Trusted Certificate Service

Implementing private trust … and SMIME BR changes in TCS Gen 4

David Groep

TCS Policy Management Authority

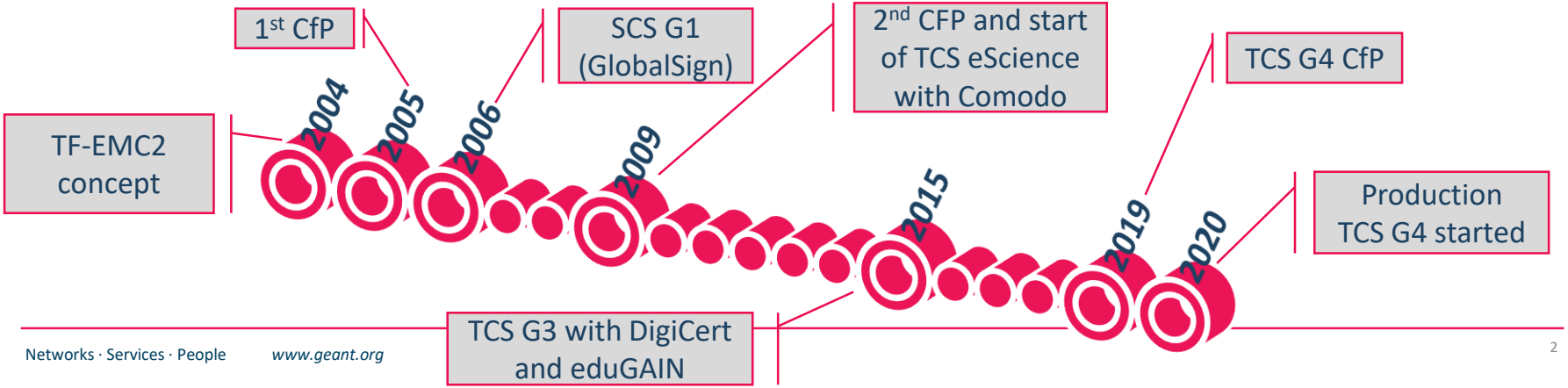
Nikhef PDP and Maastricht University

EUGridPMA59, Abingdon

3 October 2023

Almost 20 years of TCS service!

- based on a concept by Jan Meijer back in 2004
- driven primarily by the NREN constituency, but with the eScience use cases very much in mind
- NREN (GEANT constituency) requirements on public trust, today esp. EV, but also eIDAS
- in a way that scales to 45 countries and ~100k active certificates today, increasing steadily
- and also ~10000 organisations, most of which cannot deal with certificates … or with much change
- now in its 4th iteration: GlobalSign, Comodo, DigiCert, … and with Sectigo again



TCS constituency

- service is ultimately driven by the GEANT members: 45 national R&E network organisations
- wide range of inputs: some countries adore Qualified Certificated and eIDAS, others don't care
- some countries really need a native-language interface (like .fr, .es, …),
  while others don't care (.nl, .se)
- stakeholders regard EV as mandatory, and many stakeholders pushed for ultimate stability – since the subscribers have actually no knowledge of PKI, nor of validation, and certainly not about chaining
- eScience use cases are important for many, although not the *only* driving factor in the game

TCS is a GEANT service – with the TCS PMA defining the profiles and policy

- TCS PMA drawn from the wider GEANT community (NRENs as well as individual orgs)

- Current PMA members … some of whom you will have seen
  - Kurt Bauer (ACONET, AT)
  - Kent Engström (SUNET, SE)
  - David Groep (Nikhef, NL)
  - Nicole Harris (GEANT)
  - Barbara Monticini (GARR),
  - Jürgen Brauckman (DFN),
  - Tim de Boer (SURF).

The basic structure remains the same … again!

