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Production Grid Infrastructure WG

Work towards common security profiles

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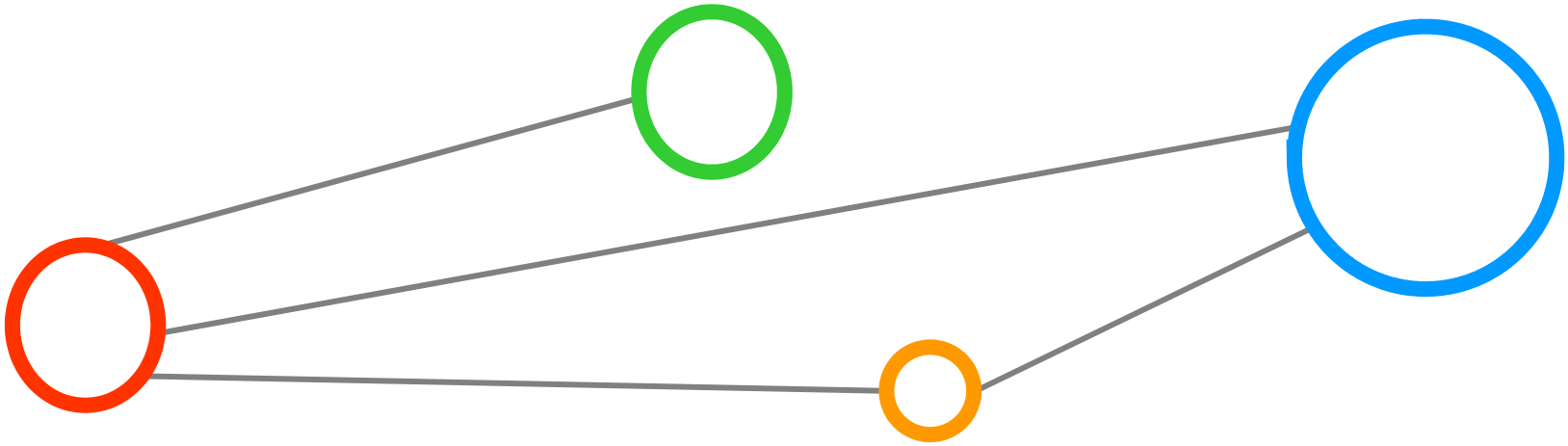
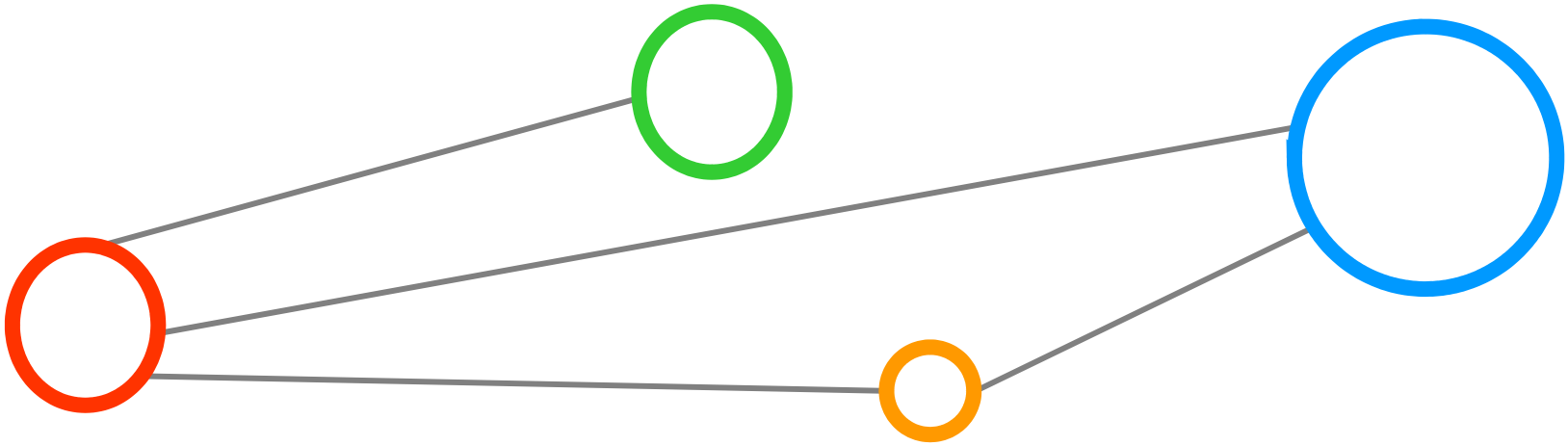
Outline



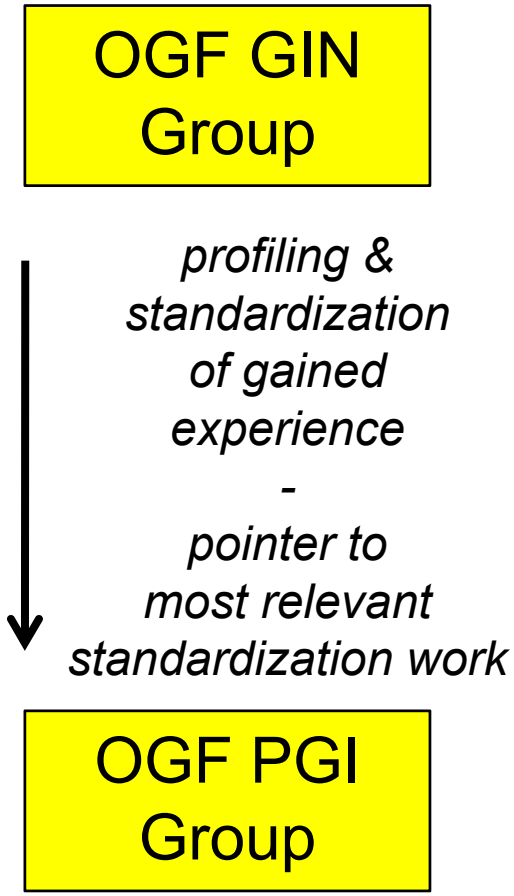
Outline

- OGF PGI 101
- 3 ‚Plumbings' for Authentication & Message Layer
- 2 ‚Plumbings for Attribute-based Authorization
- Common attributes
- Constraints/restrictions
- Out of Scope
- EMI in Context
- Conclusions

OGF PGI 101



GIN & PGI Groups



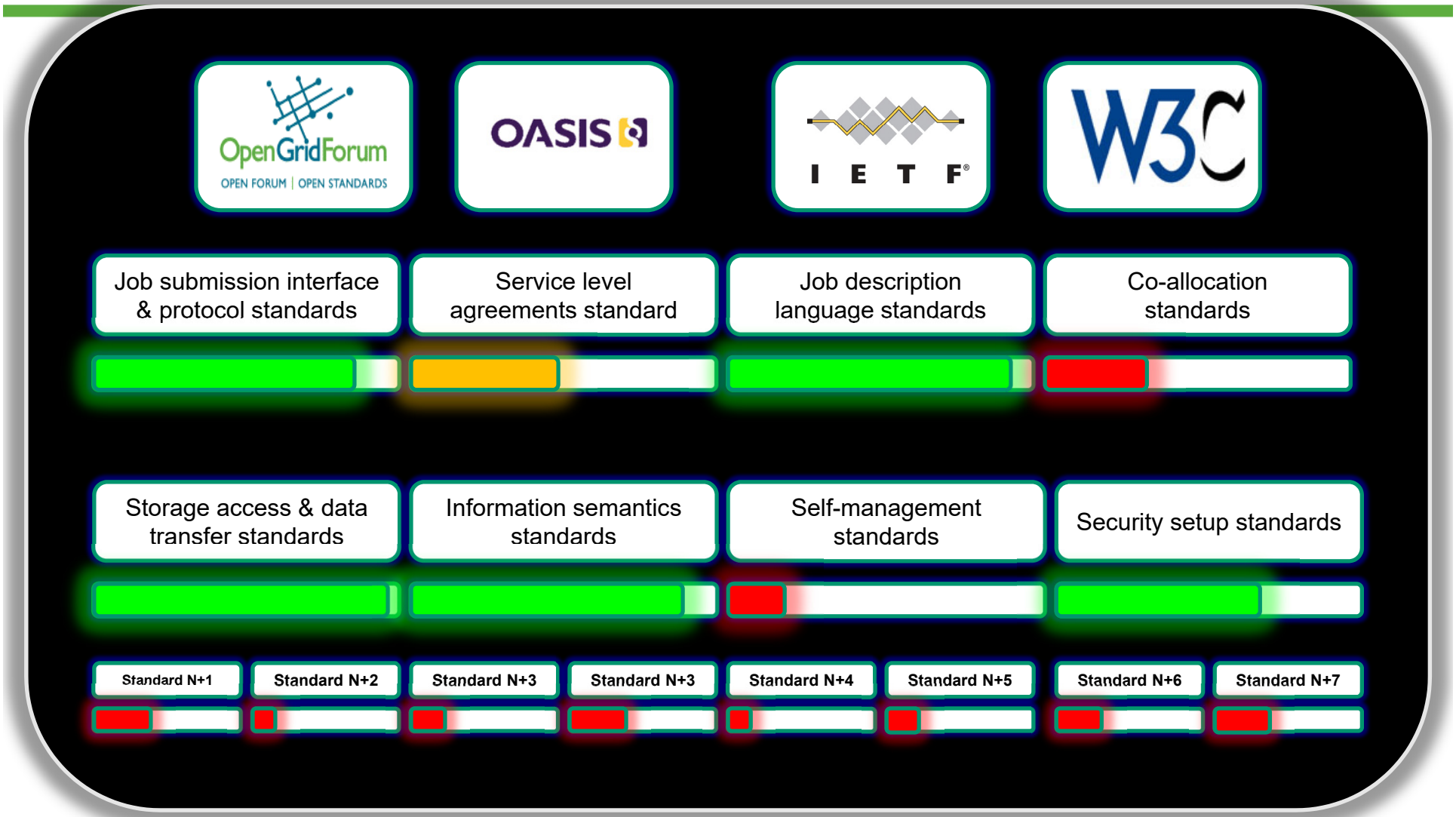
- OGF Grid Interoperation Now (GIN) Community Group
  - Cross-Grid use case applications that require resources in more than one Grid
  - (Often HTC and HPC interoperability)
  - Interoperation of multiple Grid infrastructures based on workarounds and small hacks / modifications
  - E.g. WISDOM, EUFORIA, VPH,…
- OGF Production Grid Infrastructure (PGI) Working Group
  - Takes gained experience from production interop of GIN into account
  - Standardization of a suitable set of standards based on lessons learned
  - Tunings, re-definition & focus on missing links between open standards

