2ME

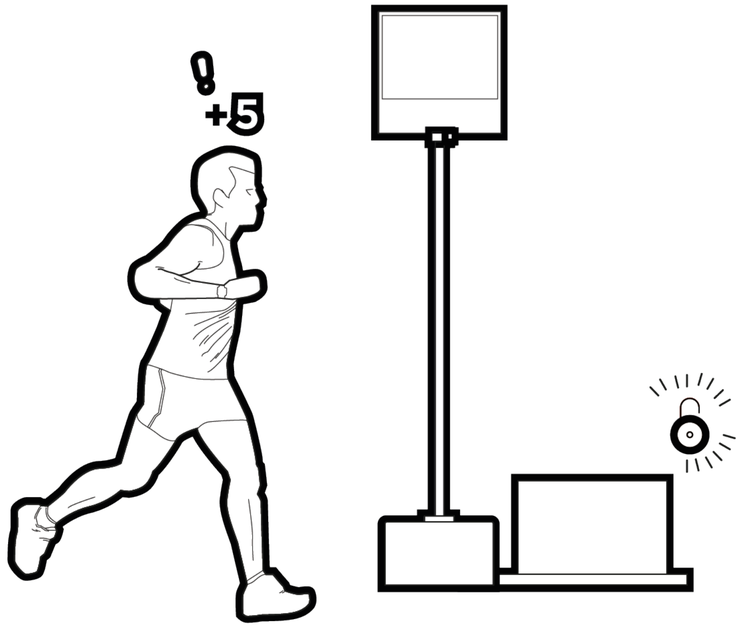
Close to the bus stop someone gets an notification. Letting them know that there is a delivery that needs help. If they bring container #0012 with them on the bus they can make 45 SEK and save in on the bus ticket.

By picking up container #0012 the courier agree on a contract, to bring the container at least closer to its final destination and taking responsibility for its content. The contract is fulfilled and compensation received once the container reaches a new fixed point or is transferred to a new courier (human or drone). The courier lives close to the final destinations and decides to bring the container to Anders nearest bus stop, receiving 92% of the price.



USE CASE | ME2ME

While Anders is out running he gets updates about his shipment. He get notified that someone agreed to pick up his delivery, he can get a live feed of where it's at the moment and each time it changes courier. When the package has reached the bus stop close to Anders home he get notified that it's ready for pickup. Anders can wait for someone to go and get it for him, but he decides to pick it up himself and save the last 3,60 SEK for something else.



USE CASE | THE CITY VILLAGE

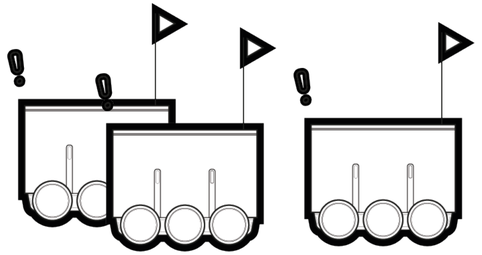
Ida lives in a inner city neighbourhood. She just turned 67 and have decided to start renovating in the living room. She never had the time or opportunity to do a project like this and needs to invest in some new basic tools. She request tools online asking for a power drill, tiger saw and laser spirit level.

#Requests a power drill, tiger saw and a laser spirit level

USE CASE | THE CITY VILLAGE

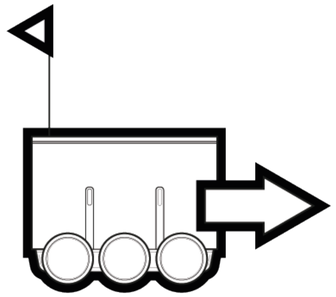
Bosse works as a caretaker at a small hotel a couple of blocks away. It’s a small place, tiny actually, so part of Bosse’s job is to try to relocate tools he don’t use every day and distributes them around the neighbourhood. He sees Ida’s requests and decides to rent out his power drill and spirit level.

Because Bosse ships quite a lot of stuff in and out daily he has a scheduled pickup by a couple of drones every morning. He enters what he gonna send and where in the system and places Idas stuff in one of the boxes. Sets a price on the delivery and ships it of to Ida.



USE CASE | THE CITY VILLAGE

Ida gets notified that a delivery is on its way and that a drone will arrive in approximately 32 minutes. She makes a cup of tea and then walks down to the door to receive her delivery.



THINGS TO THINK ABOUT

There is a series of decisions that need to be made, but are still in discussion, as of this stage of the project. Some of them can be summarized here:

1. Who Implements this? The concept implies a decentralized system, thus having one central implementer seems like a stretch. No private company will have interest on building and implementing such a platform and infrastructure. In that regard, the government seems like a better candidate as it has civic interests on facilitating a new logistics paradigm for the last mile that will support the UN sustainable goals and, in general, a more sustainable city. Other options discussed are: A rich mad man, a public transport group that includes this system in their services or, plainly, the community.

2. What's the tone of the system?

3. What will happen during night time? During night, there will be a substantial decrease of people moving in the system, and even the public transport system (crucial for the concept to work) will not be operational. What will happen then? How the system can still be functional for even better efficiency?

4. What happens in case of technical failure?

5. What happens if there is no people available to do the transport? A very important assumption of this concept is that there will be enough people willing to be part of the system. Achieving a critical mass of users is crucial for it to work, as it relies heavily in the citizens as agents of the system. Then, when there is no one (or not enough) people to move the goods? How the system responds?

6. What happens when there are damaged goods? In case of an accident or something that may damage the goods transported, what will happen? Maybe insurance companies will be included in the design as important factors in the building of trust and motivation for using the system.

7. What happens in case of thief? In this case, apart from some insurance system, it is probable that the concept will need to include the communication with local authorities, like the police. At the end, the system is always tracking the goods, so dealing with thieves is possible and will increase the trust in the system.

8. What happens if somebody wants to transport something dangerous? Because of recent events, the possibility of someone trying to transport dangerous goods (a bomb comes to mind) is something to at least think about. We believe that because the system is always tracking the goods and who has them, it is unlikely to expect somebody trying to use it for dangerous or illegal materials.

9. Does anything change if there is rain? Maybe damaging the goods?

10. Is this economically viable? There is always a concern about the economic viability of a concept like this. It does try to disrupt the way logistics are made, and given the importance of it in the economy, this become more important. We can argue that there are other values of the system not connected with the economic value, but it still is something to have in mind.