# Web APIs

*Software Architecture*

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*Goals*

- Review existing networking knowledge.

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- Understand *URLs*.

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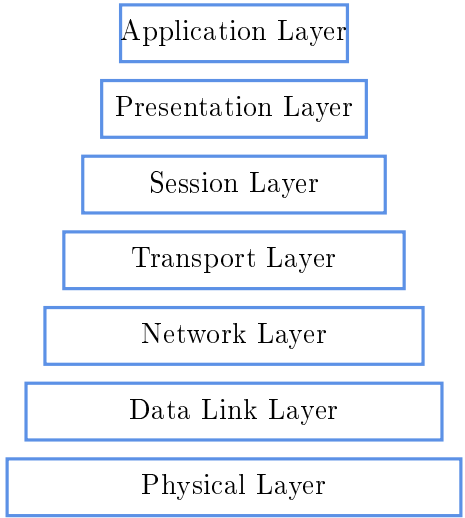
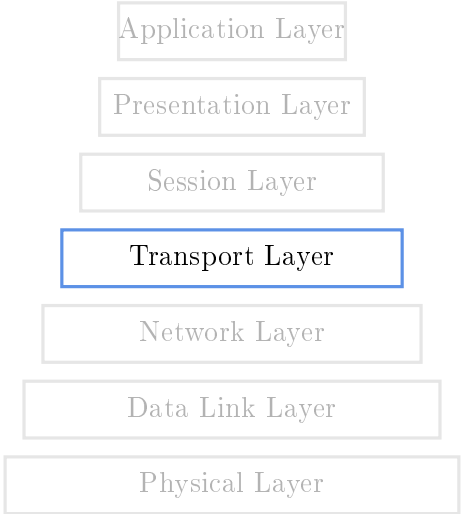
- Review existing networking knowledge.
- Understand *URLs*.
- Understand *HTTP* protocol and methods.
- Understand *RESTful* APIs.
- *Build* a basic RESTful API.

# § Networking

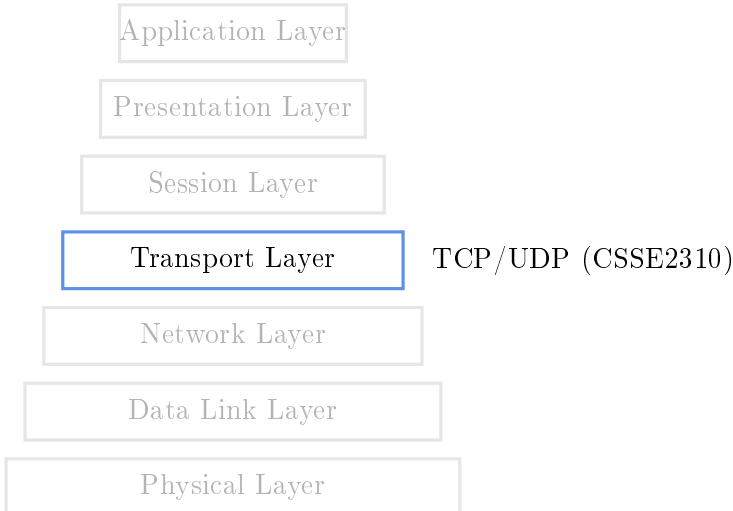
# OSI Model


Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

# OSI Model


Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

# OSI Model


Application Layer
Presentation Layer
Session Layer
Transport Layer
TCP/UDP (CSSE2310)
Network Layer
Data Link Layer
Physical Layer

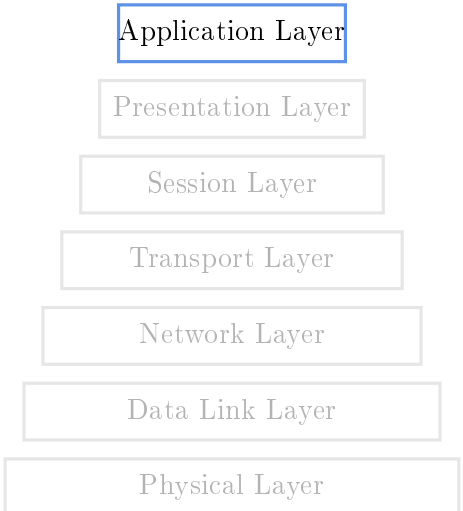
*TCP/UDP*

Low-level with *minimal abstraction*.

