Technology Needs Assessment

Ultra Wideband

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1 Executive Summary

Based on the results of the questionnaire/interviews it has been determined that Ultra Wideband (UWB) is an up and coming technology that will be desirable to consumers. Its focus is to provide data transfer between PC’s or other devices wirelessly. This would provide customers with a wireless personal area network (WPAN) between Consumer Electronic (CE) products such as your television, radio, surround sound and much more.

Our study found that most consumers are already utilizing wireless devices in their home. They are also utilizing a network of some sort in their homes, be it 802.11 or Bluetooth. These users would also benefit from the ability to transfer files wirelessly between devices. Most consumers are willing to purchase UWB ready devices that cost more than non-UWB devices, as long as the cost difference is reasonable.

2 Introduction

In view of the interest of UWB technology Panasonic would like to assess this technology in terms of its potential application to CE. Panasonic convened a panel of average customers that would be utilizing UWB CE in their homes. The panel’s assignment was to provide feedback, in the form of a questionnaire and interviews, to determine the need for UWB in CE products that Panasonic would be producing. This report presents the results of these efforts and makes recommendations based on the findings.

3 Background

UWB is a wireless radio technology for transmitting data between CE, PC peripherals, and mobile devices within short range at very high speeds, while consuming little power. It is ideally suited for wireless transfer of high-quality multimedia content, such as wirelessly streaming family videos from the digital video recorder to a high-definition television in the living room or wirelessly connecting a mobile PC to a projector in a conference room to deliver a presentation.

UWB technology uses a wide band of the radio frequency spectrum to transmit data within a short range (such as in the home or small office), allowing for greater amounts of data to be wirelessly transmitted in a given period of time than more traditional wireless technologies.

“Specifically, UWB is defined as any radio technology having a spectrum that occupies a bandwidth greater than 20 percent of the center frequency, or a bandwidth of at most 500 MHz.” [1] In February 2002 the FCC approved the use of bandwidth between 3.1 and 10.6 GHz for UWB usage. This ranges from mid S band through mid X band [2], as illustrated in Figure 1.
Figure 1. Radio frequency range of UWB [3].

“UWB is a unique and new usage of a recently legalized frequency spectrum. UWB radios can use frequencies from 3.1 GHz to 10.6 GHz – a band more than 7 GHz wide. Each radio channel can have a bandwidth of more than 500 MHz, depending on its center frequency. To allow for such a large signal bandwidth, the FCC put in place severe broadcast power restrictions. By doing so, UWB devices can make use of an extremely wide frequency band while not emitting enough energy to be noticed by narrower band devices nearby, such as 802.11a/b/g radios. This sharing of spectrum allows devices to obtain very high data throughput, but they must be within close proximity.” [3] Device range would be around a maximum of 30 feet.

Data rates can exceed 100 Mbit/s in wireless applications, and 1 gigabit per second in a wired application [2]. This capability, combined with low-power and pulsed data delivery provides increased speed when transferring data without additional interference from other wireless technologies already in use, such as Wi-Fi, WiMAX, and cellular wide-area communications. This technology will allow users to create a WPAN. Panasonic feels that the market will demand such technology in the near future and would like to prepare.
Figure 2 illustrates how UWB can be implemented. For the purposes of this assessment we are concentrating on the Blue Wireless PAN areas.

4 Purposes
Panasonic’s current set of products do not allow for the type of mobility that UWB can provide. This assessment will determine which products will fit the need for such technology. For example most homes have at least one PC and one TV, there maybe a strong need to have UWB installed in such CE products. This assessment may also determine which CE products do not have the need for UWB technology. It will also clarify any perceived notions of this technology in regard to their products.

5 Limitations
There are some limitations that face Panasonic due to the time allotment of this assessment. There isn’t enough time to contact customers world wide, and there is a limited geographical area that can be reached. Another limitation is the small number of customers that can be reached in such a small amount of time.
One final limitation was in the use of the surveys. On the Zoomerang web site (described in the tools section) we did not make the questions on the survey required. A survey taker could answer some questions and leave other questions blank. On some of the free answer questions we got very few responses because a response was not required. In the future on a survey of this type, all responses should be required before the person could submit the survey.

6 Questions

A key element of an effective analysis is careful specification of the questions to be addressed by the analysis methods. The clearer and more detailed these questions are, the more likely that you will be able to provide useful answers to them.

