Recovering from Lost Devices in FIDO

Trust a Private Recovery Service for Privacy and Availability

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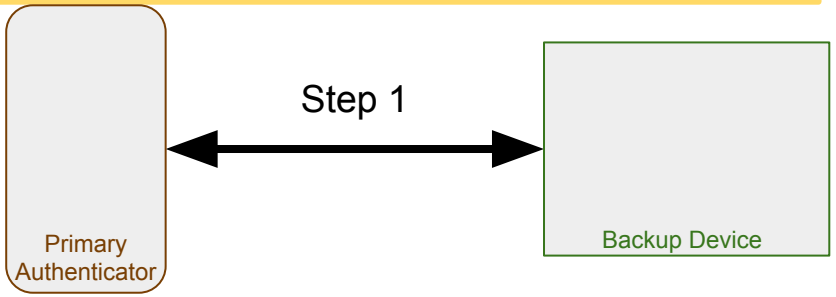
Private Recovery Service (PRS) Solution

- Assumptions:
  - Secure channel between backup device and primary authenticators
- Goals:
  - Recovery from lost primary authenticator
  - Users trust PRS for privacy (prevent linkability) and availability
  - Relying Party doesn’t need to trust (or know about) Third Party
  - Allow a single recovery device to recover many primary authenticators
  - Prevent security attacks by the PRS
  - Do not otherwise weaken existing FIDO scheme
  - Allow for multiple backup devices
  - Allow many types of backup (third party server, hardware device, key splitting)
  - Allow Transfer of Access from Primary Authenticators
- Open Problems:
  - Transfer to a new backup device

PRS Solution - Setup (User Experience)

- User needs a backup device
- User syncs backup device with primary authenticator (Step 1)
- User creates an account at the PRS and syncs each device with the PRS (Step 2)
- User uses primary authenticator for future authentications and registrations



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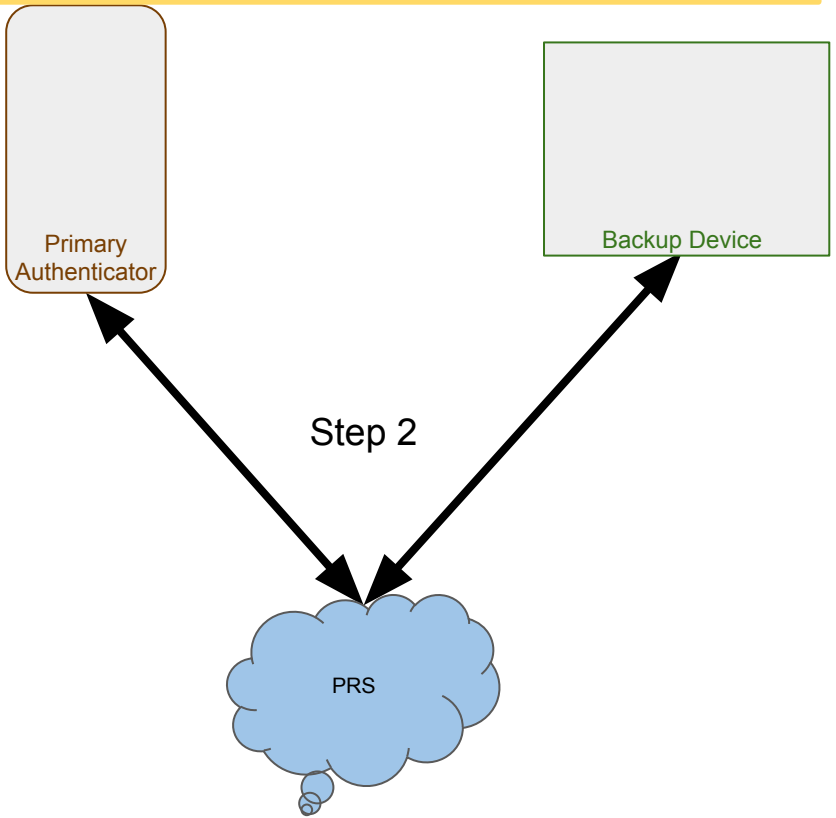
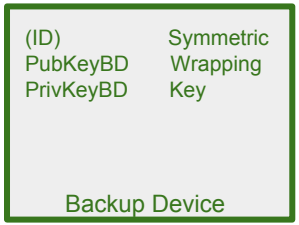


PRS Solution - Setup (Technical)

1. Primary authenticator and backup device create long-lived priv/pub key pair. The pub key is its long-term identifier.
2. User sets up local authentication on both devices
3. User creates secure channel between devices, who can exchange their identifiers.
4. User creates an account with PRS, registers both long-term identifiers with the PRS
5. Backup device generates (* some number) of key pairs, encrypts each private key with its wrapping key, and stores the pairs at the PRS. Each of these keys should be signed with PrivKeyBD (ID for the Backup Device) so that the Primary Authenticators can verify they are owned by a legitimate backup device.

* The backup device should generate (at first setup) enough key pairs to last for all registrations from all authenticators backed up by this device. (num devices * lifetime num accounts). It does not store these locally.



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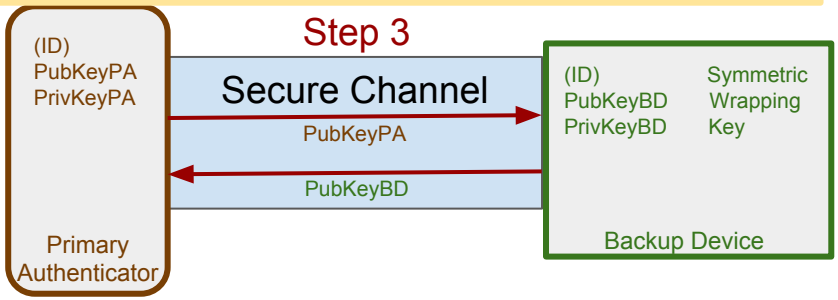

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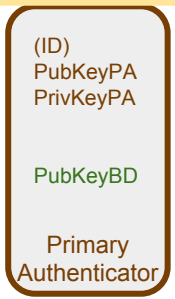

