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Authorization Federation in IaaS Multi Cloud

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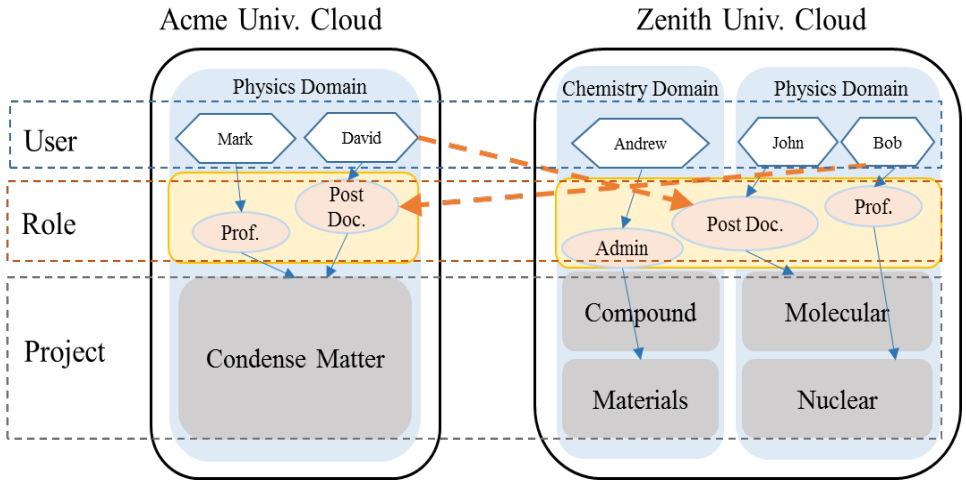
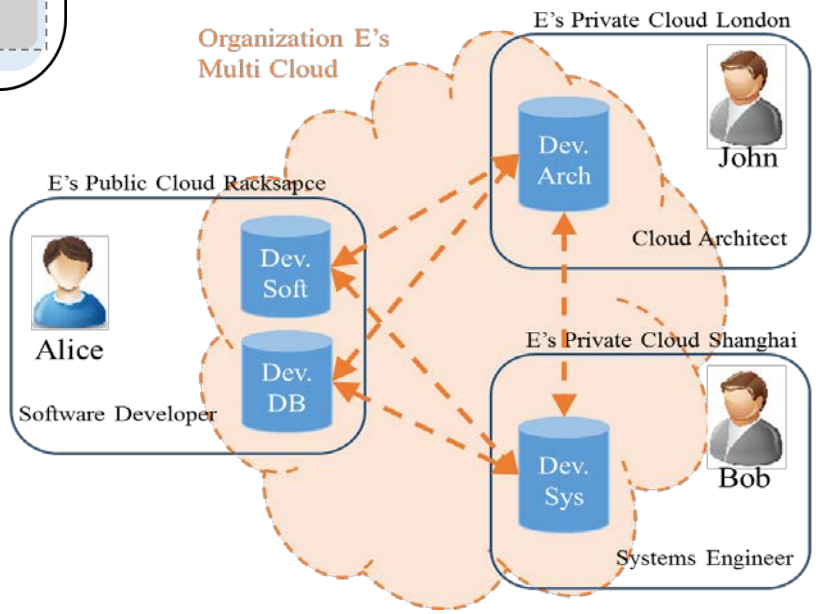
Why Multi Cloud?

