Engineering Adaptive Authentication

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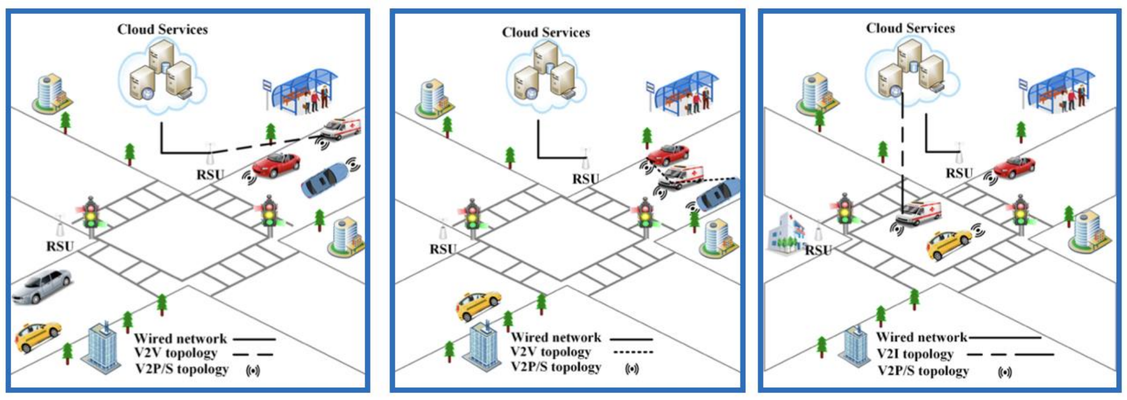
1 MOTIVATION:



(a) Scenario 1(S1) **(b)** Scenario 2(S2) **(c)** Scenario 3(S3)

Fig. 1 Authentication Scenarios in the Internet of Vehicle (IoV)

- In S1, **confidentiality and authenticity** have higher priority due to the sensitivity of road traffic information and sharing info between the parties.
- In S2, **performance requirements** have higher priority due to the exchange of distance information and node movement.
- In S3, Confidentiality and **usability requirements** have higher priority because the ambulance driver is at a junction and accessing patient information.

Different **contextual factors** can bring various **security risk** that need different **authentication methods.**

2 ADAPTIVE AUTHENTICATION:

- An adaptive authentication system **monitors** contextual factors to **identify** changing security risks.

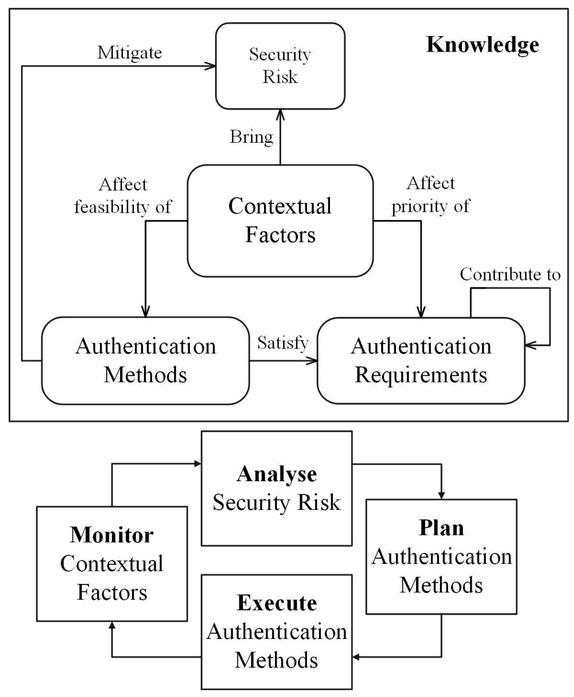


Fig. 2 Adaptive authentication System **[1]**

- The system can **decide to enforce** an authentication:
  - **Mitigate the security risks**
  - **Maximise the satisfaction of the requirements**.

3 ADAPTIVE AUTHENTICATION FRAMEWORK:

- Our framework aims to select the **most appropriate authentication method** to **mitigate security risks** and **maximise** the satisfaction of **authentication requirements [2].**
- **Goal model** represents the requirements and their relative priorities in light of contextual factors.
- **Extended feature model** represents the various features that can be used to identify an authentication method as well as the impact of those features on the satisfaction of the requirements.
- **Fuzzy causal network** and **a theorem prover (Z3)** used to reason about the information represented in **the goal and feature models** when the **context changes at the run time**.

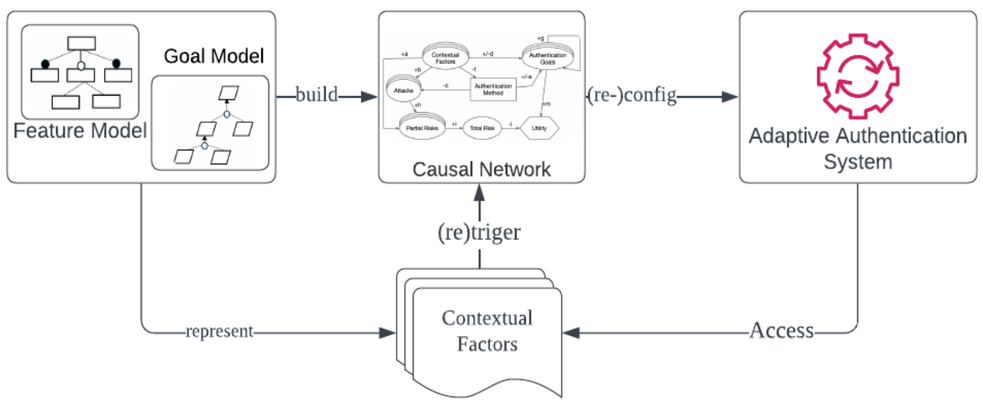
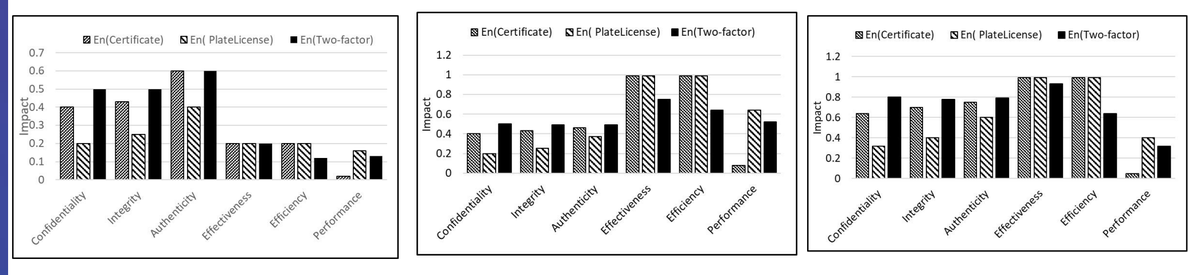


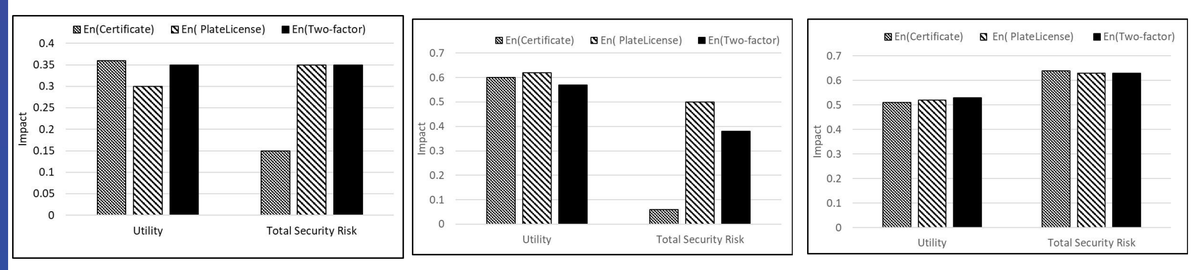
Fig.3 Our Adaptive Authentication Framework

4 RESULTS:



(a) S1 **(b)** S2 **(c)** S3

Fig.4 Impact of the authentication method on the satisfaction of the requirements



(a) S1 **(b)** S2 **(c)** S3

Fig.5 Impact of the authentication method on mitigate the total risk and maximise the Utility

References:

[1] Hassan, Alzubair, Bashar Nuseibeh, and Liliana Pasquale. "Engineering Adaptive Authentication." In 2021 IEEE International Conference on Autonomic Computing and Self-Organizing Systems Companion (ACSOS-C), pp. 275-280. IEEE, 2021.

[2] Hassan, Alzubair, Dimitri Van Landuyt, Liliana Pasquale, Manuel Cheminod, Marko Kompara, Panayiotis Kotzanikolaou, Romain Laborde, and Susana Gonzalez. "CyberSec4Europe D3. 21-Framework to design and implement adaptive security systems." PhD diss., University college Dublin; KU Leuven; Consiglio Nazionale delle Ricerche; University of Maribor; University of Piraeus Research Centre; IRIT-Institut de Recherche en Informatique de Toulouse; ATOS, 2022.

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