Hierarchical Architecture for Mobile Object Authentication in the Context of IoT Smart Cities

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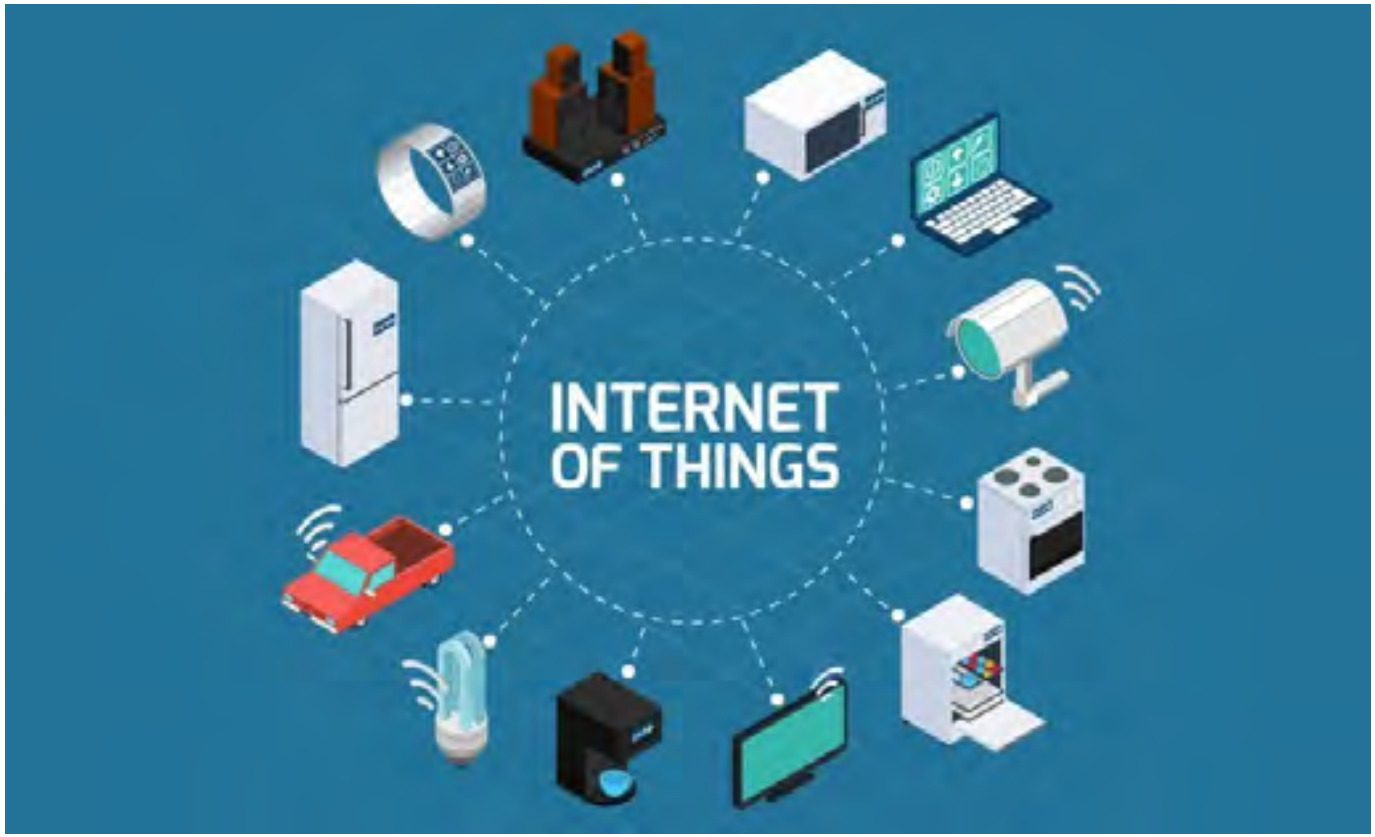
Internet of Things (IoT)

- The Internet of Things (IoT) describe a network of physical objects that are connected and are used to collect and share data.

