WebAuthn Network Transport

Increasing WebAuthn adoption, one `transport` at a time.

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The WebAuthn spec currently supports four transports

```
[usb, nfc, ble, internal,
lightning, cable, (https?)]
```

The “dream scenario”

- Nobody thinks too hard about picking a specific authenticator
- People use whatever hardware is available to them in a secure way

Google’s approach: CaBLE

- CaBLE was submitted to both the WebAuthn and CTAP2 specs
  - V1 required RP participation, V2 is purely between client-platform and authenticator
- In the V2 CaBLE PR (to CTAP2), a cloud service can facilitate binding by pre-sharing a key between the client-platform and authenticator
  - Otherwise, an out-of-band method (QR code) is used to share a secret before binding
- Once a binding is established, a BLE channel is used to communicate with the authenticator

We believe the CaBLE transport **can be extended** beyond BLE.

Why is a network transport desirable?

- Low common denominator for compatibility
- Allows for novel solutions without being prescriptive
- Makes the ecosystem **safer**

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Real problem,
unsafe solution.

nick: I am underwhelmed with some of the FIDO account recovery stuff. having some guidelines in the spec would be great.

... would like to have a better story around roaming mobile authenticators.

... want to consider multiple transports.

nick: we are thinking about a network based transport

agl: we are thinking about this, but not at liberty to say how we view it.

nick: what is main concern.

agl: it is the guarantee the authenticator near machine, but if we run that over network that is a different sort of thing.

nick: I don't think bluetooth proximity comes with unphishability. If there is way we can maintain unphisable properties over transport, we will explore that.

... I think people will opt for usability.

agl: if the exosystem degrades in that way, we have to ponder on that.

... but over network it is not webauthn at that point,

nick: i agree

... but want to look at main authentication being delegated.

“If the ecosystem degrades in that way, we have to ponder on that.”

- **@agl**

“Let’s degrade the ecosystem.”

- **Duo Labs**, probably

We should get out in front of this now, before the ecosystem **degrades** any further.

BLE

- Requires spatial proximity between the authenticator and client-platform
  - A useful property, but not what provides phishing resistance

HTTPS

- Would work in cases where BLE connectivity is not possible
- Loses spatial proximity properties, but can maintain phishing resistance

Phishing Resistance in WebAuthn

Phishing resistance is provided by:

- Lack of shared secrets
  - Credentials are scoped to the Relying Party
  - Ceremonies are not replayable like static passwords
- Origin scoping
  - Client-platform is responsible for preventing homograph-style attacks
- Binding between client-platform and authenticator
  - Currently provided as a consequence of the physically connecting devices or using a platform authenticator
  - Provided in the CaBLE V2 PR by establishing a cryptographic binding between the devices
    - This is also what we've done when prototyping this solution, albeit somewhat differently
    - We should just use the approach introduced by CaBLE, but not limit it to the BLE transport

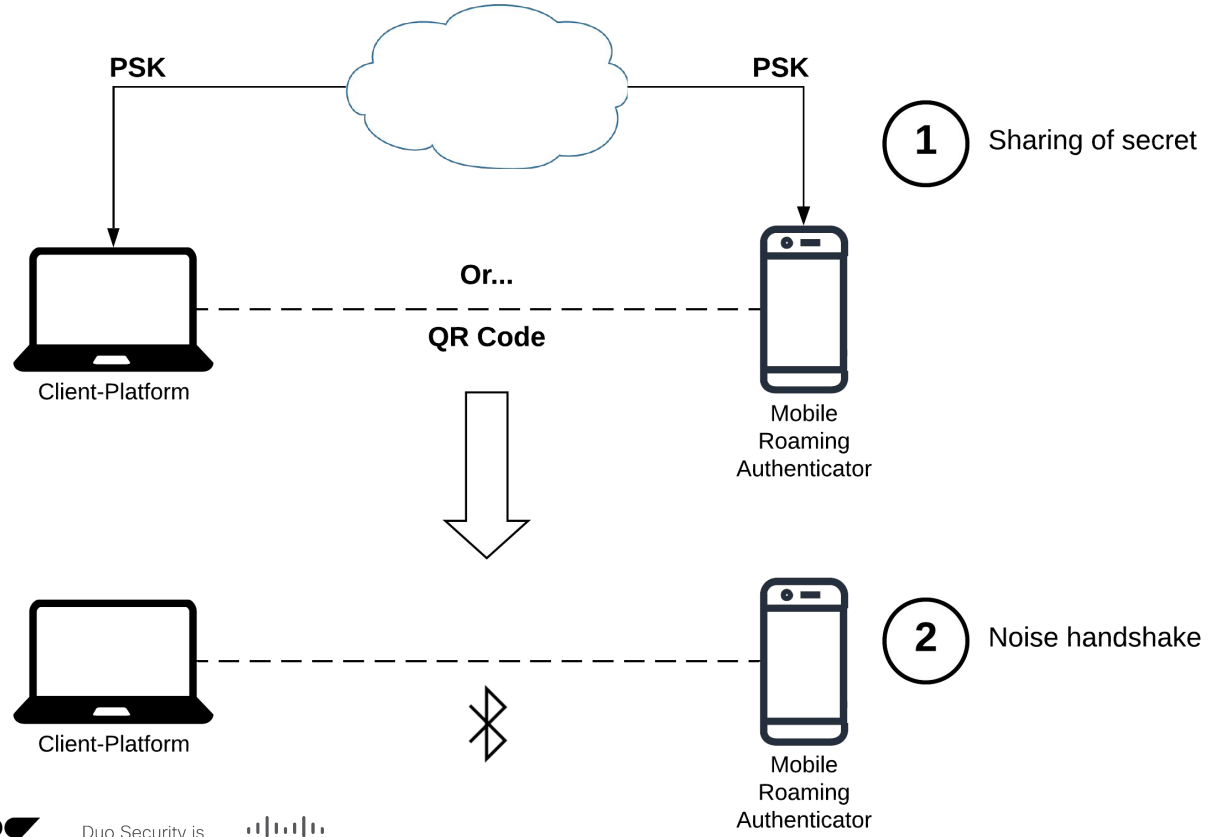
We can preserve **phishing resistance** with a network transport.

