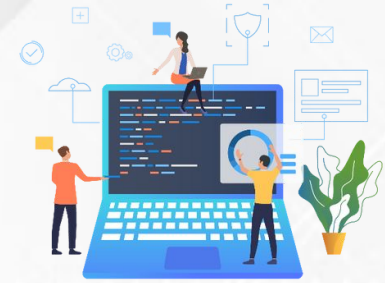


UNIT - 3

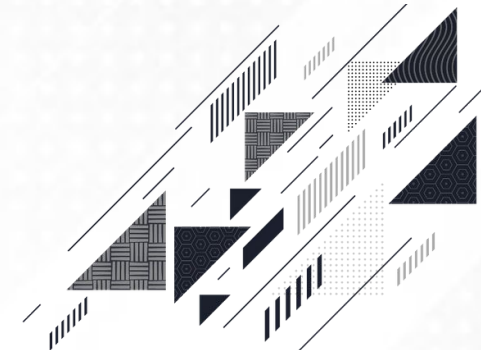
HOW INTERNET WORKS



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How Internet works?

The Internet is a global network of interconnected computer networks that allows communication and the exchange of information between users, devices, and systems worldwide. It is a vast and decentralized network that connects millions of computers and other devices, enabling them to share data and resources.



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How Internet works?

The Internet is a global network of interconnected devices that communicate with each other using a set of protocols. These protocols are organized into a layered architecture known as the OSI (Open Systems Interconnection) model or the TCP/IP (Transmission Control Protocol/Internet Protocol) model.



How Internet works?

Each layer in this model serves a specific purpose and interacts with adjacent layers to facilitate the exchange of information.

Let's explore the key protocols and their functions in different layers.





How Internet works?

Physical Layer:

At the physical layer, the actual hardware is involved in transmitting raw binary data over a physical medium (such as cables or wireless signals).

Protocols: Ethernet, Wi-Fi, Fiber optics, etc.



Data Link Layer:

This layer is responsible for framing the raw bits into frames and providing error detection and correction.

Protocols: Ethernet (for LANs), PPP (Point-to-Point Protocol), HDLC (High-Level Data Link Control).



How Internet works?

Network Layer:

The network layer is responsible for routing packets across different networks, ensuring the proper delivery of data between source and destination.

Protocols: IP (Internet Protocol), ICMP (Internet Control Message Protocol), ARP (Address Resolution Protocol).



Transport Layer:

The transport layer manages end-to-end communication, providing error recovery, flow control, and retransmission of lost data.

Protocols: TCP (Transmission Control Protocol), UDP (User Datagram Protocol)



How Internet works?

Session Layer:

The session layer establishes, maintains, and terminates connections between applications on different devices.
Protocols: NetBIOS (Network Basic Input/Output System).



Presentation Layer:

This layer is responsible for translating data between the application layer and the lower layers. It handles data compression, encryption, and formatting.
Protocols: SSL/TLS (Secure Sockets Layer/Transport Layer Security).



How Internet works?

Application Layer:

The application layer is where user interfaces and network-aware applications reside.

Protocols: HTTP/HTTPS (Hypertext Transfer Protocol/Secure), FTP (File Transfer Protocol), SMTP (Simple Mail Transfer Protocol), DNS (Domain Name System).





How Data Transmission Happens?

Data Creation:

A user or application generates data.

Application Layer:

The data is passed to the application layer, where it is formatted according to the specific application's protocol.



Transport Layer:

The transport layer (TCP or UDP) breaks down the data into smaller units, called segments or datagrams, and adds necessary information like source and destination port numbers.



How Data Transmission Happens?

Internet Layer:

The Internet layer (IP) adds source and destination IP addresses, creating packets.

Link Layer:

The link layer adds physical addresses (MAC addresses) and creates frames for transmission.



Physical Layer:

The frames are converted into electrical signals, radio waves, or optical signals for actual transmission over the physical medium.

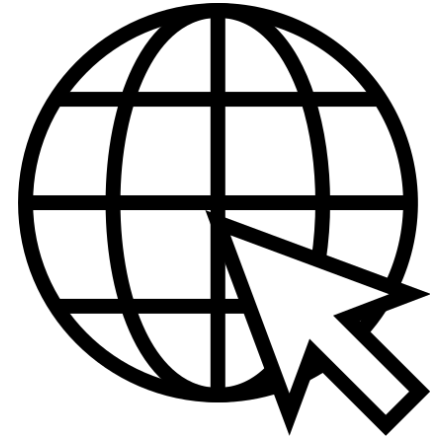
At the destination, the process is reversed, with each layer processing the received data until it reaches the application layer.



What Happens when you type web address in browser?

DNS Query:

If the IP address is not found in the cache or has expired, the browser sends a DNS query to a DNS server. This server translates the domain name into an IP address. DNS servers are distributed worldwide, and the request might go through multiple servers to find the authoritative DNS server for the domain.



DNS Response:

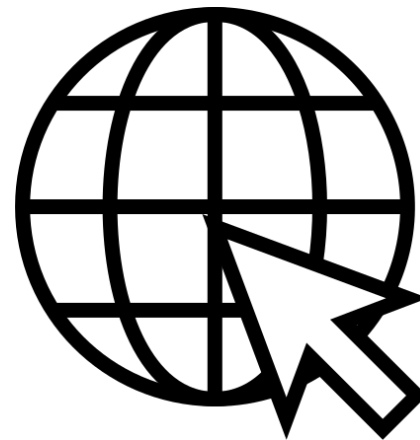
The authoritative DNS server responds with the IP address associated with the requested domain. This information is sent back to the user's browser.



What Happens when you type web address in browser?

TCP Handshake (if using HTTP):

If the website is using the HTTP protocol (not HTTPS), the browser initiates a TCP (Transmission Control Protocol) handshake with the web server. This involves establishing a connection and ensuring that both the browser and server are ready to exchange data.



HTTP Request:

The browser sends an HTTP request to the web server, specifying the requested resource (e.g., a webpage, image, or script). The request includes information such as the type of browser, accepted content types, and any cookies associated with the site.