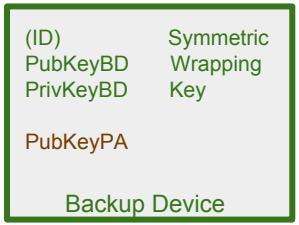

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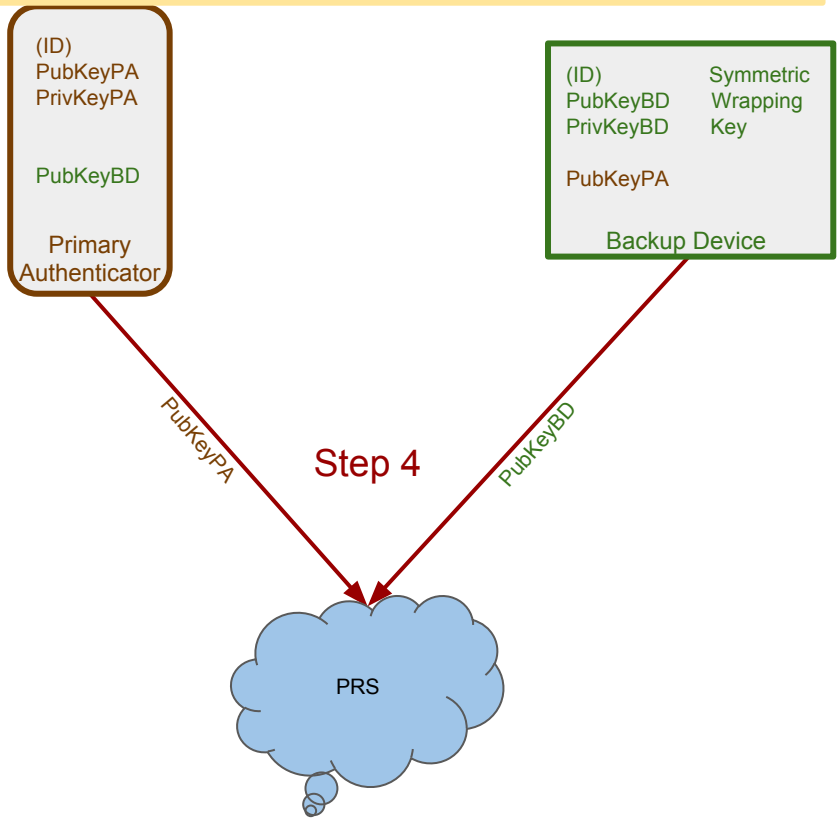

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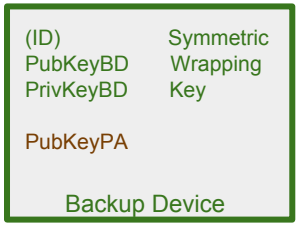

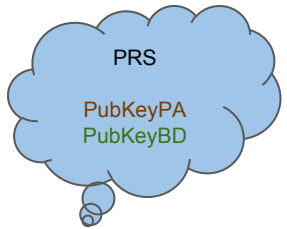

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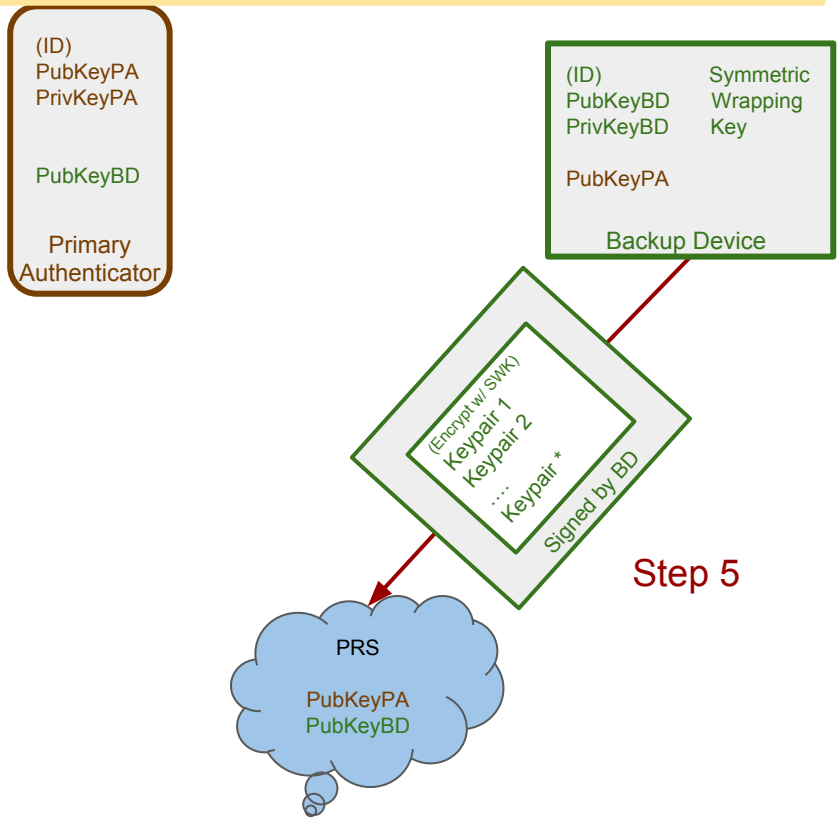

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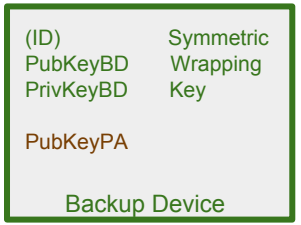

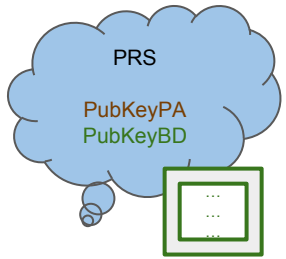

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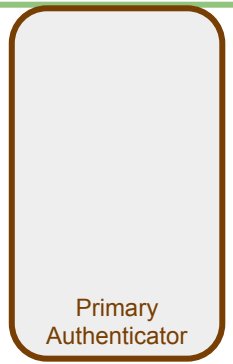
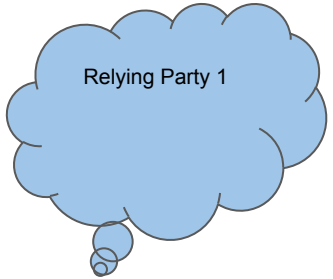
- User does a standard FIDO registration (completely unchanged) with the Relying Party (Step 1)
- User updates the Private Recovery Server through another channel (Step 2)
- Does not require the Backup Device
- Relying Party is unaware of the PRS





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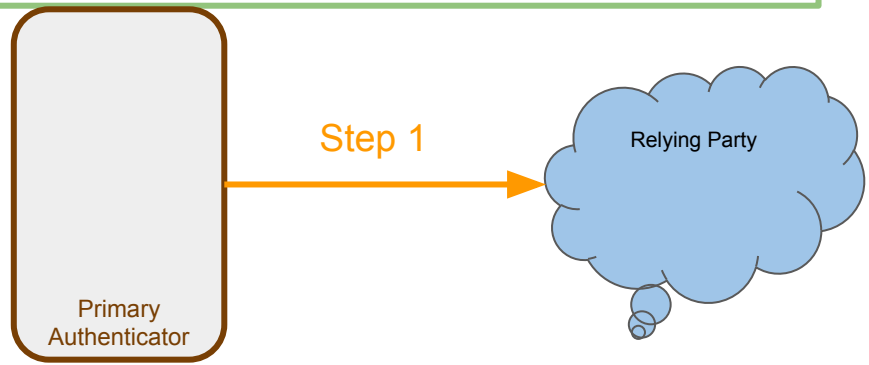

