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Simple PHP Web API

Hans-Petter Halvorsen

Contents

- A short overview of APIs in general will be given.
  - API is short for Application Programming Interface.
- We will create a simple Web API using PHP.
  - PHP is a server-side framework/programming language for creating web pages and web contents.
  - We will use MySQL as the Database system.
  - We will use the phpMyAdmin tool to administrator and setup the database.
  - We will implement a simple CRUD Web API that Create, Read, Update and Delete data in the Database.
  - We will use Visual Studio Code as the Code editor.
- Finally, we will use Python and Thonny editor to test the REST API.

Introduction

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API

- Application Programming Interface (API).
- An API is a way for two or more computer programs or components to communicate with each other.
- It is a type of software interface that offers a service to other software.
- APIs come in many shapes, some examples are SOAP API, REST API, GraphQL API, etc.
- Most programming languages today have components/libraries that can be used both to create APIs and to consume APIs (using existing APIs).

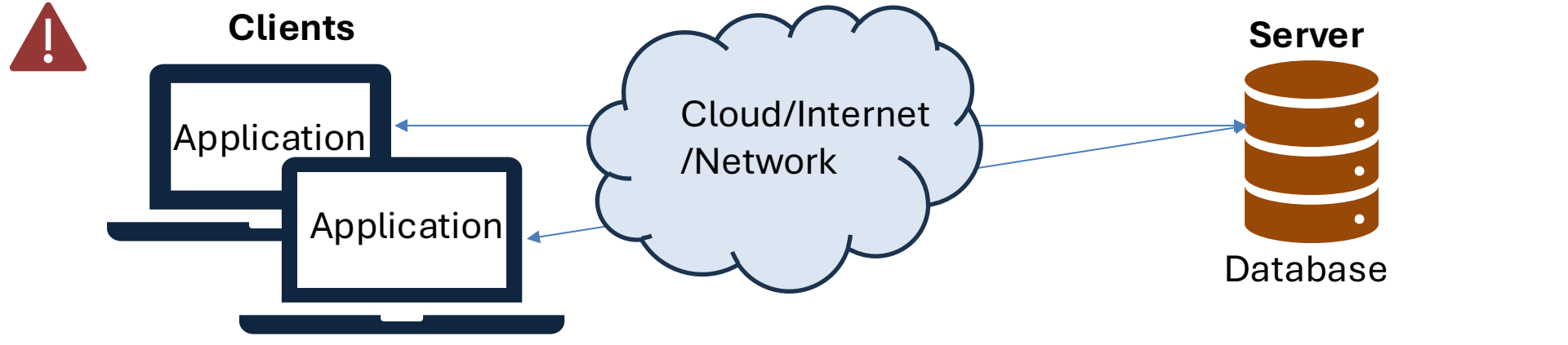
Web API

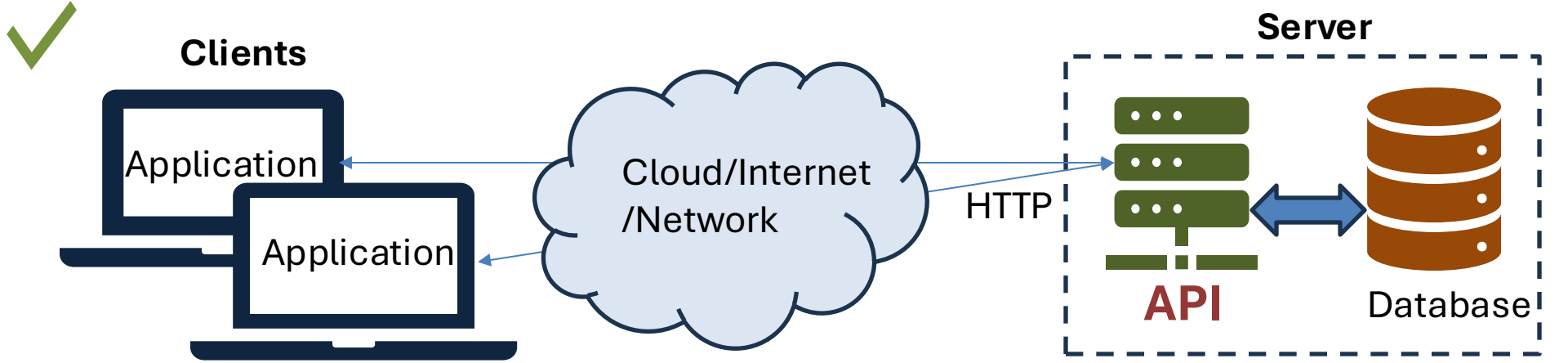
- We can create/use APIs for internal use inside an Application or between 2 or more Applications.
- Basically, an API can be just a Class with Methods that you use several places inside an Application or that you share between multiple Applications.
- A set of Stored Procedures in a Database can also be an API.
- When the Application that consume/use the API is on a local PC and the API itself is located on a Server, we can talk about so-called “Web APIs”.
- Such Web APIs also very often perform CRUD operations against a Database located on the Web.
- Normally it is not allowed to connect directly to a Database located in the Cloud from a local computer unless you configure and give access to the IP addresses for those clients.

CRUD: **C**reate, **R**ead, **U**pdate, **D**elete Data

Web API

Normally it is not allowed to connect directly to a Database located in the Cloud from a local computer unless you configure and give access to the IP addresses for those clients.





JSON

- When it comes to Web APIs and REST APIs JSON is the standard for the data format.
- Example:

```
{
  "Name": "John Wayne",
  "Work": "Actor",
  "Age": 52
  "Children": [
    "Lisa",
    "Thomas",
    "Knut"
  ]
}
```

https://en.wikipedia.org/wiki/JSON

PHP + MySQL

- You need to have a PHP + MySQL Environment on your local computer on get access to it from a server/Internet.
- For local installation you need to download and install Apache, PHP and MySQL.
- You can get server access from many providers (free or paid).
- I will use an internal LAMP server available for employees and students at my University.

LAMP

- LAMP = **L**inux, **A**pache, **M**ySQL, **P**HP
  - PHP is the Programming Language
  - MySQL is the Database System
  - Apache is the Web Server software
  - Linux is the operating system where the Web Server is running

Each part in LAMP is free and open-source, so it is a popular web hosting environment. You find also lots of online documentation and a large community.

