Future of *Bluetooth* Wireless Technology

Derek Soh, Technical Marketing Manager –Bluetooth SIG, APAC
蘇國良,技術市務經理

ABOUT *BLUETOOTH* SPECIAL INTEREST GROUP (SIG)

- The *Bluetooth* Special Interest Group (SIG) is a privately held, not-for-profit trade association. The *Bluetooth* SIG itself does not make, manufacture, or sell *Bluetooth* enabled products

- The SIG is composed of over 5,500 members who are leaders in the telecommunications, computing, automotive, music, apparel, industrial automation, and network industries, and a small group of dedicated staff in Hong Kong, Sweden, and the USA

- SIG members drive the development of *Bluetooth* wireless technology, and implement and market the technology in their products varying from mobile phones to printers

- So when purchasing a *Bluetooth* enabled product, you are not purchasing a product from the Bluetooth SIG, but from one of its many valued members
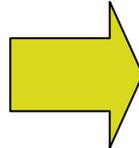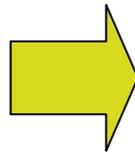
BLUETOOTH SIG MEMBERSHIP

Promoter Member
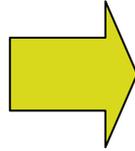
➢ Promoter companies are highly engaged in the strategic and technical development of Bluetooth wireless technology

Associate Member

➢ Granted early access to draft specifications and/or to work with other Associate and Promoter companies on enhancements to the core and profile specifications
➢ Is able to review specifications prior to their public availability
➢ Associate membership requires an Annual Fee

Adopter Member

➢ Adopter members may use published Bluetooth wireless wireless specifications and use of Bluetooth trademarks but do not have the opportunity to influence or gain early access to unpublished specifications.
➢ Adopter membership is Free

BLUETOOTH SIG MEMBERSHIP

- Eight Promoter member companies:
  Agere Systems, Inc.
  Ericsson AB
  Microsoft Corporation
  Motorola, Inc.
  Nokia Corporation
  Lenovo
  Intel Corporation
  Toshiba Corporation

- Board of Director – One seat for each Promoter

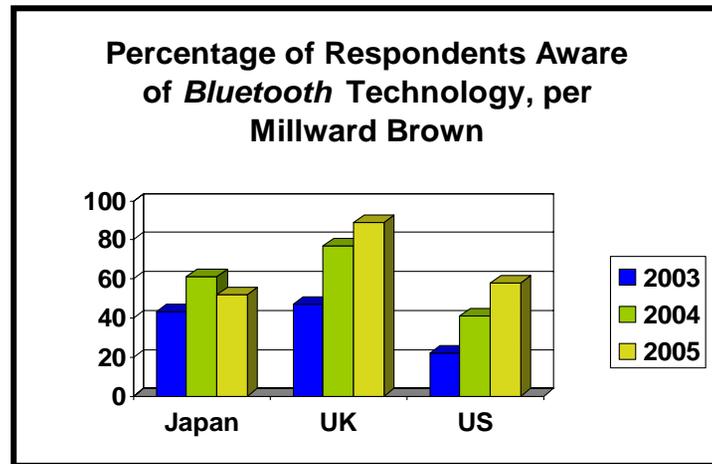# *BLUETOOTH* TECHNOLOGY GAINS ACCEPTANCE

- ## Rapid growth in 2005

  - Over 10 Million units shipping per week*

  - 44% growth in Product Listings

  - 61% growth in Devices

  - 58% awareness in the US

  * source: IMS Worldwide Market for Bluetooth Report 2005 Ed.;
  "Brand Equity Study" by Millward Brown Feb 2006