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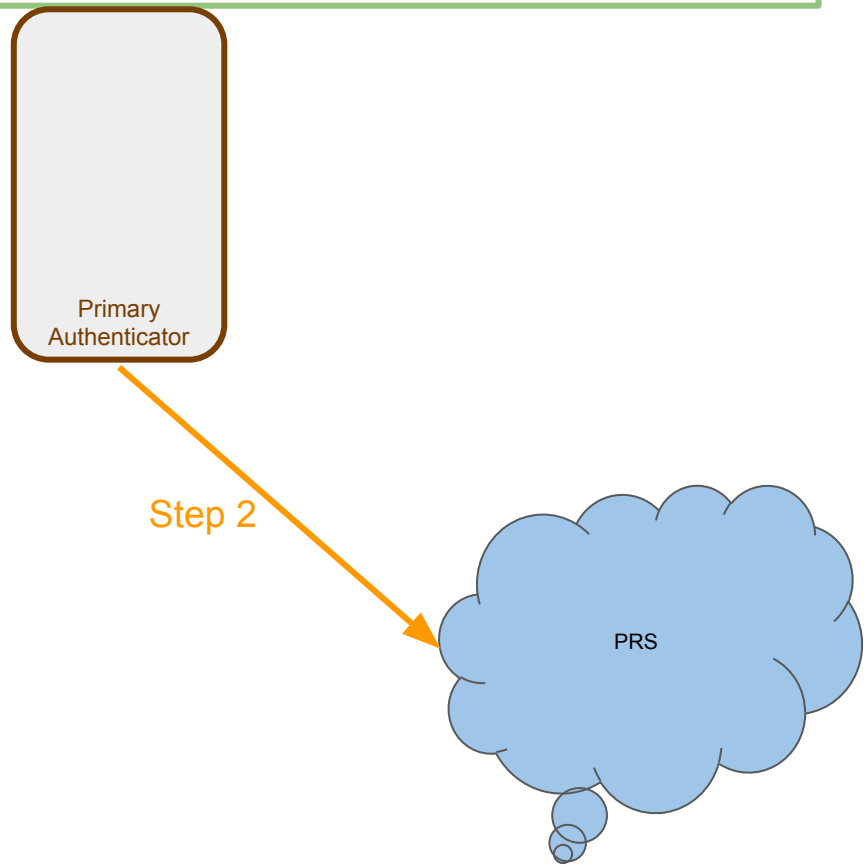

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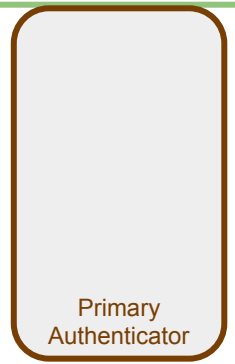

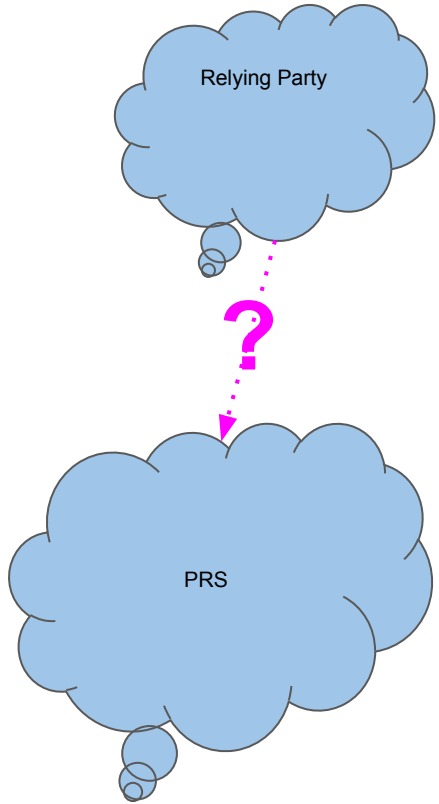

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2. Primary Authenticator logs in to Private Recovery Service using ID key pair.
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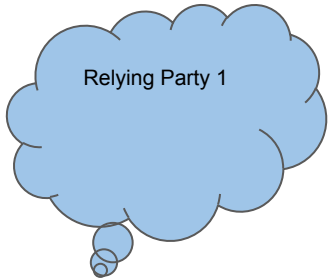

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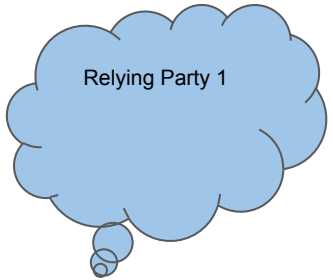

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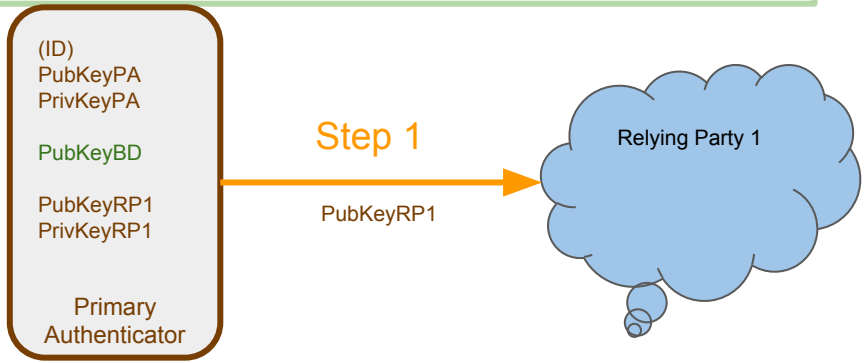