LAMP/PHP Web Hosting

- There exists hundreds/thousands of different LAMP/PHP/MySQL Hosting Providers, some free but mostly paid options.
- Hostinger - https://www.hostinger.no
- InfinityFree - https://www.infinityfree.com
- PRO ISP - https://www.proisp.no
- +++ (Just Google)

Why use Web API?

- Normally it is not allowed to connect directly to a Database located in the Cloud from a local computer
  - unless you configure and give access to the IP addresses for those clients.
  - Typically, your IT Department don’t allow that
- You can use the same API for multiple Applications, let say you have a Desktop App, an iPhone App and an Android App
  - All can use the same API
  - You save time and money by developing only once instead of specific code for each application.

API Summary

- Basically, Web APIs, REST APIs or HTTP APIs are basically the same.
- It is just different names for the same.
- They all communicate via Internet and use HTTP as communication protocol.
- And they use JSON (or sometimes XML) as Data Format.

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PHP Web API Example

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Example

We will create a Web API with CRUD functionality, meaning we will insert, read, update and delete data in a Database.

- We will start by creating a Database and Table using MySQL and the phpMyAdmin tool.
- Then we will create the PHP code for the REST API.
- We will test the API in the URL in the Web Browser.
- Finaly we will test the API creating some basic Python examples.

Tools

The following tool will be used in this example:

- PHP
- MySQL
  - phpMyAdmin
- Visual Studio Code
- WinSCP
- Python
  - Thonny Python Editor

PHP + MySQL

- You need to have a PHP + MySQL Environment on your local computer on get access to it from a server/Internet.
- For local installation you need to download and install Apache, PHP and MySQL.
- You can get server access from many providers (free or paid).
- I will use an internal LAMP server available for employees and students at my University.

Database

We start by creating a simple Database Table, e.g.:

```
CREATE TABLE BOOK
(
    BookId int PRIMARY KEY AUTO_INCREMENT,
    Title varchar(100) NOT NULL,
    Author varchar(100) NOT NULL,
    Topic varchar(100) NOT NULL
);
```

Database

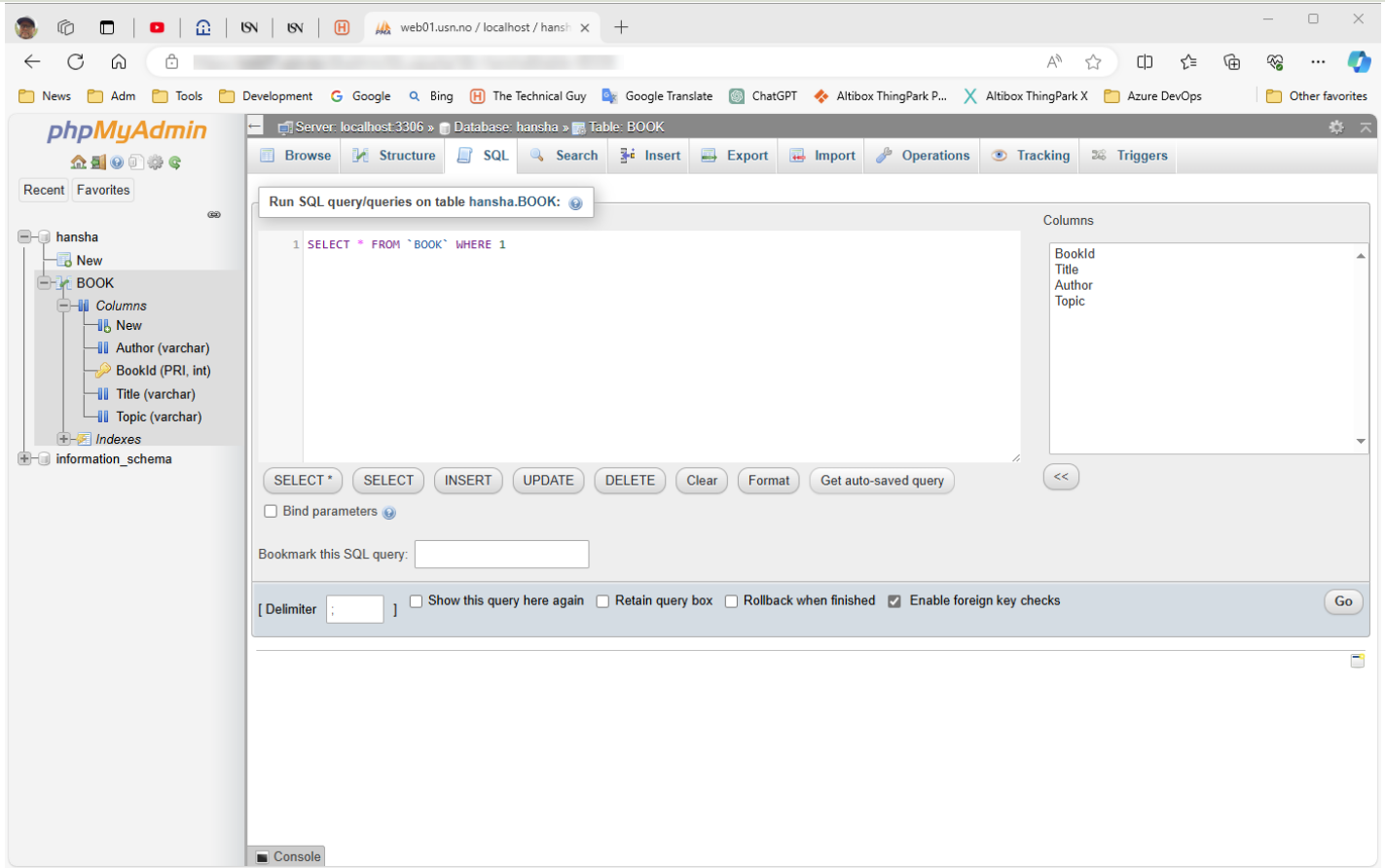
We can also insert some data into the Table, e.g.:

```
insert into BOOK (Title, Author, Topic) values
('Web Apps, 'Elvis Presly', 'Programming');

insert into BOOK (Title, Author, Topic) values
('IoT and Cloud', 'John Wayne', 'IoT');

insert into BOOK (Title, Author, Topic) values
('C#', 'Rune Hansen', 'Programming');
```

