IrDA Serial Infrared
Link Access Protocol Specification
for 16 Mb/s Addition (VFIR)

Errata to IrLAP Version 1.1

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1. Overview

This document describes proposed changes to the IrLAP specification to support Very Fast IR (VFIR). Some of these changes are required for VFIR to be functional. Others are proposed to help improve the performance of systems implementing VFIR. The main changes to IrLAP are adding a new speed and providing support for larger window sizes. An earlier proposal suggested adding larger IrLAP data sizes but this cannot be done because the 32-bit CRC proposed at the physical layer cannot protect frames larger than 2804 bytes.

2. Adding a New Speed

The proposed new speed is 16 Mbps. Section 6.6, Negotiation, needs to be updated. In particular section 6.6.3 needs to be modified with the new diagram shown below.

Baud Rate parameter format (PI = X'01', type 0)
First byte of PV field:
bit 0 = 2400 bps (lsb, transmitted first)
bit 1 = 9600 bps
bit 2 = 19200 bps
bit 3 = 38400 bps
bit 4 = 57600 bps
bit 5 = 115200 bps
bit 6 = 576000 bps
bit 7 = 1152000 bps
Second byte of PV field (needed only if 4Mbps supported):
bit 0 = 4000000 bps
bit 1 = 16000000 bps
bits 2-7 of 2nd byte: reserved and must be set to zero

Other areas in section 6.6 need to be checked for references to speed and updated appropriately.

3. Adding Support for Larger Window Sizes

Supporting window sizes greater than 7 can increased the performance of a system for certain applications. This performance increase will become more significant as the speed increases. The proposal is to add a new negotiation parameter called Extended Window Size. This parameter will only be allowed if the negotiated speed is 4 Mbps or higher. It is an optional parameter.

Extended Window Size allows the maximum window size to grow from 7 frames to 127 frames. This is accomplished by extending the IrLAP control field from 1 byte to 2 bytes. The existence of the Extended Window Size parameter indicates the desire to negotiate for Extended Control. The value of the Extended Window Size parameter contains the actual window size and is not a bit pattern like the original Window Size parameter. The length of the Extended Window Size parameter is fixed at 1 byte. This is enough to express window sizes from 1 to 127.

3.1 Extending the Definition of Negotiation Parameters

Extended Window Size is different enough from the existing negotiation parameters to warrant extending the definition of negotiation parameters in general. Currently there are two types of negotiation parameters, Type 0 and Type 1. Both have a set of rules governing how they are negotiated. The value field of these parameters is considered to be a collection of bits where each bit represents a distinct value. This is called bit-pattern form. The proposal for Extended Window Size specifies that the value field of the parameter is to be considered a scalar or integer value, and not to be interpreted as a bit-pattern. This new way of interpreting the parameter value field is called scalar form. When multi-byte scalar values are sent the least significant byte is sent first (little endian).

With the introduction of scalar form negotiation parameters, the parameter space can now be divided into four types, Type 0 bit-pattern, Type 0 scalar, Type 1 bit-pattern, and Type 1 scalar. The value of the PI field is used to denote the type. Bit 7 is still used to denote Type 0 versus Type 1 and bit 6 is used to denote bit-pattern versus scalar.
If bit 6 is set to 0 then the type is bit-pattern otherwise, if bit 6 is set to 1 the type is scalar. The table below shows the relationship between the value of the PI field and the type.

0x00 – 0x3F	Type 0 bit-pattern
0x40 – 0x7F	Type 0 scalar
0x80 – 0xBF	Type 1 bit-pattern
0xC0 – 0xFF	Type 1 scalar

The bit-pattern types are negotiated as described in the current IrLAP specification. Type 1 scalar values are negotiated in a similar way to Type 1 bit-pattern. Each parameter is negotiated separately. Each station must honor the value sent by the other station. There are a number of possible ways to negotiate type 0 scalar parameters. The basic rule for Type 0 scalar parameters is that both stations must send the parameter for it to take affect. If both stations have sent the parameter, the next step is to deal with the parameter value itself. Since there are a number of different ways to deal with the parameter value, the method used is defined on a per parameter basis as part of the definition of the parameter. The table below shows some possible ways to deal with the value of type 0 scalar parameters:

Full agreement	Both stations must agree on the value for the parameter to take affect.
MinVal	Both stations use the minimum of the two values sent.
MaxVal	Both stations use the maximum of the two values sent.
Feature Exchange	Each station must honor the value sent by the other station. This is the same as type 1 scalar.