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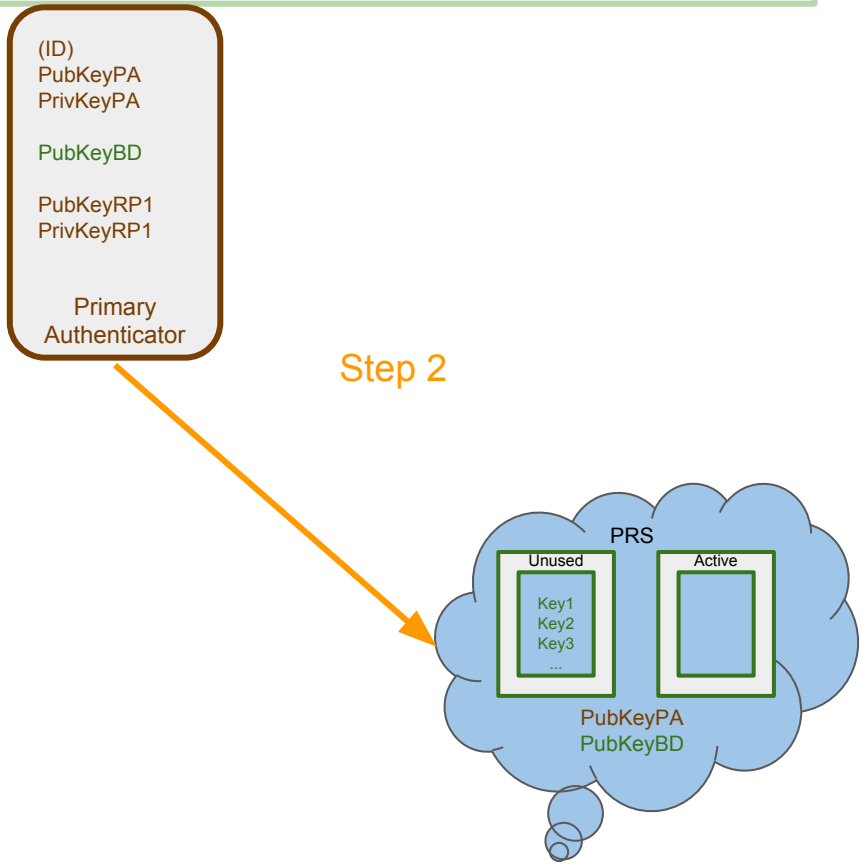

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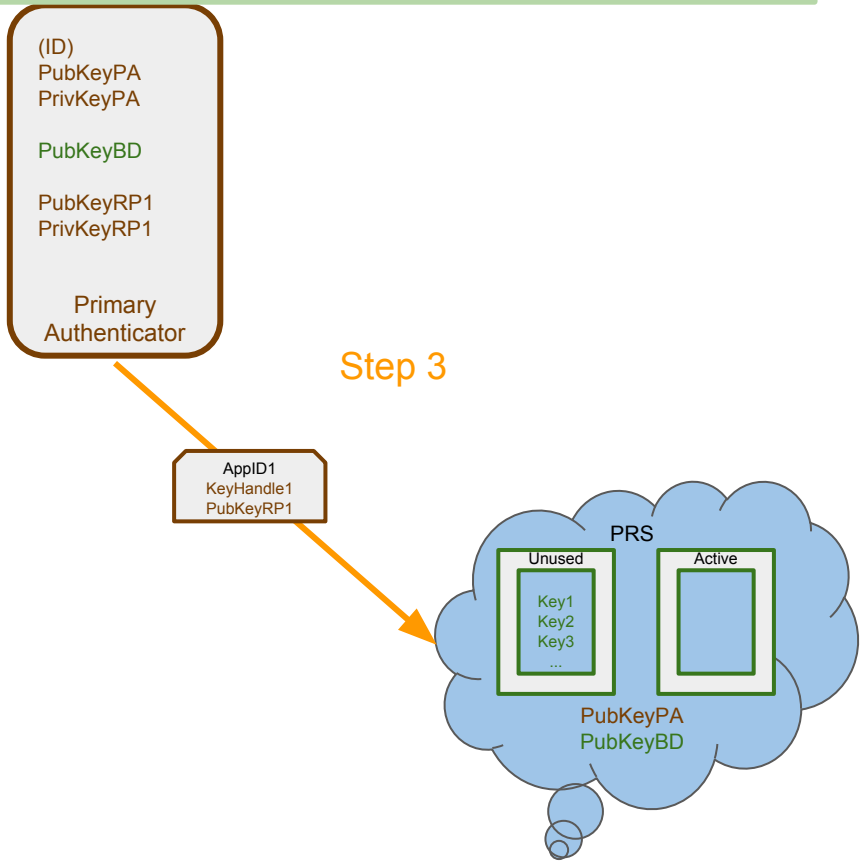

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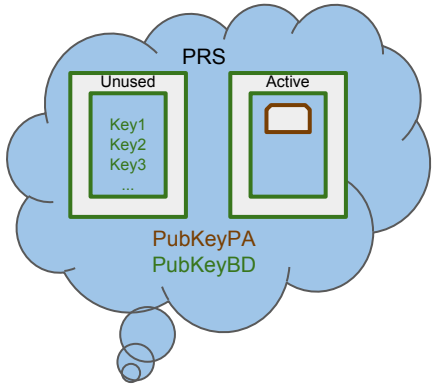

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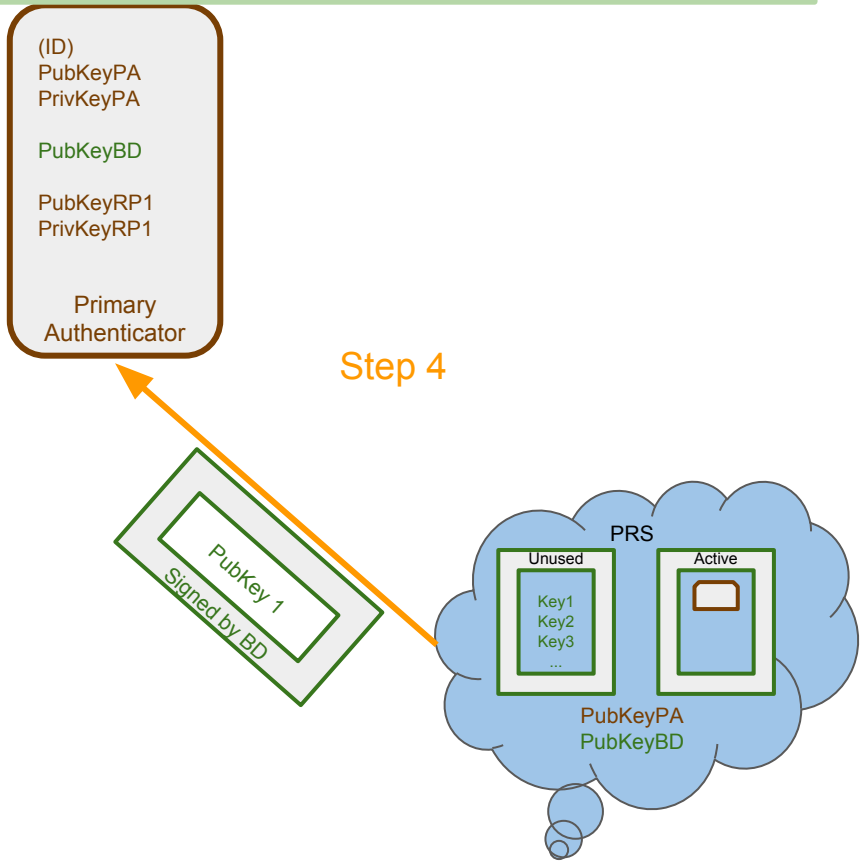

