From Social Networks to Mobile Social Networks

Zhen Liu

Lab Director

Nokia Research Center

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Nokia Research Center

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Outline

- Social networking landscape

- Mobile social networking

- State-of-the-art

- Ephemeral social networks

- Our research

- Summary

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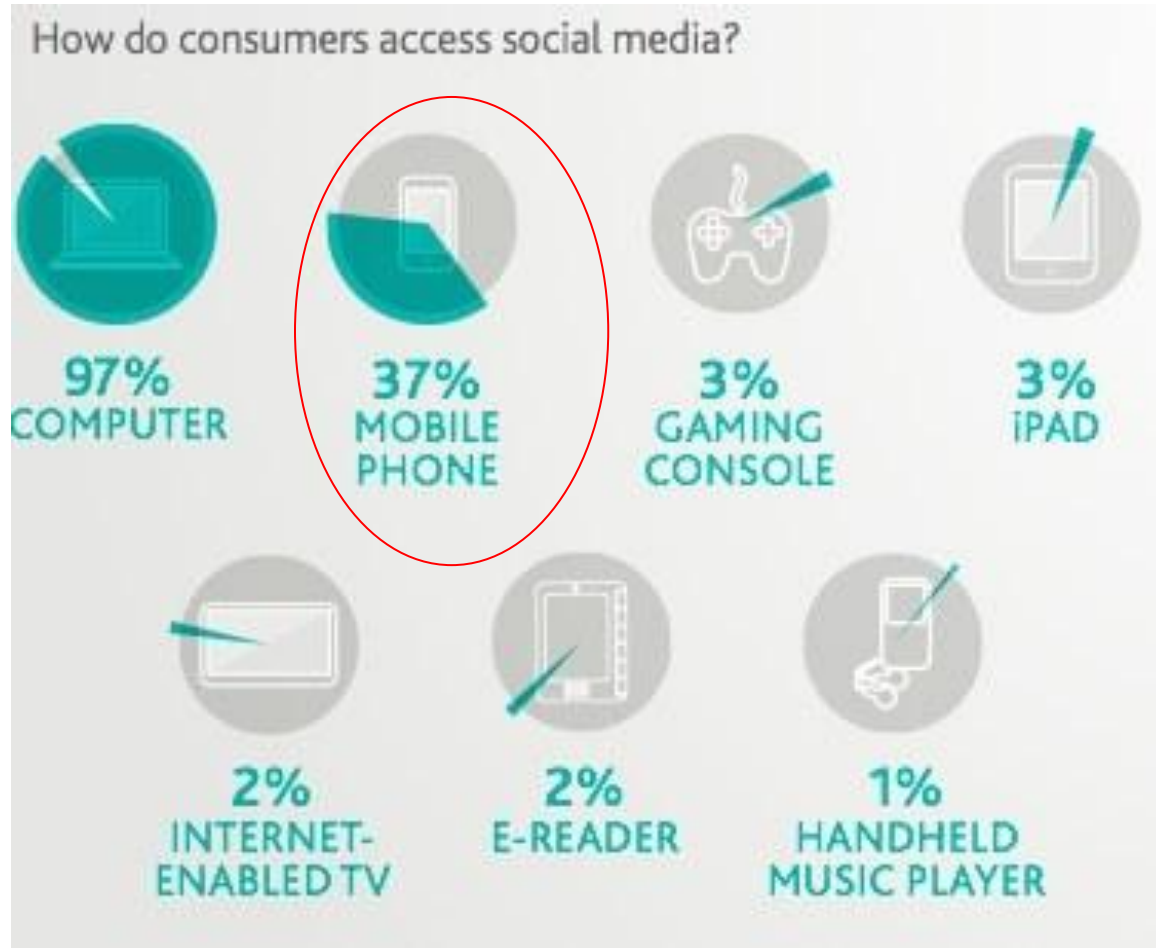
Social Networking Matrix Divided by Tie Strength & Scope

Strong tie

Specific ← → Generic

Weak tie

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Social Networking Service Penetration: Facebook

