

# Attribute-Based Access Control: Insights and Challenges

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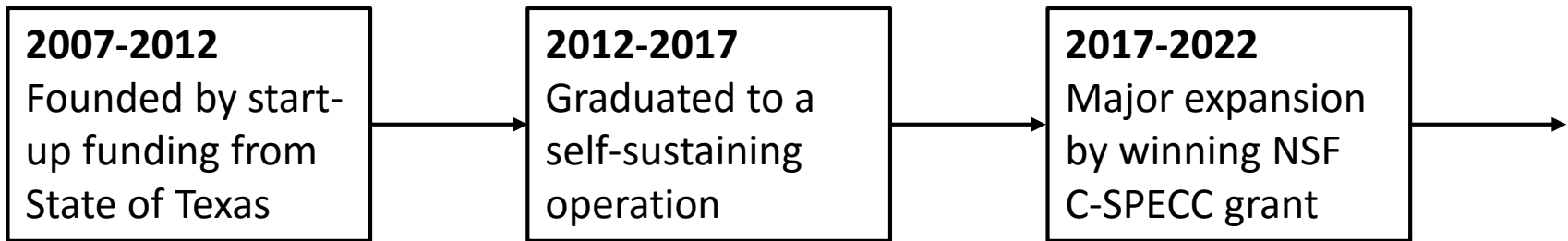
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## MISSION

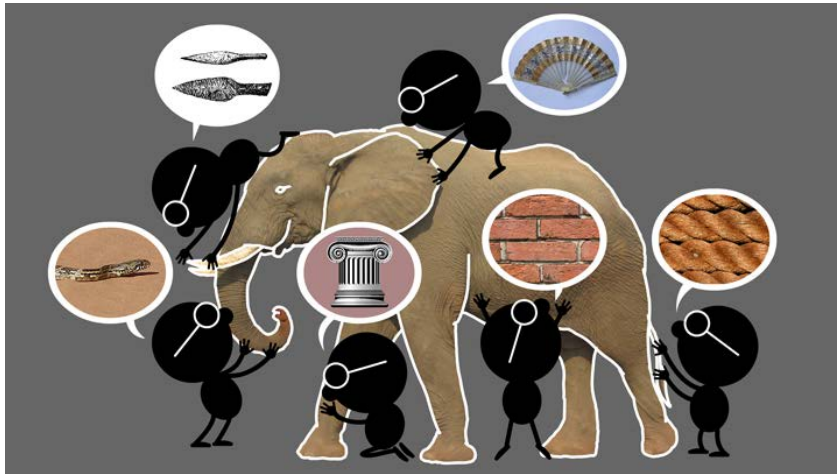
### Sustained excellence in graduate-level sponsored research



- Situated in the College of Science, Department of Computer Science
- Established world class laboratories for:  
Secure cloud computing and Malware research

**In collaboration with:**  
College of Engineering  
College of Business  
College of Education  
Open Cloud Institute  
Cyber Center for Security & Analytics

## Elephant Problem



## Cyber-Elephant Problem



**The cyber-elephant problem requires Applied and Basic research Combined (ABC)**

\* The New ABCs of Research, Ben Schneiderman, 2016

## SECURITY TECHNOLOGIES

- Access Control
- Policy
- Malware
- Detection and Forensics
- Security Dynamics

## APPLICATION DOMAINS

- Cloud Computing
- Internet of Things (IoT)
- Social Networks
- Enterprise

**Goal: Broaden and Deepen**

## Objectives

POLICY

ATTACKS

Enable  
↕  
Enforce

What?

Why?

