Production Grid Infrastructure WG
PGI Security Considerations

Thoughts about common security profiles

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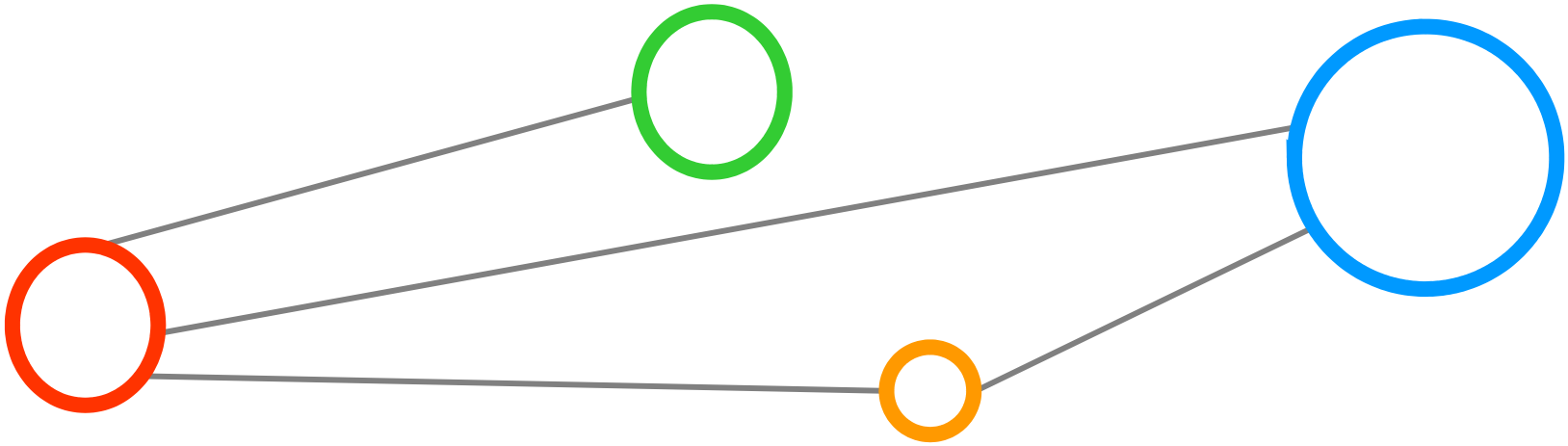
Outline



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Outline

- OGF PGI 101
- 3 ‚Plumbings‘ for Authentication
- 2 ‚Plumbings for Attribute-based Authorization
- Common attributes
- Common constraints/restrictions
- Out of Scope
- Discussions
- Conclusions

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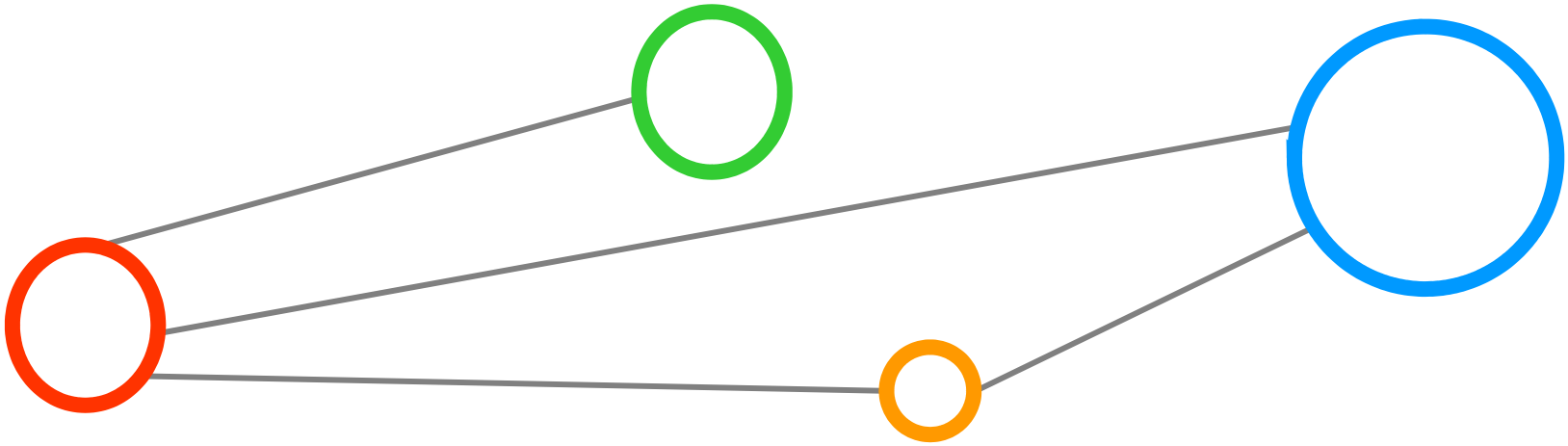
OGF PGI 101



