DNSSEC, DANE and SMTP Security

A Mid-level Overview

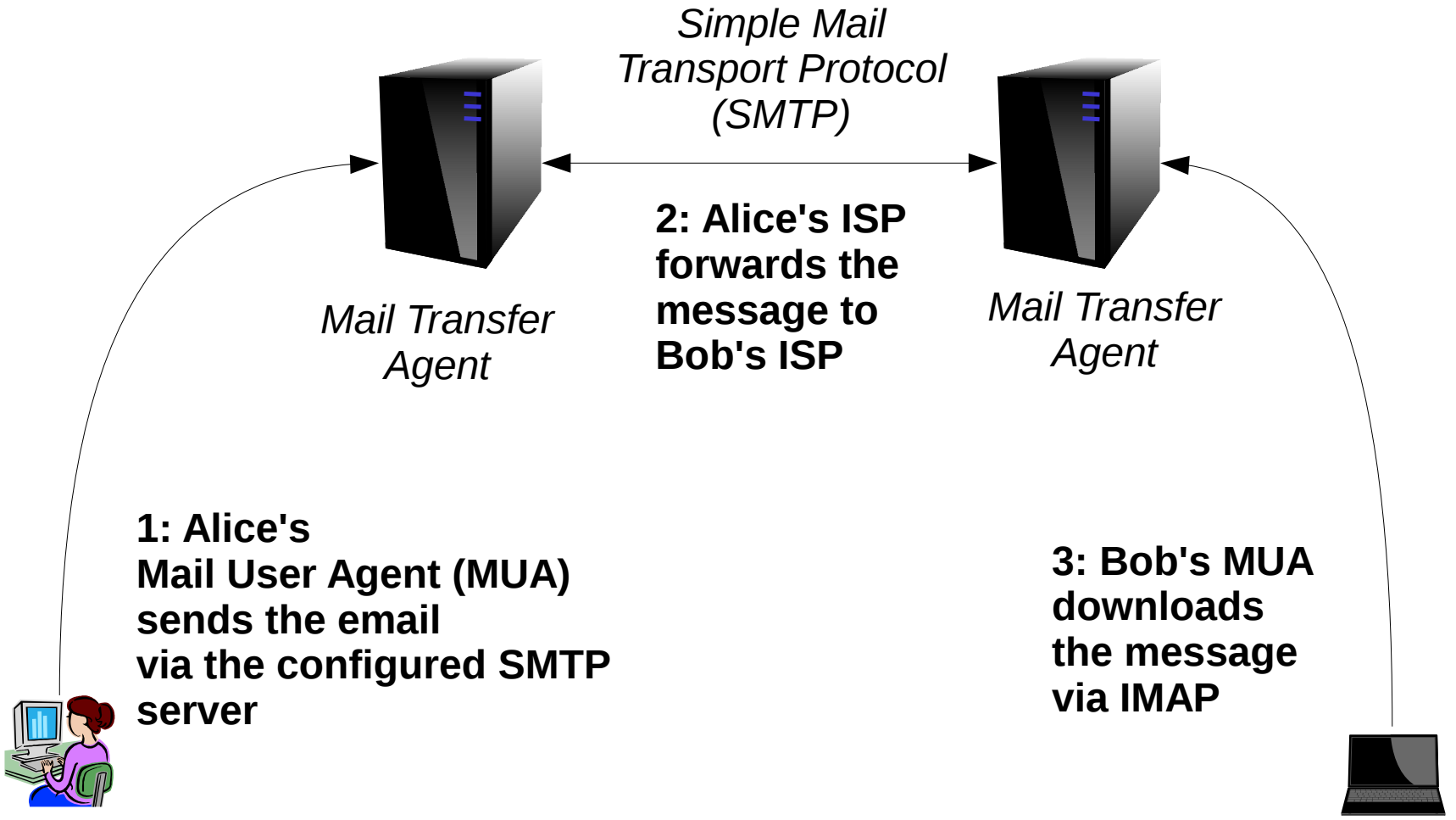
Wes Hardaker
Parsons

Downgrade Resistant, Opportunistic Security for Server To Server E-Mail Delivery

