TF-M Tech Forum

Secure Storage

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What is it for?

- Keys
- Hashes
- Certificates
- Audit logs
- Sensitive user data
- …anything requiring confidentiality, authenticity or rollback protection

PSA Storage

PSA Internal Trusted Storage (ITS)

- PSA Root of Trust Service
- Internal storage only (e.g. eFlash)
- Storage is inherently trusted: no encryption, authentication or rollback protection required in service itself
- Small datasets (e.g. keys)
- Implemented by TF-M ITS service

PSA Protected Storage (PS)

- Application Root of Trust Service
- Can use external (untrusted) storage
- Storage may be accessible to attacker: option for encryption, authentication and rollback protection in service
- Large datasets
- Implemented by TF-M Secure Storage (SST) service

How do I use it?

- Straightforward developer-facing APIs
  - Accessible to both Non-Secure and Secure callers
- uid/value semantics
  - Set data to a uid
  - Get data associated with a uid
  - Get info about a uid
  - Remove uid
- Access control: each partition can access only its own assets
- Separate APIs for ITS and PS
  - Follow same pattern

```
psa_status_t psa_its_set(psa_storage_uid_t uid,
                         size_t data_length,
                         const void *p_data,
                         psa_storage_create_flags_t create_flags)

psa_status_t psa_its_get(psa_storage_uid_t uid,
                         size_t data_offset,
                         size_t data_size,
                         void *p_data,
                         size_t *p_data_length)

psa_status_t psa_its_get_info(psa_storage_uid_t uid,
                              struct psa_storage_info_t *p_info)

psa_status_t psa_its_remove(psa_storage_uid_t uid)
```

…and equivalent for Protected Storage

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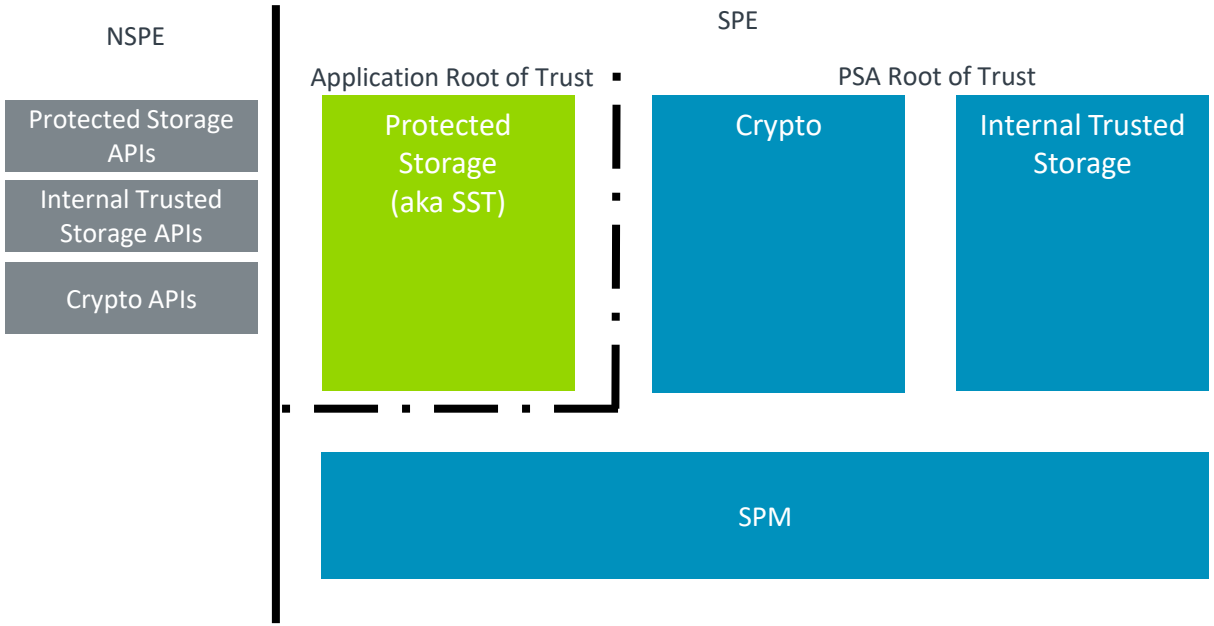
TF-M Secure Storage