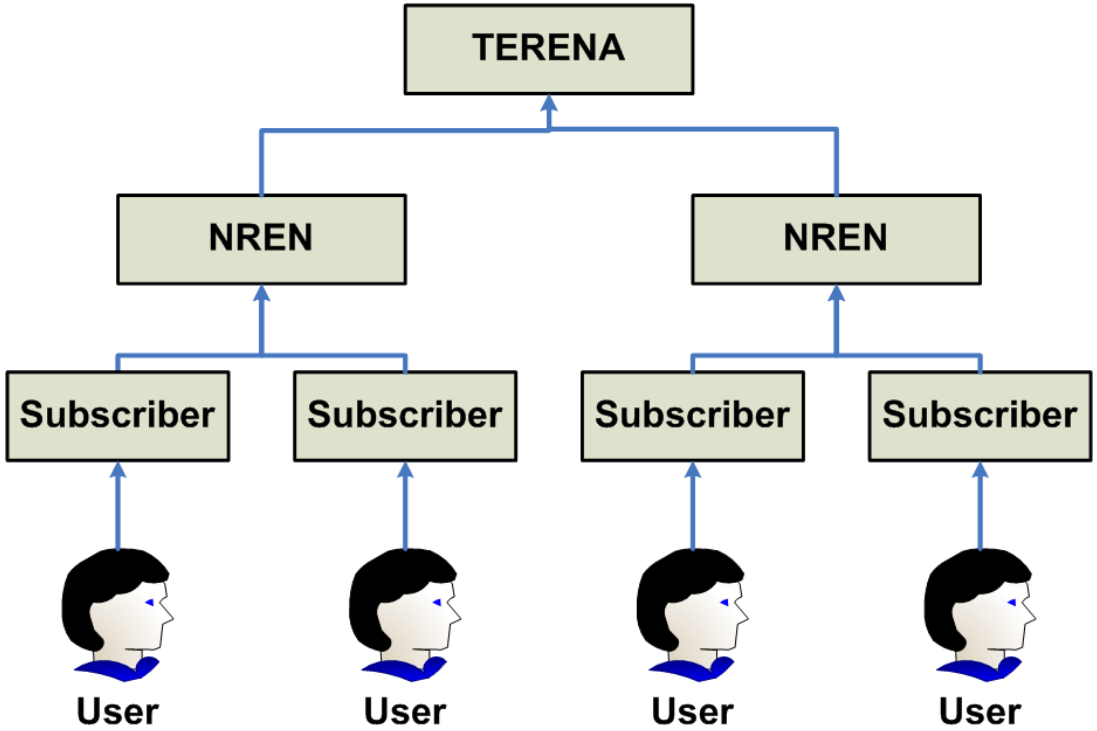
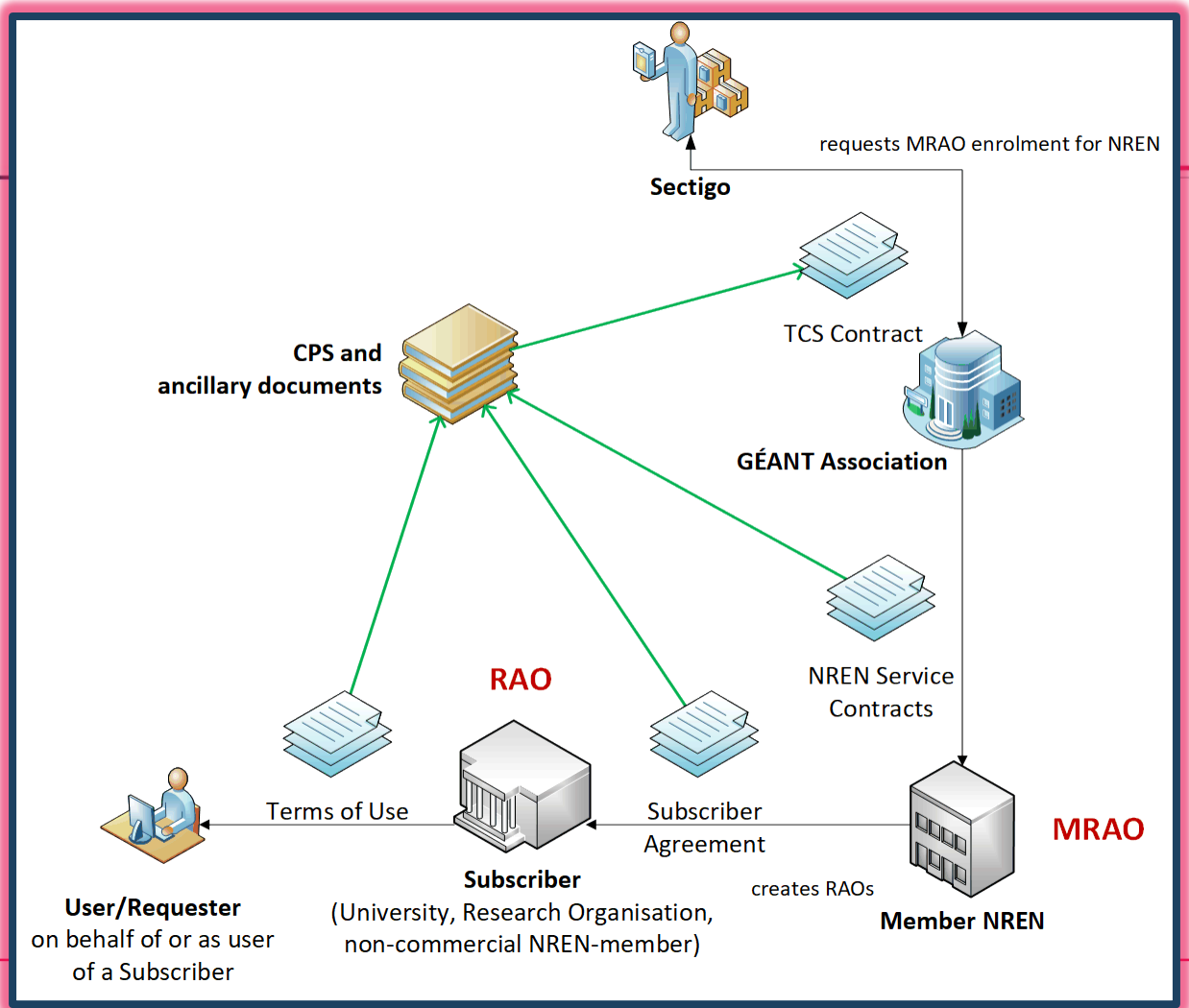


