Prototype Description
An infrastructure to provide drone services on demand is presented. Stores, parcel enterprises, groceries, pharmacies, etc. can deliver in a fast and cheap way their products. Additionally, other services like traffic, inspection of infrastructures, search and rescue, cinematography are also offered as well for end-consumers.
The Internet of Drones (IoD) is a layered network control architecture designed mainly for coordinating the access of unmanned aerial vehicles to controlled airspace, and providing navigation services between locations referred to as nodes.

With the on-going miniaturization of sensors and processors and ubiquitous wireless connectivity, drones are finding many new uses in enhancing our way of life. Ranging from the on-demand package delivery, to traffic and wild life surveillance, inspection of infrastructure, search and rescue, agriculture, and cinematography. All these applications share a common need for both navigation and airspace management.

Among these applications, aerial package delivery will most urgently require a robust airspace allocation architecture, as it could result in many thousands of daily flights in the same geographic area, with many potential conflicts between drones navigating along similar or intersecting routes. The benefit to the global logistics network is clear, as drones could usher in a new era of on-demand delivery. About 83% of Amazon’s packages weigh below 2.5 kg, the average weight of packages delivered by any courier is less than 5kg, a reasonable maximum payload for today’s drones. Such a model can provide on-demand, inexpensive, and convenient access to the goods and items already in or near an urban area, including consumer goods, fast-food, medicine, and even on-demand groceries.

Despite a wave of drone package delivery prototype announcements (Amazon, Google, DHL, Matternet,…) there hasn’t been included an architecture of a drone-specific air traffic management system.

Our contribution is to approach the drone airspace management problem by providing a system based on a universal architecture and a vocabulary of concepts to describe the IoD. This architecture provides a navigation service between any two nodes in an efficient and coordinated manner as well as other common services such as location aware communication.

Additionally, we provide a drone fleet equipped with ADS-B (Automatic Dependent Surveillance-Broadcast) system and V2V communication capable of collision free navigation along a planned route between two nodes and have various performance characteristics, such as their range, vertical take-off and landing and hovering.

Services as on-demand package delivery, inspection of infrastructures, traffic surveillance, delivery of fast-food, medicine, groceries are ready to use in our system for the main cities. A second group of services are offered for individuals with their private drones. Since airspace is a public space, in near future all drones will be required to be registered and operations will be confined to inside of these airways, intersections, and nodes. The owner will have to design his own map of these elements, according to the constraints set by municipalities. We offer this service in our platform.
Persona

Samantha
Transport/logistics manager

About
- 42, married, over 10 years of experience as transport manager
- Energetic, innovative and dynamic.
- She has a proven track record in managing a highly commercial operation in a fast-paced environment.
- Experience of effectively running a successful transport function in a high pressure environment.

Responsibilities
- **Responsible for the transport and distribution operations.** She uses IT systems to manage stock levels, delivery times and transport costs.
- **In charge of the day to day operations of the transport department.** She uses associated information systems to coordinate and control the order cycle.
- Ensuring company compliance of all transport policies, legislation and procedures.

Main Goals
- To provide excellent standards of service, efficiency and performance
- Improve customer service by pulling orders later in the day.
- Develop cost-effective transportation rates
- Reduce delivery times

Needs
- Track and trace deliveries on real time
- Same-Day Delivery
- Solving last minute delivery needs
- Pick up and deliver 24/7, including evenings, weekends, and holidays with a cost-effective

Pain Points
- High rates for evenings, weekends and holidays deliveries
- Extensive restrictions on the same-day delivery service
As a Transport/Logistic Manager

I need a way to **Deliver to customer in the same day the order is placed without increase the transportation costs**

so that **I can improve my fulfillment goals of cost-efficiency and customer satisfaction**
Summary
The Transport/Logistic Manager for a Distribution Company needs a solution to monitor and fulfill same-day-delivery orders. They have a 24/7 service and deliveries are operated through the on-demand drone package delivery service offered in a particular city.

