

# Hands-On Training

on

# **EN-WRMT**

# WebGIS Portal Database/GIS Administrator Training

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# **Training Modules**

Module 1: System Overview : WebGIS platform architecture and Workflow from data management to web visualization

Module 2: Geospatial Data Management – PostgreSQL/PostGIS

Module 3: Geospatial Data Publishing – GeoServer and web services (WMS, WFS)

Module 4: Web Visualization and Interaction – MapStore - Managing Web Maps and Dashboards

Module 5: Backup and Restore for the Database

# **Module 1**: System Overview: WebGIS platform architecture and Workflow from data management to web visualization

## 1. Introduction

Module 1 provides an overview of the EN-WRMT WebGIS platform architecture and its end-to-end workflow, from data management to web-based visualization. It introduces the integration of key open-source tools—PostgreSQL/PostGIS for spatial data storage, GeoServer for publishing geospatial services, Apache Tomcat for application hosting, and MapStore for interactive mapping and visualization. This module guides system administrators through the platform's structure, explaining how data flows between components and how each tool contributes to delivering a functional WebGIS environment. All components are deployed on a localhost setup for testing, configuration, and administrative use.

### 2. System Architecture Overview



Setup and structure of the EN-WRMT Web-GIS-Platform.

#### 2. Prerequisites

Before starting the installation, make sure your system meets the following requirements:

- Operating System: Windows 10/11 (recommended) or Linux Ubuntu 22.04+
- **RAM**: Minimum 8 GB
- Disk Space: Minimum 20 GB free
- An internet connection to download software
- Administrator privileges on the computer

#### 3. Software Installation Overview

You'll need to download:

- **PostgreSQL Installer (GUI)** → includes pgAdmin
- PostGIS Plugin (via StackBuilder)
- Apache Tomcat (Installer)
- GeoServer WAR
- MapStore WAR

# **Module 2**: Geospatial Data Management – PostgreSQL/PostGIS

#### 2.1. Installing and Configuring PostgreSQL + PostGIS

#### Step 1: Install PostgreSQL

Download from: <u>https://www.postgresql.org/download/</u>



- 1. Run the installer and please wait until the following window
- In the setup wizard:
- 2. Choose version (e.g., PostgreSQL 14+) and Keep the defaults
- 3. Set Superuser password (e.g., admin123)
- 4. Default Port: 5432

👻 Setup — 🗆 🗙	👹 Setup - 🗆 X
Advanced Options	Ready to Install
Select the locale to be used by the new database duster. Locale [Default locale]	Setup is now ready to begin installing PostgreSQL on your computer.
InstallBuilder Cancel	InstalBuilder Cancel
Installing Please wait while Setup Installs PostgreSQL on your computer. Installing Installing	
T	PostgreSQL
InstalBuilder < Back Next > Cancel	< Back Finish Cancel

- 5. Keep the defaults
- 6. Click next to start the installation
- 7. Installation in progress

#### Step 2: Install PostGIS Extension



- 8. After PostgreSQL installation, **select** and **open StackBuilder** (appears at the end of install or launch separately).
- 9. Select PostgreSQL version and port
- 10. Wait for the downloading application list
- 11. Select PostGIS under the selected PostgreSQL version under spatial extensions
- 12. Select a directory
- 13. Connecting to the server
- 14. Click the next button to start PostGIS installation
- 15. Click agree button
- 16. Select components to install
- 17. Installation started
- 18. Complete installation

Stack Builder 4.2.2	Stack Builder 4.2.2
Downloading X Connecting to server Hide details Cancel Elapsed time: 0:00:00	All the installation files have now been successfully downloaded. Please click the "Next" button to start the installations. Note: You must allow all installations to run to completion. If you are prompted to restart the computer, click "No" or "Restart Later" and manually restart your computer when all the installation have finished. Skip Installation
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Press Page Down to see the rest of the agreement.  GNU GENERAL FUELIC LICENSE Version 2, June 1991	Check the components you want to install and uncheck the components you don't want to install. Click Next to continue.
Copyright (C) 1989, 1991 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA Everyone is permitted to copy and distribute verbatin copies of this locense document, but changing it is not allowed. Preamble The licenses for most software are designed to take away your	Select components to install:
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PostGIS installed.

