Networking Roadmap

Layer	Protocols
7. Application	Web security
4.5. Secure transport	TLS
4. Transport	TCP, UDP
3. Internet	IP
2. Link	
1. Physical	

You are here

Extra protocols

	Protocols
Connect for the first time	DHCP
Convert hostname to IP address	DNS, DNSSEC

Secure Channels

Applying crypto technology in practice

- Two simple abstractions cover 80% of the use cases for crypto:
  - “Sealed blob”: Data that is encrypted and authenticated under a particular key (“object security”)
  - Secure channel: Communication channel that can’t be eavesdropped on or tampered with (“channel security”)
- TLS – a secure channel

Building Secure End-to-End Channels

- End-to-end = communication protections achieved all the way from originating client to intended server
  - With no need to trust intermediaries
- Dealing with threats:
  - Eavesdropping: Encryption (including session keys)
  - Manipulation (injection, MITM): Integrity (use of a MAC); replay protection
  - Impersonation: Signatures

(What's missing?
Availability …)

Building A Secure End-to-End Channel: SSL/TLS

- SSL = Secure Sockets Layer (predecessor)
- TLS = Transport Layer Security (standard)
  - Both terms used interchangeably
- Security for any application that uses TCP
  - Secure = encryption/confidentiality + integrity + authentication (of server, but not of client)
- Multiple uses
  - Puts the ‘s’ in “https”
  - Secures mail sent between servers (STARTTLS)
  - Virtual Private Networks

Secure Channels

CS 161: Computer Security

Prof. Raluca Ada Popa

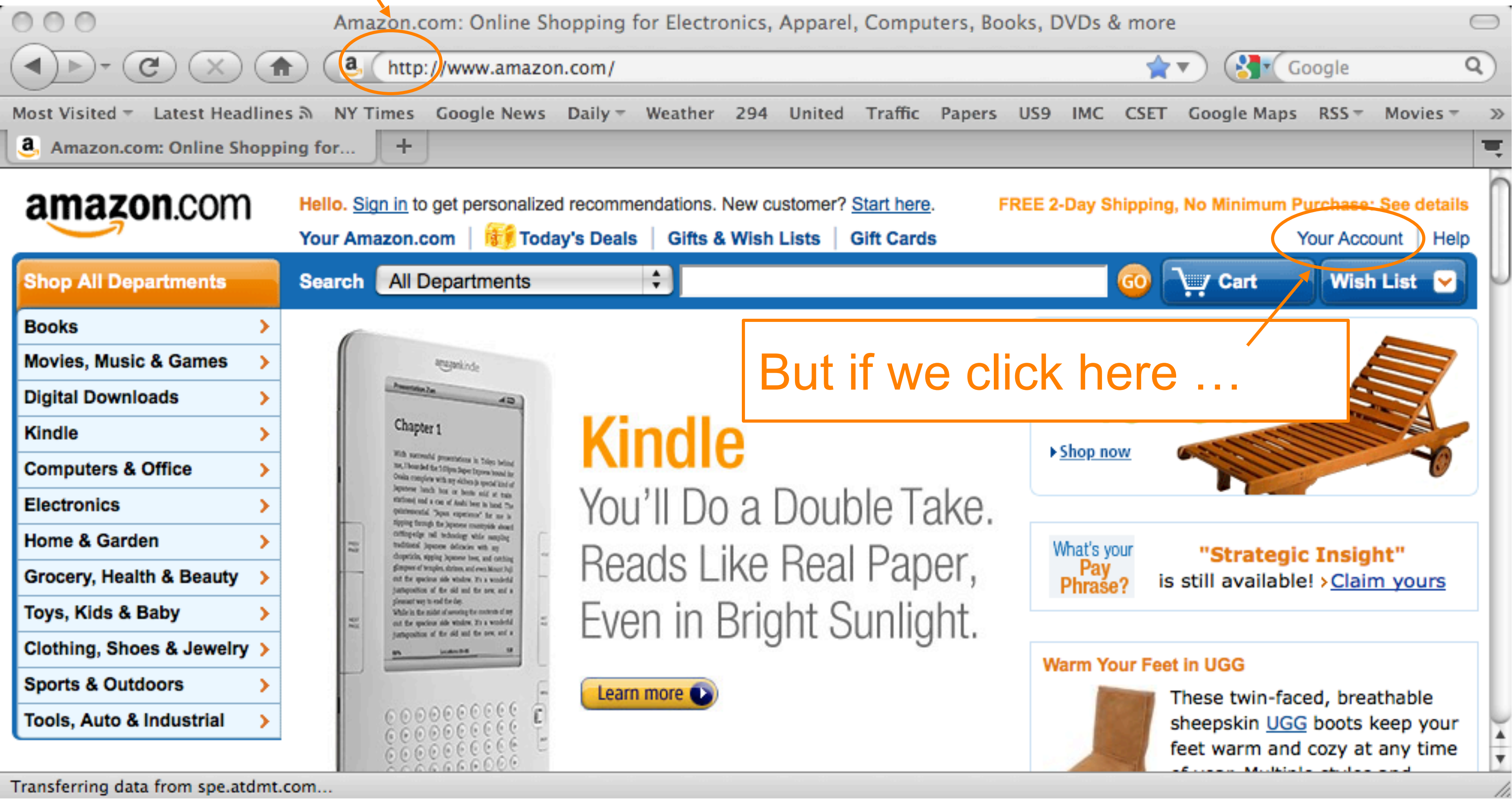
March 30, 2020

Some slides credit David Wagner

Building A Secure End-to-End Channel: TLS

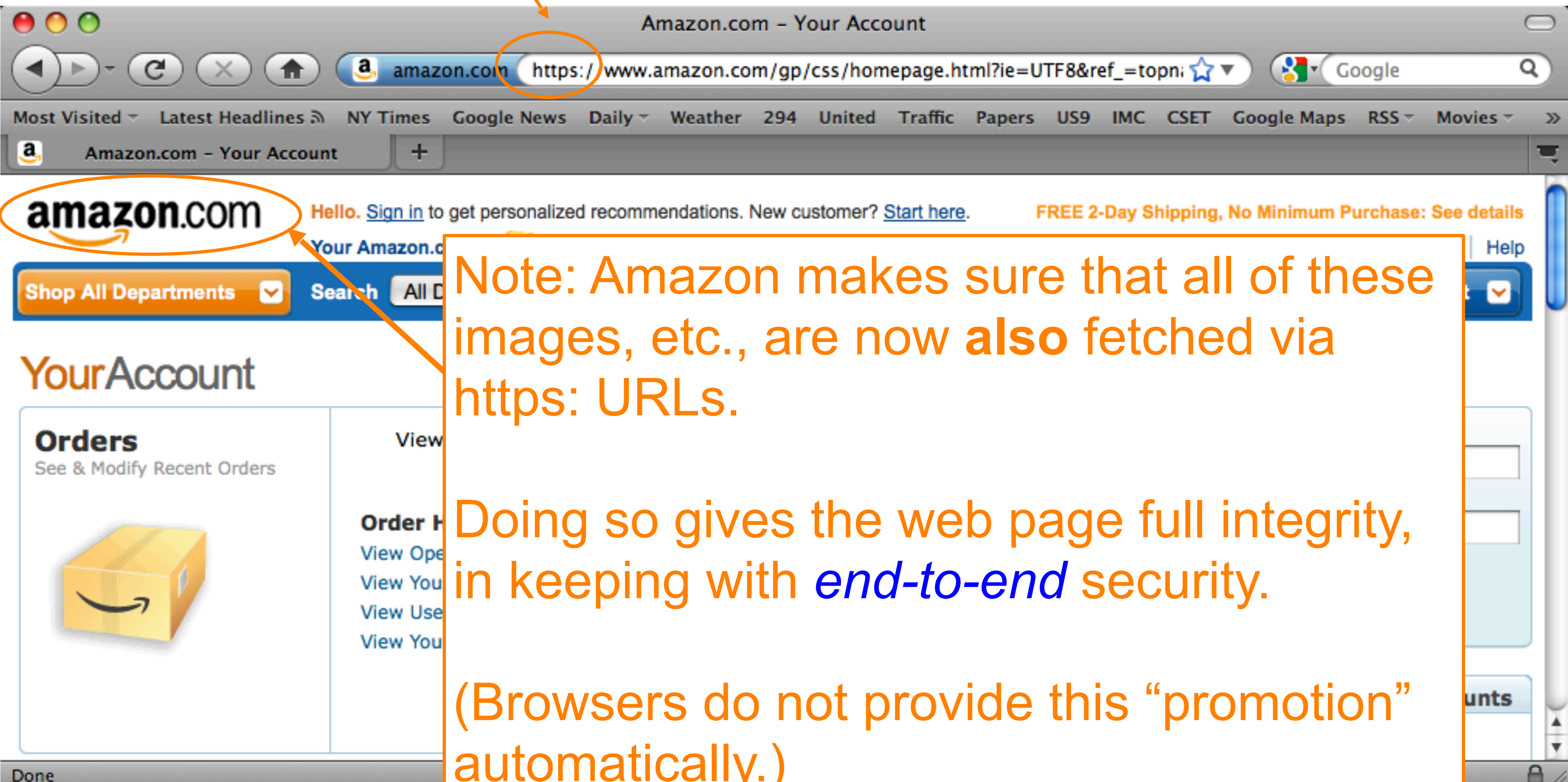
- TLS = *Transport Layer Security*
- Secure channel for applications that use TCP
  - Secure = encryption/confidentiality + integrity + authentication (of server, but *not* of client)
  - E.g., puts the ‘s’ in “https”

Regular web surfing - http: URL



But if we click here …

Web surfing with TLS - https: URL



Note: Amazon makes sure that all of these images, etc., are now **also** fetched via https: URLs.

Doing so gives the web page full integrity, in keeping with *end-to-end* security.

(Browsers do not provide this “promotion” automatically.)

RSA Encryption

We saw RSA in class as a digital signature scheme, but it can also be used as a public-key encryption algorithm:

- The encrypt algorithm is similar to the verify algorithm, and the decrypt similar to the sign algorithm
- Small differences: encrypt the message with special padding, instead of signing a hash of the message

HTTPS Connection (TLS)

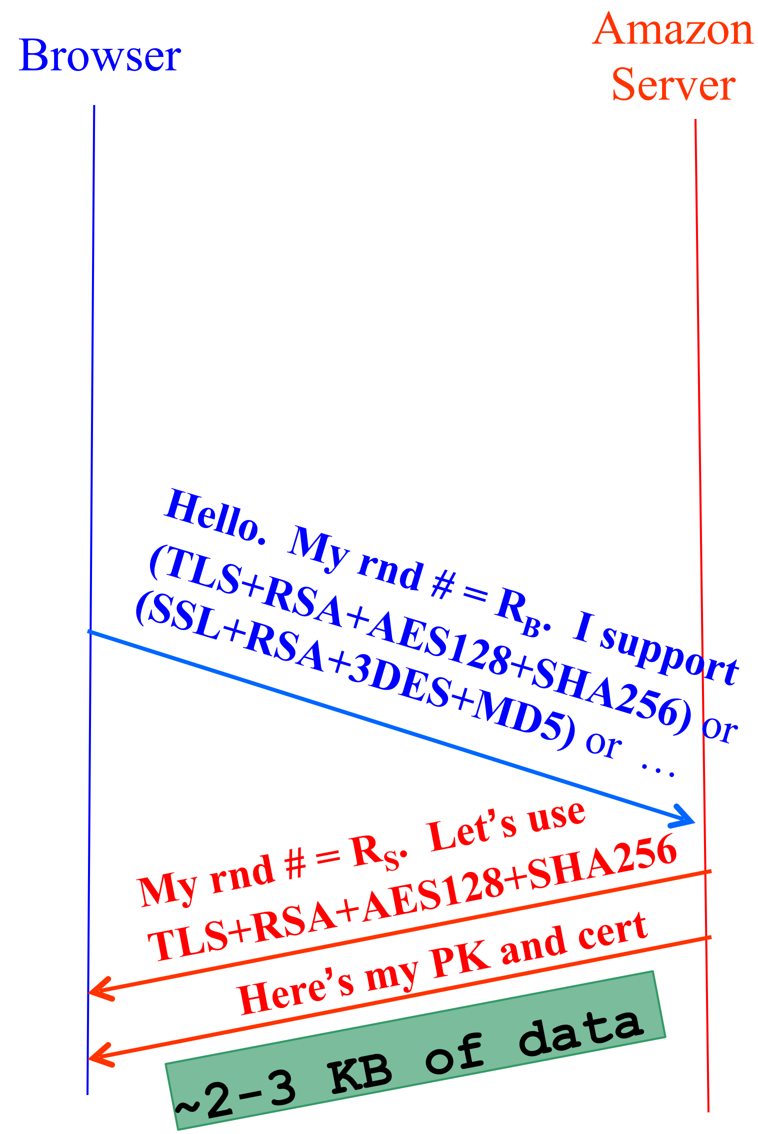
1. Suppose a browser (client) connects to a server which returns a certificate from a trusted CA
2. Client browser and server will exchange symmetric keys using TLS
3. Then, they will send encrypted & authenticated traffic to each other

