Working with Data

Importing JSON into MySQL with PHP

Creating a Security Events Table

In this tutorial, you will create a MySQL table to store security event data imported from a JSON file.

The JSON file contains homes, devices and events. Rather than storing the entire JSON structure, each event will be stored as a separate row in a database table.

This approach makes it easier to search, filter and analyse the data using SQL.

Open phpMyAdmin

Open phpMyAdmin in your browser.

Example:

http://localhost/phpmyadmin/

Select your existing database:

```
project_db
```

Create the Security Events Table

Select the **SQL** tab and run:

```
CREATE TABLE security_events (

    event_id INT AUTO_INCREMENT PRIMARY KEY,

    device_id VARCHAR(50) NOT NULL,
```

```
    device_type VARCHAR(100) NOT NULL,
    room VARCHAR(100) NOT NULL,
    event_timestamp DATETIME NOT NULL,
    event_type VARCHAR(100) NOT NULL,
    data_transmitted VARCHAR(100) NOT NULL,
    severity VARCHAR(20) NOT NULL,
    access_result VARCHAR(20) NOT NULL
);
```

This creates a table capable of storing all event information from the JSON file.

Review the Table Structure

The completed table should contain the following fields:

Field	Purpose
event_id	Unique identifier for each event
device_id	Device that generated the event
device_type	Type of device
room	Location of the device
event_timestamp	Date and time of the event
event_type	Type of activity
data_transmitted	Data involved in the event
severity	Event severity level
access_result	Result of the event

View the Table Structure

Run:

```
DESCRIBE security_events;
```

You should see a structure similar to:

Field	Type
event_id	int
device_id	varchar(50)
device_type	varchar(100)
room	varchar(100)
event_timestamp	datetime
event_type	varchar(100)
data_transmitted	varchar(100)
severity	varchar(20)
access_result	varchar(20)

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	**event_id**	int(11)			No	*None*		AUTO_INCREMENT	Change Drop More
2	**device_id**	varchar(50)	utf8mb4_general_ci		No	*None*			Change Drop More
3	**device_type**	varchar(100)	utf8mb4_general_ci		No	*None*			Change Drop More
4	**room**	varchar(100)	utf8mb4_general_ci		No	*None*			Change Drop More
5	**event_timestamp**	datetime			No	*None*			Change Drop More
6	**event_type**	varchar(100)	utf8mb4_general_ci		No	*None*			Change Drop More
7	**data_transmitted**	varchar(100)	utf8mb4_general_ci		No	*None*			Change Drop More
8	**severity**	varchar(20)	utf8mb4_general_ci		No	*None*			Change Drop More
9	**access_result**	varchar(20)	utf8mb4_general_ci		No	*None*			Change Drop More

Insert a Test Record

Before importing JSON data, insert a test record to verify the table works correctly.

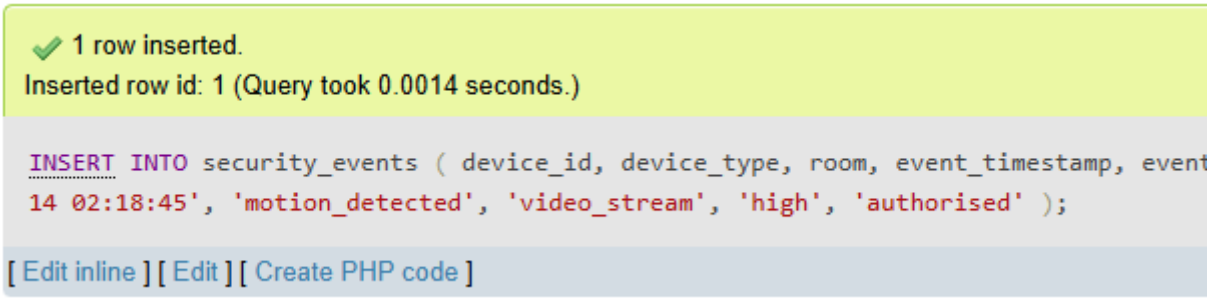
Run:

```
INSERT INTO security_events (

    device_id,
    device_type,
    room,
```

```
    event_timestamp,
    event_type,
    data_transmitted,
    severity,
    access_result

)
VALUES (

    'CAM-01',
    'Security Camera',
    'Front Entrance',
    '2026-03-14 02:18:45',
    'motion_detected',
    'video_stream',
    'high',
    'authorised'

);
```

If successful, MySQL will report:

```
1 row inserted
```



View the Data

Run:

```
SELECT * FROM security_events;
```

You should see:

event_id	device_id	device_type	room	event_timestamp	event_type	severity
1	CAM-01	Security Camera	Front Entrance	2026-03-14 02:18:45	motion_detected	high

Delete the Test Record

The test record is no longer required.

Run:

```
DELETE FROM security_events;
```

Verify the table is empty:

```
SELECT * FROM security_events;
```

You should see:

```
Empty set
```

Complete SQL Script

```
CREATE TABLE security_events (

    event_id INT AUTO_INCREMENT PRIMARY KEY,

    device_id VARCHAR(50) NOT NULL,

    device_type VARCHAR(100) NOT NULL,

    room VARCHAR(100) NOT NULL,

    event_timestamp DATETIME NOT NULL,

    event_type VARCHAR(100) NOT NULL,
```

```
    data_transmitted VARCHAR(100) NOT NULL,

    severity VARCHAR(20) NOT NULL,

    access_result VARCHAR(20) NOT NULL

);

INSERT INTO security_events (

    device_id,
    device_type,
    room,
    event_timestamp,
    event_type,
    data_transmitted,
    severity,
    access_result

)
VALUES (

    'CAM-01',
    'Security Camera',
    'Front Entrance',
    '2026-03-14 02:18:45',
    'motion_detected',
    'video_stream',
    'high',
    'authorised'

);

SELECT * FROM security_events;

DELETE FROM security_events;
```

You now have a database table ready to receive event data from a JSON file.

Next tutorial: **Importing JSON into MySQL with PHP**.

Importing JSON into MySQL with PHP

In the previous tutorial, you created a `security_events` table. In this tutorial, you will read data from a JSON file and import it into MySQL using PHP.

The JSON file contains devices and events. Each event will be inserted into the `security_events` table as a separate database record.

Project Structure

Your project should contain:

```
json-import
├── import_json.php
└── smart_security_data.json
```

Copy the JSON file into your project folder.

Create the Import Script

Create a new file called:

```
import_json.php
```

Add the following code:

```
<?php

$conn = new mysqli(
    "localhost",
```

```
    "root",
    "",
    "project_db"
);

if ($conn->connect_error) {
    die("Connection failed: " . $conn->connect_error);
}

echo "Database connection successful.";

?>
```

Test the Database Connection

Open:

```
http://localhost/json-import/import_json.php
```

You should see:

```
Database connection successful.
```

Read the JSON File

Add the following code underneath the database connection:

```
$json = file_get_contents(
    "smart_security_data.json"
);

echo $json;
```

Refresh the page.

The contents of the JSON file should be displayed in the browser.

{ "homeId": "GC-HOME-014", "location": "Gold Coast", "devices": [{ "deviceId": "CAM-01", "deviceType": "Security Car
"video_stream", "severity": "high", "accessResult": "authorised" }, { "timestamp": "2026-03-14T02:19:10", "eventType": "re
"LOCK-02", "deviceType": "Smart Door Lock", "room": "Back Door", "events": [{ "timestamp": "2026-03-13T23:47:02", "

Convert the JSON into a PHP Array

Replace:

```
echo $json;
```

with:

```
$data = json_decode(
    $json,
    true
);

print_r($data);
```

Refresh the page.

You should now see a PHP array structure.

Array ([homeId] => GC-HOME-014 [location] => Gold Coast [devices] => Array ([0] => Array ([deviceId] =
[eventType] => motion_detected [dataTransmitted] => video_stream [severity] => high [accessResult] => auth
=> critical [accessResult] => blocked))) [1] => Array ([deviceId] => LOCK-02 [deviceType] => Smart Doo
=> access_log [severity] => medium [accessResult] => denied)))))

Loop Through the Devices

Replace:

```
print_r($data);
```

with:

```
foreach ($data["devices"] as $device) {

    echo "<h3>";
```

```
    echo $device["deviceId"];
    echo "</h3>";

}
```

Refresh the page.

You should see:

```
CAM-01


LOCK-02
```

Loop Through the Events

Replace the previous code with:

```
foreach ($data["devices"] as $device) {

    foreach ($device["events"] as $event) {

        echo $event["eventType"];
        echo "<br>";

    }

}
```

Refresh the page.

You should see:

```
motion_detected
remote_access_attempt
unlock_attempt
```

Prepare the INSERT Statement

Add the following code before the loops:

```
$stmt = $conn->prepare(
    "INSERT INTO security_events (

        device_id,
        device_type,
        room,
        event_timestamp,
        event_type,
        data_transmitted,
        severity,
        access_result

    )
    VALUES (?, ?, ?, ?, ?, ?, ?, ?)"
);
```

This statement will be reused for every event.