phpMyAdmin


web01.usn.no / localhost / hansh
News
Adm
Tools
Development
Google
Bing
The Technical Guy
Google Translate
ChatGPT
Altibox ThingPark P...
Altibox ThingPark X
Azure DevOps
Other favorites
phpMyAdmin
Recent
Favorites
hansha
New
BOOK
Columns
New
Author (varchar)
BookId (PRI, int)
Title (varchar)
Topic (varchar)
Indexes
information_schema
Server: localhost:3306 » Database: hansha » Table: BOOK
Browse
Structure
SQL
Search
Insert
Export
Import
Operations
Tracking
Triggers
Run SQL query/queries on table hansha.BOOK:
SELECT * FROM `BOOK` WHERE 1
Columns
BookId
Title
Author
Topic
SELECT *
SELECT
INSERT
UPDATE
DELETE
Clear
Format
Get auto-saved query
<<
Bind parameters
Bookmark this SQL query:
[Delimiter ;]
Show this query here again
Retain query box
Rollback when finished
Enable foreign key checks
Go
Console

PHP API “Methods”

- We can create 2 PHP files, e.g.:
- config.php - contains usernames, passwords, etc. for the MySQL Server database
- In a subfolder, e.g., called “book“ we create 5 PHP files:
  - GetBooks.php
  - GetBookById.php
  - InsertBook.php
  - UpdateBook.php
  - DeleteBook.php

config.php

Connect to your Database:

```
<?php
$host = 'localhost';
$dbname = 'your_database_name';
$username = 'your_username';
$password = 'your_password';
try {
 $pdo = new PDO("mysql:host=$host;dbname=$dbname", $username, $password);
 $pdo->setAttribute(PDO::ATTR_ERRMODE, PDO::ERRMODE_EXCEPTION);
} catch (PDOException $e) {
 die("Database connection failed: " . $e->getMessage());
}
?>
```

https://www.w3schools.com/php/php_mysql_connect.asp

GetBook

This method is used to retrieve data from the Database

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GetBooks.php

```php
<?php
require_once 'config.php';

// Set the content type to JSON
header('Content-Type: application/json');

// Handle HTTP methods
$method = $_SERVER['REQUEST_METHOD'];

$stmt = $pdo->query('SELECT * FROM BOOK');
$result = $stmt->fetchAll(PDO::FETCH_ASSOC);
echo json_encode($result);
?>
```

Visual Studio Code

File Edit Selection View ··· Search

Restricted Mode is intended for safe code browsing. Trust this window to enable all features. Manage Learn More

config.php GetBooks.php

C: > Users > hansha > OneDrive > web01.usn.no > api > book > 1.0 > GetBooks.php

```php
<?php
require_once 'config.php';

// Set the content type to JSON
header('Content-Type: application/json');

// Handle HTTP methods
$method = $_SERVER['REQUEST_METHOD'];

$stmt = $pdo->query('SELECT * FROM BOOK');
$result = $stmt->fetchAll(PDO::FETCH_ASSOC);
echo json_encode($result);

?>
```

Restricted Mode ⊗ 0 ⚠ 0 0 Ln 9, Col 1 Spaces: 4 UTF-8 CRLF PHP

WinSCP (FTP)

1.0 - web01.usn.no - WinSCP

Synchronize | Queue | Transfer Settings Default

web01.usn.no | New Session

C: OS | Upload | Edit | Properties | New

C:\Users\hansha\OneDrive\web01.usn.no\api\book\1.0\

Name	Size	Type	Changed
..		Parent directory	2024-06-10 09:57:16
config.php	1 KB	PHP Source File	2024-02-20 10:50:09
DeleteBook.php	1 KB	PHP Source File	2024-06-10 09:57:50
GetBookById.php	1 KB	PHP Source File	2024-06-10 10:14:29
GetBooks.php	1 KB	PHP Source File	2024-06-10 09:55:06
InsertBook.php	1 KB	PHP Source File	2024-06-10 09:57:50
UpdateBook.php	1 KB	PHP Source File	2024-06-10 09:57:50