Scope

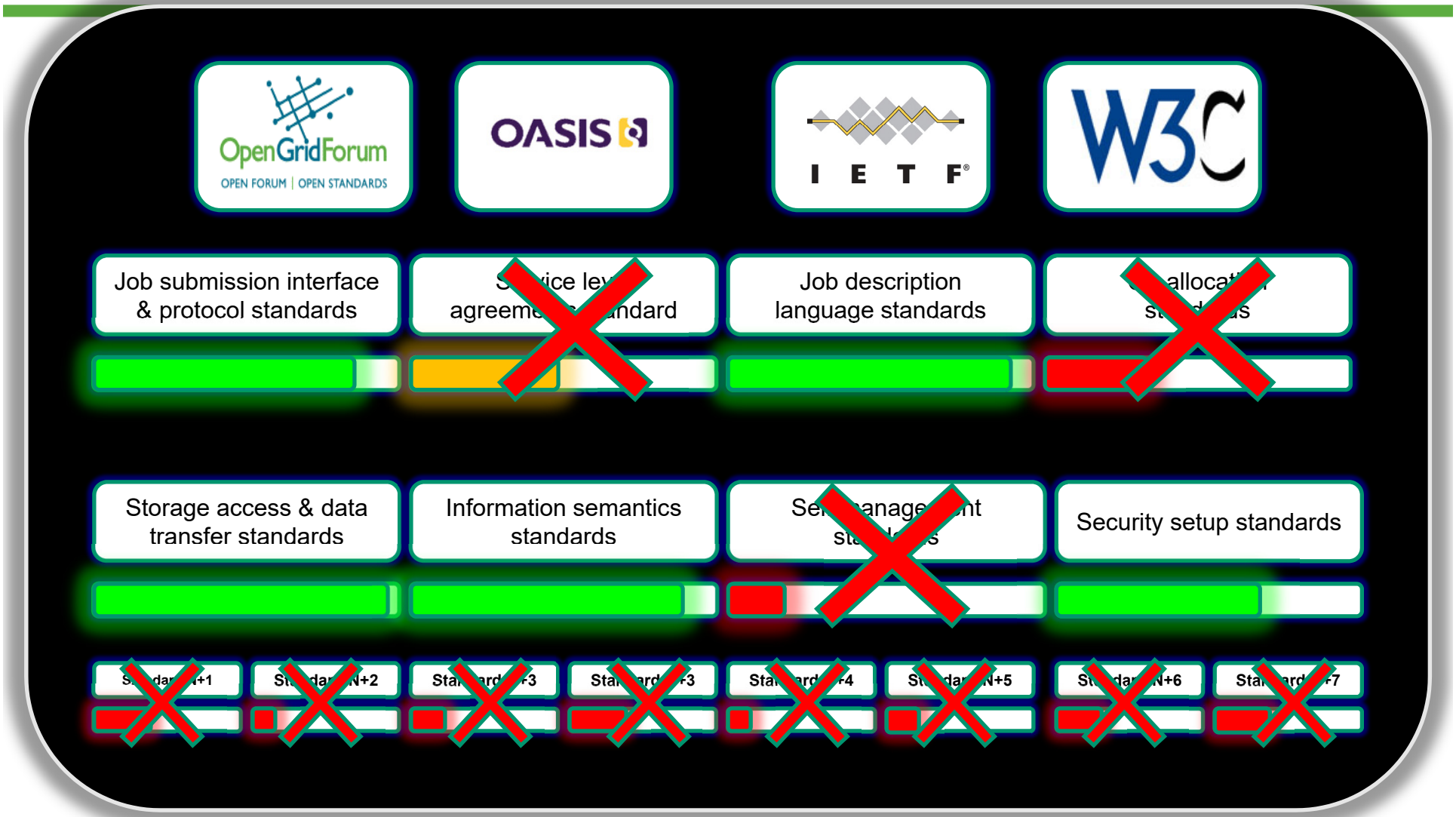
- Identified Basic Use Case
- Only matured specifications
- Specification adoption exist in production middleware systems
- Experience exists in production infrastructures
- Interoperability tests have been performed
- Real scientific use cases require these standards
- Refinements necessary and not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

→ 'Low hanging fruits'