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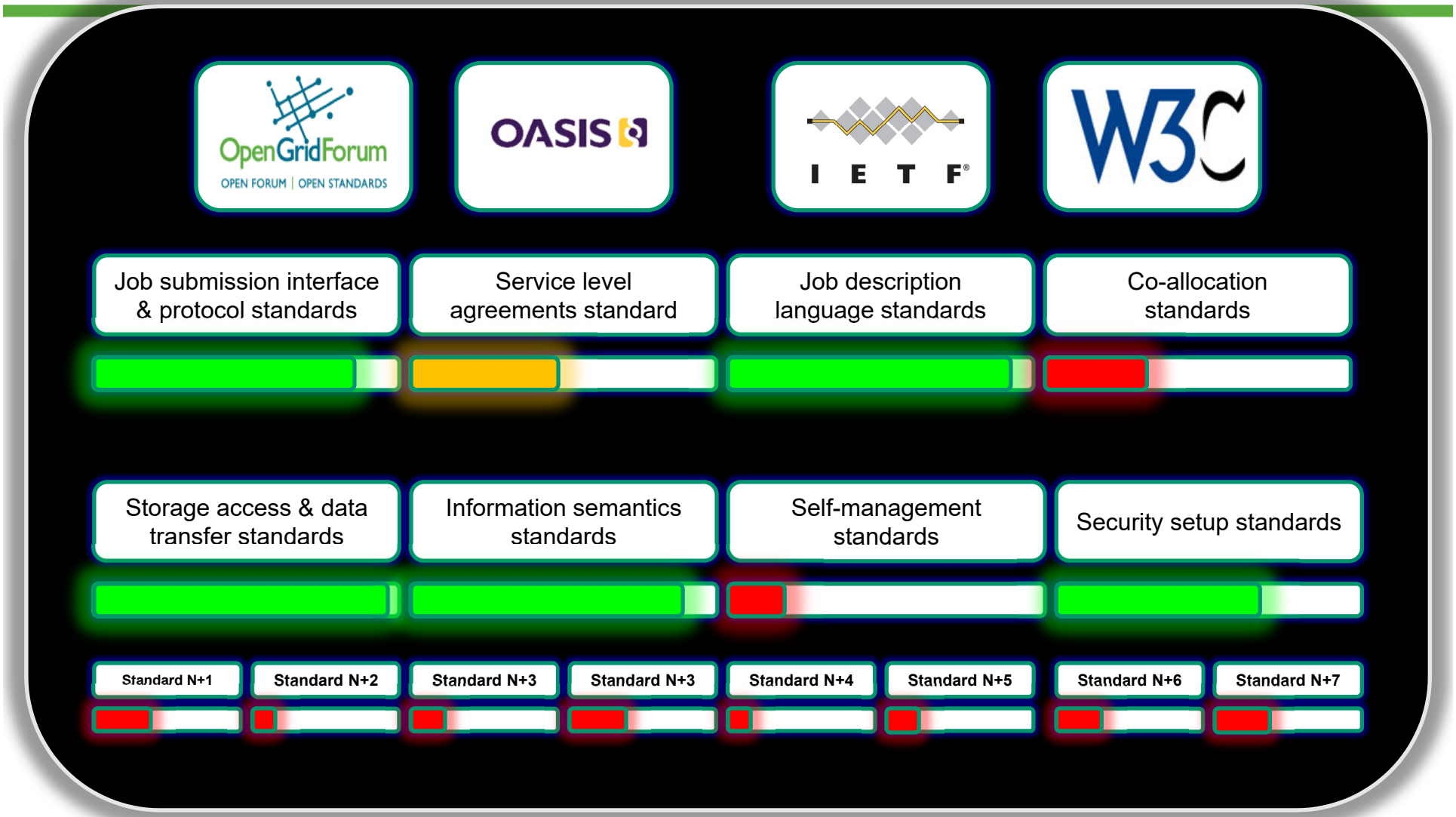
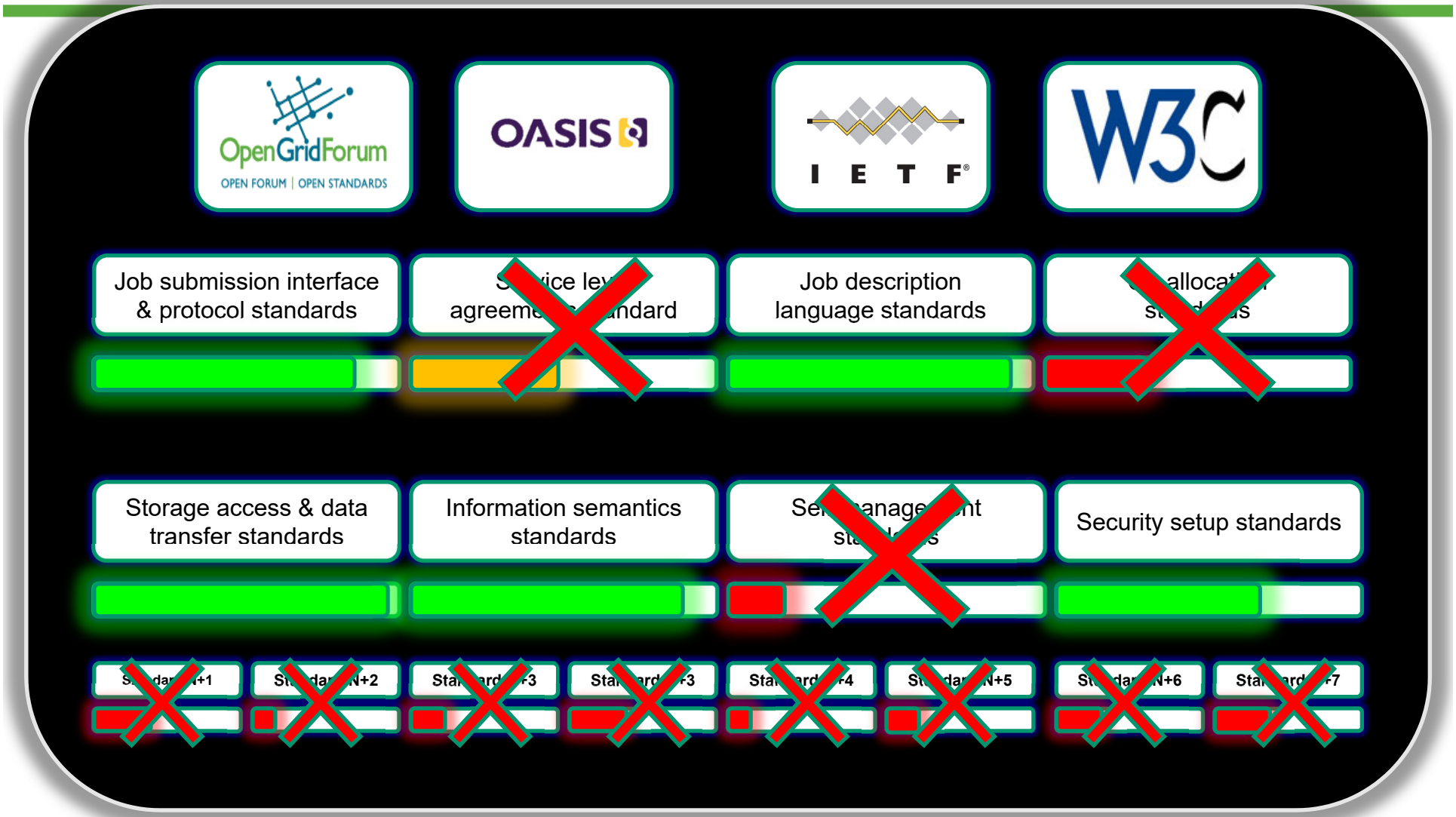
OGSA Standards



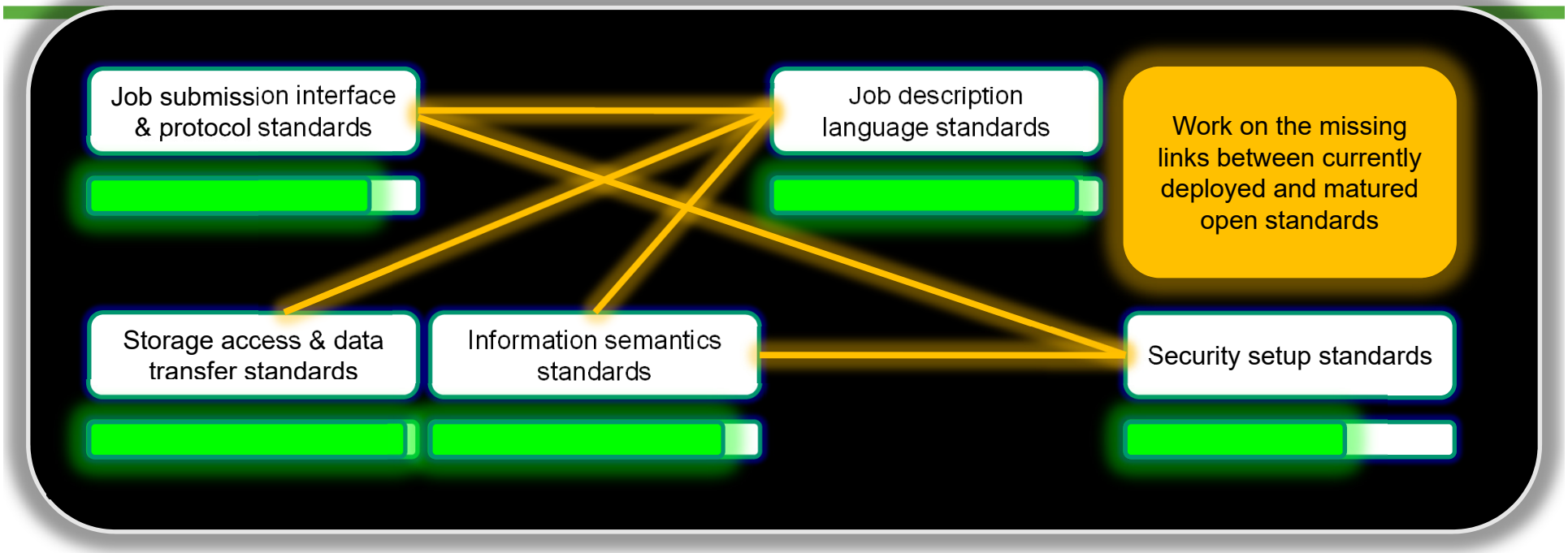
[7] Foster et al., *'The Open Grid Services Architecture'*

GIN Production Experience



[8] Riedel et al., *'Interoperation of World-Wide Production e-Science Infrastructures '*

PGI Approach (1)



