Assignment 3
Interoperability
Report of implementation
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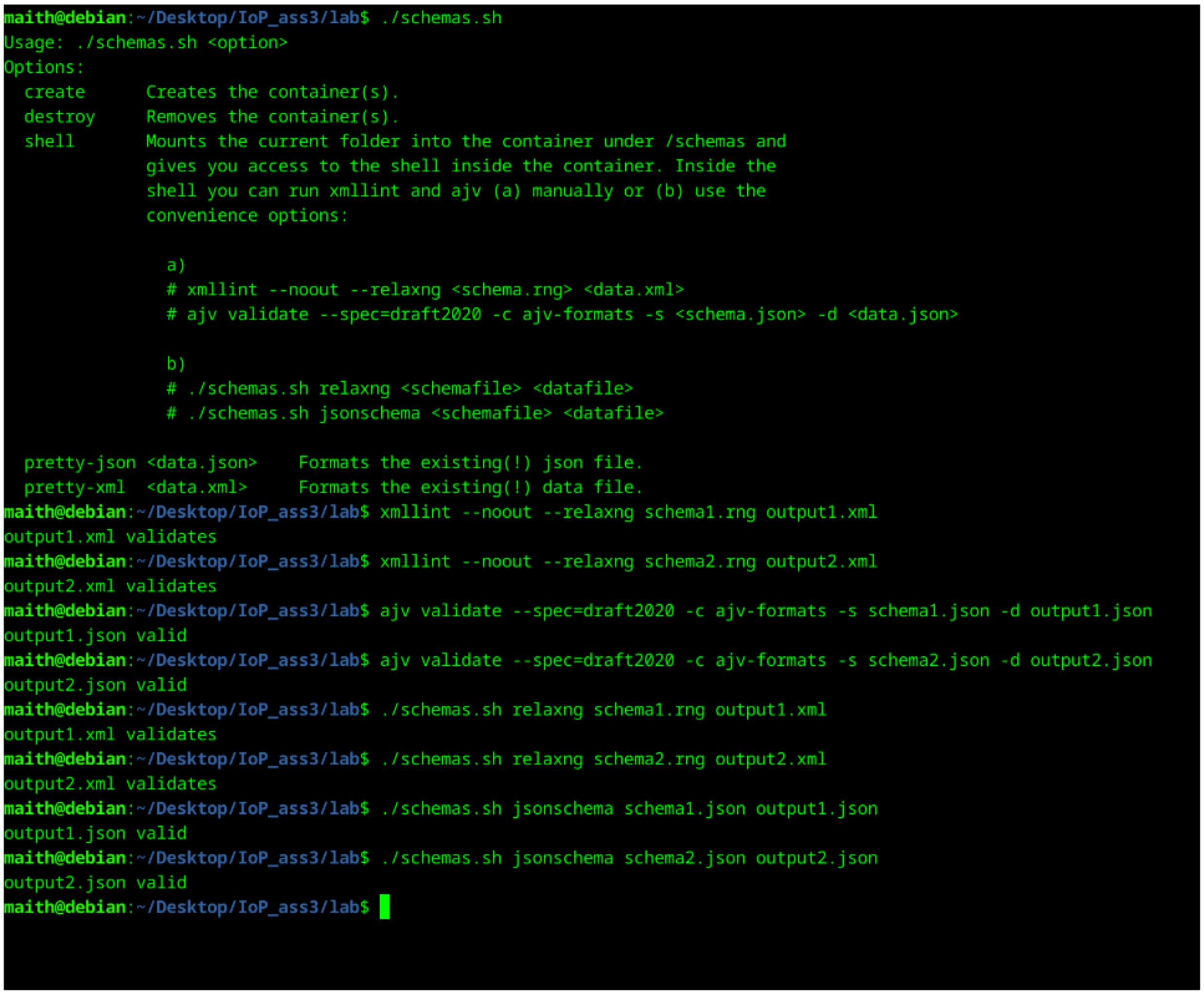
For JSON Schema at least once use

- [✓ ○ $ref] 🟦
- [✓ ○ $defs] 🟩
- [✓ ○ required] 🟨
- [✓ ○ oneOf or anyOf] 🟧
- [✓ ○ array] 🟪

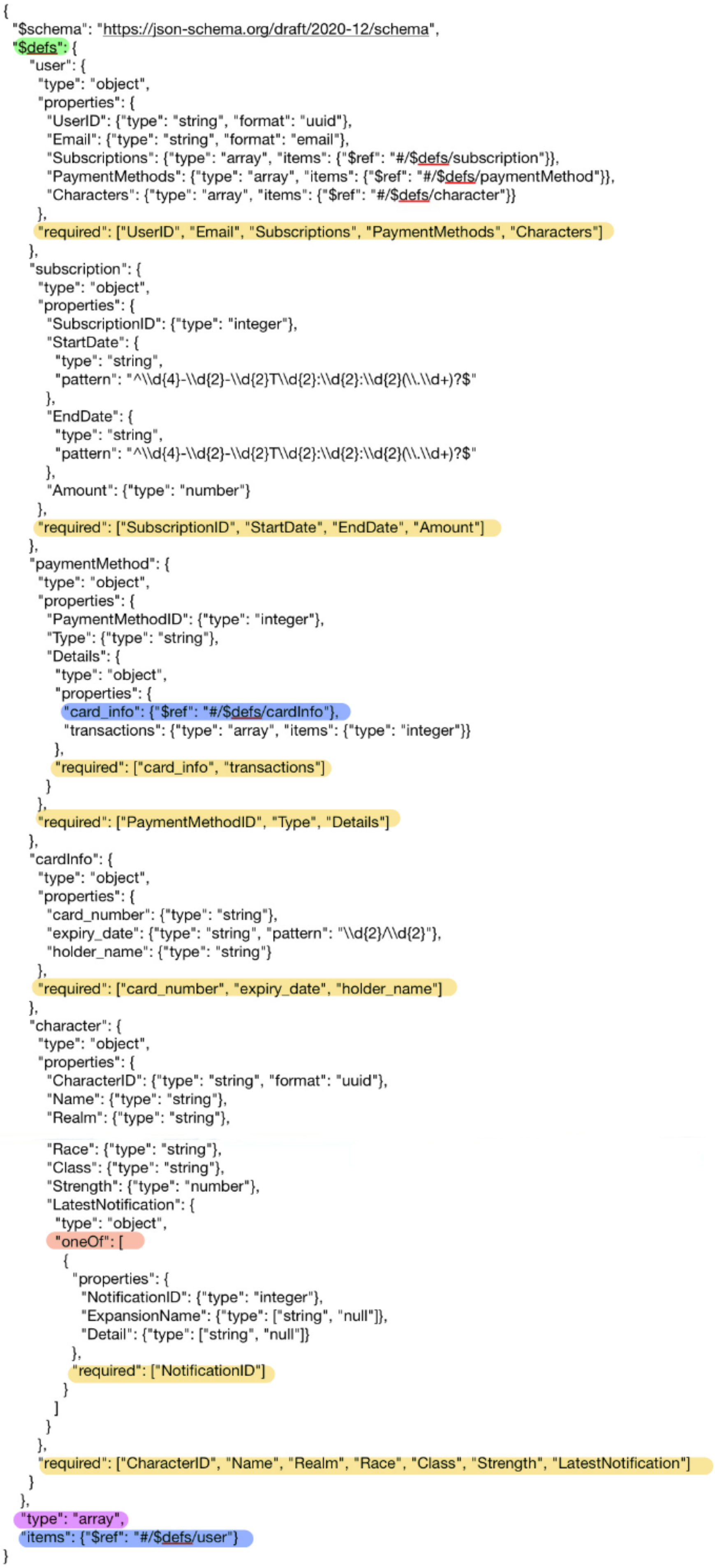
For RelaxNG at least once use the patterns (unless specified otherwise)

- [✓ ○ >= 2x define,] 🟥
- [✓ ○ choice with element or attribute] 🟨
- [✓ ○ choice with value] 🟨
- [✓ ○ choice with group,] 🟨
- [✓ ○ interleave,] 🟩
- [✓ ○ data type string with a regular expression] 🟪
- [✓ ○ data format that represents date or time or both] 🟦
- [✓ ○ oneOrMore] 🟦
- [✓ ○ text or empty in combination with element] 🟪
- [✓ ○ DO NOT use optional and zeroOrMore]



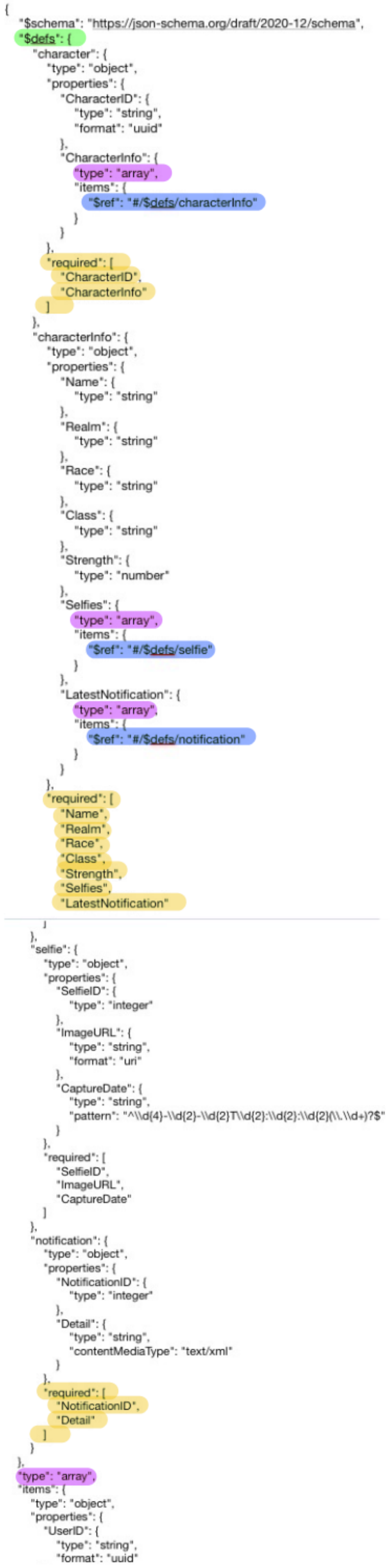
```
maith@debian:~/Desktop/IoP_ass3/lab$ ./schemas.sh
Usage: ./schemas.sh <option>
Options:
  create      Creates the container(s).
  destroy     Removes the container(s).
  shell       Mounts the current folder into the container under /schemas and
              gives you access to the shell inside the container. Inside the
              shell you can run xmllint and ajv (a) manually or (b) use the
              convenience options:

                a)
                # xmllint --noout --relaxng <schema.rng> <data.xml>
                # ajv validate --spec=draft2020 -c ajv-formats -s <schema.json> -d <data.json>

                b)
                # ./schemas.sh relaxng <schemafile> <datafile>
                # ./schemas.sh jsonschema <schemafile> <datafile>

  pretty-json <data.json>    Formats the existing(!) json file.
  pretty-xml  <data.xml>     Formats the existing(!) data file.
maith@debian:~/Desktop/IoP_ass3/lab$ xmllint --noout --relaxng schema1.rng output1.xml
output1.xml validates
maith@debian:~/Desktop/IoP_ass3/lab$ xmllint --noout --relaxng schema2.rng output2.xml
output2.xml validates
maith@debian:~/Desktop/IoP_ass3/lab$ ajv validate --spec=draft2020 -c ajv-formats -s schema1.json -d output1.json
