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BENEFITS AND APPLICATIONS OF WEBSOCKETS

Persistent, Bidirectional Communication

WebSocket is an open-source digital communications protocol that provides a persistent, low-latency, full-duplex connection between a client and server over a standard Transmission Control Protocol (TCP) connection. The plural "WebSockets" refers to individual instances of the protocol.

Overcoming many of the limitations of the older Hypertext Transfer Protocol (HTTP), WebSockets enable much more fluid communication between a client and server. This makes them especially useful in networked AV and control systems, where software and devices need to exchange large amounts of data continuously and with low latency.

BIDIRECTIONAL. Whereas HTTP relies on a client request to receive a response from the server for every exchange, WebSockets allow for full-duplex bidirectional communication. This enables the server to send real-time updates asynchronously, without requiring the client to submit a request each time. In the context of networked AV and control systems, this allows devices to send and receive continuous streams of data to and from any point on the network.

PERSISTENT. Rather than establishing and terminating the connection for each client request and server response, WebSockets allow for a persistent client-server connection. After an initial HTTP "handshake," the connection is kept alive using a "ping-pong" process, in which the server continuously pings the client for a response. The server only terminates this connection after an explicit request from the client, or implicitly when the client goes offline.

LOW-LATENCY. By eliminating the need for a new connection with every request, WebSockets greatly reduce the data size of each message, drastically decreasing latency. After the initial handshake, which includes standard HTTP header information, all subsequent messages include only relevant information. This reduction in latency enables lightning-fast AV transport and communication.

EXTENSIBLE. Flexibility is ingrained into the philosophy and design of the WebSocket protocol, enabling the implementation of subprotocols and extensions for additional functionality. Currently, the WebSocket API supports over 40 subprotocols such as WAMP, XMPP, AMQP and MQTT, as well as extensions that enable powerful functionality like multiplexing and data compression. This makes WebSockets a highly adaptable, future-proof solution.

SECURE. The WebSocket Secure (WSS) protocol uses standard SSL and TLS encryption to establish a secure connection between the client and server. Using a mutually agreed-upon authorization and authentication system, the client and server can safely exchange encrypted WebSocket messages, which is critical in sensitive government, military and corporate applications. While unsecured WebSockets uses TLS port number 80, WSS uses port 443.

Practical Applications

The WebSocket protocol's numerous advantages over HTTP make it effective in a variety of applications, including networked AV and control systems. The protocol's persistent connection and fully bidirectional nature enables a range of web services, hardware devices and distributed systems to work together seamlessly.

The decrease in latency offered by WebSockets permits the real-time information exchange necessary for fluid audio and video communication, which can be securely encrypted for sensitive applications. Finally, the extensibility of the protocol allows it to continually be updated with additional functionality as industry demands change.

HTML 5 APPLICATIONS. WebSockets are used in almost every web interface powered by HTML 5. This includes messaging and chat services, browser-based games and any website that needs to provide real-time updated information. Since all major browsers currently support the WebSocket protocol, WebSockets are becoming more and more widespread on the web.

INTERNET OF THINGS (IOT) APPLICATIONS. WebSockets enable IoT devices such as smart speakers and smart appliances to communicate fluidly, with minimal latency and a small code footprint. The widespread adoption of the MQTT subprotocol means WebSockets are already the standard for data transport in IoT devices. Having such a broadly accepted standard allows a wide range of devices to work together seamlessly, creating the potential for vast distributed systems.

NETWORKED AV HARDWARE APPLICATIONS. WebSockets are ideal for providing real-time transport and communication between AV-over-IP devices. For example, the BSS DCP-555 Template-Based Conferencing Processor uses a WebSocket connection in parallel with a standard TCP connection to allow configuration of meeting rooms via a web browser interface. The DCP-555 also employs ticket-based authentication and authorization to provide secure encryption for sensitive applications.

BUILDING MANAGEMENT AND CONTROL APPLICATIONS. Similar to their applications in IoT devices, WebSockets enable seamless communication and control in large-scale building management systems. In IoT-as-a-service platforms like Siemens MindSphere, WebSockets allow massive distributed systems of hardware and software to be controlled with a streamlined user interface. In this context, WebSockets are playing a vital role in creating the next generation of factories, schools, offices, medical facilities and living spaces.

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