

Recovering from Lost Devices in FIDO

Pre-emptively syncing recovery keys

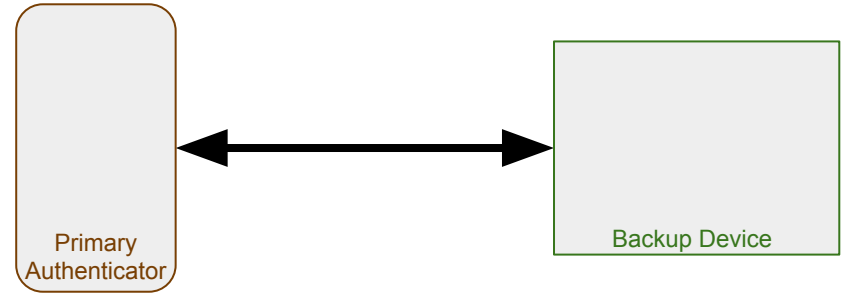
Alex Takakuwa, University of Washington

Pre-emptively Sync Keys (PSK) Solution

- Assumptions:
 - Secure channel between backup device and primary authenticators
 - Secure storage and computation will continue to get cheaper/easier
- Goals:
 - Recovery from lost primary authenticator
 - Do not need to trust anyone for privacy or availability
 - Allow a single recovery device to recover many primary authenticators
 - 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
 - Allow Transfer of Access from Backup Authenticators
- Open Problems:
 - Storage Overhead
 - Revocation

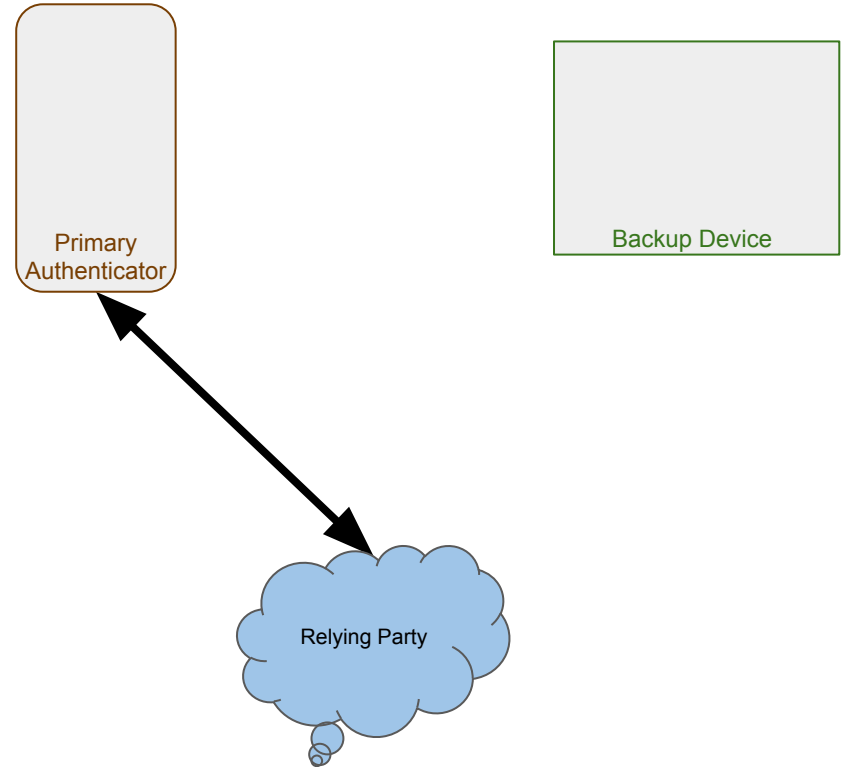
PSK Solution - Setup (User Experience)

- User needs a backup device
- User syncs backup device with primary authenticator
- User uses primary authenticator for future authentications and registrations



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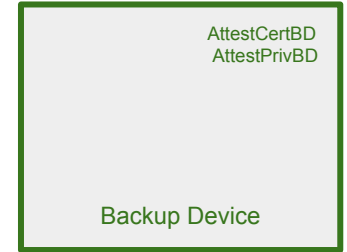
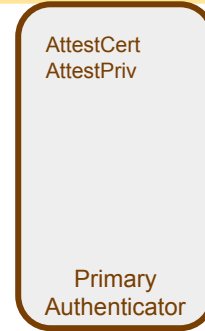
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PSK Solution - Setup (Technical)

1. User sets up local authentication on both devices
2. User creates secure channel between devices.
3. Backup device generates (* some number) of key pairs and corresponding key handles and associates each of them with the Primary Authenticator.
4. Backup Device sends its Attestation Certificate to the Primary Authenticator
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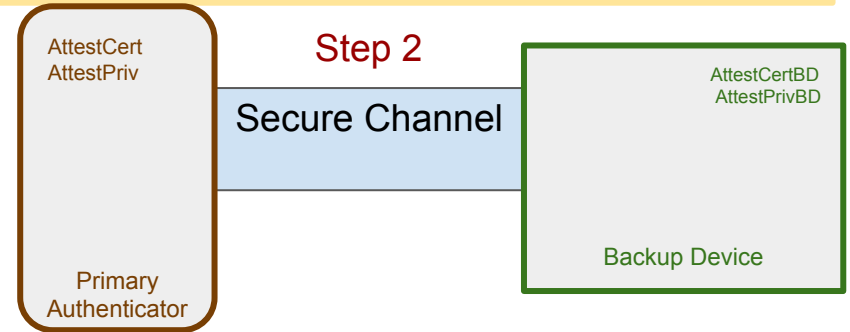
* The backup device should generate (at first setup) enough key pairs to last for all registrations performed by this particular Primary Authenticator. This number can be reduced, but we would need to notify the user to re-sync with the Backup Device should the user run low on generated Backup Device public keys.