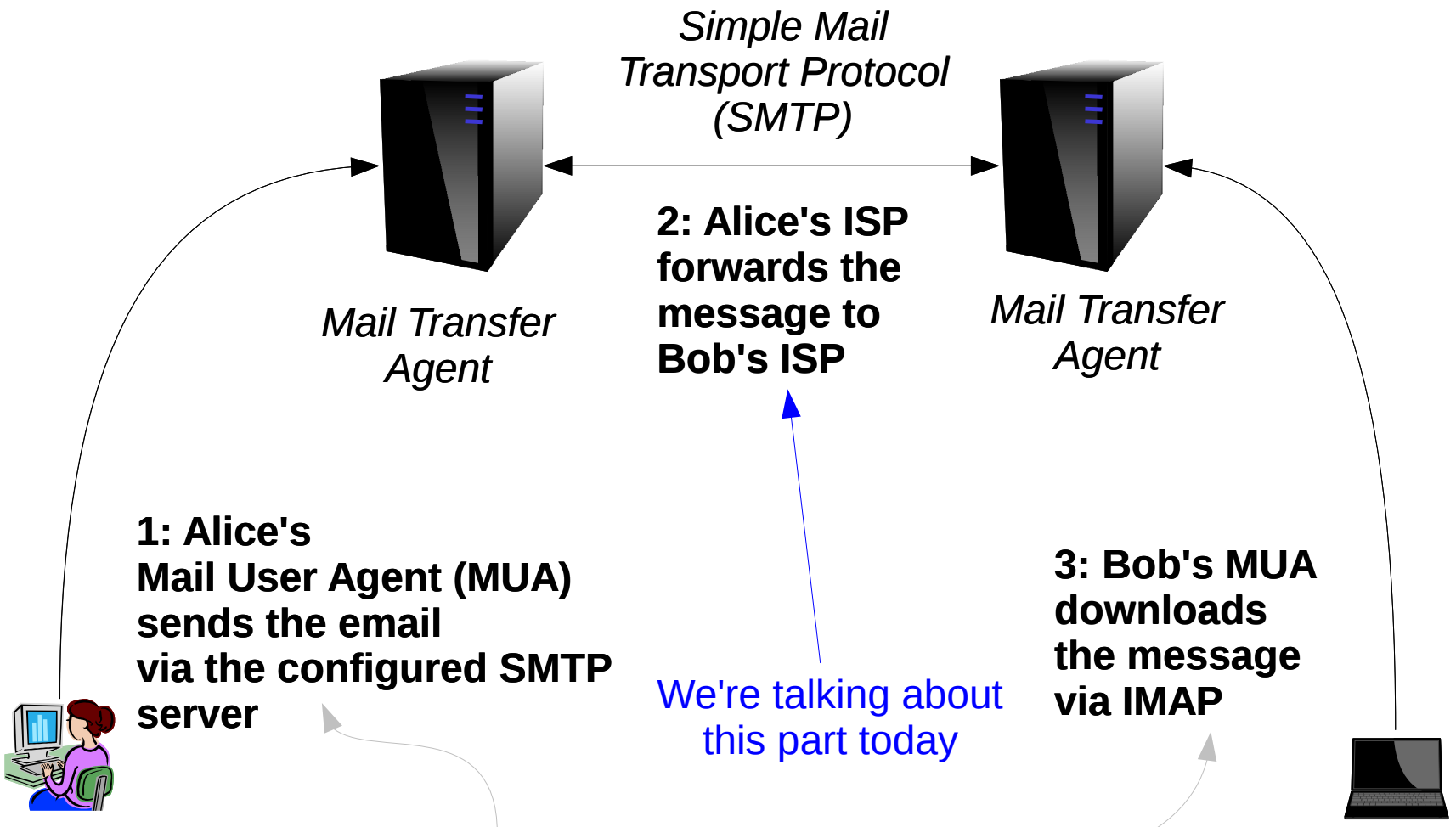
Overview

- Server-to-Server E-Mail background
- SMTP Vulnerabilities
- DANE/SMTP to the rescue
- Implementation and Deployment Status

