

Incisor interview

Eric Kaplan

Frontline Test Equipment

Typically, Incisor tends to look at the world through the eyes of people in product marketing. As part of the test and conformity flavour of this issue, we thought it would be interesting to use a different viewpoint and find out what is on the minds of the software and hardware development and test engineers who do so much of the work behind the scenes and who usually get ignored by the media. So Vince Holton asked Eric Kaplan, Founder of Frontline Test Equipment, Inc. Frontline is deeply entrenched in Bluetooth and also works with other communication technologies such as USB and IEEE 802.15.4/ZigBee. Frontline's products are tools known as protocol analyzers or sniffers. These tools are used by development engineers and test engineers throughout the entire life cycle of a product. Frontline is the acknowledged industry leader when it comes to Bluetooth sniffers. In addition to being used at hundreds of Bluetooth SIG member companies, Frontline's FTS4BT technology has been licensed by the Bluetooth SIG and is integrated into the SIG's Profile Tuning Suite product qualification tool.

VH: Where shall we begin?

Kaplan: Well, if I only had the chance to talk about one thing, it would be a new feature that arrived as part of the Bluetooth 2.1 spec called Secure Simple Pairing, or SSP, for short. SSP has the potential to cause major problems and, to avoid these problems, we've got to bring your readers up to speed on the test issues related to SSP.

VH: Okay, you certainly got my attention with that statement.

Kaplan: I'll give you the key points here, and I'll give you a more detailed technical write-up that you can publish. This will save the marketing people the trouble of having to explain it to their development teams, they can just hand them the write-up.

The problem with SSP is that it so secure, that if companies aren't careful, they are going to build products that can't be tested. The internal development engineers will be able to do their testing, because they have access to the guts of their products. But, once a product is put into its final packaging, and debug access points are no longer available, the internal quality assurance engineers and all the people do external testing, are going to be stuck. There is a simple solution. The problem is, not a technical problem, the problem is an educational one.

The 2.1 spec provides for testing using what is known as SSP Debug Mode. But there must be a way to place the product into SSP Debug Mode. If there is no way to activate SSP Debug Mode then, essentially, the product cannot be tested.

VH: How come I haven't heard about this before?

Kaplan: Because 2.1 chips haven't been on the market very long. There is always a lag time between the time that new chips become available and the time those chips end up in products that are in the stores available for sale. Some chip companies still haven't released 2.1 chips. Since there aren't many 2.1 products on the market yet, there aren't many products to test and therefore the external testers haven't started seeing the problem yet.

VH: And, the solution is?

Kaplan: Make sure that every product with a 2.1 chip in it provides for a way for a user to enable SSP Debug Mode. If the product is a mobile phone, bury a special option, deep in the menu system—the option can even be password protected to make sure that a user doesn't enable the option by mistake. If the product is a headset, allow the option to be enabled via some intricate sequence of button pushes.

A concern is that some manufacturers will rely on the fact that when testing a device pair, only one of the two devices has to be in Debug Mode. Manufacturer A might take the approach that they don't need to support Debug Mode because manufacturer B will support it. But, what happens when both manufacturers A and B take the same approach and

someone tries to test products from A and B? This is why it is so important that all manufacturers be proactive and support SSP Debug Mode.

VH: At the risk of beating a dead horse deader, would you please indulge me just a bit more on this subject.

Kaplan: Do I have a choice?

VH: I don't quite follow you. You say that without SSP Debug Mode, two devices can't be tested. But what prevents the testing from taking place? What happens when testing is conducted without SSP Debug Mode enabled?

Kaplan: Technically speaking the testing can be executed. However, if the testing reveals an interoperability problem, there will be no reasonable way to resolve the problem. Problem resolution relies heavily on being able to analyze the data flowing between the two devices. Being able to analyze the data requires that the protocol analyzer being used be able to decrypt the data. Due the design of SSP, when working with a sealed product that doesn't have any debug access points, the protocol analyzer can only do the decryption if SSP Debug Mode is enabled.

VH: Got it. And moving on, what do you hear about Bluetooth low energy wireless technology?

Kaplan: Let's make sure that everybody knows what we are talking about. Low energy is the new name for what was being called ultra low power Bluetooth technology. Before that low energy was called Wibree.

Overall, as you have probably heard, there is a lot of excitement about low energy. Progress is good. However, I think it is taking longer to bring the technology to market that was originally expected. My understanding is that originally it was hoped that the first low energy solutions wouldn't require new chips and that, at least for some chip companies, all that would be needed would be new firmware. As people dug into the details though, it became clear that to do low energy well, new chips are required.

VH: "Progress is good." is quite a vague statement. Would you please elaborate?

Kaplan: The spec has still not been finalized. However, there is early silicon, and there is even interop testing taking place.