output1.json valid
maith@debian:~/Desktop/IoP_ass3/lab$ ajv validate --spec=draft2020 -c ajv-formats -s schema2.json -d output2.json
output2.json valid
maith@debian:~/Desktop/IoP_ass3/lab$ ./schemas.sh relaxng schema1.rng output1.xml
output1.xml validates
maith@debian:~/Desktop/IoP_ass3/lab$ ./schemas.sh relaxng schema2.rng output2.xml
output2.xml validates
maith@debian:~/Desktop/IoP_ass3/lab$ ./schemas.sh jsonschema schema1.json output1.json
output1.json valid
maith@debian:~/Desktop/IoP_ass3/lab$ ./schemas.sh jsonschema schema2.json output2.json
output2.json valid
maith@debian:~/Desktop/IoP_ass3/lab$ 
```

Json schema 1:

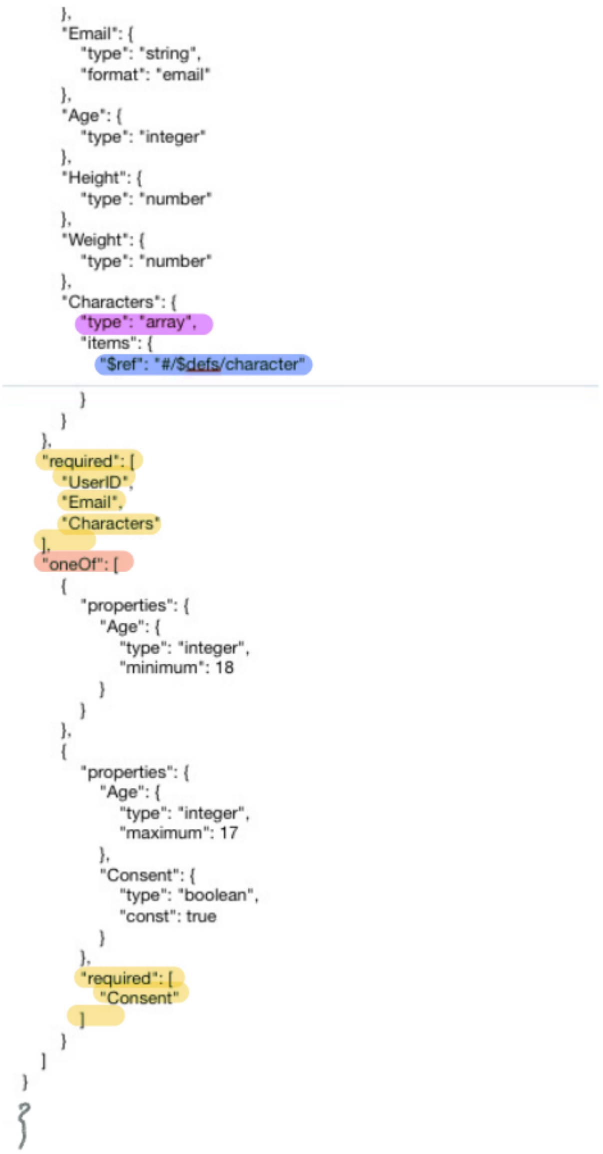


```
{
 "$schema": "https://json-schema.org/draft/2020-12/schema",
 "$defs": {
  "user": {
   "type": "object",
   "properties": {
    "UserID": {"type": "string", "format": "uuid"},
    "Email": {"type": "string", "format": "email"},
    "Subscriptions": {"type": "array", "items": {"$ref": "#/$defs/subscription"}},
    "PaymentMethods": {"type": "array", "items": {"$ref": "#/$defs/paymentMethod"}},
    "Characters": {"type": "array", "items": {"$ref": "#/$defs/character"}}
   },
   "required": ["UserID", "Email", "Subscriptions", "PaymentMethods", "Characters"]
  },
  "subscription": {
   "type": "object",
   "properties": {
    "SubscriptionID": {"type": "integer"},
    "StartDate": {
     "type": "string",
     "pattern": "^\\d{4}-\\d{2}-\\d{2}T\\d{2}:\\d{2}:\\d{2}(\\.\\d+)?$"
    },
    "EndDate": {
     "type": "string",
     "pattern": "^\\d{4}-\\d{2}-\\d{2}T\\d{2}:\\d{2}:\\d{2}(\\.\\d+)?$"
    },
    "Amount": {"type": "number"}
   },
   "required": ["SubscriptionID", "StartDate", "EndDate", "Amount"]
  },
  "paymentMethod": {
   "type": "object",
   "properties": {
    "PaymentMethodID": {"type": "integer"},
    "Type": {"type": "string"},
    "Details": {
     "type": "object",
     "properties": {
      "card_info": {"$ref": "#/$defs/cardInfo"},