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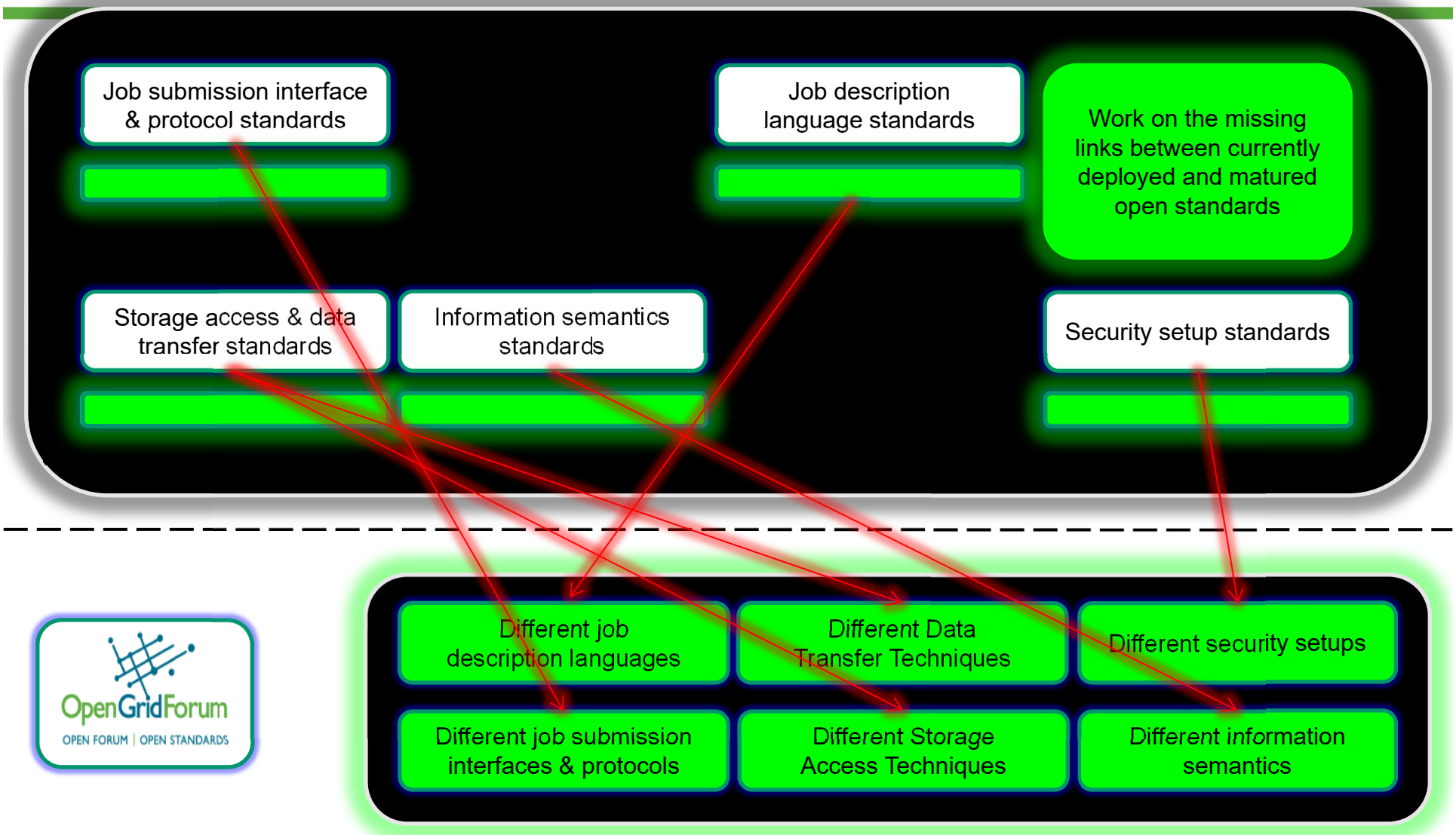
PGI Approach (2)



[5] Riedel et al., *'Experiences and Requirements for Interoperability between HTC- and HPC-driven e-Science Infrastructures'*

Scope

- Identified Basic Use Case
- Only matured specifications
- Specification adoption exist in production middleware systems
- Experience exists in production infrastructures
- Interoperability tests have been performed
- Real scientific use cases require these standards
- Refinements necessary and not complete spec. re-definitions

→ 'Low hanging fruits'

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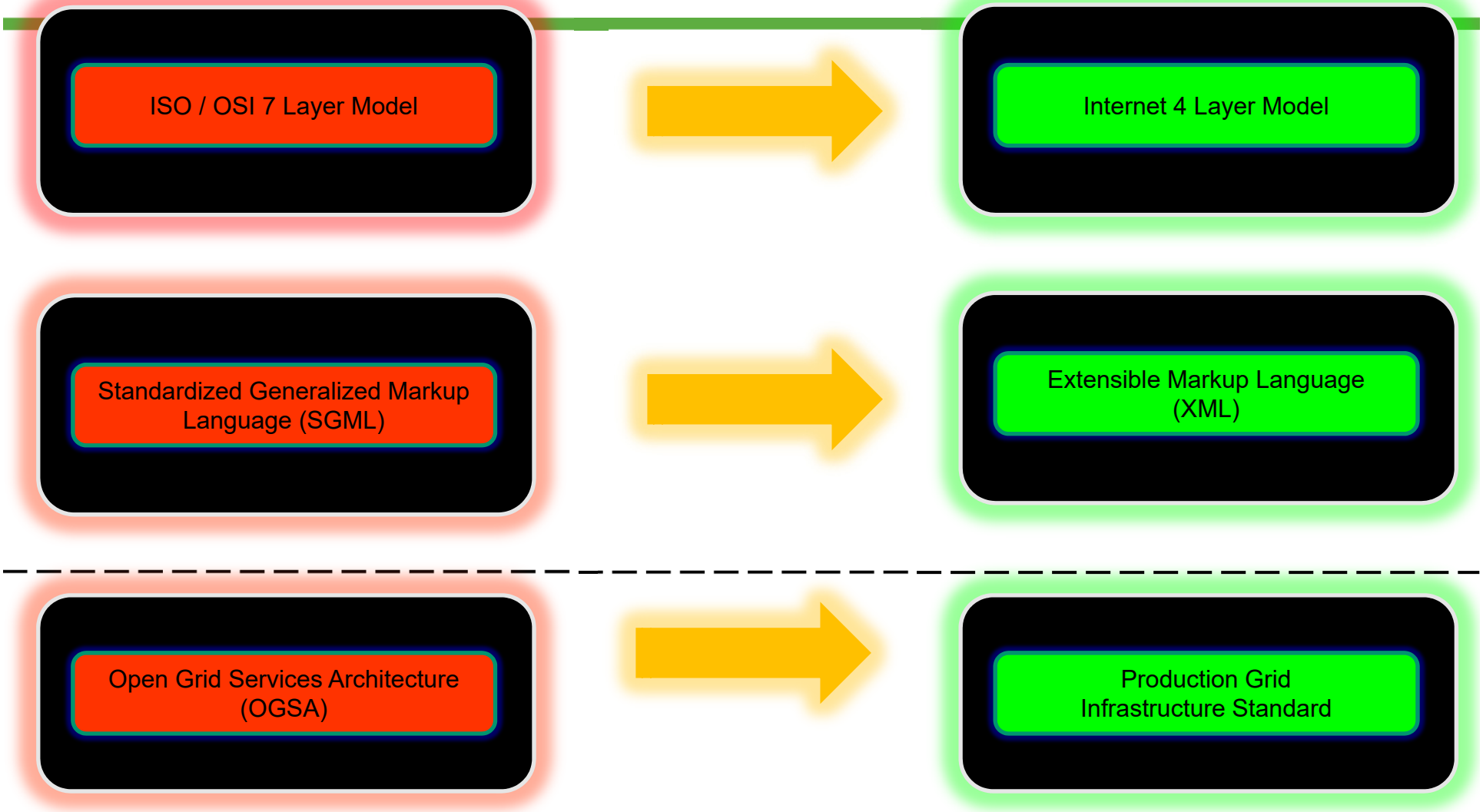
Compare History of Computer Science



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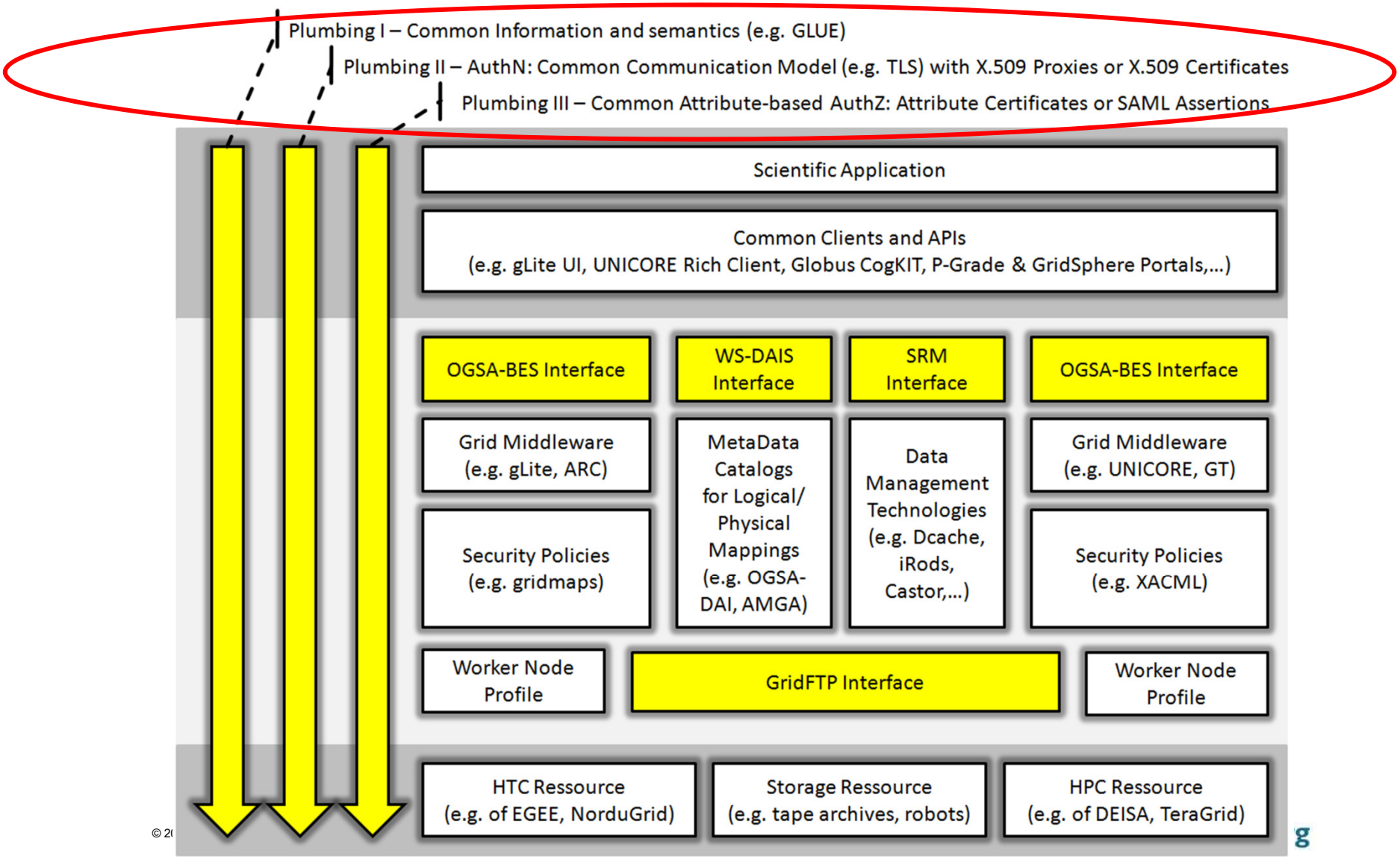
PGI Ecosystem Overview



