

# Web APIs

*Software Architecture*

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*Goals*

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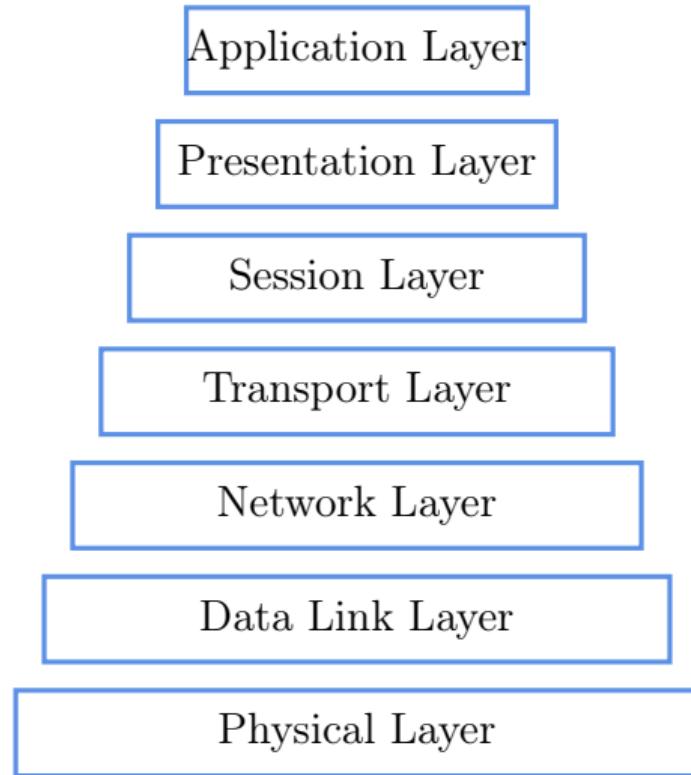
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- Understand *URLs*.
- Understand *HTTP* protocol and methods.
- Understand *RESTful* APIs.

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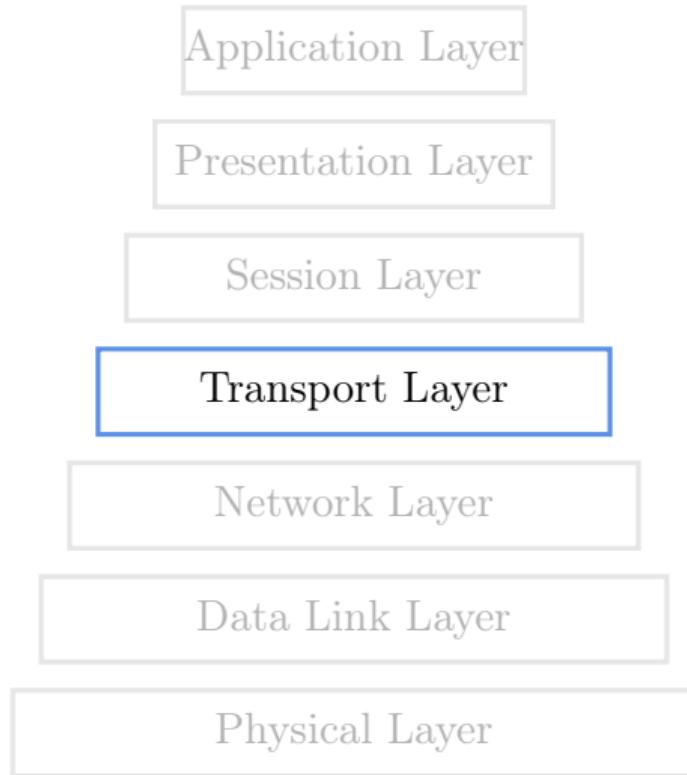
- Review existing networking knowledge.
- Understand *URLs*.
- Understand *HTTP* protocol and methods.
- Understand *RESTful* APIs.
- *Build* a basic RESTful API.