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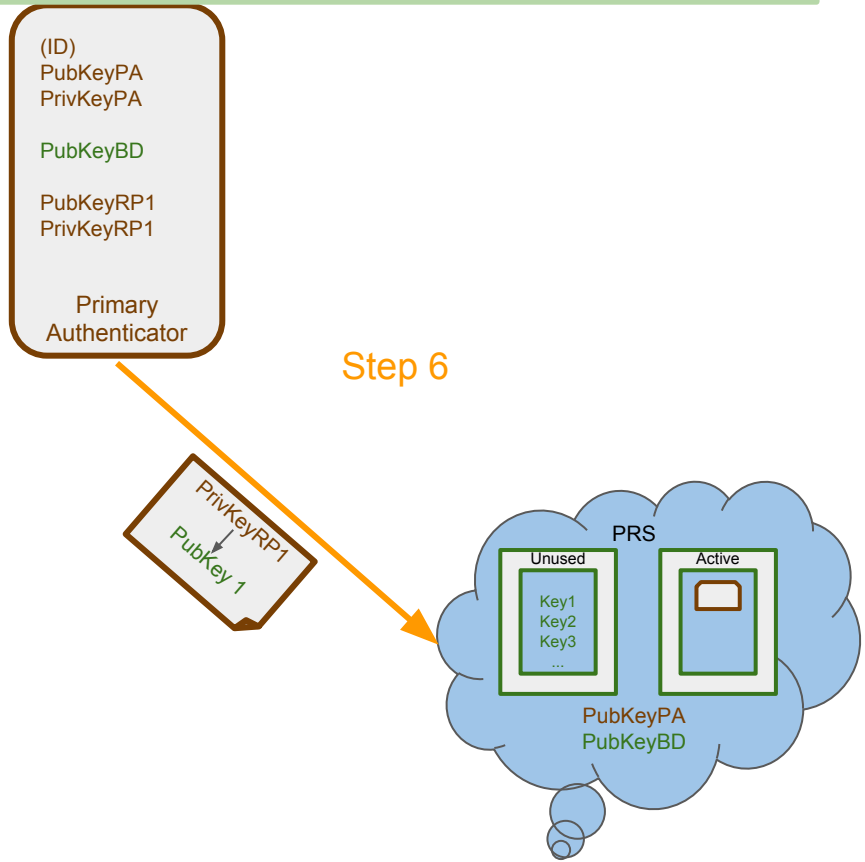

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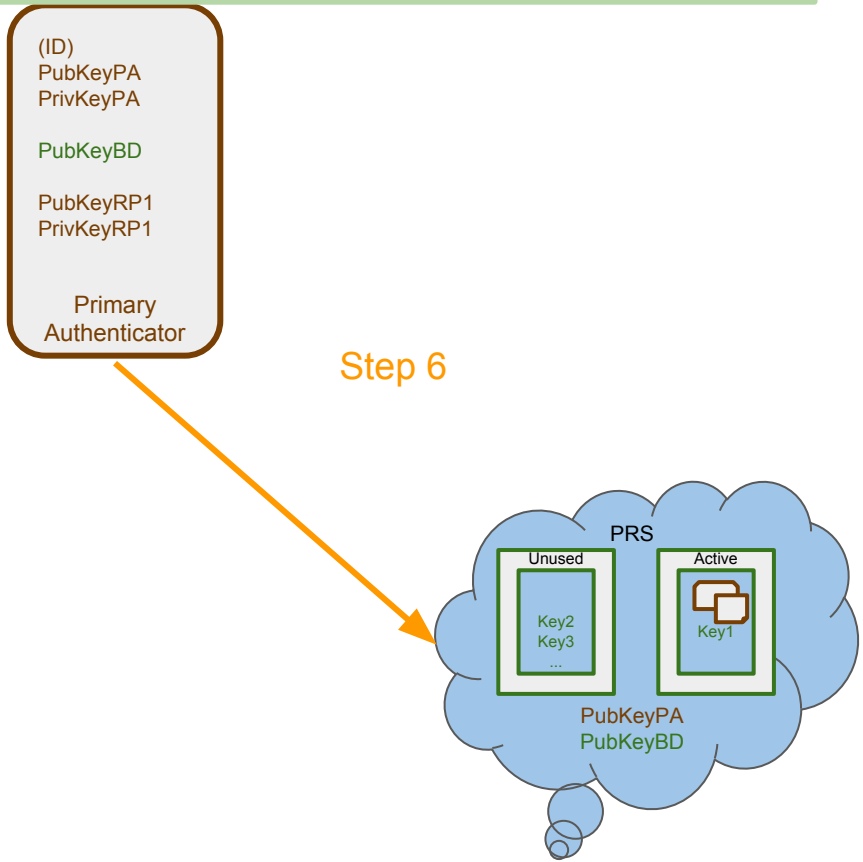
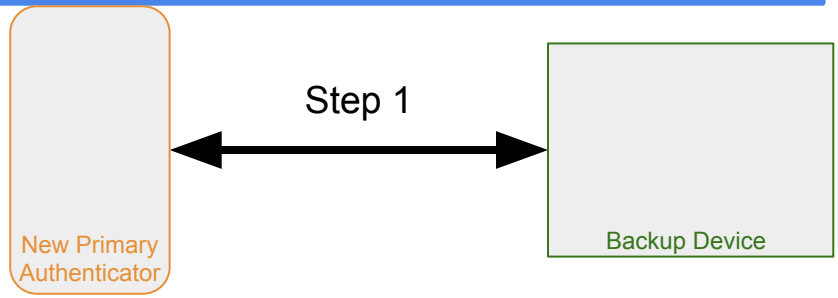


PRS Solution - Authentication

- Unchanged from Standard FIDO

PRS Solution - Recovery (User Experience)

- User retrieves the backup device
- User sets up local authentication on the new Primary Authenticator
- User syncs backup device with new primary authenticator (Step 1)
- User syncs both devices with the PRS simultaneously (Step 2)
- User tells the PRS which device the New Primary Authenticator is replacing (Step 3)
- User uses new primary authenticator for future authentications and registrations



PRS Solution - Recovery (User Experience)