#### 2.2. Setting Up Database Connection (Using pgAdmin)

#### Steps to Connect to Remote PostgreSQL via SSH Tunnel:

1. **Open Terminal** where your private key (enwrmt\_key.pem) is located. Or change the command to the correct key path.

#### Run this command to create the SSH tunnel:

ssh -i enwrmt\_key.pem -L 15432:localhost:5432
enwrmt\_admin@enwrmt.nilebasin.org

- 2. This maps the remote DB port 5432 to your local port 15432.
- 3. **Open pgAdmin** (or any PostgreSQL client).
- 4. Create a new connection with these details:
  - Host: localhost
  - **Port**: 15432
  - **Database**: enwrmt\_database
  - **Username**: enwrmt\_admin
  - **Password**: (ask if you don't have it)
- 5. **Connect** and check the database

#### Connected!

#### **Step 3: Create a Spatial Database**

- In pgAdmin:
  - Right-click **Databases**  $\rightarrow$  **Create Database**  $\rightarrow$  Name it en\_wrmt.

Open Query Tool and run:

CREATE EXTENSION postgis;

(You can also find this in the GUI under Extensions.)

Spatial database ready!

# **Module 3**: Geospatial Data Publishing – GeoServer and web services (WMS, WFS)

Step 0: Install Java JDK (if not already installed)

3.1 Check if Java is Installed

Open Command Prompt or Terminal and type: java -version

→ If Java is installed:

You will see something like:



You can proceed to the next step.

#### → If Java is *NOT* installed:

You will see an error like:



Then you must install Java manually.

### 3.2 Install Java

Step 1: Download Java JDK

- Visit: https://adoptium.net/
- Download Temurin JDK 17 LTS.



Use the drop-down boxes below to filter the list of current releases.

Operating S	ystem	Architecture		Packa	де Туре	Vers	ion
Windows	~	х64	~	JDK	~	17 - LTS	~
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April 16, 2	2025	Windows		X04	JDK - 190	мв	🛃 .zip

#### Step 2: Verify Java Installation

After installation, again type: java -version

You should see Java version correctly installed.

- Double-click the downloaded installer file.
- Follow the setup wizard (Next  $\rightarrow$  Next  $\rightarrow$  Finish).

#### 3.3. Installing Apache Tomcat

Step 1: Install Tomcat

- Open your browser and go to the following link: https://dlcdn.apache.org/tomcat/tomcat-9/v9.0.104/bin/apache-tomcat-9.0.104.exe
- Download the .exe file for Windows.
- Run the installer by double-clicking the downloaded apache-tomcat-9.0.104.exe

Apache Tomcat Setup		- 0	×П	😹 Apache Tomcat Setup		>	<	
D.	Welcome to	Apache Tomcat Setup		Choose Components Choose which features of Apa	ache Tomcat you want to install.		2	
ipache	Setup will guide you Tomcat.	through the installation of Apache		Check the components you w install. Click Next to continue.	ant to install and uncheck the comp	oonents you don't want to		
tp://tomcat.a	It is recommended ti before starting Setu relevant system file: computer. Click Next to continu	hat you close all other applications up. This will make it possible to update is without having to reboot your ue.		Select the type of install: Or, select the optional components you wish to install:	Normal	Description Position your mouse over a component to see its description.		
분 Apache Tomcat 9		1		Space required: 15.9 MB	Examples			
		Next > Cancel		Nullsoft Install System v3.11 —	< Back	Next > Cancel	3	
Apache Tomcat Setup: Conf	figuration Options	- 0	×	😹 Apache Tomcat Setup: Java	Virtual Machine path selection	– 🗆 🗙	😹 Browse For Folder	×
Configuration Tomcat basic configuration.			¥.	Java Virtual Machine Java Virtual Machine path sele	ction.		n Roman Film	
Server Shutdown Port HTTP/1.1 Connector Port	+1   8080	2 3		Please select the path of a Jar	va 8 or later JRE installed on your syst	tem.	Program miles     Program miles     Adobe     Adobe     Apache Software Foundati     Autodesk	ion
Windows Service Name	Tomo	cat9		C:\Program Files\Eclipse Ado	ptium\idk-17.0.12.7-hotspot		Blackmagic Design     Common Files     DIFX     dotnet	
Create shortcuts for all users							Eclipse Adoptium	
Tomcat Administrator Login (optional)	User Name					4	> jdk-17.0.12.7-hotspot	
Nullsoft Install System v3.11	Password Roles mana	ager-gui		Nullsoft Install System v3.11			Google     HEC     Hexagon     Intel	*
	<	Back Next > Cance	I		< Back N	Vext > Cancel	Make New Folder OK 0	Dancel

- 1. The Apache Tomcat Setup wizard will appear and Click Next > to begin the setup.
- 2. Choose Components
- 3. Configure Server Settings
  - a. Server Shutdown Port: leave default 1 as shown)
  - b. HTTP/1.1 Connector Port: 8080
  - c. Windows Service Name: Tomcat9
  - d. Tomcat Administrator Login:
    - i. User Name: e.g., admin
    - ii. Password: e.g., admin123 (Must be Strong Password)
    - iii. Roles: manager-gui
- 4. Select Java Virtual Machine
  - a. You must have Java JDK (version 8 or later) installed.
  - b. Click Browse... to locate the Java path.
  - c. Select your JDK directory, e.g.: C:\Program Files\Eclipse Adoptium\jdk-17.0.12.7-hotspot
- 5. Click Next>Install> to begin the setup.

- 6. Complete Installation and Click Finish.
  - Ensure both checkboxes are ticked:
    - Run Apache Tomcat
    - Show Readme
- 7. Access Tomcat in Browser

0

- Open a web browser.
- Go to: https://enwrmt.nilebasin.org/tomcat

If Tomcat is installed and running correctly, you will see tomcat homepage:

"If you're seeing this, you've successfully installed Tomcat. Congratulations!"



**V** Tomcat is running.

Apache Tomcat/9.0.87 ×	+		
	g/tomcat/		ବ
Home	Documentation Configuration Examples Wil	i Mailing Lists	Find Help
Apac	he Tomcat/9.0.87		APACHE SOFTWARE FOUNDATION
	If you're seeing this, you've succ	essfully installed Tomcat. Cong	aratulations!
	Recommended Reading:		Server Status
	Security Considerations How-To		Manager App
	Clustering/Session Replication How	То	Host Manager
Devel	oper Quick Start		
Tomcat	Setup Realms & AAA	Examples	Servlet Specifications
First W	b Application JDBC DataSources		Tomcat Versions

#### 3.4. Deploying GeoServer WAR

Step 1: Download the GeoServer WAR file

• Website: <u>https://geoserver.org/download/</u>

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	🍈 GeoServer		About   Blog   Download   Documentation   Community -
	Downloads Choose a version of GeoServer to download.	Geoderver release schedule	offers six months of stable releases, followed by six months of maintenance releases.
	Production	Development	> Archive
		Stable         GeoServer 2.27 releases           GeoServer 2.27 archives, Java 11 and Java 17 compatible:         227.0           Maintenance         GeoServer 2.26 releases           GeoServer 2.26 archives, Java 11 and Java 17 compatible:         226.2 2.26.1 2.26.0	]

#### Step 2: Deploy GeoServer WAR

- Copy the geoserver.war inside Tomcat's webapps/ folder via File Explorer.
- Restart Tomcat (close + reopen startup.bat).

Tomcat automatically extracts it after a few seconds.

