AUTONOMIC SCIENCE INFRASTRUCTURE PANEL

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HOW IS SCIENCE INFRASTRUCTURE DIFFERENT FROM COMMERCIAL INFRASTRUCTURE?

How is science infrastructure different ?

from commercial infrastructure

- What's specific about Scientific Computation?

  total control of computing system

  - hardware (dedicated, own machines, servers)
  - software (known applications)
  - scheduling and optimization

- **... supposedly ... but**

  - **variability** at execution time

    e.g., access times (cache); values in data (iterations depth)
  - **shared infrastructures**, multiple users

    peaks (e.g. when conference deadlines nearing)
  - less predictable $\rightarrow$ requires more **runtime management**

$\longrightarrow$ **need for autonomic administration in HPC**

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THREE EXAMPLES OF AUTONOMOUS CAPABILITIES THAT YOU WANT TO SEE IN SCIENCE INFRASTRUCTURE

Three examples of autonomous capabilities

1. **high level workflows** seen as DAGs (dependency graphs)
   sequences and parallel branches of large grain tasks
   conditional branchings, uncertainty on order of termination events
   Domain-Specific Language, automata & discrete control **[jSS17]**

2. **modularity, reusability, composability**
   software **components**, wrapping lecacy code
   interfaces & attributes, **hierarchical composites** : reconfigurability
   configurations space: automata & discrete control **[ICAC15]**

3. **reliability** of self-adaptation, **model-based** e.g. **control theory** :
   - classical (continuous) : differential equations
   - discrete : Petri nets, automata
   - stochastic : Markov Decision Processes

   multiple, hierarchical loops ; **composable** sub-systems **[CBSE14]**