20 Years
Network Management Research Group (NMRG)

Jürgen Schönwälder (1999-2011)
Olivier Festor (2011-2015)
Lisandro Zambenedetti Granville (2011-2018)
Laurent Ciavaglia (2015-)
51 NMRG Meetings, 8 RFCs Published

- RFC 3430: SNMP over TCP  
  (Mar 1999 - Dec 2002)
- RFC 3434: On the Difference between Information Models and Data Models  
  (Jul 2002 - Jan 2003)
- RFC 3780: SMIng - Next Generation Structure of Management Information  
  (Jun 1999 - May 2004)
- RFC 3781: SMIng Mappings to SNMP  
  (Jun 1999 - May 2004)
- RFC 5345: SNMP Trace Formats  
  (May 2006 - Oct 2008)
- RFC 7575: Autonomic Networking: Definitions and Design Goals  
  (Dec 2013 - Jun 2015)
- RFC 7576: General Gap Analysis for Autonomic Networking  
  (Apr 2014 - Jun 2015)
- RFC 8316: Autonomic Networking Use Case for Distributed Detection of SLA Violations  
  (Jun 2014 - Feb 2018)
NMRG Timeline

SMING WG
EOS WG


NMRG

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RFC 3430
RFC 3444
RFC 3780, RFC 3781
RFC 5345
RFC 7575
RFC 7576
RFC 8316

ANIMA WG
Network Management 20 Years Ago

• Policy-based management (COPS, COPS-PR, SPPI)
• Directory-enabled networks (DEN)
• Policy information models (DMTF/IETF)
• Limitations of SNMP/SMIv2 were obvious
• SNMP technology evolution appeared to be deadlocked
• Experiments with “web-based” management protocols
  • use HTTP instead of SNMP
  • pushing data instead of polling data
  • technology fragmentation (WebServices, SOAP, BEEP, WBEM, ...)
• Networking devices mostly closed boxes with proprietary CLIs
• Technology made robust automation difficult and expensive for operators
Meeting in Lausanne

• Meeting in Lausanne in November 1998 gave birth to the idea to propose a research group in the IRTF

• Lausanne meeting participants:
  • Aiko Pras (University of Twente)
  • Luca Deri (University of Pisa)
  • Ron Sprenkels (University of Twente)
  • Jean-Philippe Martin-Flatin (Swiss Federal Institute of Technology)
  • Bert Wijnen (IBM T.J. Watson Research, IETF AD)

• NMRG approved on March 14th 1999 by the IRTF chair Abel Weinrib (who soon afterwards stepped down).
Phase 1: management technology

• Goal #1: avoid fragmented and overlapping data models
  • integrate SMIv2, SPPI, ... into SMIng, a protocol neutral modeling language
  • NMRG effort became a working group (SMIng)
  • working group managed to agree on objectives but not on a solution

• Goal #2: evolve the SNMP framework
  • structured data and not just flat tables
  • more efficient protocol primitives (getsubtree, filtering, compression, ...)
  • effort became a working group (EOS = Evolution of SNMP)
  • working group failed to reach consensus on anything (EOS = End of SNMP)

• Goal #3: collect data how SNMP is used in real networks
  • provide evidence for the folklore (that was sometimes disputed)
  • created tools and data exchange formats for SNMP traces
Phase 2: autonomic network management

• Goal #1: Common understanding, gap analysis, use cases
  • Series of meetings at NMRG:
  • Gap analysis, definitions, network configuration, bootstrapping trust, P2P detection of SLA violations, Lessons learned, Real world experiences...
  • RFC 7575 and RFC 7576
  • UCAN BoF, ANIMA WG

• Goal #2: Autonomics 3.0
  • New application areas: 5G, IoT, Smart X: factory, city...
  • Highly-virtualized, programmable infrastructures
  • Network automation “mega” trend, self-driving networks, insight-driven networks
  • New wave of AI/ML I-D: [draft-pedro-nmrg-anticipated-adaptation-02]
  • Better link with real-world operations and needs: NANOG, RIPE, SRE/NRE
  • Effective deployment: reasons for lack of wide-scale deployment?
Phase 3: intent, machine learning, ...

• Goal #1: Intent as a means for better usability and manageability
  • Abstractions and mechanisms
  • Transfer of knowledge and reasoning from human to machines
  • Higher degree of flexibility, adaptation... and user reward / incentive...

• Goal #2: Use of AI techniques for network management
  • Not new... but new techniques and capabilities
    • DNN, GNN, DRL, federating learning...
    • Data explosion, computing power, storage capacity, data processing techniques...
  • Challenges: beyond “ML hammer” to solve all “network nail problems”
    • Integration of AI/ML in-for Networks
    • Network specific AI/ML
Future of Network Management...

• Networks and Network Management have changed a lot in 20 years
• NMRG adaptation over time to address the changes (phases)

• Difficult to “predict” what future networks will be... however, necessary to think about:
  - What networks are today / near future
  - How they are designed, deployed, operated
  - What are the key (research) problems / challenges
  - Is network management the right “approach”