

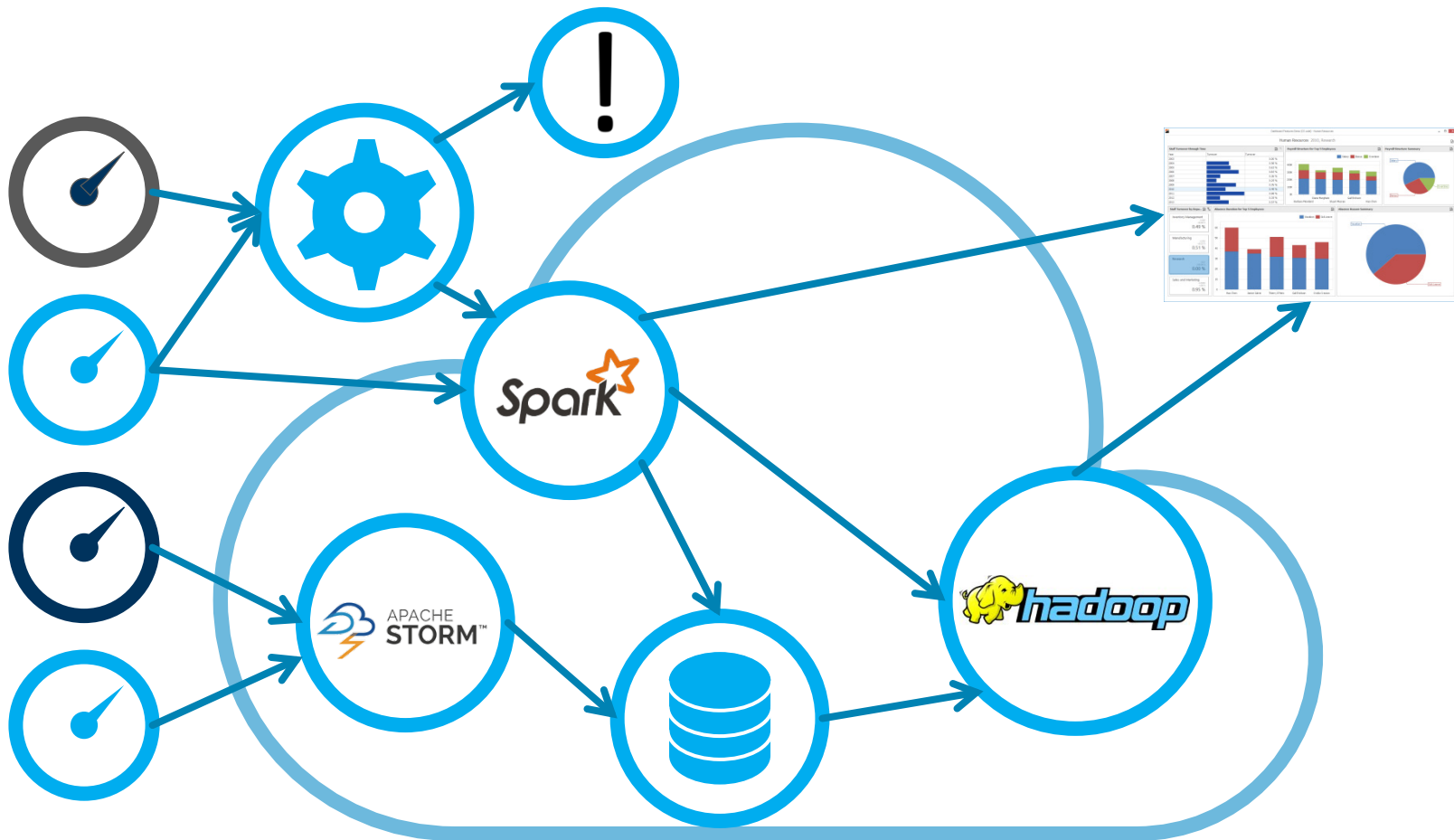
# Cloud-Based Big Data Management

Nicolas Ferry

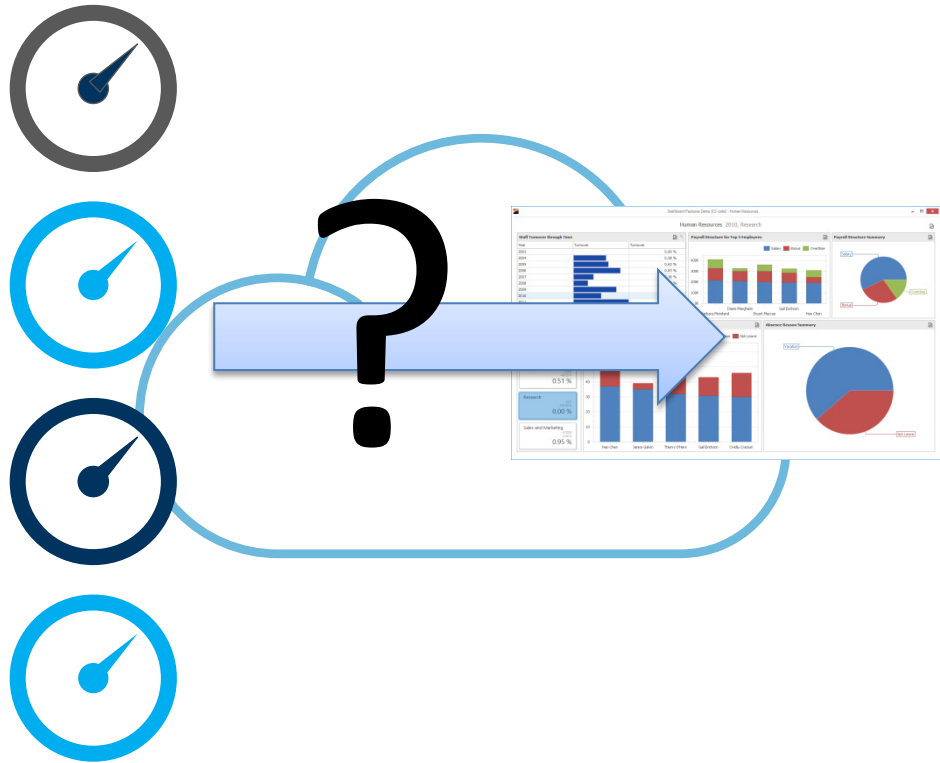
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# Building flexible data management workflows



# Challenges when managing data management workflows



- Variability:
  - Data sources (heterogeneity)
  - Source number (combinatory)
  - Forms of data (Variety)
- Unpredictability:
  - When & who will crash
  - When & which requirement will change