This	PC	> Local Disk (C:	:) > Program Files > Apac	he Software Foundation >	Tomcat 9.0 ⇒ v	vebapps
	Na	ame	^	Date modified	Туре	Size
		docs		12/18/2024 12:18 PM	File folder	
7		geoserver	Doploy CooServer	12/18/2024 2:12 PM	File folder	
A		manager	Deploy GeoServer	12/18/2024 12:18 PM	File folder	
*		mapstore		4/26/2025 3:00 PM	File folder	
*		ROOT		12/18/2024 12:18 PM	File folder	
	Ľ	geoserver.war		11/19/2024 5:03 AM	WAR File	108,176 KB

#### Step 3: Access GeoServer

Open browser: https://enwrmt.nilebasin.org/geoserver

- Login using the default credentials:
  - Username: admin
  - Password: geoserver

🗸 🍲 GeoServer: Welcome	×	+			
← → C 😁 enw	rmt.nilebasin.org	/geoserver/we	b/?3		
GeoServer					Logged in as admin. 👩 Logout 🛞 en 🗸
About & Status	Welcome GeoServer Web Servi	ice, admin access to 1	l workspaces, with 152 layer	s.	≅ ▼
Server Status GeoServer Logs Contact Information	Designed for interope	erability, GeoServer pu	ublishes data from any majo	r spatial data source using open standards.	For more information visit OSGeo.
Process status	152 Layers			📀 Add new layer	
Dete	0 Layer groups			Add new layer group	
Data	1 Stores			Add new store	
Workspaces	1 Workspaces			Add new workspace	
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Services	A compliant implement	ntation of WMS plus r	most of the SLD extension (o	dynamic styling). Can also generate PDF, SV	/G, KML, GeoRSS
ling wcs ling wms ling wfs ling wmts	WMS 1.3.0	WMS 1.1.1			
the WPS	GeoServer We	b Map Tile Ser	rvice		
Settings	A compliant implement	ntation of WMTS serv	rice.		
Global     Image Processing     Raster Access	WMTS 1.1.1	TMS 1.0.0	WMS-C 1.1.1		
Tile Caching					
Tile Layers	GeoServer We	b Feature Serv	vice		
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Disk Quota	WFS	WFS	WFS		
BlobStores	2.0.0	1.1.0	1.0.0		
Security					

GeoServer deployed.

## 3.5. Setting Up GeoServer

#### Step 1: Create a New Workspace

1. Log in to GeoServer via your browser:https://enwrmt.nilebasin.org/

🗸 🚸 GeoServer: User login	× +	— (
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GeoServer	admin Remember me	) June Login
	User login	
About & Status About GeoServer	You're trying to access a secure page. Please provide your credentials in order to login.	
Data	Remember me	
Demos		

- 2. In the left menu, go to Workspaces  $\rightarrow$  Add new workspace.
- 3. Fill in the following:
  - Workspace Name: en\_wrmt
  - **Namespace URI**:https://enwrmt.nilebasin.org/ (or any URI you define for your project)
  - Click Save.



4. Vow the workspace en\_wrmt is created and will organize all your data stores and layers under a clean namespace.

#### Step 2: Add PostGIS Store

- Open GeoServer Admin Page:https://enwrmt.nilebasin.org/ and then Login as admin/geoserver
- 1. After logging in, in the left menu, click on Stores → Add new Store
- 2. Select →**PostGIS**
- 3. Under Workspace, select the one you created earlier (e.g., en\_wrmt)
- 4. Fill in connection parameters:
  - Data Source Name: en\_wrmt\_store
  - Host: localhost
  - **Port**: 5432
  - Database: enwrmt\_database
  - User: postgres
  - **Password**: (your password)



• Click Save

GeoServer now connects to your PostGIS database under the defined workspace.

#### Step 3: Publishing a Layer

- 5. After connecting:
  - a. Go to Layers → Add New Layer
  - b. Choose your Store and see the layers in that store.
  - c. Filter the layer "en\_basins"
  - d. Click "Publish" on your spatial table.
  - e. Set Bounding Boxes (click Compute from Data / Native CRS).
  - f. Save.

Data from PostGIS now visible in GeoServer.