**Percentage of Respondents Aware of *Bluetooth* Technology, per Millward Brown**
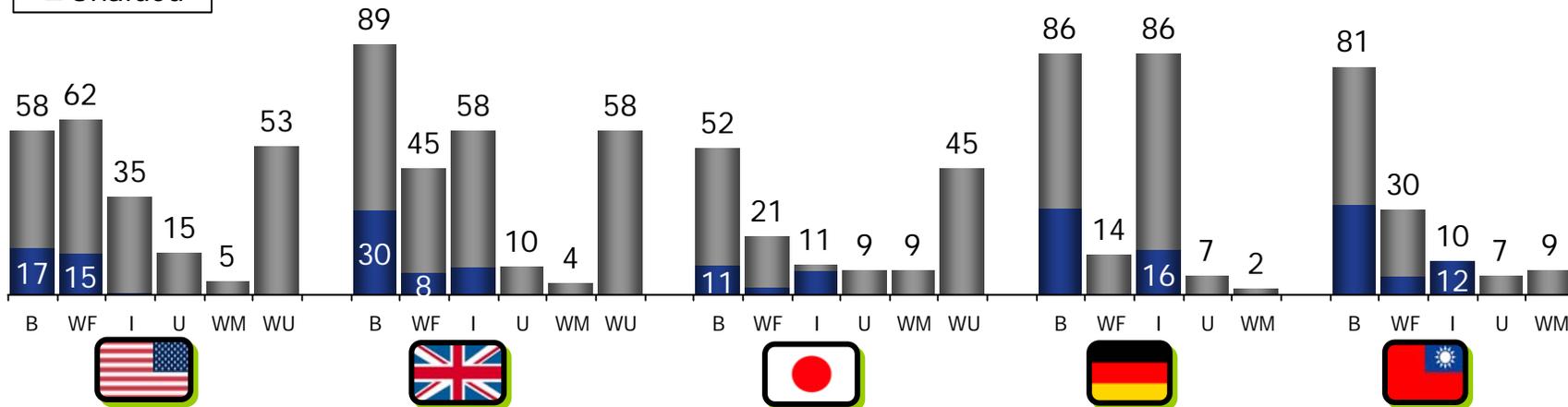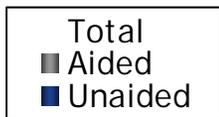
WHY USE *BLUETOOH* WIRELESS TECHNOLOGY?

Bluetooth wireless technology is a short-range communications system intended to replace cables connecting portable and/or fixed electronic devices

Technical Advantages are:

Operates in unlicensed Instrumental Scientific Medical (ISM) band at 2.4000-2.4835 GHz
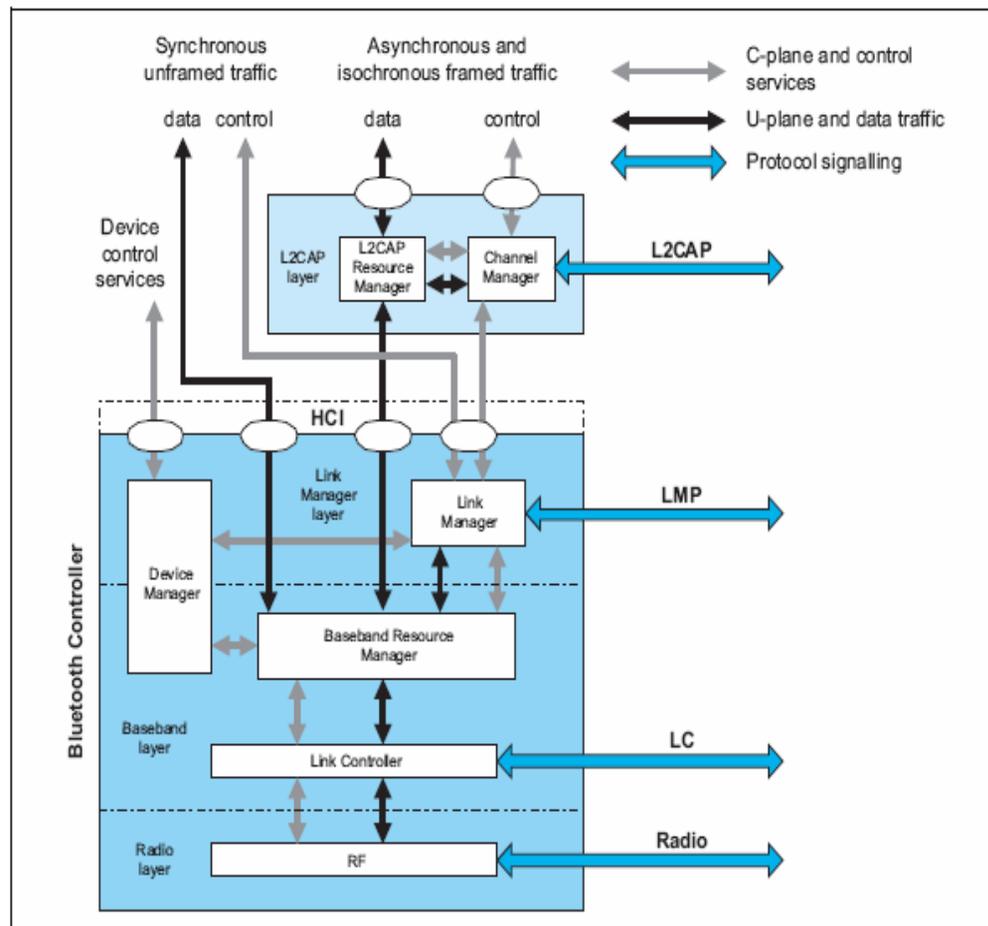
Bluetooth core system architecture
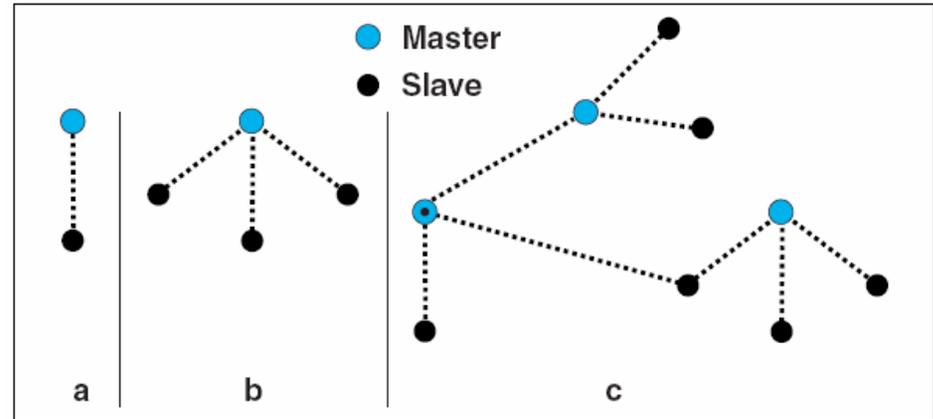
WHY USE *BLUETOOTH* WIRELESS TECHNOLOGY?