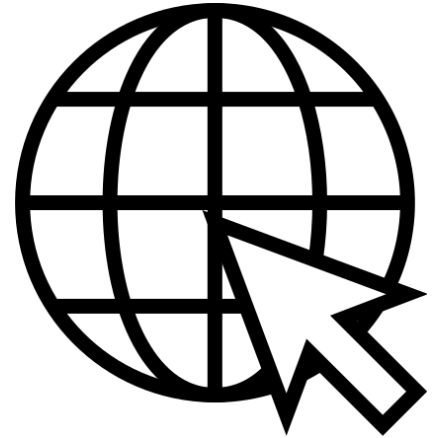
What Happens when you type web address in browser?

Server Processing:

The web server processes the HTTP request and retrieves the requested resource from its storage or generates it dynamically based on server-side code (e.g., PHP, Python, or Ruby scripts).

HTTP Response:

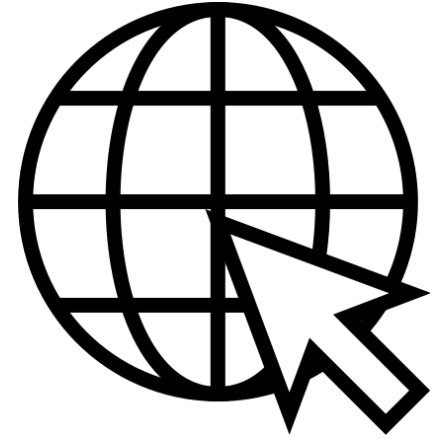
The web server sends back an HTTP response to the browser. This response includes the requested resource (HTML, images, CSS, JavaScript, etc.) along with an HTTP status code indicating the success or failure of the request.



What Happens when you type web address in browser?

Rendering the Page:

The browser receives the HTTP response and begins to render the webpage. It parses the HTML content, executes any JavaScript, and loads additional resources such as images and stylesheets.



Displaying the Page:

The browser renders and displays the webpage on your screen. Any interactive elements or scripts are executed, and you can interact with the content.

Throughout this process, various protocols, such as DNS, HTTP, and TCP, are involved in facilitating communication between your browser and the web server. Additionally, if the website uses HTTPS, an extra



Fundamental Protocols of Internet

Internet Protocol (IP):

IP is a fundamental protocol responsible for addressing and routing data packets between devices on a network. It provides a unique IP address for each device connected to the Internet, enabling communication across different networks.



Transmission Control Protocol (TCP):

TCP is a connection-oriented protocol that ensures reliable and ordered delivery of data between devices. It breaks down data into smaller units (segments) and manages the flow control, error detection, and retransmission of lost or corrupted segments.



Fundamental Protocols of Internet

User Datagram Protocol (UDP):

UDP is a connectionless protocol that provides a lightweight and faster alternative to TCP. While it does not guarantee reliable delivery like TCP, it is often used for real-time applications such as streaming, voice over IP (VoIP), and online gaming.

Hypertext Transfer Protocol (HTTP) / Hypertext Transfer Protocol Secure (HTTPS):

HTTP is the protocol used for transmitting hypertext (text with links) over the World Wide Web. HTTPS is a secure version of HTTP that employs SSL/TLS encryption to protect data during transmission. These protocols define how web browsers and web servers communicate.





Fundamental Protocols of Internet

Domain Name System (DNS):

DNS translates human-readable domain names (like `www.example.com`) into IP addresses that computers use for communication. It is a distributed hierarchical system that helps users access websites using domain names instead of numerical IP addresses.



Dynamic Host Configuration Protocol (DHCP):

DHCP is a network protocol that automatically assigns IP addresses and other network configuration information to devices on a network. It simplifies the process of network setup by dynamically allocating IP addresses.



Fundamental Protocols of Internet

Internet Control Message Protocol (ICMP):

ICMP is used for sending error messages and operational information about network conditions. It is commonly associated with the "ping" command, which tests the reachability of a host on an Internet Protocol (IP) network.

Secure Sockets Layer (SSL) / Transport Layer Security (TLS):

SSL and its successor, TLS, are cryptographic protocols used to secure communication over a computer network. They are commonly used with HTTPS to ensure the confidentiality and integrity of data exchanged between a web browser and a server.



These protocols work together to enable the reliable and secure



Fundamental Protocols of Internet

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These protocols work together to enable the reliable and secure



Indian IT ACT 2000

Section 65: Tampering with Computer Source Documents:

This section deals with the offense of tampering with computer source documents. Tampering refers to altering, damaging, deleting, or hiding any part of the computer source code, which is intended to be used for computer programs.

Penalty: The penalties for this offense are not explicitly outlined in the Act.



Section 66: Hacking with Computer System:

This section deals with hacking offenses. It penalizes unauthorized access to computer systems with the intent of causing wrongful loss or damage.



Indian IT ACT 2000

Section 66A: Punishment for Sending Offensive Messages through Communication Service:

This section, though it was repealed by the Supreme Court of India in 2015, was initially about the punishment for sending offensive messages through communication services. It faced controversy for being vague and was deemed unconstitutional.

Section 66B: Punishment for Dishonestly Receiving Stolen Computer Resource or Communication Device:

This section deals with the offense of dishonestly receiving stolen computer resources or communication devices. It penalizes the act of knowingly receiving, retaining, or disposing of stolen computer resources



Indian IT ACT 2000

Section 66C: Punishment for Identity Theft:

This section addresses the offense of identity theft. It penalizes the dishonest use of someone else's electronic signature, password, or any other unique identification feature.

Penalty: Imprisonment for a term which may extend to three years or with a fine which may extend to one lakh rupees, or with both.

Section 66D: Punishment for Cheating by Personation by Using Computer Resource:

This section deals with cheating by personation using a computer resource. It penalizes the act of cheating by pretending to be someone else using a computer resource.

Penalty: Imprisonment for a term which may extend to three years or with a



Indian IT ACT 2000

Section 66E: Punishment for Violation of Privacy:

This section deals with the offense of violation of privacy. It penalizes the capturing, publishing, or transmitting of private images of a person without their consent.

Penalty: Imprisonment for a term which may extend to three years or with a fine which may extend to two lakh rupees, or with both.

Section 66F: Punishment for Cyber Terrorism:

This section addresses the offense of cyber-terrorism. It penalizes the act of accessing a computer resource with the intent to threaten the unity, integrity, security, or sovereignty of India.