Insert the Events

Replace the existing loops with:

```
foreach ($data["devices"] as $device) {

    foreach ($device["events"] as $event) {

        $stmt->bind_param(
            "ssssssss",

            $device["deviceId"],
            $device["deviceType"],
            $device["room"],

            $event["timestamp"],
            $event["eventType"],
            $event["dataTransmitted"],
```

```
            $event["severity"],
            $event["accessResult"]

        );

        $stmt->execute();

    }

}
```

Display a Success Message

Add:

```
echo "Import completed successfully.";
```

after the loops.

The completed import should now run automatically when the page loads.

Run the Import

Open:

```
http://localhost/json-import/import_json.php
```

You should see:

```
Import completed successfully.
```

Verify the Imported Data

Open phpMyAdmin.

Run:

```
SELECT * FROM security_events;
```

You should now see three imported events from the JSON file.

Example:

event_id	device_id	event_type	severity
1	CAM-01	motion_detected	high
2	CAM-01	remote_access_attempt	critical
3	LOCK-02	unlock_attempt	medium

Complete import_json.php File

```
<?php

$conn = new mysqli(
    "localhost",
    "root",
    "",
    "project_db"
);

if ($conn->connect_error) {
    die("Connection failed: " . $conn->connect_error);
}

$json = file_get_contents(
    "smart_security_data.json"
);

$data = json_decode(
    $json,
    true
);

$stmt = $conn->prepare(
```

```
    "INSERT INTO security_events (

        device_id,
        device_type,
        room,
        event_timestamp,
        event_type,
        data_transmitted,
        severity,
        access_result

    )
    VALUES (?, ?, ?, ?, ?, ?, ?, ?)"
);

foreach ($data["devices"] as $device) {

    foreach ($device["events"] as $event) {

        $stmt->bind_param(
            "ssssssss",

            $device["deviceId"],
            $device["deviceType"],
            $device["room"],

            $event["timestamp"],
            $event["eventType"],
            $event["dataTransmitted"],
            $event["severity"],
            $event["accessResult"]

        );

        $stmt->execute();

    }

}
```

```
echo "Import completed successfully.";


?>
```

You have successfully imported JSON data into MySQL using PHP.

Next tutorial: **Querying Imported Data with SQL**.

Querying Imported Data with SQL

In the previous tutorial, you imported JSON data into the `security_events` table. In this tutorial, you will use SQL queries to analyse the imported data.

View All Events

Open phpMyAdmin and select the:

```
security_events
```

table.

Run:

```
SELECT *
FROM security_events;
```

This displays all imported records.

Count All Events

To find the total number of events:

```
SELECT COUNT(*) AS total_events
FROM security_events;
```

Example result:

total_events

```
3
```

This query is useful for dashboards and reporting.

Find Critical Events

To display only critical events:

```
SELECT *
FROM security_events
WHERE severity = 'critical';
```

Example result:

device_id	event_type	severity
CAM-01	remote_access_attempt	critical

Count Events by Severity

Run:

```
SELECT
    severity,
    COUNT(*) AS total
FROM security_events
GROUP BY severity;
```

Example result:

severity	total
critical	1
high	1
medium	1

This is often used to build dashboard summary cards.

Find Events from a Specific Device

To display events generated by the security camera:

```
SELECT *
FROM security_events
WHERE device_id = 'CAM-01';
```

Example result:

device_id	event_type
CAM-01	motion_detected
CAM-01	remote_access_attempt

Count Events Per Device

Run:

```
SELECT
    device_id,
    COUNT(*) AS total_events
FROM security_events
GROUP BY device_id;
```

Example result:

device_id	total_events
CAM-01	2
LOCK-02	1

This identifies which devices are generating the most activity.

Find High-Risk Events

To display high and critical events:

```
SELECT *
FROM security_events
WHERE severity IN ('high', 'critical');
```

Example result:

device_id	event_type	severity
CAM-01	motion_detected	high
CAM-01	remote_access_attempt	critical

This query could be used to generate security alerts.

Sort Events by Time

To view the newest events first:

```
SELECT *
FROM security_events
ORDER BY event_timestamp DESC;
```

This is commonly used in event logs and monitoring systems.

Useful Dashboard Queries

Total Events

```
SELECT COUNT(*) AS total_events
FROM security_events;
```

Critical Events

```
SELECT COUNT(*) AS critical_events
FROM security_events
WHERE severity = 'critical';
```

Device Count

```
SELECT COUNT(DISTINCT device_id) AS total_devices
FROM security_events;
```

Events by Severity

```
SELECT
    severity,
    COUNT(*) AS total
FROM security_events
GROUP BY severity;
```

These queries are commonly used when building dashboards.

Complete Practice Queries

```
SELECT *
FROM security_events;

SELECT COUNT(*) AS total_events
FROM security_events;

SELECT *
FROM security_events
WHERE severity = 'critical';

SELECT
    severity,
    COUNT(*) AS total
FROM security_events
GROUP BY severity;

SELECT
    device_id,
    COUNT(*) AS total_events
```

```
FROM security_events
GROUP BY device_id;

SELECT *
FROM security_events
ORDER BY event_timestamp DESC;
```

You have successfully queried imported JSON data using SQL.

Next tutorial: **Building a Security Dashboard Using PHP and MySQL**.

Building a Security Dashboard Using PHP and MySQL

In the previous tutorial, you used SQL queries to analyse imported JSON data. In this tutorial, you will build a dashboard that displays security statistics directly from the database.

The dashboard will display:

- Total Devices
- Total Events
- Critical Events
- High Events
- Recent Security Events

Create the Dashboard File

Create a new file called:

```
dashboard.php
```

Add the database connection:

```
<?php

$conn = new mysqli(
    "localhost",
    "root",
    "",
    "project_db"
);
```

```
if ($conn->connect_error) {
    die("Connection failed: " . $conn->connect_error);
}

?>
```

Get the Total Number of Events

Add:

```
$totalEventsQuery = "
    SELECT COUNT(*) AS total_events
    FROM security_events
";

$totalEventsResult =
    $conn->query($totalEventsQuery);

$totalEvents =
    $totalEventsResult->fetch_assoc()["total_events"];
```

Get the Number of Devices

Add:

```
$totalDevicesQuery = "
    SELECT COUNT(DISTINCT device_id)
    AS total_devices
    FROM security_events
";

$totalDevicesResult =
    $conn->query($totalDevicesQuery);
```

```
$totalDevices =
    $totalDevicesResult->fetch_assoc()["total_devices"];
```

Get Critical Events

Add:

```
$criticalEventsQuery = "
    SELECT COUNT(*) AS critical_events
    FROM security_events
    WHERE severity = 'critical'
";

$criticalEventsResult =
    $conn->query($criticalEventsQuery);

$criticalEvents =
    $criticalEventsResult->fetch_assoc()["critical_events"];
```

Get High Events

Add:

```
$highEventsQuery = "
    SELECT COUNT(*) AS high_events
    FROM security_events
    WHERE severity = 'high'
";

$highEventsResult =
    $conn->query($highEventsQuery);

$highEvents =
    $highEventsResult->fetch_assoc()["high_events"];
```

Create the Dashboard Page

Add the following HTML underneath the PHP code:

```
<!DOCTYPE html>
<html>
<head>
    <title>Security Dashboard</title>
</head>
<body>

<h1>Security Dashboard</h1>

<div>
    <h2>Total Devices</h2>
    <p><?php echo $totalDevices; ?></p>
</div>

<div>
    <h2>Total Events</h2>
    <p><?php echo $totalEvents; ?></p>
</div>

<div>
    <h2>Critical Events</h2>
    <p><?php echo $criticalEvents; ?></p>
</div>

<div>
    <h2>High Events</h2>
    <p><?php echo $highEvents; ?></p>
</div>

</body>
</html>
```

Test the Dashboard

Open:

```
http://localhost/json-import/dashboard.php
```

Using the sample data, you should see something similar to:

```
Security Dashboard

Total Devices: 2
Total Events: 3
Critical Events: 1
High Events: 1
```

Display Recent Events

Add the following query before the HTML:

```
$recentEventsQuery = "
    SELECT *
    FROM security_events
    ORDER BY event_timestamp DESC
";

$recentEvents =
    $conn->query($recentEventsQuery);
```

Create the Events Table

Add the following underneath the dashboard cards:

```
<h2>Recent Events</h2>

<table border="1">
```

```
<tr>
    <th>Device</th>
    <th>Event Type</th>
    <th>Severity</th>
    <th>Timestamp</th>
</tr>

<?php

while (
    $row =
    $recentEvents->fetch_assoc()
) {

?>

<tr>
    <td><?php echo $row["device_id"]; ?></td>
    <td><?php echo $row["event_type"]; ?></td>
    <td><?php echo $row["severity"]; ?></td>
    <td><?php echo $row["event_timestamp"]; ?></td>
</tr>

<?php

}

?>

</table>
```

Refresh the page.

