# Enhancing Presentation via Bluetooth™ Technology in Higher Educational Institutes

by

Fadhlina Binti Shoib

Dissertation submitted in partial fulfillment of
the requirements for the
Bachelor of Technology (Hons)
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CERTIFICATION OF APPROVAL

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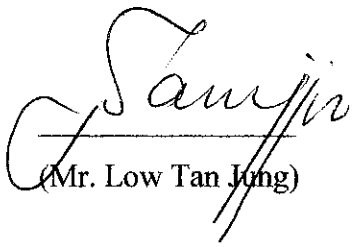
Approved by,



(Mr. Low Tan Jung)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
January 2004

## CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

FADHLINA BINTI SHOIB

# ABSTRACT

This paper is intended to present a project in introducing a new generation of wireless technology, Bluetooth™ to the higher educational institute and its future perspectives in Malaysia. One question arises, how Bluetooth™ technology can benefit educators to deliver their knowledge presentations in the feasible and easiest ways? Consequently, the short-range wireless connectivity technology lets electronics devices automatically recognize, connect and transfer data between each other. This technology is aimed high in eliminating wires and cables between both a handheld device and personal computer (PC) through the Bluetooth™ USB Dongle. Moreover, it is also purposely done to deliver better service for lecturer to control slide presentation. The information for the project is being acquired through the research on the Bluetooth™ specifications and some methods are being carried out from time to time in area of observation, preliminary information gathering, data collection through questionnaires, data analysis and simulation development in the methodology which is required to achieve its goal. The architecture and simulation of the transmission between a Bluetooth™ enabled handheld device and a PC facilitated with a Bluetooth™ USB Dongle will be proposed to represent the project. This study's conclusion denotes that wireless technology is essential in enhancing presentations delivery that can help a better communication between lecturers and students.

**Keywords:** *Bluetooth™, wireless technology, personal computer (PC), handheld device, presentations.*

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# CHAPTER 1

# INTRODUCTION

## 1.0 INTRODUCTION

This chapter comprises the background information on the project study, the problem statement and the objectives of the project as well as the scope of study.

## 1.1 BACKGROUND OF STUDY

Bluetooth™ is a wireless specification delivering short-range radio communication between electronic devices that are equipped with specialized Bluetooth™ chips. It lets nearly all potential devices communicate to one and another by creating a common language between them. It is designed to ensure interoperability between wireless devices such as mobile phones, computers and portable handheld devices and connectivity to the Internet. Bluetooth™ technology redefines the very way we experience the connectivity. The technology revolutionizes the personal connectivity market by providing freedom from wired connections which enabling links between electronic devices in a Personal Area network (PAN).

In this study, the author explores some potential usage of Bluetooth™ to enhance a portion in education environment in Malaysia. Currently, in higher educational institute, most universities and colleges are still using wired electronic equipment such as a set of desktop PC that sometimes is not hassle free with its tangled wires and cables here and there. Nowadays, the emerge Bluetooth™ technology will help educators to easily deliver their lectures more effectively. In a nutshell, a wireless technology can contribute to the success of education products if we exploit as many emerging technology as possible in simplifying the daily routine of educational area.

## 1.2 PROBLEM STATEMENT

Throughout years in the education sector, presentations deliverance is an essential part in teaching mechanism to audience such as students. In reality, there are a lot of circumstances in delivering speech or presentation to audience such as lectures, tutorials, courses, classes and any other occasions. These need some electronic equipment and software in ensuring that the presentation can be well apprehended by the audience. Somehow, the number of devices cause one medium (i.e., personal computer) must be connected with tangling of wires. Based on this situation, **how Bluetooth™ technology can benefit educators to deliver their knowledge presentations in the feasible and easiest ways?**

### 1.2.1 Problem Identification

Recently, a new lecture hall has been constructed rapidly in fulfilling the need of around five thousand students in gaining comfortable environment during the lessons. With the sophisticated teaching equipments such as computer, projector as well as speaker, some campus community believe that those tools are enough to produce an effective lecture session. In essence, the facilities are actually adequate in accomplishing the mission and vision of the university to produce well educated graduates.

However, some enthusiastic lecturers realize that they are not comfortable in delivering lecture or speech in a restricted mode. This is prior to the wired mouse and keyboard that they have to use in order to shift the content from one slide to another using the Microsoft PowerPoint presentation. Therefore, in order to pursue their speeches while continuously go to another slide, they must stand beside the computer that is being used as a platform to locate the media. The condition causes difficulties for lecturer to move around the lecture hall or classroom in presenting any talks or lectures.

Consequently, the environment in a teaching classroom itself cannot create an effective interaction and communication between a speaker (a lecturer) and audience (students) because the movement is limited.

Furthermore, some PCs in the lecture room are just standalone which is not being connected to the Internet. In some cases, certain subjects may need references from several particular websites and in consequence, the lecturer will display certain websites prior to the lectures. Students will always write down all the recommended websites in their notes but at the end they do not even bother to browse through those websites at home. The scenario showed that the result would not lead to effective delivery.

Subsequently, the preceding problem has escorted some lecturers to conduct their lectures at the Multimedia Laboratory, which is facilitated with the Internet connections. As the lab cannot occupy many seats for students, the lecturer will have to carry out many sessions for students and the situation can affect other lecturers' sessions. At last, an issue will be brought up where classrooms are not enough to reside students.

From this we can conclude that any effort to reduce slide presentation delivering in a small room would require some enhancement to the system networking. Based on the matter, this project will analyse and try to prevent the problem from happen by adapting Bluetooth™ technology in Wireless Personal Area Network such as in lecture room and lecture hall.

### 1.2.2 Significant of the project

In education sector, especially in teaching session, Bluetooth™ may be used as a helper in simplifying the presentations arrangement. This will lead to the following advantages:

- Create wireless environment that eases speaker to handle certain equipments in a teaching room.

- In long term, the cost for teaching apparatus such as cables can be reduced since one mobile device can be used to control many desktop PCs with Bluetooth™ protocol.

- The expenses in hiring technicians will be reduced when the lecturers can easily handle a PC in the teaching room by themselves without need any help from the technicians in IT Department.

- The specification standard defines a short radius range (10 meter) radio link that can cover almost one small class or hall.

- A lecturer can grab students' attention by displaying the actual website directly to students if the desktop PC is connected to the Internet service

## 1.3 OBJECTIVE AND SCOPE OF STUDY

### 1.3.1 Objectives

The objectives of the project are:

- Eliminates wires and cables between both Personal Computer (PC) enabling with Bluetooth™ USB Dongle and a handheld device

- To propose a Bluetooth™ wireless technology for lecturers in delivering their presentation as well as controlling visual aid presentation

- Facilitate data transfer and data synchronization

### 1.3.2 Scope of Study

The project will concentrate on the research in the emerging Bluetooth™ technology that exists to be one of the methods in handling and simplifying workload, as it is the only specification targeted at this new market of cable replacement. In order to know deeply about the Bluetooth™ technology, the author will revise the feasibilities study that consists of strength, weaknesses, opportunity and threat in its practice. Additional area that will be looked into is the beneficial elements and impacts that Bluetooth™ can generate through its usage in our daily life. Through the research, the Bluetooth™ devices can be discovered along the period of the project. Furthermore, the capabilities and reliabilities of the applicable electronic devices can be tested and integrated through suitable software.

Other than that, data transmission between two devices will also be a part of this study where the transmission of Bluetooth™ radio wave will be visualized through a simulation in a Flash player. In this case, the audience will gain more understanding on

Bluetooth™ operation of particular devices that support its protocol in the Personal Area Network (PAN).

Basically, a product or prototype is one of the requirements in completing the project in an excellent and effective approach. In commencing the project, the author has to analyse the necessity of applications and hardware to generate one working product in delivering the output of the conducted research on Bluetooth™ technology. As for the product, one Pocket PC will be integrated with one personal computer (PC) through Bluetooth™ protocol.

This analysis will be completed within the time frame given, which is 14 weeks. Within the time frame, the *Enhancing Presentation via Bluetooth™ Technology in Higher Educational Institutes* project is feasible enough to be completed with a working prototype that will broaden the usage of the wireless technology.

# CHAPTER 2

# LITERATURE REVIEW AND THEORY

## 2.1 LITERATURE REVIEW

### 2.1.1 Advantages of the Wireless Network

"When nodes are connected via wire, it is clear that there is very little mobility enabled while wireless breaks the tether and facilities within reason, the ability to roam about while continuing to communicate. Similarly, communication can be established using wireless from several different locations without requiring a physical plug into the network. Do you remember the civilization portrayed in the *Star Wars* movies? Even their wireless communication devices were impressive with their small size and long range, although these seemed to carry only voice conversations. Ironically, the little robot R2-D2 had to locate and plug into network access point whenever it wanted to communicate with a computer, putting itself in physical danger time after time. Establishing the wireless link would have been far more practical, much safer and also would have removed a significance source of cinematic excitement." (Robert Morrow, 2003)

Based on the quotation above, obviously, a wired network requires installing a lot of cable because each node in the network must have physical access to the cable from its particular location. This can cause big headaches when the walls, floors and ceilings of an existing building must be torn apart for a cable installation. Many office buildings especially the old courthouses used by several state and local governments have historical significance and alternating their structure for cables is often frowned upon. The cable used for connecting a computer to a peripheral can provide valuable clues about its function. We can look at both ends of the cable and discover the attached devices that are communicating with each other. The connectors on each end are often

related to the purpose for which the cable is used, so we can scrutinize the cable and the peripheral attached to it and immediately know the hardware and software required to access that peripheral. As a result, one cable is needed for each peripheral, so all of these cables begin to look like a spaghetti factory. It will not be like that with wireless; the only physical medium is over the air, so connection possibilities are far more versatile without the mess behind the computer.

### 2.1.2 Bluetooth™ Wireless Technology

What is the easiest way in interpreting the definition of Bluetooth™? Bluetooth™ could be explained more on the by this statement: "The Bluetooth™ wireless technology was created to solve the simple problem: replacing the cables used on electronic devices with radio frequency waves." (James Kardach, Mobile Computing Group, Intel Corporation).

Bluetooth™ is one of the new transpire technologies available today are a apart of wireless word that can integrated phone, palm devices and any electronic devices that support the protocol. The goals of the technology did not include developing another Wireless Local Area Network (LAN) technology, because there were already many in the market and many more are being developed nowadays but in essence to replace the cables carried by mobile travellers. "Bluetooth™ is a protocol for pushing bits and bytes around wirelessly, at high speeds, and over short distances. Much has been made of wireless data being used to solve the "last mile" of connectivity needs. Bluetooth™ provides a potential "last meter" solution (actually closer to ten meters). Think of Bluetooth™ as offering each Pocket PC user a wireless communications bubble around them of up to 33 feet in radius. The technology offers data throughput speeds of up to 741kbps (more than 6 times faster than a serial cable)."(Pocket PC Magazine, Jim Cummiskey)

The integration between devices in Bluetooth™ technology is more technically express by using point-to-point protocol. To find out whether a device supports a particular

service, the application needs to connect to the device and use the service discovery protocol. "PPPD, the Point-to-Point Protocol Datagram provides a method for transmitting datagrams over serial point-to-point links. PPP is composed of three parts: a method for encapsulating datagrams over serial links, an extensible Link Control Protocol (LCP), and a family of Network Control Protocols (NCP) for establishing and configuring different network- layer protocols." (Bluetooth™ over TCP with your Palm, David A. Desrosiers 2003)

To integrate all the devices, Bluetooth™ is using this protocol to make it possible to operate perfectly as we intended. This is to ensure the voice and data transmission synchronizes in a well manner. "The Synchronous Connection Oriented SCO links support symmetrical, circuit-switched, point-to-point connections, which is typically used by voice transmission. A robust voice-encoding scheme is employed. The scheme is based on Continuous Variable Slope Delta (CVSD) modulation, which is very resistant to bit error, as the modulation intensifies as bit error increase. At the same time, the Asynchronous Connection-less ACL links support all the packet-switched, asymmetrical or asymmetrical, point to multipoint connections needed by the data transmission."(Goh Song-Joo Ph.D.,Technical Applications Manager Excelpoint Systems Pte Ltd.)

### 2.1.3 Advantages of the Bluetooth™ Wireless Technology

According to Cordless Freedom Article, Logitech website (2004), these are points of advantages that Bluetooth™ technology carries out:

#### *2.1.3.1 Standard Technology*

Bluetooth is a cross-platform technology, which means it can be adapted on all kind of electronic devices (PC, PDAs, mobile phones, and more). It is also used by several hundreds of manufacturers, with no inter-compatibility issues.

### *2.1.3.2 Longer Range*

Devices can communicate across a room and in most cases. even from a room to another. It is up to 30 feet which covers 10 meters radius from the device that acted as a server.

### *2.1.3.3 Higher Security*

128-bit encryption offers your data some of the highest ciphering protection currently available fro authentication. The key size is configurable between 8 and 128 bits.

### *2.1.3.4 Lower Interfaces*

The connection type of spread spectrum frequency hopping. Bluetooth™ devices automatically switch to the most reliable frequency. for a better and faster transmission. It mitigates the effects of interference and fading.

However. according to H. Peter Alesso and Craig F. Smith (2002). there are certain concerns where benefits must be balanced against this:

- Radio signal interference
- Power Management
- Interoperability
- Security
- Frequency availability
- Installation issues

The process of transmitting and receiving radio and laser signals through the air makes wireless vulnerable to noise and interference. Network security on wireless system depends primarily on its encryption capability.

### 2.1.4 Differences of Bluetooth™ Wireless Technology with other Wireless Technologies

Bluetooth wireless technology and WiFi are complementary technologies which do different things. Bluetooth is designed to replace USB or other cable-based connections between cell phones, laptops, and other computing and communication devices within a 10-meter range. WiFi is wireless Ethernet: it provides an extension or replacement of wired networks for dozens of computing devices. (Cordless Freedom, Logitech 2004)

- Bluetooth is the wireless equivalent of USB connectivity
- WiFi is the wireless equivalent of Ethernet (network connection)
- Bluetooth may offer more versatility, wherever WiFi is more adapted for heavier data transfer
- Both Bluetooth and WiFi use the unlicensed, globally available 2.4 GHz ISM band

### 2.1.5 Significance of Wireless towards Challenges in the Classroom

In the Daily News on "Wireless Generation Showcases Handheld Assessment Software in Senate Hearing on Education Technology" in Washington DC, the hearing convened by Senator Harkin brings together expert witnesses from educational institutions and leading educational technology vendors to help the committee understand the challenges and opportunities associated with the use of technology in the classroom. "The hearing reflects the growing national search for breakthrough technologies that make a real difference in schools. We believe that Wireless Generation's innovative tools for capturing rich student performance data right at the point of instruction represent just such a breakthrough, and we are grateful for this occasion to share our vision with the leaders who shape educational technology policy."(Larry Berger, CEO of Wireless Generation (2001))

In the report, the company's easy-to-use applications for handheld computers put rich and meaningful information about student performance in the palm of the teacher's hand and provide robust, Web-based tools for analysis, diagnostics, tracking, and reporting. By capturing actionable student performance data right at the point of instruction and automating previously paper-based bookkeeping tasks, Wireless Generation helps teachers provide targeted, individualized instruction; administrators manage toward continuous improvement; and parents play a meaningful role in learning. This could enhance students' performance during the class in an attractive way with the wireless technology.

Wireless networks will continue the trend toward mobile teacher workstations that can be seamlessly integrated into the teaching process. Teachers will come to rely on these electronic teaching tools as much as teachers used to depend on access to filmstrips, wall charts and blackboards. The important difference is that the information that students and teachers use will be up-to-date and more easily appeal to a wider variety of student learning styles. (Teacher Workstation Article, Tom Snyder Productions, Florida)

As the topic turns to older conventional schools, old school buildings frequently have inadequate electrical wiring, asbestos flooring and asbestos insulation that was sealed by earlier remodelling or old linear building layouts that make electrical and network wiring more expensive. Newer schools may have one or two network connections in each classroom but adding additional connections may be too expensive to contemplate. Portable computers using wireless networks allow student to easily move around the room to work in small groups. Mobile carts that contain a printer, laptops, charging stations and small wireless hub can be moved from room to room and they eliminate the need for multiple network connections all around the room. Wireless networks provide alternative solutions to many conventional network problems. (Janine Lim, Berrien County Intermediate School District, Wireless Networks – An Enabling Technology)

### 2.1.6 Presentations Delivery

The lecture in its many forms is the most commonly used method for transferring information. However, there are many serious questions regarding the effectiveness of the traditional lecture approach.