Penalty: Imprisonment for life.



Indian IT ACT 2000

Section 67: Punishment for Publishing or Transmitting Obscene Material in Electronic Form:

This section deals with the offense of publishing or transmitting obscene material in electronic form. It penalizes the publication, transmission, or causing to be published or transmitted, any obscene material in electronic form.

Penalty: First conviction: Imprisonment for a term which may extend to three years or with a fine which may extend to five lakh rupees, or with both. Second or subsequent conviction: Imprisonment for a term which may extend to five years and with a fine which may extend to ten lakh rupees.



Indian IT ACT 2000

Section 67A: Punishment for Publishing or Transmitting Material Containing Sexually Explicit Act in Electronic Form:

This section deals with the punishment for publishing or transmitting material containing sexually explicit acts in electronic form.

Penalty: First conviction: Imprisonment for a term which may extend to five years and with fine which may extend to ten lakh rupees.

Second or subsequent conviction: Imprisonment for a term which may extend to seven years and with fine which may extend to ten lakh rupees.



Indian IT ACT 2000

Section 67B: Punishment for Publishing or Transmitting Material Depicting Children in Sexually Explicit Act, etc., in Electronic Form:

This section addresses the punishment for publishing or transmitting material that depicts children in sexually explicit acts or conduct in electronic form.

Penalty: Imprisonment for a term which may extend to five years and with fine which may extend to ten lakh rupees.



Section 68: Power of Controller to Give Directions:

This section grants the Controller of Certifying Authorities the power to give directions regarding various matters, including the maintenance of books of account, audit, and submission of reports.

Penalty: Penalties are not explicitly outlined in this section.

Indian IT ACT 2000

Section 69: Powers to Issue Directions for Interception or Monitoring or Decryption of Any Information through Any Computer Resource:

This section empowers the Central Government to issue directions for the interception or monitoring of information through any computer resource for reasons of national security.

Penalty: Non-compliance can lead to imprisonment for a term which may extend to seven years.

Section 69A: Power to Issue Directions for Blocking for Public Access of Any Information through Any Computer Resource:

This section grants the Central Government the power to issue directions for blocking public access to any information through any computer resource for reasons such as sovereignty, integrity, defense, and security of the state.



Indian IT ACT 2000

Section 69B: Power to Authorize to Monitor and Collect Traffic Data or Information through Any Computer Resource for Cyber Security:

This section empowers the Central Government to authorize agencies for monitoring and collecting traffic data or information through any computer resource for ensuring cybersecurity.

Penalty: Non-compliance can lead to imprisonment for a term which may extend to seven years.

Section 70: Protected System:

This section defines a "protected system" and lays down the criteria for considering a computer, computer system, or computer network as a protected system.

Penalty: Penalties are not explicitly outlined in this section.



Indian IT ACT 2000

Section 71: Penalty for Misrepresentation:

This section penalizes misrepresentation with the intent to cause damage or injury. It deals with the offense of knowingly making a false representation for the purpose of causing damage or injury.

Penalty: Imprisonment for a term which may extend to two years or with a fine which may extend to one lakh rupees, or with both.



Section 72: Breach of Confidentiality and Privacy:

This section penalizes the breach of confidentiality and privacy. It deals with offenses related to wrongful disclosure of personal information or records.

Penalty: Imprisonment for a term which may extend to two years or with a fine which may extend to one lakh rupees, or with both.

Indian IT ACT 2000

Section 72A: Punishment for Disclosure of Information in Breach of Lawful Contract:

This section deals with the punishment for disclosing information in breach of a lawful contract. It penalizes the disclosure of information obtained while providing services under a lawful contract.

Penalty: Imprisonment for a term which may extend to three years or with a fine which may extend to one lakh rupees, or with both.



Section 72B: Penalty for Breach of Confidentiality and Privacy:

This section penalizes the breach of confidentiality and privacy with a higher penalty if the offender had secured access to the information in his capacity as an intermediary.

Penalty: Imprisonment for a term which may extend to two years or with a fine which may extend to one lakh rupees, or with both.

DPDA 2023

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COOKIES

Cookies are small pieces of data stored on the client's browser. They are sent between the client (browser) and the server with each HTTP request.

How Do Cookies Work?

Creation on Server:

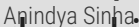
The server generates a cookie and sends it to the client's browser as part of the HTTP response.


Storage on Client:

The client's browser stores the cookie data. Cookies have an expiration time, and they can be session-based (deleted when the browser is closed) or persistent (stored for a specific period).

Sent with Requests:

For subsequent requests to the same domain, the client's browser automatically sends the stored cookies back to the server with each HTTP request.

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How Do Cookies Work?

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For subsequent requests to the same domain, the client's browser automatically sends the stored cookies back to the server with each HTTP request



COOKIE HIJACKING

Scenario:

An attacker intercepts or steals the cookies of a user to gain unauthorized access to their account.

Example:

Man-in-the-Middle (MITM) Attack:

An attacker intercepts the communication between a user and a website. If the connection is not secure (not using HTTPS), the attacker can capture the cookies exchanged during the login process.

Cross-Site Scripting (XSS):

If a website is vulnerable to XSS, an attacker can inject malicious scripts into the site. These scripts can steal cookies from other users who visit the compromised page.



COOKIES - Why are they used

State Management: Cookies are often used to store small pieces of information on the client's browser, allowing websites to remember user preferences, language settings, and other state-related information.

User Tracking: Cookies can be used for tracking user activities on a website, helping with analytics and improving user experience.

Authentication: Cookies are commonly employed to store authentication tokens or session identifiers, allowing users to stay logged in across multiple requests.

Personalization: Cookies enable websites to provide personalized content based on user preferences and behavior.

Example:



COOKIES - How do they look

// Set a cookie with JavaScript

```
document.cookie = "username=John Doe; expires=Thu, 18 Dec 2023 12:00:00 UTC; path=/";
```

// Retrieve cookies

```
const cookies = document.cookie;  
console.log(cookies);
```

Explanation:

```
document.cookie = "username=John Doe; expires=Thu, 18 Dec 2023 12:00:00 UTC; path=/";
```

This line sets a cookie named "username" with the value "John Doe" and an expiration date of December 18, 2023. The path=/ ensures that the cookie is accessible across the entire website.

```
const cookies = document.cookie;
```

SESSIONS

A session is a way to persist user-specific data across multiple requests during their interaction with a web application.