Respond  
↕  
Defend

## Mechanisms

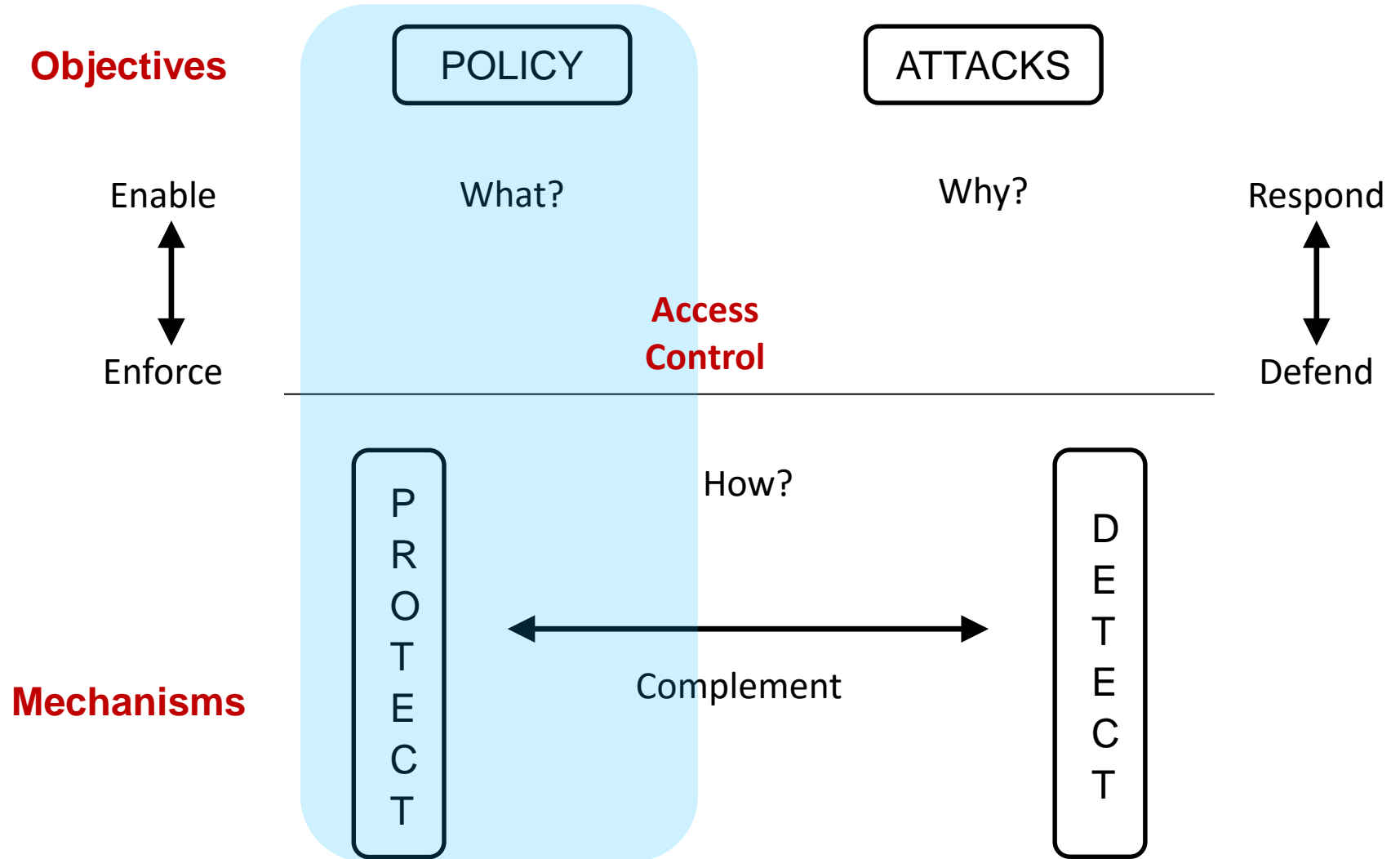
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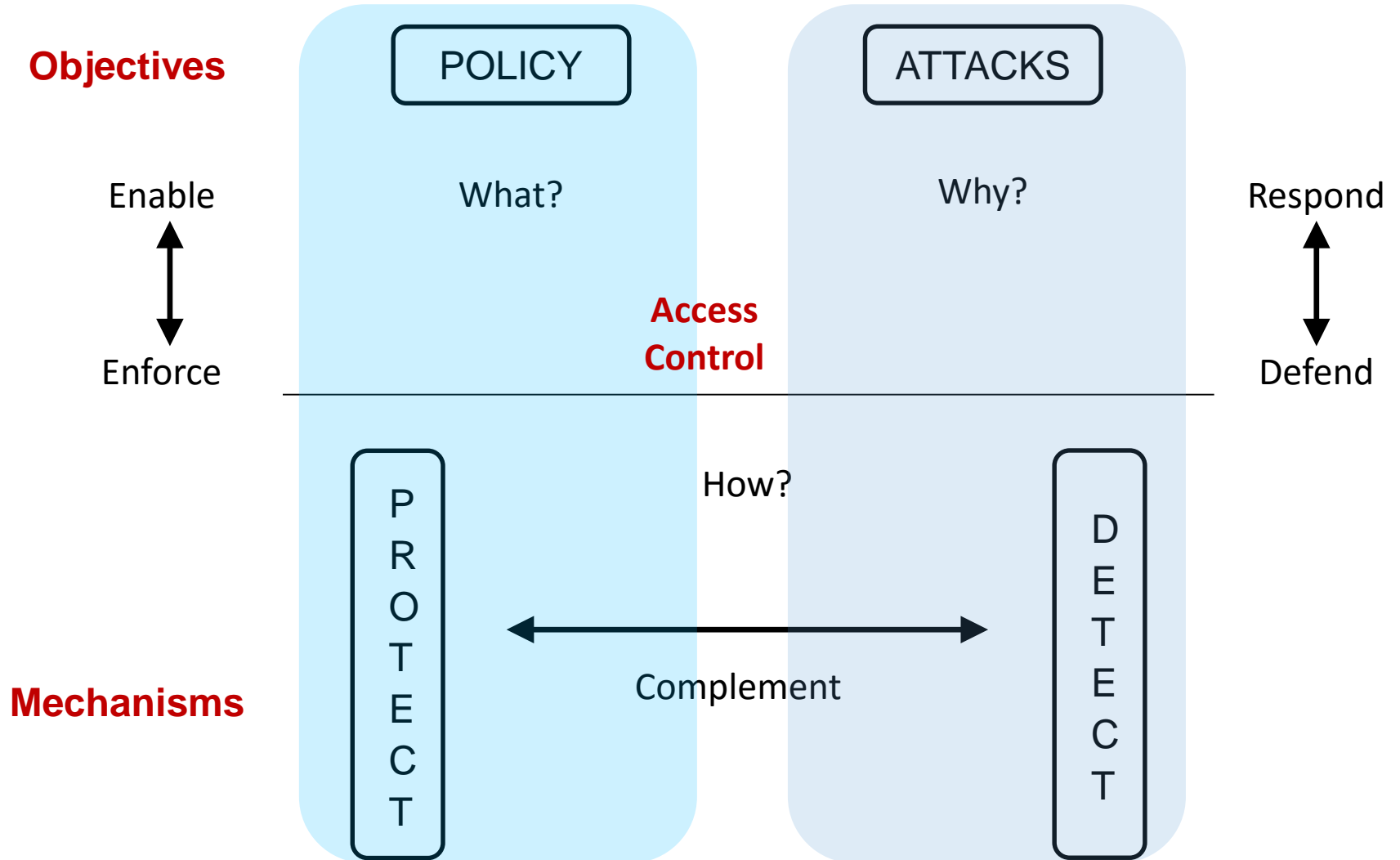
How?