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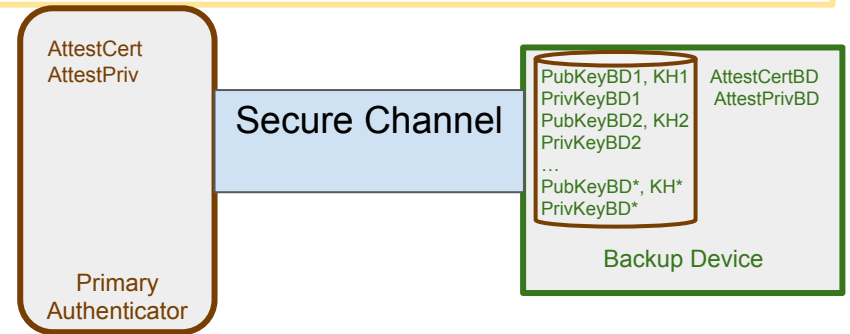
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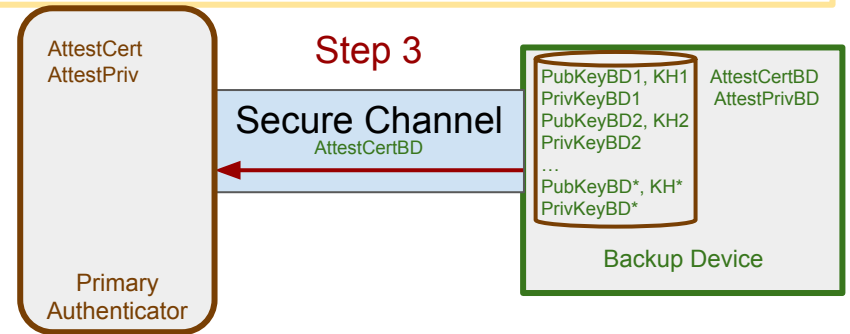
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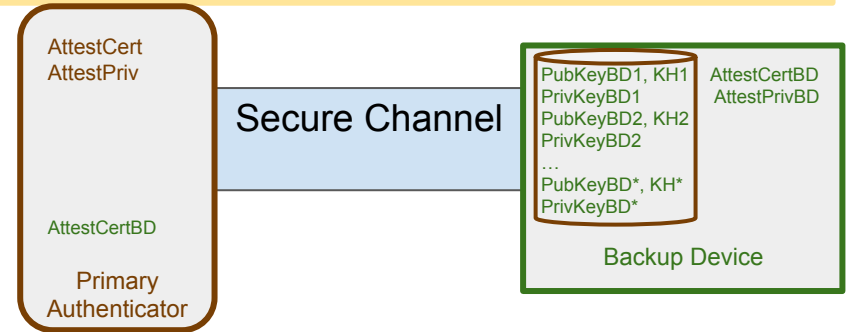
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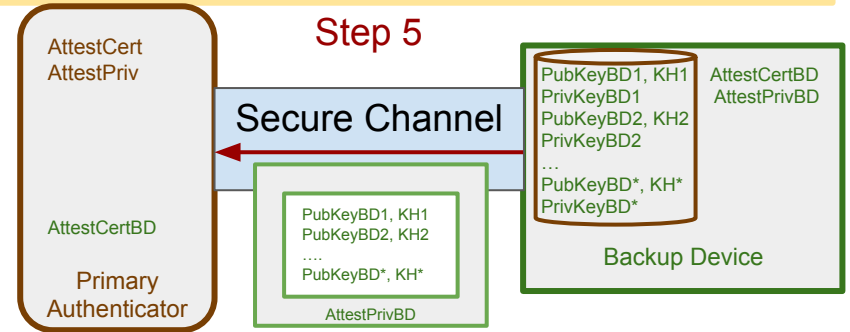
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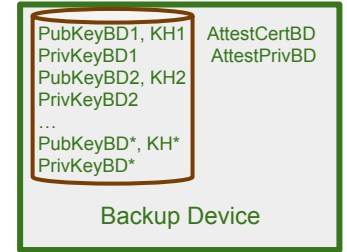
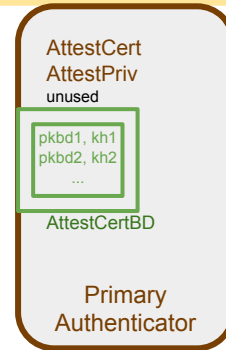
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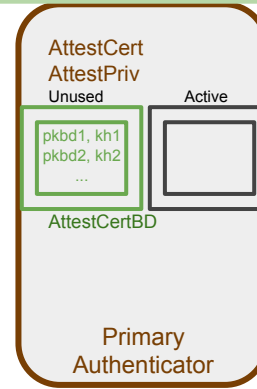
PSK Solution - Registration (User Experience)

- User does a standard FIDO registration with the Relying Party. From the user's perspective, this is unchanged from standard FIDO
- Does not require the Backup Device

PSK Solution - Registration (Technical)

Registration (with Backup)

