

MicroCast: Cooperative Video Streaming on Smartphones

Yejin Li

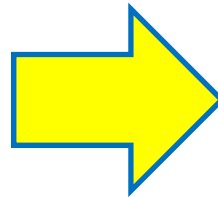
*Electrical and Computer Engineering Dept.
Worcester Polytechnic Institute (WPI)*





Motivation

- A group of smartphone users who are interested in watching the same video from the Internet at the same time.

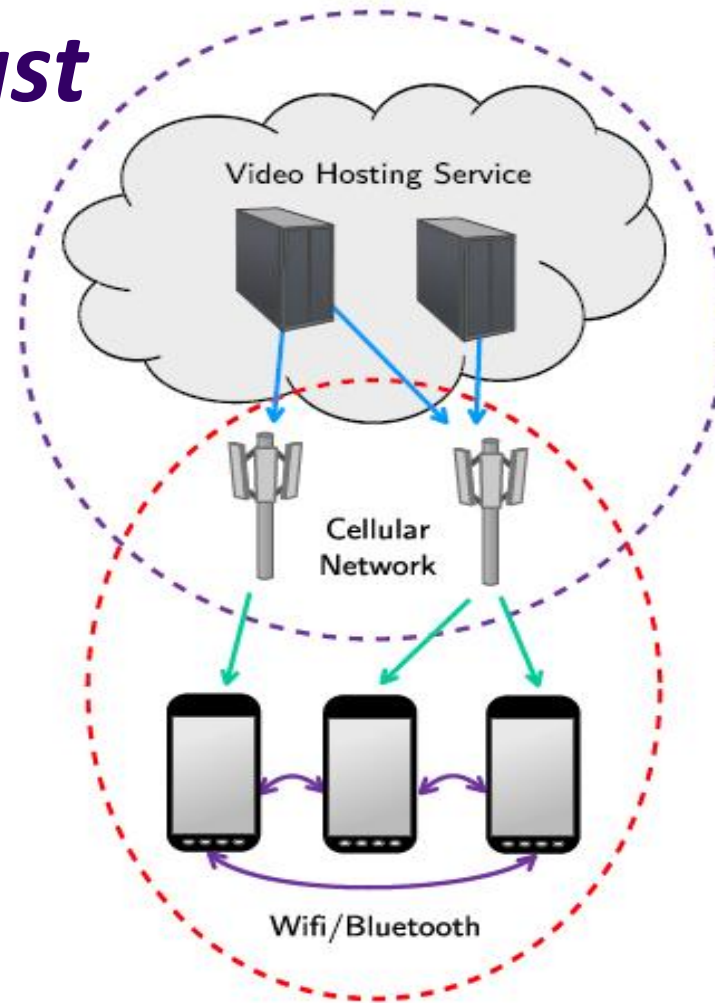




Solution—MicroCast

Each phone uses simultaneously two network interfaces:

- *One (cellular) to connect to the video server;*
- *Another (WiFi) to connect to the rest of the group.*





Related Work

- *Co-operation between mobile devices.*
- *New feature in Android 4.0—provides P2P connectivity using WiFi Direct.*
- *Network coding for P2P system.*



