```
***************************************************************************
```

ATM Forum Document Number: ATM Forum/95-0973

```
***************************************************************************
```

Title: Out-of-Rate RM Cell Issues and Inconsistencies in the End System
Behavior and Pseudocode

```
***************************************************************************
```

Abstract:

The out-of-rate RM cells are mandatory in the end systems to handle the
case of ACR = 0. Also several inconsistencies among the TM text, source
behaviour, and pseudo code are pointed out.

```
***************************************************************************
```

Source:

Raj Jain, Shiv Kalyanaraman, Sonia Fahmy and Fang Lu
The Ohio State University

Raj Jain is now at Washington University in Saint Louis, jain@cse.wustl.edu http://www.cse.wustl.edu/~jain/

```
***************************************************************************
```

Date: August 6-11th, 1995

```
***************************************************************************
```

Distribution: ATM Forum Technical Working Group Members
(Traffic Management)

```
***************************************************************************
```

```
***************************************************************************
```

Any switch algorithm will work only if the feedback it generates reaches
the sources. The network may set the ACR of ABR sources to MCR (which
may be zero) if VBR sources occupy the available bandwidth. In this
situation, no RM cells are sent in-rate in the forward or in the the
reverse direction. The only way to get out of this situation is for the
sources to send out-of-rate (OOR) RM cells. Although the TM document
describes this use of OOR RM cells, it is a general belief that OOR RM
cells are optional, which they are not since there is no other mechanism
to get out of this state. Trm is ineffective for ACR=0. It only applies
for low non-zero ACR.

If OOR cells are mandatory, then there are multiple possibilities for
sending them at 10 cells per second per VC (controlled by the TCR

parameter). It is not clear whether these RM cells have to be equally spaced and if not how is this rate measured. For example, is "100 RM cells every 10 second" a complient behavior?

At one point the TM document also states that the minimum ACR is 1 cell per second but this point is not included in the source behavior. Even if it was stated, one cell per second would be too slow for most situations where transient VBR overload can frequently cause ABR to be zero (or close to zero).

In addition, we have observed the following inconsistencies between the TM document text and the pseudo code:

1) The OOR Backward RM (BRM) cells are not controlled to 10 cells/s (tcr).

2) When ACR < TCR, no data or in-rate BRM cells are allowed. Only OOR FRMs are continuously sent.

3) ACR is not reset to ICR after idle periods (data-in-queue = 0). The source behavior section does not say anything about idle periods but there are statements elsewhere to this effect.

4) SES rule 3a) should read :

The next in-rate cell shall be a forward RM-cell if and only if, since the last in-rate forward RM-cell was sent

i) either at least Mrm in-rate cells have been sent and at least Trm seconds have elapsed
OR
ii) Nrm - 1 in-rate cells have been sent.

We present alternatives and simulation results in our presentation.