Range42 status update – Semi-Technical Overview

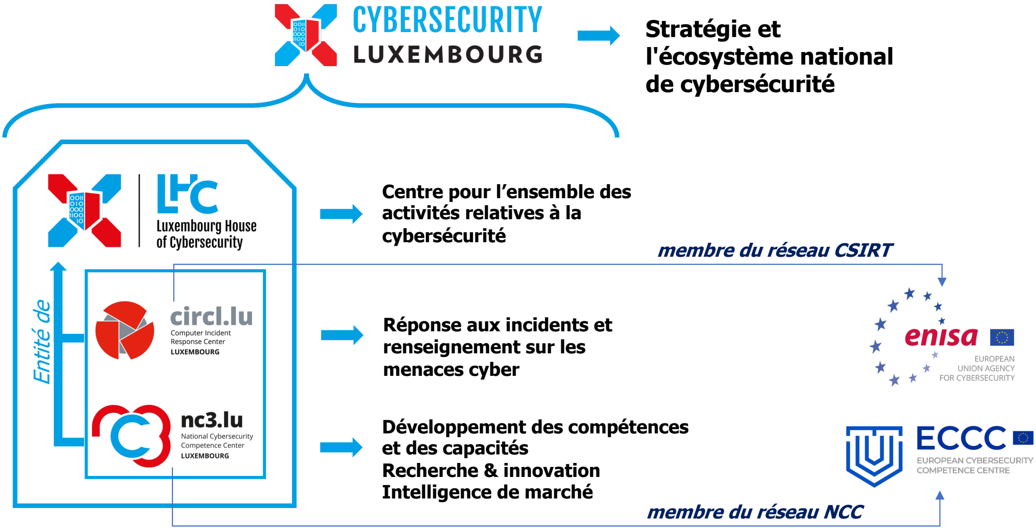
Modular Cyber Range Platform for Real-World Readiness

NC3 / Range42 Team

September 30, 2025

Proxmox   Ansible   Orchestration   Telemetry

TLP:CLEAR – Information may be shared freely without restriction.



CYBERSECURITY LUXEMBOURG

Stratégie et l'écosystème national de cybersécurité

Luxembourg House of Cybersecurity

Centre pour l'ensemble des activités relatives à la cybersécurité

Entité de

circl.lu
Computer Incident
Response Center
LUXEMBOURG

Réponse aux incidents et renseignement sur les menaces cyber

nc3.lu
National Cybersecurity
Competence Center
LUXEMBOURG

Développement des compétences et des capacités
Recherche & innovation
Intelligence de marché

membre du réseau CSIRT

enisa
EUROPEAN
UNION AGENCY
FOR CYBERSECURITY

ECCC
EUROPEAN CYBERSECURITY
COMPETENCE CENTRE

membre du réseau NCC

- Développement des compétences
- Renforcement des capacités
- Recherche & innovation
- Écosystème & industrialisation
- Coordination NCC

ABOUT US

La mission NC3 est de soutenir l'écosystème luxembourgeois dans le développement des compétences et des capacités en cybersécurité, de manière à contribuer au développement d'une base industrielle en cybersécurité et à renforcer l'autonomie stratégique de l'Union européenne.

nc3.l
National Cybers
Competence Ce
LUXEMBOURG

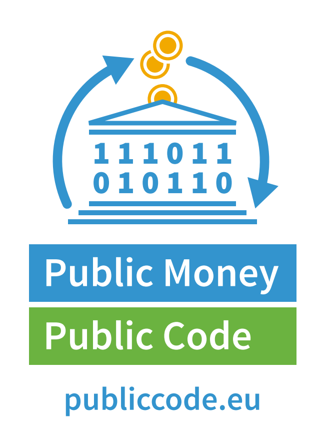
Public money, public code. Let’s go all the way, shall we?

Current Team

- Core development team of 3 contributors
- Mix of InfoSec, DevOps engineers, and platform architects
- Collaborative model with NC3 and academic partners

Current Funding

- Public grant for cyber training infrastructure
- Open-source model: no licensing fees, transparent development
- Investment in reusable, community-tooling



Public money, public code. Let’s go all the way, shall we?

Current Challenges

- Governance standardization across 13+ repositories from the get go
- Balancing rapid development with documentation maturity
- Recruitment, we need YOU, to apply here →

Agenda

1. What Range42 is & why it matters
2. Competitive landscape
3. Architecture at a glance
4. Repository audit findings (13 repositories analyzed)
5. Risks, governance, and quality gates

What is Range42?

- **Modular cyber range platform** for offensive, defensive, and hybrid training.
- **Reproducible IaC**: build, deploy, document labs via Proxmox, Ansible, Docker.
- **Private APIs** for orchestration & telemetry; developer toolkits for pipelines.

ℹ Built to simulate *real-world incidents* safely, with isolation, snapshots, and telemetry.