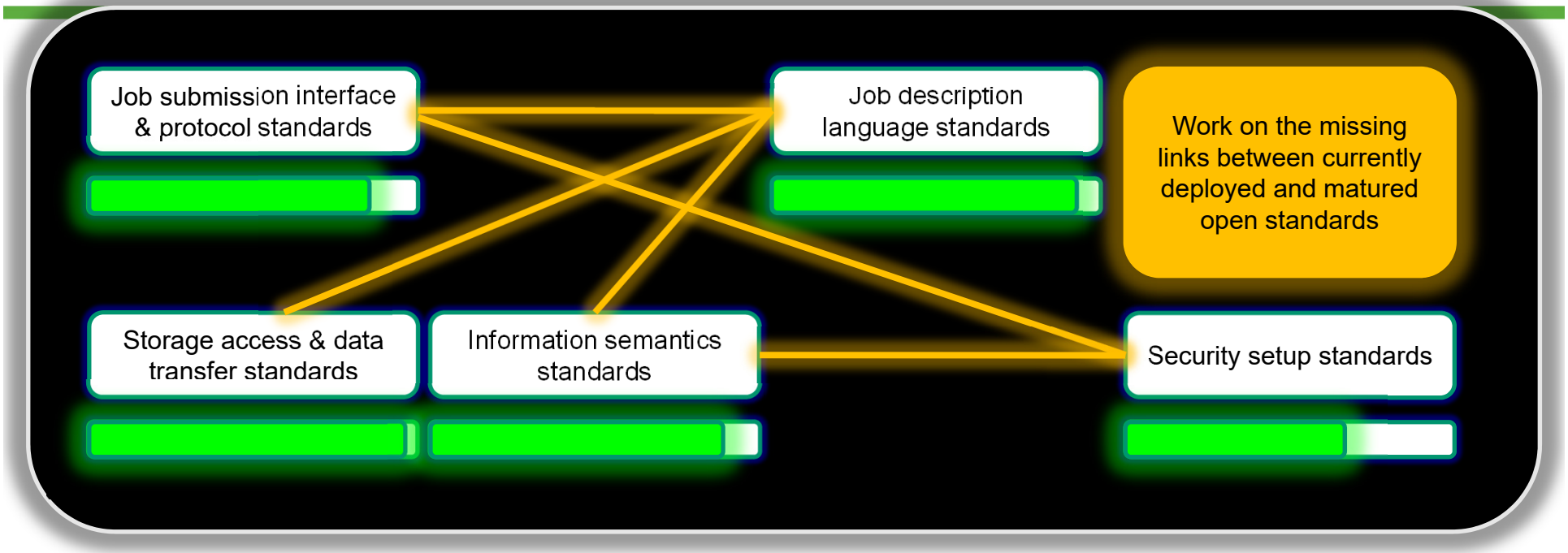
OGSA Standards



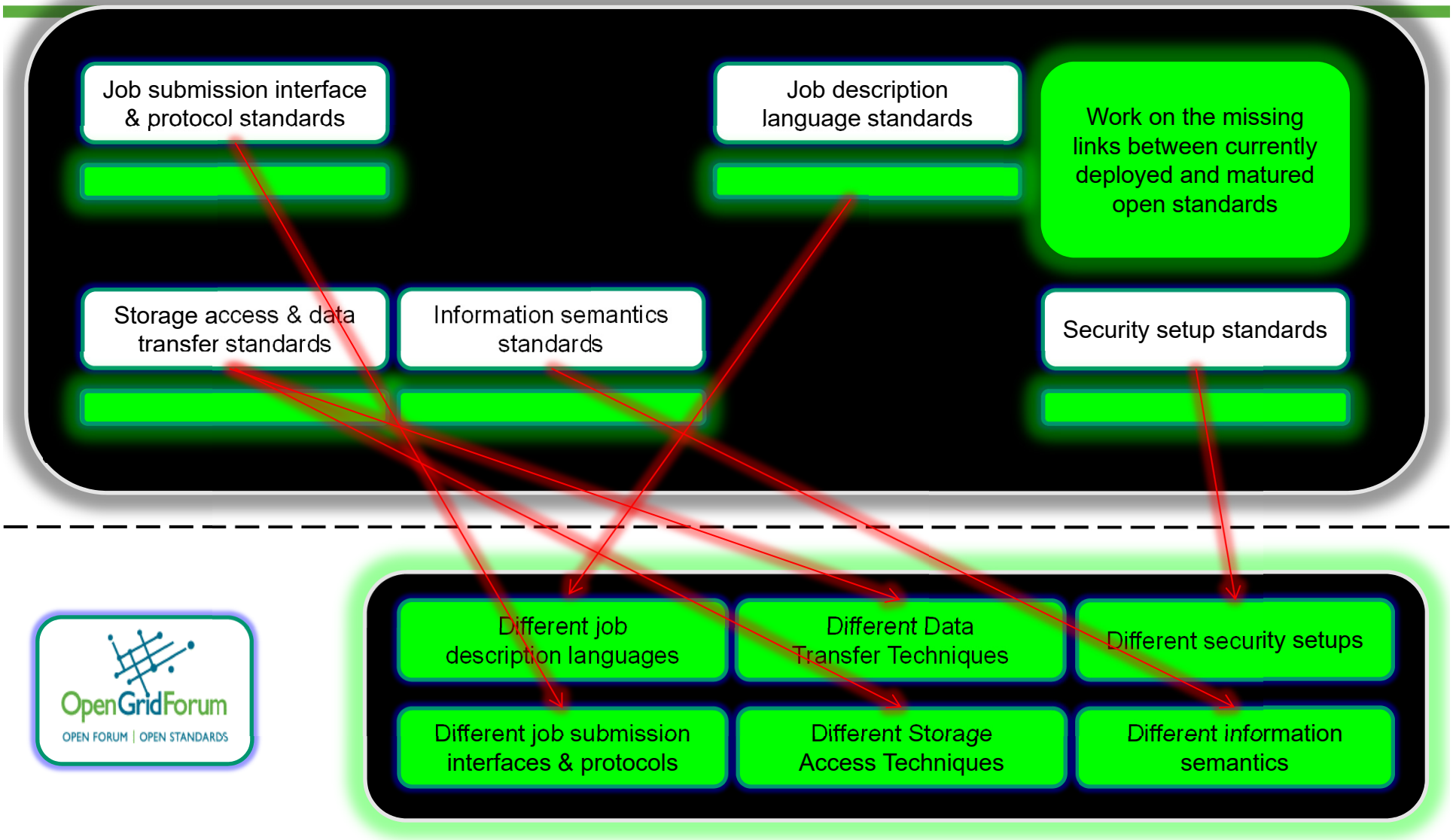
GIN Production Experience



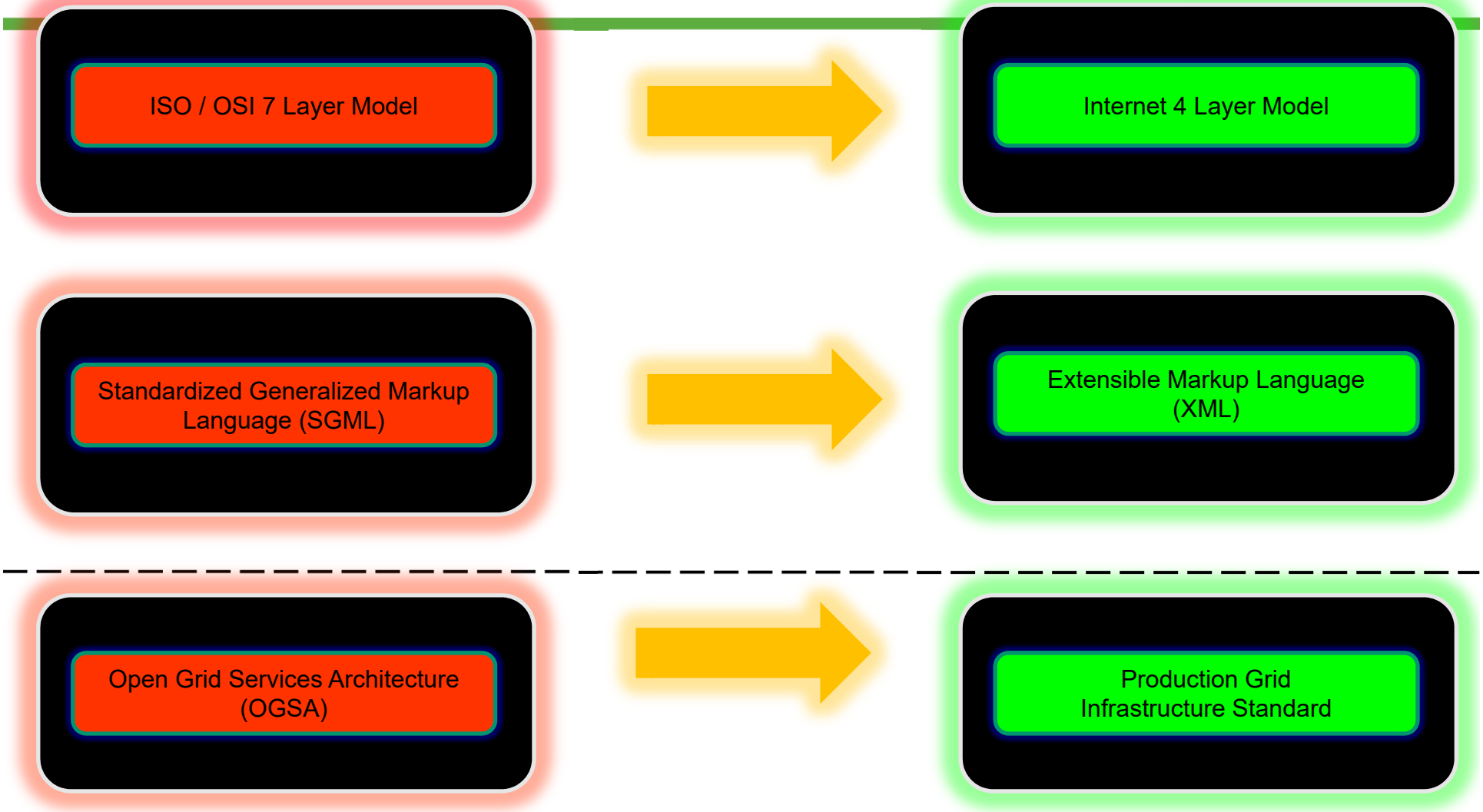
PGI Approach (1)