image source: Jan Meijer, 2008!

TCS G4


requests MRAO enrolment for NREN
Sectigo
TCS Contract
CPS and
ancillary documents
GÉANT Association
NREN Service
Contracts
RAO
Terms of Use
Subscriber
Agreement
MRAO
creates RAOs
Member NREN
Subscriber
(University, Research Organisation,
non-commercial NREN-member)
User/Requester
on behalf of or as user
of a Subscriber

Assurance levels

Joint Public & IGTF trust: certs all meet CABF OV requirements, exceeding 'IGTF Classic' a bit

- OV validation requires DCV, which is stronger than the RA checks minimally required
- the IGTF+public trust combination is getting more important for S3/cloud like deployments

User and personal robot certs

- SAML process, and the eligibility checking by the subscribers (organisations), remains the same *urn:mace:terena.org:tcs:personal-user* in attribute *eduPersonEntitlement*
- real name of the person – by the subscriber agreement and CP/CPS this goes beyond R&S assurance
- manual side-process may remain just like today, based on data entry by the 'RAO/DRAO' in SCM as per https://wiki.geant.org/display/TCSNT/Documentation 'non-SAML issuance model process'
- the CP/CPS requirements though the Subscriber Agreement meet IGTF BIRCH

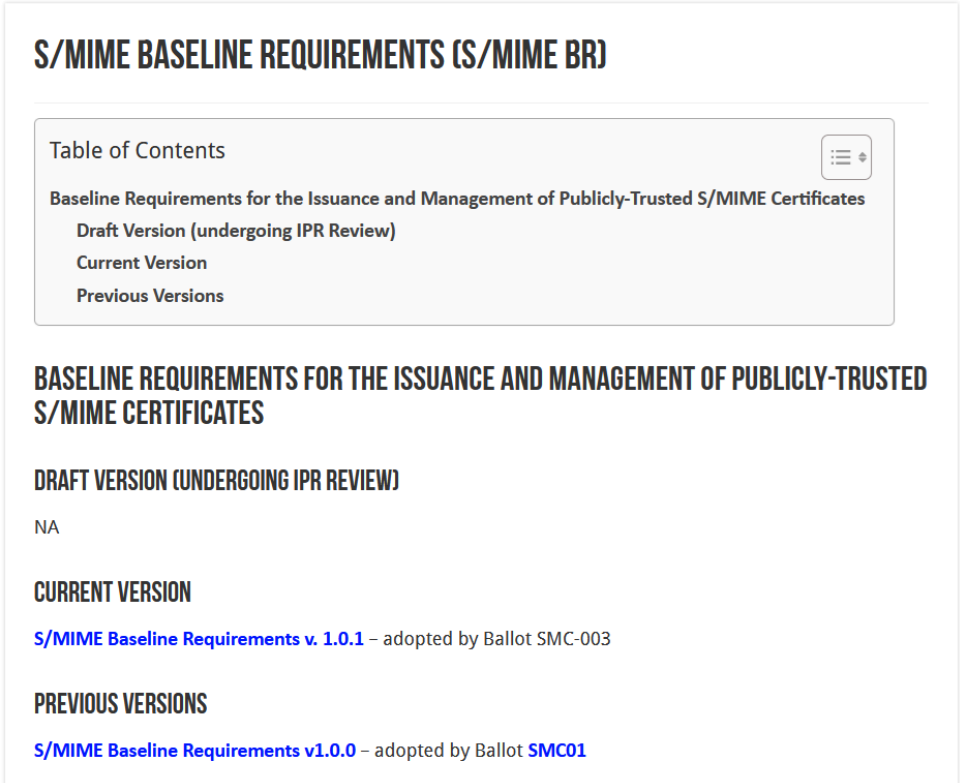
Audited already for CABF/WebTrust compliance (SSL certs) and similarly for the 'S/MIME' use cases

