

# Convergent Access Control to Enable Secure Smart Communities

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- Introduction
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## Smart Communities vs. Smart Cities



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Source: [https://www.nsf.gov/news/news\\_images.jsp?cntn\\_id=244863&org=NSF](https://www.nsf.gov/news/news_images.jsp?cntn_id=244863&org=NSF)

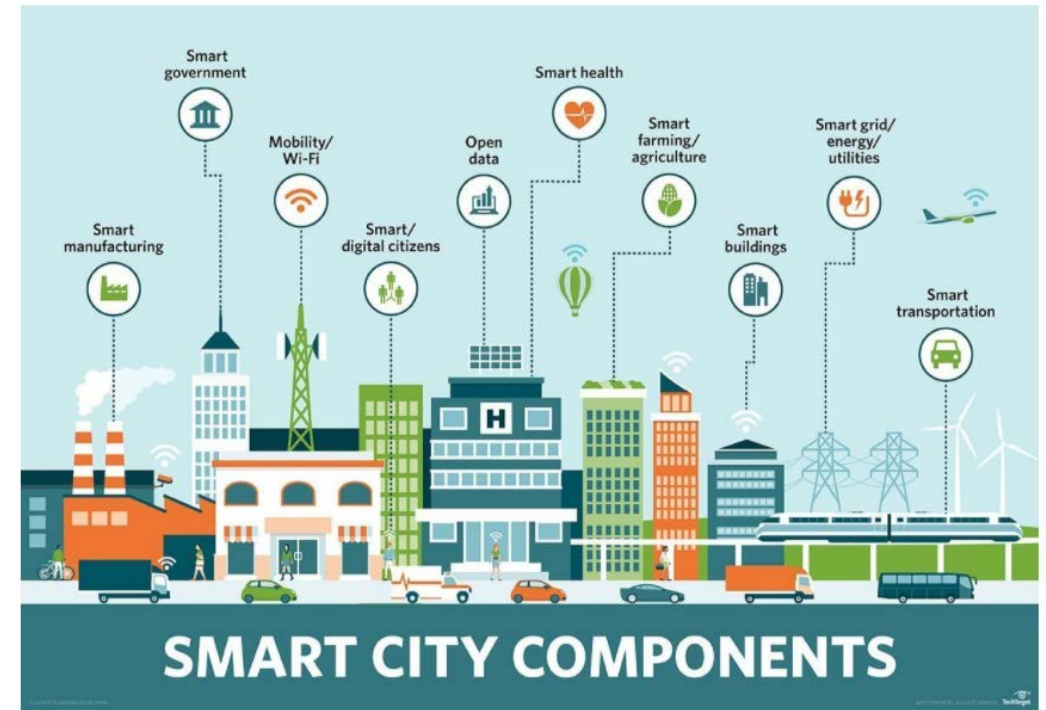
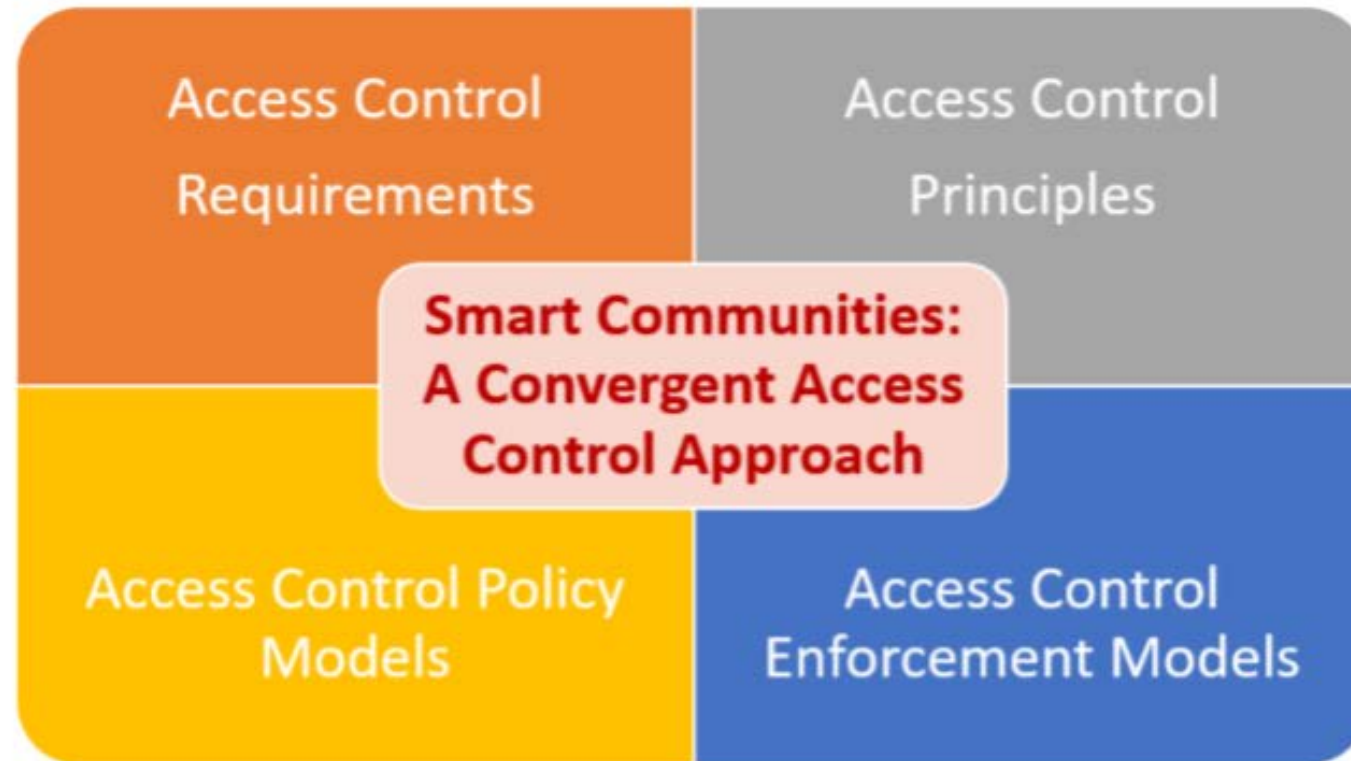


