

The Case for Independent Validation Testing

Not sure whether you should require third party validation testing for your new metro Wi-Fi system? Uptown Services, LLC has completed comprehensive testing of three commercially available Wi-Fi systems in Sunnyvale, Mountain View and Lompoc. This was all part of the development process for the firm's new testing service – WiVeriFi. The top line results (shown in the table below) should be enough to convince any City Manager or CIO that they should definitely include third party testing as part of their future RFP and/or contract for citywide Wi-Fi services.

System Wide Averages	System A	System B	System C
Percent Coverage	90%	84%	69%
Throughput, kbps	1,093	531	273
Latency, ms	174	266	508

Uptown is reluctant to match each City to their respective test results, but you don't need to know who is who to see that there is a major need for independent testing in this industry. If you feel lucky and want to roll the dice, you might end up with a relatively solid performer like System A. On the other hand, what if your network turns out like System C? This is why we strongly recommend that each RFP and contract include a reference to the terms and conditions discussed below.

Technical Trial vs. Proof of Concept

Sometimes it boils down to semantics. Most of today's testing is associated with so called "Proof of Concept" networks. So some operators claim that once the "concept" has been "proven", the need for testing goes away. This is why we recommend that the first phase of implementation be called the "Technical Trial." A technical trial is a vital stage in any new service introduction and should not be skipped. Every market is different from a right of way and geography perspective, so each market needs to be tested like it was the first of its kind.

Technical Trial Area

The technical trial area should be representative of the more challenging areas to be covered from both right of way and topographical points of view. The test area should be no less than two square miles and cover a mix of residential and urban areas.

Technical Trial Period

The technical trial does not need to take place over an extended period of time. Testing should begin from the date that the network has been deemed ready by the network operator. Testing should take less than a week, with the processing of results and report generation taking another week. Adding another week for the operator to review the results, adds up to three weeks for the technical trial period. There is no reason why the technical trial period needs to last longer than a month.

Note: Some network operators will object to having to stop progress on the network for up to a month for the technical trial. This doesn't have to be the case as long as they

agree to hold off on offering any commercial services until the successful completion of the technical trial.

Acceptance Testing Criteria

Testing criteria must be based on the need to characterize the end user experience. This translates to where a subscriber can use the network, what kind of throughput can be enjoyed and what kind of delay (a.k.a., latency) is encountered. Each agreement is different, but they should all spell out the required performance for both coverage (90% indoor and 95% outdoor) and throughput (1.0 Mbps upload and download). This requirement should also grow over time to keep pace with the ever-increasing bandwidth capabilities of DSL and cable modem offerings. If the network is going to be used for any type of voice, gaming, audio/videos streaming and/or web conferencing, then latency (100 ms or less) should also be included in the test criteria.

Acceptance Testing Procedures

Most metro scale Wi-Fi systems will undergo a variety of tests as part of the build and activation process. Third party validation testing should not start until the network integrator, operator or service provider has certified the system as ready. The independent testing firm should then proceed with a full complement of testing procedures. These testing procedures should be geared towards collecting data to measure the technical trial network's compliance with the stated performance criteria in the agreement / RFP. Recommended test procedures are outlined next.

Drive Testing

100% of the technical trial area should be tested for the stated performance criteria. In most cases, a drive test will be the best approach to cover several square miles. Uptown has complete regression analysis on test results from over 24 square miles of drive testing and found that the vehicle speed below 30 mph did not have an impact on throughput, signal strength or latency test results.

Off-Street Testing

Drive testing is the best approach for characterizing the entire service area for all performance criteria. However, it is also important to understand how the network performs in off street areas. Testing in these areas will show how well the wireless network performs when its signals are obstructed by obstacles like buildings and foliage. Procedures will vary for this type of testing, but it is recommended that it be required for some sample areas.

