Adaptive RACH Congestion Management to Support M2M Communication in 4G LTE Networks [1]

Yin-Hong, Hsu

10 24, 2016

Outline

Aim

- Proposed a adaptive RACH congestion management function (ARC)
- Adaptively chooses the most efficient congestion handling method to overcome from congestion

Background

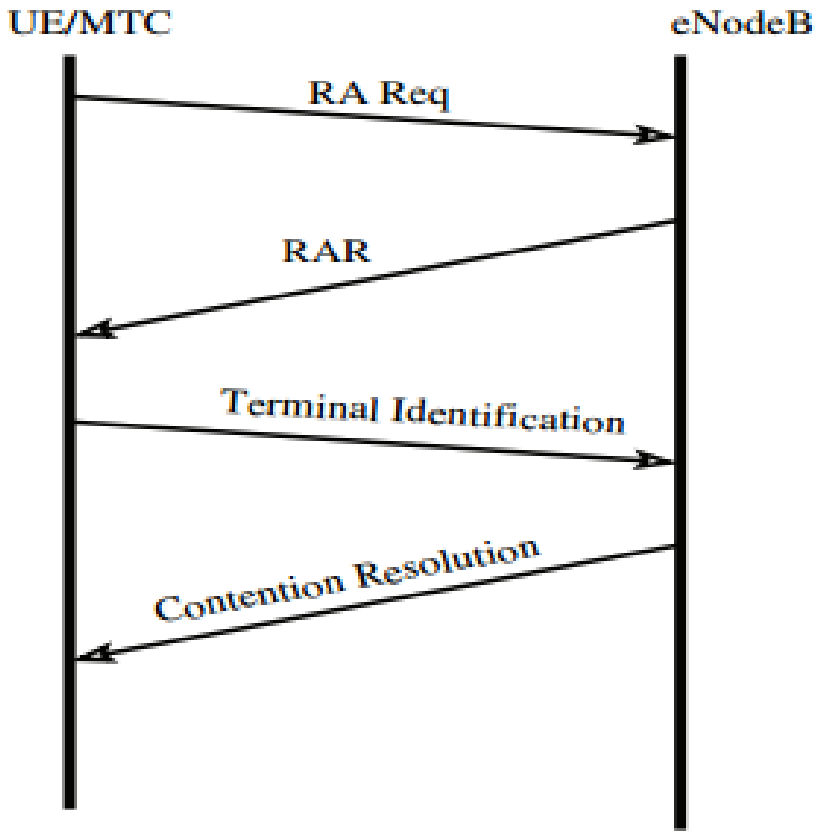

Fig. 1: RACH Procedure

Proposed solution

- Various methods were discussed to handle the RACH congestion
  - e.g. slotted access/ p-persistent/ numbering scheme...
- Divide the RACH congestion level into three categories
  - no congestion
  - moderate congestion
  - extreme congestion

Proposed solution - algorithm

- best congestion handling method selection algorithm (BCHMS)
  - pick the best congestion handling method in specific congestion level
- congestion estimation algorithm
  - return the current congestion level

Proposed solution - ARC algorithm

- adaptive RACH congestion handling algorithm
- main function for this paper
- call congestion estimation algo to detect the level of congestion
- apply the corresponding congestion handling method

Result

TABLE I: Simulation Parameters

Parameters	Values
Number of preambles	54
Number of MTC devices	1000 to 30000
Number of preamble re-transmissions	10
HARQ retransmission probability	10%
Preamble detection probability	1- $1/e^i$ where i is the i^{th} preamble transmission
PRACH slots per frame	1
$\lambda_1, \lambda_2, \alpha$	3, 10, 0.7
Simulation Time	10s
BackOff Time	20ms
User Arrival Distribution	Beta Distribution

