

Comparative analysis of different autonomic management architectures

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The concept of Autonomic Network Management (ANM) was born several years ago. It comes with the promise of automated network management that provides proper network configuration, fault management (self-healing) and network optimization. In opposite to existing management approaches ANMs is based on real-time or near-real-time operations. Moreover, in order to provide scalability and fast reaction time, a distributed management approach is preferred over a classical centralized one. The ANM concept is of premium importance for network operators due to the elimination of human assisted management (human configuration errors probability is significantly minimized), OPEX reduction and ability to cope with continuously growing number of networking devices that have to be managed (including those installed at user premises). The existing Autonomic Network Management (ANM) approaches are typically based on the IBM Autonomic Management model. Such a feedback loop system consists of sensors (monitoring part), knowledge base (algorithms) and actuators (control knobs). In the cognitive approach the algorithms have learning ability.

During last 5-7 years there were started many projects focused on ANM. These projects include European Union funded FP6 and FP7 projects like the 4WARD, that introduced the concept of In-Network-Management or the EFIPSANS project which main achievement is the Generic Autonomic Network Architecture (GANA). Through the efforts of EFIPSANS a new ETSI Industry Specification Group (ISG) has been created, namely the Autonomic network engineering for the self-managing Future Internet (a.k.a. Autonomic Future Internet – AFI ETSI ISG). Another big project that is ongoing is UNIVERSELF which main goal is to enable the adoption of autonomics by the industry by looking at several use cases, capitalizing of the past projects/results, defining a Unified Management Framework (UMF) supporting the introduction of autonomics migration path. Other relevant projects include SelfNet, the under way CELTIC COMMUNE and E3. Research projects related to autonomic network management were also carried in the context of mobile network (in most cases these project were solely technology specific ones) and such projects include SOCRATES, BIONETS. It is worth to mention that 3GPP initiated work on Self-organized mobile Networks (SONs) that is in-line with the ANM concept.

Despite enormous efforts the adoption of ANM or CNM is very low. The first generation of research projects has identified some new problems that have to be resolved. The list of problems is long and includes such issues like management system response time and stability, resolving conflicts caused by different decision elements, management related signaling overhead (scalability issue), coping with unreliable signaling, combining of direct, manual management with autonomic one (a feature requested by network operators) and last but not least a problem with trust related to autonomic operations. In the speech the introduction to Autonomic Network Management, comparison of the most prominent, above mentioned approaches and list of open ANM issues will be presented.