FOR RESEARCH AND EDUCATION NETWORKING

DSpace-as-a-Service (DSaaS) Engineering Bootcamp II

Harare, Zimbabwe - November 9-13, 2026

Deploying and Managing Institutional Repositories using DSpace 9 and Docker

DURATION: 5 DAYS

Target Audience

- NREN System Engineers
- University Infrastructure Engineers
- Linux System Administrators
- Repository System Administrators

Bootcamp Overview

This intensive five-day engineering bootcamp is designed to equip system engineers with the practical skills required to deploy, configure, secure, operate and maintain production-ready DSpace 9 institutional repositories using modern container technologies.

The bootcamp adopts a learn-by-building approach, where participants progressively construct a complete production deployment throughout the five days - from preparing the Linux host and Docker environment to deploying, configuring, securing, operating and managing multiple institutional repositories on a shared server.

Bootcamp Success Criterion

By the end of the five-day bootcamp, each team shall deliver a complete production-ready DSpace deployment comprising:

- A Docker-based DSpace 9 deployment.
- Multiple institutional repository instances hosted on a shared server.
- Configured repository branding, metadata, users and workflows.
- Secure HTTPS access via a reverse proxy.
- Configured backup and recovery procedures.
- Enabled repository interoperability through OAI-PMH.
- Operational documentation, including deployment, maintenance, backup and troubleshooting procedures.
- A demonstration of routine operational tasks and production readiness.

Learning Objectives

Upon successful completion of this bootcamp, participants will be able to:

- Understand the architecture and components of DSpace 9.
- Deploy DSpace 9 using Docker and Docker Compose.
- Configure and customize institutional repositories.
- Manage multiple DSpace repository instances on a shared infrastructure.
- Secure, monitor, troubleshoot, back up and recover production repositories.
- Implement repository interoperability standards and discoverability best practices.
- Apply production deployment and operational best practices.
- Understand the evolution of Institutional Repositories towards Current Research Information Systems (CRIS) through DSpace-CRIS.

Programme Progression Summary

Day	Theme	Daily Deliverable
Day 1	**Linux, Docker & Open Science Foundations**	Linux server prepared and Docker environment ready for deployment
Day 2	**Deploying and Customizing DSpace 9**	Fully functional and branded DSpace 9 repository running in Docker
Day 3	**Repository Configuration & Multi-Instance Management**	Multiple institutional repositories hosted and managed on a shared server
Day 4	**Operations, Security & Interoperability**	Secure, monitored, backed-up and production-ready repository environment
Day 5	**Production Operations & Advanced Topics**	Complete production-ready multi-instance DSpace deployment with operational documentation

DAY 1

Linux and Docker Foundations

MORNING SESSION

Module 1.1 - Linux Essentials for DSpace Administrators

- Linux filesystem hierarchy
- Working with files and directories
- Linux users and permissions
- SSH access
- Package management
- Basic networking
- System logs
- Basic troubleshooting

Module 1.2 - Docker Fundamentals

- Containers vs Virtual Machines
- Docker architecture
- Images
- Containers
- Docker Hub
- Docker CLI
- Volumes
- Networks

AFTERNOON SESSION

Module 1.3 - Open Science and Repository Ecosystem

- Introduction to Open Science
- Scholarly Communication
- Institutional Repositories
- Repository ecosystem
- Introduction to DSpace
- DSpace as a Service (DSaaS)
- Repository lifecycle

LABORATORY

- Accessing the training environment
- Docker fundamentals exercises
- Running and managing containers
- Working with images

- Managing Docker volumes
- Docker networking exercises

DAY DELIVERABLE *A fully prepared Linux and Docker environment ready for DSpace deployment.*

DAY 2

Deploying and Customizing DSpace 9

MORNING SESSION

Module 2.1 - Understanding DSpace 9 Architecture

- DSpace components and services
- Angular Front-end
- REST API
- PostgreSQL
- Apache Solr
- Asset Store
- Handle System
- OAI-PMH
- Component interaction and request flow

Module 2.2 - Docker Compose

- Docker Compose fundamentals
- Compose file structure
- Environment variables
- Persistent volumes
- Docker networks
- Restart policies
- Service orchestration

AFTERNOON SESSION

Module 2.3 - Deploying DSpace 9

- Preparing the deployment environment
- Configuring Docker Compose
- Deploying DSpace services
- Validating deployments
- Managing running services

Module 2.4 - Repository Branding and Customization

- Repository branding
- Homepage customization
- Themes
- Email templates
- Language configuration
- Basic user interface customization