You should now see all imported events underneath the dashboard.

Add Basic Styling

Inside the `<head>` section add:

```
<style>

body {
    font-family: Arial, sans-serif;
}

.card {
    border: 1px solid #cccccc;
    border-radius: 8px;
    padding: 15px;
    margin-bottom: 10px;
}

table {
    border-collapse: collapse;
    width: 100%;
}

th,
td {
    border: 1px solid #cccccc;
    padding: 10px;
}

th {
    background-color: #f2f2f2;
}

</style>
```

Then update each dashboard `<div>`:

```
<div class="card">
```

The dashboard should now look much more professional.

Complete Dashboard Features

Your dashboard now:

- Connects to MySQL
- Runs SQL queries
- Displays summary statistics
- Displays recent events
- Updates automatically whenever new JSON data is imported

This is one of the major advantages of importing JSON into a database rather than displaying the JSON directly.

Next tutorial: **Creating Filters and Search Options for the Dashboard**.

Data Visualisation with Google Charts

Creating Charts with Google Charts

Google Charts is a free JavaScript library that can create professional graphs and charts using your data.

Google Charts can display:

- Pie Charts
- Bar Charts
- Column Charts
- Line Charts
- Area Charts

In this tutorial you will create your first chart using sample data.

Step 1 - Load the Google Charts Library

Add the following line inside the `<head>` section of your webpage.

```
<script src="https://www.gstatic.com/charts/loader.js"></script>
```

Step 2 - Create a Chart Container

Add a `div` where the chart will be displayed.

```
<div id="chart_div"
     style="width:800px; height:500px;">
```

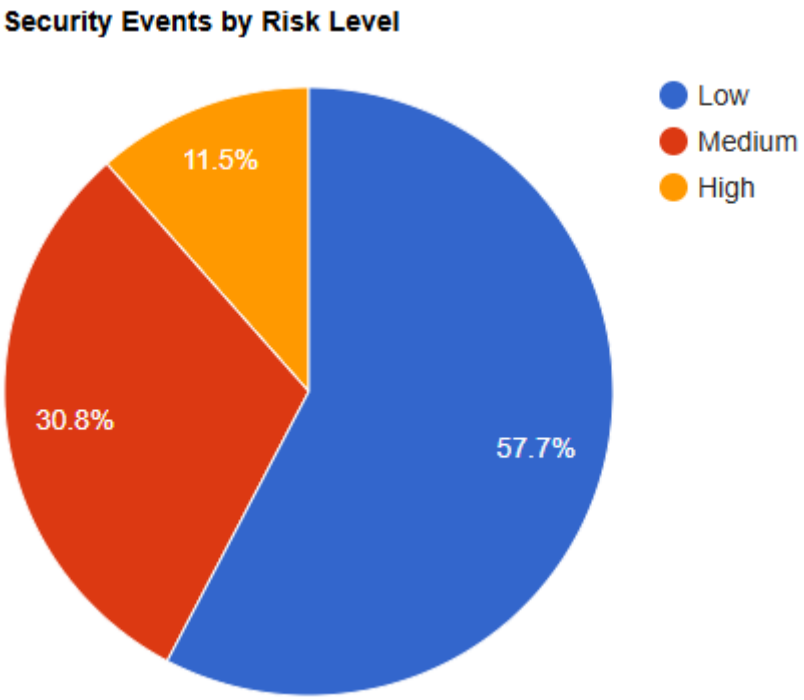
```
</div>
```

Step 3 - Create the Chart

Add the following JavaScript before the closing `</body>` tag.

```
<script>

google.charts.load(
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data =
        google.visualization.arrayToDataTable([

        ['Risk Level', 'Count'],

        ['Low',15],

        ['Medium',8],

        ['High',3]

    ]);


    var options = {

        title:'Security Events by Risk Level'

    };
```

```
    var chart =
        new google.visualization.PieChart(

        document.getElementById('chart_div')

    );


    chart.draw(data, options);

}

</script>
```



Understanding the Data

Google Charts uses an array to store chart data.

```
[
 ['Risk Level', 'Count'],

 ['Low',15],

 ['Medium',8],

 ['High',3]
]
```

The first row contains the headings.

The remaining rows contain the data values.

Changing the Chart Type

The chart type is controlled by:

```
google.visualization.PieChart
```

You can change it to:

Chart	Class
Pie Chart	PieChart
Column Chart	ColumnChart
Bar Chart	BarChart
Line Chart	LineChart
Area Chart	AreaChart

Example:

```
google.visualization.BarChart
```

will display the same data as a bar chart.

Complete Example

```
<!DOCTYPE html>

<html>

<head>

    <title>Google Charts Example</title>

    <script src="https://www.gstatic.com/charts/loader.js"></script>

</head>

<body>

<div id="chart_div"
     style="width:800px; height:500px;">
</div>



<script>

google.charts.load(
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data =
        google.visualization.arrayToDataTable([

        ['Risk Level', 'Count'],
```

```
        ['Low',15],
        ['Medium',8],
        ['High',3]
    ]);

    var options = {
        title:'Security Events by Risk Level'
    };

    var chart =
        new google.visualization.PieChart(
        document.getElementById('chart_div')
    );

    chart.draw(data, options);
}
</script>
</body>
</html>
```

Next Tutorial

Pie Charts from SQL Data

Instead of manually entering the data, you will learn how to retrieve information from a MySQL database and display it automatically in a Google Chart.

Pie Charts from SQL Data

In the previous tutorial, the chart data was entered manually.

In this tutorial, the chart data will come directly from a MySQL database.

The example below uses the `cyber_security_events` table.

Step 1 - Create the SQL Query

The following query counts how many events belong to each risk level.

```
SELECT

    risk_level,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY risk_level;
```

Example result:

risk_level	total
Low	15
Medium	8
High	3

Step 2 - Retrieve the Data with PHP

```
<?php

$sql = "

SELECT

    risk_level,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY risk_level

";

$result = $pdo->query($sql);

$data = [];

while($row = $result->fetch())
{

    $data[] = [

        $row['risk_level'],

        (int)$row['total']

    ];

}

?>
```

Step 3 - Convert the PHP Array to JSON

Google Charts uses JavaScript arrays.

PHP can convert data into JavaScript using:

```
<?php

echo json_encode($data);

?>
```

Step 4 - Create the Chart

```
<script>

google.charts.load(
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data = google.visualization.arrayToDataTable([

        ['Risk Level','Count'],

        ...<?php echo json_encode($data); ?>

    ]);
```

```
    var options = {

        title:
        'Security Events by Risk Level'

    };


    var chart =

        new google.visualization.PieChart(

            document.getElementById('chart_div')

        );


    chart.draw(data, options);

}

</script>
```

Step 5 - Add the Chart Container

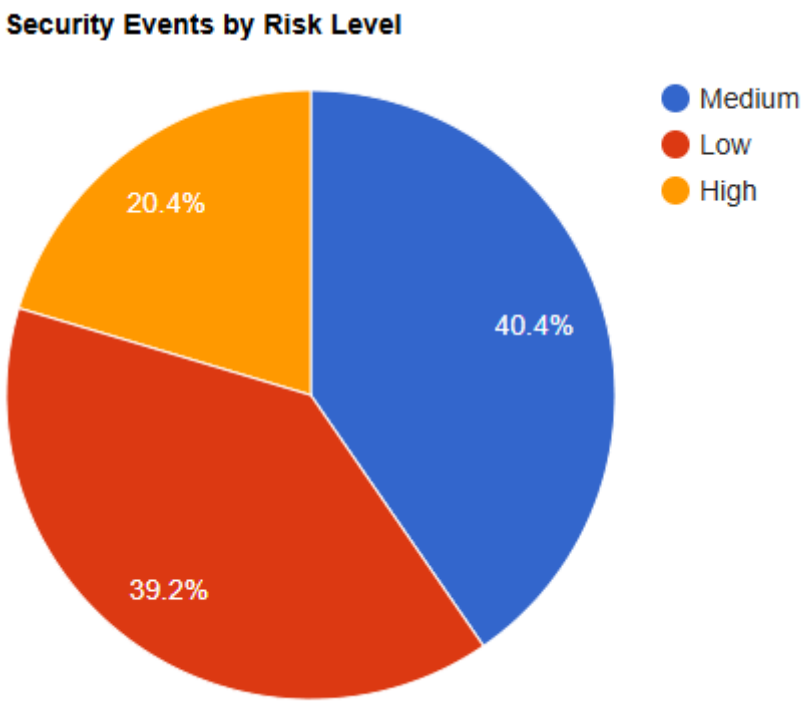
```
<div id="chart_div"
     style="width:800px; height:500px;">
</div>
```

Complete Example

```
<?php

$sql = "

SELECT

    risk_level,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY risk_level

";

$result = $pdo->query($sql);

$data = [];

while($row = $result->fetch())
{

    $data[] = [

        $row['risk_level'],

        (int)$row['total']

    ];

}

?>

<!DOCTYPE html>

<html>

<head>
```

```
<script src="https://www.gstatic.com/charts/loader.js"></script>

</head>

<body>

<div id="chart_div"
     style="width:800px; height:500px;">
</div>


<script>

google.charts.load(
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data =

        google.visualization.arrayToDataTable([

        ['Risk Level','Count'],

        ...<?php echo json_encode($data); ?>

    ]);


    var options = {

        title:
        'Security Events by Risk Level'
```

```
    };

    var chart =
        new google.visualization.PieChart(
            document.getElementById('chart_div')
        );

    chart.draw(data, options);
}
</script>
</body>
</html>
```



Next Tutorial

Bar Charts from SQL Data

Learn how to display the same SQL data as a bar chart.

