Group4 Protocol Specification

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1. Introduction

This protocol specification defines the communication protocol between Amazon (A) and UPS (U) systems, facilitating the exchange of information for transportation logistics.

2. Terminology

- **A (Amazon)**: Represents the Amazon system.
- **U (UPS)**: Represents the UPS system.

3. Messages that can be sent

3.1. AUCommands

```
message AUCommands {
  repeated AUNeedATruck need = 1;
  repeated AUTruckCanGo go = 2;
  repeated Err errors = 3;
  repeated int64 acks = 4;
}
```

This is the message Amazon sends to UPS, and all the details are embedded in this message, which we will discuss in the next section.

For each field in this message, they MAY be provided. However, for the entire message, it MUST contain at least one field, in other words, the entire message MUST NOT be empty (there is no point in sending an empty message).

3.2. UACommands

```
message UACommands {
   repeated UATruckArrived arrived = 1;
   repeated UADelivered delivered = 2;
   repeated Err errors = 3;
   repeated int64 acks = 4;
}
```

This is the message UPS sends to Amazon, and all the details are embedded in this message, which we will discuss in the next section.
For each field in this message, they MAY be provided. However, for the entire message, it MUST contain at least one field, in other words, the entire message MUST NOT be empty (there is no point in sending an empty message).

3.3. UAInitConnect

```
message UAInitConnect{
   required int64 worldid = 1;
}
```

- Purpose: UPS sends this message to let Amazon know which world it should connect to.
- Fields:
  - worldid: Indicates the world id.
- Requirements:
  - worldid MUST be provided.

3.4. AUConfirmConnect

```
message AUConfirmConnect{
   required int64 worldid = 1;
   required bool connected = 2;
}
```

- Purpose: Confirms that Amazon now knows which world to connect to.
- Fields:
  - worldid: Indicates the world id that amazon and ups should connect to.
  - connected: Indicates whether the connection is successful (true) or not (false).
- Requirements:
  - worldid MUST be provided.
  - connected MUST be provided.

4. Message Definitions and Usage Scenarios

4.1. A Messages (starts with AU, means Amazon sends to UPS)

4.1.1. AUNeedATruck

```
message AUNeedATruck{
   required int32 x = 1;
   required int32 y = 2;
   repeated Order orders = 3;
   required int64 seqnum = 4;
}
```

- Scenario: When Amazon needs UPS to send a truck to the warehouse to load packages, it sends UPS this message
- Purpose: Requests a truck for transportation from UPS.
- Fields:
  - x: X-coordinate of the warehouse location.
  - y: Y-coordinate of the warehouse location.
  - orders: List of orders to be transported.
  - seqnum: Sequence number for message identification.
- Requirements:
  - x MUST be provided.
  - y MUST be provided.
  - At least one order in orders MUST be provided.
  - seqnum MUST be provided.

4.1.2. AUTruckCanGo

```
message AUTruckCanGo{
   required int32 truckid = 1;
   repeated Order orders = 2;
   required int64 seqnum = 3;
}
```

- Scenario: When the load is complete, Amazon sends this message to UPS to tell that the truck is ready to leave.
- Purpose: Indicates that a truck is ready to leave with the loaded orders.
- Fields:
  - truckid: Identifier of the truck.

    - orders: List of orders loaded onto the truck.
    - seqnum: Sequence number for message identification.
- Requirements:
    - truckid MUST be provided.
    - At least one order in orders MUST be provided.
    - seqnum MUST be provided.

4.2. U Messages (starts with UA, means UPS sends to Amazon)

4.2.1. UATruckArrived

```
message UATruckArrived{
   required int32 truckid = 1;
   repeated Order orders = 2;
   required int64 seqnum = 3;
}
```

- Scenario: When a UPS truck arrives at an Amazon warehouse, UPS sends this message to Amazon.
- Purpose: Notifies Amazon that a truck has arrived at warehouse.
- Fields:
    - truckid: Identifier of the truck.
    - orders: List of orders to be loaded.
    - seqnum: Sequence number for message identification.
- Requirements:
    - truckid MUST be provided.
    - At least one order in orders MUST be provided.
    - seqnum MUST be provided.

4.2.2. UADelivered

```
message UADelivered{
   required int32 truckid = 1;
   required Order order = 2;
   required int64 seqnum = 3;
}
```

- Scenario: When a package is delivered, UPS sends this message to let Amazon know so that Amazon can update package status.
- Purpose: Indicates that a truck has delivered an order to the user.
- Fields:

  - truckid: Identifier of the truck.
  - order: Details of the delivered order.
  - seqnum: Sequence number for message identification.
- Requirements:
  - truckid MUST be provided.
  - order MUST be provided.
  - seqnum MUST be provided.

4.3. Shared Messages

4.3.1. Order

```
message Order{
   required int32 x = 1;
   required int32 y = 2;
   required int64 trackingid = 3;
   required int32 amzaccount = 4;
   optional int32 upsaccount = 5;
}
```

- Purpose: Represents an order to be transported, containing essential information such as coordinates, tracking ID, and account details.
- Fields:
  - x: X-coordinate of the buyer’s address.
  - y: Y-coordinate of the buyer’s address.
  - trackingid: Unique identifier for tracking the order.
  - amzaccount: Amazon account associated with the order.
  - upsaccount: (Optional) UPS account associated with the order.
- Requirements:
  - x MUST be provided.
  - y MUST be provided.
  - trackingid MUST be provided.
  - amzaccount MUST be provided.
  - upsaccount MAY be provided.

4.3.2. Error

```
message Err{
   required string msg = 1;
   required int64 originseqnum = 2;
   required int64 seqnum = 3;
}
```

- Purpose: Represents an error message, indicating a failure or problem encountered.
- Fields:
  - msg: Description of the error message.
  - originseqnum: Sequence number of the original message that triggered the error.
  - seqnum: Sequence number for message identification.
- Requirements:
  - msg MUST be provided.
  - originseqnum MUST be provided.
  - seqnum MUST be provided.

5. overall communication process

When Amazon receives an order and the warehouse has inventory, it will send topack to the world and send **AUNeedATruck** to UPS. After receiving this message, UPS should reply an **ack** to Amazon as confirmation. When the UPS truck arrives at Amazon's warehouse, it will send **UATruckArrived** to inform Amazon that the truck has arrived, and Amazon will reply **ack** to confirm. At the same time, if the package is already packed, Amazon can send load to the world to start loading. After the packages are loaded, Amazon will send the message **AUTruckCanGo** to UPS to inform UPS that the packages have been loaded and the truck can leave. UPS should send **ack** as confirmation. Whenever a package is delivered, UPS sends **UADelivered** to Amazon to inform it of the situation, and Amazon sends **ack** as confirmation..