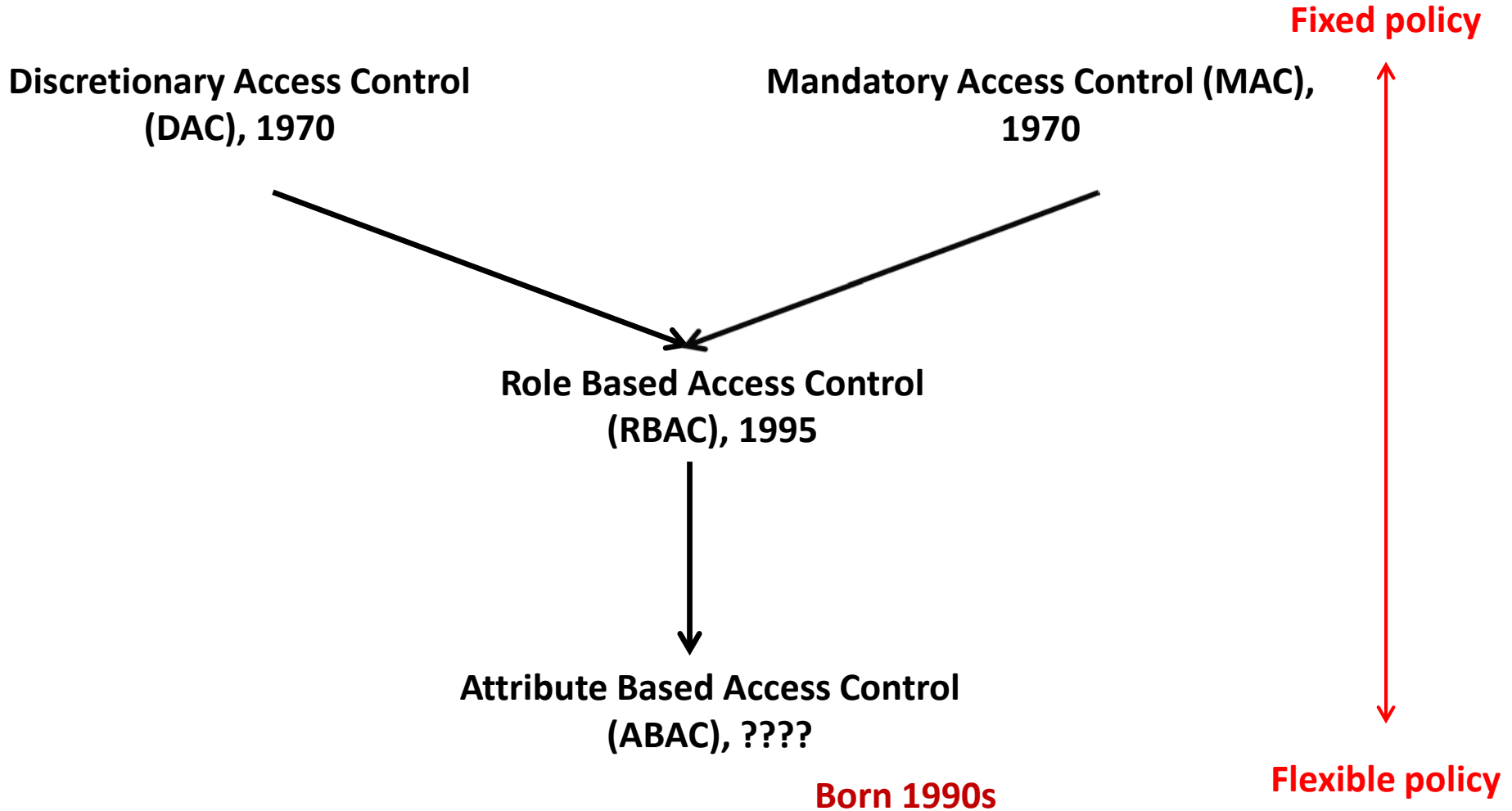
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Complement









7. ABAC Design, Engineering and Applications

5. ABAC Policy  
Architectures  
and Languages

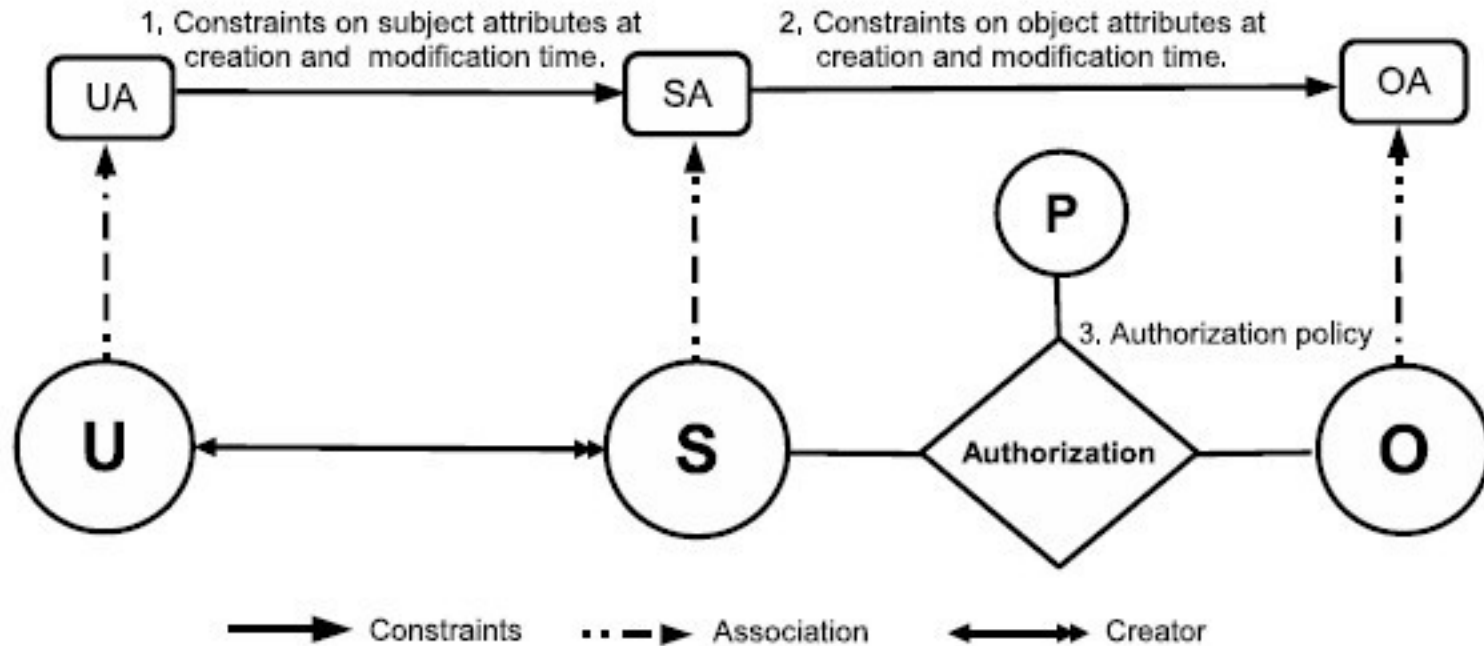
3. Administrative  
ABAC Models

4. Extended  
ABAC Models

6. ABAC  
Enforcement  
Architectures

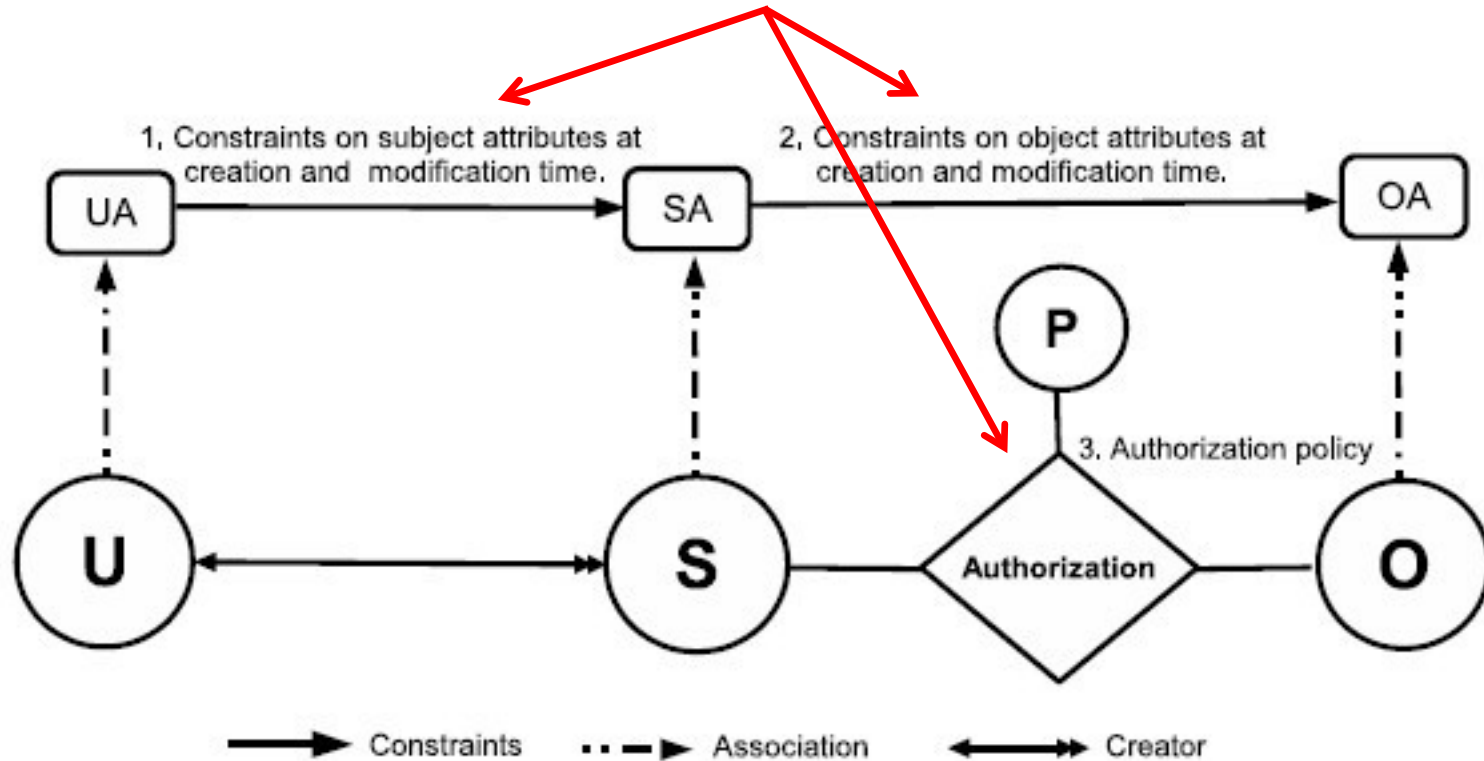
