Assignment: Survey of a Wireless Networking Topic
18-452/750 Wireless Networking, Spring 2018

For this assignment, teams of 2 students must prepare a survey of particular topic in the area of wireless networking. A list of possible topics is given below. For each topic we have identified a set of initial papers that can be used to explore the topic.

What is a survey?

The goal of a survey is to give a broad, structured overview of a specific area. Here are two example scenarios in which you may have to prepare a survey after you graduate:

- You are working for a company that is exploring a new wireless technology or market, so employees and management are very not very familiar with this new area. You could be asked to prepare a 20 minute presentation to introduce a topic, describe different approaches, challenges, risks, and opportunities.

- You decided to go to graduate school and you are writing your first paper on a research project you just finished. You need to write a short related work section that includes a survey of existing work in the areas relevant to your research.

A survey is different from a summary of a set of papers. Instead, think of it as a short lecture that introduces a topic to an audience with a (conveniently) shared background corresponding to the material presented in the course. The survey should focus on presenting the "big picture" using the papers as examples. For each topic, we have identified three papers to get you started, but we generally expect that you will have to consult additional material. Examples may be papers cited in the original papers, material found on the web, or results from online libraries, like IEEE Explorer, or the ACM portal.

Besides giving you experience in preparing a survey, this assignment should also help you sharpen your critical thinking skills. You should not blindly accept all statements you read (including in the papers cited below) simply because they appear in print in a refereed publication. While the material will generally be technically correct, parts of the papers may be biased or may ignore relevant related work (typically by accident), or the claims may overstate the results that are presented. These problems most often show up in the evaluation section of the papers. The evaluation is sometimes flawed (e.g. uses inaccurate simulators, ignores certain sources of overhead, or presents graphs in misleading ways) or may be very limited in scope (e.g., a paper that makes broad claims only presents results on one testbed that may be atypical). Your assessment of the accuracy of the results should be reflected in the survey, i.e. the survey must present your perspective on the state of the art in the area.

You can consult pretty much any material as long as you cite the source. However, you cannot copy text from other papers or the web, since that is plagiarism. The only exception is that you can quote short excerpts or figures from other material, assuming you make it clear that it is a quote and you cite the source.

Deliverables

Teams of two students should prepare a 30 minute presentation. Staying within your time slot is hard but it is an important skill, so you should plan to practice your survey presentation. The surveys will start after spring break.

The first step is to propose three rank-ordered topics. The instructors will then assign a topic to each team, considering the relevance of topics, their breadth and diversity. One of the three topics you list can be self defined, i.e. you can pick a topic that is not on the list. For self-defined topics, you must provide the initial set of papers that you propose to use as the starting point for the core. Please e-mail your rank-ordered list of topics to the instructor by March 9.

Milestones

First half of the semester:

	Milestone	Comment
Friday, March 9	Team info and list of topics due	E-mail to instructor
Wed Mar 14	Instructor announce topics	
After Springbreak	Surveys will be presented	Dates listed on web page

In the weeks before your survey:

	Milestone	Comment
14 days before survey	Submit draft slides to instructor for feedback	Hard deadline.
Within a week	Meet with instructor for feedback	Scheduled time
3 days before survey	New draft for feedback	Earlier is better
9am morning of survey	Submit slides for posting	

Topics for Spring 2018

We list example topics with an initial set of papers for each topic. The specific papers may be changed slightly once topics have been assigned. Preference will be given to "Hot Topic" and "Technology rules" papers, but it is fine to have a few "Classic" topics.

For some papers, you need a CMU IP address to access the paper, i.e. you need to be on campus or use a VPN.

Hot Topics

1. **Visible Light Communication**

- [Indoor Optical Wireless Communication: Potential and State-of-the art](#), IEEE Communications Magazine, Sep 2011.

- [Vehicle to vehicle communication using visible light communication](#), IEEE Photonics Journal, 2014

- [PixNet: Interference-Free Wireless Links Using LCD-Camera Pairs](#), ACM Mobicom, 2010.

2. **Vehicular**

- [A-star: A mobile ad hoc routing strategy for metropolis vehicular communications](#)," in IFIP NETWORKING 2004., Lecture Notes in Computer Science, Springer,

- R. Frank, E. Giordano, P. Cataldi, and M. Gerla, "[TrafRoute: A different approach to routing in vehicular networks](#)," in Wireless and Mobile Computing, Networking and Communications (WiMob), 2010 IEEE 6th International Conference on, 2010

- [DAZL: Density-Aware Zone-based Packet Forwarding in Vehicular Networks](#), 2012 IEEE Vehicular Networking Conference.