Currently, there are many calls to move away from the traditional lecture to interactive computer learning systems that allow students access to information when and where they need it (Edlich 1993; McIntosh 1996; Twigg 1994). While this shift to "just in time" information provided by computer is occurring, there is, and will continue to be, a need for educators who are prepared to deliver lectures.

According to Swanson and Torraco (1995), the lecture was established formally centuries ago as a teaching process that began with a literal reading of important passages from the text by the master, followed by the master's interpretation of the text. Students were expected to sit, listen and take notes. In writing about the lecture method in medical education, Vella (1992) defines the lecture as the formal presentation of content by the educator (as subject matter expert) for the subsequent learning and recall in examinations by students. Ruyle (1995) describes the lecture simply as an oral presentation of instructional material. In discussing the effective presentation of transferring knowledge to students, we have to consider and examine the characteristic of the lecturer at the first hand. After that, we could offer suggestions for planning and delivering more effective lectures.

# CHAPTER 3

# METHODOLOGY AND PROJECT WORK

## 3.1 METHODOLOGY USED

In conducting this project, some of the methods in acquiring the research and output are being applied. Some methods that involved in carrying out this project are observation, preliminary information gathering, data collection through questionnaires, data analysis and simulation development.

### 3.1.1 Observation

The author had check out the conventional way and current way of conducting presentation through the trends in this university itself. A conventional way is representing a collection of OHP projector and slide transparencies while a current way is consisting a computer; a wall screen and a screen projector. A comparison had been made between those two methods and a proposed wireless presentation. It had been observed that with the use of latest wireless technology, a new method of managing wires and cables could be invented and developed. Consequently, a new form of presentation and learning aid could be derived from this project

### 3.1.2 Preliminary Information Gathering

#### *3.1.2.1 Primary Sources – Unstructured Interview and Class Survey*

In order to obtain feedback and information on the lecture presentations in this university, some of lecturers have been informally interviewed in getting their view of

the current visual aid equipments. The problem statement, objectives and scope of study were being defined towards the project. This unstructured interview was being made from time to time and was covered on human computer interaction area.

The measurement of class size was also being conducted in order to get the plan of the building. This was focused on the range of Bluetooth™ point placement in certain area of lectures. Three sample classes were collected and sketched for its size. The dimension was included in Results and Discussions part of the report.

#### *3.1.2.2 Secondary Sources – Published Materials*

Other than that, data information on the study was also being collected through the books, magazines, white papers and Internet. A depth study was derived in the Literature Review section as well as Results and Findings section.

### 3.1.3 Data Collection

In this phase, a questionnaire was developed and designed to focus on the factor that influenced the way of lectures is being handled in the perspective of students. It covered the interactiveness, flexibility and knowledge level sections and had been distributed to lecturers in every department randomly. The questionnaires consisted seventeen questions and most of them were measured using Likert Scale.

### 3.1.4 Data Analysis

Data are obtained from the analysed questionnaires to see the feasibility of the Bluetooth™ Technology application on the educator's presentation. All the data were processed through Microsoft Excel in form of bar graphs to visualize the percentage of the collected information from the survey conducted before.

### 3.1.5 Simulation Development

The simulation of the data transmission between a Bluetooth™ enabled handheld device such as Pocket PC and a PC facilitated with a Bluetooth™ USB Dongle was proposed to represent the project. The simulation was constructed using Macromedia Flash MX to get a sophisticated design for the demonstration. Two phase of the presentation was included in the simulation, which was conventional approach and wireless approach by using Bluetooth™ gadgets.

## 3.2 TOOLS REQUIRED

These are all the equipments and software that are to be tested throughout the project. It will help the author to understand the operation and use of the Bluetooth™ technology in more detail.

### 3.2.1 Hardware Specifications

1. **Personal Computer**

**Table 3.1: Specifications of a PC**

| Type | Specification |
|---|---|
| Platform | Windows 98/2000/XP |
| Processor | Intel Pentium III 733 MHz with MMX support |
| Memory | 256 MB RAM |
| Hard drive | 40 GB |
| CD-ROM Drive | 52X speed (transfer rate: 1200 kbps)<br>Average seek time: 200 milliseconds |
| Video card | VGA 16-bit colors, 1024 x 768<br>64 MB of Video RAM |

## 2. Pocket PC (hp iPAQ Pocket PC h1940)

**Table 3.2: Specifications of a Pocket PC**

| Specifications |
|---|
| Integrated Bluetooth™ |
| Secure Digital Slot (supports SDIO/MMC cards) |
| 64MB RAM (56MB main memory) |
| 13MB hp iPAQ file store (non-volatile memory) |
| Samsung® (2410) 266 MHz processor |
| 3.5-inch transflective TFT display with 64K colors |
| Integrated microphone, speaker |
| 2.5mm stereo audio jack |
| 900mAH lithium ion removable/rechargeable battery |
| Microsoft® Pocket PC 2003 Professional Edition |

## 3. Bluetooth™ USB Dongle (MSI™ BToes)

**Table 3.3: Specifications of a Bluetooth™ USB Dongle**

| Type | Specifications |
|---|---|
| **1. General** | |
| Hardware interface | USB |
| Bluetooth™ specification compliance | Version 1.1 |
| Throughput | 723Kbps (data channels) |
| Operating volt. | 5V from USB interface |
| Operating range | Up to 30M for open space |
| Regulatory approval | FCC, CE, BSMI |
| Temperature | Storage temperature: -20° C to 100° C<br>Operating temperature: 0° C to 70° C |
| **2. Radio** | |
| Spread spectrum | Frequency Hopping Spread Spectrum (FHSS)<br>Compliant with FCC part 15 |
| Frequency range | 2.4 to 2.4835GHz (2.4GHz ISM Band) |
| RF Channels | 79 channel system for USA, Japan and Europe<br>(except France, 23 channel system) |
| Modulation | GFSK, BT=0.5 |
| Output Power Class | Bluetooth™ Power Class 2 |

| | |
|---|---|
| Output Power | +6dBm (max.) |
| Receiver sensitivity | Better than -82dBm with BER <0.1% |
| Max Input Level | -5dBm |
| Power control | Yes |
| **3. Base Band** | |
| Physical Links | Support ACL link |
| Network Capabilities | Support piconet point-to-point and point-to-multipoint connections |
| **4. Software** | |
| System support | Windows® 2000/ME/98/XP |
| Profile support | Generic Access Profile, Service Discovery Profile, Serial Port Profile, Dial-Up Networking Profile, Fax Profile, LAN Access Profile, Generic Object Exchange Profile, File Transfer Profile, Object Push Profile, Synchronization Profile, Personal Area Network Profile, Hard Cable Replacement Profile. |

**5. Screen Projector**

### 3.2.2 Software Specifications

**1. Microsoft® PowerPoint**

It is a main application that is being used in the presentation of the lecturer or instructor throughout semester.

**2. ClearVue Presentation**

This is the software that must be installed in the Pocket PC to run the application of Microsoft® application such as Microsoft® PowerPoint, Microsoft® Word and Microsoft® Excel.

3. **Macromedia Flash**

   In order to build up the simulation, the Macromedia Flash is chosen as designing software to complete the process of data transmission.

4. **Adobe Photoshop 7.0**

   As a graphic editor for image and graphic processing.

# CHAPTER 4

# RESULTS AND DISCUSSION

## 4.0 RESULTS AND DISCUSSION

This chapter represents the overall results and findings on the research done throughout the project timeline. On top of that, the discussion based on those two essential part; results and findings, is also determined in completing the research.

## 4.1 RESULTS AND FINDINGS

The results and findings are the most critical and vital fraction in examining the significant of this project. In addition, the comprehensive research works and product are based on this section. Since the target audience are presenters and their spectators, the working product ought to meet the necessities in order to fulfil their expectations. The sources of collecting data information including informal interviews, Internet, reference books, newspaper articles, journals and research papers. These are the activities done about project together with the findings explanation.

### 4.1.1 Data Gathering

#### *4.1.1.1 Bluetooth™ Wireless Technology Awareness*

The first essential element in delivering this technology to people out there is the initial knowledge of the wireless technology itself. There was one survey in Scottsdale, Arizona from In-Stat/MDR Press Room (http://www.instat.com) that found out that

education still remains a significant challenge to inform consumers about the benefits and uses of Bluetooth™ wireless connectivity.

The report analyses the changes in results from the 2002 Technology Adoption Panel survey to the 2003 survey, and includes new 2003 questions. It provides the results from In-Stat/MDR's consumer survey that was fielded to its Technology Adoption Panel.

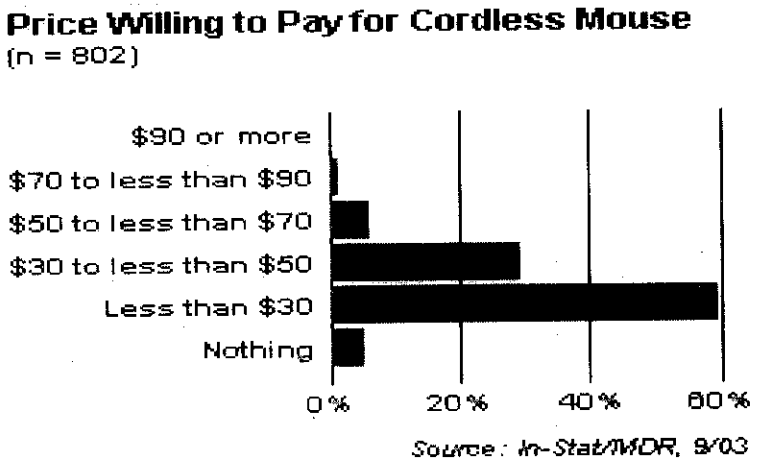



**Figure 4.1: Price Willing to Pay for Wireless Electronic Device**

According to the report, *Survey Says PAN Wireless Connectivity Demand Grows, But Price Points Demanding* (2003), nevertheless the challenge that faced by the education sector, the high-tech market research firm finds that progress is being made all the way through this period. On behalf of mass-market education, it really takes additional exposure from the retail channel and service providers. Up to the particular date, that exposure of wireless technology has been minimal. However, the service provider percentage was up to 9% in year 2003 compared to only 2% in year 2002, which is showing positive progress towards future.

The In-Stat/MDR report had also specified certain outcomes from the consumer that responded to this survey. The respective study found that:

- While many of the respondents were at least somewhat familiar with Bluetooth™, they were less this year who had never heard of the term.

Although some progress has been made, education still presents a challenge to educate the US population about Bluetooth™, what its benefits are, and how this wireless PAN (Personal Area Network) differs from 802.11b wireless LAN.

- Most panellists indicated having learned about Bluetooth™ from technical journals or magazines

- There is solid interest in wireless communication between PDAs and PCs, cordlessly connecting to a mobile phone via PDA or laptop, interest in wirelessly printing and accessing the Internet, and hands-free systems, mobile phones and headsets. Additionally, respondents showed a strong interest in cordless mice and keyboards. Although respondents are interested in devices with cordless features, this survey shows a high demand for challenging price points for manufacturers to meet.

- A significant percentage of survey respondents do not know if they have a Bluetooth™ feature on their current mobile phone or not, confirming the need for more consumer education and marketing. In addition, if they have the Bluetooth™ feature on their phone, not all are using it yet.

#### *4.1.1.2 Bluetooth™ Characteristics*

The Bluetooth™ characteristic can be defined by its short range of coverage that is about 10 meters in linking to the master side devices. More than just a replacement for cables, Bluetooth™ wireless technology provides a universal bridge to existing data networks, a peripheral interface, and a mechanism to form small private ad hoc groupings of connected mobile devices away from fixed network infrastructures. The devices carrying Bluetooth™ – enabled chips can easily transfer data at rate of almost 720 Kbps within 10 meters (33 feet) of range through walls, clothing and luggage bags. The interactions

between devices occur by itself without direct human intervention whenever they are within each other's range. In this process, the software technology embedded in the Bluetooth™ transceiver chip triggers an automatic connection to deliver and accept the data flow.

Whenever devices carrying Bluetooth™ technology are within each other's range they create an automatic ad hoc PAN called a piconet. In this arrangement, one device acts as the "master" such as laptop whiles other devices function as "slaves" such as printers or scanners. The master device decides if a particular communication service is needed from a slave device.

**Table 4.1: Performance Characteristics of Bluetooth™ Products**

| Feature | Performance |
|---|---|
| **Connection Type** | Spread spectrum (frequency hopping) |
| **Spectrum** | 2.4 GHz ISM band |
| **Transmission Power** | 1 milliwatt (mW) |
| **Aggregate Data Rate** | 1 Mbps using frequency hopping |
| **Range** | Up to 30 feet (10 meters) |
| **Supported Stations** | Up to eight (8) devices per piconet |
| **Voice Channels** | Up to three (3) |
| **Data Security** | ▪ For authentication, a 128-bit key<br>▪ For encryption, the key size is configurable between 8 and 128 bits |
| **Addressing** | Each device has a 48-bit MAC address that is used to establish a connection with another device |

### *4.1.1.3 Architecture of Bluetooth™*

Bluetooth™ is a lower layer specification by the view of OSI. Figure 4.2 shows the main protocols of Bluetooth™. The key parts of it are Radio (RF) layer, Baseband and Link layer (include Link Manager and Logical Link Control and Adaptation Protocol (L2CAP). In order to implement other applications such as file transfer, voice and WAP over Bluetooth™, it also include adaptive interface layer.

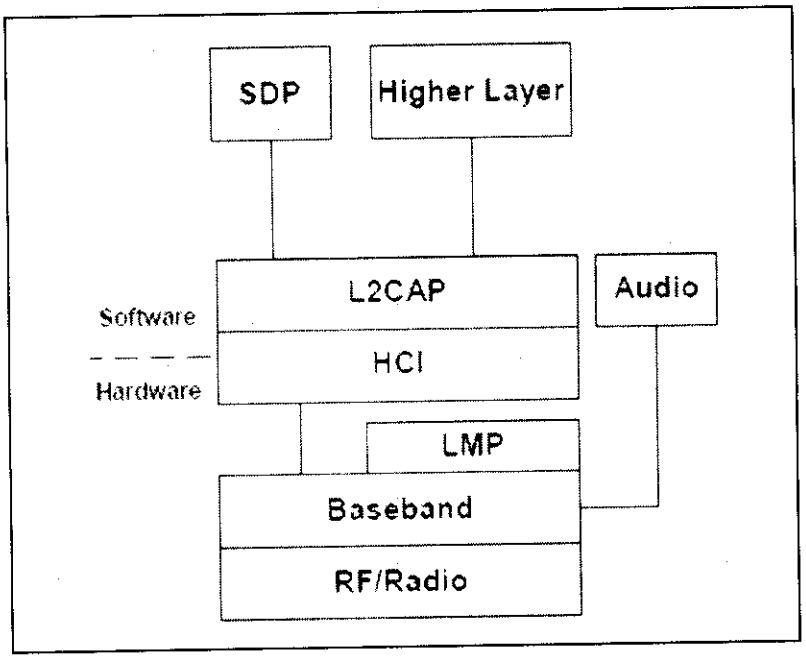



**Figure 4.2: Bluetooth™ Architectural Overview (Source: Bluetooth – The Fastest Developing Wireless Technology Journal, Tsinghua University, Beijing )**

Radio or RF is the lowest layer that defines the frequency bands and channel arrangement, transmitter and receiver characteristics. Baseband defines packet format, physical and logical channels, channel control and hop selection. Link Manager Protocol (LMP) is used for link set-up and control. The signals are interpreted and filtered out by the Link Manager on the receiving side and they are not propagated to higher layers. RF, Baseband and LMP are usually integrated one or two chips to provide a hardware platform for the higher layer application. The interfaces between the hardware and software are such common ones as USB, UART and PCM which are include in Host Controller Interface (HCI) to make them universal to the different

vendors. L2CAP supports higher-level protocol multiplexing, packet segmentation and reassembly and the conveying of quality of service information. Other than that, Bluetooth™ also includes other important protocols such as Service Discovery Protocol (SDP), audio and some Bluetooth™ specific adaptation protocol (RFCOMM, IrDA, Telephony Control) at the software framework.