0 B of 2,41 KB in 0 of 6

1.0 | Find Files | Download | Edit | Properties | New

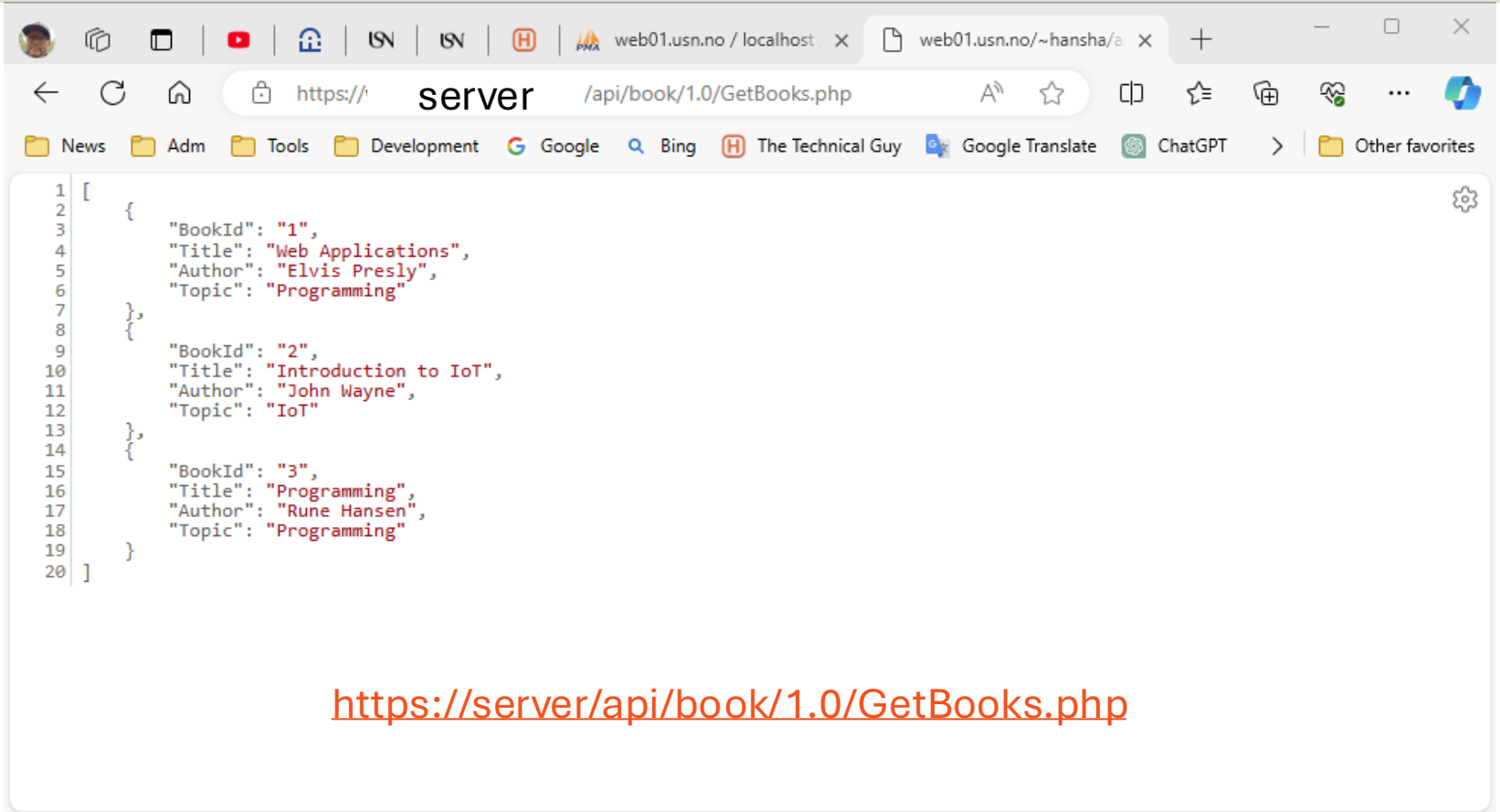
/home/hansha/public_html/api/book/1.0/

Name	Size	Changed	Rights
..		2024-06-10 09:57:58	rwxr-sr-
config.php	1 KB	2024-02-20 10:50:09	rw-r--r-
DeleteBook.php	1 KB	2024-06-10 09:57:50	rw-r--r-
GetBookById.php	1 KB	2024-06-10 10:14:29	rw-r--r-
GetBooks.php	1 KB	2024-06-10 09:55:06	rw-r--r-
InsertBook.php	1 KB	2024-06-10 09:57:50	rw-r--r-
UpdateBook.php	1 KB	2024-06-10 09:57:50	rw-r--r-

0 B of 2,41 KB in 0 of 6

SFTP-3 | 0:43:20

GetBooks - Web Browser




```
[
    {
        "BookId": "1",
        "Title": "Web Applications",
        "Author": "Elvis Presly",
        "Topic": "Programming"
    },
    {
        "BookId": "2",
        "Title": "Introduction to IoT",
        "Author": "John Wayne",
        "Topic": "IoT"
    },
    {
        "BookId": "3",
        "Title": "Programming",
        "Author": "Rune Hansen",
        "Topic": "Programming"
    }
]
```


https://server/api/book/1.0/GetBooks.php

GetBooks - Python

```python
import requests

server = "https://servername/"
api = "api/book/1.0/"
method = "GetBooks"
url = server + api + method + ".php"
print(url)

response = requests.get(url)
print(response)
print(response.json())
```

Thonny – Running Python Script

Thonny - C:\Users\hansha\OneDrive\Courses\Webutvikling\Tutorials\Simple WebAPI\Development\Python\api_getbooks.py @ 8 : 1

File Edit View Run Tools Help

api_getbooks.py

```python
import requests

server = "https://        server        /"
api = "api/book/1.0/"
method = "GetBooks"
url = server + api + method + ".php"
print(url)

response = requests.get(url)
print(response)
print(response.json())
```

Shell

```
>>> %Run api_getbooks.py
                                /api/book/1.0/GetBooks.php
 <Response [200]>
 [{'BookId': '1', 'Title': 'Web Applications', 'Author': 'Elvis Presly', 'Topic': 'Programming'}, {'BookId': '
 2', 'Title': 'Introduction to IoT', 'Author': 'John Wayne', 'Topic': 'IoT'}, {'BookId': '3', 'Title': 'Progra
 mming', 'Author': 'Rune Hansen', 'Topic': 'Programming'}]

>>>
```

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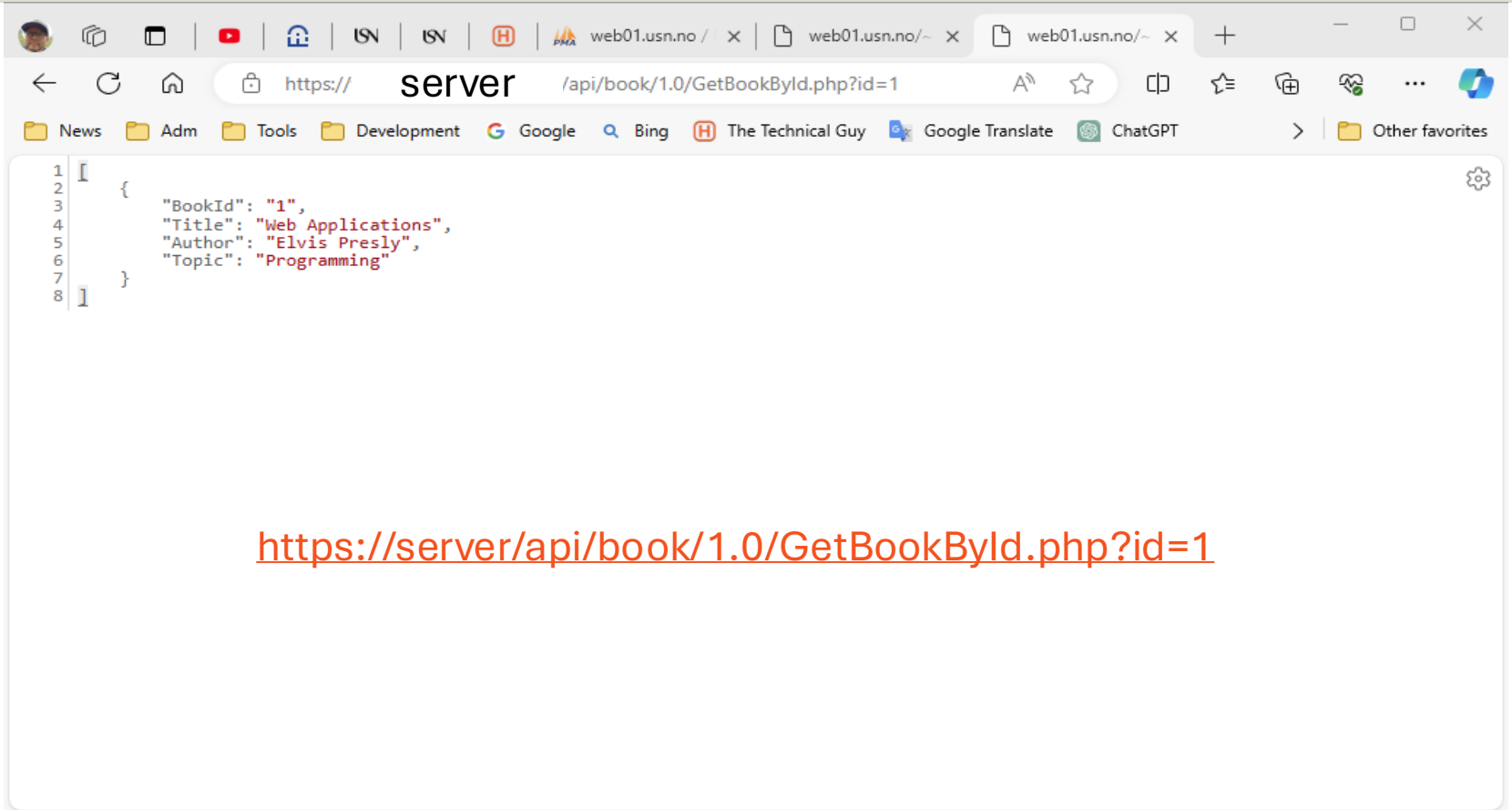
GetBookById.php

```php
<?php
require_once 'config.php';

// Set the content type to JSON
header('Content-Type: application/json');

// Handle HTTP methods
$method = $_SERVER['REQUEST_METHOD'];

$id = htmlspecialchars($_GET['id']);

$stmt = $pdo->prepare('SELECT * FROM BOOK WHERE BookId=?');
$stmt->execute([$id]);

$result = $stmt->fetchAll(PDO::FETCH_ASSOC);
echo json_encode($result);
?>
```