LABORATORY

- Deploy a complete DSpace 9 staging environment
- Customize repository branding
- Validate repository functionality
- Troubleshoot deployment issues

DAY DELIVERABLE *A fully functional and branded DSpace 9 repository running in Docker.*

DAY 3

Repository Configuration and Multi-Instance Management

MORNING SESSION

Module 3.1 - Repository Administration

- Communities
- Collections
- Users
- Groups
- Roles and permissions
- Submission workflows

Module 3.2 - Metadata Management

- Dublin Core
- Qualified Dublin Core
- Metadata Registry
- Controlled vocabularies
- Metadata quality
- Metadata best practices

AFTERNOON SESSION

Module 3.3 - Managing Multiple Institutional Repository Instances

- Multi-instance architecture
- Repository directory structure
- Docker Compose project separation
- Storage allocation
- Port management
- Reverse proxy concepts
- HTTPS certificates
- Repository isolation
- Resource allocation

LABORATORY

- Configure two institutional repositories on the same server
- Configure repository structures
- Configure metadata
- Configure workflows
- Validate independent repository operation

DAY DELIVERABLE *A multi-instance DSpace environment hosting multiple institutional repositories on a shared server.*

DAY 4

Operations, Security and Interoperability

MORNING SESSION

Module 4.1 - Security Fundamentals

- HTTPS and SSL/TLS
- Reverse Proxy (NGINX)
- Firewall fundamentals
- Container security
- Access control
- Security updates

Module 4.2 - Monitoring and Troubleshooting

- Docker logs
- DSpace logs
- PostgreSQL logs
- Apache Solr logs
- Container health checks
- Resource monitoring
- Structured troubleshooting methodology
- Common deployment issues

AFTERNOON SESSION

Module 4.3 - Backup and Disaster Recovery

- PostgreSQL backups
- Asset Store backups
- Docker volume backups
- Restore procedures
- Disaster recovery planning

Module 4.4 - Repository Interoperability

- OAI-PMH
- Metadata harvesting
- Google Scholar indexing
- AfricArxiv
- OpenAIRE
- CORE
- ORCID overview
- DOI services (Crossref and DataCite)
- Repository discoverability

LABORATORY

- Configure OAI-PMH
- Perform repository backups
- Restore a repository
- Validate metadata harvesting
- Troubleshoot simulated production failures

DAY DELIVERABLE *A secure, monitored and recoverable DSpace deployment ready for production use.*

DAY 5

Production Operations and Advanced Topics

MORNING SESSION

Module 5.1 - Production Deployment Best Practices

- Production architecture
- Capacity planning
- Storage sizing
- Reverse proxy design
- SSL certificate management
- Upgrade strategy
- Version management
- Production deployment checklist
- Production validation

Module 5.2 - Production Operations

- Routine maintenance
- Operational documentation
- Standard Operating Procedures (SOPs)
- Incident management
- Change management
- Service monitoring
- Production support best practices

AFTERNOON SESSION

Module 5.3 - Introduction to DSpace-CRIS (Seminar & Demonstration)

- Evolution of Institutional Repositories
- Repository vs Current Research Information System (CRIS)
- Introduction to CERIF
- Research Information Management
- Researcher Profiles
- Projects
- Grants
- Organizations
- Equipment
- Publications
- Datasets
- ORCID integration
- DOI integration

- DSpace-CRIS architecture
- Live demonstration of DSpace-CRIS

This session is intended as an overview and demonstration of DSpace-CRIS and does not include hands-on practical exercises.

CAPSTONE LABORATORY

- Deploying a production-ready DSpace 9 repository using Docker Compose
- Hosting multiple institutional repository instances on a shared server
- Configuring repository branding, communities, collections, metadata, users and workflows
- Configuring HTTPS using a reverse proxy
- Enabling OAI-PMH interoperability
- Implementing backup and recovery procedures
- Demonstrating routine operational tasks including monitoring, troubleshooting and repository maintenance
- Presenting their deployment architecture, operational documentation and production readiness

DAY 5 DELIVERABLE *Each team presents and validates a complete production-ready multi-instance DSpace deployment.*

Training Deliverables

Upon successful completion of the bootcamp, participants will have:

- A production-ready Docker-based DSpace 9 deployment.
- A multi-instance repository environment hosting multiple institutional repositories.
- Practical experience deploying, configuring and administering DSpace.
- Hands-on experience implementing security, monitoring, backup and disaster recovery.
- Experience configuring repository interoperability and discoverability services.
- Operational documentation and deployment procedures that can be reused within their institutions.
- Exposure to DSpace-CRIS and the evolution of Institutional Repositories into Research Information Management platforms.
- Membership in the UbuntuNet Alliance Open Pan-African Repository Community of Practice (OPAR CoP) for continued collaboration and technical support.

