Chapter 62
Simple Mail Transfer Protocol

- **You've got Mail!**

> **“President Bush said for security reasons, he's sworn off all e-mail communication. He will not be using email at the White House at all. Is that a good idea? I mean, it's not like that speaking thing was working out so good.”**

-- Jay Leno

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Chapter 62
Simple Mail Transfer Protocol

- Agenda
  - SMTP Basics
  - SMTP Security Risks
  - Anti-Spam Frameworks
  - E-Mail Content

SMTP Basics

- The Foundation of Mail Delivery.

SMTP Properties

- Text based protocol
  - Commands use 7-bit ASCII
  - Data may use 8-bit encodings
- Message transmission as header+body
- Uses different TCP ports
  - 25/TCP for server-server communication
  - 465/TCP for SMTP+SSL
  - 587/TCP for message submission

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Sample SMTP Session

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250-PIPELINING
250-SIZE 52428800
250-VRFY
250-ETRN
250-STARTTLS
250-ENHANCEDSTATUSCODES
250-8BITMIME
250 DSN
MAIL From: <lynx@example.net>
250 2.1.0 Ok
RCPT To: <lynx@agamemnon.example.net>
250 2.1.5 Ok
DATA
354 End data with <CR><LF>.<CR><LF>
Hi!

Bye,
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250 2.0.0 Ok: queued as 2CB7C24008A9
QUIT
221 2.0.0 Bye
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Extended SMTP (ESMTP)

- Adds commands and functionalities
  - Command pipelining
  - SSL/TLS support
  - 8-bit support for data
  - On-demand relay for mobile users
- Many MTAs support ESMTP

SMTP Security Risks

- Let's Shoot the Messenger.

Open / Unauthorised Relays

- UBE/UCE still a big problem
  - Malware packed into email
  - Spam
- MTA needs to verify source of email
- *Any* open relay will be misused
  - Disrupt email delivery
  - Put IP range(s) on RBLs
- Risk: medium
- Impact: high

SMTP EHLO/HELO Pipe Bombs

- Imagine you inspect HELO strings
- Your logs look like this someday
  - 2007-…rblsmtp: 43 EHLO “|http://a.b.cc/cgi/put.cgi”
  - 2007-…rblsmtp: 43 HELO “|http://a.b.cc/cgi/put.cgi”
- Scripting security also applies to MTAs!
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SMTP VRFY

- SMTP VRFY tests email addresses
  - Existing accounts will be confirmed
  - (Ab)use for reconnaissance
- Some clients require VRFY
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SMTP + SSL/TLS

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  - Provides everything that SSL/TLS promises
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Anti-Spam Frameworks

- Enhanced Complexity as Security Measure.

Domain Keys

- Adds header with signature
  - Signed content of message
  - Signature linked to domain name
- Cryptographic checksums per message
- In-transit modification breaks checks
  - Mailing list managers
  - Content filter
- Envelope not part of signature
  - Replay injection possible

Domain Keys & DNS

- DomainKey-Signature header has fields: …d=example.net; s=dkim.key;…
- PK lookup: dkim.key._domainkey.example.net
- DNS security determines DKIM security
  - DNS attacks apply as well
  - Attacker may try to offer own key

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Sender Policy Framework (SPF)

- Based on published policies in DNS
  - Domains name valid email origins
  - Domains name default trust level
- SPF works in SMTP dialogue
  - Early blocking possible
- SPF *completely* breaks email forwarding
  - Message must be rewritten
  - Sender Rewriting Scheme (SRS)

Real Time Blacklisting (RBL)

- RBL are simply based on lists
  - Distribution by DNS is common
  - Listing may have arbitrary parameters
- Most RBLs are based on reputation
  - Metrics help measurement
  - Scores can change dynamically
- Using any RBL outsources access lists

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- Summary
  - SMTP needs protection.
  - SMTP relies on DNS infrastructure.
  - SMTP + SSL/TLS isn't necessarily safe.
  - SMTP servers on RBL are useless.
  - Pick RBLs carefully.

Thank You

- Questions?

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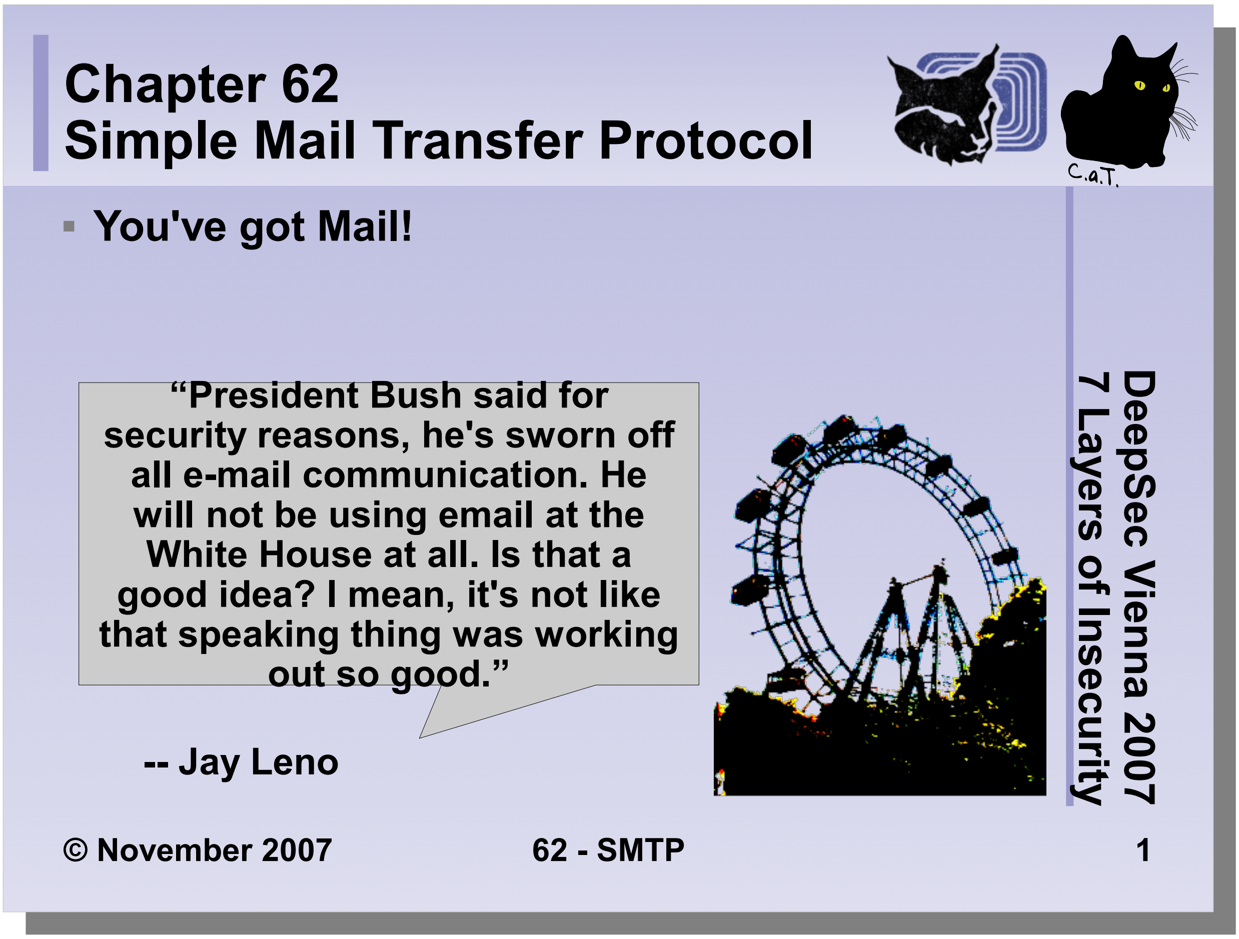

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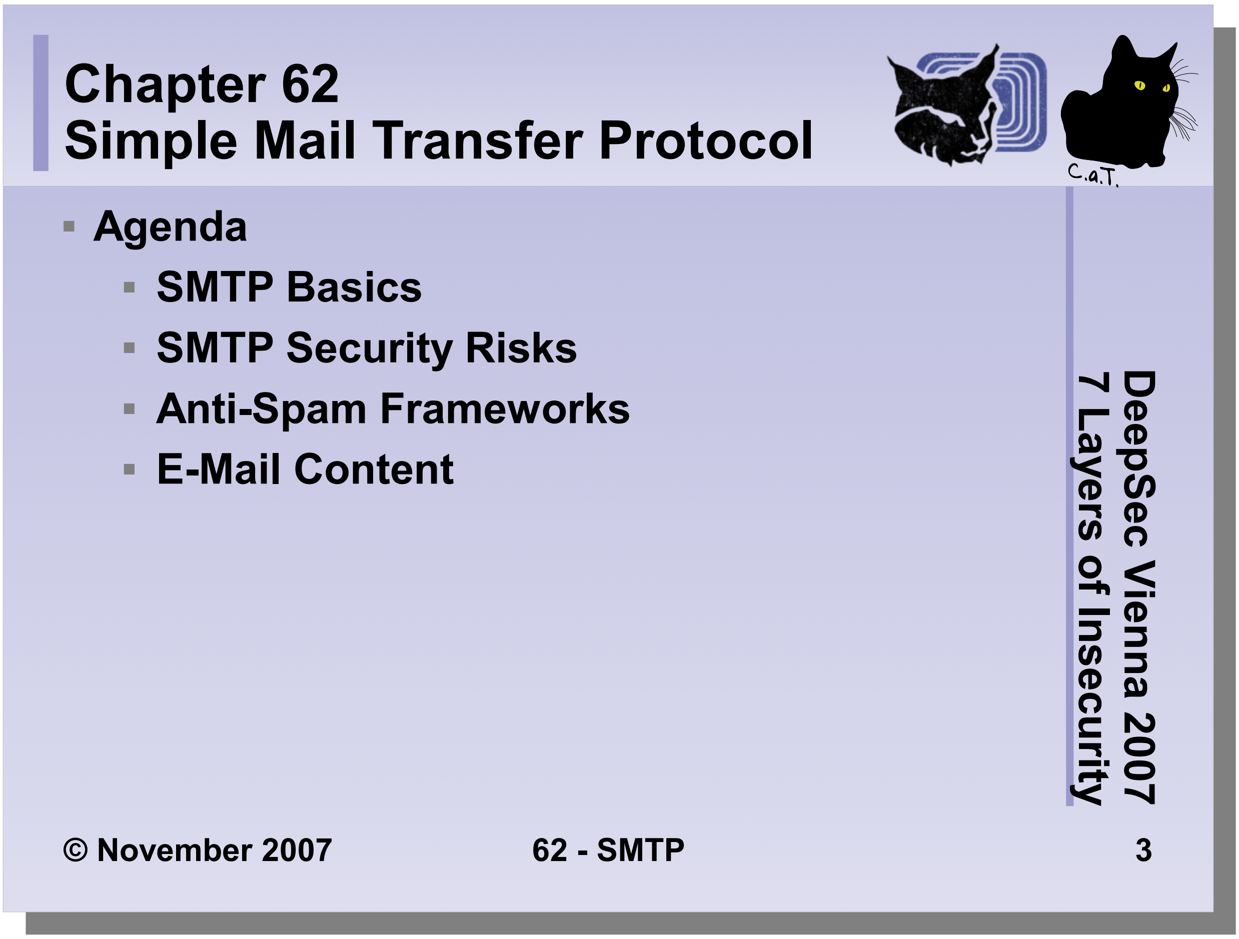

