



An Introduction to Bluetooth

Stonestreet One

Presentation Goals

What is Bluetooth?

Can we buy it?

Can we implement it ourselves?

What can it do?

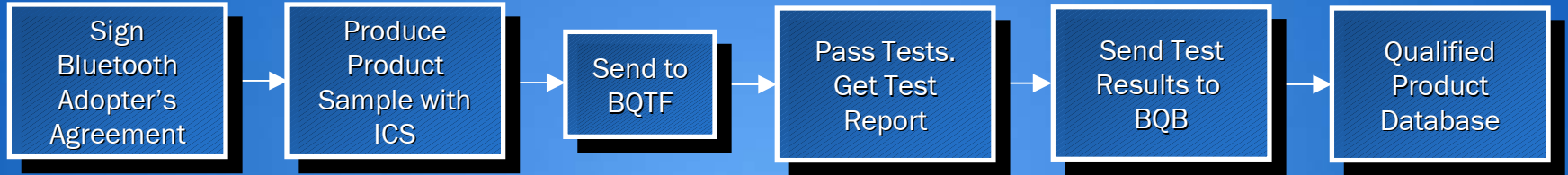
Cost?

Time?

Bluetooth History

- Began as a private development effort at Ericsson in 1994
- 5 companies joined to form the Bluetooth Special Interest Group (SIG) in 1998
- First specification released in July 1999
- Current specification is version 1.1

Bluetooth Qualification



- Interoperability is key to success
- SIG defines Qualification process
- Qualified device may use the Bluetooth logo and trademark
- Qualified products listed on the Bluetooth SIG website

Bluetooth SIG Overview

- Membership Levels
 - Promoter Companies
 - Associate Members
 - Adopter Companies
- Organization
 - Management
 - Marketing
 - Qualification (BQB, BQTF)
 - Working Groups

Bluetooth Goals

- Open Specification
- Voice and Data Capability
- Worldwide Usability
- Short-Range Wireless Solutions

Where does Bluetooth fit in?

Technology	Ideal Application	Range (m)	Data Rate (Mbps)	Current Required	Cost (\$)	Connection Type
IR	Device synchronization, data transfer	1	16	Low	10	Single Freq
Bluetooth	Cable Replacement, Ad hoc PAN	10-100	< 1	Medium	10	FHSS
HomeRF	PCs to consumer goods	50	1-2	High	45	FHSS
802.11b	High speed LAN	100+	11	High	45	DSSS