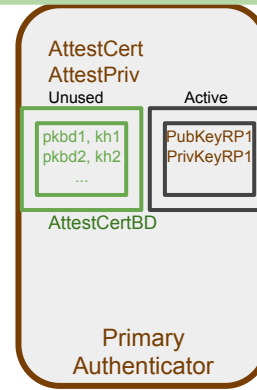
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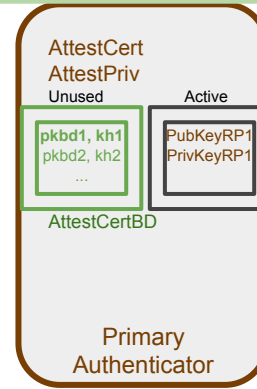
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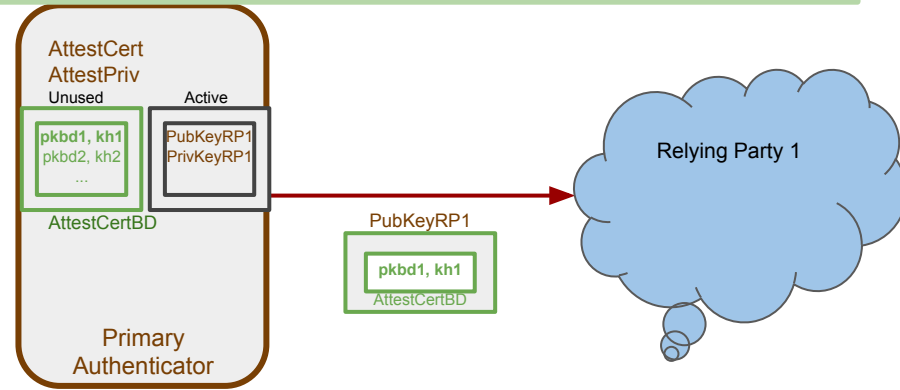
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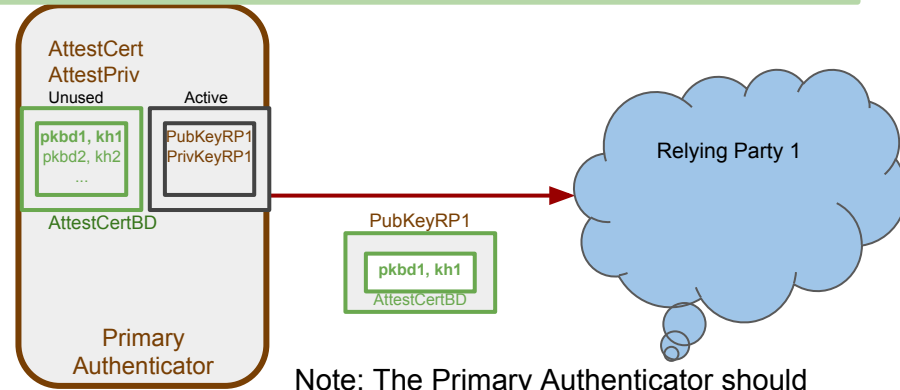
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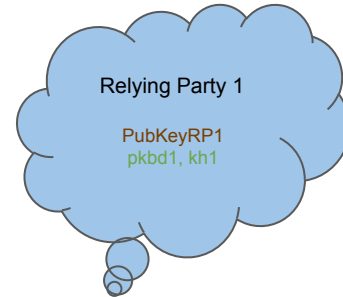
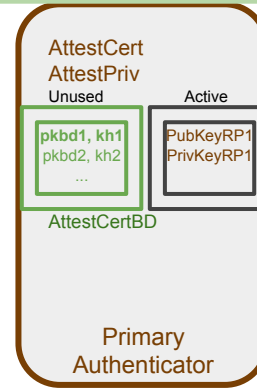


Note: The Primary Authenticator should also send the Attestation Certificates for both itself and the Backup Device during registrations

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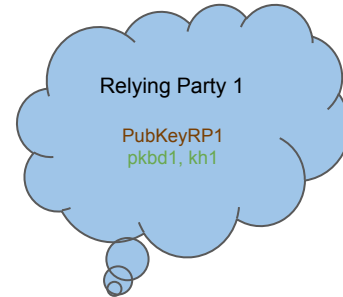
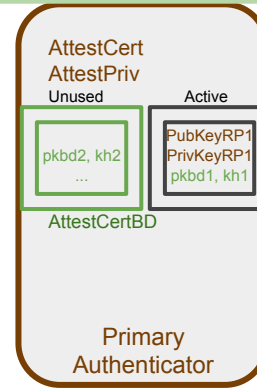
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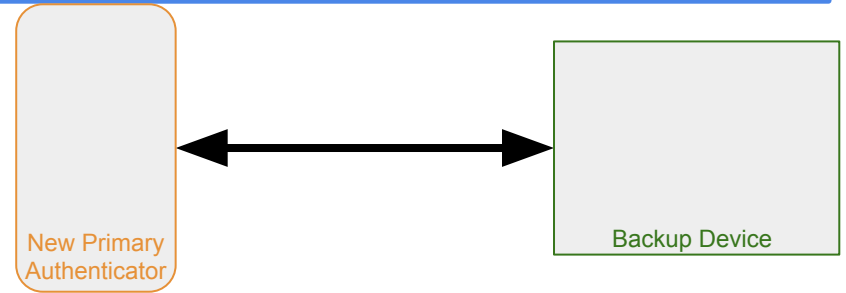


PSK Solution - Authentication

- Unchanged from Standard FIDO
- Note that the Key Handle used is one created by the Backup Key, not the Primary Authenticator
- Does not require the backup device

PSK Solution - Recovery (Usability)

- User retrieves the backup device
- User sets up local authentication on the new Primary Authenticator
- User syncs backup device with new primary authenticator
- User selects “recover from Old Primary Authenticator”.
- User uses new primary authenticator for future authentications and registrations



PSK Solution - Recovery (Technical)

1. Create a secure channel between New Primary Authenticator and Backup Device.
2. User selects "Recover from Old Primary Authenticator"
3. Backup Device looks up how many keys it gave to the Old Primary Authenticator (say it created and provided N total keys to the Old Primary Authenticator), and sends that integer N to the New Primary Authenticator.
4. New Primary Authenticator creates N corresponding key pairs and sends all N generated public keys to the Backup Device.
5. Backup Device signs a delegation from each of its private keys associated with the Old Primary Authenticator to one of the public keys given it by the New Primary Authenticator and internally re-associates its key pair with the New Primary Authenticator.
6. Backup Device sends each of those N public keys, associated key handles, and delegations to the New Primary Authenticator
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10. At next login, the RP sends a challenge to the Key Handle it knows, KH1. The New Primary Authenticator Recognizes that key handle and responds with the recovery message, signed with PrivKeyRP1'.
11. Primary Authenticator and Relying Party 1 can update storage.
12. Registrations proceed as before

AttestCert'
AttestPriv'

New Primary
Authenticator

PubKeyBD1, KH1
PrivKeyBD1
PubKeyBD2, KH2
PrivKeyBD2
...
PubKeyBDN, KHN
PrivKeyBDN