Plumbings Idea

- Plumbings can be used to put different ‚elements' through
  - E.g. warm water (realizing normal OpenSSL-TLS connections) vs. Cold water (realizing GSI connections)
- Many plumbings can be installed in parallel – while not crossing the other plumbings
  - E.g. modern container concepts allow easily addition of n handler that can take care of the elements by n plumbings
- Different plumbings can use the same source and can be sink into the same achievement/functionality
  - E.g. Attribute-based VOMS system vs. SAML-based VOMS system
  - Both based on same VO DBs but convey attributes differently
  - However, authZ decision based on these attributes can be again usable for both approaches (e.g. one XACML policy file)
- Plumbings may be removed over time while new plumbings are already deployed in infrastructures

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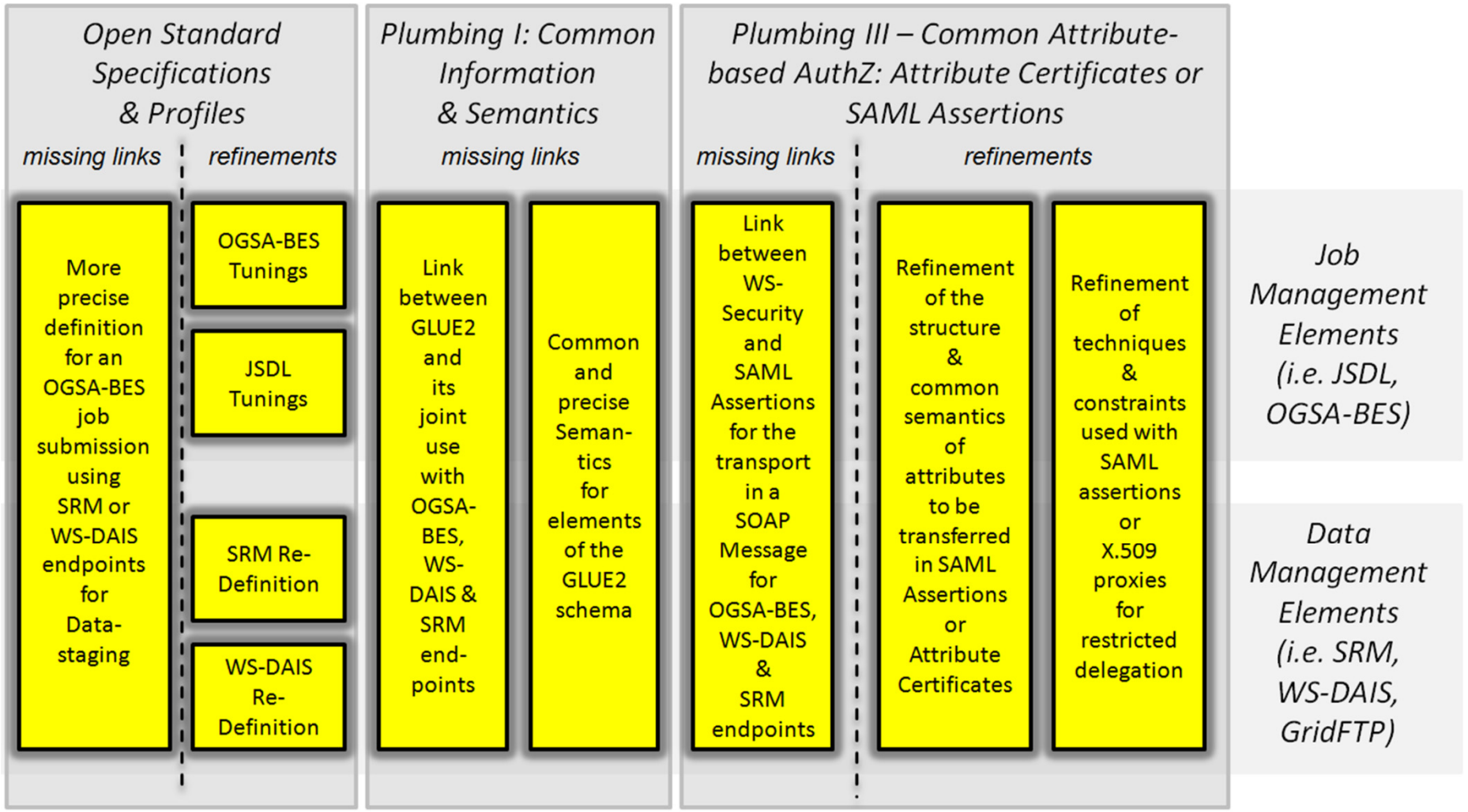
Missing Links & Refinements



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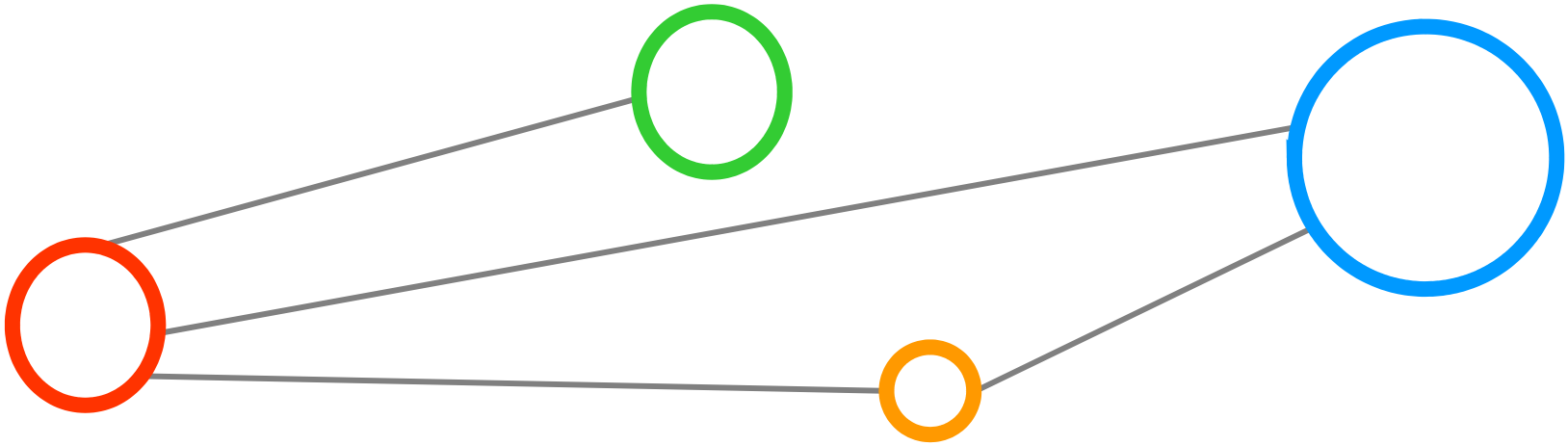
3 Plumbings for Authentication