Architecture

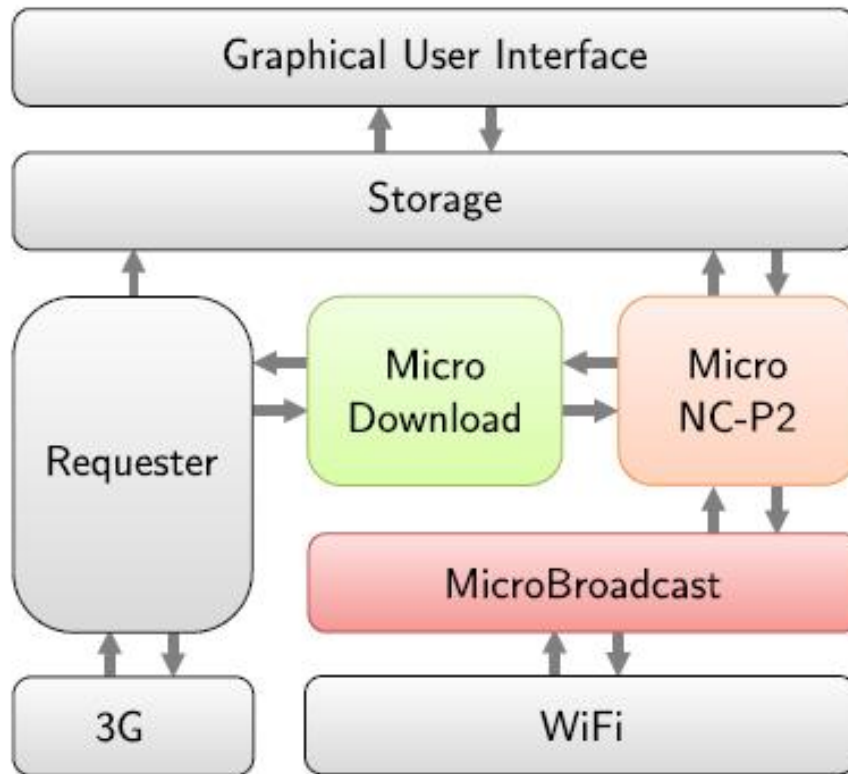


Figure 2: Architecture of MicroCast.

MicroCast =

MicroDownload



MicroNC-P2



MicroBroadcast



MicroDownload

- The video is divided into **segments** of fixed size. the next segment to be downloaded is assigned to a phone which has the smallest **backlog**.

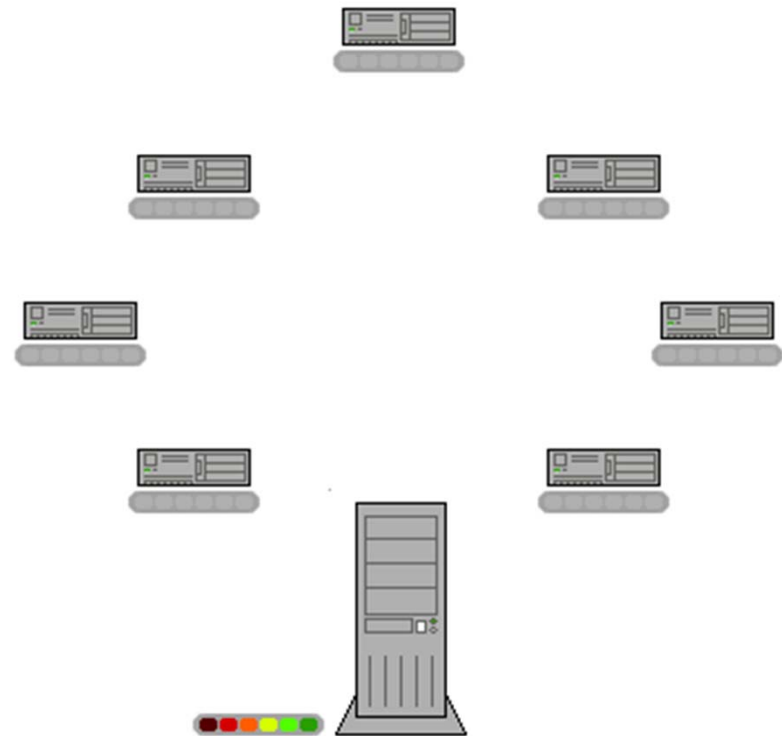
Algorithm 1 MicroDownload Algorithm

```
1: while there are segments to assign do
2:   Find the phone with the smallest backlog
3:   if the backlog of the phone is smaller than  $K$  then
4:     Schedule the phone to download the next segment
5:   else
6:     Sleep until new feedback is received
7:   end if
8:   if feedback from phone indicates a failure then
9:     Schedule the phone to download another segment
10:    Add the segment that failed to the list of segments
11:  end if
12: end while
```

MicroNC-P2

A novel all-to-all dissemination scheme for locally sharing content among group members within proximity of each other.