      "transactions": {"type": "array", "items": {"type": "integer"}}
     },
     "required": ["card_info", "transactions"]
    }
   },
   "required": ["PaymentMethodID", "Type", "Details"]
  },
  "cardInfo": {
   "type": "object",
   "properties": {
    "card_number": {"type": "string"},
    "expiry_date": {"type": "string", "pattern": "\\d{2}/\\d{2}"},
    "holder_name": {"type": "string"}
   },
   "required": ["card_number", "expiry_date", "holder_name"]
  },
  "character": {
   "type": "object",
   "properties": {
    "CharacterID": {"type": "string", "format": "uuid"},
    "Name": {"type": "string"},
    "Realm": {"type": "string"},
    "Race": {"type": "string"},
    "Class": {"type": "string"},
    "Strength": {"type": "number"},
    "LatestNotification": {
     "type": "object",
     "oneOf": [
      {
       "properties": {
        "NotificationID": {"type": "integer"},
        "ExpansionName": {"type": ["string", "null"]},
        "Detail": {"type": ["string", "null"]}
       },
       "required": ["NotificationID"]
      }
     ]
    }
   },
   "required": ["CharacterID", "Name", "Realm", "Race", "Class", "Strength", "LatestNotification"]
  }
 },
 "type": "array",
 "items": {"$ref": "#/$defs/user"}
}
```

Json schema 2:

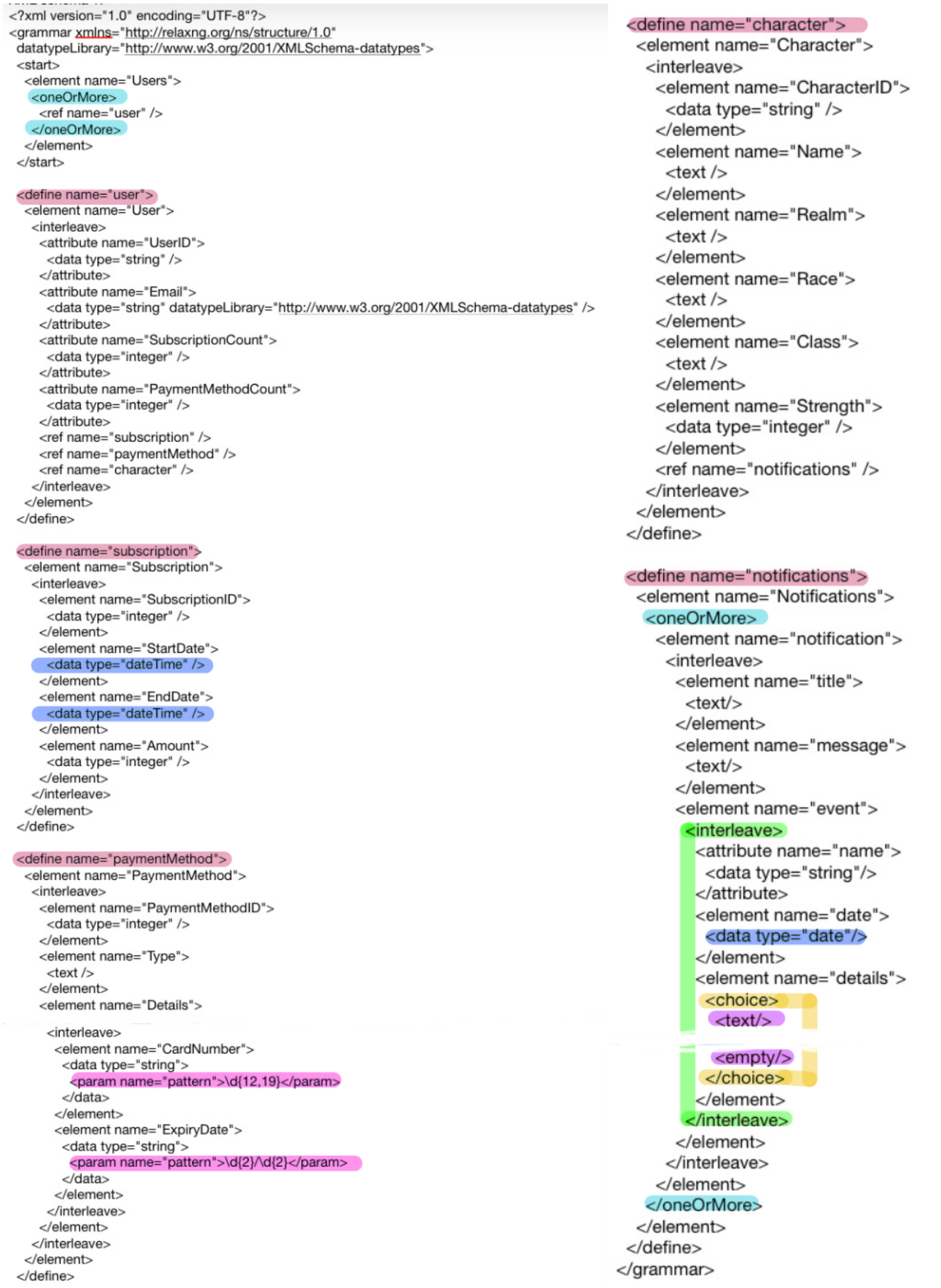


```
{
  "$schema": "https://json-schema.org/draft/2020-12/schema",
  "$defs": {
    "character": {
      "type": "object",
      "properties": {
        "CharacterID": {
          "type": "string",
          "format": "uuid"
        },
        "CharacterInfo": {
          "type": "array",
          "items": {
            "$ref": "#/$defs/characterInfo"
          }
        }
      },
      "required": [
        "CharacterID",
        "CharacterInfo"
      ]
    },
    "characterInfo": {
      "type": "object",
      "properties": {
        "Name": {
          "type": "string"
        },
        "Realm": {
          "type": "string"
        },
        "Race": {
          "type": "string"
        },
        "Class": {
          "type": "string"