Server-to-Server Email

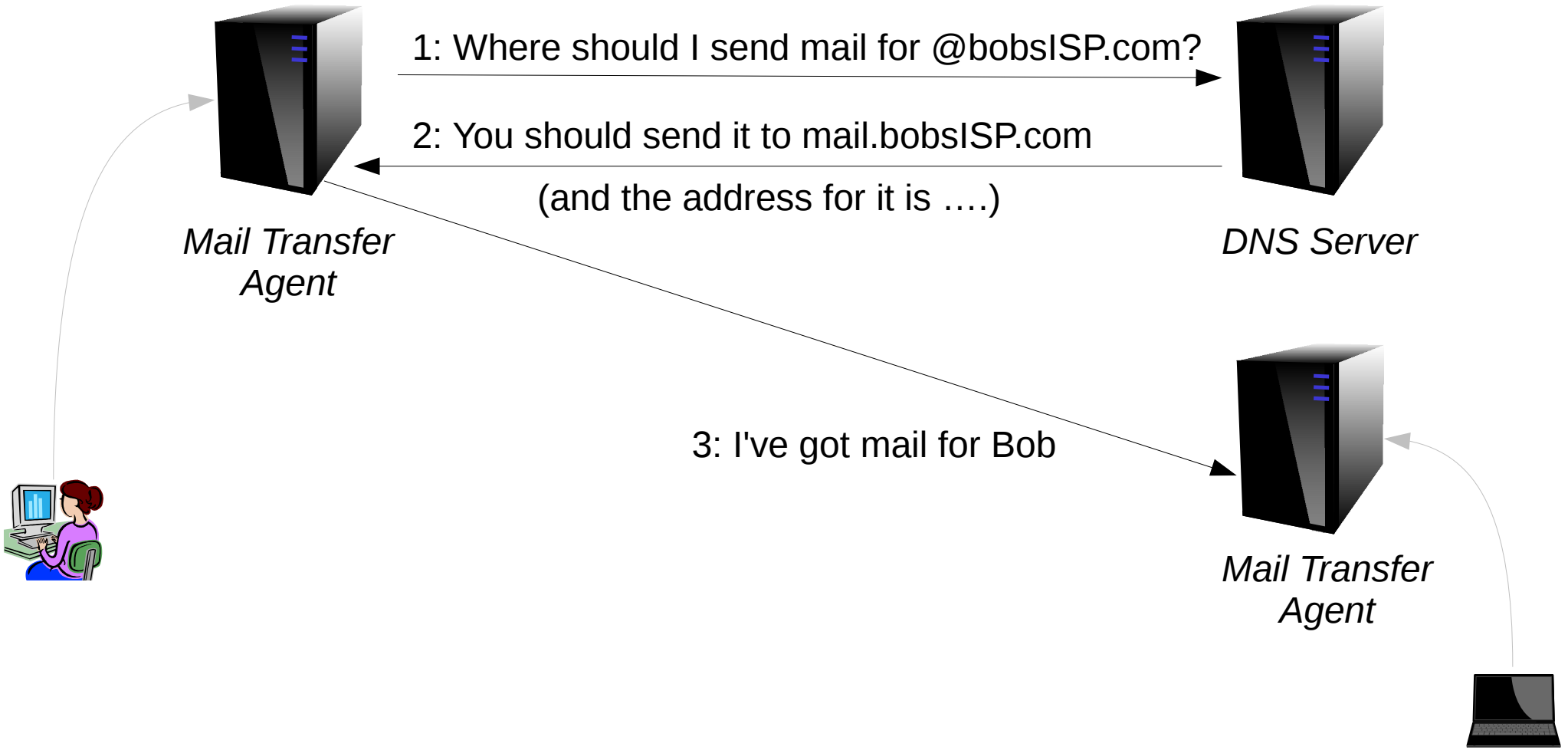


Server-to-Server Email



wes.hardaker@parsons.com

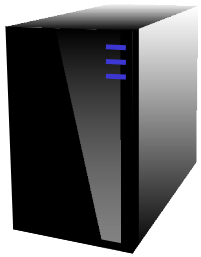
Server-to-Server Email with DNS



I Wish It Were So Simple

- There can be multiple DNS servers
  - Every domain should have at least two
- Alice's mail server asks her ISP's resolver
  - It doesn't talk directly to the distant DNS server
  - There may be multiple resolvers
- There can be multiple mail servers

Server-to-Server Email
Reality Sets In



DNS Server

1: Where should I send mail for @bobsISP.com?