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Source: <https://johnenglander.net/will-smart-cities-save-us-from-rising-seas/>





- **Smart Communities** –

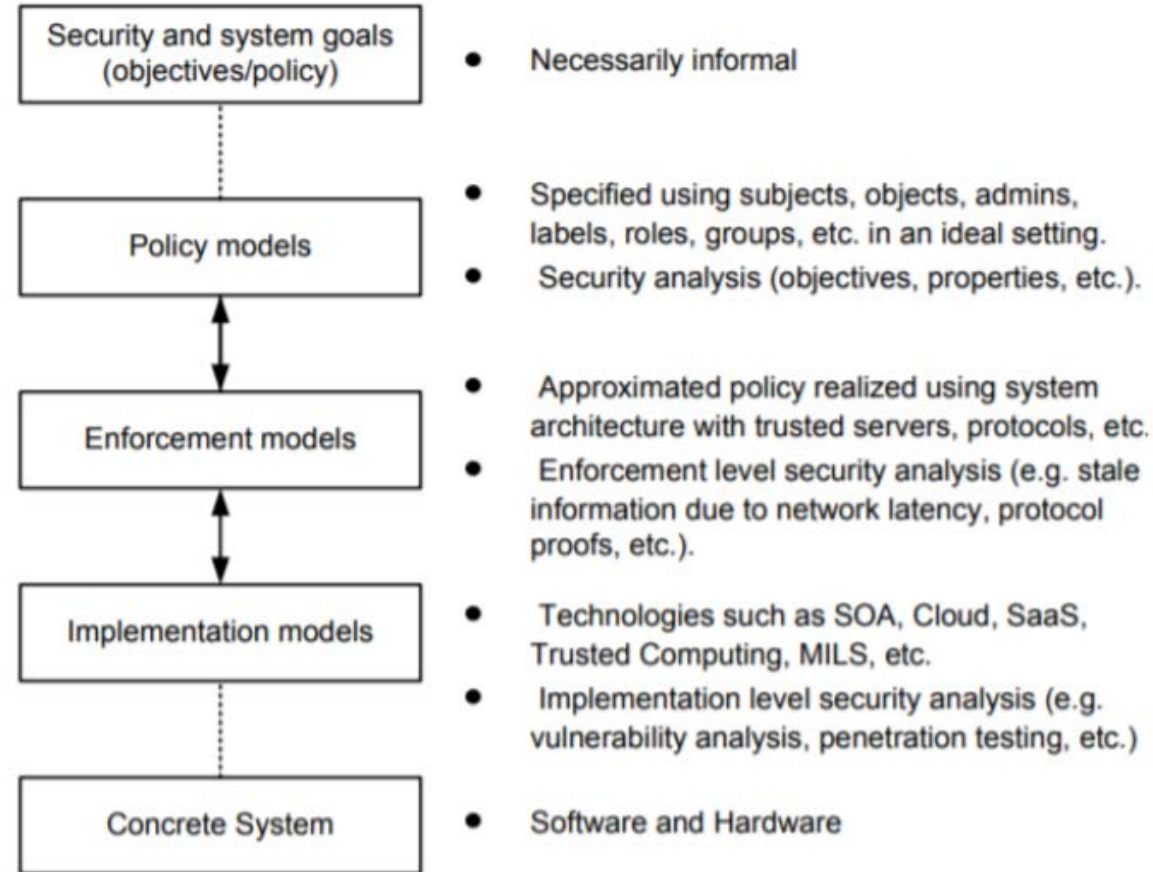
- *Smart Communities (SCs) are emerging today with the convergence of IoT, Cyber-Physical Systems (CPS), cloud and edge computing, and intelligent applications based on AI and ML (Machine Learning) technologies.*