`HTTPS` Connection (SSL / TLS)

- Browser (client) connects to Amazon's **`HTTPS`** server
- Client picks 256-bit random number R_B, sends over list of crypto algorithms it supports
- Server picks 256-bit random number R_S, selects algorithms to use for this session
- Server sends over its certificate with its PK_{Amazon}

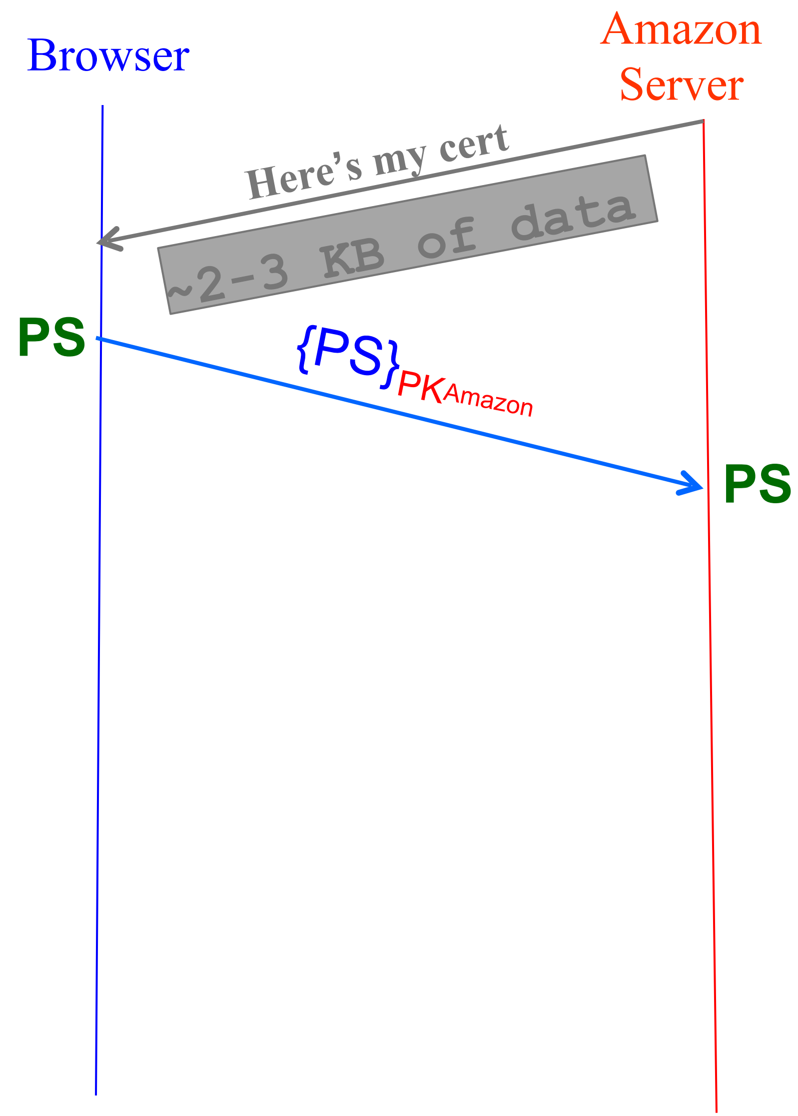
(all of this is in the clear)

- ***Client now validates cert***



`HTTPS` Connection (SSL / TLS), cont.

- For RSA, browser constructs "Premaster Secret" **PS**
- Browser sends PS encrypted using Amazon's public RSA key PK_{Amazon}
- Using PS, R_B, and R_S, browser & server derive symm. *cipher keys* (C_B, C_S) & MAC *integrity keys* (I_B, I_S)
  - One pair to use in each direction



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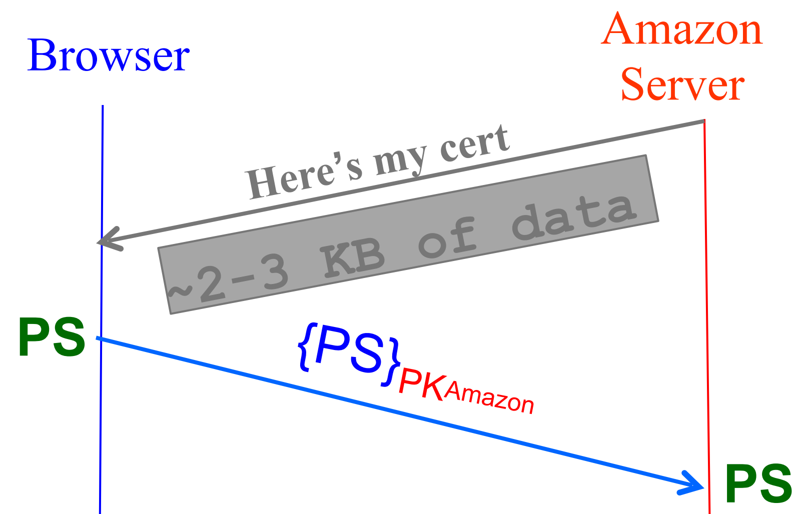
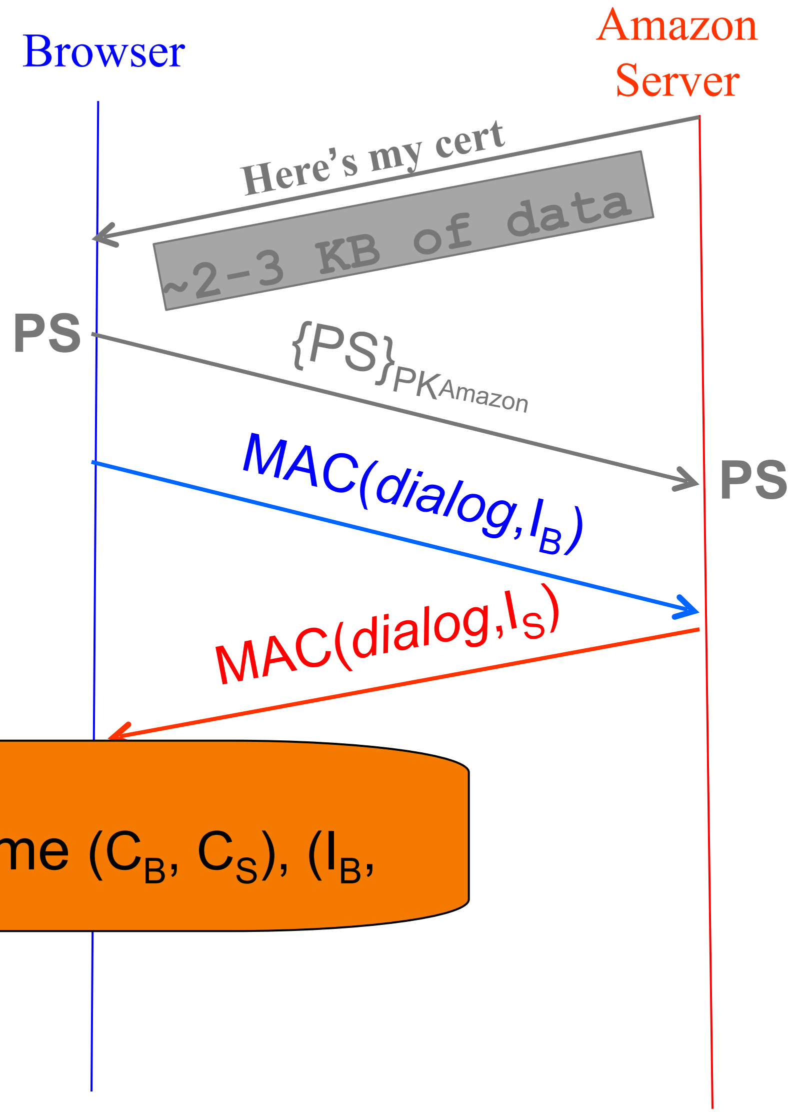


These seed a cryptographically strong pseudo-random number generator (PRNG).
Q: why R_B and R_S?
A: prevents a replay attack, attacker captures handshake from either the client or server and replays it. Why not only one of them? You don't need to check for reuse by the other side... just make sure you don't reuse it on your side!

`HTTPS` Connection (SSL / TLS), cont.

- For RSA, browser constructs "Premaster Secret" **PS**
- Browser sends PS encrypted using Amazon's public RSA key PK_{Amazon}
- Using PS, R_B, and R_S, browser & server derive symm. *cipher keys* (C_B, C_S) & MAC *integrity keys* (I_B, I_S)
  - One pair to use in each direction
- Browser & server exchange MACs computed over entire dialog so far

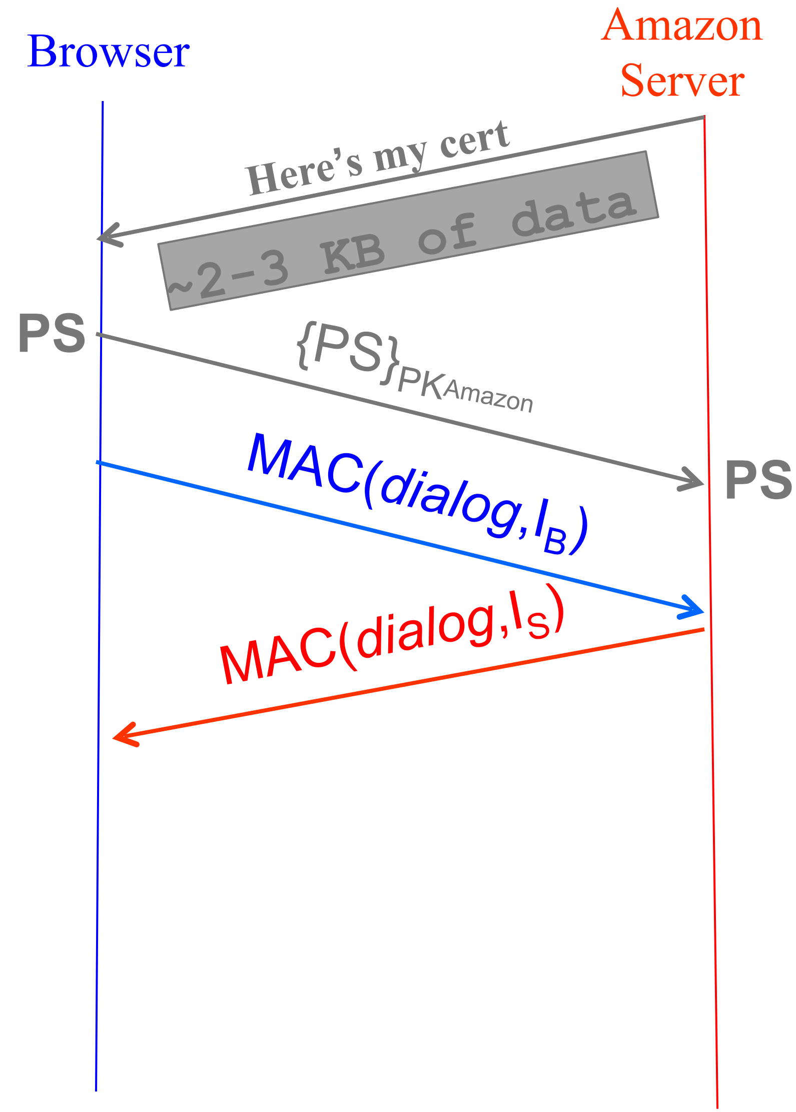


Q: Why?

A: So they know they have the same (C_B, C_S), (I_B, I_S)

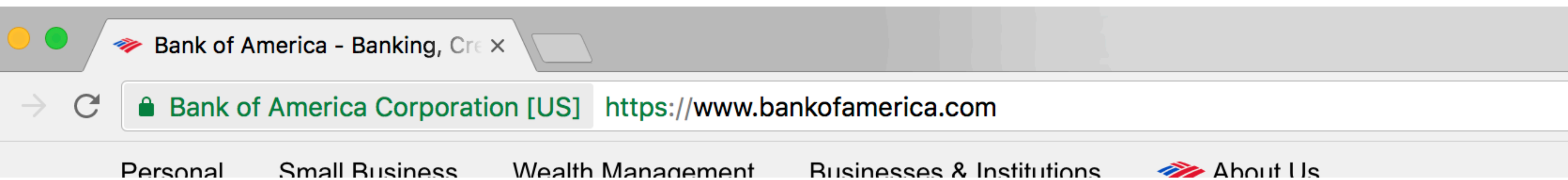
`HTTPS` Connection (SSL / TLS), cont.

