CERIAS

SERAT: SEcure Role mApping Technique for decentralized secure interoperability

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Secure Interoperability

- Given n secure systems, $G_i=<V_i, A_i>$, $i=1,\ldots,n$, the interoperability between these systems is achieved by introducing:
  - Cross domain arcs, *F*.
  - Restricted access set, *R*.
- How to satisfy the interoperability principles of autonomy and security.

Secure Interoperability

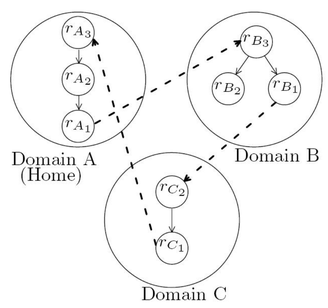
- *Principle of autonomy*, requires that any access permitted within an individual domain must also be permitted under secure interoperation.
- *Principle of security*, requires that any access not permitted within an individual domain must also be denied under secure interoperation.

The Maximal Secure Interoperability (MSI)

"For any positive integer $K \leq |F|$, determine whether a secure solution S exists such that $S \subseteq F$ and $|S| \geq K$."

- Issues with the MSI solution:
  - NP-Completeness
  - Centralized Algorithm
  - Static Solution
  - Not Fair Solution

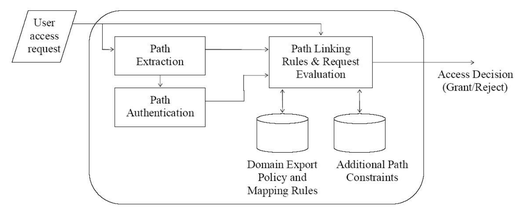
Issues with the MSI Solution



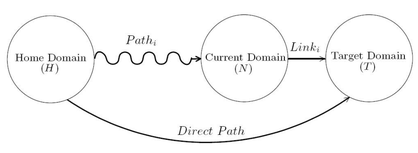
Path Linking Rules

- Introduce an access path, which describes the user's role accesses in the visited domains.
- Introduce path linking rules
- Introduce additional path constraints
- Introduce path protection and authentication
- Introduce path discovery

SERAT system architecture



Decentralized Secure interoperation



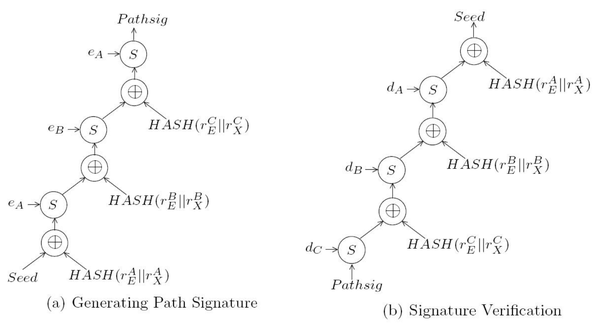
Path Linking Rules

- Strict linking rules:
  - The strict path linking rules do not allow the presence of null cross links.
- Flexible linking rules:
  - These rules allow null cross links to exist and are used as a methodology for *open interoperation*.

Additional Path Constraints

- Separation of Duty (SoD) Constraints
- Bound on Number of Domains
- Path Ordering Constraints

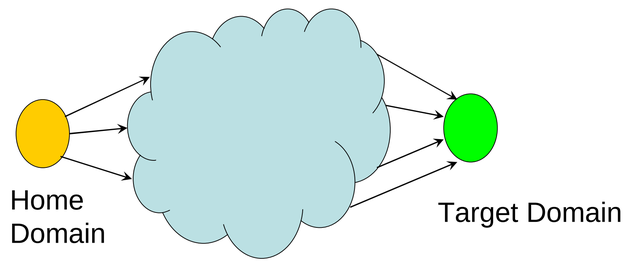
Path Protection and Authentication



On-demand Path Discovery

- Neighborhood Maintenance
  - Hello messages to neighbors.
- Path Querying
- Path Selection

On-demand Path Discovery



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