RT-Based Administrative Models for Community Cyber Security Information Sharing

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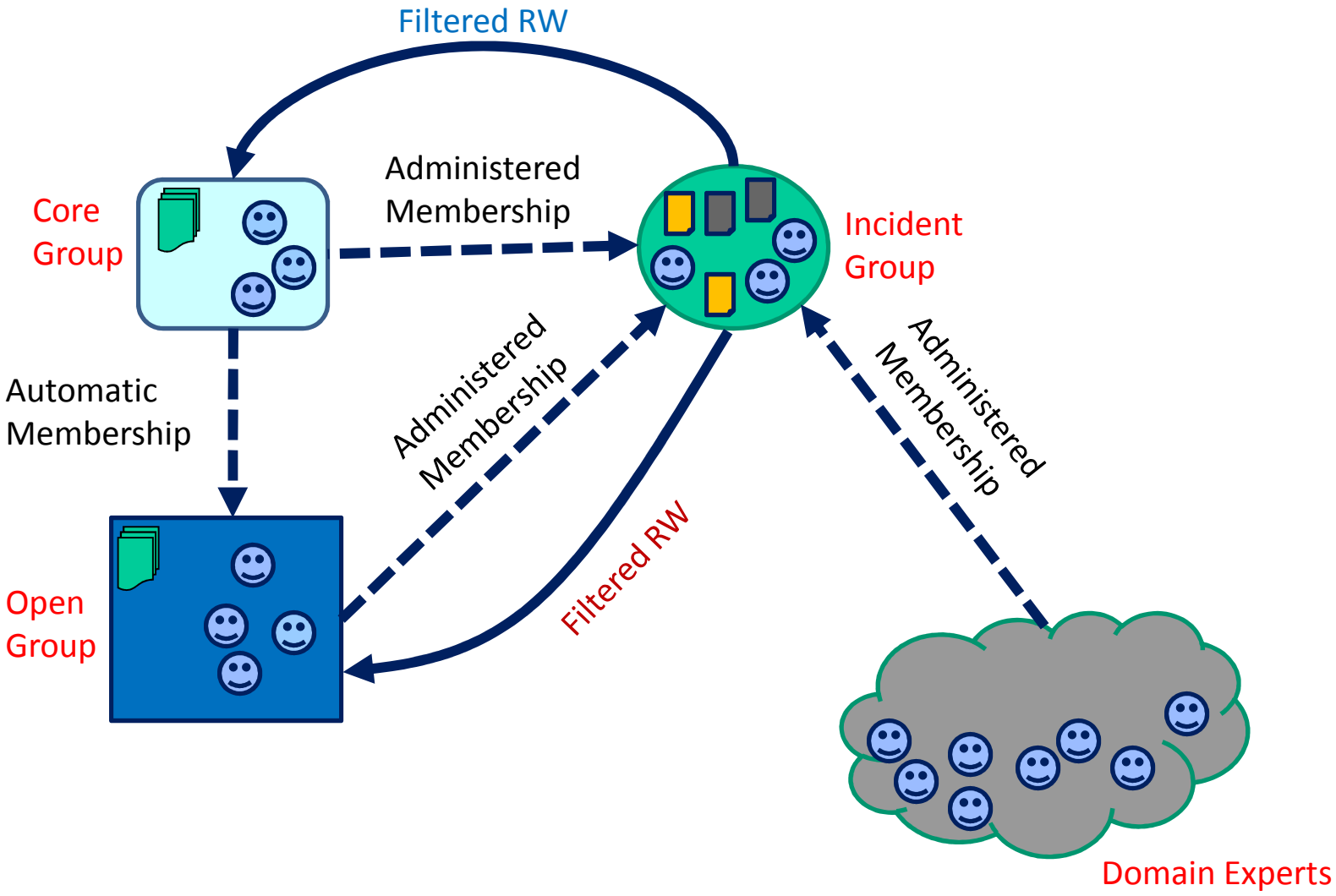
Community Cyber Security

- Community is well demarcated geographical boundary
  - E.g. county or larger city
- Secure Information Sharing in Community
- Center for Infrastructure Assurance and Security (CIAS)
  - communication, incident response, disaster recovery, etc
- Sandhu et al[1] proposed an informal requirements for information sharing for cooperative cyber incident management in a community

[1]R. Sandhu, R. Krishnan, and G. White. Towards secure information sharing models for community cyber security. In Proc. 6th IEEE Int. Conf. on Collaborative Computing, 2010.

