CCN - Java Opensource Kit EmulatoR for Wireless Ad Hoc Networks

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✓ Introduction

✓ Wireless Ad Hoc Networks and CCN

✓ CCN Joker

✓ Testbed

✓ Preliminary Experiments: scenario and results

✓ Conclusions and future works

Different Technologies

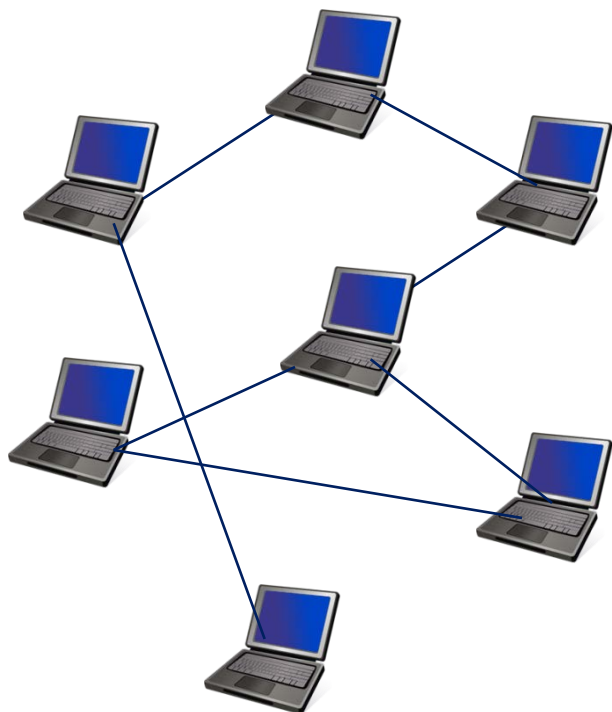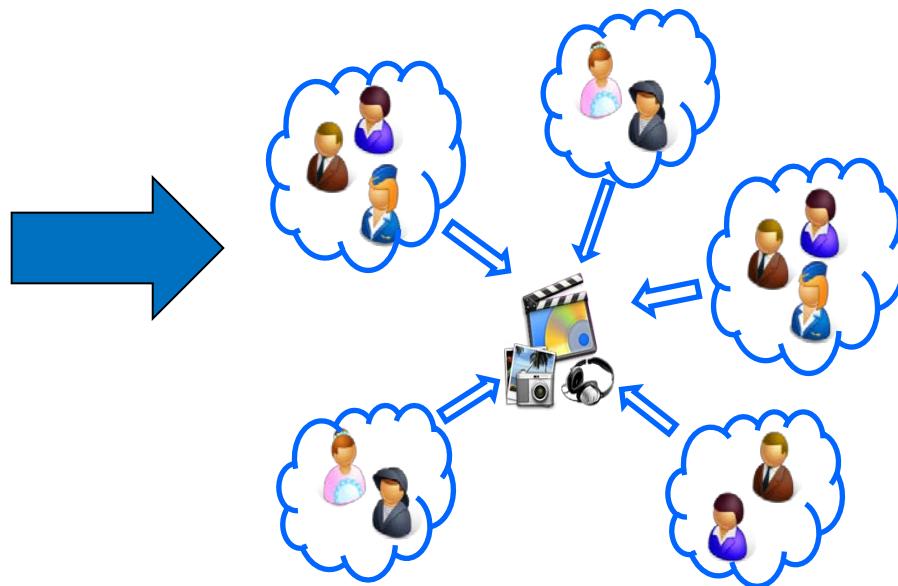Contents

Where are we going to?

Current Architecture

- based on **NODES**

- location-based routing (IP addresses)

- network congestion

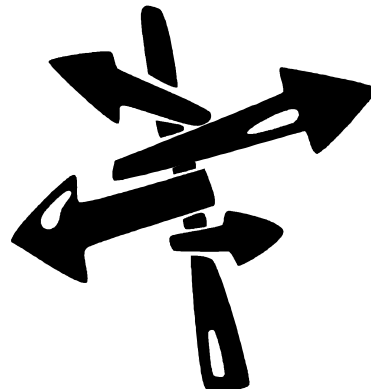- weak support for mobility and broadcasting

Future Internet Architecture

- based on **CONTENTS**

- named-based routing

- improvement of network performance

- good support for mobility and broadcasting

- Publish Subscribe Internet Routing Protocol (PSIRP)

- 4WARD NetInf Protocol

- Cache-and-Forward (CNF)