FACEBOOK USAGE AND INTERNET STATISTICS FOR JUNE 30, 2011					
Geographic World Regions	Population (2011 Est.)	FB Users Aug. 31, 2010	FB Users June 30, 2011	FB Growth (10 Months)	Facebook Penetration
Asia	3,879,740,877	93,584,580	152,957,480	59,372,900	3.9 %
Africa	1,037,524,058	17,607,440	30,665,460	13,058,020	3.0 %
Europe	816,426,346	162,104,640	208,907,040	46,802,400	25.6 %
Latin America	555,856,161	68,189,920	115,288,940	47,099,020	20.7 %
North America	347,394,870	149,054,040	167,999,540	18,945,500	48.4 %
Middle East	216,258,843	11,698,120	16,125,180	4,240,946	7.5 %
The Caribbean	41,427,004	3,925,060	5,903,520	1,978,460	14.3 %
Oceania / Australia	35,426,995	11,596,660	12,881,560	1,284,900	36.4 %
WORLD TOTAL	6,930,055,154	517,760,460	710,728,720	192,968,260	10.3 %

Source: http://www.internetworldstats.com

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Social Media on Mobile in the U.S.

How do consumers access social media?

97% COMPUTER

37% MOBILE PHONE

3% GAMING CONSOLE

3% iPAD

2% INTERNET-ENABLED TV

2% E-READER

1% HANDHELD MUSIC PLAYER

Source: Nielsen http://cn.nielsen.com/documents/SocialMediaReport_SCN.pdf, Q3 2011

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Social Networking on Mobile in China
Most Downloaded iPhone Free Apps

1	QQ 2011	1087884次 — 0
2	微信	572596次 — 0
3	微博	316555次 ▲ 1
4	语音微博	10767次 ▼ 1
5	QQ空间	0次 ▲ 2
6	飞信-中国移动官方出	1483次 — 0
7	微微-免费打电话发短	539次 ▲ 4
8	遇见-交友必备	4939次 ▼ 3
9	美丽说-时尚女生逛渐	50160次 ▼ 1
10	腾讯微博	117306次 — 0
11	人人网	149001次 ▲ 1
12	Weico 新浪微博客户	88945次 ▲ 1

Source: 同步推 http://app.tongbu.com/iphone/paihang/itunes-cn-6005-free, Nov. 2011

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Is this really mobile social networking? No, this is social networking on mobile!

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Mobile Social Networking
Making the mobile an integral part of your social network and lifestyle

distributed content sharing

social networks

sensor networks

pervasive computing

Integrate contact, content and context into mobile social networks

Provide integrated experience by fusing physical and digital social interactions through the mobile

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Social Networking on Mobile vs. Mobile Social Networking

Feature	Social networking on mobile	Mobile social networking
Duration	Continuous	Ephemeral
Offline interaction	None	Activity-based
Proximity and Location	Co-location	Nearby, encounter
Context sensing	None	Environment and phone sensing
Contact management	Indirect discovery	Direct discovery
Content sharing	Public	Public, Private, Group
Collaboration	Coordination	Ad-hoc

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Industry Efforts in Mobile Social Networking

Content

Contact

Context

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Initial Research Efforts in Mobile Social Networking (1)

- Opportunistic networking
  - Familiar Stranger (Paulos and Goodman, 2002)
  - Cityware (Kostakos, 2008)
  - Conferator (Atzmueller et al, 2011)

- User behavior vs. online social networks
  - Probability of user joining online community increases as number of friends already there increases (Backstrom et al, 2006)
  - Correlation between social connectivity and tag vocabulary (Marlow et al, 2006)
  - Relationship between communication and personal behavior, using demographic data (Singla et al, 2008)
  - User behaviors in above are conducted online, or inferred by their online profiles

