HESTIA: High-level and Extensible System for Training and Infrastructure risk Assessment

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Introduction – Transition

- Transition of Industrial Control Systems (ICS) into Cyber Physical Control Systems (CPCS).
  - Digital / analog equipment of ICS is being replaced by cyber-enabled equipment.

Introduction – New Vector of Vulnerabilities

- Increased connectivity of CPCS to the internet.
- Open-source applications are purchased commercially off-the-shelf (COTS), without consideration of applying current standard patches.

Introduction – Change in Attack Framework

- Until recently, CPCS attacks originated from an insider threat.
- In the recent years, attacks originating from outside are becoming frequent.

Introduction – Financial Impact

- Cyber-attacks on CPCS are occurring at an ever-increasing rate, incurring financial loss to both governments and industries.
- Estimates project losses as high as $1.87 billion by 2018, due to cyber-attacks on CPCS infrastructure.

Problem – Identifying Vulnerabilities

- For a Chief Security Officer (CSO):
- Identifying vulnerabilities specific to a particular CPCS infrastructure can be a challenge, if there is no high-level security policy specification.

Problem – Designing best hardening strategy

- Obtaining the high-level security policy specification of the existing CPCS state is not sufficient by itself.
- A CSO should be able to design the best hardening strategy for their particular CPCS system.

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Problem – Required Investigation

- Such a design process includes investigating:
  - “where to best use defense resources, which parts to harden, and in which particular order?”

Problem – Investigation Factors

- Several factors come into play:
  - Completeness and consistency of the CPCS infrastructure policies;
  - Likeliness of attacks and respective defenses against the particular system;
  - Overall cost of possible attacks versus overall cost of possible defenses.
    - Overall cost = Time and money.

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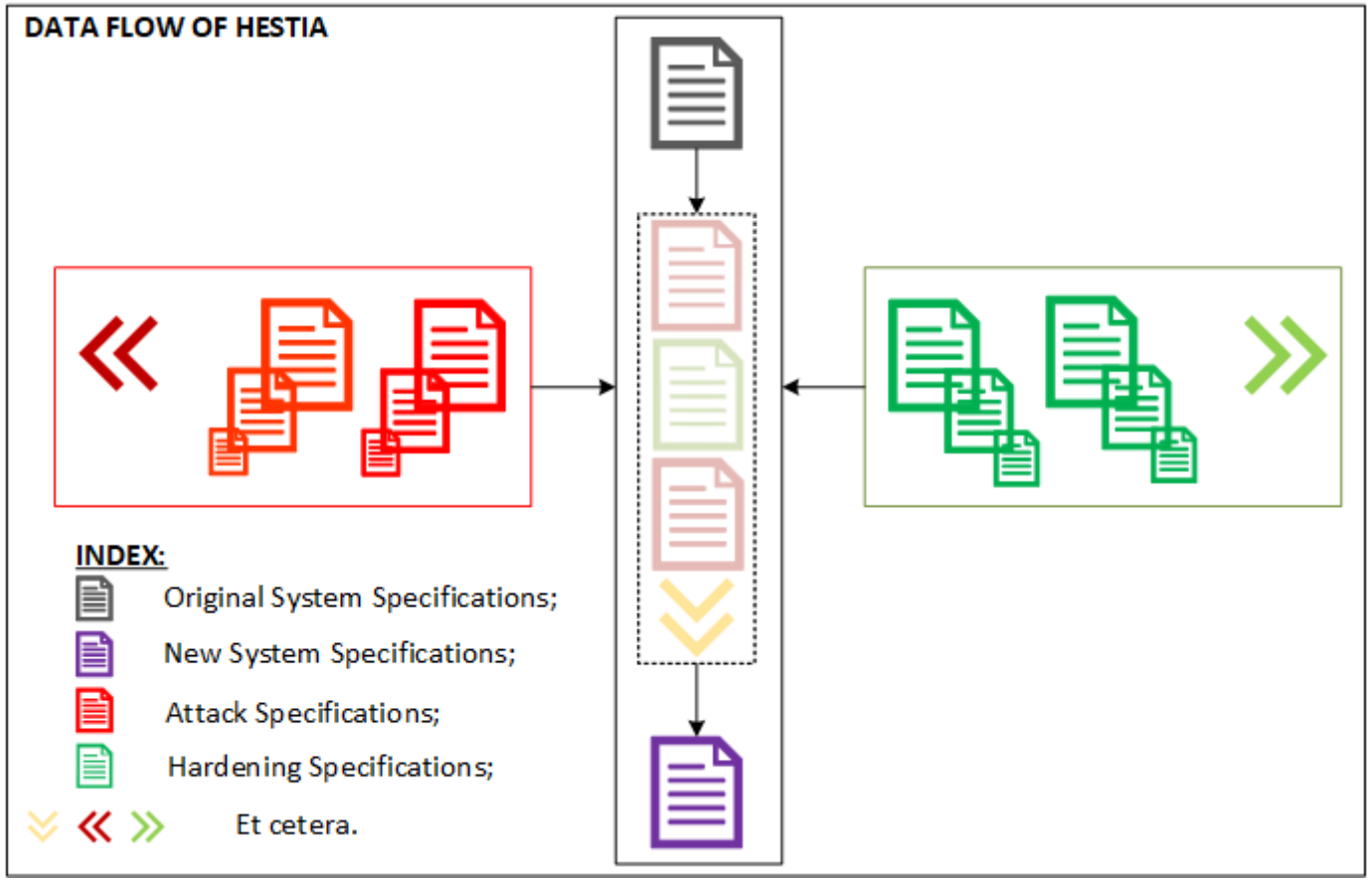
Proposed Solution – HESTIA