- eXpressive Internet Architecture

- Data-Oriented Network Architecture

- Content-centric Networking (CCN)

✓Contents exchange independently of the physical location of hosts

✓Distributed caching adoption

✓Named-based routing

✓Hierarchical structure of names which leads to a tree-based resolution

✓Secure data sharing

✓Reduction of servers computational load and bandwidth consumption

Wireless Ad Hoc Networks
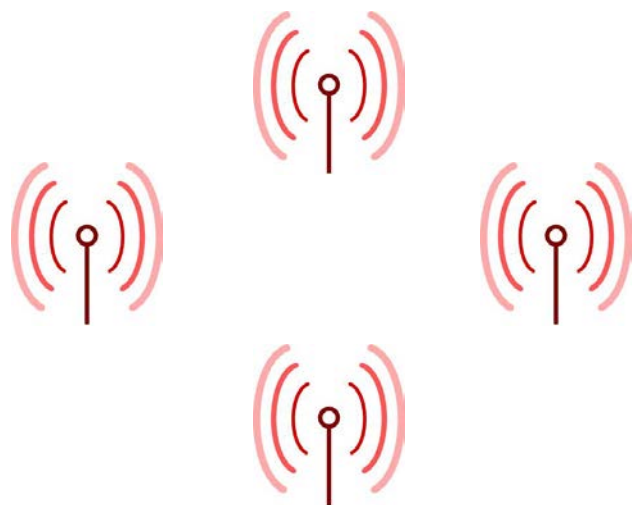
Collections of wireless nodes that can self-organize an arbitrary network without any predetermined infrastructure

Each node can communicate directly to each other

- ➢ Noisy, limited-range, and not secure wireless transmission
- ➢ Energy constraints

CCN allows nodes to communicate based on what data they need, without knowing a specific path to reach a specific node

CCN guarantees energy efficiency

CCN routing avoids routing loops

Nodes can use application data names directly to forward Interests and data packets among each other

M. Amadeo and A. Molinaro. CHANET: A content-centric architecture for ieee 802.11 MANETs. In *Int. Conf. on the Network of the Future (NOF),* Paris, France, Nov. 2011.

G. Arnould, D. Khadraoui, and Z. Habbas. A self-organizing content centric network model for hybrid vehicular ad-hoc networks. In *Proc. of the first ACM Int. symposium on Design and analysis of intelligent vehicular networks and applications, Miami,* Florida, USA, Oct. 2011. ACM.

S. Y. Oh, D. Lau, and M. Gerla. Content centric networking in tactical and emergency manets. In *Wireless Days, IFIP, Venice, Italy, Oct. 2010.*

CCN – Joker is a new fully customizable and open-source emulation platform that allows the emulations of the basic aspects of a CCN node through a lightweight high-level program
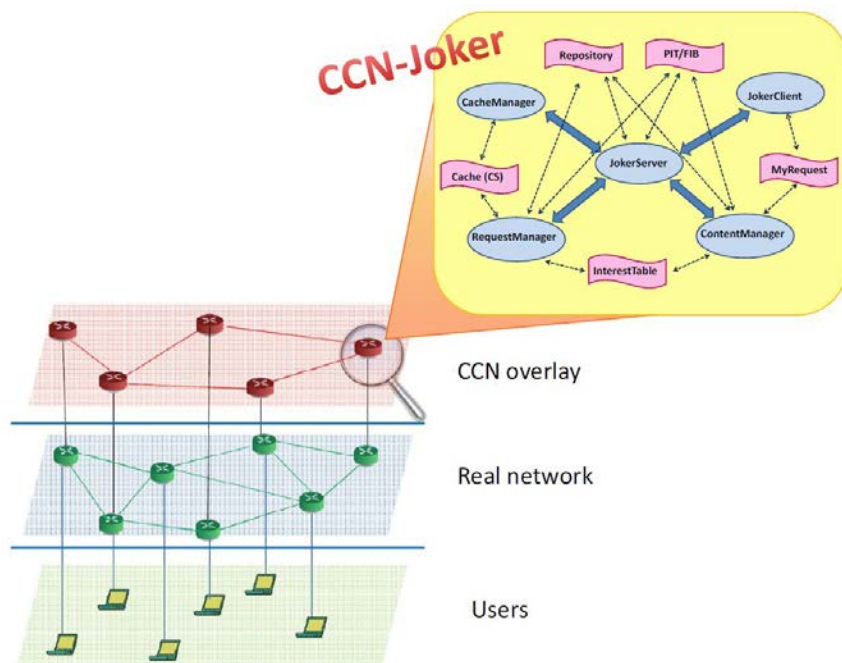
It has been written using the *Java Language* and conceived to run on top of wireless devices with limited resources. In this way, we might have evidences about the CCN suitability for wireless ad hoc network environments

For details about CCN – Joker see the paper of this presentation.