Authenticator Proximity != Phishing Resistance

- CaBLE approach
  - Pairing generally serves two main purposes:
    - (1) Establishing encryption credentials for secure discovery and communication, and
    - (2) ensuring that the two devices communicating are the two the user intends
- Can we maintain these properties without spatial proximity?

Yes,  (we think).

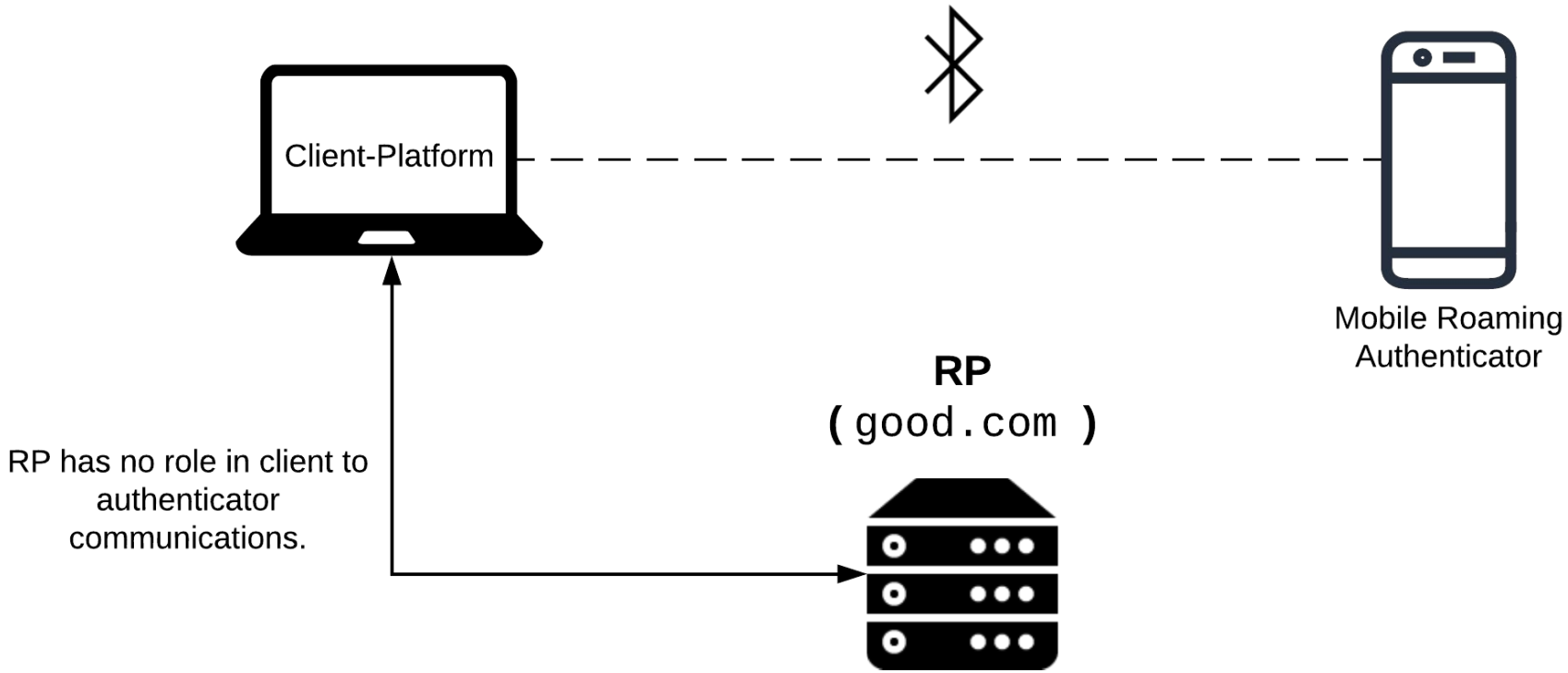
Binding Establishment



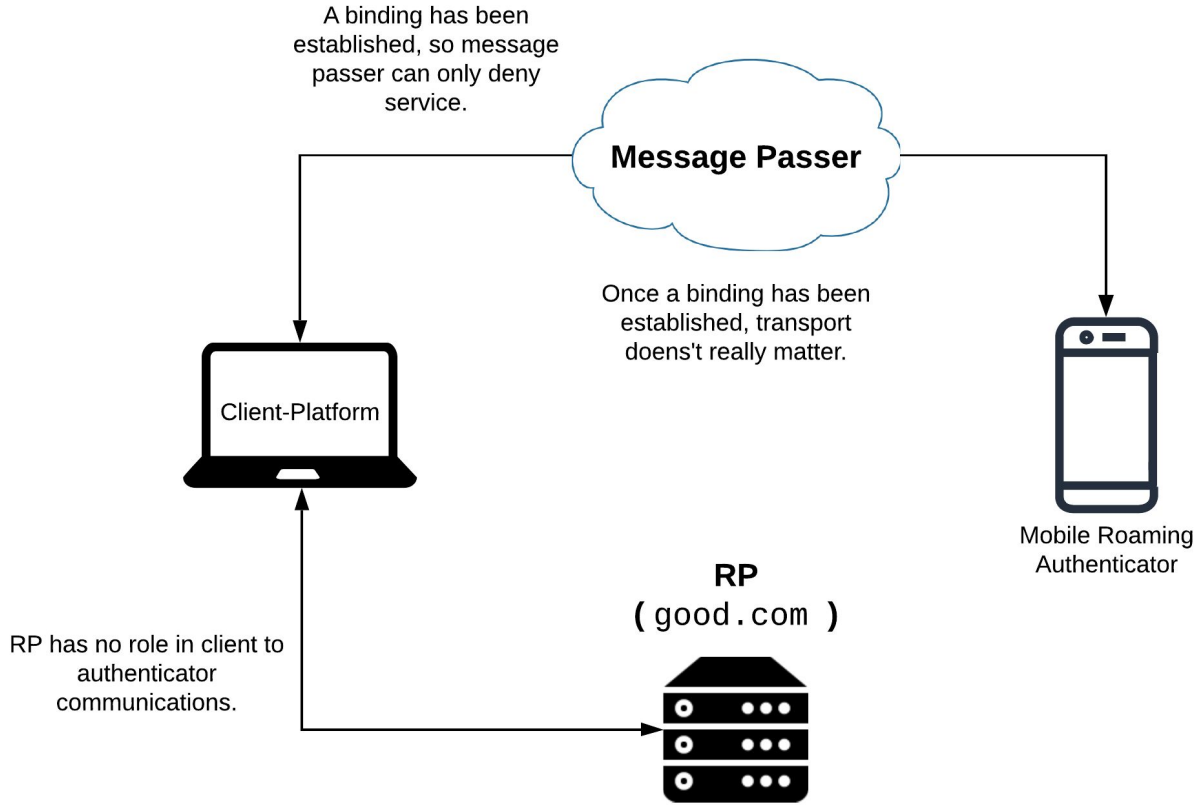
Our Approach to Pairing

- QR Code Contents
  - Address of message relay
  - Public-key of client-platform
  - Other metadata

CTAP2 Interactions (BLE)



CTAP2 Interactions (Network Transport)



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Components of a Network Transport

