Angel

Debug Protocol Messages

Document number: ARM DUI 0053D
Issued: Sept 1999

Proprietary Notice

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Change Log

Issue	Date	By	Change
A	Feb 1998	KTB/RI-C	First release
B	May 1998	RI-C	Clarified and updated
C	Aug 1998	RI-C	Final revisions.
D	Sep 1999	RI-C	Updated for ADP1.1.

Key

Code and other program texts are set in a `monospaced font`.

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Contents

1 Introduction

The Angel Debug Protocol (ADP) provides a reliable connection between a debug target and a host debugger during a debugging session. This document describes the messages used at the higher levels of the protocol, notably by the debug agent (the ADP messages) and the C Library. For details of the protocols, ordering constraints and other information, please refer to the document *Angel Debug Protocol* (ARM DUI 0053).

This document describes ADP version 1.0 and the notes the extensions included in version 1.1.

1.1 RPC Type Specifications

Because the protocols define a procedure call interface, albeit with servers at both ends of the connection, the interface is described here in terms of conventional function calls. The relevant terminology is presented below:

Syntax element	Simple description	Example
BYTE	An integer type, 8 bits in size. Often used for character storage.	BYTE char:
INT16	A signed integer, 16 bits in size.	INT16 count:
INT32	A signed integer, 32 bits in size.	UINT32 address:
UINT16	An unsigned integer, 16 bits in size.	UINT16 count:
UINT32	A unsigned integer, 32 bits in size.	UINT32 address:
[<size>]TYPE	The type is an array of <size> elements; if <size> is missing, the size is variable.	[32]BYTE message:
RECORD … IS … :	A record definition.	(see below)
VAL … IS … :	A constant specification.	VAL Escape IS 27:
<literal>(<type>)	Consider <literal> to be of type <type>. This is a type decoration, explicitly defining the interpretation of a literal.	32(UINT32)
(<result>) = <name>(<params>)	Define a function called <name>, returning <result> when given a parameter list <params>.	(INT16 x) = sin(INT16 y)

Arrays of BYTEs specifically representing strings will be zero terminated unless otherwise noted. The size includes the zero terminator byte.

Multiple return values are represented as a list in the same way as multiple parameters, with a bracketed list of types and names. Where types do not change between successive items, the type name can be omitted (that is, “UINT32 x, UINT32 y” is the same as “UINT32 x, y”.

Named groups of types can be represented with record definitions. A record is described with the following syntax:

```
RECORD <name> IS (<list>):
```

For example, a point could be represented with the following definition:

```
RECORD Point IS (UINT32 x, UINT32 y):
```

Records are used much the same way as ordinary types:

```
RECORD Point x:
```

or an array of 32 points:

```
[32]RECORD Point point.segments:
```

To represent a variable length array, the following structure should be used:

```
<inttype> size, [size]<arraytype> name:
```

Where <inttype> is an integer (BYTE, INT16, UINT32) type containing the size of the array, and <arraytype> is the type of each element, eg. BYTE. It should be noted that the name of the size variable also appears in the array bound for the array.

Finally, it should be noted that use is made of the constant –1 as a (usually error) return value, especially in the Clib requests. This constant is always encoded as 0xFFFFFFFF.

2 ADP Remote Procedure Calls

This chapter describes the calls used to boot the target system (the TBOOT and HBOOT channels) and the calls used by the debugger to debug the target (the HADP and TADP channels).

2.1 ADP 1.1

The ADP has been extended in two ways for version 1.1:

- the packets types ADP_ReadExt, ADP_WriteExt have been added, extending the original calls with an access method parameter
- All memory and file I/O packet types (ADP_Read, ADP_ReadExt, ADP_Write, ADP_WriteExt, CL_Read, CL_Write, CL_ReadX, CL_WriteX) may use the long buffer system used only for ADP_Write in previous versions.

There are two ways for a debugger to identify the version of ADP in use:

- In the boot message, the ADP version number for 1.0 is 0x3 – for version 1.1 it must be 0x4.
- If the agent implements the ADP_ReadExt or ADP_WriteExt functions, it can be assumed to be conformant to at least version 1.1 of ADP: it may, of course, implement a higher (as yet unspecified) version.

All other details of ADP are unchanged.