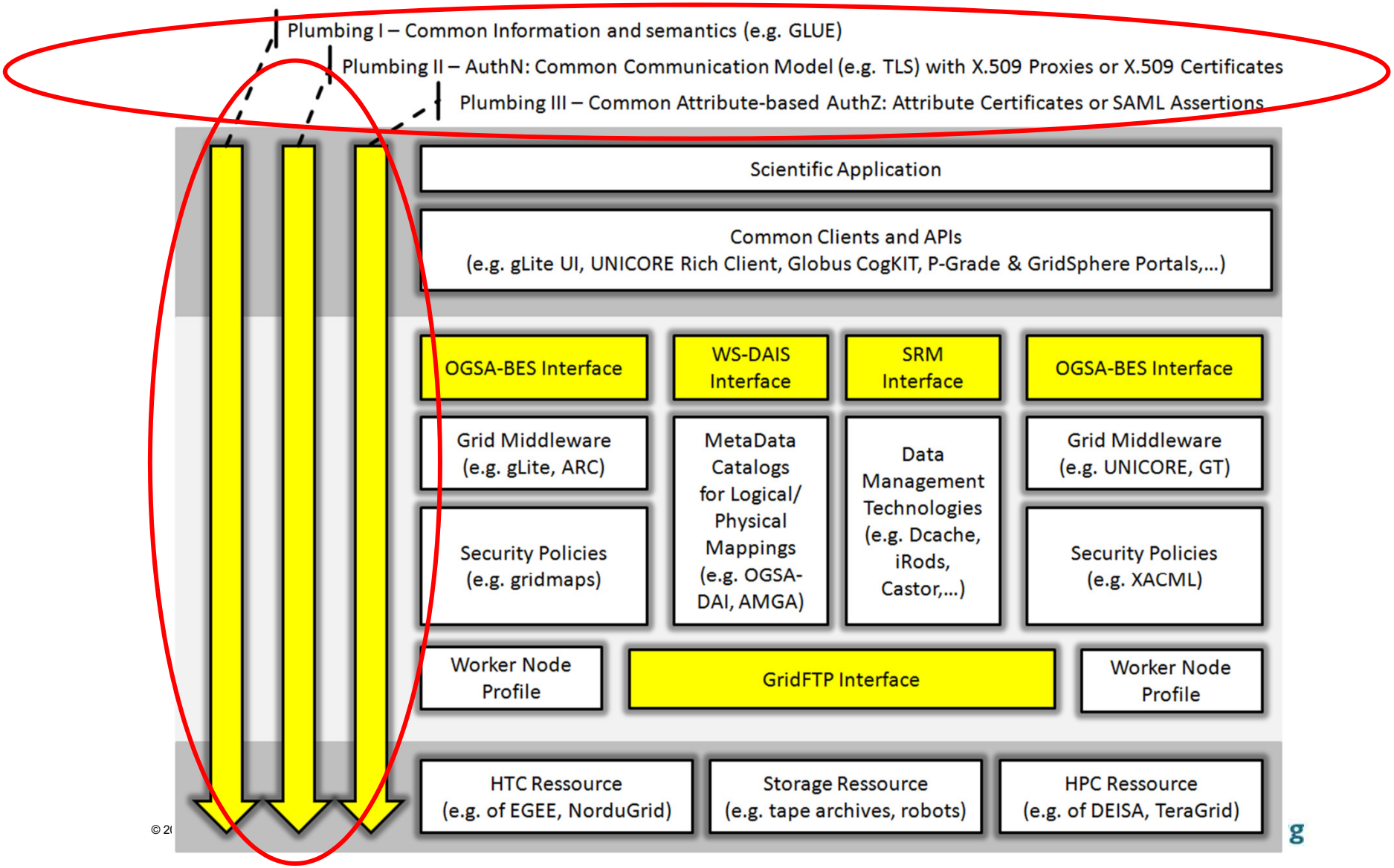
PGI Approach (2)



Compare History of Computer Science



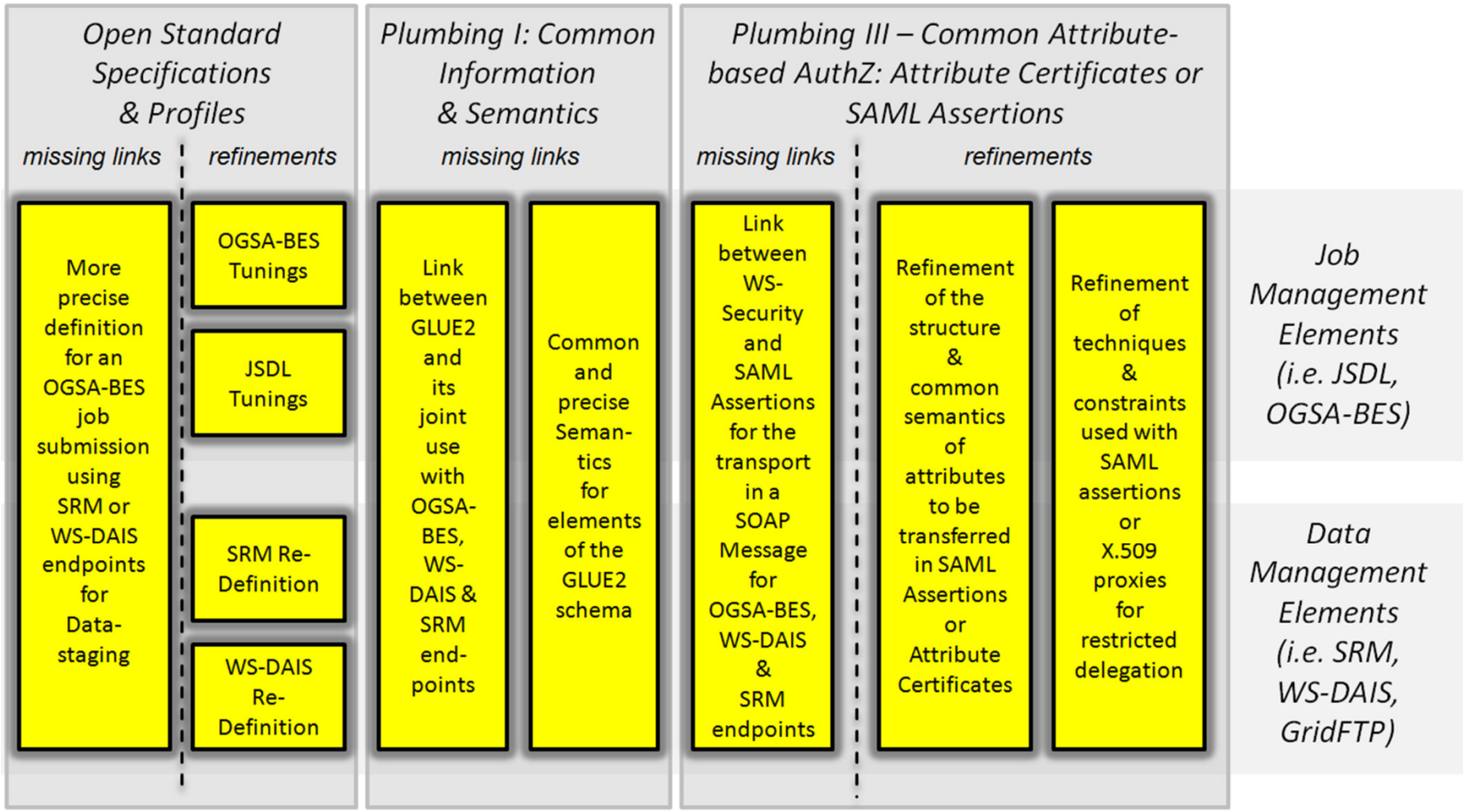
PGI Ecosystem Overview



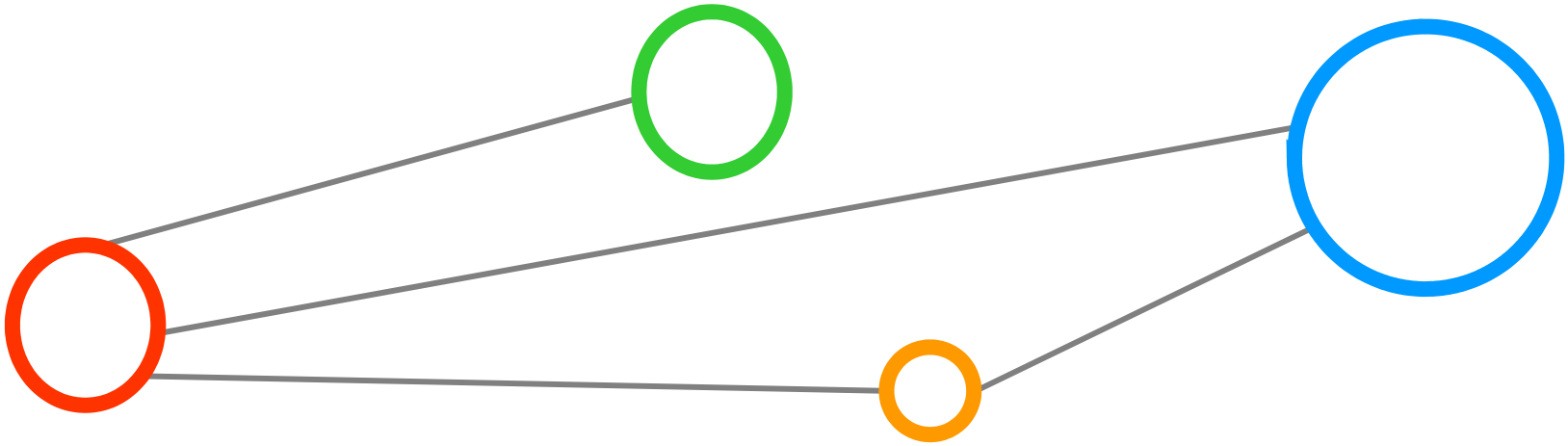
Plumbings Idea

- Plumbings can be used to put different ‚elements' through
  - E.g. warm water (realizing normal OpenSSL-TLS connections) vs. Cold water (realizing GSI connections), depends on deployments
- Many plumbings can be installed in parallel – while not crossing the other plumbings or breaking the 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