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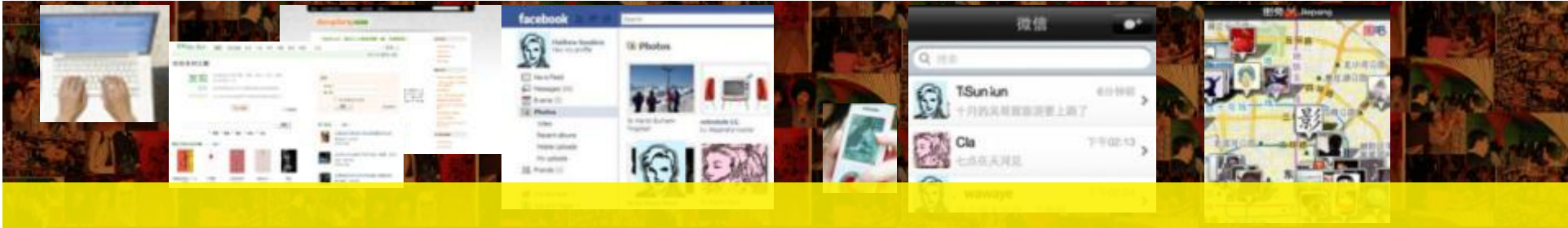# Initial Research Efforts in Mobile Social Networking (2)

- Proximity as a social pattern of user behavior
    - Using GPS (Eagle and Pentland, 2009),
    - Location entropy (Crawnshaw et al, 2010)
    - Bluetooth to discover the relative physical closeness (Quercia and Capra, 2009)