# *§ Networking*

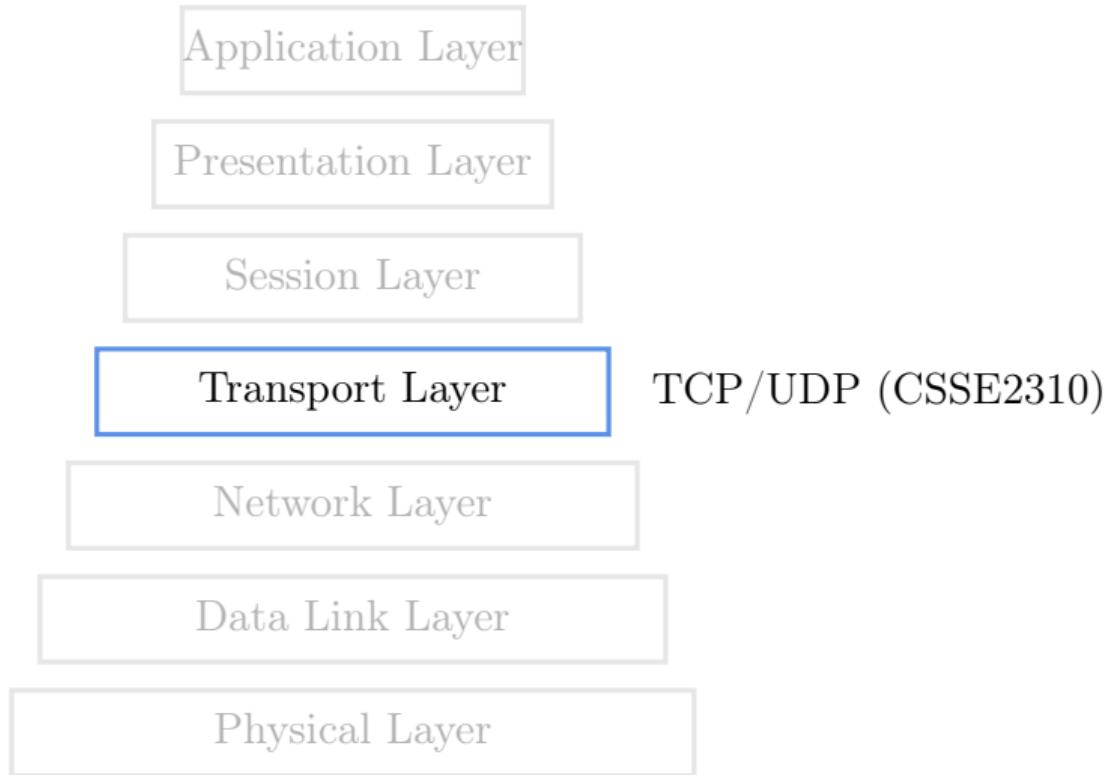
# OSI Model



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*TCP/UDP*

Low-level with *minimal abstraction*.