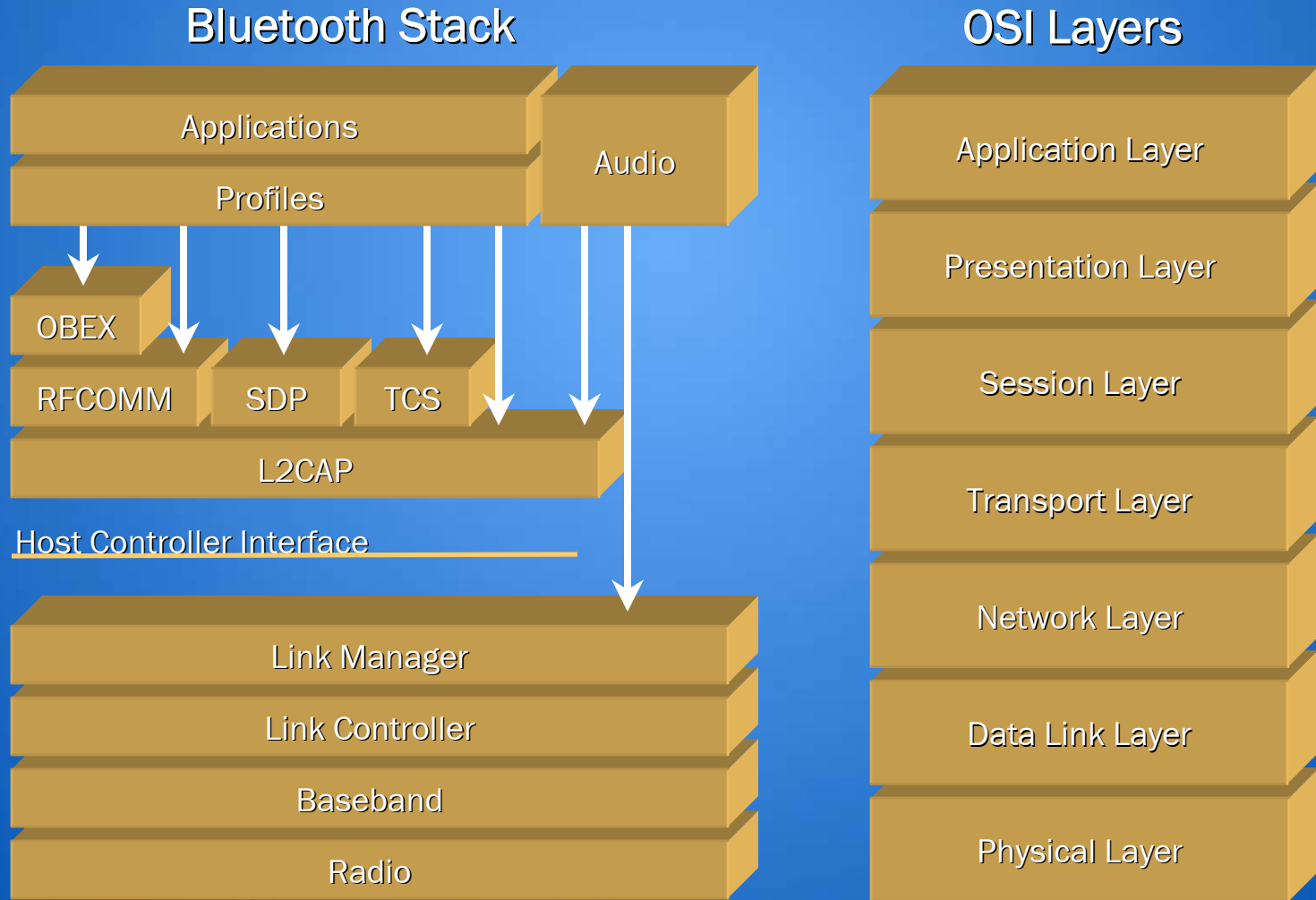
Bluetooth Technology 101

- Radio Frequency Based
- 2.4 GHz ISM band
- Bandwidth
- Maximum – 723.2 kb/s
- Specification includes Protocols and Profiles