Below are the questions that we used in the survey for Ultra Wideband. The screen shots below are taken from Zoomerang.com. Zoomerang is described in more detail in the “Tools” section of this document.
Technology Needs Assessment

1. Please check the Consumer Electronic products that you currently have in your home?
   - Personal Computer/Laptop
   - Television
   - VCR/DVD Player
   - PDA
   - MP3 Player
   - Game station (ex: Xbox)
   - Digital Camera/Recorder
   - Other, Please Specify

2. Are you currently utilizing wireless technology (ex: wireless laptop)?
   - YES  NO

   Additional Comment

3. Do you travel and have the need to transfer files from one consumer electronic device to another wirelessly (ex: from digital camera to laptop)?
   - YES  NO

   Additional Comment
4. Do you currently have a home network set-up?
   - YES
   - NO
   Additional Comment

5. Which wireless technology do you use in your home?
   - Bluetooth
   - 802.11a/b/g
   - Other, please specify

6. Do you experience your batteries draining faster when using wireless devices?
   - YES
   - NO
   Additional Comment

7. Do you experience latency in your wireless network?
   - YES
   - NO
   Additional Comment
What consumer electronic products currently reside on your home network?

- Personal Computer/Laptop
- Television
- VCR/DVD Player
- PDA
- MP3 Player
- Game station (e.g., Xbox)
- Digital Camera/Recorder
- Other, please specify

Would you benefit from having your entertainment system be wireless?

- YES
- NO

Additional Comment

Please rank the following consumer electronic products. Which products would benefit the most from the use of UWB. (1 being the most beneficial)

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Computer/Laptop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Television</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCR/DVD Player</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP3 Player</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Game station (e.g., Xbox)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Camera/Recorder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11. Identify the key strengths and weaknesses of Ultra Wideband in consumer electronic products.

Strengths: 
Weaknesses: 

12. Do you have any recommendations to strengthen the idea of Ultra Wideband in consumer electronic products, please enter them below?

13. Would you be more prone to purchase consumer electronics products that have Ultra Wideband capability?

[ ] YES  [ ] NO

Why?

14. Would you be willing to pay more for a consumer electronics product that had Ultra Wideband capability?

[ ] YES  [ ] NO

How much more?

15. Additional Comments:

Thanks for your feedback.
7 Methods

It is usually a good idea to collect needs assessment data in several ways from several sources, especially in projects that are quite costly. Described below are the two methods in which we chose to collect data.

Two methods were used to gather data on Ultra Wideband: Surveys and Interviews. Surveys were done using the Zoomerang web site. This web site is described in more detail in the Instrumentation Section. The survey was created on the Zoomerang web site and sent to a sample of 25 people via a URL link in an email. This sample included people who had both technical computer backgrounds and people that do not. 20 of the 25 people filled out the survey.

The interviews were conducted in person. Of the four interviews that were conducted, 2 interviewees were of technical computer backgrounds and 2 were from non-technical backgrounds. The interviews include a loose discussion based around the same questions that were included in the survey. The interview allowed for more feedback because of the personal nature and open discussion.

8 Instrumentation

The Zoomerang survey web site (www.Zoomerang.com) [5] was the only tool used for this assessment. Zoomerang allows for the easy creation of an online survey. Each survey has a unique URL that can be emailed to the target audience. Zoomerang has various levels of service. They offer a free account, and several higher-level accounts, which require a fee. The free account was used for this assessment. The free account allows us to create surveys with various types of questions. Types of questions include yes/no questions, multiple-choice questions, free answer questions, ranking questions, and many other types.

9 Results

The following figures represent the results of the survey. At each of the interviews, the interviewees were asked the survey questions. Results were incorporated into the survey results below.
Technology Needs Assessment

Question 1 results show that the majority of consumers we surveyed have multiple CE devices.

Question 2 results show that 17 of the people asked use some form of wireless technology.

Question 3 shows that UWB would be a desirable feature to add to consumer electronics. 15 of 18 people have the need to transfer files wirelessly.

Question 4 shows that the majority of people surveyed have some form or network setup in their home. This network could be wired or wireless.
4. Do you currently have a home network set-up?

<table>
<thead>
<tr>
<th>#</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>only LAN no WIFI</td>
</tr>
</tbody>
</table>

5. Which wireless technology do you use in your home?

<table>
<thead>
<tr>
<th>Technology</th>
<th>Number of Responses</th>
<th>Response Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bluetooth</td>
<td>0</td>
<td>47%</td>
</tr>
<tr>
<td>802.11</td>
<td>11</td>
<td>65%</td>
</tr>
<tr>
<td>Other, please specify</td>
<td>4</td>
<td>24%</td>
</tr>
</tbody>
</table>

Question 5 shows that 8 people surveyed use Bluetooth, 11 people use 802.11, and 4 use some other form of wireless technology. The hope is that if people are already using wireless, that they will be open to try UWB when the technology is put on the market.

