



A TravelSky Company

# Recommendations on how to improve the NDC schemas

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# Agenda

- Our experience with the NDC schemas
- NDC Schema evolution
  - Homogenous Namespace design (NDC 15.2/17.2)
  - Chameleon Namespace design (NDC 18.1)
  - Heterogenous Namespace design (NDC 18.2)
- JAXB representation summary
  - duplicate classes
  - similar classes
- Recommendations

# OpenJaw experience with the NDC schemas

# OpenJaw experience with the NDC schemas

- NDC 15.2 schemas (XSLT)
- Migrating to the 18.1/18.2 schemas (JAXB)
- Problematic schema bindings
- NDC 17.2/18.1/18.2 schema analysis (Java reflection  
→ classes generated by JAXB)

# NDC Schema evolution

# Homogenous Namespace design (NDC 15.2/17.2)

AirShoppingRQ.xsd

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns="http://www.iata.org/IATA/EDIST/2017.2"
  targetNamespace="http://www.iata.org/IATA/EDIST/2017.2" elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xsd:include schemaLocation="edist_commontypes.xsd"/>
  <xsd:include schemaLocation="aidm_commontypes.xsd"/>
  <xsd:element name="AirShoppingRQ">
    <xsd:annotation>
      <xsd:documentation source="description" xml:lang="en">The AirShopping...</xsd:documentation>
    </xsd:annotation>
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element ref="PointOfSale" minOccurs="0"/>
        <xsd:element ref="Document"/>
        <xsd:element ref="Party"/>
        <!-- ... -->
      </xsd:sequence>
      <xsd:attributeGroup ref="IATA_PayloadStdAttributes"/>
    </xsd:complexType>
  </xsd:element>
  <!-- ... -->
</xsd:schema>
```

edist\_commontypes.xsd

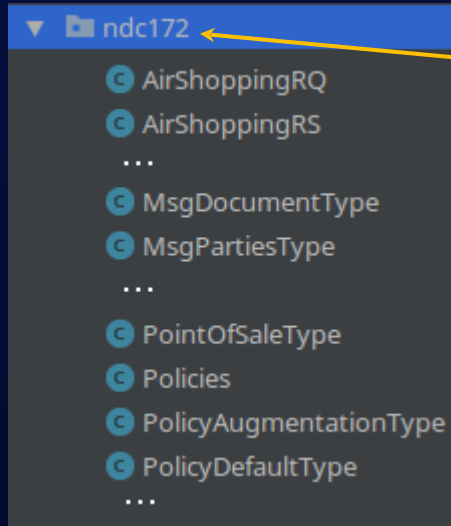
```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns="http://www.iata.org/IATA/EDIST/2017.2"
  targetNamespace="http://www.iata.org/IATA/EDIST/2017.2" elementFormDefault="qualified" attributeFormDefault="unqualified">
  <xsd:annotation>
    <xsd:documentation xml:lang="en">EDIST XML SPECIFICATION: Common XML Types</xsd:documentation>
  </xsd:annotation>
  <xsd:element name="PointOfSale" type="PointOfSaleType">
    <xsd:annotation>
      <xsd:documentation source="description" xml:lang="en">Point of Sale</xsd:documentation>
    </xsd:annotation>
  </xsd:element>
  <xsd:complexType name="PointOfSaleType">
    <xsd:annotation>
```

Many common types included

# Homogenous Namespace design (NDC 15.2/**17.2**)

*JAXB representation*

Homogenous



`package-info.java` with namespace =  
"<http://www.iata.org/IATA/EDIST/2017.2>"]

**796** files (JAXB classes) generated

# Chameleon Namespace design (NDC 18.1)

AirShoppingRQ.xsd