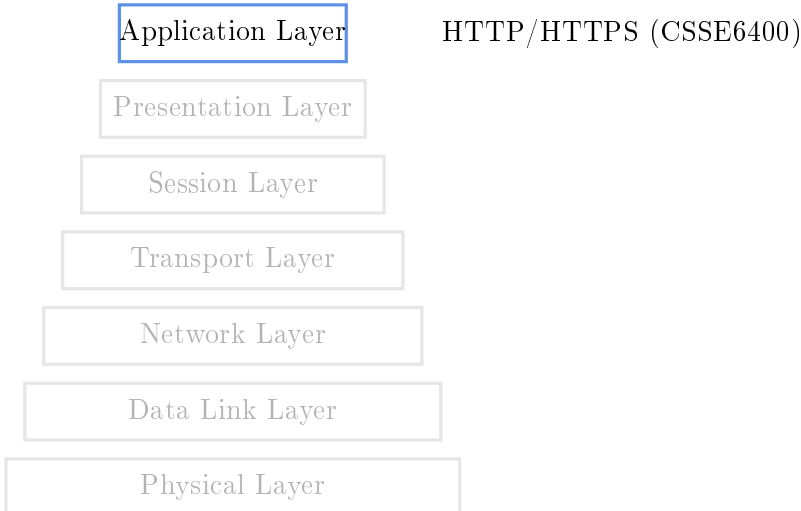
*TCP/UDP*

*Impractical* for building web APIs.

# OSI Model


Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

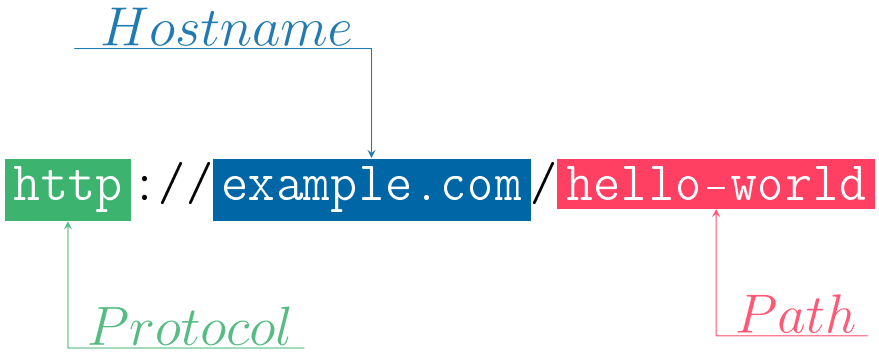
# OSI Model

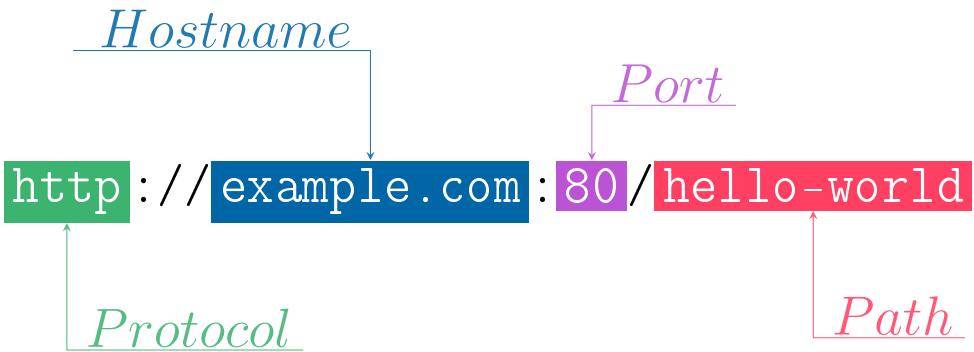

Application Layer
HTTP/HTTPS (CSSE6400)
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

