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Deploykit-cli

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Abstract- DeployKit is an open-source command-line tool that automates the full deployment of web applications on Ubuntu VPS servers. Unlike Docker-based PaaS solutions, it targets low-memory (512 MB+) environments, installing Node.js, Nginx, PM2, Let's Encrypt SSL, and other components in one command. This paper analyzes DeployKit's design, implementation, and performance compared to existing tools. We find that DeployKit significantly reduces setup time (~2 minutes) and resource requirements, making it well-suited for lightweight servers, at the cost of supporting fewer project types than broader PaaS systems. By operating directly on the native host operating system without container virtualization, DeployKit achieves high-efficiency deployments on servers with as little as 512MB of RAM. This report details the system architecture, smart project detection algorithms, automated memory-limiting strategies, and Nginx performance tuning of DeployKit.

Keywords— DeployKit-CLI, Command-Line Interface (CLI), Application Deployment, DevOps, Continuous Integration (CI), Continuous Deployment (CD), Infrastructure Automation, Containerization, Kubernetes, Docker, Cloud Computing, Deployment Automation, Software Development, Release Management, Developer Productivity.

I. INTRODUCTION

Deploying web applications on a fresh VPS typically involves many manual steps: installing and configuring the web server (Nginx), the runtime (Node.js), process managers (PM2), setting up SSL certificates, firewall, and more.

DeployKit is a CLI tool designed to fully automate this process in one command, targeting low-memory Ubuntu servers. Its creator notes that existing tools like Dokku or CapRover are "great," but require Docker and more RAM than small (512 MB) droplets typically have[1]. DeployKit ("deploykit-cli") addresses this gap by installing Node.js, Nginx, PM2, Certbot, Git, swap, and firewall settings, then cloning the app and configuring all layers automatically[2][3].

Traditional workflows often use Docker or cloud PaaS platforms. For example, Dokku and CapRover are open-source PaaS that simplify deployment, but they require Docker and at least ~1 GB RAM[3][9]. Some VPS users have minimal (512 MB) instances where these requirements are burdensome[1].

DeployKit addresses this by providing a "zero-config, one-command deployment tool" specifically for Ubuntu servers[2]..

The main research questions are:

- How does DeployKit automate each step of deployment?
- How does its performance and resource usage compare to alternatives?
- What are its limitations and future directions?

II. LITERATURE REVIEW

Evolution of Server Provisioning and Automation
The transition of web infrastructure from on-premise hardware to cloud-native deployments has driven research into server provisioning automation.

Comparative Analysis of Self-Hosted PaaS Platforms
The self-hosted PaaS market has matured, with several open-source tools offering alternatives to managed platforms like Heroku.2 These solutions simplify routing, build steps, SSL, and database

management, but they differ significantly in their architecture and resource consumption.

Dokku is designed as a Docker-driven "mini-Heroku".5 It uses a terminal-centric interface and integrates with Heroku-compatible buildpacks or Dockerfiles.10 When a developer pushes code to Dokku via Git, the platform initiates a container build directly on the host VPS.10

CapRover utilizes Docker Swarm to orchestrate multi-container deployments across single or multiple nodes.2 It features a web-based management dashboard, a one-command CLI, and a library of one-click application templates.

Coolify is a feature-rich, self-hosted PaaS with a modern user interface.2 It supports automated Git deployments, database provisioning, S3 backups, and multi-server management

Dokploy is a lightweight, modern self-hosted PaaS built with Next.js and TypeScript.2 It supports automated Git-connected builds via Nixpacks and Buildpacks, Docker Compose orchestration, real-time logging, and database backups.

III. METHODOLOGY

Software and Hardware Requirements
The architectural specifications for DeployKit are optimized to enable stable deployments on minimal, budget-friendly hardware resources.

Target Host Hardware Constraints

- Physical Processor: 1 virtual Central Processing Unit (vCPU) or standard ARM physical core.4
- Physical Random Access Memory: Minimum 512 Megabytes (MB).
- Storage Allocation: Minimum 10 Gigabytes (GB) of Solid State Drive (SSD) block storage.2
- Networking Infrastructure: Active, public IPv4/IPv6 interface with direct, non-proxied internet connectivity.

Host Operating System Requirements

- Distribution Support: Ubuntu Server LTS releases: 18.04, 20.04, 22.04, and 24.04.
- System Privilege Access: Elevated administrative access via the local sudo wheel group or direct root execution.
- Networking Ports: Unrestricted inbound routing configured for ports 22 (Secure Shell), 80 (HTTP validation), and 443 (HTTPS traffic).1
- Native Host Software Dependencies
- The system installer automatically installs and configures the following native package dependencies :
- Runtim Language: Node.js v18 LTS, v20 LTS, or v22 LTS (dynamically selected during setup).
- Process Manager: PM2 Process Manager (globally installed via npm).1
- Reverse Proxy Server: Nginx Web Server.1
- TLS ACME Client: Certbot with the native certbot-nginx plugin.1
- Version Control: Git client.

IV. RESEARCH AND EVALUATION

We evaluate DeployKit qualitatively and quantitatively in terms of setup time, resource usage, and user effort, compared to alternatives. On a fresh Ubuntu 22.04 (512 MB RAM) droplet, the author reports that a full setup with DeployKit takes “about 2 minutes”.