# Challenges when managing data management workflows

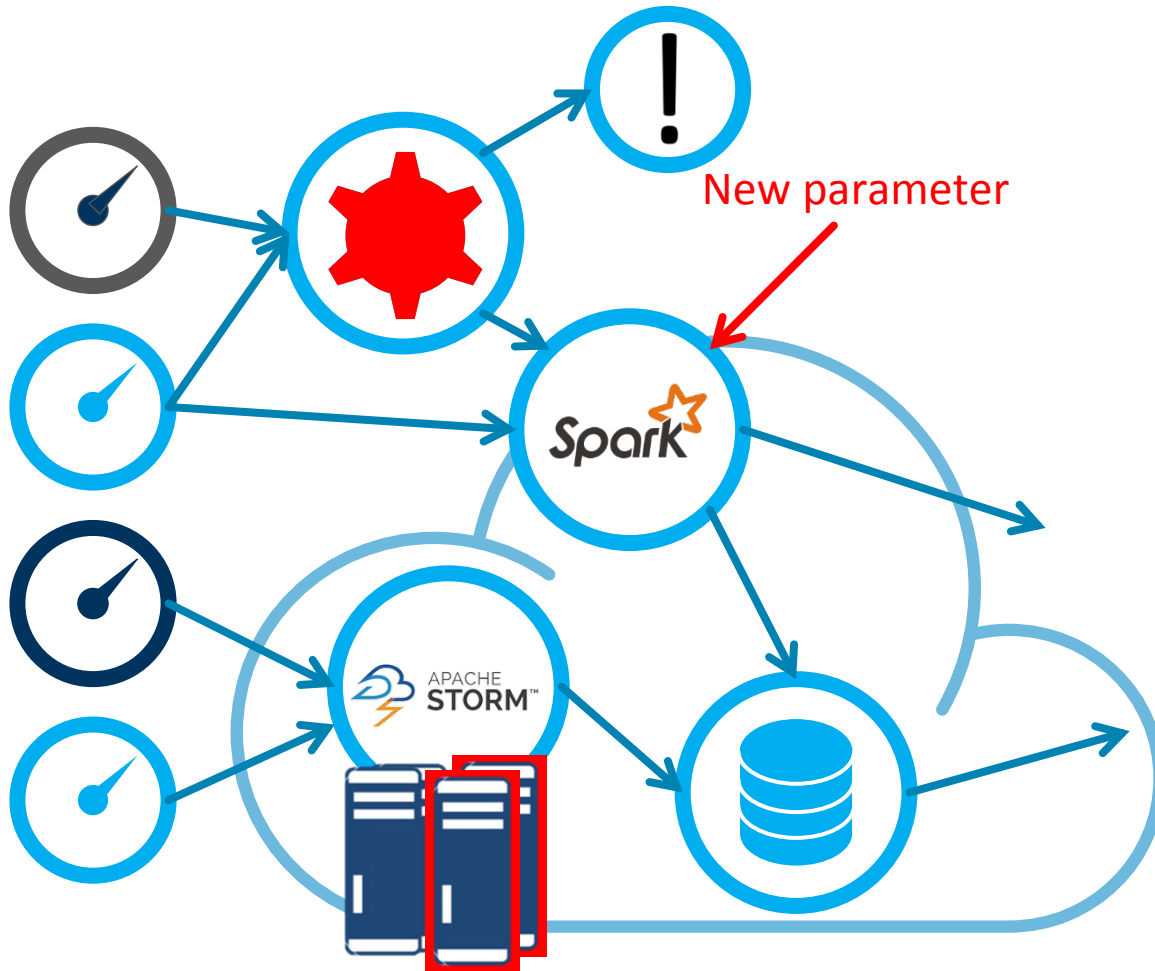


- Volume:
  - Large volume of data to store, clean, analyze
  - Cost
  - Performance
- Velocity:
  - Frequency
  - Static or dynamic
  - Combined with the other challenges!

