

## What is PM2?

**PM2** (Process Manager 2) is a popular **production process manager for Node.js applications**. It is widely used to ensure that applications are **kept alive indefinitely**, automatically restart on failure, and scale to meet application demands. PM2 simplifies the management of applications in a production environment by handling the complexities of process monitoring, logging, and clustering.

### Key Features:

1. **Keep Applications Alive:** Automatically restarts apps if they crash or are accidentally terminated.
2. **Load Balancing:** Enables clustering for Node.js apps to utilize multi-core systems efficiently.
3. **Monitoring:** Provides real-time monitoring of processes, resource usage (CPU, memory), and more.
4. **Log Management:** Consolidates logs and provides easy log rotation and management.
5. **Deployment Automation:** Includes a deployment module for seamless app deployment and updates.
6. **Cross-Platform Support:** Works on Linux, macOS, and Windows.

### Applications of PM2

1. **Ensuring High Availability:**
  - Keeps services running 24/7 by automatically restarting on crashes.
  - Ideal for production environments.
2. **Load Balancing and Scaling:**
  - Uses clustering to run multiple instances of an app across multiple CPU cores for improved performance.
3. **Monitoring and Debugging:**
  - Simplifies resource usage monitoring and log management.
4. **Microservices Management:**
  - Suitable for managing multiple services in a microservices architecture.
5. **Automation:**
  - Automates deployment and process management for CI/CD workflows.
6. **Cross-Platform Consistency:**
  - Unified application management across development, staging, and production environments.

## Basic Operations

- ✓ `pm2 start <app.js>` - Start an application.
  - ✓ `pm2 list` - List all running processes.
  - ✓ `pm2 stop <id|name>` - Stop a process by its ID or name.
  - ✓ `pm2 delete <id|name>` - Stop and remove a process from the PM2 list.
  - ✓ `pm2 restart <id|name>` - Restart a process.
  - ✓ `pm2 reload <id|name>` - Reload a process without downtime (for clustering).
  - ✓ `pm2 logs` - View logs of all managed processes.
  - ✓ `pm2 monit` - Monitor real-time metrics like CPU and memory usage.
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## Startup and Boot Management

- ✓ `pm2 save` - Save the current process list for startup after reboot.
  - ✓ `pm2 startup` - Generate a startup script for PM2.
  - ✓ `pm2 resurrect` - Reload processes from the saved list.
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## Process Scaling and Clustering

- ✓ `pm2 start <app.js> -i <number>` - Start multiple instances of an app (clustering).
  - ✓ `pm2 start <app.js> -i max` - Use all CPU cores for clustering.
  - ✓ `pm2 scale <app-name> <number>` - Scale an application to a specified number of instances.
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## Deployment Operations

- ✓ `pm2 deploy <ecosystem.config.js> <environment>` - Deploy an app using an ecosystem file.
  - ✓ `pm2 deploy <environment> update` - Update the deployment for the specified environment.
  - ✓ `pm2 deploy <environment> rollback` - Roll back to the previous deployment version.
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## Configuration Management

- ✓ `pm2 start <app.js> --name <app-name>` - Start an app with a custom name.
- ✓ `pm2 describe <id|name>` - Display detailed info about a process.
- ✓ `pm2 reload all` - Reload all processes without downtime.
- ✓ `pm2 restart all` - Restart all processes.

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## Log Management

- ✓ `pm2 flush` - Clear all logs.
  - ✓ `pm2 reloadLogs` - Reload all log files.
  - ✓ `pm2 logs <id|name>` - View logs for a specific process.
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## Monitoring and Metrics

- ✓ `pm2 metrics` - Display detailed performance metrics.
  - ✓ `pm2 list` - View the status of all processes.
  - ✓ `pm2 show <id|name>` - Show detailed info for a specific app.
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## Maintenance and Troubleshooting

- ✓ `pm2 kill` - Stop all PM2 processes and the PM2 daemon.
  - ✓ `pm2 update` - Update PM2 to the latest version.
  - ✓ `pm2 unstartup` - Remove PM2 auto-startup configuration.
  - ✓ `pm2 env <id|name>` - View the environment variables for a process.
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## Advanced Features

- ✓ `pm2 sendSignal SIGUSR2 <id|name>` - Send custom signals to processes.
- ✓ `pm2 trigger <app-name> <action>` - Trigger custom actions defined in the app.
- ✓ `pm2 exec <command>` - Run a system command in the PM2 environment.