Towards Proactive Adaptation: A Journey along the S-Cube Service Life-Cycle

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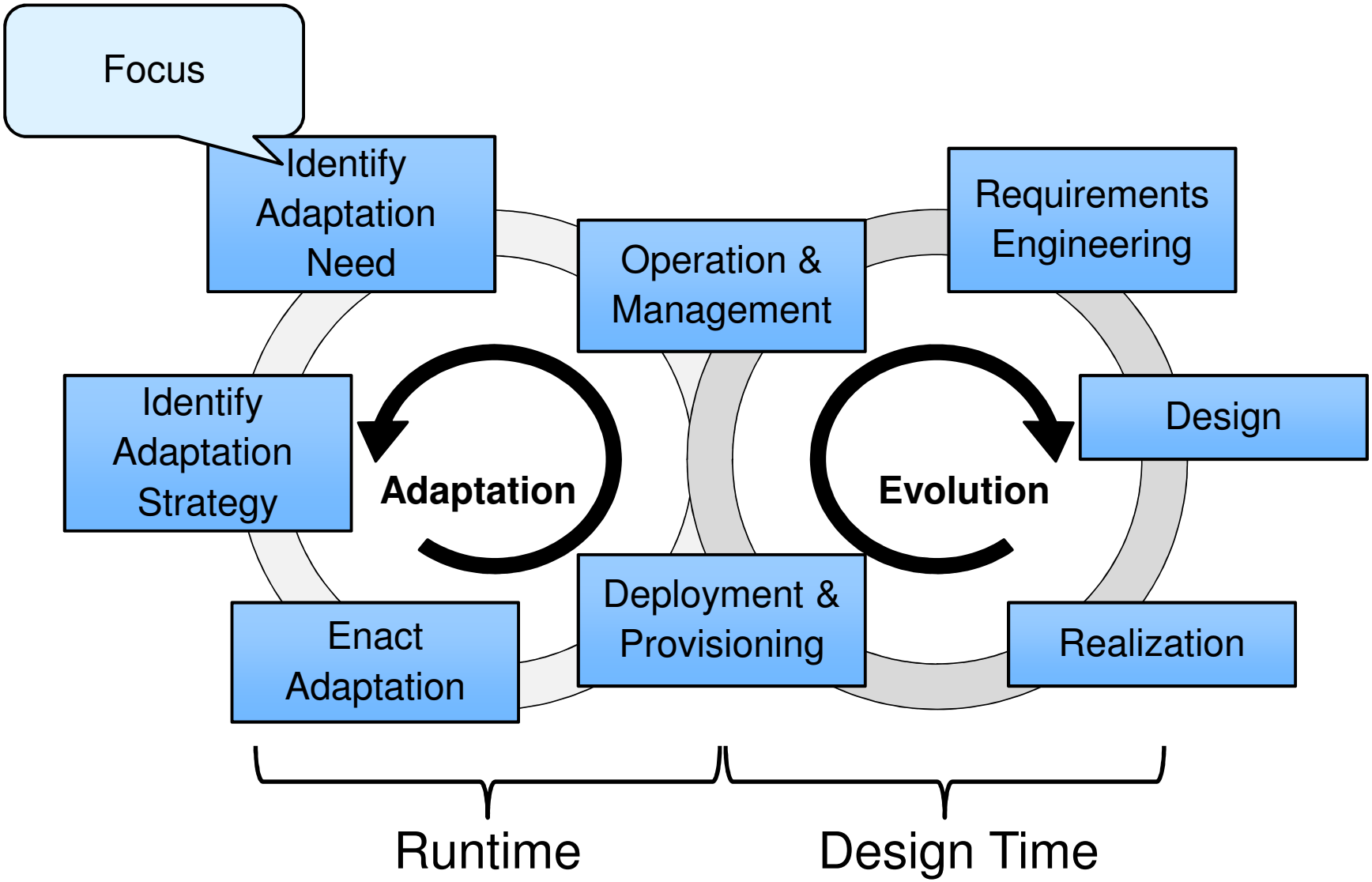
Agenda

- **Motivation and Problem Statement**
- **Example Scenarios**
- **Solution**
- **Future Work**