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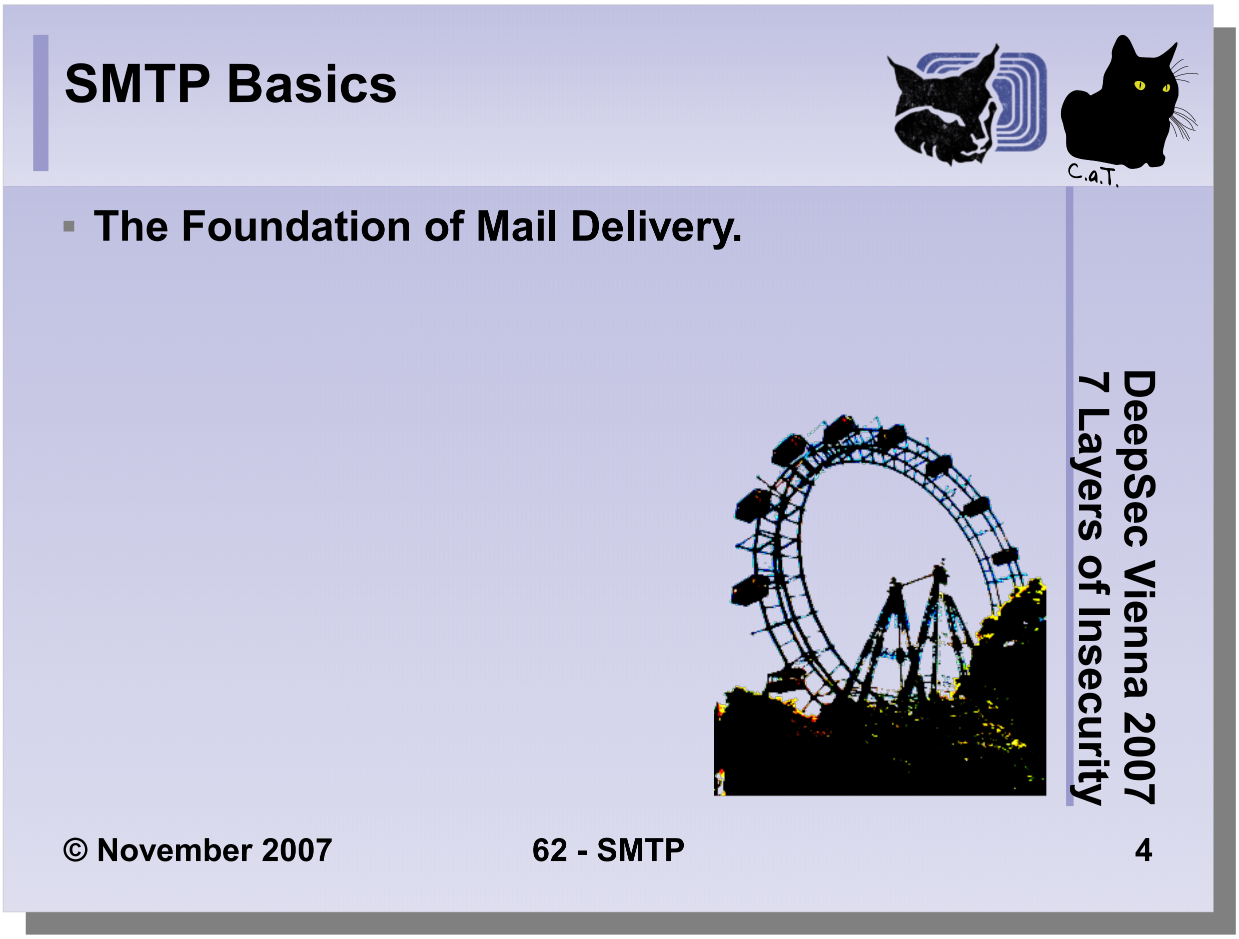

SMTP Basics

- The Foundation of Mail Delivery.

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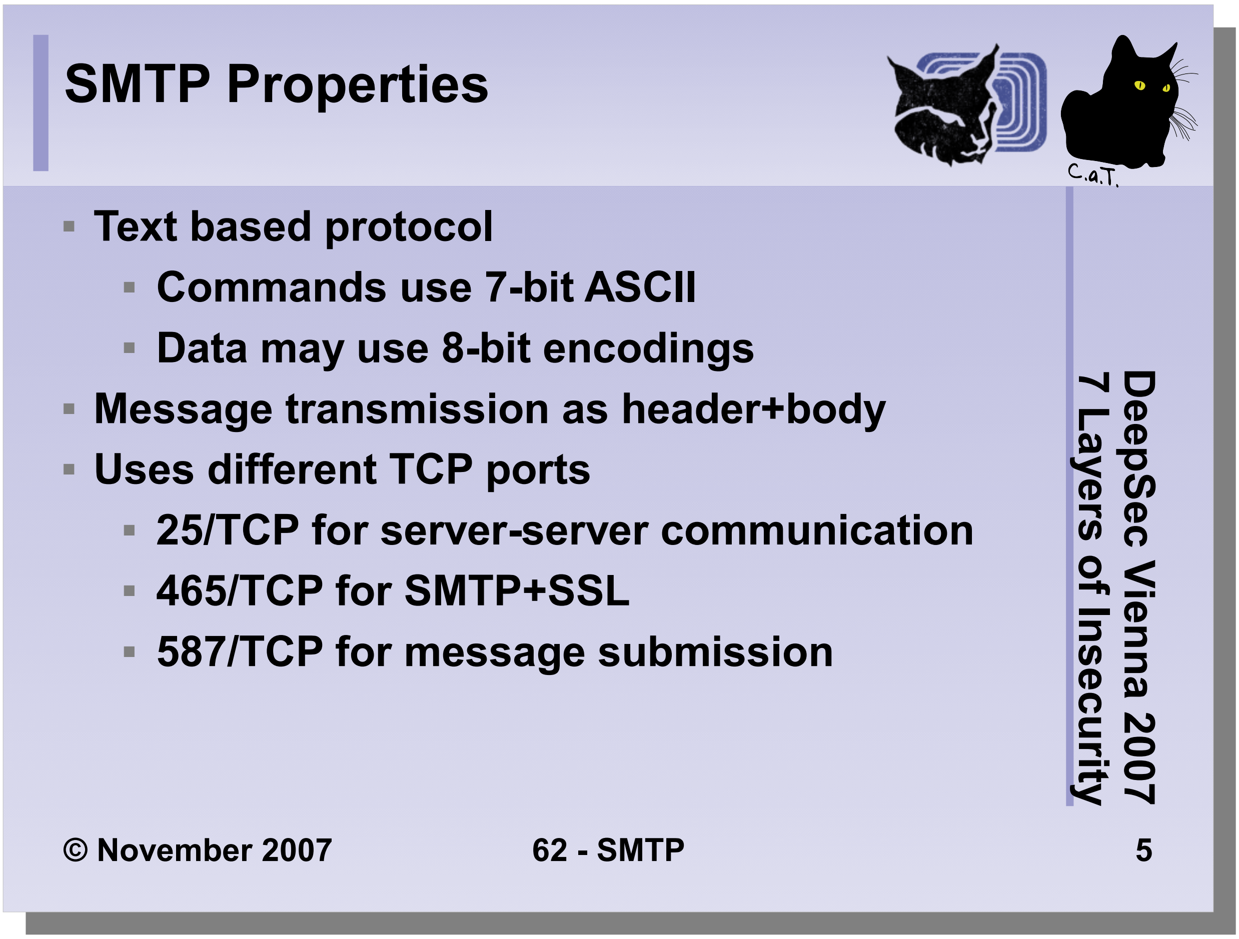

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C.a.T.

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SMTP/ESMTP transactions distinguish between three roles of the endpoint.

• Mail Submission Agent (MSA) receives email from a MUA and relays it to other MTAs.