GetBookById - Web Browser



https://server/api/book/1.0/GetBookById.php?id=1

GetBookById - Python

```
import requests

server = "https://servername/"
api = "api/book/1.0/"
method = "GetBookById"

id = "1"
query = "?id=" + id

url = server + api + method + ".php" + query
print(url)

response = requests.get(url)
print(response)
print(response.json())
```

Thonny – Running Python Script

Thonny - C:\Users\hansha\OneDrive\Courses\Webutvikling\Tutorials\Simple WebAPI\Development\Python\api_getbookbyid.py @ 15 : 23

File Edit View Run Tools Help

api_getbooks.py | api_getbookbyid.py

```python
import requests

server = "https://        server        /"
api = "api/book/1.0/"
method = "GetBookById"

id = "1"
query = "?id=" + id

url = server + api + method + ".php" + query
print(url)

response = requests.get(url)
```

Shell

```
>>> %Run api_getbookbyid.py
                                /api/book/1.0/GetBookById.php?id=1
 [{'BookId': '1', 'Title': 'Web Applications', 'Author': 'Elvis Presly', 'Topic': 'Programming'}]
>>>
```

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InsertBook

This method is used to insert new data stored in the Database

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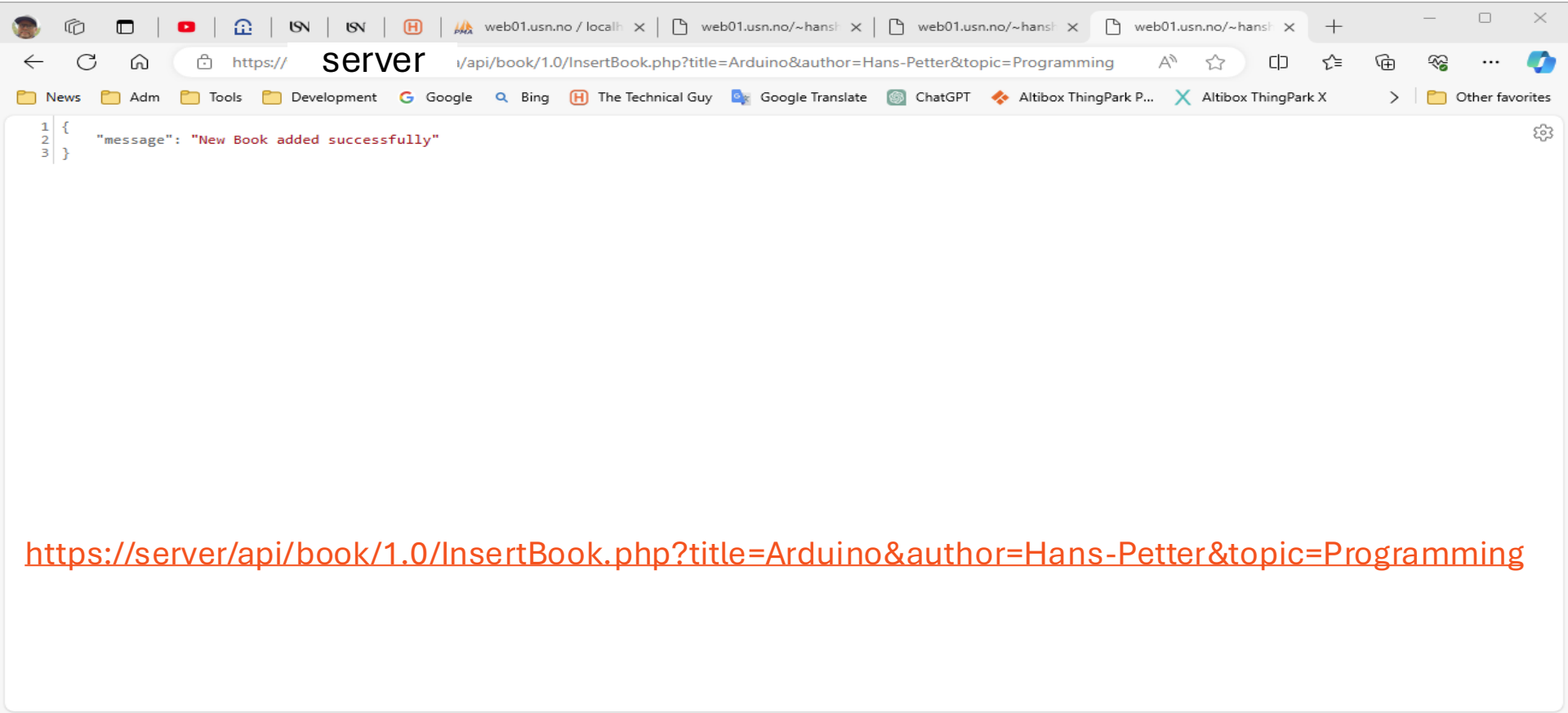
InsertBook.php

```php
<?php
require_once 'config.php';

// Set the content type to JSON
header('Content-Type: application/json');

// Handle HTTP methods
$method = $_SERVER['REQUEST_METHOD'];

$title = htmlspecialchars($_GET['title']);
$author = htmlspecialchars($_GET['author']);
$topic = htmlspecialchars($_GET['topic']);

$stmt = $pdo->prepare('INSERT INTO BOOK (Title, Author, Topic) VALUES (?, ?, ?)');
$stmt->execute([$title, $author, $topic]);

echo json_encode(['message' => 'New Book added successfully']);

?>
```