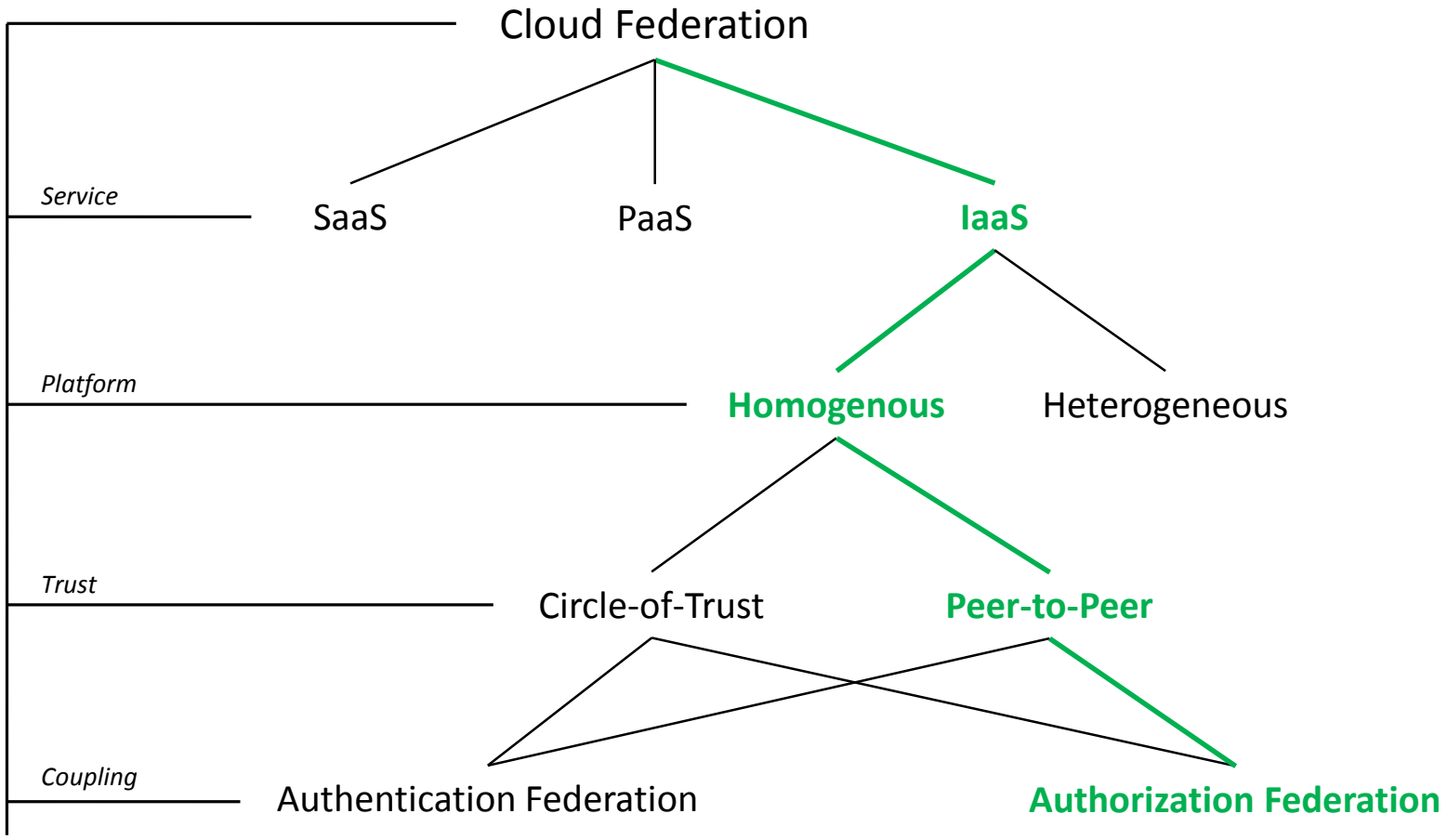


Collaboration of organizations across clouds.

Organizations with resources across multiple clouds.