#### *4.1.1.4 Personal Area Network (PAN)*

One of the common goals shared by the IEEE and the Bluetooth™ SIG is the global use of wireless personal area networks (PANs). The IEEE's 802.15 working group is looking at creating standards that will provide the foundation for a broad range of interoperable consumer devices by establishing universally adopted standards for wireless digital communications.

The goal of the 802.15 working group is to create a consensus standard that has broad market applicability and deals effectively with the issues of coexistence with other wireless networking solutions. While the IEEE 802.11 wireless LAN technologies are specifically designed for devices in and around the office or home, devices using the IEEE 802.15 wireless PAN and Bluetooth™ wireless technology will provide country-to-country usage for travellers in cars and airplanes. The performance characteristics of Bluetooth™ products that operate in the 24-GHz range can be summarized in Table 4.1.

#### *4.1.1.5 Bluetooth™ Topology*

The devices within a piconet play two roles that are as master or slave. The master is the device in a piconet whose clock and hopping sequence are used to synchronize all other devices such as slaves in the piconet. The unit that carries out the paging procedure and established a connection is by default the master of the connection. The slaves are the

units within a piconet that are synchronized to the master via its clock and hopping sequence.

The Bluetooth™ topology is best described as a multiple piconet structure. Since the Bluetooth™ specification supports both point-to-point and point-to-multipoint connections. several piconets can be established and linked together in a topology called "scatternet" whenever the need arises.

Piconets are uncoordinated with frequency hopping occurring independently. Several piconets can be established and linked together ad hoc. where each piconet is identified by a different frequency hopping sequence. All users participating on the same piconet are synchronized to this hopping sequence. Although synchronization of different piconets is not permitted in the unlicensed ISM band. units using Bluetooth™ wireless technology may participate in different piconets through time division multiplexing (TDM). This enables a unit to participate sequentially in different piconets by being active in only one piconet at a time.

With its service discovery protocol. the Bluetooth™ specification enables a much broader vision of networking. including the creation of Personal Area Networks. where all devices in a person's life can communicate and work together. Technical safeguards ensure that a cluster of Bluetooth™ devices in public places. such as an airport lounge or train terminal. would not suddenly start talking to one another.

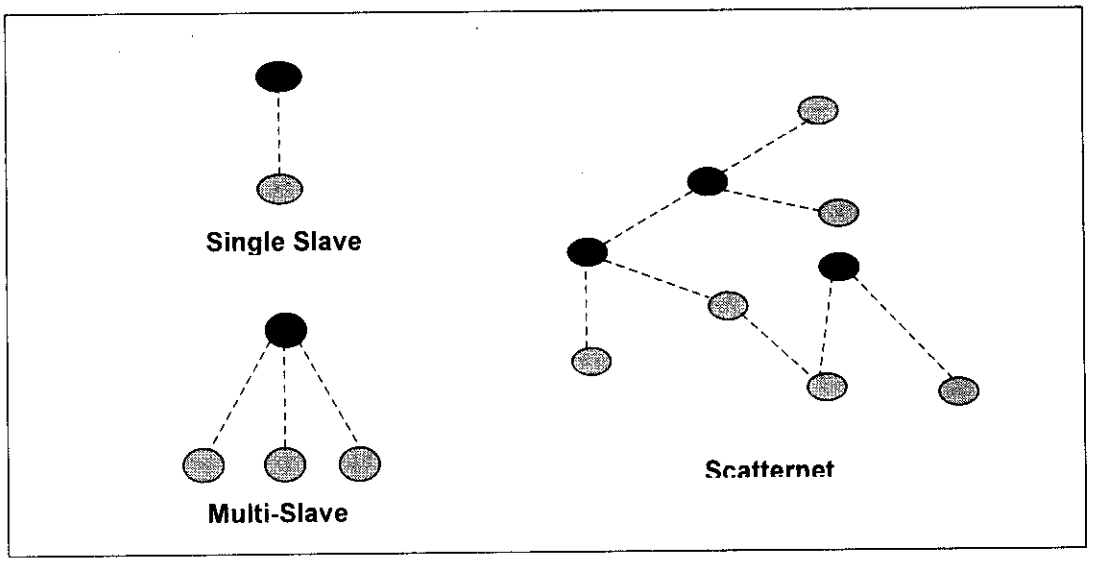



**Figure 4.3: Topologies of Networked Bluetooth™ Devices, where each device is either a master or slave (Source: Bluetooth Demysfied, McGraw Hill Telecom)**

#### *4.1.1.6 Bluetooth™ Security Level of Services*

The security architecture provides a flexible security framework that dictates when to involve a user (e.g. to provide a PIN) and what actions the underlying Bluetooth™ protocol layers need to follow to support the desired security checks. The Bluetooth™ security architecture is built on top of the link-level security features of the Bluetooth™ system. The security level of service is defined by three attributes:

- **Authorization required**

  Access is granted automatically only to trusted devices (as for example, those devices marked as such in the device database), or untrusted devices after an authorization procedure. Authorization always requires authentication to verify that the remote device is the correct one.

- **Authentication required**

  Before connecting to an application, the remote device must be authenticated.

- **Encryption required**

  The link must be changed to encrypted mode before access to the service is permitted.

This attribute information is stored in the service database of the security manager. If no registration has taken place, a default security level is used. For an incoming connection, the default is authorization and authentication required. For an outgoing connection, the default is authentication required. See Figure 4.4.

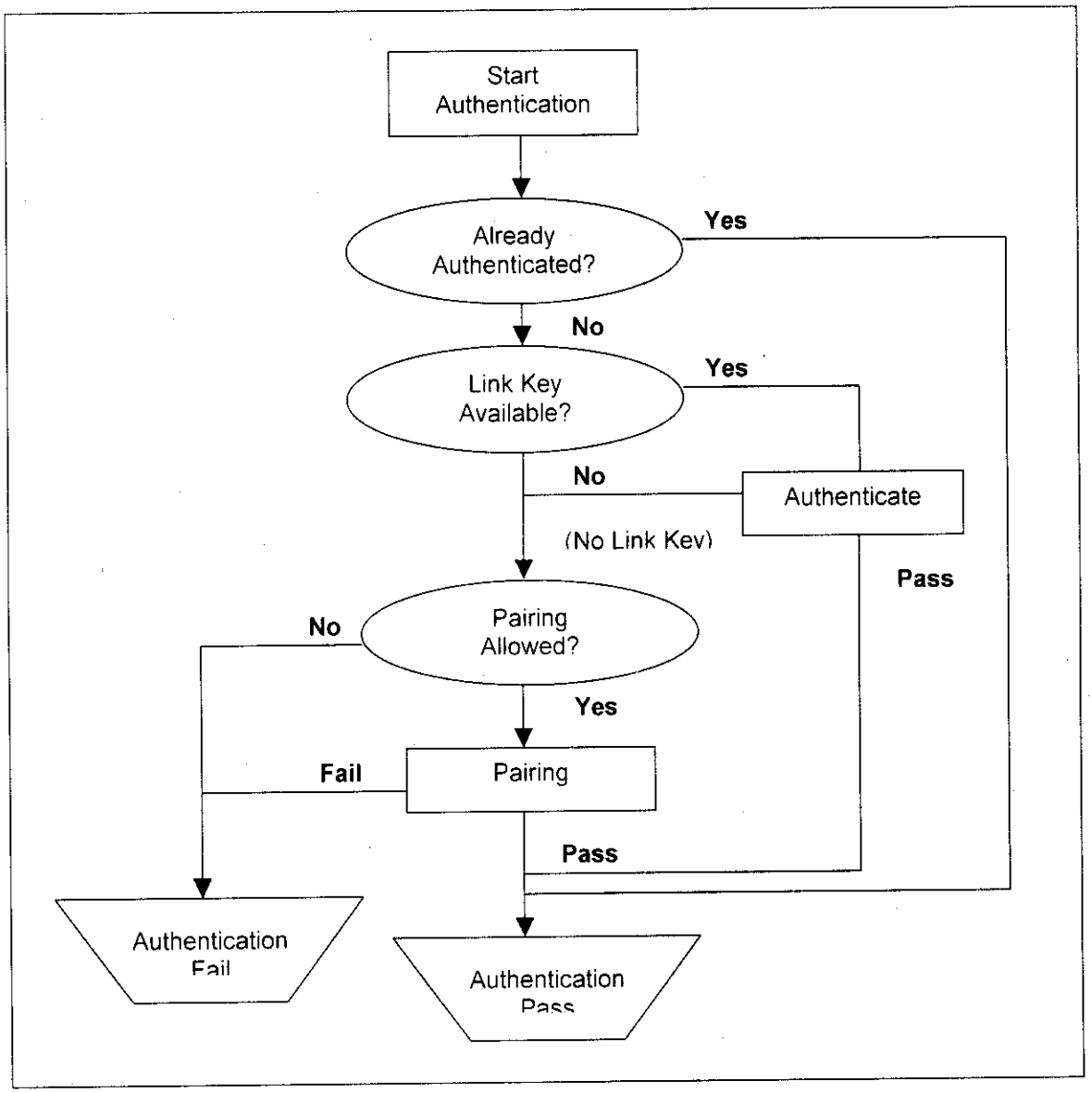



**Figure 4.4: Flow Chart for the Authentication Procedure (Source: Bluetooth Demystified, McGraw-Hill Telecom)**

### *4.1.1.7 Bluetooth™ vs Infrared (IrDA)*

The closer wireless technology to Bluetooth™ is infrared technology. Some devices can communicate through optical connections like infrared. This method of communication uses 850-nanometers (nm) infrared light between devices for voice as well as data. But this type of signal must have a clear, straight path from one device to another. Even with a line of sight, the devices must be positioned close to each other because the connection only works over very short distances of three feet (1 meter) or less. Whereas infrared is intended for point-to-point links between two devices for simple data transfers and file synchronization. Bluetooth™ wireless technology was designed from the start to support both data and multiple voice channels over a range of 30 feet (10 meters).

If infrared and Bluetooth™ devices can support many of the same applications, why do we need both technologies? The answer lies in the fact that each technology has its advantages and disadvantages. The ability of Bluetooth™ technology to penetrate solid objects and its capability to communicate with other devices in a piconet allows for data exchange opportunities that are very difficult or impossible with infrared.

As for example, using Bluetooth™ wireless technology we could synchronize our mobile phone with a notebook computer without taking the phone out of jacket pocket. This would allow us to type a new address at the computer and move it to our mobile phone's directory without unpacking the phone and setting up a cable connection between the two devices.

The omnidirectional capability of Bluetooth™ allows synchronization to occur instantly, assuming that the phone and computer are within 30 feet of each other. This is not possible with infrared because the signal is not able to penetrate solid objects even a jacket pockets and the devices must be within a few feet of each other.

**Table 4.2 : Performance Characteristics of Infrared (Copyright© 2001 McGraw-Hill Companies, Inc.)**

| Feature | Performance |
|---|---|
| **Connection Type** | Infrared, narrow beam (30 degree angle or less) |
| **Spectrum** | Optical, 850 nanometers (nm) |
| **Transmission Power** | 100 milliwatts (mW) |
| **Aggregate Data Rate** | Up to 16 Mbps using Very Fast Infrared (VFIR) |
| **Range** | Up to 3 feet (1 meter) |
| **Supported Devices** | Two (2) |
| **Voice Channels** | One (1) |
| **Data Security** | The short range and narrow angle of the infrared beam provides a simple form of security; otherwise, there are no security capabilities at the link level. |
| **Addressing** | Each device has a 32-bit physical ID that is used to establish a connection with another device. |

#### *4.1.1.8 Visual Aids in an Effective Presentation*

With the script developed and the audience research completed, this decision should be simple. A five minutes presentation to a three persons audience is probably best made with handout material alone, or even simple flip charts. Larger audiences might be effectively reached by using a few simple overhead transparencies. A half hour training or sales presentation may clearly indicate a 35 millimeters slide show or even video. If the resources are available, dual projector dissolve presentations have a natural continuity and convey a more professional image at an economical price.

The resolution, brightness and availability of LCD Computer/Video projectors continue to improve. Laptop based presentations are becoming very popular. However, many speakers believe these are a direct substitute for overheads. Traditional overhead transparencies were great for lighted rooms, where people could take notes. Most LCD Projectors just are not that bright, and might be more aptly used as an alternative to 35mm Slides. Single gun, 400 or 600 lumen projectors are still very expensive.

Good presentation visuals, however, do not necessarily have to be expensive. When properly planned and produced, simple, well-designed graphics add professionalism and impact to virtually any show. Even presentations working within a limited budget can benefit from images created on a professional graphics system by professional audio-visual designers. The proper use of text images, charts and graphs as well as the correct type of chart or graph to use in various circumstances is the subject of a good presentation.

#### *4.1.1.9 Findings on the Classroom Measurement*

In order to check for the validity of the Bluetooth™ range in giving and retrieving signal from each electronic device in the classrooms and halls, the author had surveyed the size of the classes in the new academic area of Universiti Teknologi PETRONAS (UTP). The sample classes are Programming Lab in Block 1 and Lecture Hall in Pocket C and Pocket D.

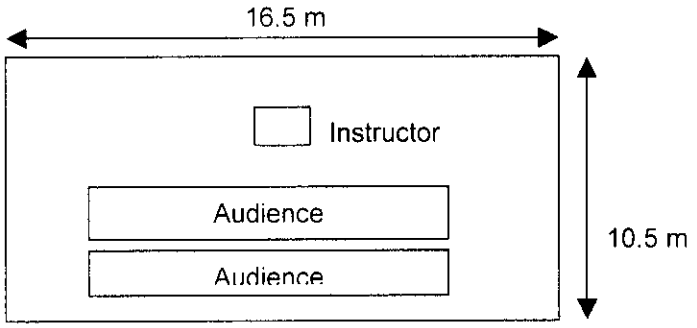



**Figure 4.5: Programming Lab Plan in Block 1**

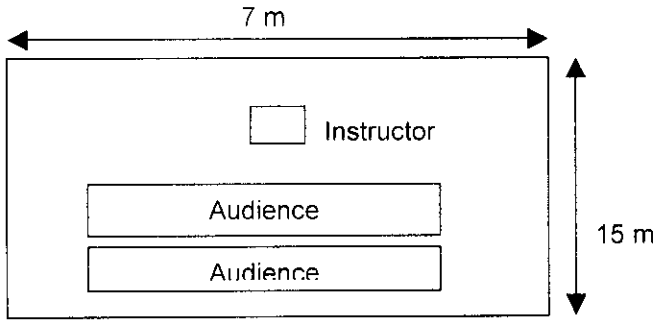



**Figure 4.6: Small Lecture Hall in Pocket C and D**

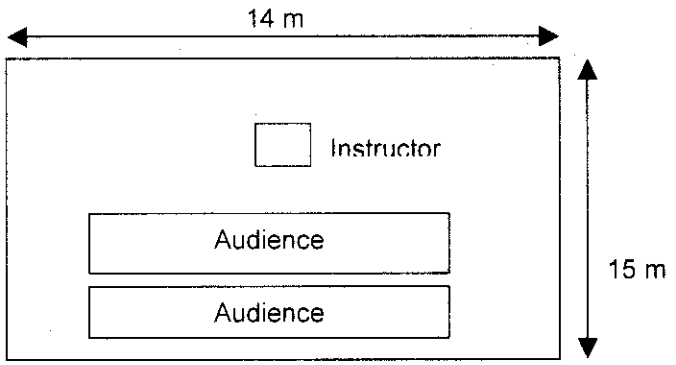



**Figure 4.7: Large Lecture Hall in Pocket C and D**

The dimension of those classes have proved that the Bluetooth™ technology can be implemented and integrated with UTP learning environment since the network communications of this technology has quite enough length of coverage. The most important thing that should be considered is the placement of the receiver (act as a server/master) because it will be a starting point for the communication radius range. See Figure 4.8.