It leverages the combination of network coding and WiFi overhearing

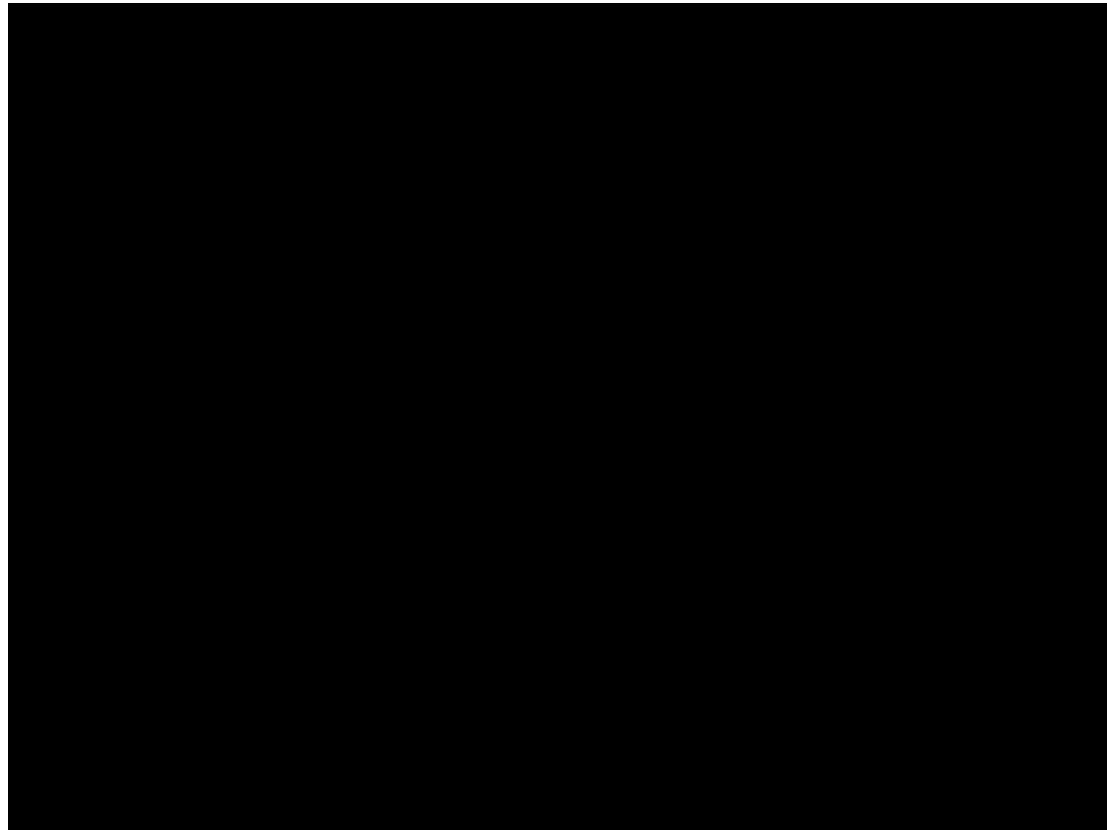


Test Environment



- four Samsung Captivate and three Nexus S.
- All smartphones have a 1 Ghz Cortex-A8 CPU and 512 MB RAM.
- Six of them use Android Gingerbread (2.3) and one (Nexus S) uses Android Ice Cream Sandwich (4.0) as their operating systems.