- HESTIA: High-level and Extensible System for Training and Infrastructure risk Assessment.
  - Work in progress.

Data Flow of HESTIA



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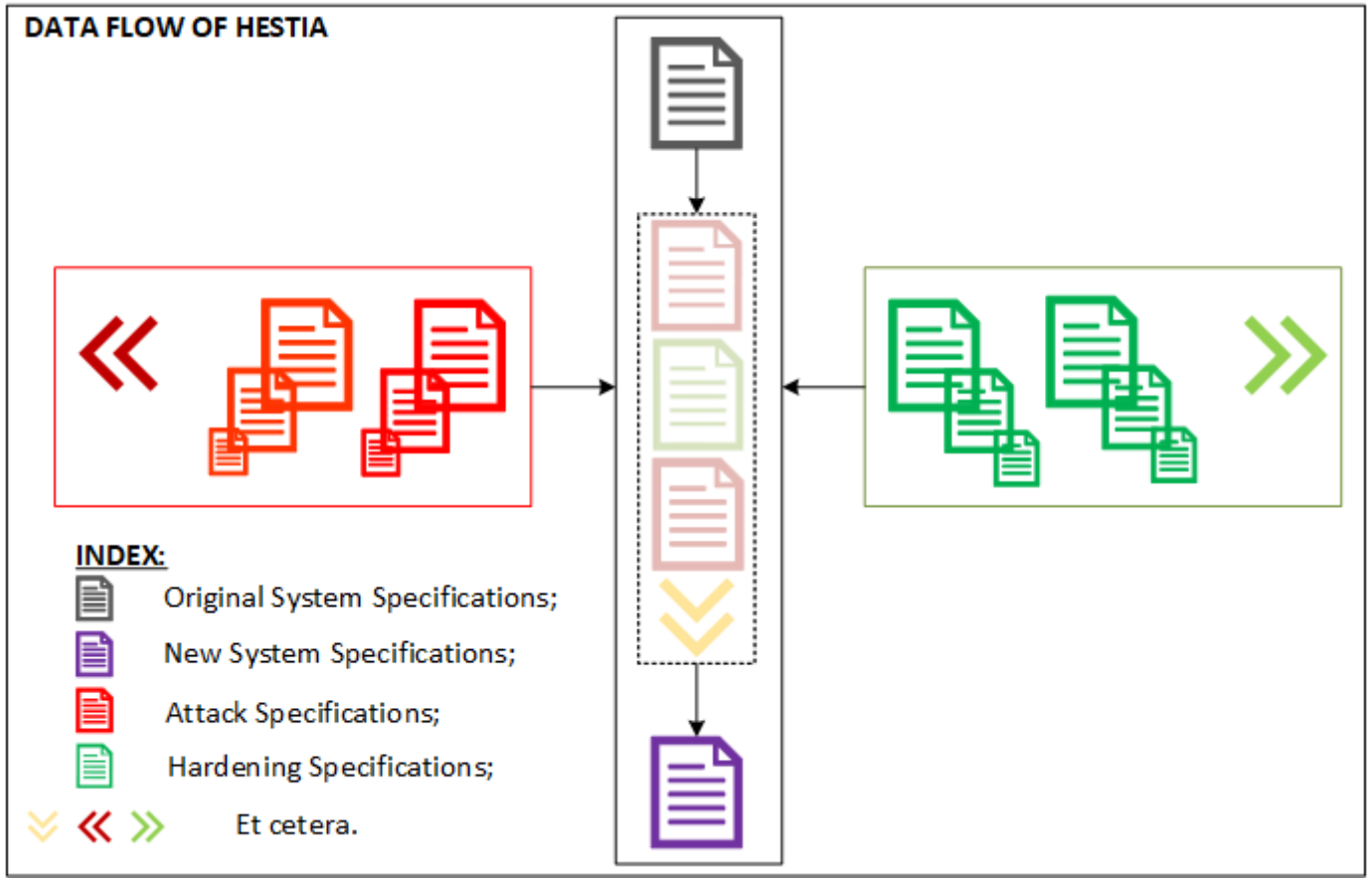
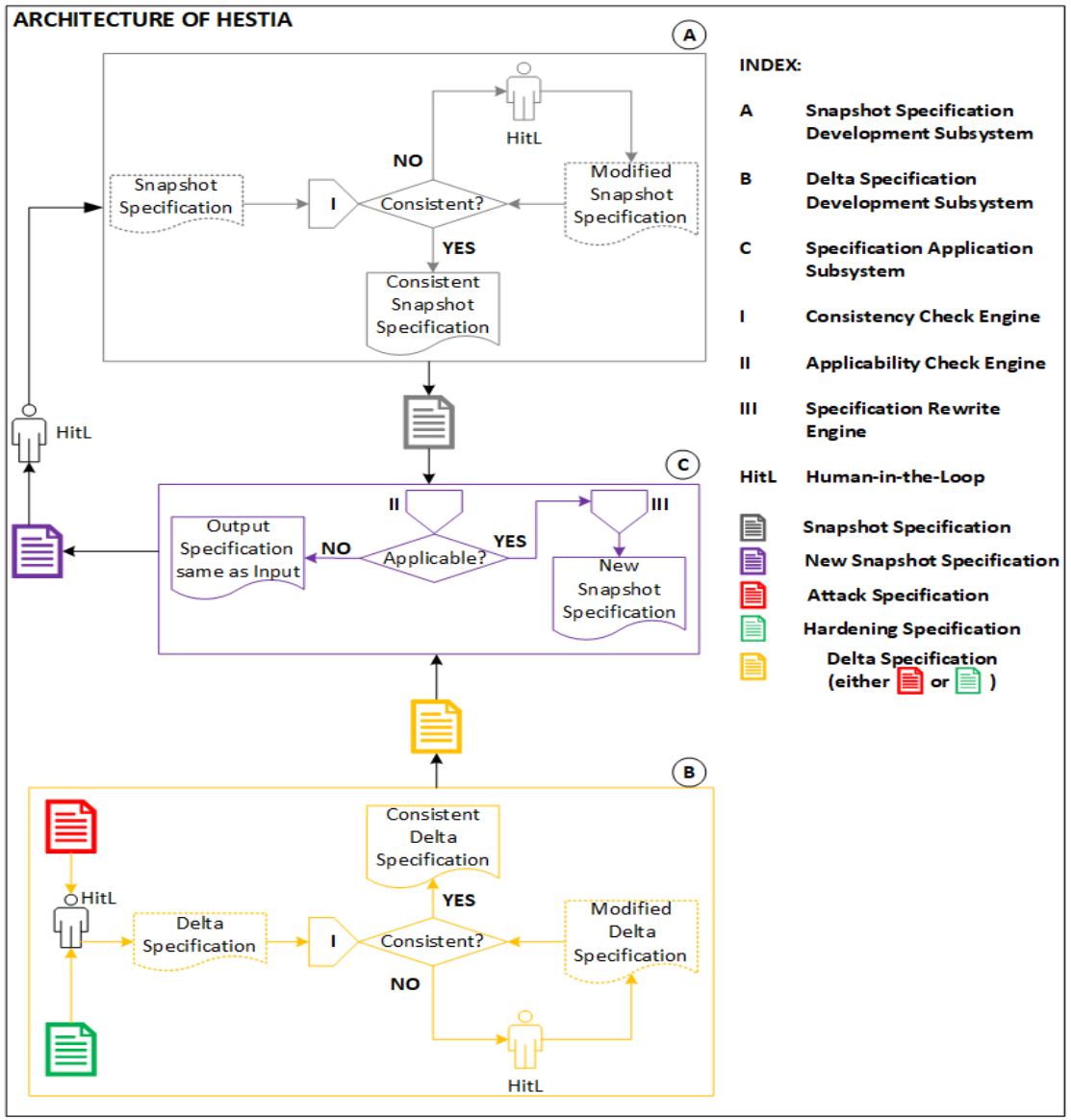