Missing Links & Refinements



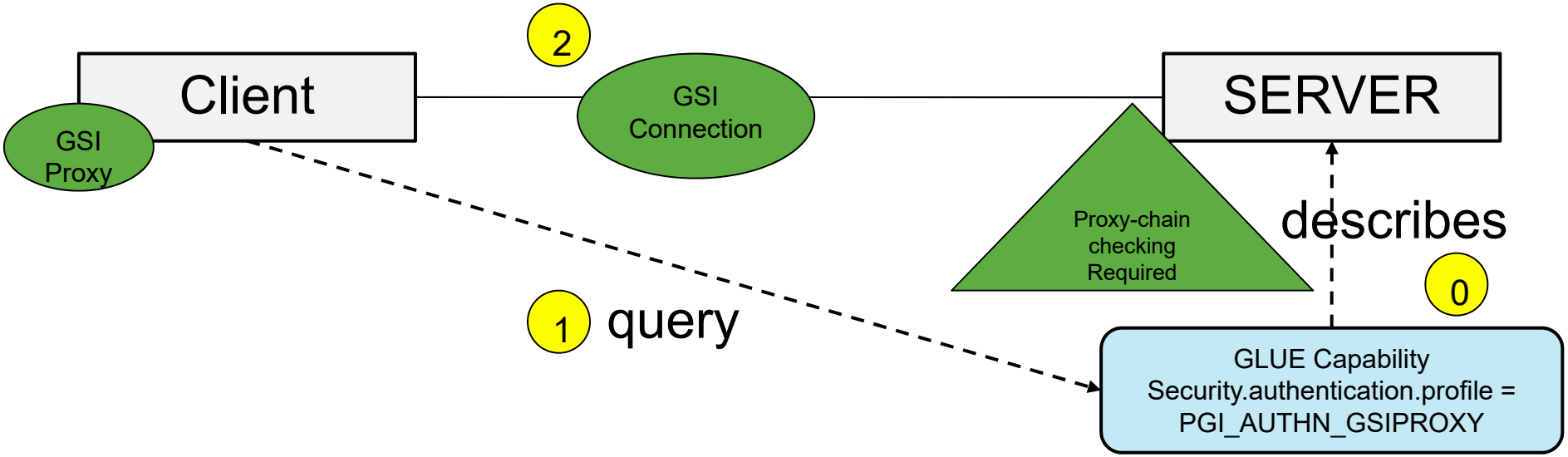
3 Plumbings for Authentication



(1) TLS with GSI Proxies

- General PGI paradigm
  - Move away from Grid Security Infrastructure (GSI) to align with Web-based world
  - Easier tooling, interoperability with Web on transport level
- GSI-based ‚TLS' is not compatible with OpenSSL TLS
  - Possible to make GSI-based TLS be compatible with OpenSSL TLS (GT4 environment variable to switch on compatible TLS)
- Many production systems require still the GSI-based TLS
  - Proxies needed since the data staging might be delegated
  - E.g. OGF Storage Ressource Manager (SRM) interface implementations and OGF GridFTP implementation
  - Changes in all these implementations take time
  - Deployments of these implementations then take more time
  - Idea: GSI plumbing until GSI is deprecated and not used anymore

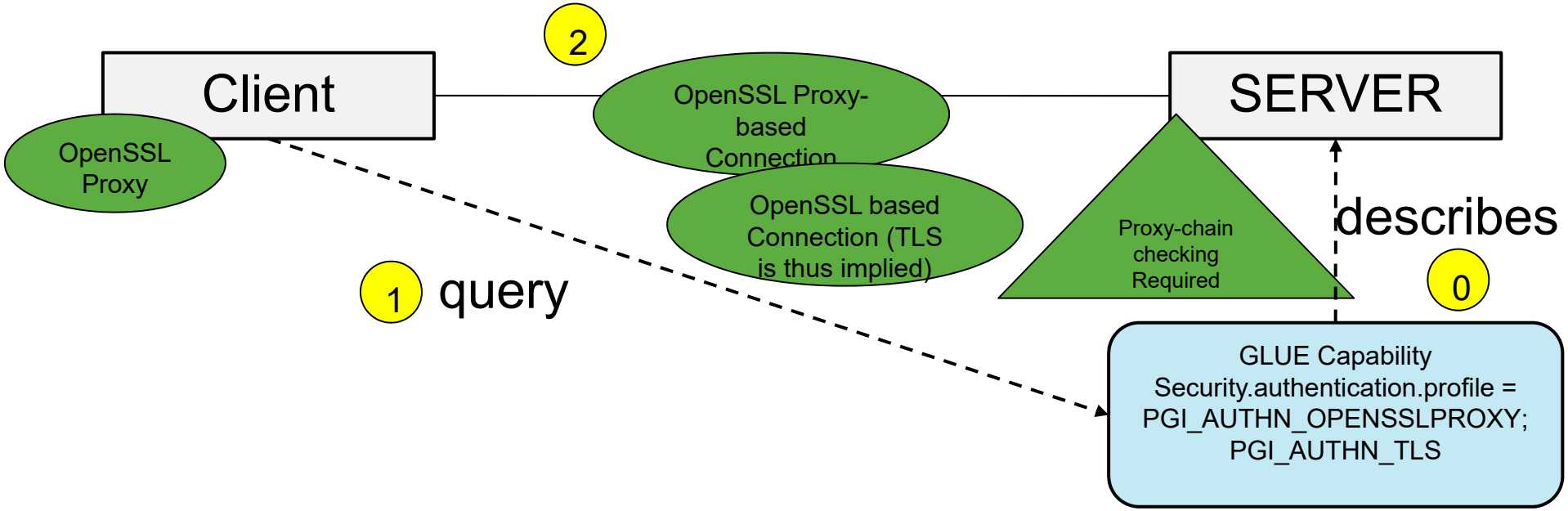
(1) TLS with GSI Proxies



(2) TLS with OpenSSL Proxies

- Components of NAREGI, ARC & gLite 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 (well specified in RFC3820)
  - Issues with proxy renewal (MyProxy is a proprietary protocol and thus not inline with a standards approach, but de-facto)
- 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

(2) TLS with OpenSSL Proxies



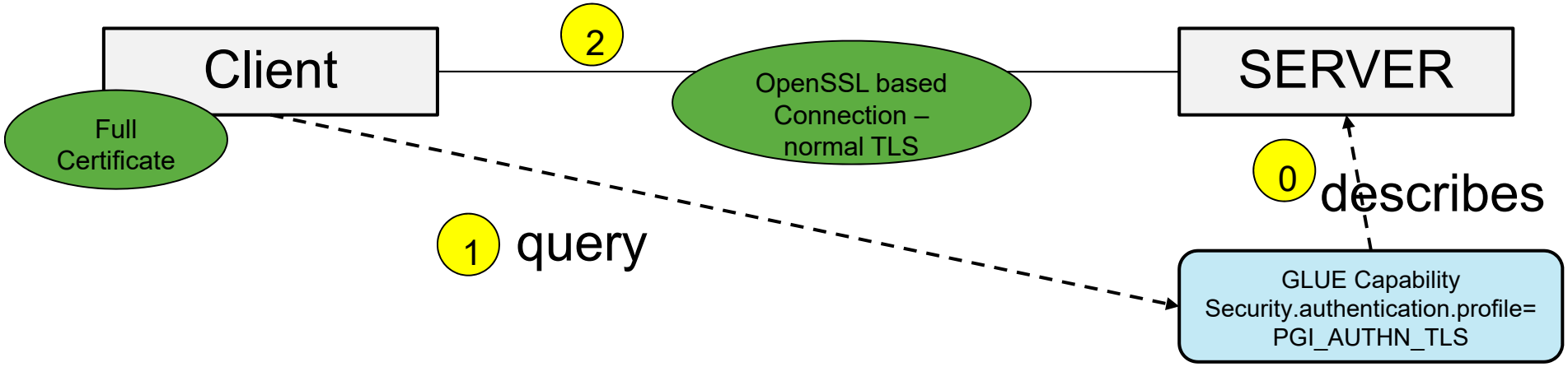
- „Classic VOMS“ supports RFC proxies instead of GSI proxies to generate valid proxies with Acs
  - Medium-term move towards this solution if consumers of ACs support this

(3) TLS with Full Certificates

- Some service container (e.g. UNICORE) required TLS connections using full end-entity certificates
  - Service container could not work with proxies in this setup
  - Proxy chain checking is not required!