```
<xs:schema xmlns="http://www.iata.org/IATA/2015/00/2018.1/AirShoppingRQ" xmlns:xs="http://www.w3.org/2001/XMLSchema" targetNamespace="http://www.iata.org/IATA/2015/00/2018.1/AirShoppingRQ" elementFormDefault="qualified">
  <xs:include schemaLocation="edist_commontypes_for_AIDM.xsd"/>
  <xs:element name="AirShoppingRQ">
    <!-- ... -->
    <xs:complexType base="ShoppingCriteriaType">
      <xs:sequence>
        <!-- ... -->
        <xs:element name="PricingMethodCriteria" type="BestPricingPreferencesType" minOccurs="0">
          <xs:annotation>
            <xs:documentation>Contains information to identify how reservation was re-priced to</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:complexType>
    <!-- ... -->
  </xs:element>
</xs:schema>
```

edist\_commontypes for AIDM.xsd

```
<!-- ... -->
<xs:complexType name="BestPricingPreferencesType">
  <xs:annotation>
    <xs:documentation source="description" xml:lang="en">A data type</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="BestPricingOption">
      <!-- ... -->
    </xs:element>
  </xs:sequence>
</xs:complexType>
<!-- ... -->
</xs:schema>
```

**No target namespace!**

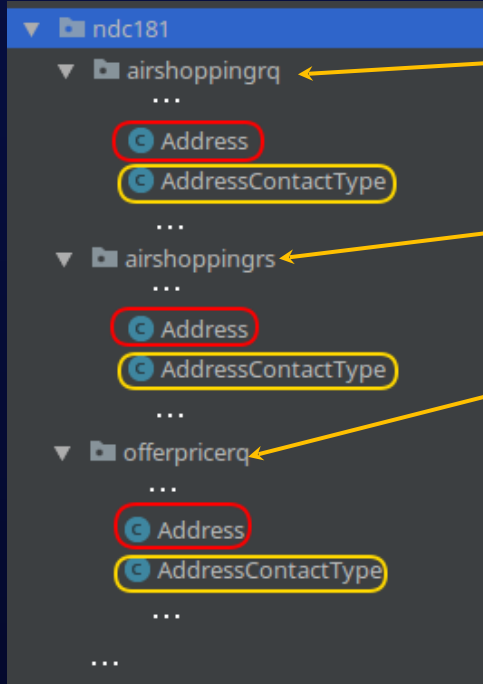
Not so many common types included



# Chameleon Namespace design (NDC 18.1)

*JAXB representation*

Chameleon



`package-info.java` with namespace =  
"http://www.iata.org/IATA/2015/00/2018.1/AirShoppingRQ"

`package-info.java` with namespace =  
"http://www.iata.org/IATA/2015/00/2018.1/AirShoppingRS"

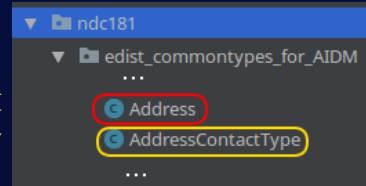
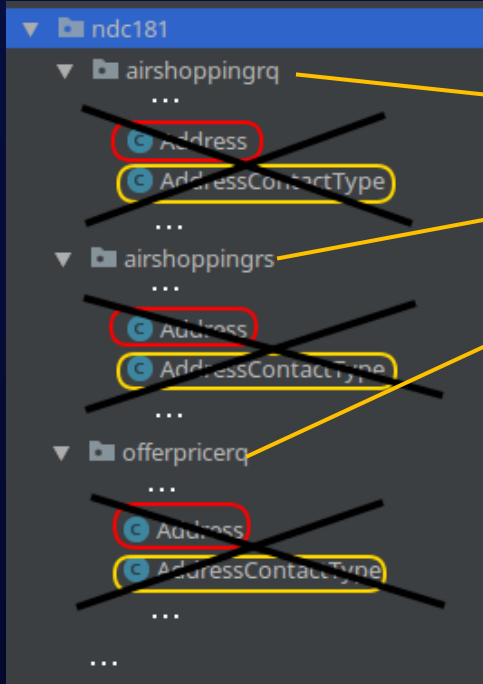
`package-info.java` with namespace =  
"http://www.iata.org/IATA/2015/00/2018.1/OfferPriceRQ"

**16301** files (JAXB classes) generated

# Chameleon Namespace design (NDC 18.1)

*JAXB representation*

