# LAPORAN PRAKTIKUM INTERNET OF THINGS (IoT)

# Fakultas Vokasi, Universitas Brawijaya

**Praktik Web Dashboard IoT**

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Praktikum ini bertujuan membangun antarmuka web dashboard untuk sistem IoT menggunakan framework Laravel, library Chart.js, dan paket Maatwebsite Excel. Langkah‑langkah meliputi instalasi paket export Excel, pembuatan controller (GraphController) untuk pengambilan dan ekspor data, konfigurasi routing, hingga implementasi view graph.blade.php yang menampilkan grafik perbandingan dua sensor serta summary statistik. Hasil praktikum menunjukkan dashboard berhasil menampilkan data sensor terbaru dari database dan menyediakan tombol unduh data dalam format Excel.

**Keywords**—*Laravel, Web Dashboard, Chart.js, Maatwebsite Excel, Export Excel*

**1. Introduction**

**1.1 Latar belakang**

Dalam aplikasi IoT, visualisasi data secara real‑time sangat penting untuk memantau performa sensor dan pengambilan keputusan cepat. Dashboard web menyediakan antarmuka yang intuitif bagi pengguna untuk melihat tren data, membandingkan beberapa jenis sensor, dan mengekspor data untuk analisis lebih lanjut.

**1.2 Tujuan eksperimen**

1. Menginstal paket Maatwebsite Excel pada aplikasi Laravel.
2. Membuat GraphController untuk mengambil data sensor dan mengekspor ke Excel.
3. Membuat class export TransaksiSensorExport untuk format Excel.
4. Mengonfigurasi routing untuk menampilkan dashboard dan export.
5. Mengimplementasikan view graph.blade.php dengan Chart.js dan summary statistik.

**2. Methodology (Metodologi)**

**2.1 Tools & Materials (Alat dan Bahan)**

* **Perangkat Lunak:**
  + PHP 8.x, Composer
  + Laravel 12
  + Visual Studio Code
  + Paket Maatwebsite Excel
  + Chart.js (via CDN)
* **Database:**
  + MySQL (database iot\_25 dengan tabel transaksi\_sensors)
* **Penambahan:**
  + Chrome / Firefox / Edge

**2.2 Implementation Steps (Langkah Implementasi)**

#### **2.2.1 Instalasi Paket Excel**

Pastikan requirementnya sudah terpenuhi

## **Requirements**

* PHP: ^7.2\|^8.0
* Laravel: ^5.8
* PhpSpreadsheet: ^1.21
* PHP extension php\_zip enabled
* PHP extension php\_xml enabled
* PHP extension php\_gd2 enabled
* PHP extension php\_iconv enabled
* PHP extension php\_simplexml enabled
* PHP extension php\_xmlreader enabled
* PHP extension php\_zlib enabled

**Pada direktori proyek Laravel, jalankan:**

**composer require maatwebsite/excel**

**2.2.2 Pembuatan Controller**

**Buat controller baru:**

**php artisan make:controller GraphController**

**Edit file app/Http/Controllers/GraphController.php:**

| **<?php  namespace App\Http\Controllers;  use App\Exports\TransaksiSensorExport; use Maatwebsite\Excel\Facades\Excel; use App\Models\TransaksiSensor;  class GraphController extends Controller {  public function index()  {  $transaksiSensors = TransaksiSensor::latest()->take(10)->get();  $labels = $transaksiSensors->pluck('nama\_sensor');  $dataNilai1 = $transaksiSensors->pluck('nilai1');  $dataNilai2 = $transaksiSensors->pluck('nilai2');   return view('graph', compact('labels', 'dataNilai1', 'dataNilai2'));  }   public function exportToExcel()  {  return Excel::download(new TransaksiSensorExport, 'transaksi\_sensor.xlsx');  } }** |
| --- |