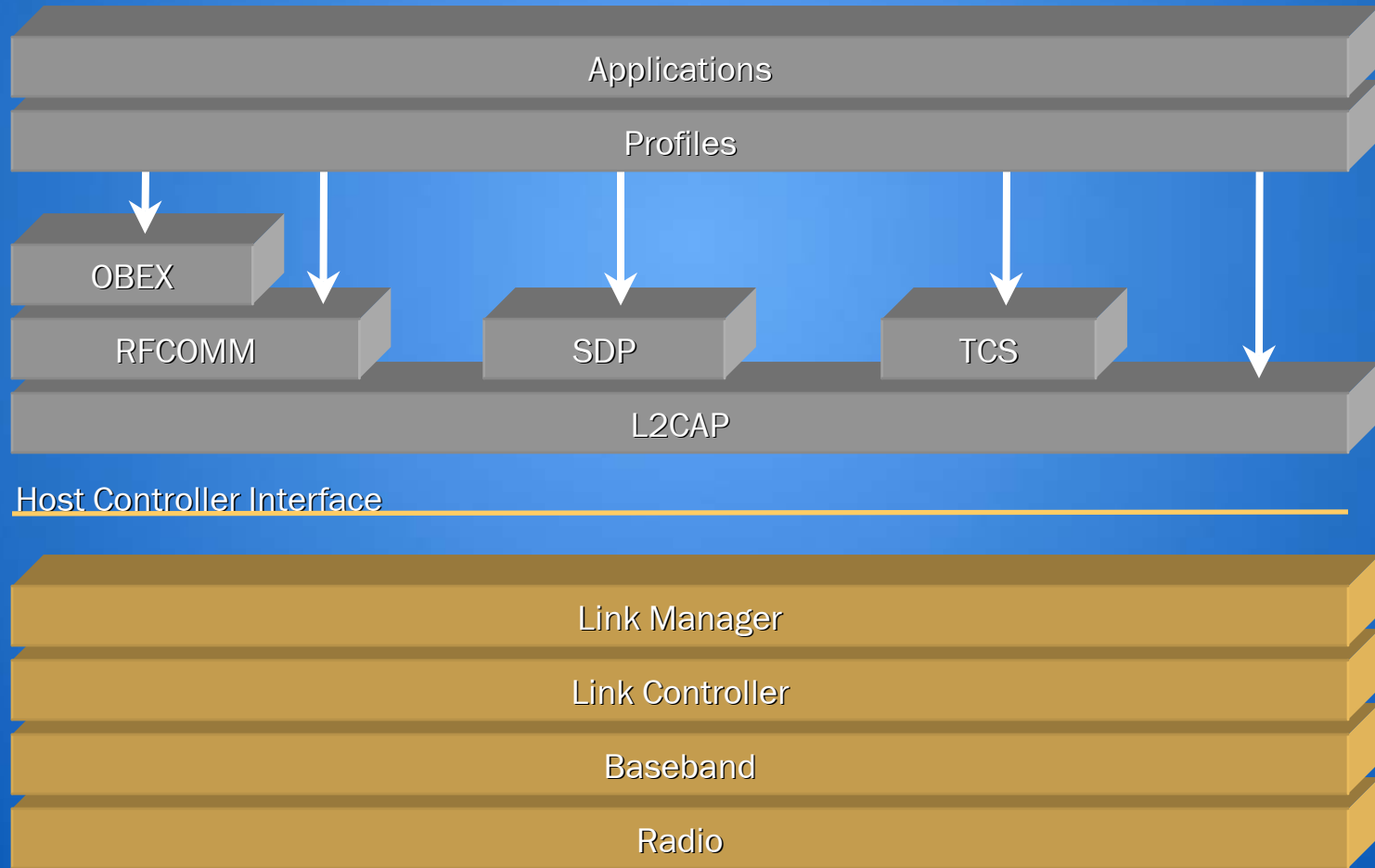
Bluetooth Data Rates

Packet Type	Max Payload (bytes)	Symmetric Rate (kbps)	Asymmetric Rate (kbps) Forward	Asymmetric Rate (kbps) Reverse
DM1	17	108.8	108.8	108.8
DH1	27	172.8	172.8	172.8
DM3	121	258.1	387.2	54.4
DH3	183	390.4	585.6	86.4
DM5	224	286.7	477.8	36.3
DH5	339	433.9	723.2	57.6
HV1	10	64	n/a	n/a
HV2	20	64	n/a	n/a
HV3	30	64	n/a	n/a