- User retrieves the backup device
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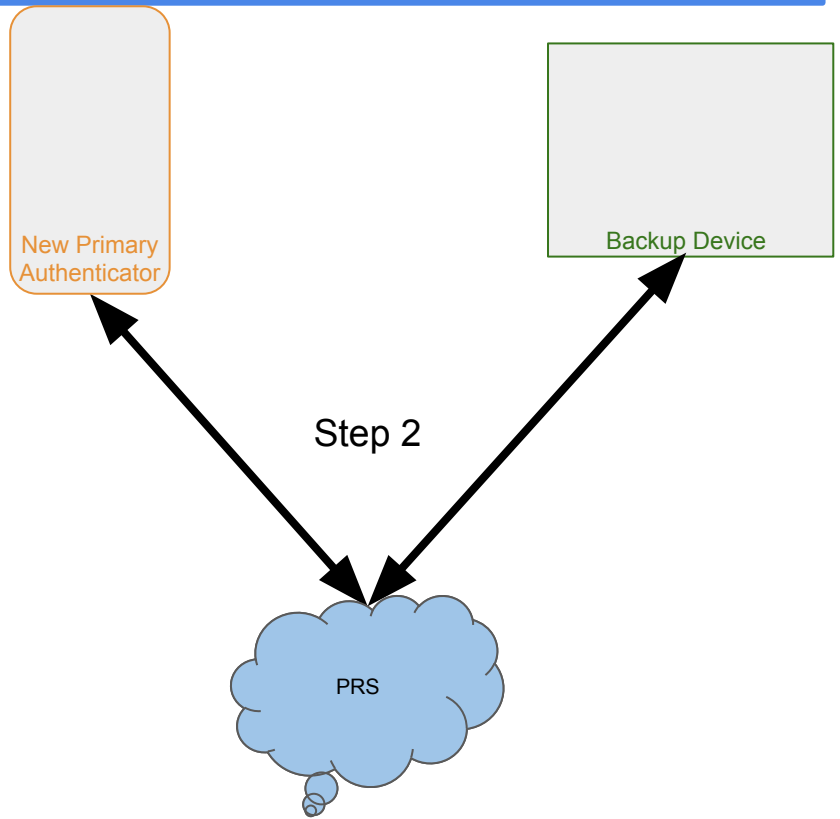

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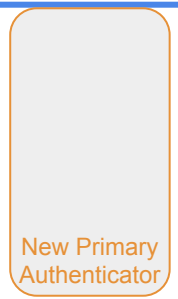

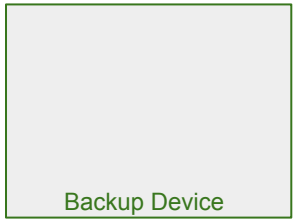

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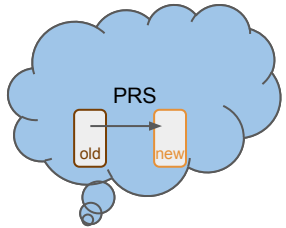

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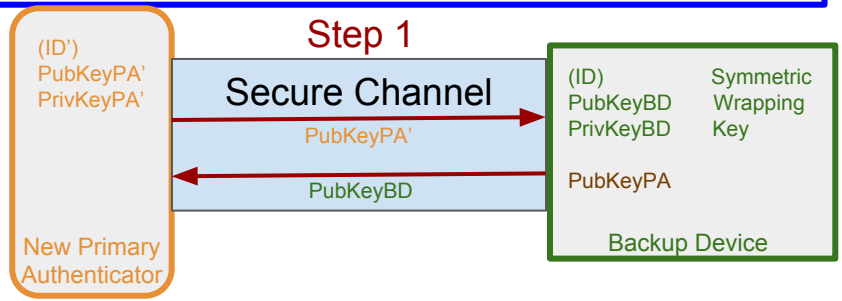

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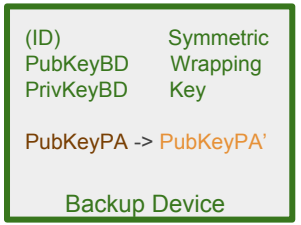

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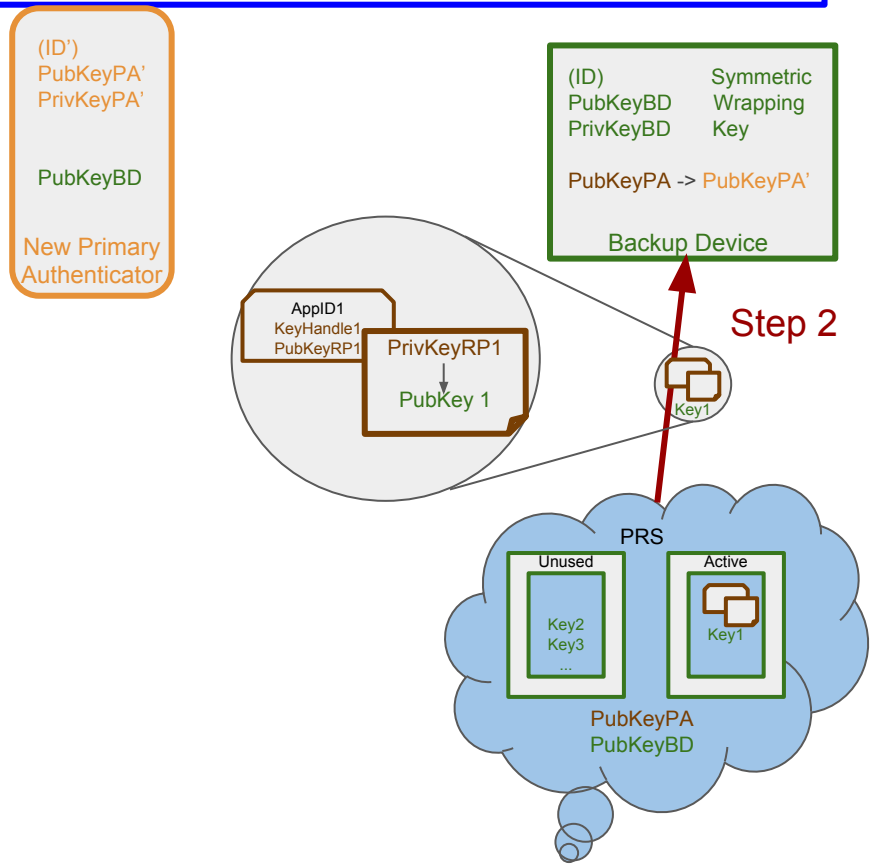

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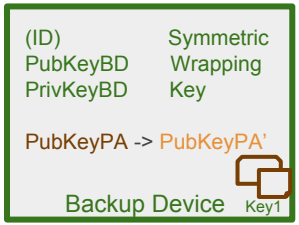