- Several smart *application domains* within SCs

- Smart Health
- Smart Energy
- Smart Transportation and Autonomous Vehicles
- Smart Farming and Infrastructure
- ...



## The PEI (Policy, Enforcement, and Implementation) Framework

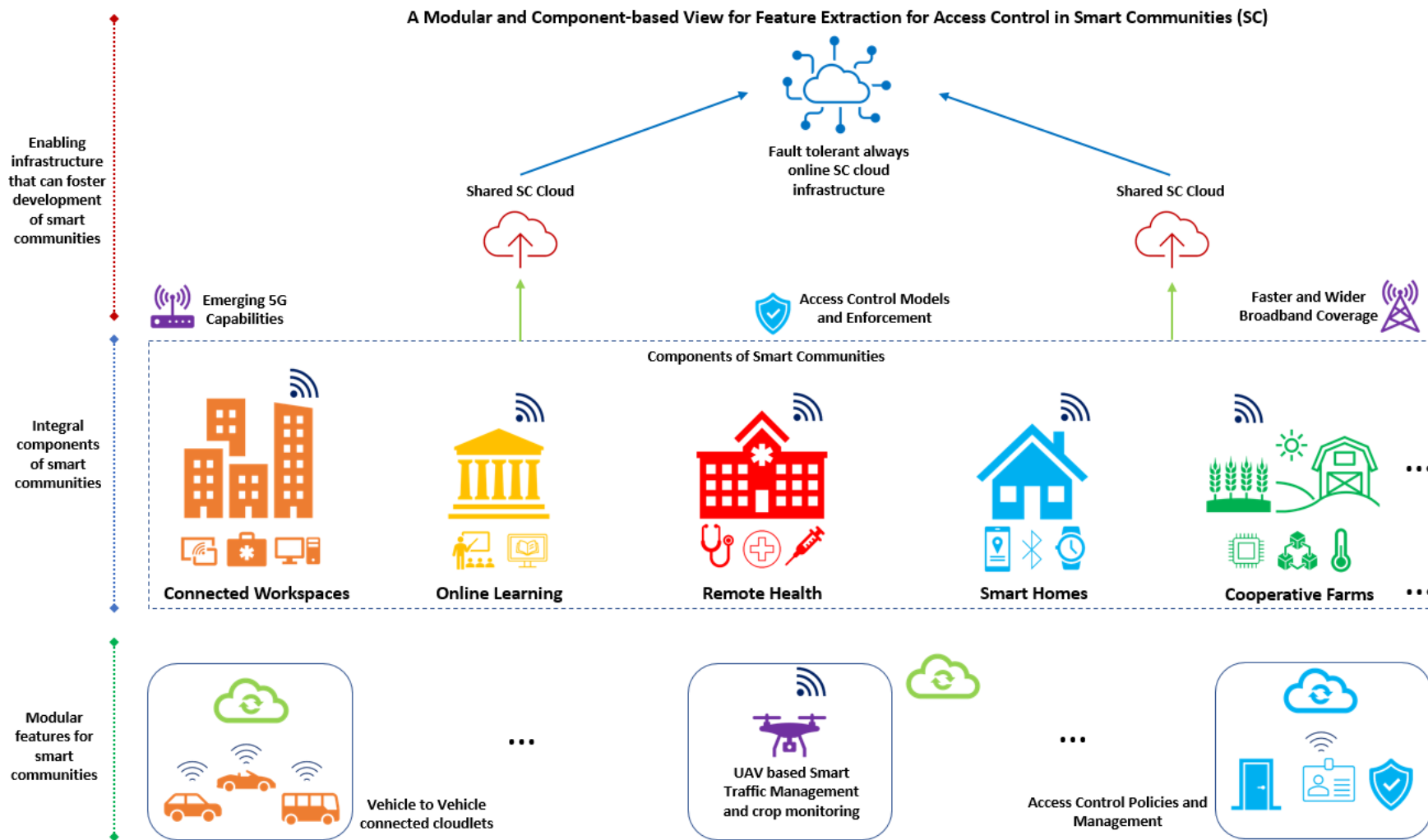


- **ASCAA** Principles for Next-Generation Role-Based Access Control
  - **Abstraction:** *abstract privileges*
  - **Separation:** *separation of operative and administrative functions*
  - **Containment:** *least privilege and usage control*
  - **Automation:** *automatic access control administration*
  - **Accountability:** *hold users accountable of their actions in cyberspace*

- **Next-generation connected Smart Communities** → high dynamic and distributed architectures with evolving access control requirements
  
- ❖ Essential Requirements for Access Control models for Smart Communities
  - *Dynamic Authorization*
  - *Flexibility*
  - *Scalability*
  - *Decentralization*
  - *Compliance*
  - *Light-Weight*
  - *Privacy-Preserving*



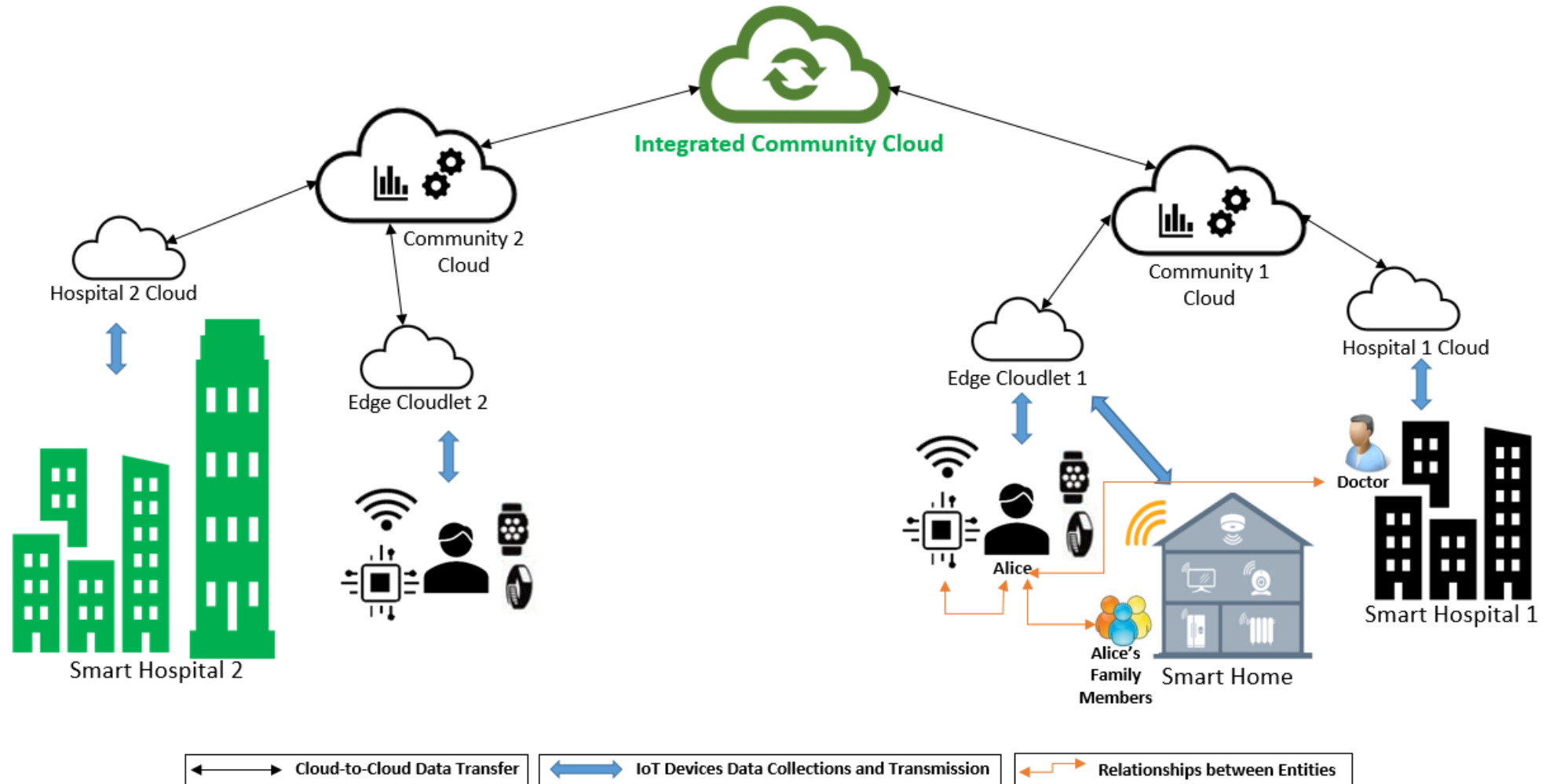
# Connected Smart Communities Vision



## ■ Access Control Principles for Next-generation connected Smart Communities

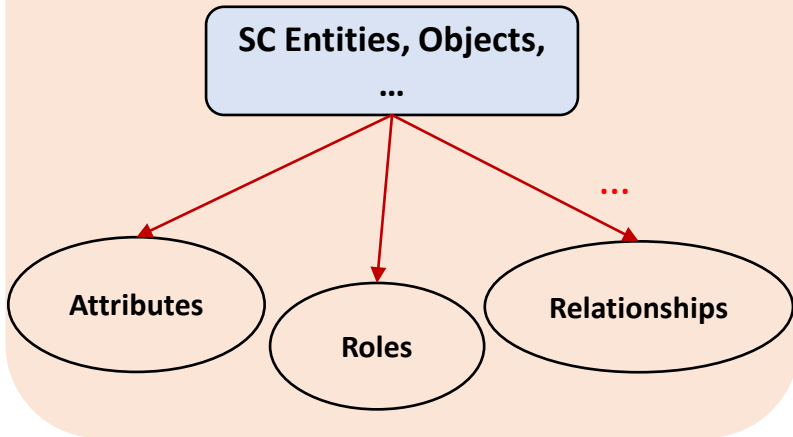
- *Some of these principles are adopted from ASCAA principles and revised in the context of SCs*

- ❖ **Abstraction:** *different types of entities access, and resources in various SC components*
- ❖ **Dynamic Separation:** *dynamic separations of admin and operational permissions for users*
- ❖ **Cooperation:** *trust and cooperation between several SC's entities in managing access*
- ❖ **Delegation:** *access delegation towards enabling autonomous environment*
- ❖ **Containment:** *incorporates least privilege and need to know to ensure secure cooperation*
- ❖ **Adaptability:** *allows to incorporate changes in different SC components, entities, and access*
- ❖ **Autonomous:** *to enable fully autonomous access control models once defined and deployed*
- ❖ **Accountability:** *similar to ASCAA, hold different parties accountable for their actions*