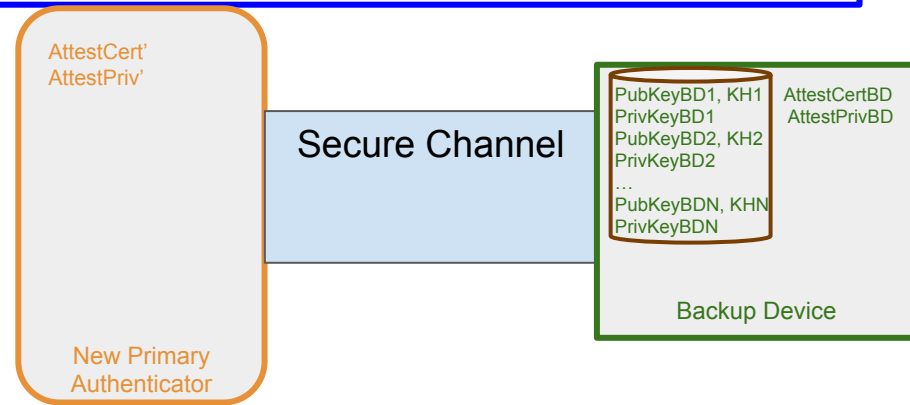
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Backup Device

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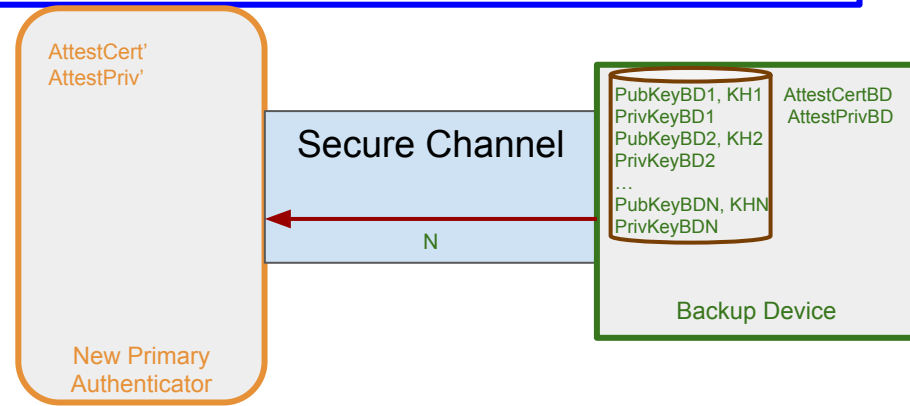
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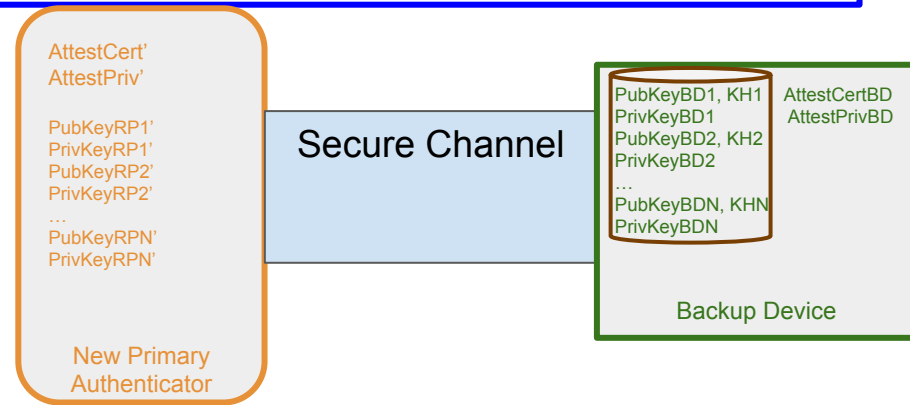
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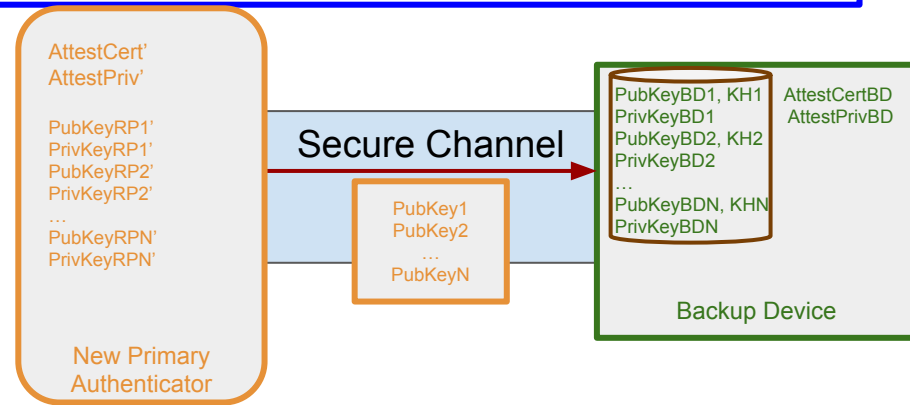
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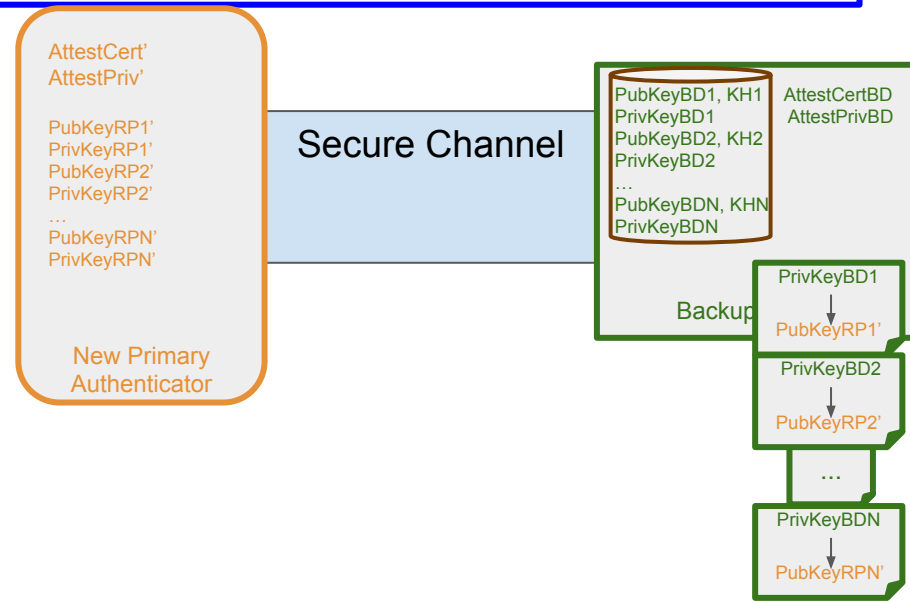
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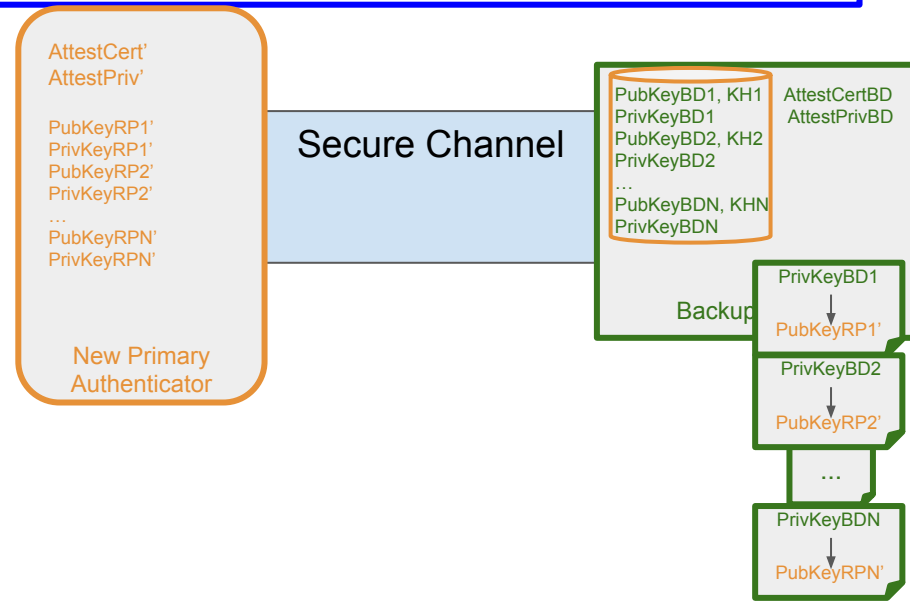