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TLS with GSI Proxies

- GSI-based TLS is not compatible with OpenSSL TLS
  - Fixed with Globus Version 4 (*probably should be mentioned like this: It is possible to make GSI-based TLS be compatible with OpenSSL TLS, since even in GT4 (or later version), you still need to setup an environment variable to switch on compatible TLS*)
  - (a full end-entity X.509 certificate can‘t be used with this and fails) (*a full end-entity X.509 certificate actually can be used for GSI-based TLS, at least if the private key is not protected by passphrase, according to practice*) - but GSI libraries are required?!
- However, many production systems require still the GSI-based TLS
  - Proxies needed since the data staging might be delegated
  - For instance, current implementations of the SRM interface (same Web Service Level as Basic Execution Services)
  - Numerous GridFTP implementations

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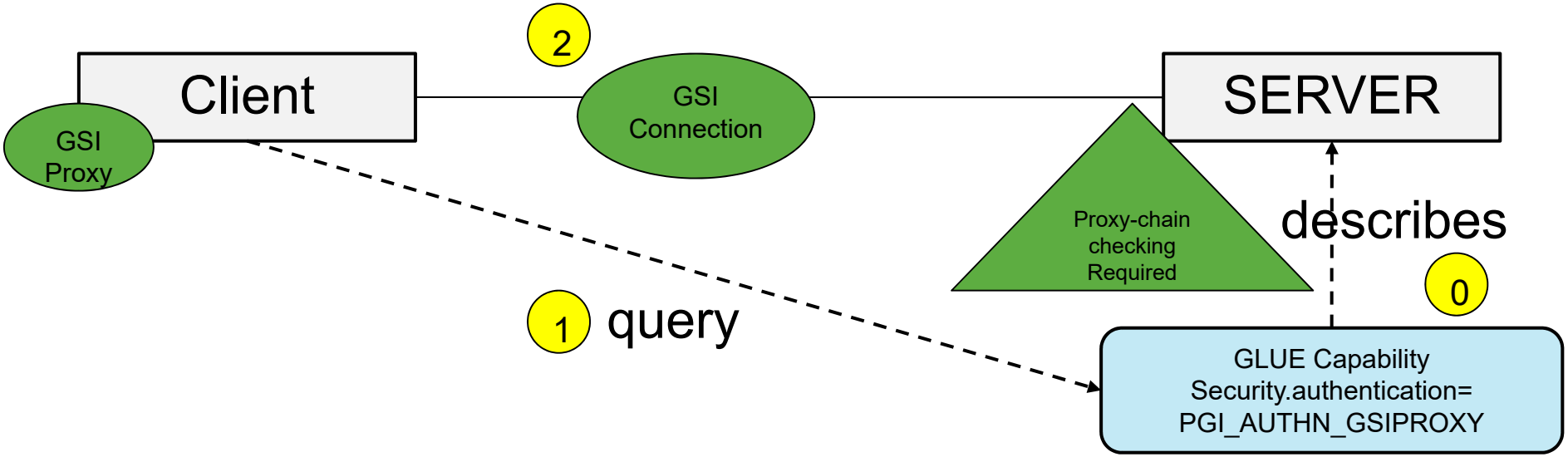
TLS with GSI Proxies



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TLS with OpenSSL Proxies

- Service Container of NAREGI, ARC & gLite (CREAM-BES) require OpenSSL-based Proxies TLS Connections
  - Proxies because a job submit might be delegated
  - Service container could work with non TLS proxies
  - Implies proxy chain checking
- UNICORE can work with OpenSSL-based Proxies
  - Implements optionally the proxy chain checking for these security setups
  - Proxies not needed for delegation – but used for interoperability

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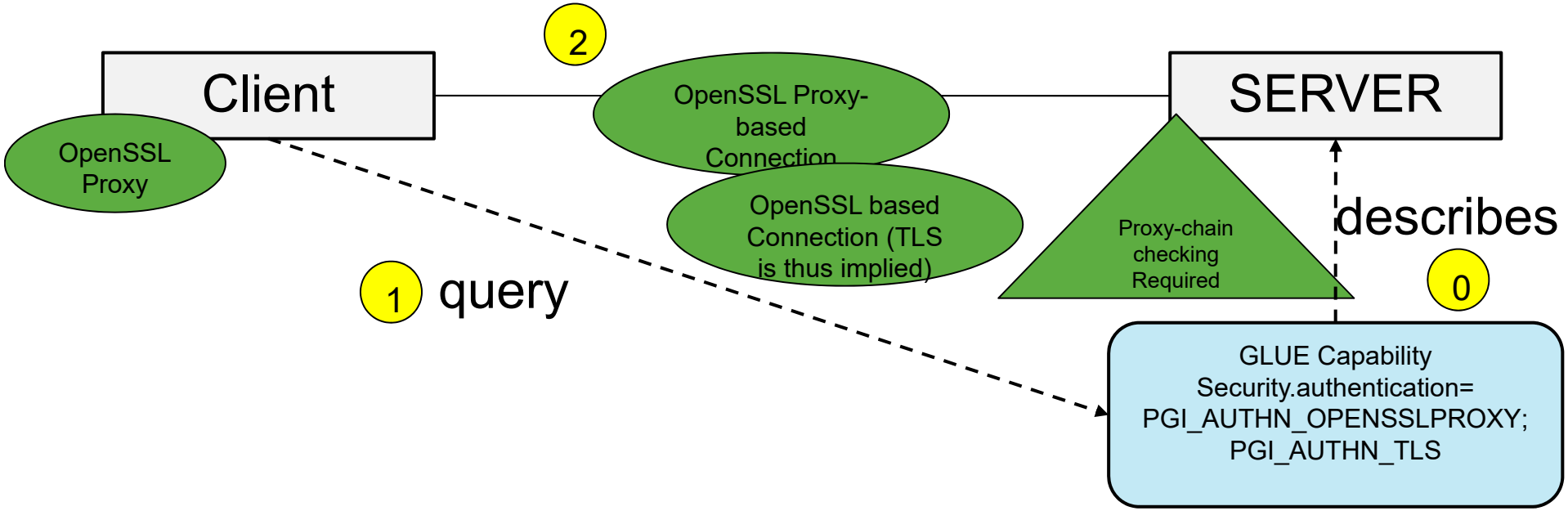
TLS with OpenSSL Proxies



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TLS with Full Certificates

- Service Container of UNICORE require TLS connections using full end-entity certificates
  - Service container could not work with proxies in this setup
  - proxy chain checking is not required!

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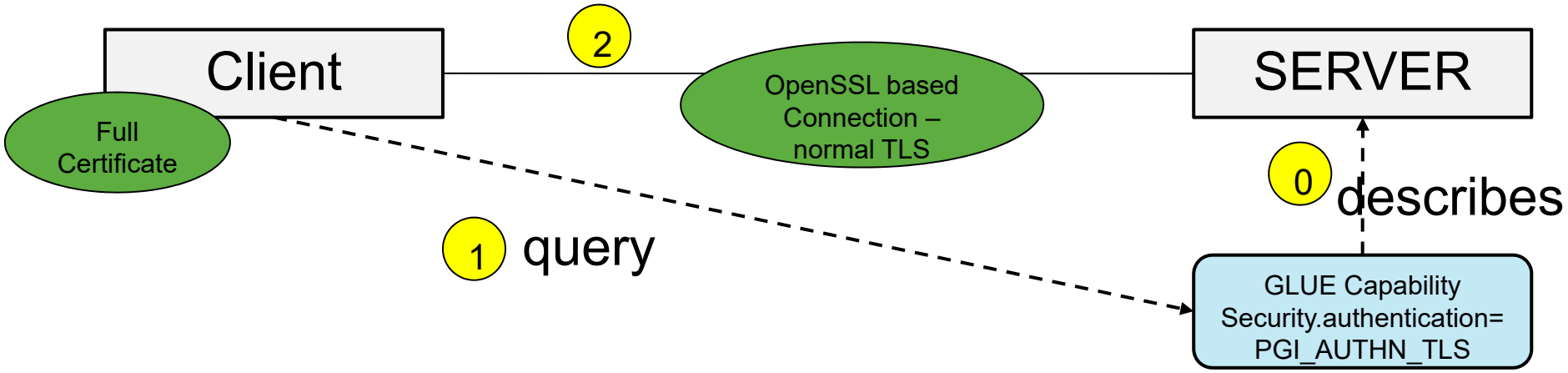
TLS with Full Certificates



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Message layer Authentication

- WS-Security Specifications
  - UsernameToken profile
  - X.509 Token profile (Can be directly generated if a X.509 credential is possessed)
  - SAML Token profile
    - A third-party authority is required to issue SAML Token
    - Should be considered together with the SAML attribute assertion used for AuthZ. SAML Token includes <saml:Subject> and <saml:Attribute> (see Web Services Security:SAML Token Profile V1.0)
    - The VOMS SAML Service can be enhanced to support this profile