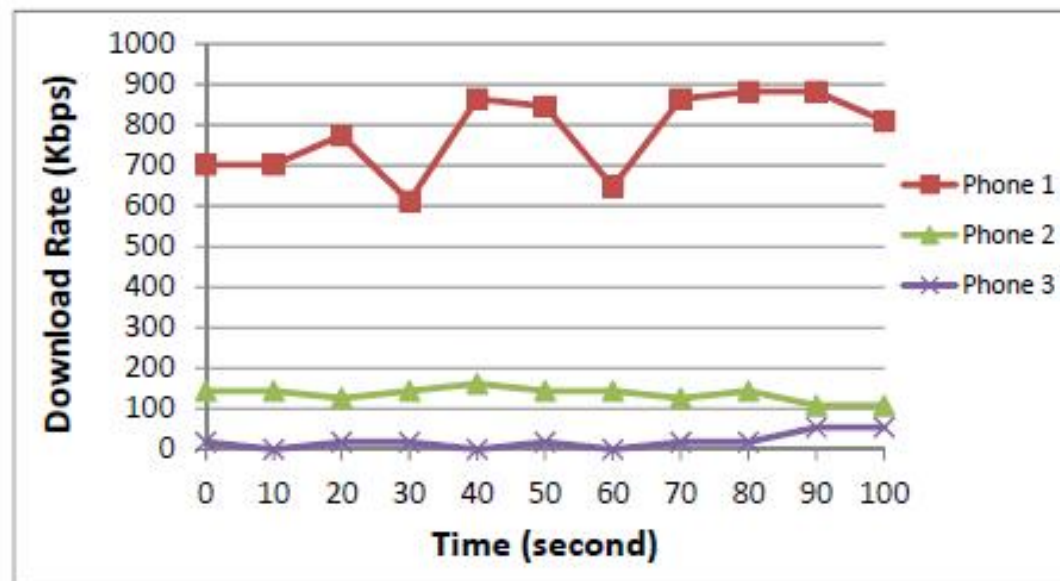
Video Demo





Evaluation—MicroDownload

- Disabled MicroNC-P2, the download rates of the smartphones over 100 seconds.