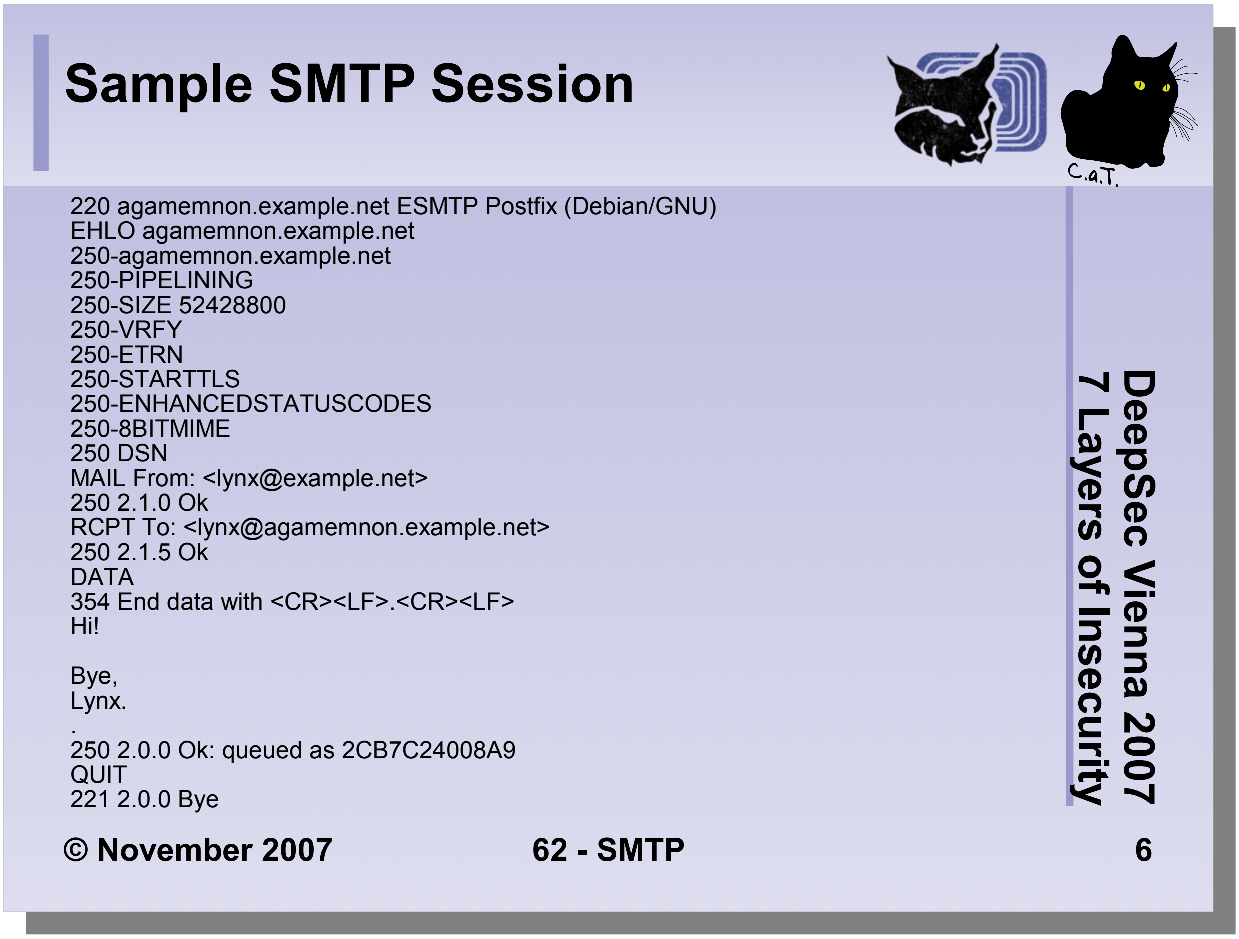
• Mail Transport Agent (MTA) is the classical “mail server” that transports email messages to other MTAs.

• Mail User Agent (MUA) is the classical “mail software” that enables users to read, write and send email.

MTAs speak ESMTP/SMTP with each other on port 25/TCP. MUAs submit their messages either via ESMTP/SMTP to a MTA on port 25/TCP or to a MSA on port 587/TCP. Submission by using MSA supports mobile users and offers authentication along with correction of the submitted messages (adding missing header fields for example). In practice most MUAs use a local MTA or submission via 25/TCP.

ESMTP/SMTP is proposed in RFC 821, 822, 2821, 2822 among others.

Message submission via 587/TCP is proposed in RFC 2476.



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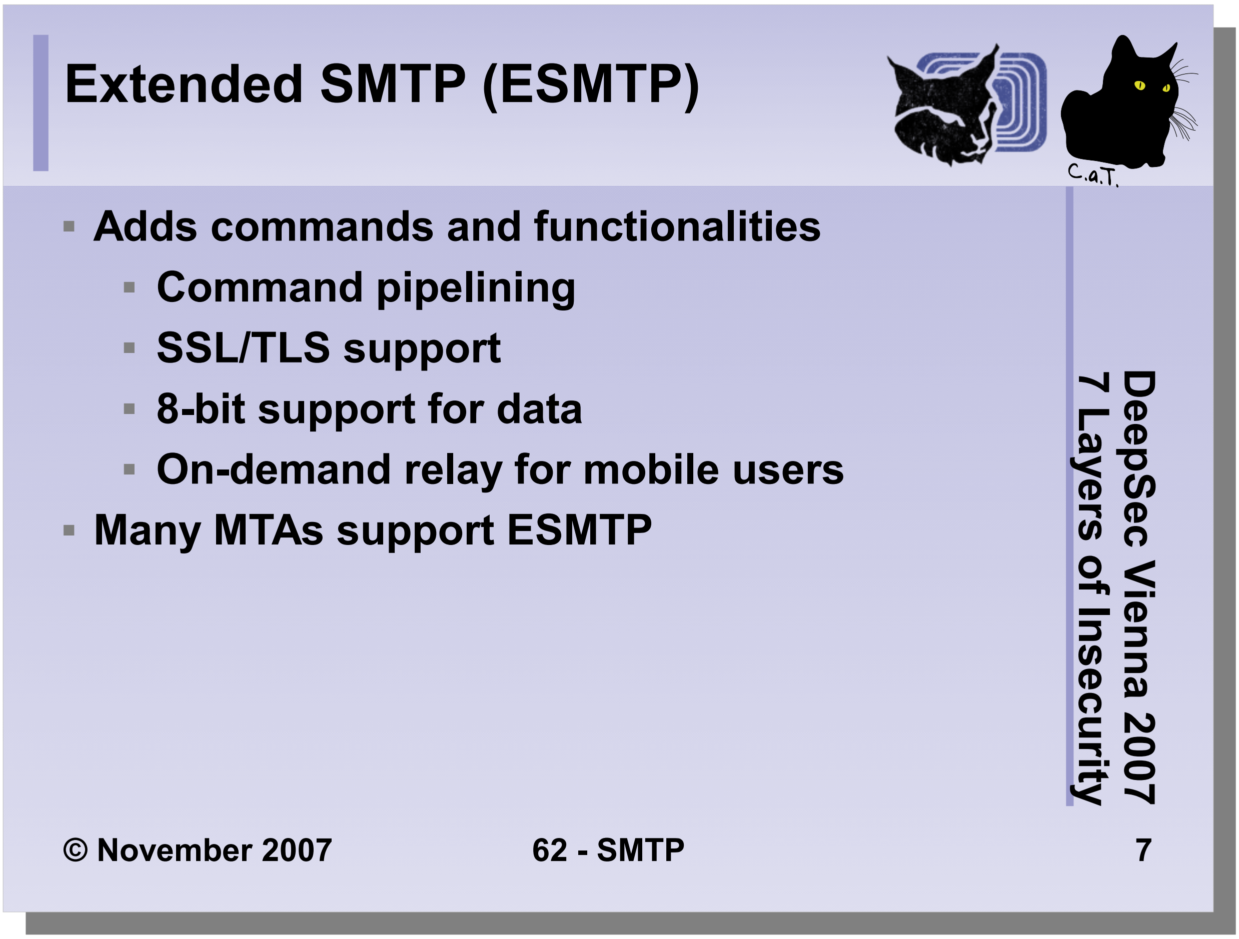

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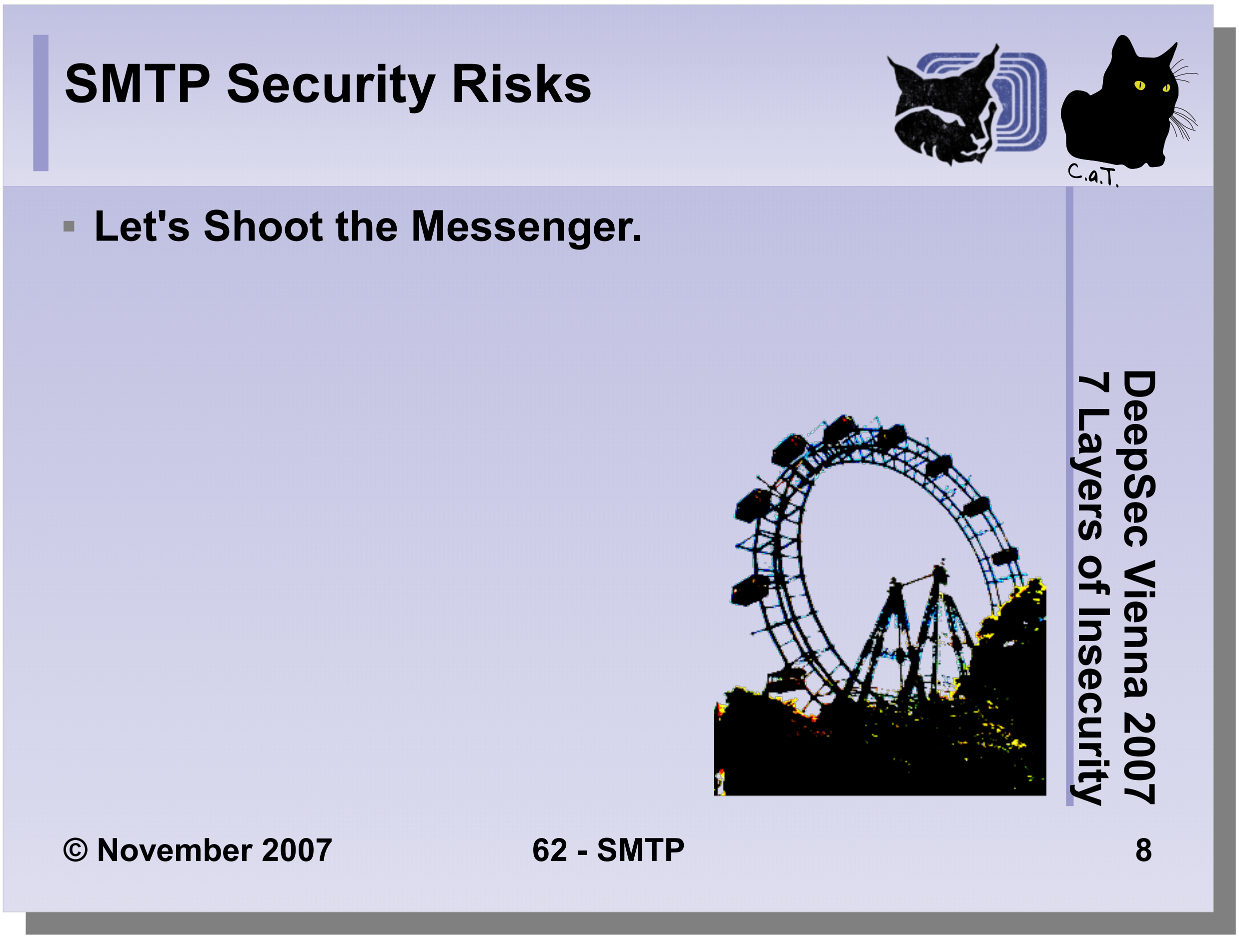