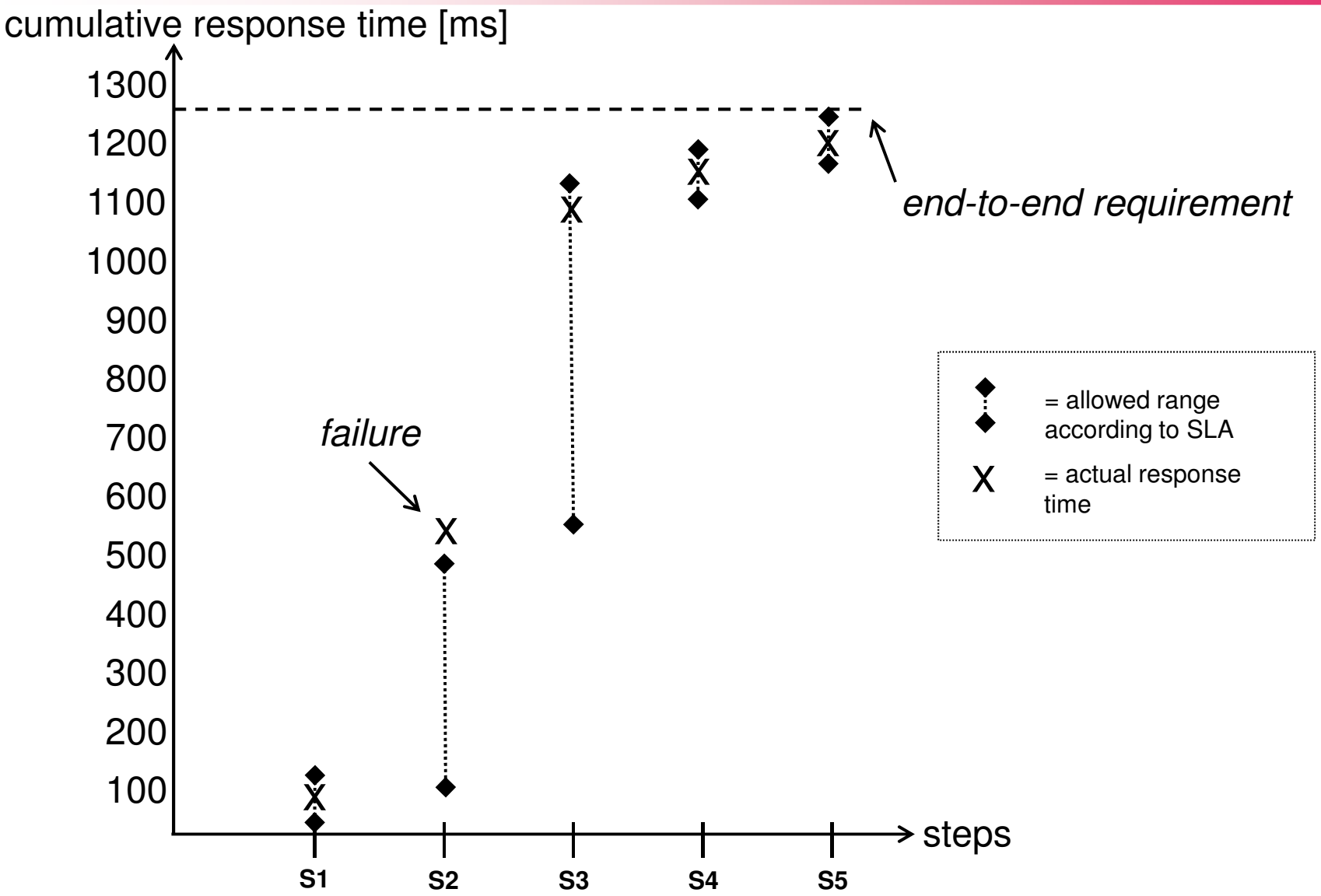
Motivation: Context
S-Cube Service Life Cycle



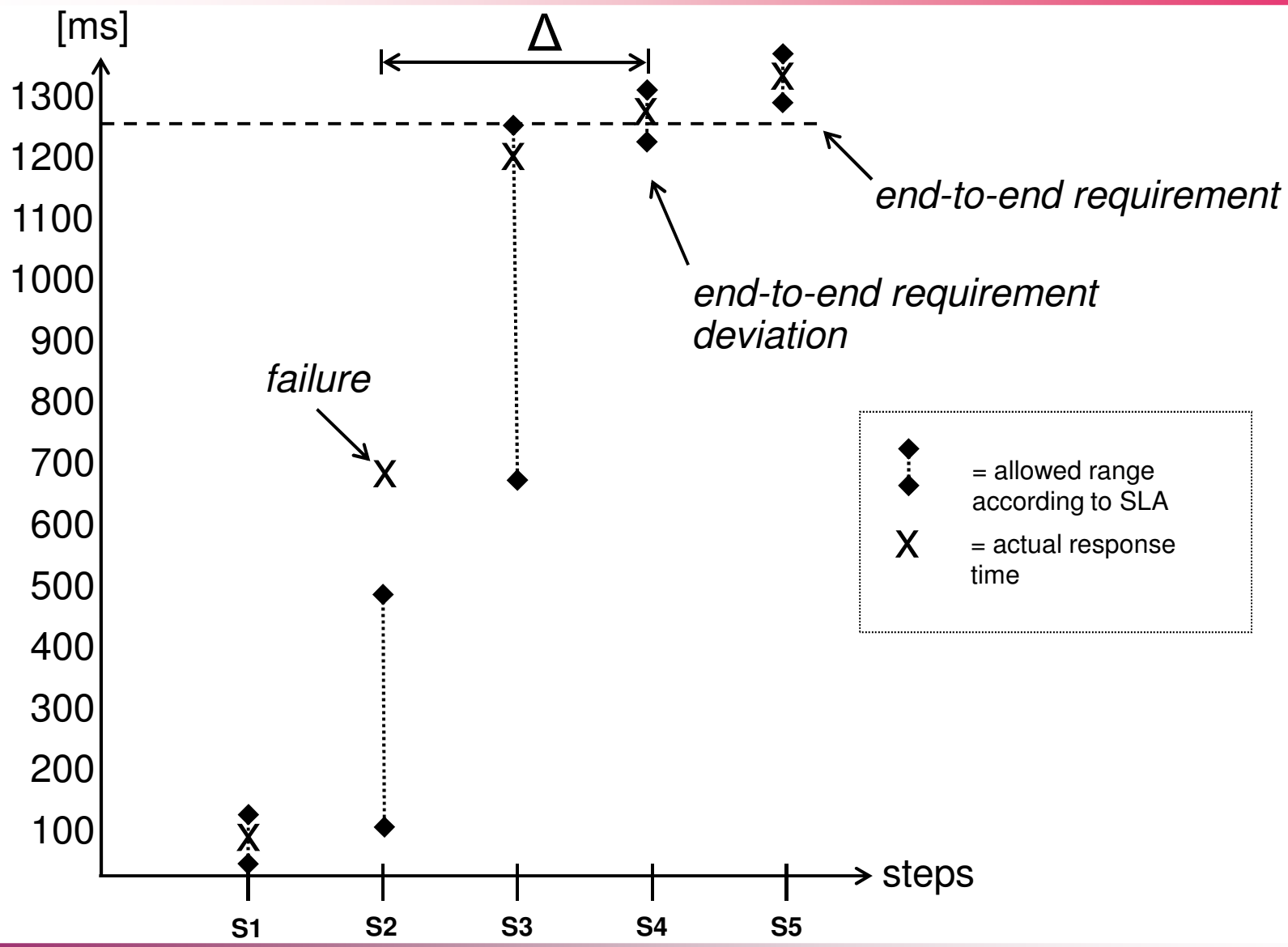
Motivation: Problem Statement

- Problem in the context of Service Based Applications (SBA) is: it must be determined whether **SBAs might deviate from its requirements** during its future runtime
- SBAs shall **automatically and dynamically adapt** ➔Target is to keep large and/or massive distributed systems maintainable
- Major work on adaptation has been centered around **two reactive adaptation capabilities based on monitoring**. These approaches
  … monitor **individual services** ➔ unclear whether the failure of a single service leads to a violation of the SBA's requirements (**Service Monitoring**)
  and/or
  … are restricted to **monitoring of requirements** ➔ Monitoring events might arrive so late that an adaptation of the SBA is not possible anymore (**Requirements Monitoring**)

