TLS 1.3
IMPLEMENTATION REPORT
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PARTICIPANTS

- Apple, Cisco, FreeRADIUS, hostap / wpa_supplicant, Microsoft
- Testing based on -13
  - due to pre-existing implementations, and a desire to not confuse the issue for new participants
- Implementations tested
  - client (Microsoft and wpa_supplicant)
  - server (FreeRADIUS and hostap)
METHODS TESTED

- EAP-TLS, PEAPv0, TTLSv0
- Any implementation should be able to add basic TLS 1.3 support with minimal code changes
  - Presuming that the TLS layer is already abstracted out.
- EAP-TLS is simple, PEAP, TTLS have more issues.
  - Many corner cases with interactions between TLS and EAP state machines
  - TLS libraries APIs can be opaque and difficult to control from an application
OPAQUE TLS LIBRARIES

- In many cases, API calls are *configuration*, not *state change*
  - i.e. “allow X” versus “do X now”
- `SSL_CTX_num_tickets()` - allow tickets
- `SSL_new_session_ticket()` - send ticket now
  - But only in OpenSSL 3.0.0, which is not yet released
- As a result, inter-operability for PEAP and TTLS is still in flux
OPAQUE TLS LIBRARIES

- It is impossible in current OpenSSL releases to control when session tickets are sent.
- For PEAP / TTLS, we see session tickets sent from the server, all alone.
  - Not merged application data, despite application data being ready.
  - This confuses the clients, who expect something more useful.
EXTRA NOTES

- All implementations will send (server) or store (peer) only one session ticket
  - Consensus that more than one is not necessary, it's not clear what more than one can be used for, and RFC 8446 suggests only one for EAP use-case
- Minimal feedback from Apple
  - silence means agreement, or disinterest, or not enough time?
- Cisco is looking into it in more detail in the coming weeks
  - and will have more feedback
SUMMARY

‣ Both close_notify and 1 octet application data tested for EAP-TLS
‣ tested on client / server via configurable flags (to be removed on finalization)
‣ Application data is preferred by implementors
‣ It can be difficult to convince the TLS layer to send close_notify.
‣ Key exporters are -13
‣ no strong opinions on changes in -14, simple enough to change the code
‣ Still much spelunking to do in TLS / application interaction for PEAP / TTLS