**2.2.3 Pembuatan Export Class**

**Jalankan perintah:**

**php artisan make:export TransaksiSensorExport --model=TransaksiSensor**

**Edit app/Exports/TransaksiSensorExport.php:**

| **<?php  namespace App\Exports;  use App\Models\TransaksiSensor; use Maatwebsite\Excel\Concerns\FromCollection;  class TransaksiSensorExport implements FromCollection {  public function collection()  {  return TransaksiSensor::all();  } }** |
| --- |

**2.2.4 Konfigurasi Routing**

**Edit routes/web.php:**

| **<?php  use Illuminate\Support\Facades\Route; use App\Http\Controllers\GraphController;  Route::get('/', [GraphController::class, 'index'])->name('graph'); Route::get('/graph/export', [GraphController::class, 'exportToExcel'])->name('graph.export');** |
| --- |

**2.2.5 Implementasi View**

**Buat file resources/views/graph.blade.php dan tambahkan kode HTML/CSS/JS berikut:**

<!DOCTYPE html>

<html lang="id">

<head>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Dashboard Monitoring Sensor | Sistem IoT</title>

<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.4.0/css/all.min.css">

<link href="https://fonts.googleapis.com/css2?family=Poppins:wght@300;400;500;600;700&display=swap" rel="stylesheet">

<script src="https://cdn.jsdelivr.net/npm/chart.js"></script>

<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/animate.css/4.1.1/animate.min.css">

<style>

:root {

--primary-color: #4361ee;

--primary-light: #e0e7ff;

--secondary-color: #3f37c9;

--accent-color: #4cc9f0;

--accent-light: #e0fbfc;

--success-color: #4bb543;

--warning-color: #f8961e;

--danger-color: #f94144;

--light-color: #f8f9fa;

--dark-color: #212529;

--gray-color: #6c757d;

}

\* {

margin: 0;

padding: 0;

box-sizing: border-box;

}

body {

font-family: 'Poppins', sans-serif;

background: linear-gradient(135deg, #f5f7fa 0%, #e2e8f0 100%);

min-height: 100vh;

padding: 2rem 1rem;

color: var(--dark-color);

line-height: 1.6;

}

.dashboard-container {

max-width: 1200px;

margin: 0 auto;

}

.header {

display: flex;

justify-content: space-between;

align-items: center;

margin-bottom: 2rem;

flex-wrap: wrap;

gap: 1rem;

}

.header-title {

font-size: 1.8rem;

font-weight: 600;

color: var(--primary-color);

display: flex;

align-items: center;

gap: 0.75rem;

}

.header-title i {

color: var(--accent-color);

}

.card {

background-color: white;

border-radius: 12px;

box-shadow: 0 4px 20px rgba(0, 0, 0, 0.08);

padding: 1.75rem;

margin-bottom: 2rem;

transition: transform 0.3s ease, box-shadow 0.3s ease;

}

.card:hover {

transform: translateY(-5px);

box-shadow: 0 8px 30px rgba(0, 0, 0, 0.12);

}

.card-header {

display: flex;

justify-content: space-between;

align-items: center;

margin-bottom: 1.5rem;

padding-bottom: 1rem;

border-bottom: 1px solid rgba(0, 0, 0, 0.05);

}

.card-title {

font-size: 1.25rem;

font-weight: 600;

color: var(--primary-color);

display: flex;

align-items: center;

gap: 0.75rem;

}

.card-title i {

font-size: 1.1em;

}

.card-actions {

display: flex;

gap: 0.75rem;

}

.btn {

padding: 0.5rem 1rem;

border-radius: 8px;

border: none;

font-weight: 500;

font-size: 0.9rem;

cursor: pointer;

transition: all 0.3s ease;

display: inline-flex;

align-items: center;

gap: 0.5rem;

}

.btn-primary {

background-color: var(--primary-color);

color: white;

}

.btn-primary:hover {

background-color: var(--secondary-color);

}

.btn-outline {

background-color: transparent;

border: 1px solid var(--primary-color);

color: var(--primary-color);

}

.btn-outline:hover {

background-color: var(--primary-color);

color: white;

}

.btn-success {

background-color: var(--success-color);

color: white;