- But(!) it can exist in parallel to Plumbing (2) in the same container
  - When moved away from GSI connections, TLS is interoperable
  - Proxy chain checking does not break the acceptance of full end-entity certificates since all are X.509 certificates
  - Both plumbings can exist smoothly in parallel and deployment of solution is subject to policy decisions on the infrastructures

(3) TLS with Full Certificates



Message layer Authentication (1)

- Numerous 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 attribute-based AuthZ
    - SAML Token includes <saml:Subject> and <saml:Attribute>
    - The UVOS and VOMS SAML Service might be enhanced to support this profile

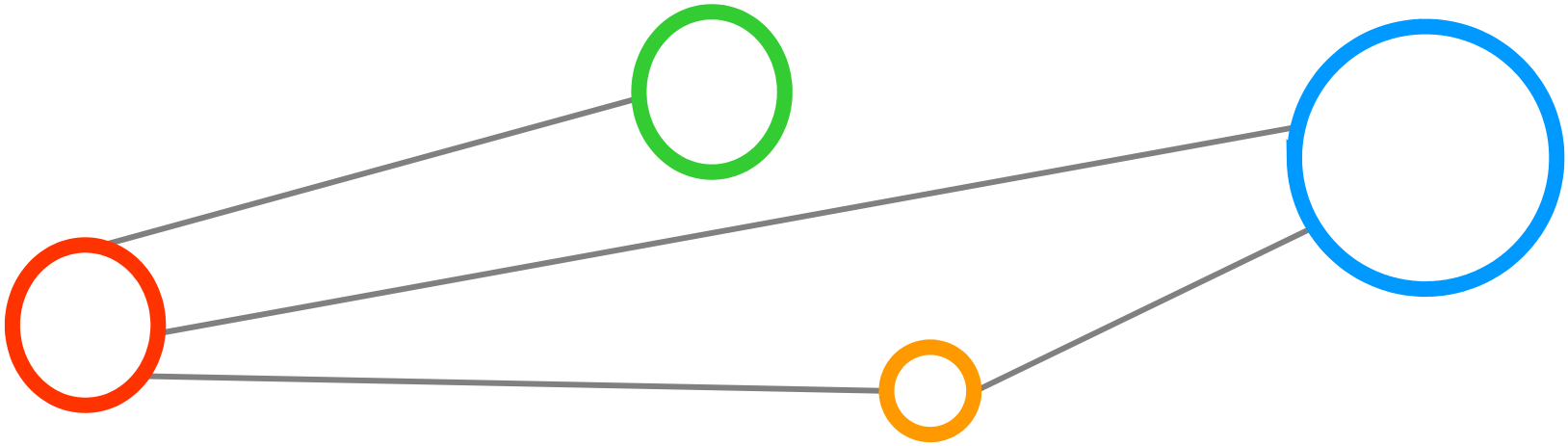
SAML Example

```
<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>
```

Message layer Authentication (2)

- WS-Trust Discussions
  - 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.

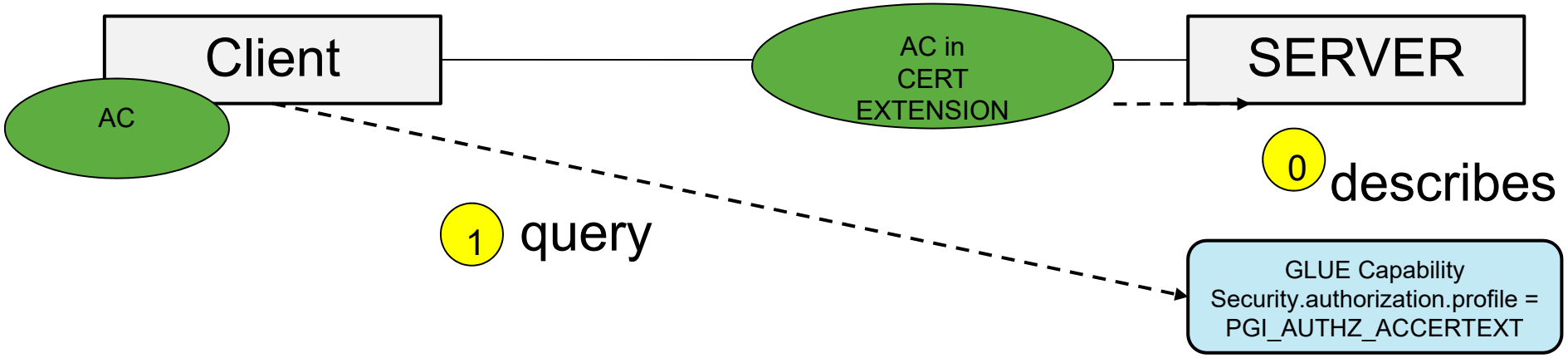
2 Plumings for AuthZ



(1) AC Certificates in Extensions

- Supporting „Classic VOMS“ exposing ACs
- Normally ACs are shipped via certificate extensions
- But since the ACs are bound to end-entity certificates, they may be shipped as alternative to SAML assertions in SOAP headers
- Plumbing might be removed in a few years when SAML became majorly used
  - PGI pushes the use of SAML, respecting production AC setups

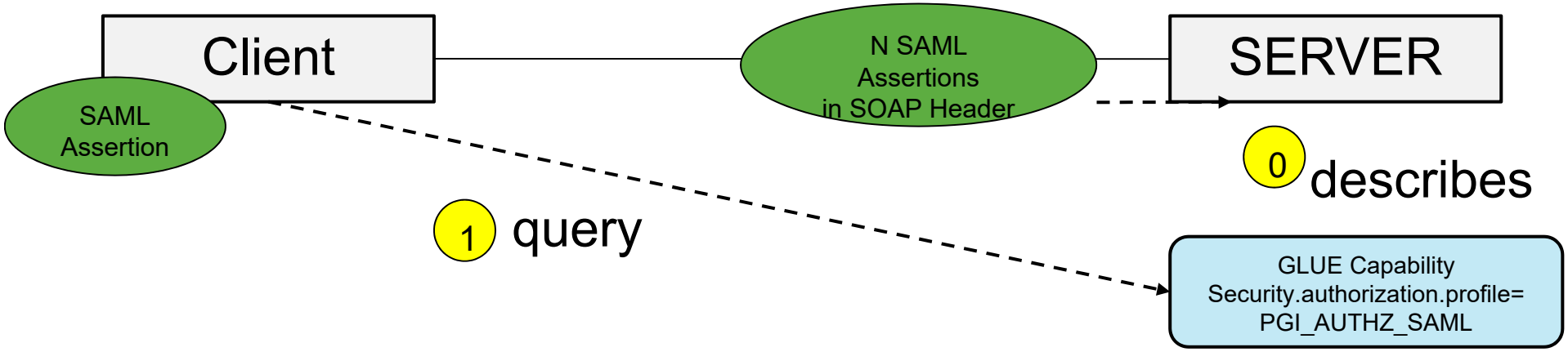
(1) AC Certificates in Extension



(2) SAML Assertions in SOAP Header

- Move towards SAML is pushed by PGI as a long-term goal while still respecting the production legacy setups
- Supported SAML-based VOMS or UVOS exposing SAML assertions (Attribute Authorities)
- n SAML assertions can be shipped in SOAP headers
  - Being careful: SAML assertions should be bound to a subject identity, otherwise each hop can „hi-jack“ the assertion for further usage (i.e. by other subjects)
  - But in general much more flexible as the AC approach