2: You should send it to mail1, mail2 or mail3

3: Do you have an address for mail1?

4: Yep, it's 192.0.2.3

DNS Server

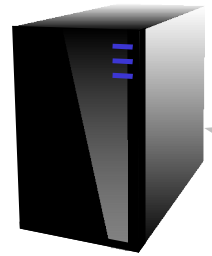
Mail Transfer Agent

5: Hi, I'm representing Alice, I have mail for Bob

6: Hi, I'll take mail for Bob; **PS: I don't do security**

7: Here's the mail for Bob from Alice

8: Thanks, I'll make sure he gets it



Mail Transfer Agent

*(Actually, reality is **even worse** but wouldn't fit on this slide)*

Back To: I Wish It Were So Simple

- There can be multiple DNS servers
  - Every domain should have at least two
- Alice's mail server asks her ISP's resolver
  - It doesn't talk directly to the distant DNS server
  - There may be multiple resolvers
- There can be multiple mail servers

What could possibly go wrong???

- There can be multiple DNS servers
  - Compromised?
- Alice's mail server asks her ISP's resolver
  - It doesn't talk directly to the distant DNS server
  - Compromised?
- There can be multiple mail servers
  - Compromised?
- Man In The Middle

Network Attack

DNS Attack Point!!!

DANE/DNSSEC To The Rescue

- There can be multiple DNS servers
  - Compromised?
- Alice's mail server asks her ISP's resolver
  - It doesn't talk directly to the distant DNS server
  - Compromised?
- There can be multiple mail servers
  - Compromised?
- Man In The Middle

Use DNSSEC

Use DANE

SMTP Vulnerabilities

- MX, A and other DNS records can be spoofed
  - DNS redirects SMTP clients to the...
  - DNSSEC detects this, and clients won't proceed
- Eavesdropping is Easy
  - SMTP is **un**encrypted by default
  - Opportunistic encryption helps
    - See if they offer a certificate and start encryption
    - However, you may just be encrypting to the...

SMTP Vulnerabilities

- If DNS is spoofed, you get a...
- ...Man In The Middle
  - SMTP is unauthenticated by default
  - SMTP is unencrypted by default
  - They ***can*** turn on opportunistic encryption
    - Server indicates “I do security”
    - But a man-in-the-middle can just say “I don't do security”
  - CA based solutions don't help because:
    - The man-in-the-middle says “I don't do security”
    - You've been redirected to a name the attacker controls

DNSSEC/DANE For The Win

- DNSSEC and DANE solves all these problems!
- With DNSSEC: you can believe:
  - The MX that led you here
  - The TLSA is accurately pointing to my certificate
- With DANE's TLSA record:
  - “This is my certificate” or “This is my CA”
    - (accept no others)
  - You MUST expect security!!! *(i.e., must do TLS)*
  - *You connected to the right place*

Deployment Options

- Postfix 2.11
  - Server side (receiving mail):
    - Publish a TLSA record: _25._tcp.smtp.example.com
    - smtpd_tls_cert_file = /path/to/mycert.crt
    - smtpd_tls_key_file = /paht/to/mycert.key
  - Client side (sending mail):
    - smtp_tls_security_level = dane
    - smtp_dns_support_level = dnssec
    - **CAVEAT: MUST use a secure local resolver**
- Exim: Implementation underway (~ 2015)

Known Large Early Adopters

- posteo.de
- mailbox.org
- bund.de
- denic.de
- umkbw.de
- freebsd.org
- unitybox.de
- debian.org
- ietf.org
- nlnet.nl
- nic.cz

Questions?

(See me anytime this week if you want a greater level of detail about how it all works)

wes.hardaker@parsons.com