Link State Routing (LSR) is a routing protocol used in computer networks to determine the best path for data to travel. It operates based on the concept of maintaining a global view of the network by having each router build a complete map (or topology) of the network. This allows routers to make efficient and informed decisions about routing packets.

### Key Features of Link State Routing

**Topology Awareness**:

**Efficient Route Calculation**:

**Link-State Advertisements (LSAs)**:

**Flooding of LSAs**:

**Convergence**:

### **Link State Routing Process**

**(1) Learning about neighbors:**

• Send ‘HELLO’ packet to point – to – point line

• Neighbor replies, who it is?

• When two (or) more routers connected, learning about neighbor is

complicated

• **(2) Measuring Line Cost (or) Delay**

• Send special **‘ECHO’** packet over line, otherwise send back

immediately

• **(3) Building Link State Packets:**

• After collecting Information, about exchange router build a packet,

contain all data

**(4) Distributing Link State Packets:**

• It uses Flooding Technique, to distribute packets

• The data structure used by router B for the subnet shown in Fig. 5-

13(a) is depicted in Fig. 5-14.

**Shortest Path Calculation**:

Each router uses algorithms like Dijkstra's to calculate the shortest path to all destinations based on the topology database.

### Advantages

* **Scalability**: Effective in large and complex networks.
* **Fast Convergence**: Changes in the network are quickly reflected due to flooding and independent route computation.
* **Loop-Free Paths**: Routes are calculated using global topology, minimizing routing loops.

### Disadvantages

* **Resource Intensive**: Requires more memory and processing power for topology databases and SPF computations.
* **Complexity**: Configuration and maintenance can be more complex than distance vector protocols.

### Common Link-State Protocols

1. **Open Shortest Path First (OSPF)**: Widely used in enterprise networks.
2. **Intermediate System to Intermediate System (IS-IS)**: Common in service provider networks.

### Comparison with Distance Vector Routing

| **Feature** | **Link State Routing** | **Distance Vector Routing** |
| --- | --- | --- |
| **Knowledge** | Full network topology | Only next-hop and distance |
| **Algorithm** | Dijkstra's SPF | Bellman-Ford |
| **Convergence Speed** | Fast | Slower |
| **Resource Usage** | High | Low |
| **Example Protocols** | OSPF, IS-IS | RIP |

##### In summary, link state routing is robust and efficient for large-scale networks, providing fast and accurate routing decisions, although at the cost of increased

**explain world wide web with its protocols**

The **World Wide Web (WWW)** is a system of interlinked hypertext documents and multimedia resources accessible over the Internet. Users can navigate the web using web browsers by retrieving web pages and resources hosted on servers.

The web operates using a suite of protocols and standards to facilitate communication, resource sharing, and data presentation.

### ****Components of the World Wide Web****

**Web Pages**:

* + Documents written in markup languages like HTML (HyperText Markup Language).
  + Can include text, images, videos, and hyperlinks to other resources.

**Web Browsers**:

* + Software applications (e.g., Chrome, Firefox, Safari) used to retrieve and display web content.

**Web Servers**:

* + Computers or software that store web content and respond to requests from clients (browsers).

**Hyperlinks**:

* + Allow navigation between different web pages or resources.

### ****Key Protocols Used in the World Wide Web****

**HTTP (HyperText Transfer Protocol)**:

Primary protocol for transferring web pages between a client (browser) and a web server.

Works as a request-response protocol:

* + - **Request**: The browser requests a resource (e.g., an HTML file).
    - **Response**: The server sends the requested resource or an error message.

**HTTPS (HTTP Secure)**

* + - Secure version of HTTP using encryption protocols like SSL/TLS for secure data transfer.
    - Ensures data integrity, confidentiality, and authentication.

**DNS (Domain Name System)**:

* + Translates human-readable domain names (e.g., [www.example.com](http://www.example.com" \t "_new)) into IP addresses (e.g., 192.168.1.1) that computers use to identify servers.

**TCP/IP (Transmission Control Protocol/Internet Protocol)**:

* + Foundational suite of communication protocols for the Internet.
    - **TCP** ensures reliable data delivery.
    - **IP** handles addressing and routing data packets across the network.

**FTP (File Transfer Protocol)**:

* + Used for transferring files between a client and server.
  + Less common today for web browsing but still used for uploading website content to servers.

**SMTP, POP3, IMAP** (For Email Integration):

* + Email protocols are often integrated into web services to handle communication.
  + SMTP (sending), POP3, and IMAP (receiving).

**URI/URL (Uniform Resource Identifier/Uniform Resource Locator)**:

* + Standard format to identify resources on the web.
  + Example: https://www.example.com/index.html
    - https: Protocol
    - www.example.com: Domain
    - /index.html: Path to the resource.

### ****How the Web Works****

**Client Requests a Resource**:

* + A user enters a URL or clicks a hyperlink in a browser.
  + The browser sends an HTTP(S) request to the corresponding web server.

**DNS Resolution**:

* + The domain name in the URL is resolved to an IP address via DNS.

**Server Response**:

* + The web server processes the request and returns the appropriate content (e.g., an HTML file or an error message).

**Content Rendering**:

* + The browser interprets the HTML, CSS, JavaScript, and other resources to display the web page.

### ****Web Protocol Layers****

| **Layer** | **Protocol/Technology** | **Function** |
| --- | --- | --- |
| **Application** | HTTP, HTTPS, DNS | User-facing data exchange and name resolution |
| **Transport** | TCP | Reliable delivery of web resources |
| **Internet** | IP | Routing and addressing |
| **Network Access** | Ethernet, Wi-Fi | Physical and data link transmission |

### ****Importance of WWW Protocols****

* Enable consistent and universal communication across the Internet.
* Support interoperability between different systems and devices.
* Ensure security and privacy in data transfer.

In summary, the World Wide Web is a vast interconnected system, made functional and accessible by these standardized protocols. It has transformed how information is shared and accessed globally.