Architecture of HESTIA



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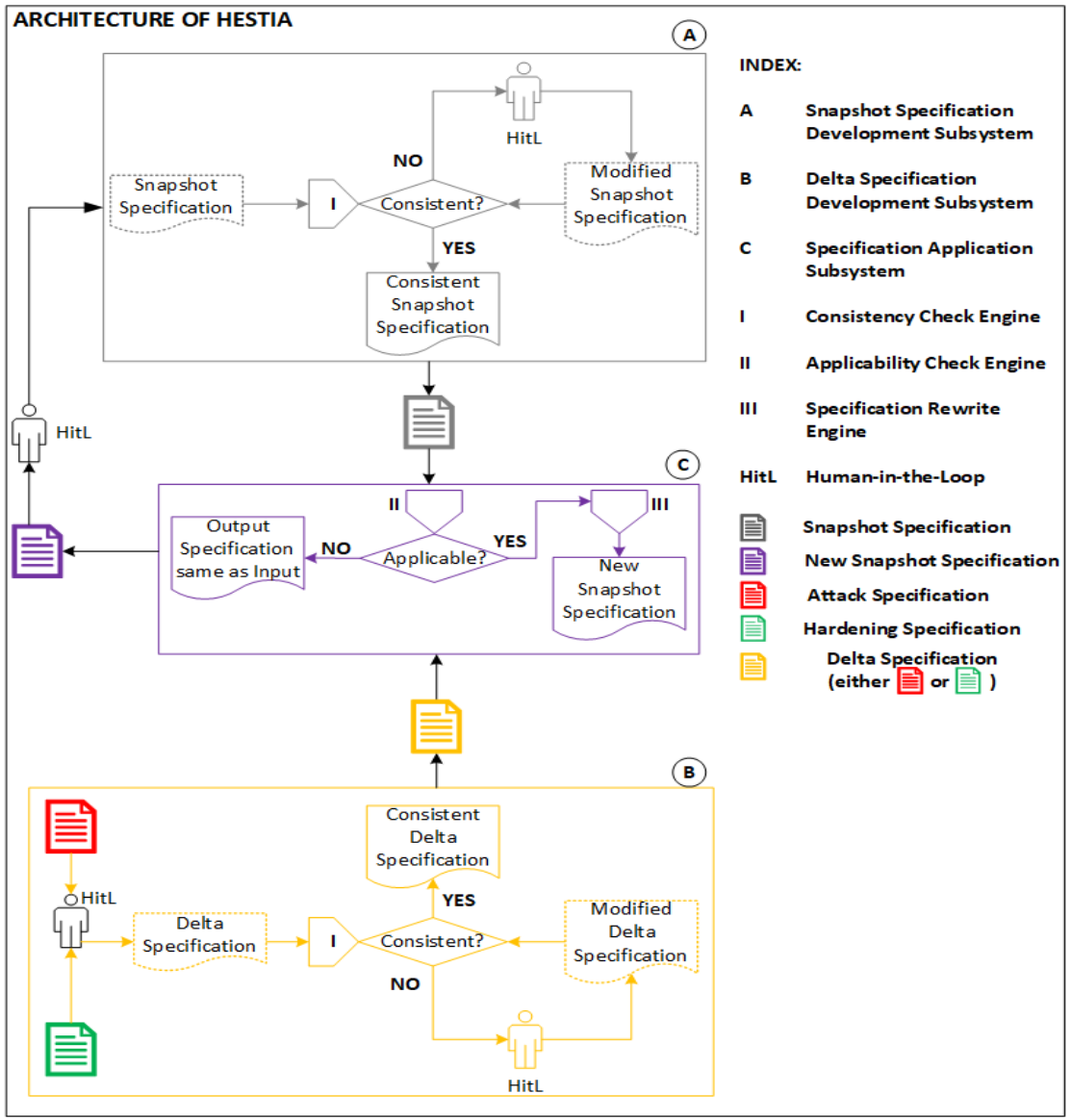