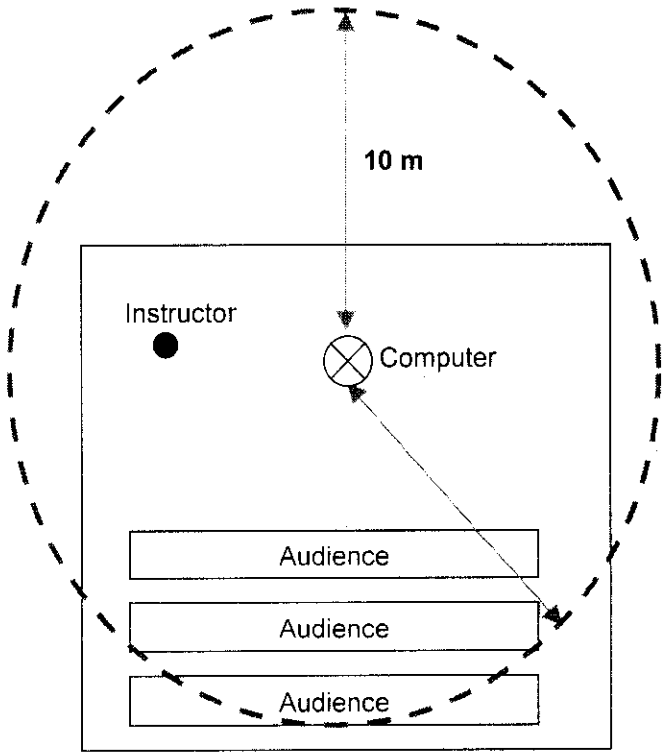



**Figure 4.8: Network Access Coverage for Bluetooth™ in a Classroom**

### 4.1.2 Data Analysis

#### *4.1.2.1 Sampling design*

For the sampling design, the author has chosen to implement the judgment sampling under the non-probability sampling. Since the focus is more on the lecturer's experience and opinions, this type of design would be more appropriate in the study.

Sample's background= 7 lecturers and 3 tutors
Sample size = 10
Respondent's feedback= 100% (all handed back)

Some of the main objectives of the questionnaires that handed out in this study is:

- To collect data on the way lecturers in UTP handled their presentation in class
- Get some information/overview on the common problems that they faced during the presentation
- To measure the current level of flexibility in class based on the lecturer's experience and knowledge
- To gather information on their level of knowledge regarding wireless technology and get their opinions.

#### *4.1.2.2 Results in terms of Flexibility (Mobility in Class)*

In terms of flexibility, the author generally asked questions regarding the easiness of the lecturer in setting up equipments, the mobility to move around in the class and also their normal style in giving lectures. The questionnaires are provided in Appendix C.

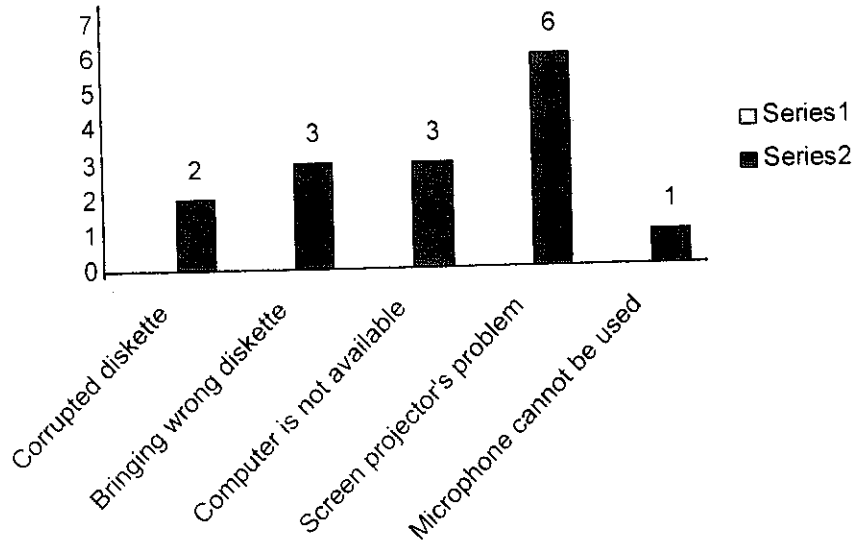



**Figure 4.9: Results regarding the common problems faced by lecturers during presentation**

Based on the Figure 4.9. most common problems that the lecturers faced are on having troubles with screen projector (60%) and wrong diskettes (30%). (Refer question 5 in the questionnaire). The findings also indicate that lecturers prefer to move around rather than to stay put in one place. This can be refer to diagram 10.4 where more than 70% of the respondents said that they are comfortable to present by moving around the class. (Refer question 8 in the questionnaire).

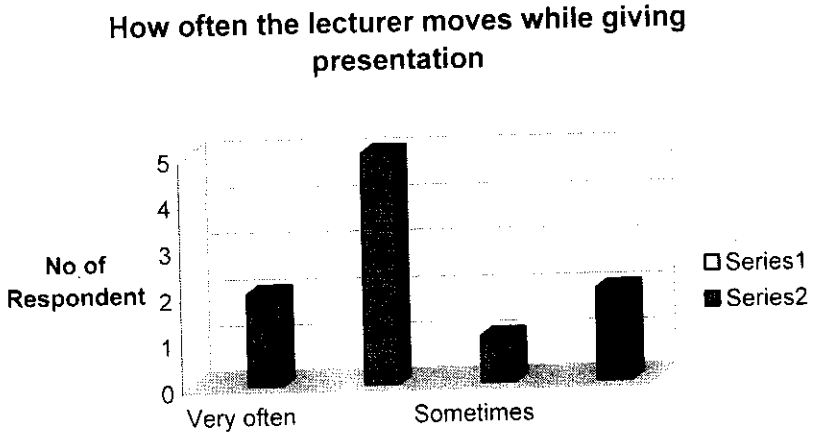



**Figure 4.10: Results regarding the importance of two ways communication in class**

Another significant finding form the questionnaire for the survey is the response regarding the use of wired mouse (conventional) while controlling the slides during presentation. 80% of the respondents agreed that it really limits their movement in class and somehow can distract their concentration. Other 20% of respondents are being moderate with the idea. (Refer question 9 in the questionnaire).

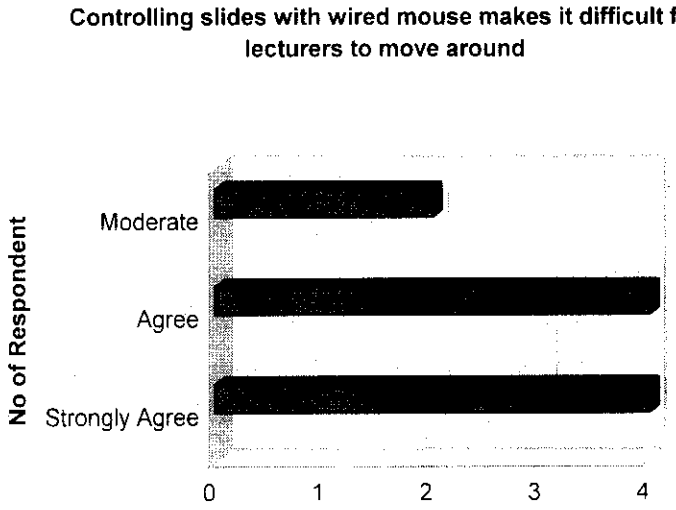



**Figure 4.11: Results on opinions of the lecturers using wired mouse to control the slide presentation.**

### *4.1.2.3 Results in terms of Knowledge on Wireless Technology and Application*

In this section of questionnaires, the author would like to elicit more details on the respondent's level of knowledge on the wireless application and technology as for the investigation on the possibility to implement it in the classroom or lecture hall. Based on the diagram below, 6 of the respondents have a moderate level of knowledge in wireless application while another 40% have good level of knowledge in this area. (Question no 11)

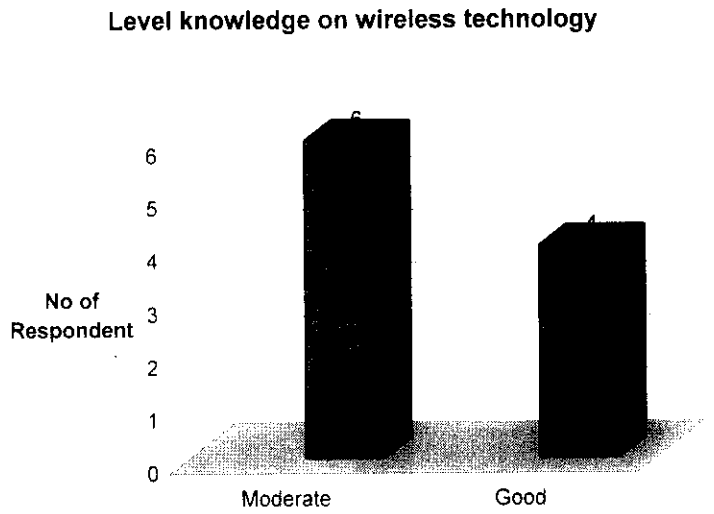



**Figure 4.12: Results showing the level of knowledge on wireless technology among the respondents.**

Other than that, the result stated that 50% of the respondents prefer to use PDA from other wireless devices if the university is implementing the technology. The laptop and cordless mouse fall to second and third place. (Question no 13)

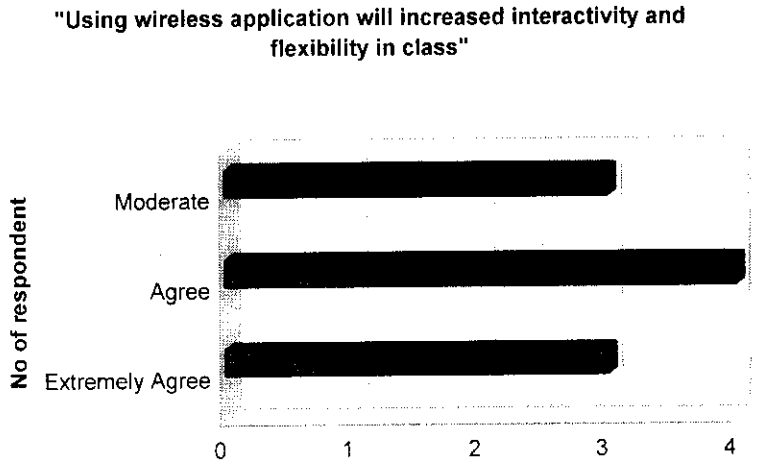



**Figure 4.13: Results on the acceptance of using wireless application in class to improve interactivity and flexibility**

To get a more clear feedback regarding the acceptance level of the respondents on wireless application, the author came out with the statement "Using wireless application will increased interactivity and flexibility in class". The result shows that 7 respondents agreed on this statement while another 3 are being moderated with the idea. This shows that there is positive acceptance from the respondents on the possibility to implement the technology in the classroom.

### 4.1.3 How the Proposed Solution Work?

There are four major components in delivering a wireless presentation for this project that are a presenter, a handheld device, a Bluetooth™ enabled personal computer and a screen projector (refer to Figure 4.14).

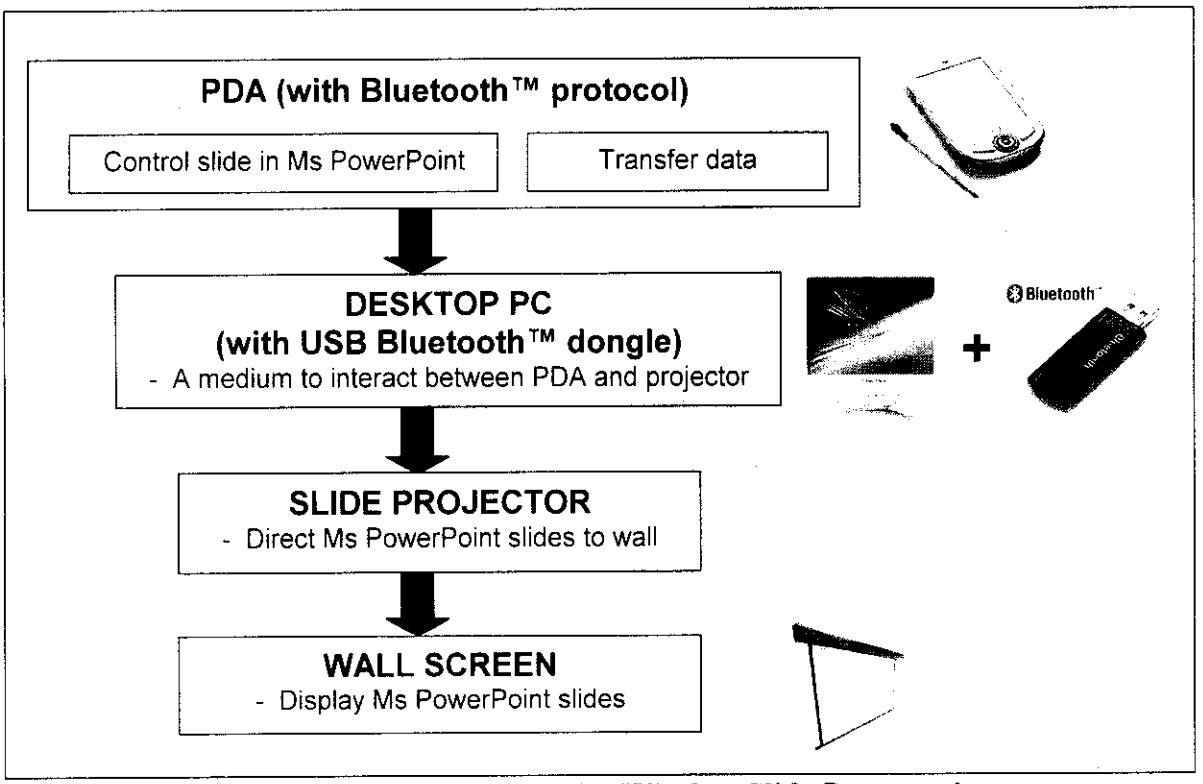



**Figure 4.14: System model for Wireless Slide Presentation**

The process flow of the presentation starts as the presenter activates the Bluetooth™ facility in the handheld device (as for example Pocket PC). At the same time, the PC that has been connected by the Bluetooth™ USB dongle must also be activated in order

to retrieve signal from the handheld device. At the PC itself, user must "find the Bluetooth™ device in the range" on the Bluetooth™ application folder in the Internet Explorer. The access point (Bluetooth™ USB dongle) will start to search for device within its radius range (10 meters). Once it detects the handheld device, it will automatically send a signal to the device where a message box pops up at the user's Pocket PC. It will ask for the authentication from the Pocket PC side in order for PC to remotely access the Pocket PC. However, for the first time, if the handheld device has not ever been connected to the PC, it will ask for the pairing between those two devices.

Each time the presenter wants to open the file or folder in the Pocket PC through the PC, the Pocket PC will request the authentication. After that, the audience can see the slide presentation in the PC through the screen, which connected to the desktop PC through the screen projector cable. The presenter can move around with the Pocket PC while he can control the slide presentation in the classroom. However, there is a space constraint that must be put on the movement of the presenter from the access point at the PC in a range of 10 meters.

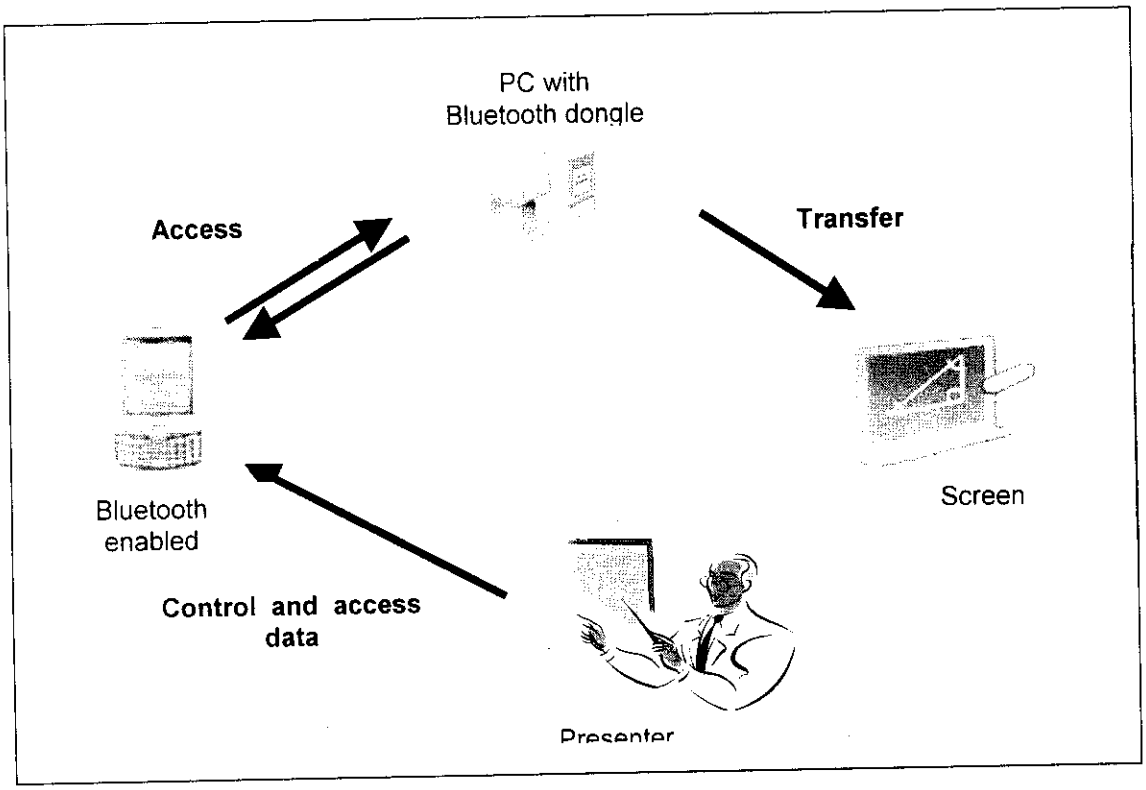



**Figure 4.15: Process Flow**

## 4.2 DISCUSSIONS

Based on the project research and formal interviews done during the project, the author discovered that among the many things, Bluetooth™ wireless technology enables users to do is swap data and synchronize files without having to cable devices together. Data exchange can be as simple as synchronizing personal information between a palmtop and desktop computer, merely by having the devices come within range of each other.

