CONTEXT: Understanding the Role of Contexts in Managing Privacy Online

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Outline

- Motivation: Why context matters in privacy
- Goal one:
  - Develop a novel ontology for privacy
- Goal two:
  - Develop an agent-based PET for automated privacy reasoning
- Summary

Motivation: Why context matters in privacy

Assume Bob has a tracking app:

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Bob's location settings:

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Assume Bob has a tracking app:

Bob's location settings:

- **Problem**: It might be inappropriate to share a user's location information if exposing the user to danger.
- Privacy preferences are diverse and context dependent.

Motivation: Why context matters in privacy policy

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- What do we need?

Figure 1: Bob's location settings

Main Goal: Understand the role of contexts in privacy policy

- Goal one: Develop a novel ontology to represent privacy contexts[1]
  - Capture new context-oriented privacy requirements
  - Use a formal language to represent privacy contexts

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- Goal two: Develop an agent-based PET for automated privacy reasoning
  - Model use-case scenarios
  - Implement the proposed agent-based PET using Semantic Web Technologies (SWT)

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- Example:
  - An agent-based PET that automates privacy decision-making in a medical context.

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Goal One: Capture new context-oriented privacy requirements

RQ: What are the privacy requirements captured in the existing IoT ontologies?

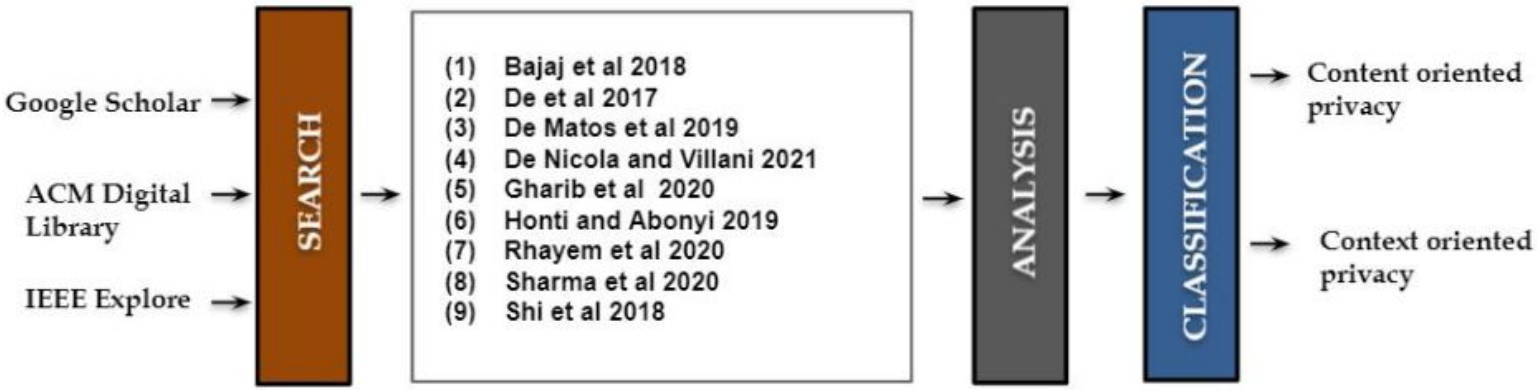


Figure 2: Research Methodology in Three Steps

Goal One: Capture new context-oriented privacy requirements

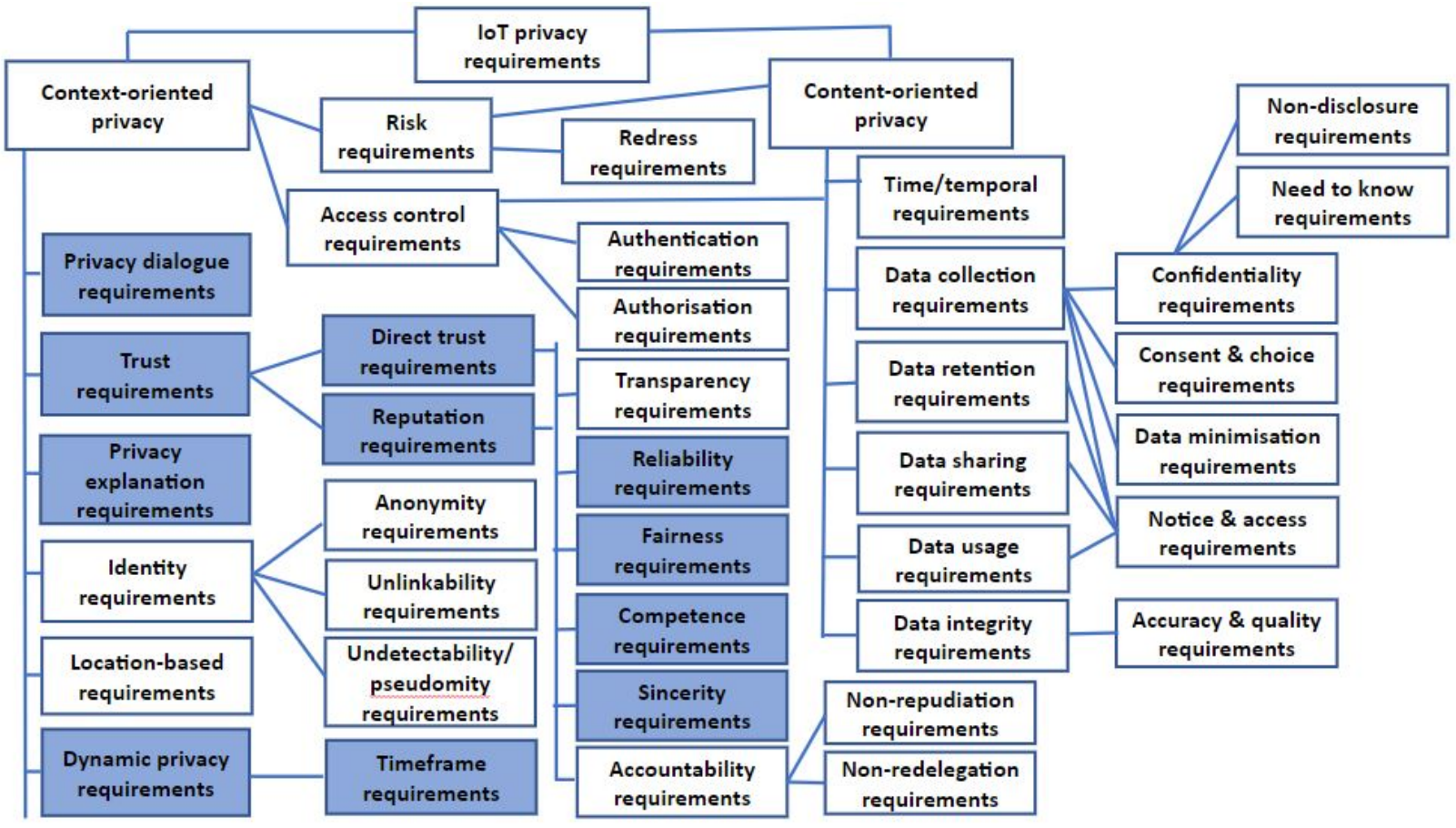


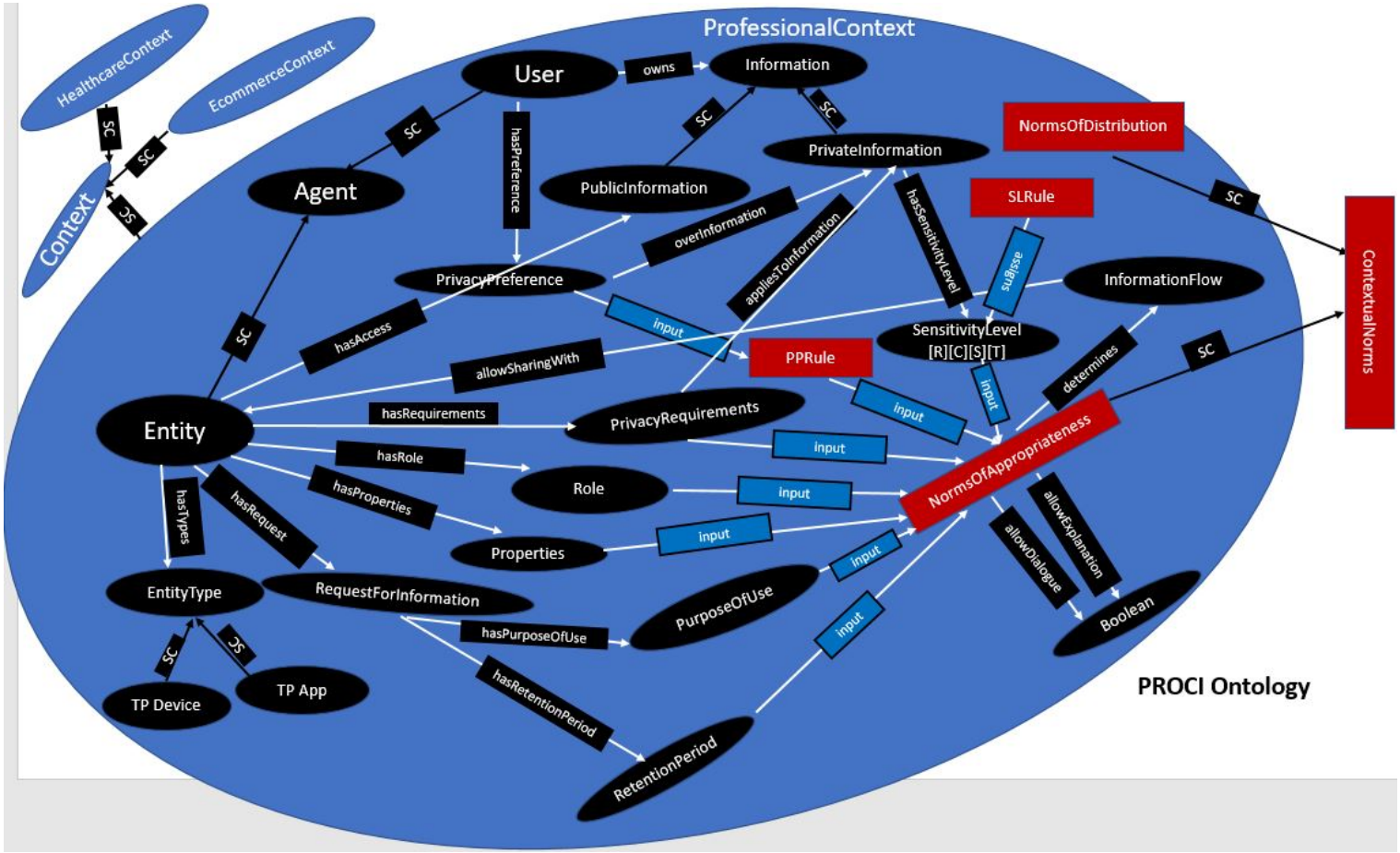
Figure 3: A Taxonomy of Privacy Requirements [1]