Bluetooth Protocol Stack



Bluetooth Modules

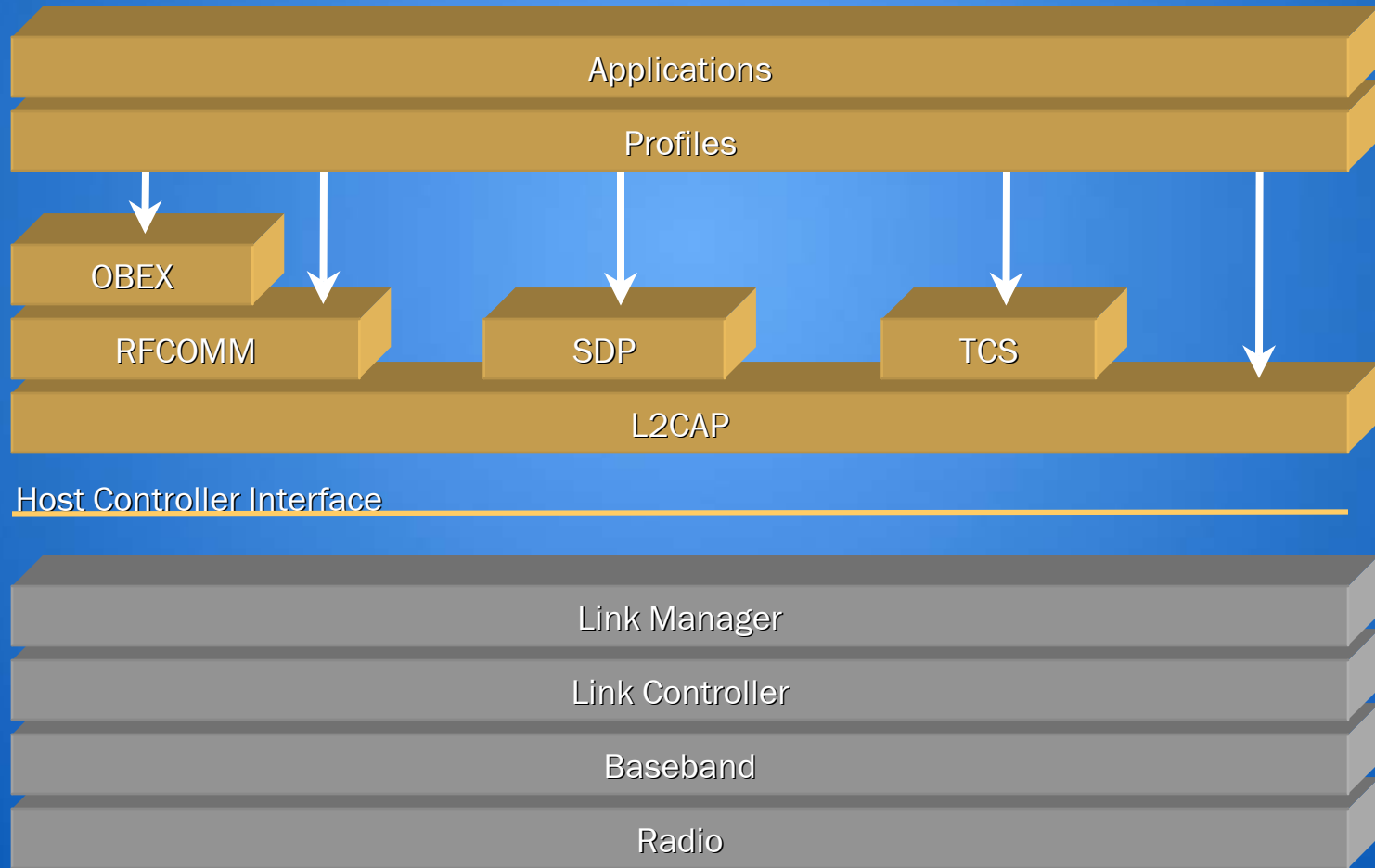


Bluetooth Modules (con't)

	Power	Range
Class 1	20 dBm	100 m
Class 2	0-4 dBm	10 m
Class 3	0 dBm	1 m

Interface	
USB	Universal Serial Bus
UART	Universal Asynchronous Receiver-Transmitter

Bluetooth Protocol Stacks



Usage Model vs. Profiles

- Usage Models
 - Define real world situations
 - Resulted in profiles
- Profiles
 - Included in the specification
 - Instructions for implementing Usage Models

Real World Scenarios

- Cable Replacement
 - PCs & peripherals, home networking, headsets
- Data and Voice Access Points
 - E-mail, web access, cordless telephone, etc.
- Ad-hoc Networking
 - Business card exchange, multi-player games, vending machines, white goods, etc.
- Medical
 - Monitoring devices
- Industrial
 - Inventory management systems