        },
        "Strength": {
          "type": "number"
        },
        "Selfies": {
          "type": "array",
          "items": {
            "$ref": "#/$defs/selfie"
          }
        },
        "LatestNotification": {
          "type": "array",
          "items": {
            "$ref": "#/$defs/notification"
          }
        }
      },
      "required": [
        "Name",
        "Realm",
        "Race",
        "Class",
        "Strength",
        "Selfies",
        "LatestNotification"
      ]
    },
    "selfie": {
      "type": "object",
      "properties": {
        "SelfieID": {
          "type": "integer"
        },
        "ImageURL": {
          "type": "string",
          "format": "uri"
        },
        "CaptureDate": {
          "type": "string",
          "pattern": "^\\d{4}-\\d{2}-\\d{2}T\\d{2}:\\d{2}:\\d{2}(\\.\\d+)?$"
        }
      },
      "required": [
        "SelfieID",
        "ImageURL",
        "CaptureDate"
      ]
    },
    "notification": {
      "type": "object",
      "properties": {
        "NotificationID": {
          "type": "integer"
        },
        "Detail": {
          "type": "string",
          "contentMediaType": "text/xml"
        }
      },
      "required": [
        "NotificationID",
        "Detail"
      ]
    }
  },
  "type": "array",
  "items": {
    "type": "object",
    "properties": {
      "UserID": {
        "type": "string",
        "format": "uuid"
```



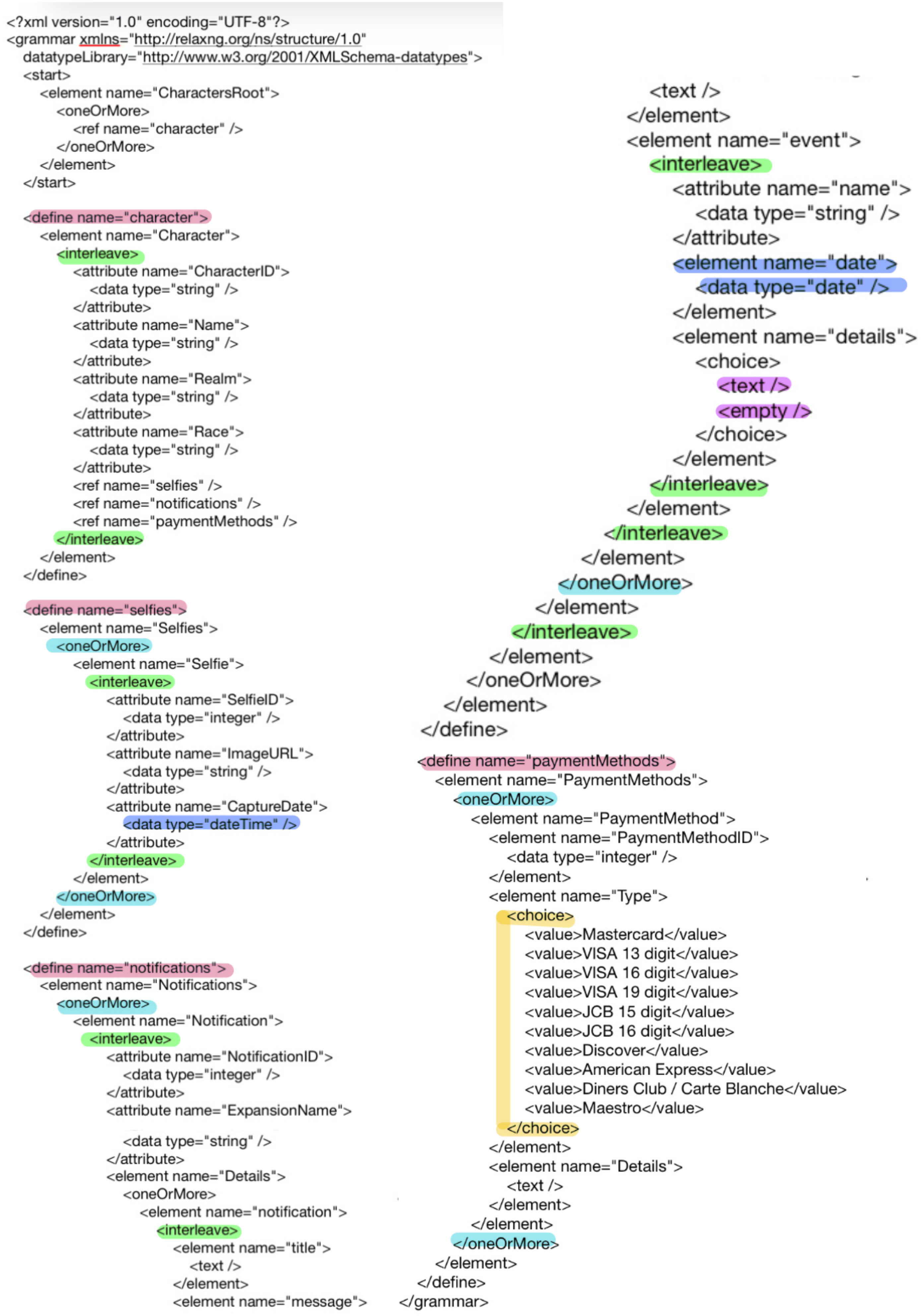
```
      },
      "Email": {
        "type": "string",
        "format": "email"
      },
      "Age": {
        "type": "integer"
      },
      "Height": {
        "type": "number"
      },
      "Weight": {
        "type": "number"
      },
      "Characters": {
        "type": "array",
        "items": {
          "$ref": "#/$defs/character"
        }
      }
    },
    "required": [
      "UserID",
      "Email",
      "Characters"
    ],
    "oneOf": [
      {
        "properties": {