Bar Charts from SQL Data

Bar charts are useful for comparing values between categories.

In this tutorial, the number of security events at each risk level will be displayed as a bar chart.

Step 1 - Create the SQL Query

```
SELECT

    risk_level,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY risk_level;
```

Example result:

risk_level	total
Low	15
Medium	8
High	3

Step 2 - Retrieve the Data with PHP

```php
<?php

$sql = "

SELECT

    risk_level,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY risk_level

";

$result = $pdo->query($sql);

$data = [];

while($row = $result->fetch())
{

    $data[] = [

        $row['risk_level'],

        (int)$row['total']

    ];

}

?>
```

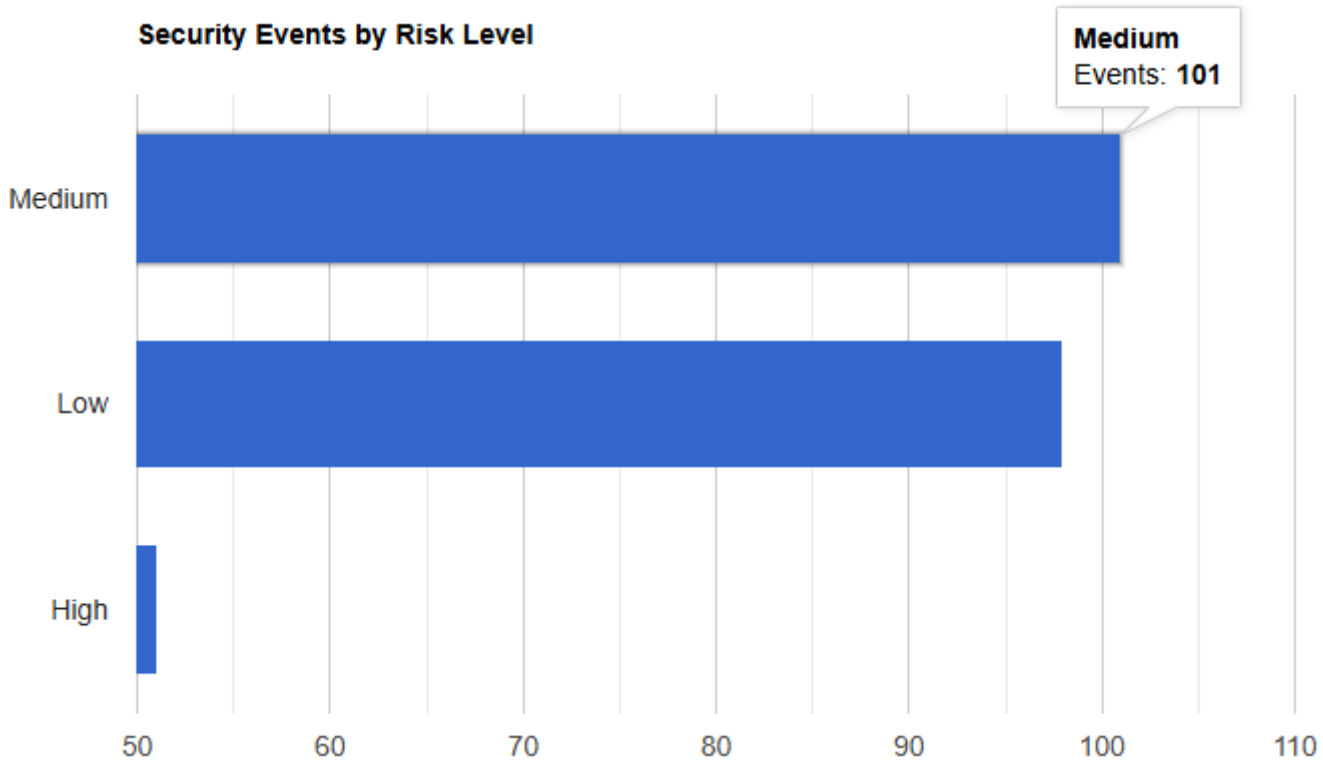
Step 3 - Create the Chart Container

```
<div id="chart_div"
     style="width:900px; height:500px;">
</div>
```

Step 4 - Create the Bar Chart

```
<script>

google.charts.load(
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data =

        google.visualization.arrayToDataTable([

        ['Risk Level','Events'],

        ...<?php echo json_encode($data); ?>

    ]);


    var options = {
```

```
        title:'Security Events by Risk Level',
        legend:{position:'none'}
    };

    var chart =
        new google.visualization.BarChart(
            document.getElementById('chart_div')
        );

    chart.draw(data, options);
}
</script>
```



Changing the Chart Type

Only one line of code needs to change.

Pie Chart:

```
new google.visualization.PieChart()
```

Bar Chart:

```
new google.visualization.BarChart()
```

Column Chart:

```
new google.visualization.ColumnChart()
```

Line Chart:

```
new google.visualization.LineChart()
```

Complete Example

```
<?php

$sql = "

SELECT

    risk_level,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY risk_level

";
```

```
$result = $pdo->query($sql);

$data = [];

while($row = $result->fetch())
{

    $data[] = [

        $row['risk_level'],

        (int)$row['total']

    ];

}

?>

<!DOCTYPE html>

<html>

<head>

<script src="https://www.gstatic.com/charts/loader.js"></script>

</head>

<body>

<div id="chart_div"
     style="width:900px; height:500px;">
</div>



<script>

google.charts.load(
```

```
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data =

        google.visualization.arrayToDataTable([

        ['Risk Level','Events'],

        ...<?php echo json_encode($data); ?>

    ]);


    var options = {

        title:'Security Events by Risk Level',

        legend:{position:'none'}

    };


    var chart =

        new google.visualization.BarChart(

            document.getElementById('chart_div')

        );


    chart.draw(data, options);
```

```
}

</script>

</body>

</html>
```

Next Tutorial

Line Charts from SQL Data

Learn how to display trends and changes over time using a line chart.

Line Charts from SQL Data

Line charts are used to display trends and changes over time.

In this tutorial, the number of security events per day will be displayed using a line chart.

Step 1 - Create the SQL Query

The following query counts the number of events recorded each day.

```
SELECT

    DATE(event_timestamp) AS event_date,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY DATE(event_timestamp)

ORDER BY event_date;
```

Example result:

event_date	total
2026-06-01	12
2026-06-02	18
2026-06-03	9
2026-06-04	15

Step 2 - Retrieve the Data with PHP

```
<?php

$sql = "

SELECT

    DATE(event_timestamp) AS event_date,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY DATE(event_timestamp)

ORDER BY event_date

";

$result = $pdo->query($sql);

$data = [];

while($row = $result->fetch())
{

    $data[] = [

        $row['event_date'],

        (int)$row['total']

    ];

}
```

```
?>
```