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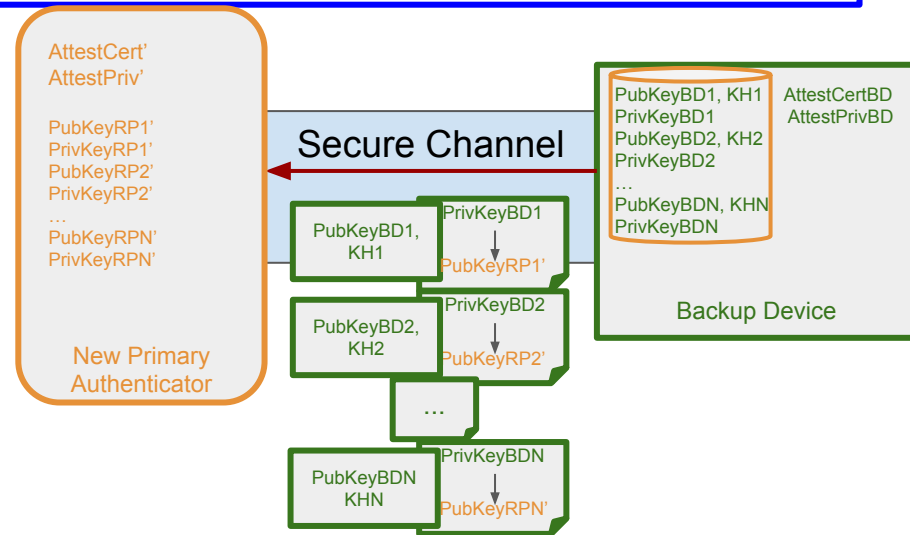
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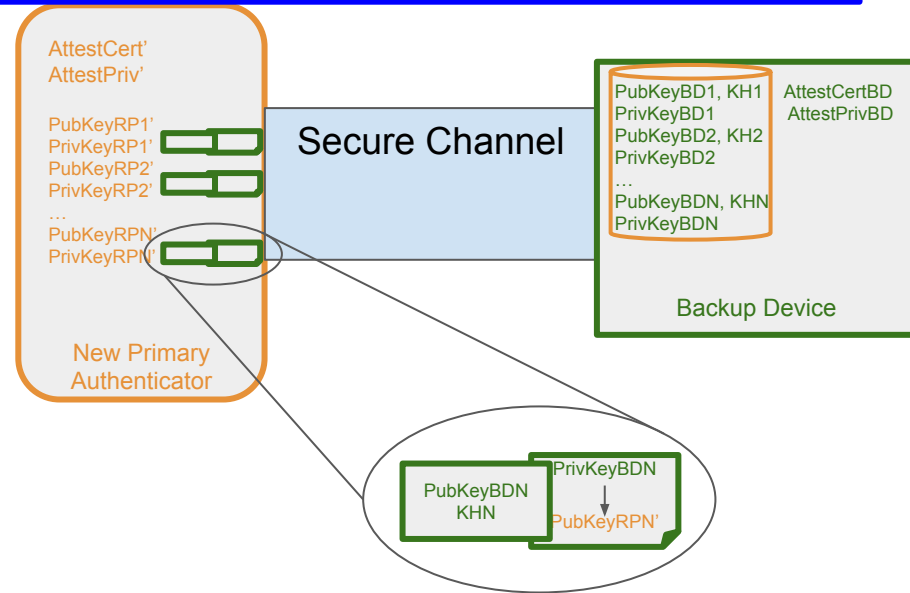
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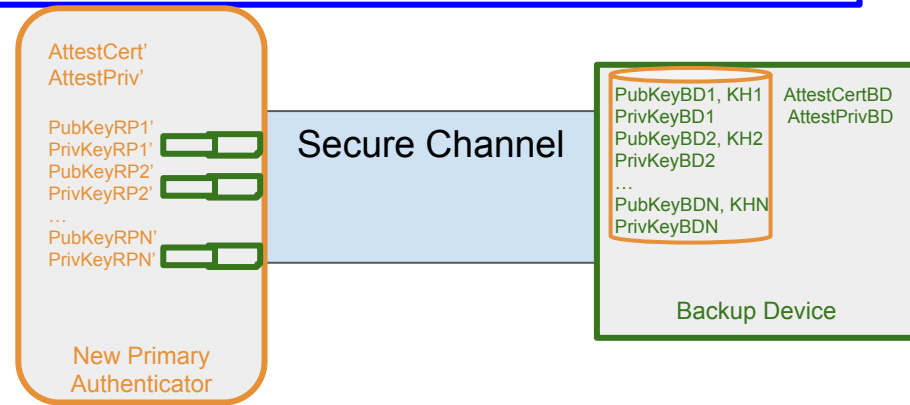
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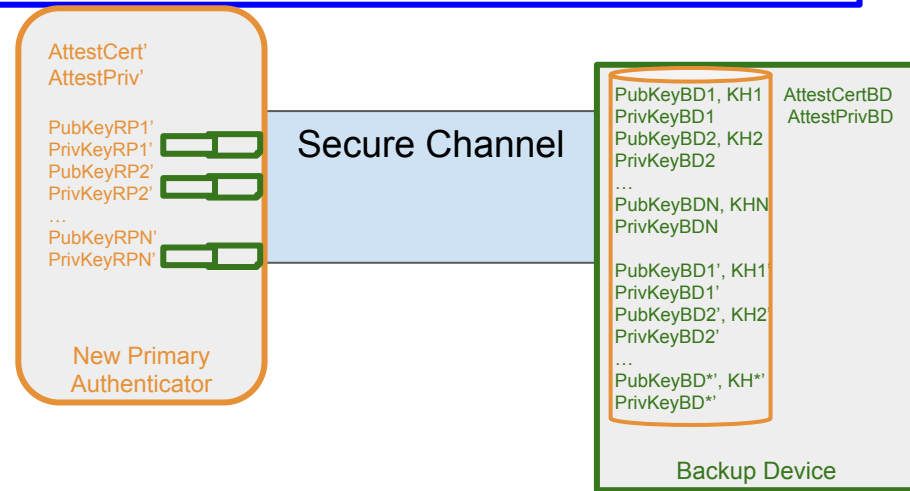
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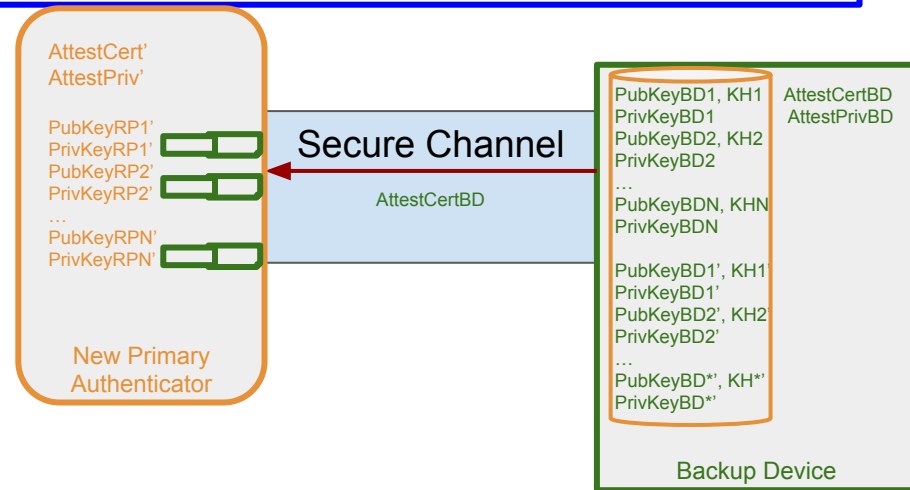
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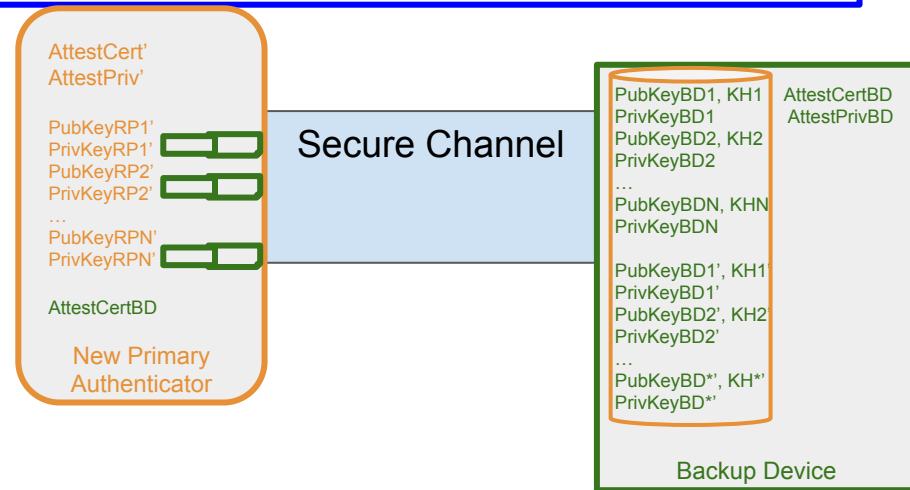
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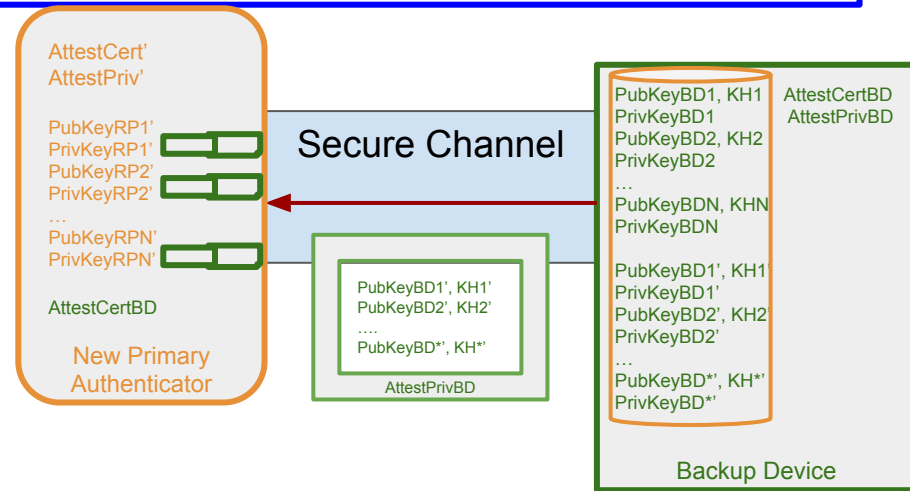