2.2 Function Signatures and Packet Formation

As an example of the format used to describe a remote call, the following text identifies a function called CalcMinMax which accepts a 32-bit integer, a previous maximum and minimum value found, and returns two values, a new minimum and maximum. When packetized, a reference number 8 is used to represent the name:

Channel: **CI_MISC**

Reason Code: **8**

Signature:

(UINT32 newmin, UINT32 newmax) = CalcMinMax(UINT32 value, lastmin, lastmax)

Parameters:

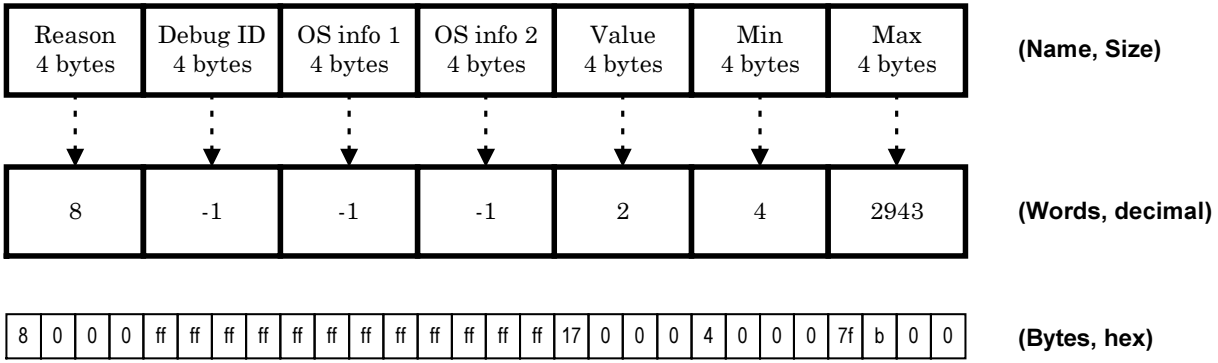
value	a new value to check
lastmin	the previous minimum value found
lastmax	the previous maximum value found
newmin	the new minimum value, taking ‘value’ into account
newmax	the new maximum value, taking ‘value’ into account

When converted into ADP form, this translates into two packets as shown in the figures below. The packets are, of course, also wrapped with the data link protocol used at the time.

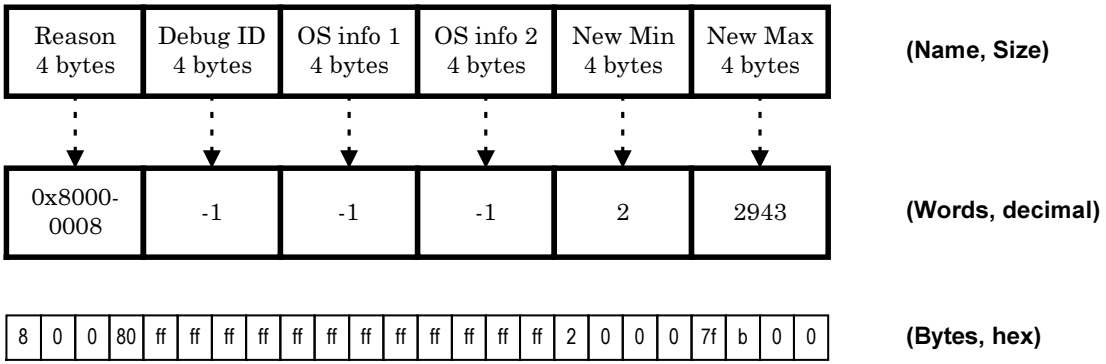
Notes:

- There is no length information explicitly present; the function knows there are 3 parameters, and simply extracts them from the packet. Similarly, when returning the data, it just constructs a packet with two words in it and sends this off to the caller.
- While the request packet’s reason code has been set to 8, the response code is set to 0x80000008; this is because the TtoH bit has been set in the response. For a request originated by the target, this would be reversed.

Request Packet:



Response Packet:



2.3 Boot Channel Messages

2.3.1 ADP_Booted

Channel: **CI_TBOOT**

Reason Code: **0**

Signature:

(UINT32 status) = ADP_Booted(VAL UINT32 bufsize, largesize, angelversion, adpversion, archinfo, cpuinfo, hwstatus, bannersize, [bannersize]BYTE banner)

Parameters:

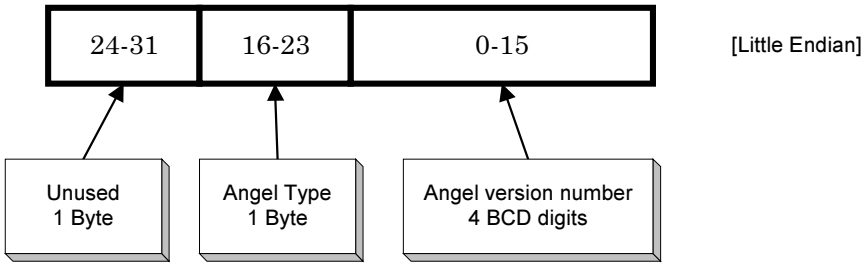
bufsize	Angel message default buffer size
largesize	Angel message large buffer size (may be same as default)
angelversion	Angel version number, including type (eg. boot ROM)
adpversion	ADP version number
archinfo	ARM architecture information
cpuinfo	ARM CPU information, including target endianness.
hwstatus	Target hardware status
bannersize	Number of bytes in banner message, must be <= 204 bytes.
banner	Startup banner message (single-threaded readable descriptive text, not nul lterminated)
status	`Adp_ok` for success, otherwise indicates an error

Description:

This message is sent by the target after the Angel system has been initialized. This message also contains information describing the Angel world. The information can then be used to check that the target debug agent and source debugger are compatible.

Angel version word

The Angel version word is formatted as shown below:



The version number is stored in BCD, with the least significant digit stored in the least significant byte of the word. The Type is set according to the following table, depending on the nature of the Angel code which is running:

Name	Code	Description
Boot Rom	0	Monitor ROM providing download capability. Standard type.
Application ROM	1	ROM based application
Application Download	2	Downloaded Angel-based application
Unknown	3	Unknown type.

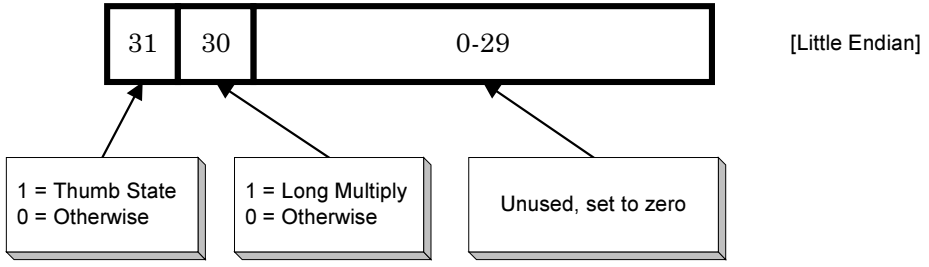
The unused bits at the top of the word should be ignored on read, and written as zero.

ADP version word

Currently only the least significant 8 bits are used in this word, which contains the version of ADP being used by this version of Angel.

ARM architecture word

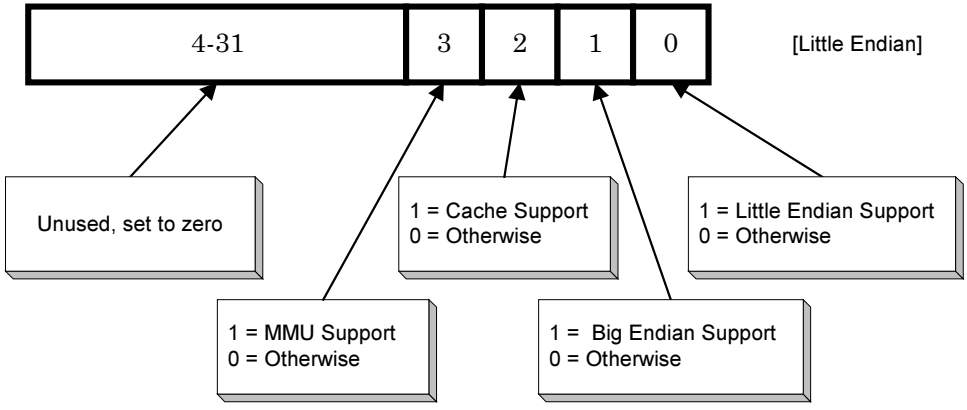
This word defines the ARM architecture version of the target CPU. There are only two bits defined, which are both set when the given architecture feature is present:



CPU architecture word

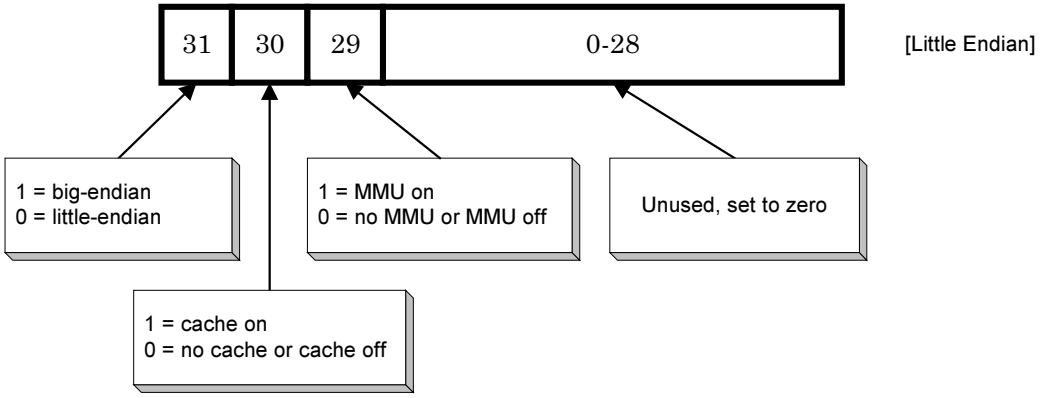
The following flags describe the feature set of the processor

Note that if the system can be switched between big-endian and little-endian modes of operation, both flags can be set at once.



Target status word

The target status word contains flags which reflect current target hardware status:



2.3.2 ADP_TargetResetIndication

Channel: **CI_TBOOT**

Reason Code: **1**

Signature:

RECORD Parameter IS (UINT32 param, UINT32 value):

() = ADP_TargetResetIndication(UINT32 status,
UINT32 nparams, [nparams]RECORD Parameter params)

Parameters:

status	Always 0 (makes body same as ADP_ParamNegotiate response)
nparams	The number of parameters supplied
params	The parameter list supplied

Description:

If parameter negotiation is enabled at the target, it configures itself to various likely parameter settings and sends this message at each configuration. The message describes the default settings, and after sending at each configuration the target sets itself to the defaults it has just broadcast, to await either an acknowledgement on TBOOT or a request or reset indication on HBOOT.

If the host receives this message successfully, it resets to the indicated parameters and sends a reply. The reply has no associated body, just the normal ADP header.

This message is not used in current implementations of Angel.

2.3.3 ADP_Reboot

Channel: **CI_HBOOT**

Reason Code: **2**

Signature:

(UINT32 status) = ADP_Reboot(UINT32 hostfeatures)

Parameters:

hostfeatures	Host supported feature word
status	Boot acknowledgement code

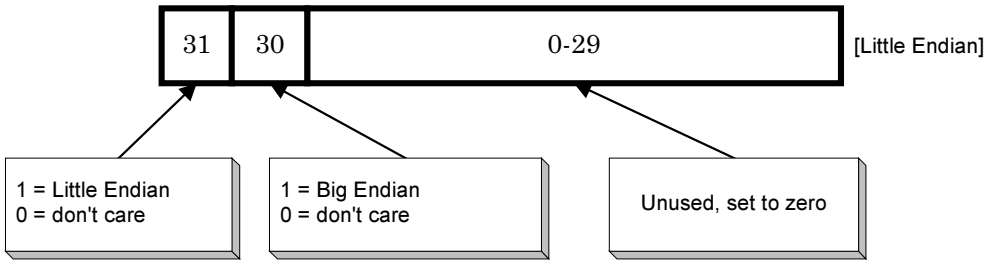
Description:

This message is sent when the host wants the target system to be completely reset, back to the boot monitor Angel. This is how a host forces a cold reboot.

Note *An acknowledgement message must be sent by the target immediately; this must be sent before reboot occurs.*

The parameter to this function is a bitset of host supported features (the same as for ADP_Reset below). This can be used by the target system to avoid using debug channel bandwidth raising messages that will be ignored by the host.

Host feature word



If the host sets neither of these in the word sent on a reset or reboot, the host does not care about the endianess of the target.

Boot acknowledgement codes

The following codes are defined:

Name	Code	Description
Normal Ack	0	Will comply, immediate booted message
Late Ack	1	Will comply, late startup
Error	2	Cannot comply

2.3.4 ADP_Reset

Channel: **CI_HBOOT**

Reason Code: **3**

Signature:

(UINT32 status) = ADP_Reset(UINT32 hostfeatures)

Parameters:

hostfeatures	Host supported feature word
status	Boot acknowledgement code

Description:

This message is a request from the host, which should eventually result in the "ADP_Booted" message being sent by the target. An acknowledgement message will be sent immediately; this must be sent before the target can reset. This reset message is *always* treated as a warm boot, with the target preserving as much state as possible. However, the host will expect packet sequence numbers to be reset to zero, and consequently any unacknowledged packets should be deleted.