SMTP Security Risks

- Let's Shoot the Messenger.

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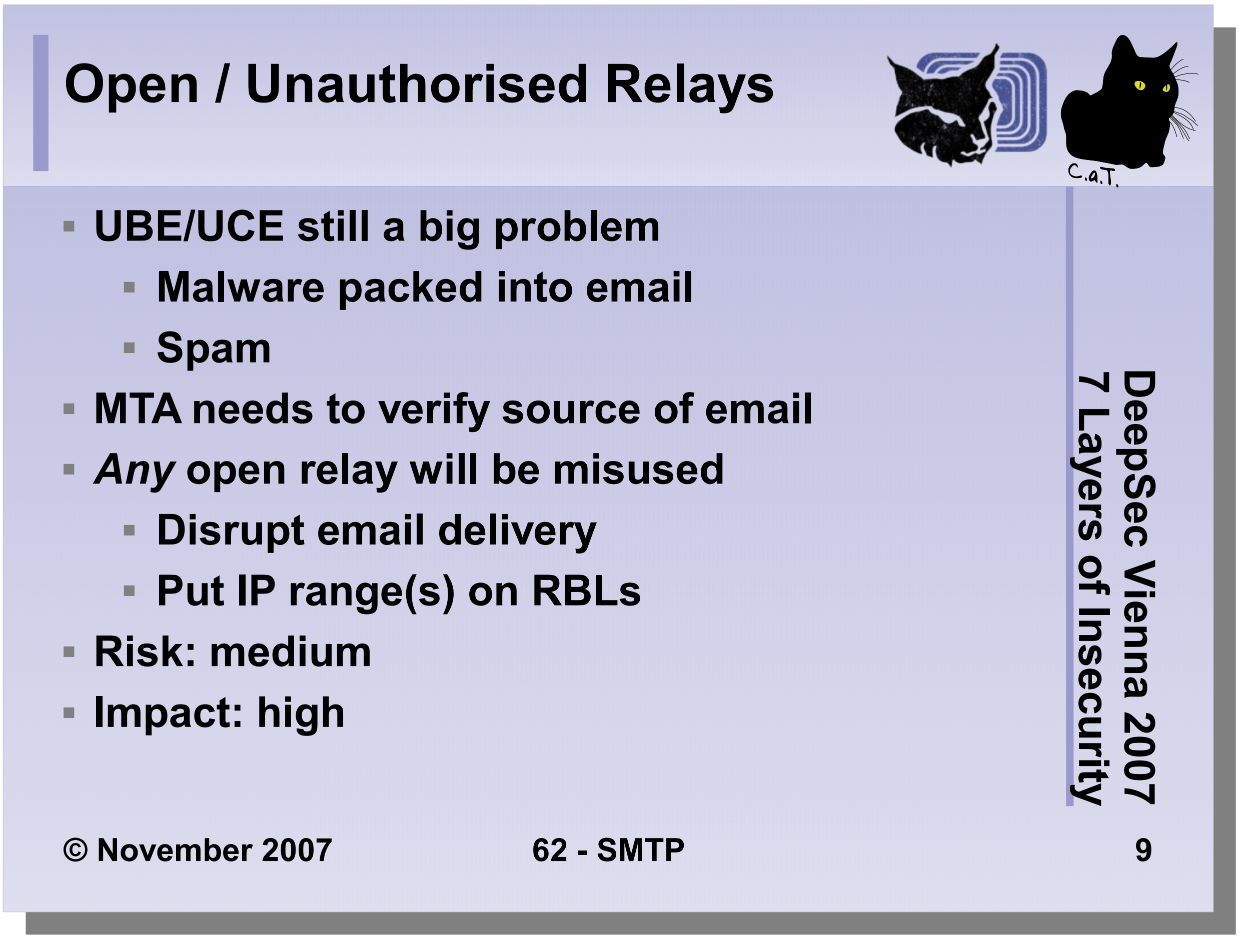

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  - Put IP range(s) on RBLs
- Risk: medium
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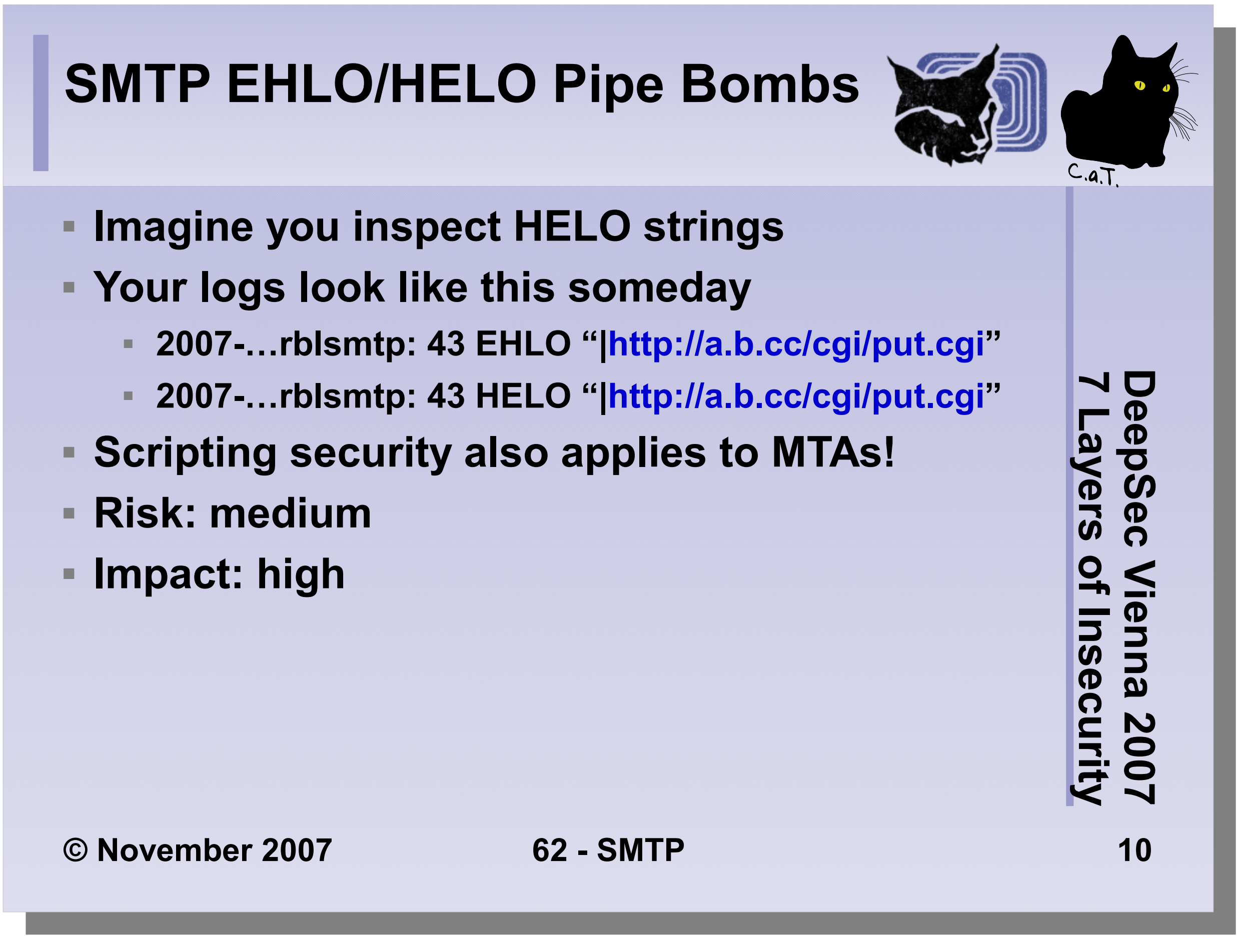
Most MTAs are equipped with anti-spam and anti-virus filters. This is no safeguard against open relaying of malware or email messages. A lot of servers have satellite MTAs installed that act only as a collector for locally generated email. Usually the central mail hub gets all messages and delivers them. The mail filters are not equally strong and so a satellite MTA may inject malformed messages, thus discrediting the central MTA when the emails leave the network. ISPs often suffer from this effect, because they have to relay mail from their customers. The same can happen to a LAN where the outbound MTA trusts every client. DMZs usually have their share of web servers that might act as HTTP-to-SMTP gateway and also feed the central MTA with malware or spam emails.

