A way forward for AIoT temporary ID

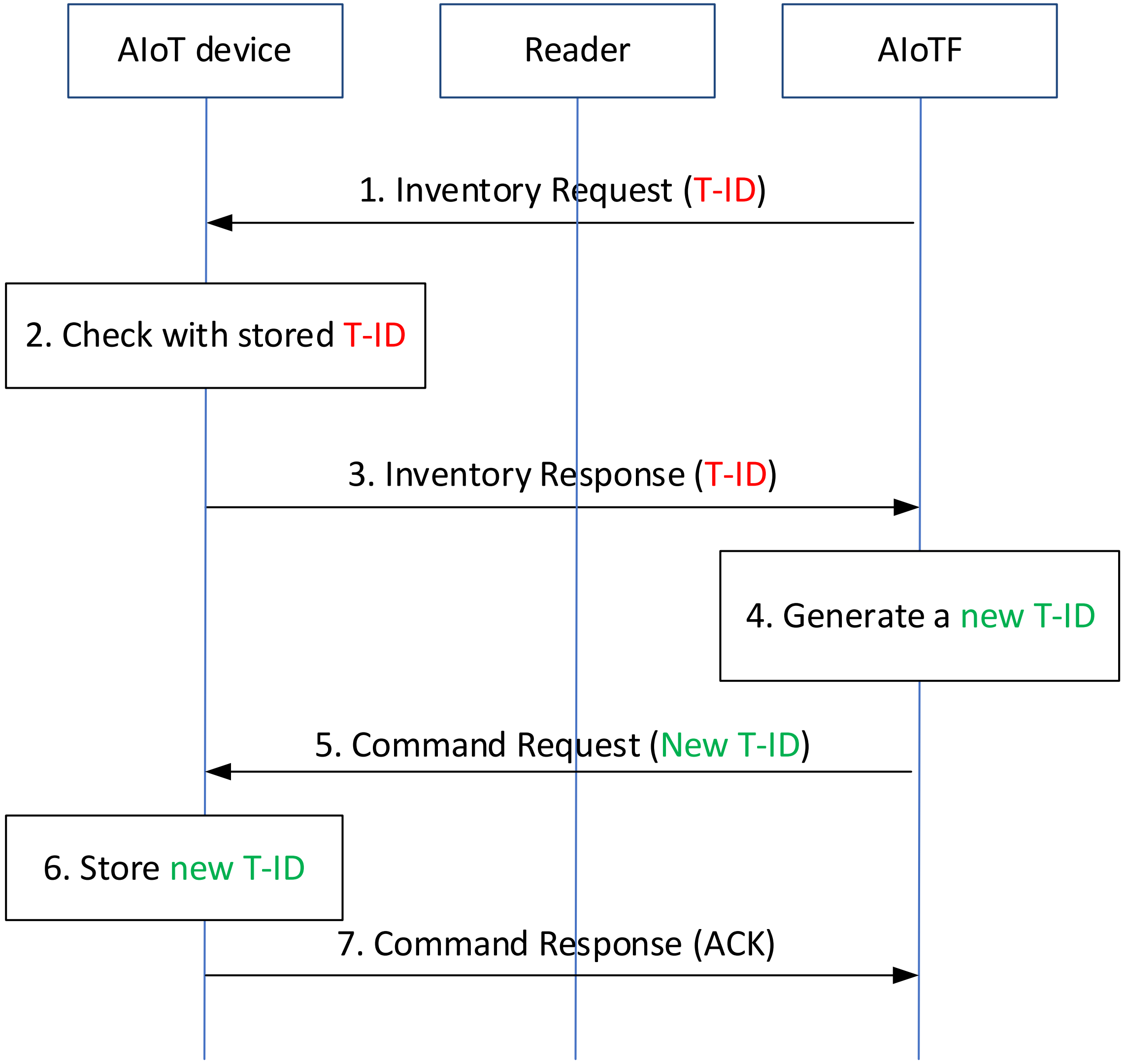
Potential issues in network-assigned temp ID

Individual inventory

Procedure

- AIoTF performs inventory procedure using previously assigned T-ID
- AIoTF assigns a new T-ID using command procedure