          "Age": {
            "type": "integer",
            "minimum": 18
          }
        }
      },
      {
        "properties": {
          "Age": {
            "type": "integer",
            "maximum": 17
          },
          "Consent": {
            "type": "boolean",
            "const": true
          }
        },
        "required": [
          "Consent"
        ]
      }
    ]
  }
}
```

XML schema 1:



```
<?xml version="1.0" encoding="UTF-8"?>
<grammar xmlns="http://relaxng.org/ns/structure/1.0"
  datatypeLibrary="http://www.w3.org/2001/XMLSchema-datatypes">
  <start>
    <element name="Users">
      <oneOrMore>
        <ref name="user" />
      </oneOrMore>
    </element>
  </start>

  <define name="user">
    <element name="User">
      <interleave>
        <attribute name="UserID">
          <data type="string" />
        </attribute>
        <attribute name="Email">
          <data type="string" datatypeLibrary="http://www.w3.org/2001/XMLSchema-datatypes" />
        </attribute>
        <attribute name="SubscriptionCount">
          <data type="integer" />
        </attribute>
        <attribute name="PaymentMethodCount">
          <data type="integer" />
        </attribute>
        <ref name="subscription" />
        <ref name="paymentMethod" />
        <ref name="character" />
      </interleave>
    </element>
  </define>

  <define name="subscription">
    <element name="Subscription">
      <interleave>
        <element name="SubscriptionID">
          <data type="integer" />
        </element>
        <element name="StartDate">
          <data type="dateTime" />
        </element>
        <element name="EndDate">
          <data type="dateTime" />
        </element>
        <element name="Amount">
          <data type="integer" />
        </element>
      </interleave>
    </element>
  </define>

  <define name="paymentMethod">
    <element name="PaymentMethod">
      <interleave>
        <element name="PaymentMethodID">
          <data type="integer" />