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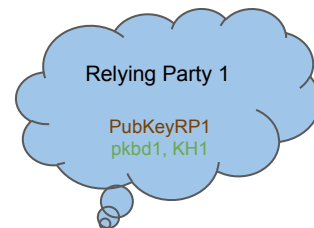
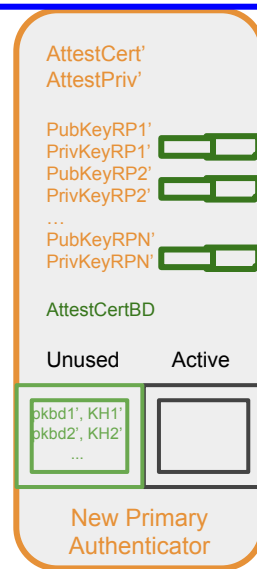
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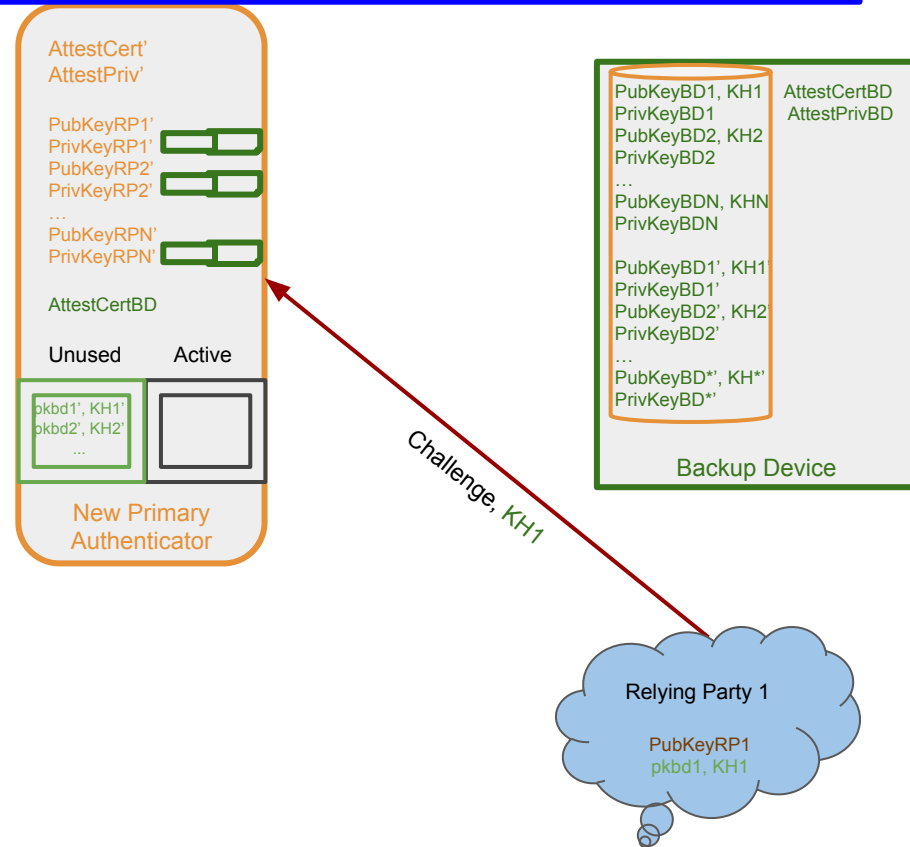
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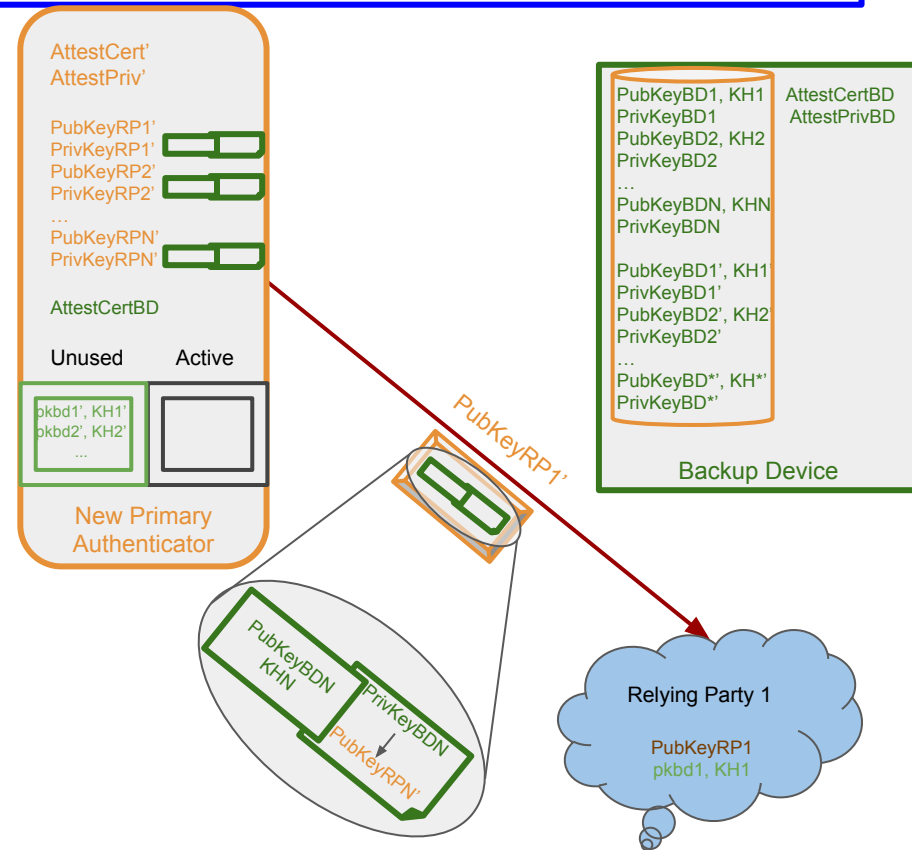
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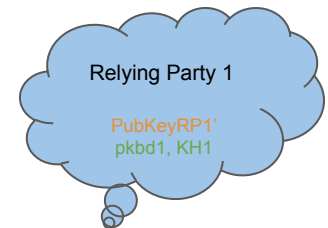
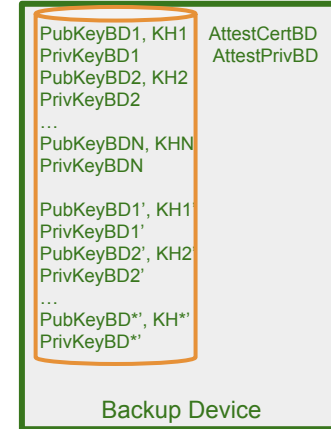
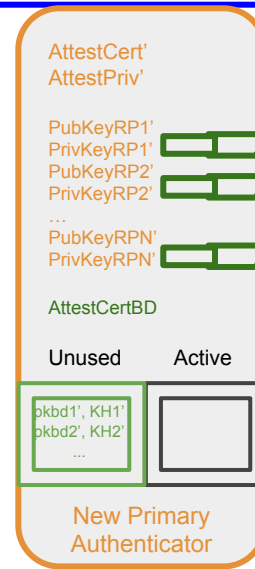
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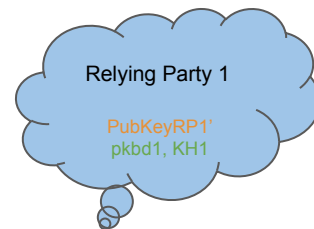