VH: Other than the fact that it is new, are there any specific technical challenges?

Kaplan: I can't speak for the companies developing the chips, but from Frontline's point of view, the lack of a clock for the piconet presents some interesting challenges. It isn't always obvious where the data is going to be.

VH: If you don't know where to look for the data, how can you capture it?

Kaplan: We are building hardware that will contain three radios. Ironically, this means that our low energy tool will use more energy than our standard tool since our standard tool only uses one radio.

VH: It sounds like Frontline is quite active in low energy.

Kaplan: We are. We are part of the SIG's working group for low energy and we are actively working on a low energy sniffer. At the UnPlugFest in Bangkok in June we will be testing our low energy sniffer.

VH: When do think that there will be low energy technology available?

Kaplan: You'll have to ask the chip vendors what their release schedules are. Frontline hopes that we will have a low energy sniffer available in the Fall.

VH: Sounds like you are pretty advanced with this project – I'll bet that as a tech-y guy you haven't set a price yet?

Kaplan: Thanks for the stereotyping! Actually, we think the suggested list price in the U.S. is going to be about US\$25,000. If there are enough early adopters, we hope to be able lower that price. We want to gauge market interest so that we can build enough units in the initial production run, drive the price down, and pass the cost savings onto our customers.

VH: Okay, you suckered me into this What should someone do to let Frontline know that they are interested in getting an early unit?

Kaplan: They can email me at ekaplan@fte.com.

VH: Now we have the advert out of the way, where else in Bluetooth are you seeing a lot of engineering activity related to new features and functions?

Kaplan: Wi-Fi is very active now. And it is active on two fronts: convergence of Bluetooth and Wi-Fi into single devices and Wi-Fi as a transport for High Speed Bluetooth. Since Bluetooth and Wi-Fi both broadcast in the ISM band, Frontline is being asked to help with coexistence issues.

Our solution is a new option to our Bluetooth sniffer that allows the sniffer to capture both Bluetooth and Wi-Fi packets at the same time. In addition to the Wi-Fi packet decoding that is an obvious product feature, we've also designed a new way to look at data called the Coexistence View. This view graphically shows a user what is happening. With this view the user very quickly can see what the throughput is for both Bluetooth and Wi-Fi and how the two technologies are impacting each other. I hope you'll have room to print a screenshot of this view—it is really well done and the users who have gotten sneak peeks of it are very enthusiastic.

VH: Here we go with Commercial #2 then! When is that available and at what price?

Kaplan: Available in beta now with production release expected around July. List price in the U.S. is US\$5,000.

VH: You mentioned Wi-Fi as it relates to High Speed Bluetooth. Tell me more.

Kaplan: For a number of reasons, there are now two ways defined to send High Speed Bluetooth data. One, as many people know is using WiMedia UWB as the high speed channel. The second, that was chosen quite a bit after the WiMedia announcement was made in Seattle in 2006, is Wi-Fi.

The interesting thing is that even though WiMedia had a big head-start, it looks like Bluetooth over Wi-Fi will be available before Bluetooth over UWB.

VH: Why do you think Wi-Fi has overtaken UWB in the Bluetooth space?

Kaplan: From a technical point of view, I think the reason is that Wi-Fi is mature technology and UWB isn't. With Wi-Fi there are already chips, a testing program, etc. The technical obstacles to using Wi-Fi as a transport for Bluetooth are primarily software issues. Contrast that with UWB where there is a whole new technology to create.

Eventually, if UWB can be made to work well and deliver on what it promises, there will be plenty of room for both Wi-Fi and UWB.

I think an issue right now is that the Bluetooth development and test ecosystem is being asked to do a lot, all at the same time, and it just isn't possible for most companies to do a good job, in parallel on so many different things. Bluetooth low energy, Bluetooth over Wi-Fi, and Bluetooth over UWB are three very different things, each one with its own set of issues to solve.

Using my own company as an example, we've had to make choices. We'll be first to market with a Bluetooth low energy sniffer and we'll be first to market with a solution for Bluetooth/Wi-Fi coexistence testing. But we won't start out as the market leader for UWB. I'm hoping that we'll be able to catch up, and by the time UWB is a key technology in the Bluetooth space, that we'll have an industry leading solution.

VH: Any other thoughts on UWB?

Kaplan: So far you and I have been discussing UWB in the context of Bluetooth. Keep in mind that UWB's initial market thrust is Certified Wireless USB. I'm not that familiar with that market yet, so you should probably talk to somebody who is to get a perspective on how that market is developing. I would like your readers to know that Frontline will also have a solution for Certified Wireless USB. But as I mentioned a few minutes ago, we can't do everything at once. We have been improving our wired USB analyzer so that once we have the UWB platform we'll be in a good position to deliver a robust Certified Wireless USB tool.