    - Sensing and phone context (Madan et al, 2010; Aharony et al, 2011)
    - Enhancing social interactions at conferences using RFID proximity (Atzmueller et al, 2011)

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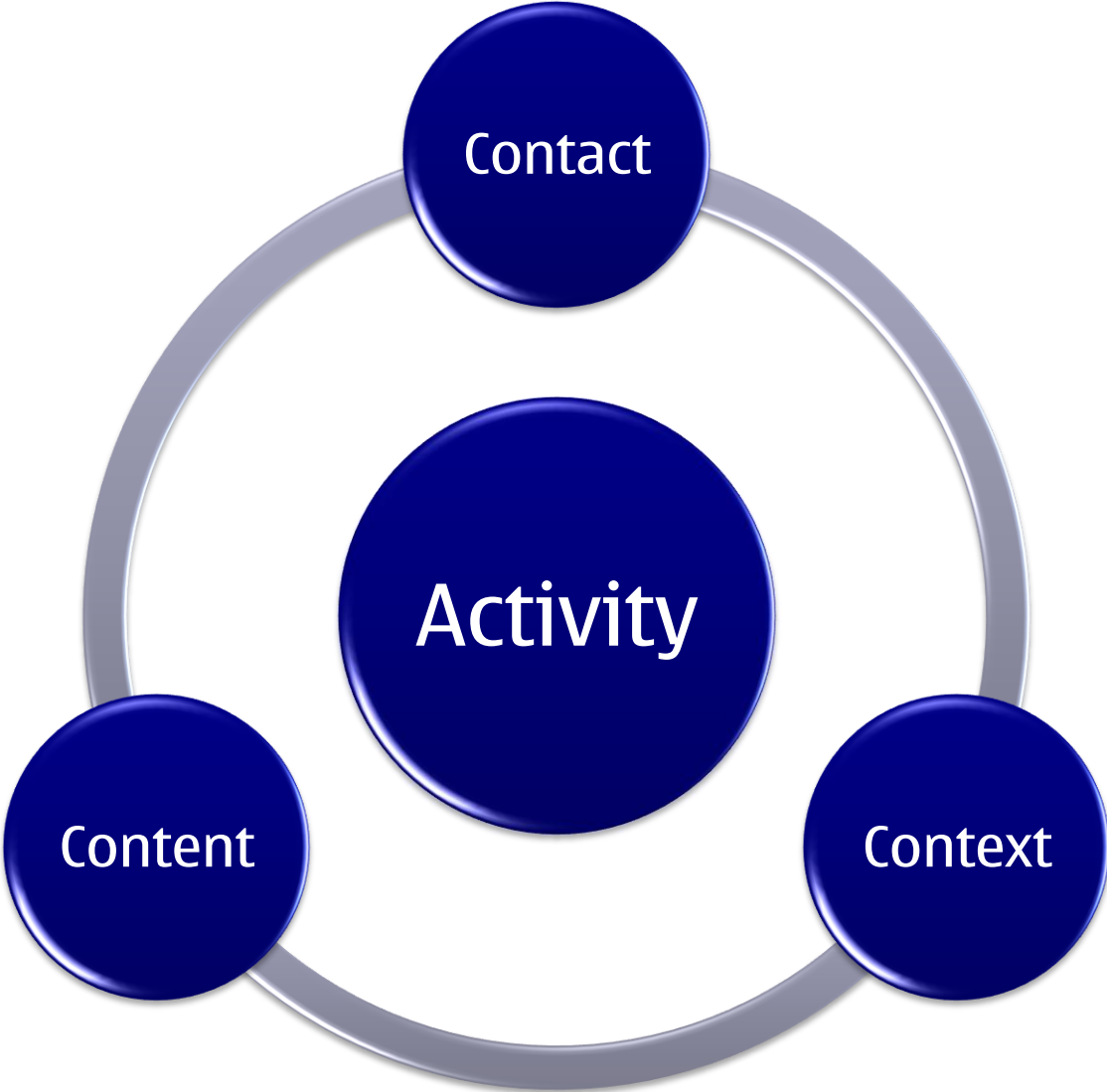# Gap between Offline and Online Social Networks

