

Windows Sockets 2

*A joint meeting of the
Operating Framework
and
Generic API Extensions
functionality groups*

December 12, 1994

Agenda

<i>9:00 - 9:30</i>	<i>Arrivals and Introductions</i>
<i>9:30 - 9:45</i>	<i>Meeting Objectives</i>
<i>9:45 - 10:00</i>	<i>Brief Historical Background</i>
<i>10:00 - 12:00</i>	<i>Technical Presentation</i>
<i>12:00 - 1:00</i>	<i>Lunch Break</i>
<i>1:00 - 2:30</i>	<i>Technical Presentation</i>
<i>2:30 - 3:00</i>	<i>Next Steps</i>
<i>3:00 - ???</i>	<i>General Q&A / Feedback</i>

Technical Presentation Outline

Requirements Summary

New Features by Category

*Simultaneous access to multiple transport
providers*

Latency and throughput enhancements

Quality of Service

Generic functionality extensions

Open Issues

Meeting Objectives

Report on a joint effort to produce core elements of a strawman spec

Answer questions and solicit feedback

Goal: API and SPI specs published by Christmas

Refine the process for moving Winsock 2 forward

A Brief Historical Perspective

How the strawman team came to be
Motivations
Work methods and time span

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Operating Framework Requirements

<i>Requirement</i>	<i>Status</i>
<i>1) Operating System versions - Windows 3.1, Windows 3.11, Windows 95, Windows NT</i>	<i>✓</i>
<i>2) Architecture</i>	<i>✓</i>
<i>3) Multiple protocol stacks on a single host via a single DLL</i>	<i>✓</i>
<i>4) Mechanism for determining version of a specific Window Sockets DLL</i>	<i>Partial</i>
<i>5) Configuration</i>	<i>✓</i>
<i>6) Clearinghouse for address family, protocol, socket type, and socket option ordinals</i>	<i>✓</i>

Generic API Requirements

<i>Requirement</i>	<i>Status</i>
<i>1) C++ class libraries</i>	<i>Deferred</i>
<i>2) Callbacks</i>	✓
<i>3) Shared sockets</i>	✓
<i>4) More socket types</i>	✓
<i>5) Send and recv from preemptive context</i>	✓
<i>6) Socket groups</i>	✓
<i>7) User data exchange during conn setup</i>	✓
<i>8) Apps can establish host name/addr</i>	<i>Disagree</i>
<i>9) Quality of service</i>	✓
<i>10) Conditional acceptance</i>	✓
<i>11) Allow optional winsock extensions</i>	<i>Partial</i>

Generic API Requirements (cont)

<i>Requirement</i>	<i>Status</i>
<i>12) Prevent reentrant msgs while blocking</i>	<i>blocking hook</i>
<i>13) Define std error text</i>	<i>pending</i>
<i>14) Define std debugging paradigm</i>	<i>needed?</i>
<i>15) Way to get DLL version</i>	<i>✓</i>
<i>16) Asymmetric send / recv msg size</i>	<i>pending</i>
<i>17) Scatter / gather [readv(), writev()]</i>	<i>needed?</i>
<i>18) Asynchronous (overlapped) I/O</i>	<i>✓</i>
<i>19) Sock opts for send / recv timeouts</i>	<i>event objects</i>
<i>20) Four byte per socket context value</i>	<i>disagree</i>
<i>21) Support for msg-oriented (partial) recv</i>	<i>✓</i>
<i>22) Re-enabling after error in FD_READ</i>	<i>needed?</i>

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SP discovery and usage model

Standardized Winsock2 DLLs

Service Provider Interfaces (16 and 32 bit)

Multiple Simultaneous Protocols: A Paradigm Shift

Old: well-known socket types and protocol values

Apps hard coded to certain protos because of their well-known attributes

New: don't care about socket type and protocol value

Apps select protos on the basis of their attributes - need not be hard coded!