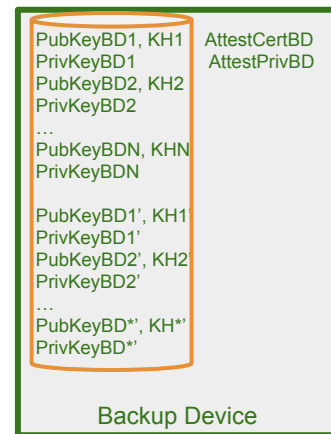
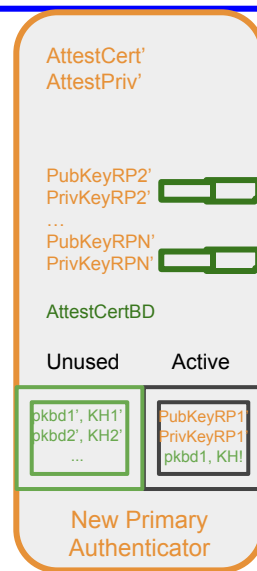
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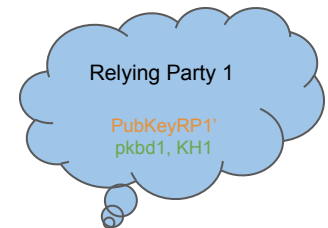
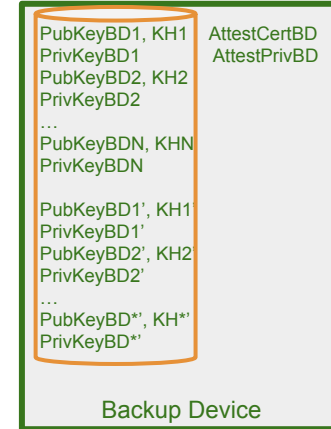
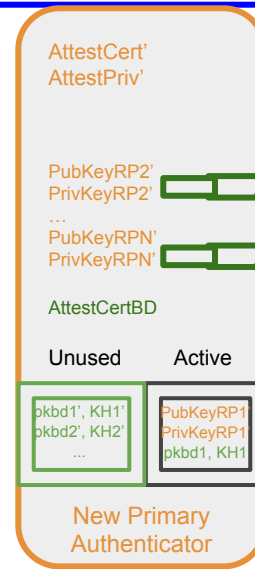
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PSK Solution - Transfer Access

- Transfer Access should be straightforward, as in the [Transfer Access Protocol](#)
 - Old Primary simply conveys stored information from the Backup to the new Primary Authenticator
 - New Primary can Register as normal
- Transferring to a new Backup authenticator should be simple as well. There are two options
 - User can transfer access from the old backup to the new backup by creating a secure channel directly between the two, without Phone A.
 - User can “switch” backup devices by creating a secure channel between the new Backup Device and the Primary Authenticator.
 - Primary gets new backup keys for each of its existing accounts
 - Primary gets fresh “unused” keys for future registrations
 - Primary must inform the RPs of the change on the next visit and then can delete information about the old backup