How many of your Facebook friends are really your friends? (V. Miller, Associated Content, July 27, 2009)

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powered by
TouchGraph

But Social Networking is Done Mostly Offline!

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Ephemeral Social Network

$$ESN = AC^3$$

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Using ESN to Bridge Online to Offline and vice versa

Offline physical activities (Conf., Meeting, Party, Shopping, Hiking...)

Activity 1 — ESN 1
Activity 2 — ESN 2
Activity 3 — ESN 3
...
Activity n — ESN n

Online social networks (FB, Twitter, Weibo, Renren...)

time

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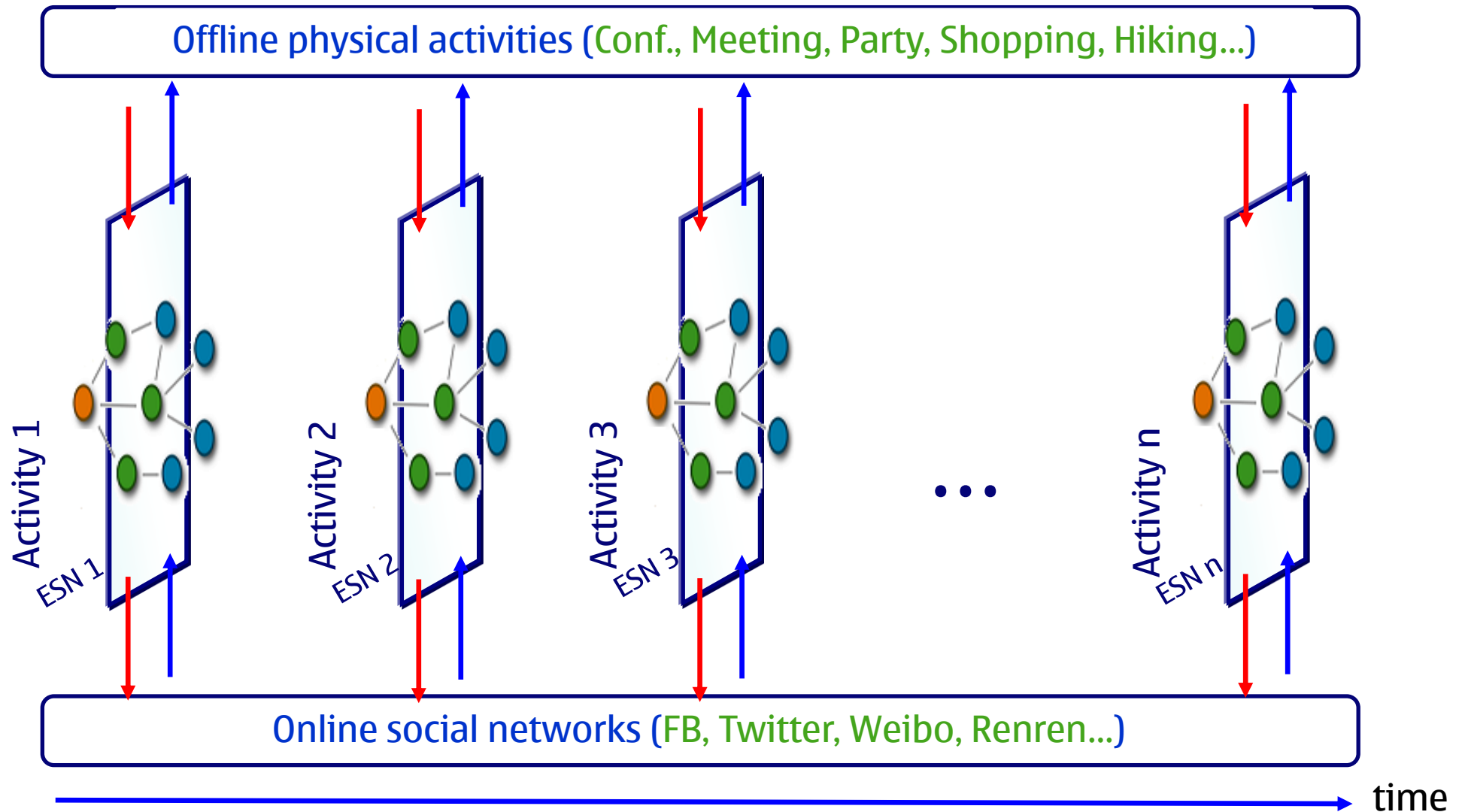
Ephemeral Social Networks: User Benefits

- In physical world, social networks are built on activities

- ESN mirrors your offline memorable moments in online world

- ESN enhances your O2O social interactions to help form your social network

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Research Questions: Network and Model

- What are the characteristics of the ESN?

  - Network, social, temporal, content, environment

- How to collect context to infer social community intelligence?

  - Positioning and proximity, social, collaborative sensing, behavioural modeling, group and activity identification

- How to record, model and identify an ESN?

- What is the interaction between online to offline and vice versa, and how to persist from offline to online?

  - Overlap and transition, network models

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Research Questions: User and Social

- How to record and manage social relationships?

- How to handle privacy and trust in an ESN and how does this change when transition to online?

- How to use the ESN for distribution and recommendation of content, contact and context?

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What We Have Done

- Developed a platform for ephemeral social networking called Nokia Find & Connect