Chameleon problem solved



**3517** files (JAXB classes) generated

# "Heterogenous" Namespace design (NDC 18.2)

IATA\_AirShoppingRQ.xsd

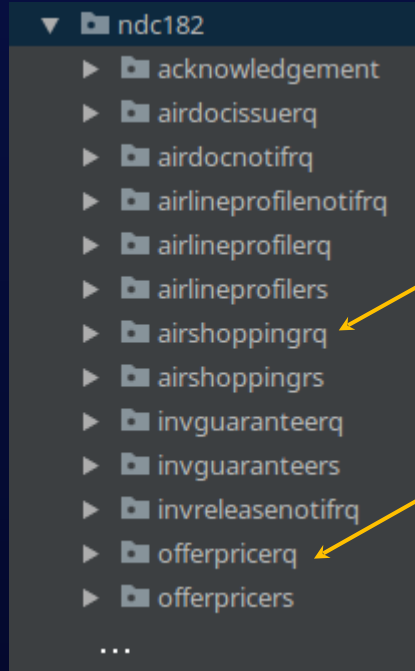
```
<xs:schema xmlns="http://www.iata.org/IATA/2015/00/2018.2/IATA_AirShoppingRQ" xmlns:k="http://www
targetNamespace="http://www.iata.org/IATA/2015/00/2018.2/IATA_AirShoppingRQ" elementFormDefa
<xs:element name="IATA_AirShoppingRQ">
  <xs:complexType>
    <xs:sequence>
      <!-- ... -->
      <xs:element name="Party" type="PartyType" minOccurs="1" maxOccurs="1">
        <xs:annotation>
          <xs:documentation>Party information. This information is intended for b
        </xs:annotation>
      </xs:element>
      <xs:element name="PayloadAttributes" type="IATAPayloadStandardAttributesType" mi
        <xs:annotation>
          <xs:documentation>IATA payload standard attributes.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="PointOfSale" type="POS_Type" minOccurs="0" maxOccurs="1">
        <xs:annotation>
          <xs:documentation>Point of Sale Information</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Request" type="RequestType" minOccurs="1" maxOccurs="1">
        <xs:annotation>
          <xs:documentation>AirShoppingRQ payload information.</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<!-- ... -->
</xs:schema>
```

No common types included

# "Heterogenous" Namespace design (NDC 18.2)

*JAXB representation*

"Heterogenous"



`package-info.java` with namespace =  
"http://www.iata.org/IATA/2015/00/2018.2/IATA\_AirShoppingRQ"

`package-info.java` with namespace =  
"http://www.iata.org/IATA/2015/00/2018.2/IATA\_OfferPriceRQ"