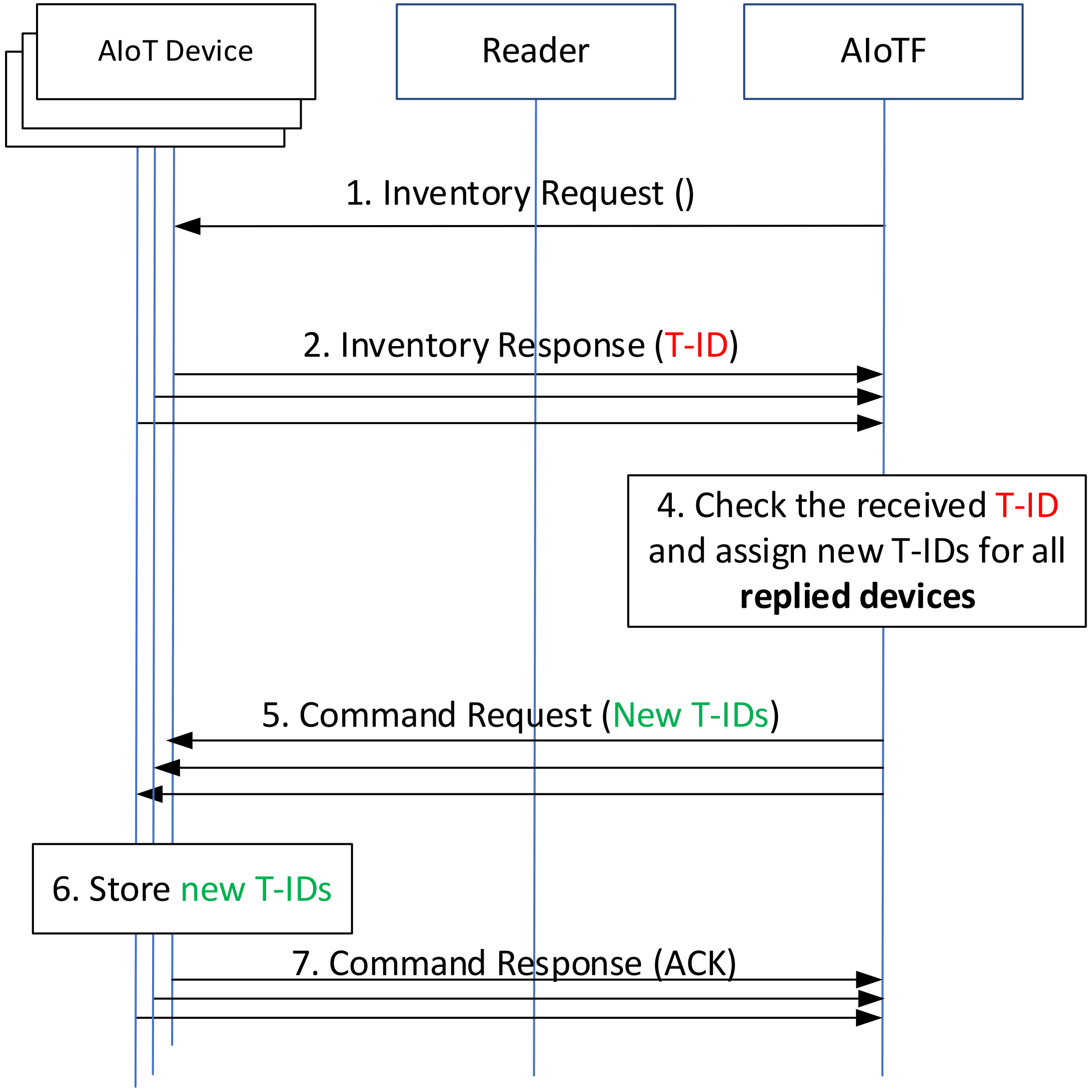
- Issues
  - T-ID desync can happen
    - Command Response (T-ID allocation ACK) can be missed/dropped
  - Command procedure always needs to be performed
    - No inventory-only procedure
    - Misalignment with SA2
  - Protocol reliability cannot be assumed
    - AIoT device may not be able to store T-ID due to insufficient energy (indicated by RAN 1 Reply LS, S3-243813)
  - Use of default ID loses privacy
- Benefit
  - Reuse of 5G CN paging and 5G-GUTI allocation


AIoT device
Reader
AIoTF
1. Inventory Request (T-ID)
2. Check with stored T-ID
3. Inventory Response (T-ID)
4. Generate a new T-ID
5. Command Request (New T-ID)
6. Store new T-ID
7. Command Response (ACK)

Potential issues in network-assigned temp ID

Group inventory

- Procedure
  - AIoTF performs group inventory procedure, i.e., no device ID in the inventory request
  - AIoTF performs command procedures with all AIoT devices who sent Inventory Response
- Issues
  - Messaging overhead is introduced in the presence of many AIoT devices
    - Can be exploited to overload AIoTF
  - Same issues as those of individual inventory
    - T-ID desync can happen
    - Command procedure always needs to be performed
    - Protocol reliability cannot be assumed
    - Use of default ID loses privacy
- Benefit
  - Reuse of 5G CN paging and 5G-GUTI allocation

