ENHANCED ANDROID CONNECTION MANAGER
An Application-based Solution to Manage Mobile Data Traffic

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Network Evolution

- Spectrum Optimization
- Refarming
- LTE, LTE+, etc.

- Wi-Fi
- Femtocell

- Smart Buffering
- Remote Caching
- TransRating/Coding
- Content Optimization
- Many others...
Mobile Data Offloading

Hot-Spot Wi-Fi or Femtocell
Offloading Strategies

- Traffic Offloading
  - Mobility
    - Network & Terminal Oriented
      - Mobile IP
      - DSMIP
      - PMIP
  - Authentication
    - Network & Terminal Oriented
      - EAP-SIM
      - EAP
      - 802.1X
  - Flow Optimization
    - Network & Terminal Oriented
      - IFOM
      - LIPA
      - SIPTO

3GPP, IEEE, IETF, ... STANDARDS
Wi-Fi Sim-Based Authentication
802.1X / EAP / EAP-SIM

Terminal
Supplicant

Hot Spot 802.1X
Authenticator

Radius
Authentication Server

HLR

EAP - SIM
Interference between Femto and Macrocellular radio access

- Interference Macro-Femto
- Interference Femto-Macro
E.A.C.M. Strategy to Traffic Offloading

- Mobile IP
- DSMIP
- PMIP

- EAP-SIM
- EAP
- 802.1X

- IFOM
- LIPA
- SIPTO

STANDARDS
E.A.C.M. Requirements & Features

- "Downloadable" application/library, must work with standard handsets without needing firmware customization or Root Access
- Transparent to user and other applications: extend the default connection manager without affecting standard functionality
- Must Handle simultaneous connections to WiFi and Mobile Networks
- Functions Shared among multiple concurrent Applications using APIs
- Allow per-IP access rules defined by Applications or User
Route & Unroute

Route(...);

Unroute(...);

URL List
- www.virgilio.it
- openlab.telecomitalia.it
- .........

Application Package

Key

APN o Hot-Spot
E.A.C.M. Android Architecture

APP 1
APP 2
APP N

E.A.C.M. Kernel

SQL Database

APP EXT
Embedded Connection Manager
User Setting

Route/Unroute Request
Route/Unroute Response

E.A.C.M. Android Architecture

ANDROID

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Android restriction:
- Unroute of a single connection from a group of many is not allowed: All connections are simultaneously unrouted

E.A.C.M. Solution:
- A connection table (SQL DB) allows to Unroute any connections and to restore all the other ones keeping the same parameters.
Service Authentication Test

- Core Network
- ISP Network
- USIM Authentication
- Session Key
- openlab.telecomitalia.it
- Your Data
WiFi Authentication Test

Core Network

WiFi aut. server

ISP Network

WiFi Key
Image Test

Images have been concurrently loaded in 16 seconds from:
Altervista: IP 79.40.222.109
Virgilio: IP 109.52.240.8
E.A.C.M. Stress Test: Memory Allocation

Allocated Memory (MBytes)

Max memory (2500 req)
Max memory (1600 req)
Max memory (900 req)

- 2500 Requests
- 1600 Requests
- 900 Requests

Time(s)
E.A.C.M. Stress Test: Processing Time

- **Processing Time (s)**
- **Requests**
- **E.A.C.M. Processing**
- **Android O.S. Processing**

- **First Request**
- **Last Request**
E.A.C.M. Stress Test: Memory & Time

- Internal Memory Size (pending requests)
- Max memory (2500 req)
- Max memory (900 req)
- Max memory (1600 req)
- Time(s)
- 2500 Requests
- 1600 Requests
- 900 Requests