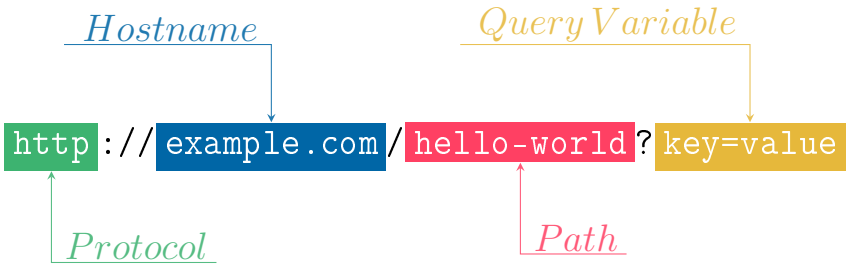
# § URLs

*The anatomy of*

# URLs


Hostname
http://example.com/hello-world
Protocol
Path


Hostname
Port
http://example.com:80/hello-world
Protocol
Path


Hostname
Query Variable
http://example.com/hello-world?key=value
Protocol
Path

# § HTTP

*HTTP*

A *request-response* abstraction for networking.

*HTTP Request*

| | |
|---|---|
| URL | An endpoint to send request to. |
| Method | Described later. |
| Headers | Specify type of data, e.g. JSON, HTML, etc. |
| Body | Optional extra data to include. |

*HTTP Response*

| | |
|---|---|
| Status Code | A number between 100 and 599 giving details about the response. |
| Headers | Specify type of response data, e.g. JSON, HTML, etc. |
| Body | Content of the response. |

*Status Codes*

200s Indicate the request was *successful*, 200 is most common.

300s *Redirects* the client to another location.

400s Indicates that the *request was wrong*

e.g. 404 meaning that the request was for something that doesn't exist.

500s Indicates that the *server had a problem* fulfilling the request.

*Types of HTTP communication*

# HTTP Methods

GET *Query* for information.

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POST *Create* resource.

GET *Query* for information.

POST *Create* resource.

PUT *Update* resource.

# HTTP Methods

GET *Query* for information.

POST *Create* resource.

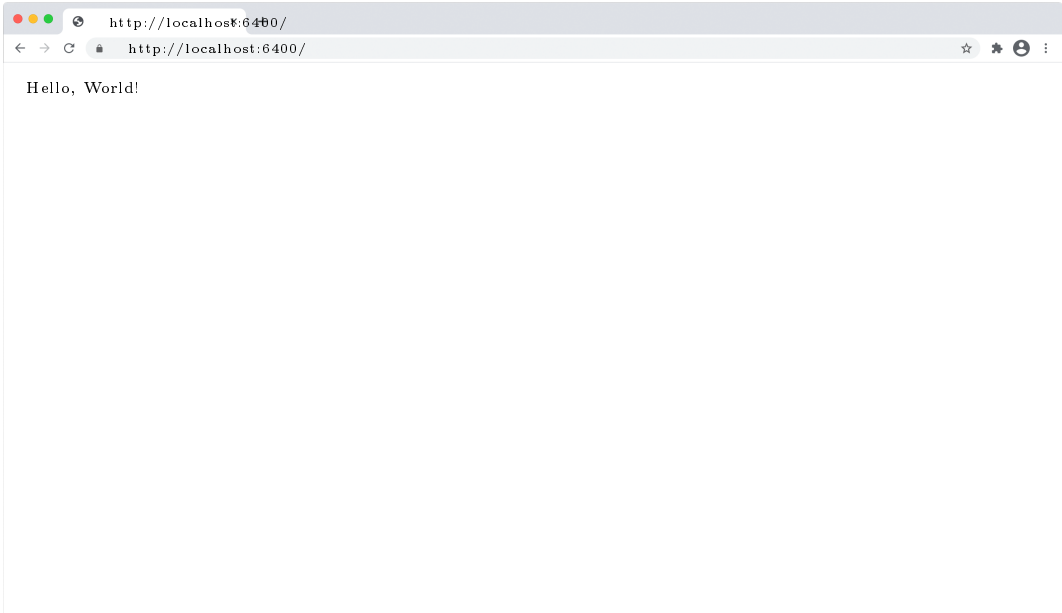
PUT *Update* resource.