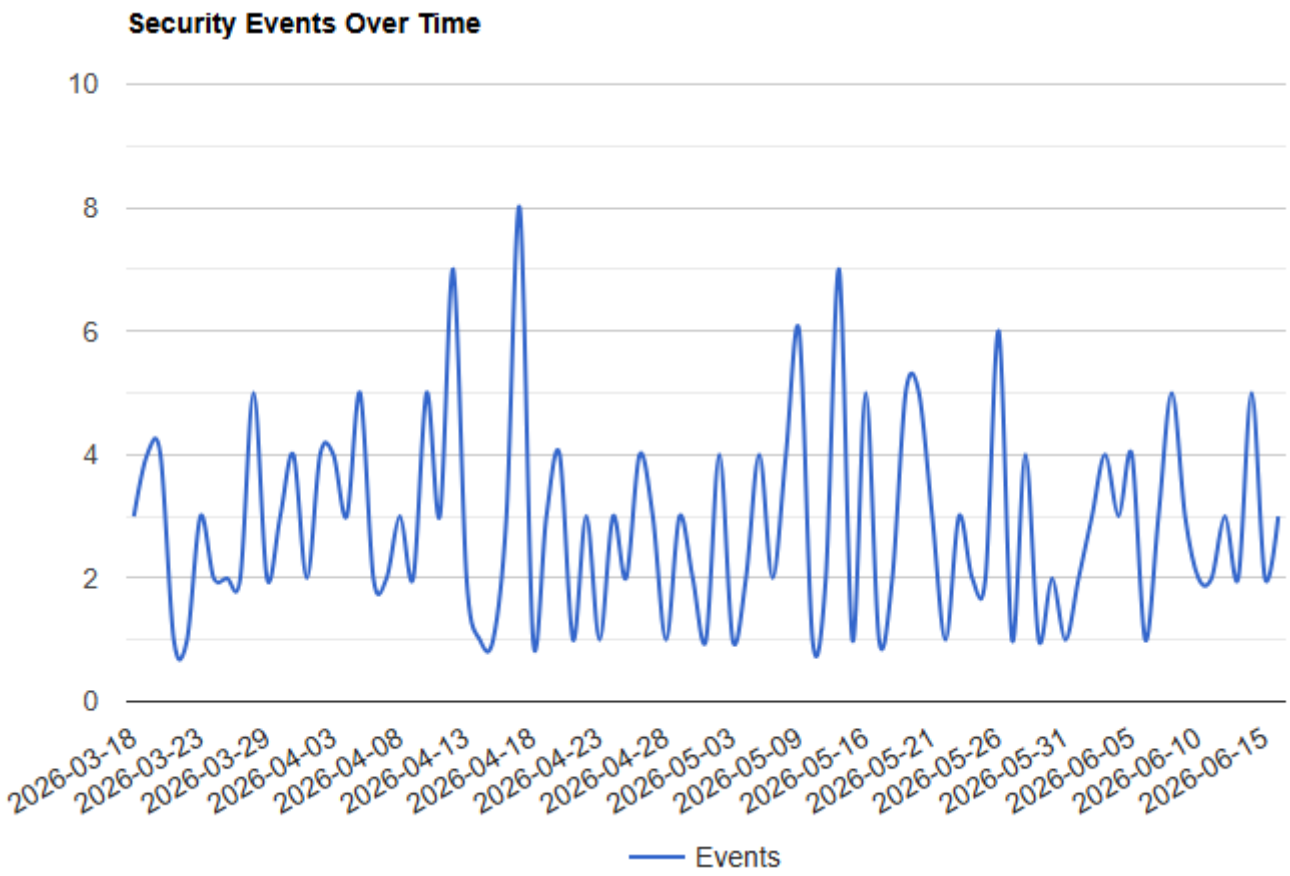
Step 3 - Create the Chart Container

```
<div id="chart_div"
     style="width:900px; height:500px;">
</div>
```

Step 4 - Create the Line Chart

```
<script>

google.charts.load(
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data =

        google.visualization.arrayToDataTable([

        ['Date','Events'],

        ...<?php echo json_encode($data); ?>

    ]);
```

```
    var options = {
        title:'Security Events Over Time',
        curveType:'function',
        legend:{position:'bottom'}
    };

    var chart =
        new google.visualization.LineChart(
            document.getElementById('chart_div')
        );

    chart.draw(data, options);
}
</script>
```



Understanding the Chart

The horizontal axis displays:

```
Date
```

The vertical axis displays:

```
Number of Security Events
```

This makes it easier to identify:

- Busy periods
- Trends over time
- Sudden increases in activity
- Patterns in the data

Complete Example

```
<?php

$sql = "

SELECT

    DATE(event_timestamp) AS event_date,

    COUNT(*) AS total

FROM cyber_security_events

GROUP BY DATE(event_timestamp)

ORDER BY event_date

";

$result = $pdo->query($sql);

$data = [];

while($row = $result->fetch())
{

    $data[] = [

        $row['event_date'],

        (int)$row['total']

    ];

}

?>
```

```
<!DOCTYPE html>

<html>

<head>

<script src="https://www.gstatic.com/charts/loader.js"></script>

</head>

<body>

<div id="chart_div"
     style="width:900px; height:500px;">
</div>


<script>

google.charts.load(
    'current',
    {'packages':['corechart']}
);

google.charts.setOnLoadCallback(drawChart);

function drawChart()
{

    var data =

        google.visualization.arrayToDataTable([

        ['Date','Events'],

        ...<?php echo json_encode($data); ?>

    ]);
```

```
    var options = {
        title:'Security Events Over Time',
        curveType:'function',
        legend:{position:'bottom'}
    };

    var chart =
        new google.visualization.LineChart(
            document.getElementById('chart_div')
        );

    chart.draw(data, options);
}
</script>
</body>
</html>
```

Working with APIs

Creating a Simple JSON API with PHP

In this tutorial, you will create a simple API using PHP.

The API will return JSON data when visited in a browser.

This is the same type of data format used by many real-world APIs.

Project Structure

Create a folder called:

```
api-demo
```

Inside the folder place:

```
api-demo
├── api.php
└── smart_security_data.json
```

Create the API File

Create:

```
api.php
```

Add:

```
<?php

header(
    "Content-Type: application/json"
);

echo file_get_contents(
    "smart_security_data.json"
);

?>
```

Save the file.

Understanding the Code

This line tells the browser that JSON data is being returned:

```
header(
    "Content-Type: application/json"
);
```

This line reads the JSON file:

```
file_get_contents(
    "smart_security_data.json"
);
```

This line sends the JSON data to the browser:

```
echo file_get_contents(
    "smart_security_data.json"
);
```

Test the API

Open:

```
http://localhost/api-demo/api.php
```

You should see:

```
{
  "homeId": "GC-HOME-014",
  "location": "Gold Coast"
}
```

along with the rest of the JSON data.

Test the API in a New Browser Tab

Notice that the URL now behaves like a data source.

Instead of displaying a webpage, it returns structured JSON data.

This is the same concept used by many modern APIs.

Example:

```
https://example.com/api/users
https://example.com/api/products
https://example.com/api/weather
```

Complete API File

```
<?php

header(
    "Content-Type: application/json"
);

echo file_get_contents(
    "smart_security_data.json"
```

```
);


?>
```

You have successfully created a JSON API using PHP.

Next tutorial: **Reading API Data with JavaScript**.

Reading API Data with JavaScript

In the previous tutorial, you created a simple API using PHP.

The API returns JSON data when visited in a browser.

In this tutorial, you will use JavaScript to read data from the API and display it on a webpage.

Project Structure

Your project should contain:

```
api-demo
├── api.php
├── index.html
└── smart_security_data.json
```

Create the HTML Page

Create:

```
index.html
```

Add:

```
<!DOCTYPE html>
<html>
<head>
    <title>API Demo</title>
```

```
</head>
<body>

<h1>API Dashboard</h1>

<div id="output"></div>

<script>

</script>

</body>
</html>
```

Save the file.

Read the API

Inside the `<script>` tags add:

```
fetch("api.php")
    .then(response => response.json())
    .then(data => {

        console.log(data);

    });
```

Save the file.

Test the API Request

Open:

```
http://localhost/api-demo/
```

Press:

```
F12
```

Open the **Console** tab.

You should see the JSON object displayed.

Display the Home Information

Replace:

```
console.log(data);
```

with:

```
document.getElementById(
    "output"
).innerHTML = `

    <p>
        <strong>Home ID:</strong>
        ${data.homeId}
    </p>

    <p>
        <strong>Location:</strong>
        ${data.location}
    </p>

`;
```

Refresh the page.

You should see:

```
Home ID: GC-HOME-014


Location: Gold Coast
```

Display Device Information

Replace the existing code with:

```
let html = `

    <h2>Devices</h2>

    <table border="1">

        <tr>
            <th>Device ID</th>
            <th>Device Type</th>
            <th>Room</th>
        </tr>

`;

data.devices.forEach(device => {

    html += `

        <tr>
            <td>${device.deviceId}</td>
            <td>${device.deviceType}</td>
            <td>${device.room}</td>
        </tr>

    `;

});

html += "</table>";

document.getElementById(
    "output"
).innerHTML = html;
```

Refresh the page.

You should now see a table of devices.

Why Use an API?

Previously, the data was loaded directly from:

```
fetch("smart_security_data.json")
```

Now the data is loaded from:

```
fetch("api.php")
```

This means the data can be:

- Generated dynamically
- Stored in a database
- Updated automatically
- Filtered before being sent

The webpage does not need to know where the data comes from. It only needs the JSON returned by the API.

