



# Requirements for a **Generic Autonomic Network Architecture (GANA)** that allows for the production of **Standardizable Autonomic Behaviour Specifications**

**Ranganai Chaparadza**

**Fraunhofer FOKUS, Germany**

**Contact:** [Ranganai.Chaparadza@fokus.fraunhofer.de](mailto:Ranganai.Chaparadza@fokus.fraunhofer.de);  
[ran4chap@yahoo.com](mailto:ran4chap@yahoo.com)





# Overview and Problem Statement (1)

- The quest for Self-Managing Networks or Autonomic Networks is what is mainly calling for a re-visitation of today's networking models, architectures and paradigms.
- Autonomicity is an enabler for self-manageability of networks, meaning that autonomic elements, which automate network operations based on realizing (implementing) control loops, and being instrumented in the nodes is what should power a self-managing network.
- **Problem-Statement:** Whether an evolutionary approach or revolutionary approach is taken, there is a requirement for a **Generic Autonomic Network Architecture (GANA)** that allows for the production of **Standardizable Specifications of Autonomic Behaviors** i.e. **Self-\* functions** (expect them to be complex) for diverse networking environments, bearing in mind that the **Autonomic Behaviors (Self-\*)** must be testable and verifiable (a challenge). [a holistic approach is required].
  - Self-managing/autonomic properties of a network node or the network as a whole, at **different levels of abstracted networking or system functions** such that we should be able to talk about, for example, **Autonomic Routing, Autonomic QoS-management, Autonomic Forwarding, Autonomic Information/Knowledge Dissemination, etc.**
  - **Hierarchical levels of Control Loops** and their associated Decision-making Elements (DEs) for self-manageability/autonomicity, including **peering DE relationships** (to allow for distributed self-management/autonomic behaviors).
  - **Issues that require centralization** of some of the autonomic decision-making processes should be captured.

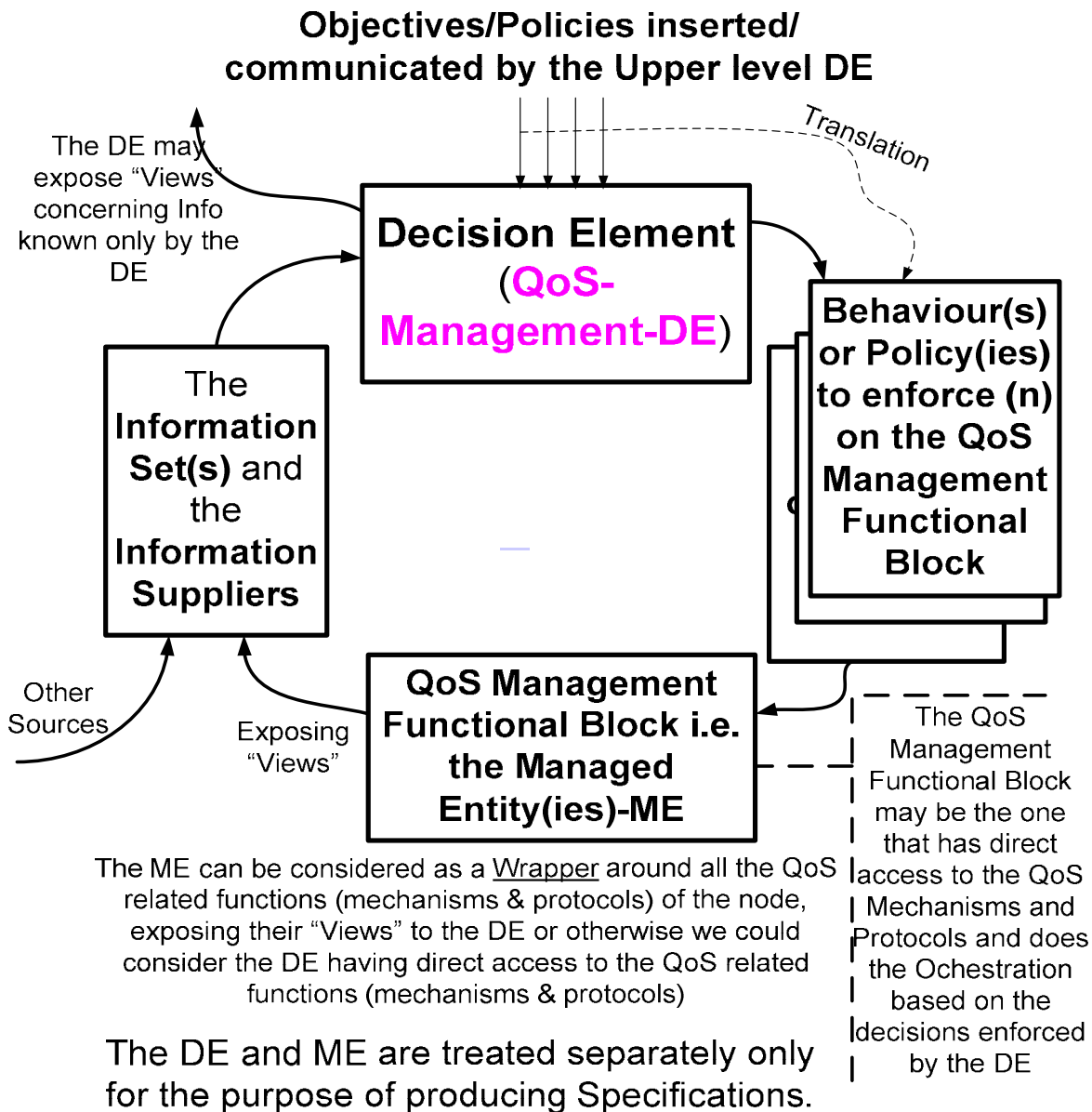


## Problem Statement (cntd)

- **The point is:** by separating issues of concern for different well-defined levels of **autonomic decision-making processes** i.e. control loops, the architecture (**GANA**) would allow for the production of standardizable specifications of autonomic behaviours including their coupling and interactions.
- The Generic Autonomic Network Architecture should allow for **Modeling and Validation of the captured (specified) Autonomic Behaviors using Formal Description Techniques (FDTs)** such as the well-known and successful **SDL**.
- **A Domain-Specific Meta-model for the Autonomic Networking Domain is required**, that defines the concepts, constrains and semantics for **autonomic network engineering**, concepts such as control loops, decision-making elements and their associated managed entities (and other types of information suppliers), interfaces, etc.
- **With well-defined Standardizable Specifications of Autonomic Behaviors (Self-\*) as part of the Generic Autonomic Network Architecture, an evolution path for today's networking models, architectures and paradigms** i.e. the **Future Internet** can emerge (or can be easily defined).
- **Some of the input to producing Specifications of Autonomic Behaviors for diverse networking environments should come from what has been achieved in isolated cases of autonomic networking of which the information is currently scattered in scientific conference, workshop and journal papers, Projects.**



# An Example of a DE (inside a node)





# Hierarchy, Peering & Sibling Relations between DEs