Community Cyber Security



Administrative Model

- [1]Role Based Trust Management (RT) framework
  - Strong mathematical foundation, explicit inclusions of roles, sizeable literature

- The basic constructs of RT_0
  - Entities (A, B_1, Alice, etc)
  - Role names (r, r_1, student, etc)
  - Role (A.r, $B_1.r_1$, U_1.student, etc)

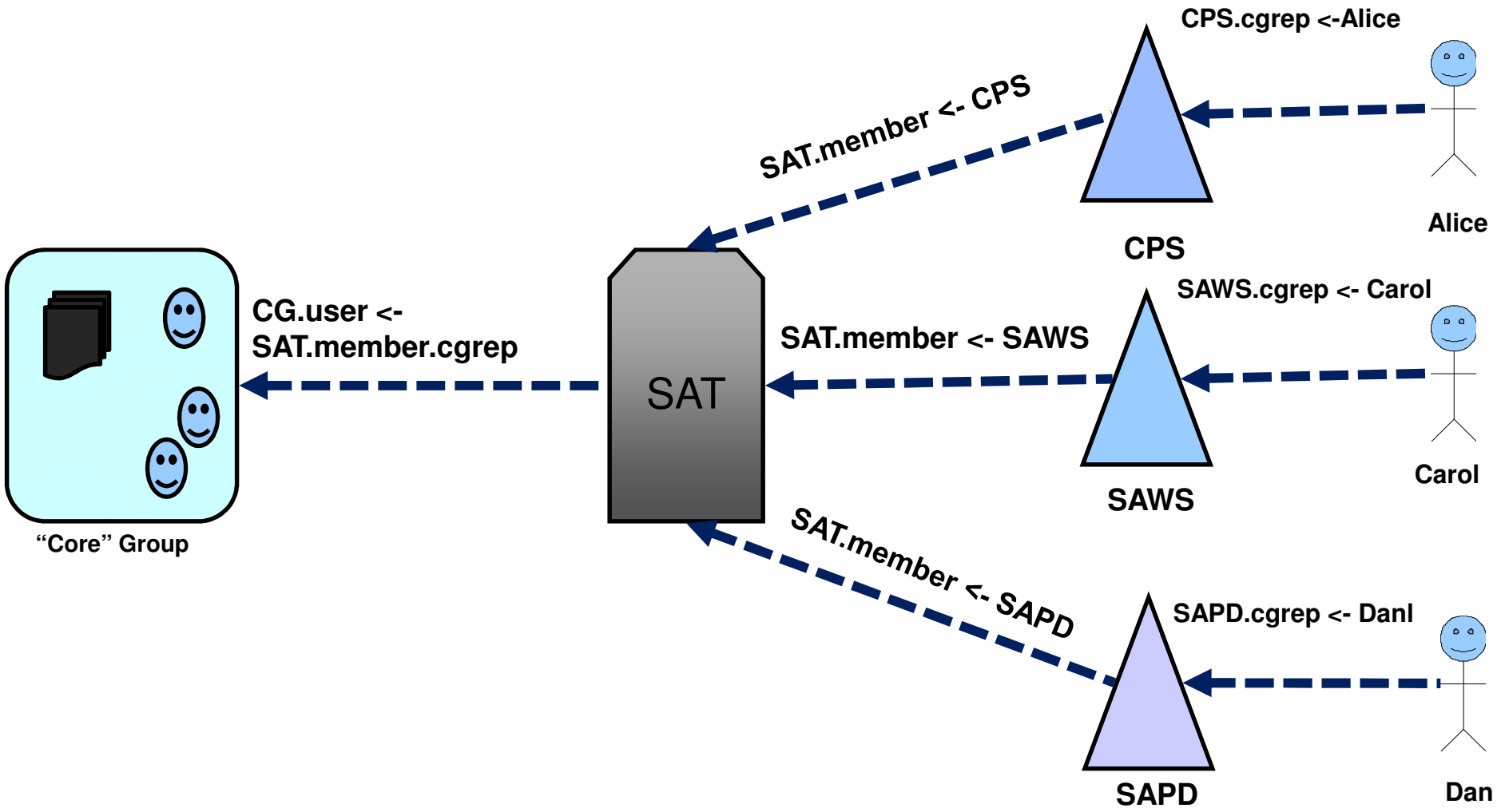
- Four types of credentials (An Entity can issue)
  - Simple Member: $A.r \leftarrow D$
  - Simple Inclusion: $A.r \leftarrow B.r$
  - Linking Inclusion: $A.r \leftarrow A.r_1.r_2$
  - Intersection Inclusion: $A.r \leftarrow B_1.r_1 \cap B_2.r_2$

[1]N. Li, J. C. Mitchell, and W. H. Winsborough. Design of a rolebased trust management framework. In Proc. of the IEEE Symposium on Security and Privacy, May 2002, 2010.