Complete Page

```
<!DOCTYPE html>
<html>
<head>
    <title>API Demo</title>
</head>
<body>

<h1>API Dashboard</h1>

<div id="output"></div>

<script>

fetch("api.php")
```

```
    .then(response => response.json())
    .then(data => {

        let html = `

            <h2>Devices</h2>

            <table border="1">

                <tr>
                    <th>Device ID</th>
                    <th>Device Type</th>
                    <th>Room</th>
                </tr>

        `;

        data.devices.forEach(device => {

            html += `

                <tr>
                    <td>${device.deviceId}</td>
                    <td>${device.deviceType}</td>
                    <td>${device.room}</td>
                </tr>

            `;

        });

        html += "</table>";

        document.getElementById(
            "output"
        ).innerHTML = html;

    });

</script>
```

```
</body>
</html>
```

You have successfully consumed data from an API using JavaScript.

Next tutorial: **Creating a Database-Driven API with PHP and MySQL**.

Creating a Database-Driven API with PHP and MySQL

In the previous tutorials, the API returned data from a JSON file.

In this tutorial, you will create an API that reads data from a MySQL database and returns it as JSON.

The System Architecture

The completed system will work like this:

```
security_events table
        ↓
      api.php
        ↓
       JSON
        ↓
   JavaScript
```

Instead of reading a JSON file, the API will generate JSON directly from the database.

Create the API File

Create:

```
api_events.php
```

Add the database connection:

```
<?php

$conn = new mysqli(
    "localhost",
    "root",
    "",
    "project_db"
);

if ($conn->connect_error) {
    die("Connection failed: " .
        $conn->connect_error);
}

?>
```

Set the Content Type

Add:

```
header(
    "Content-Type: application/json"
);
```

The API will now return JSON instead of HTML.

Query the Database

Add:

```
$query = "
    SELECT *
    FROM security_events
";
```

```
$result =
    $conn->query($query);
```

This retrieves all records from the table.

Create an Array

Add:

```
$events = [];
```

This array will hold all database records.

Loop Through the Results

Add:

```
while (
    $row =
    $result->fetch_assoc()
) {

    $events[] = $row;

}
```

This converts each database record into an array item.

Convert the Array to JSON

Add:

```
echo json_encode(
    $events,
```

```
    JSON_PRETTY_PRINT
);
```

The completed API should now return JSON.

Test the API

Open:

```
http://localhost/api-demo/api_events.php
```

You should see:

```
[
    {
        "event_id":"1",
        "device_id":"CAM-01",
        "event_type":"motion_detected",
        "severity":"high"
    },
    {
        "event_id":"2",
        "device_id":"CAM-01",
        "event_type":"remote_access_attempt",
        "severity":"critical"
    }
]
```

The exact records will depend on your database.

Complete API File

```
<?php

$conn = new mysqli(
    "localhost",
    "root",
```

```
    "",
    "project_db"
);

if ($conn->connect_error) {
    die("Connection failed: " .
        $conn->connect_error);
}

header(
    "Content-Type: application/json"
);

$query = "
    SELECT *
    FROM security_events
";

$result =
    $conn->query($query);

$events = [];

while (
    $row =
    $result->fetch_assoc()
) {

    $events[] = $row;

}

echo json_encode(
    $events,
    JSON_PRETTY_PRINT
);

?>
```

Create a Webpage to Read the API

Create:

```
events.html
```

Add:

```
<!DOCTYPE html>
<html>
<head>
    <title>Security Events</title>
</head>
<body>

<h1>Security Events</h1>

<div id="output"></div>

<script>

fetch("api_events.php")
    .then(response => response.json())
    .then(data => {

        let html = `
            <table border="1">

                <tr>
                    <th>Device</th>
                    <th>Event Type</th>
                    <th>Severity</th>
                </tr>
        `;

        data.forEach(event => {

            html += `
                <tr>
```

```
                    <td>${event.device_id}</td>
                    <td>${event.event_type}</td>
                    <td>${event.severity}</td>
                </tr>
            `;

        });

        html += "</table>";

        document.getElementById(
            "output"
        ).innerHTML = html;

    });

</script>

</body>
</html>
```

Test the Complete System

Open:

```
http://localhost/api-demo/events.html
```

The page should display the records stored in MySQL.

Why This Is Useful

Previously:

```
JSON File
↓
JavaScript
```

Now:

```
MySQL Database
↓
PHP API
↓
JavaScript
```

This means:

- New records can be added to the database
- The API updates automatically
- The webpage updates automatically
- No JSON file needs to be edited manually

This is the foundation of many modern web applications.

Next tutorial: **Creating API Endpoints for Specific Data (Critical Events, Devices and Statistics)**.

Creating API Endpoints for Specific Data

In the previous tutorial, you created an API that returned every record from the `security_events` table.

In this tutorial, you will create multiple API endpoints that return different types of data.

This approach is commonly used in modern web applications.

Why Create Multiple Endpoints?

Your current API returns all records:

```
api_events.php
```

This works, but many applications need smaller, more focused datasets.

For example:

```
api_events.php
api_critical_events.php
api_statistics.php
```

Each endpoint has a specific purpose.

Create a Critical Events API

Create:

```
api_critical_events.php
```

Add:

```
<?php

$conn = new mysqli(
    "localhost",
    "root",
    "",
    "project_db"
);

header(
    "Content-Type: application/json"
);

$query = "
    SELECT *
    FROM security_events
    WHERE severity = 'critical'
";

$result =
    $conn->query($query);

$events = [];

while (
    $row =
    $result->fetch_assoc()
) {

    $events[] = $row;

}

echo json_encode(
    $events,
    JSON_PRETTY_PRINT
);
```

```
?>
```

Test the Endpoint

Open:

```
http://localhost/api-demo/api_critical_events.php
```

You should only see critical events.

> **Screenshot Placeholder**
>
> Insert screenshot showing critical event results.

Create a Statistics API

Create:

```
api_statistics.php
```

Add:

```
<?php

$conn = new mysqli(
    "localhost",
    "root",
    "",
    "project_db"
);

header(
    "Content-Type: application/json"
);
```

```
$statistics = [

    "total_events" => 0,
    "critical_events" => 0,
    "high_events" => 0

];

$result =
    $conn->query(
        "SELECT COUNT(*) AS total
         FROM security_events"
    );

$statistics["total_events"] =
    $result->fetch_assoc()["total"];

$result =
    $conn->query(
        "SELECT COUNT(*) AS total
         FROM security_events
         WHERE severity='critical'"
    );

$statistics["critical_events"] =
    $result->fetch_assoc()["total"];

$result =
    $conn->query(
        "SELECT COUNT(*) AS total
         FROM security_events
         WHERE severity='high'"
    );

$statistics["high_events"] =
    $result->fetch_assoc()["total"];

echo json_encode(
    $statistics,
    JSON_PRETTY_PRINT
```

```
);

?>
```

Test the Statistics Endpoint

Open:

```
http://localhost/api-demo/api_statistics.php
```

Example:

```
{
    "total_events": 3,
    "critical_events": 1,
    "high_events": 1
}
```

Read the Statistics API with JavaScript

Create:

```
dashboard.html
```

Add:

```
<!DOCTYPE html>
<html>
<head>
    <title>Dashboard</title>
</head>
<body>

<h1>Security Dashboard</h1>
```

```
<div id="output"></div>

<script>

fetch("api_statistics.php")
    .then(response => response.json())
    .then(data => {

        document.getElementById(
            "output"
        ).innerHTML = `

            <p>
                Total Events:
                ${data.total_events}
            </p>

            <p>
                Critical Events:
                ${data.critical_events}
            </p>

            <p>
                High Events:
                ${data.high_events}
            </p>

        `;

    });

</script>

</body>
</html>
```

Common Endpoint Examples

Many real systems use endpoints such as:

```
/api/users
/api/products
/api/orders
/api/messages
/api/statistics
```

Each endpoint returns only the data required by the application.

Summary

You now have:

```
api_events.php
```

Returns all events.

```
api_critical_events.php
```

Returns only critical events.

```
api_statistics.php
```

Returns dashboard statistics.

This approach keeps APIs organised and makes applications easier to maintain.

Next tutorial: **Adding Parameters to an API Using URL Variables**.

Working with JSON Data in JavaScript

Loading JSON Data with JavaScript

In this tutorial, you will load data from a JSON file and display it on a webpage using JavaScript.

The JSON file contains information about a smart home, including devices and security events.

Create the Project Files

Create a new folder called:

```
json-demo
```

Inside the folder create:

```
index.html
smart_security_data.json
```

Copy the JSON file into the project folder.

Your folder structure should look like:

```
json-demo
├── index.html
└── smart_security_data.json
```

Create the HTML Page

Open:

```
index.html
```

Add the following code:

```
<!DOCTYPE html>
<html>
<head>
    <title>JSON Demo</title>
</head>
<body>

<h1>Smart Home Dashboard</h1>

<div id="output"></div>

<script src="script.js"></script>

</body>
</html>
```

Save the file.

