Summary of Autonomic Networking 3.0

Jéferson Nobre
Laurent Ciavaglia
Lisandro Granville

Outline

- Introduction
- Quick Recap on Academic Research
- IETF/IRTF Efforts
- Outlook

Introduction

- Minimum set of properties of an Autonomic System (AS)
  - Automatic, i.e. it can "self-control its internal functions and operations"
  - Adaptive, i.e. it can change its "configuration, state and functions"
  - Aware, i.e. it can "monitor its operational context"
- Different set of definitions for an AS
  - E.g., self-CHOP, MAPE-K, OODA
- Application to the complete network lifecycle (e.g. installation, commissioning, operating) → Autonomic Networking (AN)
- AN usually addressed by the Network Management Area (IM, NOMS, CNSM)

Quick Recap on Academic Research

- First mentions → *circa* 2005, 2006
  - Several antecedentes → e.g., Artificial Intelligence in NM (90s)
- A lot of momentum → circa 2007-2009
  - 6h Framework Network of Excellence. Deliverable D9.5 Autonomic Management: Challenges and Solutions
- Decrease in interest → circa 2011-2013
  - Other technology gaining momentum? → SDN, NFV...

IETF/IRTF efforts (past and ongoing)

- 3 Autonomics for Network Management meetings @ NMRG
  - Gap analysis, definitions, network configuration, bootstrapping trust, P2P detection of SLA violations, Lessons learned, Real world experiences
- Outcomes of the NMRG work
  - UCAN BoF (IETF 90) → ANIMA WG
  - RFC 7575, RFC 7576
- Related efforts
  - SUPA, HOMENET, SDNRG, NFVRG, NMLRG (proposed), IDN (BoF?)

ANIMA WG

- First charter
  - Development of protocol specifications (or extensions)
    - Discovery and Negotiation for autonomic nodes → GRASP
    - Bootstrapping a trust infrastructure → BRSKI
    - Separated Autonomic Control Plane → ACP
  - Limited initial set of work items → avoid "boiling the ocean"
  - Unchartered work encouraged as individual submissions or **NMRG submissions**
- “Nov 2018 - recharter to refocus scope, or close”

Outlook for Autonomic Networking

- New terminology
  - Cognitive,Intelligence-driven, Intent-Based..
- Autonomous <> Autonomic
  - Host speaker series

IETF 103 - Host Speaker Series

Topic: Challenges of Evolution Towards Autonomous Network

The network is in the process of changing to adapt to cloud requirements and closer integration with computation and storage resources, which requires network provisioning within seconds. Network autonomy is a response to this challenge; to implement autonomy, the network has to be simplified. The simplification applies to protocol systems as well, as protocols play a key role in networking.

Based on network autonomy, virtualization and softwarization of networks help to decouple tenant network provisioning from the underlying physical resource, which makes the speed of network service deployment match the one for computing and storage resources. In addition, intelligence is going to be introduced into the network to provide abundant data on network status for timely diagnosis, decisions, and configuration changes. Chang Yue will share his experience and insight to these trends, as well as his opinions on technology evolution.

Speaker: Chang Yue, Chief Architect of Network Product Line, Huawei Technologies

Outlook for Autonomic Networking

- New application areas
- Highly-virtualized, programmable infrastructures
  - Lots of interest on SDNRG (defunct) and NFVRG
  - I-D: [draft-pedro-nmrg-anticipated-adaptation-02]
- Areas of application: 5G, IoT, Smart X (factory, city, health…)
- Better link with real-world operations (NANOG, RIPE, etc)
- Effective deployment
  - Reasons for lack of wide-scale deployment?

Outlook for AN @ NMRG

- Is there a need/interest/energy for **Autonomics 3.0**?
- If yes, 4 proposed efforts:
  - Intent-Based Networking
    - I-D: [draft-clemm-nmrg-dist-intent-01]
  - AI/ML for Network Management
    - I-D: [draft-kim-nmrg-rl-03]
  - Integration with network automation approaches
    - ETSI Zero Touch Network and Service Management
  - “Eat your own dog food” approach → revisit RFC 7575/7576
    - What is out of ANIMA scope in a long term (after recharter)?

Thank you.

Questions?