To download the code and subscribe to the users group go to: " *telematics.poliba.it* "

EFIKAs are small but complete and powerful computers based on a RISC PowerPC processor. These devices target mostly embedded applications and they have a very low power consumption


- *ATX board (153x118x38 mm);*
- *Freescale MPC5200B PowerPC SoC up to 466 MHz;*
- *128 MB DDR RAM @ 266 MHz;*
- *44 pin IDE connector;*
- *1 PCI (33/66 MHz PCI 2.2);*
- *10/100 Mbit/s Ethernet (Realtek 8201 Phyceiver);*
- *2 USB ports (1.1);*
- *1 RS232 Serial port D-SUB9;*
- *Stereo audio out, microphone and line input S/PDIF (Sigmatel STAC 9766 AC97);*
- *Infrared port (IRDA) from 2400 bps to 4 Mbps;*
- *RTC clock (power management on/off).*

Six EFIKAs equipped with a 4GByte Flash memory and a Wifi module

Linux operating system (OpenSuse) installed on top of each device

Each Efika, running CCN-Joker, behaves as a CCN node

..........— wireless link

Efika
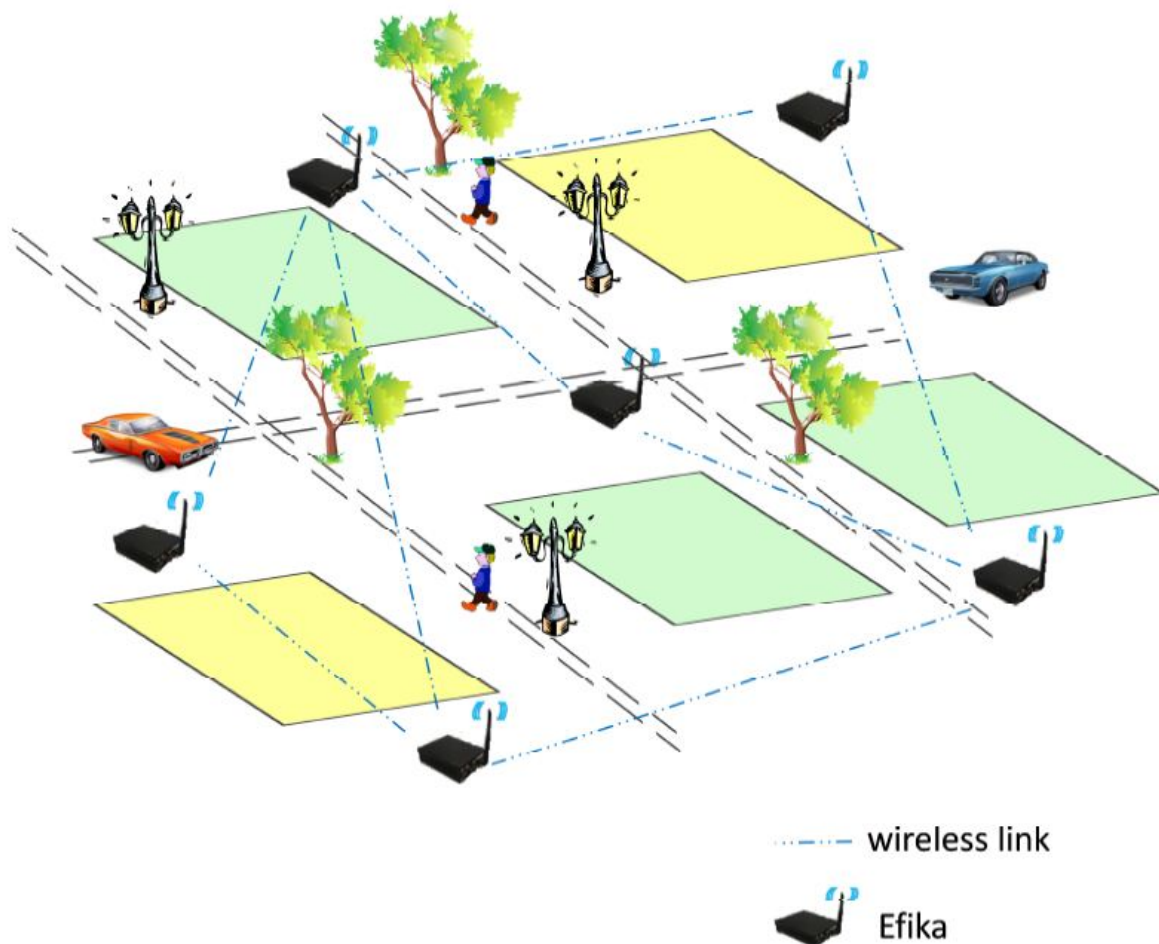
Adopted parameters

- Number of nodes = 6

- Cache size = 125 [item]

- Catalog size = 2500 [item]

- Content size = 10 kB

- Poisson request generation process with λ = 1 request/s

- Zipf's distribution of content popularity with α = 0.65

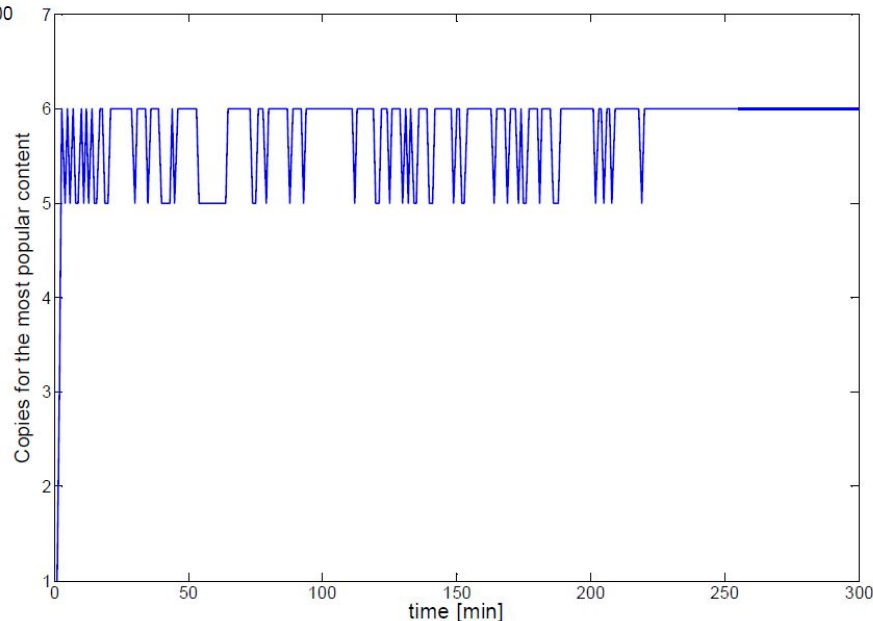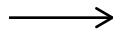- Experiments duration = 5 hours