Create the JavaScript File

Create a new file called:

```
script.js
```

Your folder should now look like:

```
json-demo
├── index.html
├── script.js
└── smart_security_data.json
```

Load the JSON File

Open:

```
script.js
```

Add:

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        console.log(data);

    });
```

Save the file.

This code loads the JSON file and converts it into a JavaScript object.

Open Developer Tools

Open:

```
index.html
```

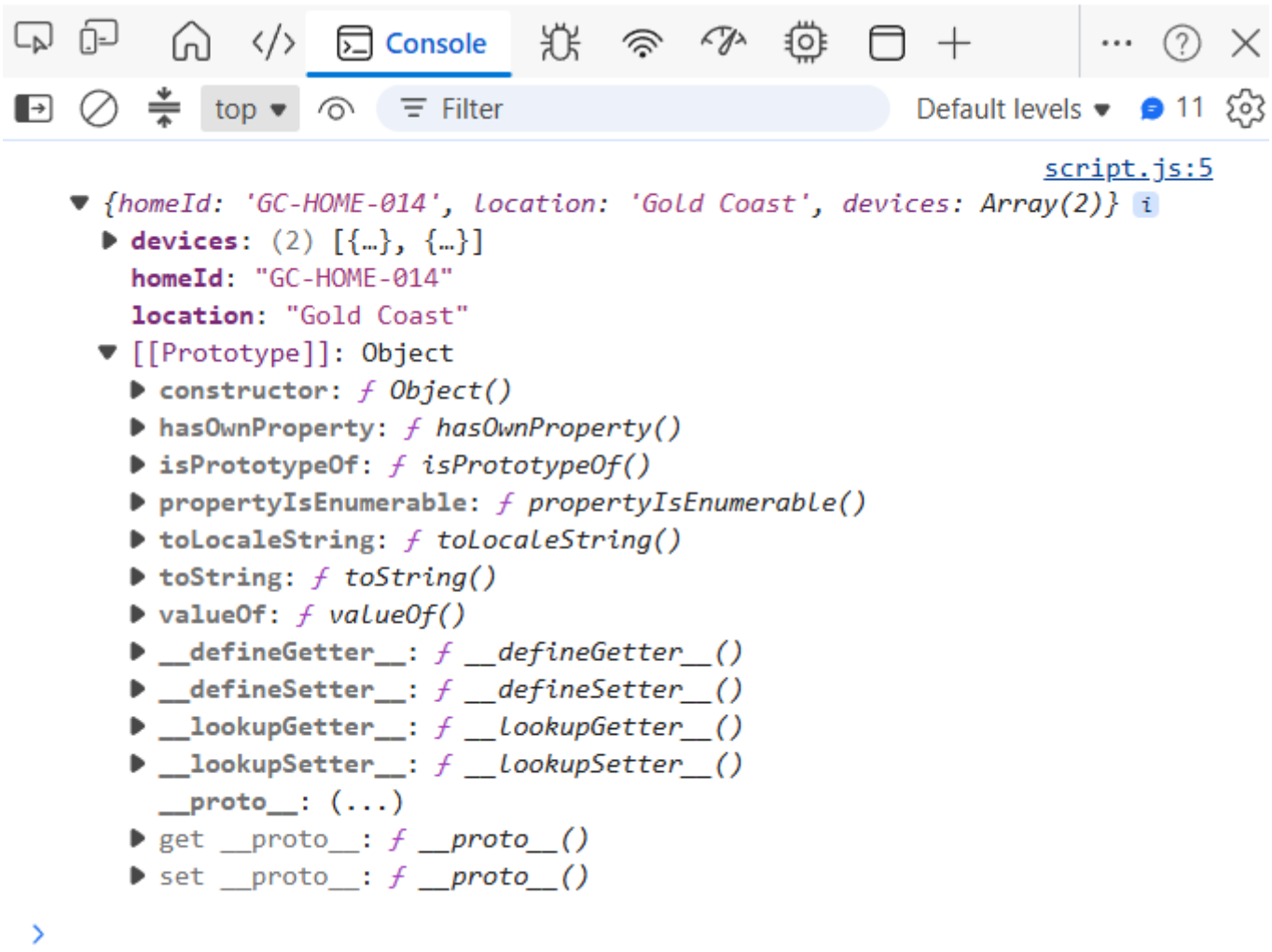
in your browser.

Press:

```
F12
```

and select the **Console** tab.

You should see the JSON data displayed.



Display the Home Information

Replace the contents of:

```
.then(data => {


});
```

with:

```
.then(data => {

    document.getElementById("output").innerHTML = `
        <p><strong>Home ID:</strong> ${data.homeId}</p>
        <p><strong>Location:</strong> ${data.location}</p>
    `;
```

```
});
```

Save the file.

Refresh the page.

You should now see:

```
Home ID: GC-HOME-014
Location: Gold Coast
```

Display the Devices

Update the code:

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        let html = `
            <p><strong>Home ID:</strong> ${data.homeId}</p>
            <p><strong>Location:</strong> ${data.location}</p>

            <h2>Devices</h2>
            <ul>
        `;

        data.devices.forEach(device => {

            html += `
                <li>
                    ${device.deviceId}
                    (${device.deviceType})
                </li>
            `;

        });

        html += "</ul>";
```

```
        document.getElementById("output").innerHTML = html;

    });
```

Refresh the page.

You should now see:

```
Home ID: GC-HOME-014
Location: Gold Coast

Devices

CAM-01 (Security Camera)
LOCK-02 (Smart Door Lock)
```

Complete JavaScript File

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        let html = `
            <p><strong>Home ID:</strong> ${data.homeId}</p>
            <p><strong>Location:</strong> ${data.location}</p>

            <h2>Devices</h2>
            <ul>
        `;

        data.devices.forEach(device => {

            html += `
                <li>
                    ${device.deviceId}
                    (${device.deviceType})
                </li>
```

```
            `;

        });

        html += "</ul>";

        document.getElementById("output").innerHTML = html;

    });
```

You have successfully loaded a JSON file and displayed data using JavaScript.

Next tutorial: **Displaying JSON Data in a Table**.

Displaying JSON Data in a Table

In the previous tutorial, you loaded a JSON file and displayed basic information about the smart home. In this tutorial, you will display the device data in an HTML table using JavaScript.

Current Project Structure

Your project should contain:

```
json-demo
├── index.html
├── script.js
└── smart_security_data.json
```

Create a Table Container

Open:

```
index.html
```

Update the page so it contains:

```
<!DOCTYPE html>
<html>
<head>
    <title>JSON Demo</title>
</head>
<body>
```

```
<h1>Smart Home Dashboard</h1>

<div id="output"></div>

<script src="script.js"></script>

</body>
</html>
```

The table will be generated inside the `output` div.

Create the Table Structure

Open:

```
script.js
```

Replace the previous code with:

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        let html = `
            <h2>Devices</h2>

            <table border="1">

                <tr>
                    <th>Device ID</th>
                    <th>Device Type</th>
                    <th>Room</th>
                </tr>
        `;

        data.devices.forEach(device => {

            html += `
```

```
                <tr>
                    <td>${device.deviceId}</td>
                    <td>${device.deviceType}</td>
                    <td>${device.room}</td>
                </tr>
            `;

        });

        html += "</table>";

        document.getElementById("output").innerHTML = html;

    });
```

Save the file.

View the Results

Open:

```
http://localhost/json-demo/
```

You should see:

Device ID	Device Type	Room
CAM-01	Security Camera	Front Entrance
LOCK-02	Smart Door Lock	Back Door

Add Basic Styling

The table works, but it looks very plain.

Add the following CSS inside the `<head>` section of `index.html`:

```
<style>

table {
    border-collapse: collapse;
    width: 100%;
}

th,
td {
    border: 1px solid #cccccc;
    padding: 10px;
    text-align: left;
}

th {
    background-color: #f2f2f2;
}

</style>
```

Refresh the page.

The table should now be easier to read.

Display the Home Information Above the Table

Update the start of the HTML string:

```
let html = `
    <p>
        <strong>Home ID:</strong>
        ${data.homeId}
    </p>

    <p>
        <strong>Location:</strong>
```

```
        ${data.location}
    </p>

    <h2>Devices</h2>

    <table border="1">

        <tr>
            <th>Device ID</th>
            <th>Device Type</th>
            <th>Room</th>
        </tr>
`;
```

The page should now display:

```
Home ID: GC-HOME-014
Location: Gold Coast

Devices
```

followed by the table.