InsertBook - Web Browser



https://server/api/book/1.0/InsertBook.php?title=Arduino&author=Hans-Petter&topic=Programming

InsertBook - Python

```
import requests

server = "https://servername/"
api = "api/book/1.0/"
method = "InsertBook"

title = "Arduino"
author = "Hans-Petter"
topic = "IoT"
query = "?title=" + title + "&author=" + author + "&topic=" + topic

url = server + api + method + ".php" + query
print(url)

response = requests.get(url)
print(response)
print(response.json())
```

UpdateBook

This method is used to update data stored in the Database

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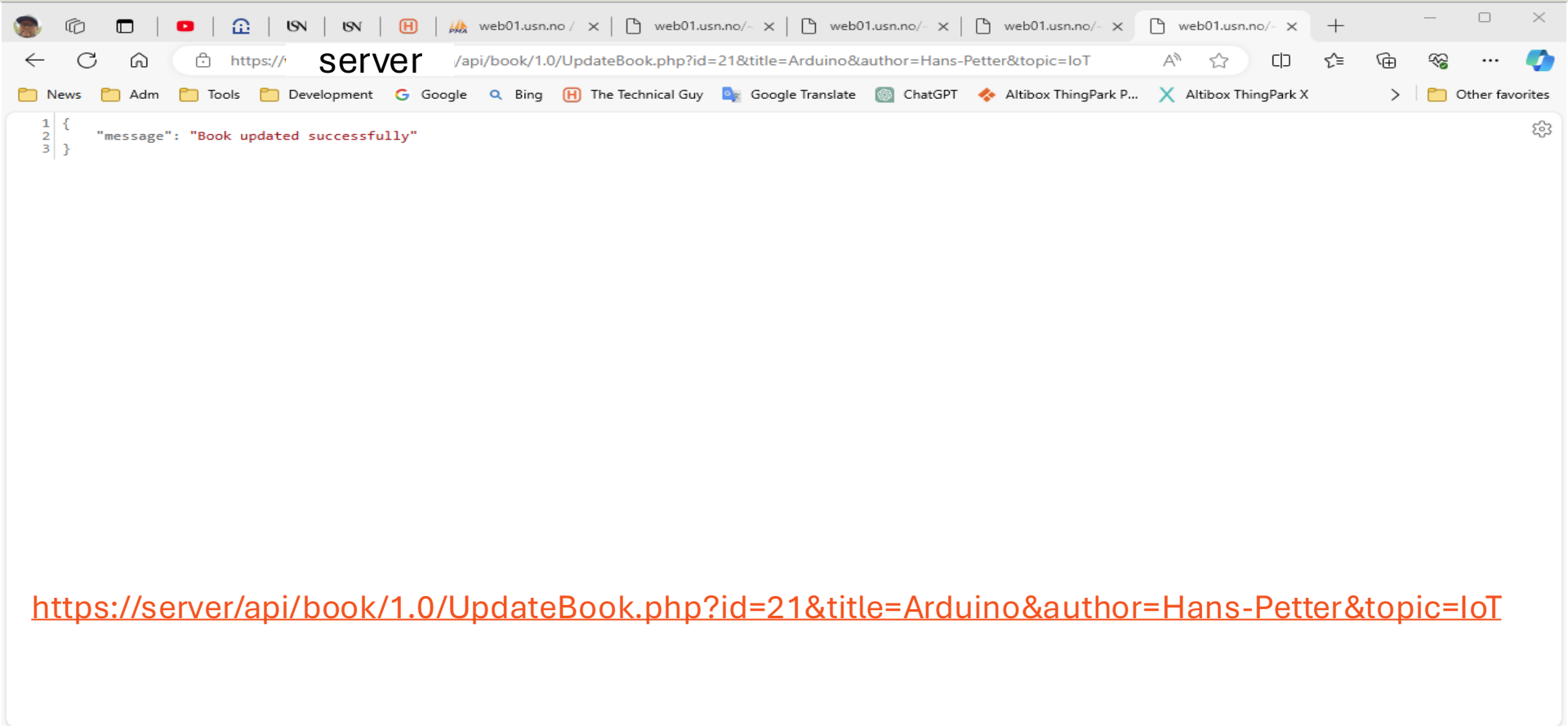
UpdateBook.php

```php
<?php
require_once 'config.php';

// Set the content type to JSON
header('Content-Type: application/json');

// Handle HTTP methods
$method = $_SERVER['REQUEST_METHOD'];

$id = htmlspecialchars($_GET['id']);
$title = htmlspecialchars($_GET['title']);
$author = htmlspecialchars($_GET['author']);
$topic = htmlspecialchars($_GET['topic']);

$stmt = $pdo->prepare('UPDATE BOOK SET Title=?, Author=?, Topic=? WHERE BookId=?');
$stmt->execute([$title, $author, $topic, $id]);

echo json_encode(['message' => 'Book updated successfully']);

?>
```

UpdateBook - Web Browser



https://server/api/book/1.0/UpdateBook.php?id=21&title=Arduino&author=Hans-Petter&topic=IoT