Specification v1.1 Profiles

- Generic Access Profile
- Service Discovery Application Profile
- Serial Port Profile
 - Virtual COM port
 - Dial-up Networking Profile
 - FAX Profile
 - LAN Access Profile
 - Headset Profile

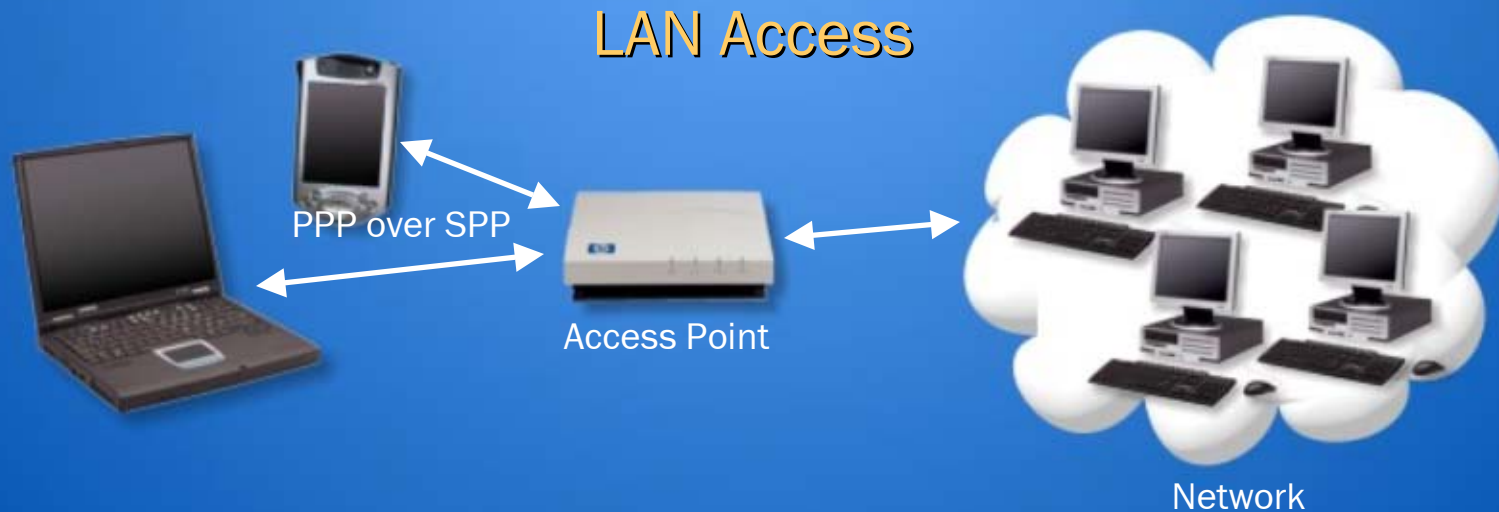
Specification v1.1 Profiles (con't)

- Generic Object Exchange Profile
 - Object Push Profile
 - File Transfer Profile
 - Synchronization Profile
- TCS
 - Cordless Telephony Profile
 - Intercom Profile

Post Specification v1.1 Profiles

- Human Interface Profile
- Hands-free Profile
- Hardcopy Cable Replacement Profile
- Personal Area Networking
- SIM Access Profile
- Audio/Video Profiles
- Printing Profiles
- Others

Networking Profiles



Headset Profile



Profile provides:

- Both devices must provide capability to initiate connection and accept/terminate calls.
- Volume can be controlled from either device.
- Audio gateway can notify headset of an incoming call.

Object Push Profile



Profile provides:

- Limited client-server interactions:
 - exchange objects between devices
 - pull objects from server
 - push objects to server
- Uses OBEX to transfer vCard, vCalendar, vNote, and vMessage objects.