The parameter to this function is a bitset of host supported features. This can be used by the target system to avoid using debug channel bandwitdth raising messages that will be ignored by the host.

The Host features word, and the Boot acknowledgement status code, are the same as for ADP_Reboot.

2.3.5 ADP_HostResetIndication

Channel: **CI_HBOOT**

Reason Code: **4**

Signature:

RECORD Parameter IS (UINT32 param, UINT32 value):

() = ADP_HostResetIndication(UINT32 status,

UINT32 nparams, [nparams]RECORD Parameter params)

Parameters:

status	Always 0 (makes body same as ADP_ParamNegotiate response)
nparams	The number of parameters supplied
params	The parameter list supplied

Description:

This is as for ADP_TargetResetIndication, but is sent by the host when it first starts up in case the target is listening at a non-default setting. Having sent at various configurations, the host then listens at the defaults it has just broadcast, to await either an acknowledgement on HBOOT or a reset indication on TBOOT.

For arguments and reply, see ADP_TargetResetIndication.

This message is not used in current implementations of Angel.

2.3.6 ADP_ParamNegotiate

Channel: **CI_HBOOT**

Reason Code: **5**

Signature:

RECORD Parameter IS (UINT32 param, UINT32 value):

RECORD ParameterSet IS (UINT32 param, nvalues, [nvalues]UINT32 values):

(UINT32 status, nparams, [nparams]RECORD Parameter params) =

ADP_ ParamNegotiate(UINT32 noptions,

[noptions]RECORD ParameterSet options)

Parameters:

noptions	The number of parameters supplied
options	The parameter option list supplied
status	Adp_ok if negotiate succeeded, error code otherwise

nparams	The number of parameters returned
params	The parameter option list returned

Description:

The host sends this messages to negotiate new parameters with the target. For each parameter the host specifies a range of possibilities, starting with the most favoured. All possible combinations of parameters must be valid.

If the target can operate at a combination of the offered parameters, it will reply with the parameters it is willing to use. After sending the reply, the target switches to this combination. On receiving the reply, the host will switch to the new combination and send a ADP_LinkCheck message (see below).

If the target cannot operate at any combination of the offered parameters, it will reply with an error status. The reply only contains the new parameters if the status was Adp_ok.

A list of parameter types currently defined:

Name	Value	Description
AP_PARAMS_START	0xC000	Base value for parameter names
AP_BAUD_RATE	0xC000	New baud rate when using serial connection. Must be one of: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400

All Parameter types should have associated semantics which can be represented within one word per parameter, or an associated enum for choices.

Note *There are maximum numbers of parameter types, and parameter options. These values were increased for Angel 1.04 (SDT2.11a):*

	Angel 1.03 and before	Angel 1.04
Number of Types	1	4
Number of Options per Type	5	12

In addition, Angel 1.04 is more lenient if these limits are exceeded in a message sent to it; it ignores those items which exceed the limit. Previously, Angel would abort processing of the message, and thus refuse to boot.

2.3.7 ADP_LinkCheck

Channel: CI_HBOOT

Reason Code: 6

Signature:

() = ADP_ LinkCheck()

Description:

This should be the first message that the host sends after a successful parameter negotiation. It is really just a 'ping'. There are no associated parameters, but there must be a reply message.

2.4 Host ADP Channel Messages

2.4.1 ADP_HADPUnrecognised

Channel: **CI_HADP**

Reason Code: **0**

Signature:

(UINT32 status) = ADP_HADPUnrecognised()

Parameters:

status	Reason code which was not recognised

Description:

This message is unusual in that it is normally sent in reply to another message which is not understood (the normal protocol states that a reply must have the same base reason code as the original). There is a single reply parameter; the reason code that was not understood.

This message can also be sent, and the reply is as if the message were unrecognised.

2.4.2 ADP_Info

Channel: **CI_HADP**

Reason Code: **1**

Description:

This is the ADP information message. It is used to interrogate the target debug agent, and provides information on the processor as well as the state of the debug world. This allows the host to configure itself to the capabilities of the target.