Multiple Protocols from an Application's Perspective

Client / Server apps

Servers listen on all suitable protocols

Clients connect using any suitable protocol

Address discovery via WS2 name resolution

Peer to peer apps

Address book contains typed addresses

Example: phone #, TCP/IP addr, ATM addr

*Use suitable protocols that match address type
(i.e. address family)*

Choosing One or More Protocols

WSAEnumProtocols()

Input: filter (optional), buffer, buffer length

Output: filled in buffer, revised buffer length

PROTOCOL_INFO structs

One per protocol (usually)

Describes protocol attributes and behavior

*Supplies all params needed for **socket()** or **WSASocket()***

Protocol Attributes

Service Flags

<i>Connectionless</i>	<i>Reliable</i>	<i>Guaranteed order</i>
<i>Message oriented</i>	<i>Pseudo stream</i>	<i>Graceful close</i>
<i>Expedited data</i>	<i>Connect data</i>	<i>Broadcast capable</i>
<i>Multicast capable</i>	<i>QOS supported</i>	<i>Encryption supported</i>
<i>Interrupt capable</i>	<i>Unidirectional send</i>	<i>Unidirectional recv</i>

Lots of space reserved for future expansion

Protocol Attributes (cont.)

Parameter Values

<i>Address family</i>	<i>Address length</i>	<i>Socket type</i>
<i>Protocol value</i>	<i>Protocol name</i>	<i>Protocol version</i>
<i>Provider ID</i>	<i>Message Size</i>	<i>Name space IDs</i>

