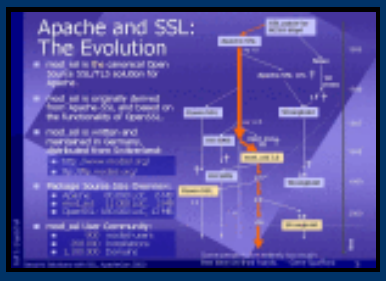
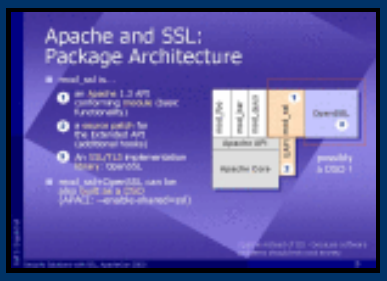
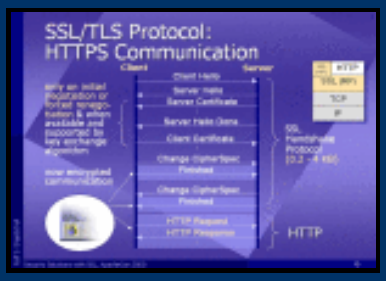
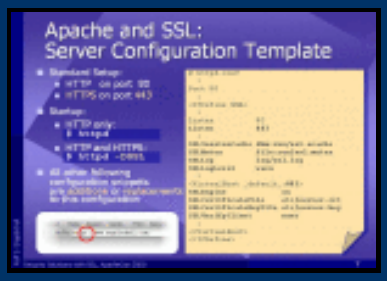
Security Solutions with SSL

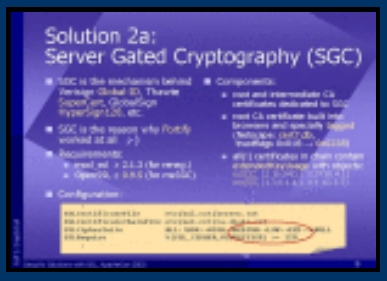
ApacheCon 2000, Ralf S. Engelschall

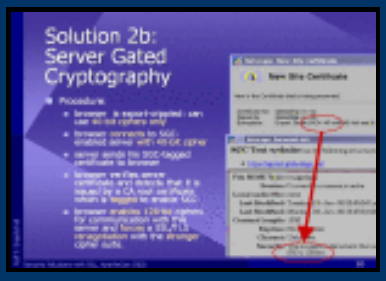


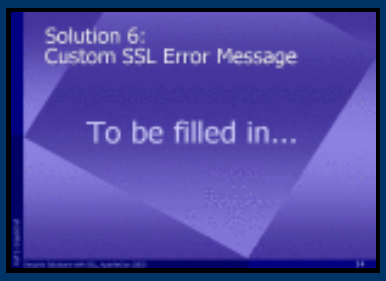


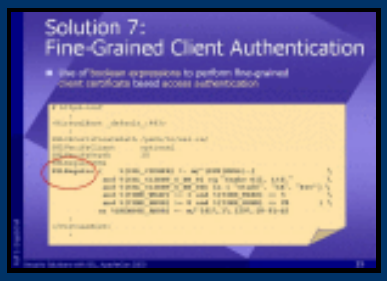


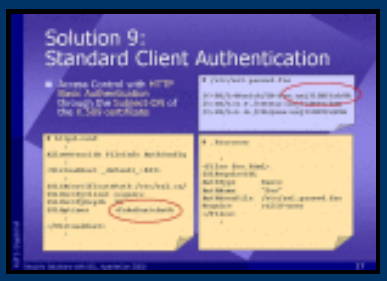


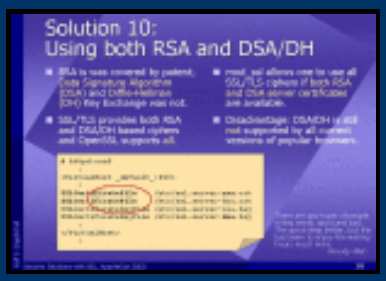


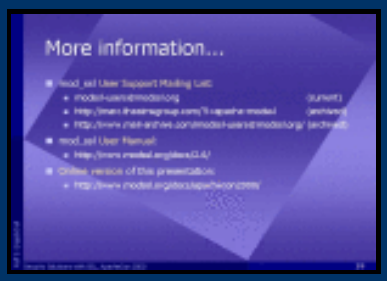












Security Solutions with SSL

Selected security solutions for the Apache webserver, based on the SSL/TLS protocol

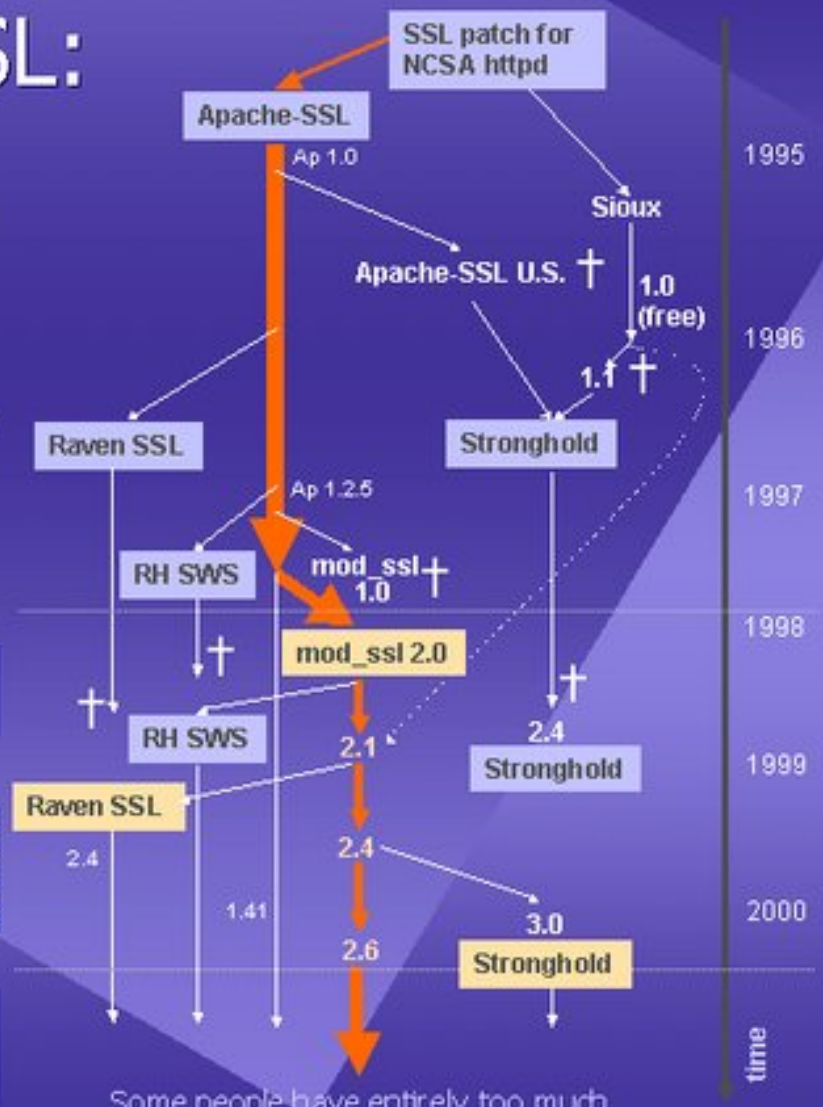
M21 APACHECON 2000

Mon, 23 Oct 2000 18:30-20:00

Ralf S. Engelschall

Apache and SSL: The Evolution

- mod_ssl is the canonical Open Source SSL/TLS solution for Apache.
- mod_ssl is originally derived from Apache-SSL and based on the functionality of OpenSSL.
- mod_ssl is written and maintained in Germany, distributed from Switzerland:
  - http://www.modssl.org/
  - ftp://ftp.modssl.org/
- Package Source Size Overview:
  - Apache: 80.000 LoC, 6 MB
  - mod_ssl: 11.000 LoC, 3 MB
  - OpenSSL: 180.000 LoC, 12 MB
- mod_ssl User Community:
  - 900 modssl-users
  - 200.000 Installations
  - 1,100.000 Domains



Some people have entirely too much free time on their hands. - Gene Spafford

Apache and SSL: Installation Illustration

Seek simplicity,
but distrust it.
- A. N. Whitehead

```
$ gunzip <apache_1.3.12.tar.gz         | tar xf -
$ gunzip <mod_ssl-2.6.6-1.3.12.tar.gz | tar xf -
$ gunzip <openssl-0.9.5a.tar.gz        | tar xf -

$ cd openssl-0.9.5a
$ ./config
$ make

$ cd ../mod_ssl-2.6.6
$ ./configure --with-apache=../apache_1.3.12 \
              --with-ssl=../openssl-0.9.5a \
              --prefix=/usr/local/apache

$ cd ../apache_1.3.12
$ make
$ make certificate TYPE=dummy
$ make install

$ /usr/local/apache/bin/httpd -DSSL
$ netscape https://localhost/
```

1. extract sources
2. build OpenSSL
3. apply mod_ssl to Apache source tree and configure it
4. build and install Apache plus mod_ssl
5. test the server!

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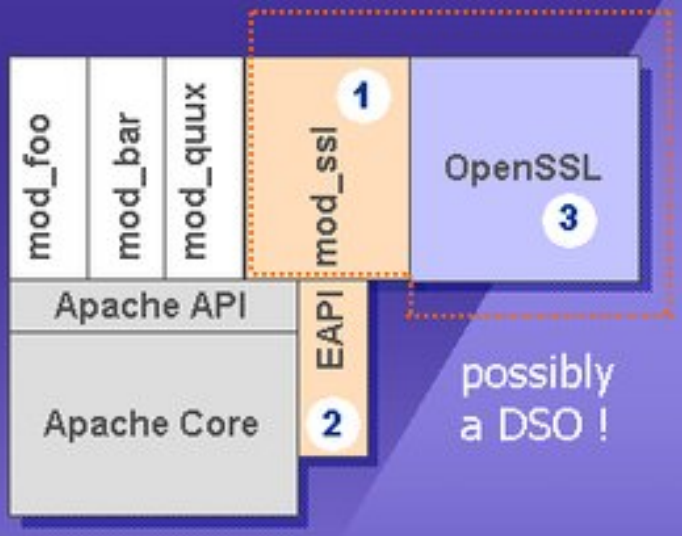
Apache and SSL: Feature Overview

mod_ssl - The best SSL solution for Apache money can't buy.