Storyline
The Transport/Logistic Manager is in charge of the use of the on-demand drone service for same-day-delivery orders. She has to ensure that the goods reach customers on the same day they are ordered. For every order with total weight less than 5 Kg she can use the drone service. The order number is used in the drone transport order as reference. Notification of the time goods are going to arrive to customer has to be done as well as notification when customer receive them. She needs to trace and monitoring the whole process.
**UX Journey**

**User Experience Journey: Process Same-Day-Delivery**

<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>MINDSET</th>
<th>FEELING</th>
<th>TOUCHPOINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samantha, the logistic/transp ort manager, look at orders list for same-day-delivery order type and filter the list by total weight less than 5 Kg.</td>
<td>“oops! we need to use the on-demand drone service”</td>
<td>🎈</td>
<td>ERP System: orders list</td>
</tr>
<tr>
<td>Request a drone for every order specifying the collection time calculated with the preparation time for the items (picking, packaging and labeling).</td>
<td>Are transport costs within budget? I use order number as reference to be sure we load the right items in the drone</td>
<td>😞</td>
<td>ERP System</td>
</tr>
<tr>
<td>Accept the drone quotation sent by the nearest one. Update delivery note / transport order</td>
<td>Logistic team should know the drone is coming We should integrate on-demand drone system with our ERP</td>
<td>😞</td>
<td>Drone on-demand System</td>
</tr>
<tr>
<td>Drone create an “open safe basket key” and bind it with the reference. Samantha can trace drone position and uses its camera</td>
<td>Where is the drone right now? Drone should check we load the right items</td>
<td>😞</td>
<td>ERP System</td>
</tr>
<tr>
<td>When drone arrives, reads and checks package label. A logistic worker, press open safe basket. (it will be opened only for expected label).</td>
<td>Will the right Drone? I wish I had a robot at docking to deliver 24/7</td>
<td>😞</td>
<td>Drone on-demand System</td>
</tr>
<tr>
<td>The logistic worker load packet and press “close safe basket” button and confirm drone take-off.</td>
<td>Well, I hope no traffic problems ....</td>
<td>😞</td>
<td>Drone on-demand System</td>
</tr>
<tr>
<td>Drone starts fly to target address. Drone notify customer (or contact person at target) about arrival time and the “open safe basket key”</td>
<td>At arrival customer open safe basket, pick up the good and confirm delivery. Drone notify delivery done to Samantha Update Order Status</td>
<td>😞</td>
<td>Drone on-demand System</td>
</tr>
</tbody>
</table>

| TOUCHPOINTS | |
|-------------||
| ERP System: orders list | ERP System |
| Drone on-demand System | Drone on-demand System |
| ERP System | Drone camera |
| Drone on-demand System | Package Label |
| Drone on-demand System | Drone Barcode reader |
| Drone on-demand app | Drone on-demand System |
| Drone | Drone on-demand System |
| Drone on-demand System | ERP System: update status |
Prototype

Prototype mockup for an IoT application to solve the PoV

BUILD: https://standard.build.me/prototype-editors/api/public/v1/snapshots/83d650b96ab5b2370cd42675/artifacts/latest/index.html#/page_0
BUILD Feedback: https://standard.build.me/user-research/83d650b96ab5b2370cd42675/preview/1770adde651305390e20583e

Drone Services
- Package Delivery
- Inspection of Infrastructures
- Surveillance
- Delivery of Fast Food / Medicines

Drone XI-207 - MAD

Drone Package Delivery Request

Goods to Transport
- Pick Up / Reference: 50789260
- Weight (g): 850

*From
- Benito Gutierrez 10, 28038 Madrid

*Deliver To
- Pº Castellana 259, 28042 Madrid
- antonio.leites@ussoftware.es

*Collected in
- 15 minutes

Request Drone

Accept
Reject

Drone XI-207 - MAD

Product Pick Up
- Reference: 50789260
- Delivery Address: Pº de la Castellana 259, 28042 Madrid
- Distance to target: 2.5 Kg
- Estim. flight time: 19 minutes 30 seconds

Open
Close
Take-Off

Drone XI-207 - MAD

Product Delivery
- From: UC Software SL
- Delivery Address: Pº de la Castellana 259, 28042 Madrid
- Reference: 50789260
- Weight: 850 g

Open
Close
Take-Off

Drone XI-207 - MAD

Delivery Service Quotation

- Arrival in: 17 minutes
- Distance to target: 6.5 Km
- Max. Weight: 2.5 Kg
- Price: 8 €

Do you really want to reject the offered Service?
- Yes
- No

Price: 8 €

Accept
Reject

Drone XI-207 - MAD

Drone Service Rejection