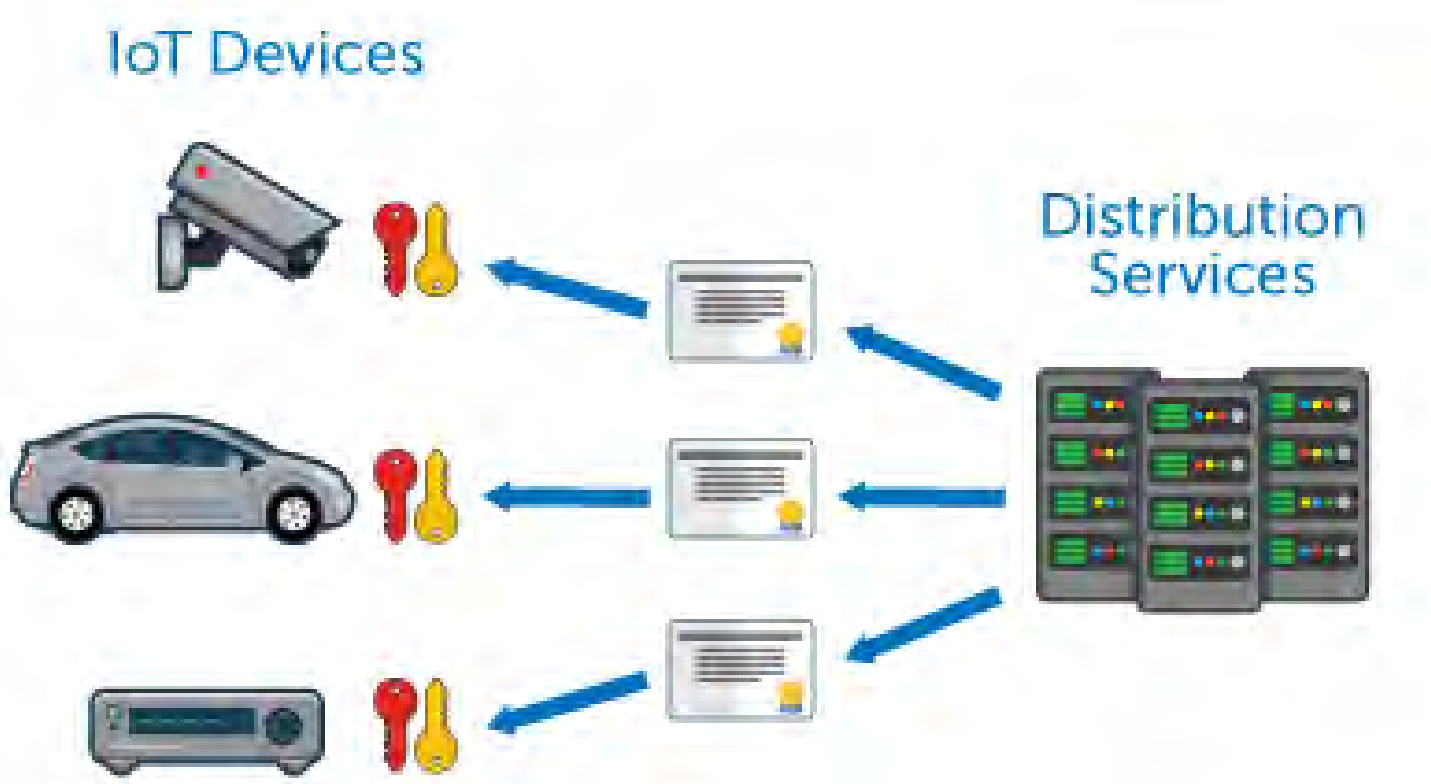


Smart Cities

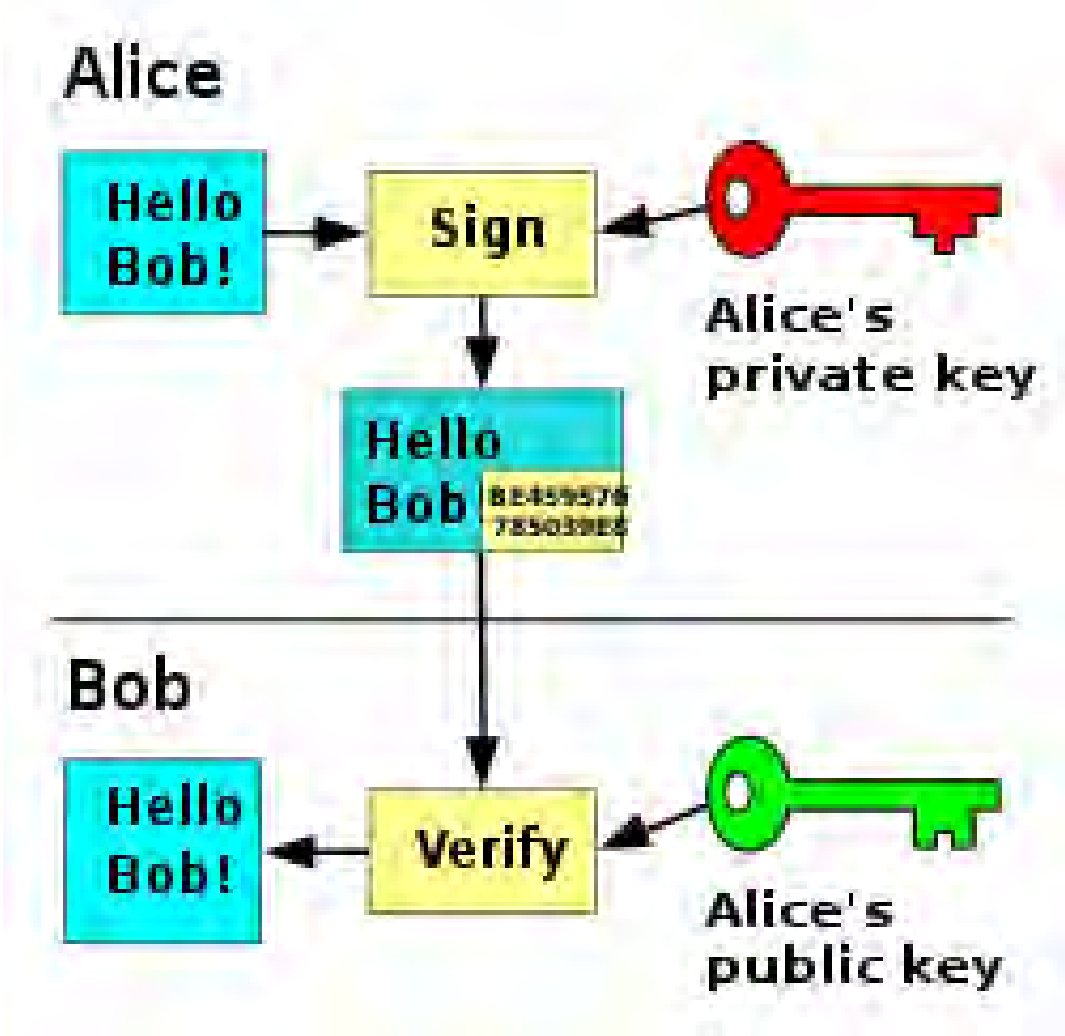
- Smart cities are built by the integration of several smart systems and technologies, such as smart sensor networks, smart meters, smart grids, smart homes, and smart vehicular networks.

Authentication

- Is the method of proving the identity of a user.
- One way to prove authenticate user is by using digital signature.

