

# WAC 2005 Panel 2: Autonomic Communication Roadmap Proposal

Position statements by  
Lidia Yamamoto and Christian Tschudin  
University of Basel  
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## AC Roadmap

- ◆ Roadmap: a path from now to full AC
  - ❖ and maybe beyond
- ◆ Now
  - ❖ Brittle systems, require babysitting, blackbox Internet, blue screen, viruses,...
- ◆ Full AC
  - ❖ Full autonomic operation: underlying systems conspire to do what we want automatically
  - ❖ Self-everything?
- ◆ Beyond AC: life after AC
  - ❖ Intelligence? Autonomy? Creation?

# Roadmap phases

- ◆ Phase 0: now: establish the field
  - ❖ Definition
  - ❖ Funding actions, dissemination
- ◆ Phase 1: 4 years: establish foundations
  - ❖ EU FP6 FET S&AC, 2006-9: 4 Projects: ANA, BIONETS, CASCADAS, HAGGLE
- ◆ Phase 2: move forward, advanced aspects
  - ❖ FP7 (2007-13) and worldwide
- ◆ Phase 3: maturity and beyond
  - ❖ Research: Beyond AC?
  - ❖ Society: **use** of AC-based mature solutions

## Phase 0

- ◆ Definition: **TO DO NOW!**
  - ❖ What is AC?
  - ❖ What is **not** AC?
    - We must agree!
- ◆ Funding actions, dissemination
  - ❖ (Well) done!
    - WAC 04, WAC 05, ...
    - Countless AC sessions in conferences, workshops, ...
    - FET S&AC

# What is AC? Tentative definition

- ◆ Systems that do what we want without direct human supervision
  - ❖ Context, knowledge
  - ❖ Conflict resolution, policies
  - ❖ Performance evaluation and feedback
- ◆ By themselves: self-<sup>\*</sup>
  - ❖ Self-organization and emergence
  - ❖ Self-management
    - Self-protect (security, immunity)
    - Self-diagnose (detect)
    - Self-heal (correct, repair, recover)
    - Self-configure, self-update
    - Self-optimize, self-adapt, self-evolve
    - Self-deploy, self-deprecate

# What is not AC

- ◆ Too many self-<sup>\*</sup> ?
- ◆ Related areas
  - ❖ Pervasive, ubiquitous computing
    - might benefit from autonomics, but are not autonomics
  - ❖ Autonomic computing
    - AC inherits (partial) name and motivation, but not necessarily the techniques
  - ❖ Networking
    - AC is networking, but networking is not AC: study of algorithms/protocols in isolation, very small networks, human controlled/managed, not self-<sup>\*</sup>, ...

# AC Measure?

- ◆ Instead of binary definition (AC or not AC)
- ◆ A measure of the “autonomicity” of a system, [0; 1]
  - ❖ E.g. weighted sum of different criteria in the definition?
  - ❖ Inversely proportional to the amount of human intervention (and invention?) required
- ◆ Pros: avoid in-out black-white
- ◆ Cons: complexity, ambiguity, risk of too wide scope

# Phase 1: FET A&C

- ◆ HAGGLE: PSN, wireless, opportunistic networking, replace USB storage
- ◆ ANA: AC architecture and testbed: ANA@Home platform
- ◆ CASCADAS: pervasive AC, context & knowledge, AC component models
- ◆ BIONETS: bio-inspired AC, evolutionary protocols and services, socio-economic models

risk, time, futuristic

# Phase 1: FET A&C

- ◆ Expected results
  - ❖ Well-established theoretical foundations for AC
  - ❖ Practical case studies with tested prototypes
    - AC@pocket
    - AC@meetings
    - AC@confs
    - AC@home (overlay)

# Phase 2: FP7

- ◆ AC in Mainstream IST
  - ❖ End of DNS, DHCP, E2E obligation
  - ❖ Usability, acceptance, socio-economic issues
- ◆ AC in FET
  - ❖ Complex systems & emergence
  - ❖ Context & environment
  - ❖ Conflict resolution
  - ❖ Adaptation & evolution
  - ❖ Eternal software, autocatalytic systems

# Phase 3

- ◆ Society: use and benefit from AC
  - ❖ If not by 2013, then we've failed!!
  - ❖ Measure of autonomicity= measure of AC success?
- ◆ Research: Beyond AC? Life after AC?
  - ❖ If everything autonomic, what is left to do?
    - Intelligence (autonomic < intelligent) ?
    - Autonomy (autonomic < autonomous) ?
    - Creation
      - automated software synthesis, self-engineering, self-producing, fully automated AC lifecycle, ...
      - automated research???