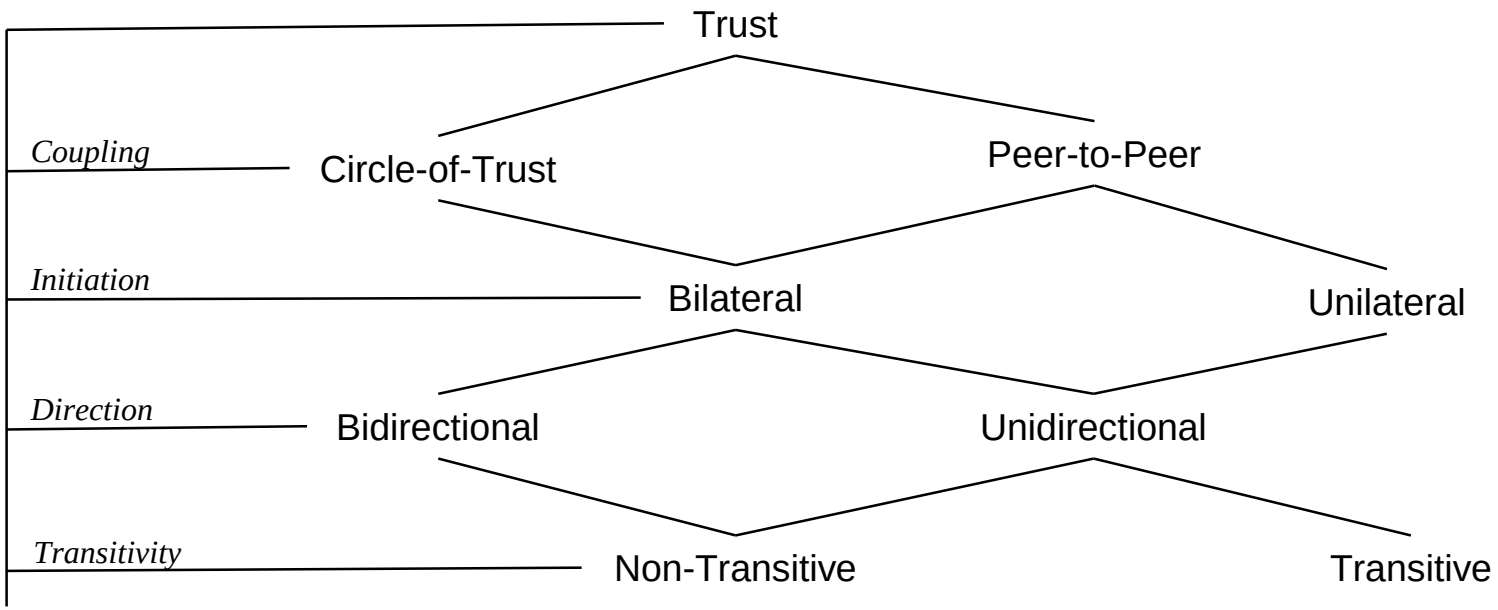
Scope of Contribution



Multi Cloud Collaboration

- Cloud Federation
  - Service (IaaS, PaaS, SaaS)
    - Heterogeneous: Google account (Open ID 2.0) Heterogeneous within google.
    - Homogenous: Eduroam federated network access.
  - Platform
    - Heterogeneous: OpenStack federation with AWS.
    - Homogenous: Keystone to Keystone federation.
  - Trust
    - Circle-of-Trust: Alliance of institutions for sharing scientific data such as CERN.
    - Peer-to-Peer: Best Buy federating with Rackspace.
  - Coupling
    - Identity Federation: SAML, OAuth, OpenID, SSO.
    - Authorization Federation: SAML, OAuth.