- Open-Source software
- Useable for commercial and non-commercial use
- Available for both Unix and Win32
- 128-bit strong crypto world-wide
- Supports SSLv2, SSLv3 and TLSv1
- Very clean reviewable ANSI C source code
- Clean Apache module architecture
- Integrates seamlessly into Apache through Extended API (EAPI)
- Full Dynamic Shared Object (DSO) support via mod_so+EAPI
- Advanced pass-phrase handling for private keys
- X.509 based client & server authentication
- X.509 Certificate Revocation List (CRL) support
- per-URL renegotiation of SSL /TLS parameters
- Supports RSA and DSA/DH ciphers
- Support for explicit PRNG seeding
- Boolean-expression based access control facility
- Backward compatibility to other SSL solutions (Apache-SSL, SH, ...)
- Inter-process SSL session cache (DBM or Shared Memory)
- Powerful dedicated SSL engine logging facility
- Simple and robust application to Apache source
- Fully integrated into Apache 1.3 configuration mechanism
- Additionally integration into APACI
- Assistance in X.509v3 certificate generation (RSA and DSA)

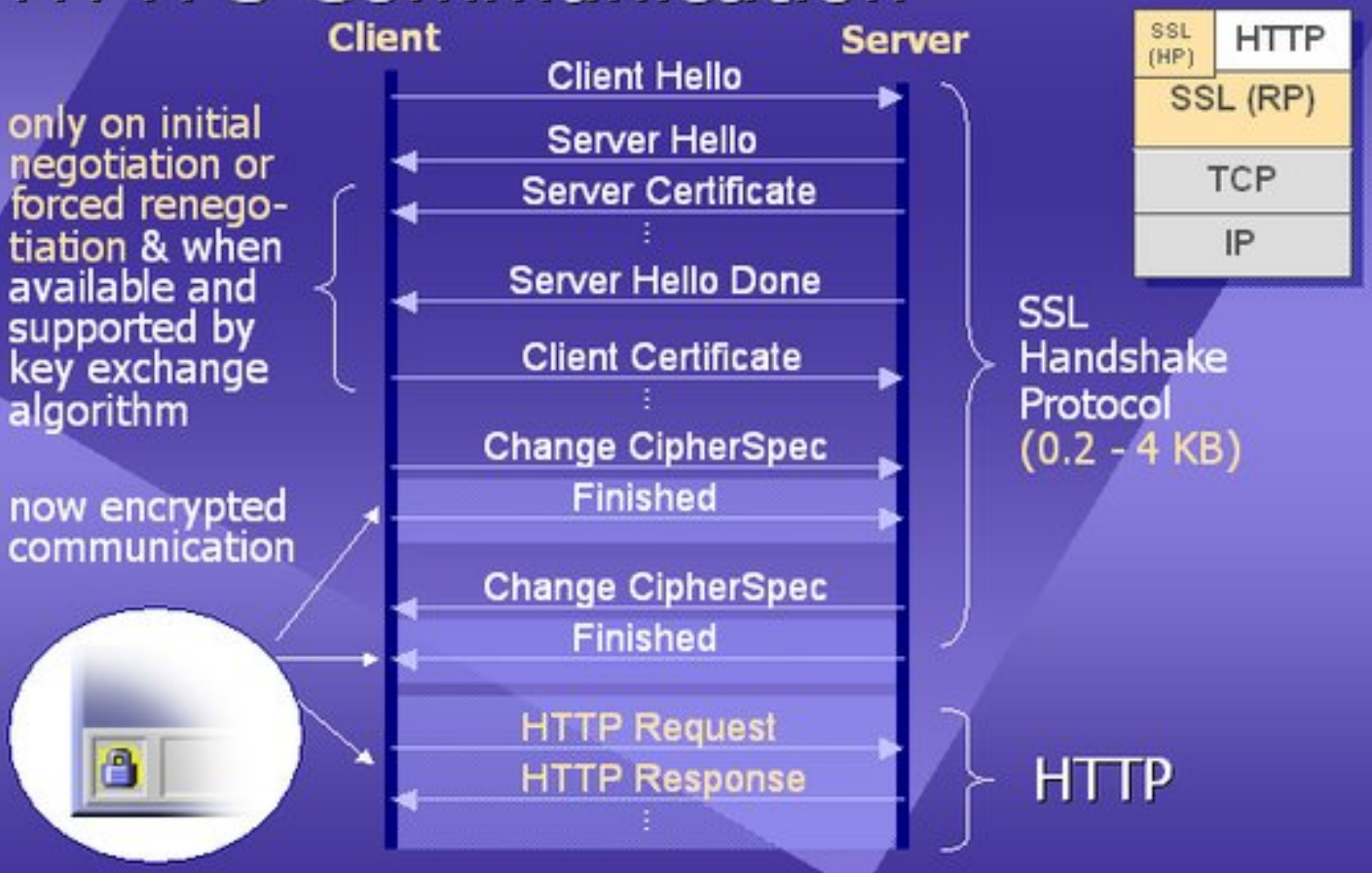
Apache and SSL: Package Architecture

- mod_ssl is...
  1. an Apache 1.3 API conforming module (basic functionality)
  2. a source patch for the Extended API (additional hooks)
  3. An SSL/TLS implementation library: OpenSSL
- mod_ssl+OpenSSL can be also built as a DSO (APACI: --enable-shared=ssl)



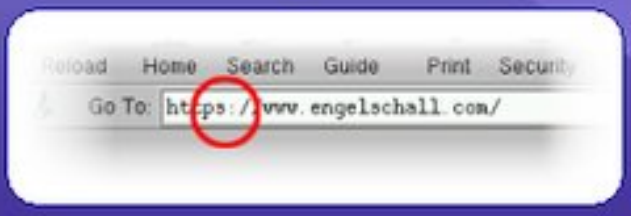
Apache instead of IIS - because software problems should not cost money.

SSL/TLS Protocol: HTTPS Communication



Apache and SSL: Server Configuration Template

- Standard Setup:
  - HTTP on port 80
  - HTTPS on port 443
- Startup:
  - HTTP only:
    ```
    $ httpd
    ```
  - HTTP and HTTPS:
    ```
    $ httpd -DSSL
    ```
- All other following configuration snippets are additions or replacements to this configuration




```
# httpd.conf
  :
Port 80
  :
<IfDefine SSL>
  :
Listen          80
Listen          443
  :
SSLSessionCache dbm:run/ssl.scache
SSLMutex        file:run/ssl.mutex
SSLLog          log/ssl.log
SSLLogLevel     warn
  :
<VirtualHost _default_:443>
SSLEngine               on
SSLCertificateFile      etc/server.crt
SSLCertificateKeyFile   etc/server.key
SSLVerifyClient         none
  :
</VirtualHost>
</IfDefine>
```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Solution 1: Speed Up Processing

- Use Shared Memory based SSL/TLS Session Cache:
  MM: Shared Memory Library, http://www.engelschall.com/sw/mm/
  Build-Time: (mod_ssl) `configure --with-mm=../mm-1.1.3`
  Run-Time:
  ```
  SSLSessionCache shm:/var/run/scache(512000)
  ```
- Increase Session Cache Timeout:
  Run-Time:
  ```
  SSLSessionCacheTimeout 1200
  ```
- Use Semaphore based Mutex:
  Run-Time:
  ```
  SSLMutex sem
  ```
- Use minimal logging:
  Run-Time:
  ```
  SSLLog      /dev/null
  SSLLogLevel error
  ```
- Export SSI/CGI Variables only for reasonable contexts:
  Run-Time:
  ```
  <Files ~ "*.(cgi|shtml)$">
  SSLOptions +StdEnvVars
  </Files>
  ```
- Use optimized renegotiations:
  Run-Time:
  ```
  SSLOptions +OptRenegotiate
  ```
- Use HTTP Keepalive facility:
  Run-Time:
  ```
  KeepAlive             on
  MaxKeepAliveRequests  100
  KeepAliveTimeout      15
  ```

Premature optimization is the root of all evil.
- D.E.Knuth

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Solution 2a: Server Gated Cryptography (SGC)

- SGC is the mechanism behind Verisign Global-ID, Thawte SuperCert, GlobalSign HyperSign128, etc.
- SGC is the reason why Fortify worked at all ;-)
- Requirements:
  - mod_ssl ≥ 2.1.3 (for reneg.)
  - OpenSSL ≥ 0.9.5 (for msSGC)
- Components:
  - root and intermediate CA certificates dedicated to SGC
  - root CA certificate built into browsers and specially tagged (Netscape: cert7.db, trustflags 0x018 → 0x0238)
  - all(!) certificates in chain contain extendedKeyUsage with objects:
    nsSGC (2.16.840.1.113730.4.1)
    msSGC (1.3.6.1.4.1.311.10.3.3)
- Configuration:

```
    :
SSLCertificateFile      etc/ssl.crt/server.crt
SSLCertificateChainFile etc/ssl.crt/ca-chain.crt
SSLCipherSuite          ALL:!ADH:+HIGH:+MEDIUM:+LOW:+EXP:+eNULL
SSLRequire              %{SSL_CIPHER_USEKEYSIZE} >= 128
    :
```


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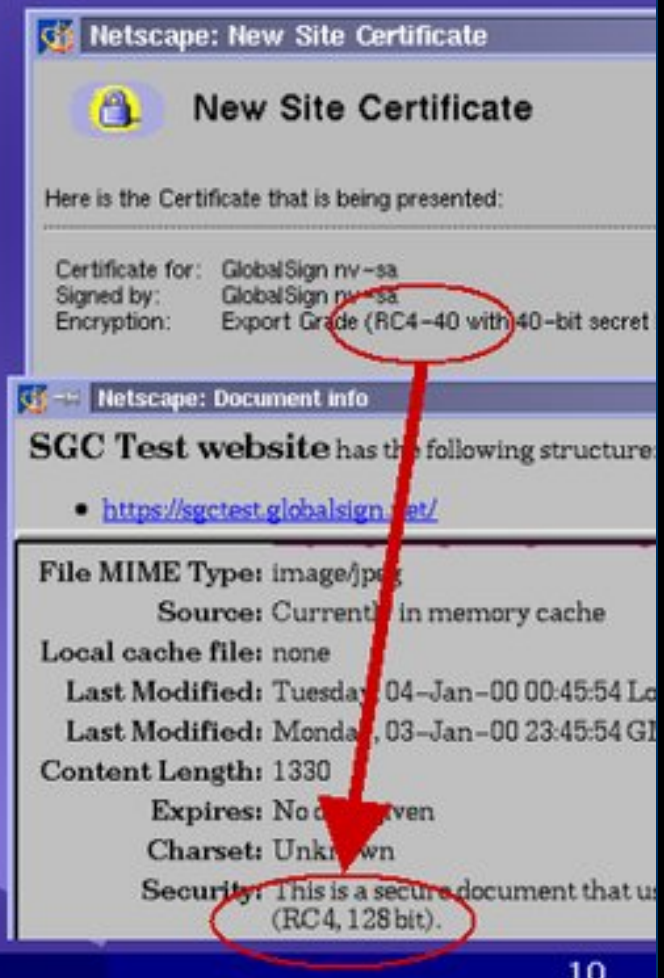
Solution 2b: Server Gated Cryptography

- Procedure:
  - browser is export-crippled: can use 40-bit ciphers only
  - browser connects to SGC-enabled server with 40-bit cipher
  - server sends his SGC-tagged certificate to browser
  - browser verifies server certificate and detects that it is issued by a CA root certificate which is tagged to enable SGC
  - browser enables 128-bit ciphers for communication with this server and forces a SSL/TLS renegotiation with the stronger cipher suite.