- Technology Advantages:

Ad-Hoc Networking

Enables point-to-point connection between two wireless devices which does not require a base station/router/access point

Low Cost, Low Power

Enable low power consumption, hence enable longer battery life on mobile devices

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

Power Class	Maximum Output Power (Pmax)	Nominal Output Power	Minimum Output Power[1]	Power Control
1	100 mW (20 dBm)	N/A	1 mW (0 dBm)	Pmin<+4 dBm to Pmax Optional: Pmin[2] to Pmax
2	2.5 mW (4 dBm)	1 mW (0 dBm)	0.25 mW (-6 dBm)	Optional: Pmin[2)] to Pmax
3	1 mW (0 dBm)	N/A	N/A	Optional: Pmin[2)] to Pmax

Power classes

WHY USE *BLUETOOTH* WIRELESS TECHNOLOGY?

• Technology Advantages:

Adaptive Frequency Hopping (AFH)

• Bluetooth wireless technology uses adaptive frequency hopping, "hopping" between the allocated 79 frequencies at 1,600 times per second, making it extremely difficult to intercept transmissions and limits interface from other signals

• Bluetooth has built-in security such as 128bit encryption and PIN code authentication
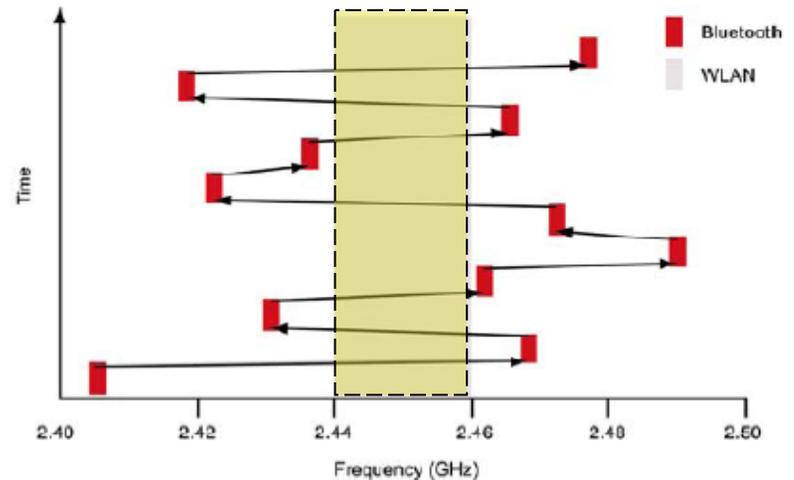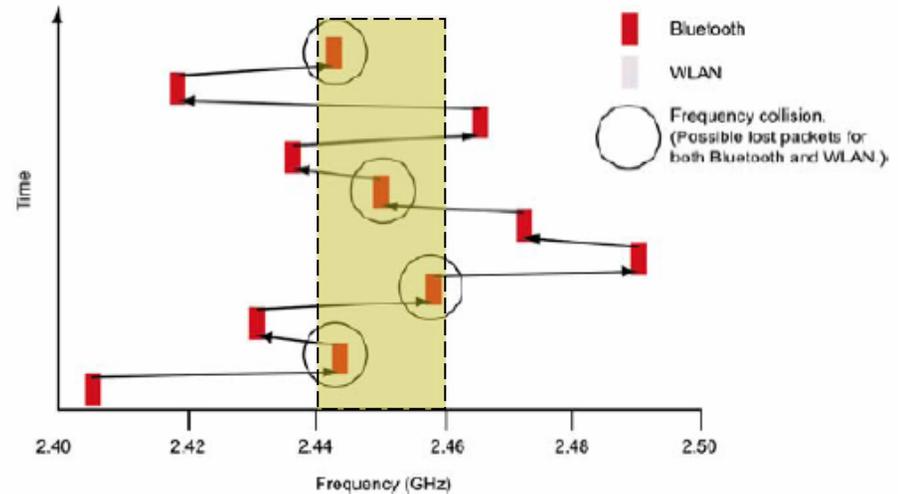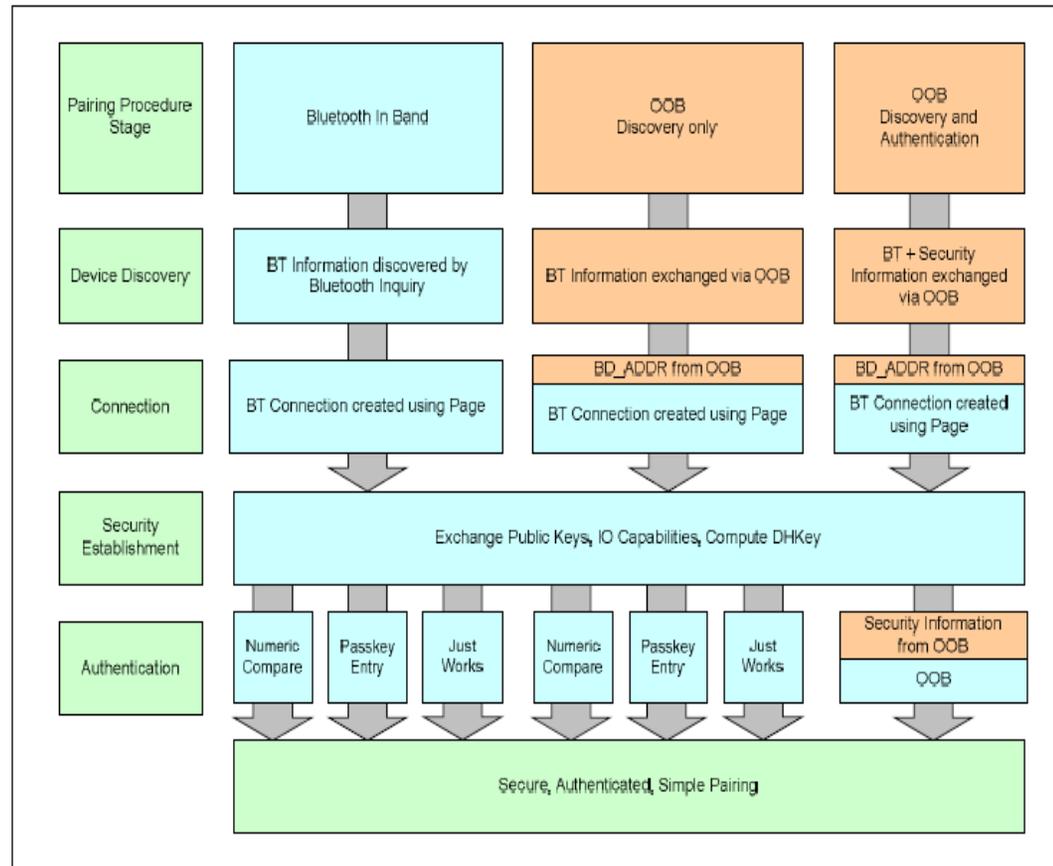
WHY USE *BLUETOOTH* WIRELESS TECHNOLOGY?

- ## Technology Advantages:

Secure & Easy-to-use

- Current Bluetooth version 2.0+EDR uses 16 Character, Numeric digit PIN, 53 bits entropy with 4 PIN implementation. E.g. "0000" or "1111"

- New improved pairing method – Simple Pairing enables pairing using a combination of in-band with numeric compare, passkey entry and Just works or Out-of-band mechanism

- Simple Pairing uses 16 Character, Case sensitive, Alphanumeric PIN with Pairing algorithm, 95 entropy, FIPS compliant, Elliptic Curve Diffe-Hellman public key cryptography with P-192 curve - 6 PIN implementation achieving 1:1,000,000 MITM protection

Simple Pairing Association Models

* Simple pairing white paper is available download from **https://www.bluetooth.org/spec/**

WHY USE *BLUETOOTH* WIRELESS TECHNOLOGY?