VH: OK, enough already with promoting Frontline. Is there anything else you want to talk about?

Kaplan: Well, I have an observation to make about the Bluetooth SIG.

VH: Yes ?

Kaplan: Bluetooth is growing in so many directions and so fast and I think the SIG deserves a lot of the credit. When I look at the test infrastructure that the SIG has created, and I compare it to other technologies that I'm involved with, it is very impressive.

Bluetooth UnPlugFests are great events. They are extremely well run and well attended, with typically 300 to 400 engineers. The SIG was very brave when they decided to purchase the Profile Tuning Suite technology and build a development team from scratch to support and enhance. That looks like it was a very good decision.

The list goes on and on and the SIG has their own Marketing department so I won't go on too long about what a good job they've done. But, I do think they deserve to be acknowledged and I suspect that many people who work in Bluetooth and don't work in other standards do not have an appreciation for the work of the SIG.

Oh yes, there is one other point about the SIG. I like the program for small businesses that they recently announced. It greatly lowers the cost of entry to get a Bluetooth product to market and makes it easy for small business to have access to the Profile Tuning Suite.

VH: Okay, thanks for that commercial for the SIG. I think I better get control back of this interview. A while ago I heard you talk about something called robustness testing. What is that and how is it catching on?

Kaplan: The concept of robustness testing is brilliant because it is elegant in its simplicity and it is effective. The basic concept is to intentionally send corrupted data to the device under test in an attempt to get the device under test to fail. The basic technique has been used by development and test engineers forever, but a robustness tester automates the process and does it much more thoroughly than the typical engineer would ever do on their own.

The theory is that if the device under test can survive the pounding that the robustness tester delivers, it is likely to hold up very well under real-world scenarios. Conversely, if the robustness tester can cause a device to fail, then maybe the device is susceptible to failure, even under less harsh conditions.

It's catching on reasonably well. Because the market for Bluetooth robustness testers is not large, the unit cost of a robustness tester is high enough that it isn't an impulse item. Frontline resells a robustness tester as a complement to our Bluetooth sniffer and we have been working with the company that makes the robustness tester to find the right price point.

VH: I've noticed that several times as we've been speaking you've mentioned pricing as an issue. I find it odd that price plays such an important role in your business. My impression would be that because the tools you sell are so critical to engineers doing their jobs and to product quality that price would not be an issue.

Kaplan: If only it were that easy. Typically, price plays a big role in a company's purchasing decisions. What we try to do is find the right balance between getting the price low enough so that the pricing issue is minimized, but, charging enough for the products so that we can continue to invest in the products to not only keep them current, but to stay far enough ahead of our customers so that our tools have the necessary features and functions early enough in the product lifecycle to provide the biggest benefit to the customers.

I'll give you an example. We are about to introduce a new type of license that is geared to addressing the issue of lowering the price per user. Many of our customers now have geographically distributed development and test engineering. Development engineering, for example, might be in California and test engineering might be in China. Customers have been coming to us and asking us to give them a way that two engineers whose work days don't overlap, because of being in very different time zones, can share one license of the same product. So we've come up with what we call a Universal license.

A Universal license allows a product to be shared using licensing technology that uses the Internet to control the sharing and in some cases, costs only 30% more than a Standard license. For example, if a Standard license were US\$1.00, with a Universal license the cost to equip two engineers could be as low US\$1.30 instead of US\$2.00. And, there is no limit on the number of users who can share a Universal license, so, the savings could be much higher.

Our hope is that by lowering the cost per user, companies will equip more engineers with our tools and productivity will go up. As productivity goes up, companies will come to appreciate the importance of our tools even more and they will purchase additional licenses.

Would you mind if I said a few words about another tool that I think would help productivity? We haven't done a good job promoting it.

VH: OK, but the readers will be thinking about checking their watched items on eBay by now, so please be brief.

Kaplan: When Bluetooth EDR became popular, we created a new tool called the High Speed UART sniffer that allows HCI data to be sniffed on the UART connection between a host CPU and a Bluetooth host controller. Those people who have used this tool find it to be extremely useful.

VH: OK, but even I'm losing the will to live now. You can talk about one final aspect of Bluetooth testing.

Kaplan: The success of Bluetooth has spawned an entire new industry. There are now companies popping up all over the place that provide the service of performing Bluetooth interoperability testing. For example, a mobile phone maker might want to test their newest phone against 50 popular Bluetooth headsets. Rather than do this testing in-house, they will turn the entire project over to an outside vendor.

I guess when you starting seeing things like this, where new industries are born to support specific technologies, you know that a technology has become important. I think we can safely say that Bluetooth has arrived and isn't leaving anytime soon.

By the way, Frontline now provides Bluetooth interoperability testing as a service offering.

Incisor: Thanks for speaking – at length - with Incisor.

Kaplan: My pleasure.