



**Institute for High Energy Physics named by A.A. Logunov
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**Using the StackStorm automation engine for workflow
orchestration in the complex Linux-based production
environment of the computing center at NRC
“Kurchatov Institute” – IHEP**

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\1/ Introduction

Challenges in Managing a Linux-Based Production Environment:

- High complexity in distributed multi-component systems
- Need for automation in operational workflows
- Manual management is error-prone and inefficient

Key Operational Tasks:

- Distributed backups
- System upgrades
- Administration tasks
- Monitoring



\2/ Approaches to Automation

Several methods can be used to automate workflows:

- Operational Scripts (Bash, Python, etc.)
 - Flexible but hard to maintain at scale
- Specialized Software (Backup tools, config managers)
 - Good for specific tasks but lack integration
- Advanced Orchestration Tools
 - Best for end-to-end automation

Why StackStorm?

- Event-driven automation
- Extensible with integrations
- Supports complex workflows



\3/ What is StackStorm?

Open-source (on python) automation platform for event-driven workflows

Key Features:

- Rules & Sensors (trigger actions based on events)
- Actions (reusable tasks in any language)
- Workflows (orchestrate multiple steps)
- Integrations (APIs, ChatOps, monitoring tools)

Use Cases:

- Incident response
- Auto-remediation
- Scheduled maintenance



\4/ Implementation at NRC «Kurchatov Institute» – IHEP

Environment: Large-scale Linux computing center (150 servers, 3000CPU, 2.5 PB of 50 storage servers)

StackStorm Setup:

- Centralized control with remote execution
- Custom sensors for monitoring
- Integration with existing tools (Ansible, CheckMK)

Results:

- Faster incident resolution
- Reliable automated workflows
- Improved operational efficiency



\5/ StackStorm Deployment Methods & Workflow Migration Challenges

1. Two Deployment Approaches:

Manual Installation

Installed from
source/package

Custom configurations

Requires manual updates

Ansible-Based Installation

Automated, repeatable
deployment

Consistent across
environments

Version-controlled via
playbooks

2. Migration Challenge: Mistral-Based Workflows

Problem: Moving workflows from the manual StackStorm to the Ansible-deployed StackStorm is non-trivial.

- Version mismatches
- Dependency conflicts



\6/ Use_case_1: Distributed Backups

Problem: Managing backups across multiple Linux servers manually is tedious.

Solution with StackStorm:

- Automated backup triggers (time-based or event-based)

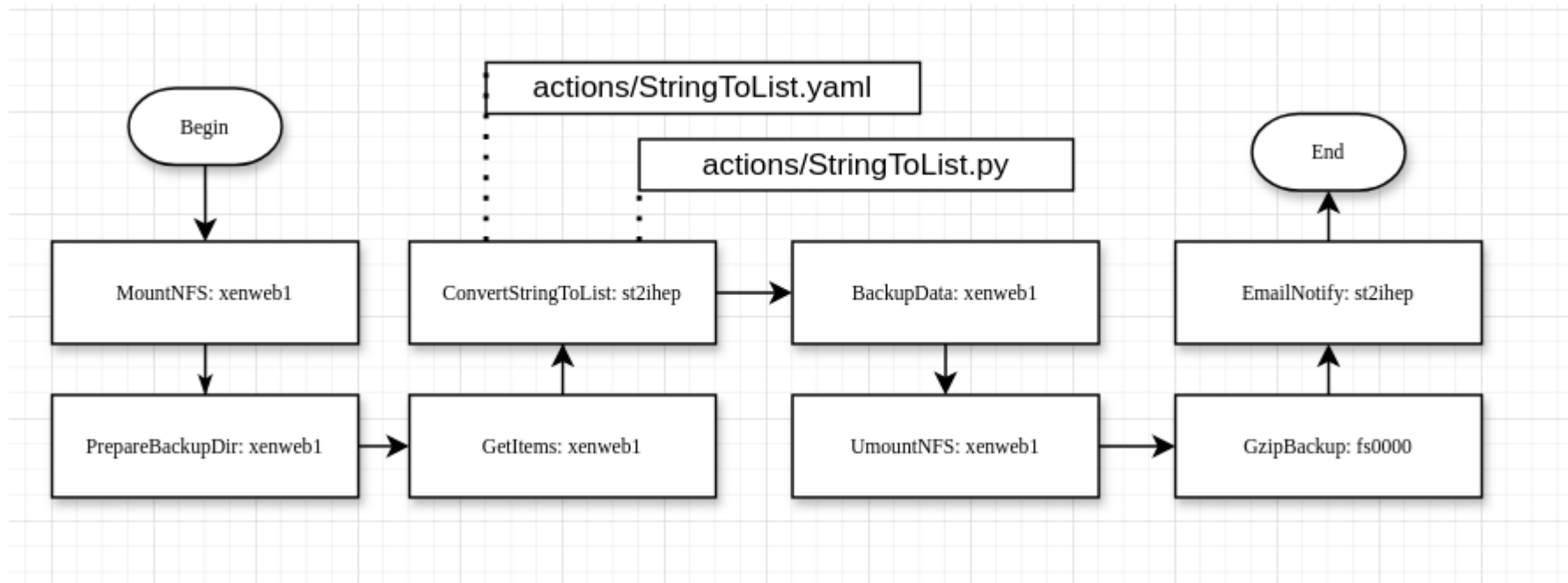
Workflow:

- Mount target server directory
- Prepare backup directory
- Prepare list of virtual machines to be backedup
- Verify backup integrity
- Compress backup on target server
- Notify admins on success/failure

Benefits:

- Consistency, reliability, and reduced admin workload

\7/ Use_case_1: Backup workflow





\8/ Use_case_2: System upgrades

Problem: Manually upgrading of many nodes from one system to another is time-consuming.