2. Core ABAC Models

1. Foundational Principles and Theory

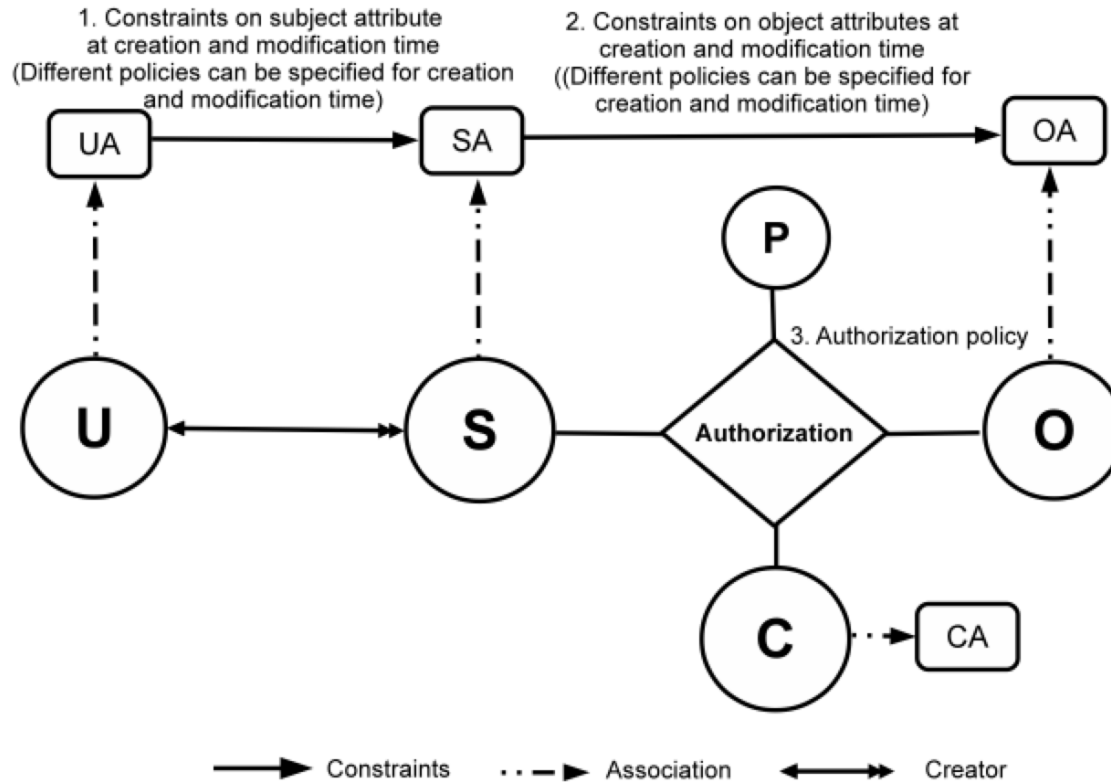


**Can be configured to do simple forms of DAC,  
MAC, RBAC (Jin, Krishnan, Sandhu 2012)**

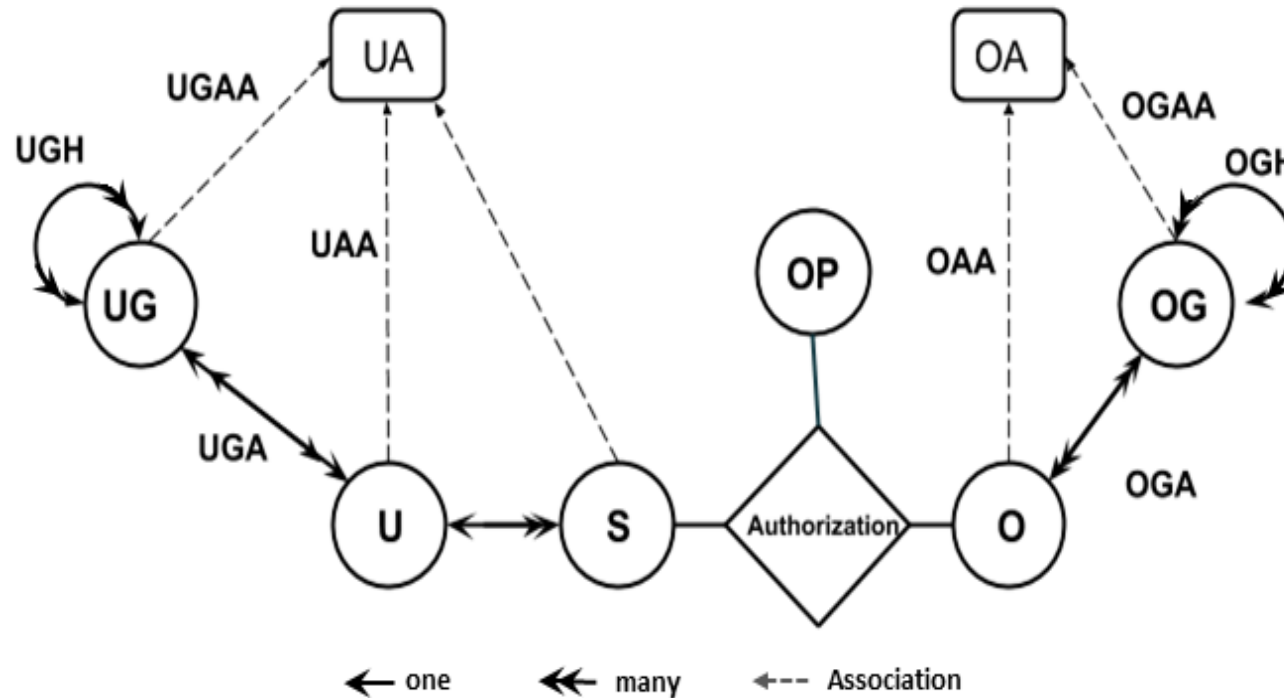
**Policy Configuration Points**



**Can be