Session Creation:

When a user visits a website, the server creates a unique session identifier and may store session-related data on the server side.

Session ID in Cookies:

The session ID is often stored in a cookie on the client's browser. This cookie is sent back to the server with each request, identifying the user's session.

Server-Side Storage:

The server uses the session ID to retrieve stored session data. Session data can include user preferences, login status, or any other information relevant to the user.

Expiration:



SESSION HIJACKING

Scenario:

An attacker steals the session identifier to impersonate a user.

Example:

Session Sniffing:

An attacker captures session identifiers by monitoring unencrypted network traffic. This can be done in public Wi-Fi networks or compromised routers.

Session Fixation:

An attacker tricks a user into using a specific session identifier. This can be done by providing a malicious link that sets the session ID or through social engineering.

Prevention:

Use HTTPS to encrypt session data during transmission.

Implement session regeneration after login.

Store session identifiers securely on the client side



SESSION - Why are they used

Purpose:

User Authentication: Sessions are used to manage user authentication and authorization. When a user logs in, a session is typically created to keep track of their authenticated state.

State Persistence: Sessions allow the persistence of user-specific data across multiple requests. This is essential for maintaining a continuous user experience.

Data Storage: Sessions can store temporary data on the server side, reducing the amount of information sent back and forth between the client and server.

Security: Sessions help in implementing security measures like session regeneration and timeout, enhancing overall security.

Example:



SESSION - How do they look

Sessions (PHP):

Code:

```
php
Copy code
<?php
// Start a session in PHP
session_start();

// Store data in the session
$_SESSION['username'] = 'John Doe';

// Retrieve data from the session
$username = $_SESSION['username'];
echo $username;
```




SESSION - How do they look

Explanation:

```
session_start();
```

Initiates a new session or resumes an existing one. This should be called before any output is sent to the browser.

```
$_SESSION['username'] = 'John Doe';
```

Stores the value 'John Doe' in the session variable named 'username'.

```
$username = $_SESSION['username'];
```

Retrieves the value stored in the 'username' session variable.


TOKENS

Tokens, in the context of web security, usually refer to authentication tokens or access tokens. They are used to authenticate and authorize users.

User Authentication:
When a user logs in, the server generates a token (JWT or OAuth token) and sends it to the client.

Token Storage:
The client typically stores the token securely, often in the browser's local storage or as an HTTP-only cookie.

Sent with Requests:
The client includes the token with each subsequent request to the server, usually in the Authorization header.

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Sent with Requests:

The client includes the token with each subsequent request to the server, usually in the Authorization header.



TOKENS

Server Verification:

The server verifies the token's authenticity and extracts user information or permissions encoded in the token.

Expiration and Renewal:

Tokens have expiration times, and if needed, the client can obtain a new token through a refresh token mechanism.



TOKENS

```
// Creating a JWT token
const jwt = require('jsonwebtoken');
const token = jwt.sign({ userId: 123 }, 'secret_key', { expiresIn: '1h' });

// Storing the token securely (e.g., local storage)
localStorage.setItem('authToken', token);

// Including the token in HTTP requests
const authToken = localStorage.getItem('authToken');
fetch('https://api.example.com/data', {
  headers: {
    'Authorization': `Bearer ${authToken}`
  }
});
```

TOKEN HIJACKING

Scenario:

An attacker steals an authentication token to gain unauthorized access.

Example:

Stolen Token from Local Storage:

If a website stores authentication tokens in local storage without proper security measures, an attacker using XSS can read and steal the token.

Phishing Attacks:

An attacker tricks a user into revealing their authentication token by creating a fake login page that appears legitimate.

Prevention:

Use secure storage mechanisms like HTTP-only cookies for tokens.

TOKEN - How do they look

// Creating a JWT token

```
const jwt = require('jsonwebtoken');
```

```
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```

```
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```

```
    'Authorization': `Bearer ${authToken}`
```

```
  }
```

```
});
```

TOKEN - How do they look

Explanation:

```
const token = jwt.sign({ userId: 123 }, 'secret_key', { expiresIn: '1h' });
```

Creates a JWT (JSON Web Token) with a payload containing user information (in this case, the user ID), signed using a secret key, and set to expire in one hour.

```
localStorage.setItem('authToken', token);
```

Stores the JWT token securely in the browser's local storage.

```
const authToken = localStorage.getItem('authToken');
```

Retrieves the token from local storage.

```
fetch('https://api.example.com/data', { headers: { 'Authorization': 'Bearer ' + authToken } });
```

Includes the token in an HTTP request header for authentication when accessing a protected resource

E-Governance

E-Governance involves leveraging information and communication technologies (ICTs) to enhance government services, improve efficiency, and foster citizen engagement. In the realm of cybersecurity, e-Governance focuses on securing government data, systems, and services from cyber threats to maintain public trust and confidence.

Example: Consider a government agency responsible for issuing driver's licenses. To streamline the application process and improve accessibility for citizens, the agency develops an online portal where individuals can submit their license applications electronically.



E-Governance

To ensure cybersecurity, the agency implements various measures such as:

Encryption: All data transmitted between the citizen's device and the government server is encrypted to protect it from unauthorized interception.

Authentication: Users are required to authenticate themselves using multi-factor authentication methods (e.g., username/password and one-time passcode sent to their mobile phone) to prevent unauthorized access.

Access Control: The portal employs access control mechanisms to ensure that only authorized personnel can access and modify sensitive data.

Regular Security Audits: The agency conducts regular security audits and assessments to identify vulnerabilities and weaknesses in the system, ensuring continuous improvement of cybersecurity measures.



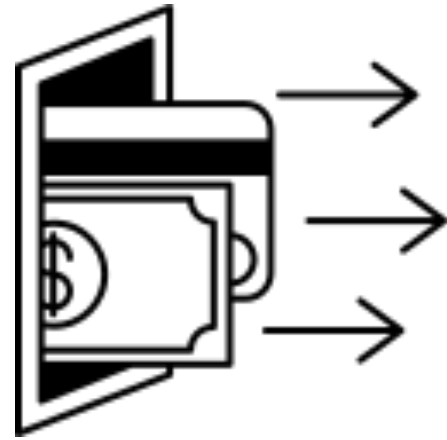
GDPR (General Data Protection Regulation)

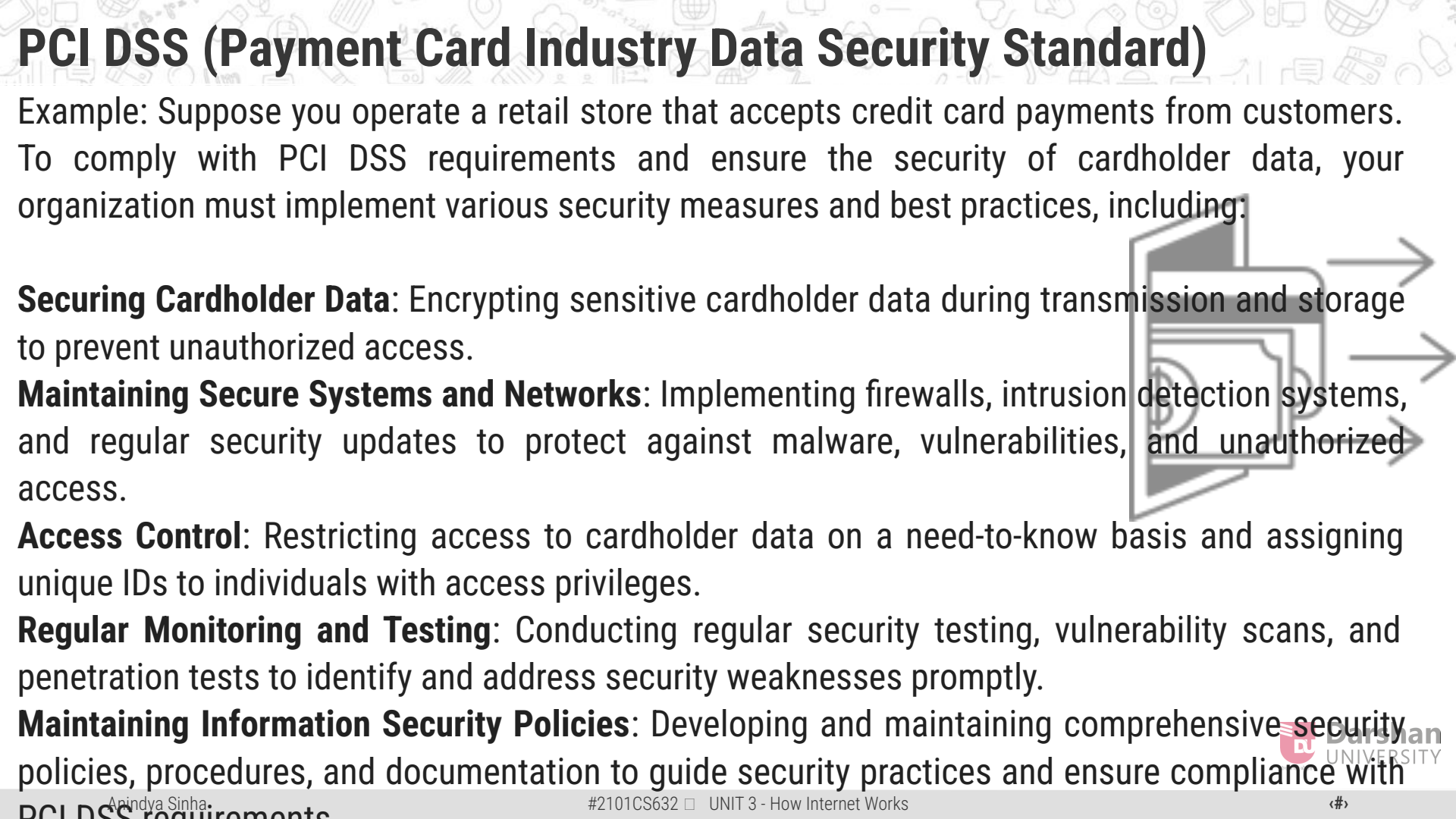
GDPR is a comprehensive data protection law enacted by the European Union (EU) to strengthen individuals' privacy rights and regulate the processing of personal data by organizations. It imposes strict requirements on how organizations collect, store, process, and transfer personal data to ensure transparency, accountability, and respect for individuals' privacy.



PCI DSS (Payment Card Industry Data Security Standard)

PCI DSS is a set of security standards established by the Payment Card Industry Security Standards Council (PCI SSC) to protect payment card data and prevent credit card fraud. It applies to organizations that handle payment card transactions, including merchants, banks, payment processors, and service providers.





PCI DSS (Payment Card Industry Data Security Standard)

Example: Suppose you operate a retail store that accepts credit card payments from customers. To comply with PCI DSS requirements and ensure the security of cardholder data, your organization must implement various security measures and best practices, including:

Securing Cardholder Data: Encrypting sensitive cardholder data during transmission and storage to prevent unauthorized access.

Maintaining Secure Systems and Networks: Implementing firewalls, intrusion detection systems, and regular security updates to protect against malware, vulnerabilities, and unauthorized access.

Access Control: Restricting access to cardholder data on a need-to-know basis and assigning unique IDs to individuals with access privileges.

Regular Monitoring and Testing: Conducting regular security testing, vulnerability scans, and penetration tests to identify and address security weaknesses promptly.

Maintaining Information Security Policies: Developing and maintaining comprehensive security policies, procedures, and documentation to guide security practices and ensure compliance with

HIPAA (Health Insurance Portability and Accountability Act)

HIPAA is a US federal law that sets standards for the protection of sensitive health information and ensures the confidentiality, integrity, and availability of electronic protected health information (ePHI). It applies to healthcare providers, health plans, healthcare clearinghouses, and their business associates.



