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Efficient Implementation of Entity On-Boarding and Authentication in Zero-Trust Systems

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OVERVIEW

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   - Digital Certificate
2. **PROPOSED WORK**
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   - Certificate Generation
   - User Registration in Zero-Trust Network
   - User Authentication using Public Key Infrastructure in Zero-Trust network
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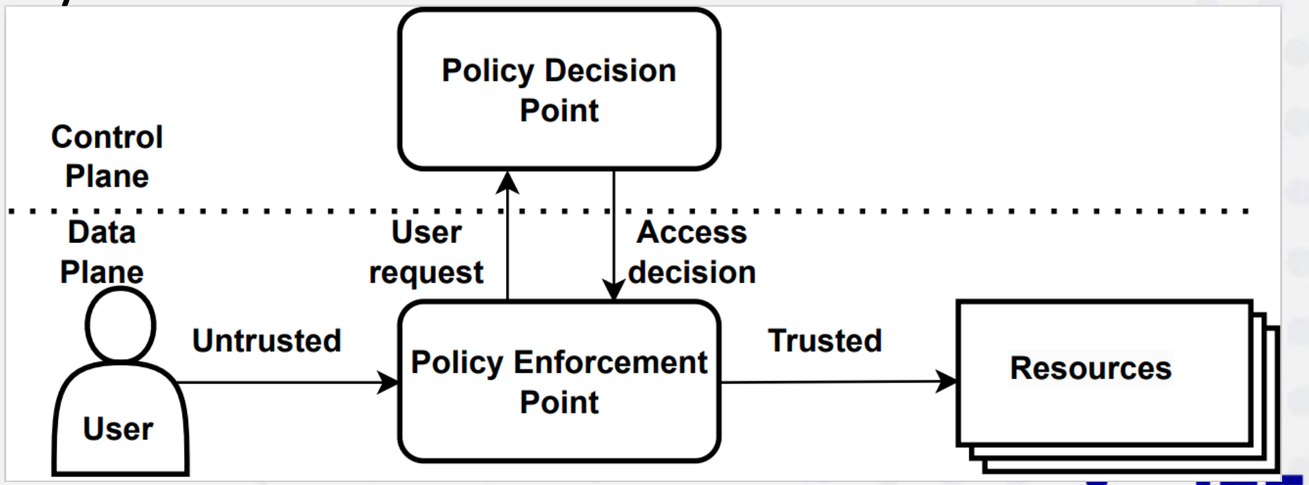
INTRODUCTION

Zero-Trust Architecture (ZTA)

- ZTA based on a security model which is proactive dynamic and real-time security model
- It does not trust any entity by default
- The traditional security model trust the insider object by default
- National Institute of Standards and Technology (NIST) give the concept of ZTA
- ZTA is different from traditional security architecture



[A Logical View of ZTA [1]]

Public Key Infrastructure (PKI)

- Provide a framework
- Manage digital keys and certificates [3]
- Secure the communications over the network [2]
- Verify identities of entities over the network

Key components of PKI:

1. **Public and Private Keys:** Use for encryption [2]
2. **Certificate Authority (CA):** Validate user's identity, generate and manage digital certificates [2]
3. **Registration Authority (RA):** Intermediary between entities and the CA [2]
4. **Certificate Repository:** Stores and manages digital certificates [3]
5. **Certificate Revocation List Distribution Unit:** Check validity of certificates [3]
6. **Key Management System :** Generates, stores, and manage keys [3]

Digital Certificate

- Ensure the authenticity of the entities

Digital Certificate

- **Owner's Name**
- **Validity Period**
- **Issuing CA**
- **Owner's Public Key**
- **Digital Signature of CA**