configured to do simple forms of DAC,  
MAC, RBAC (Jin, Krishnan, Sandhu 2012)**



**Can further be configured to do many RBAC extensions (Jin, Krishnan, Sandhu 2014)**

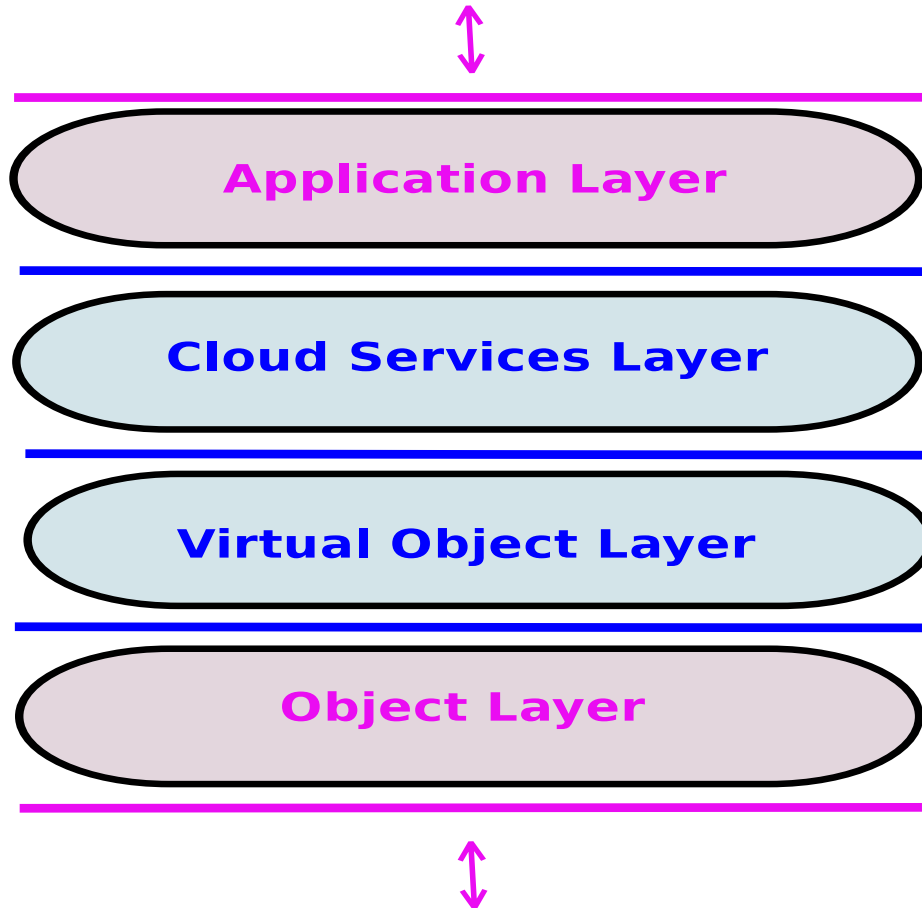


➤ Hierarchical Group and Attribute Based Access Control (HGABAC)