- Technology Advantages:

Comprehensive Application Layers

- 29 Profile Specifications
- 6 Protocol Specifications
- 4 Transport Specifications

Comprehensive Working Groups

- 13 Working Groups
- 5 Study Groups

A2DP, AVRCP, BIP, BPP, CIP, CTP, DID, DUN, FAX, FTP, GAVDP, GOEP, HCRP, HFP, HID, HSP, ICP, MAP, OPP, PAN, PBAP, SAP, SDAP, SPP, SYNCH, UDI, VCP, VDP, WAPB, AVCTP, AVDTP, BNEP, OBEX, TCP, RFCOMM

Alternate MAC/PHY, Audio/Video, Automation, Car, Core Specification, Global Navigation Satellite System, HID, ISDN, Medical Devices, Personal Area Networking, Printing, Security Expert, Marketing, Usability, Still Image, Unrestricted Digital Information, Attribute, Bluetooth Embedded Control Interface, Message Push, USB Profile, UWB (Ultra wideband)

Bluetooth
SPECIAL INTEREST GROUP

WHY USE *BLUETOOTH* WIRELESS TECHNOLOGY?

- Technology Advantages:

Roadmap to create high-speed *Bluetooth* technology

Date Rate (Mbps, Megabits Per Second)

480				Max Data Rate up to 480Mbps
:				
:				
:				
3		3 Mbps	3 Mbps	
2		2 Mbps	2 Mbps	
1	1 Mbps	1 Mbps	1 Mbps	1 Mbps
	v 1.1	v 1.2	v 2.0 + EDR	v 2.1 + EDR	Bluetooth + UWB
	2002	2003	2004	2006 *	2007 *

Bluetooth Core Specification Version
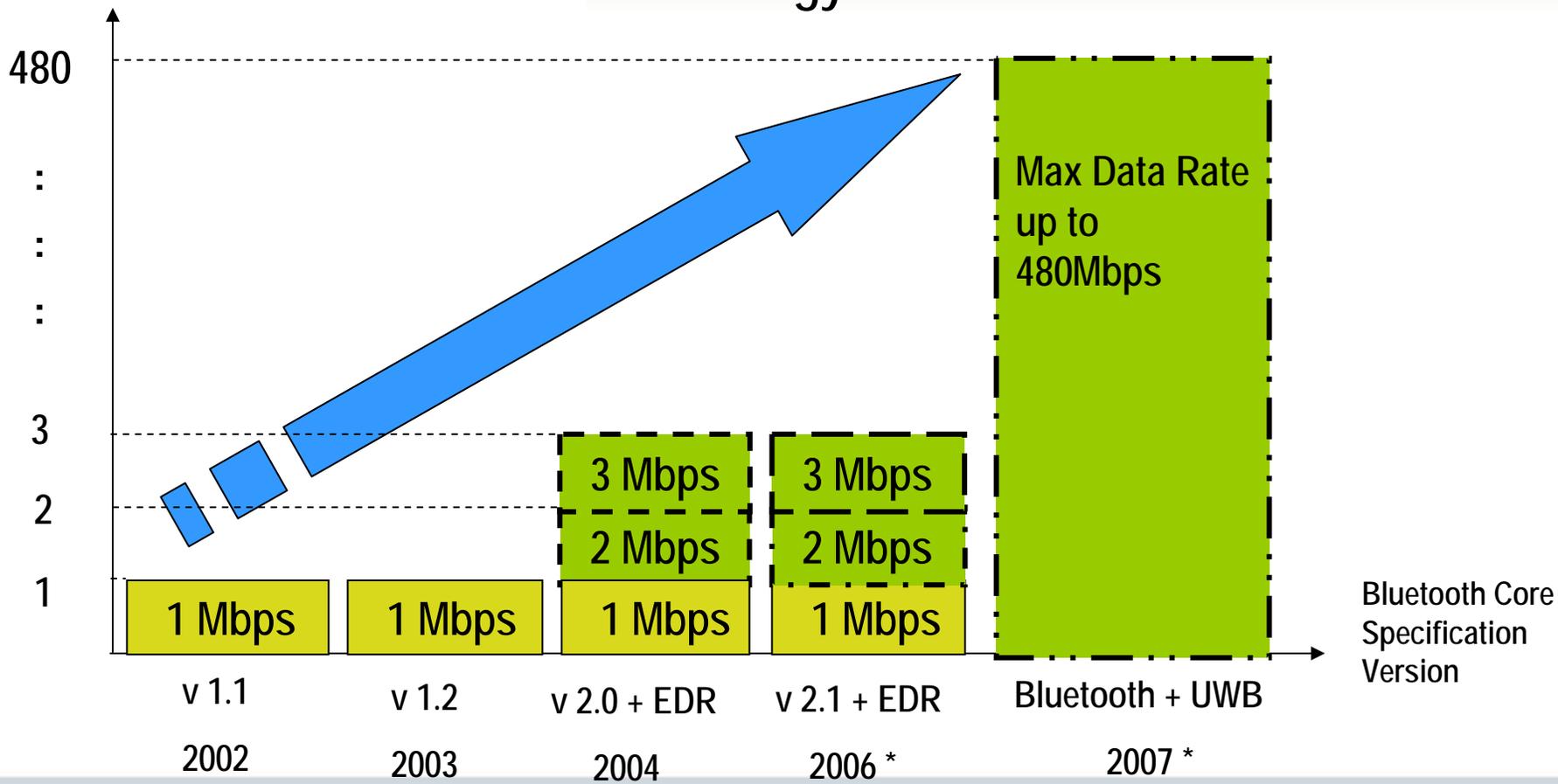
* Estimated Adoption schedule