Range42 vs. Other Cyber Ranges

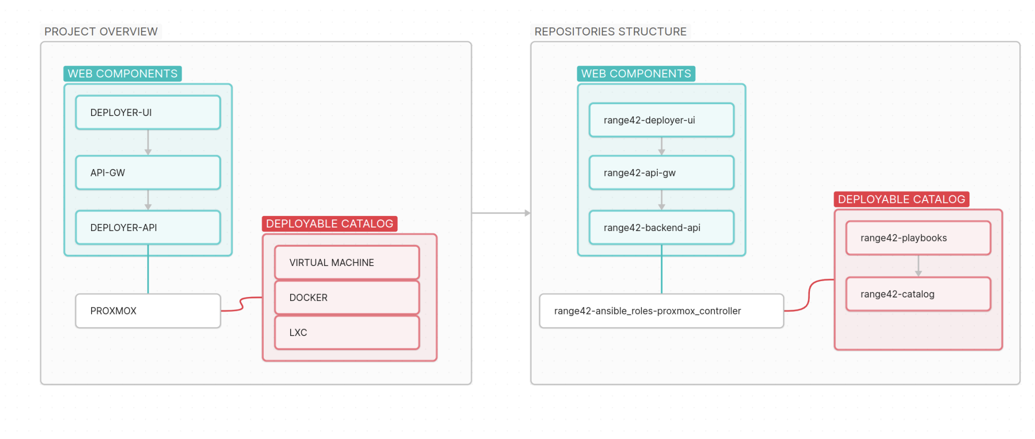
Feature	Range42	Commercial SaaS	Cloud Native	Traditional
Open Architecture	✓	×	×	×
IaC/GitOps	✓	~	✓	×
Private Deployment	✓	×	~	✓
Cost Control	✓	×	~	✓
Full Data Custody	✓	×	×	✓
API Orchestration	✓	✓	✓	×
Rapid Reset/Snapshots	✓	✓	~	~
Custom Scenarios	✓	×	~	✓

💡 **Range42's Edge:** Full control, reproducibility, and cost-effectiveness without vendor lock-in.

Architecture at a Glance

- **Hypervisor layer**: Proxmox VMs/LXCs; snapshots; network segments.
- **Automation layer**: Ansible roles orchestrate lifecycle, network, firewall, images.
- **Control plane**: Backend API (routes for VM/Net/Runner); Kong gateway.
- **UX**: Deployer UI (visual design), EMP mockup (exercise mgmt), trainee access.
- **Observability**: Wazuh for logs/alerts; structured telemetry.

Architecture: Logical Components → Repository Mapping



ℹ **Left:** Logical architecture flow. **Right:** Actual GitHub repository structure.

Repository Audit Findings

Organization-Wide Audit Results

13 Repositories Analyzed (2 public, 11 private)

Critical Findings

- 9/13 repositories have LICENSE template placeholders (`<year>`, `<name of author>`)
- 13/13 repositories missing SECURITY.md vulnerability disclosure policy
- 12/13 repositories have no CI/CD pipeline
- 0 repositories have all required governance files

✓ **Good News:** Zero high-severity security findings across all code scans (bandit, pip-audit, npm audit).

gh-repo-organizer: Audit Tool

Status: Active **Commits:** 18 **Lang:** Bash

Purpose: Bash script for mass cloning and auditing GitHub organization repositories with comprehensive standards compliance checking.

Key Features

- Production-ready tool for mass repository cloning and standards auditing
- Detects LICENSE template placeholders, missing documentation, and CI/CD configurations
- Zero security findings; needs CI pipeline and contributor documentation

Repository Standards Compliance Checks

Automated Sanity Checks Performed

- **License Validation**: LICENSE files with template placeholder detection
- **Documentation**: README, CHANGELOG, CONTRIBUTING, SECURITY policies
- **Git Configuration**: .gitignore, .editorconfig standards
- **CI/CD Detection**: GitHub Actions, GitLab CI, Jenkins, Travis, etc.
- **Templates**: Issue/PR templates, CODE OF CONDUCT

> ℹ Directly addresses governance gaps: *license placeholders, missing SECURITY policies, CI/CD standardization.*

Automation

range42-ansible_roles-private-devkit >_

Status: Active **Commits:** 179 **Lang:** Shell

Purpose: Helper scripts for Proxmox and Ansible operations including VM/LXC management, firewall rules, and JSON transformations.

Key Findings

- DevKit provides 100+ helper scripts following strict naming convention
- Zero Bandit findings; actively used with 179 commits but lacks CI pipeline
- Priority: finalize LICENSE placeholders and add governance documentation

range42-ansible_roles-proxmox_controller ⚙

Status: Active **Commits:** 108 **Lang:** Ansible/YAML

Purpose: Ansible role for managing Proxmox nodes via API: VMs, LXC containers, networking, storage, firewall, and snapshots.

Key Findings

- Comprehensive Ansible role managing full Proxmox lifecycle with 108 commits
- Broad functionality coverage but lacks CI pipeline for ansible-lint and idempotence tests
- Immediate actions: finalize LICENSE, add CI, and document variables with examples

Control Plane

range42-backend-api

Status: Active **Commits:** 125 **Lang:** Python/Shell/YAML

Purpose: FastAPI backend orchestrating Proxmox deployments via Ansible, with routes for VM control, networking, and bundle execution.