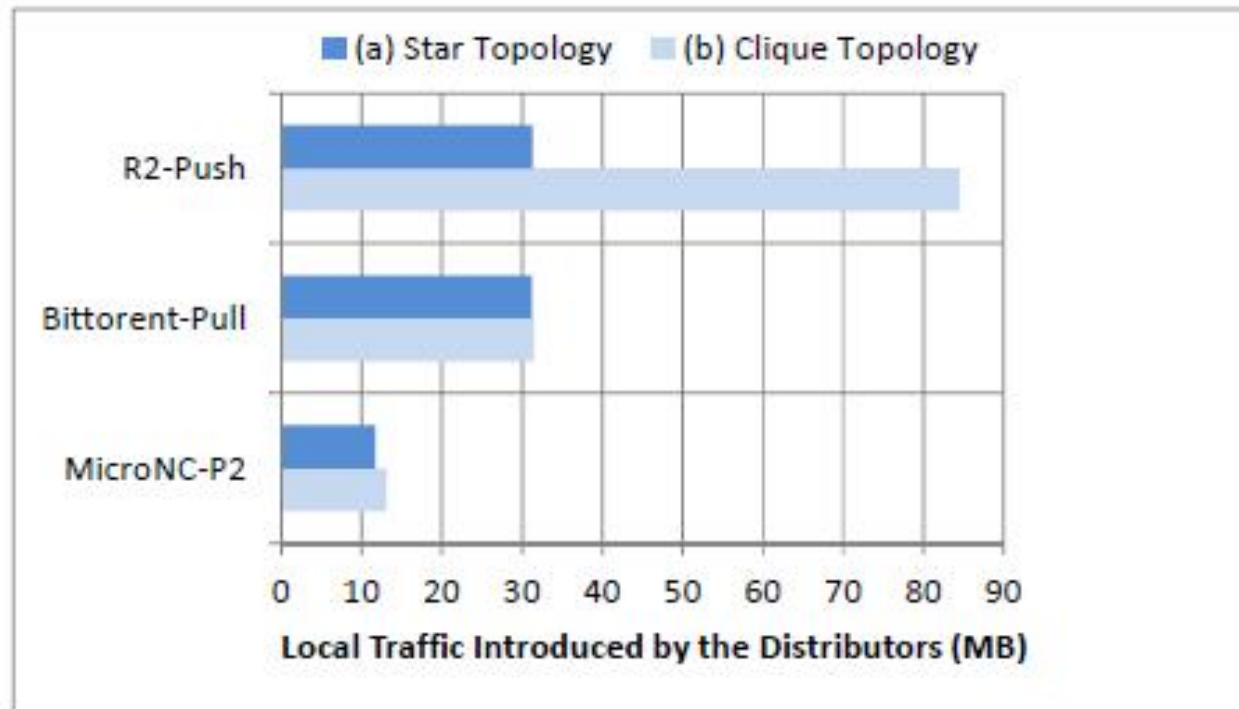


Phone 1, 2—3G; Phone 3—EDGE



Evaluation—MicroNC-P2

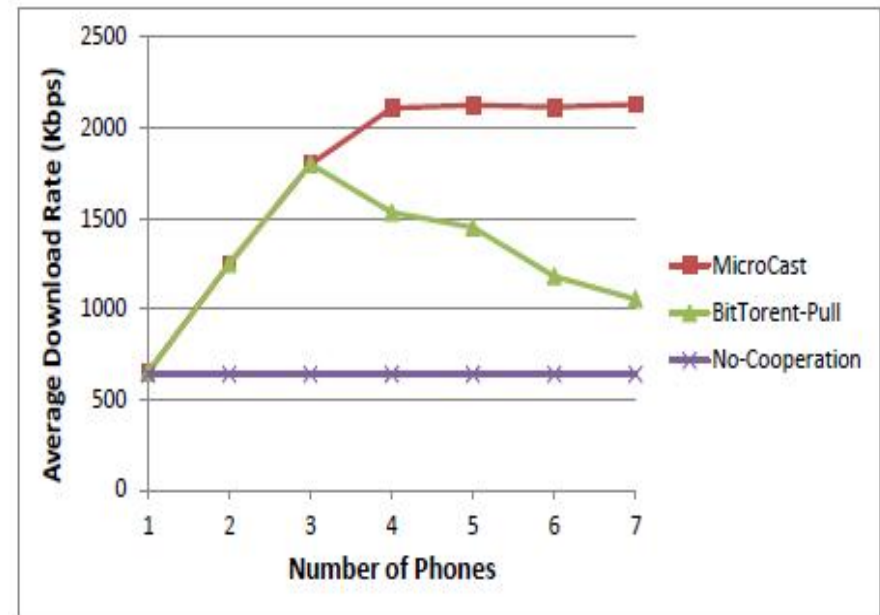
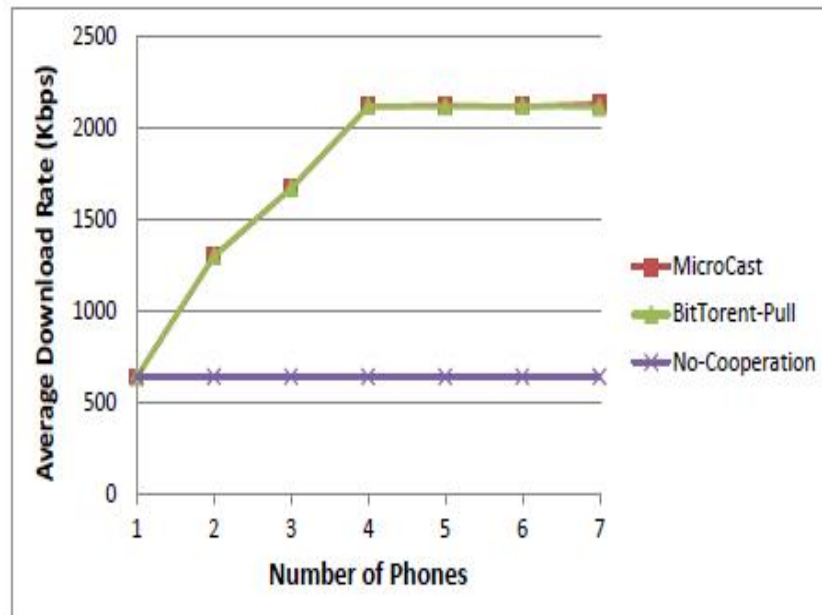
- The amount of local traffic using different distributors. The file is 9.93 MB.