File Transfer Profile



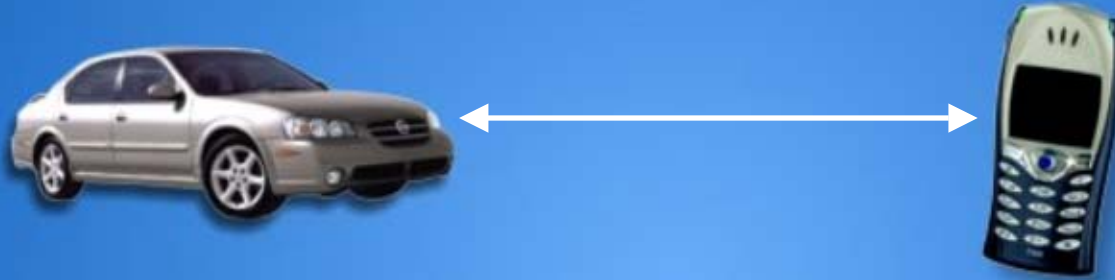
Profile provides:

- Enhanced client-server interactions:
 - browse, create, transfer folders
 - browse, pull, push, delete files
- Uses OBEX

TCS Profiles



Hands Free Profile



Profile supports:

- Hands-free unit may support these capabilities:
 - Retrieve and display registration status
 - Retrieve and display call status
 - Initiate, answer, reject, terminate a call
 - Initiate a call using voice recognition
 - Initiate a call using memory dialing
 - Three-way calling
 - Volume control

Human Interface Device Profile



- Other HID devices:
 - knobs
 - switches
 - buttons
 - sliders
 - trackballs

The Future of Bluetooth

- Radio2 Working Group
 - Working to overcome bandwidth, interference, and connection setup issues while remaining compatible with current radio
- Other Working Groups
 - Audio/Video, Car, Co-existence, HCI, ISDN, Local Positioning, Personal Area Networking, Printing, Still Image, UDI
- Study Groups
 - Industrial Automation

Requirements of Success

- Interoperability
 - Between manufacturers
 - Between types of devices
- Ease of Use
 - No user's guide
 - Self-descriptive interface
- Low Price
 - Same or less than the cable it is replacing
- Low Power Consumption
 - No/little additional charging



About Stonestreet One

Company Overview

- Short-range wireless solutions provider
- Specialize in embedded application design and development
- Provide services to leading companies in industries such as:
 - Automotive
 - Mobile communications
 - Food Service Equipment
 - Biomedical
 - Industrial Controls

Bluetooth Experience

- Associate Member; Bluetooth SIG
- First Bluetooth stack Qualified in December 2000
- Developed Bluetooth training course
- Provides Bluetooth design services to numerous Fortune 1000 companies
- Relationships with over 50 customers and 16 partners

Bluetooth Partners

- Alps
- Avnet
- Ericsson
- gigaAnt
- Hitachi
- Memec/Insight
- MindReady
- MontaVista
- Philips
- QNX
- Silicon Wave
- Taiyo Yuden
- Texas Instruments
- Toshiba
- Wind River
- Zeevo

