Chapter 8

Ordered Core Based Tree (OCBT)

8.1 High-level Description

Ordered Core Based Tree (OCBT) protocol [SG97] is a relatively new development in the area of multicast routing. It was observed by Shields and Garcia-Luna-Aceves in [SG97] that the CBT protocol with multiple cores has some basic problems. First of all, CBT with multiple cores may result in the formation of loops in the event of unicast routing instability. Secondly, it is also possible that CBT may not form the multicast tree under certain conditions. OCBT provides a modification to the basic CBT protocol with multiple cores to make it loop-free and robust.

Recall that in CBT, when a receiver wants to join a multicast tree, its designated router sends a join request towards the nearest core (which may be the primary core or a secondary core). In addition, the secondary cores send join request towards the primary core. However, CBT does not distinguish between these two join requests and that leads to the above-stated problems in CBT.

The main contribution of OCBT is providing a mechanism to differentiate between a leaf-initiated join and a core-initiated join. In fact, the cores in OCBT are assigned a logical level, which is a label that indicates
the core's position in the hierarchy of cores. Any control message originating from a core is stamped with a level number which is one more than that of the core's. Using this ordering scheme, OCBT is able to ensure loop-free multicast routing and is also able to provide a finite convergence time after link failures.

8.2 Architecture

Architecture of OCBT is similar to that of CBT. OCBT supports multiple cores except that each core has a level associated with it. Thus the key components of OCBT architecture are:

1. **Cores:** there are cores at levels $i$, $i = 1, 2, ..., N$ where $N$ is the maximum number of levels. A core at level $m$ is considered higher than a core at level $m-1$.

2. **Designated Router (DR):** this is one of the many routers connected to a multi-access sub-network. The DR is responsible for sending Join messages on behalf of the end-hosts in a sub-network.

8.3 Protocol

This section describes how the multicast tree is set up by OCBT under a normal condition. The details of what happens when a link fails and how the tree is reconstructed can be found in [S97].

8.3.1 Multicast tree construction

The steps of tree construction will be explained with respect to Figure 8.1. In the figure, there are 17 routers rt0 through rt16 of which rt2 and rt5 are level-N cores, rt9 and rt14 are level-$(N+1)$ cores and rt12, a level-$(N+2)$ core. There is a sender S and three receivers (R1, R2 and R3) which want to join the multicast group. Note, however, that OCBT does not distinguish between senders and receivers when the multicast tree is built. Each of the group members S, R1, R2 and R3 use IGMP Host-Membership Report to indicate to their respective designated routers rt1, rt0, rt15 and rt6 that they want to join the multicast group. After that, the following steps are taken: