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Advanced Networking and Web APIs

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Session Layer

Intermediary between the Transport and Presentation Layers

Responsible for opening and closing communication between the two devices

Synchronizes data transfer with checkpoints

RPC, NetBIOS, PAP, ZIP, AppleTalk Session Protocol, SCP

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Presentation Layer

Primary function is to ensure that the data exchanged between communicating systems is presented in a format that both the sender and the receiver can understand

Responsible for compressing data

LPP, NCP, NDR, XDR, Apple Filing Protocol(AFP), SSL

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Application Layer

Takes care of the technical details to ensure that when you click a link or send an email, the data goes where it's supposed to

HTTP/HTTPS, FTP, SMTP, DHCP

Layer where most API protocols operate:
gRPC, REST, SOAP, GraphQL

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RPC

```
POST /updateProductPrice HTTP/1.1

HOST: api.example.com

Content-Type: application/json

{"productId": "123", "newPrice": "20.00"}
```

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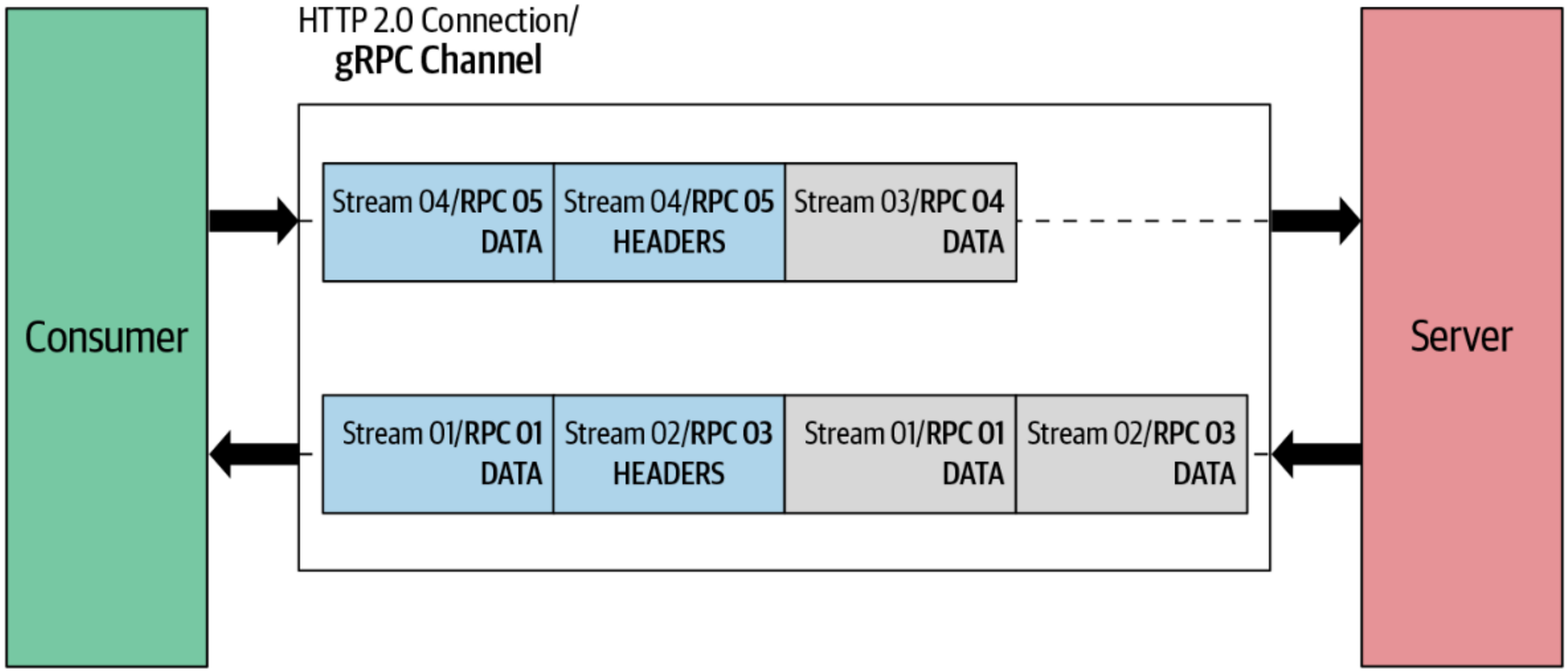
gRPC



