# Frontline Interoperability Test Team Case Studies

## Frontline IOT Means Maximum Device Compatibility

**Case Summary**

A large *Bluetooth®* developer (Customer X) created a new *Bluetooth*-enabled phone for commercial distribution. The new phone had performed well during testing, but Company X needed to ensure that it would interact seamlessly with the wide variety of *Bluetooth*-enabled devices and automobiles in the current *Bluetooth* ecosystem.

Customer's Options:

- **Test the device against their existing device library**
  Customer X evaluated their device library to determine if it would meet their needs. They deemed it too small and not current enough to provide a comprehensive testing environment. *Not a viable solution.*
- **Build up their internal device library**
  Customer X determined that the creation of a fully operational device library required not only the addition of hundreds of devices (including car kits that are only available in cars), but the market knowledge, infrastructure and staff to select, catalog, manage and master those devices. Customer X determined that upgrading and staffing an advanced library was not an expense they wanted assume. *Not a viable solution.*
- **Contract with Frontline for *Bluetooth* Interoperability Testing (IOT)**
  Frontline has an immense and ever-growing device library, including its own lot of cars. Frontline's dedicated team of testers are unparalleled users - well-versed on a wide variety of devices, and highly knowledgeable about complex *Bluetooth* technology. Customer X determined that they could add Frontline as an extension of their own QA department without incurring the ongoing physical and intellectual overhead of a large and evolving testing device library. *A viable solution!*

**Project Goal**
Customer X contracted Frontline's Interoperability Test Group (IOT) to test connectivity with 1500 commercially available *Bluetooth* devices, to be completed in six months.

**Steps**
1. A comprehensive range of devices based on geographical region, from headsets and audio players to hands-free car kits, was selected from the current and ever-expanding Frontline IOT device library for testing, and a number of specific devices of interest for the project were purchased and added to the device library's inventory.

2. Detailed documentation templates were prepared to record multiple profile tests for each device
3. Wrote bug reports for failed tests and tracked regression tests of bug fixes
4. Provided customer with and managed an extranet portal through which they could access test results and bug reports in real time
5. Provided OTA capture files for customer analysis
6. Held daily troubleshooting calls with customer technicians, and weekly management conference calls to check progress and reset priorities as needed
7. Perform interoperability testing on 500+ *Bluetooth*-enabled devices

**Results**

Despite the large scope of the project, the IOT team's comprehensive device library  and vast hands-on experience with a wide variety of *Bluetooth* devices enabled them to move efficiently and accurately through the testing process.

1. Goal to test  500 devices against the customer device was met well ahead of deadline.

2. Customer X obtained feedback on compatibility of their device with a broad selection of post-market *Bluetooth* devices before pilot release.

3. Frontline worked with customer to identify a smaller population of "golden devices" that were used for in-depth follow up tests.

4. Customer X received benefit of broad test device survey without having to manage a large device library or worry about tedious regression tests .

5. Frontline became a valued and trusted extension of the customer QA team, extending the work day test window due to our geographic location.

Testing of all 500+ devices was completed  a full month before Customer X's deadline. The Frontline IOT team exceeded the 500 device test goal, and delivered not only customer device test reports, but additional reference device comparison test results and sniffer log files.

## Frontline IOT Means Results When You Need Them

**Case Summary**

A communications technology company (Customer Y) urgently needed multi-point, multi-device test experience data to provide as "proof of concept" at an important technical review of their prototype smartphone. The acquisition of this broad sampling of data combined with an aggressive deadline of 24 hours required significant *Bluetooth* expertise and an established and diverse device library.

Customer's Options:

- **Test the device with existing internal resources**
  Customer Y evaluated their device library and infrastructure to determine if it they could provide adequate test data within a very short deadline. They deemed it too small and not current enough to provide comprehensive testing reporting, and they did not have the dedicated human resources required to complete the project on schedule. *Not a viable solution.*

- **Outsource the project to an unproven test house**
  Customer Y decided that the company to whom they assigned the project would need to have a proven track record in protocol analysis, an expansive device library at the ready, and a testing staff that had significant *Bluetooth* expertise with no ramp-up time. Customer Y determined that the project was too critical and time-sensitive to outsource to anything less than a proven industry expert. *Not a viable solution.*

- **Contract with Frontline for *Bluetooth* Interoperability Testing (IOT)**
  Frontline has been at the forefront of protocol analysis for over a quarter of a century, and in the *Bluetooth* space for over a decade as a contributing member of the Bluetooth Special Interest Group. Their device library, unmatched in the industry in its size and scope, reflects that long term commitment. Frontline's testing staff are highly skilled and conversant in Bluetooth technology, and have unique access to the most up-to-the-minute analysis tools in the world. Customer Y determined that Frontline had the industry record, expertise and existing infrastructure to be able to provide cost-effective and comprehensive reporting on a tight timeline. *A viable solution!*

**Project Goal**
Customer Y contracted Frontline's Interoperability Test Group (IOT) to test and provide reporting on single and multi-point connectivity with 50 commercially available *Bluetooth* devices, to be completed and delivered within 24 hours.