Solution 3: HTTP/HTTPS Gateway

To be filled in...

Solution 4: Per-Directory SSL/TLS Parameters

To be filled in...

Solution 5: Internet/Intranet Access

To be filled in...

Solution 6:
Custom SSL Error Message

To be filled in...

Solution 7: Fine-Grained Client Authentication

- Use of boolean expressions to perform fine-grained client certificate based access authentication

```
# httpd.conf
    :
<VirtualHost _default_:443>
    :
SSLCACertificatePath /path/to/ssl.ca/
SSLVerifyClient      optional
SSLVerifyDepth       10
SSLRequireSSL
SSLRequire (    %{SSL_CIPHER} !~ m/^(EXP|NULL)-/                  \
           and %{SSL_CLIENT_S_DN_O} eq "Snake Oil, Ltd."          \
           and %{SSL_CLIENT_S_DN_OU} in { "Staff", "CA", "Dev" } \
           and %{TIME_WDAY} >= 1 and %{TIME_WDAY} <= 5            \
           and %{TIME_HOUR} >= 8 and %{TIME_HOUR} <= 20        ) \
          or %{REMOTE_ADDR} =~ m/^141\.1\.129\.[0-9]+$/
    :
</VirtualHost>
    :
```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Solution 8:
Certificate Revocation Lists (CRL)

To be filled in...

Solution 9: Standard Client Authentication

- Access Control with HTTP Basic Authentication through the Subject-DN of the X.509 certificate

```
# /etc/ssl.passwd.foo

/C=DE/L=Munich/CN=Foo:xxj31ZMTZzkVA
/C=US/L=S.F./CN=Bar:xxj31ZMTZzkVA
/C=US/L=L.A./CN=Quux:xxj31ZMTZzkVA
```

```
# httpd.conf
    :
AllowOverride FileInfo AuthConfig
    :
<VirtualHost _default_:443>
    :
SSLCACertificatePath /etc/ssl.ca/
SSLVerifyClient require
SSLVerifyDepth  10
SSLOptions      +FakeBasicAuth
    :
</VirtualHost>
    :
```

```
# .htaccess

    :
<Files foo.html>
SSLRequireSSL
AuthType        Basic
AuthName        "foo"
AuthUserFile    /etc/ssl.passwd.foo
Require         valid-user
</Files>
    :
```


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Solution 10: Using both RSA and DSA/DH

- RSA is was covered by patent, Data Signature Algorithm (DSA) and Diffie-Hellman (DH) Key Exchange was not.
- SSL/TLS provides both RSA and DSA/DH based ciphers and OpenSSL supports all.
- mod_ssl allows one to use all SSL/TLS ciphers if both RSA and DSA server certificates are available.
- Disadvantage: DSA/DH is still not supported by all current versions of popular browsers.

```
# httpd.conf
    :
<VirtualHost _default_:443>
    :
SSLCertificateFile     /etc/ssl.server-rsa.crt
SSLCertificateFile     /etc/ssl.server-dsa.crt
SSLCertificateKeyFile /etc/ssl.server-rsa.key
SSLCertificateKeyFile /etc/ssl.server-dsa.key
    :
</VirtualHost>
    :
```

There are two types of people in this world, good and bad. The good sleep better, but the bad seem to enjoy the waking hours much more.
Woody Allen

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More information...

- mod_ssl User Support Mailing List:
  - modssl-users@modssl.org (current)
  - http://marc.theaimsgroup.com/?l=apache-modssl (archived)
  - http://www.mail-archive.com/modssl-users@modssl.org/ (archived)
- mod_ssl User Manual:
  - http://www.modssl.org/docs/2.6/
- Online version of this presentation:
  - http://www.modssl.org/docs/apachecon2000/

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Security Solutions with SSL
Selected security solutions for the Apache webserver, based on the SSL/TLS protocol
M21
APACHECON 2000
Mon, 23 Oct 2000 18:30-20:00
mod_SSL
The Apache Interface To
OpenSSL
Engelschall
Ralf S. Engelschall
Security Solutions with SSL, ApacheCon 2000
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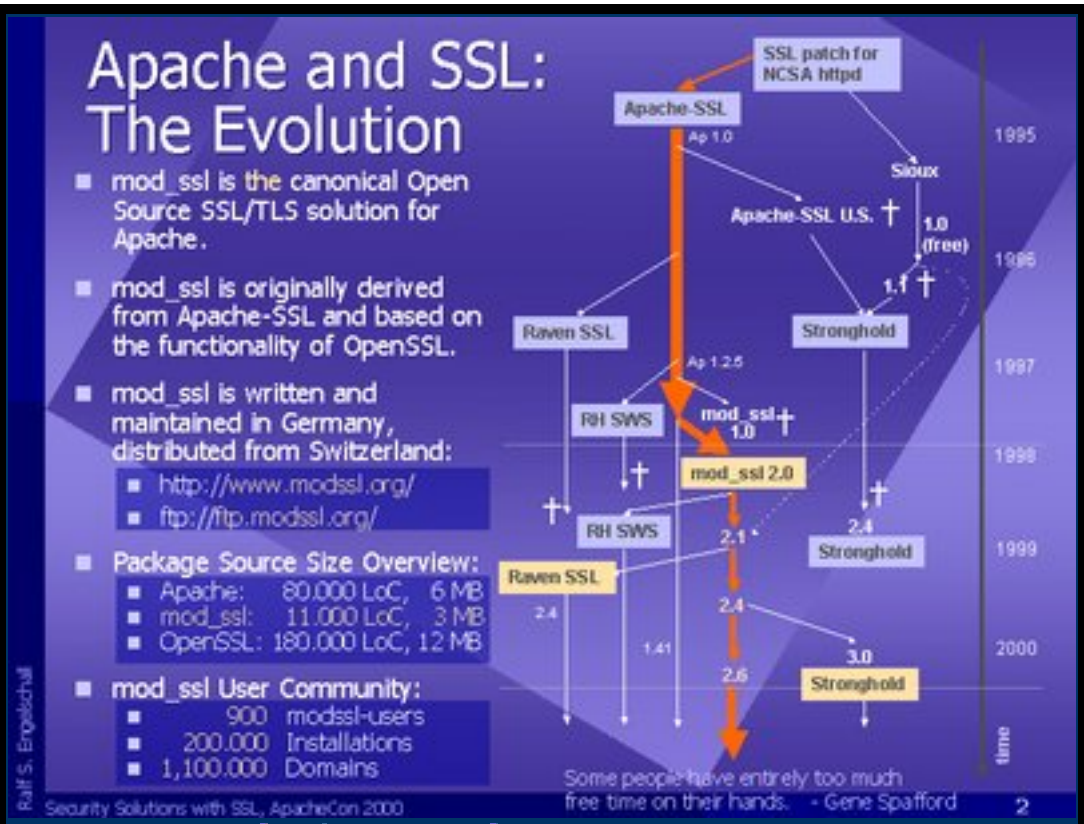

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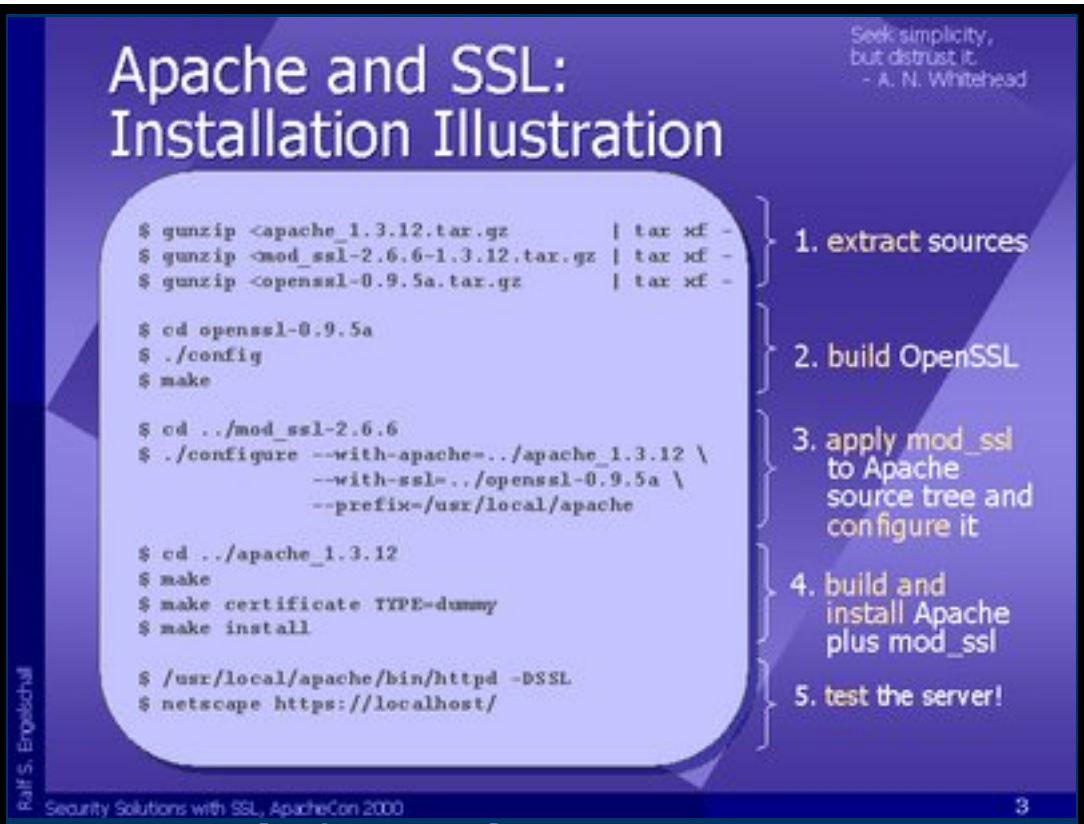
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Installation Illustration
Seek simplicity,
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$ gunzip <openssl-0.9.5a.tar.gz | tar xf -
$ cd openssl-0.9.5a
$ ./config
$ make
$ cd ../mod_ssl-2.6.6
$ ./configure --with-apache=../apache_1.3.12 \
--with-ssl=../openssl-0.9.5a \
--prefix=/usr/local/apache
$ cd ../apache_1.3.12
$ make
$ make certificate TYPE=dummy
$ make install
$ /usr/local/apache/bin/httpd -DSSL
$ netscape https://localhost/
1. extract sources
2. build OpenSSL
3. apply mod_ssl to Apache source tree and configure it
4. build and install Apache plus mod_ssl
5. test the server!
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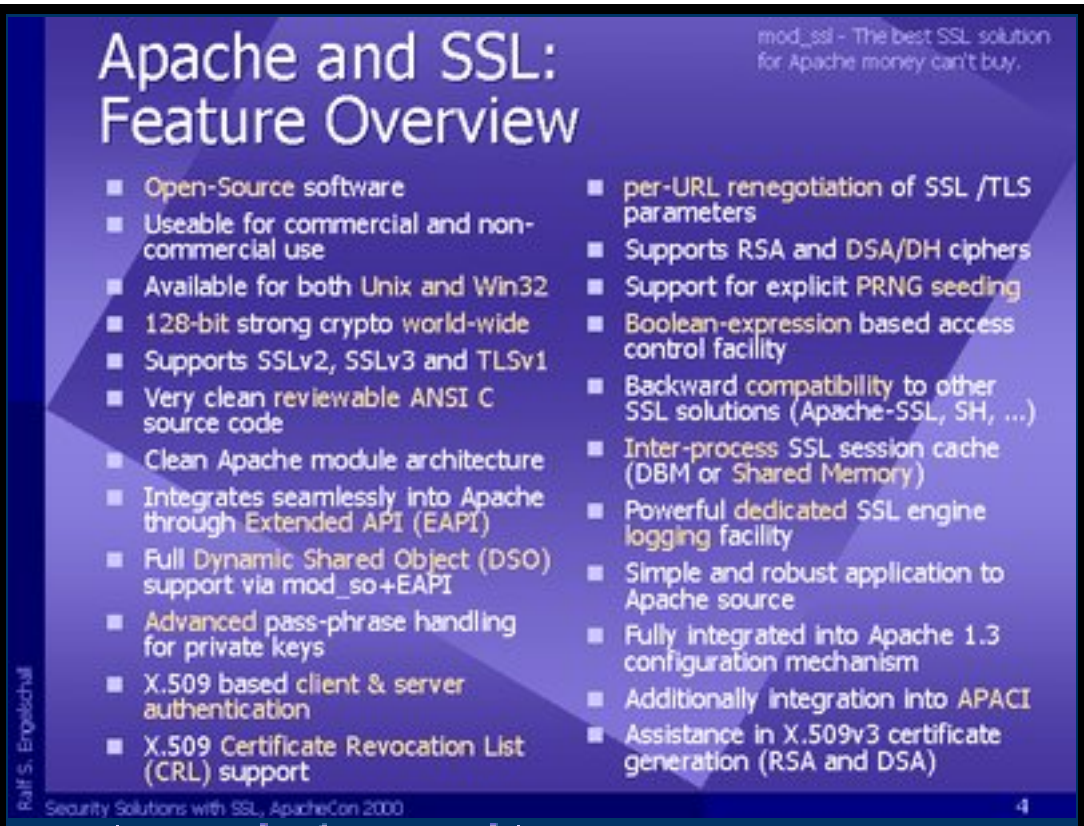
Apache and SSL:
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Open-Source software
Useable for commercial and non-commercial use
Available for both Unix and Win32
128-bit strong crypto world-wide
Supports SSLv2, SSLv3 and TLSv1
Very clean reviewable ANSI C source code
Clean Apache module architecture
Integrates seamlessly into Apache through Extended API (EAPI)
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Advanced pass-phrase handling for private keys
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Powerful dedicated SSL engine logging facility
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Fully integrated into Apache 1.3 configuration mechanism
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Apache and SSL: Package Architecture