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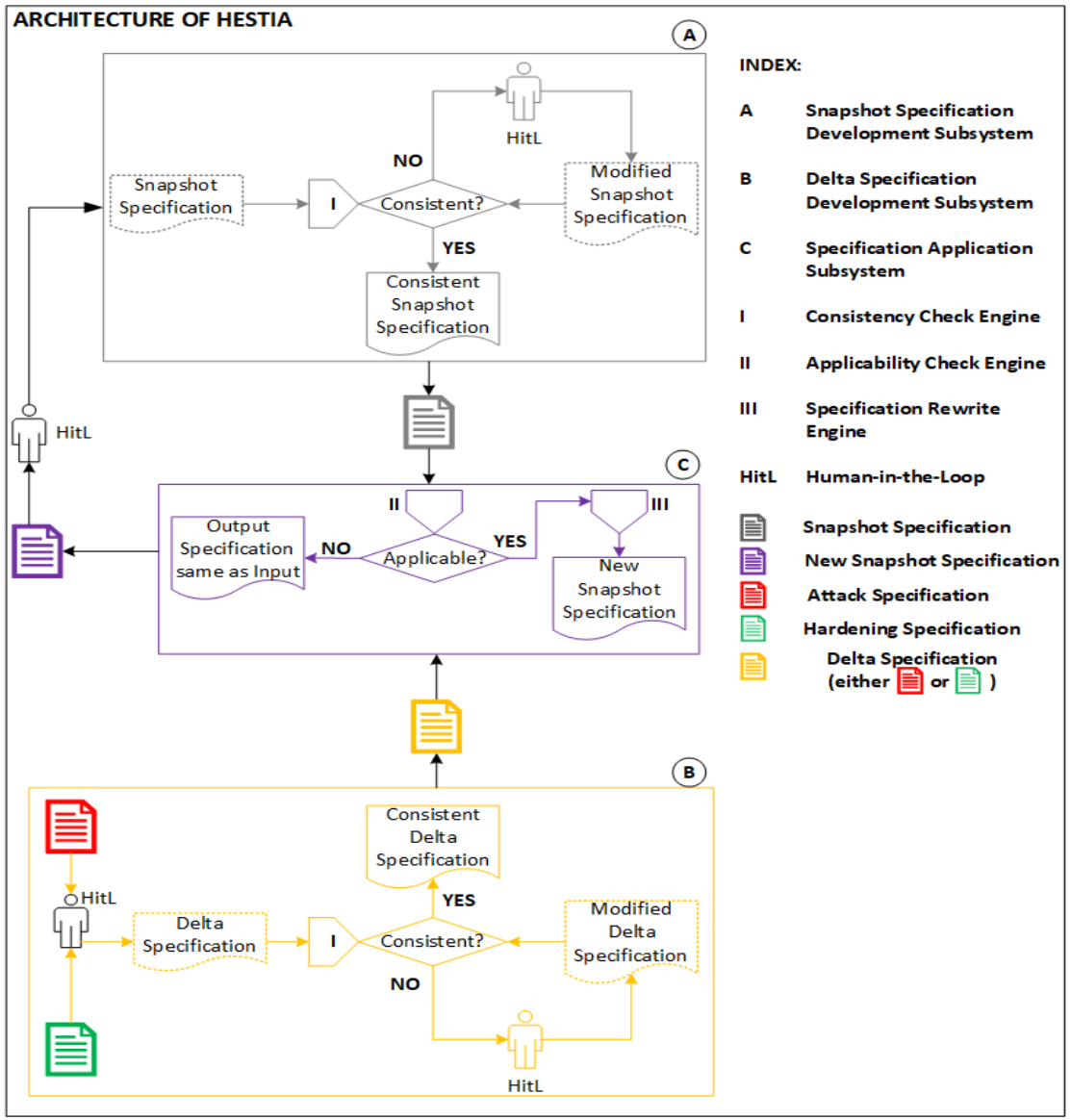