# Towards a model-based framework

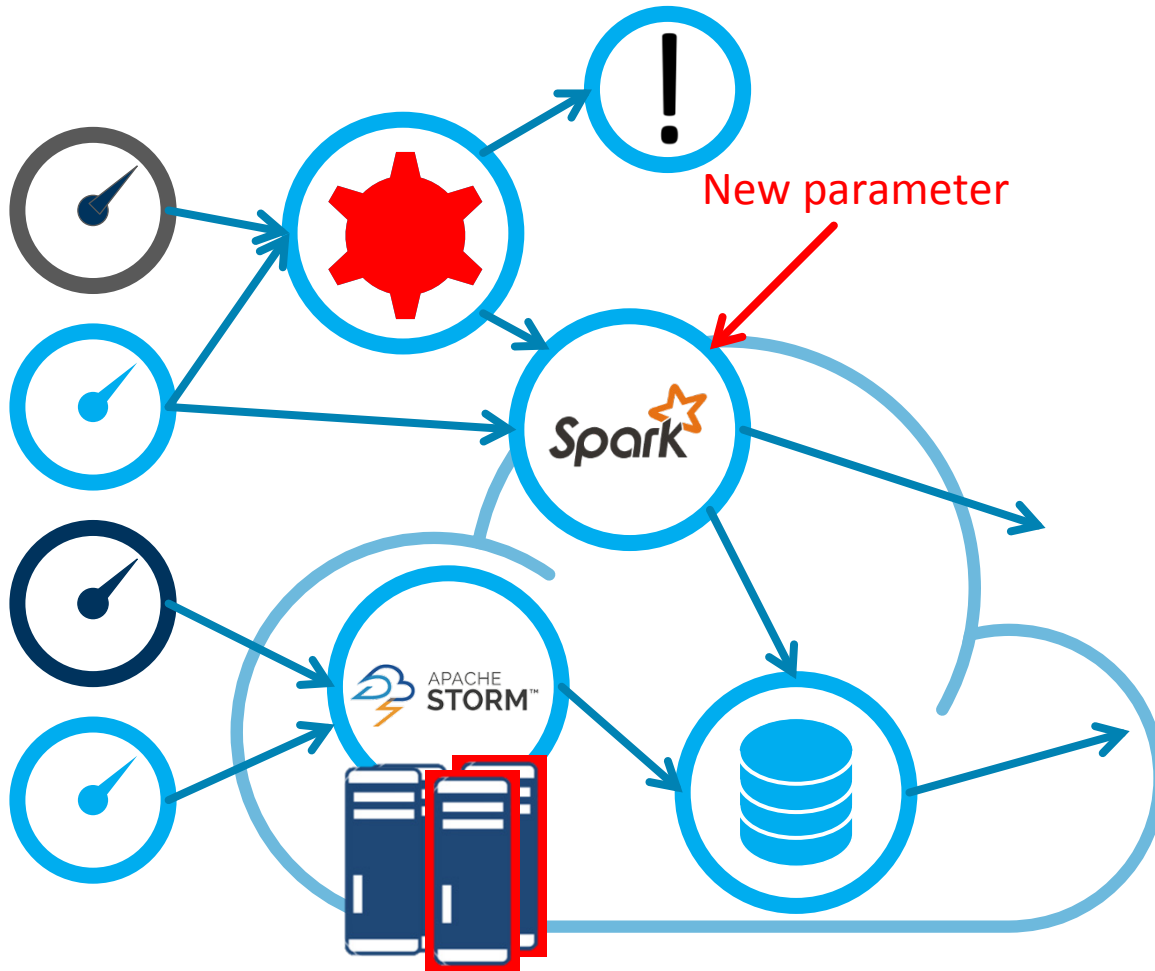
- Exploit software engineering techniques to build a **framework/language** to support the management of big-data management workflows
  - **Different abstractions/views** over the system
    - Facilitate the design, deployment and management of big data workflows
    - Facilitate the design, provisioning and management of their infrastructures (in term of resources)
- Workflows must be maintained and might evolve over the time
  - **Need for adaptation**, e.g.:
    - News sensors
    - New monitoring rules
    - Optimize cloud resources (e.g., data location, bursting)
  - With minimal impact on the already running system

