# TLS 1.3

draft-ietf-tls-tls13-21

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# Agenda

- Middlebox issues (PR#1091)
- `close_notify` and half-close (PR#1092)
- SNI and resumption(PR#1080)

# Middlebox issues

- Some middleboxes appear to be sad when you negotiate TLS 1.3
- Error rates (Firefox Beta versus Cloudflare)
  - 2.2% for TLS 1.2
  - 3.9% for TLS 1.3
- This means you need fallback to deploy TLS 1.3
- Proposal: make TLS 1.3 look like TLS 1.2 resumption

# Emulate TLS 1.2 resumption part 1: Always

- Move version negotiation entirely into `supported_versions`
  - ServerHello.version == 0x0303 (TLS 1.2)
- Restore the missing `session_id` and compression fields in ServerHello
- Change the post-ServerHello record layer version to 0x0303
- Merge HRR and ServerHello into a single message with the semantics distinguished by a special ServerHello.Random value.
- Implementations MUST ignore ChangeCipherSpec during handshake

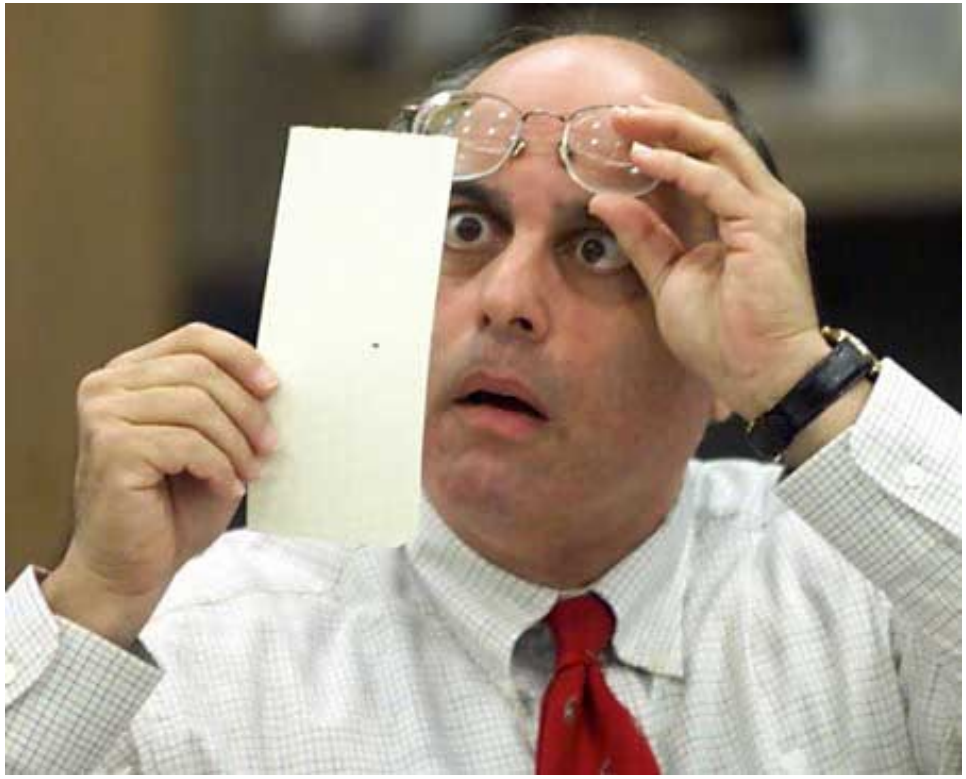
# Emulate TLS 1.2 resumption part 2: Compatibility Mode

- The client sends a fake `session_id` and the server echoes it
- The server sends ChangeCipherSpec messages after ServerHello/HelloRetryRequest (so that the middlebox ignores any "encrypted" data afterwards), and the client sends ChangeCipherSpec after ClientHello. ClientHello
  - Server's ChangeCipherSpec SHOULD be sent when the client sends the fake `session_id` (not in PR#1091)

# Issues Raised

- Should we only have compatibility mode?
  - We don't need this for TLS 1.3/QUIC or DTLS
  - It's not *entirely* clear we need the client-side CCS
  - At some point we may be able to stop sending server-side CCS
- Should we require the client to enforce CCS cardinality?
  - Require CCS be present
  - Require CCS to appear only once
  - This complicates the implementation of the receiver

# Interlude: Chrome Data from David Benjamin



Firefox data hopefully coming soon

# Chrome initial draft 18 deployment

- No evidence of TLS 1.3 ClientHello intolerance. `supported_versions` and GREASE did their job.
- TLS 1.3 ServerHello was a very different story.
- Successful handshakes to a TLS-1.3-capable service in Chrome beta:
  - TLS 1.2 - 98.3%
  - Draft 18 - 92.3%
- Middleboxes are intolerant to TLS 1.3 ServerHello. This violates TLS versioning rules: ClientHello is invariant, rest is version-specific.

# Middleboxes

- TLS-terminating middleboxes generally work fine with TLS 1.3.
  - "Just" a server and client connected back-to-back. Server half negotiates TLS 1.2, client half only offers what it implements.
- Other middleboxes process TLS without terminating it. They then try to parse unknown version-specific messages and break.
- This is an oversimplified picture. A lot of middleboxes are a mix of the two strategies.

# TLS 1.3 variants, round one

- "Experiment" $\rightarrow$ PR 1091 without the record-layer version change.
- We tested what we could locally, then performed A/B tests in the wild (1-RTT).
- Successful handshakes to a TLS-1.3-capable service in Chrome beta:
  - TLS 1.2 - 99.2%
  - Draft 18 - 95.8%
  - PR 1051 - 90.3%
  - Experiment - 98.2%
  - Experiment w/o client session ID - 95.4%
- Lots of user reports confirmed problems with each variant, including some for Experiment.

# TLS 1.3 variants, round two

- Reproduced Experiment problems and changed record version for round 2.
- Successful handshakes to a TLS-1.3-capable service in Chrome beta:
  - TLS 1.2 - 98.6%
  - PR 1091 - 98.8%
- Corroborated by HTTP-level metrics.
- No user reports of problems thus far.

## `close_notify` and half-close (PR#1092)

- Right now `close_notify` is sorta full-close
  - Receiver has to flush outstanding untransmitted data
  - And immediately send `close_notify`
- Not ideal
  - Lots of implementations don't do this
  - Data may already be in flight
  - Reasons people may want half-close
  - Not clear why it's there in the first place
- Proposal
  - Allow implementations to keep sending after receiving `close_notify`
  - Backward compatible with previous behavior

# SNI and Resumption (PR#1080)

- RFC 6066 totally prohibits resuming with different SNIs
- Implementations aren't good about following this
- Proposal
  - Client MUST only resume if SNI is in certificate
  - Client SHOULD only resume if the SNI is the same
    - No reason to think it will work anyway
  - Leaves the door open for the server to say that you can resume with different SNI
- Not entirely clear how to analyze this
  - But it looks like we already have these problems with existing implementations and HTTP coalescence

# Next step

- Merge outstanding PRs (these and some editorial stuff)
- Issue -22
- Targeted WGLC?