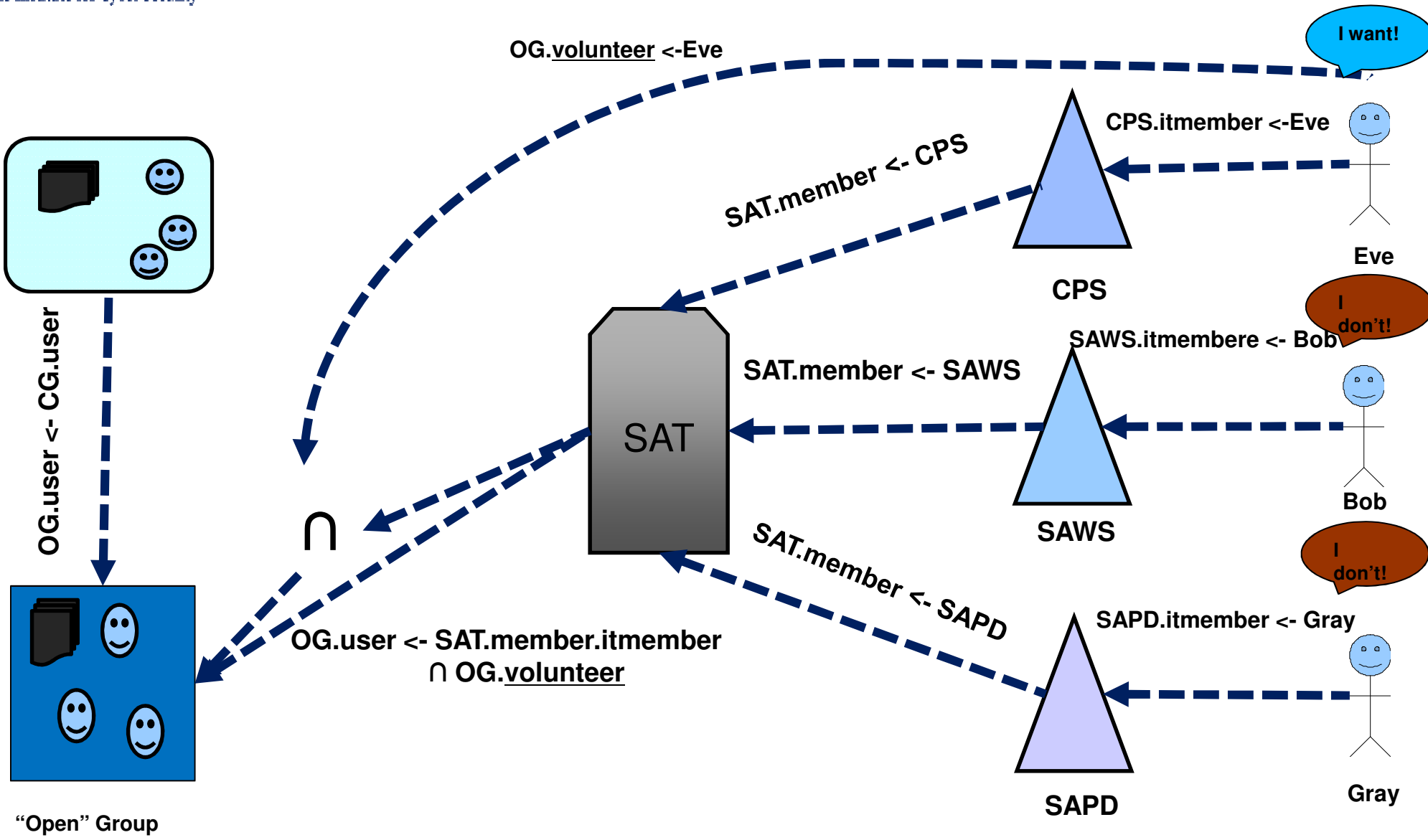
Community Elements

- Community Entities
  - CG (core group), OG (open group), IG (incident group)
  - CPS (San Antonio Energy Utility), SAWS (San Antonio Water System), SAPD (San Antonio Police Department)
  - SAT (Hypothetical Entity that represents the community), etc
- Roles
  - CG.user (All core group users)
  - SAT.member (Members of San Antonio Community)
  - CPS.itmember (IT members of CPS), etc