Bluetopia[®] Bluetooth Protocol Stack

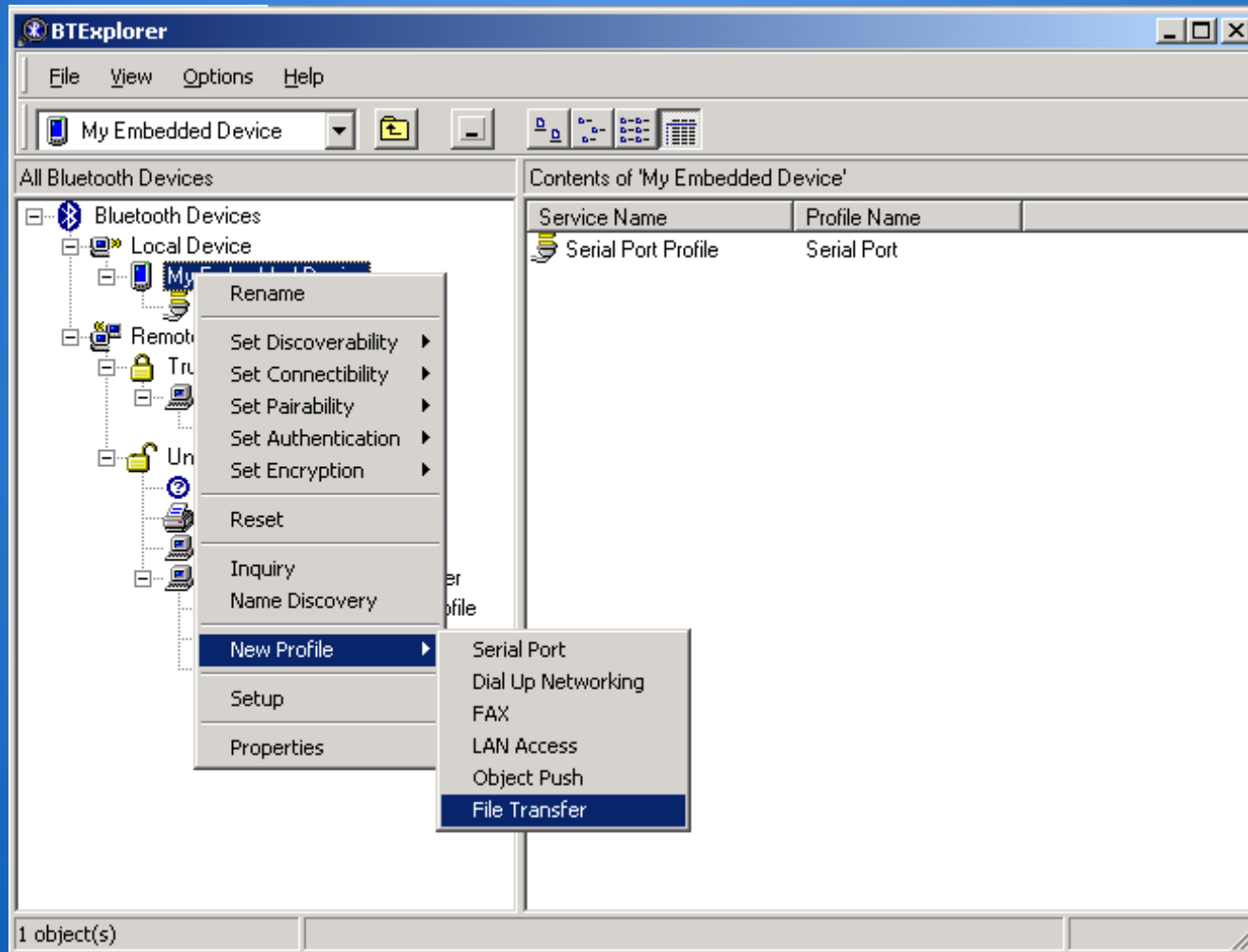


bluetopia[®]
protocol stack

Bluetopia Features

- Written in ANSI-C
- Customizable RAM and ROM requirements
- Hardware encapsulation, along with ANSI-C and flexible RAM/ROM footprint, allows for ease of porting
- Shared API among existing platforms
- Proven on numerous Operating Systems, processors, and Bluetooth chipsets
- Versions of Bluetopia for major operating systems (Windows, Windows CE, QNX, Linux) allow for easier prototyping and testing of embedded applications

BTExplorer Connectivity Application



Bluetooth Development Tools & Hardware



DP Series Bluetooth Development Tool Set

Bluetooth Hardware



- SPR-200
 - RS232 cable replacement
 - optional battery power
 - application/processor on-board
 - use for development
 - use for reference designs
 - Available from Inside Out Networks



- USB Dongle
 - line powered
 - compact size
 - FCC Certified
 - Bluetooth Qualified

Bluetooth Design Services

- “Total Bluetooth Solution”
 - Turnkey product prototype development
- Hardware and software
- Customized OEM modules
- Application development
- Expert Bluetooth engineers with valuable development experience



Stonestreet One Summary

- Bluetooth Products and Services
 - Bluetopia Bluetooth Protocol Stack
 - BTExplorer
 - Development Tools
 - Products
- Engineering Services

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