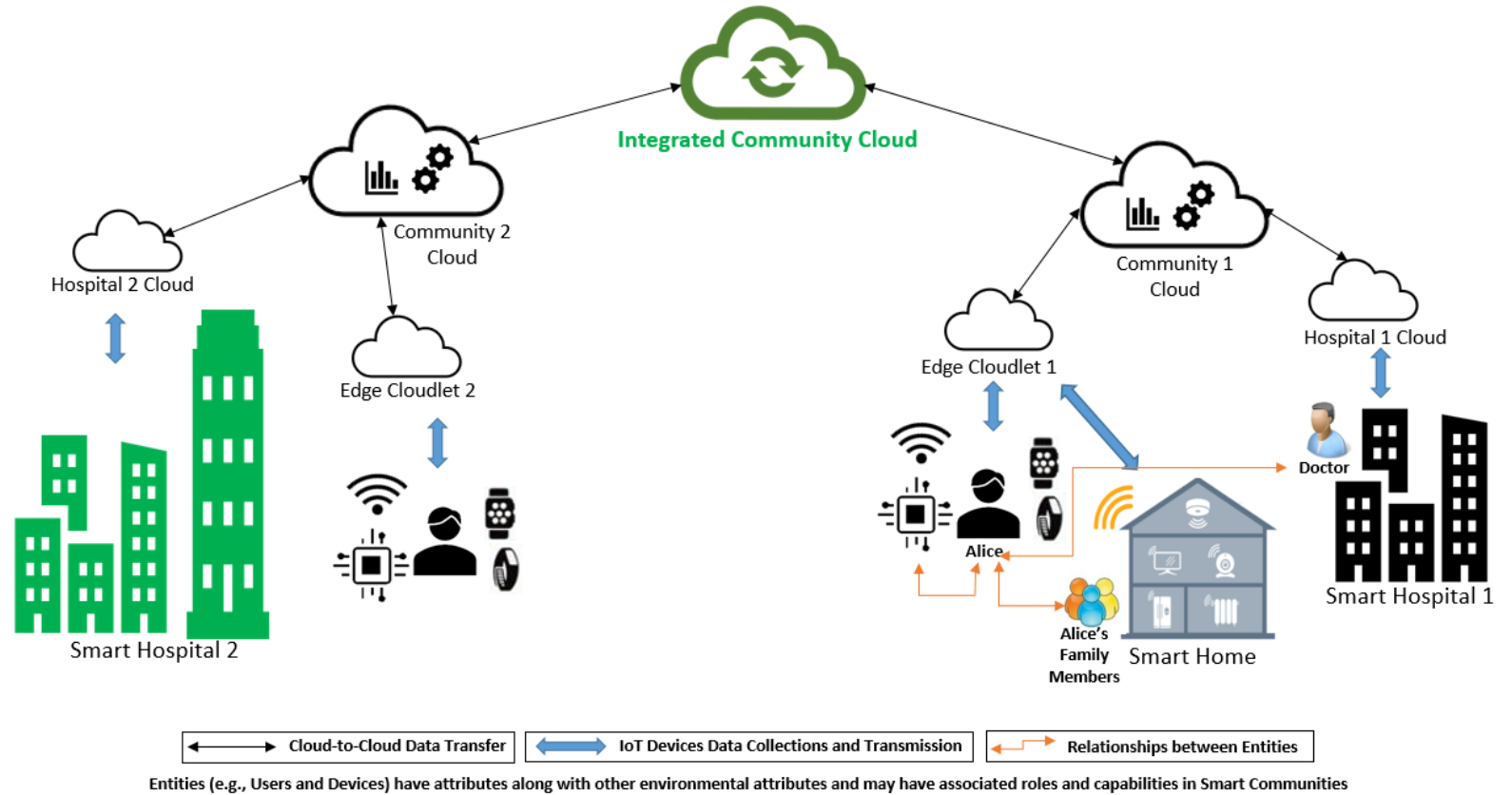
Entities (e.g., Users and Devices) have attributes along with other environmental attributes and may have associated roles and capabilities in Smart Communities