**Steps**
1. The test plan, including requirements, test scenario and test cases, was designed and submitted to the customer for approval.

2. To demonstrate broad compatibility, Frontline worked with Customer Y to select a wide range of *Bluetooth* products from the device library.
3. A summary customer report document was outlined to address the specific needs of the presentation.
4. Interoperability testing was performed on multiple *Bluetooth*-enabled devices supporting multi-profile piconets, including such complex scenarios as FTP, HFP, HID and A2DP profile support.
5. Testing was performed, data was assembled and capture files were recorded to provide supporting documentation.

**Results**

The IOT team's established and comprehensive device library and industry-leading *Bluetooth* expertise enabled the team to accelerate the project with no negative impacts on quality, scope or deliverables.

1. Within hours of initiating the project, Frontline had created test plans, submitted a summary report outline for approval, and allocated approved test devices.

2. With interoperability testing underway, interim results were reported to Customer Y as data was being produced to allow early integration into presentation materials.

3. Final test results and files were delivered to the customer before close of business on the same day the project was initiated.

4. Customer Y  received the benefit of significant Bluetooth expertise and an established infrastructure without years of investment and training, and were able to pass the stress of a seemingly impossible deadline to Frontline.

5. Frontline became Customer Y's "go-to" testing facility for its ability to provide uncompromised results under highly compromised circumstances.

Testing of more than 50 devices was completed, and complete and comprehensive test results and supporting capture logs were delivered to Customer Y within 24 hours, and well before their technical review.  In addition, Frontline's robust testing procedures filled a significant gap in multi-profile device test coverage for Customer Y.

## Frontline IOT Means More Efficient Project Management

**Case Summary**

The project lead at a *Bluetooth* technology developer (Customer Z) was tasked with performing long term interoperability testing on a device, and to distribute the results to multiple internal teams, each with different informational requirements and access restrictions, in order to facilitate more effective inter-departmental communications.

Customer's Options:

- **Test the device against their existing device library and develop an automated and user-authenticated distribution method internally**
  Customer Z determined that their device library contained too few devices to provide adequate interoperability coverage, and that the devices in it were not representative of the most desirable *Bluetooth* devices currently on the market. They also decided that they did not have the resources to improve the library and create a custom distribution environment to improve communication across departments. *Not a viable solution.*
- **Outsource the device testing, and develop an automated and user-authenticated distribution method internally**
  Customer Z considered outsourcing the interoperability testing and creating the distribution mechanism internally. They discarded idea, which would require multiple procedural redundancies and duplicated efforts, as inefficient and not cost-effective. *Not a viable solution.*
- **Contract with Frontline for *Bluetooth* Interoperability Testing (IOT) and custom reporting solutions**
  Frontline, with its unparalleled library, expert staff and rock-solid reputation, was an easy choice for the testing aspect of the project. But when Customer Z approached Frontline with the challenge of how to improve information dissemination to stakeholders, they found a willing partner that would tackle the problem and make sure that the solution met the needs of a diverse audience. Customer Z determined that handing the entire project to Frontline was the most economical and reliable path to quality testing results and innovative distribution of those results. *A viable solution!*

**Project Goal**

Customer Z contracted Frontline's Interoperability Test Group (IOT) for interoperability testing, and to develop a system of customized information distribution based on user group.

**Steps**

1. After consulting with the customer, test devices (including "golden devices" deemed to be the most desirable Bluetooth devices on the market) were selected, and test plans were outlined and customized based on customer feedback.

2. Test outcome reports were defined with the customer's help to support key audience viewpoints.
3. Worked with the customer to tailor the bug handling and tracking mechanism to mirror their existing processes.
4. Created an extranet portal through which Customer Z could access test results, bug reports and capture files in real time.
5. Met daily with Customer Z's technical team to address high priority test issues and to adapt test strategies to changing customer priorities.
6. Performed interoperability testing and posted same day results.

**Results**

Despite the logistical and technical challenges posed be the two-pronged nature of the mission, the project was executed on time, and an on-line reporting tool was launched successfully to the client's teams.

1. Interoperability testing was completed and reported ahead of schedule.

2. Customer Z obtained detailed device compatibility data with a broad selection of *Bluetooth* devices.

3. Frontline provided "golden device" test outcomes that were used for in-depth follow up tests.

4. Customer Z was able to shift the burdens of device library, testing staff, and information management to Frontline.

5. Frontline exceeded customer expectations by innovating methods to distribute information across internal customer channels, thereby improving the customer's project management process.

Interoperability testing is on-schedule, and the customer's various audiences are able to log in to a secure online environment at any time and from anywhere in the world to view data tailored to their specific needs.  Cross-department communication has improved significantly for the customer - the specifics of the project are delivered in real-time to all stakeholders, maximizing transparency and efficiency of project management.