Mitigation:

- Tightly configure access rules for *all* of your MTAs.
- Inspect internal email as you would inspect external email messages.
- Use multiple outbound relays and use them for specific classes of email.



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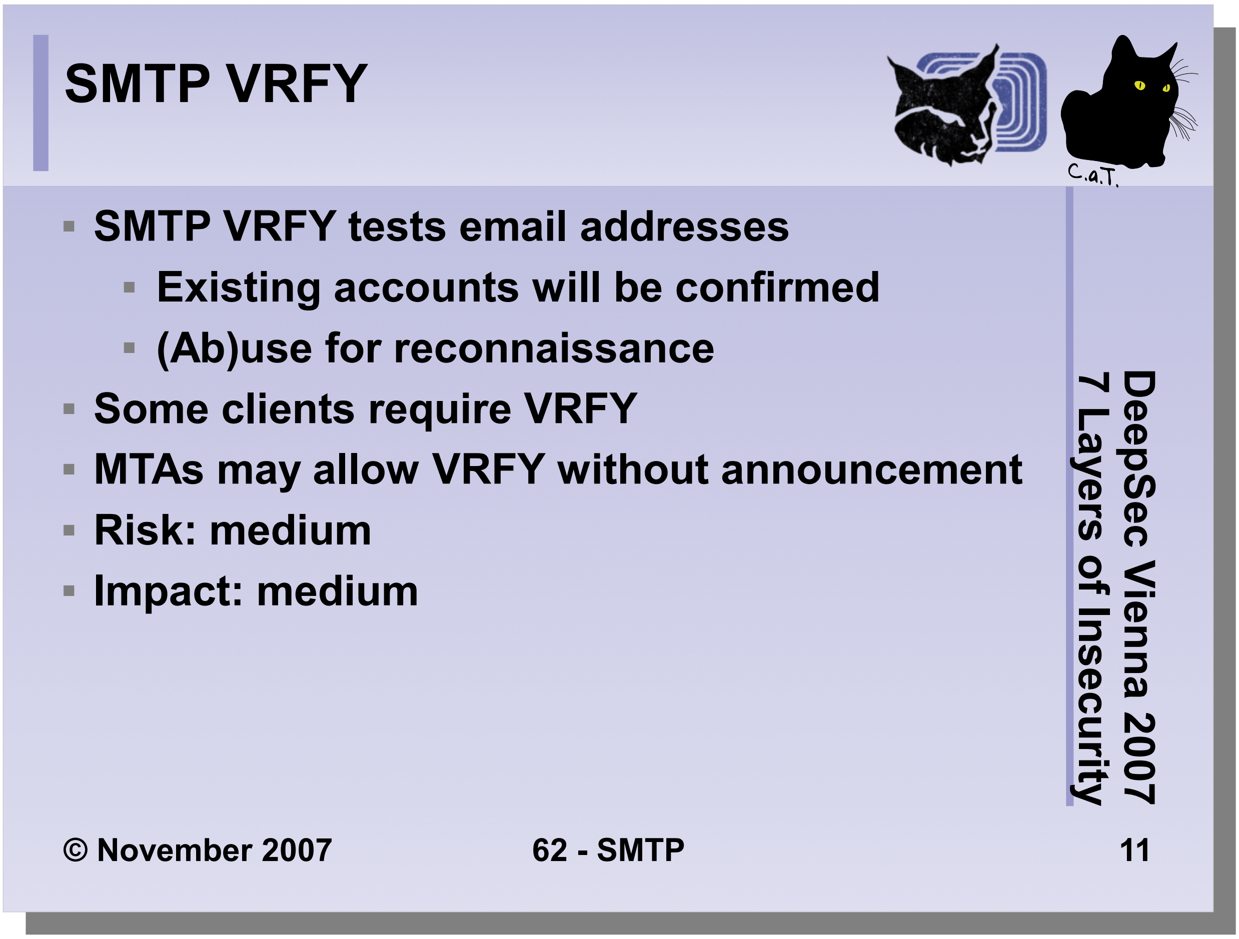
Mitigation:

• Be careful with MTA functionality augmented by plugins.

• Limit MTA software on server (access controls, privileges).

• Do security checks with all your filtering systems (collections of malformed email can be generated and are available).



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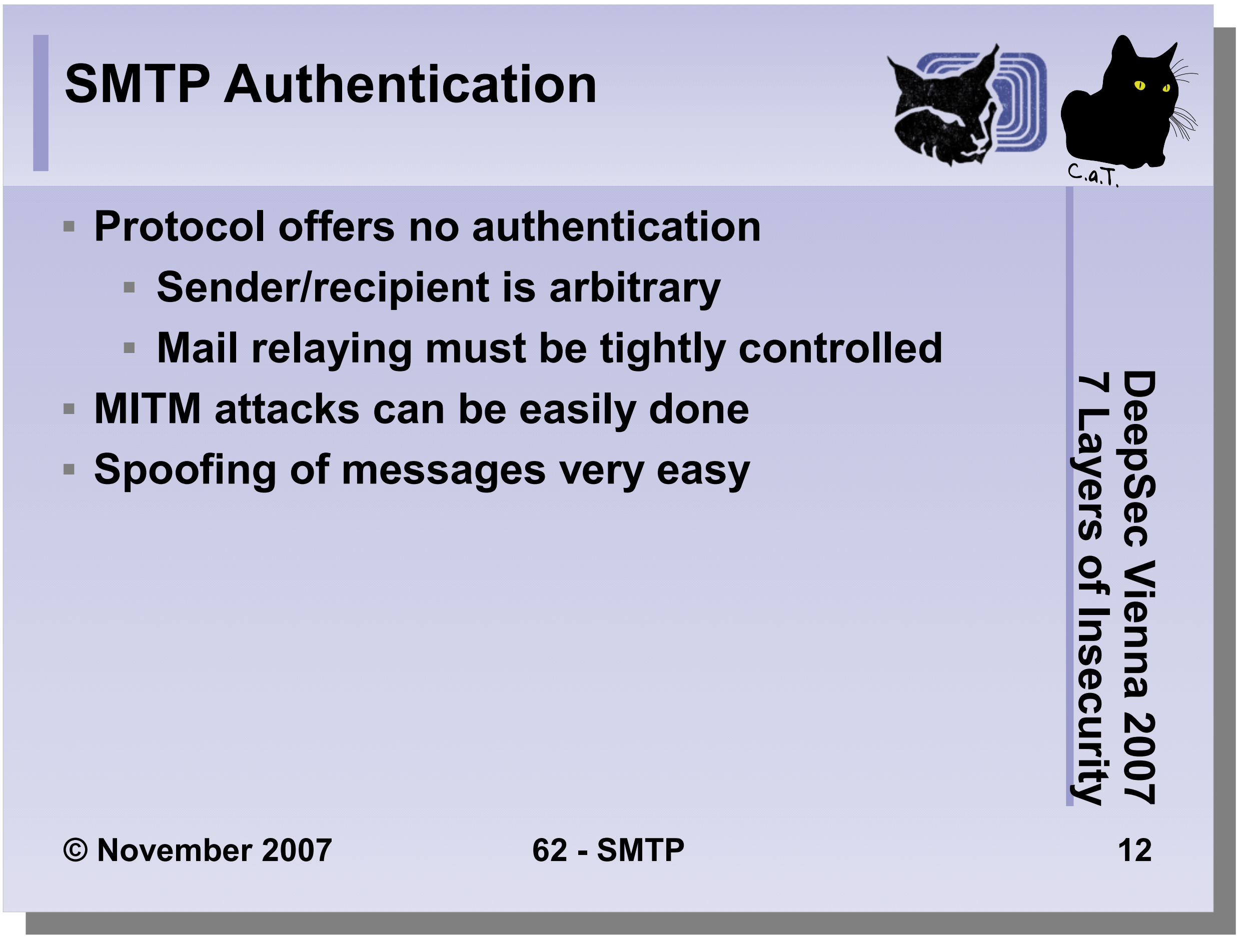
Account/address enumeration is a tool routinely used by attackers. SMTP is one way of getting hold of verified information, harvesting LDAP trees is another.

Mitigation:

- Disable VRFY if possible.
- Disable the EXPN command (allows listing of mailing list subscribers).
- Limit SMTP connection and disconnect after *n* invalid commands or errors.
- Deploy SMTP greylisting and rate limiting at your border MTAs.



