A Load Balancing Algorithm against DDoS Attacks in Beyond 3G Wireless Networks

Stefania Zinno, Giovanni Di Stasi, Stefano Avallone, Giorgio Ventre

Università degli Studi di Napoli Federico II
Dipartimento di Ingegneria Elettrica e delle Tecnologie dell'Informazione

INW 2015
12th Italian Networking Workshop: Cavalese, Italy
1 Introduction
   • Fundamentals

2 The proposed Tecnique
   • Simulations

3 Conclusion
   • Results
LTE also known as 4G is a Wireless Standard developed by 3GPP, the 3rd Generation Partnership Project.

- OFDMA
- MIMO Techniques
- IP-based system
- DL 3 Gbps,
  UL 1.5 Gbps
Denial of Service Attacks

DDoS stands for Distributed Denial of Service. It is a specific Denial of Service attack performed by a multitude of compromised systems against a specific target.

- BotMaster
- Handler
- Agent o Zombie
- Victim Host Network
Handover is supported in LTE networks to ensure service continuity when moving out of the LTE coverage area.

- Network Controlled UE Assisted
- Based on X2 Interface and Received Signal Strength Indication
Self-organizing networks (SON) are the attempt to simplify and speed up the planning, configuration, management, optimization and healing of LTE and LTE-Advanced-based networks.
Load Balancing Procedure in RRC state CONNECTED
Ns3 offers a much more plain MAC model than the 3GPP one. Transport block is equal to a MAC PDU.
Load Balancing Technique

The Algorithm is:
- Distributed
- Iterative
- Local
- Optimized
- Perfectly Integrated in LTE Architecture
eNodeB Control Messages:
- Late Path Switching
- Measurement Report
- Loseless and Seamless Data Communication
Ns-3 is a network simulator for Internet systems, targeted primarily for research and educational use. Ns-3 is free software and is publicly available for research, development, and use.

- Discrete-event network simulator
- Open Source
- Librerie C++
Ns3 Module

Two are the main modified classes:

- lte-enb-rrc.h
- epc-x2-sap.h
At execution time all information regarding all TB scheduled are collected by each eNodeB through a DL transmission statistics callback.
procedure CALC_USERS_WEIGHTS
  for all Users do
    User_weight = TBS * UO
    Insert User_weight in Users_weights
  end for
  return Users_weights
end procedure

procedure CALC_eNODEB_WEIGHTS(Users_weights)
  for all eNodeBs do
    eNodeB_weight = Sum(Weights(eNodeB_users))
    Insert eNodeB_weight in eNodeB_weights
  end for
  return eNodeB_weights
end procedure
Scenario Set Up

**eNodeB:** Constant Position Mobility Model

**UE:** Constant Velocity Mobility Model constant speed of 20 m/s.

**Multimedia Users:**
- Non Guaranteed Bit Rate VIDEO TCP PREMIUM
- Non Guaranteed Bit Rate VIDEO TCP DEFAULT
- Guaranteed Bit Rate NON CONVersational VIDEO

**Voice Users:**
- Tre Guaranteed Bit Rate CONVersational VOICE
Scenario:
Network Topology and Packet Traffic
Scenario:
Ten attacked eNodeB

(a) Algorithm Inactive in eNodeB1
(b) Algorithm Active in eNodeB1
Results

- More efficiency achieved in resource distribution
- Traffic flows and network performances are increased
- Perfectly integrated with LTE Modules
- No backup infrastructure needed
Thank you for the attention!