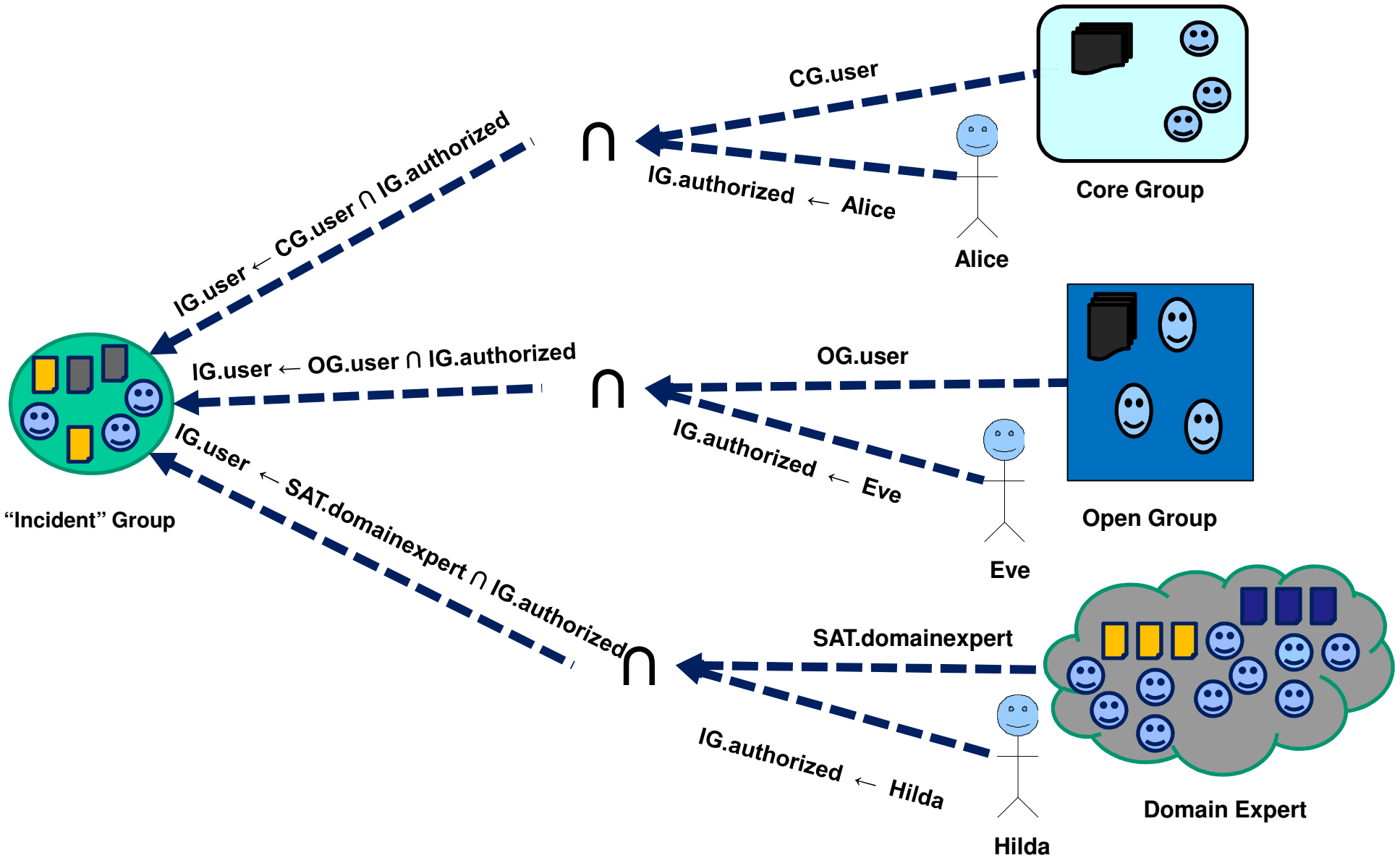
Membership Management (Core Group)



Membership Management (Open Group)