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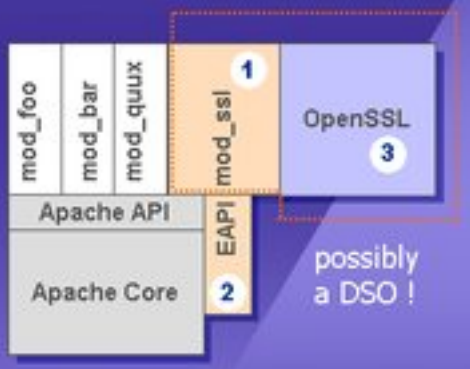

Apache instead of IIS - because software problems should not cost money.

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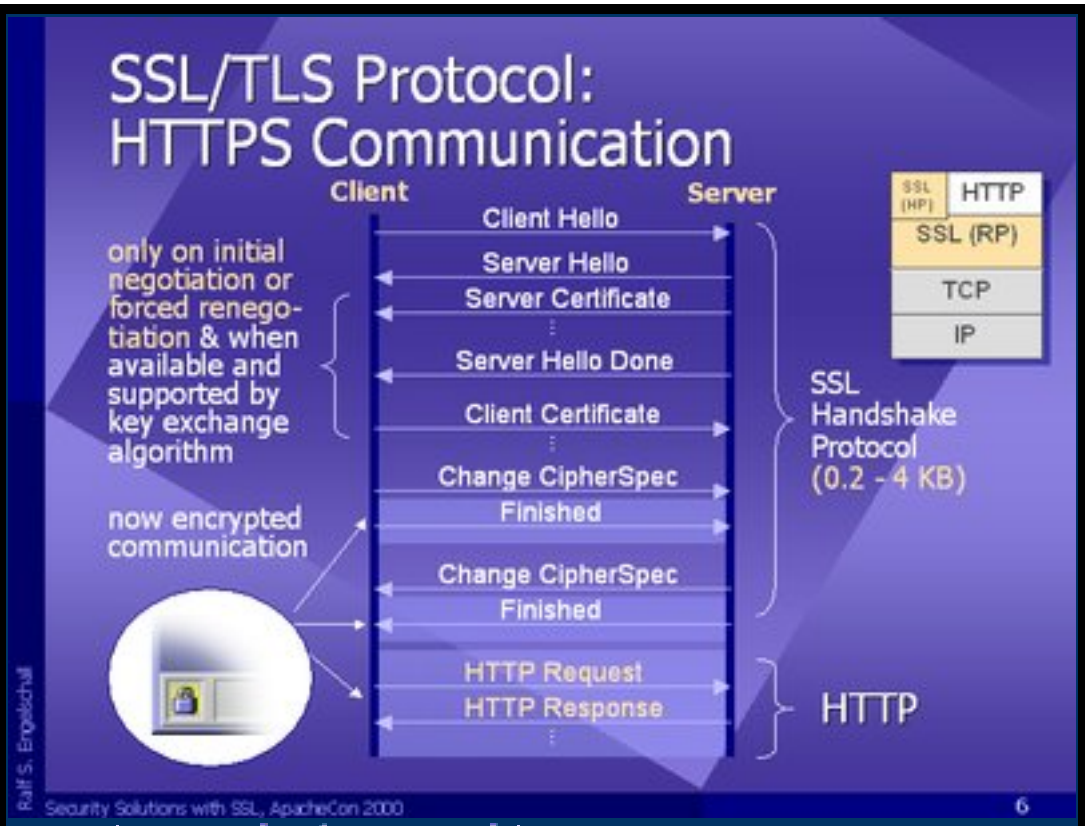

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Apache and SSL: Server Configuration Template

- Standard Setup:
  - HTTP on port 80
  - HTTPS on port 443
- Startup:
  - HTTP only:
    `$ httpd`
  - HTTP and HTTPS:
    `$ httpd -DSSL`
- All other following configuration snippets are additions or replacements to this configuration


```
# httpd.conf
  :
Port 80
  :
<IfDefine SSL>
  :
Listen          80
Listen          443
  :
SSLSessionCache dbm:run/ssl.scache
SSLMutex        file:run/ssl.mutex
SSLLog          log/ssl.log
SSLLogLevel     warn
  :
<VirtualHost _default_:443>
SSLEngine               on
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SSLCertificateKeyFile etc/server.key
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  :
</VirtualHost>
</IfDefine>
```

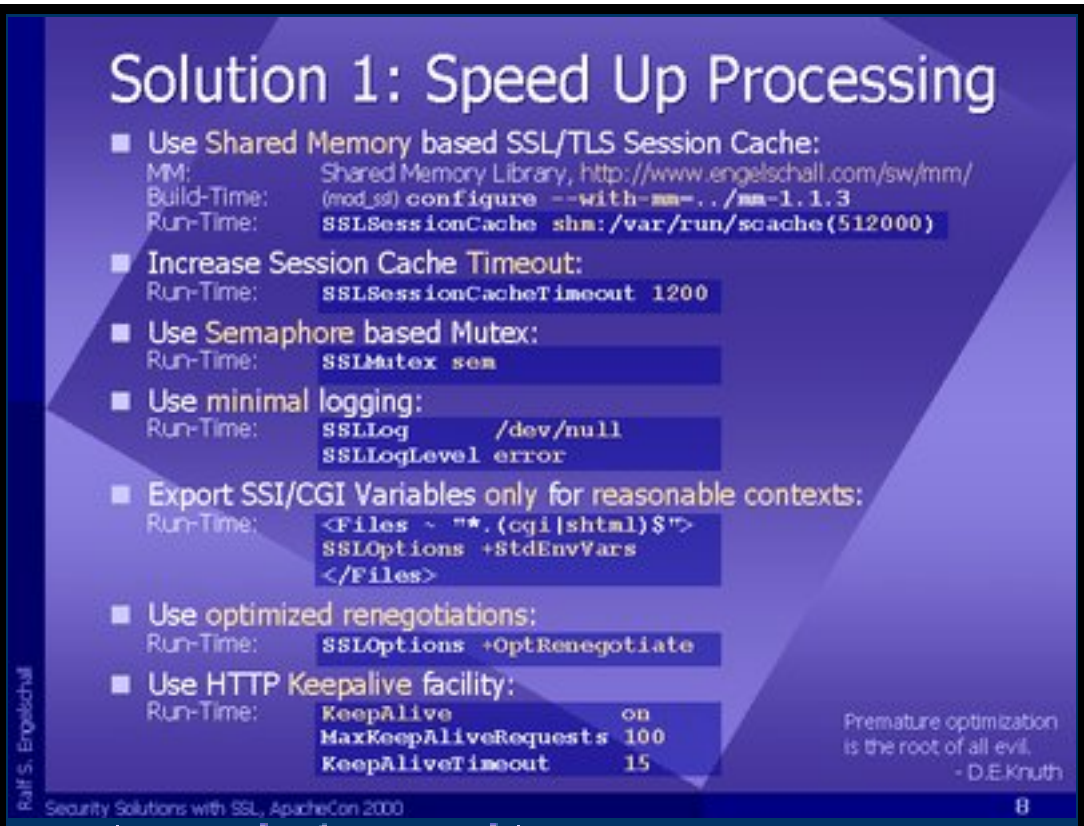
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Use Shared Memory based SSL/TLS Session Cache:
MM: Shared Memory Library, http://www.engelschall.com/sw/mm/
Build-Time: (mod_ssl) configure --with-mm=../mm-1.1.3
Run-Time: SSLSessionCache shm:/var/run/scache(512000)
Increase Session Cache Timeout:
Run-Time: SSLSessionCacheTimeout 1200
Use Semaphore based Mutex:
Run-Time: SSLMutex sem
Use minimal logging:
Run-Time: SSLLog /dev/null
SSLLogLevel error
Export SSI/CGI Variables only for reasonable contexts:
Run-Time: <Files ~ "*.(cgi|shtml)$">
SSLOptions +StdEnvVars
</Files>
Use optimized renegotiations:
Run-Time: SSLOptions +OptRenegotiate
Use HTTP Keepalive facility:
Run-Time: KeepAlive on
MaxKeepAliveRequests 100
KeepAliveTimeout 15
Premature optimization is the root of all evil.
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Solution 2a: Server Gated Cryptography (SGC)