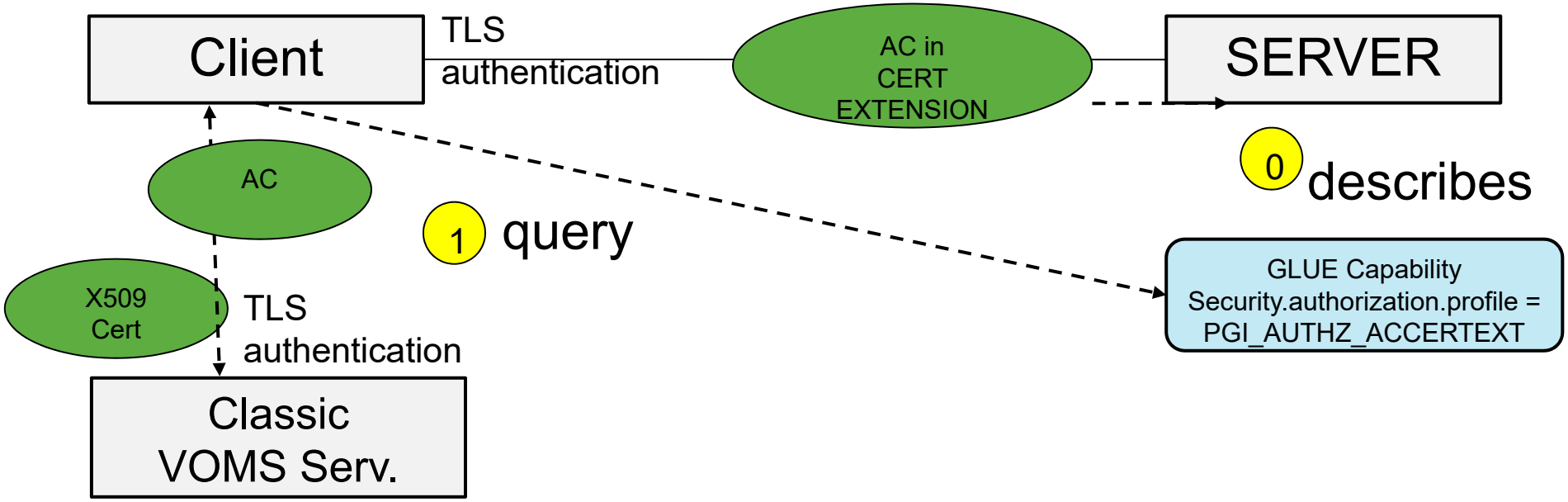
(2) SAML Assertion in SOAP Header



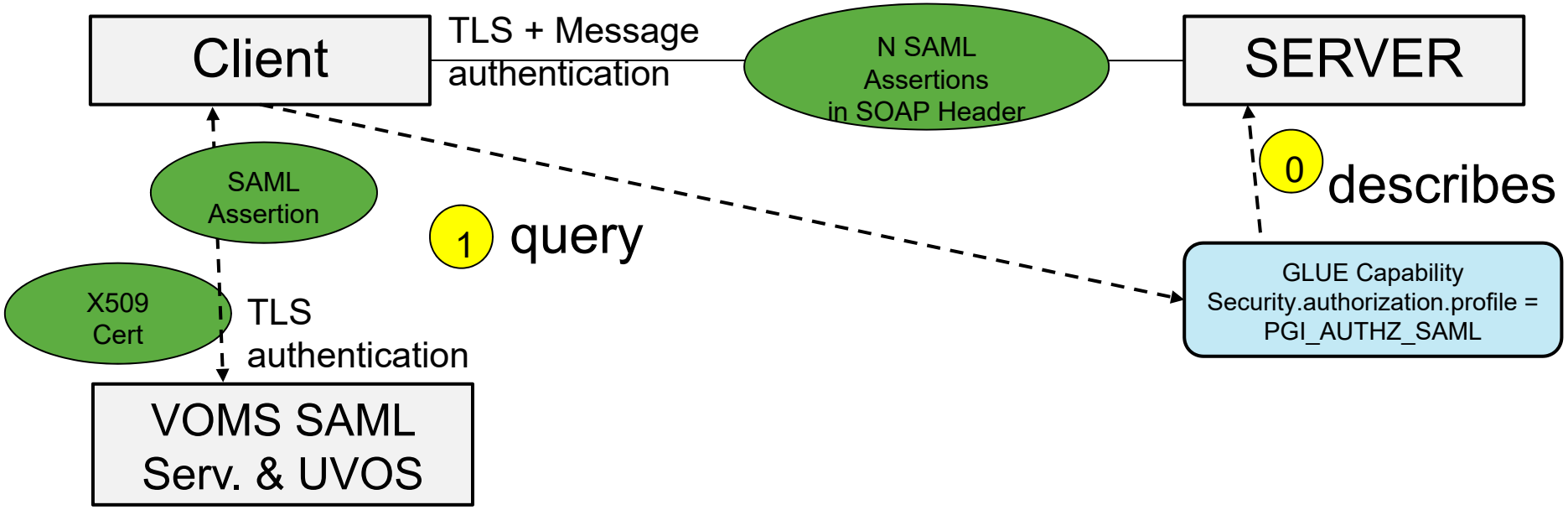
Two profiles for attribute based AuthZ

- Attribute Certificate (AC) – „Classic VOMS“ mechanism
  - Proxy certificate for transport layer authentication
  - One AC carried by proxy certificate
  - Third-party authority needed for AC issuing
  - Interface to „Classic VOMS“ is unfortunately proprietary
- SAML (Attribute) Assertions carried by SAML Tokens
  - SAML Token for message (SOAP) layer authentication
  - Third-party authority needed for SAML assertion issuing
  - 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
  - Interface to UVOS/SAML-based VOMS is standard (SAML)

AC Certificates in Extension



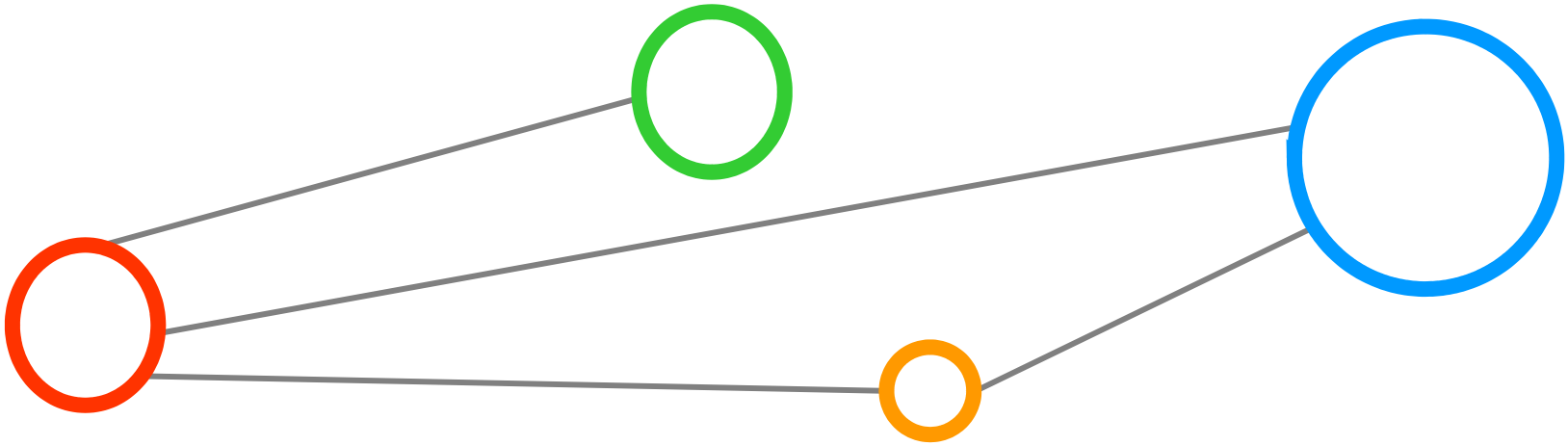
SAML Assertion in SOAP Header



Combination of Both

- PGI mandates to use at least one of the AUTHZ plumbings
  - Ensures a better interoperability then before (although not completely interoperability coverage)
- In principle we can apply (2) and (3) both together
  - UNICORE implements (2) with openssl proxies and (3) SAML assertions in one container (AC support planned)
- So using jointly the plumbings where necessary
  - PGI_AUTHZ_ACCERTEXT together with
  - PGI_AUTHZ_SAML

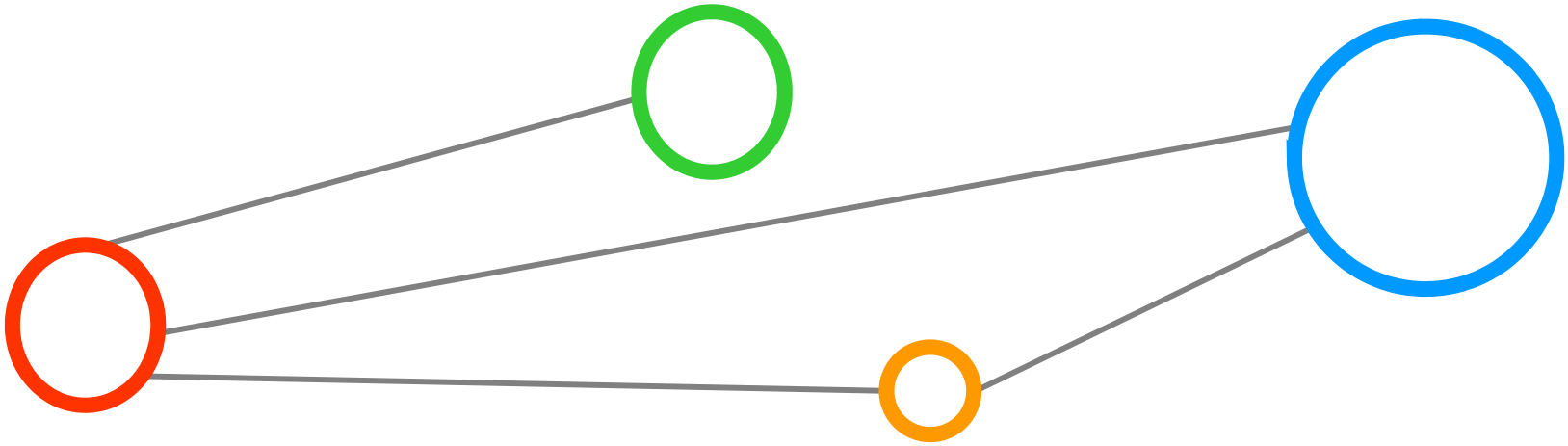
Common Attributes



Common Attributes

- Goal: common understanding and agreement of syntax and semantics of attributes between Grids
  - Technically oriented – does not deal with usage policies, etc.)
- Aspects of mapping between EGEE VOs and DEISA DECI Projects have been partly done also in JSPG
  - Open questions are virtual communities (Fusion, Virtual Physiological Human, etc.) that are different from DECI projects
- VOMS Format defines one possible FQAN syntax & semantics
  - No official standard document for it yet – work in progress…
  - Focussed on needs of EGEE and NDGF, some work has to be done to map needs of other infrastructures (i.e. DEISA, PRACE)