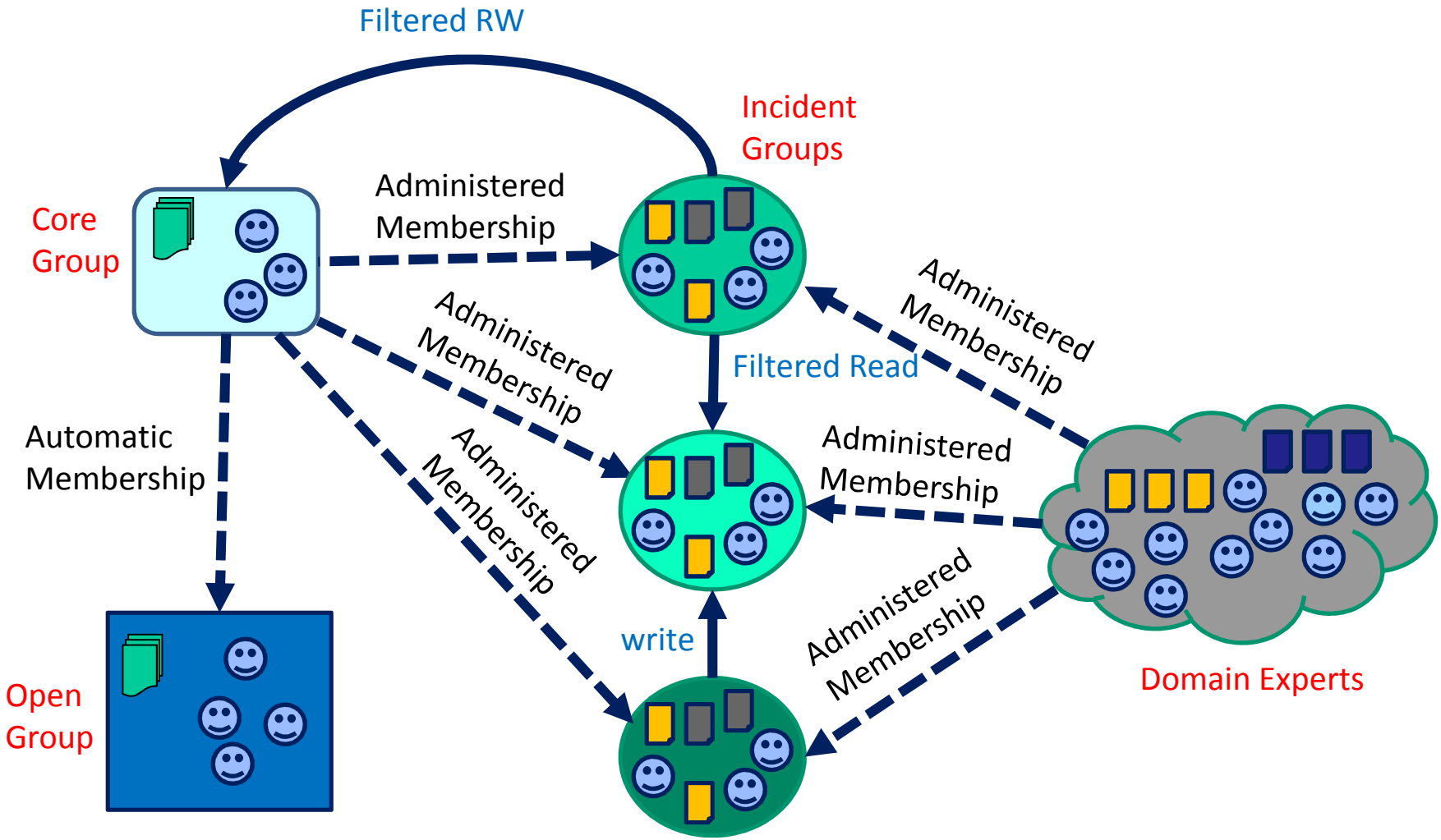
Membership Management (Incident Group)



Extended Features

- Single Document Releases to An Incident Group
  - Using RT_1 and RT_Θ
  - An incident group can request a particular document to core
  - Parameterized Role CG.read(?o) can read single object ?o upon approval from core
  - A CG.user can approve it if he is not an IG.user of that Incident group
- Delegation of Role Activation
  - Using RT^D

Community Cyber Security



Conclusion

- RT as an administrative model in this context

- Limitations of RT approach
  - Entity-Owned only membership
  - Reverse Credential Chains
  - Unable to Support Administration from an External Entity