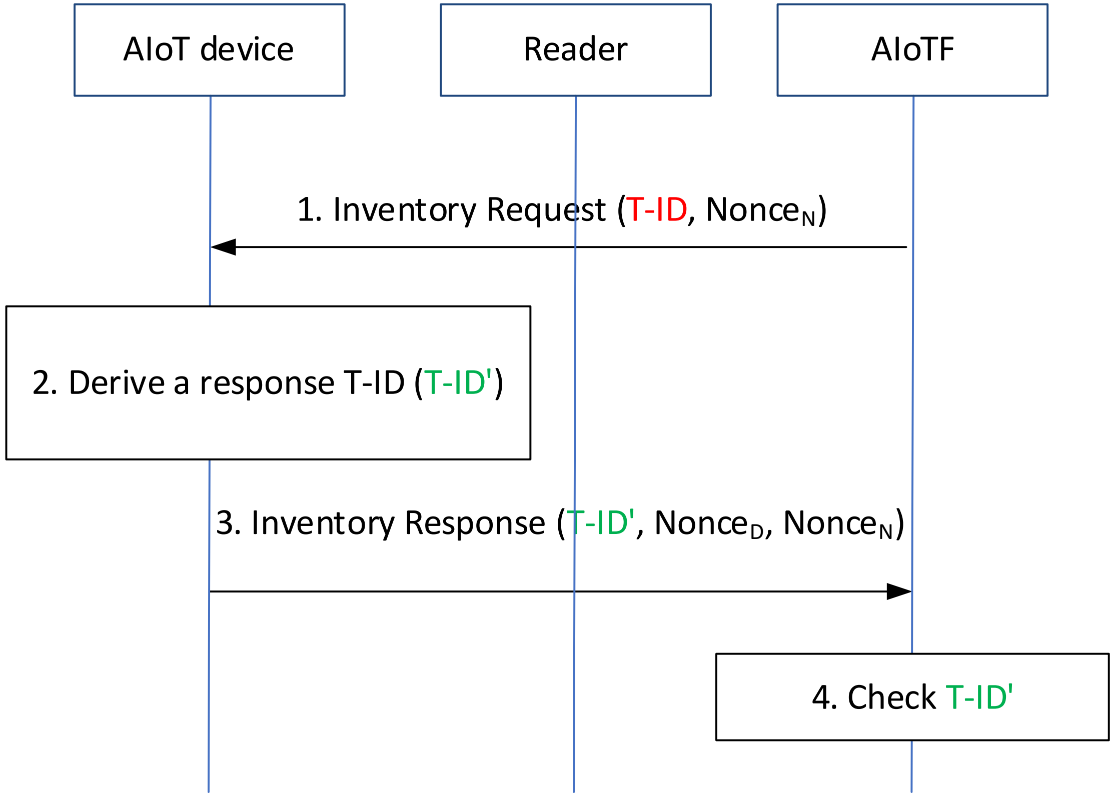

AIoT Device
Reader
AIoTF
1. Inventory Request ()
2. Inventory Response (T-ID)
4. Check the received T-ID and assign new T-IDs for all **replied devices**
5. Command Request (New T-IDs)
6. Store new T-IDs
7. Command Response (ACK)

Derived temp. ID using device credential

Individual inventory

K_D: Device key
Nonce_N : Network Nonce
Nonce_D : Device Nonce

- Procedure
  - AIoTF derives a T-ID for an AIoT device
    - T-ID = F(K_D, device ID, Nonce_N)
  - AIoTF sends Inventory Request with T-ID
  - AIoT device checks the T-ID
  - AIoT device generates response T-ID (T-ID’)
    - T-ID’ = F(K_D, device ID, Nonce_N, Nonce_D)
  - AIoT device sends Inventory Response with T-ID’
- Issues
  - Potential T-ID collision risk
    - Use of different T-IDs in request and response doubles the effective T-ID length
    - Longer ID length can reduce the risk
- Benefit
  - Stateless operation (no state or memory write at AIoT device)
  - No desync issue

