

Container & Runtimes

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Docker

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Dokuwiki Deployment

Requirements

In order to proceed, you must have a k8s platform, the kubectl command line utility, and a persistent storage volume.

Create a namespace for the wiki to live

```
kubectl create namespace dokuwiki
```

Dokuwiki manifests

Deploy Dokuwiki to Kubernetes with YAML manifests that declare these resources:

- **Deployment:** runs the Dokuwiki container (image, port, replicas).
- **PersistentVolume / PVC:** stores wiki pages and uploads persistently.
- **Service:** exposes the pod within the cluster (ClusterIP/NodePort/LoadBalancer).
- **Ingress:** routes external HTTP(S) traffic to the Service (optional; depends on ingress controller).

Notes: set resource limits, securityContext, and back up volumes for production.

dokuwiki-pvc.yaml

This file requests persistent storage for the wiki using Longhorn (or your preferred Kubernetes storage class – update the config accordingly). See [previous post] for more info.

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: dokuwiki-pvc
  namespace: dokuwiki
spec:
  accessModes:
    - ReadWriteOnce
```

```
storageClassName: longhorn
resources:
  requests:
    storage: 2Gi
---
```

dokuwiki-deployment.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  labels:
    app: dokuwiki
  name: dokuwiki
  namespace: dokuwiki
spec:
  replicas: 1
  selector:
    matchLabels:
      app: dokuwiki
  template:
    metadata:
      labels:
        app: dokuwiki
    spec:
      containers:
      - name: dokuwiki-container
        image: lscr.io/linuxserver/dokuwiki
        imagePullPolicy: IfNotPresent
        env:
          - name: PUID
            value: "1001"
          - name: PGID
            value: "1001"
          - name: TZ
            value: "Europe/Amsterdam"
        ports:
          - containerPort: 80
            name: "http-wiki"
        volumeMounts:
          - name: dokuwiki-storage
            mountPath: "/config"
      volumes:
      - name: dokuwiki-storage
        persistentVolumeClaim:
          claimName: dokuwiki-pvc # Uses your existing Longhorn PVC
---
```

Apply these manifests

Use these files to deploy a PersistentVolumeClaim and the Deployment to your cluster:

```
kubectl apply -n dokuwiki -f dokuwiki-pvc-yaml -f dokuwiki-deployment.yaml
```

Verify objects are ready:

```
kubectl -n dokuwiki get deployments
kubectl -n dokuwiki get pvc
```

Create an in-cluster Service object

Once the deployment is fully initialized — including successful binding of the PVC — a Service resource must be created to expose the Dokuwiki container.

There are two equivalent approaches:

1. **Declarative:** Apply a Service manifest (recommended for reproducibility)
2. **Imperative:** Create the Service directly via the command line

Option 1: Using a Service YAML file (declarative)

dokuwiki-service.yaml

```
apiVersion: v1
kind: Service
metadata:
  name: dokuwiki
  namespace: dokuwiki
spec:
  type: ClusterIP
  ports:
    - port: 80
      targetPort: 8080
  selector:
    app: dokuwiki
```

Apply the configuration:

```
kubectl apply -f dokuwiki-service.yaml
```

Option 2: Using kubectl directly (imperative)

Create a ClusterIP Service that routes internal cluster traffic to the Dokuwiki pods:

```
kubectl expose deployment dokuwiki \  
  --type=ClusterIP \  
  --port=80 \  
  --target-port=8080 \  
  --name=dokuwiki
```

Verification

To confirm that the Service has been created and is correctly configured:

```
kubectl describe svc dokuwiki
```

Optional quick check:

```
kubectl get svc dokuwiki -o wide
```

Accessing the Wiki with Nginx Proxy Manager

I'm using Nginx Proxy Manager (NPM) as proxy service and AdGuard Home as DNS to handle external access and Let's Encrypt certificates for HTTPS. This simplifies exposing the wiki!

You can skip the TLS Secret and Ingress sections below if using NPM. NPM handles TLS termination and routing directly.

Here's how to configure NPM:

1. **Proxy Host:** Create a new proxy host in NPM, pointing to your DokuWiki service (e.g., `<ip-of-dokuwiki-service:80`).
2. **Domain Name:** Configure the desired domain name (e.g., `wiki.example.net`).
3. **Let's Encrypt:** Enable Let's Encrypt for automatic certificate management.

NPM will handle the SSL/TLS certificate and route traffic to your DokuWiki service within Kubernetes. No need to configure Ingress or Kubernetes Secrets for TLS!

Regarding DNS:

Create DNS A records on your local network pointing `wiki.example.net` to the IP address of your Proxmox host running NPM. NPM will then forward traffic to the DokuWiki service. This is also only needed if you do not have a DNS server in your home network. I am using AdGuard Home for this which forwards all requests to NPM first and then to the outside world. A piHole-Project server should also work fine here.