Certificate profiles before the transition in client certs

OV TLS Server (MD)	BR OV validated multi-domain with mixed SANs
EV TLS Server (MD)	BR EV validated multi-domain with mixed SANs
Personal webClientAuth and S/MIME	**End-user personal certificate recognised by the major MUAs suitable for identifying the users real name**
Personal webClientAuth IGTF and S/MIME	**End-user personal certificate adhering to IGTF profile (using IA5String representation of the name with unique prefix /DC=org/DC=terena/DC=tcs/...), suitable both for authentication, and also including validated name and email address**
Personal Robot webClientAuth IGTF and S/MIME	**End-user personal software agent certificate adhering to IGTF profile (like above) and Robot Profile, suitable both for authentication, and also including validated name and email address**
Robot Email webClientAuth IGTF and S/MIME	**E-mail validated software agent certificate adhering to IGTF profile (like above) and Robot Profile, suitable both for authentication, and also including validated email address**
IGTF OV TLS Server (MD)	BR OV validated multi-domain with mixed SANs including unique prefix "/DC=org/DC=terena/DC=tcs/..."
Document Signing	Adobe AATL compliant signing certificate
Code Signing	Conventional code signing certificate recognised by Oracle, MSFT, &c
EV Code Signing	BR EV Code Signing certificate recognised by MSFT &c

CA/BF now started considering S/MIME trust as well

- until now, the IGTF personal requirements were much stricter than ‘public’ email signing, in that we did insist on a reasonable name and a ‘sponsor’ (organization) that was validated
- CA/BF is putting requirements on S/MIME for the first time
- assurance-wise it is no problem, but the technicalities change ...



S/MIME BASELINE REQUIREMENTS (S/MIME BR)

Table of Contents

BASELINE REQUIREMENTS FOR THE ISSUANCE AND MANAGEMENT OF PUBLICLY-TRUSTED S/MIME CERTIFICATES

DRAFT VERSION (UNDERGOING IPR REVIEW)

NA

CURRENT VERSION

S/MIME Baseline Requirements v. 1.0.1 – adopted by Ballot SMC-003

PREVIOUS VERSIONS

S/MIME Baseline Requirements v1.0.0 – adopted by Ballot **SMC01**

Different ‘profiles’ and validations

- **Strict**
  - 825-days (2yr), limited RDN attributes allowed
  - intended only for S/MIME
- **Multi-purpose**
  - 825 days (2yr), slightly more eKUs allowed
  - crossover use cases between document signing and secure erossover use cases between document signing and secure emailmail
- **Legacy**
  - 1185 days (3yr)
  - transitional profile (likely to be phased out in the end)
  - bit more freedom in subject, still allows DC naming, but otherwise not much more than MP
- **mailbox-validated**
  - just the rfc822name (only!)
- **organization-validated**
  - includes only Organizational (Legal Entity) attributes in the Subject
- **sponsor-validated**
  - Combines Individual (Natural Person) attributes and organizationName (associated Legal Entity) attribute
- **individual-validated**
  - Includes only Individual (Natural Person) attributes in the Subject

Interesting validation modes: organisation and sponsor

Sponsor-validated:

'Refers to a Certificate Subject which combines Individual (Natural Person) attributes in conjunction with an subject:organizationName (an associated Legal Entity) attribute. Registration for Sponsor-validated Certificates MAY be performed by an Enterprise RA where the subject:organizationName is either that of the delegated enterprise, or an Affiliate of the delegated enterprise, or that the delegated enterprise is an agent of the named Subject Organization.'