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SOAP

```
<?xml version='1.0' Encoding='UTF-8' ?>
<env:Envelope xmlns:env="http://www.w3.org/2003/05/soap-envelope">
 <env:Header>
  <m:reservation xmlns:m="http://travelcompany.example.org/reservation"
                 env:role="http://www.w3.org/2003/05/soap-envelope/role/next">
   <m:reference>uuid:093a2da1-q345-739r-ba5d-pqff98fe8j7d</m:reference>
   <m:dateAndTime>2007-11-29T13:20:00.000-05:00</m:dateAndTime>
  </m:reservation>
  <n:passenger xmlns:n="http://mycompany.example.com/employees"
                 env:role="http://www.w3.org/2003/05/soap-envelope/role/next">
   <n:name>Fred Bloggs</n:name>
  </n:passenger>
 </env:Header>
 <env:Body>
  <p:itinerary xmlns:p="http://travelcompany.example.org/reservation/travel">
   <p:departure>
     <p:departing>New York</p:departing>
     <p:arriving>Los Angeles</p:arriving>
     <p:departureDate>2007-12-14</p:departureDate>
     <p:departureTime>late afternoon</p:departureTime>
     <p:seatPreference>aisle</p:seatPreference>
   </p:departure>
   <p:return>
     <p:departing>Los Angeles</p:departing>
     <p:arriving>New York</p:arriving>
     <p:departureDate>2007-12-20</p:departureDate>
     <p:departureTime>mid-morning</p:departureTime>
     <p:seatPreference></p:seatPreference>
   </p:return>
  </p:itinerary>
 </env:Body>
</env:Envelope>
```

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REST

```
POST /api/2.2/sites/9a8b7c6d-5e4f-3a2b-1c0d-9e8f7a6b5c4d/users HTTP/1.1
HOST: my-server
X-Tableau-Auth: 12ab34cd56ef78ab90cd12ef34ab56cd
Content-Type: application/json

{
  "user": {
    "name": "NewUser1",
    "siteRole":  "Publisher"
  }
}
```

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GraphQL

```
{
  human(id: "1000") {
    name
    height(unit: FOOT)
  }
}
```

```
  "data": {
    "human": {
      "name": "Luke Skywalker",
      "height": 5.6430448
    }
  }
}
```

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JWT Token

Encoded PASTE A TOKEN HERE

```
eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.ey
JzdWIiOiIxMjM0NTY3ODkwIiwibmFtZSI6Ikpva
G4gRG9lIiwiYWRtaW4iOnRydWV9.TJVA95OrM7E
2cBab30RMHrHDcEfxjoYZgeFONFh7HgQ
```

Decoded EDIT THE PAYLOAD AND SECRET (ONLY HS256 SUPPORTED)

HEADER: ALGORITHM & TOKEN TYPE

```
{
  "alg": "HS256",
  "typ": "JWT"
}
```

PAYLOAD: DATA

```
{
  "sub": "1234567890",
  "name": "John Doe",
  "admin": true
}
```

VERIFY SIGNATURE

```
HMACSHA256(
  base64UrlEncode(header) + "." +
  base64UrlEncode(payload),
  secret
) secret base64 encoded
```

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Access Tokens

Access Token

```
eyJz93a...k4laUWw
```

Refresh Token

```
tGzv3JOkF0XG5Qx2TlKWIA
```

Bearer Token

```
Authorization: Bearer tGzv3JOkF0XG5Qx2TlKWIAeyJz93a….
```

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Summary

- Most APIs use application layer of OSI model
- The most wide spread API is REST one
- Autorisation tokens like JWT or Bearer token are used almost everywhere in the internet for providing secure access to apps and services