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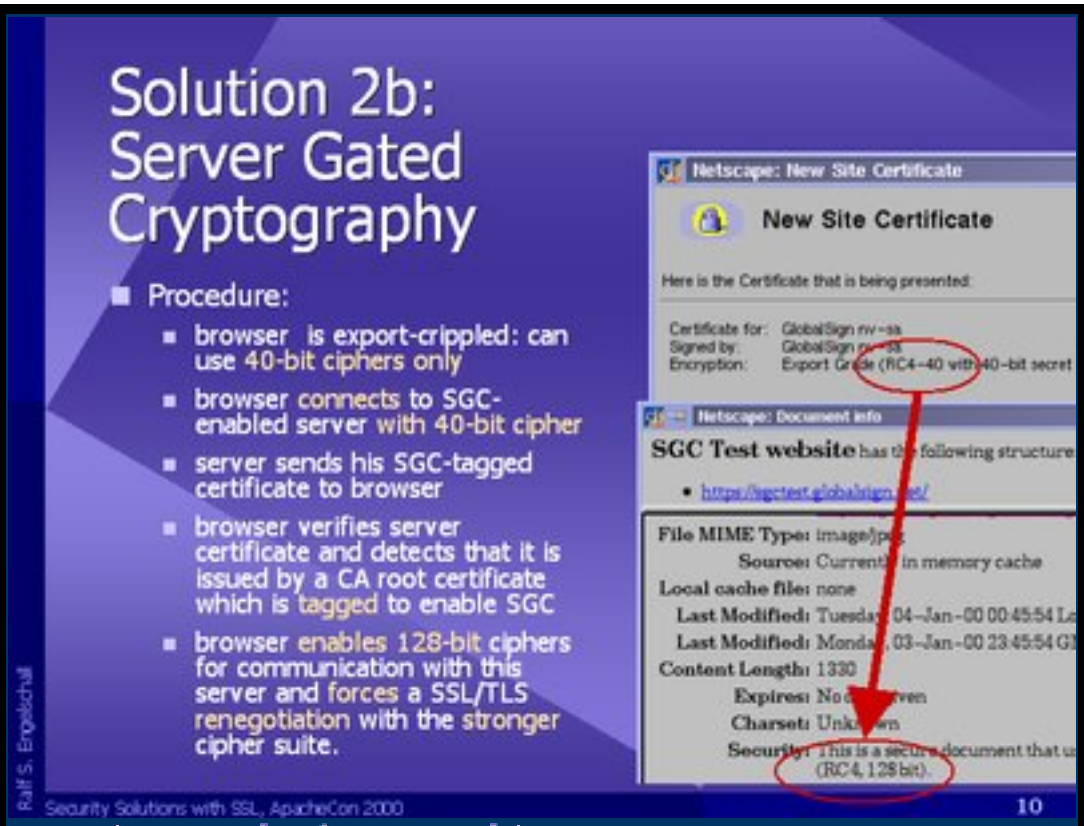
- Components:
  - root and intermediate CA certificates dedicated to SGC
  - root CA certificate built into browsers and specially tagged (Netscape: cert7.db, trustflags 0x018 → 0x0238)
  - all(!) certificates in chain contain extendedKeyUsage with objects:
    nsSGC (2.16.840.1.113730.4.1)
    msSGC (1.3.6.1.4.1.311.10.3.3)
- Configuration:

```
    :
SSLCertificateFile      etc/ssl.crt/server.crt
SSLCertificateChainFile etc/ssl.crt/ca-chain.crt
SSLCipherSuite          ALL:!ADH:+HIGH:+MEDIUM:+LOW:+EXP:+eNULL
SSLRequire              %{SSL_CIPHER_USEKEYSIZE} >= 128
    :
```


Solution 2b:
Server Gated
Cryptography
Procedure:
browser is export-crippled: can use 40-bit ciphers only
browser connects to SGC-enabled server with 40-bit cipher
server sends his SGC-tagged certificate to browser
browser verifies server certificate and detects that it is issued by a CA root certificate which is tagged to enable SGC
browser enables 128-bit ciphers for communication with this server and forces a SSL/TLS renegotiation with the stronger cipher suite.
Netscape: New Site Certificate
New Site Certificate
Here is the Certificate that is being presented:
Certificate for:
Signed by:
Encryption:
Netscape: Document Info
SGC Test website
File MIME Type:
Source:
Local cache file: none
Last Modified:
Last Modified:
Content Length: 1330
Expires:
Charset:
Security:
(RC4, 128 bit).
Ralf S. Engelschall
Security Solutions with SSL, ApacheCon 2000
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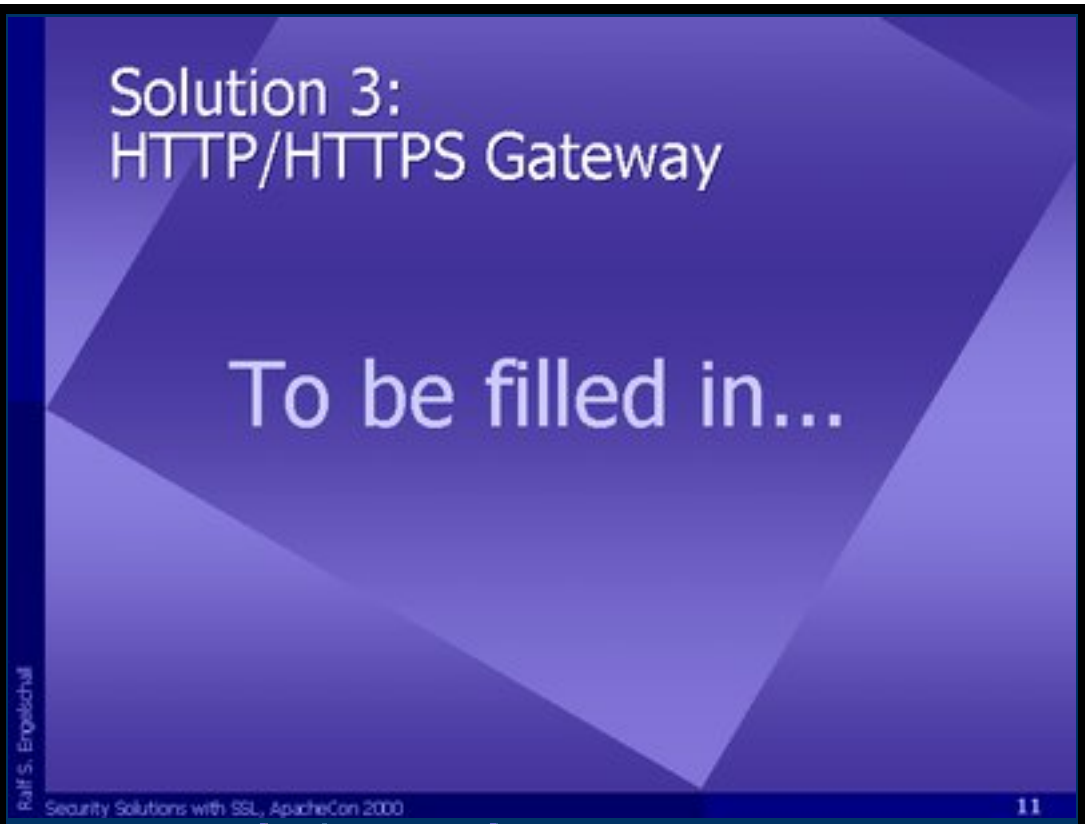