Certificate Type	Description
Mailbox-validated	Subject is limited to (optional) `subject:emailAddress` and/or `subject:serialNumber` attributes.
Organization-validated	Includes only Organizational (Legal Entity) attributes in the Subject.
Sponsor-validated	Combines Individual (Natural Person) attributes in conjunction with an `subject:organizationName` (an associated Legal Entity) attribute. Registration for Sponsor-validated Certificates MAY be performed by an Enterprise RA.

commonName

7.1.4.2.2 Subject distinguished name fields

a. **Certificate Field:** `subject:commonName` (OID 2.5.4.3)
Contents: If present, this attribute SHALL contain one of the following values verified in accordance with Section 3.2.

Certificate Type	Contents
`Mailbox-validated`	Mailbox Address
`Organization-validated`	`subject:organizationName` or Mailbox Address
`Sponsor-validated`	Personal Name, `subject:pseudonym`, or Mailbox Address
`Individual-validated`	Personal Name, `subject:pseudonym`, or Mailbox Address

If present, the Personal Name SHALL contain a name of the Subject. The Personal Name SHOULD be presented as `subject:givenName` and/or `subject:surname`. The Personal Name MAY be in the Subject's preferred presentation format or a format preferred by the CA or Enterprise RA, but SHALL be a meaningful representation of the Subject's name as verified under Section 3.2.4.

Where does that leave us?

- The ‘Legacy’ profile (still) allowed ‘other’ attributes, so for the moment e.g. DC prefixing would be OK-ish

- However the commonName is regulated, and:
  - must be derived from (and include!) givenName and surname
  - **must not** contain other elements (like ePPN), impacting uniqueness (as used in TCS)
  - does *not* allow for ‘Robot’s in the commonName
    these would go to Pseudonym, which is an ill-supported attribute
  - this anyway inflicts a subjectDN change

- who knows when the legacy profile will be deprecated! Will not be long ☹

However …

… contrary to the host-cert issue, there is

no joint-trust needed for email signing and client authentication!

- separating these could (should?) always have been done, already in 2005/2008?

  using TCS Personal certs for authentication is bad (since they are not unique), and using TCS IGTF MICS client certs for S/MIME email is bad (since it's 7-bit ASCII only)

- this just formalizes that move beyond restricting keyUsage & eKU

What TCS did

- Have S/MIME personal certs, organization-verified, continue to be publicly trusted
  - sponsor-validated (multi-purpose) BR-compliant (for ‘humans’) or org-validated (‘robot email’)
  - we define all TCS members as Enterprise RAs (clarified in Ballot SMC-03
  - does require all orgs to be revalidated using a Government Information Source or LEI (3.2.3.2.1)
  - their subject name will be filled with the required fields (such as LEI, jurisdiction, address)
  - the /clientgeant SAML endpoint (the only way for personal certs!) auo-upgrades Validation to “High”

- Move the *client authentication* trust to a ‘private CA’ (non-public trust anchor), retaining *exactly the same subject DNs*, just a different ICA issuerDN and Root
  - Add some additional ICAs and non-public Roots to the IGTF distribution so for IGTF RPs the change is minimal and transparent
  - Inform relying parties, *also outside of the IGTF*, that client trust will become a specific decision. This is probably good, also for OpenVPN services, web access (.htpasswd), &c. The IGTF RPs are not impacted, others likely will be.