UpdateBook - Python

```
import requests

server = "https://servername/"
api = "api/book/1.0/"
method = "UpdateBook"

id = "18"
title = "Arduino2"
author = "Hans-Petter2"
topic = "Programming"
query = "?id=" + id + "&title=" + title + "&author=" + author + "&topic=" + topic

url = server + api + method + ".php" + query
print(url)

response = requests.get(url)
print(response)
print(response.json())
```

DeleteBook

This method is used to delete data stored in the Database

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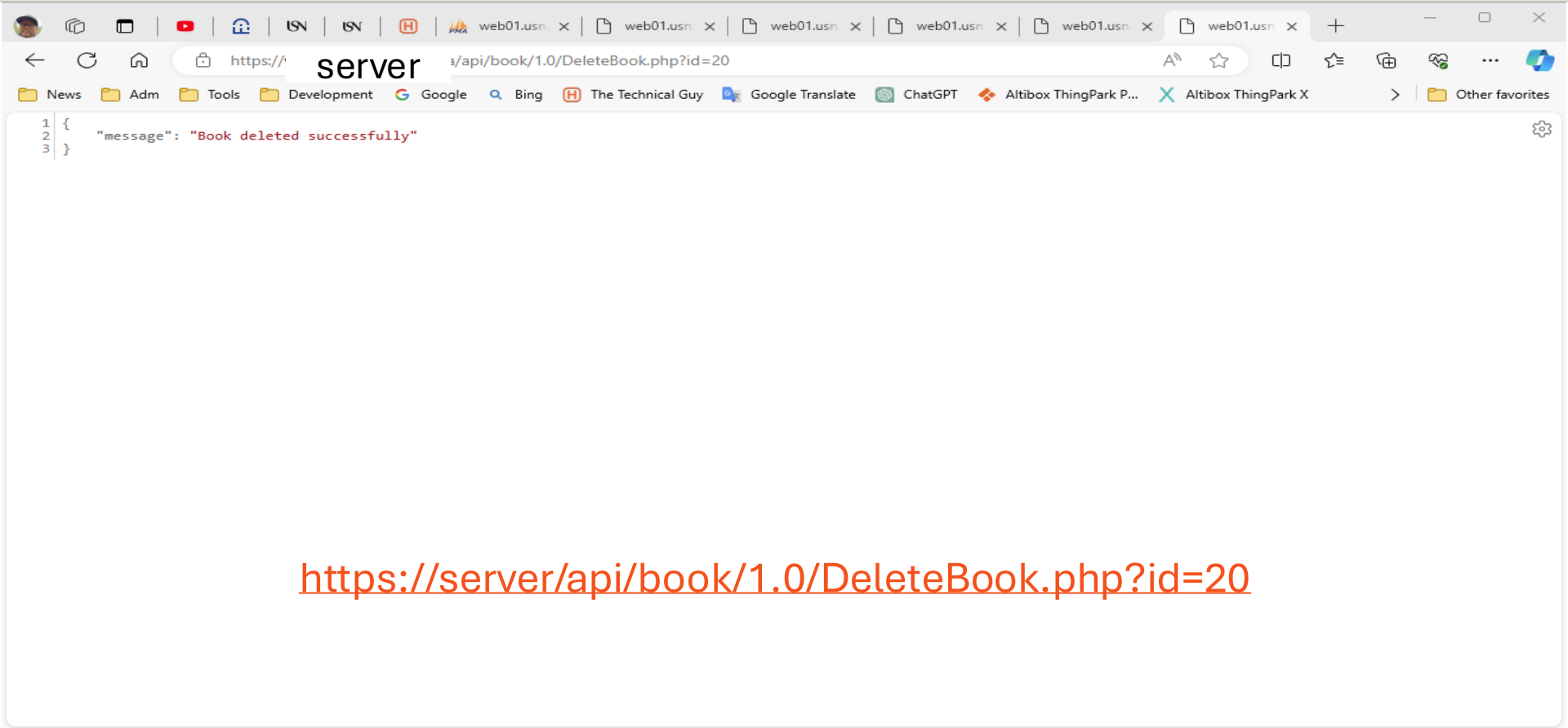
DeleteBook.php

```php
<?php
require_once 'config.php';

// Set the content type to JSON
header('Content-Type: application/json');

// Handle HTTP methods
$method = $_SERVER['REQUEST_METHOD'];

$id = htmlspecialchars($_GET['id']);

$stmt = $pdo->prepare('DELETE FROM BOOK WHERE BookId=?');
$stmt->execute([$id]);

echo json_encode(['message' => 'Book deleted successfully']);

?>
```

DeleteBook - Web Browser



https://server/api/book/1.0/DeleteBook.php?id=20

Delete Book - Python

```
import requests

server = "https://servername/"
api = "book/"
method = "DeleteBook"

id = "19"
query = "?id=" + id

url = server + api + method + ".php" + query
print(url)

response = requests.get(url)
print(response)
print(response.json())
```

Summary

Hans-Petter Halvorsen

Web API Structure

Make sure to keep a good folder structure. Sooner or later, you will have multiple APIs and you also probably need to maintain multiple versions of the same API, e.g., like this:

- API
  - Book
    - 1.0
      - » PHP API Files
    - 2.0
      - » PHP API Files
  - Customer
    - 1.0
      - » PHP API Files
    - ..

Basic Security and Access Control

- It is a good idea to add some security and access control.
- In that way only users that has access can get, insert, update or delete data.
- You then need to add a basic check in your PHP files to check if password is correct.

