

# Assignment: Survey of a Wireless Networking Topic

18-759 Wireless Networking, Spring 2017

For this assignment, each student 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 to area, highlighting different approaches, challenges, opportunities, and risks.
- 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 set of paper summaries. 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 materials. 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. collects results on one testbed that may be atypical, but then makes broad claims). 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

You should prepare a 20 minute presentation. We will allocate 30 minute slots for each survey, leaving time for questions after each presentation. The surveys will start after spring break.

The first step is to propose three rank-ordered topics. The instructors will then assign topics to teams, 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 Monday Feb 20.

## Milestones

	Milestone	Comment
Wednesday Mar 1	List of proposed topics due	
Monday Mar 6	Instructors announce topics	
After Springbreak	In class presentations	
7 days before your presentation	Submit draft slides for feedback from instructors	Earlier is always better

## Topics for Spring 2017

We list example topics with an initial set of papers for each topic. 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.

### **NOTE: the specific papers for each topic will be updated**

#### **1. 802.11 rate adaptation**

- ✓ [Efficient channel-aware Rate Adaptation in Dynamic Environments](#), ACM Mobicom 2008
- [Robust rate adaptation for 802.11 wireless networks](#), ACM Mobicom 2006
- [Anticipatory Wireless Bitrate Control for Blocks](#), ACM CoNEXT 2011
- Cross-Layer Wireless Bit Rate Adaptation, ACM Sigcomm 2009

#### **2. Localization**

- ✓ [RADAR: An In-Building RF-based User Location and Tracking System](#), Infocom 2000.
- [CEASAR: Carrier Sense Ranging in Off-the-Shelf 802.11 Wireless LAN](#), ACM CoNext 2011
- [The Limits of Localization Using Signal Strength: A Comparative Study](#), SECON 2004.
- [No Need to War-Drive: Unsupervised Indoor Localization](#), Mobicom 2012

- [Accurate Indoor localization with zero start-up cost](#) , ACM Mobicom 2014

### 3. 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.

### 4. Sensing with WiFi

- Smart Homes that Monitor Breathing and Heart Rate, CHI 2015

### 5. Cellular handsets

- ✓ [Anatomizing Application Performance Differences on Smartphones](#), ACM MobiSys 2010.
- [MAUI: Making Smartphones Last Longer with Code Offload](#), ACM MobiSys 2010
- [Diversity in Smartphone Usage](#), ACM MobiSys 2010

### 6. MIMO

- JMB: Scaling Wireless Capacity with User Demands, ACM Sigcomm 2012
- Vidyut: Exploiting Power Line Infrastructure For Enterprise Wireless Networks, ACM Sigcomm 2014
- Full Duplex MIMO Radios, NSDI 2014

### 7. Backscatter and Ambient Communication

- Ambient Backscatter: Wireless Communication Out of Thin Air, ACM Sigcomm 2013
- Dewdrop: An Energy-Aware Runtime for Computational RFID, NSDI 2011
- Passive Wi-Fi: Bringing Low Power to Wi-Fi Transmissions, NSDI 2016
- Powering the Next Billion Devices with WiFi, ACM CoNEXT 2015

### 8. 5G – Millimeter wave

- Boon and Bane of 60 GHz Networks: Practical Insights into Beamforming, Interference, and Frame Level Operation, ACM CoNEXT 2015
- Millimeter Wave Communications: From Point-to-Point Links to Agile Network Connections, ACM HotNext 2016

## 9. Network coding

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

## 10. Wireless security

- Acoustic Eavesdropping through Wireless Vibrometry, Mobicom 2015
- Securing RFIDs by Randomizing the Modulation and Channel, NSDI 2015
- Keystroke Recognition Using WiFi Signals, ACM Mobicom 2015
- SafeSlinger: Easy-to-Use and Secure Public-Key Exchange, Mobicom 2013

## 11. Diagnostics

- [RFDump: An Architecture for Monitoring the Wireless Ether](#), ACM CoNEXT 2009
- ✓ [Airshark: Detecting Non-WiFi RF Devices using Commodity WiFi Hardware](#), ACM IMC 2011.
- [Jigsaw: Solving the Puzzle of Enterprise 802.11 Analysis](#), ACM SIGCOMM, September 2006.
- (optional) [Understand 802.11 Performance in Heterogeneous Environments](#), HomeNets 2011.

## 12. Disruption Tolerant Networking – DTN

- ✓ [A delay-tolerant network architecture for challenged internets](#), ACM Sigcomm 2003
- [A Message Ferrying Approach for Data Delivery in Sparse Mobile Ad Hoc Networks](#), ACM Mobicom 2004
- [Low-Cost Communication for Rural Internet Kiosks Using Mechanical Backhaul](#), MobiCom 2006.
- [DTN Routing as a Resource Allocation Problem](#), ACM SIGCOMM 2007

## 13. Channel-aware optimization

- [CENTAUR: Realizing the Full Potential of Centralized WLANs through a Hybrid Data Path](#), ACM MobiCom 2009
- [Interference-Aware Transmission Power Control for Dense Wireless Networks](#), Proceedings of the Annual Conference of ITA, September 2007.
- ✓ [DIRC: Increasing Indoor Wireless Capacity Using Directional Antennas](#), ACM Sigcomm 2009.