Some hypotheses can be made through the survey on In-Stat/MDR Press Room where more consumers learn about Bluetooth™, the greater the interest in products with Bluetooth™ capabilities. Therefore, over time, as more consumers are educated about Bluetooth™, their interest in Bluetooth™ products will increase, thus driving the demand for such products. The area that can force people to increase their usage on Bluetooth™ is education where many countries prioritise their budgets on it.

From the findings, the Bluetooth™ specification are well positioned to handle virtually any short-range communication need, enabling seamless data communication over wireless links between mobile and stationary devices, including mobile phones, wireless information devices and personal digital assistants that can interconnect with each other. It is whether with desktop computer or home and office phones or new gateway devices that will permit dialup access to virtually any appliance in the home for remote control.

### 4.2.1 Constraints and Limitations

In implementing this project, there are certain constraints and limitations that the author faced up during the development phase. These are restrictions for the system:

- **Human Manners**

  Certain individuals like to keep on looking on the notes and books during their intellectual presentations. The condition makes the presenter feels

distracted in relying only on the limited space for notes in the PDA. However, for some particular people, they do not like to hold anything during their presentations.

- **Cost Limitations**

  Until now, the Bluetooth™ integrated devices market in Malaysia still remain as expensive devices due to the lack of usage manipulation in daily activities of citizens.

- **Hardware and Network Structure**

  In incorporating the Bluetooth™ technology, one must have the right hardware for the particular protocol to be worked out successfully. In addition, some electronic appliances do not yet support Bluetooth™ protocol such as certain computers and projectors.

- **Power Shutdown and Exhausted Battery**

  Another nuisance variable that people have to accept since every electronic gadget depend on the electricity and battery.

# CHAPTER 5

# CONCLUSION

## 5.1 RELEVANCY TO THE OBJECTIVES

In the growth of education sectors in Malaysia, it still remains a significant challenge to inform consumers about the benefits and uses of Bluetooth™ wireless connectivity. However, the high-tech market research firm finds that progress is being made. For mass-market education, it really takes additional exposure from the retail channel and service providers. The more consumers learn about Bluetooth™, the greater the interest in products with Bluetooth™ capabilities. Therefore, over time, as more consumers are educated about Bluetooth™, their interest in Bluetooth™ products will increase, thus driving the demand for such products. There is solid interest in wireless communication between Pocket PCs and PCs, cordlessly connecting to a mobile phone via PDA or laptop. Based on the project development, the author emphasizes more on the Bluetooth™ technology. The Bluetooth™ system is an invaluable asset for every field of daily life such as business enterprise and education. Furthermore, the growing awareness in simplifying workload without having to connect and plug into cables for every electronic devices, have increase tremendously. This will lead to good progress in developing seamless device communication in daily routine, specifically in education area. According to the data gathering and analysing, it seems that people from high educational background would like to try a new state-of-the-art and sophisticated approach of presenting their ideas to audience for effective and flexible presentation delivery. This will be achieved by conducting an awareness program must be conducted in introducing and manipulating the technology in higher educational institutes and to help these particular educator community to handle the wireless technology. As a conclusion, Bluetooth™ system is an invaluable asset for every field in daily life in reducing workload of a person.

## 5.2 RECOMMENDATIONS

Because Bluetooth™ is so new, just about any application could be called futuristic, but we will take a look at a few of those that could be considered an extension or addition to the Bluetooth™ profiles. These applications take advantage in varying degrees of Bluetooth™'s capability to be always on, always connected, mobile and easy to use.

### 5.2.1 Collaborative Networks in Teaching

*"The instructor prepares a slide deck in advance using PowerPoint. The slides are then converted into a separate format either by using a PowerPoint plugin to export them. When the instructor arrives in class, starts Presenter on both a tablet PC, and on a second machine connected to the data projector, then goes through a short connection sequence and broadcast the slides. Lecturing is done from the tablet PC and the students view the slides and writing projected onto a screen."*

One of the most exciting aspects of Bluetooth™ wireless technology is that it allows devices to communicate with each other and form a wireless personal area network (WPAN) that moves with a person wherever he goes. This can allow personal devices to increase their utility, as they can be conveniently used in multiple environments. When two such networks of personal devices are joined, we call this a collaborative network. In such situation, as for example based the above situations, this product could enhance the presentation of the instructor by allowing two ways communication. In a collaborative way, a new template of slide presentation could be made with all the colour palettes such as pen or highlighter that are electronically set up like Microsoft Paint. In a classroom attended by audience who has tablet PC, a program can be made in such that the audience (students) can access directly to their lecturer's slide presentation in his PDA in front and download the slide simultaneously. At the same time, these students can freely jot down some important point in the slide presentation in their tablet PC.

### 5.2.2 Universal Remote Control

By replacing traditional IR links with the Bluetooth™ RF, the remote control no longer needs to be pointed at the appliance being controlled. Home theatre systems, for example are often deployed in several locations within the room, or even in adjacent rooms, making Bluetooth™ the ideal controlling medium. If ever, home theatre system is being applied as one of the learning equipment in this university, Bluetooth™ could help it a lot in controlling the education channels.

### 5.2.3 Wireless Pen

A Bluetooth™-equipped writing instrument that automatically digitises its motions can be employed to enable the user to easily e-mail a drawing or handwritten note to any recipient through an accompanying cellular phone.

# REFERENCES


Bedell, P. 2001. *Wireless Crash Course*. United States of America, McGraw-Hill.

Bray, F. & Sturman, C. F. 2002. *Bluetooth 1.1 Connect Without Cables*. Upper Saddle River, Prentice-Hall Inc.

Prasad, R. & Ruggieri, M. 2003. *Technology Trends in Wireless Communications*. Boston, Artech House.

Muller, N. J. 2001. *Bluetooth Demystified*. United States of America, McGraw-Hill.

Uma Sekaran 2003. *Research Methods for Business: A Skill Building Approach*. 4th Edition, Wiley.

Jafreezal, J. 2004, Information Technology School, Universiti Teknologi PETRONAS, Malaysia, Private Communication.

Faizal, A. F. 2004, Information Technology School, Universiti Teknologi PETRONAS, Malaysia, Private Communication.

Johnny, Y. C. M. 2004. Electrical & Electronic Engineering, Multimedia Universiti, Malaysia, Private Communication.

Mohd Shahrizad, M. S. 2004, Bufori Motorcars Company Sdn. Bhd., Malaysia, Private Communication.

Sami, P. and Thomas, B. 2001. *Verifying Bluetooth Applications in a Virtual Prototyping Environment*. Innoveda, Inc.

Intan Fareesha, A. 2002, *Development of Driving Simulator – A Feasibility Study for the Safety Training of Novice Drivers*, Universiti Teknologi PETRONAS.

Mohd Shahrizad, M. S. 2002, *Data Mining Towards K-Economy*, Universiti Teknologi PETRONAS.

Gehrmann, C., Bluetooth SIG Security Expert Group, 2002, *Bluetooth Security White Paper*, Ericsson.

James, K. 2001, Mobile Computing Group, *Bluetooth Architecture Overview*, Intel Corporation.

Specification of the Bluetooth System, Core. Version 1.1 (2001) <www.bluetooth.com>

Bluetooth Tutorial, Apurva, K. 2002 < http://www.research.ibm.com/people/k/kapurva>

Cordless Freedom, Logitech 2004, 4 March 2004 <http://www.logitech.com/index.cfm>

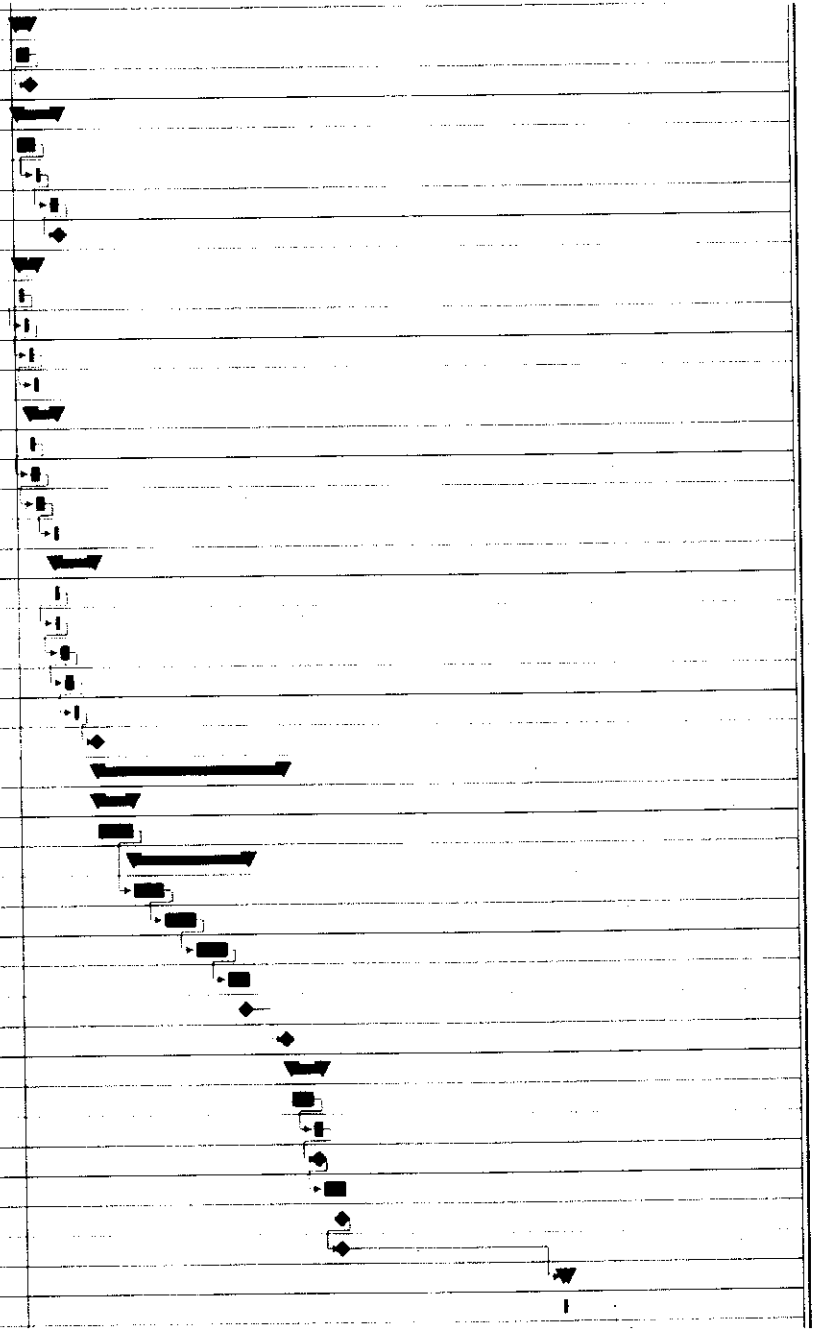
VL SI-EDA Lab, ECE Dept, University of Winsconsin, Madison, 1 January 2004 <http://www.cae.wisc.edu/~sachin/bluetooth/archive.htm>

# APPENDICES

# APPENDIX A

## Gantt Chart

| | Bluetooth Teaching Aid System | | | | |
|---|---|---|---|---|---|
| 2 | **1.0 Survey Phase** | **2/2/2004** | **2/5/2004** | **3d** | |
| 3 | 1.1 Topic Selection | 2/2/2004 | 2/4/2004 | 3d | |
| 4 | 1.2 Project Title Proposal | 2/5/2004 | 2/5/2004 | 0d | |
| 5 | **2.0 Preliminary Data Gathering** | **2/2/2004** | **2/11/2004** | **7d** | |
| 6 | 2.1 List problems, opportunities and directives | 2/2/2004 | 2/5/2004 | 4d | |
| 7 | 2.2 Negotiate scope | 2/6/2004 | 2/6/2004 | 1d | |
| 8 | 2.3 Plan the project | 2/9/2004 | 2/10/2004 | 2d | |
| 9 | 2.4 Present the project and plan | 2/11/2004 | 2/11/2004 | 0d | |
| 10 | **3.0 Study Phase** | **2/2/2004** | **2/5/2004** | **4d** | |
| 11 | 3.1 Analyze the current system | 2/2/2004 | 2/2/2004 | 1d | |
| 12 | 3.2 Establish system improvement objectives | 2/3/2004 | 2/3/2004 | 1d | |
| 13 | 3.4 Present findings and recommendations | 2/4/2004 | 2/4/2004 | 1d | |
| 14 | 3.5 Problem statement completed | 2/5/2004 | 2/5/2004 | 1d | |
| 15 | **4.0 Definition** | **2/4/2004** | **2/9/2004** | **4d** | |
| 16 | 4.1 Identify business requirements | 2/4/2004 | 2/4/2004 | 1d | |
| 17 | 4.2 Analyze system requirements | 2/4/2004 | 2/5/2004 | 2d | |
| 18 | 4.3 Update the project plan | 2/5/2004 | 2/6/2004 | 2d | |
| 19 | 4.4 Preliminary Report submission | 2/9/2004 | 2/9/2004 | 1d | |
| 20 | **5.0 System Recommendation Phase** | **2/9/2004** | **2/18/2004** | **7d** | |
| 21 | 5.1 Identify candidate solution | 2/9/2004 | 2/9/2004 | 1d | |
| 22 | 5.2 Analyze candidate solution | 2/9/2004 | 2/9/2004 | 1d | |
| 23 | 5.3 Recommend target solution | 2/10/2004 | 2/11/2004 | 2d | |
| 24 | 5.4 Recommend a project solution | 2/11/2004 | 2/12/2004 | 2d | |
| 25 | 5.5 System recommendation completed | 2/13/2004 | 2/13/2004 | 1d | |
| 26 | 5.6 Progress Report submission | 2/18/2004 | 2/18/2004 | 0d | |
| 27 | **6.0 Design Phase** | **2/18/2004** | **3/31/2004** | **30d** | |
| 28 | **6.1 Workflow design** | **2/18/2004** | **2/25/2004** | **6d** | |
| 29 | 6.1.1 Paper-form design and evaluation | 2/18/2004 | 2/25/2004 | 6d | |
| 30 | **6.2 Simulation design** | **2/26/2004** | **3/22/2004** | **18d** | |
| 31 | 6.2.1 Design the network communication | 2/26/2004 | 3/3/2004 | 5d | |
| 32 | 6.2.2 Design the system interface | 3/4/2004 | 3/10/2004 | 5d | |
| 33 | 6.2.3 Design the system data flow | 3/11/2004 | 3/17/2004 | 5d | |
| 34 | 6.2.4 Update the project plan | 3/18/2004 | 3/22/2004 | 3d | |
| 35 | 6.3 Design specification completed | 3/22/2004 | 3/22/2004 | 0d | |
| 36 | 6.4 Supervisor's Draft submission | 3/31/2004 | 3/31/2004 | 0d | |
| 37 | **7.0 Construction** | **4/1/2004** | **4/7/2004** | **5d** | |
| 38 | 7.1 Construct the network connection | 4/1/2004 | 4/5/2004 | 3d | |
| 39 | 7.2 Construct the application | 4/6/2004 | 4/7/2004 | 2d | |
| 40 | 7.3 System construction completed | 4/7/2004 | 4/7/2004 | 0d | |
| 41 | 8.0 Implementation | 4/8/2004 | 4/12/2004 | 3d | |
| 42 | **9.0 Testing** | **4/12/2004** | **4/12/2004** | **0d** | |
| 43 | 10.0 Final Draft Submission | 4/12/2004 | 4/12/2004 | 0d | |
| 44 | **11.0 Demonstration** | **6/1/2004** | **6/1/2004** | **1d** | |
| 45 | 11.1 Oral Presentation | 6/1/2004 | 6/1/2004 | 1d | |



# APPENDIX B

## Bluetooth™ Beginner's Guide

# Bluetooth Beginner's Guide

## Bluetooth Summary

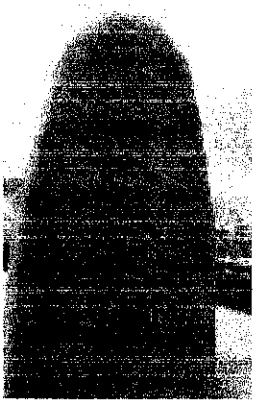
The Bluetooth wireless technology comprises hardware, software and interoperability requirements. It has been adopted not only by all major players in the telecom, computer and home entertainment industry, but also in such diverse areas as the automotive industry and health care, automation and toys, etc. - almost all sectors of the economy.