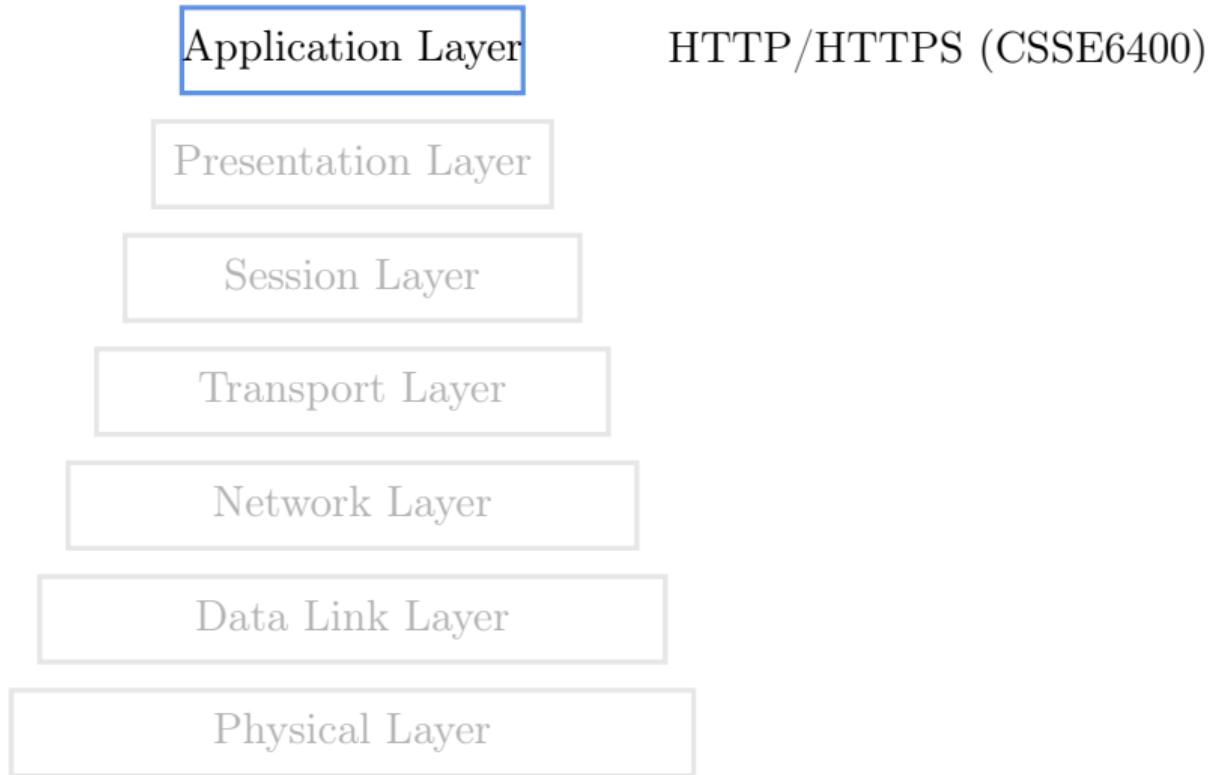
*TCP/UDP*

*Impractical* for building web APIs.