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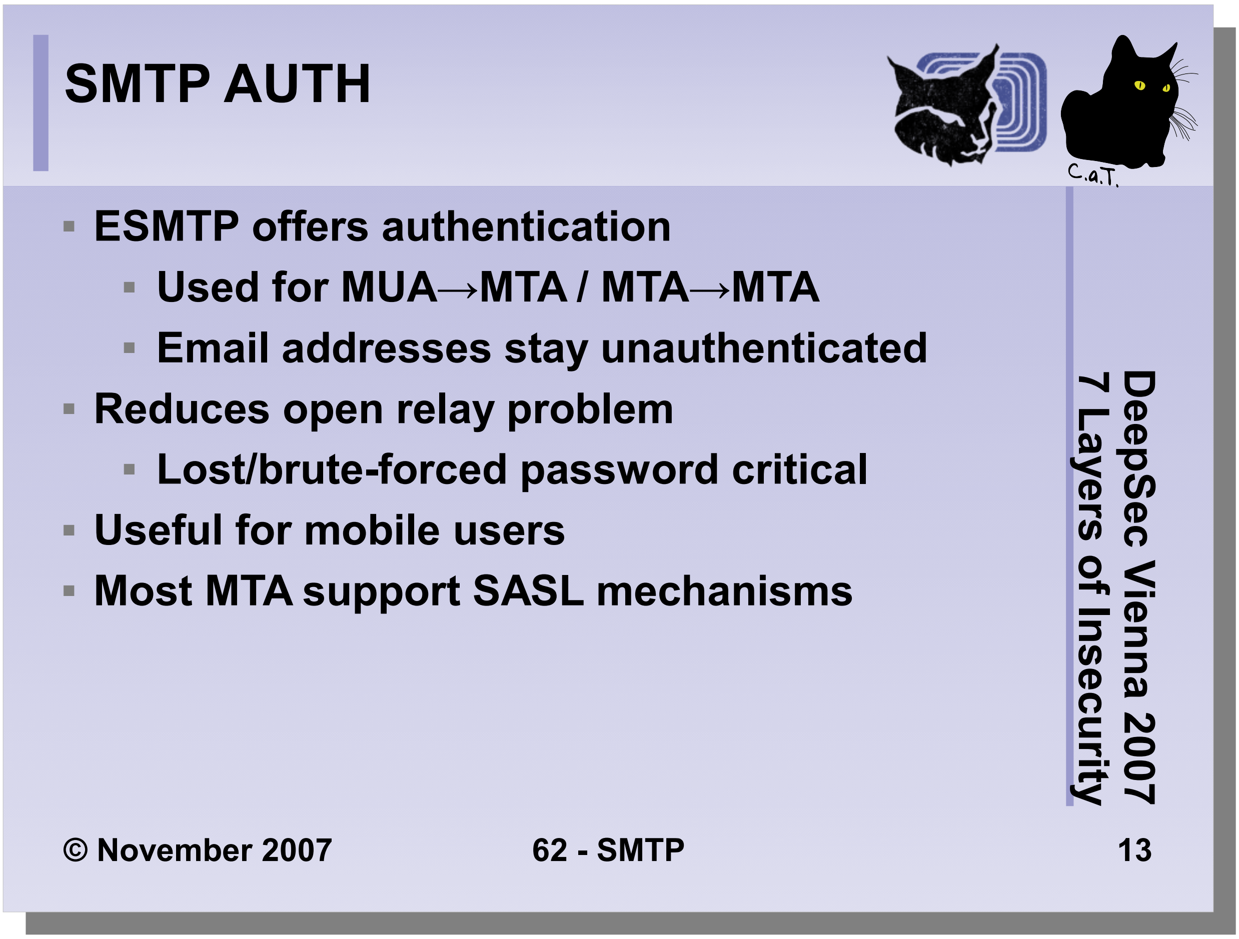

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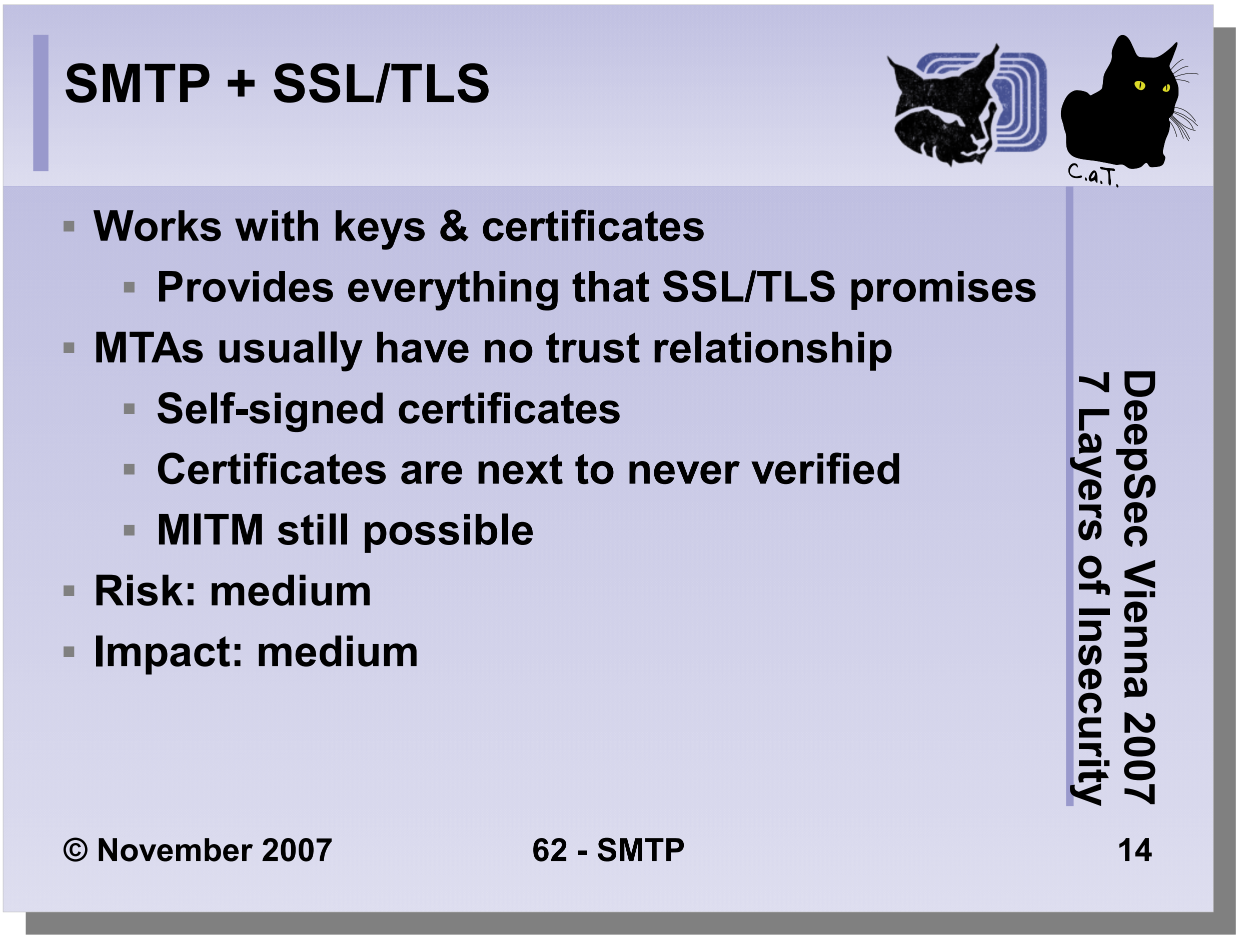

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  - Certificates are next to never verified
  - MITM still possible
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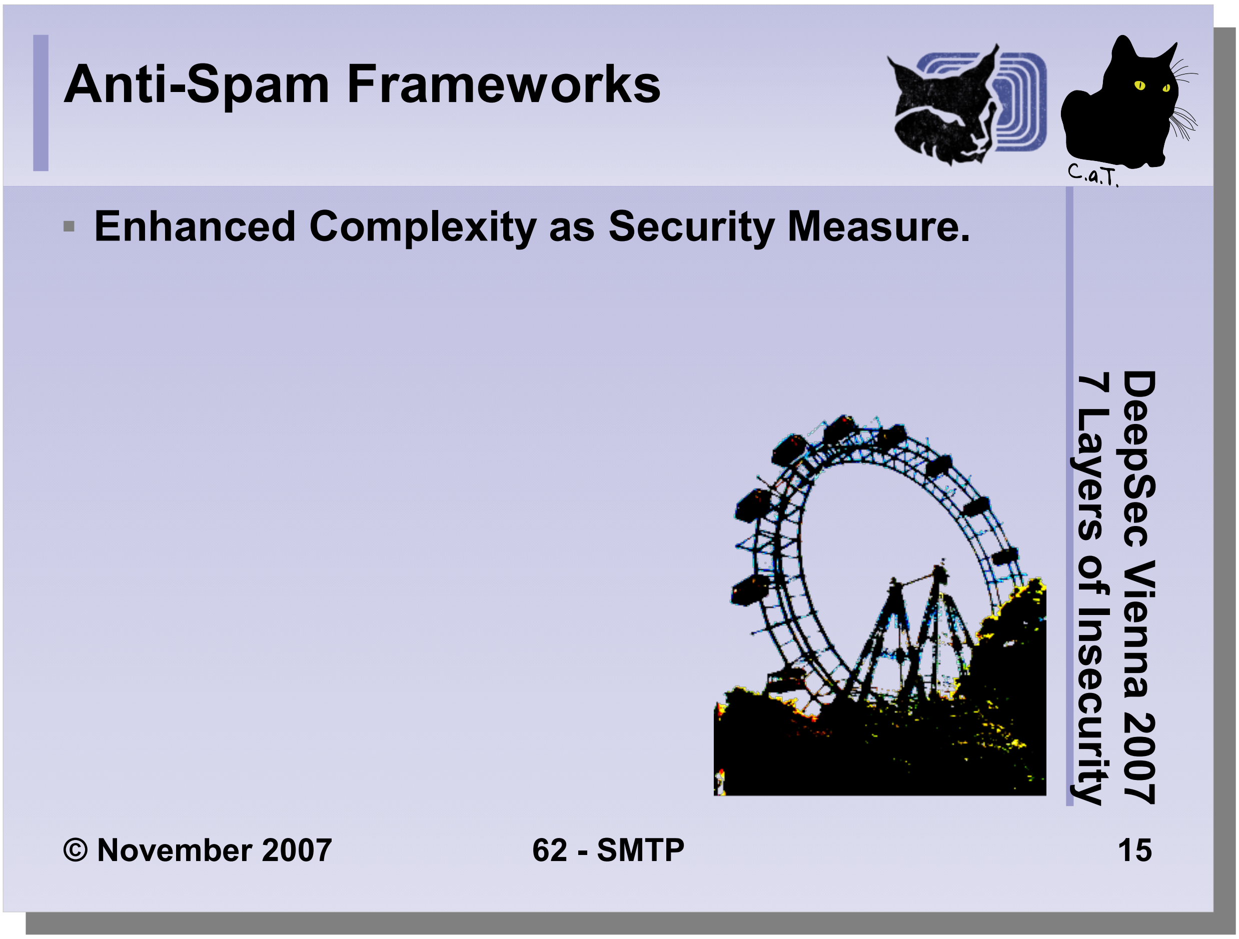
Most MTAs can be configured to deny unencrypted SMTP sessions. However this breaks the SMTP specification and thus can only used for clients and networks under your control.