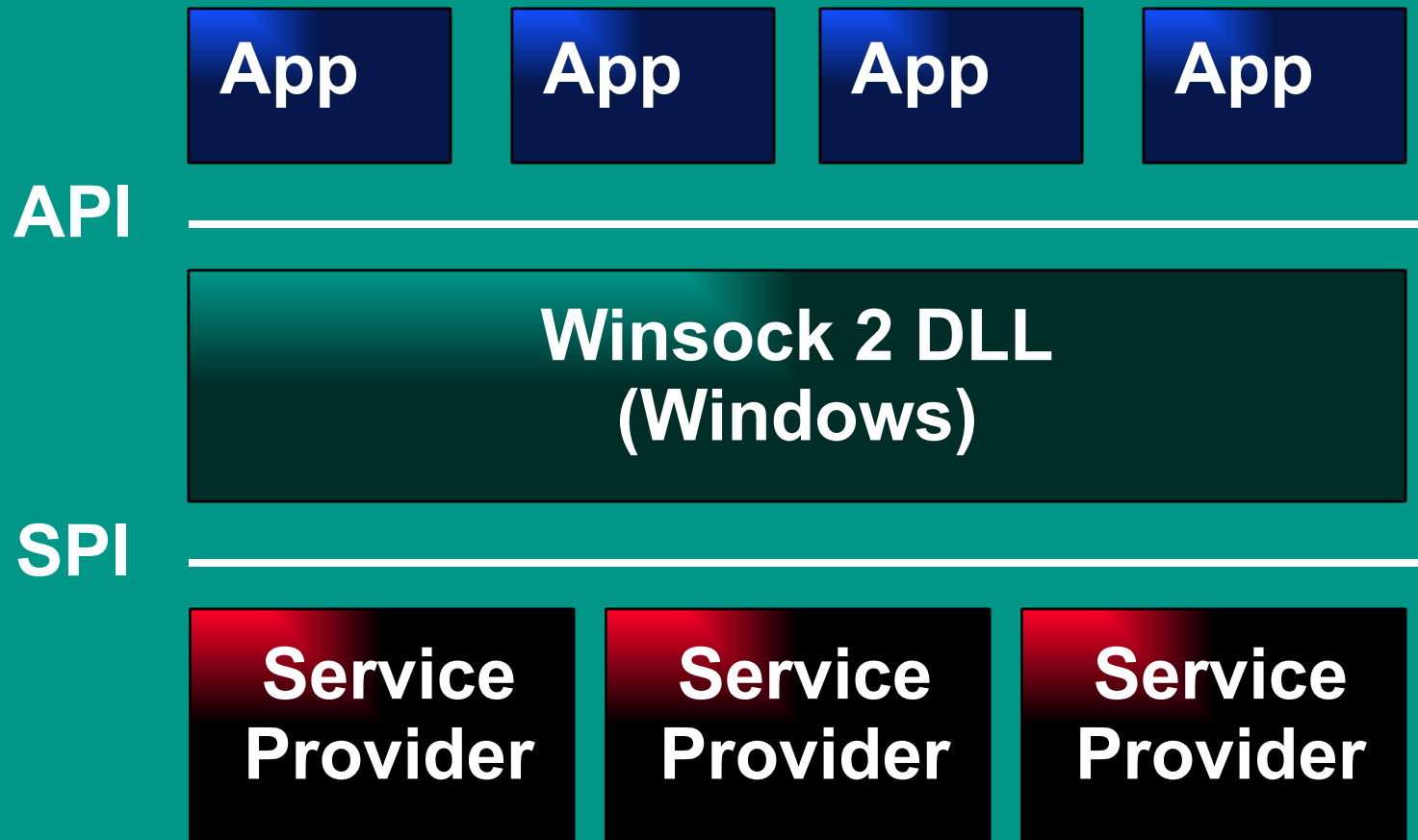
Multi-behaviored Protocols

One PROTOCOL_INFO entry per behavior

All entries have same Protocol Value

Socket type used to distinguish

Winsock 2 Architecture



SPI Concepts

(WS2SPI.DOC, section 1)

One winsock2 DLL per platform

Thin winsock2 DLL routes to providers

Architectural freedom for providers

Provider IDs

Provider handles any necessary buffering

32-Bit vs. 16-Bit SPI

(WS2SPI.DOC, section 2.7)

*Differences minimized; portability
maximized*

Blocking models differ

Handle management differs

Installation APIs

(WS2SPI.DOC, section 5)

WPUInstallProvider()

WPUDeinstallProvider()

*Do not install files; only inform winsock2
DLL.*

Abstract storage of config info

Helper Upcalls

(WS2SPI.DOC, section 4)

Thread Management

Thread ID

Queue APC/callback

Handle Management

creation of unique socket handles

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Overlapped socket operations

