Lifecyle Attestation:

Maintaining Appraisal Over System Changes

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Background

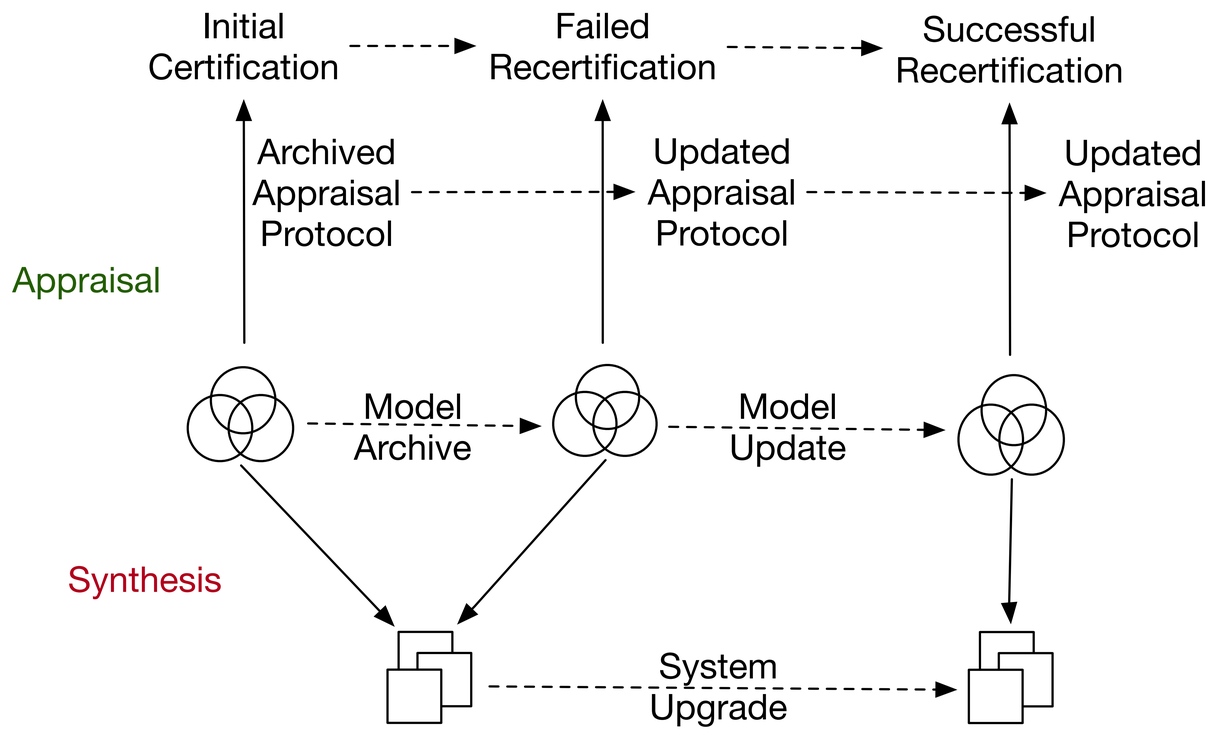
Semantic Remote Attestation provides mechanisms for measuring and appraising systems. The basic approach mimics any system appraisal or certification process:

- Appraiser requests an attestation
- Target produces bundled evidence
- Appraiser assesses evidence

An *attestation protocol* governs interactions and the gathering of evidence.

Research Questions

- Can we use an attestation protocol more generically as an *appraisal protocol*?
- Can we use the appraisal protocol to maintain evidence over system lifecycle?
- Can we use synthesis and ML techniques to repair protocols over system lifecycle?



Methods and Materials

- GPT for machine learning of Copland proofs in Coq
- Existing Copland proof-base for learning corpus
- Used Copland attestation protocol representation for appraisal protocols
- Copland semantics and Coq sigma types for evidence representation
- Eventually use Coq Cakeml extraction for system synthesis

Initial Results

- CoqDog GPT-based learning demonstrations for repairing and adapting proofs
  - Automatically generate proof snippets in Coq, Isabelle and Lean
  - Learning from proofs over Copland protocol verification
- Highly parameterized attestation manager for running appraisal protocols
  - General purpose mechanism for integrating attestation services
  - Enhance traditional measurements with proofs and tests
- Dependently typed theory for maintaining systems and evidence
  - Record observations made by individual appraisal actions
  - Record if and how evidence supports conclusions

Future Work

- Deeper ML for proof repair in the context of appraisal protocols
- ML for refining and adapting appraisal protocols
- ML informed synthesis techniques that mix ML with traditional program synthesis
- Tighter integration with appraisal and certification workflows
- Synthesis of artifacts from specifications

References

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