Mitigation:

- Use certificate verification on a dedicated TLS-only MTA for roaming users.
- Use VPN technology to bring roaming users to your MTA.



Anti-Spam Frameworks

- Enhanced Complexity as Security Measure.

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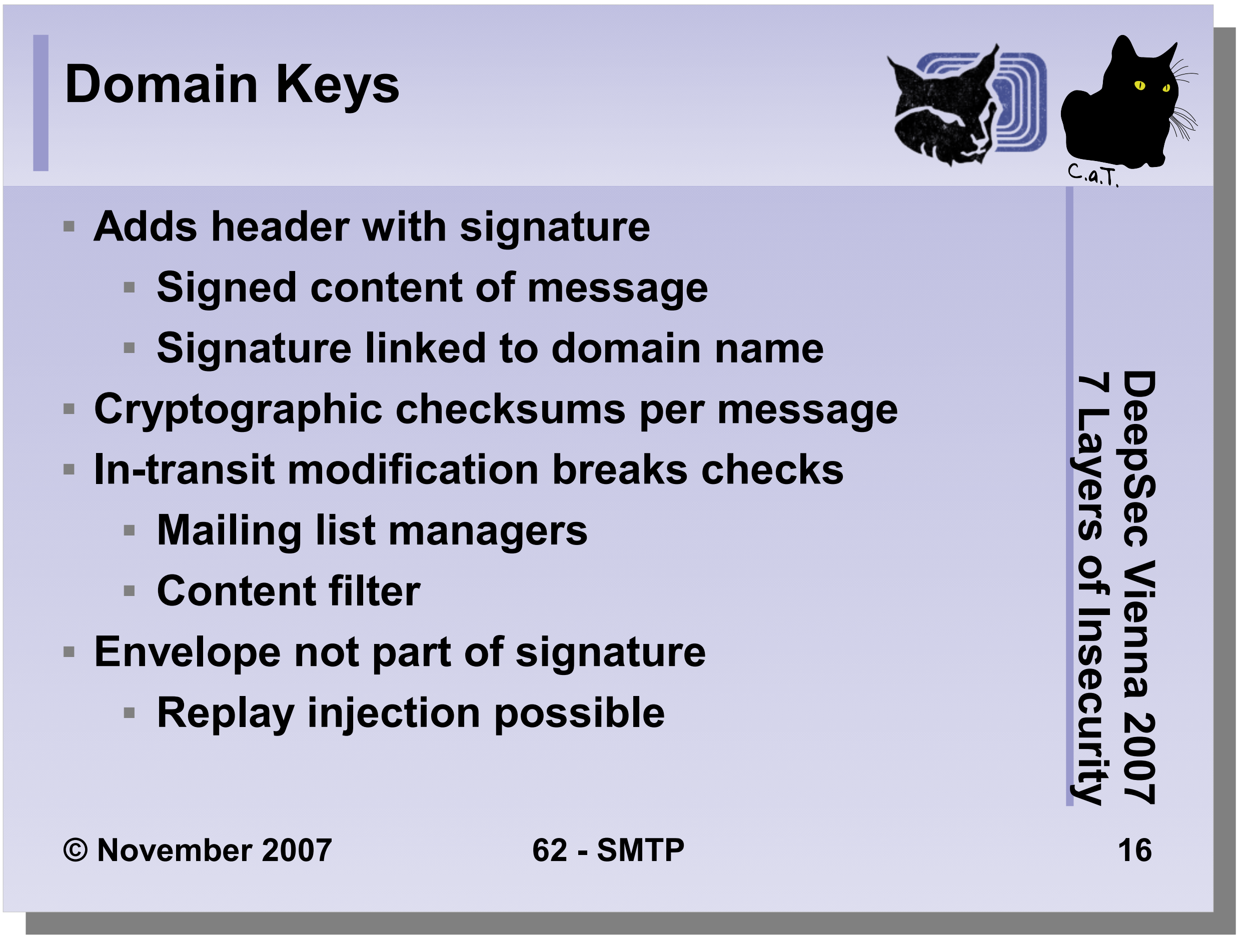

Domain Keys

- Adds header with signature
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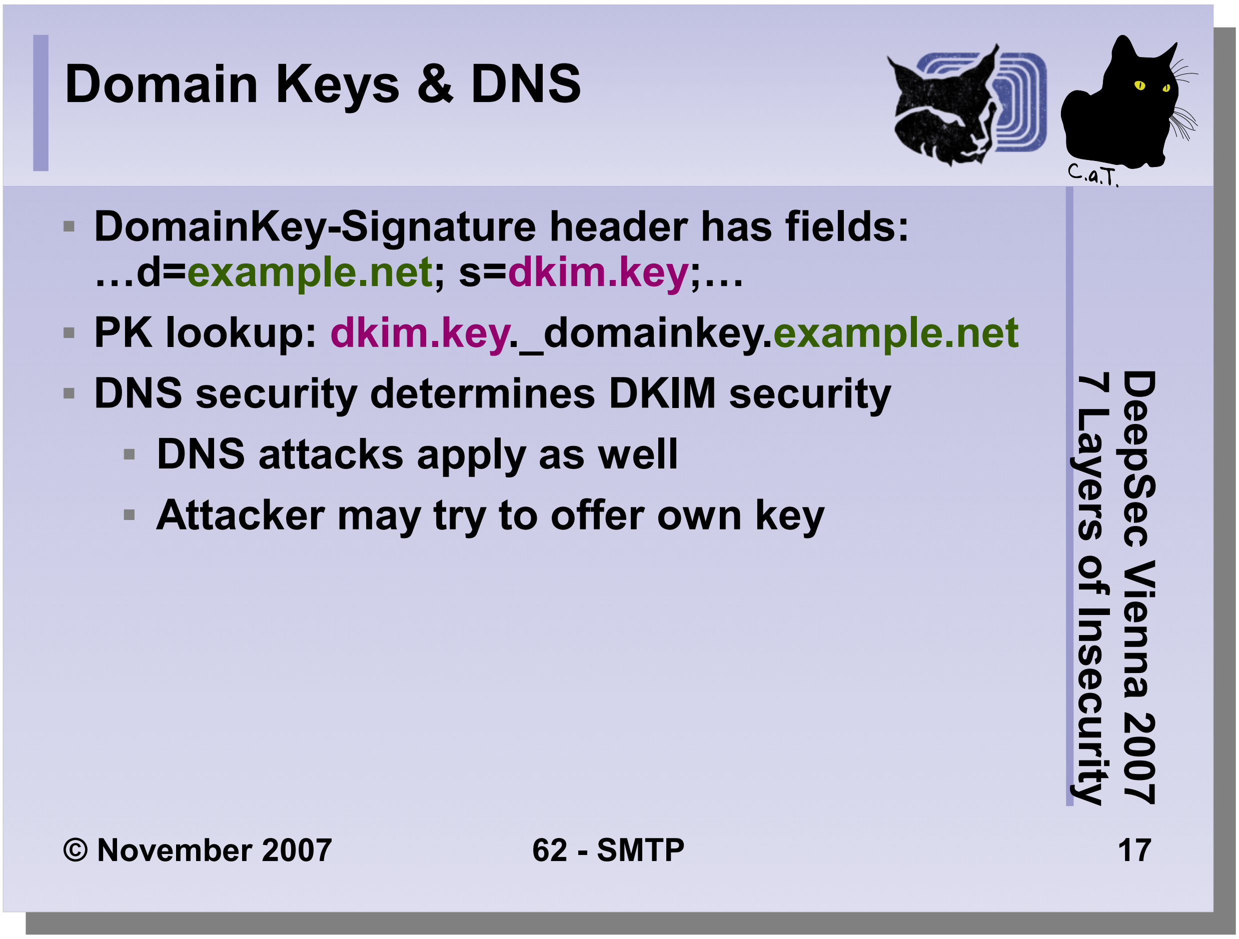
Domain Keys should always be used as a component in a layered security design. Use it in combination with VPN technologies, SSL/TLS, authentication and verified configurations of MUAs/MTAs.