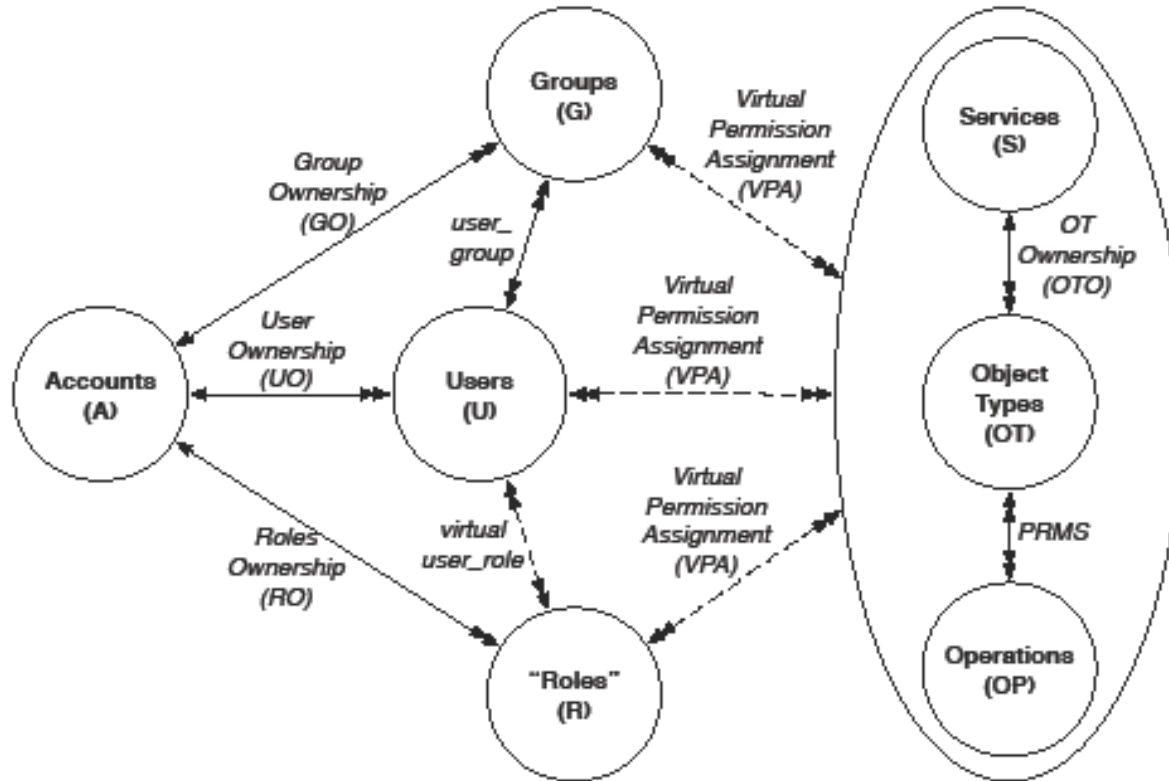
- ❖ Introduces User and Object Groups
- ❖ Simplifies administration of attributes

