ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

EPFL MIDDLE EAST

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Empirical Performance Evaluation of Data Dissemination Mechanisms for Spot Applications

Objectives

Find/Design a *package* of mechanisms that delivers dissemination service to *spot applications*

Consider all challenging scenarios…

Evaluate the performance through *measurements* on a realistic testbed composed of *50 wireless devices*

Spot Applications:

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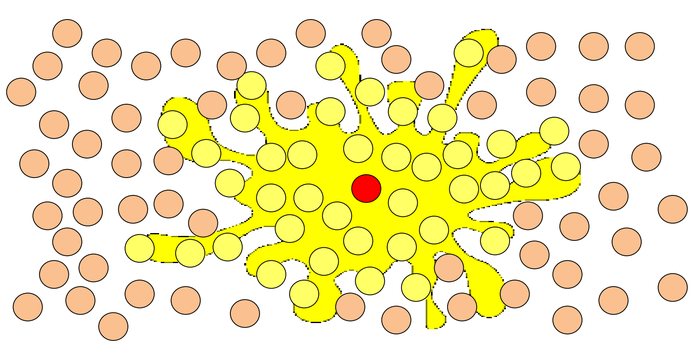
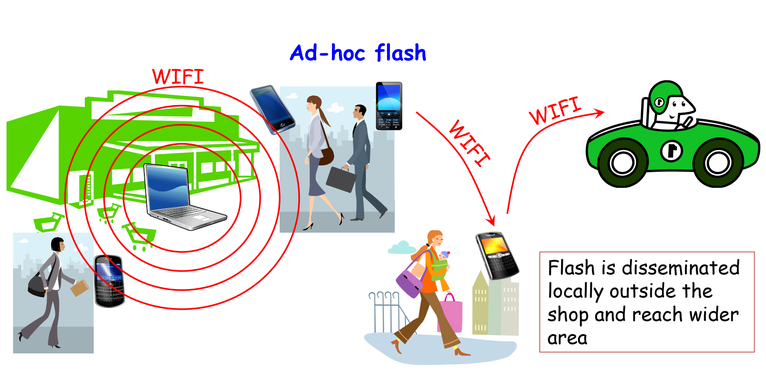
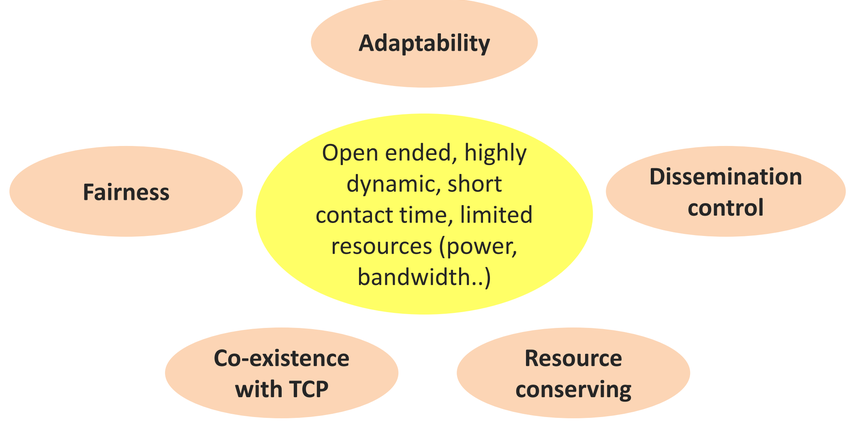


Traffic info, social networks, car sharing, mobile concierge….

Ad-hoc Flash Sales: Typical Spot Application



Five Success Criteria:



Three Building Blocks Based on Blind Mechanisms:

We consider only *blind mechanisms*, no handshaking, no network information, no communication overhead… only local observation is considered

Forwarding Factor Control: minimizes redundant transmissions.

Virtual-rate based FF control: penalizes over-sent/over received packets.

```
Upon sent/receive event of pkt X
VRx ← C * a^rcvCount * b^sendCount
Send pkt X at currentTime + 1/VRx
(0 < a, b < 1; C = [pkt/s])
```

New encounter detection**: (for dynamic networks)

```
Upon any receive event
If source-id is a new encounter
    Schedule all packets for transmission
```

* First time evaluated in this context and while inter-acting with the remaining of the mechanisms

** New mechanism that we propose

Buffer Management: cleans the buffer in order to keep space for new incoming packets.

TTL*:

```
1- Drop pkt if TTL > maxTTL
2- If buffer is full: drop pkt with largest TTL
```

TTL with Head Drop**: similar to TTL but

```
If buffer is full: drop head pkt
```

Aging: adapts packet life time based on the netwrok activity.

```
1- Upon any send or receive event
   loop: over all packets
      age ← age + K
      If age > maxAge: drop packet
   end loop
2- If buffer is full: drop pkt with largest age
```

Lightened Aging**: A light version of aging

Flow Control: controls the application injection rate.