6. Do you experience your batteries draining faster when using wireless devices?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
<th>Response Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>11</td>
<td>61%</td>
</tr>
<tr>
<td>No</td>
<td>7</td>
<td>39%</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100%</td>
</tr>
</tbody>
</table>

Question 6 shows that more than half of the people surveyed notice their battery drain faster when using wireless technology. UWB has the potential to improve battery life of CE devices. This will be a feature that will help sell UWB devices.

6. Do you experience your batteries draining faster when using wireless devices?

<table>
<thead>
<tr>
<th>#</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>not initially, but after 1-2 years batteries start losing charge faster</td>
</tr>
<tr>
<td>2</td>
<td>Don't know</td>
</tr>
</tbody>
</table>

7. Do you experience latency in your wireless network?

<table>
<thead>
<tr>
<th>Response</th>
<th>Number of Responses</th>
<th>Response Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12</td>
<td>67%</td>
</tr>
<tr>
<td>No</td>
<td>6</td>
<td>33%</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>100%</td>
</tr>
</tbody>
</table>

Question 7 asked about latency in wireless networks. UWB is a faster technology than most on the market today. The fact that users of wireless notice latency shows that faster speed will also be desired feature of UWB.
7. Do you experience latency in your wireless network?

<table>
<thead>
<tr>
<th>#</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sometimes</td>
</tr>
<tr>
<td>2</td>
<td>No home network</td>
</tr>
</tbody>
</table>

8. What consumer electronic products currently reside on your home network?

<table>
<thead>
<tr>
<th>Product</th>
<th>Number of Responses</th>
<th>Response Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Computer/Laptop</td>
<td>16</td>
<td>94%</td>
</tr>
<tr>
<td>Television</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>VCR/DVD Player</td>
<td>1</td>
<td>6%</td>
</tr>
<tr>
<td>PDA</td>
<td>2</td>
<td>13%</td>
</tr>
<tr>
<td>MP3 Player</td>
<td>4</td>
<td>25%</td>
</tr>
<tr>
<td>Gamestation (Xbox/PS3)</td>
<td>8</td>
<td>50%</td>
</tr>
<tr>
<td>Digital Camera/Recorder</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Question 8 shows that laptops and game stations are the most prevalent devices that are included in a home network. UWB will allow for expansion into all the different devices listed above.

9. Would you benefit from having your entertainment system be wireless?

<table>
<thead>
<tr>
<th></th>
<th>Number of Responses</th>
<th>Response Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>14</td>
<td>73%</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>22%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

Question 9 shows that consumers do have the desire to have a wireless home entertainment center.

9. Would you benefit from having your entertainment system be wireless?

<table>
<thead>
<tr>
<th>#</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Less wires to clutter up.</td>
</tr>
</tbody>
</table>
Question 10 was used to find out which devices consumers would most like to see UWB technology. The highest ranking device was a Personal Computer/Laptop. 56% of people rated a Personal Computer/Laptop as their number one choice.

The second highest ranking was for Television. The majority of people ranked television as high on their list of devices that would benefit from UWB.

40% of people ranked MP3 players low on the list, meaning that they have a low desire to see UWB in MP3 players.

In question 11, the main strength of UWB includes less wires and better power consumption. The weaknesses include possible security problems, and concern about ease of setup.
Question 12 got very few responses. The few people that did answer suggested that devices come pre-configured with UWB, and expressed concerns about the reliability of UWB.

Question 13 shows that the majority of people would be more likely to purchase CE with UWB technology and CE without it.

Question 14 shows that a little more than half of the people surveyed would be willing to pay more for UWB capable products. The price increase could be about 10-20%.
10 Recommendations

Based on the results of our survey/interviews we feel there is evidence that supports Panasonic’s decision to move forward in producing UWB ready products. The first product that should be produced is a UWB laptop, then a UWB ready PDA. It is also important to the consumer that the UWB products do not exceed 10%-20% more than their predecessors without UWB.

11 Conclusion

Respondents agree that UWB is indeed a desired technology. Moreover, it will continue to grow, as people require wireless devices to be networked together. The two major concerns that surfaced through our questionnaire/interviews had to do with Security and Set-up. It’s important to the users that the CE’s will be Secure since you will be sharing files wirelessly. In addition to security all the CE products that have UWB installed should require little or no set-up. Basically once you have all the products UWB ready they will recognize one another and start communicating.

13 Resources


14 Acronyms

CE – Consumer Electronics
PC – Personal Computer
PAN – Personal Area Network
PDA – Personal Data Assistant
UWB – Ultra Wideband
WPAN – Wireless Personal Area Network