Send and recv from within preemptive contexts

More efficient notification: events, APCs, callbacks

Overlapped I/O

Fewer data buffer copies

Multiple simultaneous pending I/O requests per socket

Thread-safe callback mechanism in preemptive environments

Flexible notification options (APCs or event objects)

Notification Mechanisms

select()

WSAAsyncSelect()

WSAEventSelect()

APCs and event objects (overlapped i/o completion)

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Flow specs

Socket groups

Socket prioritization

Flow Spec

Usage Model

*characteristics of a uni-directional flow
apps request and networks respond
map QOS Name to Flow Spec
coincident on connection set-up time
query established Flow Spec
get notified for any changes*

Flow Spec (continued)

Categories of Flow Spec parameters

Bandwidth (peak, average, burst length)

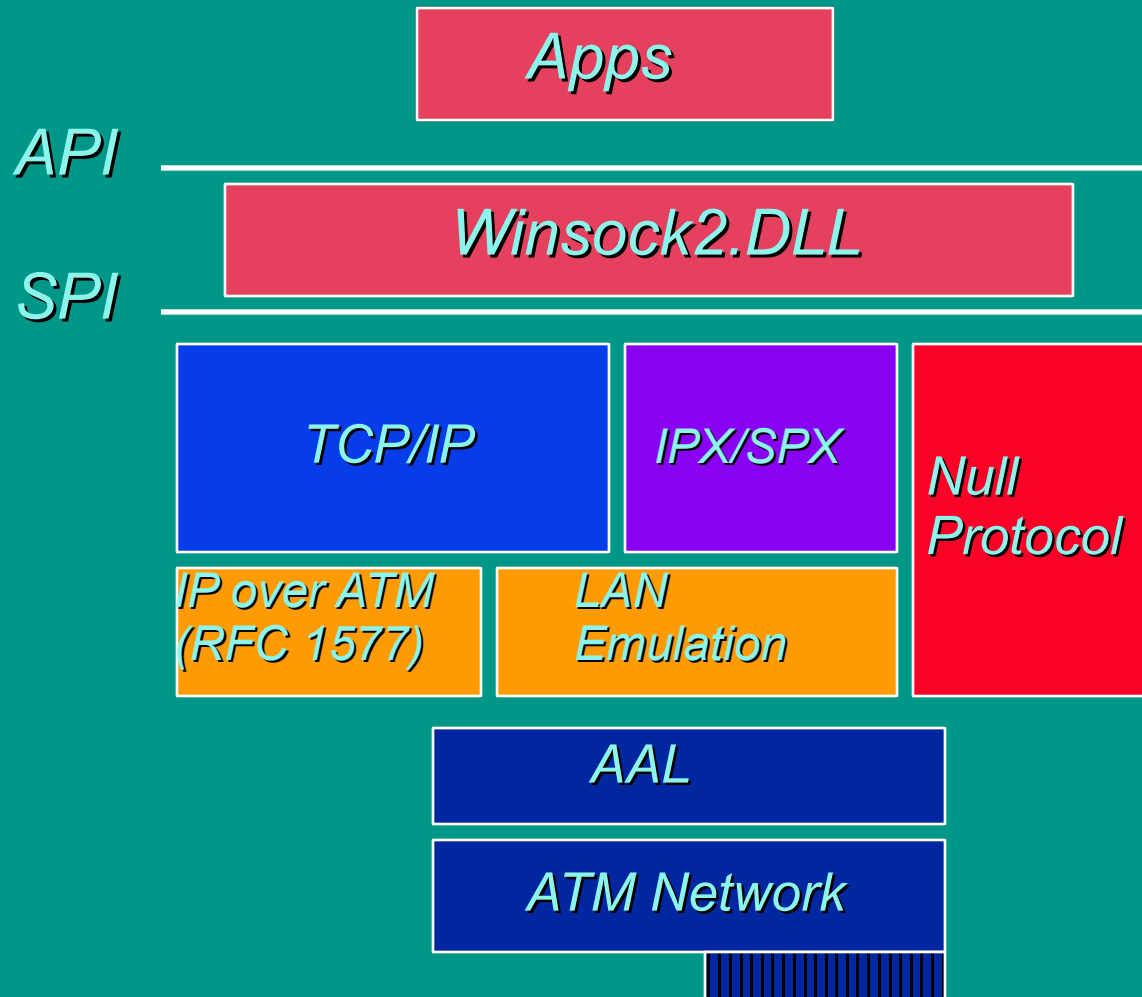
Latency (end-to-end delay, delay variation)