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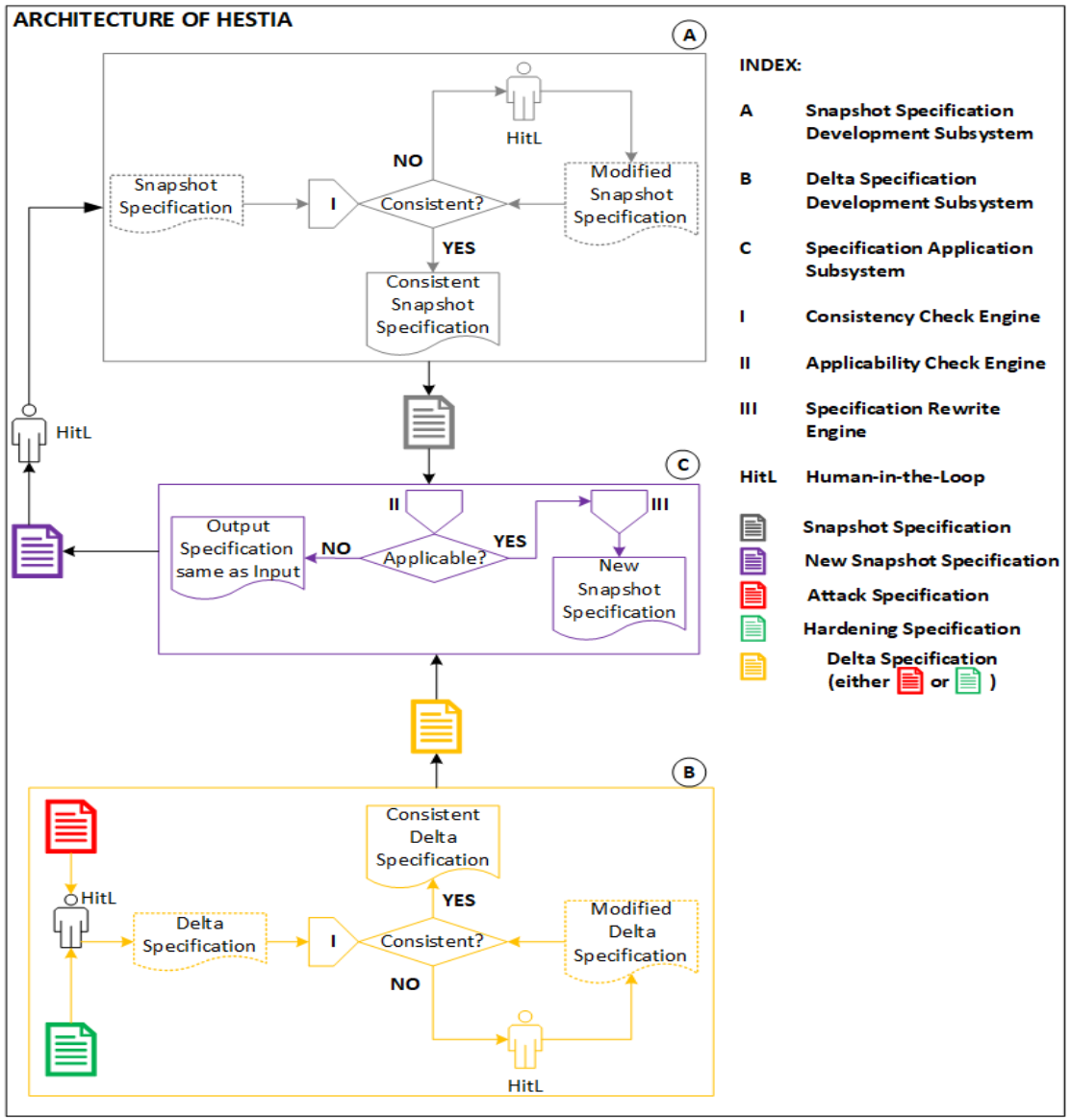