Indoor Testing

One of the biggest challenges emerging in the metro scale WiFi industry is indoor coverage. While many users will enjoy the system outdoors or in their vehicle, the overwhelming majority of subscribers will be using the system as an alternative to their current dial-up, DSL or cable modem connection. All of these services are used in the home or business, which means that the WiFi provider needs to provide reliable indoor service throughout the coverage area. Indoor testing is very difficult to carry out,

especially in a limited trial area. However, it is recommended that it be required as part of the testing procedures to ensure that indoor coverage will not be a problem.

Review of Acceptance Test Results

Once the testing has been completed and results compiled, the network operator should be given a pass / fail grade. In the case of failing grade, the operator should be allowed to review all of the test data and then to make any adjustments to the network that may be required. The operator should be responsible for funding and independent retesting until the desired results are achieved. If the desired results are not achieved, then the City will need to determine the appropriate course of action per the specific terms of the given agreement.

Ongoing Testing Requirements

Given the ever changing environmental and technical factors associated with a WiFi deployment, it is recommended that the City require some form of annual testing. Much like the FCC requires cable systems to complete annual CLI testing, the City should require the WiFi operator to demonstrate that they are continuing to comply with the quality standards called out in their agreement.

Sample Contract Language

Wireless agreements will vary from network to network, but Uptown recommends that the following language be incorporated somewhere in each contract between a City and wireless service provider.

Performance Requirements

The network operator will be responsible for installing and operating a wireless system that meets the following performance requirements:

Coverage (Defined as the number of locations that meet the throughput and latency requirements divided by the number of locations tested.)

1. No less than 90% coverage to any Wi-Fi equipped device located within 50 feet of a city street;
2. No less than 90% coverage to any window mounted 200 mW Wi-Fi client or access point located in any building within city limits; and
3. No less than 95% coverage to any vehicle-mounted 200 mW Wi-Fi client access point located within 50 feet of a city street.

Throughput

1. No less than 1.0 Mbps average download (i.e., network to end user) throughput;
2. No less than 512 Kbps average upload (i.e., end user to network) throughput.

Latency

1. Average ping time of 100 ms or less between an end user and a server on the wireless network;
2. Average ping time of 200 ms or less between an end user and a server not on the wireless network (e.g. Google, Yahoo, eBay, etc).

Technical Trial

The network operator will be responsible for supporting a technical trial phase lasting at least three weeks in duration. The purpose of this trial will be to certify the performance of the network in terms of coverage, throughput and latency. The technical trial period shall commence on the day after the network operator certifies the network as ready for commercial use. The technical trial period will end the day that a third party testing firm confirms that the network is meeting the requirements called out in this RFP.

Third Party Testing Process

The network operator and City shall jointly select a qualified third party testing firm to complete the required testing during the technical trial. The selected firm will be responsible for completing all testing (drive, fixed, off-street and indoor) required to certify the performance of the technical trial network. The testing firm shall be required to complete a minimum of one pass testing the network performance on all publicly accessible streets for the entire trial area. The testing firm shall also be required to test a specified number of off-street and indoor locations (with public access) in order to determine the performance of the system in those conditions.

Evaluation of Test Results

The testing firm shall process the test results and render a pass / fail grade for each of the performance criteria in the technical trial area. In the case of a failing grade, the network operator shall be given the opportunity to review the detailed test data and make any changes to the technical trial network. The network operator shall be responsible for implementing all third party retests; until such time that the network “passes.”

Annual Testing

The City shall have the option to require annual testing of the wireless network to measure its compliance with the original performance requirements. This testing shall be completed using an independent third party firm that is mutually acceptable to the network operator and the City.

About Uptown Services, LLC

Uptown Services provides leading edge consulting and implementation support services to municipally owned utilities and municipalities considering entering the broadband services sector. Their services and expertise cover the full potential of this industry including local telephony, video entertainment, and high speed Internet access. Since 1998, they have provided detailed analytical and consultative services to more than 40 public power companies and municipalities across the US. Uptown is deeply involved in the municipal wireless industry and provides third party wireless validation testing services through its WiVeriFi offering.