It is a global standard that:

- eliminates wires and cables between both stationary and mobile devices
- facilitates both data and voice communication
- offers the possibility of ad hoc networks and delivers the ultimate synchronicity between all personal devices

## Harald Bluetooth

Harald Bluetooth was a viking and King of Denmark between 940 and 981. One of his skills was getting people to talk to each other, and during his rule Denmark and Norway were christianized and united. Today Bluetooth wireless technology enables devices to talk to each other, but this time by means of a low-cost short-range radio link.



In the Danish town of Jelling, Harald Bluetooth raised an enormous rune stone which still stands in its original position. It has the following runic inscription, adorned with an image of Christ: "King Harald raised this monument to the memory of Gorm his father and Thyre his mother, that (same) Harald which won all Denmark and Norway and made the Danes Christian." Originally, the stone was painted.

In September 1999, a new stone was raised outside of Ericsson Mobile Communications in Lund, this time to the memory of Harald Bluetooth.

## The First Steps

The idea that resulted in the Bluetooth wireless technology was born in 1994 when Ericsson Mobile Communications decided to investigate the feasibility of a low-power, low-cost radio interface between mobile phones and their accessories. The idea was that a small radio built into both the cellular telephone and the laptop would replace the cumbersome cable used today to connect the two devices.

A year later the engineering work began and the true potential of the technology began to crystallize. But beyond unleashing devices by replacing cables, the radio technology showed possibilities of becoming a universal bridge for existing data networks, a peripheral interface, and a mechanism to form small private ad hoc groupings of connected devices away from fixed network infrastructures.

## The SIG

In February 1998, the Special Interest Group (SIG) was formed. Today the Bluetooth SIG includes promoter companies 3Com, Ericsson, IBM, Intel, Agere Systems, Microsoft, Motorola, Nokia and Toshiba, and thousands of Adopter/Associate member companies.

The assignment of the SIG originally was to monitor the technical development of short range radio and to create an open global standard, thus preventing the technology from becoming the property of a single company. This work resulted in the release of the first Bluetooth Specification in July 1999. The further development of the Specification still is one of the main issues for the SIG. Other important tasks are interoperability requirements, frequency band harmonization and promotion of the technology. Learn more about the Bluetooth SIG at http://www.bluetooth.com.

## Interoperability

From the very start, one of the main goals for the SIG has been to include a regulatory framework in the Specification that will guarantee full interoperability between different devices from various manufacturers - as long as they share the same Profile.

While the usage models describe applications and intended devices, the Profiles specify how to use the Bluetooth protocol stack for an interoperable solution. Each Profile states how to reduce options and set parameters in the base standard, how to use procedures from several base standards. A common user experience is also defined. For example, a computer mouse doesn't need to communicate with a headset, and so they are built to comply with different Profiles.

The Profiles are a part of the Bluetooth Specification, and all devices must be tested against one or more of the Profiles in order to fulfill the Bluetooth certification requirements. The number of Profiles will continue to grow as new Bluetooth applications arise.

## Compliance

The Bluetooth Qualification Program guarantees global interoperability between devices regardless of the vendor and regardless of the country in which they are used. During the test procedure which all devices must pass, it must be verified that they meet all requirements regarding: radio link quality, lower layer protocols, profiles and information to end-users. One way to test interoperability is with the Blue Unit from Ericsson Technology Licensing. All qualified devices are listed at www.bluetooth.com.

## Usage Models

The Profiles defined in Version 1.1 of the Specification mainly address usage models concerning the telecom and computing industries.

Three examples are "Internet Bridge", the "Ultimate Headset" and the "Automatic Synchronizer".

An **Internet Bridge** giving constant access to the Internet is a useful and time-saving feature, especially when the bandwidth of mobile phones is increasing rapidly. Bluetooth wireless technology lets you surf the Internet without any cable connections wherever you are, either using a computer or by using the phone itself. When close to a wire-bound connection point, your mobile computer or handheld device can also connect directly to the land line, but still without cables.

The **Ultimate Headset** allows you to use your mobile phone even when it's inside a briefcase, thereby keeping your hands free for more important tasks when you're at the office or in your car.

**Automatic Synchronization** of calendars, address books, etc. is a feature long-awaited for many of us. Simply by entering your office, the calendar in your phone or PDA will be automatically updated to agree with the one in your desktop PC, or vice versa. Phone numbers and addresses will always be correct in all your portable devices without docking through cables or infrared.

## Why Bluetooth wireless technology?

In phase with the IT-boom, the mobility among people has constantly grown and wireless technologies for voice and data have evolved rapidly during the past years.

Countless electronic devices for home, personal and business use have been presented to the market during recent years but no widespread technology has been presented to address the needs of connecting personal devices in Personal Area Networks (PAN). The demand for a system that could easily connect devices for transfer of data and voice over a short distances—without cables—grows stronger, and unlike infrared devices, Bluetooth units are not limited to line-of-sight communication.

Bluetooth wireless technology fills this important communication need, with its ability to communicate both voice and data wirelessly, using a standard low-power, low-cost technology which can be integrated in all devices and thus enable total mobility. The price will be low and result in mass production. The more units around, the more benefits for the customer.

## The Technology

The Bluetooth Specification defines a short range (around 10 meters) or optionally a medium range (around 100 meters) radio link capable of voice or data transmission to a maximum capacity of 720 kilobits per second (kb/s) per channel.

Radio frequency operation is in the unlicensed industrial, scientific and medical (ISM) band at 2.40 to 2.48 GHz, using a spread spectrum, frequency hopping, full-duplex signal at a nominal rate of 1600 hops/sec. The signal hops among 79 frequencies at 1 MHz intervals to give a high degree of interference immunity. RF output is specified as 0 dBm (1 mW) in the 10m-range version and -30 to +20 dBm (100 mW) in the longer range version.

When producing the radio specification, high emphasis was put on specifying a design that enables low cost, minimum power consumption and a small chip size required for implementation in mobile devices.

### *Voice*

Up to three simultaneous synchronous voice channels are used, or a channel which simultaneously supports asynchronous data and synchronous voice. Each voice channel supports a 64 kb/s synchronous (voice) channel in each direction.

### *Data*

The asynchronous data channel can support maximal 723.2 kb/s asymmetric (and still up to 57.6 kb/s in the return direction), or 433.9 kb/s symmetric.

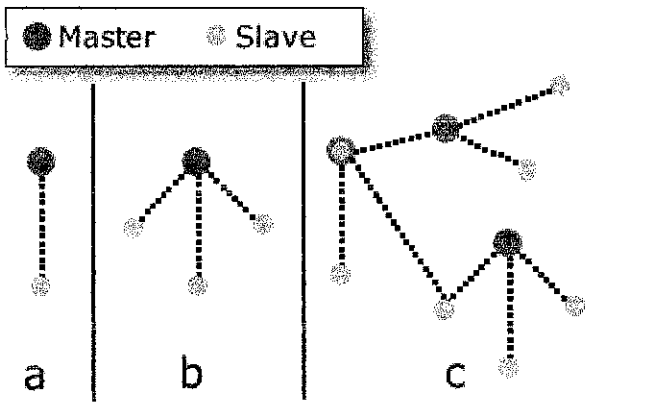
- a Master can share an asynchronous channel with up to 7 simultaneously active Slaves in a Piconet.

- by swapping out active and parked slaves respectively in the piconet, 255 slaves can be virtually connected (a device can participate again within 2 ms). There is no theoretical limit to the number of slaves that can be parked.

Slaves can participate in different piconets and a master of one piconet can be the slave in another, resulting in what is known as a Scatternet. Up to 10 piconets within range can form a scatternet.

## Network Topology

Bluetooth units that come within range of each other can set up ad hoc point-to-point and/or point-to-multipoint connections. Units can dynamically be added or disconnected to the network. Two or more Bluetooth units that share a channel form a piconet.




***Piconets with a single slave operation (a), a multi-slave operation (b), and a scatternet operation (c).***

Several piconets can be established and linked together in ad hoc scatternets to allow communication and data exchange in flexible configurations. If several other piconets are within range they each work independently and each have access to full bandwidth. Each piconet is established by a different frequency hopping scheme. All users participating in the same piconet are synchronized to this hopping scheme/pattern. Unlike infrared devices, Bluetooth units are not limited to line-of-sight communication.

To control traffic of each piconet's hopping scheme, one of the participating units becomes a master of the piconet, while all other units become slaves. With the current Bluetooth Specification, up to seven slaves can actively communicate with one master. However, there can be virtually an unlimited number of units attached to a master, able to start communication instantly.

## Security

As radio signals can be easily intercepted, Bluetooth devices have built-in security to prevent eavesdropping or falsifying the origin of messages (spoofing).

The main security features are:

- a challenge-response routine - for authentication, which prevents spoofing and unwanted access to critical data and functions.
- stream cipher - for encryption, which prevents eavesdropping and maintains link privacy.
- session key generation - session keys can be changed at any time during a connection.

Three entities are used in the security algorithms:

**The Bluetooth device address** (48 bits), is a public entity unique for each device. The address can be obtained through the inquiry procedure.

**A private user key** (128 bits), is a secret entity. The private key is derived during initialization and is never disclosed.

**A random number** (128 bits), is different for each new transaction. The random number is derived from a pseudo-random process in the Bluetooth unit.

In addition to these link-level functions, frequency hopping and the limited transmission range also help to prevent eavesdropping.

## Hardware Architecture

The Bluetooth Specification does not define what should be hardware and/or software. The following architecture solution is Ericsson's interpretation, one of the earliest and most stable implementations.

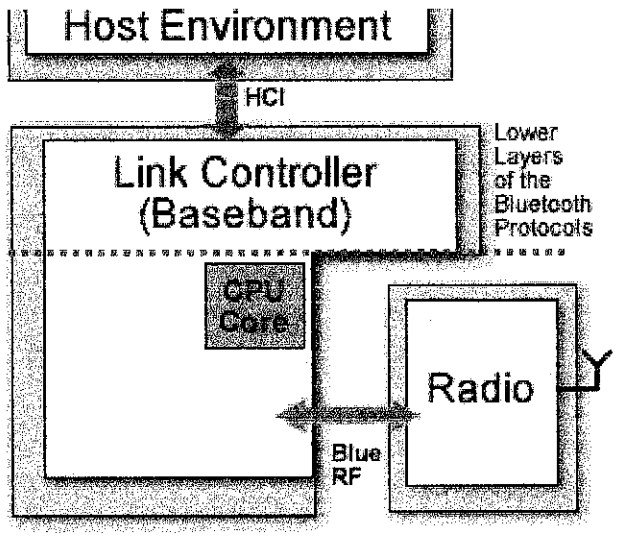
The Bluetooth hardware consists of an analog radio part and a digital part - the Host Controller. The Host Controller has a hardware digital signal processing part called the Link Controller (LC), a CPU core and interfaces to the host environment.

The Link Controller consists of hardware that performs baseband processing and physical layer protocols such as ARQ-protocol and FEC coding. The function of the Link Controller includes Asynchronous transfers, Synchronous transfers, Audio coding and Encryption.

The CPU core allows the Bluetooth module to handle Inquiries and filter Page requests without involving the host device. The Host Controller can be programmed to answer certain Page messages and authenticate remote links.

The Link Manager (LM) software runs on the CPU core. The LM discovers other LM's and communicates with them via the Link Manager Protocol (LMP) to perform its service provider role and to use the services of the underlying Link Controller.

Ericsson Technology Licensing offers complete packages of intellectual property (IP) that support both **Bluetooth core** and **Bluetooth radio chip** development.



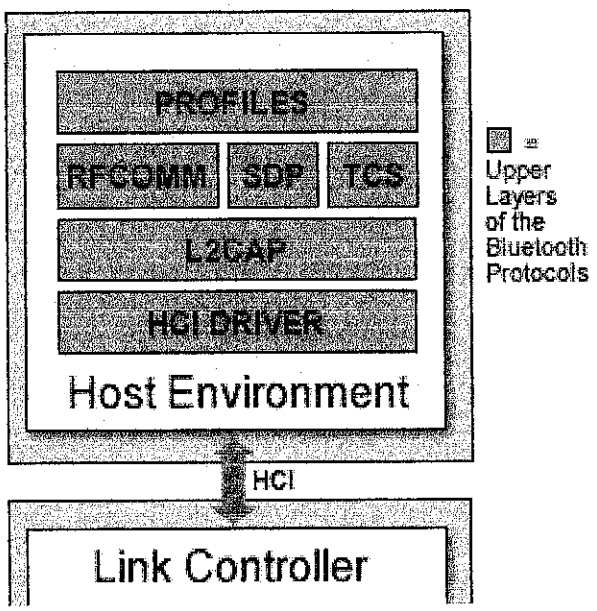
## Software Architecture

The upper layers of the Bluetooth protocols are marked with blue color in the illustration below. In order to make different hardware implementations compatible, Bluetooth devices use the Host Controller Interface (HCI) as a common interface between the Bluetooth host (e.g. a portable PC) and the Bluetooth core.

Higher level protocols like the Service Discovery Protocol (SDP), RFCOMM (emulating a serial port connection) and the Telephony Control protocol (TCS) are interfaced to baseband services via the Logical Link Control and Adaptation Protocol (L2CAP). Among the issues L2CAP takes care of is segmentation and reassembly to allow larger data packets to be carried over a Bluetooth baseband connection.

The Service Discovery Protocol allows applications to find out about available services and their characteristics when, for example, devices are moved or switched off.

Ericsson Technology Licensing offers a generic **software stack** that includes HCI Driver, L2CAP, RFCOMM and SDP, as well as the Profiles GAP, SDAP, and SPP (Generic Access Profile, Service Discovery Application Profile, Serial Port Profile) to be integrated in a host environment.




## Complementary Technologies

There is no single competitor covering the entire concept of the Bluetooth wireless technology but in certain market segments other technologies exist.

For cable replacement the infrared standard **IrDA** has been around for some years and is quite well known and widespread. IrDA is faster than the Bluetooth wireless technology but is limited to point-to-point connections and above all it requires a clear line-of-sight. In the past IrDA has had problems with incompatible standard implementations, a lesson that the Bluetooth SIG has learned.

Two other short-range radio technologies using frequency hopping technique reside in the 2.4 GHz band:

Wireless LANs based on the **IEEE 802.11** standard. The technology is used to replace a wired LAN throughout a building. The transmission capacity is high and so is the number of simultaneous users. On the other hand it is, compared to Bluetooth wireless technology, more expensive, power consuming and the hardware requires more space and it is therefore not suited for small mobile devices.

The other 2.4 GHz radio is **Home RF** which has many similarities with the Bluetooth wireless technology. Home RF can operate ad hoc networks (data only) or be under the control of a connection point coordinating the system and providing a gateway to the telephone network (data & voice). The hop frequency is 8 Hz while a Bluetooth link hops at 1600 Hz.