PROPOSED WORK
Generation of Self-Signed Certificate Authority

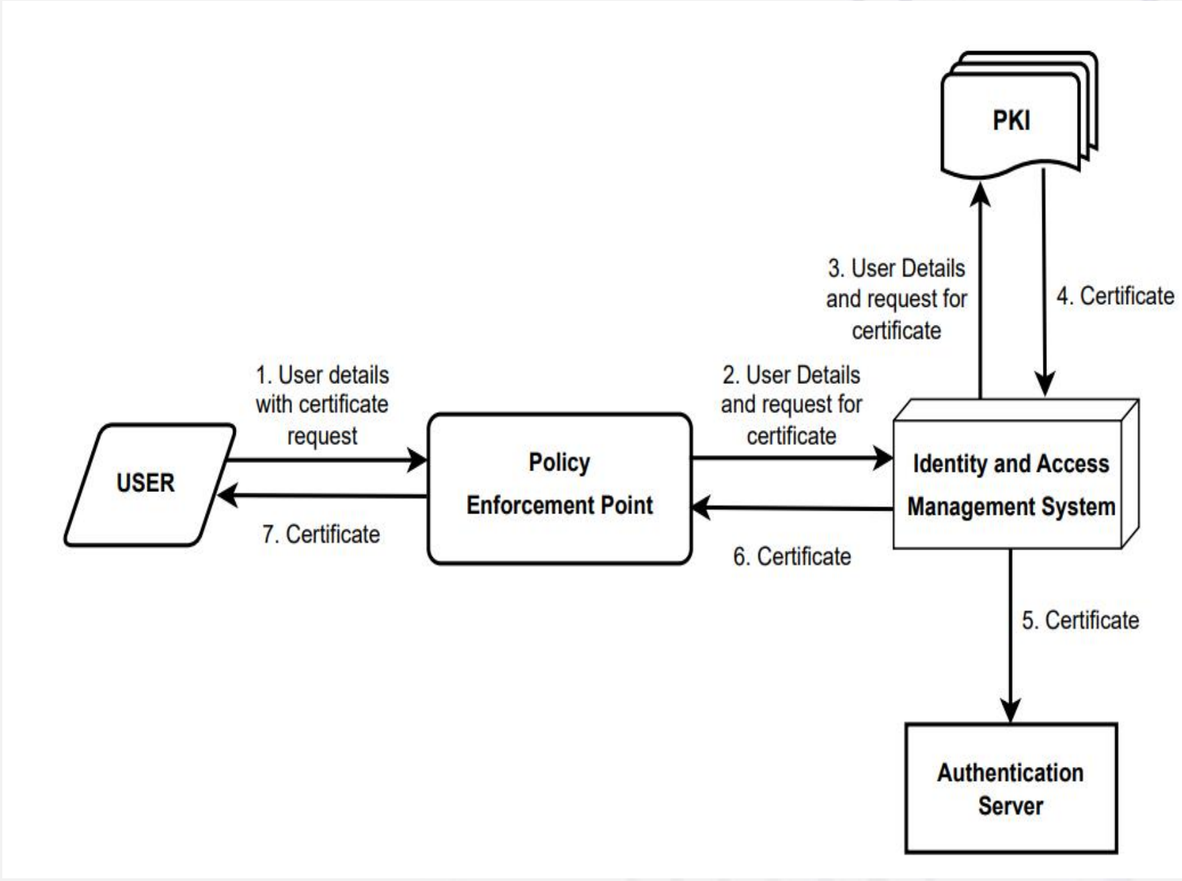
- Use of Open Source Secure Sockets Layer (OpenSSL) tool
- Generation of the private and public key of the CA
- Command to generate private key: **openssl genpkey -algorithm RSA-out ca.key -aes256**
- Generation of self-signed certificate for CA
- Certificate is valid for 365 days

Certificate Generation

- User generates private-public key pair using Rivest-Shamir-Adleman (RSA) algorithm
- User creates a Certificate Signing Request (CSR) including its public key and identity information
- Command to generate CSR: **openssl req -new -key client.key -out client.csr**
- CSR is provided to the CA
- Then CA checks the user details and publish the certificate