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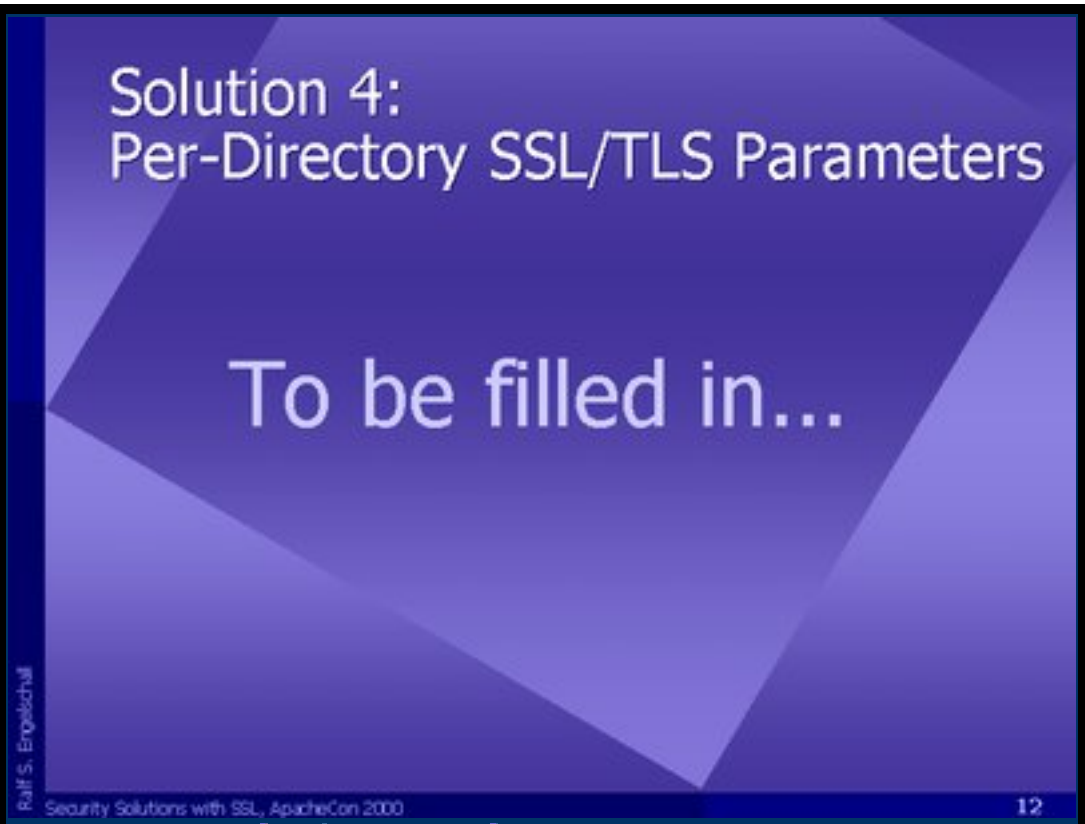
Solution 4:
Per-Directory SSL/TLS Parameters
To be filled in...
Ralf S. Engelschall
Security Solutions with SSL, ApacheCon 2000
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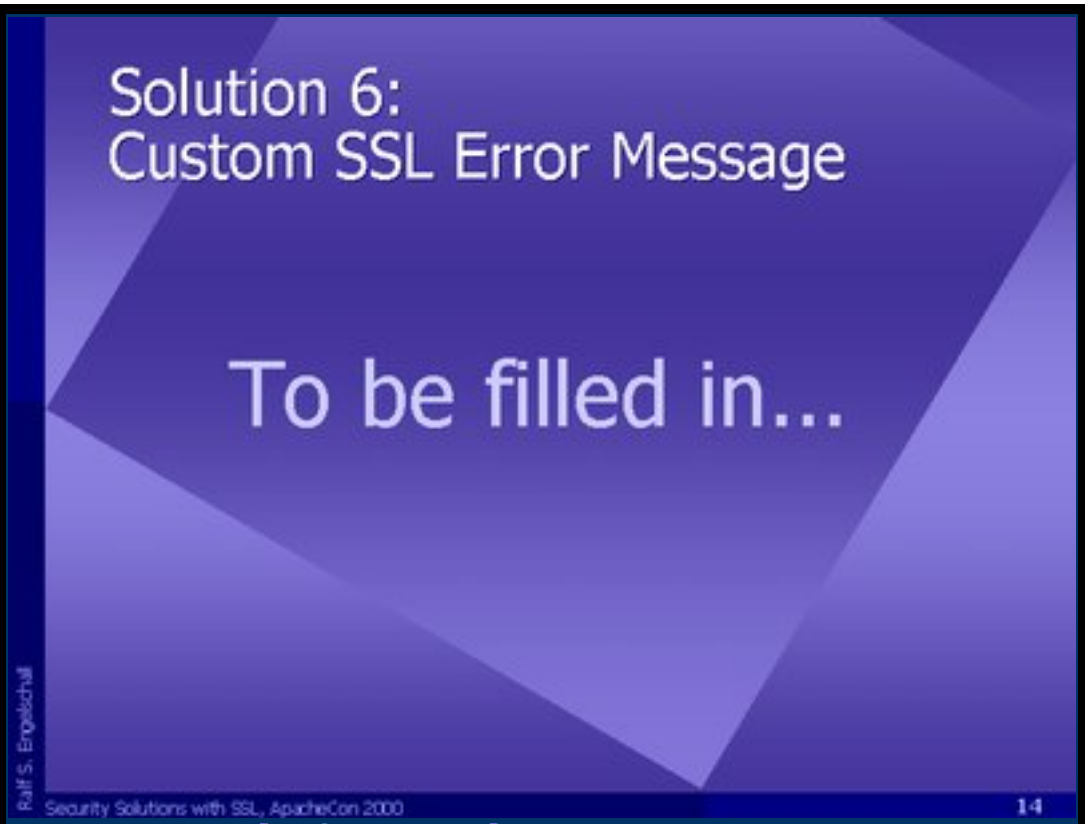

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Solution 7: Fine-Grained Client Authentication

- Use of boolean expressions to perform fine-grained client certificate based access authentication

```
# httpd.conf
    :
<VirtualHost _default_:443>
    :
SSLCACertificatePath /path/to/ssl.ca/
SSLVerifyClient      optional
SSLVerifyDepth       10
SSLRequireSSL
SSLRequire (    %{SSL_CIPHER} !~ m/^(EXP|NULL)-/                  \
           and %{SSL_CLIENT_S_DN_O} eq "Snake Oil, Ltd."          \
           and %{SSL_CLIENT_S_DN_OU} in { "Staff", "CA", "Dev"} \
           and %{TIME_WDAY} >= 1 and %{TIME_WDAY} <= 5            \
           and %{TIME_HOUR} >= 8 and %{TIME_HOUR} <= 20        ) \
          or %{REMOTE_ADDR} =~ m/^141\.1\.129\.[0-9]+$/
    :
</VirtualHost>
    :
```


Solution 8:
Certificate Revocation Lists (CRL)
To be filled in...
Ralf S. Engelschall
Security Solutions with SSL, ApacheCon 2000
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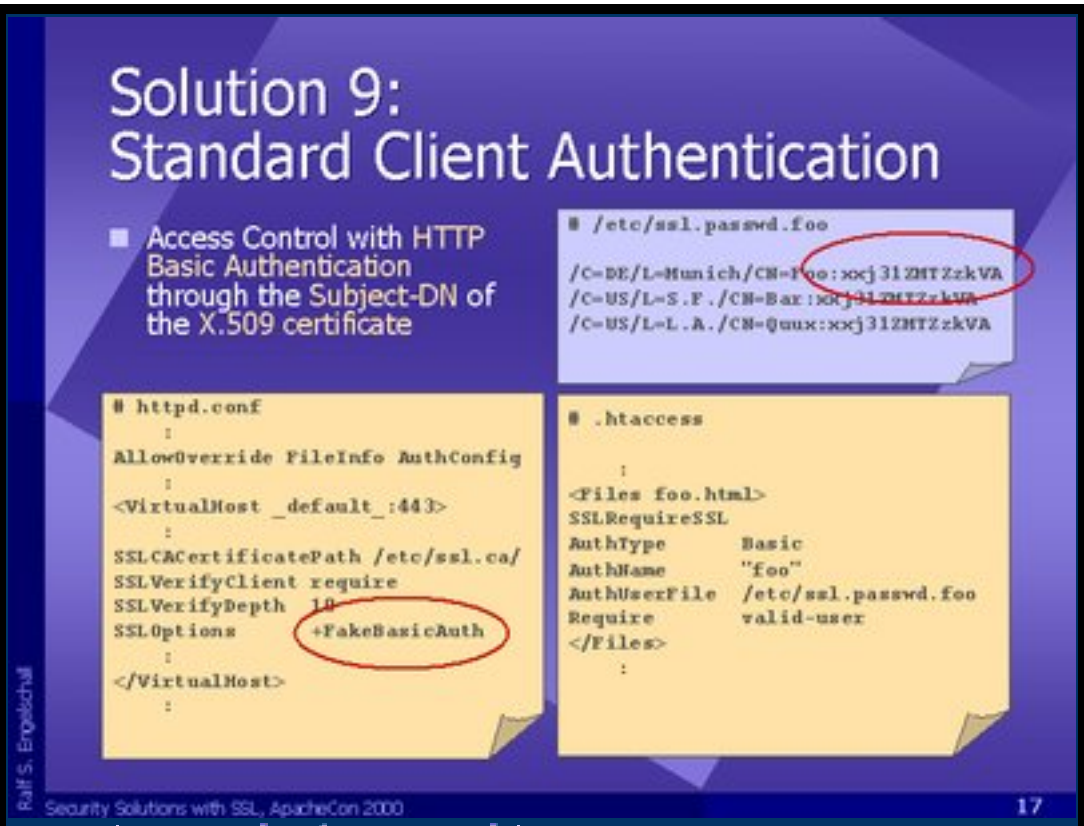

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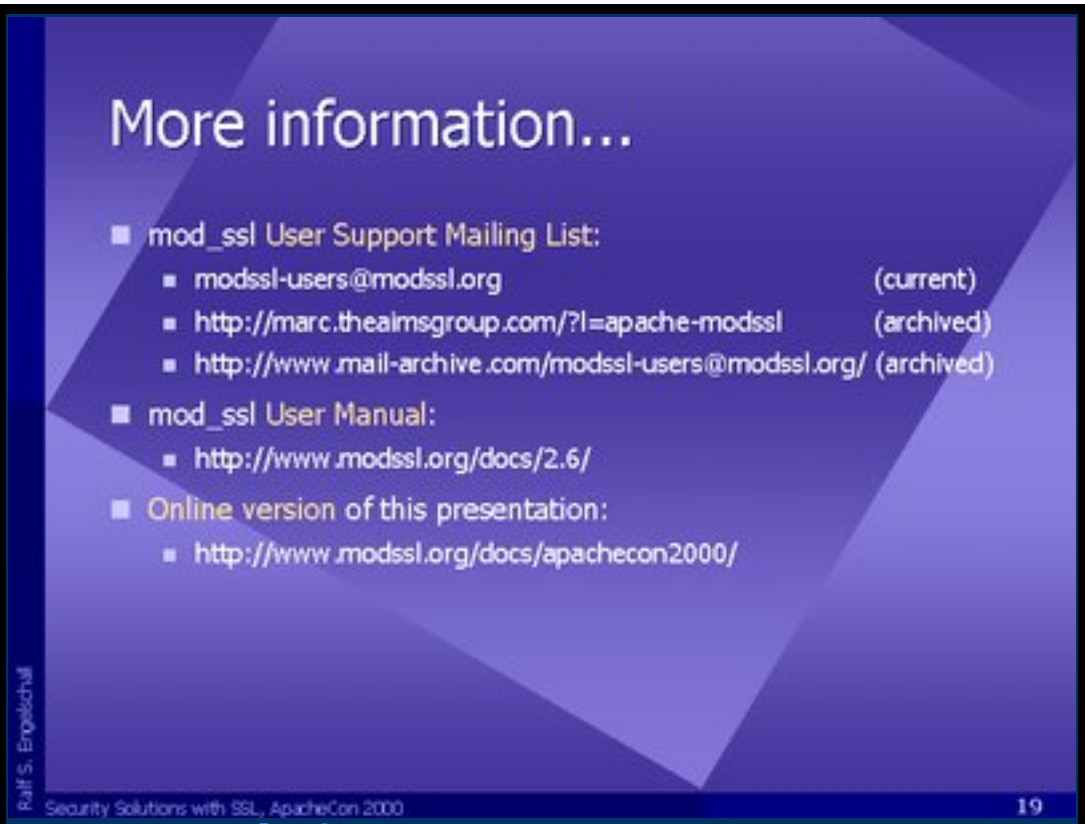
Solution 10: Using both RSA and DSA/DH

- RSA is was covered by patent, Data Signature Algorithm (DSA) and Diffie-Hellman (DH) Key Exchange was not.
- SSL/TLS provides both RSA and DSA/DH based ciphers and OpenSSL supports all.
- mod_ssl allows one to use all SSL/TLS ciphers if both RSA and DSA server certificates are available.
- Disadvantage: DSA/DH is still not supported by all current versions of popular browsers.

```
# httpd.conf
    :
<VirtualHost _default_:443>
    :
SSLCertificateFile    /etc/ssl.server-rsa.crt
SSLCertificateFile    /etc/ssl.server-dsa.crt
SSLCertificateKeyFile /etc/ssl.server-rsa.key
SSLCertificateKeyFile /etc/ssl.server-dsa.key
    :
</VirtualHost>
    :
```