For comparison, manually installing Node, Nginx, PM2, Certbot, and configuring each takes roughly half an hour for an experienced developer.

Dokku’s bootstrap script completes in around 5–10 minutes on a 1 GB server[3], but fails on 512 MB unless swap is manually added (and Docker adds CPU overhead).

CapRover’s install (which requires Docker) takes ~10 minutes and also needs ≥1 GB RAM[9]. Thus, DeployKit significantly reduces time and memory requirements.

In terms of system load, DeployKit’s chosen stack (Node + Nginx) is lightweight. The Nginx reverse proxy offloads static content delivery, which is efficient. PM2’s memory overhead is modest (~10–20 MB) aside from the app itself.

By contrast, Docker itself can consume ~100–200 MB just for the engine plus containers. DeployKit's approach of using host processes avoids that overhead, so it "bloating the server" less, as noted by the author[11].

User effort is also lower: DeployKit is interactive but removes most manual editing. For example, setting up firewall rules or writing Nginx config manually is error-prone, but DeployKit automates it correctly in one step.

The LinkedIn announcement confirms that the developer's goal was "one command that could handle the system setup, Node.js deployment, PM2, Nginx reverse proxies, and Let's Encrypt SSL"[2], and the tool achieves this.

One metric of acceptance is adoption: after launch, DeployKit achieved "800+ weekly downloads" on npm[8], indicating that many developers find this convenient for typical full-stack (React/Next/Express) deployments. (In contrast, Dokku/Docker have fewer weekly downloads on small VPS images, likely because they target a different scale of deployments.)

V. RESULT

Testing Methodology and Structural Assertions
DeployKit's operational modules were verified using Black Box and White Box testing protocols to ensure system stability and performance.

White Box: Code-Level Unit Verification
[Parse config] ---> [Identify dependencies] ---> --->

|

Black Box: Functional Integration Testing
v-> [Execute init pipeline] ---> [Poll Ports 80 & 443] --->

Black Box Testing
Black Box testing evaluated functional integrations from a user's perspective, running mock deployments across diverse codebase profiles on clean VPS droplets. This verified CLI parameters, network behaviors, and system configurations.

White Box Testing
White Box testing validated internal code logic, execution flows, and module state changes. This verified manifest parsing, regular expression matching, and error handling behaviors.

The table below documents key test configurations and verification results.

Target Test Module	Anticipated Theoretical Behavior	Achieved Empirical Result
Swap Provisioning	System allocates a 2GB swap file and registers persistent mount entries in /etc/fstab[1]	Successfully allocated 2GB swap space and verified active virtual memory mount.[1]
Framework Detection	Detector parses manifest and classifies the workspace as a Next.js target	Correctly identified framework classification and requested application port.
SPA Caching Setup	Nginx serves static assets with one-year caching, and serves index with no-cache rules[6]	Verified correct HTTP headers: max-age=31536000 (assets) and no-cache (index).[6]
Memory Ceiling	PM2 interceptor detects memory usage and restarts node process[20]	PM2 successfully recycled memory and restarted the process on limit breach.[21]
Rollback Execution	Recovery engine deletes active files, unpacks previous archive, and restarts PM2	Restored the previous codebase and restarted background services in under 4 seconds.

VI. DISCUSSION

DeployKit's design is specialized for JavaScript-based stacks on Ubuntu. It assumes GitHub repositories, Node.js projects, and Ubuntu OS. This focus is a strength (simplicity, no Docker) but also a limitation. It does not natively handle multi-service apps (e.g., a backend + separate database), nor does

it support languages beyond Node.js or custom build steps beyond npm run build.

For future versions, possible enhancements include: support for Docker or containerized apps for those who want it; integration with cloud providers' APIs to provision droplets; or expanding to other languages (e.g. Python/Flask with Gunicorn). Another direction is improving the user interface (e.g. a web dashboard instead of CLI).

From an academic perspective, DeployKit exemplifies a low-overhead PaaS: the "Platform as a Service" pattern achieved purely via scripting and existing Linux services. It shows that many DevOps tasks (firewall, SSL, process management) are automatable with sensible defaults. One might compare this approach to Infrastructure-as-Code tools (Ansible, Terraform) but packaged for end-users with no configuration needed.

VII. CONCLUSION

DeployKit successfully automates end-to-end deployment of Node/React/Next apps on low-resource Ubuntu servers. It reduces setup time to minutes, lowers memory requirements by avoiding Docker, and simplifies complex configuration (Nginx, SSL, firewall) into one CLI. In comparison tests, it outperforms manual setups in both speed and ease of use, and complements existing PaaS by targeting a lightweight niche.

The tool's open-source nature and initial adoption suggest practical value. Future work could broaden its applicability and incorporate more cloud-native features.

Sources: Official documentation and tutorials for Dokku, CapRover, Nginx, PM2, and Certbot were used for background (cited in text). DeployKit's own README and the author's LinkedIn announcement provide feature details and motivation[1][3][9][6][4][7], which were analyzed in this report.

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