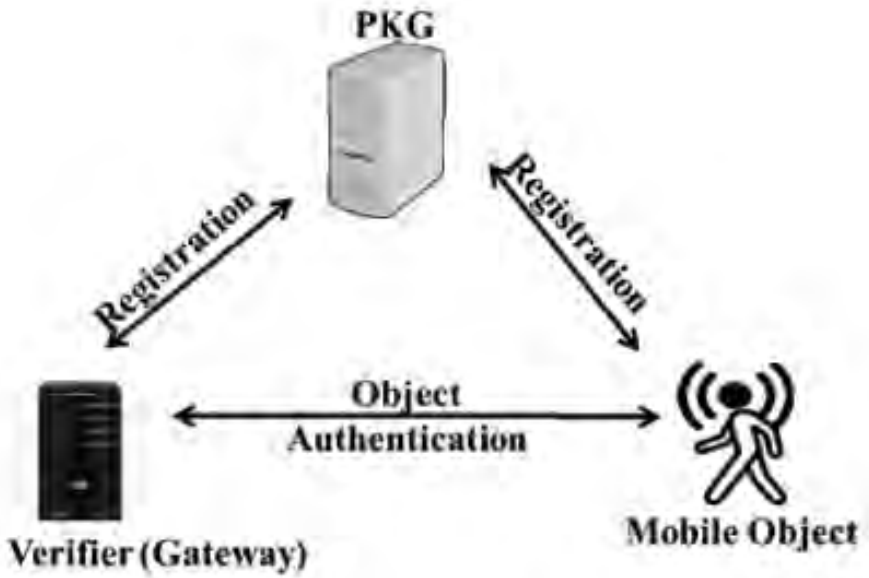


Public Key Cryptography



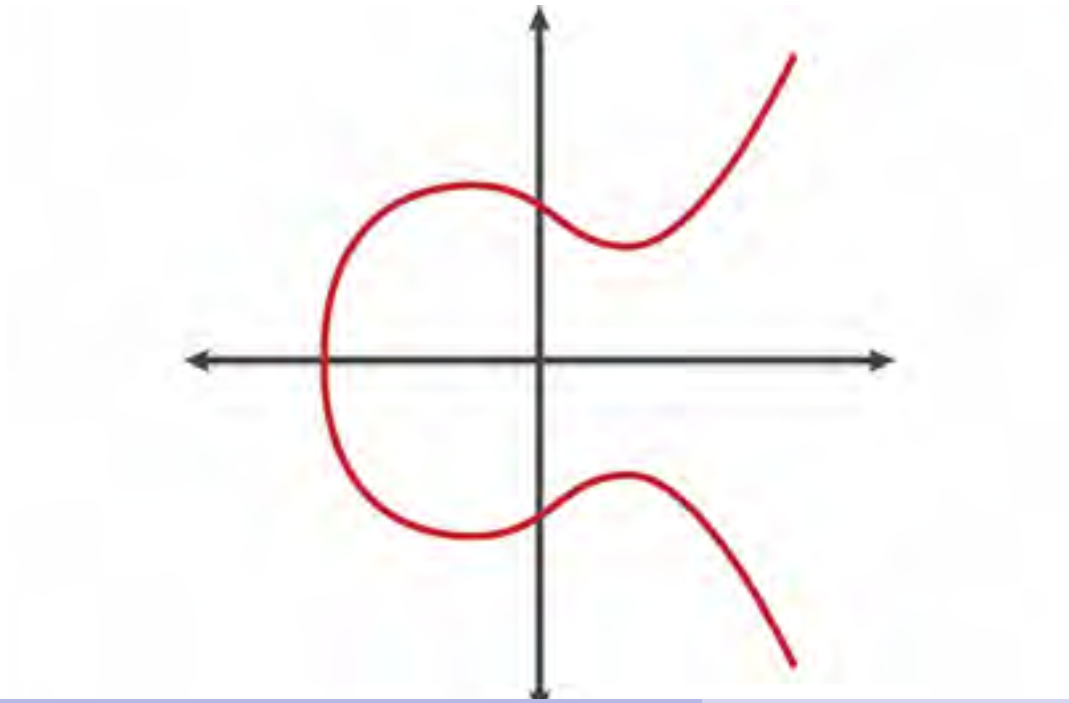
Identity-Based Signatures

- It is a type of public key cryptography.
- The public key is the identity of the user.
- The corresponding private key is issued by a trusted public key generator (PKG)