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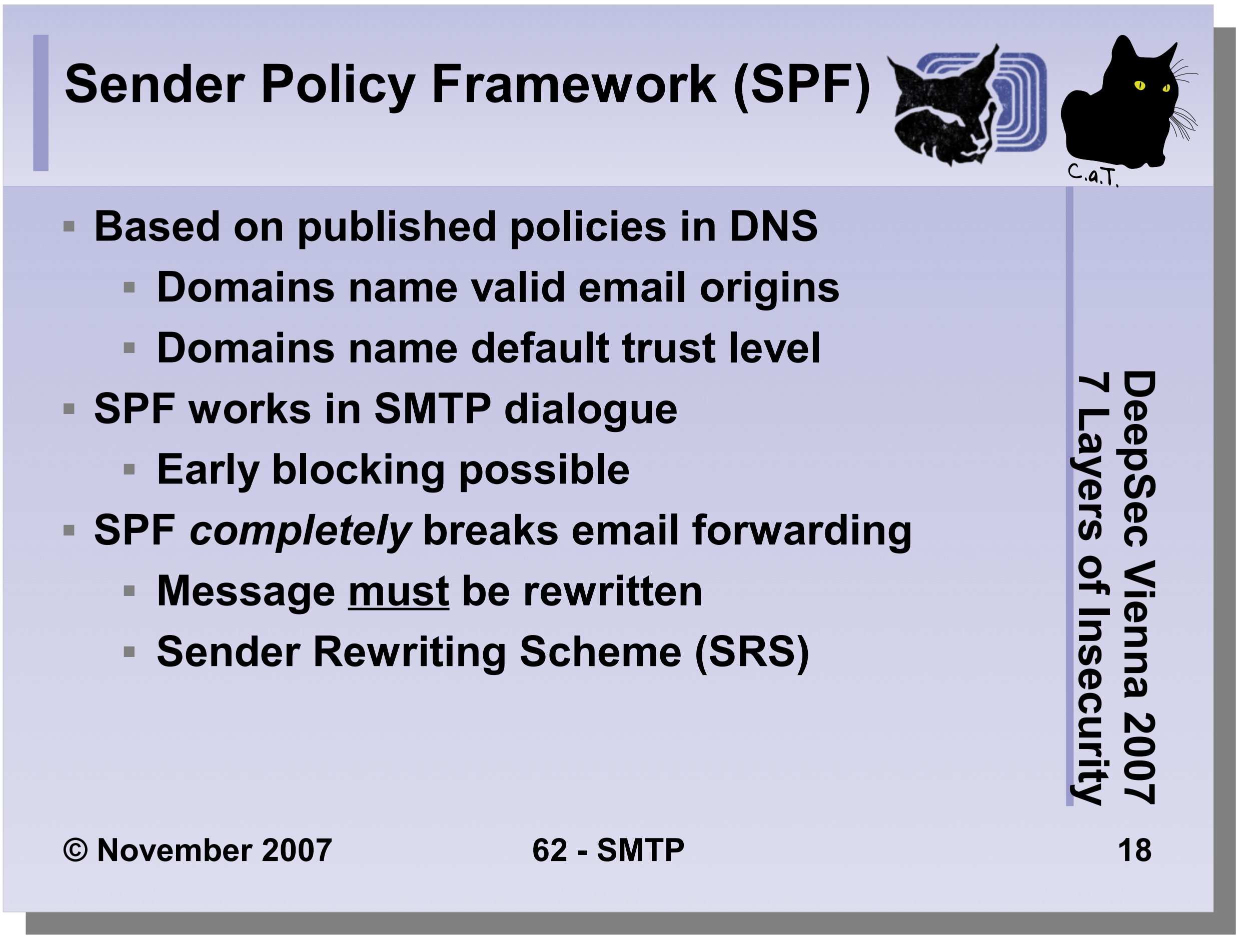

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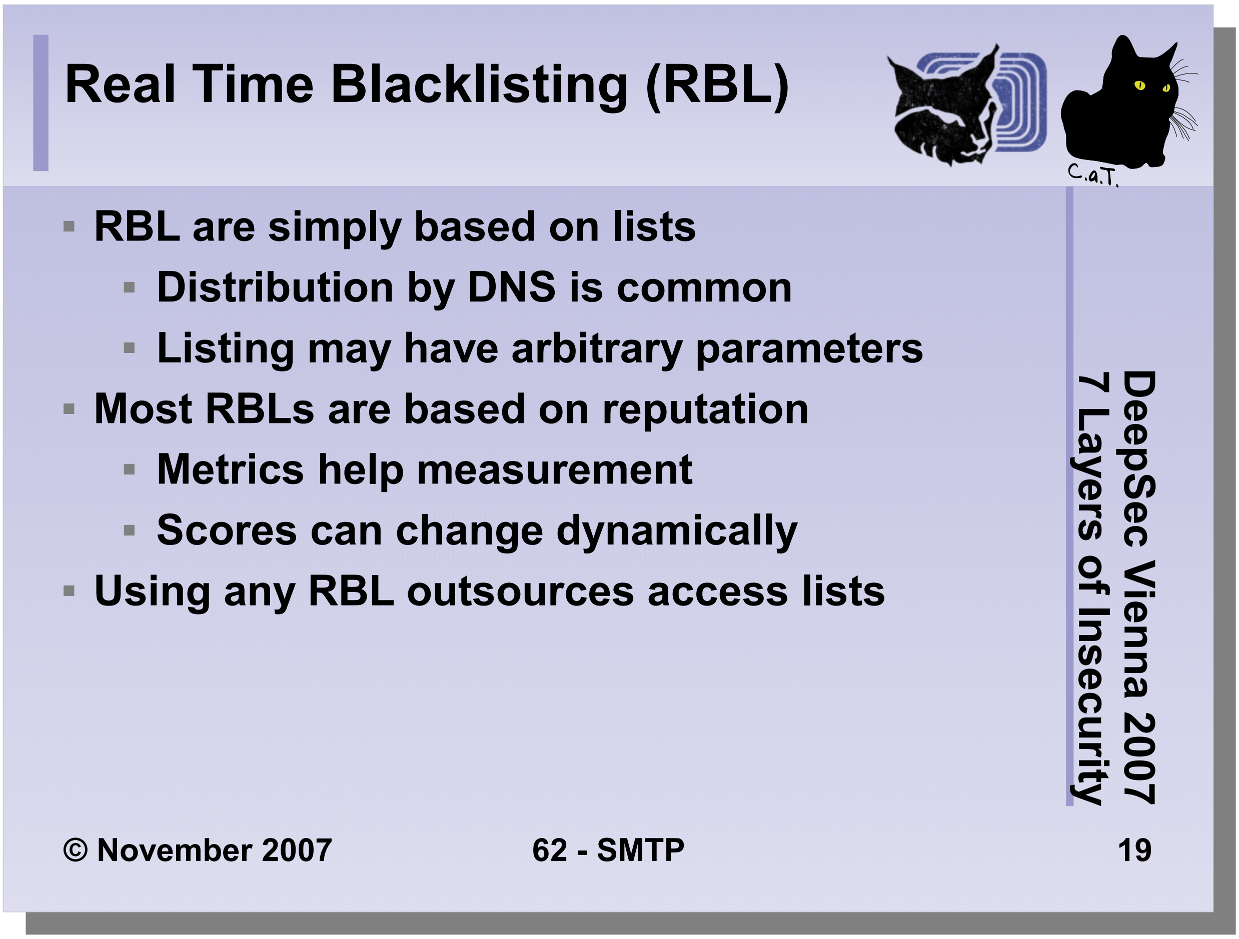

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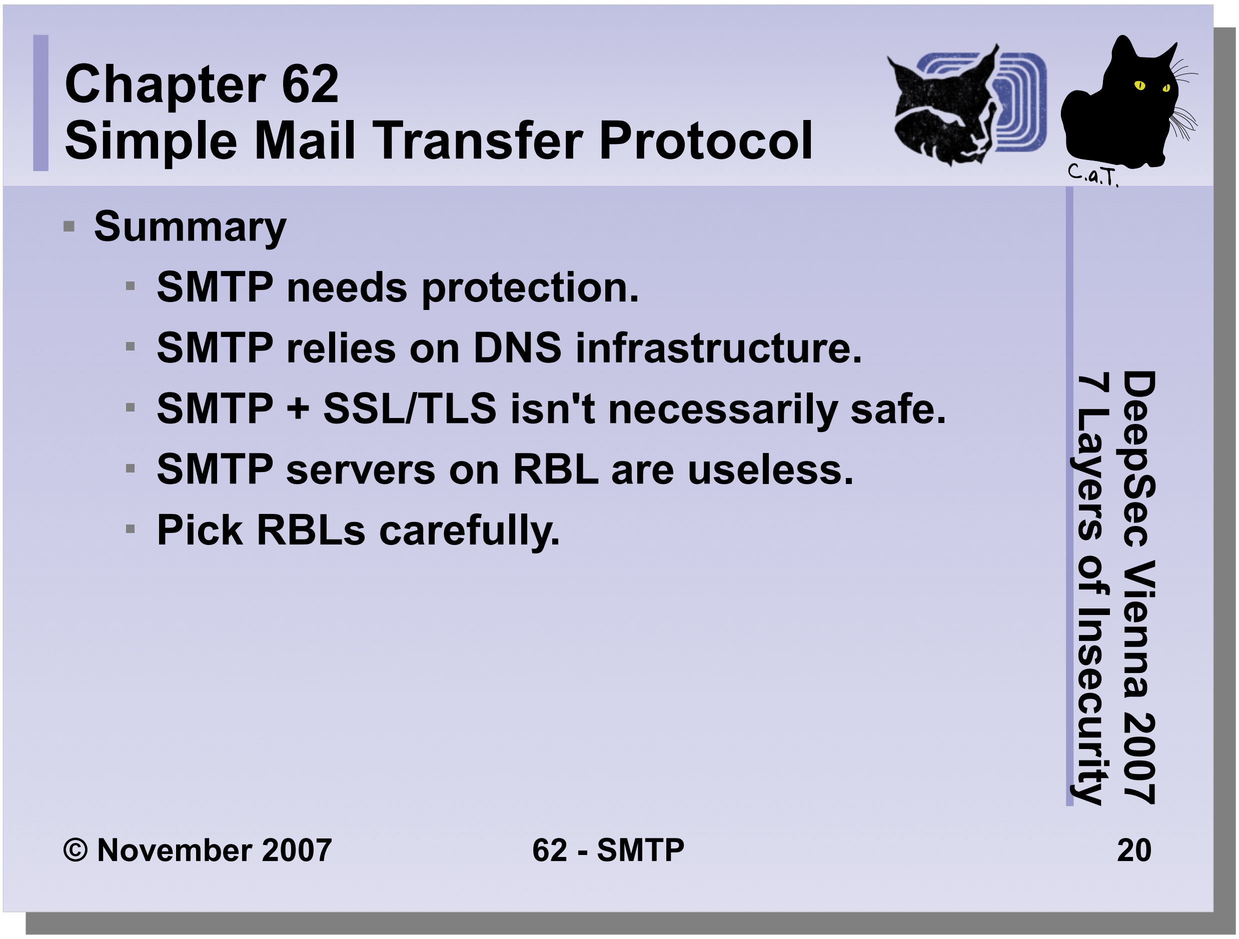

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