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```
<saml:Assertion
  <saml:AttributeStatement>
    <saml:Subject>
      <saml:NameIdentifier NameQualifier="www.example.com" Format="...">
    uid=joe,ou=people,ou=saml-demo,o=grid.org
      </saml:NameIdentifier>
      <saml:SubjectConfirmation>
        <saml:ConfirmationMethod>urn:oasis:names:tc:SAML:1.0:cm:holder-of-key
        </saml:ConfirmationMethod>
        <ds:KeyInfo>
          <ds:KeyValue>...</ds:KeyValue>
        </ds:KeyInfo>
      </saml:SubjectConfirmation>
    </saml:Subject>
  <saml:Attribute AttributeName="MemberLevel"
AttributeNamespace="http://www.oasis.open.org/Catalyst2002/attributes">
    <saml:AttributeValue>gold</saml:AttributeValue>
  </saml:Attribute>
  </saml:AttributeStatement>
  <ds:Signature>...</ds:Signature>
</saml:Assertion>
```

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Message layer Authentication

- WS-Trust
  - Define primitives and extensions for security token exchange
  - Enable the issuance and dissemination of credentials within different trust domains
  - Can be used for defining the token exchange: e.g. getting SAML Token by providing X.509 Token, etc.

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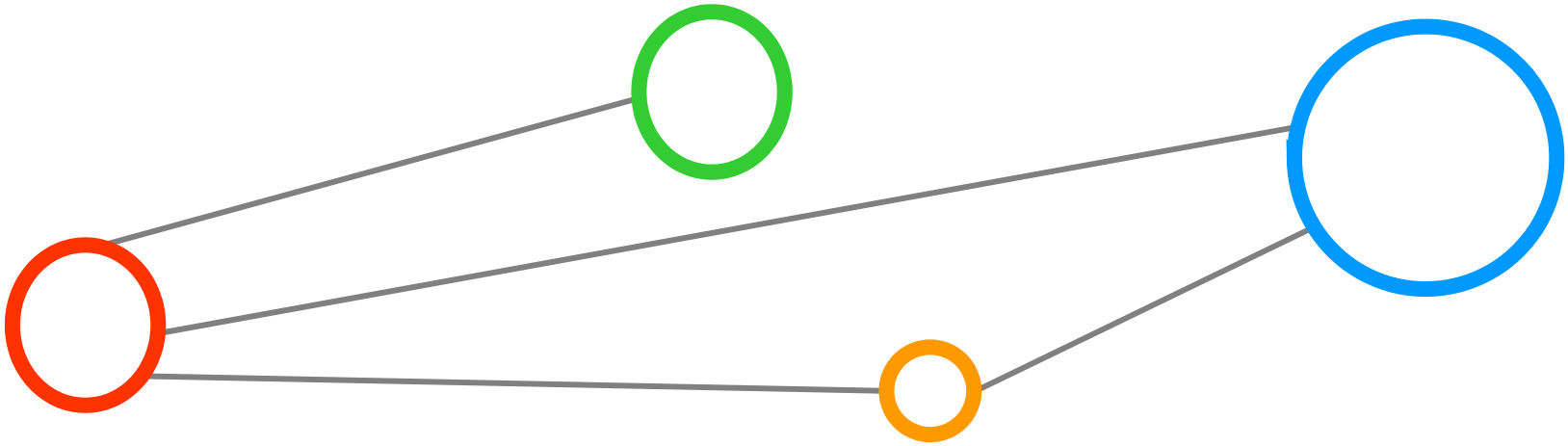
2 Plumings for AuthZ



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AC Certificates in Extensions

- Supporting legacy VOMS exposing ACs

- AC can be combined transported with any option used for AUTHENTICATION (*? should not the AC be transported through Proxy certificate's extension, and proxy is the only option for authentication in this case?*)

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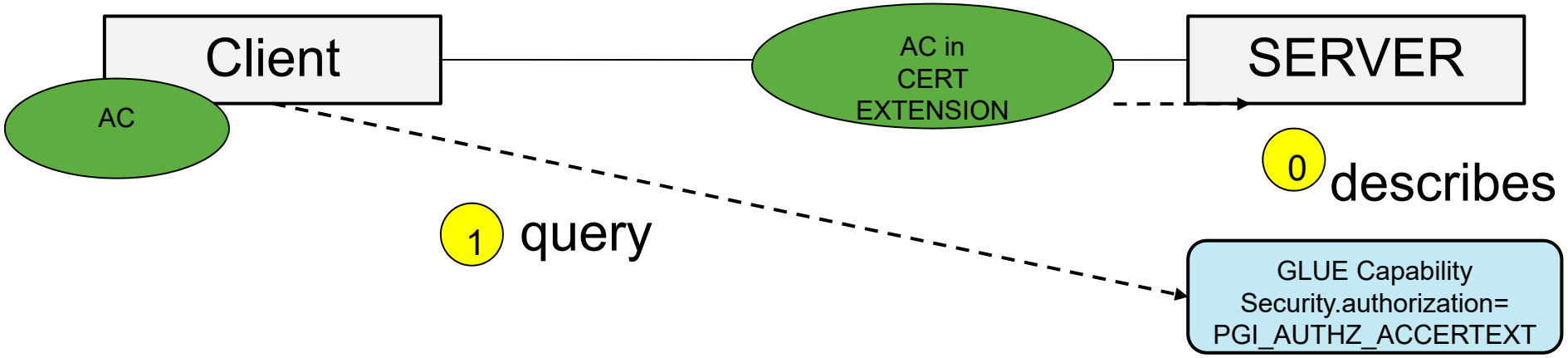
AC Certificates in Extension



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SAML Assertions in SOAP Header