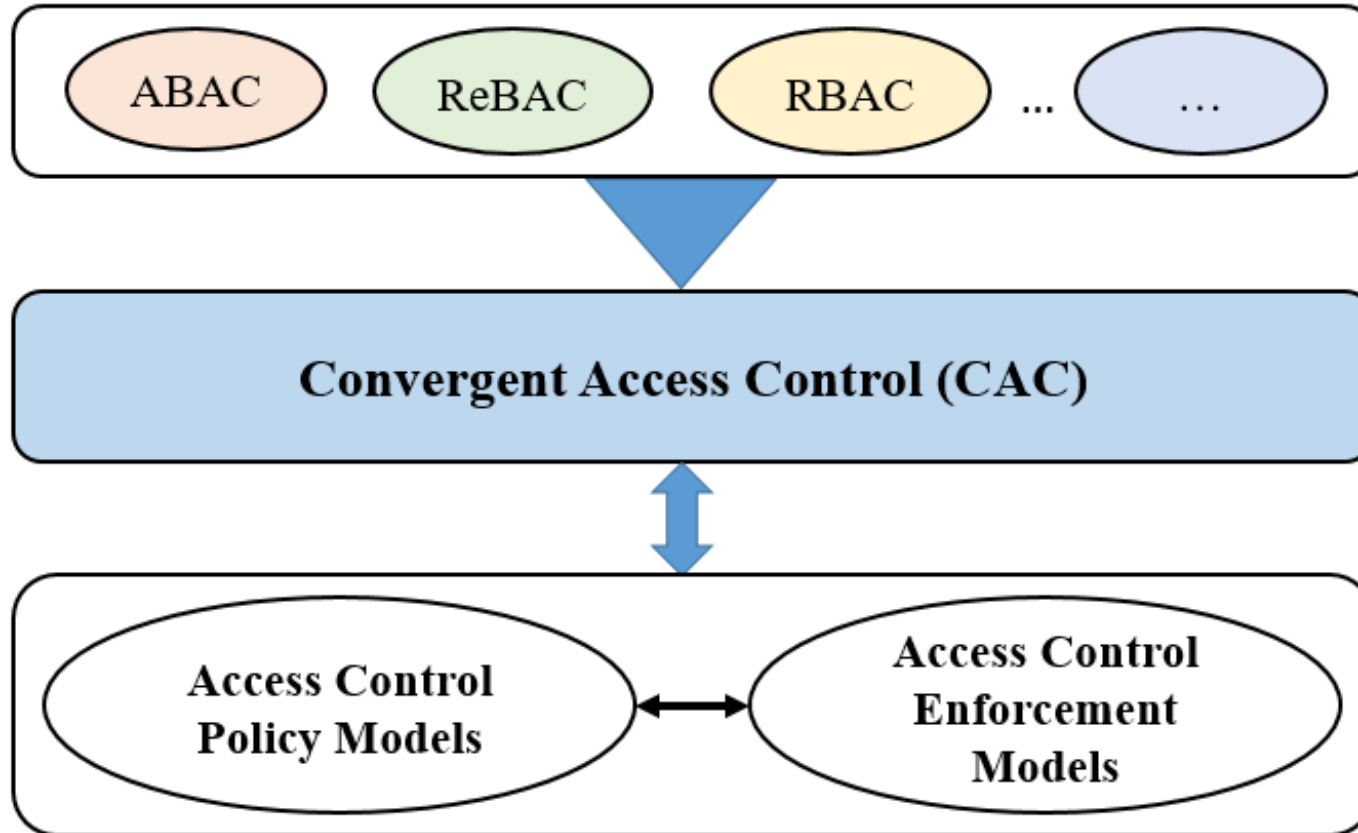
## SC Application Domain



How can we converge these access control features ?

How does access control requirements change as per different SC application domains?







- **Overarching Vision – Convergence of Access Control Models towards developing CAC Framework**
- **Future collaborative and interdisciplinary research efforts from research community**
  - Some future research directions --
    - **Suitability of Access Control Models and Systems**
    - **Hybrid Access Control Models**
    - **AI-Enabled Strategies for Access Control**
    - **Access Control Evaluation Frameworks**

## Questions?

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