Level of service guarantee

Cost

Provider-specific parameter

Example: Winsock 2.0 over ATM



Socket Groups

Establish relationship for a particular set of sockets

Socket group created/joined at connection set-up time

Group QOS maps to the underlying call

Relative priorities among sockets within a group

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Shared sockets

Connection establishment

Conditional Acceptance

Exchange of user to user data

Bi-directional flags parameter in receive functions

Shared Sockets

Single socket with multiple handles

*Use **WSADuplicateSocket()** to create*

Parameters:

source socket handle

destination task handle

*Returns: socket handle valid only in context of
destination task*

*IPC needed to get destination task handle
and to supply new socket handle*

Shared Sockets (cont)

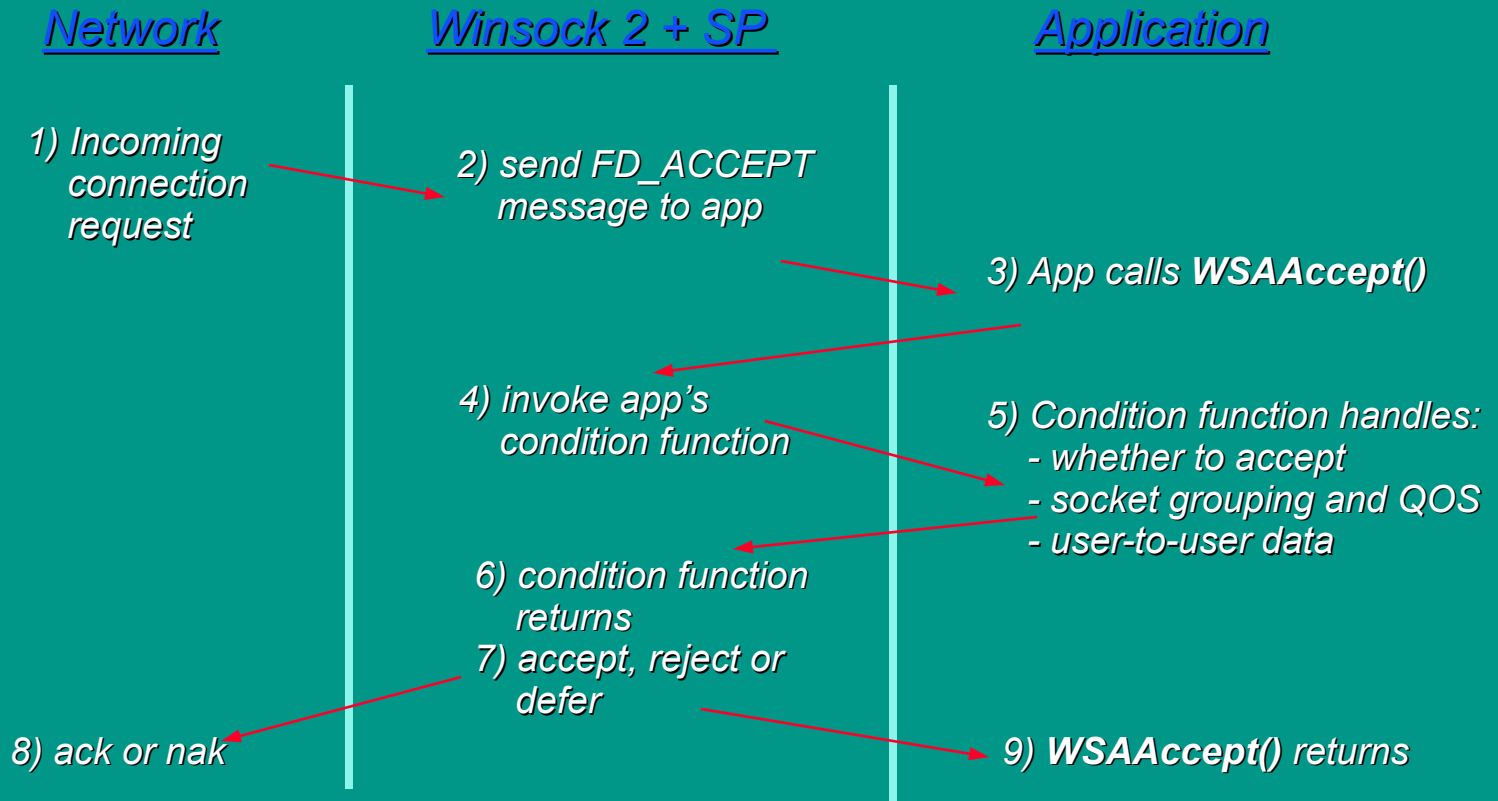
I/O must be coordinated by apps

*Notification is **independent** to each handle*

Socket options and ioctl's are common

Conditional Acceptance

WSAAccept() condition function



Exchanging Connect Data

Support for user data exchange during connect sequence

*Initiator uses **WSAConnect()***

*supplies buffers for inbound and outbound data
inbound buffer only valid after FD_CONNECT*

*Listener uses **WSAAccept()***

condition function used to get/supply buffers

Only works if supported by protocol

Making recv flags IN OUT

Use of 'MORE' flag by some protocols
*Winsock 1.1 **recv()** and **recvfrom()** have*
flags parameter as INPUT only
WSARecv()** and **WSARecvFrom()
flags parameter is IN OUT
useable by both overlapped and regular
sockets

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Do we need scatter/gather?

*Should **WSASocket()** take a
PROTOCOL_INFO struct as input?*

*Do we need independent notification on
shared sockets?*

Open Issues (cont)

Should our two groups be merged?