- For RSA, browser constructs "Premaster Secret" **PS**
- Browser sends PS encrypted using Amazon's public RSA key PK_{Amazon}
- Using PS, R_B, and R_S, browser & server derive symm. *cipher keys* (C_B, C_S) & MAC *integrity keys* (I_B, I_S)
  - One pair to use in each direction
- Browser & server exchange MACs computed over entire dialog so far
- If good MAC, browser displays



On Firefox:

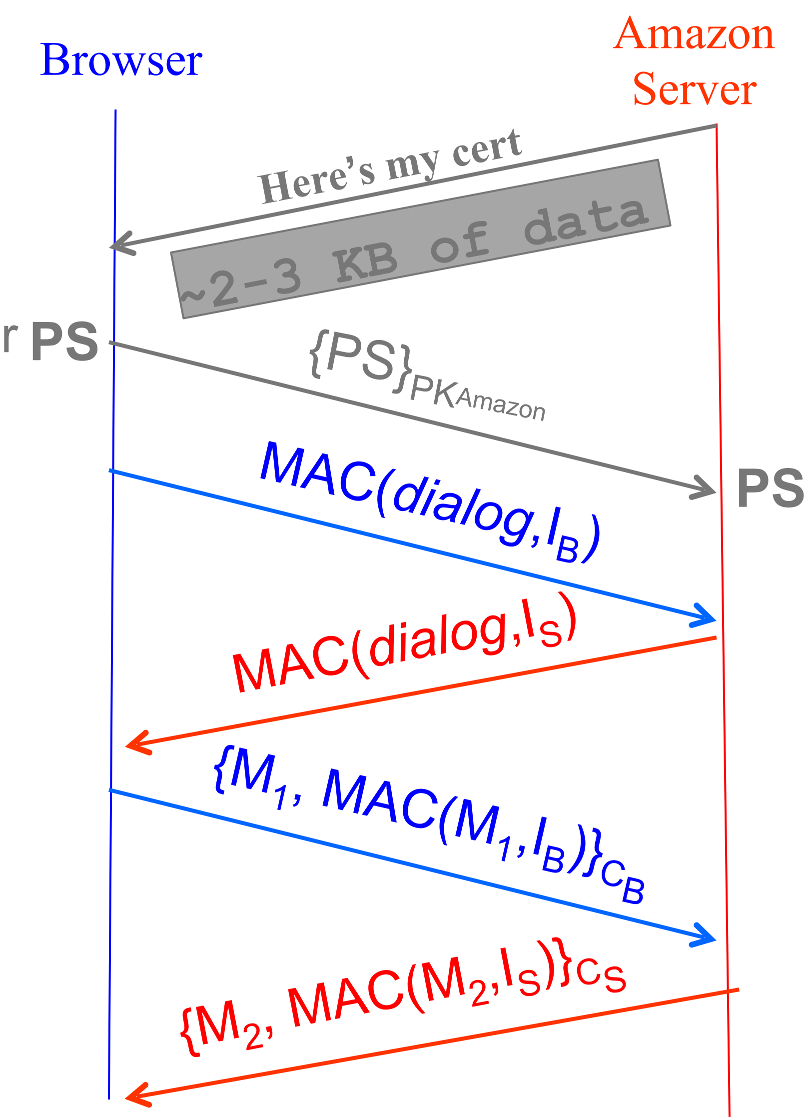
On Chrome:



The communication before the green lock is called the SSL handshake; its purpose is to establish shared symmetric keys for secure communication.

`HTTPS` Connection (SSL / TLS), cont.

- For RSA, browser constructs "Premaster Secret" **PS**
- Browser sends PS encrypted using Amazon's public RSA key PK_{Amazon}
- Using PS, R_B, and R_S, browser & server derive symm. *cipher keys* (C_B, C_S) & MAC *integrity keys* (I_B, I_S)
  - One pair to use in each direction
- Browser & server exchange MACs computed over entire dialog so far
- If good MAC, Browser displays
- All subsequent communication encrypted w/ symmetric cipher (e.g., AES128) cipher keys in some agreed upon chaining mode, MACs
  - Sequence #'s included with every message to thwart replay attacks

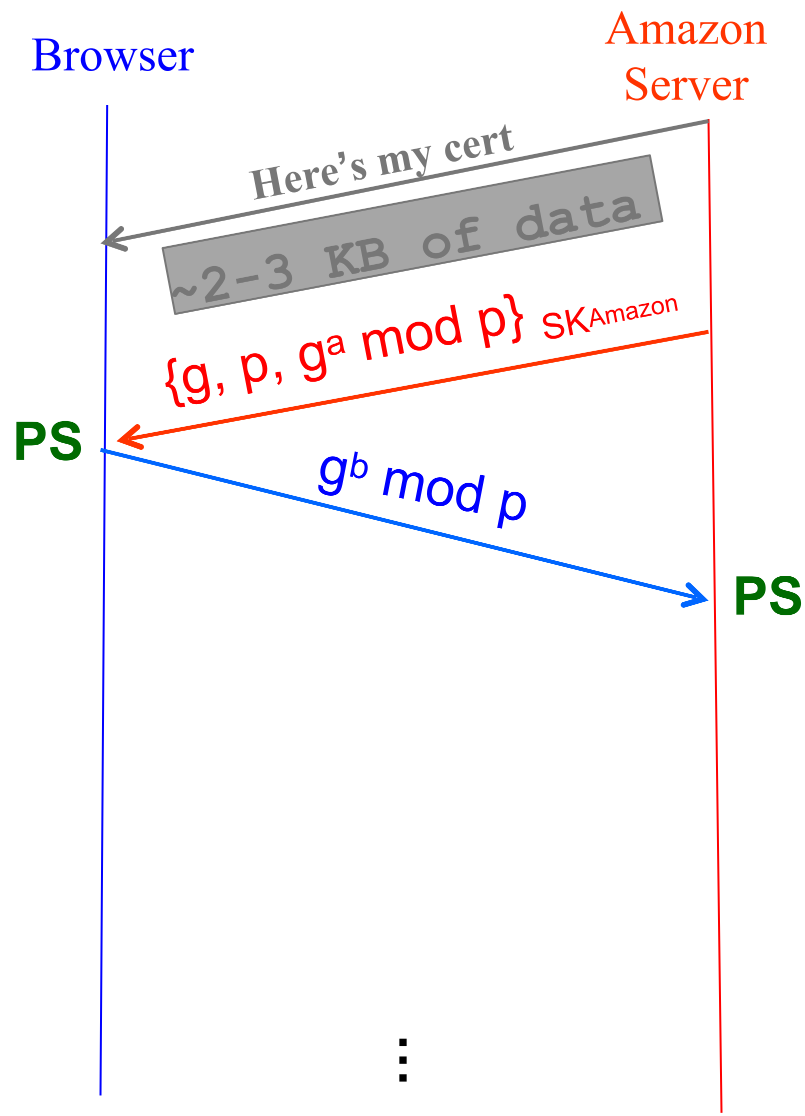


Alternative: Key Exchange via Diffie-Hellman

- For Diffie-Hellman, server generates random a, sends public params and g^a mod p

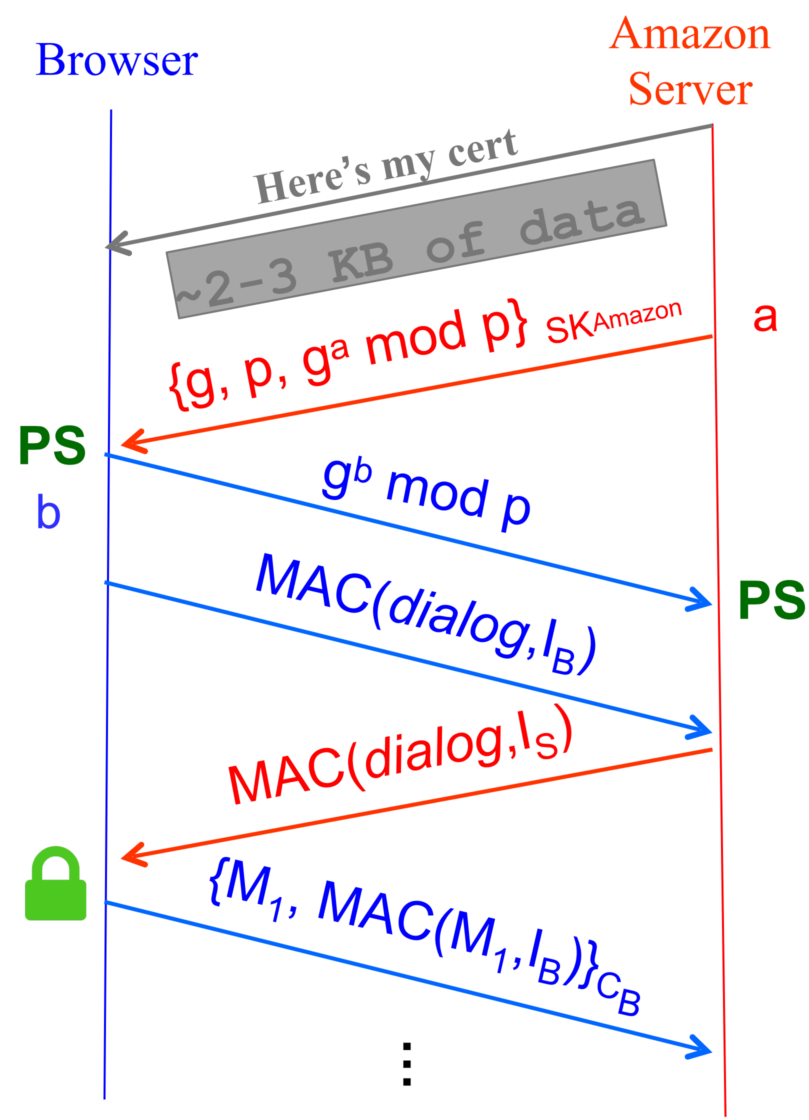
Q: How can we prevent MITM?

A: Server signs g^a mod p using SK_{Amazon}, browser verifies using PK_{Amazon} from server certificate



Alternative: Key Exchange via Diffie-Hellman

- For Diffie-Hellman, server generates random a, sends public params and g^a mod p
  - Signed with server's private key
- Browser verifies signature using PK from certificate
- Browser generates random b, computes **PS** = g^{ab} mod p, sends to server its public key
- Server also computes **PS** = g^{ab} mod p
- Remainder is as before: from PS, R_B, and R_S, browser & server derive symm. *cipher keys* (C_B, C_S) and MAC *integrity keys* (I_B, I_S), etc…



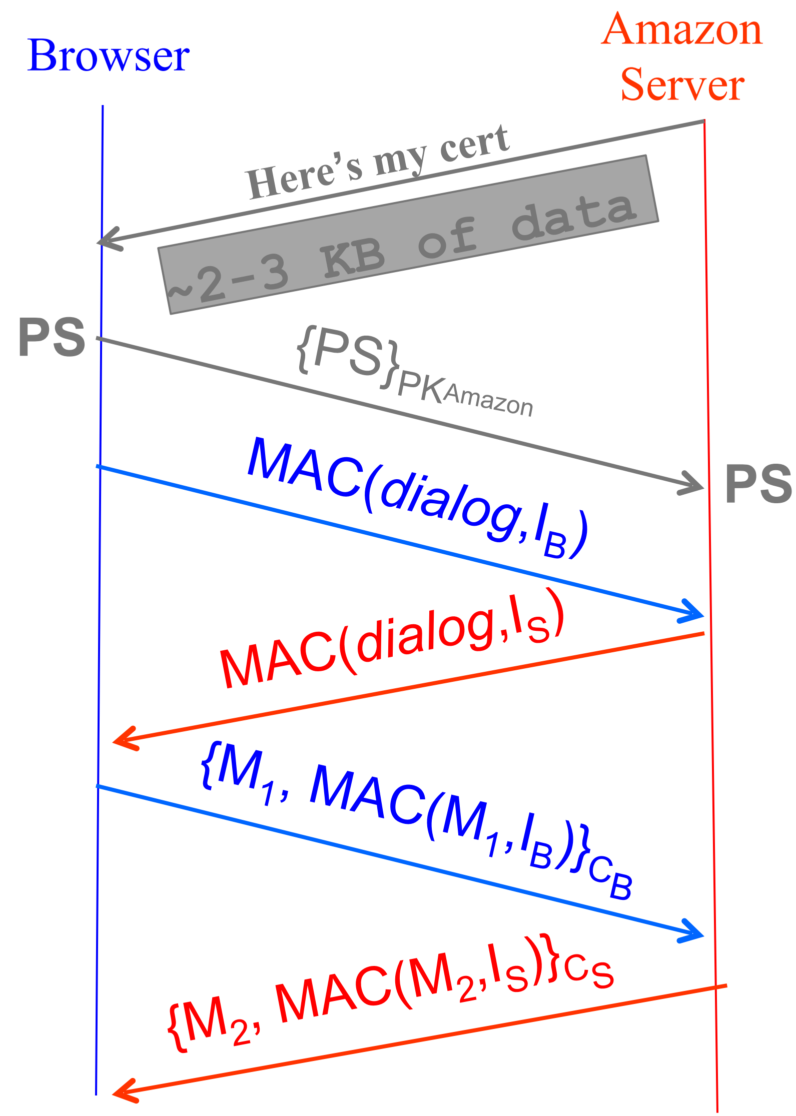
RSA versus Diffie-Hellman

- Forward secrecy: If attacker steals long term secret key of server, SK_{Amazon}, should not be able to read past conversations (cannot compromise past session keys (C_B, C_S) & (I_B, I_S))
- Why matters?
  - Attackers log traffic now. Compromise key in future and try to decrypt the traffic.
- TLS with RSA does not have forward secrecy
- TLS DH has forward secrecy