User Registration in Zero-Trust network

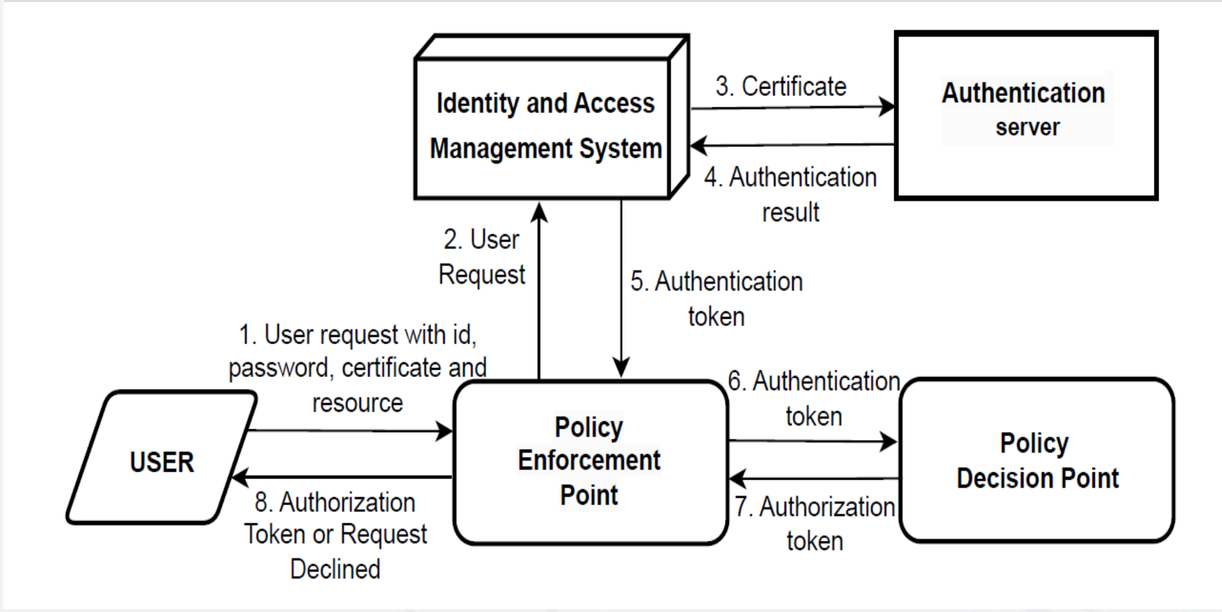
- Policy Enforcement Point (PEP) provides the user request to the Identity and Access Management System (IAMS)
- The IAMS verifies the user information
- IAMS forwards the certificate request to the PKI of the verified user and stores the user information in its database
- PKI generates the certificate and provide it to the IAMS
- AIMS forwards the certificates to the authentication server and the user



[The proposed model for user registration in the zero-trust network]

User Authentication and Authorization using Public Key Infrastructure in Zero-Trust Network

- PEP is the gateway between user and resource
- It forwards the user's request data to the AIMS
- AIMS sends the user's certificate to the authentication server
- The authentication server verifies the digital certificate and informs the result to the AIMS
- Upon successful authentication, the AIMS sends the authentication token to the PEP
- PEP forwards the authentication token to the Policy Decision Point (PDP)
- PDP take access decision through PE and sends authorization token to PEP
- Based on the authorization token PEP allow or deny the user to access the resource



[Proposed model for user authentication and authorization in zero-trust network]

CONCLUSION

- The zero-trust model ensures robust authentication
- The requesting entity in the zero-trust system must be authenticated
- The digital certificate validate the identity during the authentication process
- Generation of a self-signed CA
- Generation of digital certificate by the CA in the zero-trust enterprise systems during user registration
- Authentication performed by the PEP using IAMS integrated with the authentication server

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