Example:

https://server/api/book/1.0/DeleteBook.php**?password=xxx**&id=20

Updated PHP Files

File Edit Selection View Go Run ··· Search

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config.php × GetBooks.php GetBookById.php InsertBook.php UpdateBook.php DeleteBook.php

C: > Users > hansha > OneDrive > web01.usn.no > api > book > 1.0 > config.php

```php
<?php
$api_key='[redacted]';
$host = 'localhost';
$dbname = '[redacted]';
$username = '[redacted]';
$password = '[redacted]';
try {
 $pdo = new PDO("mysql:host=$host;dbname=$dbname
 $pdo->setAttribute(PDO::ATTR_ERRMODE, PDO::ERR
} catch (PDOException $e) {
 die("Database connection failed: " . $e->getMes
}
?>
```

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File Edit Selection View Go Run ··· Search

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config.php GetBooks.php GetBookById.php InsertBook.php UpdateBook.php DeleteBook.php ×

C: > Users > hansha > OneDrive > web01.usn.no > api > book > 1.0 > DeleteBook.php

```php
<?php
require_once 'config.php';

// Set the content type to JSON
header('Content-Type: application/json');

// Handle HTTP methods
$method = $_SERVER['REQUEST_METHOD'];

$key = htmlspecialchars($_GET['key']);
$id = htmlspecialchars($_GET['id']);

if ($key == $api_key)
{
    $stmt = $pdo->prepare('DELETE FROM BOOK WHERE BookId=?');
    $stmt->execute([$id]);

    echo json_encode(['message' => 'Book deleted successfully']);
}
else
    echo json_encode(['message' => 'You dont have access']);

?>
```

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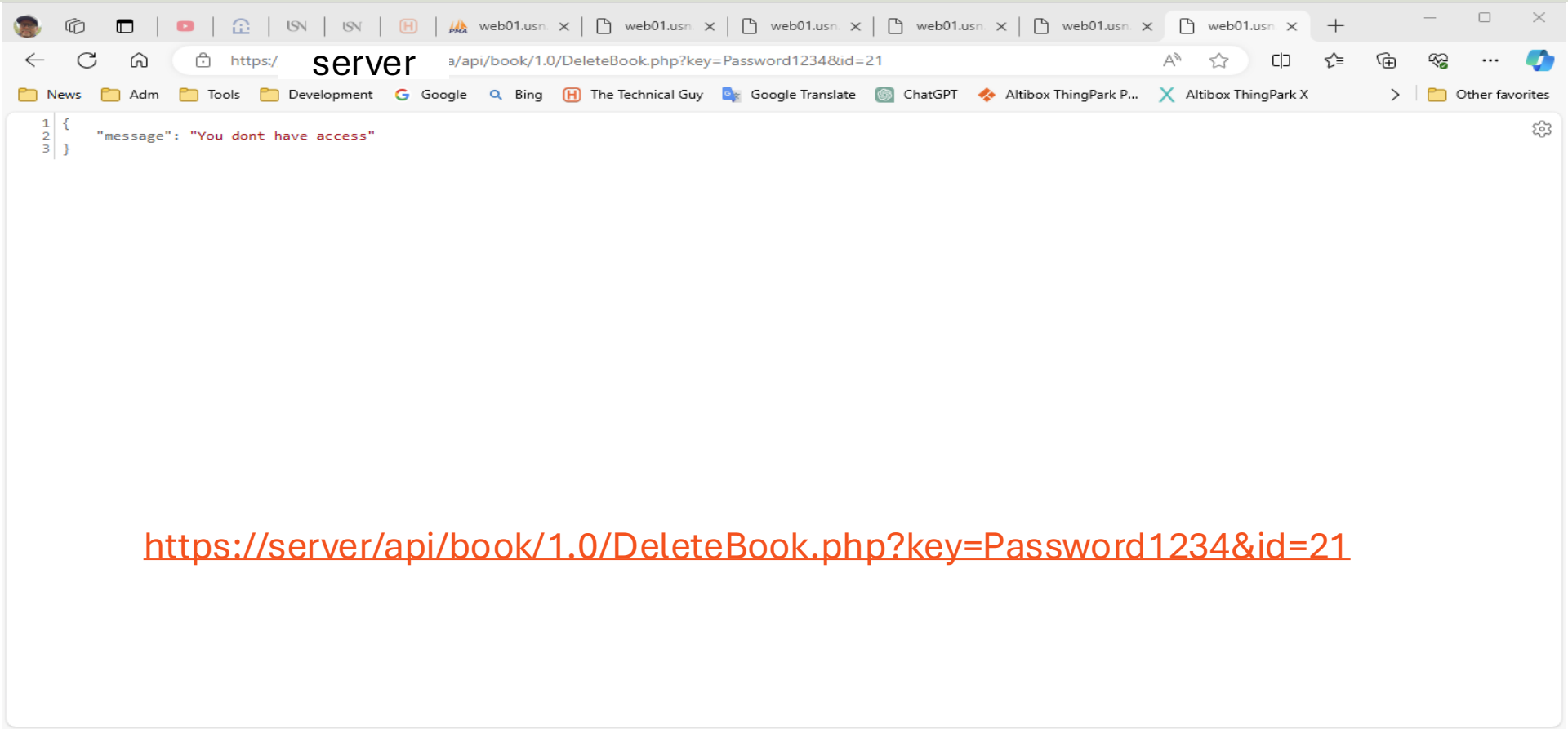
Test in Web Browser



https://server/api/book/1.0/DeleteBook.php?key=Password1234&id=21

Python

Thonny - C:\Users\hansha\OneDrive\Courses\Webutvikling\Tutorials\Simple WebAPI\Development\Python\api_deletebook.py @ 7 : 20

File Edit View Run Tools Help

api_getbooks.py | api_getbookbyid.py | api_insertbook.py | api_updatebook.py | api_deletebook.py

```python
import requests

server = "https://        server        /"
api = "api/book/1.0/"
method = "DeleteBook"

key = "Password1234"
id = "19"
query = "?key=" + key + "&id=" + id

url = server + api + method + ".php" + query
print(url)

response = requests.get(url)
print(response)
print(response.json())
```

Shell

```
>>> %Run api_deletebook.py
                                  api/book/1.0/DeleteBook.php?key=Password1234&id=19
<Response [200]>
{'message': 'You dont have access'}
>>>
```

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Summary

- We have created a simple Web API using PHP.
- We tested the Web API using Python.
- In general, we can use any kind of programming language to interact with this API.
- E.g., we an create a Windows Forms Application in Visual Studio and C#.
- In that way we can insert, read, update or delete data in the remote database from a local application.
- Normally you cannot directly interact with a remote SQL Database from your local computer due to security reasons.
- There are lots of improvements to be made to make a better code structure (create classes, etc.), make it more robust with error handling, improved security, etc. But I leave that to you to improve.
- The code is made simple to illustrate the basic principles using Web APIs.

References

- PHP Tutorial: https://www.w3schools.com/php
- MySQL Tutorial: https://www.w3schools.com/mysql
- https://medium.com/@miladev95/how-to-make-crud-rest-api-in-php-with-mysql-5063ae4cc89
- Python & APIs: https://realpython.com/python-api/

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