[1] Ogunniye, G., & Kökciyan, N. (2022). A Survey on Understanding and Representing Privacy Requirements in IoT. In: Journal of Artificial Intelligence Research (2022). Under review.

Goal One: Use a formal language to represent privacy contexts

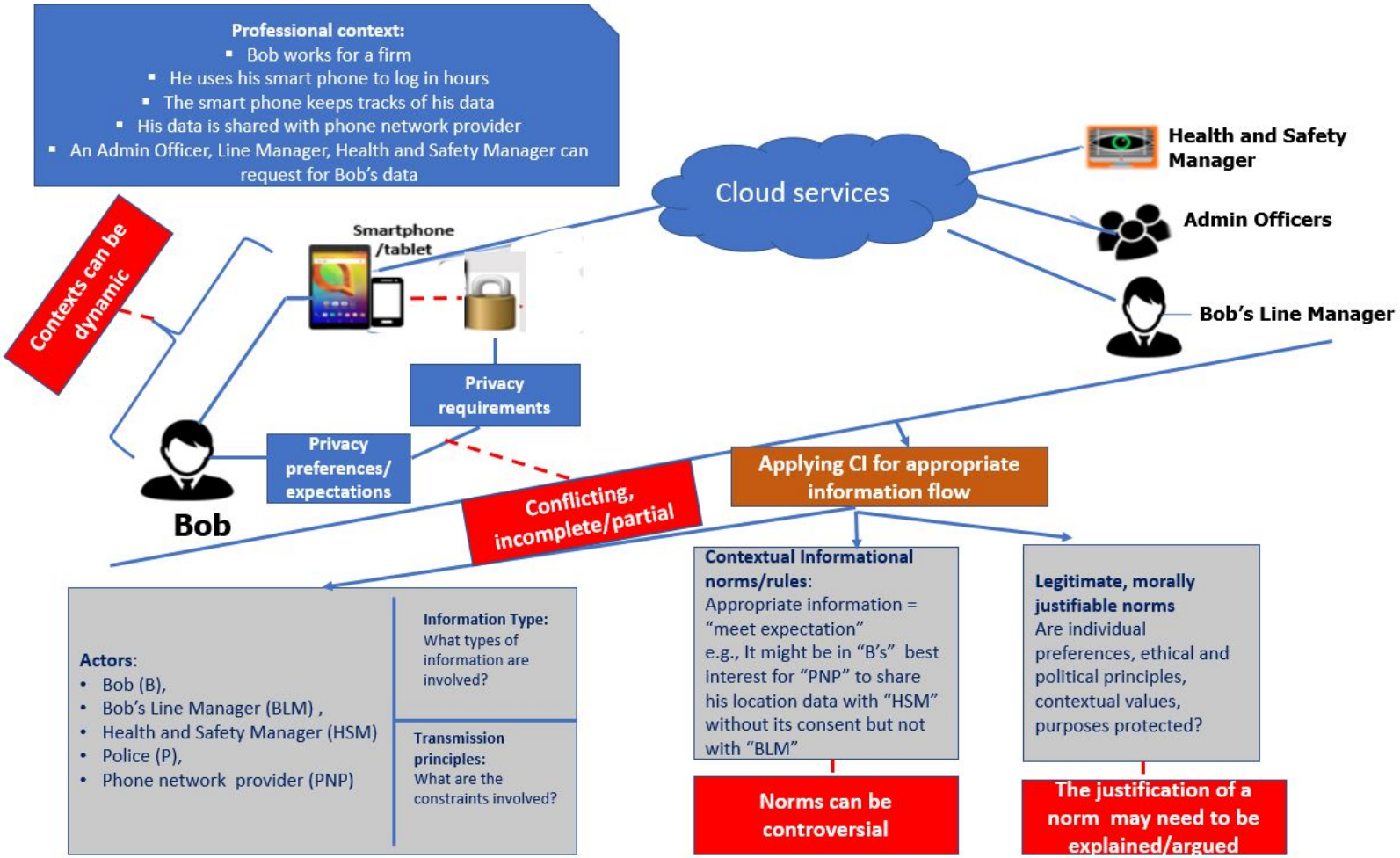
PROCI: Privacy Ontology Based on Contextual Integrity

- Theory of Contextual integrity (CI)[2], understands privacy in a social context, by defining norms that govern appropriate information flows
- We reuse classes and properties from three ontologies; *COPri*, *Aegis* and *PPIoT*



[2] Nissenbaum, H. (2004). Privacy as contextual integrity. Wash. L. Rev., 79, 119.

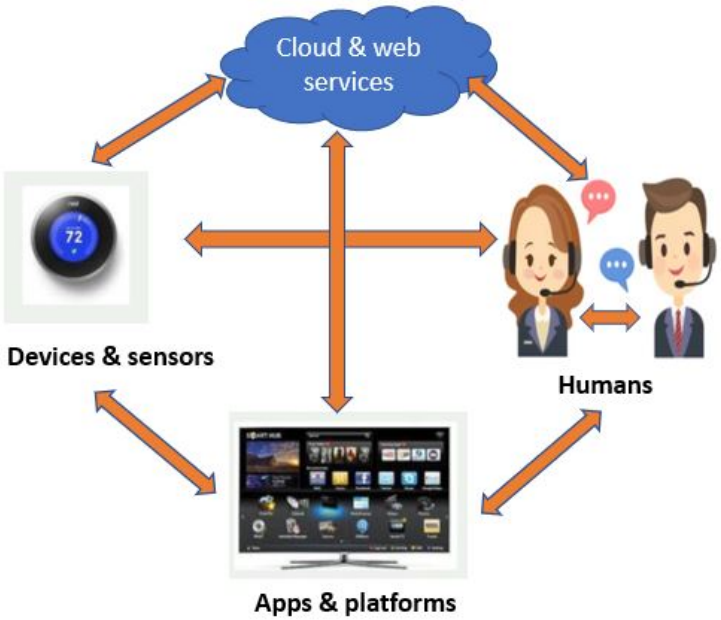
Goal Two: Model use-case scenarios



[3] Ogunniye, G., & Kökciyan, N. (2021). Argumentation-based Dialogues for Privacy Policy Reasoning. CI Symposium '21, September 30-October 01, 2021, Chicago, USA

Goal Two: An agent-based PET

- To develop an agent-based PET to:
  - represent the dynamism of privacy preferences and expectations
  - reason about contexts, norms and privacy preferences
  - reason about conflicting privacy preferences
  - communicate privacy decisions and provide explanations on the decisions



Goal Two: Implement the PET using SWT (Ongoing)

In our approach:

- We exploit Semantic Web Technology to manage the interactive setting of users' privacy preferences.
  - SWT enables a lightweight communication between a user and the Third Parties (TP) that request access to the user's private data.
  - The user and TP are represented as agents.

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[4] Modgil, S., & Prakken, H. (2014). The ASPIC+ framework for structured argumentation: a tutorial. Argument & Computation, 5(1), 31-62.

Summary

- The theory of CI helps to: understand privacy preferences and expectations and the norms of information transmission in a given context.
- Argumentation-based dialogues is a promising mechanism to:
  - represent and reason about the contextual norms of contextual integrity;
  - capture the dynamics of privacy contexts;
  - reason about uncertain, incomplete and conflicting privacy preferences.

Summary

- The theory of CI helps to: understand privacy preferences and expectations and the norms of information transmission in a given context.
- Argumentation-based dialogues is a promising mechanism to:
  - represent and reason about the contextual norms of contextual integrity;
  - capture the dynamics of privacy contexts;
  - reason about uncertain, incomplete and conflicting privacy preferences.
- Next plan:
  - A conference paper will be submitted to the 9th International Conference on Computational Models of Argument (COMMA) by 29th April 2022.