Evaluation — *MicroCast* System

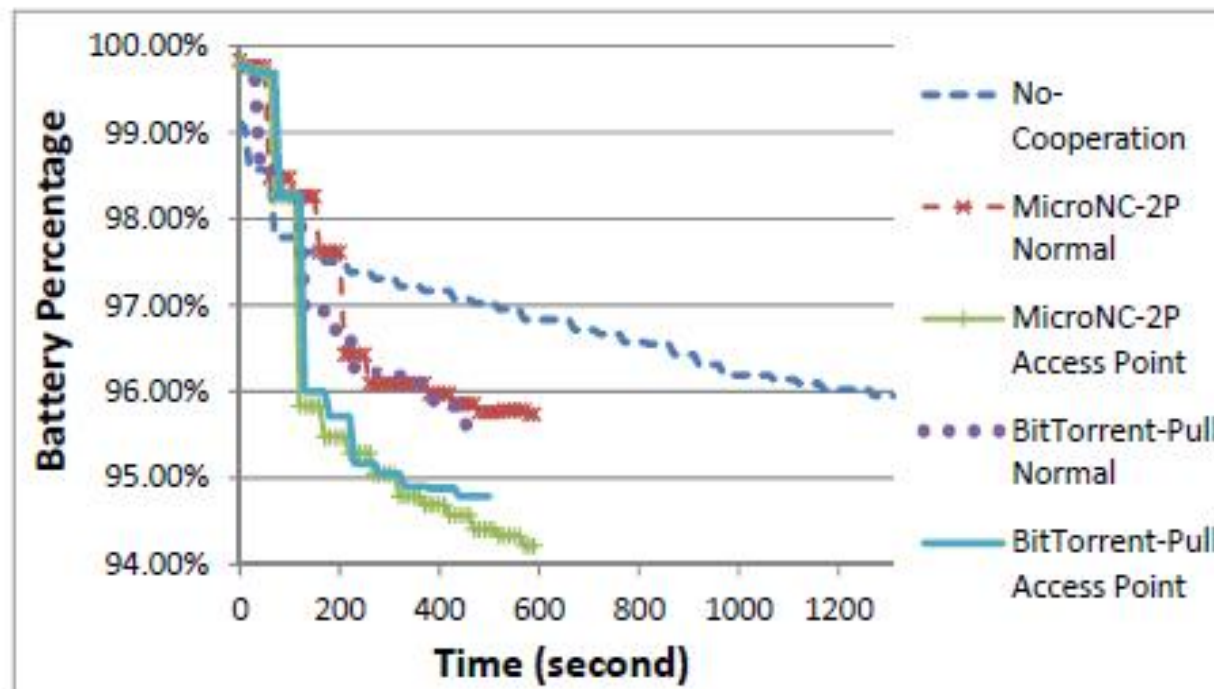
- Average download rate as a function of number of phones when the local network bandwidth is 20 Mbps vs. 4Mbps.
- Only first 4 phones had 3G connection.





Evaluation — *Battery Consumption*

- 3 phones connected to a 4th phone as AP , the 3G rates vary from 450 Kbps to 700 Kbps, and video size is 95.4 MB.
- Local network Disabled.





Discussion and conclusions

- *the current implementation can support **no more than 7** concurrent devices (when an Android 4.0 device acts as the AP) or 6 devices (when an Android 2.3 device acts as the AP).*
- ***MicroCast** cooperatively uses the resources on all smartphones of the group, such as **cellular** links and **WiFi** connections, to improve the streaming experience.*



References

- Wireless network coding: from theory to practice, project wiki-page.
- <http://odysseas.calit2.uci.edu/doku.php/public:muri09>



Thank You!