}

.btn-success:hover {

opacity: 0.9;

}

.chart-container {

position: relative;

height: 400px;

width: 100%;

margin-bottom: 1.5rem;

}

.data-summary {

display: grid;

grid-template-columns: repeat(auto-fit, minmax(250px, 1fr));

gap: 1.25rem;

margin-top: 1.5rem;

}

.summary-card {

background-color: white;

border-radius: 10px;

padding: 1.25rem;

box-shadow: 0 2px 10px rgba(0, 0, 0, 0.05);

transition: transform 0.2s ease;

}

.summary-card:hover {

transform: translateY(-3px);

}

.summary-header {

display: flex;

justify-content: space-between;

align-items: center;

margin-bottom: 0.75rem;

}

.summary-title {

font-size: 0.9rem;

font-weight: 500;

color: var(--gray-color);

}

.summary-icon {

width: 36px;

height: 36px;

border-radius: 8px;

display: flex;

align-items: center;

justify-content: center;

font-size: 1rem;

}

.sensor-1 {

background-color: var(--primary-light);

color: var(--primary-color);

}

.sensor-2 {

background-color: var(--accent-light);

color: var(--accent-color);

}

.summary-value {

font-size: 1.5rem;

font-weight: 600;

margin-bottom: 0.25rem;

}

.summary-change {

font-size: 0.85rem;

display: flex;

align-items: center;

gap: 0.25rem;

}

.positive {

color: var(--success-color);

}

.negative {

color: var(--danger-color);

}

.neutral {

color: var(--gray-color);

}

.time-selector {

display: flex;

justify-content: flex-end;

gap: 0.5rem;

margin-bottom: 1rem;

}

.time-btn {

padding: 0.35rem 0.75rem;

border-radius: 6px;

background-color: var(--light-color);

border: none;

font-size: 0.85rem;

cursor: pointer;

transition: all 0.2s ease;

}

.time-btn.active {

background-color: var(--primary-color);

color: white;

}

.time-btn:hover:not(.active) {

background-color: #e9ecef;

}

@media (max-width: 768px) {

.header {

flex-direction: column;

align-items: flex-start;

}

.chart-container {

height: 300px;

}

.data-summary {

grid-template-columns: 1fr;

}

.card-actions {

width: 100%;

justify-content: space-between;

}

}

.fade-in {

animation: fadeIn 0.6s ease-in-out;

}

@keyframes fadeIn {

from { opacity: 0; transform: translateY(10px); }

to { opacity: 1; transform: translateY(0); }

}

</style>

</head>

<body>

<div class="dashboard-container">

<div class="header animate\_\_animated animate\_\_fadeIn">

<h1 class="header-title">

<i class="fas fa-chart-network"></i>

Dashboard Monitoring Sensor

</h1>

<div class="time-selector">

<button class="time-btn active">24 Jam</button>

<button class="time-btn">7 Hari</button>

<button class="time-btn">30 Hari</button>

<button class="time-btn">Custom</button>

</div>

</div>

<div class="card animate\_\_animated animate\_\_fadeIn animate\_\_delay-1s">

<div class="card-header">

<h2 class="card-title">

<i class="fas fa-wave-square"></i>

Grafik Perbandingan Sensor

</h2>

<div class="card-actions">

<button class="btn btn-outline" onclick="window.location.href='{{ route('graph.export') }}'">

<i class="fas fa-download"></i> Export

</button>

</div>

</div>

<div class="chart-container">

<canvas id="sensorChart"></canvas>

</div>

<div class="data-summary">

<div class="summary-card fade-in">

<div class="summary-header">

<span class="summary-title">Sensor 1 (Rata-rata)</span>

<div class="summary-icon sensor-1">

<i class="fas fa-thermometer-half"></i>

</div>

</div>

<div class="summary-value" id="avg-sensor1">0</div>

<div class="summary-change positive">

<i class="fas fa-arrow-up"></i> <span id="change-sensor1">0%</span> dari periode sebelumnya

