*Attacking SSL/TLS Implementations*

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line 2: *dept. name o*  
line 3: *name of organization (of Affiliation)*line 4: City, Country  
line 5: email address or ORCID  
  
line 1: 4th Given Name Surname  
line 2: *dept. name of organization (of Affiliation)*  
line 3: *name of organization (of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

line 1: 5th Given Name Surname  
line 2: *dept. name of organization (of Affiliation)*  
line 3: *name of organization (of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

line 1: 6th Given Name Surname  
line 2: *dept. name of organization (of Affiliation)*  
line 3: *name of organization (of Affiliation)*line 4: City, Country  
line 5: email address or ORCID

*Abstract*—SSL stands for Secure Sockets Layer and, it's the standard technology for keeping an internet connection secure and safeguarding any sensitive data that is being sent between two systems, preventing criminals from reading and modifying any information transferred, including potential personal details. TLS (Transport Layer Security) is just an updated, more secure, version of SSL. We still refer to security certificates as SSL because it is a more commonly used term, but when you are [buying SSL](https://www.websecurity.digicert.com/ssl-certificate?inid=infoctr_buylink_sslhome) from DigiCert you are actually buying the most up to date TLS certificates with the option of [ECC, RSA or DSA encryption](https://www.websecurity.digicert.com/security-topics/how-ssl-works). However, there are undeniable differences between the libraries that implement SSL/TLS protocol and vulnerabilities in these libraries. Hence, the two main questions asked are: what’s the difference between TLS vs SSL? And is it something we need to worry about? In this report, we summarize some of the limitations by considering implementations of each along with review of past protocol-based and software-based vulnerabilities.

# Introduction

The Secure Sockets Layer (SSL) protocol is a security technology that offers online privacy. The protocol enables secure communication between client and server applications. Clients can choose to authenticate themselves, while servers are always authenticated. There is a big demand right now for SSL certificates. The encryption landscape has undergone a substantial transformation since Google launched its "HTTPS Everywhere" campaign. Because not all servers provide web interfaces for managing SSL, OpenSSL can be the only choice for some systems to import and setup your certificate. OpenSSL is quite helpful if we want to speed up the entire process or don't have access to an online administration panel. With just a few OpenSSL lines, it is possible to generate the Certificate Signing Request and the private key, combine files, review the certificate's specifics, and address any potential issues. An outdated cryptographic technique that encrypts network interactions between two computer applications is called Secure Sockets Layer, or SSL. Transmission Layer Security) certificates are what we mean when we talk about SSL certificates. OpenSSL is a cryptographic tool that uses command lines to control SSL/TLS certificate creation, installation, and identification.

A web server (i.e., a website) that is SSL-secured is attempted to be contacted by a browser or server. The browser/server asks for the web server's identity. The browser or server is then sent a copy of the web server's SSL certificate. This check determines if a browser or server trusts the SSL certificate. If so, a message alerts the web server. The web server sends back a digitally signed acknowledgement to start an SSL encrypted session. Eventually, encrypted data is exchanged between the web server and browser/server. Website owners must get an SSL certificate from a certificate authority and install it on the web server (often a web host can handle this process). An impartial third party that may attest to the legitimacy of the website owner is known as a certificate authority. They maintain records of the certifications they issue. Online payments conducted via a credit card or another way are included in the SSL apps. Intranet-based traffic includes, but is not limited to, internal networks, file sharing, extranets, and database access. Webmail servers include Exchange, Office Communications Server, and Outlook Web Access. The connection between an email client like Microsoft Outlook and a mail server like Microsoft Exchange.

**SSL Benefits and Drawbacks: -**

Benefits: -

1.Improving Data Security: -

Stronger data security is one of the major advantages of SSL certificates for websites. They protect the data in transit while securing connections between the browser and server thanks to cryptography. Even if there is a data breach, the attacker won't be able to fully decrypt and comprehend all of the data because of how highly and intricately encrypted it is.

2.Identity Verification and Authentication: -

Data that is transmitted via the internet is moved between different organisations with a significant potential of ending up in the hands of intruders or other unauthorised third parties. The fact that SSL confirms and authenticates the parties' identities is another important benefit.

