TOOLBOX

Step Through a Security Handshake, Frame by Frame

By **Keith Parsons, CWNE #3** · 2026-07-16 · originally on LinkedIn

If you teach, study, or troubleshoot Wi-Fi security handshakes, open the Frame Exchange Reference (frames.bitbucketlabs.com) and step through one protocol before you read another word here. It is an interactive, frame-by-frame walk through the security exchanges we all have to reason about, and it is built against IEEE 802.11-2024, the current standard. That currency alone makes it worth your time.

Here is what it actually does, and I want to be precise, because precision is the whole point of a reference like this. Pick a protocol. Pick a mode, association or roaming. Then step the exchange one frame at a time, from the Beacon all the way to authenticated data flowing. At each step you see the frame, the fields that matter, the key derivations happening underneath, expert notes, and a citation back to the standard. It runs the full sequence across every player in the room: STA, AP, RADIUS, the directory, and DHCP.

Why this fills a real gap Search for the 4-way handshake or 802.11r Fast Transition today and the top results are good work that has aged. The canonical write-ups most of us learned from are from 2014 and 2020. They predate much of how WPA3, SAE, OWE, and FT actually get deployed now. A single, current, interactive map of the whole exchange, with WPA3, SAE, OWE, and FT all treated as first-class, is exactly the thing that has been missing.

It pairs naturally with a live capture. Read the reference to know what should happen on the air, frame by frame. Then open your Wireshark trace and match it against reality. Where they diverge, you have found your problem. That is how a reference earns its keep on a troubleshooting job, not just on a study night.

Who should use it Working WLAN engineers debugging an authentication or roaming failure. CWNP candidates studying at the CWAP and CWSP level, where the entire job is reasoning about these exchanges field by field. Instructors who want a current, visual way to walk a class through SAE or a 4-way handshake without redrawing it on a whiteboard for the

hundredth time. If WPA3, 802.1X, SAE, or FT key flows are part of your week, this belongs in your bookmarks.

And it is free to use in a browser. No install, no account, no paywall. I want to be careful with my words here: free to use is not the same as open source, and no license is posted, so treat it as a free reference you can read, not code you can fork.

The Frame Exchange Reference is new. Version 1.0.0, released in June 2026. It is current, it is interactive, and it maps the exact exchanges most of us have to explain and debug under pressure. That combination is rare enough that I am pointing you at it today.

Credit: Frame Exchange Reference · frames.bitbucketlabs.com

Is this a tool/reference you plan on using?

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