**Ultra-Wideband Radio** (UWB) is a new radio technology still under development. Short pulses are transmitted in a broad frequency range. The capacity is indicated to be high while power consumption is expected to be low.

## Intellectual Property Licensing

In 1994, Ericsson invented the short-range wireless technology which in 1998 became widely known by the Bluetooth name. Now we license our Bluetooth Cores, i.e. chip design and software solutions through packages of intellectual property. Our mission is to be the world-leading provider of intellectual property for Bluetooth wireless technology.

Ericsson is able to deliver total Bluetooth solutions comprising Radio Cores, Baseband Cores, and Software Stacks and Profiles to promote faster product time-to-market for our customers. To support our intellectual property products, we offer training, consultancy, educational material and a full range of development tools. We now also offer Bluetooth Qualification Test Services (BQTF).

Our Bluetooth Cores lead the market when it comes to technical excellence and robustness in high volume production. The Bluetooth solution from Ericsson is integrated into millions of consumers products which are already assuring a proven and stable solution today. Our high quality Bluetooth Cores enable robust production, with no design re-spins needed. The Bluetooth Cores from Ericsson are pre-qualified, which means that no additional qualification is necessary.

Using the Bluetooth Cores from Ericsson is the fastest way for a manufacturer to launch new products with a minimum of R&D spending and resources. Bluetooth wireless technology is a very complex system, and Ericson has invested hundreds of man-years of development and testing over five years of calendar time, which means YOU do not have to. We make it easy for you to implement Bluetooth wireless technology with no need for any module or radio design skills.

Our Bluetooth wireless technology solution has been optimized for the mass market of mobile handheld devices from the very beginning. This means a low power design, high volume production requirements, small size, low cost and a profile portfolio targeting mobile handheld devices such as mobile phones, headsets, PDA's, cameras, etc.

The Ericsson solution is a high-performance full implementation of the Bluetooth Specification featuring:

- Lowest CPU load on the market: our architecture allows for integrated applications. More than 80% of the ARM processor power is left for applications, which lowers the total system cost.

- Full functionality: we are the first on the market with silicon that has full Bluetooth functionality: seven slaves, master/slave switch, point-to-point and multi-point, all power saving modes, and all packet types.
- Maximum Bluetooth data rate according to the Bluetooth Specification.
- High-performance robust radio designed for the toughest of all environments—the mobile phone. It is the high level of integration that makes our design so robust.

# APPENDIX C

## Questionnaires

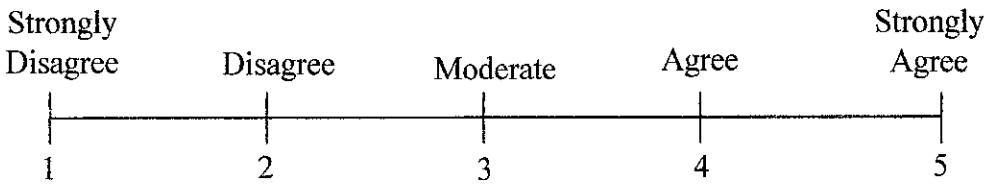
Date: _____

*The purpose of this question is to get info on the current way of lecturers handling presentations in classes. Other than that, is to get information on their opinions regarding wireless applications and technology to be implemented in lecture halls or classrooms.*

**SECTION 1: INTERACTIVENESS (communication between students and lecturer)**

1. Please rank these elements, which you think that can help you to deliver better presentation [1 for the most preferred choice and 5 for the least preferred]
   A) Equipment (eg LCD projector, OHP projector, etc)
   B) Presentation skills
   C) Knowledge on presentation contents
   D) Audience
   E) Room settings

2. Using a Likert Scale below, please indicate your respond to each of the item that follow by circling the number that best describe your feelings:




   i. Two ways communication is very important during presentations.
   1 2 3 4 5

   ii. Lecturer presents better without relying to the slide presentation.
   1 2 3 4 5

   iii. Size of the class does affect the presentation of the lecturer.
   1 2 3 4 5

   iv. Seats arrangement does affect the presentation.
   1 2 3 4 5

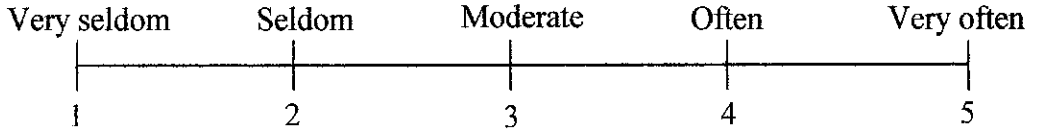
3. When do you communicate most with your students? [Choose the best 1 to 5]
   A) During class hour
   B) At the end of class hour
   C) Other from class hour

**SECTION 2: FLEXIBILITY (mobility in the class)**

4. Normally, how long do you take to set up your equipments before delivering the presentation? [Please tick (√) one only]
   A) Less than 5 minutes
   B) 5 to 10 minutes
   C) More than 10 minutes

5. What kind of problem that you usually faced during your presentations?
   A) Corrupted diskette
   B) Bring the wrong diskette
   C) Computer is not available
   D) Screen projector is not working properly
   E) Others (Please state any): _____

*Using the Likert Scale below, please indicate your respond to each of the questions (number 6 to 8) that follow by circling the number that best describe your feelings:*

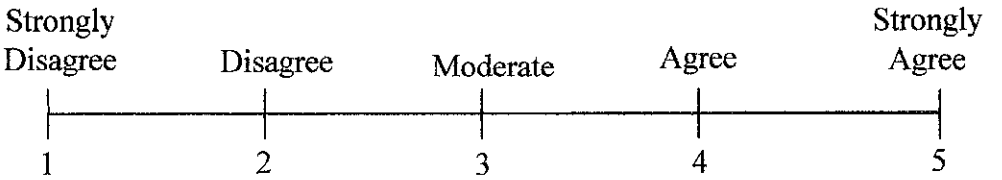



6. How often do you face the problem in setting up your presentation?
   1 2 3 4 5

7. Do you always rely on your notes while giving your lectures?
   1 2 3 4 5

8. Do you always move around while delivering your presentation?
   1 2 3 4 5

*For each statement (Question 9 to 10), please circle the number that best describe how strongly you agree or disagree using the Likert Scale below:*




9. Controlling slide with wired mouse makes it difficult for lecturers to move around.
   1 2 3 4 5

10. Holding notes or other objects is inconvenient for presenter during presentation.
    1 2 3 4 5

**SECTION 3: KNOWLEDGE LEVEL (On Wireless Technology And Applications)**

11. Your level of knowledge on wireless technology application:

| Very Poor | Poor | Moderate | Good | Very Excellent |
|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ |

12. Have you ever used wireless devices before? (eg cordless mouse, PDA, handphone, etc) If yes, please state the device:
    A) Yes, _____
    B) No

13. Please rank the wireless devices that you prefer to deliver your presentation. [1 for the most preferred and 4 for the least preferred]
    A) Cordless mouse
    B) Personal Digital Assistant (PDA)
    C) Laptop
    D) Tablet PC

14. Have you ever heard about Bluetooth technology?
    A) Yes
    B) No

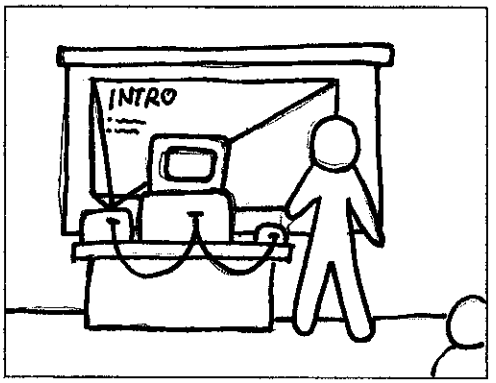
    If yes, from what sources?
    A) Internet
    B) Friends
    C) Journal/Magazine
    D) Others (Please state any): _____

15. "Using wireless applications will increase interactiveness and flexibility in the class". [Please tick (√) one only]

| Strongly Disagree | Disagree | Moderate | Agree | Strongly Agree |
|---|---|---|---|---|
| ☐ | ☐ | ☐ | ☐ | ☐ |

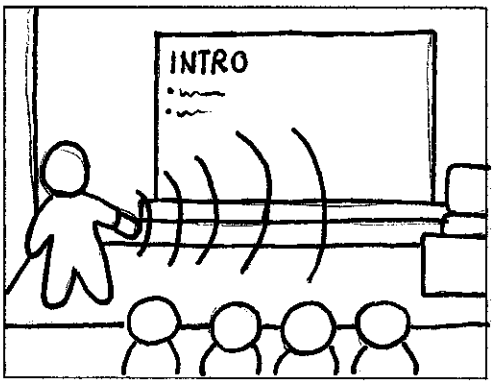
16. For this question, please refer to the diagrams below:

**Diagram A**




The diagram shows the current way in delivering the presentation in class. The presenter is using mouse and keyboard to control the slide.

**Diagram B**




The diagram shows the presentation that uses the handheld devices to remotely control the slide presentation. The presenter can move anywhere while delivering the presentation.

Based on the diagrams above, which diagram do you think will help you to deliver a better presentation?

A) Diagram A ☐
B) Diagram B ☐

17. Please recommend any suggestion

_____

_____

Thank you for your cooperation!