Exchange with RSA

Q: Forward secrecy?
A: No forward secrecy because attacker can decrypt PS and knows R_B, and R_S and computes secrets

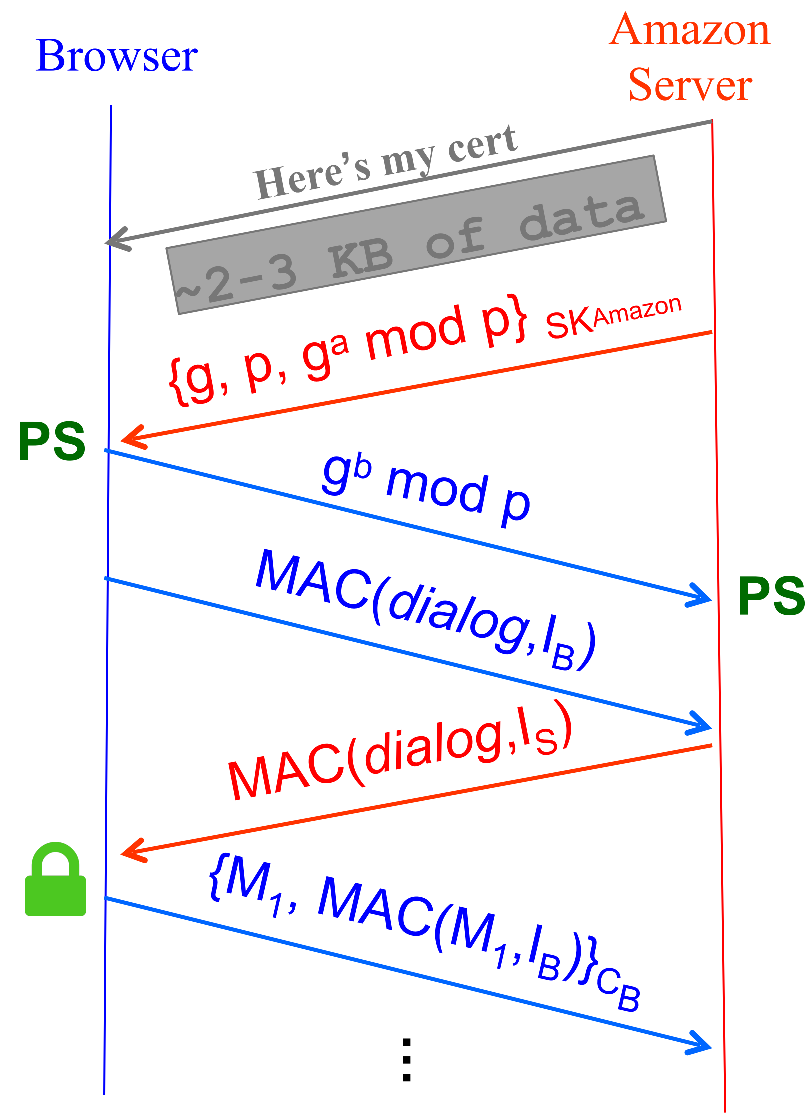
- For RSA, browser constructs "Premaster Secret" **PS**
- Browser sends PS encrypted using Amazon's public RSA key PK_{Amazon}
- Using PS, R_B, and R_S, browser & server derive symm. *cipher keys* (C_B, C_S) & MAC *integrity keys* (I_B, I_S)
  - One pair to use in each direction
- Browser & server exchange MACs computed over entire dialog so far
- If good MAC, Browser displays
- All subsequent communication encrypted w/ symmetric cipher (e.g., AES128) cipher keys in some chaining mode, MACs
  - Sequence #'s thwart replay attacks



Exchange via Diffie-Hellman

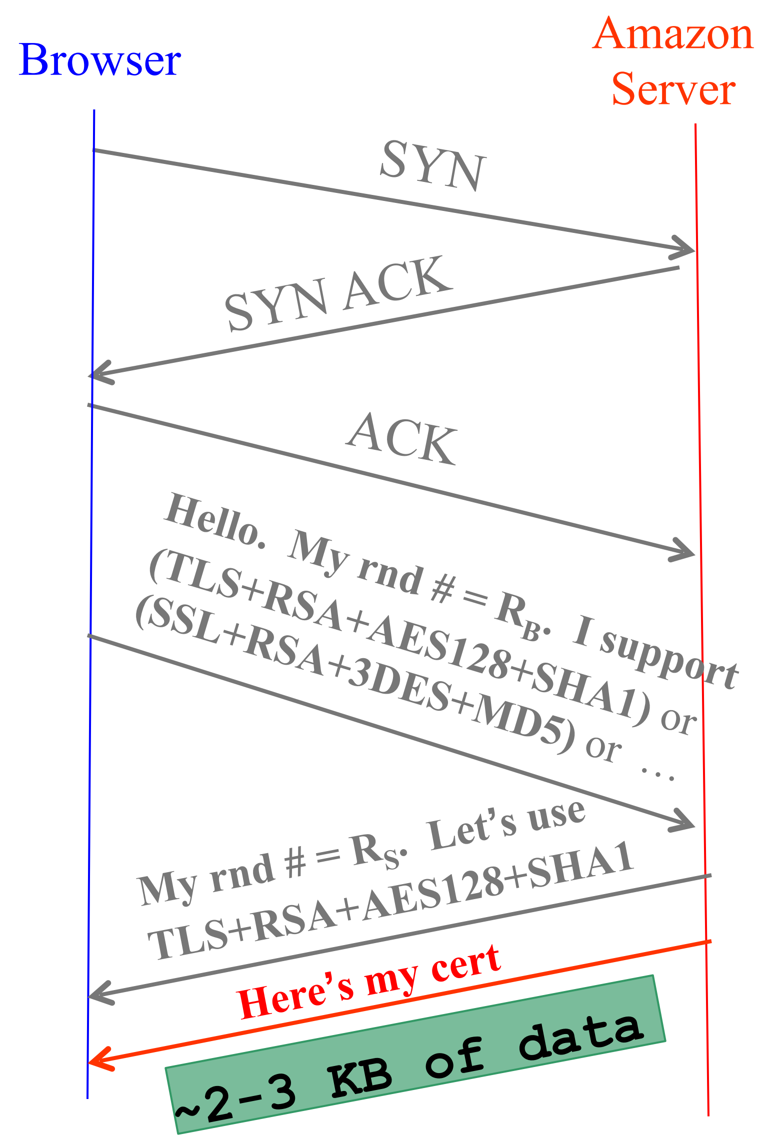
Q: Forward secrecy?
A: Has forward secrecy because shared secret never sent over the network! If attacker as SK_{Amazon}, cannot decrypt a.

- For Diffie-Hellman, server generates random a, sends public params and g^a mod p
  - Signed with server's private key
- Browser verifies signature using PK from certificate
- Browser generates random b, computes **PS** = g^{ab} mod p, sends to server
- Server also computes **PS** = g^{ab} mod p
- Remainder is as before: from PS, R_B, and R_S, browser & server derive symm. *cipher keys* (C_B, C_S) and MAC *integrity keys* (I_B, I_S), etc…



`HTTPS` Connection (SSL / TLS)

- Browser (client) connects via TCP to Amazon's **`HTTPS`** server
- Client picks 256-bit random number R_B, sends over list of crypto protocols it supports
- Server picks 256-bit random number R_S, selects protocols to use for this session
- Server sends over its certificate
- (all of this is in the clear)
- ***Client now validates cert***



Certificates

- Browser compares domain *name* in cert w/ URL
  - Note: this provides an end-to-end property (as opposed to say a cert associated with an IP address)
- Browser accesses <u>*separate*</u> cert belonging to issuer or **CA**
  - These are hardwired into the browser – and **trusted!**
- Browser applies CA's public key to verify signature **S**, obtaining hash of what CA signed
  - Compares with its own SHA-256 hash of Amazon's cert
- Assuming hashes match, now have high confidence it's indeed Amazon with that PK…
  - ***assuming signatory is trustworthy***

= assuming didn't lose private key; assuming didn't sign thoughtlessly

End-to-End ⇒ Powerful Protections

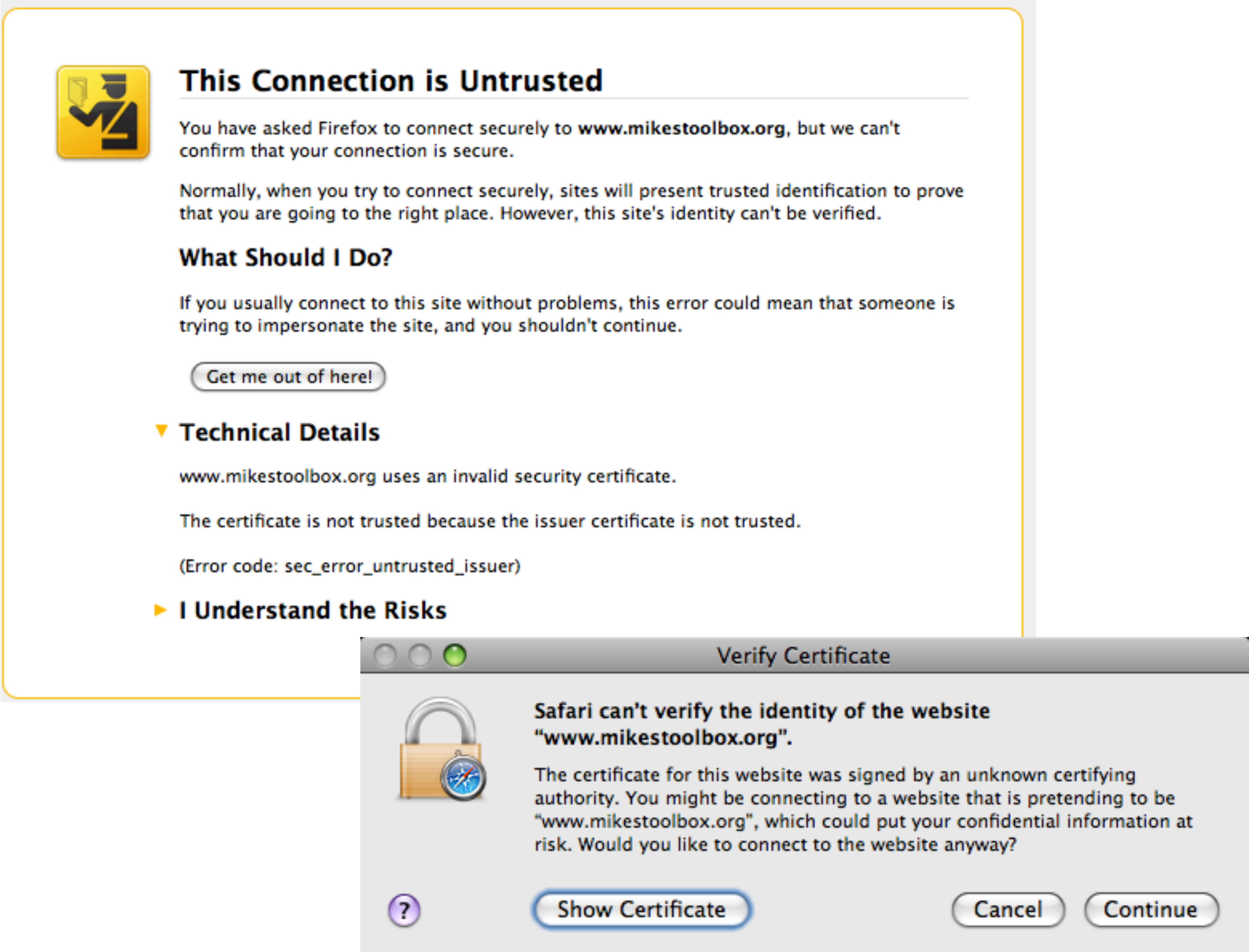
- Attacker runs a sniffer to capture our WiFi session?
  - (maybe by breaking crummy WEP security)
  - But: encrypted communication is unreadable
    - No problem!
- DNS cache poisoning gives client wrong IP address
  - Client goes to wrong server
  - But: certificate won't match
    - No problem!
- Attacker hijacks our connection, injects new traffic
  - But: data receiver rejects it due to failed integrity check
    - No problem!

Powerful Protections, cont.

- Attacker manipulates routing to run us by an eavesdropper or take us to the wrong server?
  - But: they can't read; we detect impersonation
    - No problem!
- Attacker slips in as a Man In The Middle?
  - But: they can't read, they can't inject
  - They can't even replay previous encrypted traffic
  - **No problem!**

Validating Amazon's Identity, cont.

- Browser retrieves cert belonging to the **issuer**
  - These are hardwired into the browser – and **trusted!**
- What if browser can't find a cert for the issuer?