Elliptic Curve Cryptography

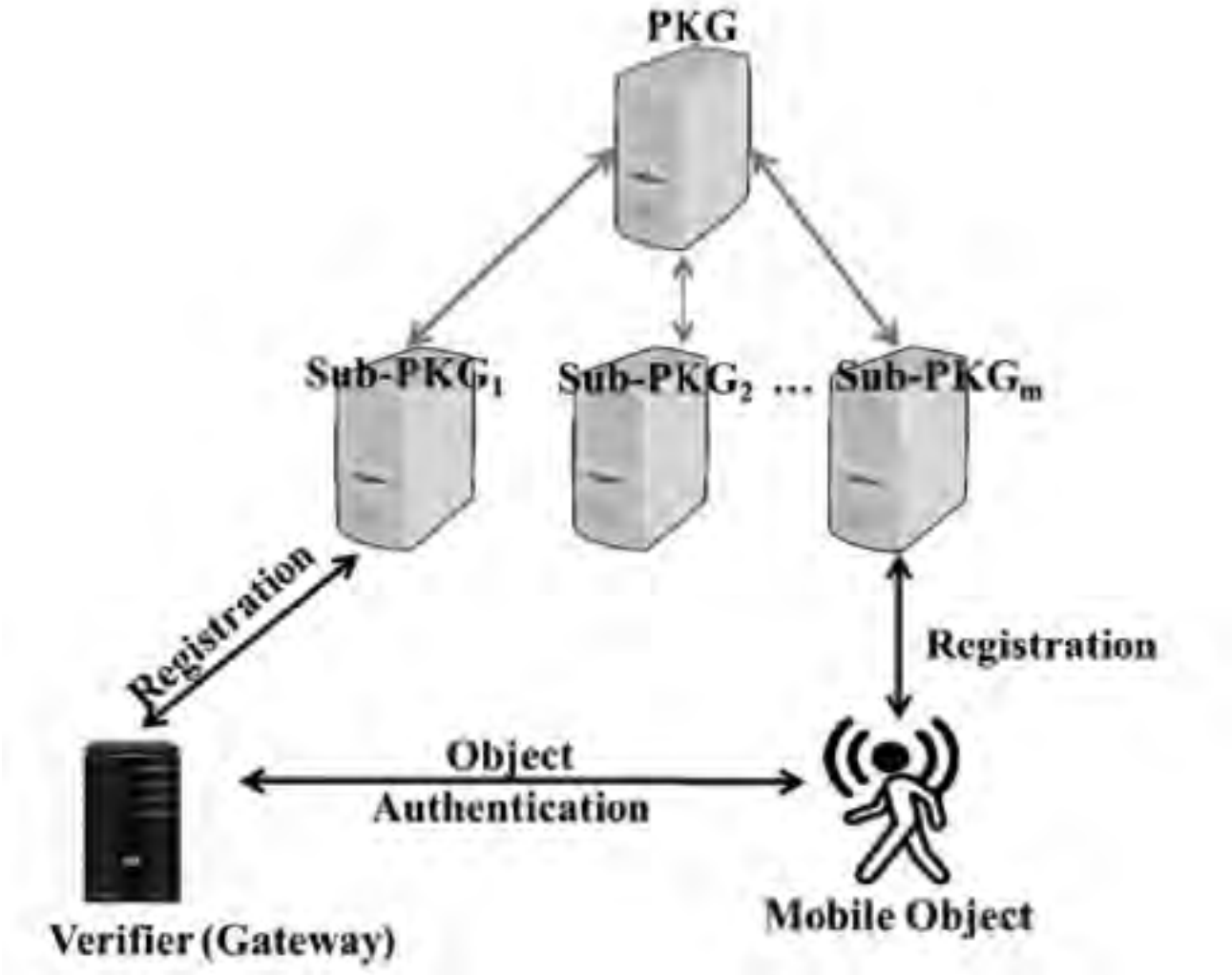
- It is an approach to public key cryptography.
- It is based on the algebraic structure of elliptic curves over finite fields.
- It allows smaller keys