There are two types of people in this world, good and bad. The good sleep better, but the bad seem to enjoy the waking hours much more.
Woody Allen



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Security Solutions with SSL

Selected security solutions for the Apache webserver, based on the SSL/TLS protocol

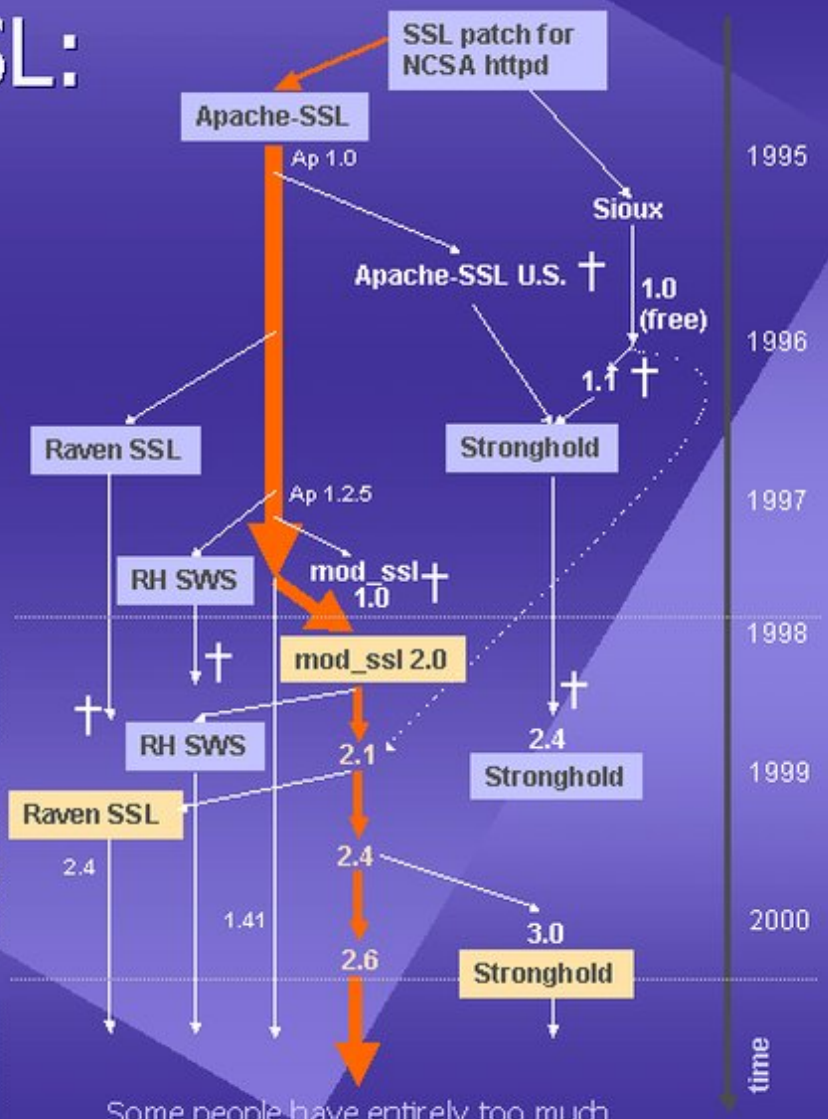
M21 APACHECON 2000

Mon, 23 Oct 2000 18:30-20:00

Ralf S. Engelschall

Apache and SSL: The Evolution

- mod_ssl is the canonical Open Source SSL/TLS solution for Apache.
- mod_ssl is originally derived from Apache-SSL and based on the functionality of OpenSSL.
- mod_ssl is written and maintained in Germany, distributed from Switzerland:
  - http://www.modssl.org/
  - ftp://ftp.modssl.org/
- Package Source Size Overview:
  - Apache: 80.000 LoC, 6 MB
  - mod_ssl: 11.000 LoC, 3 MB
  - OpenSSL: 180.000 LoC, 12 MB
- mod_ssl User Community:
  - 900 modssl-users
  - 200.000 Installations
  - 1,100.000 Domains



Some people have entirely too much free time on their hands. - Gene Spafford

Apache and SSL: Installation Illustration

Seek simplicity,
but distrust it.
- A. N. Whitehead

```
$ gunzip <apache_1.3.12.tar.gz         | tar xf -
$ gunzip <mod_ssl-2.6.6-1.3.12.tar.gz | tar xf -
$ gunzip <openssl-0.9.5a.tar.gz        | tar xf -

$ cd openssl-0.9.5a
$ ./config
$ make

$ cd ../mod_ssl-2.6.6
$ ./configure --with-apache=../apache_1.3.12 \
              --with-ssl=../openssl-0.9.5a \
              --prefix=/usr/local/apache

$ cd ../apache_1.3.12
$ make
$ make certificate TYPE=dummy
$ make install

$ /usr/local/apache/bin/httpd -DSSL
$ netscape https://localhost/
```

1. extract sources
2. build OpenSSL
3. apply mod_ssl to Apache source tree and configure it
4. build and install Apache plus mod_ssl
5. test the server!

file:///C|/APACHE~1/PROCEE~1/M21/AC2K-RSE/slide-003-l.html [9/23/2000 4:56:56 PM]

Apache and SSL: Feature Overview

mod_ssl - The best SSL solution for Apache money can't buy.

- Open-Source software
- Useable for commercial and non-commercial use
- Available for both Unix and Win32
- 128-bit strong crypto world-wide
- Supports SSLv2, SSLv3 and TLSv1
- Very clean reviewable ANSI C source code
- Clean Apache module architecture
- Integrates seamlessly into Apache through Extended API (EAPI)
- Full Dynamic Shared Object (DSO) support via mod_so+EAPI
- Advanced pass-phrase handling for private keys
- X.509 based client & server authentication
- X.509 Certificate Revocation List (CRL) support
- per-URL renegotiation of SSL /TLS parameters
- Supports RSA and DSA/DH ciphers
- Support for explicit PRNG seeding
- Boolean-expression based access control facility
- Backward compatibility to other SSL solutions (Apache-SSL, SH, ...)
- Inter-process SSL session cache (DBM or Shared Memory)
- Powerful dedicated SSL engine logging facility
- Simple and robust application to Apache source
- Fully integrated into Apache 1.3 configuration mechanism
- Additionally integration into APACI
- Assistance in X.509v3 certificate generation (RSA and DSA)

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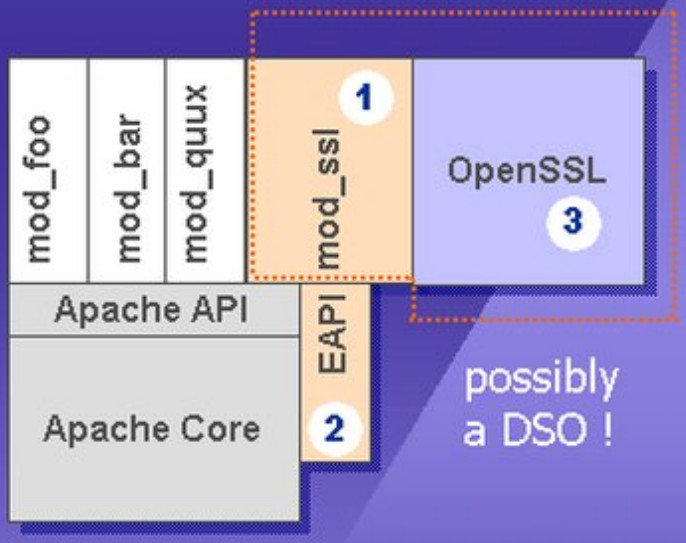
Apache and SSL: Package Architecture

- mod_ssl is...
  1. an Apache 1.3 API conforming module (basic functionality)
  2. a source patch for the Extended API (additional hooks)
  3. An SSL/TLS implementation library: OpenSSL
- mod_ssl+OpenSSL can be also built as a DSO (APACI: --enable-shared=ssl)



Apache instead of IIS - because software problems should not cost money.

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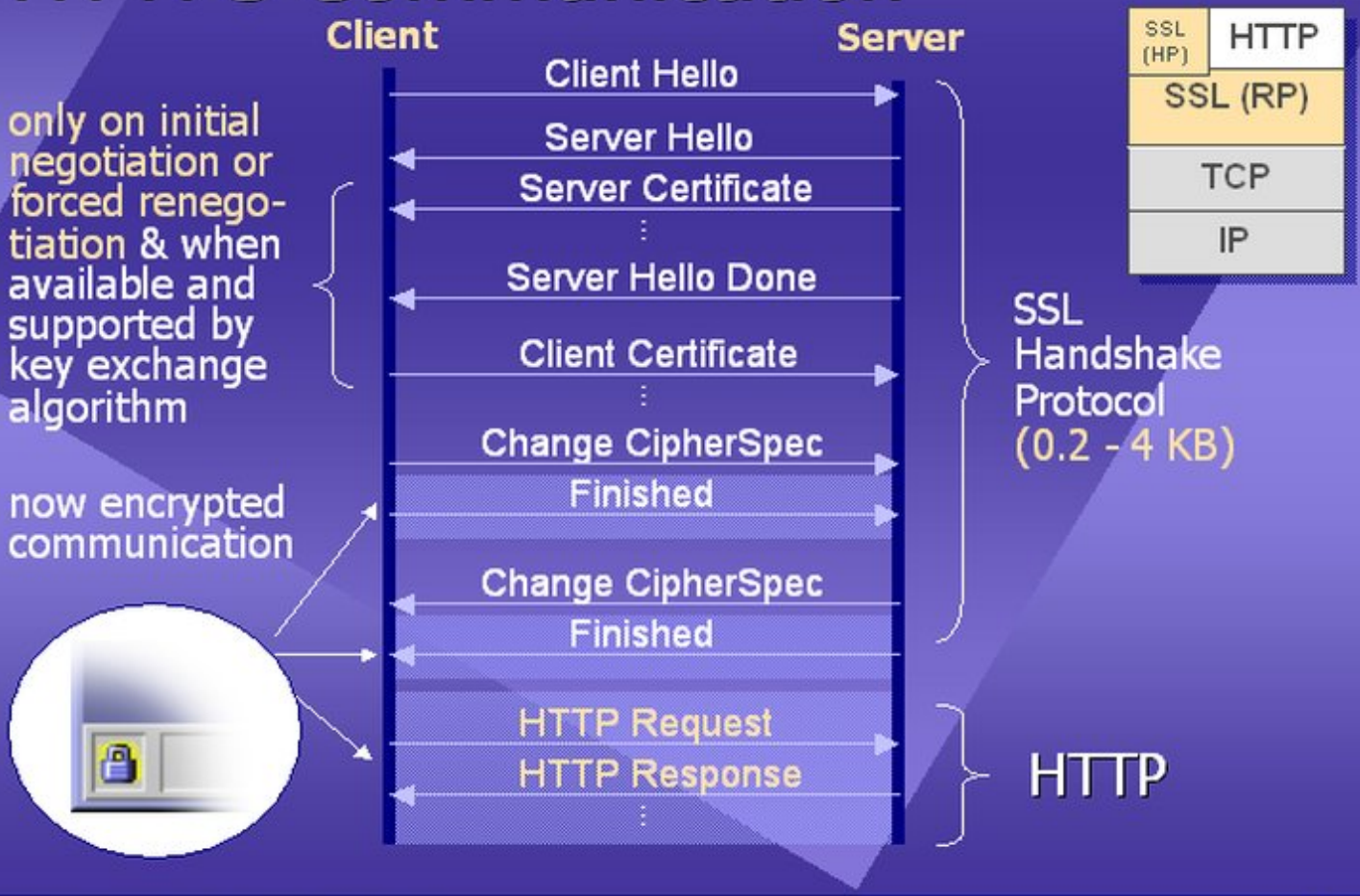
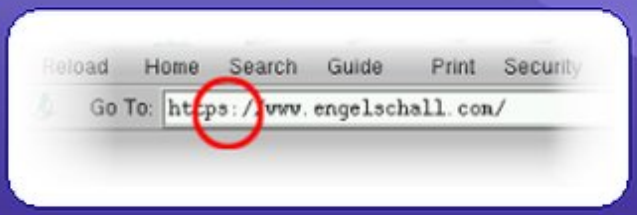
SSL/TLS Protocol: HTTPS Communication