- Examined characteristics of offline encounter network

- Determined how offline encounters influences online connections
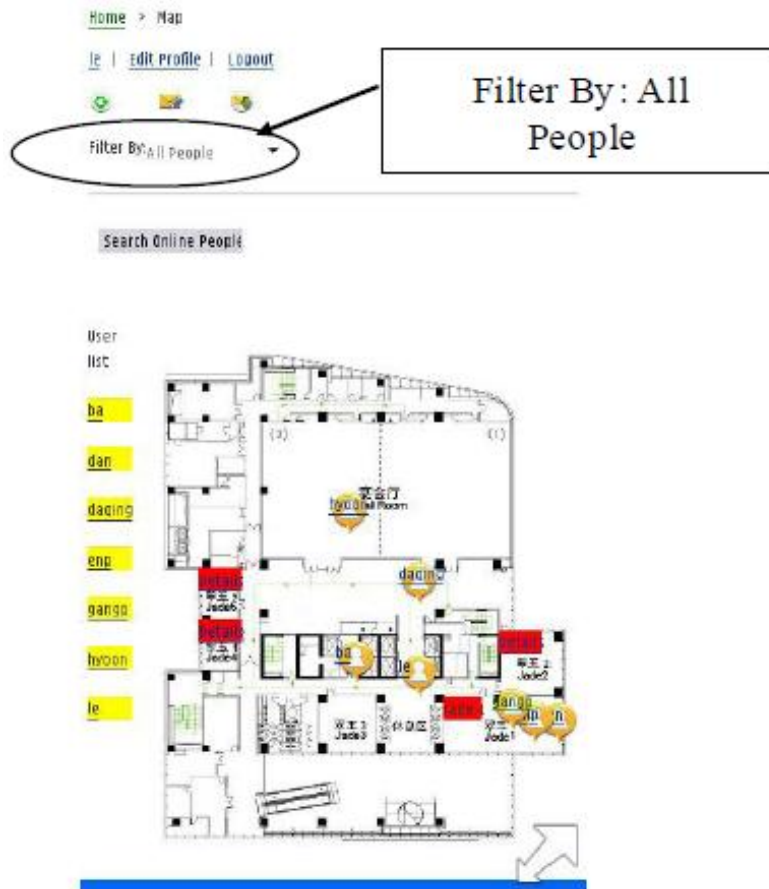
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Our Research Questions

What are the characteristics of an ESN?

How to record, model and identify the ESN?

What is the interaction between offline and online?

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Nokia Find & Connect: Platform for Enabling ESN

Find people and rooms

Connect with people

Source: Chang et al, Enhancing the Experience and Efficiency at a Conference with Mobile Social Networking: Case Study with Find & Connect, In Proc. of HumanCom 2011, 2011

Social Networks from Nokia Find & Connect

| Property	GCJK follow	GCJK contacts	GCJK encounters
# of users	72	41	70
# of links	123	51	592
Average degree	1.7083	2.5	8.46
Network density	0.02406	0.062195	0.246
Network diameter	6	6	4
Average clustering coefficient	0.221	0.195	0.683
Average shortest path length	2.7827	2.6229	2.02

Source: Xu et al, Physical Proximity and Online User Behavior in an Indoor Mobile Social Networking Application, In Proc. of CPSCom 2011, 2011

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Statistical Characteristics of Online Social Networks

Property	Brightkite	Foursquare	Twitter	LiveJournal
Total nodes	54,190	58,424	409,093	992,886
Total links	213,668	351,216	182,986,353	29,645,952
Avg. shortest path length	4.71	4.60	2.77	4.89
Network diameter	NA	NA	NA	NA
Avg. degree	7.88	12.02	447.29	29.85
Cluster coeff.	0.181	0.256	0.207	0.185
Network density	NA	NA	NA	NA

Source: Scellato et al, Distance Matters: Geo-social Metrics for Online Social Networks, In Proc. of 3rd Workshop on Online Social Networks, 2010