Scenario 1: Service Monitoring



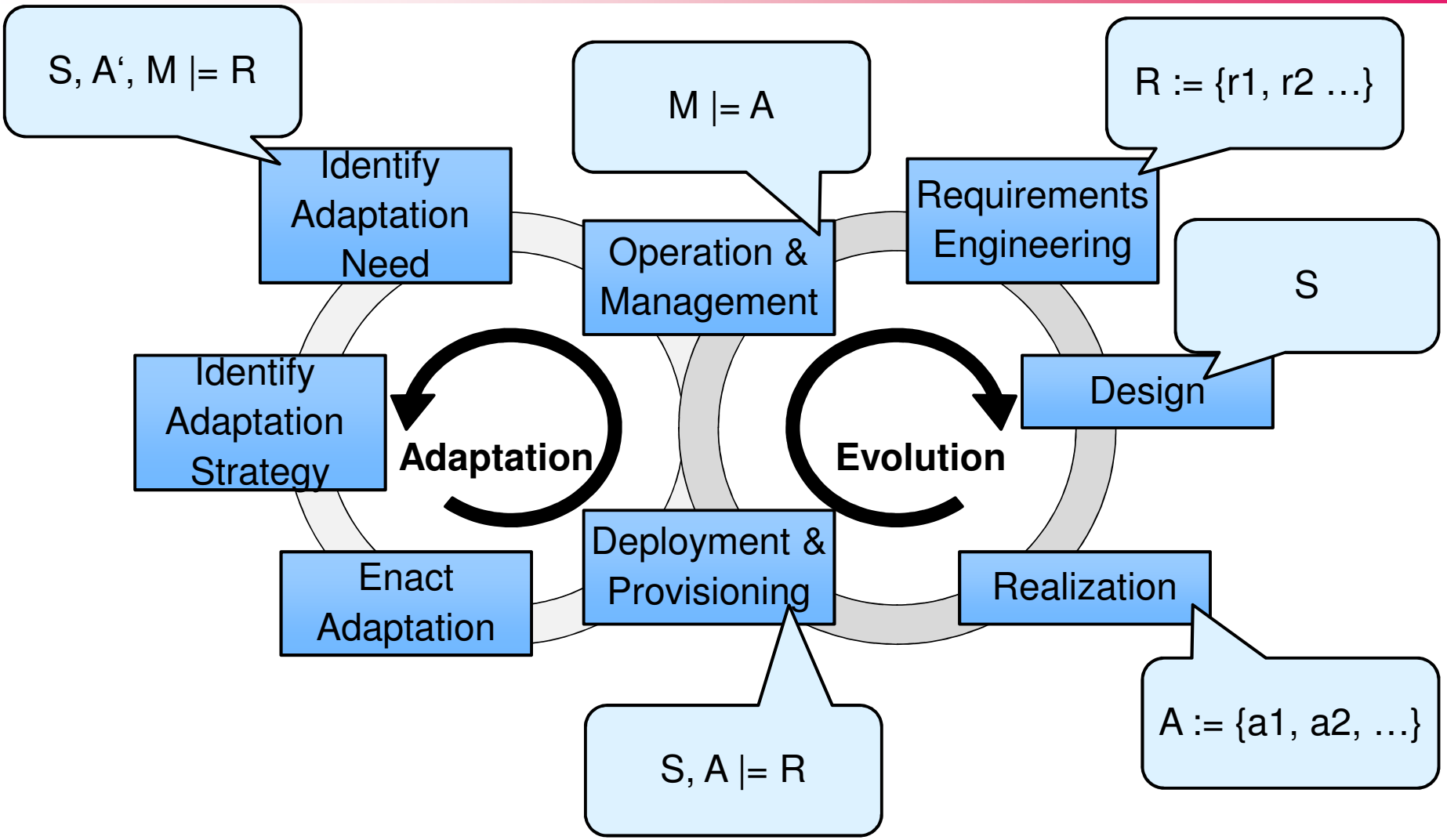
Scenario 2: Requirements Monitoring



Solution: Identify Adaptation Need

- **SBA elements** are related to **assumptions** (based on SLAs) about the SBAs context (the services to be executed)
- When a service invocation **deviates from its assumption** the following check is performed:
  - M is the monitored data
  - A' are the assumptions about the services which are not invoked yet
  - S is the specification of the Workflow (e.g. in BIR)
  - R are the requirements (e.g. expressed in LTL)
- The past monitoring data (M) together with the assumptions about the not yet invoked services (A') and the specification (S) are checked against the requirements (R):
  - **S, M, A' |= R**
- If R is satisfied, then the workflow execution is **continued**
- If R is not satisfied, the SBA must **be adapted**

