

Deploying TCP Fast Open in the wild

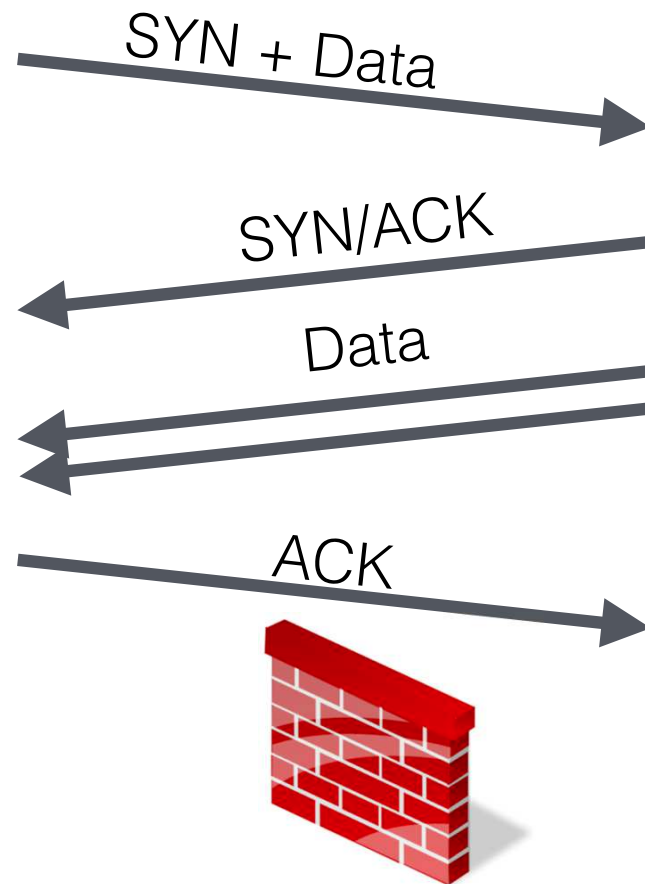
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TCP Fast Open

- TCP Fast Open in iOS 9 and OSX 10.11
- Used for an Apple Service on iOS and Mac
- Public API by using `connectx(2)`
- Overall, very good success-rate

But... middleboxes were a big issue in some ISPs...

Blackhole'd after handshake

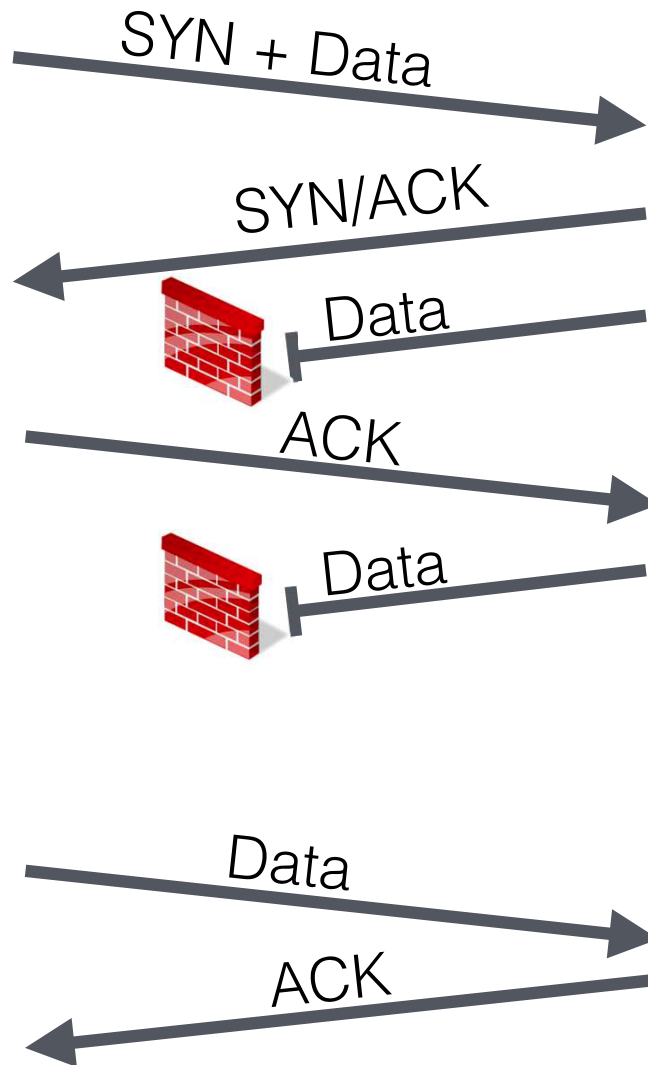


Src/Dst gets blackhole'd
for 30 seconds

Blackhole'd after handshake - Detection

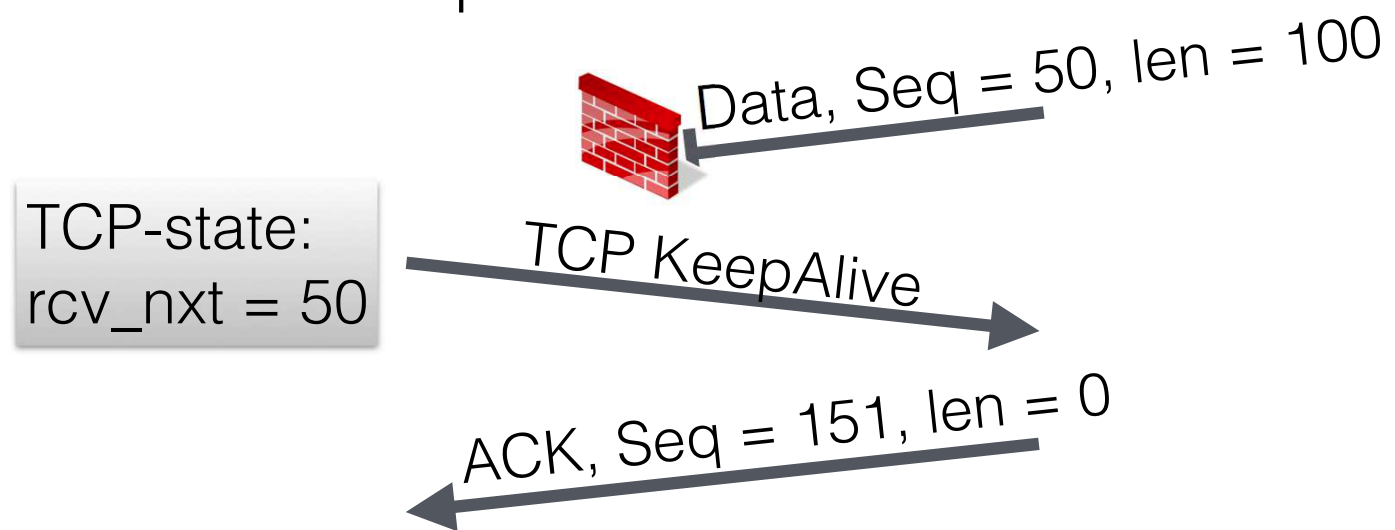
- Aggressive client-side timeouts
- “blacklist” this network for TCP Fast Open
- “whitelist” network if one successful TFO connection

Drop data in one direction



Drop data in one direction - Detection

- Client cannot know if server is trying to send data
- Send TCP Keepalive



- Client knows server has data in-flight (Seq != rcv_nxt)
- Start aggressive timeout on client

Conclusion

- TFO might break middlebox's state
- Detection-mechanisms are possible
- Middlebox/Firewall vendors out there:

Make sure TFO works across your box!