- SST and ITS services each provided by their own partition in TF-M
  - ITS is PSA RoT, SST is Application RoT
  - SST depends on Crypto, which depends on ITS
- ITS is smallest possible wrapper around filesystem
  - Main addition is access control based on client IDs
- SST also adds protection for data-at-rest
  - Encryption, authentication, rollback protection
    - Controlled by build flags, depending on required level of protection
  - Authentication & encryption: AEAD (AES-128-GCM) using HUK, via Crypto service
  - Rollback protection: collect MACs in table, keep version in NV counter



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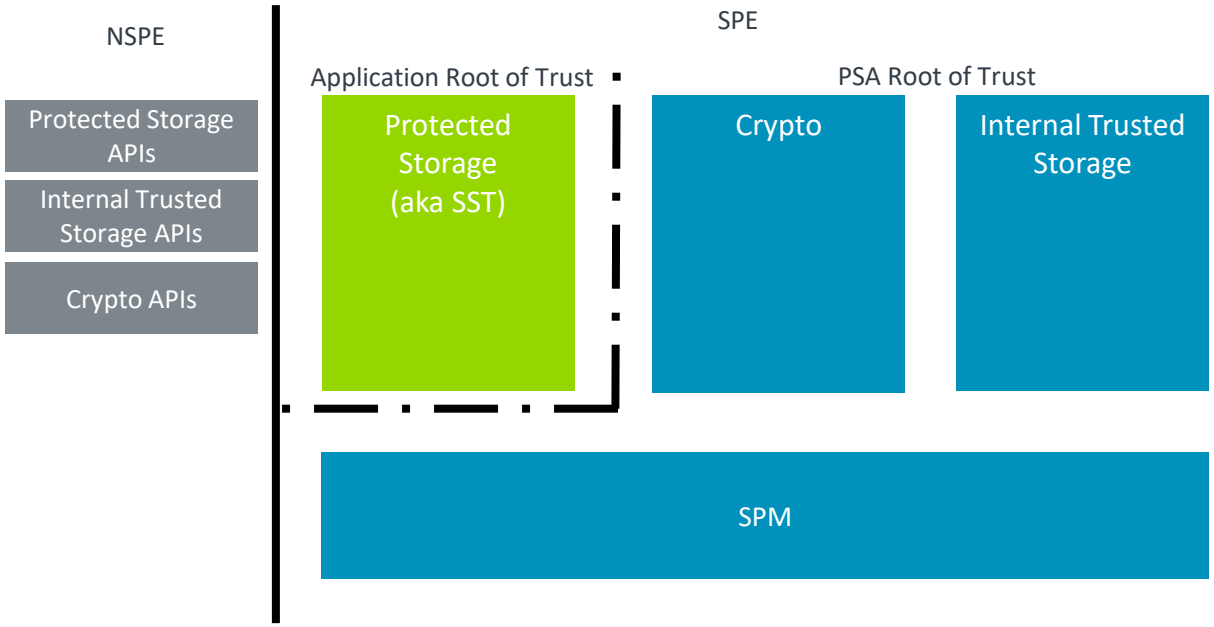
TF-M Secure Storage cont.

- Both services use same lightweight flash filesystem as backend
  - Non-hierarchical
  - Integer file IDs
  - Create/write/delete APIs
  - Reliability in case of power failure
    - Can use 2 or >=4 flash blocks
  - No fragmentation
  - Flash layer can use internal or external flash device



