Geospatial Security for Web GIS Application Training Course

Professional Development Training Course Outline

Category	GIS	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The proliferation of **Web GIS applications** has revolutionized how we interact with **geospatial data**, enabling widespread access and dynamic visualization of location-based information. From urban planning and disaster response to smart agriculture and public health, these applications are indispensable for informed decision-making across diverse sectors. However, this accessibility comes with inherent **cybersecurity risks**, making robust **geospatial security** measures paramount. Protecting sensitive **spatial data infrastructure** and ensuring the integrity of **location-based services** against evolving threats is critical for maintaining trust and operational continuity in our increasingly interconnected world.

Geospatial Security for Web GIS Application Training Course addresses the urgent need for skilled professionals capable of securing these vital systems. Participants will delve into the intricacies of **geospatial data privacy**, **Web GIS vulnerabilities**, and **threat intelligence**, gaining practical expertise in implementing cutting-edge **security protocols** and **best practices**. Through hands-on exercises and real-world case studies, attendees will learn to fortify Web GIS platforms, safeguard **geospatial data integrity**, and mitigate risks associated with **cyber-physical systems**, ultimately fostering a more secure and resilient **digital geographic landscape**.

Programme Curriculum

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Course Objectives

Upon completion of this training, participants will be able to:

1. **Identify and analyze** common **Web GIS vulnerabilities** and attack vectors.
2. Implement robust **access control mechanisms** for **geospatial data** and applications.
3. Apply **data encryption techniques** to protect **sensitive spatial information** in transit and at rest.
4. Understand and mitigate risks associated with **geospatial data privacy** and regulatory compliance
5. Develop secure coding practices for **Web GIS development** to prevent common security flaws.
6. Utilize **threat intelligence** and **vulnerability assessment tools** specific to geospatial environments.
7. Design and implement **secure Web GIS architectures** adhering to industry **security standards**.
8. Conduct **geospatial penetration testing** and **security audits** on Web GIS applications.
9. Manage and respond effectively to **geospatial security incidents** and breaches.
10. Integrate **blockchain technology** for enhanced **geospatial data integrity** and provenance.
11. Leverage **AI and Machine Learning** for **geospatial threat detection** and anomaly analysis.
12. Secure **cloud-based Web GIS deployments** and understand **cloud security best practices**.
13. Establish **geospatial security policies** and governance frameworks within organizations.

Organizational Benefits

- Safeguarding critical **geospatial datasets** and sensitive information from cyber threats, ensuring **data integrity** and confidentiality.
- Mitigating the financial and reputational risks associated with **data breaches** and ensuring compliance with evolving **data privacy regulations** (e.g., GDPR, CCPA).
- Strengthening the overall **cybersecurity posture** of Web GIS infrastructure, leading to greater system availability and operational continuity.
- Enabling more efficient allocation of security resources by understanding specific **geospatial attack surfaces** and prioritizing vulnerabilities.
- Building stakeholder trust by demonstrating a commitment to **data security** and responsible **geospatial data management**.

- Equipping staff with the specialized skills needed to proactively identify, prevent, and respond to **geospatial cyber threats**.
- Gaining a competitive edge by offering more secure and reliable **location-based services** and **Web GIS solutions**.

Target Audience

1. GIS Developers and Web GIS Engineers
2. Geospatial Analysts and Data Scientists
3. IT Security Professionals and Cybersecurity Analysts
4. Database Administrators managing spatial databases
5. Network Administrators supporting Web GIS infrastructure
6. GIS Project Managers and Solution Architects
7. Researchers and Academics in geospatial technology
8. Government Officials and Policy Makers dealing with spatial data.

Course Outline

Module 1: Introduction to Geospatial Security and Web GIS

- Understanding the landscape of **Web GIS applications** and their critical role in modern society.
- Defining **geospatial security**, its importance, and unique challenges compared to general cybersecurity.
- Overview of typical **Web GIS architectures** and components (frontend, backend, data layers, APIs).
- Introduction to common **geospatial data formats** and their inherent security considerations.
- Exploring the **threat landscape** for Web GIS, including data breaches, unauthorized access, and denial-of-service attacks.
- **Case Study:** Analyzing the impact of a public utility's leaked infrastructure map due to inadequate Web GIS security.

