GUIDE TO **TESTING WI-FI PERFORMANCE**

IN REALISTIC CUSTOMER SCENARIOS

Icotera

Guide to testing Wi-Fi performance in realistic customer scenarios

When carrying out competitive testing of Wi-Fi routers, it's crucial to ensure that the tests simulate real-world customer scenarios. This helps guarantee that the performance metrics reflect what end-users will actually experience in their homes. Below is a guide on how to conduct such tests, focusing on replicating typical customer environments to provide accurate results.

Step 1: Prepare Test Environment

1. **Select an Appropriate Location**: Choose a test site that can mimic real-world conditions as closely as possible. This could be a house or an office with multiple rooms.

2. **Simulate Customer Conditions**: Create an environment that includes obstacles such as **thick walls**, **multiple floors**, and various materials (brick, concrete, plaster). These conditions help assess signal strength and coverage, which are critical to performance.

3. **Floor plan**: It can be useful to create an electronic floor plan that you can mark the test results on. If you have Wi-Fi testing software the concept of heat maps can be applied to the floor plan. This shows signal strength using a coloured gradient, which can be useful to compare competitive devices and show where Wi-Fi 'dead' and 'not' spots exist

4. **Test Device**: It may be useful to select a couple of different end user devices to measure your test results. A laptop is an obvious device, as is a modern mobile phone (recommendation is to use both an Android and an Apple variant). It can also be worth considering using devices that have different Wi-Fi chipsets. Prepare the test devices to ensure that the settings stay consistent when testing.

5. **Wi-Fi configuration:** Testing the 2.4GHz and 5GHz (and maybe even the 6GHz band if you have it) separately makes sense so results are consistent. To achieve this, either turn off the frequencies not to be tested or apply a different Wi-Fi profile (SSID) to each frequency band.

   The use of high channels (>=100) when testing the 5GHz frequency band is recommended as the channels provide higher power output. If you can, fix the channel on the equipment under test

   It is important to consider the effects of DFS (Dynamic Frequency Selection) on the 5GHz band, which may make the active channel swap if interference is detected. Ensuring a consistent, like for like setup when comparing different vendors equipment is key

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Step 2: Define Key Testing Areas

1. **Router Placement**: If testing in a home position the router in a central location, or similar to where a customer might install it, such as in the living room or a central hallway. Ensure there is some variability by placing it in different spots within the home to evaluate coverage.

2. **Identify Test Zones**:
   It is key to test the router performance in different locations, as logically performance degrades as you move further away from the test router. High performance routers such as the Icotera i488x will potentially provide better coverage further away, meaning there is less requirement for costly and complex Wi-Fi mesh extenders.
   - **Close Range (Same Room)**: Test in the same room as the router.
   - **Mid Range (Adjacent Rooms)**: Test the coverage in rooms directly next to the one containing the router.
   - **Long Range (Upstairs or Across the House)**: Measure performance in areas that are farther away, such as upstairs rooms or the farthest point of the building.

Step 3: Testing Scenarios and Metrics

The recommendation is to carry out the tests a number of times (minimum of 3) at the same location and with the same parameters and then use the average result to remove any anomalies in the result

Use a local LAN connected test server for speed and latency tests (rather than an Internet one) otherwise you will not just be measuring performance of the router but also the Broadband connection which could introduce different results and skew any outcomes.

1. **Speed Tests**: Measure download and upload speeds at different distances and through multiple obstacles. Use a standardized speed test application to measure bandwidth performance at each location.
   The recommendation is to use a local speed test server rather than an Internet one as this will be more accurate, removing any potential delay in the Broadband circuit. A useful local speed test server is provided by Open Speed Test Server Free and Open-Source Self-Hosted HTML5 SpeedTest (Others are available)

2. **Signal Strength**: Use a Wi-Fi analyser app to record **signal strength (RSSI)** for each relevant frequency (2.4GHz and 5GHz) in each test zone. This will help you understand the impact of obstacles like walls and floors.

   Note: You need to be careful when using RSSI as a comparison as if the Wi-Fi analyser is not actually associated to the test router it is just picking up Wi-Fi beacons and different router vendors may send these in different ways. Therefore, the recommendation is to carry out an 'active' test using a device (laptop or phone) that is actually Wi-Fi associated to the test router

3. **Multi-Device Testing**: Simulate multiple users by connecting several devices—such as smartphones, tablets, and laptops—to the router simultaneously. Observe the impact on network performance, including latency and throughput.

4. **Latency and Stability**: Run continuous ping tests to assess latency and any packet loss during active use (voice calls, file transfers). Measuring latency without active load may produce misleading results.

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Step 4: Performance Evaluation

1. **Coverage Evaluation**: Document where dead zones or areas of weak Wi-Fi signal are located for both frequency bands in the testing environment and mark these on the floor plan. This is especially important to ensure that end customers experience consistent coverage throughout their home.

2. **Real-World Applications**: Test common customer applications such as streaming HD videos, online gaming, and video conferencing. Note any issues with buffering, lag, or call quality. Be careful to ensure that any tests are not buffering or caching previous downloads as this may affect the results

3. **Comparison evaluation**: When comparing different vendors equipment, it is important that the measurements are taken under the same environmental conditions, at the same location, using the same test device (laptop/phone) and ideally at the same time to ensure consistency and accuracy of side by side comparisons

Step 5: Documentation and Recommendations

1. **Testing Log**: Record all results, including speed, signal strength, latency, and any observed issues for each testing scenario and for each competitive router. This then allows the results to be mapped out in a performance graph for easy visual interpretation of the test results.
   As previously recommended it is advisable to carry out the same test's multiple times (at least 3) and then use the average of the result to remove any anomalies

Summary

By simulating real-world scenarios with obstacles like thick walls, multiple floors, and household interference, you can obtain a realistic assessment of router performance. This ensures that when deployed, the routers provide the kind of robust connectivity customers expect in their homes.

Want to know more about how Icotera's high performance routers can elevate the user experience? Check out our Wi-Fi router portfolio here or feel free to contact us at sales@icotera.com

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