WHY USE *BLUETOOTH* WIRELESS TECHNOLOGY?

- Technology Advantages:

Industry: Global Regulatory Acceptance

- Uses 2.4GHz ISM band which is available and unlicensed in most countries worldwide

Industry: Established Testing and Qualification Programs and Tools

- Products must comply to Bluetooth Qualification Program (BQP)

- 20 Bluetooth Qualified Test Facility (BQTF)

- 34 Bluetooth Qualification Body (BQB)

- 13 Bluetooth Technical Assessor (BTA)

- Profile Tuning Suite (PTS)

WHY USE *BLUETOOTH* WIRELESS TECHNOLOGY?

- Industry Acceptance:
  - Over 5,930 Members Worldwide
  - Over 3,400 Qualified Product Listing to date

BLUETOOTH FEATURES DRIVING BUSINESS SUCCESS

- Low cost, High value
  - High Volumes = Low Chip Prices
  - Selling point for high-end products like Automobiles
  - Merrill Lynch's Analyst Srini Pajjuri: "*Bluetooth* units sold will grow by 450% by 2008; *Bluetooth* chip market will be a $2 Billion opportunity in 2008."

CSR BANKS ON *BLUETOOTH*

- ## CSR Case Study

  - CSR 1st Half 2006 Revenue 97% higher year-on-year

  - CEO John Scarisbrook: "Our results reflect the growth of the *Bluetooth* market; We continue to see significant opportunities in the Bluetooth market with estimates ranging from 500 to 550 million unit shipments for the whole of 2006."

BLUETOOTH TECHNOLOGY AT WORK

- **Businesses accepting** *Bluetooth* **technology**
  - Mobile workers on the rise; devices bridge personal and work lives
  - Front door or back door, products are coming
  - Enterprises developing company policy to ensure educated/secure use; Preparedness can mean:
    - *Reduced costs*
    - *Secure Usage*
    - *Gained Efficiency*
    - *Greater Reliability*
- *Bluetooth* **applications improve productivity for the mobile workforce**
  - Printing, Synchronization, Ad-Hoc File share, Presenting, Teleconferencing, Mouse/Keyboard, Hands-Free solutions, Logistics

TODAY'S *BLUETOOTH* APPLICATIONS IN BUSINESS

HEADSET

PRINT

INPUT

TRANSFER

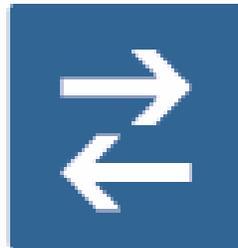# BLUETOOTH SIG PROGRAM AIDS PURCHASING

- Experience Icons

  – A ubiquitous cross-industry communications tool for product manufacturers to communicate *Bluetooth* capabilities in products

  – Achieving more informed purchase decisions by IT Managers/Buyers, managing expectations

  – A supplement to existing product information and instructions
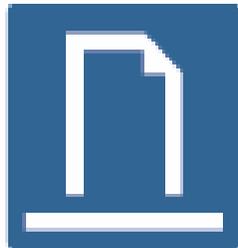
HEADSET   **PRINTING**   **TRANSFER**   **STEREO**   **INPUT**