This Connection is Untrusted
You have asked Firefox to connect securely to www.mikestoolbox.org, but we can't confirm that your connection is secure.
Normally, when you try to connect securely, sites will present trusted identification to prove that you are going to the right place. However, this site's identity can't be verified.
What Should I Do?
If you usually connect to this site without problems, this error could mean that someone is trying to impersonate the site, and you shouldn't continue.
Get me out of here!
Technical Details
www.mikestoolbox.org uses an invalid security certificate.
The certificate is not trusted because the issuer certificate is not trusted.
(Error code: sec_error_untrusted_issuer)
I Understand the Risks
Verify Certificate
Safari can't verify the identity of the website "www.mikestoolbox.org".
The certificate for this website was signed by an unknown certifying authority. You might be connecting to a website that is pretending to be "www.mikestoolbox.org", which could put your confidential information at risk. Would you like to connect to the website anyway?
?
Show Certificate
Cancel
Continue

Validating Amazon’s Identity, cont.

- Browser retrieves cert belonging to the **issuer**
  - These are hardwired into the browser – and **trusted!**
- What if browser can’t find a cert for the issuer?
- If it can’t find the cert, then warns the user that site has not been verified
  - Can still proceed, just without authentication
- Q: Which end-to-end security properties do we lose if we incorrectly trust that the site is whom we think?
- A: **All of them!**
  - Goodbye confidentiality, integrity, authentication
  - Man in the middle attacker can read everything, modify, impersonate

SSL / TLS Limitations

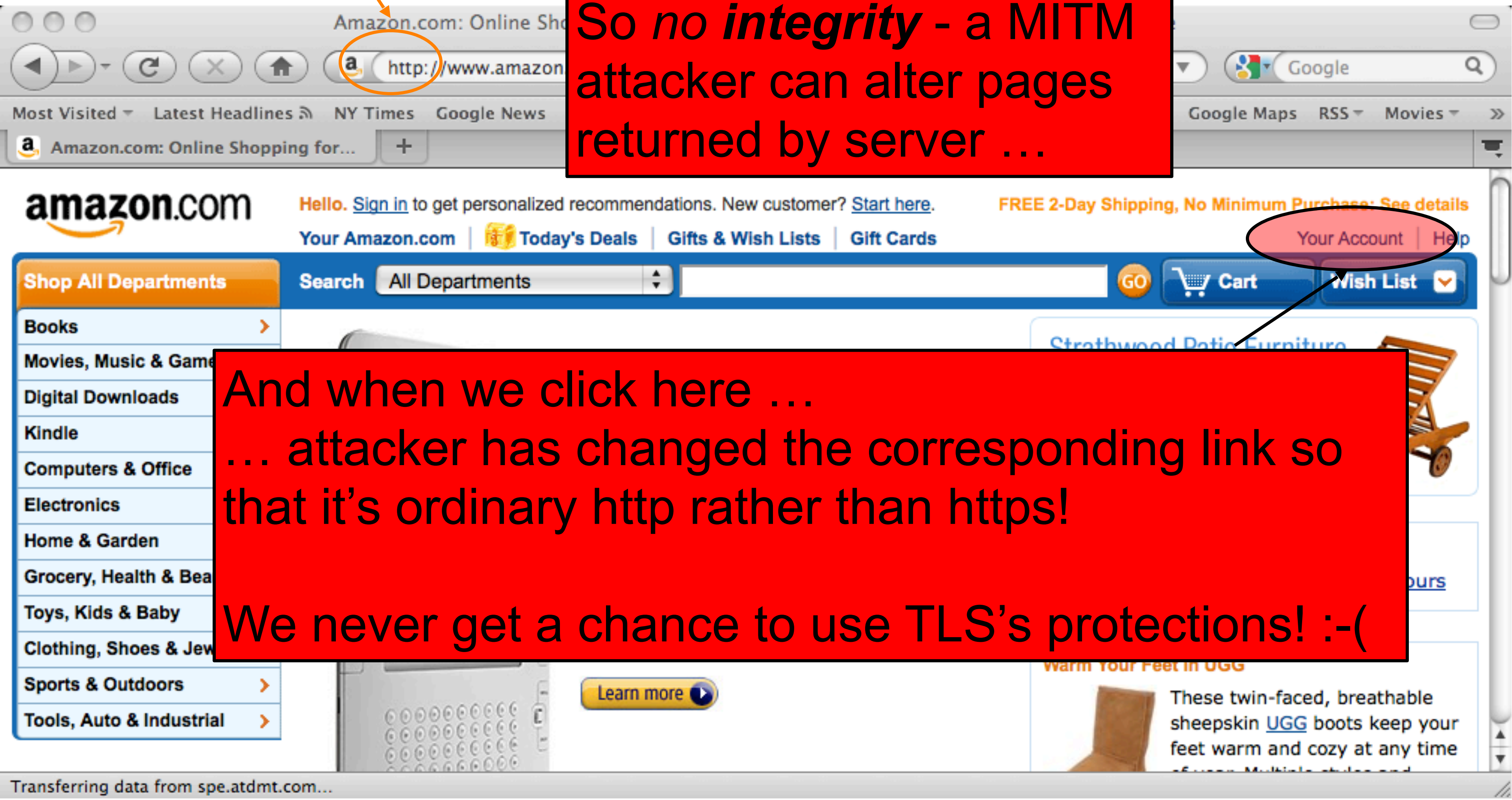
- Properly used, SSL / TLS provides powerful end-to-end protections
- Used by many sites, reasons why not all sites:
  - Cost of public-key crypto (fairly minor)
    - Takes non-trivial CPU processing (but today a minor issue)
    - Note: *symmetric* key crypto on modern hardware is non-issue
  - Hassle of buying/maintaining certs (Let's Encrypt addresses it)
  - Integrating with other sites that don't use HTTPS
  - Latency: extra round trips $\Rightarrow$ 1st page slower to load
  - Cannot cache encrypted pages

SSL / TLS Limitations, cont.

- Problems that SSL / TLS does **not** take care of ?
- TCP-level denial of service
  - SYN flooding
  - RST injection
    - (but does protect against data injection!)
- server-side coding/logic flaws
- Vulnerabilities introduced by server inconsistencies

Regular web surfing: http: URL

So *no* ***integrity*** - a MITM attacker can alter pages returned by server …



And when we click here …

… attacker has changed the corresponding link so that it's ordinary http rather than https!

We never get a chance to use TLS's protections! :-(

"sslstrip" attack

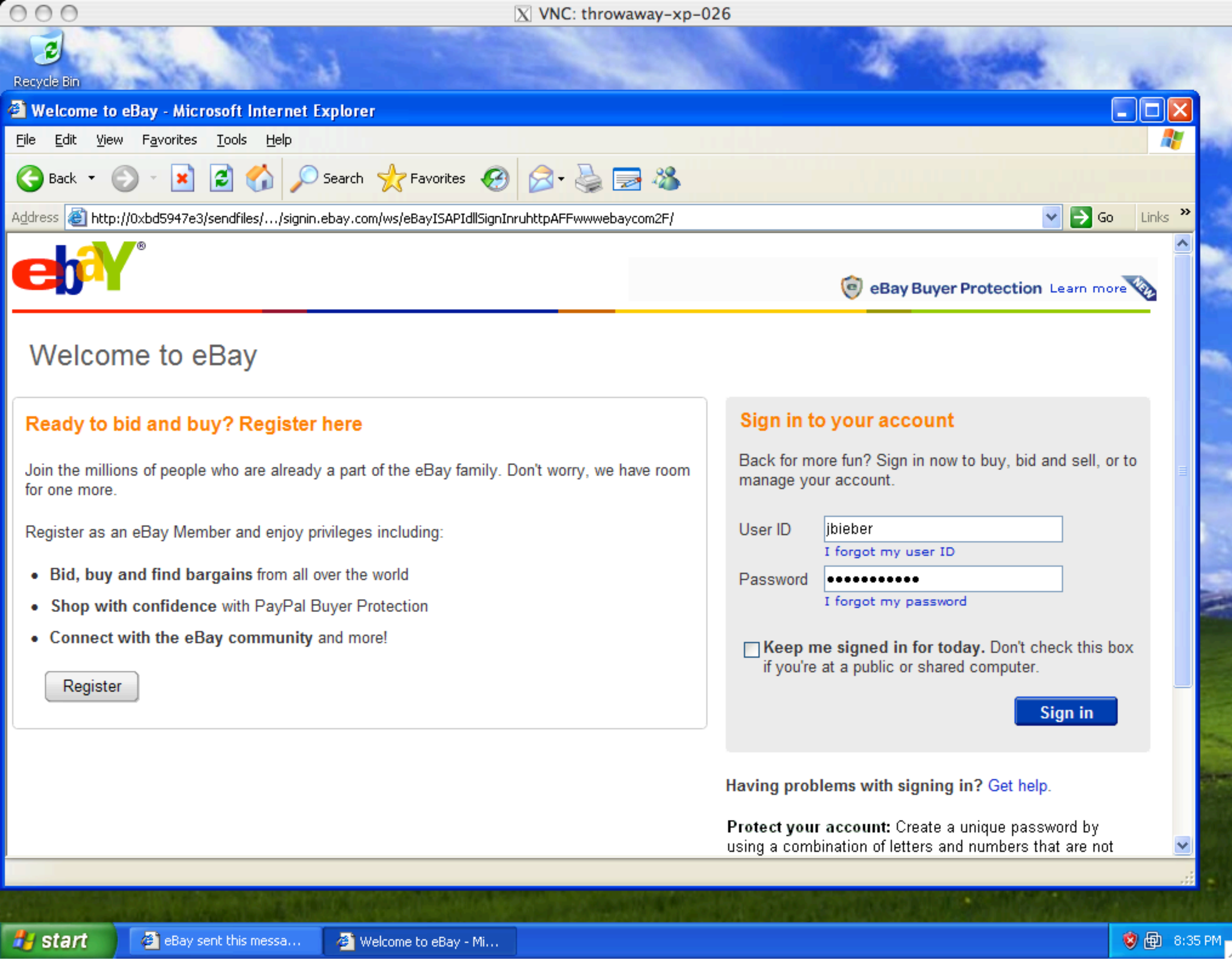
SSL / TLS Limitations, cont.

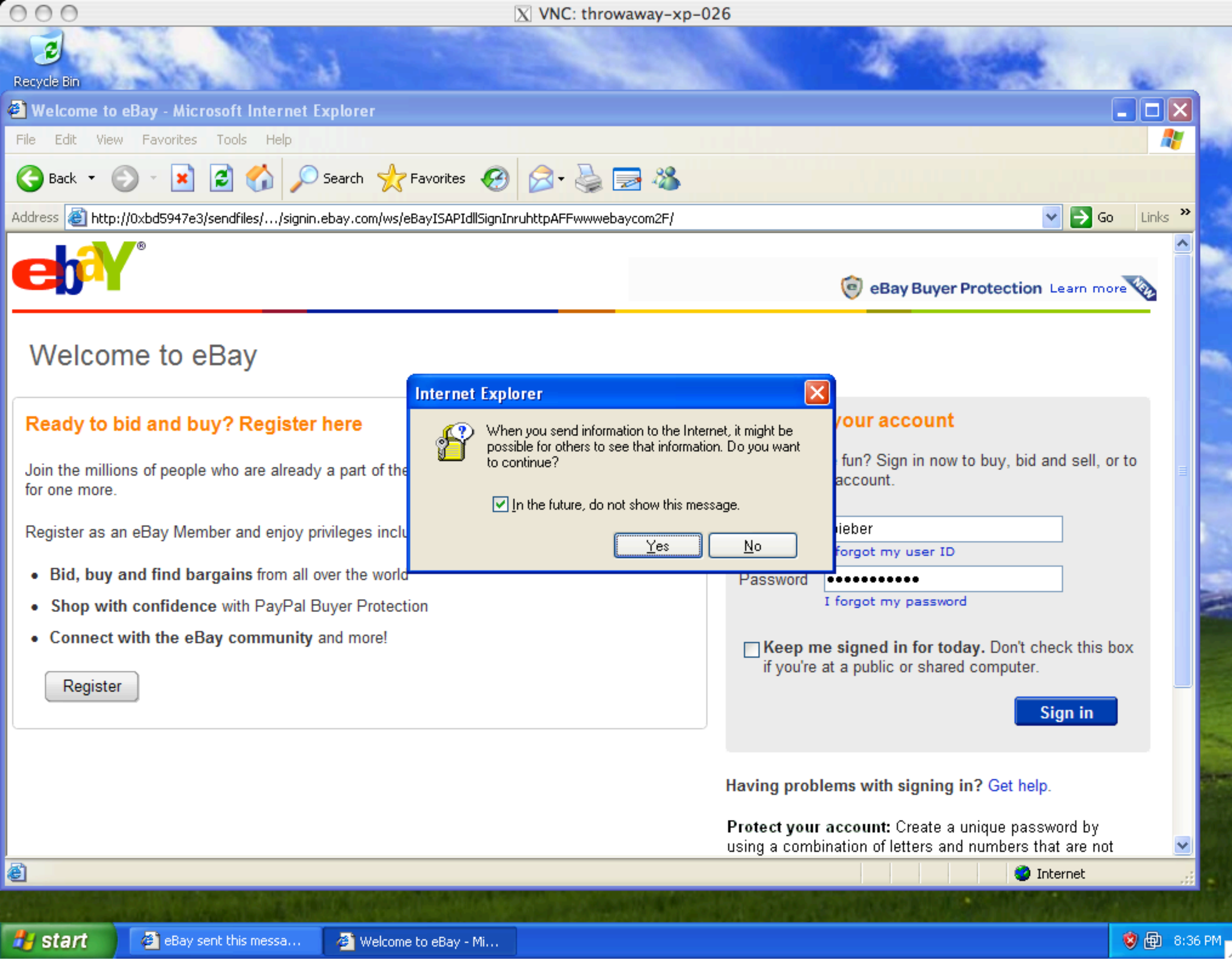
- Problems that SSL / TLS does **not** take care of ?