Solution with StackStorm:

- Automation of the upgrade process

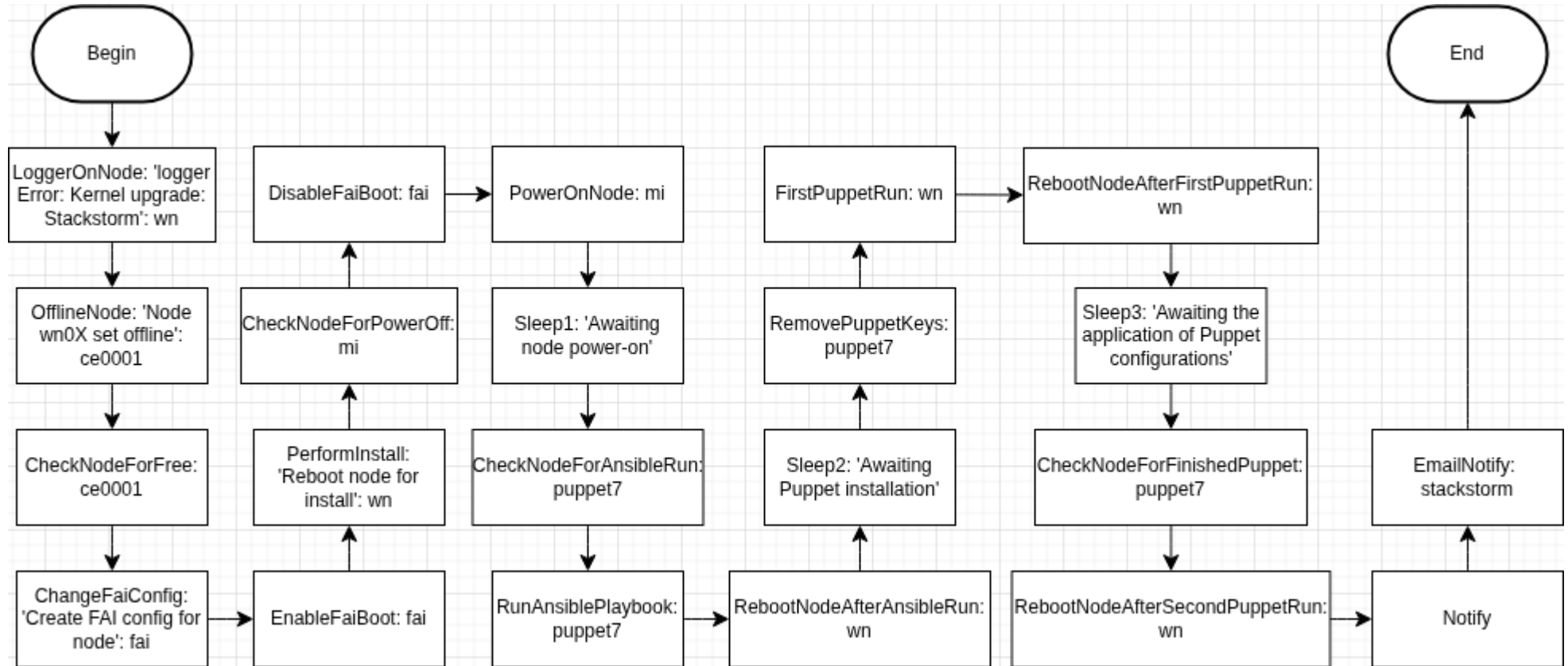
Workflow:

- Prepare node for upgrade
- Install new OS via network
- Run the installation of required packages
- Check node for finished
- Notify about current status to e-mail

Benefits:

- Optimization of system upgrades processes

\9/ Use_case_2: Upgrade workflow



\10/ Use_case_3: Distributed System Administration

Problem: Routine admin tasks (user management, log checks) are repetitive.

Solution with StackStorm:

- ChatOps integration (Mattermost)
- Self-healing workflows (CheckMK)
- Distributed cluster-aware cron
- Workflow-helper (disk replacement, kernel upgrade)

Benefits:

- Faster response times, reduced manual work





\11/ Conclusion & Future Work

Summary:

StackStorm provides scalable, event-driven automation for Linux environments.

- Successfully applied to backups, upgrades, and administration at IHEP.

Future Enhancements:

- Full migration from old stackstorm version to the new one
- Move backup services from Amanda for the whole data-center to stackstorm
- Add workflow for functional testing of the cluster



Thank you for attention!