# OSI Model



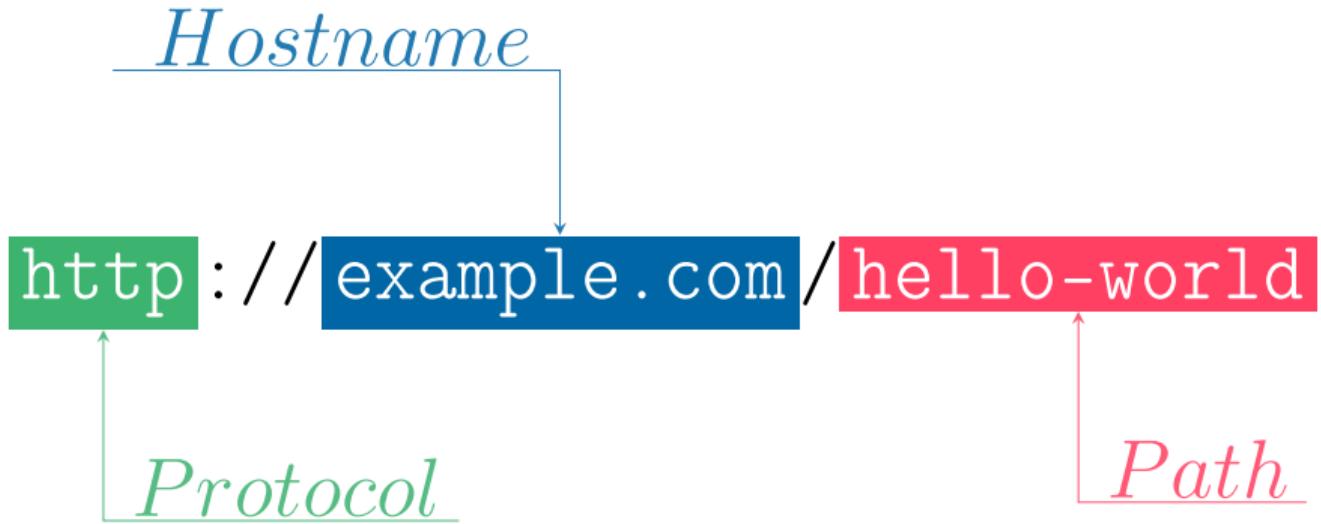
# OSI Model

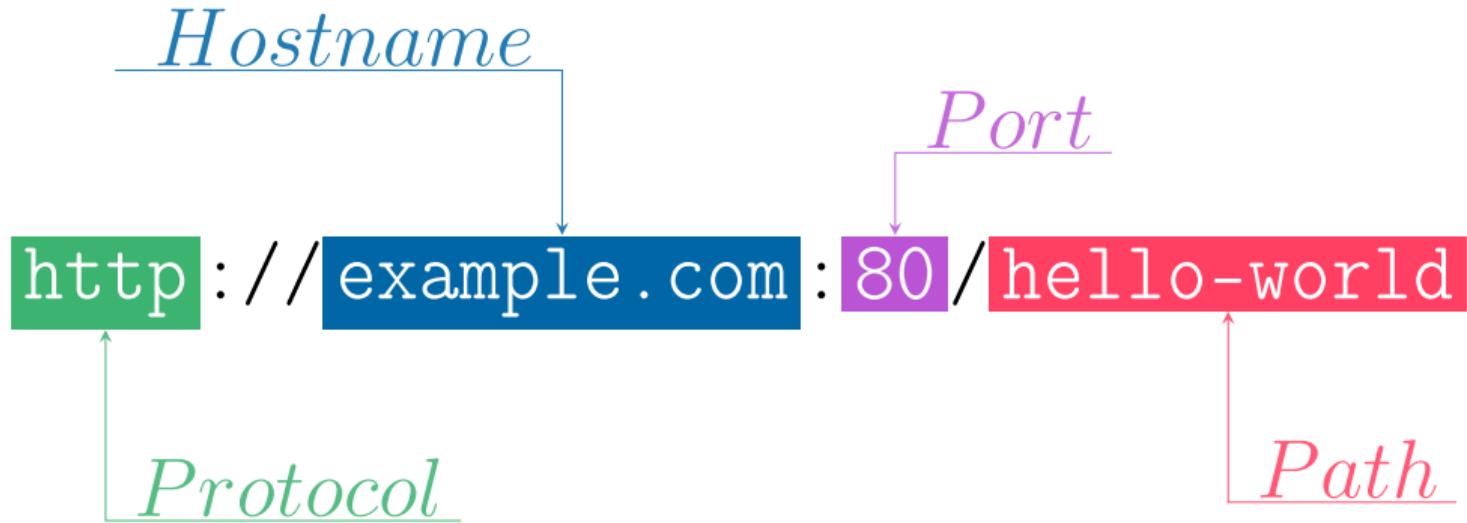


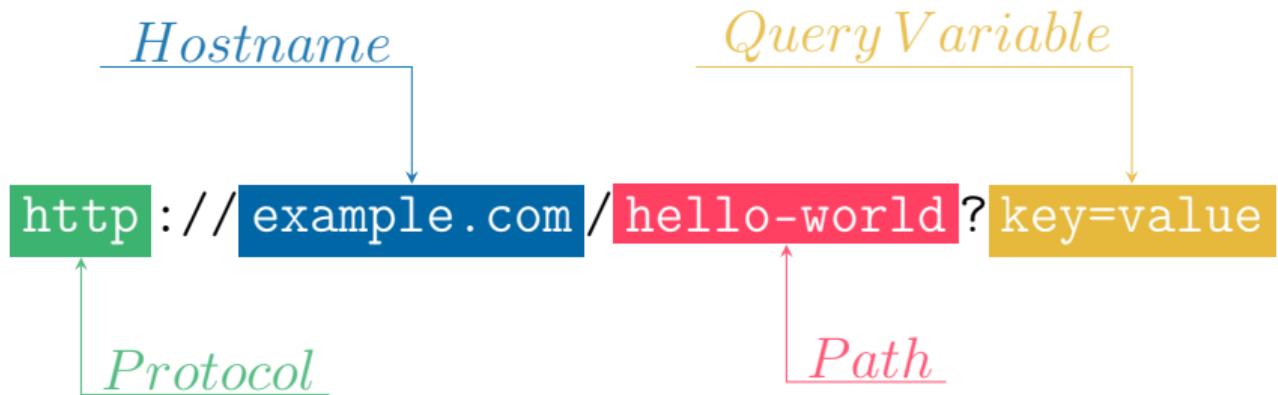
# § URLs

*The anatomy of*

URLs







# § 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

## HTTP Methods

GET *Query* for information.