Constraints/Restrictions



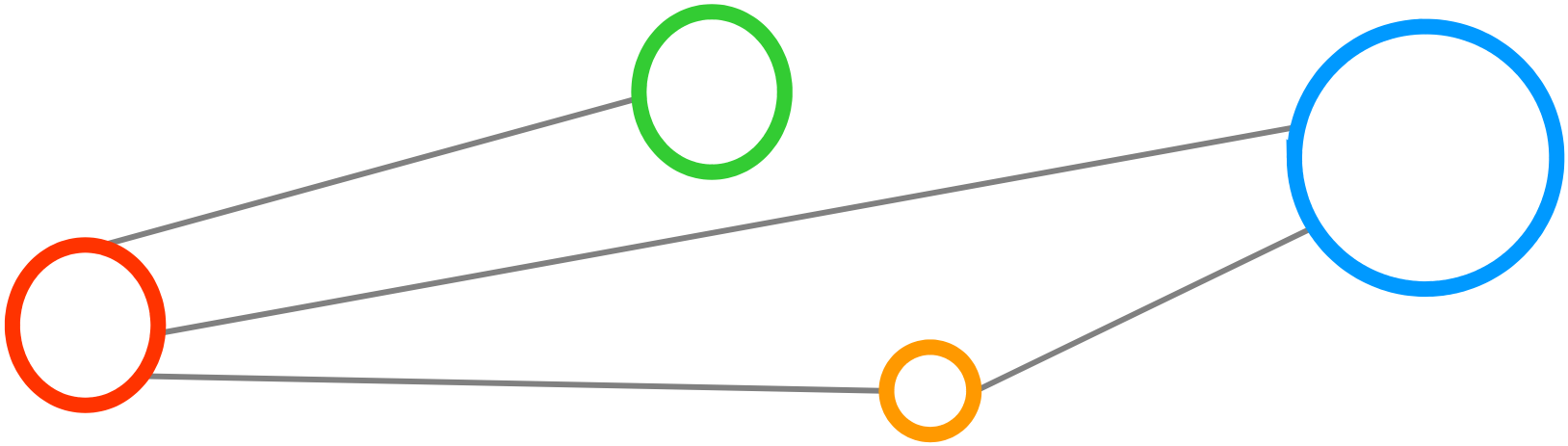
Constraints/Restrictions (1)

- SAML assertions with constraints
  - Initial experience with UNICORE (could be more)
  - Got feedback that the medical work in hospitals also rely on SAML → Here security is the most important aspect for patients
- Work from S.Cantor et al. „SAML 2.0 Single Sign-On with Constrained Delegation“
  - The person that delegates put in SAML Assertion:
    <saml:SubjectConfirmation> → Name, KeyInfo, etc. of him (aka ‘WHO delegates’)
  - The person additionally put in the SAML Assertion:
    <saml:AudienceRestriction> → used to indicate for what the assertion is actually used for AuthZ/AuthN or to whom further delegation can be performed
    - Maybe even ‘Grid actions’ can be put: Read/Write Data, Job Submission only, etc. or even specific endpoints can be mentioned
  - Plus: Attributes allows for fine-tuning about the assertion

Constraints/Restrictions (2)

- Proxies with Restrictions
  - Many different working aspects can be found it this context
  - All use the extensions in proxies for definitions
  - Globus does also work on this topic a long time ago
- Why was this never considered for production?
  - Why it is not supported? → Never had strong user requirements
  - Not in EGEE3 lifetime – maybe later?! Matter of priorities…
  - A matter of priorities and not many resource providers require it
  - Manpower issues, also it should be clarified if resource owners would like to do this
  - Hurdle to implement this is very high (for each application in VO)
- PGI common way of defining restrictions across Grids (?)

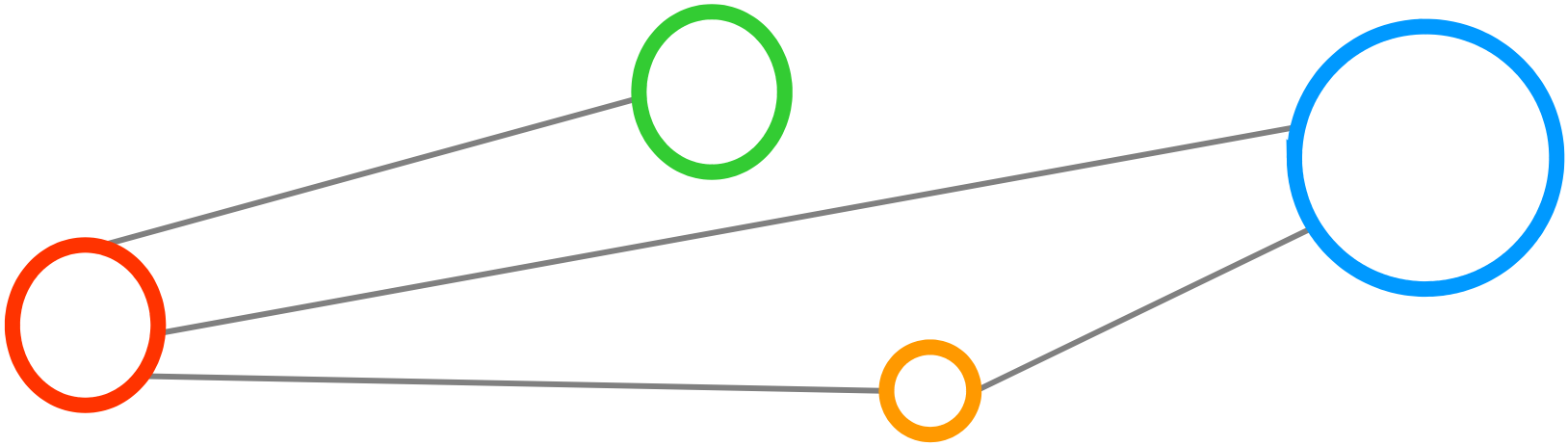
Out of Scope



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
  - Nevertheless we seek to use standard interfaces here (e.g. SAML)
- Specific policy technologies and definitions
  - How specific policies, (e.g. XACML policies) are defined is out of scope of PGI, but in general push standards where possible
- Ressource usage policy of production infrastructures
  - The policy of how and if end-users can use cross-Grid resources is out of scope of PGI (political level rather then technical level)

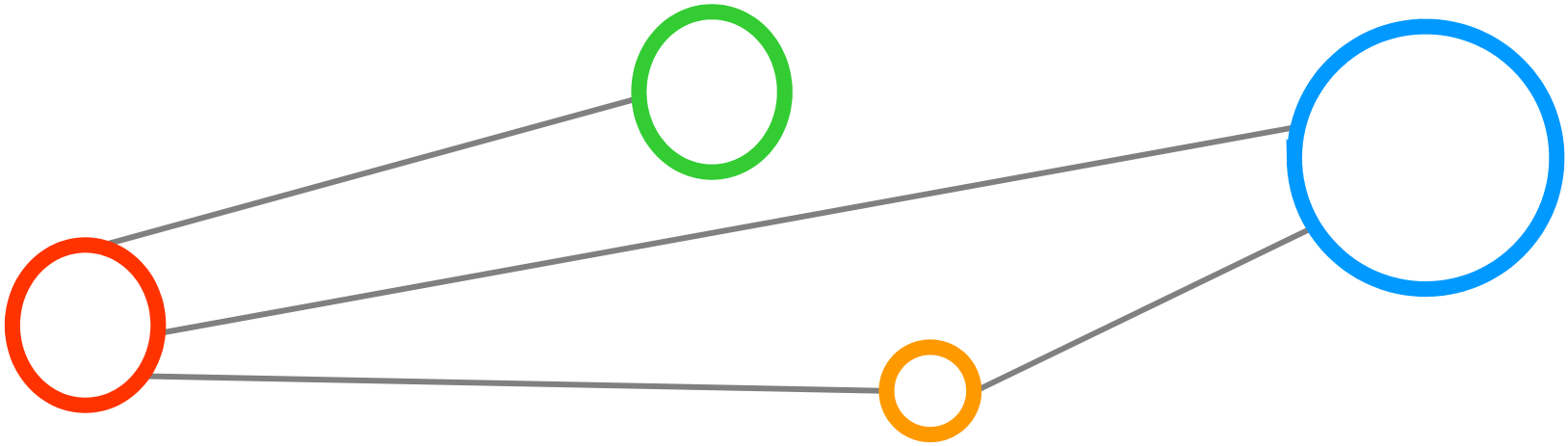
EMI in Context



EMI in Context

- European Middleware Initiative (EMI) Project Proposal
  - → Visit our EMI sessions on Thursday at EGEE 2009!
- gLite, ARC, UNICORE and other middleware already work closely together in EMI
  - First agreements on how a future common PGI security standard should look like, aligned with compute, information, data, …
- EMI will try to leverage and drive the PGI activities
- Major difference between PGI and EMI: in OGF PGI we have „no money“, but EMI has „a little bit of money“
- E.g. „little“ change picture: Some SRM implementations will be PGI-compliant moving away from GSI, hopefully forcing other SRM implementations to follow

Conclusions



Conclusions

- Changes in Security Models take a very long time
  - Compare to switch from GLUE information models → years!
- 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) with a general move away from GSI and to SAML
- The main achievements in our group is agreement about certain important elements / standards
  - E.g. BES, SRM, GridFTP, GLUE, JSDL, etc.
  - Work on missing links between them
  - Work on tunings / refinements of them
  - Pushing back elements back to the open standards itself

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