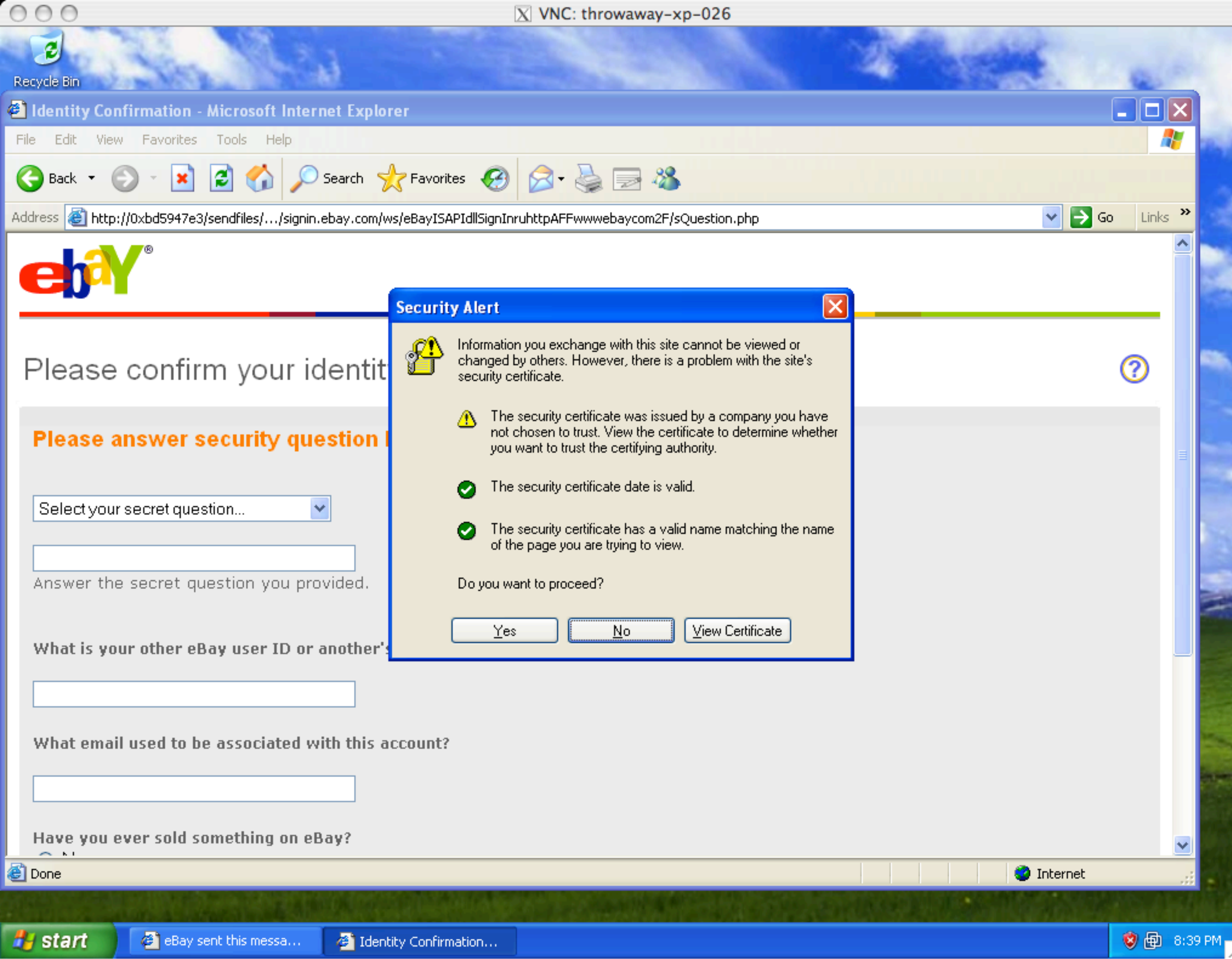
- server-side coding/logic flaws
- Vulnerabilities introduced by server inconsistencies
- Browser coding/logic flaws
- User flaws
  - Weak passwords
  - Phishing
- Issues of trust …

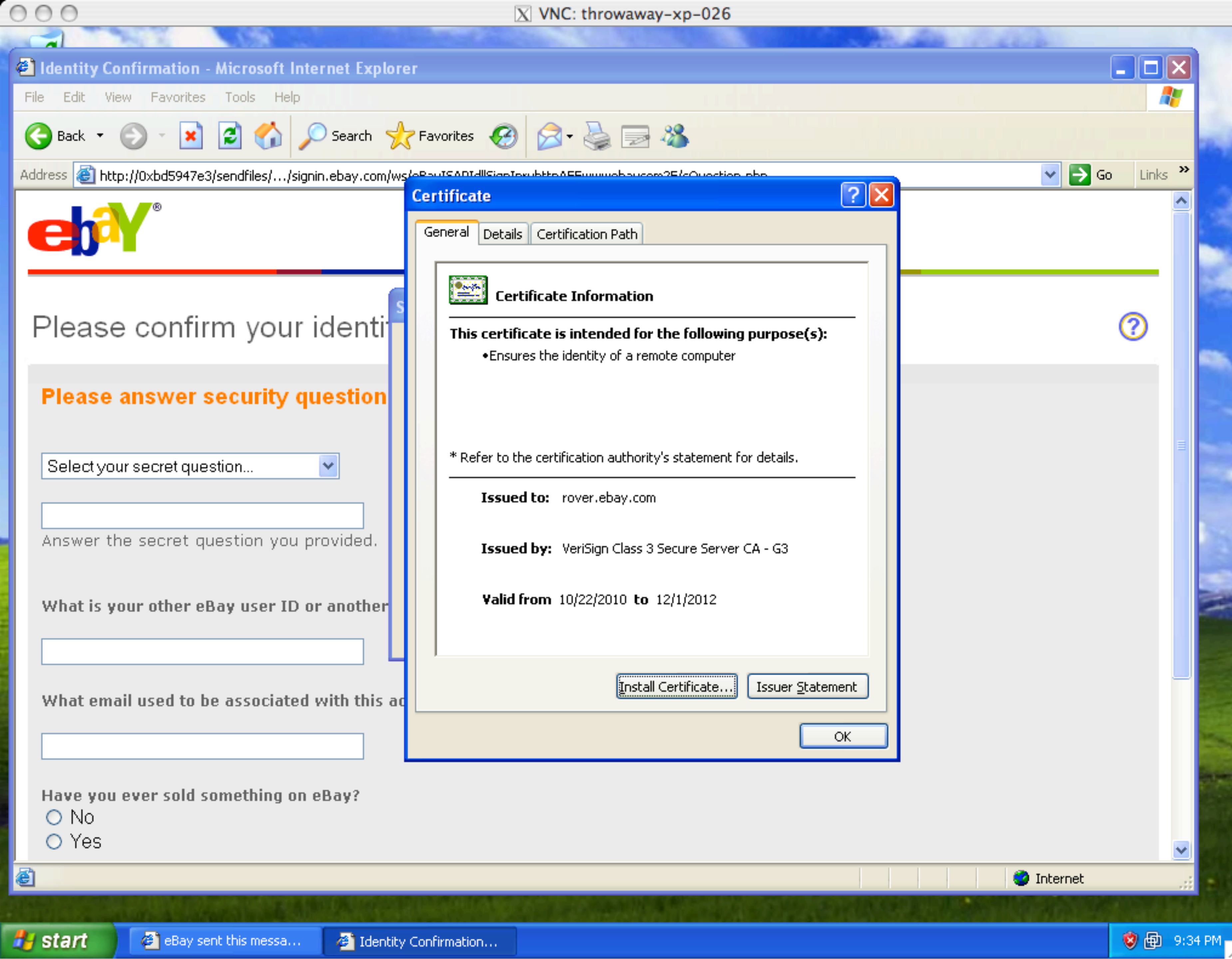
TLS/SSL Trust Issues

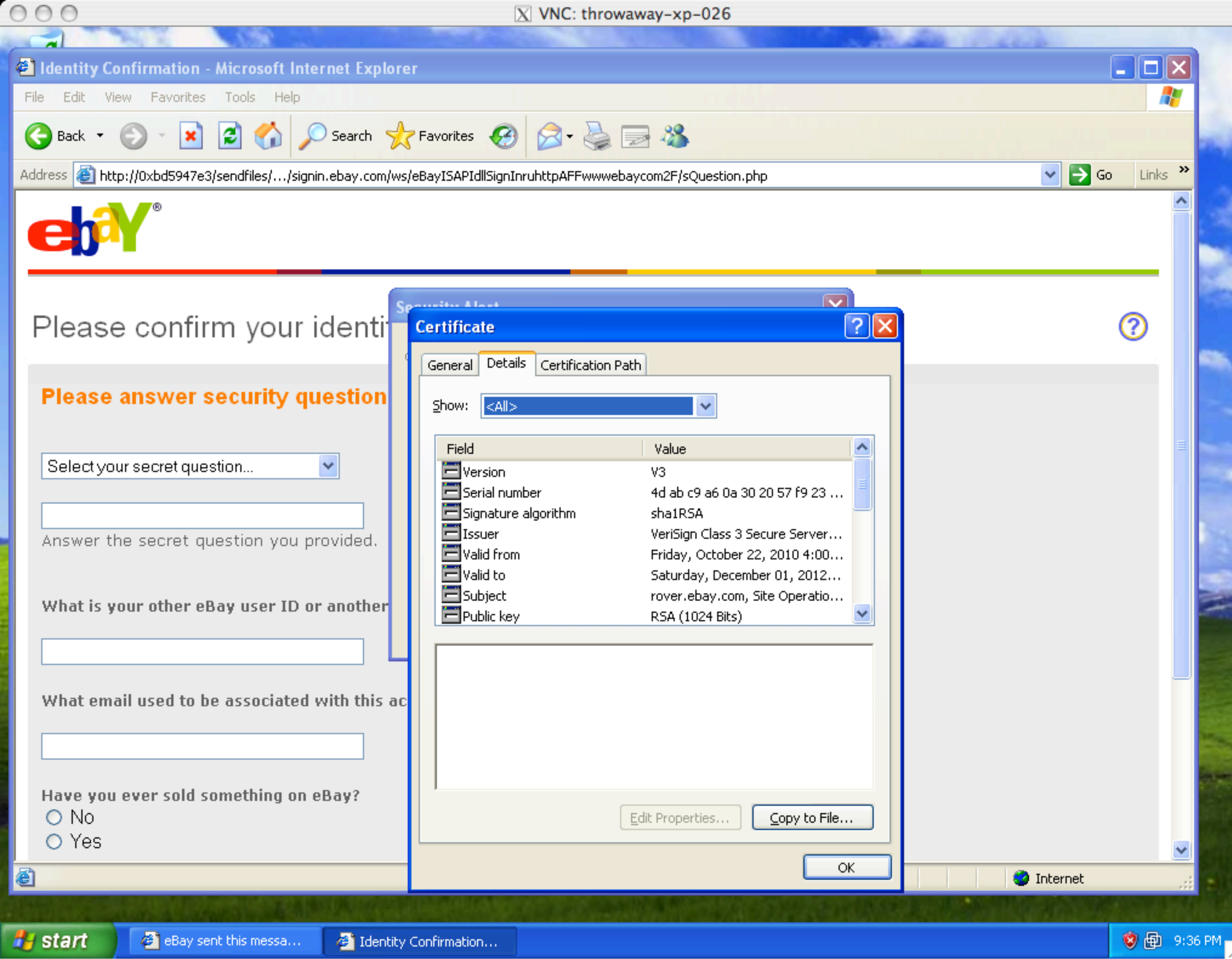
- User has to make correct trust decisions …


VNC: throwaway-xp-026
Recycle Bin
Welcome to eBay - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://0xbd5947e3/sendfiles/.../signin.ebay.com/ws/eBayISAPIdllSignInruhttpAFFwwwebaycom2F/
Go Links
eBay Buyer Protection Learn more NEW
Welcome to eBay
Ready to bid and buy? Register here
Join the millions of people who are already a part of the eBay family. Don't worry, we have room for one more.
Register as an eBay Member and enjoy privileges including:
Bid, buy and find bargains from all over the world
Shop with confidence with PayPal Buyer Protection
Connect with the eBay community and more!
Register
Sign in to your account
Back for more fun? Sign in now to buy, bid and sell, or to manage your account.
User ID
jbieber
I forgot my user ID
Password
I forgot my password
Keep me signed in for today. Don't check this box if you're at a public or shared computer.
Sign in
Having problems with signing in? Get help.
Protect your account: Create a unique password by using a combination of letters and numbers that are not
start
eBay sent this messa...
Welcome to eBay - Mi...
8:35 PM