- Supporting SAML-based VOMS exposing SAML assertions

- SAML assertions can be combined transported with any option used for AUTHENTICATION (*?What are the options? SAML token (SAML attributes are inside SAML token) for SOAP message layer authentication; and Proxy certificate (SAML attributes are as proxy extension) for transport layer authentication?*)

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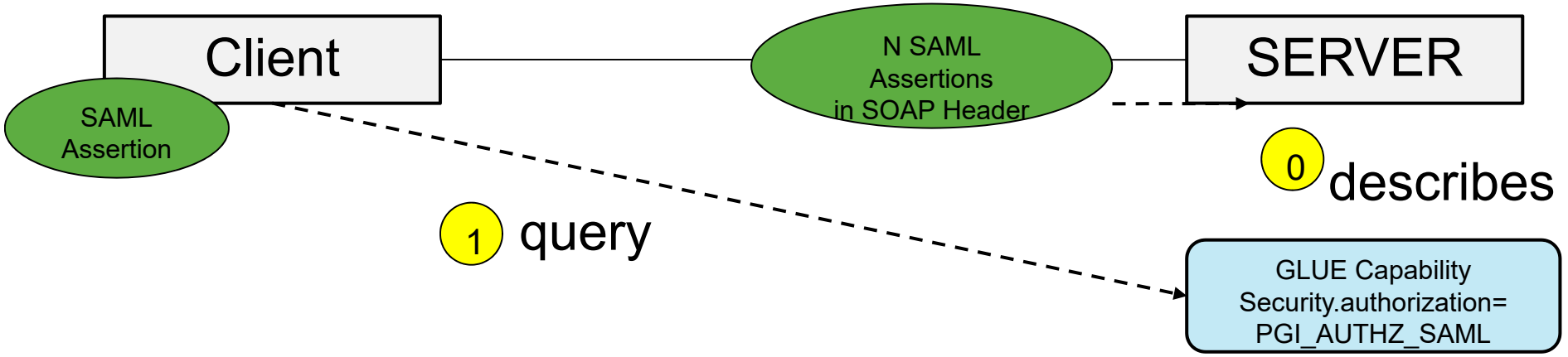
SAML Assertion in SOAP Header



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Two profiles for attribute based AuthZ

- a. Attribute Certificate (AC) --- VOMS mechanism
  - Proxy certificate for transport layer authentication
  - AC carried by proxy certificate
  - Third-party authority needed for AC issuing
- b. SAML assertion
  - SAML Token for message (SOAP) layer authentication
  - SAML attribute assertion carried by SAML Token
  - Third-party authority needed for SAML assertion issuing
  - Different from 'a', if message layer authentication needs to be achieved, the SAML assertion should include <saml:Subject/> for subject confirmation
  - VOMS SAML service can be extended to support this profile by providing 'SAML Token profile' compliant SAML Token

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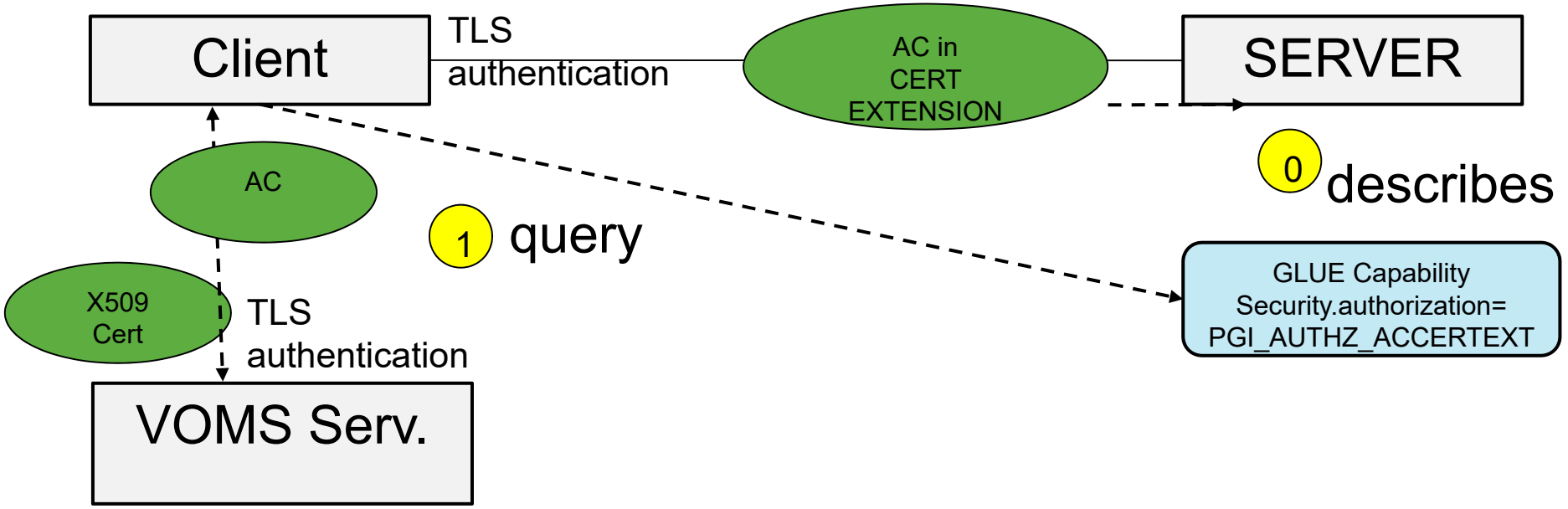
AC Certificates in Extension



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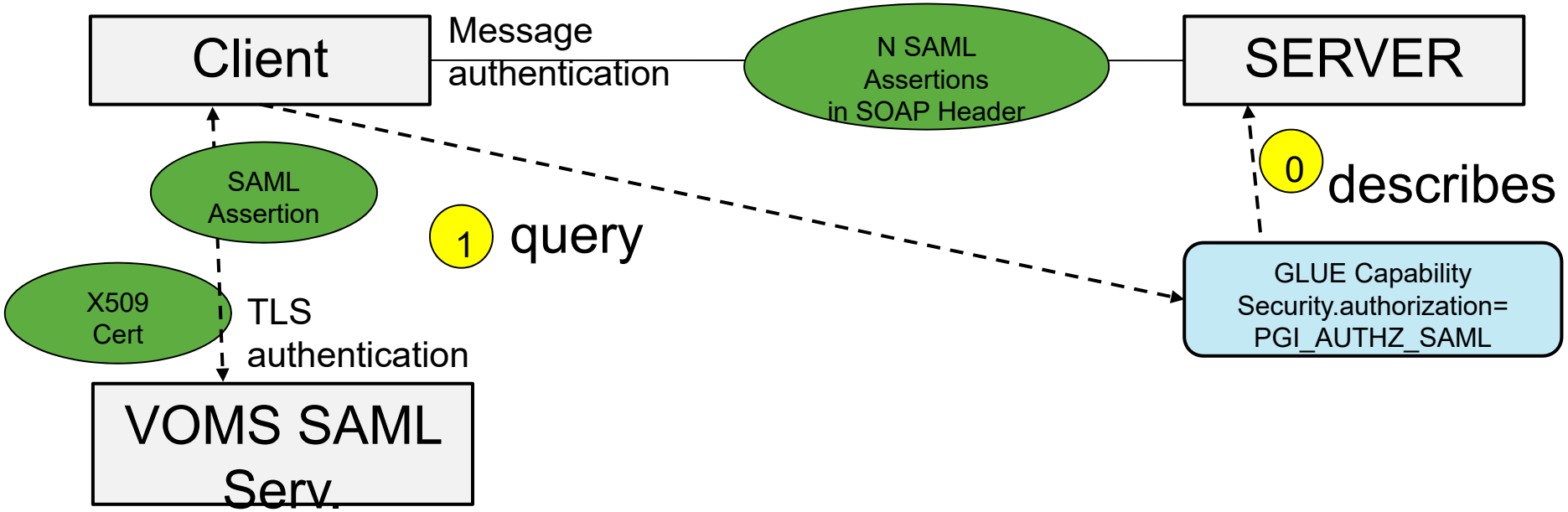
SAML Assertion in SOAP Header



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Combination of Both

- PGI mandates to use at least one of the AUTHZ plumbings should be used
- But in principle we can apply both together

- So using jointly the plumbing PGI_AUTHZ_ACCERTEXT together with PGI_AUTHZ_SAML