Module 2: Geospatial Data Privacy and Ethics

- Key principles of **geospatial data privacy**
- Understanding relevant **data protection regulations** (GDPR, CCPA, etc.) and their impact on spatial data.
- Ethical considerations in collecting, storing, and disseminating **location-based information**.
- Techniques for **data anonymization** and **differential privacy** in geospatial datasets.
- Developing **privacy-by-design** strategies for Web GIS applications.
- **Case Study:** Examining the privacy implications of tracking public transportation users' routes and stops through a Web GIS application.

Module 3: Web GIS Vulnerabilities and Attack Vectors

- Detailed exploration of the **OWASP Top 10** for Web Applications in a GIS context.
- Common **injection flaws** (SQL Injection, XSS) affecting geospatial queries and map displays.
- Broken authentication and session management in **Web GIS portals**.
- Insecure direct object references and **misconfigured security settings** for spatial data services.
- Understanding **API vulnerabilities** specific to geospatial web services (WMS, WFS, WPS).

- **Case Study:** Demonstrating a successful SQL injection attack on a publicly accessible government planning portal to retrieve sensitive land parcel data.

Module 4: Secure Web GIS Architecture Design

- Principles of **least privilege** and **defense-in-depth** for Web GIS deployments.
- Designing **secure network topologies** for GIS servers, databases, and web applications.
- Implementing **firewalls**, **IDS/IPS**, and **Web Application Firewalls (WAFs)** for geospatial traffic.
- Strategies for securing **cloud-based Web GIS platforms** (AWS, Azure, Google Cloud).
- Best practices for separating concerns and isolating components within a **Web GIS stack**.
- **Case Study:** Redesigning the architecture of an environmental monitoring Web GIS to enhance security against external threats and internal misuse.

Module 5: Authentication and Access Control

- Implementing robust **user authentication** mechanisms (MFA, SSO) for Web GIS users.
- Designing **Role-Based Access Control (RBAC)** and **Attribute-Based Access Control (ABAC)** for spatial data.
- Managing user identities and permissions across integrated **geospatial systems**.
- Securely handling user sessions and preventing session hijacking.
- Implementing **API key management** and token-based authentication for Web GIS services.
- **Case Study:** Developing an access control matrix for a municipal Web GIS, ensuring different departments have appropriate permissions for specific layers and functionalities.

Module 6: Data Encryption and Cryptography for GIS

- Fundamentals of **cryptography** and its application to **geospatial data**.
- Implementing **encryption at rest** for spatial databases and file storage.
- Securing **data in transit** using SSL/TLS for Web GIS communication.
- Techniques for **homomorphic encryption** and searchable encryption for sensitive geographic information.
- Digital signatures and hash functions for ensuring **geospatial data integrity** and authenticity.
- **Case Study:** Encrypting sensitive demographic data layers in a healthcare Web GIS to comply with patient privacy regulations while allowing secure spatial analysis.

Module 7: Geospatial Database Security

- Securing **PostGIS**, **ArcGIS Enterprise Geodatabases**, and other spatial databases.
- Implementing **database hardening techniques** and security configurations.
- Managing user roles, permissions, and auditing in spatial databases.
- Protecting against **SQL injection** and other database-specific attacks.
- Strategies for **spatial data backup** and disaster recovery.
- **Case Study:** Auditing and hardening a PostGIS database used for critical infrastructure mapping to prevent unauthorized data manipulation.

Module 8: Secure Geospatial Web Service Development

- Developing secure **RESTful APIs** for Web GIS applications.
- Implementing **input validation** and output encoding for all geospatial parameters.
- Handling errors and exceptions securely to prevent information leakage.
- Securing **Geoserver**, **MapServer**, and other open-source map servers.