**4021** files (JAXB classes) generated

# JAXB representation summary

# JAXB representation summary

| NDC version                                    | 17.2 | 18.1  | 18.2 |
|--|------|-------|------|
| Number of JAXB classes                         | 796  | 16301 | 4021 |
| Number of JAXB classes<br>(after optimization) | N/A  | 3517  | N/A  |

# JAXB representation summary

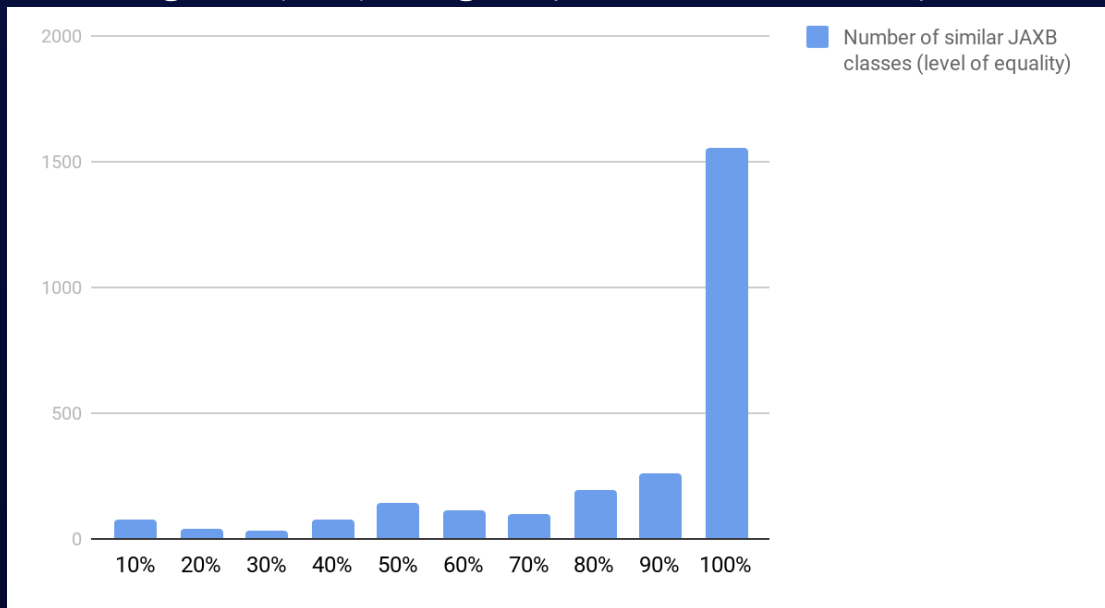
| Possible schema optimizations - remove duplicates |      |                                    |                                 |
|---|------|------------------------------------|---------------------------------|
| NDC version                                       | 17.2 | 18.1                               | 18.2                            |
| Amount of JAXB classes                            | 796  | 16301<br>3517 (after optimization) | 4021                            |
| Amount of duplicate classes                       |      | 783*<br>(could be reduced to 247)  | 632<br>(could be reduced to 73) |
| Amount of duplicate classes (groups)              |      | 1499*<br>(could be reduced to 379) | ?                               |

\* this amount refers to the JAXB classes generated after optimization (chameleon problem solved)

# JAXB representation summary

NDC 18.1

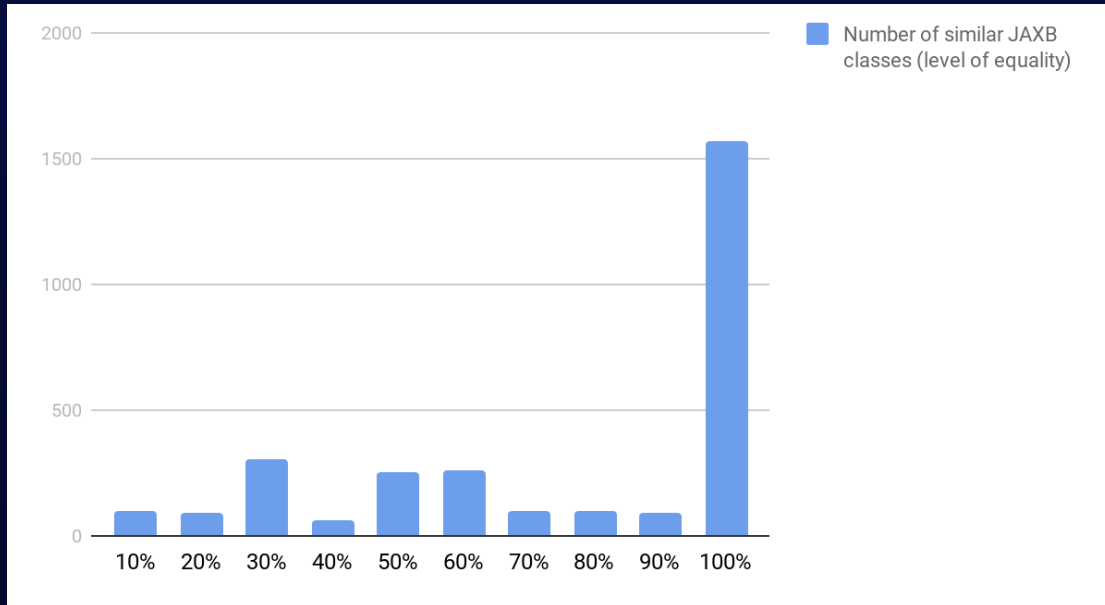
Percentage of equality histogram (API methods and fields)





# JAXB representation summary

NDC 18.2 Percentage of equality histogram (API methods and fields)



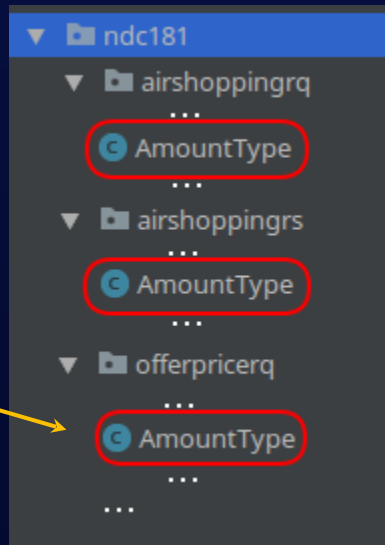
# Recommendations

# Recommendations

- Improve schema quality
  - Reuse common XML types (remove duplicates)
  - Extend the similar XML types
- Ensure backwards compatibility, if possible

# Reuse common XML types