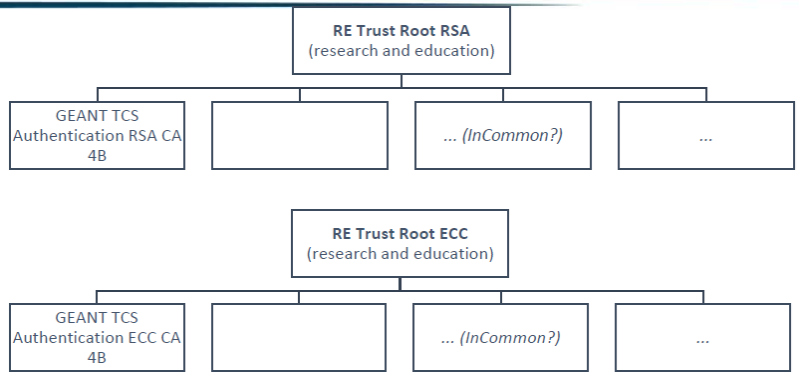
User awareness

- This is a change in communications and documentation as well, not only a set of technical changes
- In request systems, have to clearly distinguish for users *which product to order*. For example:
  - “Personal” stays the same, but is called now “Email signing and Encryption”
  - renaming “IGTF MICS Personal” to “Personal Authentication” and explain
  - renaming “IGTF MICS Robot Personal” to “Personal Automated Authentication”
  - forking “IGTF Classic Robot Email”
    - Authentication-only (IGTF) profile “Classic Robot Email”
    - Email signing profile “Organisation-validated S/MIME signing” (i.e. team-based or role-based)

The new TCS Private hierarchies

Two new “RE Trust Roots” (RSA+ECC)

- the cost is (apparently) there
- can be re-used in R&E



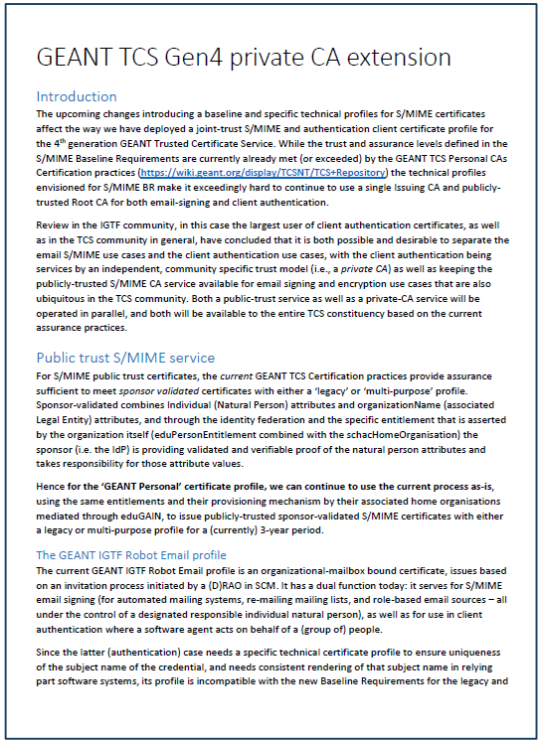
GEANT TCS Authentication RSA/ECC CA 4B issuing subordinate CA

- move all authentication use cases here
- clarify that this is wider than ‘just e-science’: web site auth, IdP login, any client auth, network login, …
- minimize disruption (at least in theory)

The actual proposed changes described

- The “Personal” profile currently used in TCS is UTF-8, and is excellent for email
- Since we want ‘email’ to be served well, this profile may evolve as per the SMIME BR requirements
  not doing so would void the public trust and render these unusable!
- The “IGTF” variants will need to change: new hierarchy, new issuer, same subject DN format, same extensions, ASCII-only, unique naming

See https://www.nikhef.nl/~davidg/tcsg4/TCS-Personal-CPS-2.2/



GEANT TCS Gen4 private CA extension

Introduction

The upcoming changes introducing a baseline and specific technical profiles for S/MIME certificates affect the way we have deployed a joint-trust S/MIME and authentication client certificate profile for the 4th generation GEANT Trusted Certificate Service. While the trust and assurance levels defined in the S/MIME Baseline Requirements are currently already met (or exceeded) by the GEANT TCS Personal CAs Certification practices (https://wiki.geant.org/display/TCSNT/TCS+Repository) the technical profiles envisioned for S/MIME BR make it exceedingly hard to continue to use a single Issuing CA and publicly-trusted Root CA for both email-signing and client authentication.

Review in the IGTF community, in this case the largest user of client authentication certificates, as well as in the TCS community in general, have concluded that it is both possible and desirable to separate the email S/MIME use cases and the client authentication use cases, with the client authentication being services by an independent, community specific trust model (i.e., a *private CA*) as well as keeping the publicly-trusted S/MIME CA service available for email signing and encryption use cases that are also ubiquitous in the TCS community. Both a public-trust service as well as a private-CA service will be operated in parallel, and both will be available to the entire TCS constituency based on the current assurance practices.