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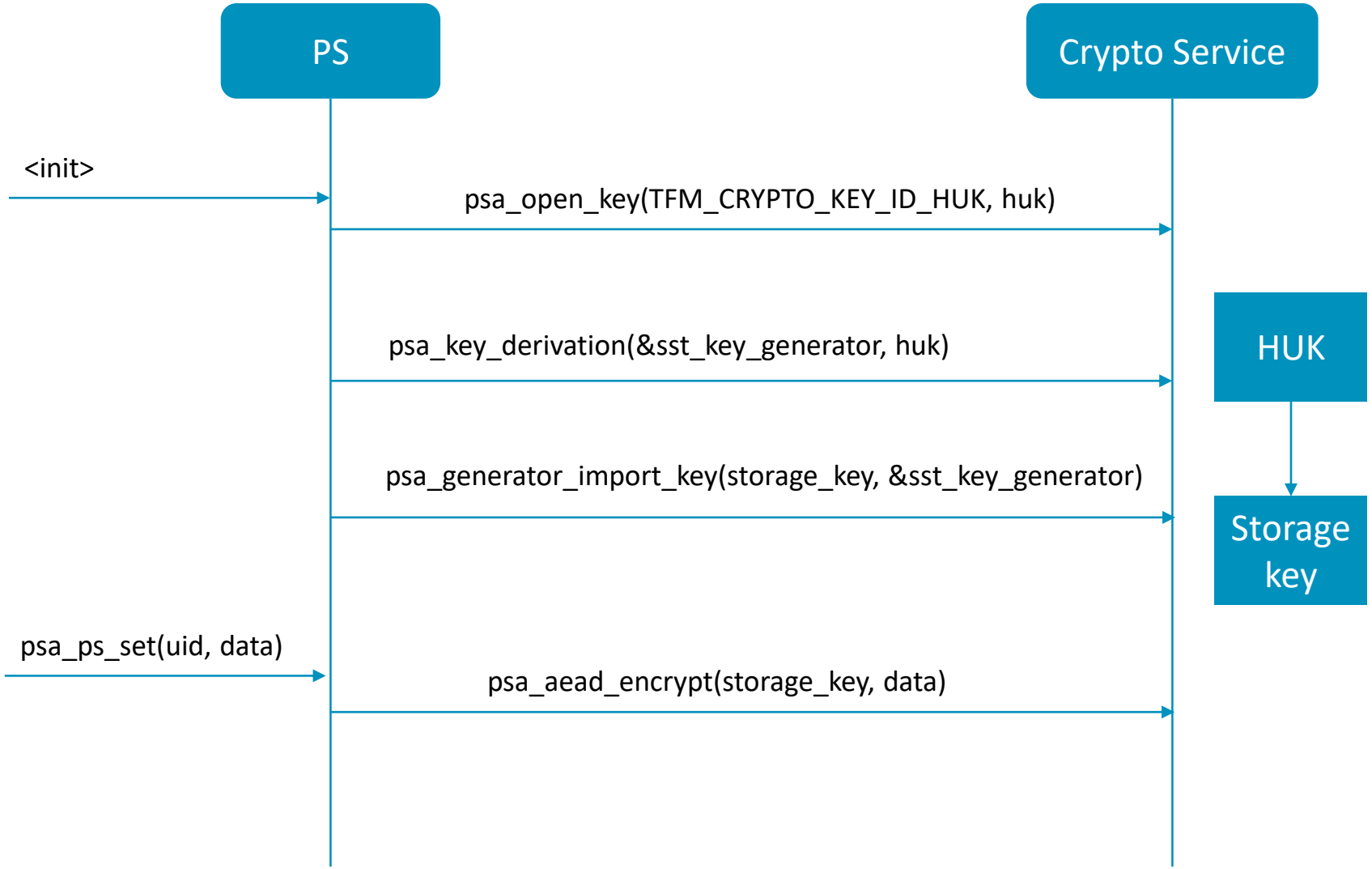
PS uses Crypto service for encryption