# Dynamic adaptations



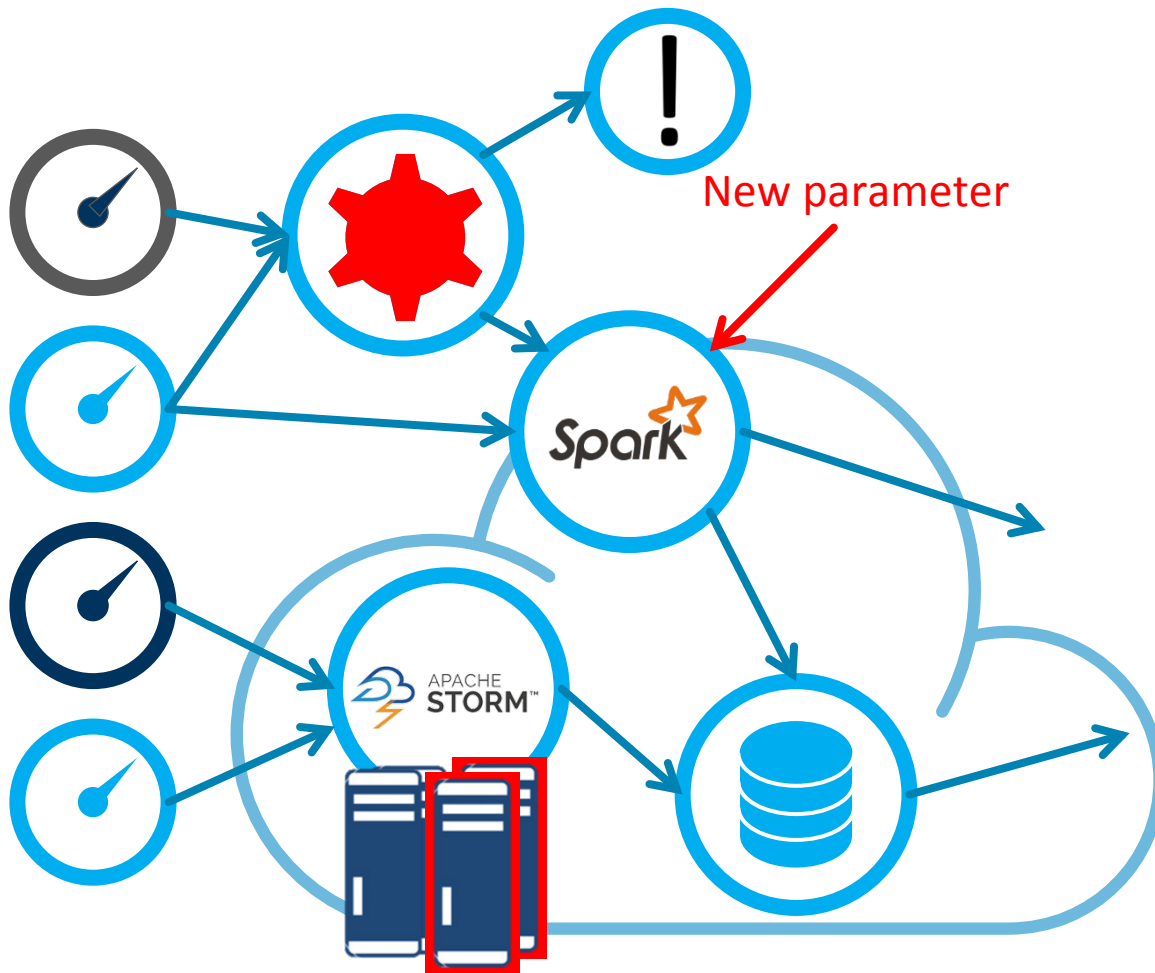
- Parameter Adaptation
  - Fast
  - Easy
  - Limited
  - Anticipated

# Dynamic adaptations



- Structural Adaptation
  - Requires modularity
  - Adapt behavior & architecture
  - Unanticipated