3. Avoid a Variety of Attacks: -

The ability of SSL certificates to protect websites and users from a variety of threats is another significant advantage. As it encrypts all data in transit, it helps prevent eavesdropping, impersonation, data theft, identity theft, and Man-in-the-Middle attacks.

Drawbacks: -

1.Cost: -

Free SSL certificates are offered, however they do not provide the necessary level of security and encryption. One must pick a CA who can offer the highest levels of protection while adhering to industry standards and rigorous compliance standards. This CA must have the necessary infrastructure, knowledge, and reputation. There is a price for this. Your fees rise if you have many domains and sub-domains.

2. Expiry : -

For continuous security, expired SSL certificates must have their expiration date monitored and renewed. In the absence of sight, the process of monitoring and renewal may be more difficult. Reputable suppliers like Entrust from Indusface offer cutting-edge Certificate Management Systems (CMS) to administer SSL easily and effectively in order to address this SSL drawback.

3.SSL-Related Vulnerabilities: -

Although SSL has many advantages for the website, it also has several security flaws. There are numerous vulnerabilities in the older SSL/TLS protocols, including POODLE, BEAST, Heartbleed, CRIME, and TLS 1.0 or TLS 1.1. Browsers label websites with certificates that use these antiquated protocols as unsafe.

**Why the developers decided on new TLS implementation instead of already using open SSL library?**

First off, developers can require particular features or components that are absent from the libraries that are currently available. Creating a custom TLS implementation from scratch allows developers to create a solution that is tailored to their needs. Second, developers can be concerned about the safety or calibre of the current libraries. Developers can have more control over the security and quality of the codebase with a new TLS implementation, which may be essential for applications that need security. Finally, developers may elect to employ a new TLS implementation as a teaching tool or as a means of better understanding the underlying technology. The process of developing a new implementation can help developers learn more about how TLS works and progress their careers.

**TLS OVER SSL**

TLS offers a more secure way to handle authentication and message exchange. TLS uses the more secure Key-Hashing for Message Authentication Code (HMAC) to ensure that a record cannot be changed during transmission over an open network like the Internet, whereas SSL uses keyed message authentication.TLS specifies the Improved Pseudorandom Function (PRF), which generates key information with the HMAC using two hash methods. By prohibiting data from being altered if only one algorithm is compromised, two algorithms strengthen security. As long as the second algorithm is not compromised, the data is secure.

TLS uses PRF and HMAC values in the message to provide a more secure authentication technique than SSL, which both send messages to each node to verify that the exchanged communications were not tampered with. the TLS protocol specifies the sort of certificate that must be sent between nodes in order to guarantee more consistency . Moreover,

TLS offers more detailed alerts concerning session issues and keeps track of when specific alarms are given.

They were identical for a while to make the switch from SSL to TLS easier. The only differences between SSL v3 and TLS 1.0 were a few minor protocol features. This made it simple to keep using SSL, as we had for so many years, rather than encouraging people to use the new TLS language. Some individuals began to use the names interchangeably. The harm had already been done when TLS 1.1 (and later) replaced SSL as the only reliable protocols when it was phased out (deprecated).

**What is the difference between HTTP and HTTPS?**

HTTPS stands for "secure" and has a S in it. HTTP over SSL/TLS is just HTTPS. Traffic to and from a website with an HTTPS address is authenticated and encrypted using the SSL/TLS protocol, and that website has a valid SSL certificate that was issued by a certificate authority. Several web browsers have started to flag HTTP pages as "not secure" or "unsafe," in an effort to persuade users to switch to the more secure HTTPS protocol. Hence, HTTPS has become crucial for establishing user trust in addition to being necessary for keeping consumers safe and user data secure.

# Limitation of SSL/TLS Implementations

SHAWN & HARSHITHA

(Times new roman 10)

# How SSL/TLS secure data ?

VENKY & SANDEEP

(Times new roman 10)

# Comparisions of DIfferent versions of SSL/TLS

VENKY & SANDEEP

(Times new roman 10)

# Vulnerabilities in SSL/TLS-Protocol based

VANI & SAUMYA

(Times new roman 10)

# Vulnerabilities in SSL/TLS-Software based

PRANATHI & SARAT

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# Concluding Thoughts

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