VERTICAL OPPORTUNITIES

- *Bluetooth* deployment increases operational efficiency
  - Transportation
  - Logistics
  - Retail
  - Distribution
  - Healthcare
  - Manufacturing
  - Factory Automation

BLUETOOTH TECHNOLOGY DELIVERS – LOGISTICS DISTRIBUTION

- FedEx Case Study
  - Utilized in 'Power Pads', *Bluetooth* enabled device
  - Handheld an capture signatures electronically, and couriers can access dispatch information wirelessly without having to go back to dispatch vehicles
  - Ken Pasley, Director of Wireless Systems Development, FedEx: "*Bluetooth* technology adds to the productivity of the courier; eliminating cables aids safety and flexibility."
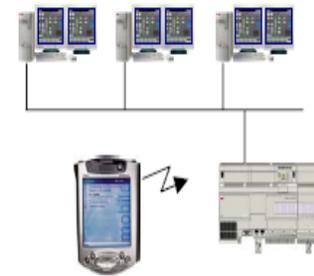
ABB Case Study

- *Bluetooth* wireless technology implemented a solution, as part of ABB Industrial control system to provide wireless maintenance and operations of water pump in Oslo

- The installation enables the utility's service engineers to use a standard Bluetooth-enabled laptop or PDA to instantly establish a wireless connection with any pump station and monitor the status of the equipment, access stored data and make any adjustments necessary

Volvo Case Study:

- Volvo's worldwide central spare parts warehouse for passenger cars uses its own in-house developed inventory system and a computer solution that is mounted on forklift trucks with inbuilt Bluetooth wireless technology

-Computers mounted on forklift trucks are connected to inventory system wirelessly. Driver scans in the goods arrive in the warehouse with a scanner linked to the truck PC. Truck PC will show driver where to place them

- All information available in the truck PC online: receiving department, status reports, when the item is in place, and when the item is dispatched from central warehouse.

- This enable workers to pick orders and carry out more administrative tasks and made the job more independent

BLUETOOTH TECHNOLOGY – INDUSTRIAL USE CASES

Wireless User Interface

– Any device with RS-232 interface and handheld with Serial Port Profile (SPP) or RFCOMM can connect wireless to obtain information to a Bluetooth Module/Device. E.g. Phone/PDA/notebook can connect using Bluetooth technology to Devices via SPP or PAN

- Applications include Point-of Sales systems, Barcode Scanners, Medical measurement and Data transfer systems, Automotive inspection and measurement systems, Telemetry and machine-to-machine interfaces, Voice communication, Industrial PCs and laptops, Logistics and transportation systems and fleet management, Fitness and sports Telemetry,etc

Industrial Access Points

- Access Points are used to connect several Bluetooth devices to existing wired network. Wired network may be an IP-based network (e.g. Ethernet) or an industrial fieldbus (e.g. Controlnet, Devicenet, Profibus and Interbus)

BLUETOOTH TECHNOLOGY – INDUSTRIAL USE CASES

Serial Cable Replacement
– Any serial port adapter with Bluetooth Serial Port Profile allows any device with an UART/RS232/RS422/RS485 port to communicate wirelessly without extra soft installation. Bluetooth adapter emulates a serial uses RFCOMM protocol to transfer data over the air

- Applications include Bar code scanners, Telemetry and machine-to-machine interfaces, Voice communication, GPS, Industrial device, Vending machine, PLC etc

Wireless Sensors and Actuators
– Connect devices that are closest to physical process (sensors, actuators and simple analog/digital IO-devices) to supervisory systems using Bluetooth

- Slow control loops are executed over Bluetooth and buffered data are transferred using Bluetooth. E.g. Vibration sensors on a moving axis