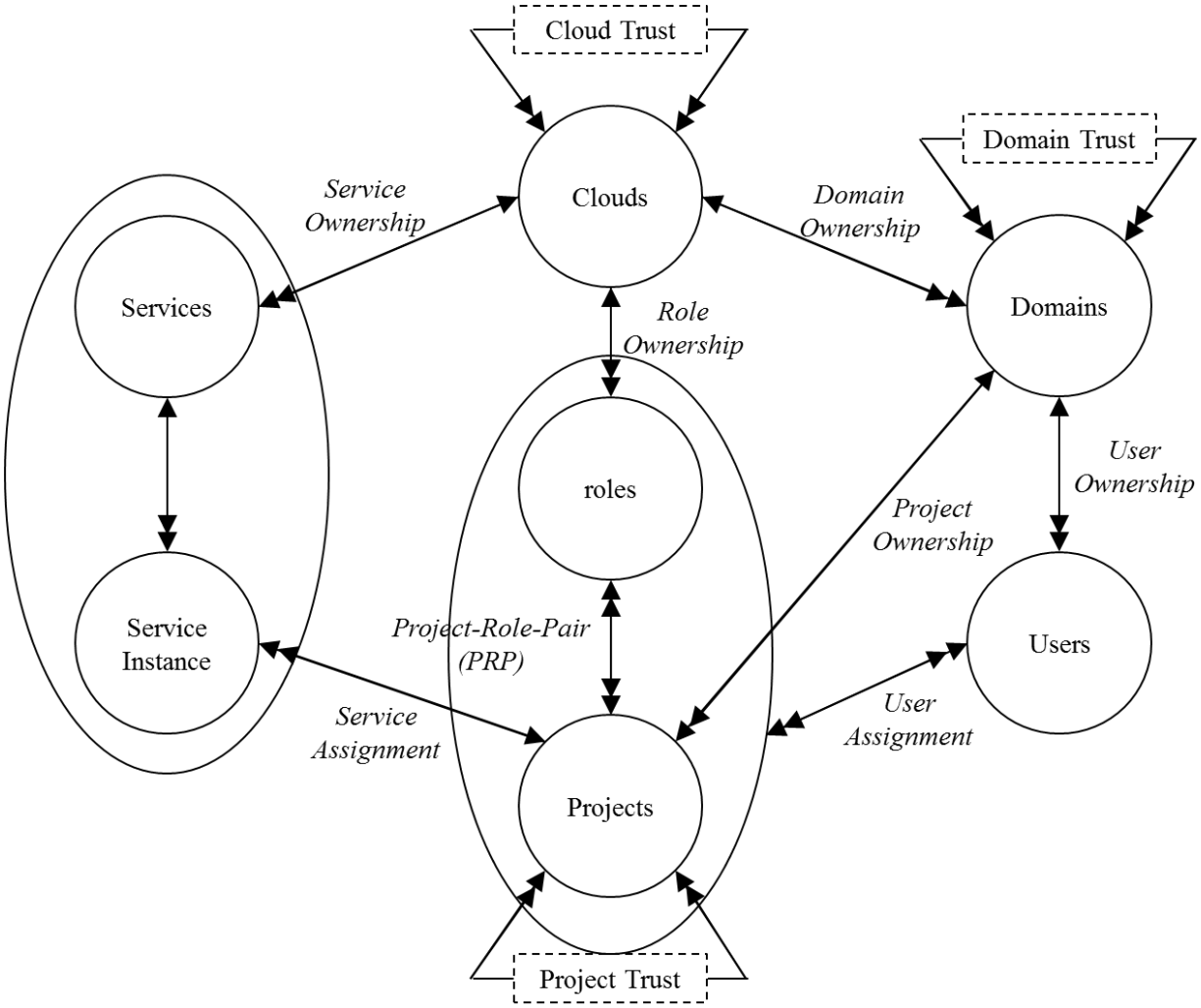
Trust Framework



Concept of Trust

- Four trust types:
  - $\boldsymbol{Type-\alpha}$: (Trustor grants inter-cloud access to trustee)
    - *If $A \trianglelefteq_{\alpha} B$, cloud A is authorized to assign B's users to cloud A's resources. In such trust type, A controls trust relation existence and cross-cloud assignments.*
  - $\boldsymbol{Type-\beta}$: (Trustee grants inter-cloud access to trustor)
    - *If $A \trianglelefteq_{\beta} B$, cloud B is authorized to assign A's users to its resources. In such trust type, A controls trust relation and B controls cross-cloud assignments.*
  - $\boldsymbol{Type-\gamma}$: (Trustee takes inter-cloud access to trustor)
    - *If $A \trianglelefteq_{\gamma} B$, cloud B is authorized to assign its users to cloud A's resources. In such trust type, A controls trust relation and B controls cross-cloud assignments.*
  - $\boldsymbol{Type-\delta}$: (Trustee controls intra-cloud access to trustor)
    - *If $A \trianglelefteq_{\gamma} B$, cloud B is authorized to assign A's users to A's resources. In such trust type, A controls trust relation and B controls intra-cloud assignments within A.*

Administrative Realms

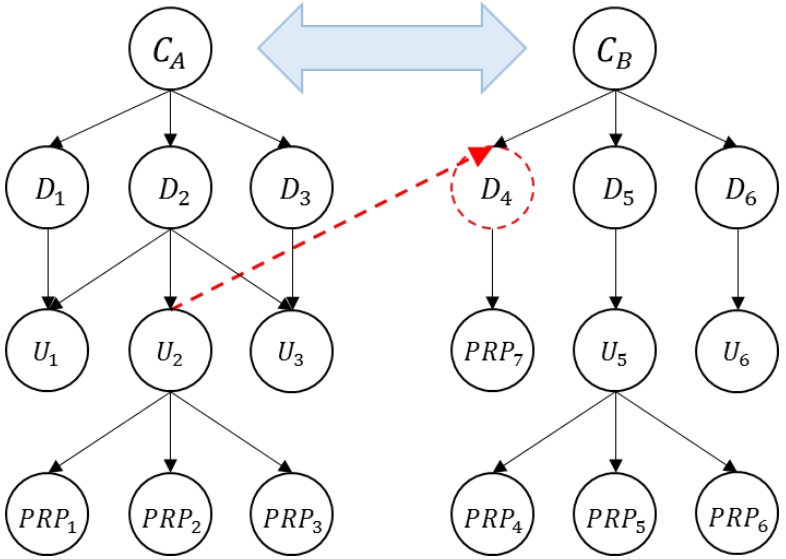


Multi Cloud Trust

- Three trust scopes based on administrative realms in cloud:
  - *Cross Cloud Trust*
    - *Sharing cloud infrastructure resources, such as services.*
  - *Cross Domain Trust*
    - *Sharing domain resources such as projects.*
  - *Cross Project Trust*
    - *Sharing project resources such as VMs.*

