Autonomic Computer Systems CS321: Course overview and adminstrative matters

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Overview 2011-09-20

Welcome to CS321 “Autonomic Computer Systems”! Today:

- Administrative matters
- Motivation
- Why “Autonomics”? Brief intro to fault tolerance
- IBM’s autonomic initiative (2001)

Which language to use:
– all slides will be in English, some lectures too
– can some lectures be given in German or not?

Lecturers and Assistants

- Lecturers:
  Manolis Sifalakis
  Christian Tschudin
  (Ghazi Bouabene, Massimo Monti, Thomas Meyer)
- Assistants:
  Ghazi Bouabene, Massimo Monti
- Please register at `https://mona.unibas.ch/` and `http://courses.cs.unibas.ch/`
  (requires an eMail address from UniBasel)

Time and Place

- Lecture schedule:
  – Tuesday 14-16, room 408, CS Dept Schanzenstrasse 46
  – Thursday 8-10, room 205, CS Dept Bernoullistrasse 16
- Exercises
  – time slot (generously) reserved for Tuesday 9–12
  – room U1075 (PharmaZentrum)
  – starting next week?

Course Profile

- Prerequisites:
  – Bachelor degree in Computer Science or equivalent,
  – especially: knowledge in OS and computer networking
- Master level course profile:
  – includes self-studies
  – not only “established” knowledge, partly exploration
- Grading (“Leistungsüberprüfung”):
  – participation in two seminar sessions
  – exercises: pass/fail or points, threshold to be discussed
  – oral exam on Dec 20st and 22nd, 2011

Organisation

- Lectures
- During exercise slots: if necessary,
  – introduction to management tools, their concepts
  – preparation for exercises
  – discussion of solutions
- Possibility of a visit to an (autonomic) computing center, or person invited
- Closing seminar

Motivation for this Course

Shifting gears:

1. (typical Bachelor CS studies)
   Getting something programmed and running:
   mastering complexity of hardware and algorithms
2. (software engineering and project management)
   Getting large projects working
3. In this course:
   Keeping *systems* running, managing them (-selves)

Goal of this Course

Adopt an “autonomic” mind set:

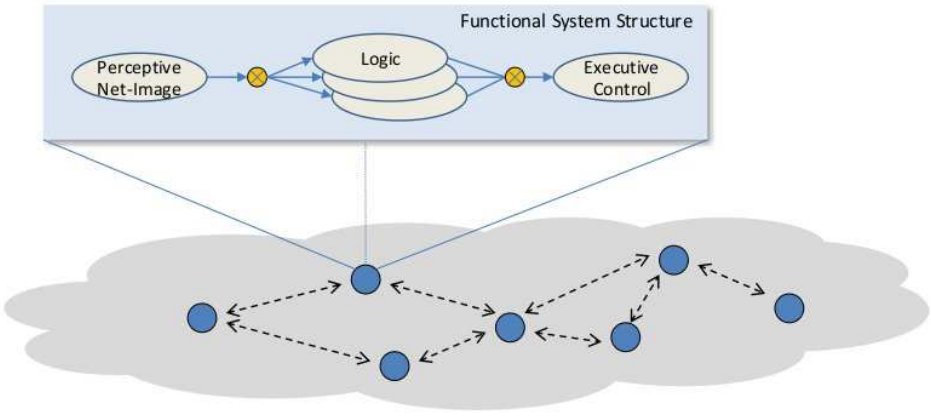
- Understand important aspects of managing
  “computer operations”, at all levels (config to high level policy)
- Get insights in (the challenges of) running mid-scale
  computer systems
- Learn about existing approaches and solutions
- “Grand challenge” of keeping computer systems running:
  Peek at the new “autonomics” research topic and projects

Content Clusters 2011

1. Intro – “autonomic” hype, the self-star inflation (see next slide set), and **Distributed algorithms**
2. **Fundamentals of Internetworking**
3. **(Network) Architecture** functional (network) composition, customization
4. **(Network) System Dynamics**

Contentwise, this course complements *“Distributed Information Systems”* of Prof Schuldt.

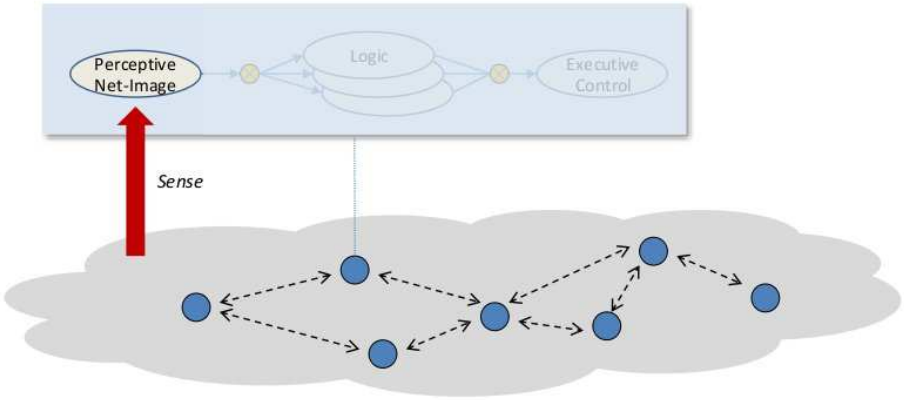
Content Clusters: a Network View (1/6)



(2/6) Perception of the Environment

Sensing, receiving, measuring, monitoring… What ?

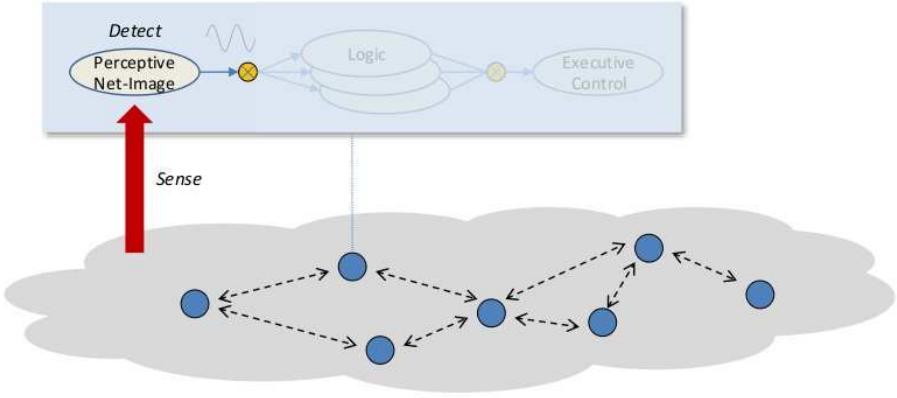
- Internal state (memory, power, cpu load, interface status, reception errors, …)
- Network topology (neighborhood, link state, routing state, …)
- Traffic (packet arrival, congestion, delay, throughout, …)
- Physical Environment (noise, attenuation, position, …)



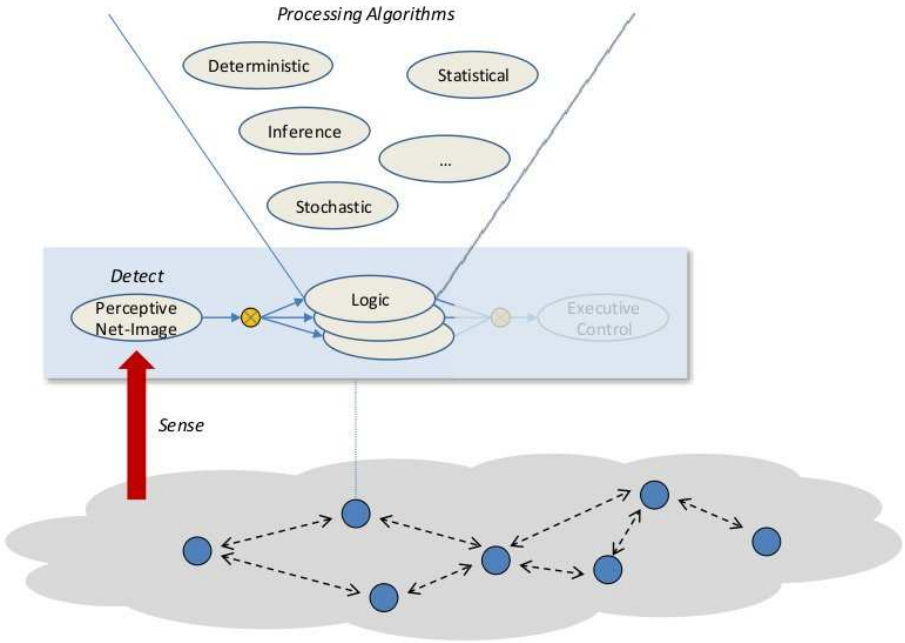
(3/6) Event Driven Operation

Detection of state changes (events) drive system/network operation (logic processing). E.g.:

- Normal events (e.g. packet arrival, neighborhood advertisements, …)
- Network state (e.g. topology changes, mobility, …)
- Perturbations (faults, race traffic conditions, resource exhaustion, …)



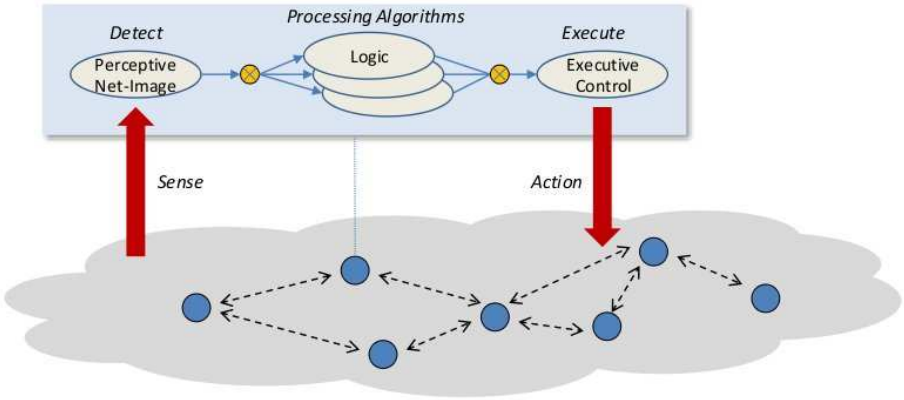
(4/6) (Reactive) Logic Operation/Analysis



(5/6) Execute Action / Adapt to Changes

Responses to events

- Normal communication (packet transmission, service provision, ...)
- (Re-)Configuration (modify state, update routing state, change name, ...)
- Adapt current functions (modify protocol parameters, allocate resources, ...)
- Modify functionality (employ new functions, deploy updates, claim new role, ...)



(6/6) Course Foci