Accessing DokuWiki from Outside the Cluster through Ingress

If you're not using Nginx Proxy Manager, you can expose the DokuWiki service using a Kubernetes Ingress. This acts as a reverse proxy, routing external traffic to your wiki.

Securing with TLS (Optional if using NPM)

For secure HTTPS access, you'll need a TLS certificate. You can use a wildcard certificate for your local network, e.g. create a certificate with `mkcert`. If you prefer unencrypted HTTP, you can skip this step.

Here's an example of a TLS secret:

```
apiVersion: v1
kind: Secret
metadata:
  name: testsecret-tls
  namespace: default
data:
  tls.crt: base64 encoded certificate data
  tls.key: base64 encoded key data
type: kubernetes.io/tls
```

Defining the Ingress Resource

The Ingress resource defines how external traffic reaches the DokuWiki service.

```
apiVersion: networking.k8s.io/v1
kind: Ingress
metadata:
  name: dokuwiki-ingress
spec:
  tls: # Omit this section if not using HTTPS
  - hosts:
    - wiki.example.net
```

```
secretName: testsecret-tls
rules:
- host: wiki.example.net
  http:
    paths:
    - path: /
      pathType: Prefix
      backend:
        service:
          name: dokuwiki
          port:
            number: 80
```

This configuration directs traffic for `wiki.example.net` to the `dokuwiki` service on port 80. If you've configured TLS, the `tls` section associates the certificate with the domain.

BookStack Deployment with Longhorn Storage

This document details the deployment of BookStack, a self-hosted, simple knowledge base platform, on a Kubernetes cluster using Docker containers. The deployment utilizes persistent volumes for data persistence and a ConfigMap for configuration.

Overview

This setup deploys BookStack with the following components:

- **BookStack Database:** A MariaDB database container to store BookStack data.
- **BookStack Application:** The BookStack application container serving the web interface.
- **Persistent Volume Claims (PVCs):** Used to request persistent storage for both the database and application data.
- **ConfigMap:** Stores non-sensitive configuration variables for the BookStack application.
- **Secrets:** Stores sensitive information like database passwords and the application key.
- **Ingress:** Configures external access to the BookStack application.

Prerequisites

- A Kubernetes cluster with access to a persistent volume provisioner (e.g., Longhorn).
- `kubectl` configured to interact with your cluster.
- A base64 encoder/decoder utility (e.g., `base64` command line tool).
- Before deploying you might need to disable security until deployment is done and pods are running:

```
kubectl label --overwrite ns bookstack pod-security.kubernetes.io/enforce=privileged
```

Deployment Steps

Short Version

```
# Create Namespace
kubectl create namespace bookstack

# Apply the different k8s configuration files in this order
kubectl apply -f bookstack-secrets.yaml
kubectl apply -f bookstack-db-pvc.yaml
kubectl apply -f bookstack-pvc.yaml
kubectl apply -f bookstack-db.yaml
kubectl apply -f bookstack-configmap.yaml
kubectl apply -f bookstack-app.yaml
kubectl apply -f bookstack-ingress.yaml
```

Create Namespace

Create a namespace for the project

```
kubectl create namespace bookstack
```

Configure Secrets

Before applying the `bookstack-secrets.yaml` file, you **must** generate and encode the necessary secrets:

- **Database User:** Choose a username for the BookStack application database user.
- **Database Password:** Create a strong password for the database user.
- **Database Root Password:** Create a strong password for the MariaDB root user.
- **Application Key:** Generate a Laravel application key (e.g., using a Laravel app-key generator) and then base64 encode it.

Use the following command to generate a random base64 encoded string for passwords:

```
openssl rand -hex 16 | base64
```

Example `bookstack-secrets.yaml` (replace placeholders with your encoded values):

```
apiVersion: v1
kind: Secret
metadata:
  name: bookstack-secrets
```

```
namespace: bookstack
type: Opaque
data:
  db-user: Ym9va3N0YWNR # Replace with base64 encoded username
  db-password: QWJjMTIzIQ== # Replace with base64 encoded password
  db-root-password: cm9vdHBhc3N3b3Jk # Replace with base64 encoded root
password
  app-key:
YmFzZTY0OmZENGJSRCtpU0tXckFDQkMvaTJvUFAYbGttbGpBU1RJY2l6UmtRNUhNTjg9 #
Replace with base64 encoded app key
```

Apply the secrets:

```
kubectl apply -f bookstack-secrets.yaml
```

Persistent Volume Claims (PVCs)

The deployment uses two PVCs for persistent storage:

- `bookstack-db-pvc.yaml`: Requests 10Gi of storage for the MariaDB database.
- `bookstack-app-pvc.yaml`: Requests 64Gi of storage for BookStack application configuration and uploaded files.