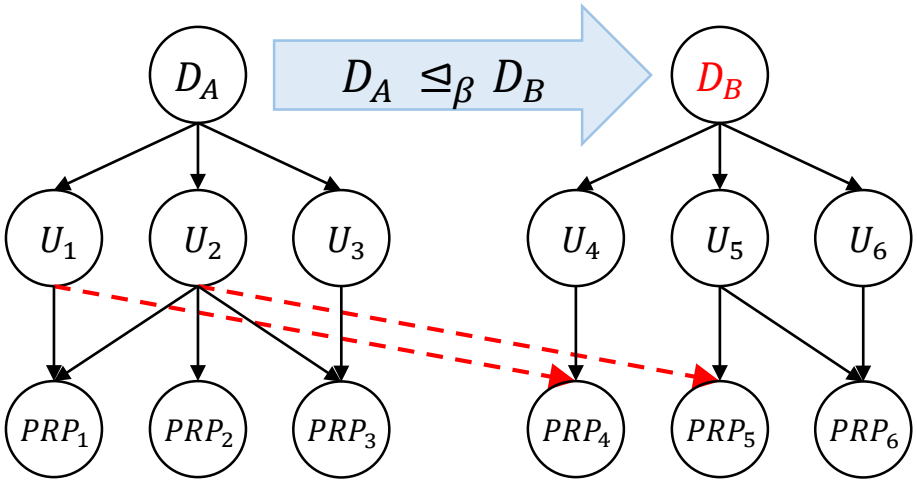
Cloud Trust

- Enables sharing cloud resources, services and domains.
  - Set of domains shared between clouds with trust type (for domain trust).
  - Sharing services by creating private domains for service allocation.
- Trust relation in Cloud Trust is Peer-to-Peer, bilateral, bidirectional, non-transitive.



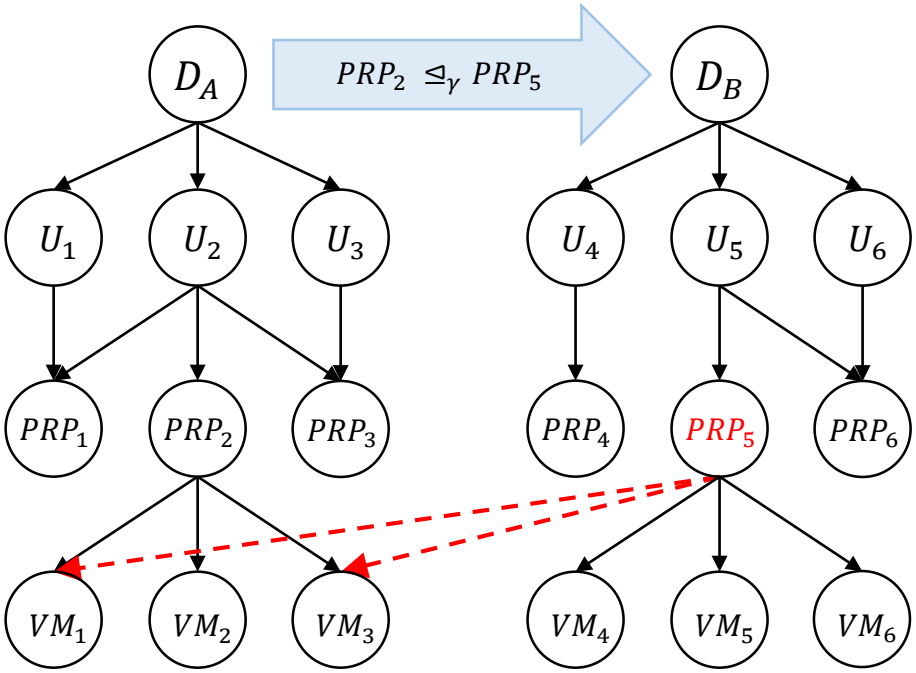
Domain Trust

- Enabling cross cloud access by assigning users to *PRPs* between trusted domains.
- Trust relations are Peer-to-Peer, unilateral, unidirectional, non-transitive.



Project Trust

- Enabling cross cloud access to service instances by assigning users to *PRPs* between trusted projects.
- Trust relations are Peer-to-Peer, unilateral, unidirectional, non-transitive.



Related Work

- RBAC extensions
  - ROBAC (collaboration ins not supported).
  - GB-RBAC (group does own users).
- Role Based delegation models
  - Delegation chains lacks dynamicity of trust in cloud federation environments.
- Multi-tenant trust models in single cloud.
  - MT-RBAC (Multi-Tenant RBAC).
  - CTTM (Cross Tenant Trust model).
  - OSAC-DT (OpenStack Access Control with Domain Trust).

Conclusion & Future Work

- Multi-cloud trust model
  - Cloud trust.
  - Domain trust.
  - Project trust.
- Trust framework & trust types
  - Four types of trust applicable to administrative realms in cloud.
- Implementation in single cloud
  - Partial implementation of domain-trust in single cloud OpenStack.
- Future Work
  - Cloud trust implementation.
  - Implementation in federated OpenStack clouds.
  - Project trust implementation.
  - Hierarchical multi-domain model.
  - Attribute based models.