```
<xs:complexType name="AmountType">  
  <xs:annotation>  
    <xs:documentation>An amount is a number of monetary units specified  
  </xs:annotation>  
  <xs:simpleContent>  
    <xs:extension base="xs:decimal">  
      <xs:attribute name="CurCode" type="xs:token" use="optional"/>  
    </xs:extension>  
  </xs:simpleContent>  
</xs:complexType>
```



# Extend the similar XML types

```
<xs:complexType name="PointofSaleType">
  <xs:annotation>
    <xs:documentation>The place at which a retail transaction is carried out.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="RequestDateTime" type="DateTimeType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>The place at which a retail transaction is carried out.</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="Device" type="DeviceType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>Device upon which the secure transaction will occur.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
```

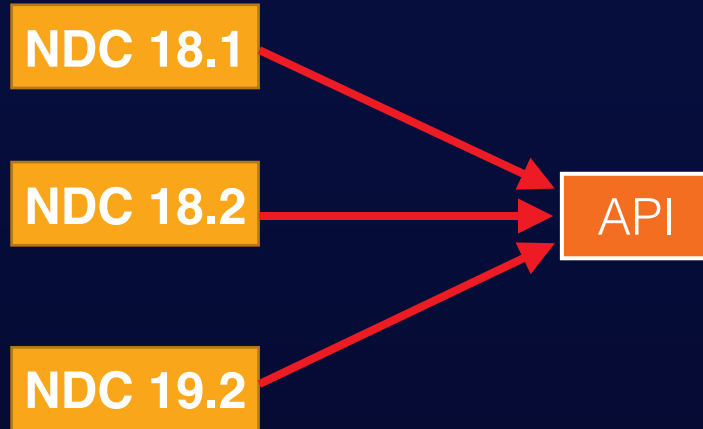


## extension



```
<xs:complexType name="PointofSaleType">
  <xs:annotation>
    <xs:documentation>The place at which a retail transaction is carried out.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="RequestTime" type="DateTimeType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>Point of sale timestamp value. Example: 2017-01-13T13:59:38Z Note: This
      </xs:annotation>
    </xs:element>
    <xs:element name="AgentDutyText" type="TextType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>Internally defined agent authority to request changes.</xs:documentation>
      </xs:annotation>
    </xs:element>
    ...
    <xs:element name="Device" type="DeviceType" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>Device upon which the secure transaction will occur.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>
```

# Backwards compatibility



Questions?



**OpenJaw**

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