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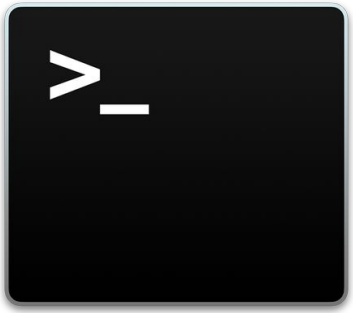
Serialization

- Serialization over-the-wire is one consideration for a network-based WebAuthn transport

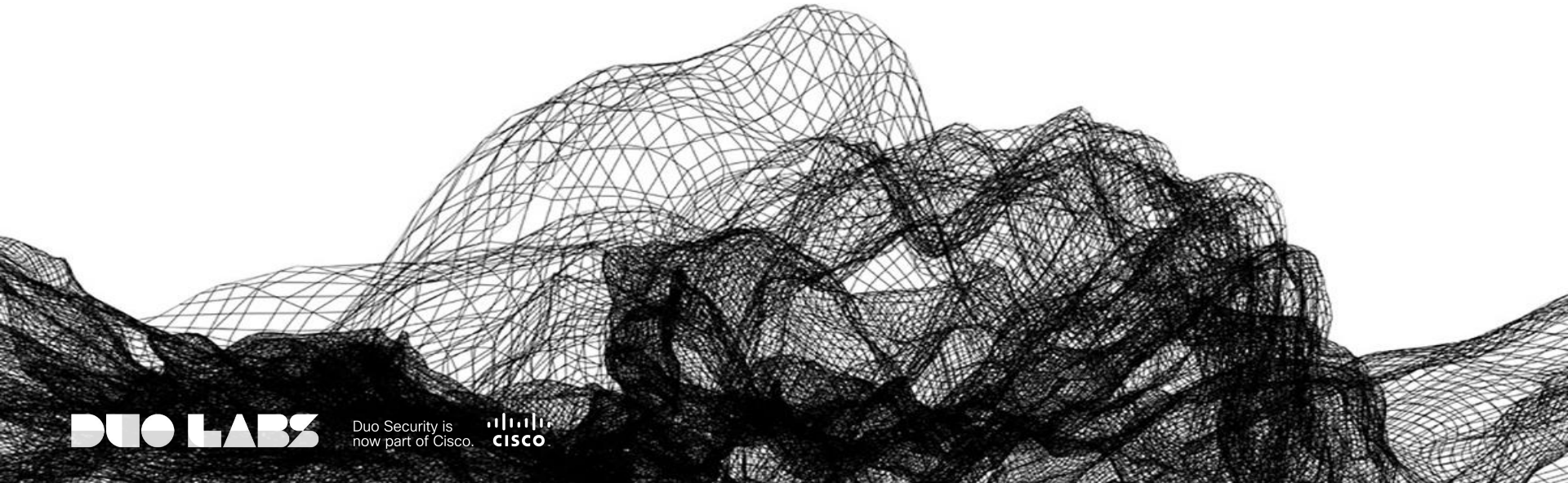
- One approach that we've implemented in our own prototypes, (and have seen others do the same), is
  - Replace all `ArrayBuffers` with URL-safe Base64-encoded strings
  - `JSON`ify the resulting object

Configuration

- Another essential component of a network transport is authenticator config
- Cryptographic binding between authenticator and client is a `MUST`
    - A URI scheme that allows a user to click a link provided by a cloud authenticator service and automatically use it for authentication would be great. Some things that would need to be configured may be:
        - API endpoints for making requests to the authenticator
        - Credentials for authenticating to the remote authenticator
        - A friendly name
        - Enterprise administration of a cloud authenticator



Protocol Options



Proposal 1: WebAuthn JSON via HTTP `POST`

- We've taken this approach in internal prototypes, and are aware of it being adopted at other organizations

- In our prototype, we encrypt the request body before sending, but a simpler version could look like the following

```
Host: auth.credentialprovider.tld
Content-Type: application/json
Authorization: Bearer sOmEsIgNaTuRe

POST /credential/create

{
  "authenticatorExtensions": "",
  "clientDataHash":
"1knXlawRhU7i3Al91QeNG6h+RfkCItKdHutQzUjxILQ=",
  "credTypesAndPubKeyAlgs": [
    [
      "public-key",
      "-7"
    ]
  ],
  "requireResidentKey": false,
  "requireUserPresence": true,
  "requireUserVerification": false,
  "rp": {
    "name": "Acme, Inc",
    "id": "webauthn.io"
  },
  "user": {
    "name": "moons@example.com",
    "displayName": "moons",
    "id": "XzKmn0tpskE8Kpi89plZ1A=="
  }
}
```