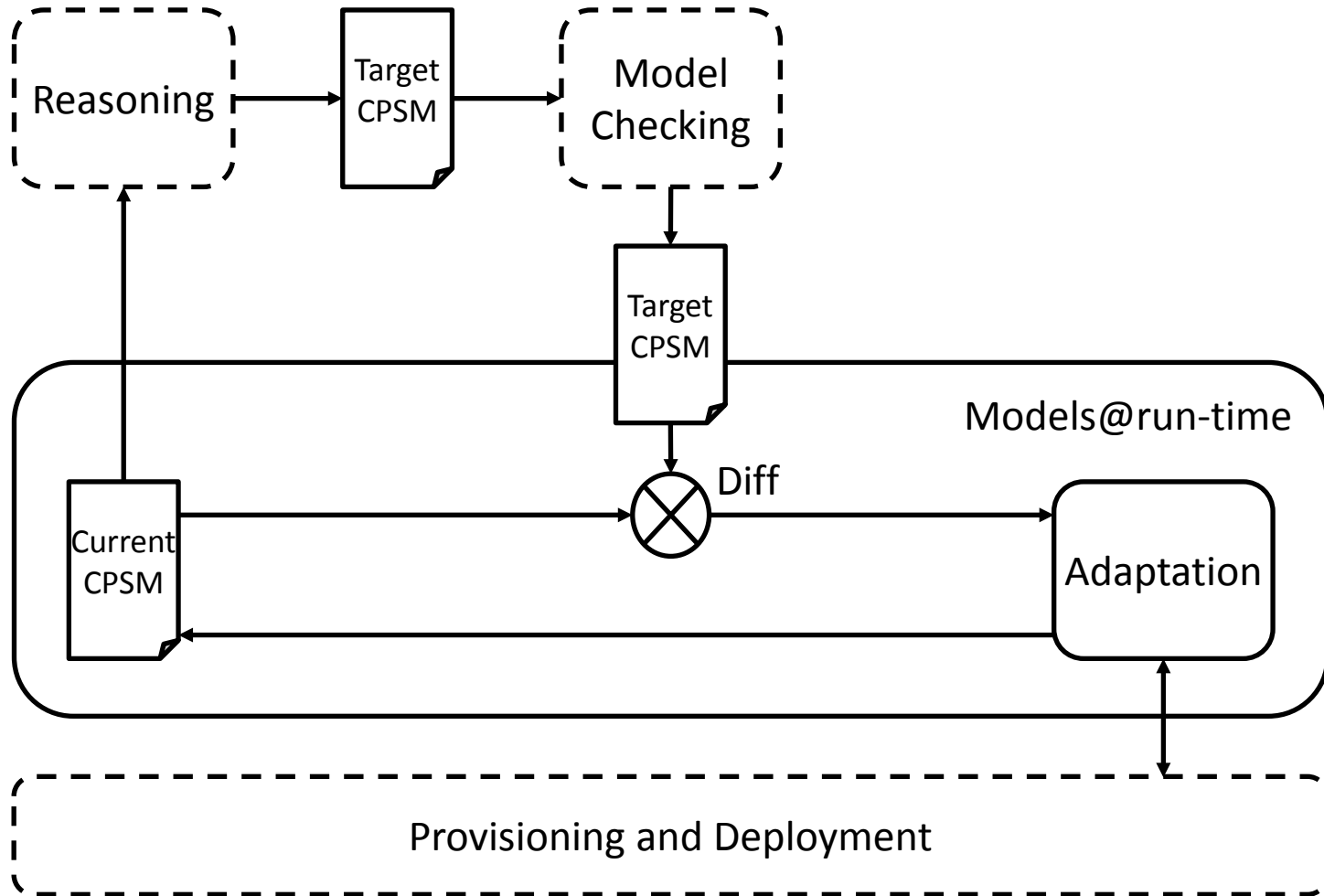
# Dynamic adaptations



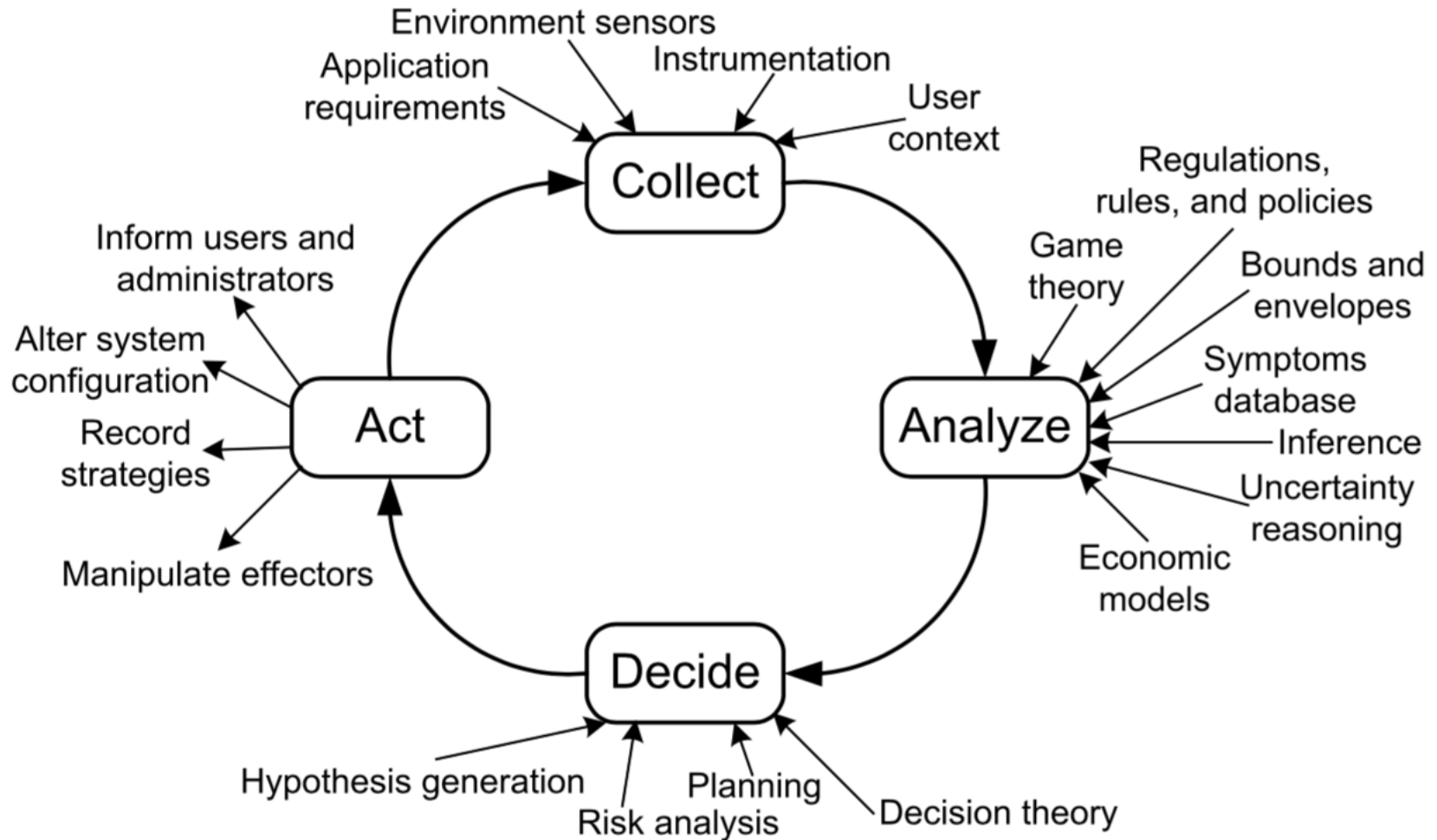
- Infrastructure Adaptation
  - Scale in/out
  - Scale up/down
  - Unanticipated
  - Location of data