Smart Home Dashboard

Devices

Device ID	Device Type	Room
CAM-01	Security Camera	Front Entrance
LOCK-02	Smart Door Lock	Back Door

Complete JavaScript File

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {
```

```
    let html = `
        <p>
            <strong>Home ID:</strong>
            ${data.homeId}
        </p>

        <p>
            <strong>Location:</strong>
            ${data.location}
        </p>

        <h2>Devices</h2>

        <table border="1">

            <tr>
                <th>Device ID</th>
                <th>Device Type</th>
                <th>Room</th>
            </tr>
    `;

    data.devices.forEach(device => {

        html += `
            <tr>
                <td>${device.deviceId}</td>
                <td>${device.deviceType}</td>
                <td>${device.room}</td>
            </tr>
        `;

    });

    html += "</table>";

    document.getElementById("output").innerHTML = html;

});
```

You have successfully loaded JSON data and displayed it in an HTML table.

Next tutorial: **Displaying Nested Event Data from JSON**.

Displaying Nested Event Data from JSON

In the previous tutorial, you displayed device information in a table. In this tutorial, you will work with nested JSON data by displaying the security events associated with each device.

The JSON file contains devices, and each device contains its own list of events.

Understanding the JSON Structure

The JSON file contains:

```
Home
 └ Devices
     └ Events
```

Example:

```
{
    "deviceId": "CAM-01",
    "events": [
        {
            "eventType": "motion_detected"
        }
    ]
}
```

To display the events, we need to loop through:

1. The devices
2. The events within each device

Create an Events Table

Open:

```
script.js
```

Replace the previous code with:

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        let html = `
            <h2>Security Events</h2>

            <table border="1">

                <tr>
                    <th>Device ID</th>
                    <th>Event Type</th>
                    <th>Severity</th>
                </tr>
        `;

        data.devices.forEach(device => {

            device.events.forEach(event => {

                html += `
                    <tr>
                        <td>${device.deviceId}</td>
                        <td>${event.eventType}</td>
                        <td>${event.severity}</td>
                    </tr>
                `;

            });

        });
```

```
        html += "</table>";

        document.getElementById("output").innerHTML = html;

    });
```

View the Results

Open:

```
http://localhost/json-demo/
```

You should see a table similar to:

Device ID	Event Type	Severity
CAM-01	motion_detected	high
CAM-01	remote_access_attempt	critical
LOCK-02	unlock_attempt	medium

Add Additional Event Information

The JSON file contains more information about each event.

Each event includes:

```
timestamp
eventType
dataTransmitted
severity
accessResult
```

Update the table headings:

```
<tr>
    <th>Device ID</th>
```

```
    <th>Timestamp</th>
    <th>Event Type</th>
    <th>Severity</th>
    <th>Access Result</th>
</tr>
```

Update the Table Rows

Replace the existing row code with:

```
html += `
    <tr>
        <td>${device.deviceId}</td>
        <td>${event.timestamp}</td>
        <td>${event.eventType}</td>
        <td>${event.severity}</td>
        <td>${event.accessResult}</td>
    </tr>
`;
```

Refresh the page.

The table should now display more detailed event information.

Smart Home Dashboard

Security Events

Device ID	Timestamp	Event Type	Severity	Access Result
CAM-01	2026-03-14T02:18:45	motion_detected	high	authorised
CAM-01	2026-03-14T02:19:10	remote_access_attempt	critical	blocked
LOCK-02	2026-03-13T23:47:02	unlock_attempt	medium	denied

Display the Device Type

Sometimes multiple devices may generate events.

Add another column heading:

```
<th>Device Type</th>
```

Update the row:

```
<td>${device.deviceType}</td>
```

Your table will now identify which type of device generated each event.

Complete JavaScript File

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        let html = `
            <h2>Security Events</h2>

            <table border="1">

                <tr>
                    <th>Device ID</th>
                    <th>Device Type</th>
                    <th>Timestamp</th>
                    <th>Event Type</th>
                    <th>Severity</th>
                    <th>Access Result</th>
                </tr>
        `;

        data.devices.forEach(device => {
```

```
            device.events.forEach(event => {

                html += `
                    <tr>
                        <td>${device.deviceId}</td>
                        <td>${device.deviceType}</td>
                        <td>${event.timestamp}</td>
                        <td>${event.eventType}</td>
                        <td>${event.severity}</td>
                        <td>${event.accessResult}</td>
                    </tr>
                `;

            });

        });

        html += "</table>";

        document.getElementById("output").innerHTML = html;

    });
```

What Happened?

In the previous tutorial, you looped through a single array:

```
data.devices
```

In this tutorial, you looped through:

```
data.devices
```

and then:

```
device.events
```

This is known as a nested loop and is commonly used when working with JSON files and APIs.

You have successfully displayed nested JSON data in a table.

Next tutorial: **Creating a Security Dashboard from JSON Data**.

Creating a Security Dashboard from JSON Data

In the previous tutorial, you displayed individual security events in a table. In this tutorial, you will create a simple dashboard that summarises the data and highlights important security information.

The dashboard will display:

- Total Devices
- Total Events
- Critical Events
- High Severity Events
- Medium Severity Events

Using the sample JSON file, there are 2 devices and 3 events, including one critical event.

Create a Dashboard Section

Open:

```
script.js
```

Replace the existing code with:

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        let totalDevices = data.devices.length;

        let totalEvents = 0;
        let criticalEvents = 0;
        let highEvents = 0;
```

```
        let mediumEvents = 0;

        data.devices.forEach(device => {

            device.events.forEach(event => {

                totalEvents++;

                if (event.severity === "critical") {
                    criticalEvents++;
                }

                if (event.severity === "high") {
                    highEvents++;
                }

                if (event.severity === "medium") {
                    mediumEvents++;
                }

            });

        });

    });
```

This code calculates summary statistics from the JSON data.

Create Dashboard Cards

Below the calculations, add:

```
let html = `
    <h2>Security Dashboard</h2>

    <div class="card">
        <h3>Total Devices</h3>
        <p>${totalDevices}</p>
```

```
    </div>

    <div class="card">
        <h3>Total Events</h3>
        <p>${totalEvents}</p>
    </div>

    <div class="card">
        <h3>Critical Events</h3>
        <p>${criticalEvents}</p>
    </div>

    <div class="card">
        <h3>High Events</h3>
        <p>${highEvents}</p>
    </div>

    <div class="card">
        <h3>Medium Events</h3>
        <p>${mediumEvents}</p>
    </div>
`;
```

Display the Dashboard

Add:

```
document.getElementById("output").innerHTML = html;
```

The completed code should now display the dashboard cards.

Add Dashboard Styling

Open:

```
index.html
```

Inside the `<style>` section, add:

```
.card {
    border: 1px solid #cccccc;
    border-radius: 8px;
    padding: 15px;
    margin-bottom: 10px;
}

.card h3 {
    margin-top: 0;
}
```

Save the file.

View the Dashboard

Open:

```
http://localhost/json-demo/
```

Using the sample JSON file, you should see something similar to:

```
Security Dashboard

Total Devices: 2
Total Events: 3
Critical Events: 1
High Events: 1
Medium Events: 1
```

Display the Event Table Below the Dashboard

The dashboard is useful, but users often want to see the detailed events as well.

Add the following code underneath the dashboard cards:

```
html += `
    <h2>Security Events</h2>

    <table border="1">

        <tr>
            <th>Device ID</th>
            <th>Event Type</th>
            <th>Severity</th>
        </tr>
`;
```

Add Event Rows

Add:

```
data.devices.forEach(device => {

    device.events.forEach(event => {

        html += `
            <tr>
                <td>${device.deviceId}</td>
                <td>${event.eventType}</td>
                <td>${event.severity}</td>
            </tr>
        `;

    });

});
```

Close the table:

```
html += "</table>";
```

Complete JavaScript File

```
fetch("smart_security_data.json")
    .then(response => response.json())
    .then(data => {

        let totalDevices = data.devices.length;

        let totalEvents = 0;
        let criticalEvents = 0;
        let highEvents = 0;
        let mediumEvents = 0;

        data.devices.forEach(device => {

            device.events.forEach(event => {

                totalEvents++;

                if (event.severity === "critical") criticalEvents++;
                if (event.severity === "high") highEvents++;
                if (event.severity === "medium") mediumEvents++;

            });

        });

        let html = `
            <h2>Security Dashboard</h2>

            <div class="card">
                <h3>Total Devices</h3>
                <p>${totalDevices}</p>
            </div>
```

```
        <div class="card">
            <h3>Total Events</h3>
            <p>${totalEvents}</p>
        </div>

        <div class="card">
            <h3>Critical Events</h3>
            <p>${criticalEvents}</p>
        </div>

        <div class="card">
            <h3>High Events</h3>
            <p>${highEvents}</p>
        </div>

        <div class="card">
            <h3>Medium Events</h3>
            <p>${mediumEvents}</p>
        </div>

        <h2>Security Events</h2>

        <table border="1">

            <tr>
                <th>Device ID</th>
                <th>Event Type</th>
                <th>Severity</th>
            </tr>
    `;

    data.devices.forEach(device => {

        device.events.forEach(event => {

            html += `
                <tr>
                    <td>${device.deviceId}</td>
                    <td>${event.eventType}</td>
                    <td>${event.severity}</td>
```

```
                    </tr>
                `;

            });

        });

        html += "</table>";

        document.getElementById("output").innerHTML = html;

    });
```

You now have a dashboard that summarises JSON data and displays detailed event information underneath.

Next tutorial: **Filtering and Highlighting Critical Security Events**.