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Offline Encounters Influences Online Friendship
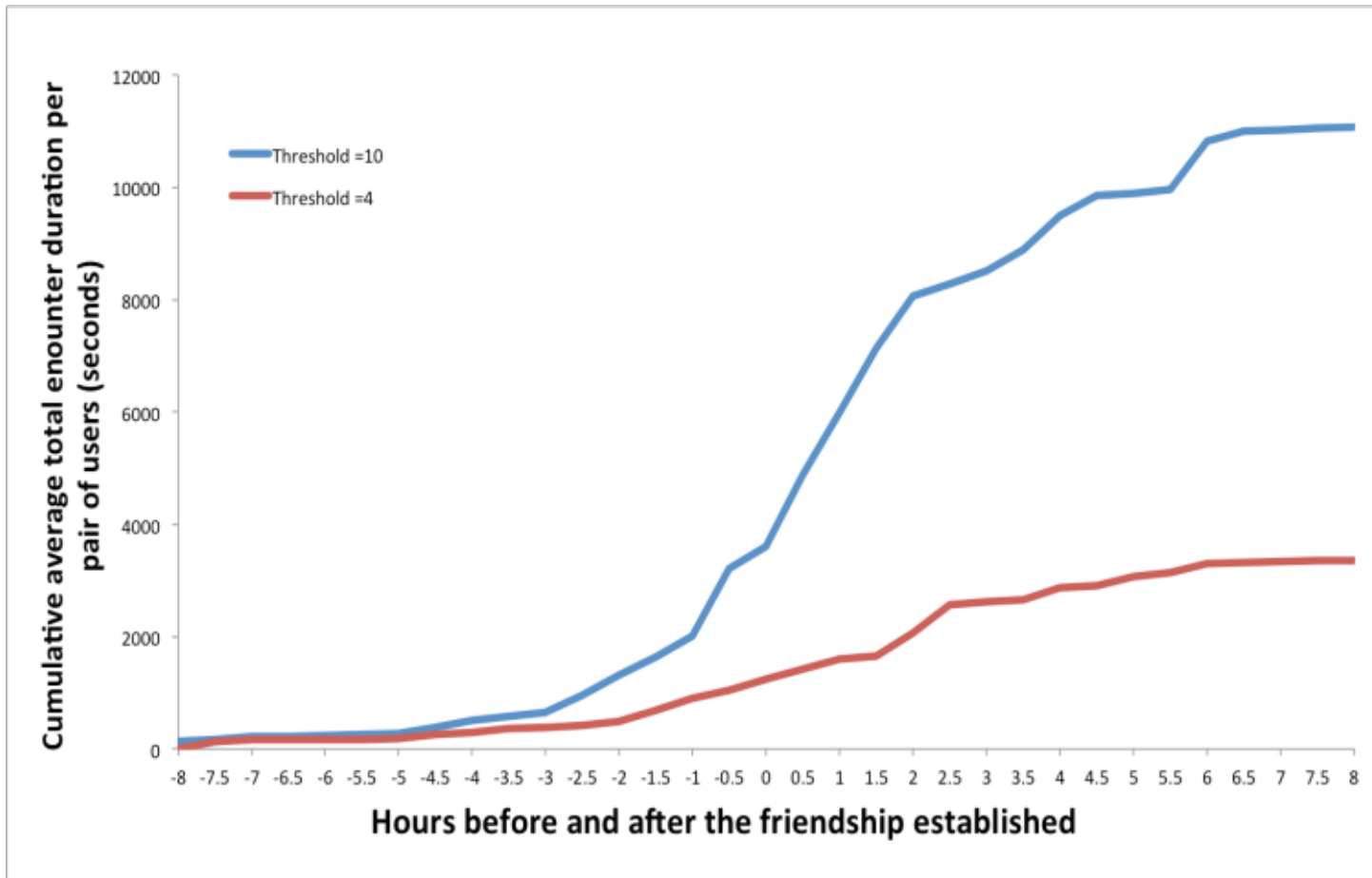
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Offline Improves Friend Recommendation

	Common friend	EncounterMeet
# of total recommendations	81	83
Average # of recommendations presented per user	8.1	8.3
% of good recommendations	32.1	44.6
% of recommended persons already known	24.7	37.3
% of recommended persons in phonebook	9.8	13.3
% of recommended persons in SNS	14.8	16.9
% of recommendations accepted	38.3	50.1

Source: Xu et al. Using Physical Context in a Mobile Social Networking Application for Improving Friend Recommendations, 1st International Workshop on Sensing, Networking and Computing on Smartphones, In Proc. of CPSCom 2011, 2011

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System Challenges

- Accuracy and relevance of finding ESN

- Proximity and positioning accuracy

- Activity detection and context recognition

- Scalability and performance

- Immediate conversion and high transfer rate from offline to online, as well as persistence from offline to online and vice versa

- .....

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Summary

- We are moving from social networking to mobile social networking

- Mobile social networking makes the mobile an integral part of your social network and lifestyle

- Context and social intelligence are needed to drive mobile social networking forward and make it a daily reality: ephemeral social networks

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