Difference between Rest API and Web Socket API

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In IoT, there are 2 communication APIs –

- REST Based Communication APIs
- Web Socket Based Communication APIs

Web service can either be implemented using REST principles or using Web Socket Protocol –

1. REST Based Communication API :

REpresentational State Transfer (REST) is a set of architectural principles by which you can design web services and web APIs that focus on a system's resources and how resource states are addressed and transferred. REST APIs follow the request-response communication model. The REST architectural constraints apply to the components, connectors, and data elements, within a distributed hypermedia system.

Advantages of REST API:

- Simplicity: REST APIs are relatively simple to design and implement, making them a popular choice for building APIs for web applications.
- Flexibility: REST APIs can be used to support a wide range of applications and services, from simple web applications to complex enterprise systems.
- Caching: REST APIs can leverage caching to improve performance and reduce server load.
- Stateless: REST APIs are stateless, meaning that each request is processed independently of any previous requests, making them easy to scale and distribute.

Disadvantages of REST API:

- Limited real-time support: REST APIs do not support real-time communication between the server and client, making them less suitable for applications that require real-time updates.
- Performance overhead: REST APIs require more overhead than WebSocket APIs, as each request and response must contain all the necessary information to complete the request.
- Complexity: REST APIs can be complex to design and implement for large, distributed systems.

  2. [Web Socket Based Communication APIs](#) :

Web Socket APIs allow bi-directional, full-duplex communication between clients and servers. It follows the exclusive pair communication model. This Communication API does not require a new connection to be set up for each message to be sent between clients and servers. Once the connection is set up the messages can be sent and received continuously without any interruption. WebSocket APIs are suitable for IoT Applications with low latency or high throughput requirements.

Advantages of WebSocket API:

- Real-time communication: WebSocket APIs enable real-time communication between the server and client, making them ideal for applications that require real-time updates.
- Efficiency: WebSocket APIs are more efficient than REST APIs for real-time applications, as they use a persistent connection to enable bidirectional communication.
- Scalability: WebSocket APIs are highly scalable, as they can support thousands of connections per server.
- Reduced overhead: WebSocket APIs have lower overhead than REST APIs, as they use a single connection to transmit data.

Disadvantages of WebSocket API:

- Complexity: WebSocket APIs are more complex to design and implement than REST APIs, requiring additional programming skills and knowledge.

- Security: WebSocket APIs can be vulnerable to security threats if not properly secured.
- Compatibility: WebSocket APIs are not supported by all browsers, requiring fallback mechanisms for older browsers.

Similarities between REST API and WebSocket API:

- Both REST API and WebSocket API are used to build APIs for web applications.
- Both REST API and WebSocket API are standardized interfaces that enable communication between the server and client.
- Both REST API and WebSocket API can be customized to suit the specific needs of a particular application or system.
- Both REST API and WebSocket API can be secured using various authentication and encryption methods.

Difference between Rest API and Web Socket API :

S.NO.	REST API	WEB SOCKET API
1.	It is Stateless protocol. It will not store the data.	It is Stateful protocol. It will store the data.
2.	It is Uni-directional. Only either server or client will communicate.	It is Bi-directional. Messages can be received or sent by both server or client.
3.	It is Request-response model.	It is Full duplex model.
4.	HTTP request contains headers like head section, title section.	It is suitable for real-time applications. It does not have any overhead.
5.	New TCP connection will be set up for each HTTP request.	Only Single TCP connection.

S.NO.	REST API	WEB SOCKET API
6.	Both horizontal and vertical scaling (we can add many resources and number of users both horizontally and vertically).	Only vertical scaling (we can add resources only vertically).
7.	It depends upon the HTTP methods to retrieve the data..	It depends upon the IP address and port number to retrieve the data
8.	It is slower than web socket regarding the transmission of messages.	web socket transmits messages very fastly than REST API.
9.	It does not need memory or buffers to store the data.	It requires memory and buffers to store the data.

Conclusion :

REST API and Web Socket API serve different purposes and are used in different contexts. REST API is used for stateless, request/response communication over HTTP, while Web Socket API is used for persistent, bi-directional communication over the WebSocket protocol. Understanding the differences between REST API and Web Socket API is essential for choosing the right API for your web application and achieving optimal performance and user experience.

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