DELETE *Delete* resource.

# § API Examples

```
» cat app.py

from flask import Flask

app = Flask(__name__)

@app.route("/")
def hello_world():
    return "Hello, World!"

if __name__ == "__main__":
    app.run(port=6400)
```

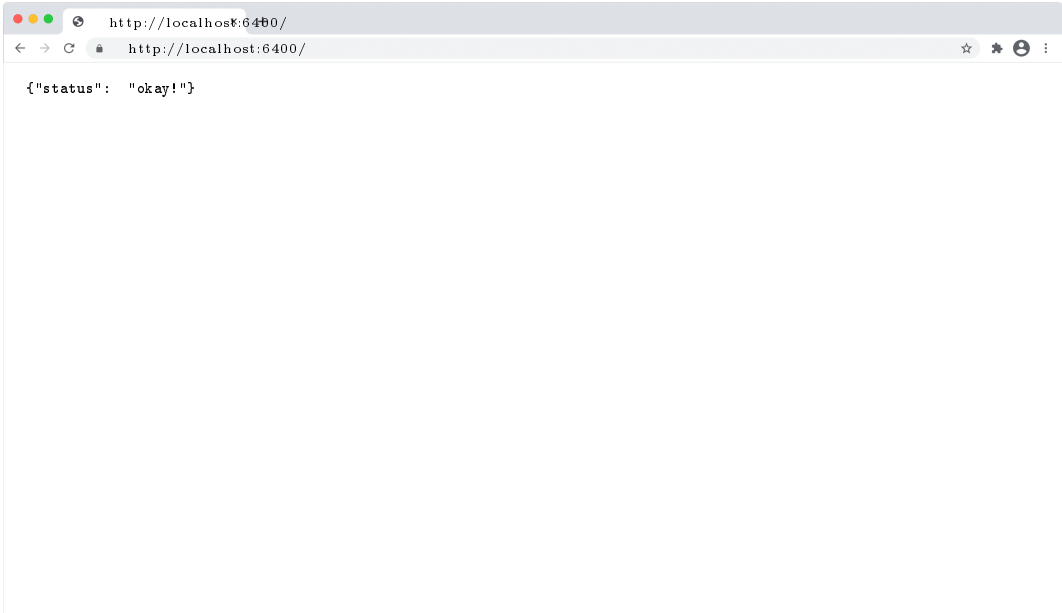
## *Result*



```
» cat app.js

const express = require('express')
const app = express()
const port = 6400

app.get('/', (req, res) => {
    res.send('Hello, World!')
})

app.listen(port, () => {
    console.log(`Example app listening on port ${port}`)
})
```

```
» cat app.py

from flask import Flask

app = Flask(__name__)

@app.route("/health")
def hello_world():
    return {"status": "okay!"}

if __name__ == "__main__":
    app.run(port=6400)
```

## *Result*



```
» cat app.js

const express = require('express')
const app = express()
const port = 6400

app.get('/', (req, res) => {
    res.send({"status": "okay!"})
})

app.listen(port, () => {
    console.log(`Example app listening on port ${port}`)
})
```

```
» cat app.py

from flask import Flask
from flask import request

app = Flask(__name__)

@app.route("/echo", methods=["POST"])
def hello_world():
    return request.json.say

if __name__ == "__main__":
    app.run(port=6400)
```

```
>>> curl -X POST \
-H "Accept: application/json" \
-H "Content-Type: application/json" \
"http://localhost:6400" \
-d '{
    "say" : "Hello, World",
}'
Hello, World
```

```
» cat app.js

const express = require('express')
const app = express()
const port = 6400

app.post('/', express.json(), (req, res) => {
    res.send(req.body.say)
})

app.listen(port, () => {
    console.log(`Example app listening on port ${port}`)
})
```