Investigated metrics

- Average number of content copies in the network

- Hit ratio
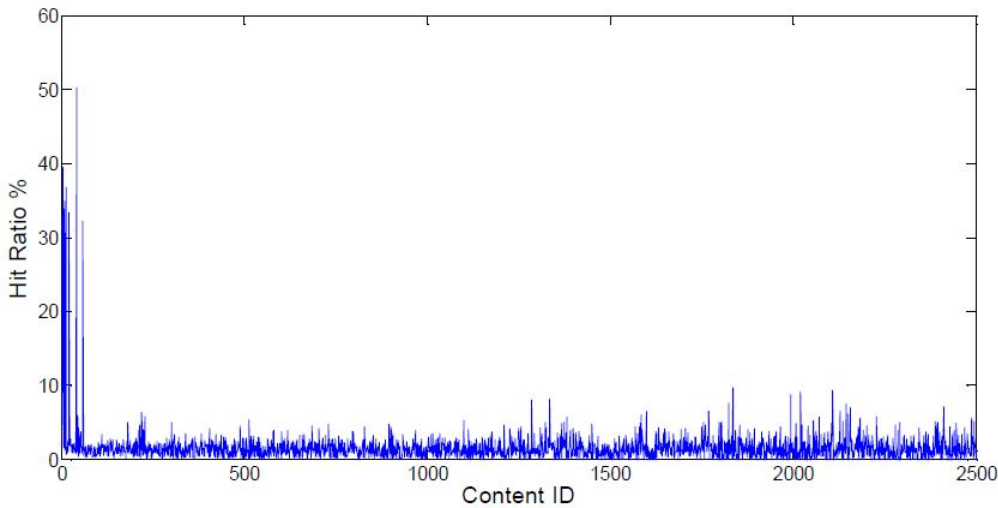
- Average download time

CATALOG SIZE = 1500 [contents]
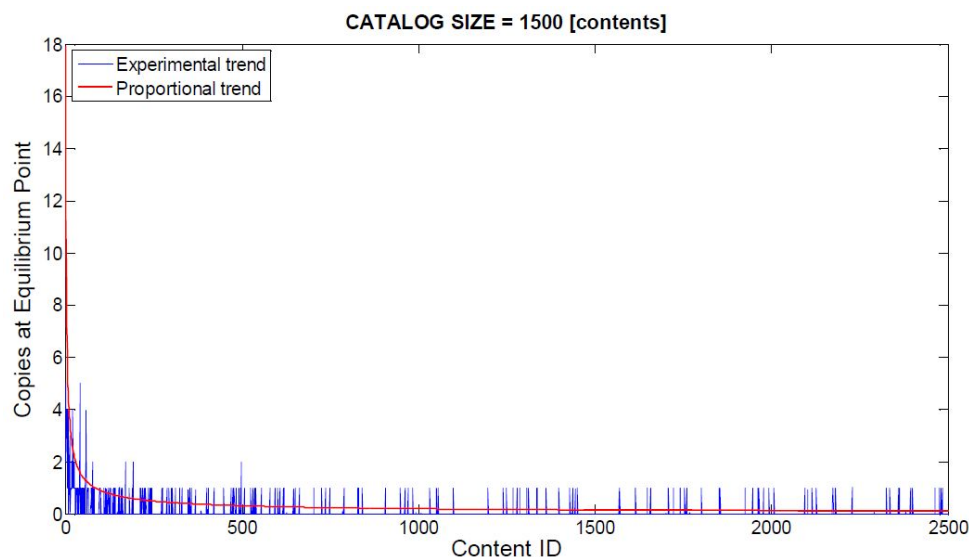
Number of contents copies in the network compared with a proportional trend (i.e. completely fair allocation)

Number of content copies for the most popular content during the emulation time
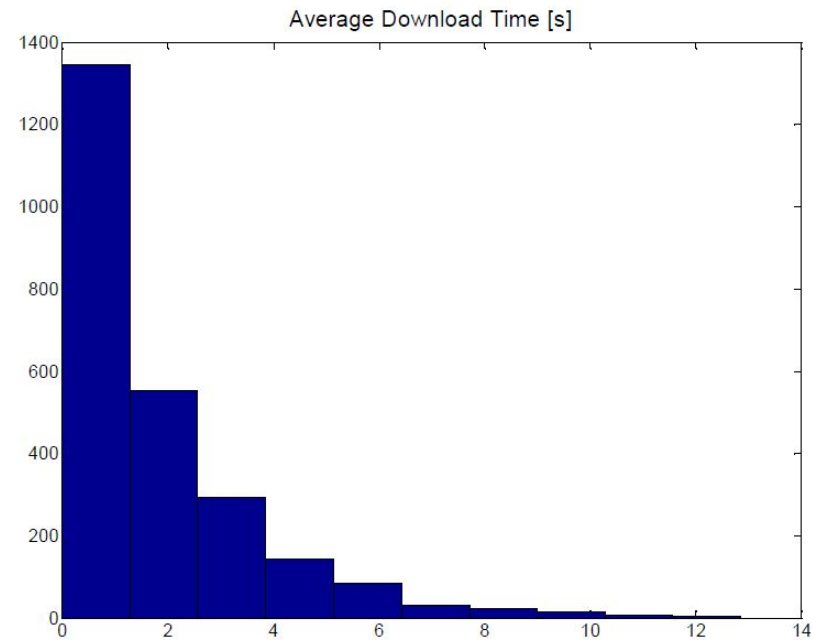
Average hit ratio for each content calculated as the ratio between the hit events and the total number of requests

Average download time

In this work:

❑ we present CCN-Joker, a new open-source emulator for CCN, able to run on top of devices with limited resources

❑ we conduct some preliminary experiments in order to demonstrate the suitability of the CCN proposal in a wireless ad hoc environment

…Future tasks:

➢ evaluating different metrics

➢ considering Internet-like scenarios

➢upgrading CCN-Joker with different services

telematicslab

Thank you for your attention!

For any question please contact the authors of this paper!

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