        </element>
        <element name="Type">
          <text />
        </element>
        <element name="Details">
          <interleave>
            <element name="CardNumber">
              <data type="string">
                <param name="pattern">\d{12,19}</param>
              </data>
            </element>
            <element name="ExpiryDate">
              <data type="string">
                <param name="pattern">\d{2}/\d{2}</param>
              </data>
            </element>
          </interleave>
        </element>
      </interleave>
    </element>
  </define>

  <define name="character">
    <element name="Character">
      <interleave>
        <element name="CharacterID">
          <data type="string" />
        </element>
        <element name="Name">
          <text />
        </element>
        <element name="Realm">
          <text />
        </element>
        <element name="Race">
          <text />
        </element>
        <element name="Class">
          <text />
        </element>
        <element name="Strength">
          <data type="integer" />
        </element>
        <ref name="notifications" />
      </interleave>
    </element>
  </define>

  <define name="notifications">
    <element name="Notifications">
      <oneOrMore>
        <element name="notification">
          <interleave>
            <element name="title">
              <text/>
            </element>
            <element name="message">
              <text/>
            </element>
            <element name="event">
              <interleave>
                <attribute name="name">
                  <data type="string"/>
                </attribute>
                <element name="date">
                  <data type="date"/>
                </element>
                <element name="details">
                  <choice>
                    <text/>
                    <empty/>
                  </choice>
                </element>
              </interleave>
            </element>
          </interleave>
        </element>
      </oneOrMore>
    </element>
  </define>
</grammar>
```

XML schema 2:



```
<?xml version="1.0" encoding="UTF-8"?>
<grammar xmlns="http://relaxng.org/ns/structure/1.0"
  datatypeLibrary="http://www.w3.org/2001/XMLSchema-datatypes">
  <start>
    <element name="CharactersRoot">
      <oneOrMore>
        <ref name="character" />
      </oneOrMore>
    </element>
  </start>

  <define name="character">
    <element name="Character">
      <interleave>
        <attribute name="CharacterID">
          <data type="string" />
        </attribute>
        <attribute name="Name">
          <data type="string" />
        </attribute>
        <attribute name="Realm">
          <data type="string" />
        </attribute>
        <attribute name="Race">
          <data type="string" />
        </attribute>
        <ref name="selfies" />
        <ref name="notifications" />
        <ref name="paymentMethods" />
      </interleave>
    </element>
  </define>

  <define name="selfies">
    <element name="Selfies">
      <oneOrMore>
        <element name="Selfie">
          <interleave>
            <attribute name="SelfieID">
              <data type="integer" />
            </attribute>
            <attribute name="ImageURL">
              <data type="string" />
            </attribute>
            <attribute name="CaptureDate">
              <data type="dateTime" />
            </attribute>
          </interleave>
        </element>
      </oneOrMore>
    </element>
  </define>

  <define name="notifications">
    <element name="Notifications">
      <oneOrMore>
        <element name="Notification">
          <interleave>
            <attribute name="NotificationID">
              <data type="integer" />
            </attribute>
            <attribute name="ExpansionName">

              <data type="string" />
            </attribute>
            <element name="Details">
              <oneOrMore>
                <element name="notification">