HIPAA (Health Insurance Portability and Accountability Act)

Example: Consider a healthcare provider operating a medical clinic that maintains electronic health records (EHRs) containing sensitive patient information. To comply with HIPAA requirements and safeguard patient privacy and confidentiality, the medical clinic must implement various security measures and safeguards, including:

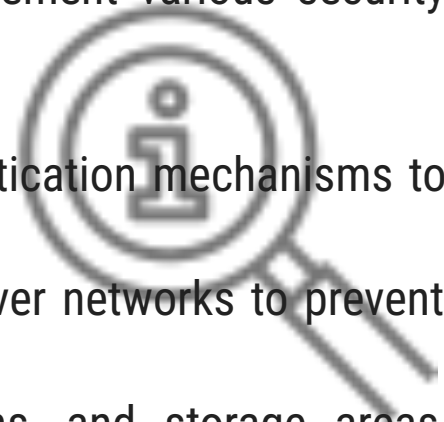
Access Controls: Implementing role-based access controls and user authentication mechanisms to restrict access to ePHI to authorized individuals only.

Encryption: Encrypting ePHI stored on electronic devices and transmitted over networks to prevent unauthorized interception or access.

Physical Safeguards: Securing physical access to facilities, workstations, and storage areas containing ePHI to prevent theft, unauthorized access, or tampering.

Security Incident Response: Establishing procedures for detecting, reporting, and responding to security incidents, breaches, or unauthorized disclosures of ePHI.

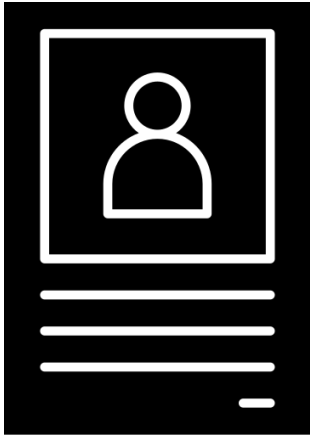
By implementing these HIPAA-compliant security measures, the medical clinic can protect patients'





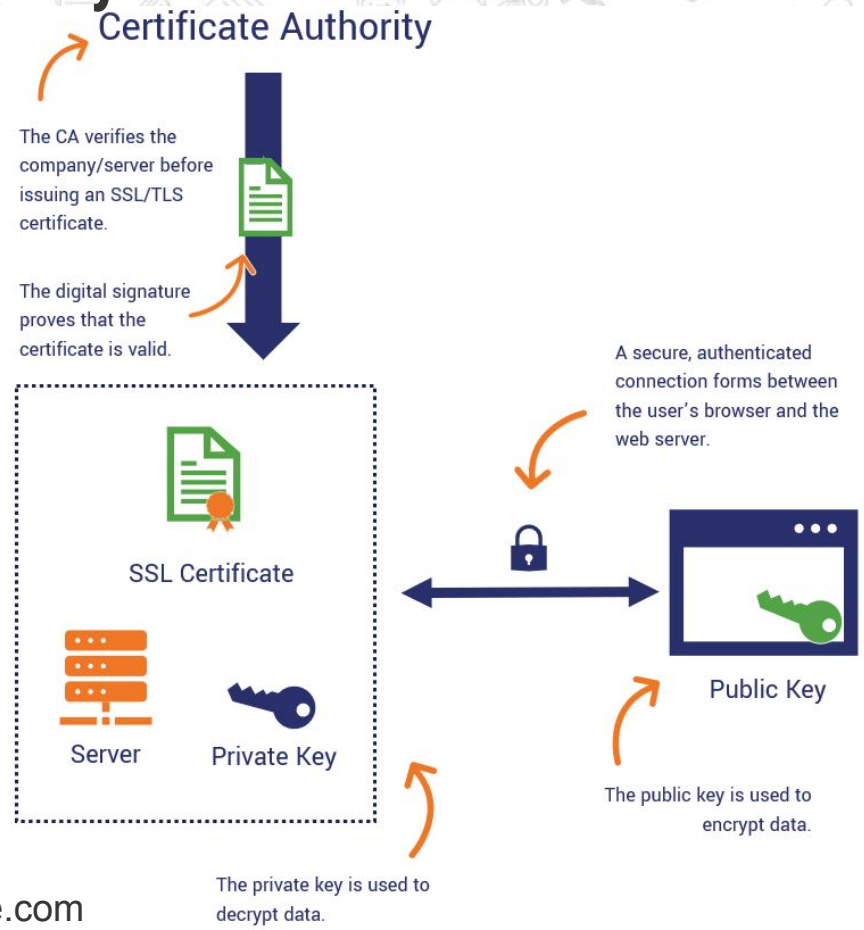
Certifying Authority

A Certification Authority (CA) is a trusted entity responsible for issuing digital certificates that validate the identity of individuals, organizations, or websites in the digital realm. These certificates serve as cryptographic proof of identity and are essential for establishing secure communication channels and verifying the authenticity and integrity of digital transactions.





Certifying Authority



Link From - thesslstore.com



Certifying Authority - How Certification Authorities Work

Certificate Request:

When an entity (such as a website or an individual) wants to obtain a digital certificate to authenticate its identity, it generates a Certificate Signing Request (CSR). This request contains the entity's public key, along with other identifying information such as its name, domain name, and contact details.

The entity then submits the CSR to the Certification Authority, requesting the issuance of a digital certificate.



Certificate Issuance:

Upon receiving the CSR, the Certification Authority verifies the identity of the requesting entity through various validation methods, depending on the type of certificate being requested (e.g., domain validation, organization validation, extended validation).

If the entity's identity is successfully validated, the Certification Authority digitally signs a certificate containing the entity's public key, identity information, expiration date, and other relevant details.