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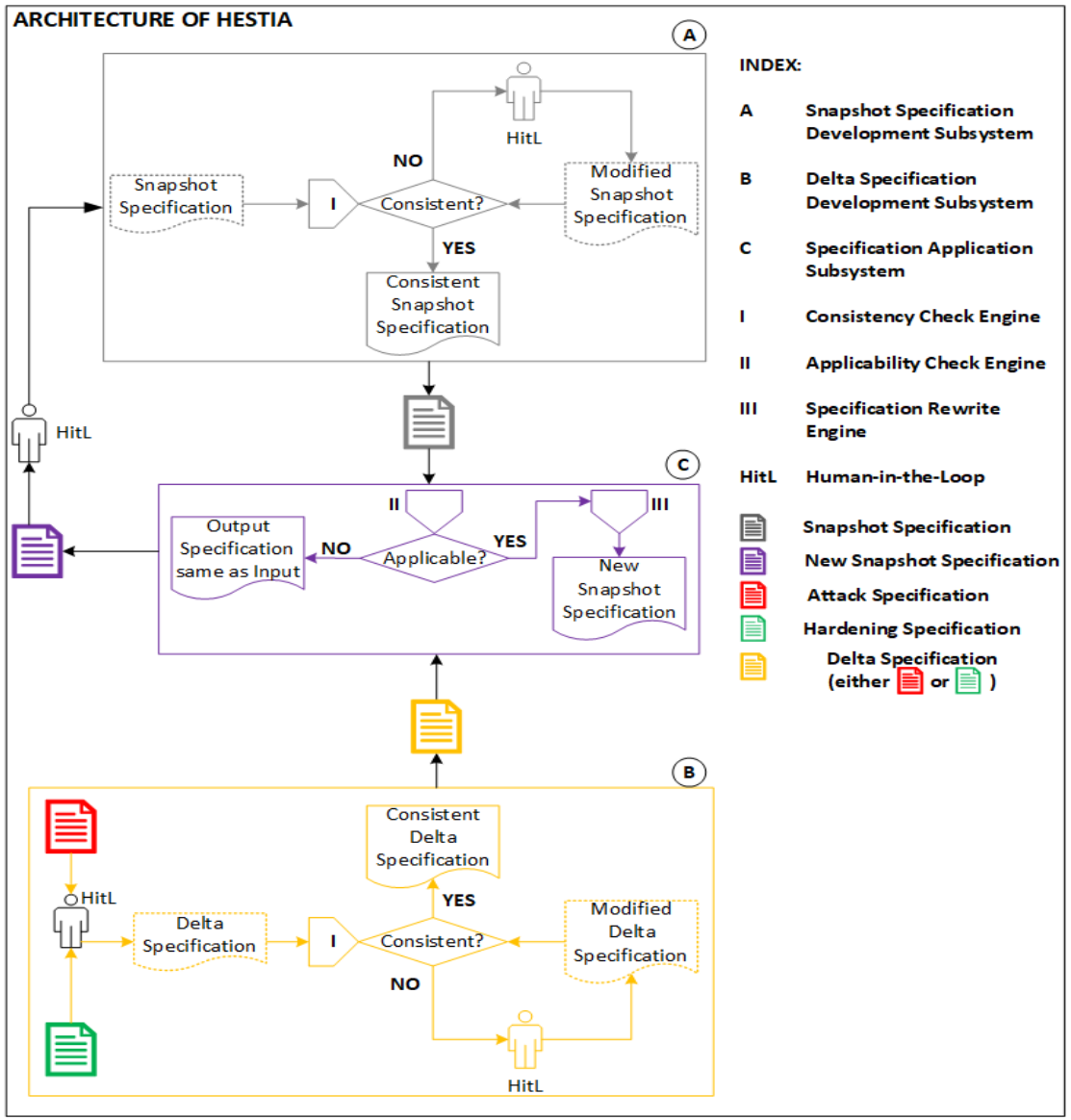