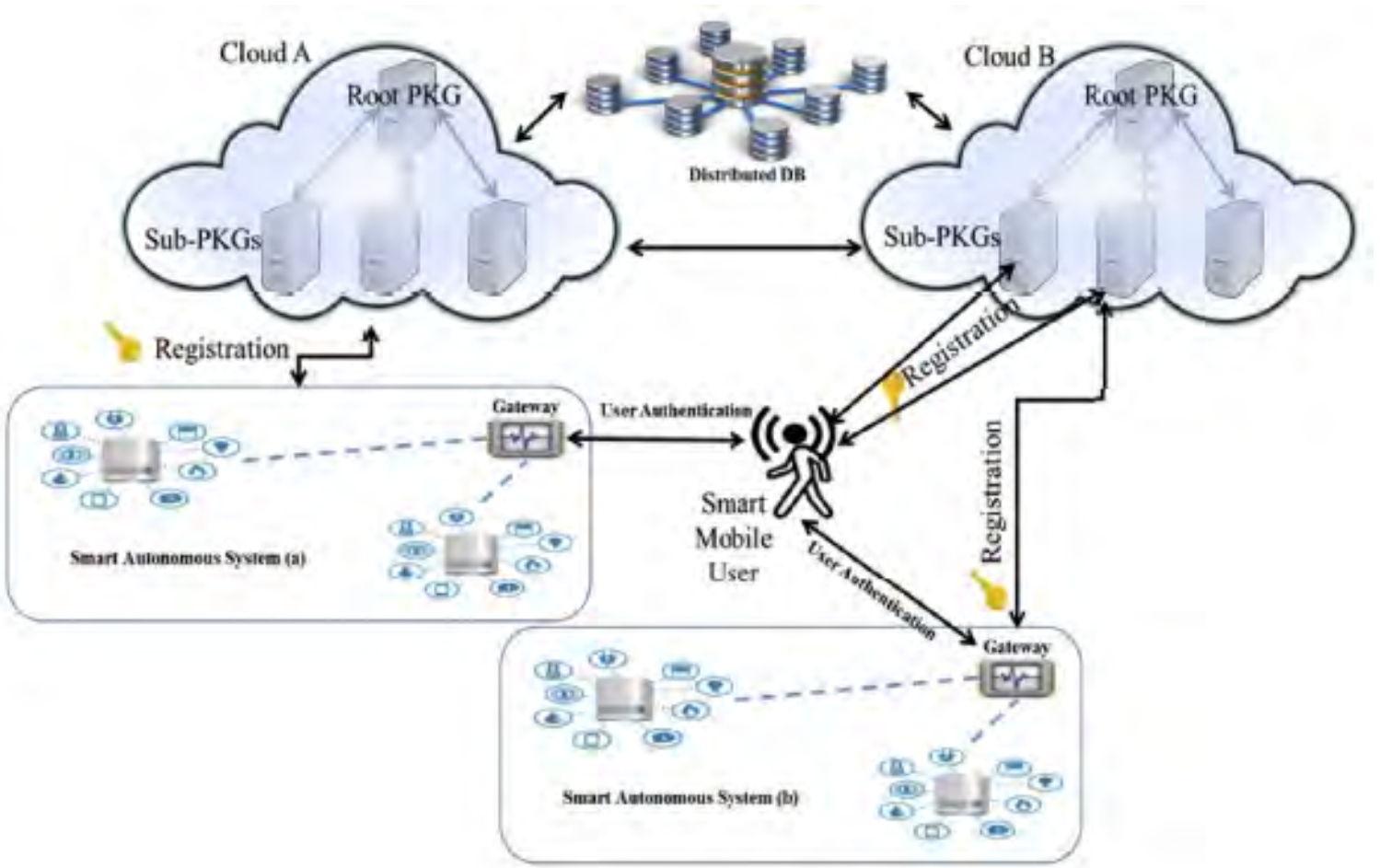
Challenges

- Scalability of IoT with large number of objects which are all connected together.
- Heterogeneity of the various objects, networks, and domains that already exist or expected to exist in the future.
- Mobility by allowing some objects to move between different networks while they still need to be authenticated in order to access resources that exist in these networks.
- Limited capabilities, such as storage and processing capabilities, of IoT constrained devices.

The Hierarchical Architecture

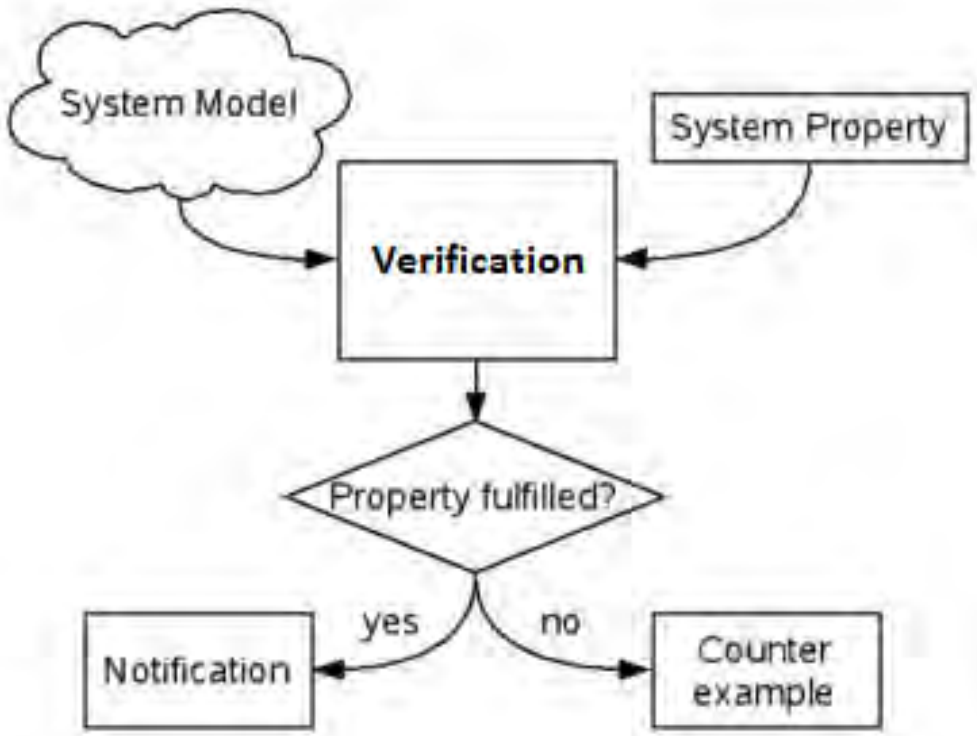


Generalized Hierarchical Architecture



Protocol Verification

- BAN logic is used to analyze the security of authentication protocols.



Security Analysis

- An adversary cannot compute the private key from the public information
- An adversary cannot link two previously sent signatures in order to calculate the private key.
- The proposed IBS protocol is safe against replay attack.
- The proposed IBS protocol is safe against impersonation attack.

Performance Evaluation

- The performance of the proposed protocol is evaluated based on the computation cost of each phase.