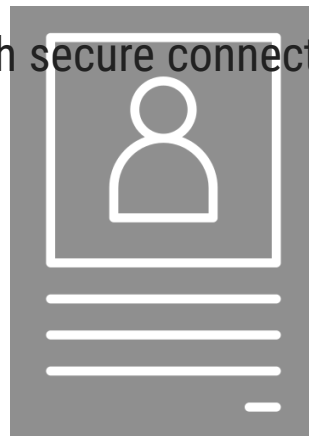


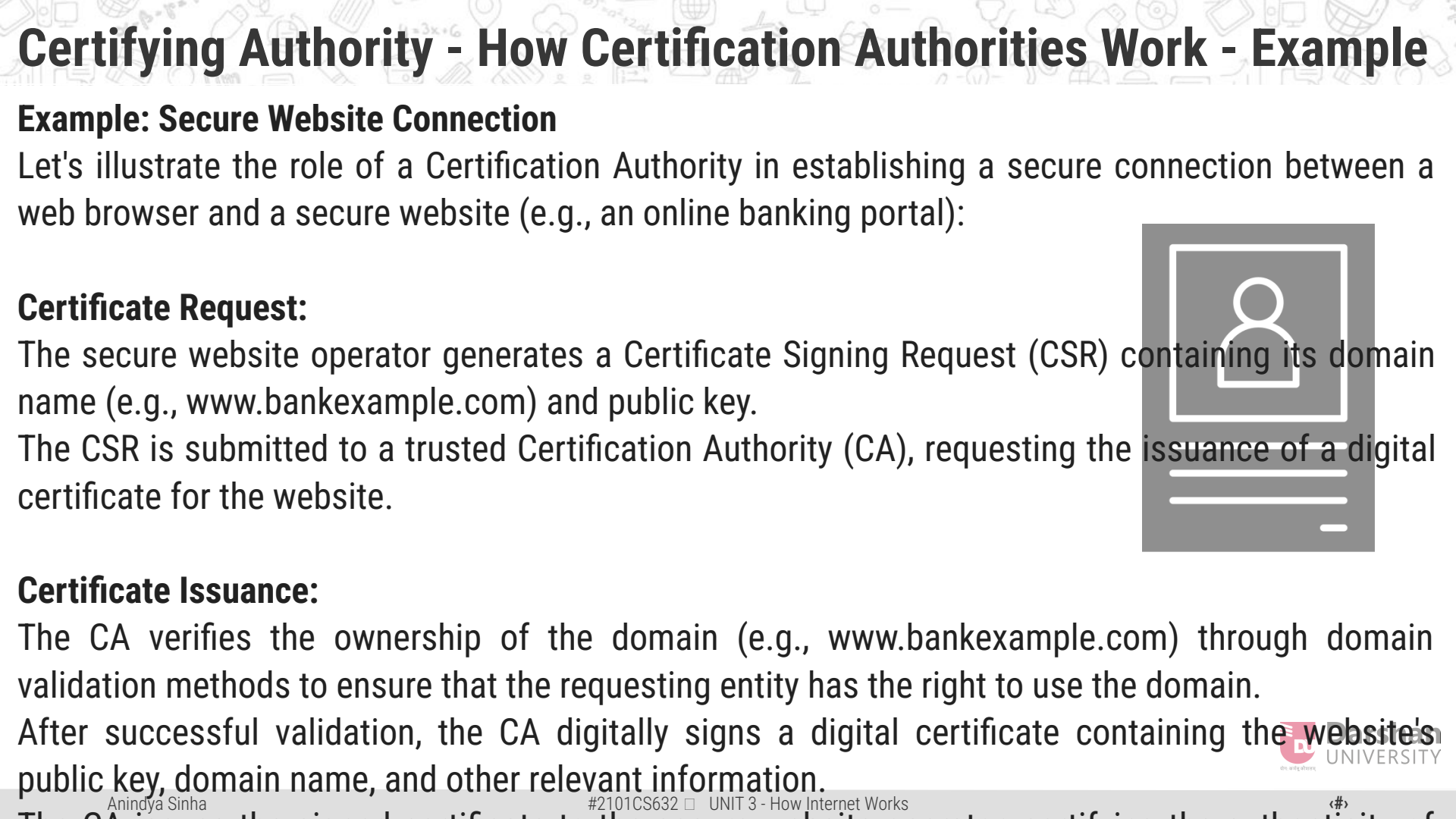
Certifying Authority - How Certification Authorities Work

Certificate Distribution:

Once issued, the digital certificate is delivered to the requesting entity through secure channels, typically encrypted to ensure confidentiality and integrity.

The entity installs the certificate on its server or device, allowing it to establish secure connections and authenticate its identity to other parties.





Certifying Authority - How Certification Authorities Work - Example

Example: Secure Website Connection

Let's illustrate the role of a Certification Authority in establishing a secure connection between a web browser and a secure website (e.g., an online banking portal):

Certificate Request:

The secure website operator generates a Certificate Signing Request (CSR) containing its domain name (e.g., `www.bankexample.com`) and public key.

The CSR is submitted to a trusted Certification Authority (CA), requesting the issuance of a digital certificate for the website.