# Models@runtime



# Toward self-adaptation

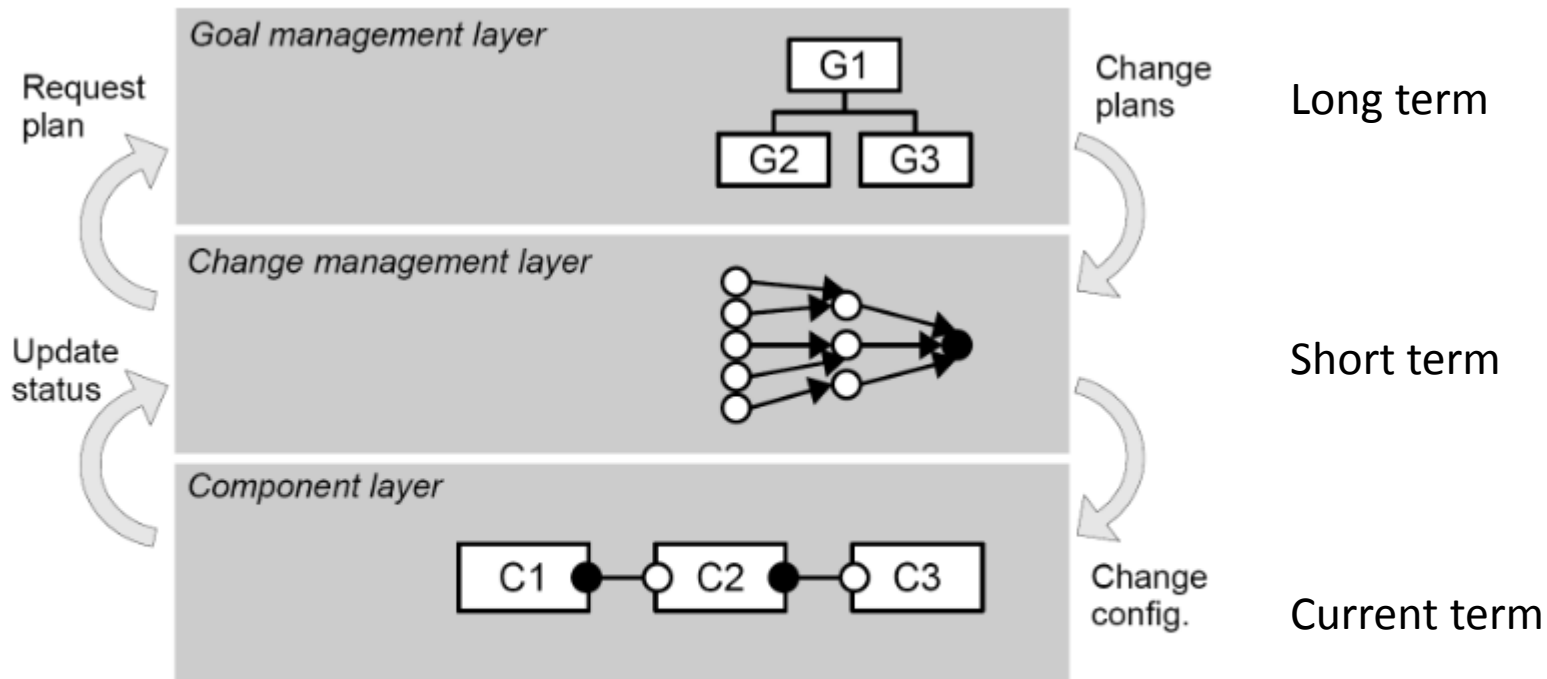


[B.H.C. Cheng *et al.*] Software engineering for Self-Adaptive systems: a research roadmap

# Multiple layers of data handling

- Multiple dynamics and levels of abstraction, e.g.:
  - Close to the physical world
  - Via the cloud
  - Involving human
- Maximize continuity of service
  - Layers can work independently

# A classical architecture for self-adaptive systems

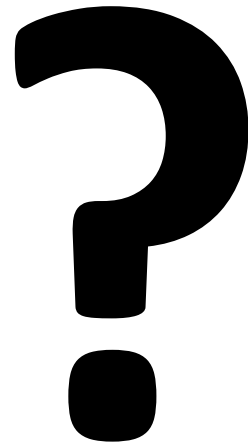


**Figure 1: Three-layered conceptual model**

[Sykes *et al*] From Goals To Components: A Combined Approach To Self-Management



Thank you !



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