Public trust S/MIME service

For S/MIME public trust certificates, the *current* GEANT TCS Certification practices provide assurance sufficient to meet *sponsor validated* certificates with either a ‘legacy’ or ‘multi-purpose’ profile. Sponsor-validated combines Individual (Natural Person) attributes and organizationName (associated Legal Entity) attributes, and through the identity federation and the specific entitlement that is asserted by the organization itself (eduPersonEntitlement combined with the schacHomeOrganisation) the sponsor (i.e. the IdP) is providing validated and verifiable proof of the natural person attributes and takes responsibility for those attribute values.

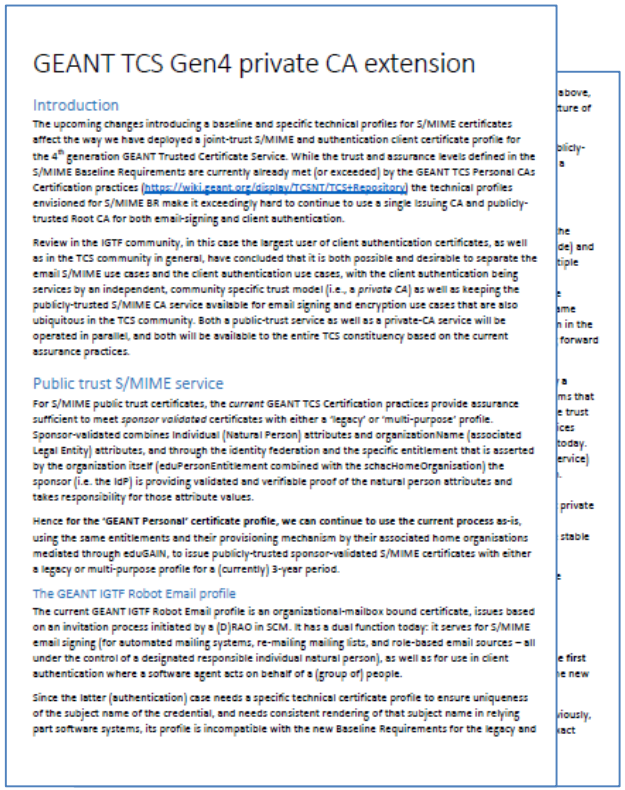
Hence for the ‘GEANT Personal’ certificate profile, we can continue to use the current process as-is, using the same entitlements and their provisioning mechanism by their associated home organisations mediated through eduGAIN, to issue publicly-trusted sponsor-validated S/MIME certificates with either a legacy or multi-purpose profile for a (currently) 3-year period.

The GEANT IGTF Robot Email profile

The current GEANT IGTF Robot Email profile is an organizational-mailbox bound certificate, issues based on an invitation process initiated by a (D)RAO in SCM. It has a dual function today: it serves for S/MIME email signing (for automated mailing systems, re-mailing mailing lists, and role-based email sources – all under the control of a designated responsible individual natural person), as well as for use in client authentication where a software agent acts on behalf of a (group of) people.

Since the latter (authentication) case needs a specific technical certificate profile to ensure uniqueness of the subject name of the credential, and needs consistent rendering of that subject name in relying part software systems, its profile is incompatible with the new Baseline Requirements for the legacy and

TCS guidance attempted to be complete



GEANT TCS Gen4 private CA extension

Introduction

The upcoming changes introducing a baseline and specific technical profiles for S/MIME certificates affect the way we have deployed a joint-trust S/MIME and authentication client certificate profile for the 4th generation GEANT Trusted Certificate Service. While the trust and assurance levels defined in the S/MIME Baseline Requirements are currently already met (or exceeded) by the GEANT TCS Personal CAs Certification practices (https://wiki.geant.org/display/TCSNT/TCS+Repository) the technical profiles envisioned for S/MIME BR make it exceedingly hard to continue to use a single issuing CA and publicly-trusted Root CA for both email-signing and client authentication.

Review in the IGTF community, in this case the largest user of client authentication certificates, as well as in the TCS community in general, have concluded that it is both possible and desirable to separate the email S/MIME use cases and the client authentication use cases, with the client authentication being services by an independent, community specific trust model (i.e., a *private CA*) as well as keeping the publicly-trusted S/MIME CA service available for email signing and encryption use cases that are also ubiquitous in the TCS community. Both a public-trust service as well as a private-CA service will be operated in parallel, and both will be available to the entire TCS constituency based on the current assurance practices.

Public trust S/MIME service

For S/MIME public trust certificates, the *current* GEANT TCS Certification practices provide assurance sufficient to meet *sponsor validated* certificates with either a 'legacy' or 'multi-purpose' profile. Sponsor-validated combines Individual (Natural Person) attributes and organizationName (associated Legal Entity) attributes, and through the identity federation and the specific entitlement that is asserted by the organization itself (eduPersonEntitlement combined with the schacHomeOrganisation) the sponsor (i.e. the IdP) is providing validated and verifiable proof of the natural person attributes and takes responsibility for those attribute values.

Hence for the 'GEANT Personal' certificate profile, we can continue to use the current process as-is, using the same entitlements and their provisioning mechanism by their associated home organisations mediated through eduGAIN, to issue publicly-trusted sponsor-validated S/MIME certificates with either a legacy or multi-purpose profile for a (currently) 3-year period.

The GEANT IGTF Robot Email profile

The current GEANT IGTF Robot Email profile is an organizational-mailbox bound certificate, issues based on an invitation process initiated by a (D)RAO in SCM. It has a dual function today: it serves for S/MIME email signing (for automated mailing systems, re-mailing mailing lists, and role-based email sources – all under the control of a designated responsible individual natural person), as well as for use in client authentication where a software agent acts on behalf of a (group of) people.

Since the latter (authentication) case needs a specific technical certificate profile to ensure uniqueness of the subject name of the credential, and needs consistent rendering of that subject name in relying part software systems, its profile is incompatible with the new Baseline Requirements for the legacy and

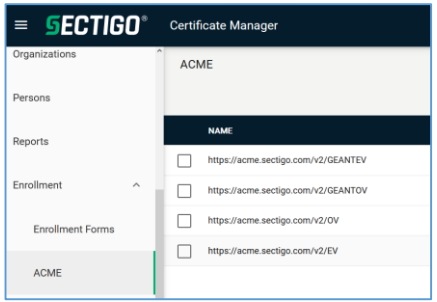
For the end-entity certificates issued by the GEANT TCS Authentication RSA/ECC CA 4B:

- The subject distinguished name shall be exactly the same as the one generated today based on the (ascii-fied) organsiation name (secondary validation) and ascii-fied state or locality name
- The subject name shall hence be prefixed (in the ASN.1 DER SEQUENCE) with “DC=org”, “DC=terena”,”DC=tcs”, followed by country ISO code and organization name, and then followed by the commonName that must include (like today) the common or displayname of the applicant and the applicant uniqueness-identifier (eduPersonPrincipalName) (“/DC=org/DC=terena/DC=tcs/C=NL/O=Nikhef/CN=David Groep davidg@nikhef.nl”)
- Personal and Email Robots will follow the current naming scheme as well
- Validation of organization name shall be done in the same way as for all OV validation public trust (CABF BR OV) validations, including the DCV validation of domain association with the organization (for matching the ‘academic code’, i.e. the *schacHomeOrganization* attribute)
- It shall be possible to specify printable 7-bit stings for the Organization field of the subject name during organization enrolment, and have this validated according to usual standards (CABF OV BR), taking into account that organization names have a printable 7-bit representation that is in line with acceptable national practice and aligned with CABF OV BR guidance.
- The certificate extensions shall be almost the same as today, with the one exception being the policy OIDs for the TCS Personal CA Practice Statement which will be changes to reflect the

Now on to some practice

- (not complete yet)
- (see demo)

Other CABF things to keep in mind



- Server SSL BR has already been updated
  - the provision for using DC prefixing has been retained
- But expect shorter validity periods in the future
  - start preparing for 90-day max in your service deployment automation systems
  - increased use of automation (ACME OV using client ID+secret)

```
[root@hekel ~]# certbot certonly \
  --standalone --non-interactive --agree-tos --email davidg@nikhef.nl \
  --server https://acme.sectigo.com/v2/GEANTOV \
  --eab-kid DUniqueID_forthisclient --eab-hmac-key mv_v3ryl0n9s3cr3tK3y \
  --domain hekel.nikhef.nl --cert-name OVGEANTcert
```

Thank you

Questions welcome … tcs-pma@lists.geant.org

davidg@nikhef.nl

GÉANT

Networks · Services · People

www.geant.org