An integral part of any network QoS system are its QoS declarations. As described in Chapter 2, QoS declarations consist of service classes, parameters, and specification units. QoS declarations are a component of the QoS architecture. As such they are a source of technical heterogeneity stemming from the fact that different QoS systems may be based on different QoS architectures and thus use different QoS declarations. A particular problem in that domain is the translation of specification units for QoS systems that are based on different forwarding technologies with respect to variable vs. fixed packet sizes, i.e., packet vs. cell switching. This is a problem that can be dealt with generically such that its solution can be applied to several situations of technically heterogeneous QoS systems like an RSVP/IntServ- or DiffServ- over an ATM-based system. While straightforward translations have been proposed, we investigate how more efficient translations can be achieved.

7.1 Motivation

Different QoS declarations may be the most obvious hurdle to take in a heterogeneous QoS system. It is immediately clear that the different services classes, parameters, and specification units of QoS systems that are based on different QoS architectures need to be mediated at the edge device between such two QoS systems. In fact, however, QoS declarations are often not that different but rather similar on a conceptual level. For example, both, RSVP/IntServ and ATM, offer service classes for hard real-time traffic: RSVP/IntServ provides GS and ATM has CBR and rt-VBR for that purpose. Furthermore, both use the concept of token buckets to regulate traffic that is injected into the network. The actual differences with respect to QoS declarations are in the very details of service classes and parameters.

The result of this discussion is that the interworking problems related to different QoS declarations in heterogeneous QoS systems are very much tied to the details of the respective service classes and parameters. Therefore, it is difficult to find problems in this area that have the potential to be treated in a generic way. In fact, it is our belief that the mapping of service classes and parameters from one set of QoS declarations to the other must be done for each possible pair of QoS architectures individually. Although one can certainly "learn" from existing mappings, it is difficult to
Chapter 7 - Different QoS Declarations

generalize without abstracting to much from the actual problem. There is, however, one problem that has some potential to be dealt with generically. That is the translation of specification units for packet-based into cell-based performance parameters. Since it is our stated goal to investigate generic interworking problems for heterogeneous QoS systems that translation is the focus of this chapter. A further argument for concentrating on this issue is that there is existing and very valid work on the mapping of service classes and parameters for the major existing QoS architectures like RSVP/IntServ, DiffServ, and ATM, so that we can refer to this work whereas the issue of translating performance parameters has been given little attention so far.

One may argue that the translation of specification units from packet-based performance parameter into cell-based ones is already a very specific problem. There is certainly some truth in this, yet the results on translation presented below are at least applicable to two prominent configurations of heterogeneous QoS systems based on different QoS architectures, namely RSVP/IntServ over ATM and DiffServ over ATM. Moreover, one may argue that cell-switching has some potential to "survive" even if ATM disappears again, as it has some fundamental advantages over (variable-size) packet switching like easier parallelization of switching hardware, very fine-grained traffic management, tight jitter control, and so on.

7.2 Outline

In order to give a comprehensive view of different QoS declarations in heterogeneous QoS systems, we review existing work in the area of mapping service classes and parameters for the most prominent configurations of heterogeneous QoS systems in the next section. Afterwards, we turn to the translation problem, and analyze straightforward approaches to translation as proposed in the literature. We show that these may have detrimental effects on the efficiency of a mapping between QoS declarations, and identify the two major problems which lead to these inefficiencies. Thereafter, translation approaches to solve or at least alleviate these problems are presented, analyzed, and compared to the straightforward approach.

7.3 Mapping of Services Classes and Parameters

We have argued above that the best which can be done with respect to the mapping of service classes and parameters is to look at each pair of QoS architectures and see how classes should be matched and how parameters are assigned to each other. There is a considerable amount of work, especially within the IETF, that does just that for the most prominent combinations of QoS architectures. These are RSVP/IntServ over ATM, DiffServ over ATM, and RSVP/IntServ over DiffServ. We briefly review these examples and highlight the most important points of the respective mapping.

7.3.1 RSVP/IntServ over ATM

The discussions on the mapping of RSVP/IntServ's onto ATM's classes and parameters are conducted along the RSVP/IntServ service classes GS and CLS. The best-effort service class is left out as it represents a rich research area of its own (see, for