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

SYN + Data

SYN/ACK

Data

ACK

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
  - TCP-state: \( rcv\_nxt = 50 \)
  - Data, \( Seq = 50, len = 100 \)
  - ACK, \( Seq = 151, len = 0 \)
  - Client knows server has data in-flight (\( Seq \neq rcv\_nxt \))
  - 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!