Proposal 2: CTAP2 (CBOR) via HTTP `POST`

- The previous approach requires the party on the other end to do some of the work that is typically the responsibility of the client

- It could be valuable to treat the transport as solely a transport and use it just to communicate binary data, *but...*
  - It's harder to debug because CBOR decoding is necessary
  - CBOR was chosen by CTAP to function in bandwidth-constrained environments
    - The overhead of a TLS connection and HTTP headers is enough to effectively negate the savings we would get by using CBOR
  - ...but, it might make sense to use CBOR/CTAP anyway since that's already been specified

```
Host: auth.credentialprovider.tld
Content-Type: application/json
Authorization: Bearer sOmEsIgNaTuRe

POST /credential/create

WligyzaRcMkDrAVvfr0qeGzAqtOCh8DPpS2pYH6i6
GVQ9N8OK0X/t+XpMqD8FLH4V4DMZr6NZL2QlUVHJ5
YIhRyzZPzE4nzEFAm5b9tyooXm82SpdE/00GuqBkZ
8oWoAM5NzxRq2u200uhR5nRN2c5LjXHnhUtsD2VA7
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sTqR5t0vJcmmwTz51GeMOLe5F5fwwgqA6BE3eCdkX
3X9d1HJI5TMMseKyThPTHsOuorLcwolBJ7Dj3HJoF
TFRw+x7VCksuS1I52M7R94zWKx0WdCnzeM1OnvqN0
ozAvmLIWxvkcN/+nsy3aBa9LSvADgCmCYEO/yUxH+
IlHUUjeMH2Dwz3ynk9C6g+V6rWt0tkD4w53vAB/mj
51eGf67wdLI6/3LRvBkD62CISIVJv5JitIx37S68W
```
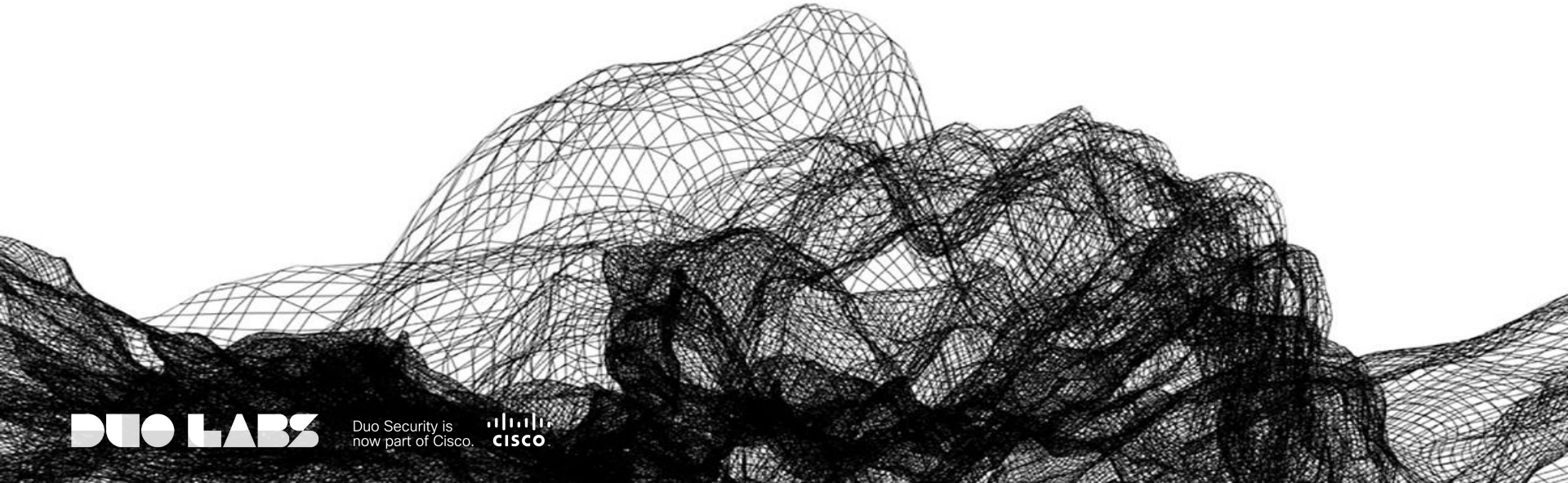

Appendix A: Delegated Authenticator Extensions

- If a network transport is too prescriptive, we could allow browsers to expose APIs that extensions could register themselves with
- Similar to the existing proxy APIs in Chrome and Firefox
- The browser is still able to implement the security checks that are the responsibility of the client, but can delegate communication with the authenticator to another party

Demo

Questions?



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