Result

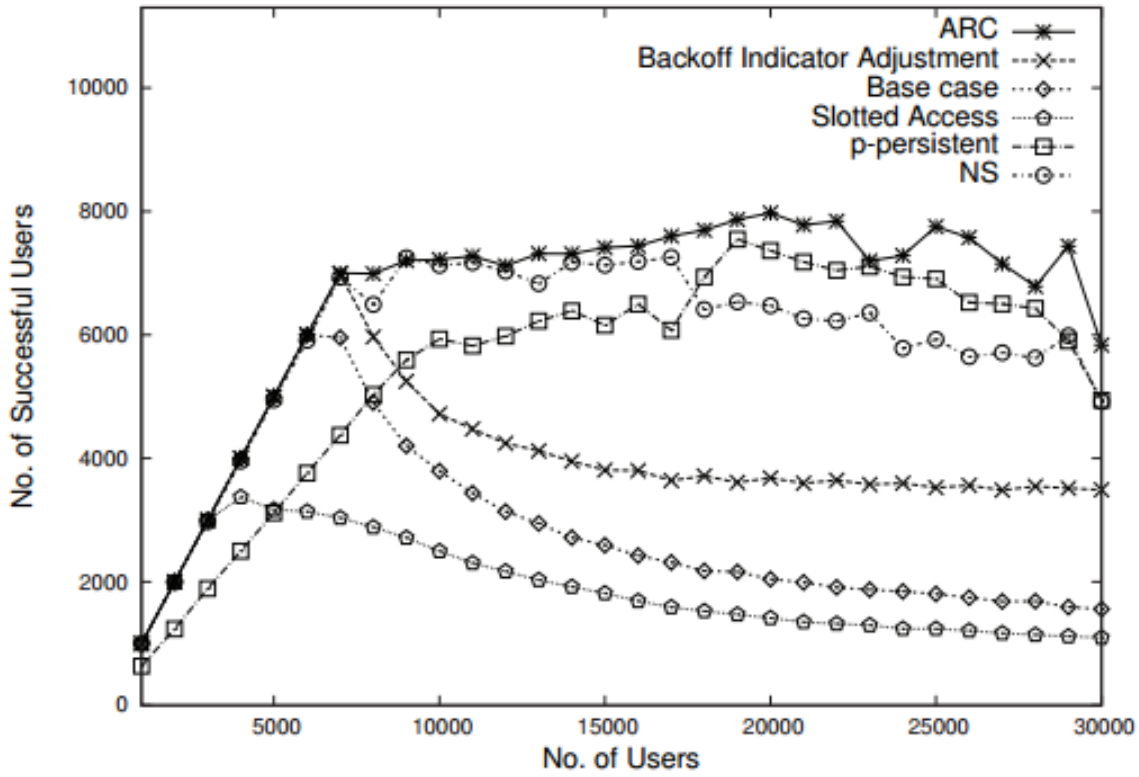

Fig. 2: Number of Successful Users

Result

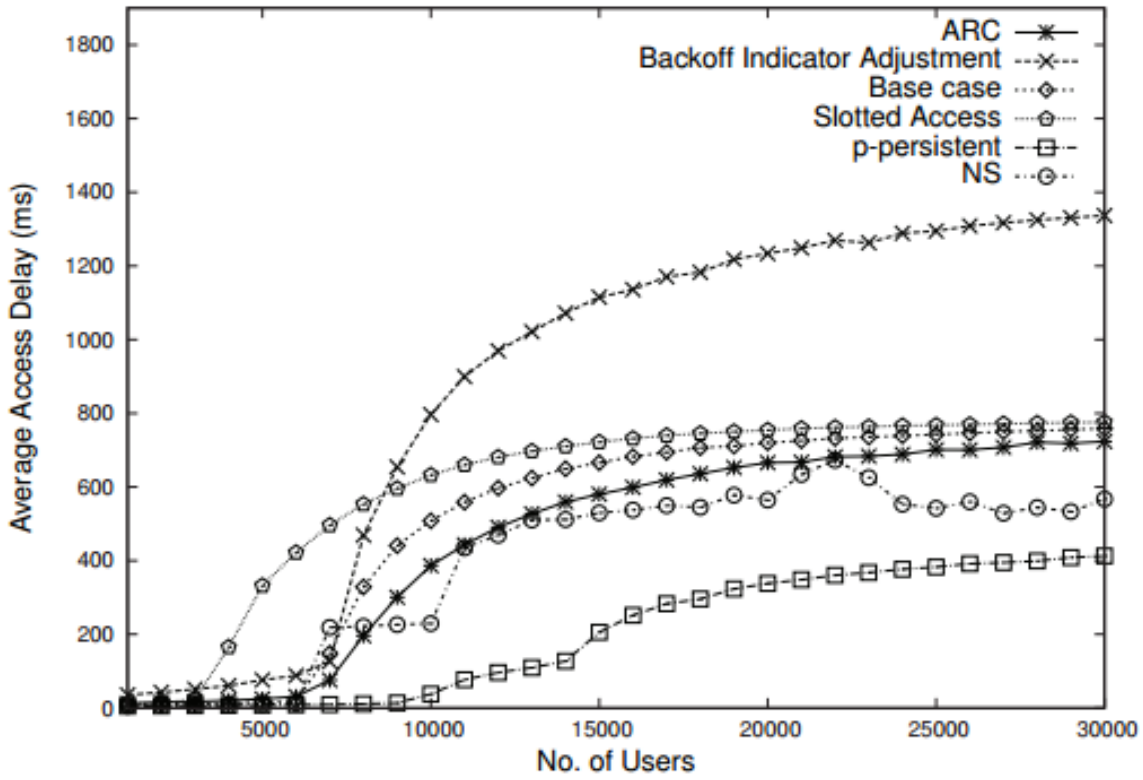

Fig. 3: Average Access Delay

Result

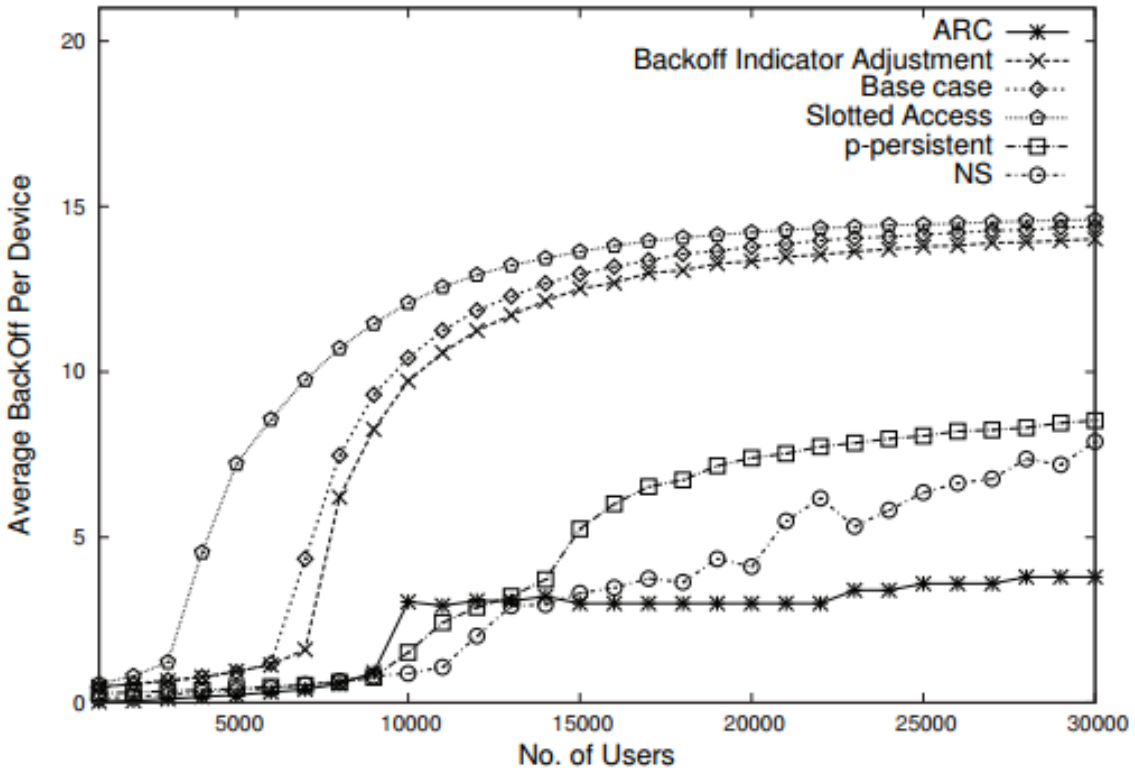

Fig. 4: Average BackOff Per Device

References

[1] M. K. Giluka, A. Prasannakumar, N. Rajoria, and B. R. Tamma, "Adaptive rach congestion management to support m2m communication in 4g lte networks," in *2013 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS)*, Dec 2013, pp. 1–6.

Thanks for Your Attentions