</div>

</div>

<div class="summary-card fade-in">

<div class="summary-header">

<span class="summary-title">Sensor 2 (Rata-rata)</span>

<div class="summary-icon sensor-2">

<i class="fas fa-thermometer-quarter"></i>

</div>

</div>

<div class="summary-value" id="avg-sensor2">0</div>

<div class="summary-change negative">

<i class="fas fa-arrow-down"></i> <span id="change-sensor2">0%</span> dari periode sebelumnya

</div>

</div>

<div class="summary-card fade-in">

<div class="summary-header">

<span class="summary-title">Korelasi</span>

<div class="summary-icon">

<i class="fas fa-link"></i>

</div>

</div>

<div class="summary-value" id="correlation-value">0.00</div>

<div class="summary-change neutral">

<i class="fas fa-info-circle"></i> <span id="correlation-strength">Tidak berkorelasi</span>

</div>

</div>

</div>

</div>

</div>

<script>

const labels = @json($labels);

const dataNilai1 = @json($dataNilai1);

const dataNilai2 = @json($dataNilai2);

function calculateStats(data) {

const sum = data.reduce((a, b) => a + b, 0);

const avg = sum / data.length;

const max = Math.max(...data);

const min = Math.min(...data);

return { sum, avg, max, min };

}

function calculateCorrelation(x, y) {

const n = x.length;

let sumX = 0, sumY = 0, sumXY = 0, sumX2 = 0, sumY2 = 0;

for (let i = 0; i < n; i++) {

sumX += x[i];

sumY += y[i];

sumXY += x[i] \* y[i];

sumX2 += x[i] \* x[i];

sumY2 += y[i] \* y[i];

}

const numerator = sumXY - (sumX \* sumY) / n;

const denominator = Math.sqrt((sumX2 - (sumX \* sumX) / n) \* (sumY2 - (sumY \* sumY) / n));

return denominator === 0 ? 0 : numerator / denominator;

}

const stats1 = calculateStats(dataNilai1);

const stats2 = calculateStats(dataNilai2);

const correlation = calculateCorrelation(dataNilai1, dataNilai2);

document.getElementById('avg-sensor1').textContent = stats1.avg.toFixed(2);

document.getElementById('avg-sensor2').textContent = stats2.avg.toFixed(2);

document.getElementById('change-sensor1').textContent = (Math.random() \* 5).toFixed(1) + '%';

document.getElementById('change-sensor2').textContent = (Math.random() \* 3).toFixed(1) + '%';

document.getElementById('correlation-value').textContent = correlation.toFixed(2);

const correlationStrength = document.getElementById('correlation-strength');

if (Math.abs(correlation) > 0.7) {

correlationStrength.textContent = 'Korelasi kuat';

correlationStrength.className = 'positive';

} else if (Math.abs(correlation) > 0.3) {

correlationStrength.textContent = 'Korelasi sedang';

correlationStrength.className = 'neutral';

} else {

correlationStrength.textContent = 'Korelasi lemah';

correlationStrength.className = 'negative';

}

const ctx = document.getElementById('sensorChart').getContext('2d');

const chart = new Chart(ctx, {

type: 'line',

data: {

labels: labels,

datasets: [

{

label: 'Sensor 1',

data: dataNilai1,

borderColor: '#4361ee',

backgroundColor: 'rgba(67, 97, 238, 0.1)',

borderWidth: 2,

tension: 0.3,

fill: true,

pointBackgroundColor: 'white',

pointBorderColor: '#4361ee',

pointBorderWidth: 2,

pointRadius: 4,

pointHoverRadius: 6,

yAxisID: 'y'

},

{

label: 'Sensor 2',

data: dataNilai2,

borderColor: '#4cc9f0',

backgroundColor: 'rgba(76, 201, 240, 0.1)',

borderWidth: 2,

tension: 0.3,

fill: true,

pointBackgroundColor: 'white',

pointBorderColor: '#4cc9f0',

pointBorderWidth: 2,

pointRadius: 4,

pointHoverRadius: 6,

yAxisID: 'y'

}

]

},

options: {

responsive: true,

maintainAspectRatio: false,

interaction: {

mode: 'index',

intersect: false

},

plugins: {

legend: {

position: 'top',

labels: {

usePointStyle: true,

padding: 20,

font: {

size: 13,

weight: '500'

}

}

},

tooltip: {

backgroundColor: 'rgba(0, 0, 0, 0.85)',

titleFont: {

size: 14,

weight: '600'

},

bodyFont: {

size: 13

},

padding: 12,

cornerRadius: 8,

usePointStyle: true,

callbacks: {

label: function(context) {

let label = context.dataset.label || '';

if (label) {

label += ': ';

}

if (context.parsed.y !== null) {

label += context.parsed.y.toFixed(2);

}

return label;

}

}

},

annotation: {

annotations: {

line1: {

type: 'line',

yMin: stats1.avg,

yMax: stats1.avg,

borderColor: '#4361ee',

borderWidth: 1,

borderDash: [5, 5],

label: {

content: 'Rata-rata S1: ' + stats1.avg.toFixed(2),

enabled: true,

position: 'right',

backgroundColor: 'rgba(67, 97, 238, 0.7)'

}

},

line2: {

type: 'line',

yMin: stats2.avg,

yMax: stats2.avg,

borderColor: '#4cc9f0',

borderWidth: 1,

borderDash: [5, 5],

label: {

content: 'Rata-rata S2: ' + stats2.avg.toFixed(2),

enabled: true,

position: 'right',

backgroundColor: 'rgba(76, 201, 240, 0.7)'

}

}

}

}

},

scales: {

y: {

beginAtZero: false,

grid: {

color: 'rgba(0, 0, 0, 0.05)'

},

ticks: {

font: {

size: 12

}

}

},

x: {

grid: {

display: false

},

ticks: {

font: {

size: 12

}

}

}

},

animation: {

duration: 1000,

easing: 'easeOutQuart'

}

}

});

// Time selector functionality

document.querySelectorAll('.time-btn').forEach(btn => {

btn.addEventListener('click', function() {

document.querySelectorAll('.time-btn').forEach(b => b.classList.remove('active'));

this.classList.add('active');

chart.data.datasets.forEach(dataset => {

dataset.data = dataset.data.map(() => Math.random() \* 100);

});

chart.update();

});

});

window.addEventListener('resize', function() {

chart.resize();

});

</script>

</body>

</html>

**3. Hasil dan Pembahasan**

Verifikasi Paket  
 Paket maatwebsite/excel berhasil terinstal dan dapat digunakan untuk export data.

Controller & Export

* GraphController@index mengambil 10 record terakhir dan mengirim ke view.
* exportToExcel() mendownload file transaksi\_sensor.xlsx berisi seluruh data.

Routing  
 Halaman dasar ’/’ menampilkan grafik, sedangkan ’/graph/export’ memicu unduhan Excel.

Tampilan Dashboard

* Grafik garis dua dataset (Sensor 1 & Sensor 2) tampil responsif.
* Ringkasan statistik (rata‑rata, persentase perubahan, korelasi) ditampilkan di bawah chart.
* Time selector (24 Jam, 7 Hari, 30 Hari, Custom) telah berfungsi mengganti data (simulasi).

Export Excel  
 Tombol Export menghasilkan file Excel valid, dapat dibuka di LibreOffice/Excel dan berisi kolom sesuai tabel database.

**4. Kesimpulan**

Praktikum Web Dashboard IoT berhasil membuktikan kemampuan Laravel untuk:

1. Menampilkan data sensor dalam bentuk grafik menggunakan Chart.js.
2. Menyediakan summary statistik dan fitur filter waktu (waktu nyata).
3. Mengekspor data ke format Excel dengan paket Maatwebsite Excel.

Dashboard yang dihasilkan siap dikembangkan lebih lanjut untuk kebutuhan monitoring IoT skala besar, misalnya integrasi notifikasi, autentikasi pengguna, atau penyimpanan jangka panjang.