Final Outcome

At the conclusion of the bootcamp, participants will not simply have learned about DSpace - they will have engineered, configured, secured, documented, and demonstrated a complete production-ready multi-instance DSpace environment capable of supporting multiple institutional repositories from a shared Docker-based infrastructure. This outcome closely reflects the practical responsibilities they will assume within their NRENs and institutions.

Appendix A: Trainer Preparation Guide

To ensure consistency in delivery across all facilitators, each training module shall be accompanied by a dedicated presentation and an associated participant exercise. The presentations should focus on introducing concepts, demonstrations, and implementation guidance, while the exercises should reinforce learning through practical application or interactive knowledge checks.

Hands-on laboratory exercises should be used where participants are expected to perform technical tasks within the training environment. Knowledge Checks should be delivered using Mentimeter (or an equivalent interactive polling platform) to reinforce key concepts, stimulate discussion, and assess participant understanding before progressing to subsequent modules.

Module	Topic	Slides	Participant Exercise
Presentation 1: Linux, Docker & Open Science Foundations			
Module 1.1	Linux Essentials for DSpace Administrators	10 - 12	Hands-on Laboratory: Linux navigation, SSH, file permissions, networking and basic administration
Module 1.2	Docker Fundamentals	12 - 15	Hands-on Laboratory: Docker containers, images, volumes, networks and container management
Module 1.3	Open Science and Repository Ecosystem	8 - 10	Knowledge Check (Mentimeter): Open Science, Institutional Repositories and DSpace concepts
Presentation 2: Deploying DSpace 9			
Module 2.1	Understanding DSpace 9 Architecture	12 - 15	Knowledge Check (Mentimeter): DSpace architecture, components and request flow
Module 2.2	Docker Compose	10 - 12	Hands-on Laboratory: Building and managing multi-container applications using Docker Compose
Module 2.3	Deploying DSpace 9	10 - 12	Hands-on Laboratory: Deploy a complete DSpace 9 repository using Docker Compose
Presentation 3: Repository Configuration & Administration			
Module 2.4	Repository Branding and Customization	6 - 8	Hands-on Laboratory: Apply institutional branding and customize the repository interface
Module 3.1	Repository Administration	10 - 12	Hands-on Laboratory: Configure communities, collections, users, groups and workflows
Module 3.2	Metadata Management	10 - 12	Hands-on Laboratory: Configure metadata schemas, fields and submission forms
Presentation 4: Multi-Instance Management & Operations			
Module 3.3	Managing Multiple Institutional Repository Instances	12 - 15	Hands-on Laboratory: Deploy and manage multiple DSpace instances on a shared server

Module 4.1	Security Fundamentals	**10 - 12**	Hands-on Laboratory: Configure HTTPS, reverse proxy, SSL certificates and access controls
Module 4.2	Monitoring and Troubleshooting	**8 - 10**	Hands-on Laboratory: Diagnose and resolve simulated deployment and operational issues
Module 4.3	Backup and Disaster Recovery	**8 - 10**	Hands-on Laboratory: Perform repository backup, restoration and recovery procedures
Module 4.4	Repository Interoperability	**10 - 12**	Hands-on Laboratory: Configure OAI-PMH and validate metadata harvesting and discoverability
Presentation 5: Production Best Practices & DSpace-CRIS			
Module 5.1	Production Deployment Best Practices	**10 - 12**	Knowledge Check (Mentimeter): Production deployment scenarios and infrastructure planning
Module 5.2	Production Operations	**8 - 10**	Knowledge Check (Mentimeter): Operational procedures, maintenance and support scenarios
Module 5.3	Introduction to DSpace-CRIS	**10 - 15**	Knowledge Check (Mentimeter): CRIS concepts, DSpace-CRIS capabilities and future deployment considerations

Trainer Deliverables

Each facilitator shall prepare the following for every module assigned to them:

- A presentation deck based on the recommended slide range.
- A participant exercise (Hands-on Laboratory or Knowledge Check, as indicated above).
- Where applicable, laboratory instructions, configuration files, and sample datasets required for the practical exercises.

This approach ensures a consistent learning experience across all facilitators while maintaining the bootcamp's emphasis on practical skills development, continuous engagement, and measurable learning outcomes.