Apply the PVC definitions:

```
kubectl apply -f bookstack-db-pvc.yaml
kubectl apply -f bookstack-app-pvc.yaml
```

Apply Database and App Deployments including Service

```
kubectl apply -f bookstack-db.yaml
kubectl apply -f bookstack-app.yaml
```

These commands deploy the MariaDB database and the BookStack application. Check the logs to confirm successful database migrations:

```
kubectl -n bookstack logs deployments/bookstack-db
kubectl -n bookstack logs deployments/bookstack
```

Example database log output indicating successful startup:

```
[migrations] started
[migrations] no migrations found
usermod: no changes
...
Connection to localhost (:::1) 3306 port [tcp/mysql] succeeded!
Logrotate is enabled
```

Example application log output indicating migration completion:

```
[migrations] started
[migrations] 01-nginx-site-confs-default: executing...
[migrations] 01-nginx-site-confs-default: succeeded ...
```

1. Apply Ingress:

```
kubectl apply -f bookstack-ingress.yaml
```

This configures the ingress for BookStack, making it accessible from outside the cluster. This assumes you are using Istio for ingress; adjust as necessary for your ingress controller.

Configuration Details

- **ConfigMap** (`bookstack-config.yaml`): Provides non-sensitive configuration settings for BookStack, like the application URL, environment, timezone, and session lifetime. The example sets `APP_ENV` to `production` and the session lifetime to 3 days. You can customize these settings as needed.
- **Deployment Strategies:** The BookStack application deployment utilizes a `Recreate` strategy, which terminates the old pod before starting a new one. This is crucial when using `ReadWriteOnce` PVCs to prevent concurrent access to the same volume.
- **Pod Affinity:** The BookStack application deployment includes `podAffinity` to encourage co-location of the application and database pods on the same Kubernetes node. This can reduce network latency.

Best Practices

- **Secrets Management:** Never commit sensitive information directly into your manifests. Use Kubernetes Secrets (as demonstrated) or a dedicated secrets management solution

(e.g., HashiCorp Vault) for production environments.

- **Storage Provisioning:** Ensure you have a suitable persistent volume provisioner configured in your cluster.
- **Resource Limits:** Consider setting resource requests and limits for the containers to ensure stable performance.
- **Monitoring:** Implement monitoring and alerting to track the health and performance of your BookStack deployment.
- **Backup and Recovery:** Establish a backup and recovery strategy for the MariaDB database.

Documentation

- **BookStack Official Documentation:** <https://www.bookstackapp.com/docs/>

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bookstack-secrets.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: bookstack-secrets
  namespace: bookstack
type: Opaque
data:
  db-user: <base64 encoded values>
  db-password: <base64 encoded values>
  db-root-password: <base64 encoded values>
  app-key: <base64 encoded values>
```

bookstack-db-pvc.yaml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: bookstack-db-pvc
  namespace: bookstack
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: longhorn
resources:
```

```
requests:
  storage: 10Gi
```

bookstack-pvc.yaml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: bookstack-config-pvc
  namespace: bookstack
spec:
  accessModes:
    - ReadWriteOnce
  storageClassName: longhorn
  resources:
    requests:
      storage: 64Gi
```

bookstack-db.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: bookstack-db
  namespace: bookstack
spec:
  selector:
    matchLabels:
      app: bookstack-db
  template:
    metadata:
      labels:
        app: bookstack-db
    spec:
      containers:
        - name: mariadb
          image: ghcr.io/linuxserver/mariadb:11.4.9-r0-ls209
          imagePullPolicy: IfNotPresent
          env:
            - name: MARIADB_AUTO_UPGRADE
              value: "1"
            - name: MYSQL_ROOT_PASSWORD
              valueFrom:
                secretKeyRef:
                  name: bookstack-secrets
                  key: db-root-password
            - name: MYSQL_DATABASE
```

```
    value: "bookstackapp"
  - name: MYSQL_USER
    valueFrom:
      secretKeyRef:
        name: bookstack-secrets
        key: db-user
  - name: MYSQL_PASSWORD
    valueFrom:
      secretKeyRef:
        name: bookstack-secrets
        key: db-password
  ports:
  - containerPort: 3306
  volumeMounts:
  - name: db-data
    mountPath: /var/lib/mysql
  volumes:
  - name: db-data
    persistentVolumeClaim:
      claimName: bookstack-db-pvc
```

```
apiVersion: v1
kind: Service
metadata:
  name: bookstack-db
  namespace: bookstack
spec:
  selector:
    app: bookstack-db
  ports:
  - port: 3306
```

bookstack-configmap.yaml

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: bookstack-env
  namespace: bookstack
data:
  app.env: |
    APP_URL=https://bookstack.example.com
    APP_ENV=production
    APP_LANG=en
    APP_TIMEZONE=Europe/Amsterdam
```