VNC: throwaway-xp-026
Recycle Bin
Welcome to eBay - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Address
http://0xbd5947e3/sendfiles/…/signin.ebay.com/ws/eBayISAPIdllSignInruhttpAFFwwwebaycom2F/
Go
Links
eBay Buyer Protection Learn more
NEW
Welcome to eBay
Ready to bid and buy? Register here
Join the millions of people who are already a part of the
for one more.
Register as an eBay Member and enjoy privileges inclu
Bid, buy and find bargains from all over the world
Shop with confidence with PayPal Buyer Protection
Connect with the eBay community and more!
Register
your account
fun? Sign in now to buy, bid and sell, or to
account.
ieber
forgot my user ID
Password
I forgot my password
Keep me signed in for today. Don't check this box if you're at a public or shared computer.
Sign in
Having problems with signing in? Get help.
Protect your account: Create a unique password by using a combination of letters and numbers that are not
Internet Explorer
When you send information to the Internet, it might be possible for others to see that information. Do you want to continue?
In the future, do not show this message.
Yes
No
Internet
start
eBay sent this messa…
Welcome to eBay - Mi…
8:36 PM


VNC: throwaway-xp-026
Recycle Bin
Identity Confirmation - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://0xbd5947e3/sendfiles/…/signin.ebay.com/ws/eBayISAPIdllSignInruhttpAFFwwwebaycom2F/sQuestion.php
Go Links
Please confirm your identit
Please answer security question
Select your secret question...
Answer the secret question you provided.
What is your other eBay user ID or another'
What email used to be associated with this account?
Have you ever sold something on eBay?
Security Alert
Information you exchange with this site cannot be viewed or changed by others. However, there is a problem with the site's security certificate.
The security certificate was issued by a company you have not chosen to trust. View the certificate to determine whether you want to trust the certifying authority.
The security certificate date is valid.
The security certificate has a valid name matching the name of the page you are trying to view.
Do you want to proceed?
Yes
No
View Certificate
Done
Internet
start
eBay sent this messa…
Identity Confirmation…
8:39 PM


VNC: throwaway-xp-026
Identity Confirmation - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Address
http://0xbd5947e3/sendfiles/…/signin.ebay.com/ws
Go
Links
Please confirm your identi
Please answer security question
Select your secret question...
Answer the secret question you provided.
What is your other eBay user ID or another
What email used to be associated with this ac
Have you ever sold something on eBay?
No
Yes
Certificate
General
Details
Certification Path
Certificate Information
This certificate is intended for the following purpose(s):
•Ensures the identity of a remote computer
* Refer to the certification authority's statement for details.
Issued to: rover.ebay.com
Issued by: VeriSign Class 3 Secure Server CA - G3
Valid from 10/22/2010 to 12/1/2012
Install Certificate...
Issuer Statement
OK
Internet
start
eBay sent this messa...
Identity Confirmation...
9:34 PM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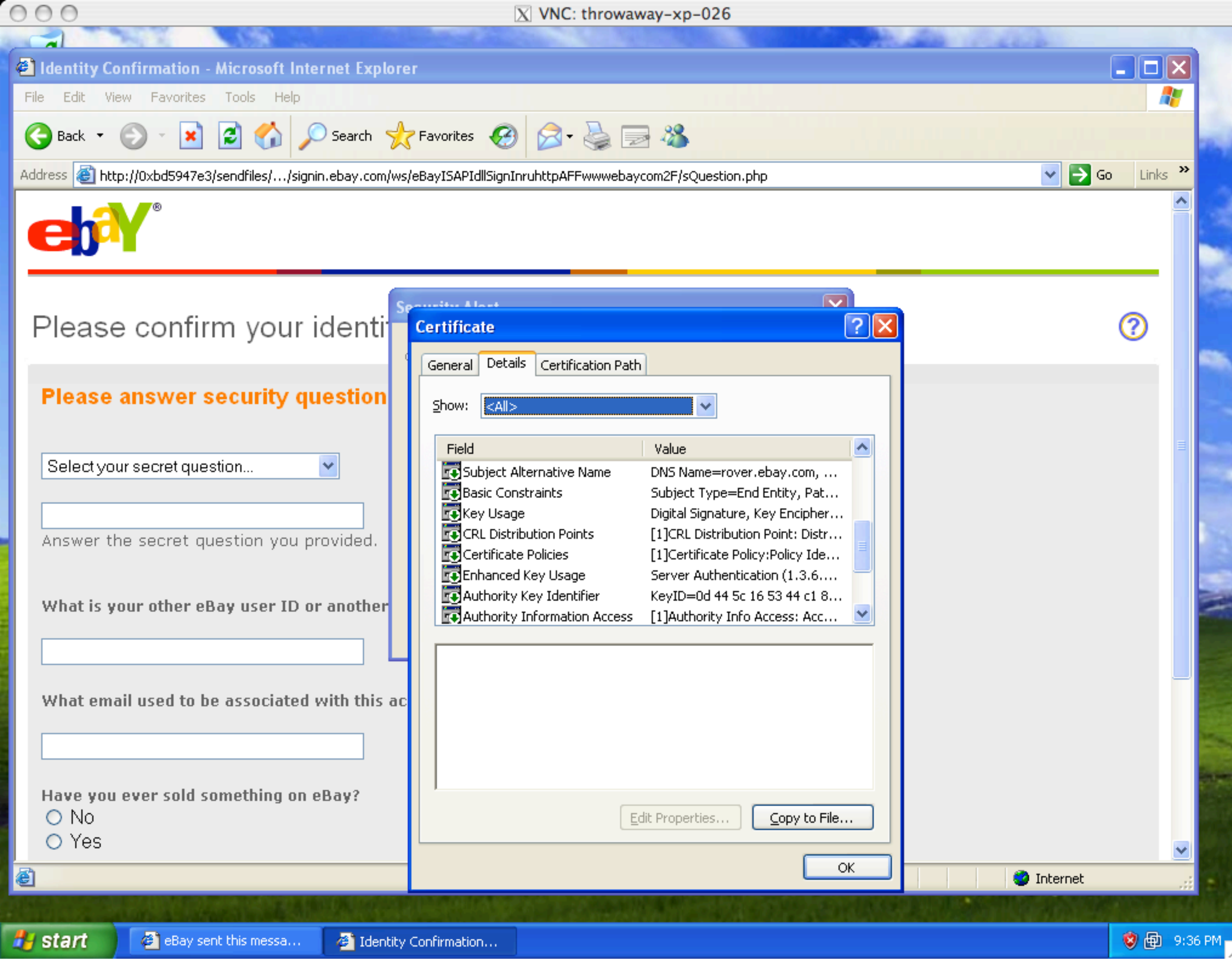
File Edit View Favorites Tools Help
Back Search Favorites
Address http://0xbd5947e3/sendfiles/.../signin.ebay.com/ws/eBayISAPIdllSignInruhttpAFFwwwebaycom2F/sQuestion.php
Go Links
Please confirm your identi
Please answer security question
Select your secret question...
Answer the secret question you provided.
What is your other eBay user ID or another
What email used to be associated with this ac
Have you ever sold something on eBay?
No
Yes
Certificate
General Details Certification Path
Show: <All>
Field Value
Version V3
Serial number 4d ab c9 a6 0a 30 20 57 f9 23 ...
Signature algorithm sha1RSA
Issuer VeriSign Class 3 Secure Server...
Valid from Friday, October 22, 2010 4:00...
Valid to Saturday, December 01, 2012...
Subject rover.ebay.com, Site Operatio...
Public key RSA (1024 Bits)
Edit Properties...
Copy to File...
OK
Internet
start
eBay sent this messa...
Identity Confirmation...
9:36 PM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Go Links
Please confirm your identi
Please answer security question
Select your secret question...
Answer the secret question you provided.
What is your other eBay user ID or another
What email used to be associated with this ac
Have you ever sold something on eBay?
No
Yes
Certificate
General Details Certification Path
Show: <All>
Field Value
Subject Alternative Name DNS Name=rover.ebay.com, …
Basic Constraints Subject Type=End Entity, Pat…
Key Usage Digital Signature, Key Encipher…
CRL Distribution Points [1]CRL Distribution Point: Distr…
Certificate Policies [1]Certificate Policy:Policy Ide…
Enhanced Key Usage Server Authentication (1.3.6.…
Authority Key Identifier KeyID=0d 44 5c 16 53 44 c1 8…
Authority Information Access [1]Authority Info Access: Acc…
Edit Properties… Copy to File…
OK
Internet
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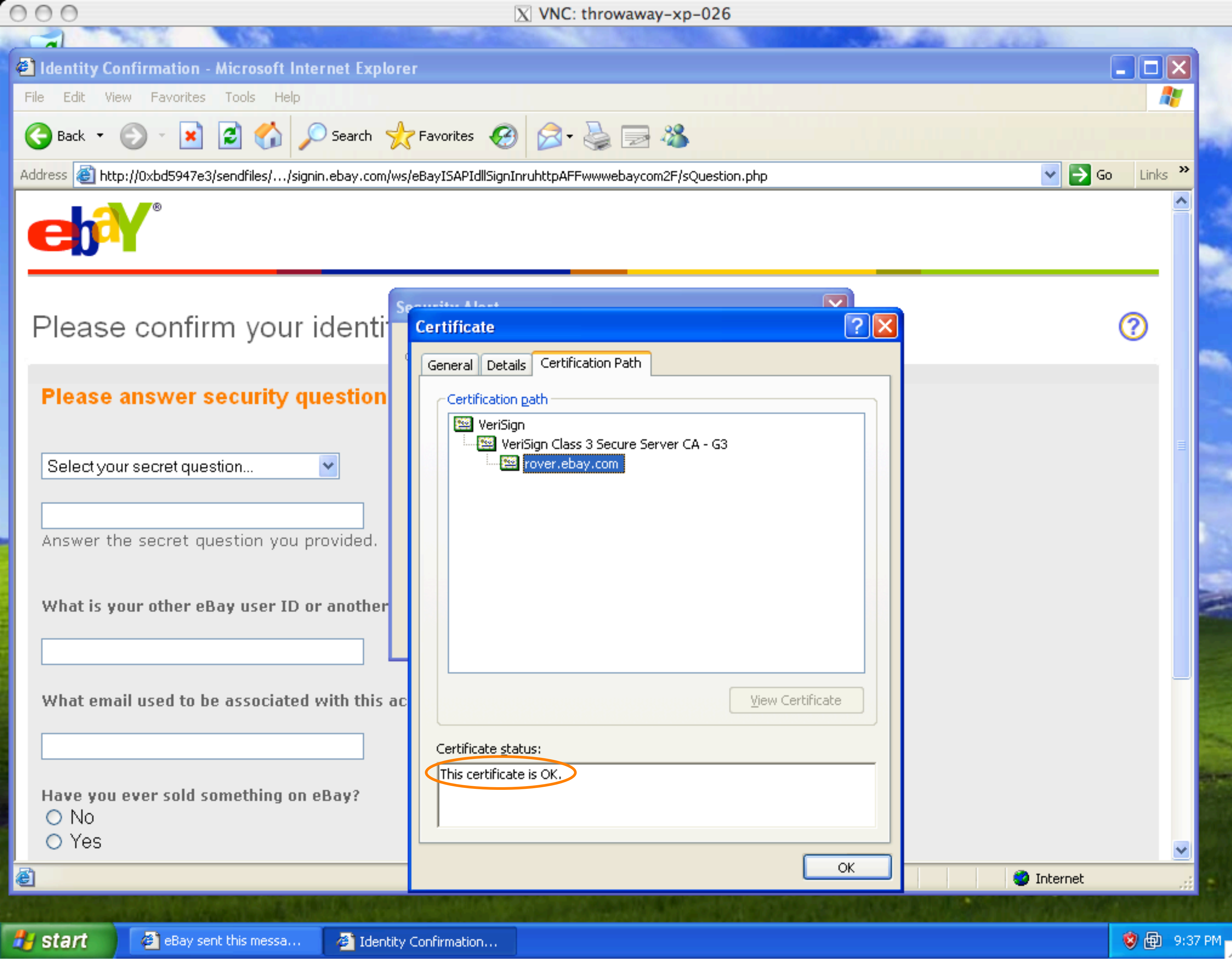
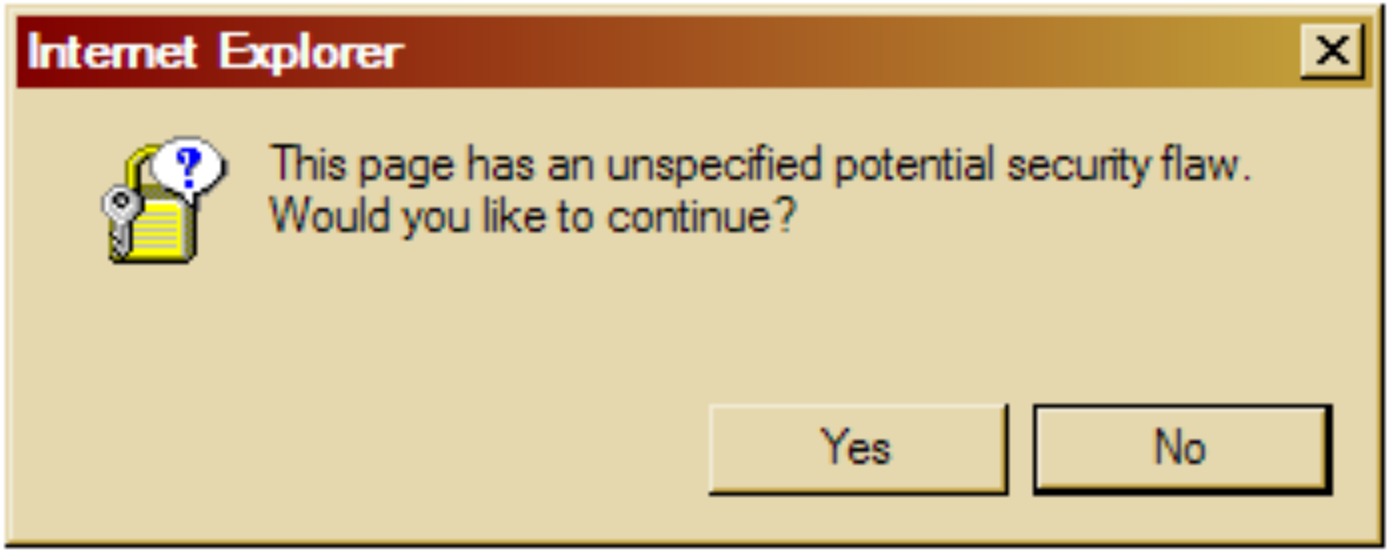
Identity Confirmation…
9:36 PM


VNC: throwaway-xp-026
Identity Confirmation - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://0xbd5947e3/sendfiles/.../signin.ebay.com/ws/eBayISAPIdllSignInruhttpAFFwwwebaycom2F/sQuestion.php
Go Links
Please confirm your identi
Please answer security question
Select your secret question...
Answer the secret question you provided.
What is your other eBay user ID or another
What email used to be associated with this ac
Have you ever sold something on eBay?
No
Yes
Certificate
General Details Certification Path
Certification path
VeriSign
VeriSign Class 3 Secure Server CA - G3
rover.ebay.com
View Certificate
Certificate status:
This certificate is OK.
OK
Internet
start
eBay sent this messa...
Identity Confirmation...
9:37 PM

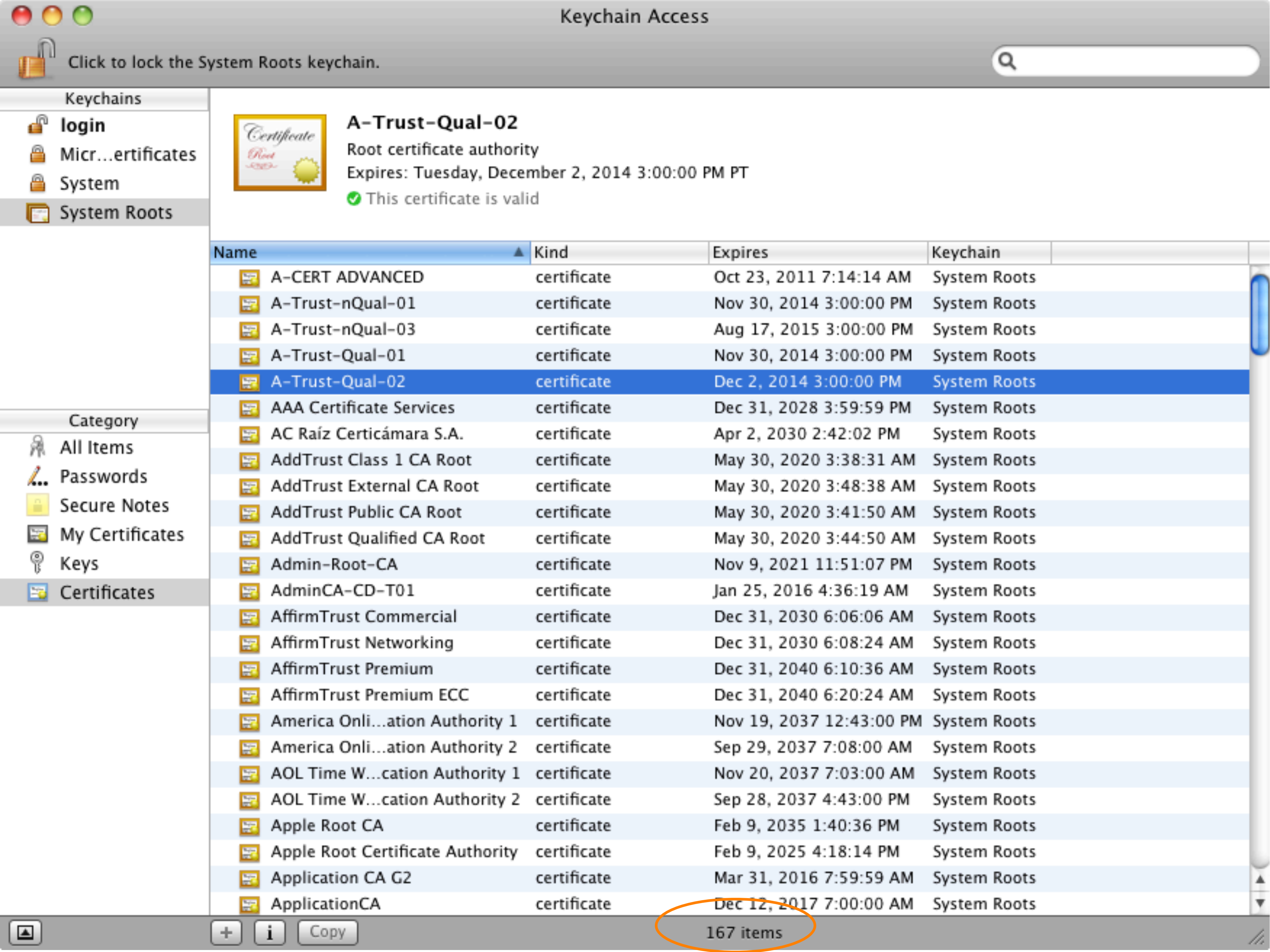
The equivalent as seen by most Internet users:



(note: an actual Windows error message!)

TLS/SSL Trust Issues, cont.

- "*Commercial certificate authorities protect you from anyone from whom they are unwilling to take money.*"
  - – Matt Blaze, circa 2001
- So how many CAs do we have to worry about, anyway?


Keychain Access
Click to lock the System Roots keychain.
Keychains
login
Micr...ertificates
System
System Roots
Category
All Items
Passwords
Secure Notes
My Certificates
Keys
Certificates
A-Trust-Qual-02
Root certificate authority
Expires: Tuesday, December 2, 2014 3:00:00 PM PT
This certificate is valid
Name | Kind | Expires | Keychain
A-CERT ADVANCED | certificate | Oct 23, 2011 7:14:14 AM | System Roots
A-Trust-nQual-01 | certificate | Nov 30, 2014 3:00:00 PM | System Roots
A-Trust-nQual-03 | certificate | Aug 17, 2015 3:00:00 PM | System Roots
A-Trust-Qual-01 | certificate | Nov 30, 2014 3:00:00 PM | System Roots
A-Trust-Qual-02 | certificate | Dec 2, 2014 3:00:00 PM | System Roots
AAA Certificate Services | certificate | Dec 31, 2028 3:59:59 PM | System Roots
AC Raíz Certicámara S.A. | certificate | Apr 2, 2030 2:42:02 PM | System Roots
AddTrust Class 1 CA Root | certificate | May 30, 2020 3:38:31 AM | System Roots
AddTrust External CA Root | certificate | May 30, 2020 3:48:38 AM | System Roots
AddTrust Public CA Root | certificate | May 30, 2020 3:41:50 AM | System Roots
AddTrust Qualified CA Root | certificate | May 30, 2020 3:44:50 AM | System Roots
Admin-Root-CA | certificate | Nov 9, 2021 11:51:07 PM | System Roots
AdminCA-CD-T01 | certificate | Jan 25, 2016 4:36:19 AM | System Roots
AffirmTrust Commercial | certificate | Dec 31, 2030 6:06:06 AM | System Roots
AffirmTrust Networking | certificate | Dec 31, 2030 6:08:24 AM | System Roots
AffirmTrust Premium | certificate | Dec 31, 2040 6:10:36 AM | System Roots
AffirmTrust Premium ECC | certificate | Dec 31, 2040 6:20:24 AM | System Roots
America Onli...ation Authority 1 | certificate | Nov 19, 2037 12:43:00 PM | System Roots
America Onli...ation Authority 2 | certificate | Sep 29, 2037 7:08:00 AM | System Roots
AOL Time W...cation Authority 1 | certificate | Nov 20, 2037 7:03:00 AM | System Roots
AOL Time W...cation Authority 2 | certificate | Sep 28, 2037 4:43:00 PM | System Roots
Apple Root CA | certificate | Feb 9, 2035 1:40:36 PM | System Roots
Apple Root Certificate Authority | certificate | Feb 9, 2025 4:18:14 PM | System Roots
Application CA G2 | certificate | Mar 31, 2016 7:59:59 AM | System Roots
ApplicationCA | certificate | Dec 12, 2017 7:00:00 AM | System Roots
Copy
167 items

TLS/SSL Trust Issues

- *"Commercial certificate authorities protect you from anyone from whom they are unwilling to take money."*
  - Matt Blaze, circa 2001
- So how many CAs do we have to worry about, anyway?
- Of course, it's not just their greed that matters …

News

Solo Iranian hacker takes credit for Comodo certificate attack

Security researchers split on whether 'ComodoHacker' is the real deal

By Gregg Keizer

March 27, 2011 08:39 PM ET

Comments (5) Recommended (37) Like 84

Computerworld - A solo Iranian hacker on Saturday claimed responsibility for stealing multiple SSL certificates belonging to some of the Web's biggest sites, including Google, Microsoft, Skype and Yahoo.

Early reaction from security experts was mixed, with some believing the hacker's claim, while others were dubious.

Last week, conjecture had focused on a state-sponsored attack, perhaps funded or conducted by the Iranian government, that hacked a certificate reseller affiliated with U.S.-based Comodo.

On March 23, Comodo acknowledged the attack, saying that eight days earlier, hackers had obtained nine bogus certificates for the log-on sites of Microsoft's Hotmail, Google's Gmail, the Internet phone and chat service Skype and Yahoo Mail. A certificate for Mozilla's Firefox add-on site was also acquired.

Fraudulent Google certificate points to Internet attack

Is Iran behind a fraudulent Google.com digital certificate? The situation is similar to one that happened in March in which spoofed certificates were traced back to Iran.

by Elinor Mills | August 29, 2011 1:22 PM PDT

Follow

A Dutch company appears to have issued a digital certificate for Google.com to someone other than Google, who may be using it to try to re-direct traffic of users based in Iran.

Yesterday, someone reported on a Google support site that when attempting to log in to Gmail the browser issued a warning for the digital certificate used as proof that the site is legitimate, according to this thread on a Google support forum site.

October 31, 2012, 10:49AM

Final Report on DigiNotar Hack Shows Total Compromise of CA Servers

The attacker who penetrated the Dutch CA DigiNotar last year had complete control of all eight of the company's certificate-issuing servers during the operation and he may also have issued some rogue certificates that have not yet been identified. The final report from a

Evidence Suggests DigiNotar, Who Issued Fraudulent Google Certificate, Was Hacked *Years* Ago

from the *diginot* dept

The big news in the security world, obviously, is the fact that a **fraudulent Google certificate made its way out into the wild**, apparently targeting internet users in Iran. The Dutch company DigiNotar has put out a statement saying that **it discovered a breach** back on July 19th during a security audit, and that fraudulent certificates were generated for "several dozen" websites. The only one known to have gotten out into the wild is the Google one.

TLS/SSL Trust Issues

- *"Commercial certificate authorities protect you from anyone from whom they are unwilling to take money."*
  – Matt Blaze, circa 2001
- So how many CAs do we have to worry about, anyway?
- Of course, it's not just their greed that matters …
- … and it's not just their diligence & security that matters …
  – *"A decade ago, I observed that commercial certificate authorities protect you from anyone from whom they are unwilling to take money. That turns out to be wrong; they don't even do that much."* - Matt Blaze, circa 2010

Conclusion

- Use SSL/TLS to secure communications end-to-end
- Relies on trustworthiness of certificates, which does not always hold