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GET *Query* for information.

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PUT *Update* resource.

## HTTP Methods

GET *Query* for information.

POST *Create* resource.

PUT *Update* resource.

DELETE *Delete* resource.

# *§ API Examples*

```
» cat app.py

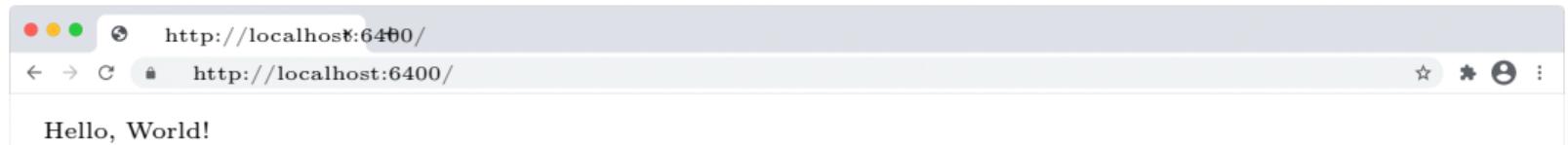
1 from flask import Flask

3 app = Flask(__name__)

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

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

## *Result*



```
» cat app.js

1 const express = require('express')
2 const app = express()
3 const port = 6400

5 app.get('/', (req, res) => {
6     res.send('Hello, World!')
7 }

9 app.listen(port, () => {
10    console.log(`Example app listening on port ${port}`)
11})
```

```
» cat app.py

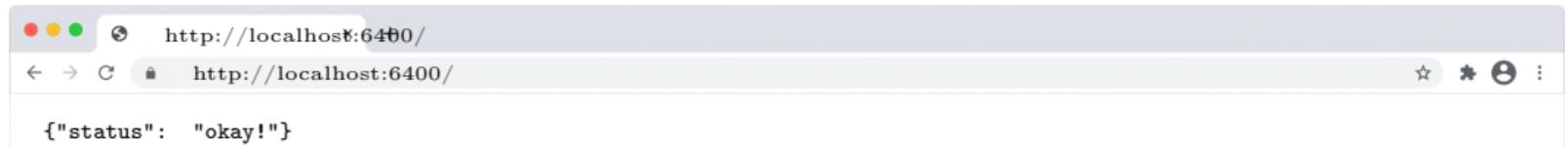
1 from flask import Flask

3 app = Flask(__name__)

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

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

## *Result*



A screenshot of a web browser window. The address bar shows the URL `http://localhost:6400/`. The main content area displays the following JSON object:

```
{"status": "okay!"}
```

```
» cat app.js

1 const express = require('express')
2 const app = express()
3 const port = 6400

5 app.get('/', (req, res) => {
6     res.send({status: "okay!"})
7 }

9 app.listen(port, () => {
10    console.log(`Example app listening on port ${port}`)
11})
```

```
» cat app.py

1 from flask import Flask
2 from flask import request

4 app = Flask(__name__)

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

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

```
1 >>> curl -X POST \
2 -H "Accept: application/json" \
3 -H "Content-Type: application/json" \
4 "http://localhost:6400" \
5 -d '{
6     "say" : "Hello, World",
7 }'
8 Hello, World
```

```
» cat app.js

1 const express = require('express')
2 const app = express()
3 const port = 6400

5 app.post('/', express.json(), (req, res) => {
6     res.send(req.body.say)
7 }

9 app.listen(port, () => {
10    console.log(`Example app listening on port ${port}`)
11})
```