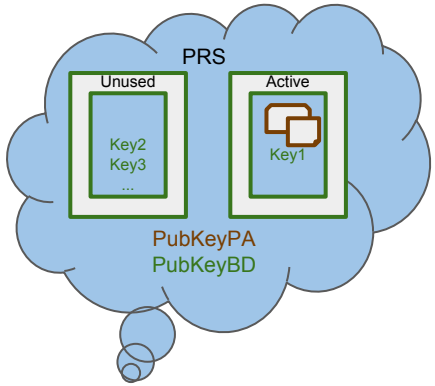

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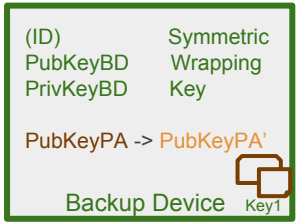

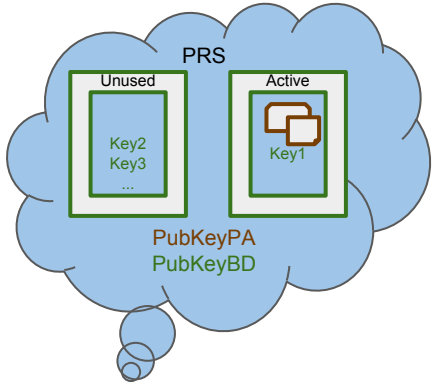

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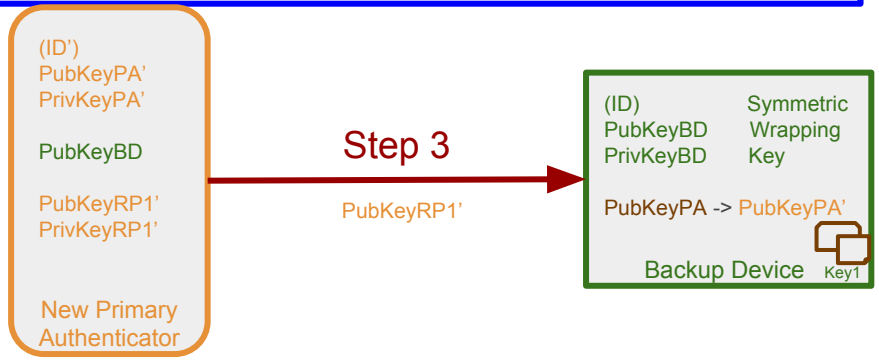

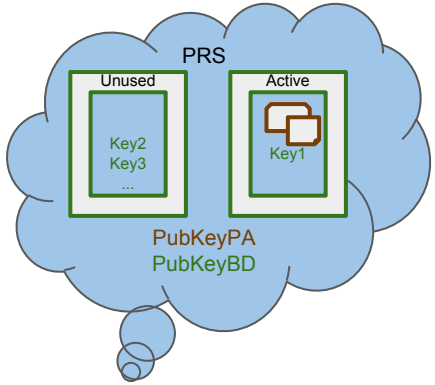

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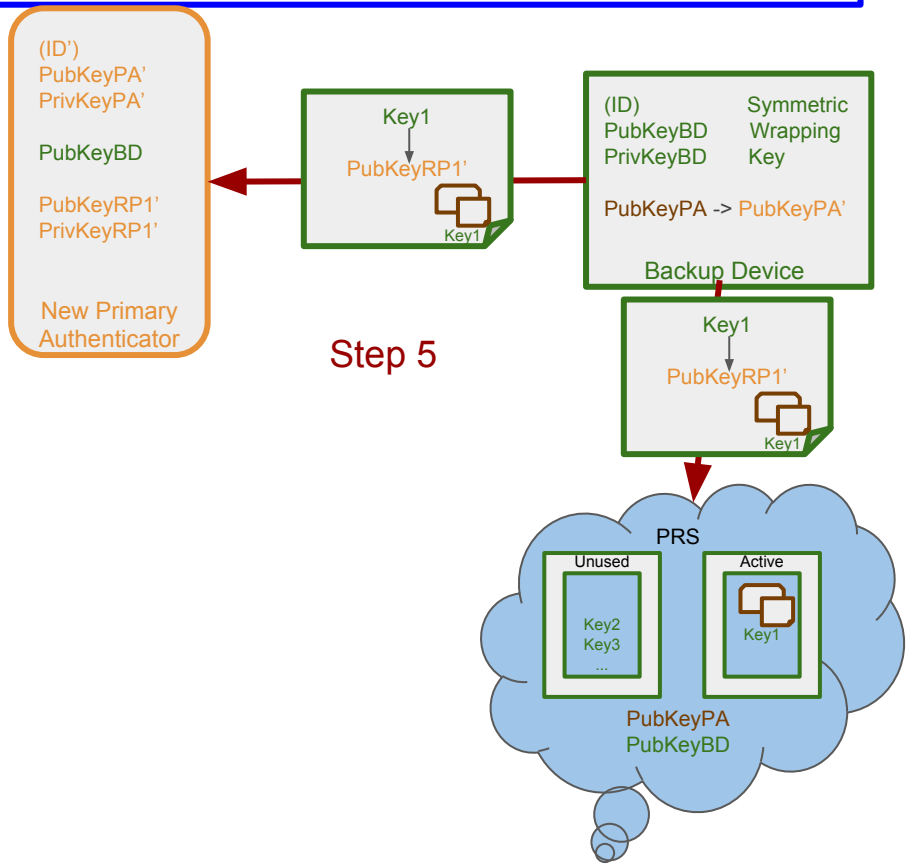

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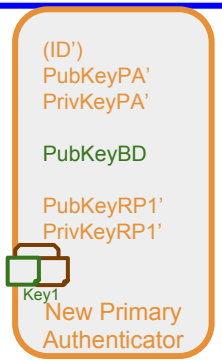

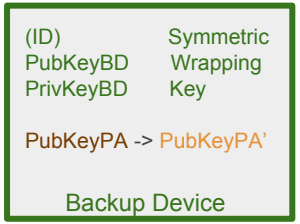

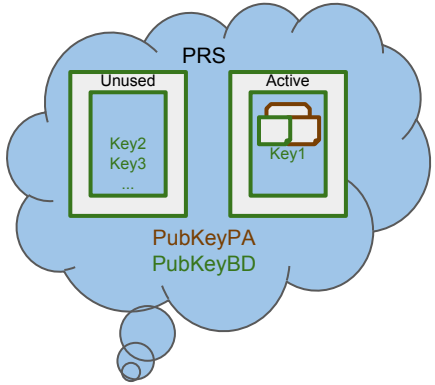

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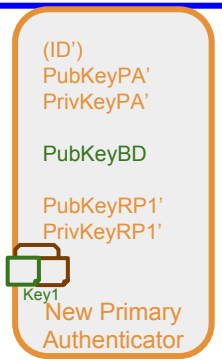

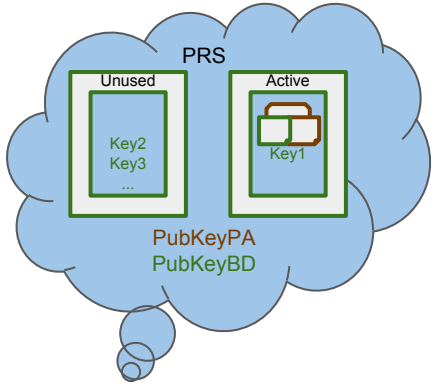

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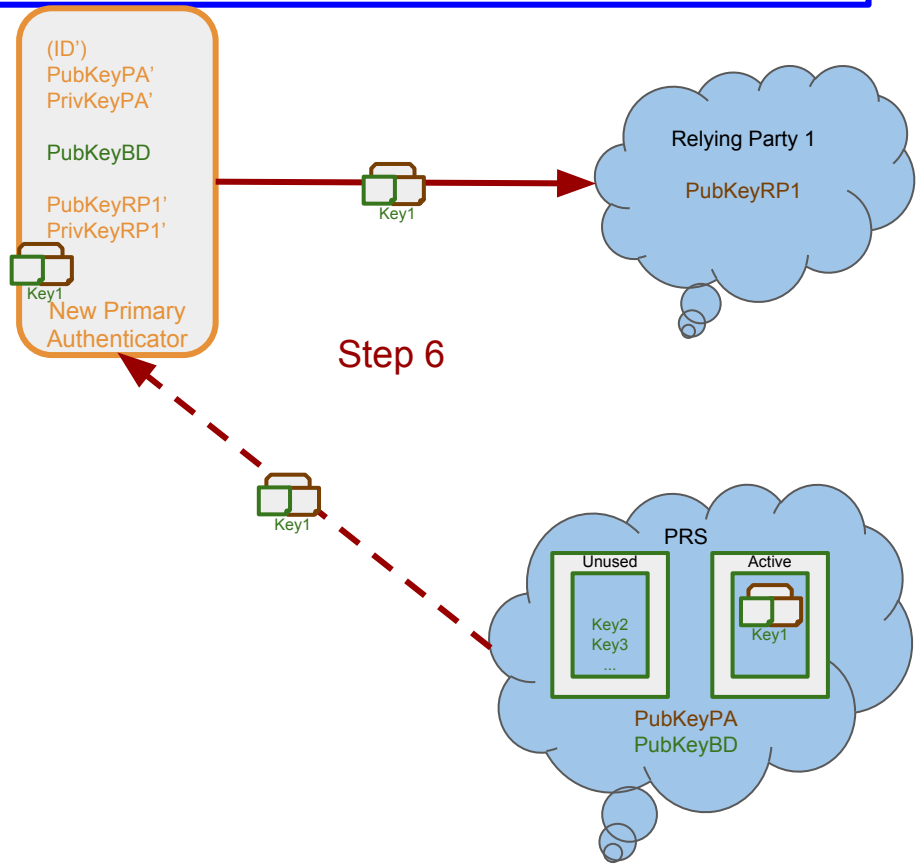

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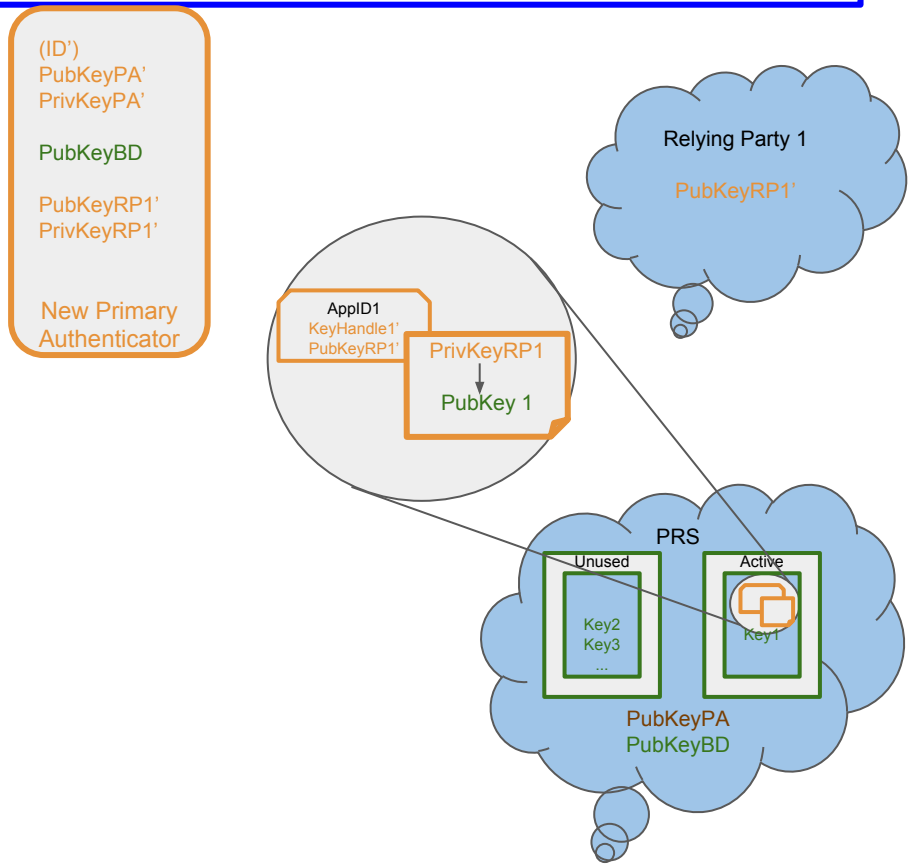

PRS Solution - Transfer Access

- Transfer Access should be straightforward, as in the Transfer Access Protocol
- Old Key copies the IDs of its backups to the new key
- The New Key needs to generate IDs
- The Old Key needs to sign a transfer from the Old ID to the New ID (so that the backup device can verify the new device is trusted)
- Transfer Access proceeds for all existing key pairs on the old device
- *The new device must sign delegations from its new key pairs to the respective Active Backup Public Key, sign in to the PRS and deliver those delegations.*

PRS Solution - Revocation

- The backup key should be able to revoke access for any device at any RP by looking at all registrations for that device.
- Revocation would simply include delivering to the RP the transfer from the selected primary authenticator to the active backup public key and indicating to the RP that no new key should be registered.
    - This is dangerous if there are no other keys on the account.