- Best practices for **secure coding** in Python, JavaScript, and other languages used in Web GIS.
- **Case Study:** Refactoring a vulnerable WFS service to prevent cross-site scripting (XSS) and ensure proper data filtering.

Module 9: Geospatial Threat Intelligence and Monitoring

- Sources and types of **geospatial threat intelligence**.
- Utilizing **Security Information and Event Management (SIEM)** systems for Web GIS.
- Implementing **logging and auditing** for geospatial events and user activities.
- Techniques for **anomaly detection** and behavioral analysis in Web GIS traffic.
- Leveraging **geospatial big data analytics** for proactive threat hunting.
- **Case Study:** Setting up a monitoring dashboard to detect unusual access patterns or data export attempts on a sensitive government land-use planning Web GIS.

Module 10: Geospatial Penetration Testing and Vulnerability Assessment

- Methodologies for conducting **penetration testing** on Web GIS applications.
- Using automated and manual tools for **vulnerability scanning** (e.g., Nessus, Burp Suite, Zap).
- Identifying and exploiting common **Web GIS vulnerabilities**.
- Reporting and prioritizing **geospatial security findings**.
- Remediation strategies for identified weaknesses in Web GIS.
- **Case Study:** Performing a simulated cyberattack on a public safety Web GIS to identify and patch critical vulnerabilities before a real incident occurs.

Module 11: Incident Response and Disaster Recovery for Web GIS

- Developing a **geospatial incident response plan**.
- Steps for identifying, containing, eradicating, and recovering from **geospatial security incidents**.
- Forensic analysis of Web GIS system breaches and data exfiltration.
- Implementing **business continuity** and **disaster recovery strategies** for spatial data and services.
- Communication protocols during and after a **geospatial security breach**.
- **Case Study:** Simulating a ransomware attack on a utility company's Web GIS and executing the incident response plan to restore operations and data.

Module 12: Emerging Technologies in Geospatial Security

- The role of **Blockchain in Geospatial Data Integrity** and provenance.
- **AI and Machine Learning for Geospatial Threat Detection** and predictive analytics.
- Securing **IoT devices** and **sensor networks** feeding data to Web GIS.
- Implications of **5G connectivity** and edge computing on geospatial security.
- Quantum computing and its potential impact on current **geospatial encryption standards**.
- **Case Study:** Exploring how blockchain can be used to verify the authenticity of land ownership records managed within a national cadastral Web GIS.

Module 13: Legal and Regulatory Frameworks

- In-depth review of **data protection laws** and their specific implications for geospatial data.
- Understanding international **cybersecurity standards** and frameworks
- Compliance requirements for handling sensitive **geospatial data** in specific sectors

- Legal aspects of **geospatial data sharing** and liability in case of breaches.
- Ethical guidelines for responsible **geospatial technology** deployment.
- **Case Study:** Analyzing a major industry-specific regulation and detailing the steps an organization must take to ensure its Web GIS applications are fully compliant.

Module 14: Supply Chain Security for Geospatial Components

- Assessing the **security risks** introduced by third-party geospatial software and data providers.
- Implementing vendor risk management for **Web GIS components** and services.
- Securing **open-source geospatial libraries** and frameworks.
- Best practices for code reviews and dependency scanning in **geospatial development pipelines**.
- Establishing trust in **geospatial data sources** and external APIs.
- **Case Study:** Evaluating the security posture of a third-party mapping API integrated into an e-commerce Web GIS and implementing mitigation strategies for identified risks.

Module 15: Building a Geospatial Security Program

- Developing a comprehensive **geospatial security policy** framework.
- Conducting **geospatial risk assessments** and gap analyses.
- Implementing **security awareness training** programs for Web GIS users and developers.
- Establishing a **continuous security improvement** cycle for geospatial systems.
- Fostering a culture of **security responsibility** within organizations handling spatial data.
- **Case Study:** Designing a phased implementation plan for a new geospatial security program within a large governmental agency.

Training Methodology

This training course employs a **blended learning approach** designed for maximum engagement and practical skill acquisition. The methodology combines:

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$12,000

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