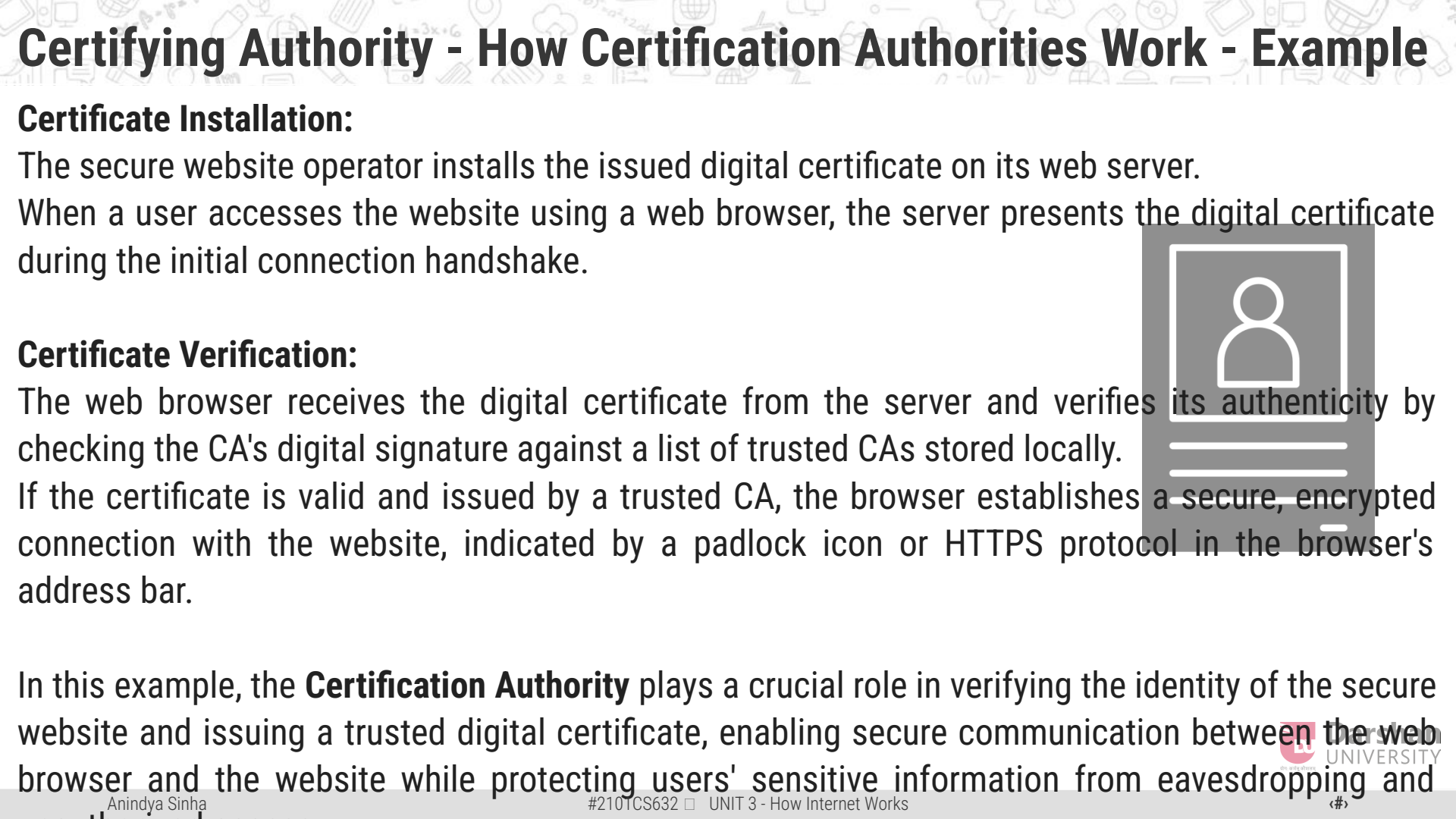


Certificate Issuance:

The CA verifies the ownership of the domain (e.g., `www.bankexample.com`) through domain validation methods to ensure that the requesting entity has the right to use the domain.

After successful validation, the CA digitally signs a digital certificate containing the website's public key, domain name, and other relevant information.





Certifying Authority - How Certification Authorities Work - Example

Certificate Installation:

The secure website operator installs the issued digital certificate on its web server.
When a user accesses the website using a web browser, the server presents the digital certificate during the initial connection handshake.

Certificate Verification:

The web browser receives the digital certificate from the server and verifies its authenticity by checking the CA's digital signature against a list of trusted CAs stored locally.
If the certificate is valid and issued by a trusted CA, the browser establishes a secure, encrypted connection with the website, indicated by a padlock icon or HTTPS protocol in the browser's address bar.



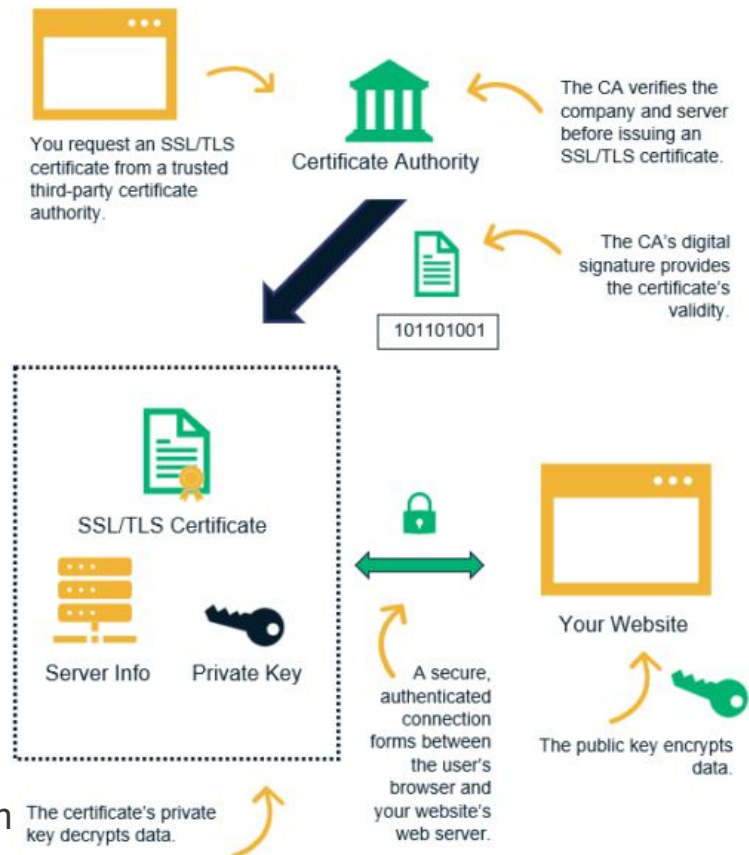
In this example, the **Certification Authority** plays a crucial role in verifying the identity of the secure website and issuing a trusted digital certificate, enabling secure communication between the web browser and the website while protecting users' sensitive information from eavesdropping and





Certifying Authority - How Certification Authorities Work - Example

How Certificate Authorities Work for Websites



Link From - sectigostore.com

Certifying Authority - How Certification Authorities Work - Example

- The process begins with the generation of a Certificate Signing Request (CSR) by the secure website operator, containing its domain name and public key.
- The CSR is sent to a trusted Certification Authority (CA) for validation and issuance of a digital certificate.
- The CA verifies the identity of the website through domain validation methods and issues a digital certificate containing the website's public key, domain name, and other relevant details.
- The digital certificate is delivered to the secure website operator and installed on its web server.
- When a user accesses the secure website using a web browser, the server presents the digital certificate during the initial connection handshake.
- The web browser verifies the authenticity of the certificate by checking the CA's digital signature against a list of trusted CAs stored locally.
- If the certificate is valid and issued by a trusted CA, the browser establishes a secure, encrypted connection with the website, ensuring the confidentiality and integrity of data