MAC-based flow control**: adapts the application rate to the MAC rate

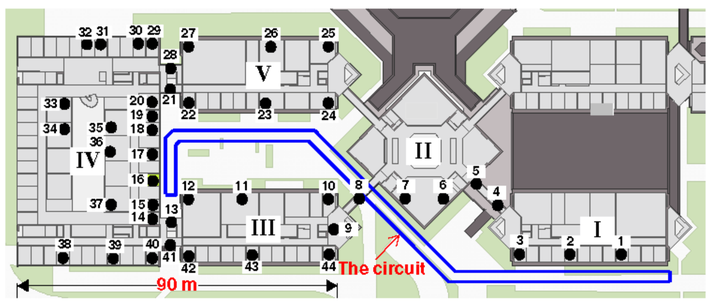
Implicit Ack-based flow control: adapts the application rate to the forwarding capacity of the network; ensures a scalable dissemination.

	Adaptability	Dissemination control	Resource conserving	Co-existence with other applications	Fairness
Forwarding factor control	X	X	X	X	
Flow control	X	X		X	X
Buffer management	X	X	X		

Testbed, Prototypes and Measurements:

Testbed:

Realistic testbed: Wireless nodes are distributed over 5 buildings. Each dot corresponds to a node.



Resource constrained device:

- C++
- Device: ASUS WL-500GP v1
- Flash: 8MB; RAM: 32MB; processor: 266MHz
- Firmware: OpenWrt

Raw sockets { Ad hoc Flash Sales / Middleware / MAC

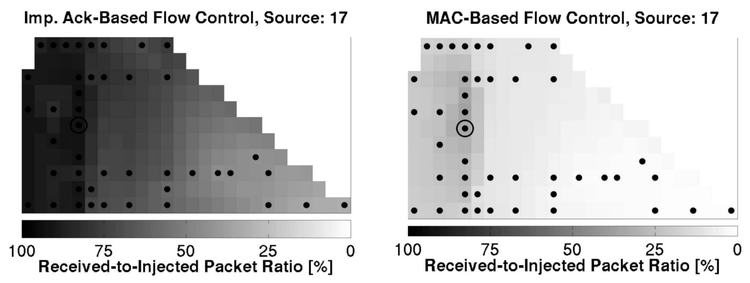
Prototypes:

Microsoft Windows · Windows Mobile · LINUX · JAVA · J2ME · C/C++

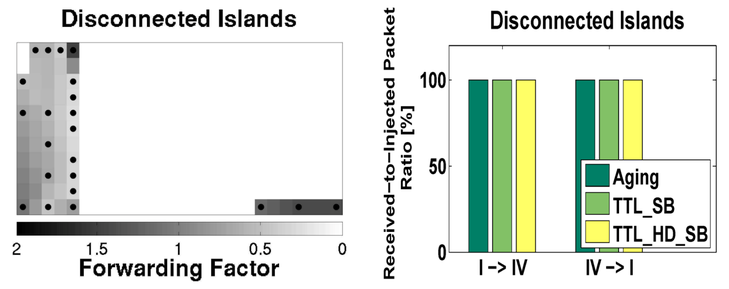
Recommended Package:

Forwarding Factor Control	Buffer Management	Flow Control
Virtual-rate based FF control New encounter detection	TTL with *small* buffer size (1000 pkts)	Implicit Ack-based flow control

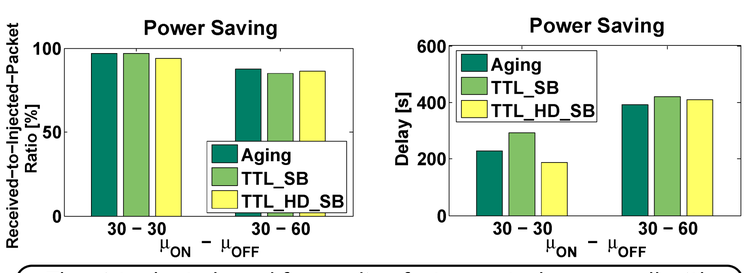
Some Measurement Results:



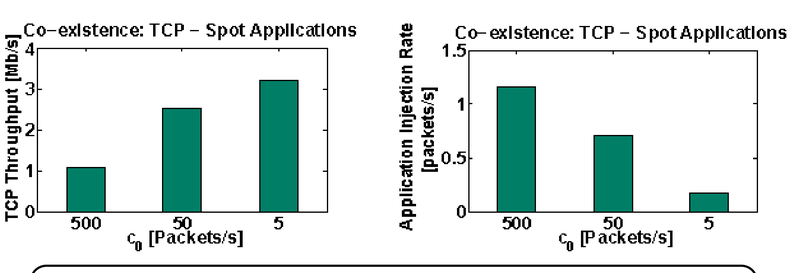
Flow Control: Implicit Ack-based flow control adapts well to the forwarding capacity of the network.
Dissemination control, fairness



Disconnected island are fully connected in time, due to mobility. Forwarding factor adapts to the node density.
Adaptability, resource conserving



The virtual rate based forwarding factor control copes well with power saving and increases the battery life time by ***300%***.
Resource conserving



Spot applications co-exist well with TCP traffic.
Co-existence with TCP applications