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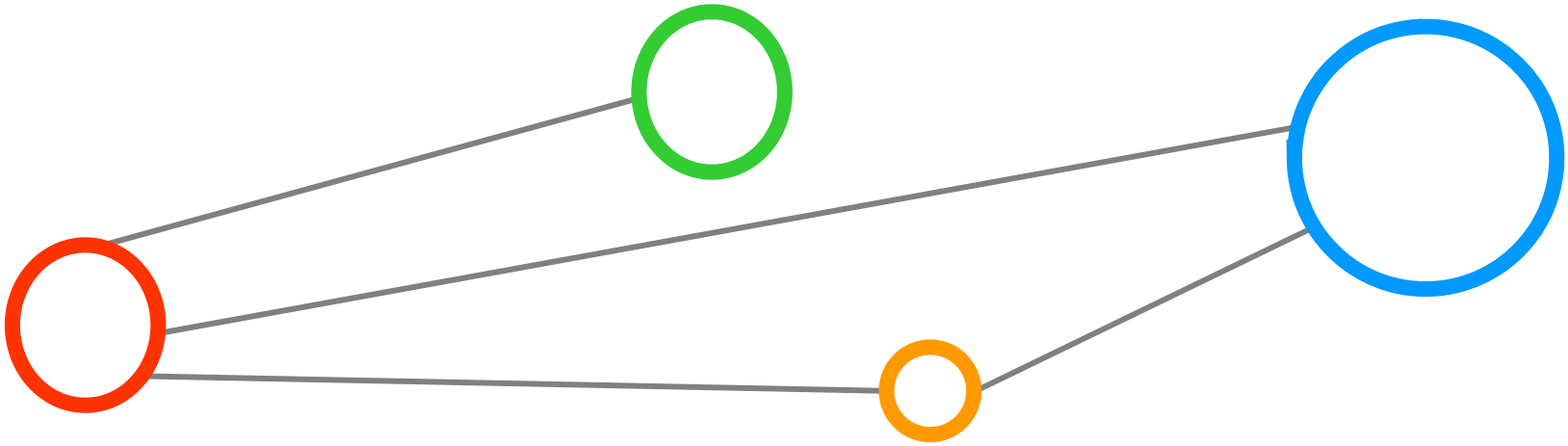
Common Attributes



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Common Attributes

- TBD

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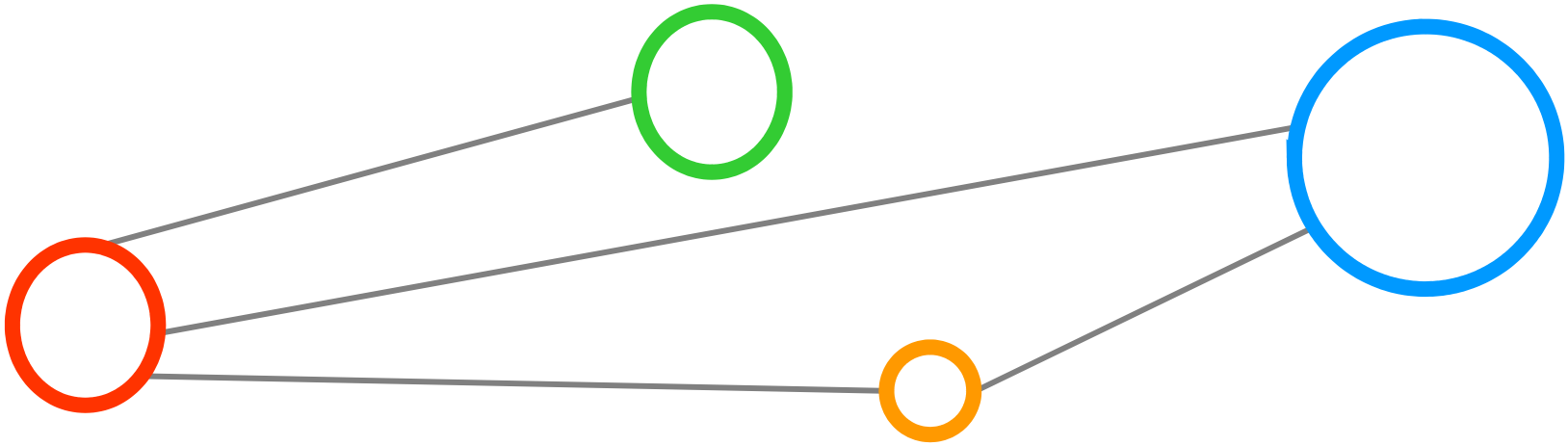
Common Constraints/Restrictions



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Common Constraints/Restrictions

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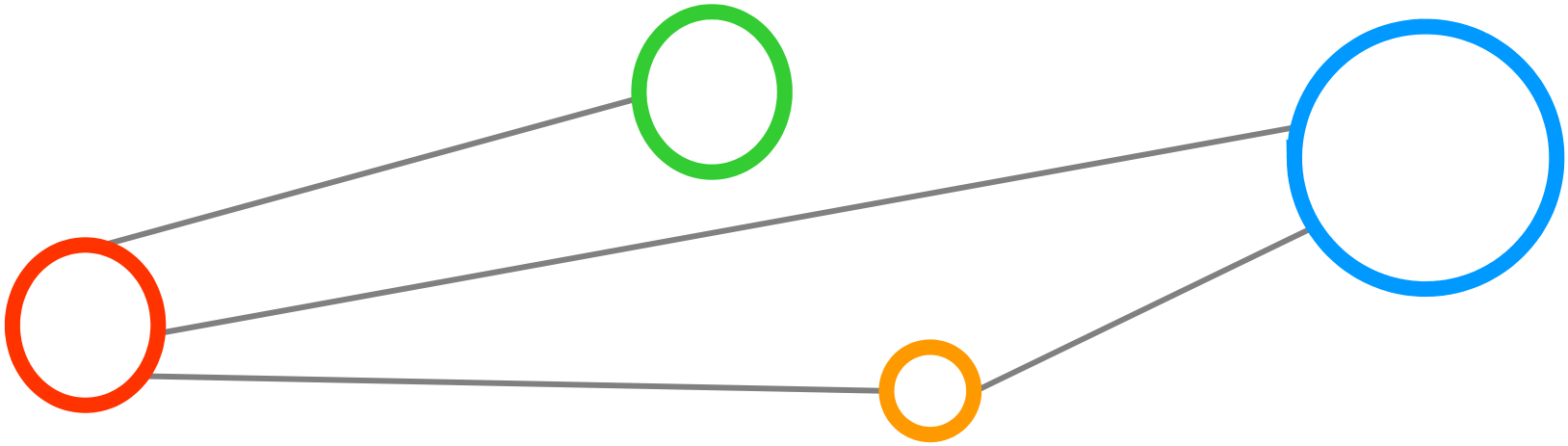

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Out of Scope

- Standardization on profiles that retrieve attributes from Attribute Authorities (Aas)
  - How end-users obtain there attributes is out of scope of PGI
- Specific policy technologies and definitions
  - How specific policies, (e.g. XACML policies) are defined is out of scope of PGI

- Usage policy of production infrastructures
  - The policy of how and if end-users can use cross-Grid resources is out of scope of PGI

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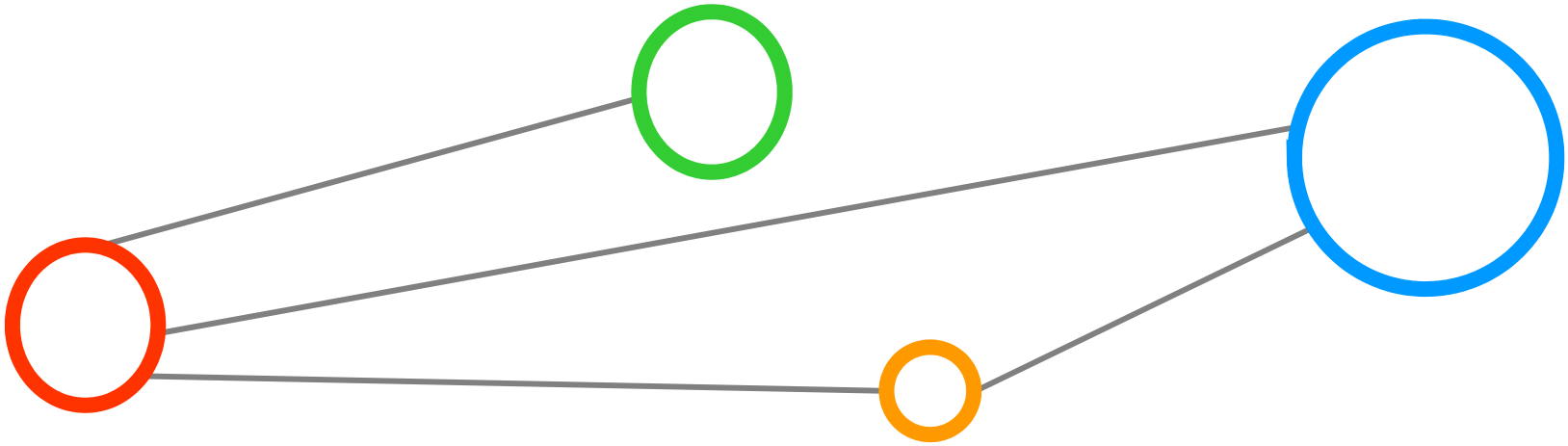
Conclusions



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Conclusions

- We basically more or less survey what security setups is used in production Grids currently
  - We thus not define a large security framework
  - We focus on elements used in production already or (very soon in production)
- The main achievements in our group is agreement about certain important elements / standards
  - E.g. BES, SRM, GridFTP, GLUE, …
  - Work on missing links between them
  - Work on tunings / refinements /re-allignments of them

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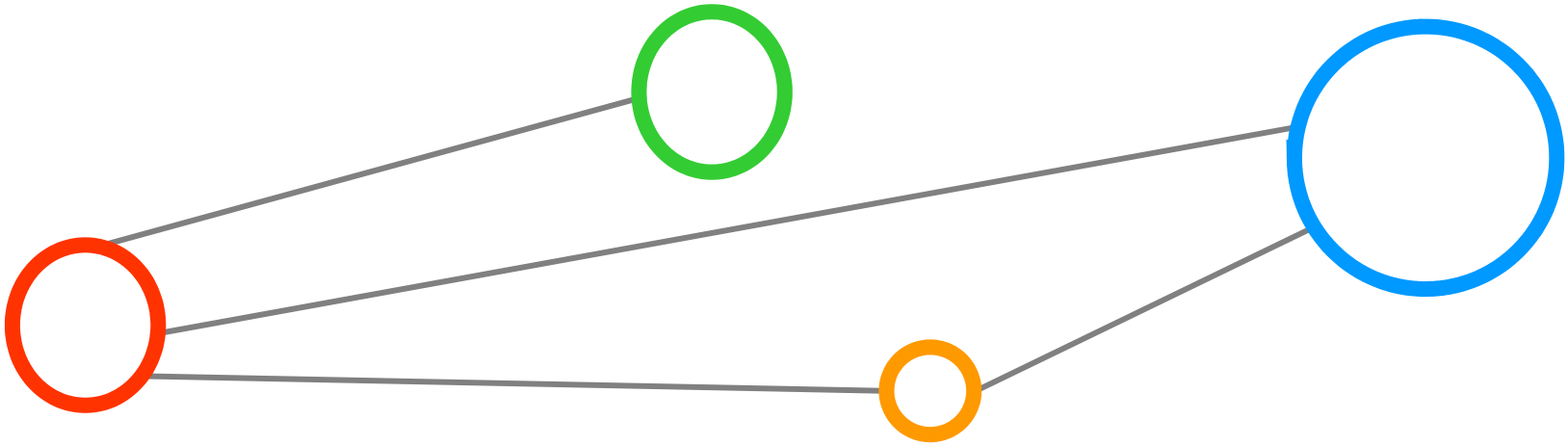
Discussions



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Discussions

- TBD

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