As mentioned earlier each type 0 scalar parameter defines the method used to handle the value field.

There is an issues with defining new type 1 parameters. The negotiation rule states that each station must honor the value of the other station but old systems will not understand new parameters so they will not be able to the honor the value. There are a couple of ways to deal with new type 1 parameters as shown below.

- They are only advisory or informational. Old systems can ignore these parameters without problems.
- They must be coupled with a type 0 parameter. If the type 0 parameter has not been sent by both stations then the type 1 parameters coupled to the type 0 parameter are ignored.

3.2 Adding New Negotiation Parameter

Extended Window size is a type 0 scalar parameter which means both stations must send the parameter for it to take affect. The Feature Exchange method is used to deal with the parameter value. This means that both stations

do not have to have the same window size. Each station must honor the value sent by the other station. If one side does not support the Extended Windows Size parameter or the negotiated speed is below 4 Mbps then window size is governed by the Window Size parameter (PI = 0x84). A station signals it does not support Extended Window Size by not sending the parameter. Thus, negotiation of Extended Window Size is backward compatible with implementations based on the current specification. Existing implementations should ignore the new parameter.

The basic rules for the amount of data that can be transmitted is still governed by the negotiated Maximum Turn Around time when using Extended Window Size. A Table similar to the maximum-line-capacity table will be created showing the maximum amount of data that can be sent at 4 Mbps and 16 Mbps for all Maximum turn times.

Section 6.6, Negotiation, will need to be updated to show the new Extended Window Size parameter and the extensions to the definition of negotiation parameters. The following diagram describes the new Extended Window Size parameter.

Extended Window Size parameter format (PI = X'40', type 0 scalar)
bit 0 - 6 = the actual window size (legal values are from 1 – 127)
bit 7 is reserved and must be 0.

A value of 0 for Extended Window Size is considered illegal making the parameter ill-formed. An ill-formed parameter should be ignored. The length field of the Extended Windows Size parameter must be 1.

Other areas in section 6.6 will need to be checked an updated appropriately.

3.3 Describing Frame Format for Extended Control

If both the primary and the secondary station send the Extended Window Size negotiation parameter then Extended Control is in affect. When Extended Control is in affect, I-Frames and S-Frames require two bytes for the IrLAP control field instead of one. U-frames still only require one byte when Extended Control is in affect (This comes directly from the HDLC specification). The frame format in section 4.2.1 will need to be updated to show Extended Control. Section 5.5, Frame Sequencing, will need to be updated to reflect a potentially larger window size. Other sections in chapter 5 will need to be updated to show the frame format for Extended Control. The diagrams below show the format of I-Frames and S-Frames when Extended Control is affect.

Extended Control field format for I-Frame

1st octet		2nd octet	
1-7	0	1-7	0
N(S)	0	N(R)	P/F

Extended Control field format for S-Frame

1st octet					2nd octet	
4-7	3	2	1	0	1-7	0
0	S	S	0	1	N(R)	P/F

4. Minimum Turn Around Time

The physical layer specification indicates that the minimum turn around time for VFIR must be 100us. It cannot be longer. Yet at lower speeds it is possible that the minimum turn around time may be longer. The solution is as follows: if the negotiated speed is 16Mbps then the minimum turn around time is 100us independent of the value sent by the remote device. The minimum turn around time value sent by the remote device is only valid for speeds below 16Mbps. At 16Mbps the minimum turn around time sent in the UA or SNRM frame is ignored and 100us is used.

5. Additional IrLAP Specification Changes

The NRM state machines in section 6.12, Procedures for Information Exchange, Reset and Disconnection, will need to be updated to reflect the larger window size. Chapter 10, Appendix D (IrLAP Frame Wrappers) will require additions or changes to deal with the new modulation anticipated for 16 Mbps. Finally, the whole document will need to be checked to make sure it is consistent with the changes for VFIR.