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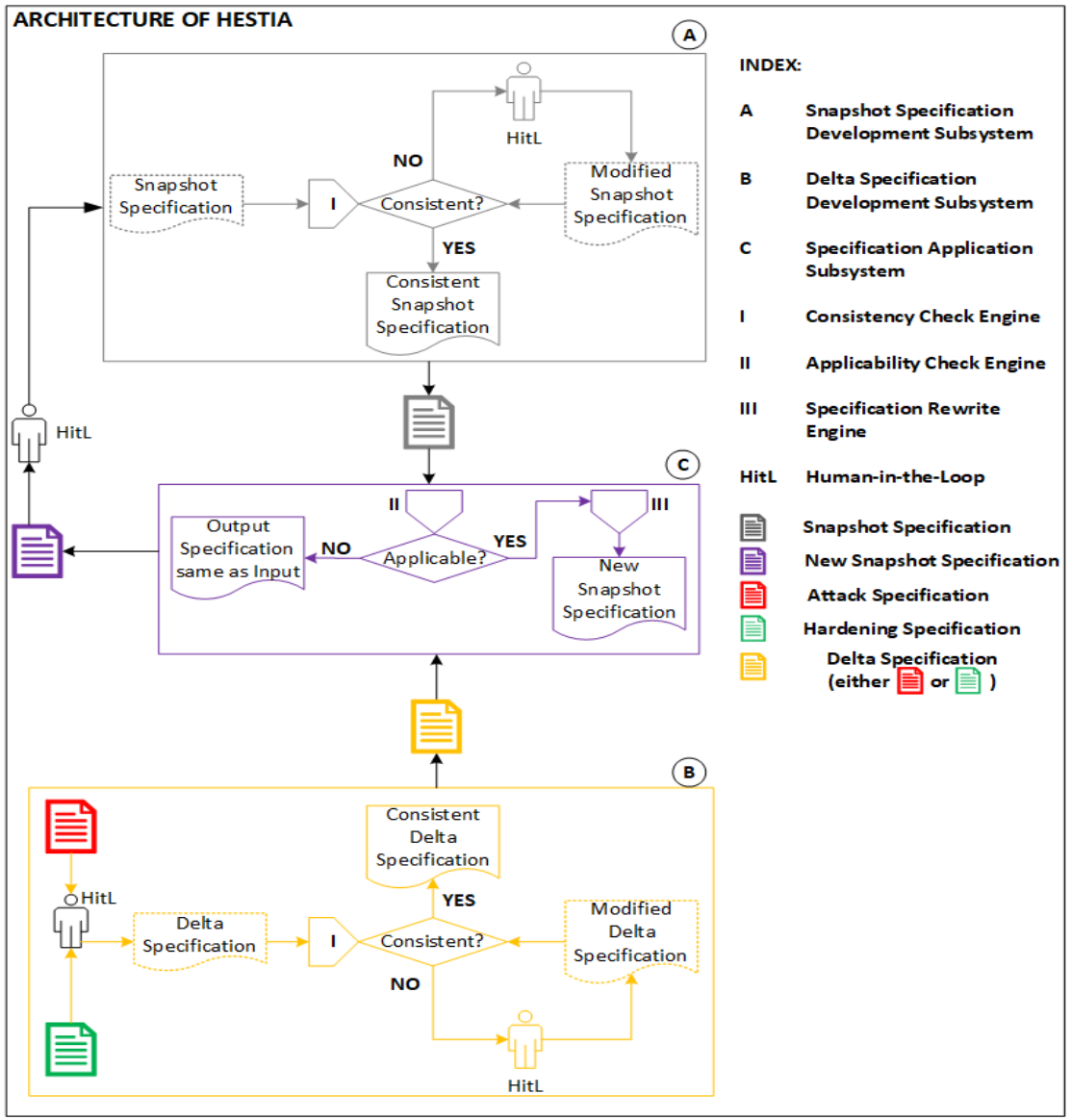

Current Research Status and Conclusion

- Developed a specification language called HERMES.
  - In process to develop the ‘Consistency check engine’.
- We hope that this endeavor will contribute to solving the problem of enabling a CSO to design the best hardening strategy.

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