BRSKI – Support for asynchronous enrollment

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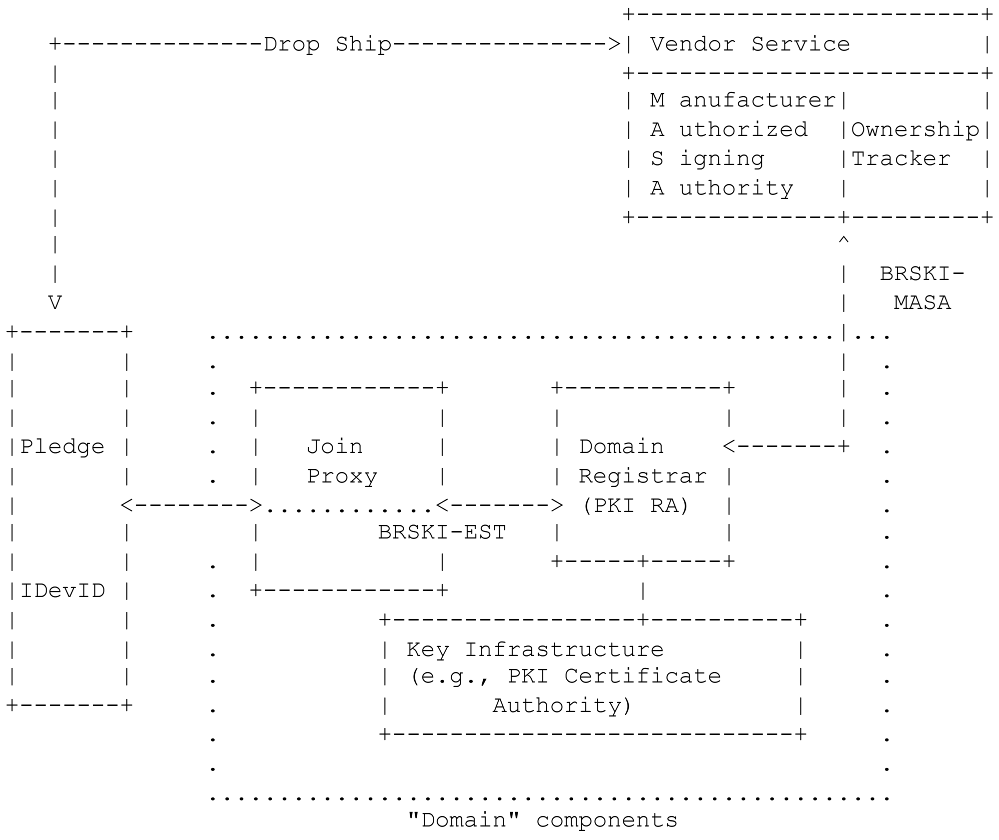
Problem statement

- Some industrial scenarios are restricted regarding their online connectivity either technically or by policy. This limits the exchange of
  - voucher information with a MASA for domain trust establishment with pledge
  - certification request/response messages with a PKI for issuing an LDevID
- Other scenarios assume only limited on-site PKI functionality support (Proxy)
  - Rely on a backend or centralized PKI, to perform (final) authorization of certification requests for an operational certificate (LDevID).
  - May not feature trusted domain component for store and forward
- Use cases with multiple hops to the issuing PKI due to network segmentation
- Required consistency for certificate management over device / system lifecycle. (e.g. , existing industrial standards require support of different enrolment mechanisms on the central side in parallel, while letting the pledge pick

BRSKI – Current support of asynchronous enrollment

- Use of self-contained voucher (RFC 8366) to transport domain certificate signed by MASA
  - does not rely on transport security
  - can be leveraged for asynchronous provisioning of the voucher
- Use of online enrollment protocol (EST, RFC 7030)
  - Utilizes PKCS#10 for CSR and uses IDevID of pledge for authentication during TLS handshake.
  - Assumes enrollment authorization based on IDevID at the on-site RA/CA with authorization database.



BRSKI-AE supports asynchronous enrollment

- Utilizes self-contained-object for certification request/response (CSR wrapping using existing certificate (IDevID)).
- BRSKI-AE allows interaction with an off-site PKI
  - rely on on-site simple store-and-forward (optionally no Domain Registrar)
  - CSR authorization in conjunction with off-site asset management system
- Support of in-band and out-of-band certificate management throughout the device lifecycle
- Allows BRSKI application in domains that already selected (other) certificate management approaches.
- May be combined with voucher exchange

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                                           +------------------------+
   +--------------Drop Ship--------------->| Vendor Service         |
   |                                       +------------------------+
   |                                       | M anufacturer|         |
   |                                       | A uthorized  |Ownership|
   |                                       | S igning     |Tracker  |
   |                                       | A uthority   |         |
   |                                       +--------------+---------+
   |                                                      ^
   |                                                      |
   V                                                      |
+--------+     .........................................  |
|        |     .                                       .  |
|        |     .  +------------+       +------------+  .  | BRSKI-
|        |     .  |            |       |            |  .  | MASA
| Pledge |     .  |   Join     |       | Domain     <-----+
|        |     .  |   Proxy    |       | Registrar/ |  .  ^
|        <-------->............<-------> Proxy      |  .  '
|        |     .  |        BRSKI-AE    |            |  .  | [alt.]
| IDevID |     .  |            |       +------^-----+  .  '
|        |     .  +------------+              |        .  |
|        |     .                              |        .  '
+--------+     ...............................|.........  |
                "on-site domain" components   |           '
                                              |           |
                                              |           '
 .............................................|...........|.........
 . +---------------------------+     +--------v-----------v------+ .
 . | Public Key Infrastructure |<----+ PKI RA                    | .
 . | PKI CA                    |---->+ [(Domain) Registrar (opt)]| .
 . +---------------------------+     +--------+--^---------------+ .
 .                                            |  |                 .
 .                                   +--------v--+---------------+ .
 .                                   | Inventory (Asset)         | .
 .                                   | Management                | .
 .                                   +---------------------------+ .
 ...................................................................
         "off-site domain" components
```

Next Steps

- Enhancement of BRSKI with support of asynchronous certificate enrollment using self-contained objects
  - Definition of an abstract self-contained approach → YANG model, protocol agnostic
  - Should allow support of existing enrollment protocols
  - Allow domain registrar to support different enrollment protocol options
- Support of coupling of voucher exchange and certificate enrollment (from transport protocol point of view) when target domain has no connection to the outside
  - Use case description / information processing for closed environments
  - Keep voucher and trust assumptions (Pledge, Domain Registrar, MASA), but allow for protocol independent transport
- Is the WG interested in this work?

Backup

Need for asynchronous enrollment (Examples)

- Rolling stock, railroad cars: sensors/actors/controller prepared to communicate locally (within the wagon), but not “aware” of backend connectivity (to PKI / asset management).
- Building automation: small or side building equipped with sensor, actuators, and controllers with limited or no connectivity to centralized building management system (Example: School)
- Substation automation: Control center, typically hosts PKI services, issues certificates for substations. Communication between the substation and control center done through a proxy/gateway/DMZ terminating the connection. Note that substation automation assumes central support SCEP/EST (IEC 62351)
- Electric vehicle infrastructure: communication limited to single protocol handling all information exchange with the backend (OCPP to carry CSRs); no second protocol allowed.