Key Findings

- FastAPI backend with 125 commits; clean security scans (bandit, pip-audit, safety)
- Comprehensive route structure for Proxmox control and bundle orchestration
- Production hardening needed: add CI pipeline, unit tests, finalize LICENSE, SECURITY policy

TLP:CLEAR – Information may be shared freely without restriction.

range42-api-definitions

Status: Stale **Commits:** 5 **Lang:** JSON

Purpose: Placeholder repository for OpenAPI/Swagger specifications defining the Range42 backend API contracts.

Key Findings

- Placeholder repository with OpenAPI specs but minimal content and only 5 commits
- Missing LICENSE file entirely; needs decision on archive versus active development
- If kept: seed with comprehensive API definitions and add CI for spec validation

TLP:CLEAR – Information may be shared freely without restriction.

range42-api-gw

Status: Active **Commits:** 5 **Lang:** N/A

Purpose: Kong API Gateway configuration for authentication, ACL, and access control policies in front of backend API.

Key Findings

- Kong API Gateway repository for authentication and access control with minimal content
- LICENSE has template placeholders; needs Kong declarative configs or deployment manifests
- Add documentation for Kong setup, plugin configuration, and integration with backend API

UX Layers

range42-deployer-ui

Status: Prototype **Commits:** 28 **Lang:** Vue/TS

Purpose: VueFlow-based visual orchestrator for designing, validating, and deploying Range42 infrastructure through node-based interface.

Key Findings

- VueFlow-based UI with node-based infrastructure design; unit/e2e tests exist but no CI
- Good UX foundation with i18n support and localStorage data management
- Wire CI for automated testing, stabilize API contracts with backend, resolve npm advisory

range42-emp-mockup

Status: Prototype **Commits:** 1 **Lang:** Vue/TS

Purpose: Exercise Management Platform scaffold with basic Vue 3 routing, TypeScript setup, and unit test foundation.

Key Findings

- Exercise Management Platform seed project with 1 commit; basic Vue 3 scaffold only
- Missing LICENSE entirely; has 2 low npm advisories and no CI pipeline
- Define MVP scope and architecture first, then add CI and resolve dependency vulnerabilities

Infrastructure & Content

range42-playbooks

Status: Active **Commits:** 75 **Lang:** Ansible/YAML

Purpose: Centralized Ansible playbooks organizing scenarios and bundles for CLI or backend API orchestration of infrastructure deployments.

Key Findings

- Central playbook repository with 75 commits organizing scenarios and reusable bundles
- Clear structure with test scripts but no CI for ansible-lint or syntax validation
- Add CI pipeline, introduce scenario taxonomy with tags, and document compatibility matrices

TLP:CLEAR – Information may be shared freely without restriction.

range42-catalog

Status: Active **Commits:** 91 **Lang:** Ansible/YAML

Purpose: Collection of reusable Ansible roles and Docker/Compose stacks for deploying vulnerable scenarios and infrastructure bundles.

Key Findings

- Catalog of Ansible roles and Docker stacks for deploying training scenarios with 91 commits
- Volatile tree structure organizing CVEs and misconfigurations by technology type
- Add CI for ansible-lint, introduce scenario taxonomy with tags, and finalize LICENSE

Documentation & Governance

.github – Community Health Files

Status: Active **Commits:** 13 **Lang:** Markdown/YAML

Purpose: Organization-wide default community health files to standardize CODE_OF_CONDUCT, CONTRIBUTING, SECURITY, issue/PR templates across public repositories.

Key Findings

- Centralizes community health files for all public repos
- Add CI to lint templates and validate YAML
- Document private-repo strategy and license requirements

⚠ **Critical Limitation**: Defaults apply *only* to public repos; private repos need local copies. LICENSE files cannot be inherited.

range42-documentation-private-obsidian

Status: Active **Commits:** 3 **Lang:** Markdown/Shell

Purpose: Private Obsidian vault containing architecture canvases, meeting notes, API drafts, and internal documentation.

Key Findings

- Private Obsidian vault with architecture canvases and internal documentation; 3 commits only
- Contains valuable schemas and meeting notes but lacks public documentation export pipeline
- Create automated export to public docs, version control architecture canvases, add pruning cadence

Risks & Governance

Key Risks & Gaps ⚠

Governance & Quality

- LICENSE placeholders in 9/13 repos: Replace `<year>` and `<name of author>` with actual values
- No SECURITY.md in any repo: Define vulnerability disclosure and triage process
- No CI/CD in 12/13 repos: Enable lint, tests, security scans, release checks
- Missing contributor docs: Add CONTRIBUTING.md, .editorconfig standards

Technical Debt

- API contract formalization needed between backend and UI
- Scenario taxonomy and compatibility matrix documentation
- Stale repositories need archive-or-activate decisions

Takeaways ✓

- Range42 = modular, reproducible cyber range for realistic training
- Strong security baseline: Zero high-severity findings across all code
- Governance is the multiplier: LICENSE, SECURITY, CI/CD, and contributor docs
- Focus areas: complete governance files, enable CI, formalize API contracts

💡 **Current Priority**: Fix LICENSE placeholders, add SECURITY.md, enable CI across all active repos.