Remote Analysis of a Distributed WLAN Using Passive Wireless-side Measurement

This paper presents network traffic measurements from a campus-wide wireless LAN (WLAN), with the data collected wirelessly by 6,775 users and 97 access points. Analysis of the data set identifies similarities and differences in the usage of different WLAN locations, as well as emerging trends in WLAN usage regarding application usage and session mobility. The findings complement existing WLAN measurement studies by providing deeper insights into how WLANs are used, and by developing models that are applicable in capacity planning, network testing, and equipment development processes.
Short summary assessment ((REQUIRED) What are the main contributions of this paper? Do you consider the issues addressed important and/or interesting? Comment on novelty, creativity, impact and technical depth(1-5 sentences))

Measurement of wireless LAN access traffic. Characterization of session duration and roaming. Based on extensive statistics collected over a long period of time.

Strengths: ((REQUIRED) What are the most important reasons to accept this paper? (1-3 sentences))

The characterization of session parameters is new and could form the basis for artificial load generation tools.

Weaknesses: ((REQUIRED) What are the most important reasons NOT to accept this paper? (1-3 sentences).)

The traffic is at a very aggregate level, focusing on presence in AP over an extended period of time rather than sub-hour statistics that would be required for a useful load generation tool.

Detailed Comment to the Authors ((REQUIRED) Please provide detailed comments that can be used by the authors to improve this paper. Specifically, if you gave a low originality grade please support with relevant citations. Also if you gave a low technical merit grade please specify the location of error(s) in the paper.)

section VI-C: logrithmic distrib: \( \theta \) is to the power x

several places in the text: instead of repeating that the K-S test passed at levels 0.1, 0.05 and 0.01, give the p-value instead. This is more useful than the test statistic (a test statistic of 1.07 corresponds to a p-value of 0.1, so I guess that all mentioned p-values are larger than 0.1)

section VII-A: give the statistic of classification as "Others" for this one hour traffic when using the port number method. Nothing says that for this specific hour the amount of web traffic classified as "Web" is 46% as for the overall traffic. Without clarifying this point, the conclusion that "others" is mostly HTTP or P2P is at best premature.

VIII.A if you have statistics for the number of APs visited per day (rather than over the entire trace) this would be more useful. The number of visit over the whole trace is influenced by the duration of the trace.

Fig 10: a log scale on the y-axis would be more illustrative

Section XI-B: Fig 17: plot the percent errored TCP packets for each packet size bin

Review 2

Reviewer B

<table>
<thead>
<tr>
<th>Originality</th>
<th>Technical Merit</th>
<th>Readability</th>
<th>Relevance</th>
<th>Reviewer Confidence</th>
<th>Overall Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 25%, but not top 10% (3)</td>
<td>Top 25%, but not top 10% (3)</td>
<td>Top 10% (4)</td>
<td>Top 10% (4)</td>
<td>Informed outsider (2)</td>
<td>Likely accept (very good, top 15% but not top 6%) (4)</td>
</tr>
</tbody>
</table>

Short summary assessment ((REQUIRED) What are the main contributions of this paper? Do you consider the issues addressed important and/or interesting? Comment on novelty, creativity, impact and technical depth(1-5 sentences))

This paper presents a measurement study of a campus wireless LAN. It provides a comprehensive analysis on the wireless traffic data collected. The study is interesting and useful.

Strengths: ((REQUIRED) What are the most important reasons to accept this paper? (1-3 sentences))

This paper presents a serious measurement study of a campus wireless LAN. The amount of wireless traffic data collected is large and the analysis of data is comprehensive.

Weaknesses: ((REQUIRED) What are the most important reasons NOT to accept this paper? (1-3 sentences).)

To make the paper more concise, the authors may consider removing some observations that are very specific to their local university where the measurement is conducted, while retaining the more generic observations.

Detailed Comment to the Authors ((REQUIRED) Please provide detailed comments that can be used by the authors to improve this paper. Specifically, if you gave a low originality grade please support with relevant citations. Also if you gave a low technical merit grade please specify the location of error(s) in the paper.)

This paper presents a measurement study of a campus wireless LAN. The wireless traffic data are collected using remote non-intrusive wireless-side measurement. The authors elaborate the design and deployment of their measurement, which demonstrates the feasibility and effectiveness of the measurement methodology. A large amount of wireless traffic data are collected. The paper performs a comprehensive analysis on the data collected from different perspectives (user, application, mobility, session etc.), including a number of features not covered by existing studies. Where possible, the paper also gives statistical models to characterize the observed features. The analysis provides a lot of information that is useful to network administrators and researchers. Overall, the paper is well organized and written. To make the paper more concise, the authors may consider removing some observations that are very specific to their local university where the measurement is conducted, while retaining the more generic observations.

Review 3
Reviewer C

Short summary assessment (REQUIRED) What are the main contributions of this paper? Do you consider the issues addressed important and/or interesting? Comment on novelty, creativity, impact and technical depth (1-5 sentences)

This paper presents a detailed measurement study of a campus-wide WLAN using commercially available devices to collect traffic simultaneously at 9 selected locations on campus for 6 weeks. The measurement results include characteristics on users, applications, mobility, user sessions, network (user traffic load & AP load), wireless channel usage and errors. These characteristics are important for network testing, planning and simulation. The measurement methodology is a main contribution and is likely to be adopted by other researchers and network administrators.

Strengths: (REQUIRED) What are the most important reasons to accept this paper? (1-3 sentences)

The measurement methodology is a main contribution. It complements the existing methodologies and is likely to be adopted by other researchers and network administrators. The study is thorough and well laid out.

Weaknesses: (REQUIRED) What are the most important reasons NOT to accept this paper? (1-3 sentences.)

Although the study is comprehensive, I do not see many new interesting results - the results reported in the paper are somewhat similar to what have been reported in existing work (e.g., [2],[6]). I would expect that with the new methodology and the information collected cross multiple layers, the authors can discover more interesting results and/or provide much deeper insights than those presented by existing studies.

Detailed Comment to the Authors (REQUIRED) Please provide detailed comments that can be used by the authors to improve this paper. Specifically, if you gave a low originality grade please support with relevant citations. Also if you gave a low technical merit grade please specify the location of error(s) in the paper.

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The measurement methodology is a main contribution and is likely to be adopted by other researchers and network administrators. The study is comprehensive and well laid out. However, I do not see many new interesting results - the results reported in the paper are somewhat similar to what have been reported in existing work (e.g., [2],[6]). I would expect that with the new methodology and the information collected cross multiple layers, the authors can discover more interesting results and/or provide much deeper insights than those in existing studies. The following are a couple of detailed comments:

1. Section XI.B (wireless error rate) provides interesting measurement results on loss rates (CRC error, MAC retransmission, etc.). I have not seen this perspective studied elsewhere. However, the current results are bit superficial. For example, do packets from/to all the APs have similar CRC error ratio? Why (or why not)? If CRC errors are caused by interference, why they are more dramatic at nighttime? Why packet losses only concentrate on dominant packet sizes (e.g., 65-128 bytes and 1 KB)? The authors suspect that the high CRC error rates are partly due to the placement of the RFGrabbers. How is this validated? How much does it overestimate the actual CRC errors? How can this be remedied in order to obtain a more accurate estimate of CRC error ratio? Similarly, for MAC packet retransmission, what are the average and maximum number of retransmission (or the distribution of the number of retransmissions)?

2. In Fig. 9, there are only 8 locations. In particular, the example in the text is missing in the figure.