- [LASP: Look-Ahead Spatial Protocol for Vehicular Multi-hop Communication](#), 2016 IEEE Vehicular Networking Conference. (brief)

3. **LTE**

- [A Control-PLae Perspective on Reducing Data Acces Latency In LTE Networks](#), ACM Mobicom 2017

- [A High Performance Packet Core for Next Generation Cellular Networks](#), ACM Sigcomm 2017

- [Automating Diagnosis of Cellular Radio Network Access Problems](#), ACM Mobicom 2017

4. **Backscatter and Ambient Communication (check for better papers)**

- [Ambient Backscatter: Wireless Communication Out of Thin Air](#), ACM Sigcomm 2013

- [Dewdrop: An Energy-Aware Runtime for Computational RFID](#), NSDI 2011

- ✓ [Powering the Next Billion Devices with WiFi](#), ACM CoNEXT 2015

5. **5G – Millimeter wave**

- [802.11ad: Directional 60GHz Communication for Multi-Gbps WiFi](#) , IEEE Communications Magazine, Dec 2014

- [Cutting the Cord in Virtual Reality](#), ACM Hotnets 2016

- [Demystifying 60GHz Outdoor Picocells](#), ACM Mobicom 2014

6. **Sensing with WiFi**

- [Smart Homes that Monitor Breathing and Heart Rate](#), CHI 2015

- [E-eyes: Device-free Location-oriented Activities Identification Using Fine-grained WiFi Signatures](#), ACM Mobicom 2014

- [Keystroke Recognition Using WiFi Signals](#), ACM Mobicom 2015

7. **Spectrum auctions**

- ✓ [Auction Approaches for Resource Allocation in Wireless Systems: A Survey](#), IEEE Communications Surveys and Tutorials, 2013 (sections I-III only)

- [Spectrum Auction Design](#), Review of Industrial Organization, 2013.

- [Enabling Spectrum Sharing in Secondary Market Auctions](#), IEEE Transactions on Mobile Computing, 2014.

Technology rules

8. **MIMO (fix second paper?)**

- ✓ [Full Duplex MIMO Radios](#), NSDI 2014

- [JMB: Scaling Wireless Capacity with User Demands](#), ACM Sigcomm 2012

- [The Case for UHF-Band MU-MIMO](#), ACM Mobicom 2014

9. **Channel-aware optimization (fix – first paper not so interesting? Maybe George's aper?)**

- [Fine-grain Spectrum Adaptation in WiFi Networks](#), ACM Mobicom 2013

- Reclaiming the White Spaces: Spectrum Efficient Coexistence with Primary Users"' ACM CoNEXT 2011

- ✓ [DIRC: Increasing Indoor Wireless Capacity Using Directional Antennas](#), ACM Sigcomm 2009.

- ✓ [CENTAUR: Realizing the Full Potential of Centralized WLANs through a Hybrid Data Path](#), ACM MobiCom 2009 (brief)

10. **Wireless security**

- ✓ [SafeSlinger: Easy-to-Use and Secure Public-Key Exchange](#), Mobicom 2013

- SecureArray: Improving WiFi Security with Fine-Grained Physical-Layer Information, ACM Mobicom 2013

- On fast and accurate detection of unauthorized wireless access points using clock skews. ACM MobiCom, 2008

Classic Topics

11.   802.11 rate adaptation

✓ Efficient channel-aware Rate Adaptation in Dynamic Environments, ACM Mobisys 2008

- Robust rate adaptation for 802.11 wireless networks, ACM Mobicom 2006

- Anticipatory Wireless Bitrate Control for Blocks, ACM CoNEXT 2011

- MIMO Rate Adaptation in 802.11n Wireless Networks, ACM Mobicom 2010

12. Localization

✓ (RADAR: An In-Building RF-based User Location and Tracking System, Infocom 2000. Presented in class)

- CEASAR: Carrier Sense Ranging in Off-the-Shelf 802.11 Wireless LAN, ACM CoNext 2011

- No Need to War-Drive: Unsupervised Indoor Localization, Mobisys 2012

- Accurate Indoor localization with zero start-up cost , ACM Mobicom 2014

13. Low power wireless

✓ Versatile low power media access for wireless sensor networks. Polastre, Joseph, Jason Hill, and David Culler, The 2nd international conference on Embedded networked sensor systems. ACM, 2004.

- Koala: Ultra-low power data retrieval in wireless sensor networks. Musăloiu-E, Răzvan, Chieh-Jan Mike Liang, and Andreas Terzis. Information Processing in Sensor Networks. IPSN 2008.

- Design and evaluation of a versatile and efficient receiver-initiated link layer for low-power wireless. Dutta, Prabal, et al. The 8th ACM Conference on Embedded Networked Sensor Systems, 2010.

14.   Network coding

- ExOR: Opportunistic Multi-Hop Routing for Wireless Networks, ACM Sigcomm 2005

✓ XORs in The Air: Practical Wireless Network Coding, ACM Sigcomm 2006

- Embracing Wireless Interference: Analog Network Coding, ACM Sigcomm 2007

- Trading Structure for Randomness in Wireless Opportunistic Routing, ACM Sigcomm 2007 (brief)