Use-case description template

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Abstract

This use case intends to bring about the Future Internet thematic of complexity and proliferation of networked devices. Network operators are focusing on optimal use and combination of access and core technologies in an attempt to provide consumers network access agnostic services. Heterogeneity is introduced for the benefit of consumers, while network operators undertake the responsibility to manage this complexity within their responsibility domain. Congestion Management is a common task that network operators are coming across on a daily basis in such an environment.

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1 Executive summary

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This use case assumes a network infrastructure of WiMAX broadband access provision to consumers. For the use case, consumers are using normal (PSTN/ISDN) telephone devices connected to Analog Telephony Adapters and the WiMAX Subscriber Stations (SS). Consumers initiate VoIP calls, when, after some time, WiMAX Base Station (BS) identifies congestion on the wireless link and examines potential remedy actions to tackle this. BS decides to decrease available bandwidth for each flow in order to maintain the current number of voice calls and conveys this decision to ATAs. ATAs then, in order to conform to this decision, switch VoIP calls to a voice codec featuring higher compression. Upon successful completeness, this reconfiguration results in an overall decrease of traffic over the previously congested wireless links with the goal to preserve Quality of Service for the initiated voice calls and maintain wireless access network health.

2 Targeted users

- *A list of primary actors*
  Operators
- *A list of supporting actors*
  Industry (network manufacturer, terminal manufacturer)
- *A list of stakeholders and their interests*
  N/A

3 Description

The envisaged use case targets congestion management in heterogeneous networks **(**Figure 1**)**.

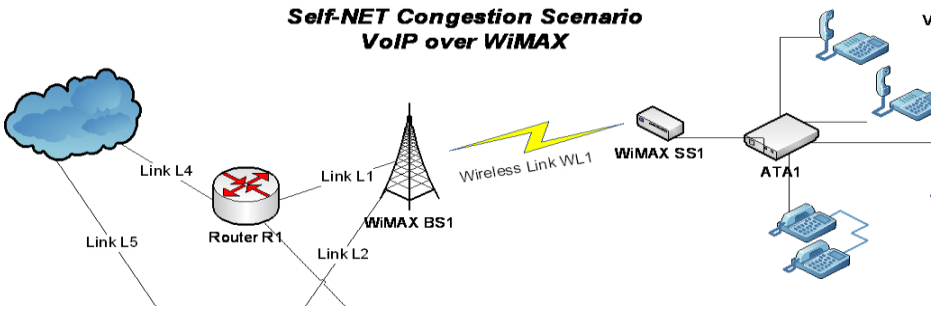

Figure 1: Self-NET Congestion Management Use Case topology

1. **Goal**: Relieving overloaded network elements from excessive traffic in order to improve overall system performance. In business terms, this can benefit the primary actor by decreasing its Operation Expenditure (OPEX). A balanced load on the network elements can result in decreasing failures probability. Handling failures currently takes up significant human effort in terms of determining the root cause and recovering from the failure.
2. **Actors**: cf. Section 2.
3. **Pre-Conditions**:
    a. WiMAX Base Station BS1 is able to detect links load.
    b. BS1 has knowledge on remedy actions in case of congested links.
4. **Trigger**: Identifying congestion at the wireless link.
5. **Steps**:
    a. Customers/Subscribers at ATA1 initiate voice calls (VoIP)**.**
    b. WiMAX Base Station BS1 detects congestion on the wireless link WL1.
    c. BS1 examines alternatives (e.g. alternative routes) and decides to indicate to ATA1 to lower bandwidth requirements in order to sustain service for all users.
    d. ATA1 decides to reconfigure itself and switch VoIP calls to a voice codec with higher compression to satisfy the bandwidth restrictions.
6. **Non-functional requirements:** Reliability.
7. **Post-Conditions:**
    a. **Success:** Load decreases along WL1.
    b. **Failure:** WL1 faces congestion load rates, increased number of packet losses.
    c. **Minimal Guarantee:** In case ATA1 reconfiguration actions fail, system has to maintain the former state, i.e. preserve service continuity for existing voice calls.
8. **Charging:** No specific charging is envisaged for this use case.

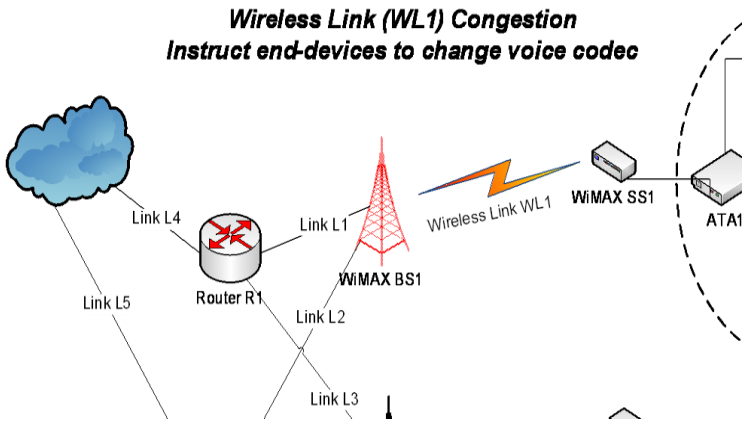

Figure 2: WiMAX Base Station BS1 detects congestion on Wireless Link WL1

4 Expected impact

4.1 Research on the Future Internet

Self-NET shall engineer the Future Internet based on cognitive behaviour with a high degree of autonomy, by proposing the operation of self-managed Future Internet elements around a novel feedback-control cycle. Furthermore, Self-NET shall embed novel management capabilities into Future Internet elements in order to take advantage of the increasing knowledge that characterises the daily operation of mobile Future Internet elements and users.

4.2 The market

The benefit of the introduced Self-NET functionalities is twofold, including both the network operators as well as the end-user.

The described use case and in general the Self-NET architecture intends to automate planning and reduce the management time of complex network parameters and structures. Currently, network operators search through vast amounts of monitoring data to find any "inconveniences" to the respective network behaviour and to ensure a proper delivery of services. Self-management capabilities in future network elements and introducing cognition in the various network element can automate the detection of unusual behaviour, the isolation of their sources, the diagnosis of the corresponding fault(s) and the expected repair of the problem. The operational costs will be reduced, since less manual effort is required to operate a network, while network resources are utilized more efficiently. Furthermore, easy adaptation of networks (e.g., in new traffic models and schemes) could be considered as an additional benefit for network operators. Continuous network management (proactively and reactively) adapted to the network dynamics is necessary so as to enable effective and efficient networking under highly demanding conditions.

On the other hand, the introduced Self-NET functionalities in the Internet architectures will offer the end users seamless experience, e.g., selecting a network in a dynamic and robust manner as well as improved service provision and adaptability by improving the overall network quality. Generally, the end user will observe increased satisfaction due to service failures minimization and service delivery continuation. Performance improvement is a matter of major importance for the user and the operator, in a competitive and liberalized telecommunications market.

4.3 Evolution of an independent entity

N/A