Step 3: Previewing a Layer in GeoServer

#### ✓ 1: Access GeoServer

- Click "Login" in the top right corner and login by providing the credentials
  - Username: admin
  - Password: geoserver (or your custom password)

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- 2: Go to Layer Preview
  - In the left-hand menu, click: "Layer Preview" (Under the "Data" section)

#### 3: Find Your Layer

- You will see a searchable list of all published layers.
- Use the search bar to type the layer name or workspace name.
- Confirm that the layer status is "Enabled".

Step 4: Preview the Layer

- Under the "Common Formats" column, click a preview option:
  - OpenLayers (most common for map view)
  - KML, GeoJSON, GML, Image, or WMS/WMTS request formats
- Clicking OpenLayers will open a map viewer in a new tab displaying your layer.



# **Module 4:** Web Visualization and Interaction – MapStore - Managing Web Maps and Dashboards

#### 4.1. Deploying MapStore WAR

#### Step 1: Download MapStore WAR

• Website: <u>https://github.com/geosolutions-</u> it/MapStore2/releases/download/v2024.02.02/mapstore.war

#### Step 1: Copy MapStore WAR

- Place mapstore.war into the same webapps/ folder.
- Restart Tomcat.

Tomcat will automatically extract and deploy it.

Nam	ne	^	Date modified	Туре	Size
	docs		12/18/2024 12:18 PM	File folder	
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	manager	Deploy MapStore	12/18/2024 12:18 PM	File folder	
	mapstore		4/26/2025 3:00 PM	File folder	
	ROOT		12/18/2024 12:18 PM	File folder	
	geoserver.war		11/19/2024 5:03 AM	WAR File	108,176 K
	mapstore.war		12/18/2024 3:05 PM	WAR File	91,461 K

#### Step 2: Access MapStore

Open browser: https://enwrmt.nilebasin.org/mapstore/

Featured Contents			- 10
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# 0. Connecting MapStore to GeoServer

#### Step 1: Configure Service

- 1. Open MapStore Admin Panel: https://enwrmt.nilebasin.org/mapstore
- Login (admin credentials).



- 2. Go to Admin Tools → Catalog Services
- 3. → Add New Service:
  - Name: EN-WRMT Service
  - URL:<u>https://enwrmt.nilebasin.org/geoserver/wms</u>
  - Type: WMS (Web Map Service)
- Save.



GeoServer service connected in MapStore!

#### 11. Creating and Viewing Maps in MapStore

#### Step 1: Create New Map

- 1. In MapStore Homepage:
  - Click Create a New Map.

#### 2. Add Layer:

- Click Catalog (Choose EN-WRMT Service).
- Browse available WMS layers.



#### • Click Add to Map.

#### Step 2: Customize Map

- Zoom in/out.
- Configure Style (symbology) from Layer Settings.
- Add titles, legends, and descriptions.

#### Step 3: Save and Share

- Click Save.
- Provide Map Title and Description.
- Optionally, **Share the Map** via a public link or embed it in a website.

Map visualization done!

# Module 5: Backup and restore for the database

Task	How To Do It
Backup Database	Open pgAdmin $\rightarrow$ Right-click Database $\rightarrow$ Backup
Restart Tomcat	Restart from Windows Services or Linux GUI Service Manager
GeoServer Backup	Copy the workspace folder inside Tomcat's webapps/geoserver/data/

♥ pplatin.4       Re Opter the fait View Window Help       ♥ Opter the fait View Window Help       ♥ Opter the faith opter       ● Opter <th><ol> <li>Right c options</li> <li>Browse</li> <li>Selecte</li> <li>Finally</li> <li>Restore (Database: enwrmthetage)</li> </ol></th> <th>lick on the database name and click on restore from the e for the backup file ed backup file click on restore t_database) X</th>	<ol> <li>Right c options</li> <li>Browse</li> <li>Selecte</li> <li>Finally</li> <li>Restore (Database: enwrmthetage)</li> </ol>	lick on the database name and click on restore from the e for the backup file ed backup file click on restore t_database) X
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	00	X Close → Reset Restore