# APPENDIX D

## Print Screen of Simulation

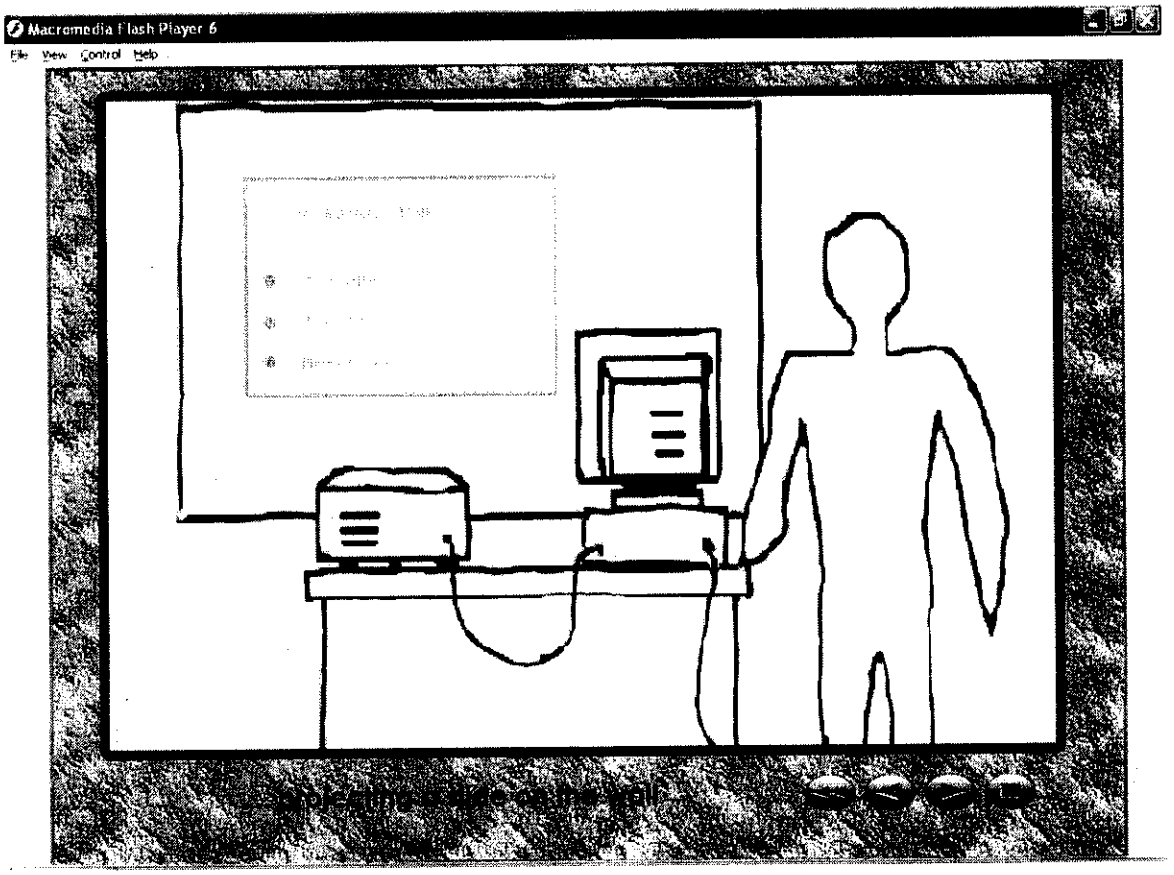



**Figure: Conventional Approach of Slide Presentations**

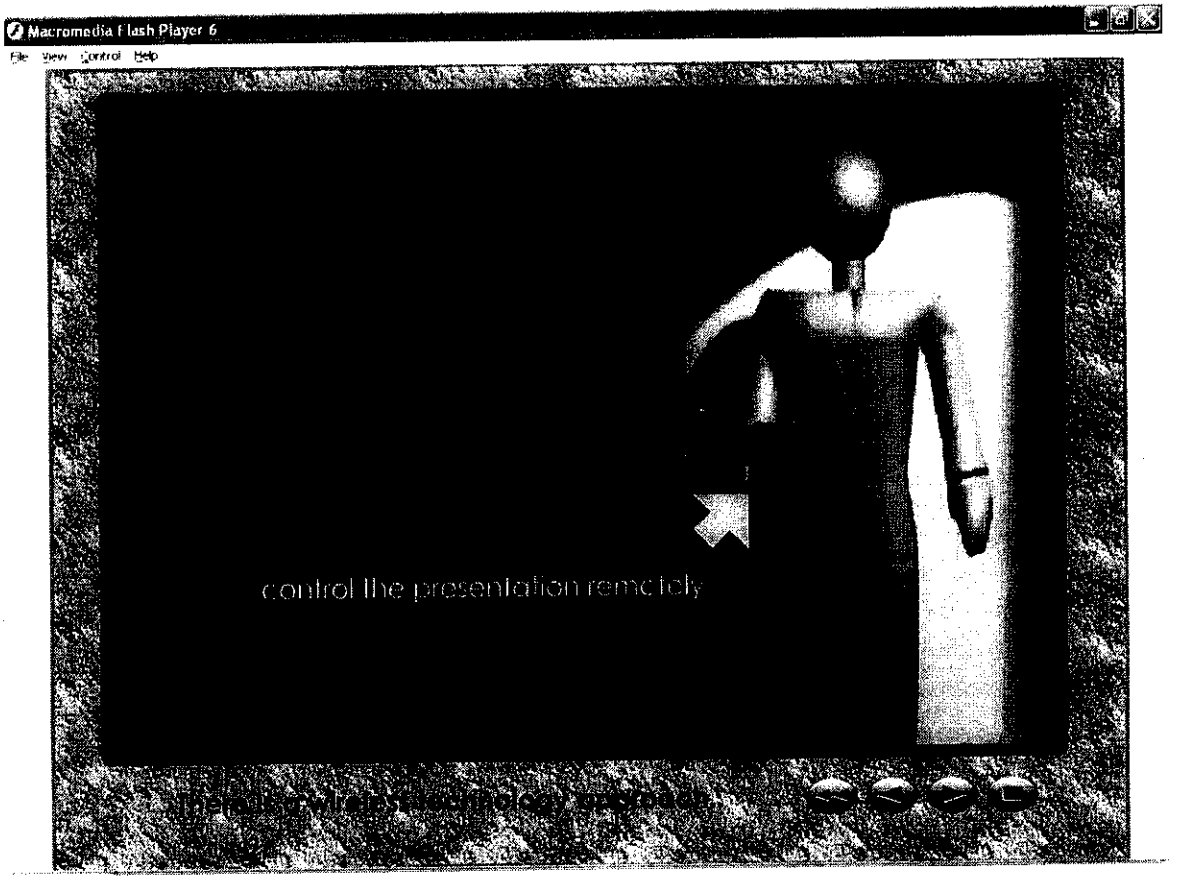



**Figure: Wireless PDA of controlling Slide Presentations**

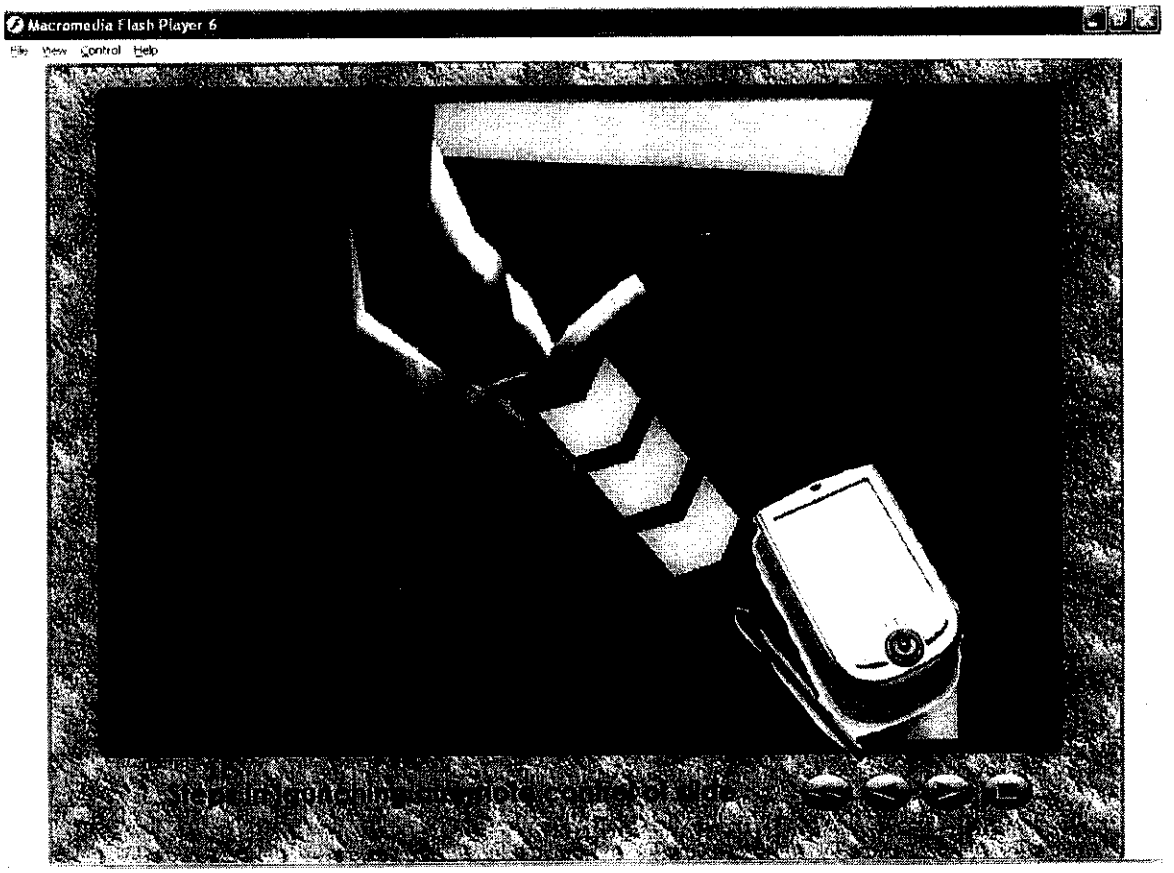



**Figure: PDA as a Remote Control**

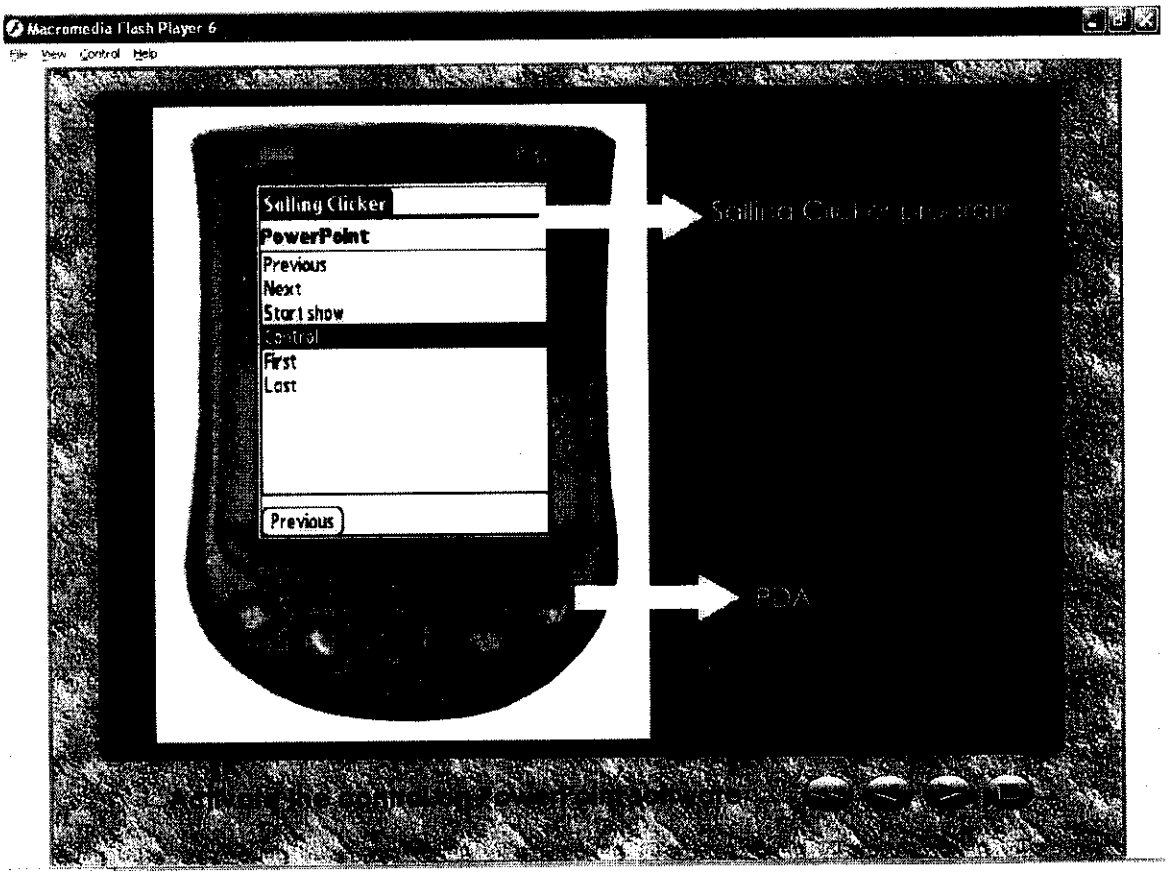



**Figure: Sailing Clicker software to control PowerPoint Slide**

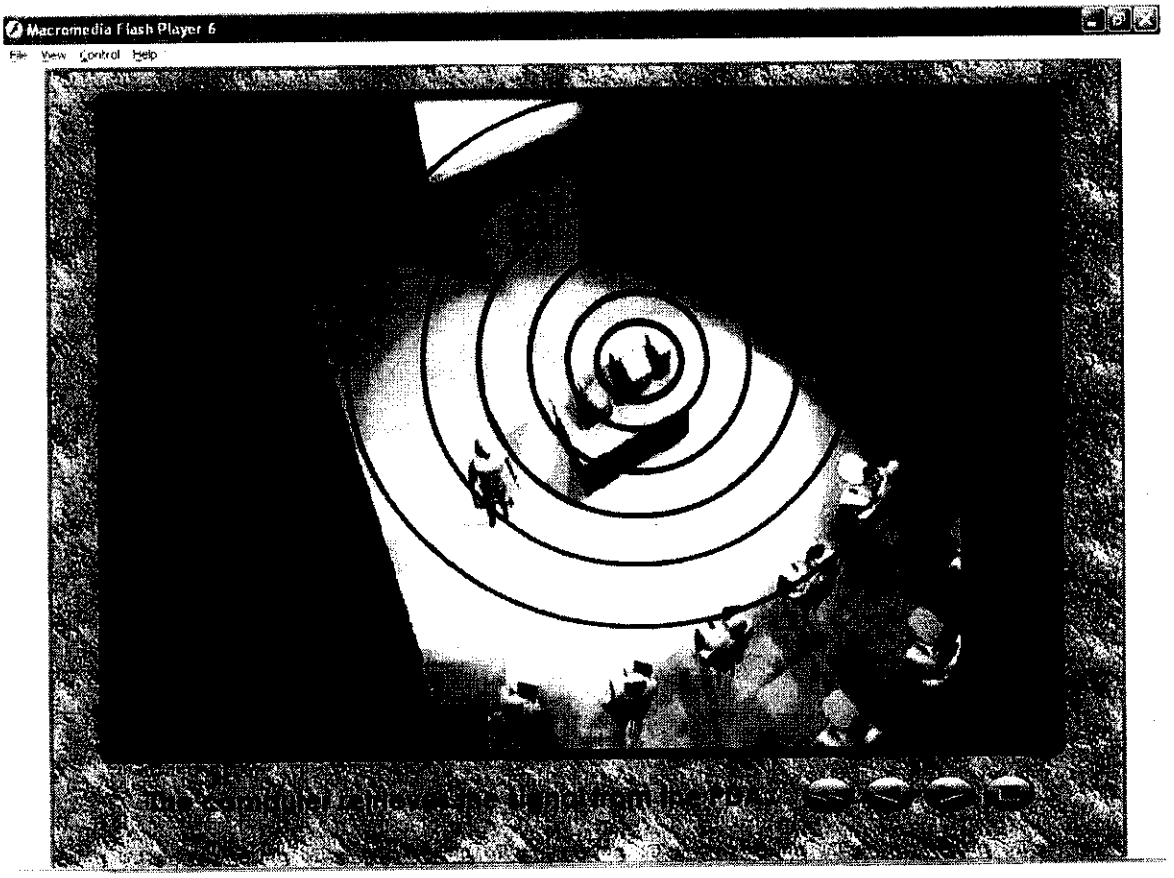



**Figure: Data transmission between computer and PDA**

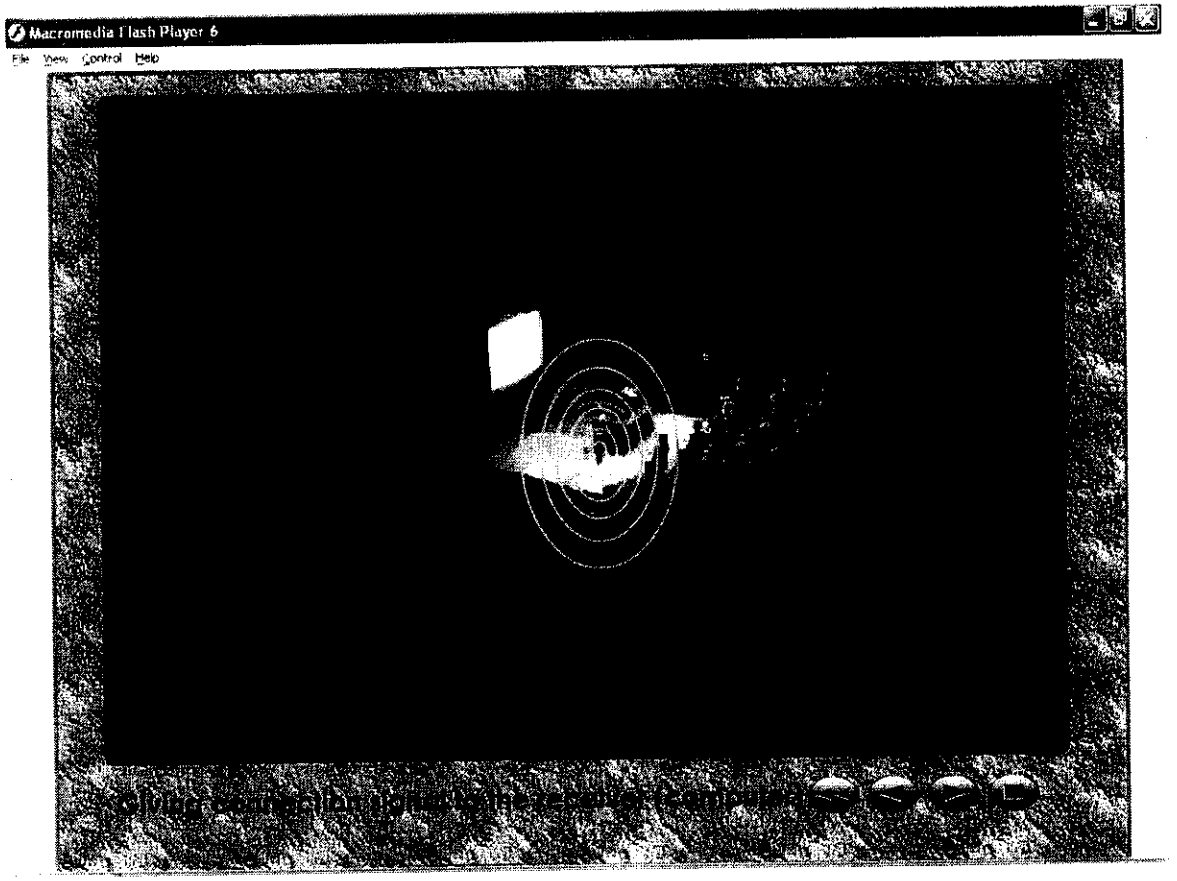



**Figure: Signal from PDA**

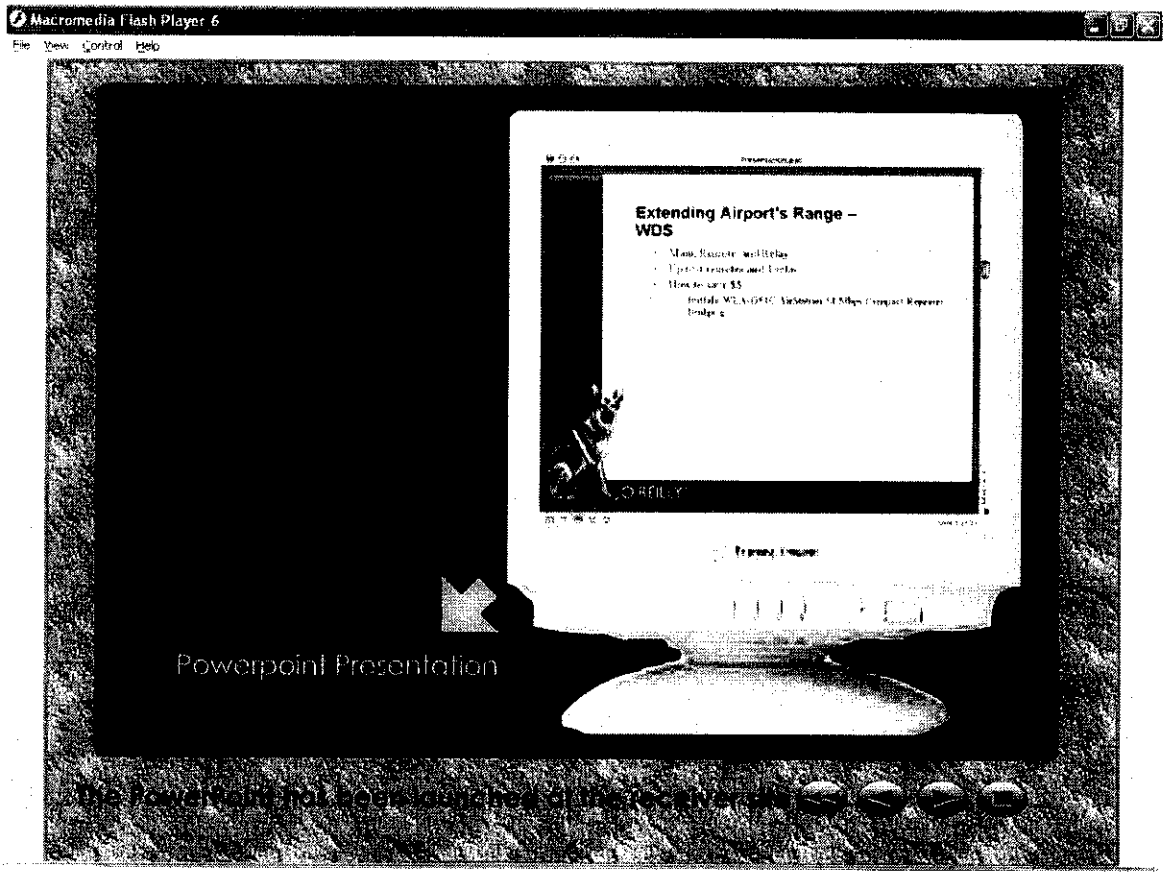



**Figure: PowerPoint Slide Presentation at the Computer that will be connected to wall screen**