Servos and Osborn, 2015

## User and Administrator Interaction



Alsheri, Bhatt, Patwa,  
Benson, Sandhu  
2016 onwards



\* 7. ABAC Design, Engineering and Applications

\*  
5. ABAC Policy  
Architectures  
and Languages

3. Administrative  
\* ABAC Models

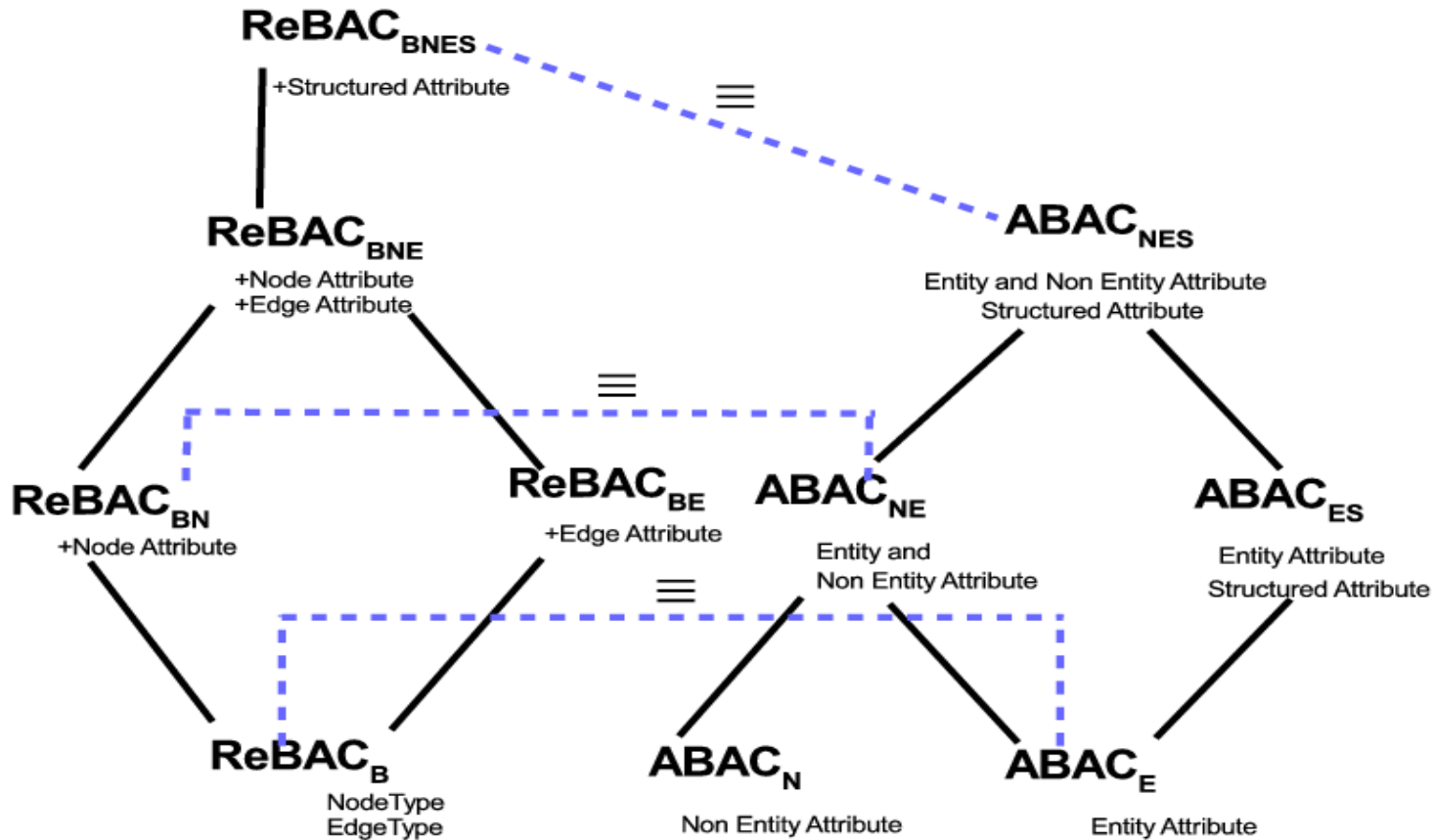
4. Extended  
ABAC Models

\* 2. Core ABAC Models

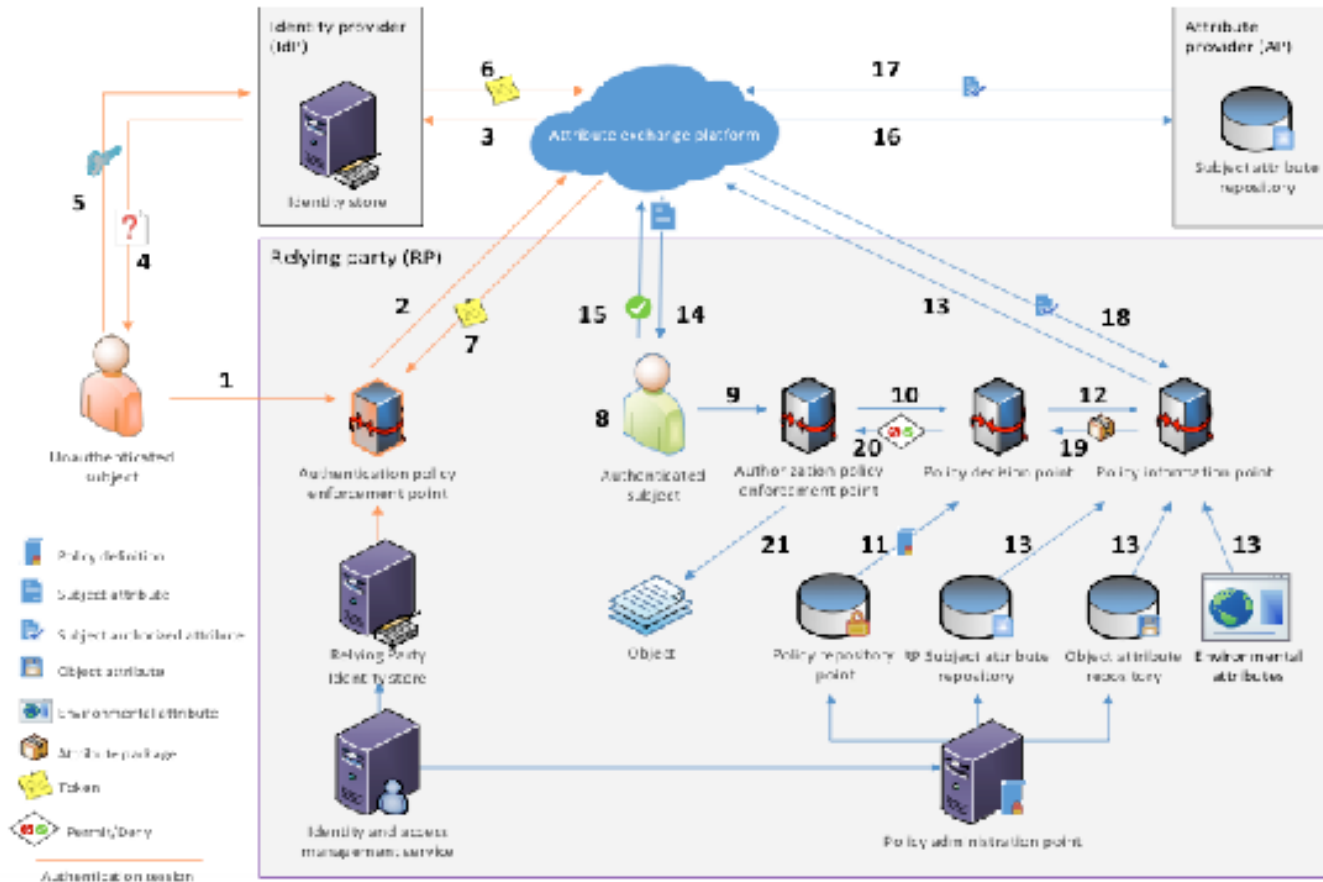
6. ABAC  
Enforcement  
Architectures

1. Foundational Principles and Theory





**ReBAC and ABAC are not that different  
(Tahmina, Sandhu 2017)**



Fisher 2015  
NCCOE, NIST, Building Block

**Discretionary Access Control  
(DAC), 1970**

**Mandatory Access Control (MAC),  
1970**

**Role Based Access Control  
(RBAC), 1995**

**Attribute Based Access Control  
(ABAC), ????**

Can subject *s* obtain a  
right *r* on object *o*?  
❖ Current state?  
❖ Some future state?

**Safety  
Complexity**

Ahmed, Rajkumar, Sandhu  
2016 onwards