Solution: S-Cube Service Life Cycle Phases



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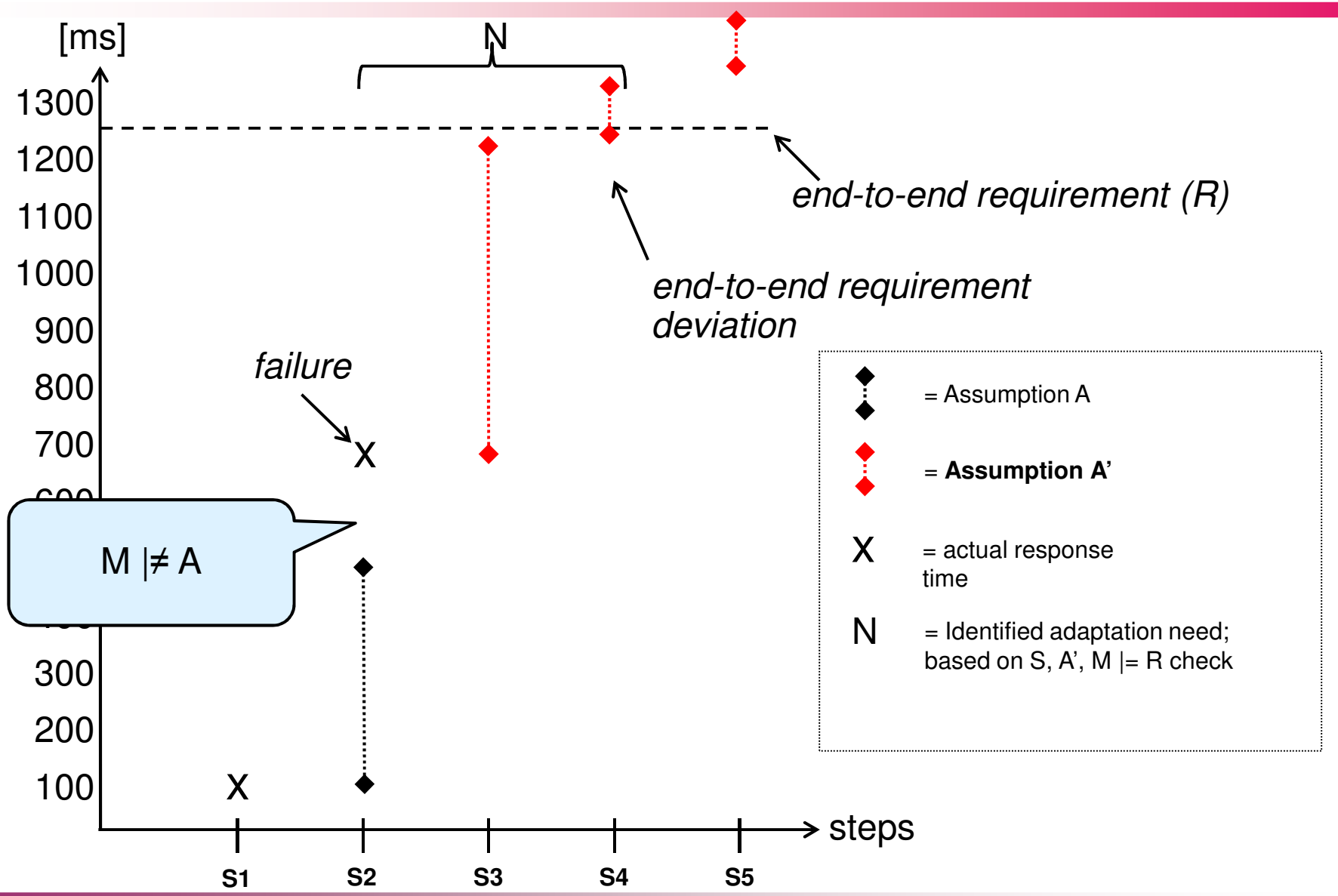

Summary and Future Work

- Presented: **proactive adaptation technique for Service Based Applications**, with focus on identifying adaptation needs early in time
- Techniques have been introduced along the key phases of the **S-Cube service life-cycle**
- Validation: **Implementation of a prototype** (ongoing)
- Future Work:
  - Enrich current approach with **online testing** in order to predict the services quality ➔ **Critical Problems can be identified earlier**, even before a service is reacting e.g. too slow
  - Reduction of false-positives by analysing **historical data**