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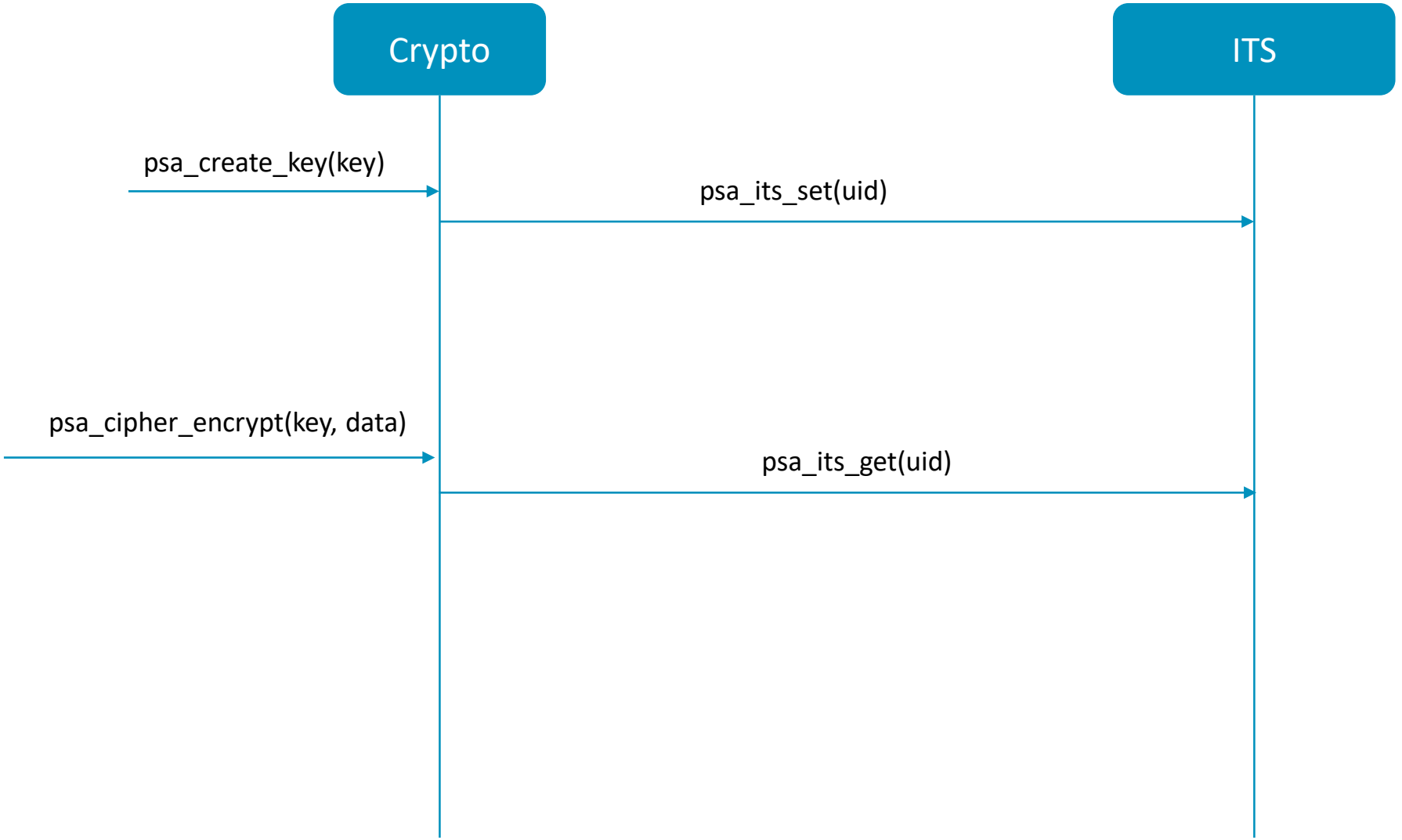
Crypto service uses ITS for storing persistent keys



Upcoming features

- Sharing common filesystem code between ITS and PS
  - SST calls ITS APIs as its backend ‘filesystem’
  - SST partition essentially becomes an encryption, authentication and rollback protection layer on top of ITS
  - Shrinks the stack size of SST, at cost of concurrent requests to ITS/PS APIs requests having to wait
    - (alternative is put FS code in shared code region, would reduce overhead a bit)
- Protected Storage 1.0
- Integration with HW keys, via crypto service
- Scalable internal buffers
  - Support for different profiles
- Key diversification
  - One key per client, or per asset
- NAND flash support

Thank You
Danke
Merci
谢谢
ありがとう
Gracias
Kiitos
감사합니다
धन्यवाद
شكرًا
תודה