BLUETOOTH TECHNOLOGY – INDUSTRIAL NETWORKING IMPLEMENTATION
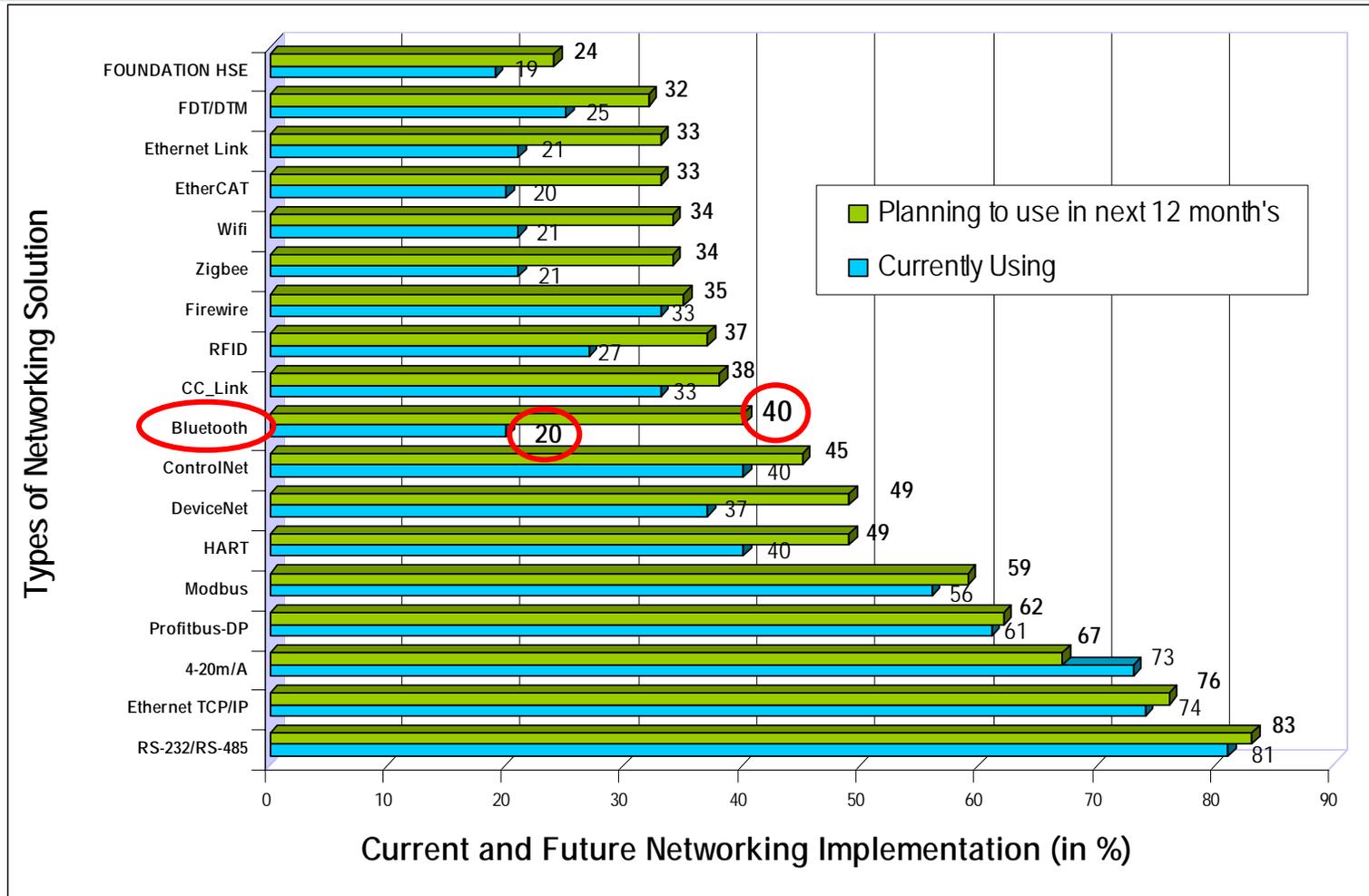
Source: Control Engineering China Magazine, Aug 2006

MOVING AHEAD AT HIGH SPEED

- High-Speed *Bluetooth* technology
  - Bluetooth SIG and WiMedia Alliance developing a combined solution
  - Solution will utilize strengths of both
    - UWB radio to enable high-speed applications
    - *Bluetooth* radio allows continued support for low power applications like mice and headsets
  - Technology will be branded under *Bluetooth* trademark and be backwards compatible with devices today

TOMORROW'S *BLUETOOTH* APPLICATIONS IN BUSINESS

Imaging

Large File Transfer

Video Streaming

IN CLOSING, *BLUETOOTH* TECHNOLOGY...

- Is firmly established as the short-range wireless solution for voice and data transmissions

- Projected to continue to grow, offering a safe bet for business

- Is being used increasingly by the mobile workforce and more frequently in enterprise environments

- Will be combined with other wireless technologies to achieve better wireless solutions, for the consumer and business

USEFUL BLUETOOTH SIG APAC TEAM CONTACTS

– Linda Ho (何萬莊)
  - Marketing Director, APAC & Japan
  - Telephone : +852 2251 8129
  - lho@bluetooth.com

– Heidy Chow (周珮君)
  - Marketing Program Manager, APAC
  - Telephone : +852 2251 8717
  - hchow@bluetooth.com

– Derek Soh (蘇國良)
  - Technical & Marketing Manager, APAC
  - Telephone : +852 2251 8727
  - dsoh@bluetooth.com

Thank You