Apache and SSL: Server Configuration Template

- Standard Setup:
  - HTTP on port 80
  - HTTPS on port 443
- Startup:
  - HTTP only:
    ```
    $ httpd
    ```
  - HTTP and HTTPS:
    ```
    $ httpd -DSSL
    ```
- All other following configuration snippets are additions or replacements to this configuration




```
# httpd.conf
  :
Port 80
  :
<IfDefine SSL>
  :
Listen          80
Listen          443
  :
SSLSessionCache dbm:run/ssl.scache
SSLMutex        file:run/ssl.mutex
SSLLog          log/ssl.log
SSLLogLevel     warn
  :
<VirtualHost _default_:443>
SSLEngine               on
SSLCertificateFile      etc/server.crt
SSLCertificateKeyFile   etc/server.key
SSLVerifyClient         none
  :
</VirtualHost>
</IfDefine>
```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Solution 1: Speed Up Processing

- Use Shared Memory based SSL/TLS Session Cache:
  MM: Shared Memory Library, http://www.engelschall.com/sw/mm/
  Build-Time: (mod_ssl) `configure --with-mm=../mm-1.1.3`
  Run-Time:
  ```
  SSLSessionCache shm:/var/run/scache(512000)
  ```
- Increase Session Cache Timeout:
  Run-Time:
  ```
  SSLSessionCacheTimeout 1200
  ```
- Use Semaphore based Mutex:
  Run-Time:
  ```
  SSLMutex sem
  ```
- Use minimal logging:
  Run-Time:
  ```
  SSLLog      /dev/null
  SSLLogLevel error
  ```
- Export SSI/CGI Variables only for reasonable contexts:
  Run-Time:
  ```
  <Files ~ "*.(cgi|shtml)$">
  SSLOptions +StdEnvVars
  </Files>
  ```
- Use optimized renegotiations:
  Run-Time:
  ```
  SSLOptions +OptRenegotiate
  ```
- Use HTTP Keepalive facility:
  Run-Time:
  ```
  KeepAlive             on
  MaxKeepAliveRequests  100
  KeepAliveTimeout      15
  ```

Premature optimization is the root of all evil.
- D.E.Knuth

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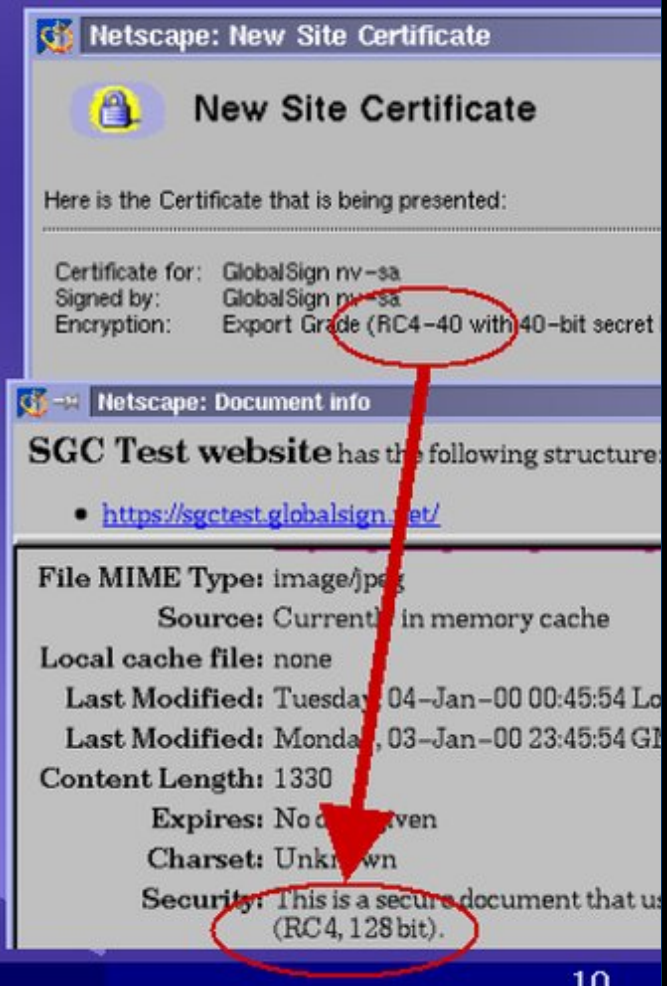
Solution 2a: Server Gated Cryptography (SGC)

- SGC is the mechanism behind Verisign Global-ID, Thawte SuperCert, GlobalSign HyperSign128, etc.
- SGC is the reason why Fortify worked at all ;-)
- Requirements:
  - mod_ssl ≥ 2.1.3 (for reneg.)
  - OpenSSL ≥ 0.9.5 (for msSGC)
- Components:
  - root and intermediate CA certificates dedicated to SGC
  - root CA certificate built into browsers and specially tagged (Netscape: cert7.db, trustflags 0x018 → 0x0238)
  - all(!) certificates in chain contain extendedKeyUsage with objects:
    nsSGC (2.16.840.1.113730.4.1)
    msSGC (1.3.6.1.4.1.311.10.3.3)
- Configuration:

```
    :
SSLCertificateFile      etc/ssl.crt/server.crt
SSLCertificateChainFile etc/ssl.crt/ca-chain.crt
SSLCipherSuite          ALL:!ADH:+HIGH:+MEDIUM:+LOW:+EXP:+eNULL
SSLRequire              %{SSL_CIPHER_USEKEYSIZE} >= 128
    :
```

Solution 2b: Server Gated Cryptography

- Procedure:
  - browser is export-crippled: can use 40-bit ciphers only
  - browser connects to SGC-enabled server with 40-bit cipher
  - server sends his SGC-tagged certificate to browser
  - browser verifies server certificate and detects that it is issued by a CA root certificate which is tagged to enable SGC
  - browser enables 128-bit ciphers for communication with this server and forces a SSL/TLS renegotiation with the stronger cipher suite.



Solution 3: HTTP/HTTPS Gateway

To be filled in...

Solution 4: Per-Directory SSL/TLS Parameters

To be filled in...

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Solution 5: Internet/Intranet Access

To be filled in...

Solution 6: Custom SSL Error Message

To be filled in...

file:///C|/APACHE~1/PROCEE~1/M21/AC2K-RSE/slide-014-l.html [9/23/2000 4:57:29 PM]

Solution 7: Fine-Grained Client Authentication

- Use of boolean expressions to perform fine-grained client certificate based access authentication

```
# httpd.conf
    :
<VirtualHost _default_:443>
    :
SSLCACertificatePath /path/to/ssl.ca/
SSLVerifyClient      optional
SSLVerifyDepth       10
SSLRequireSSL
SSLRequire (    %{SSL_CIPHER} !~ m/^(EXP|NULL)-/                  \
           and %{SSL_CLIENT_S_DN_O} eq "Snake Oil, Ltd."          \
           and %{SSL_CLIENT_S_DN_OU} in { "Staff", "CA", "Dev" } \
           and %{TIME_WDAY} >= 1 and %{TIME_WDAY} <= 5            \
           and %{TIME_HOUR} >= 8 and %{TIME_HOUR} <= 20        ) \
          or %{REMOTE_ADDR} =~ m/^141\.1\.129\.[0-9]+$/
    :
</VirtualHost>
    :
```


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Solution 8: Certificate Revocation Lists (CRL)

To be filled in...

Solution 9: Standard Client Authentication

- Access Control with HTTP Basic Authentication through the Subject-DN of the X.509 certificate

```
# /etc/ssl.passwd.foo

/C=DE/L=Munich/CN=Foo:xxj31ZMTZzkVA
/C=US/L=S.F./CN=Bar:xxj31ZMTZzkVA
/C=US/L=L.A./CN=Quux:xxj31ZMTZzkVA
```

```
# httpd.conf
    :
AllowOverride FileInfo AuthConfig
    :
<VirtualHost _default_:443>
    :
SSLCACertificatePath /etc/ssl.ca/
SSLVerifyClient require
SSLVerifyDepth  10
SSLOptions      +FakeBasicAuth
    :
</VirtualHost>
    :
```

```
# .htaccess

    :
<Files foo.html>
SSLRequireSSL
AuthType        Basic
AuthName        "foo"
AuthUserFile    /etc/ssl.passwd.foo
Require         valid-user
</Files>
    :
```


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Solution 10: Using both RSA and DSA/DH

- RSA is was covered by patent, Data Signature Algorithm (DSA) and Diffie-Hellman (DH) Key Exchange was not.
- SSL/TLS provides both RSA and DSA/DH based ciphers and OpenSSL supports all.
- mod_ssl allows one to use all SSL/TLS ciphers if both RSA and DSA server certificates are available.
- Disadvantage: DSA/DH is still not supported by all current versions of popular browsers.

```
# httpd.conf
    :
<VirtualHost _default_:443>
    :
SSLCertificateFile      /etc/ssl.server-rsa.crt
SSLCertificateFile      /etc/ssl.server-dsa.crt
SSLCertificateKeyFile /etc/ssl.server-rsa.key
SSLCertificateKeyFile /etc/ssl.server-dsa.key
    :
</VirtualHost>
    :
```

There are two types of people in this world, good and bad. The good sleep better, but the bad seem to enjoy the waking hours much more.

Woody Allen

file:///C|/APACHE~1/PROCEE~1/M21/AC2K-RSE/slide-018-l.html [9/23/2000 4:57:43 PM]