```
SESSION_LIFETIME=4320
DISABLE_EXTERNAL_SERVICES=true

# AUTH_METHOD=ldap
# LDAP Connection
# LDAP_SERVER=
# LDAP_BASE_DN=""

# The full DN and password of the user used to search the server
# Can both be left as 'false' (without quotes) to bind anonymously
# LDAP_DN=""
# LDAP_PASS="<redacted>"

# LDAP User Settings / Search Filter
# LDAP_USER_FILTER=(&(sAMAccountName={user}))

# LDAP_VERSION=3
# LDAP_ID_ATTRIBUTE=BIN;objectGUID
# LDAP_EMAIL_ATTRIBUTE=mail
# LDAP_DISPLAY_NAME_ATTRIBUTE=cn
# LDAP_START_TLS=false
# LDAP_THUMBNAIL_ATTRIBUTE=null
# LDAP_TLS_INSECURE=true
```

bookstack-app.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: bookstack
  namespace: bookstack
spec:
  replicas: 1 # Single replica since PVC is ReadWriteOnce (Longhorn)
  strategy:
    type: Recreate # Ensures old pod is terminated before a new one
starts (important for RWO volumes)
  selector:
    matchLabels:
      app: bookstack
  template:
    metadata:
      labels:
        app: bookstack # Must match selector above
    spec:
      affinity:
        podAffinity:
```

```

requiredDuringSchedulingIgnoredDuringExecution:
- labelSelector:
  matchExpressions:
  - key: app
    operator: In
    values:
      - bookstack-db # This MUST match the label in the DB
deployment
  topologyKey: "kubernetes.io/hostname"
  containers:
  - name: bookstack
    image:
nexus.amdc2.ncia.nato.int/linuxserver/bookstack:26.03.2
    imagePullPolicy: IfNotPresent # Avoid unnecessary pulls if
image already exists

    # Loads ALL key/value pairs from the ConfigMap as environment
variables
    # Use this for non-sensitive configuration (APP_URL, LDAP
settings, etc.)
    envFrom:
      - configMapRef:
          name: bookstack-env # Load values from a config map

    env:
    # Container runtime user mapping (required by linuxserver
images)
      - name: PUID
        value: "1000"
      - name: PGID
        value: "1000"

    # Sensitive values should always come from Secrets
      - name: APP_KEY
        valueFrom:
          secretKeyRef:
            name: bookstack-secrets
            key: app-key

    # Reverse proxy handling (trust all proxies)
      - name: APP_PROXIES
        value: "*"

    # Database connection settings
      - name: DB_HOST
        value: "bookstack-db"
      - name: DB_PORT

```

```
    value: "3306"

# DB credentials (from Secret)
- name: DB_USERNAME
  valueFrom:
    secretKeyRef:
      name: bookstack-secrets
      key: db-user
- name: DB_PASSWORD
  valueFrom:
    secretKeyRef:
      name: bookstack-secrets
      key: db-password

- name: DB_DATABASE
  value: "bookstackapp"
- name: APP_URL
  value: "https://bookstack.amdc2.ncia.nato.int"
- name: APP_ENV
  value: "production"
- name: APP_LANG
  value: "en"
- name: APP_TIMEZONE
  value: "Europe/Amsterdam"
- name: SESSION_LIFETIME
  value: "4320"
- name: DISABLE_EXTERNAL_SERVICES
  value: "true"

# NOTE:
# Any variable defined here OVERRIDES values from envFrom
(ConfigMap)

resources:
  limits:
    memory: 2048Mi # Hard cap
  requests:
    cpu: 100m # Guaranteed CPU
    memory: 1024Mi # Guaranteed memory

ports:
  - containerPort: 80 # BookStack runs on port 80 inside
container

volumeMounts:
  - name: bookstack-config
    mountPath: /config # Persistent app data (includes
```

```
uploads + app config)

  volumes:
    - name: bookstack-config
      persistentVolumeClaim:
        claimName: bookstack-config-pvc # Longhorn-backed PVC
(RWO)

---

apiVersion: v1
kind: Service
metadata:
  name: bookstack
  namespace: bookstack
spec:
  selector:
    app: bookstack # Routes traffic to pods with this label
  ports:
    - protocol: TCP
      port: 80 # Service port (cluster-internal)
      targetPort: 80 # Container port
```

bookstack-ingress.yaml

```
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: bookstack-routing
  namespace: istio-system
spec:
  hosts:
    - "bookstack.example.com"
  gateways:
    - my-prod-cluster-gateway
  http:
    - route:
        - destination:
            host: bookstack.bookstack.svc.cluster.local
            port:
                number: 80
```