Next Steps

Collect your comments and feedback

Update the API and SPI docs

close as many “opens” as possible

Publish docs, slides, meeting minutes

via anonymous ftp and the web

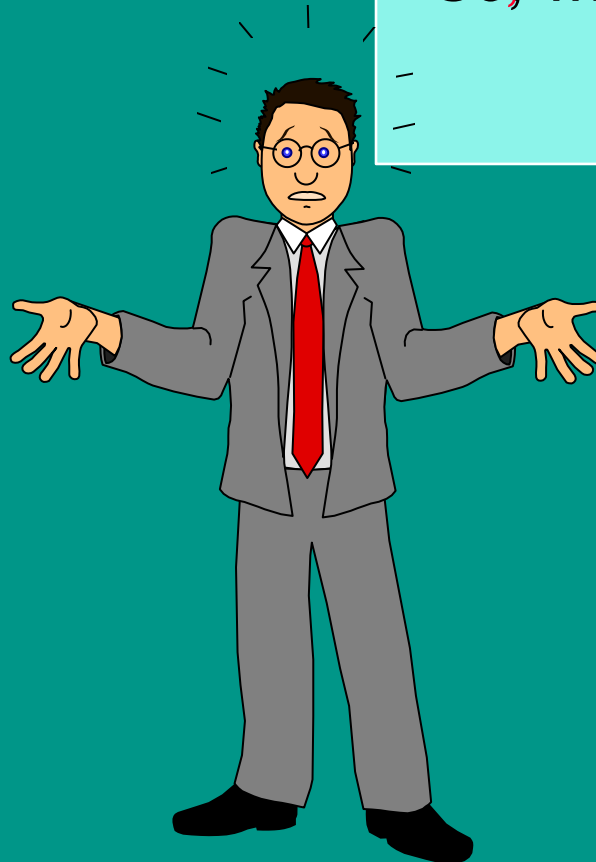
done by Christmas

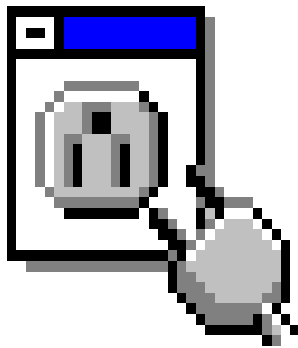
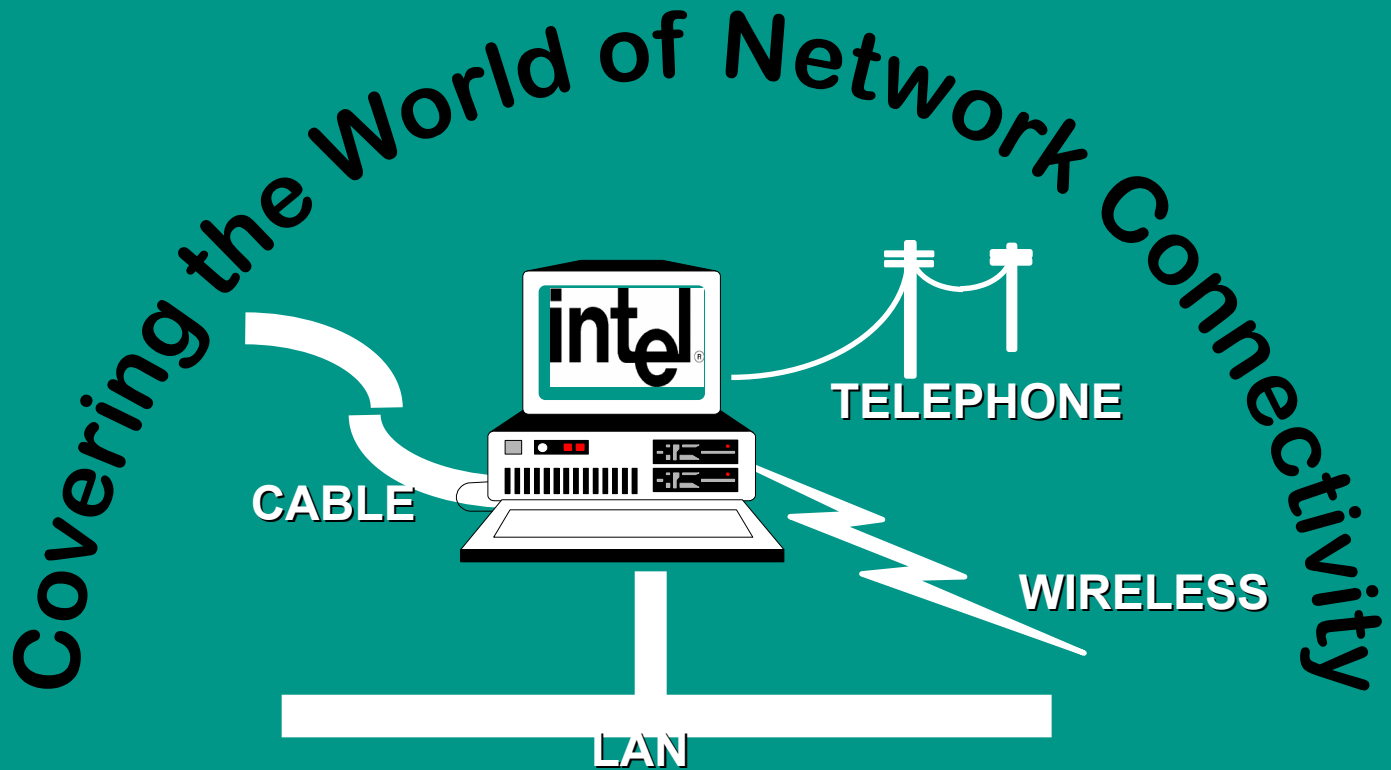
Prepare for presentation to WS2 Review

Boards in January

Q&A / Feedback

So, what do you think?





Winsock 2