                  <interleave>
                    <element name="title">
                      <text />
                    </element>
                    <element name="message">
                      <text />
                    </element>
                    <element name="event">
                      <interleave>
                        <attribute name="name">
                          <data type="string" />
                        </attribute>
                        <element name="date">
                          <data type="date" />
                        </element>
                        <element name="details">
                          <choice>
                            <text />
                            <empty />
                          </choice>
                        </element>
                      </interleave>
                    </element>
                  </interleave>
                </element>
              </oneOrMore>
            </element>
          </interleave>
        </element>
      </oneOrMore>
    </element>
  </define>

  <define name="paymentMethods">
    <element name="PaymentMethods">
      <oneOrMore>
        <element name="PaymentMethod">
          <element name="PaymentMethodID">
            <data type="integer" />
          </element>
          <element name="Type">
            <choice>
              <value>Mastercard</value>
              <value>VISA 13 digit</value>
              <value>VISA 16 digit</value>
              <value>VISA 19 digit</value>
              <value>JCB 15 digit</value>
              <value>JCB 16 digit</value>
              <value>Discover</value>
              <value>American Express</value>
              <value>Diners Club / Carte Blanche</value>
              <value>Maestro</value>
            </choice>
          </element>
          <element name="Details">
            <text />
          </element>
        </element>
      </oneOrMore>
    </element>
  </define>
</grammar>
```