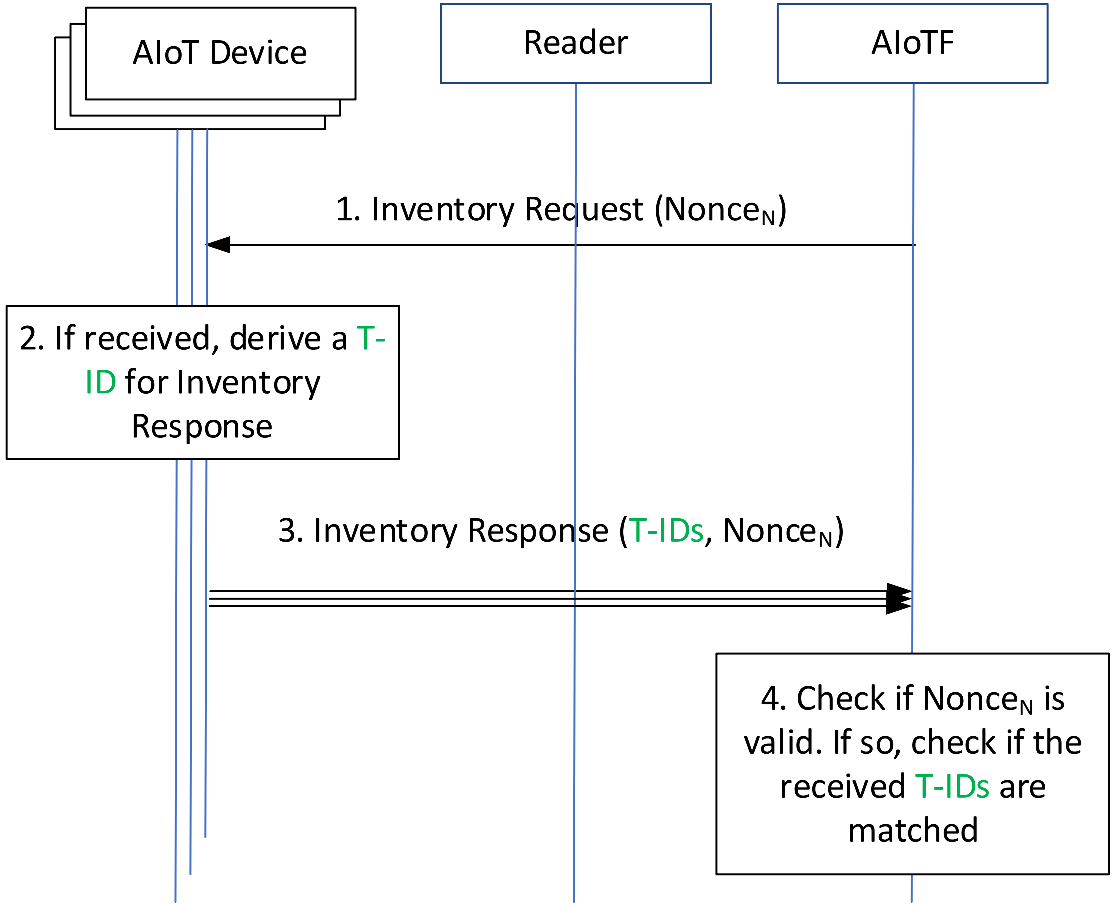

AIoT device
Reader
AIoTF
1. Inventory Request (T-ID, Nonce_N)
2. Derive a response T-ID (T-ID')
3. Inventory Response (T-ID', Nonce_D, Nonce_N)
4. Check T-ID'

Derived temp. ID using device credential

Group inventory

- Procedure
  - AIoTF sends Inventory Request containing Nonce_N
  - AIoT device generates a T-ID
    - T-ID = F(K_D, device ID, Nonce_N)
  - AIoT device sends Inventory Response with T-ID and Nonce_N
  - AIoTF computes the list of expected T-IDs and checks with the received T-ID
    - Note: list construction is done only once for the same Nonce_N
- Issues
  - Replay of group inventory
    - AIoTF can filter Inventory responses based on Nonce_N
- Benefit
  - Stateless operation (no state or memory write at AIoT device)
  - No desync issue

K_D: Device key
Nonce_N : Network Nonce
Nonce_D : Device Nonce



AIoT Device
Reader
AIoTF
1. Inventory Request (Nonce_N)
2. If received, derive a T-ID for Inventory Response
3. Inventory Response (T-IDs, Nonce_N)
4. Check if Nonce_N is valid. If so, check if the received T-IDs are matched

Way forward proposal

- Summary
  - Network-assigned temporary ID approach has issues that cannot be fixed
    - Temporary ID de-synchronization
    - No support for inventory-only procedure
    - Use of default ID or previous temporary ID (in case of de-sync) loses ID privacy
    - Protocol reliability
    - Messaging overhead
  - Derived temporary ID has potential ID collision issue but the issue can be fixed
- Way forward
  - It is proposed to use the derived temporary ID approach based on the comparative analysis