When the feature set is extended, this can be done in two supported ways:

- If an undivided reason code is to be added with no reason subcodes, such as ADP_Write, add a new ADP_Info sub-code which responds with a flag indicating whether that feature is supported by the target. If this has not been implemented then the reply will be with the ADP_HADPUnrecognised message.
- If a reason code which is subdivided into reason subcodes is added such as Adp_Info, reason subcode 0 should be set aside to indicate whether the functionality of that reason code is supported by the target. If it is not implemented, the reply will be the ADP_HADPUnrecognised message.

The first parameter to ADP_Info is a reason subcode, and subsequent parameters are defined by that subcode. The same reason subcode is always returned as the first UINT32 parameter in the reply message.

2.4.2.1 ADP_Info_NOP

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **0**

Signature:

VAL Info_NOP IS 0(UINT32):

(Info_NOP, UINT32 status) = ADP_ Info(Info_NOP)

Parameters:

status Adp_ok for success, non-zero indicates an error

Description:

This message is used to check for ADP_Info being supported. If an error is returned, there is no handler for the ADP_Info message. Normal action is to return an OK status.

2.4.2.2 ADP_Info_Target

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **1**

Signature:

VAL Info_Target IS 1(UINT32):

(Info_Target, UINT32 status, UINT32 bitset, UINT32 model) =

ADP_Info(Info_Target)

Parameters:

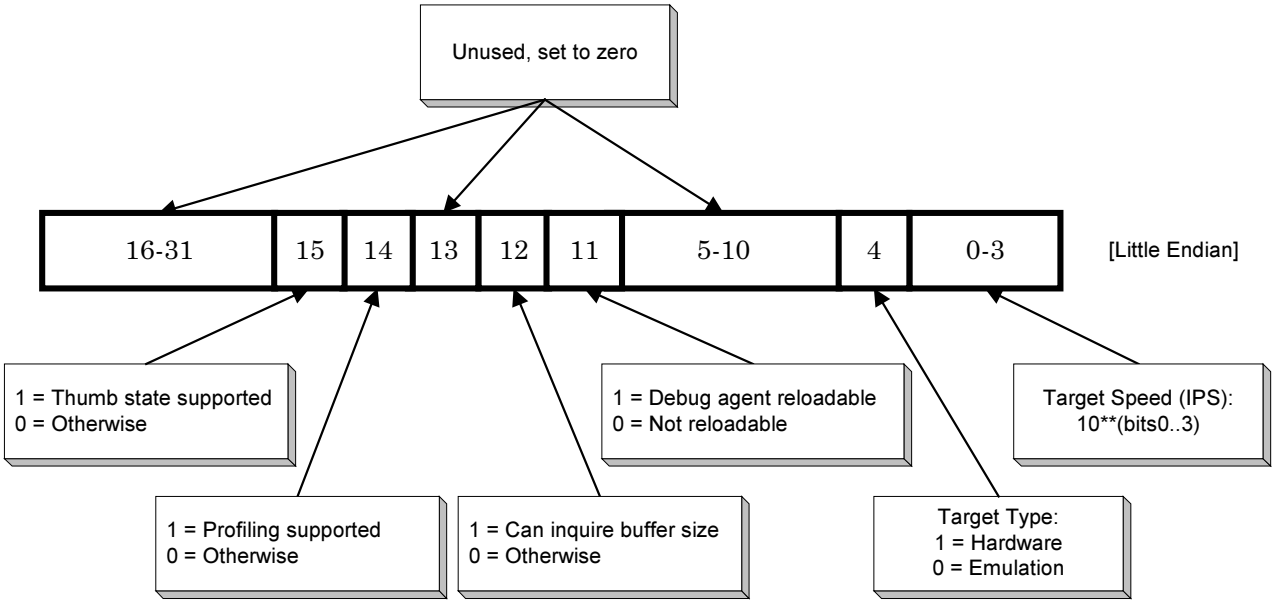
status	Adp_ok to indicate OK, or non-zero to indicate some sort of error
bitset	Described in more detail below, and is mostly compatible with that used in Demon to avoid excessive changes to the ARM debugger code
model	The target hardware ID word, as returned by the ADP_Booted message

Description:

This reason code is used to interrogate target system details.

Note *The minimum and maximum protocol levels provided under Demon are no longer supported. It was a design decision that debugging complexity should be shifted to the host if at all possible. This means that the host debugger should always try to configure itself to the features available in the target debug agent. This can be done by checking individual messages, rather than by a blanket version number dictating the feature set.*

Bitset is a word with the following bits defined:



2.4.2.3 ADP_Info_Points

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **2**

Signature:

VAL Info_Points IS 2(UINT32):

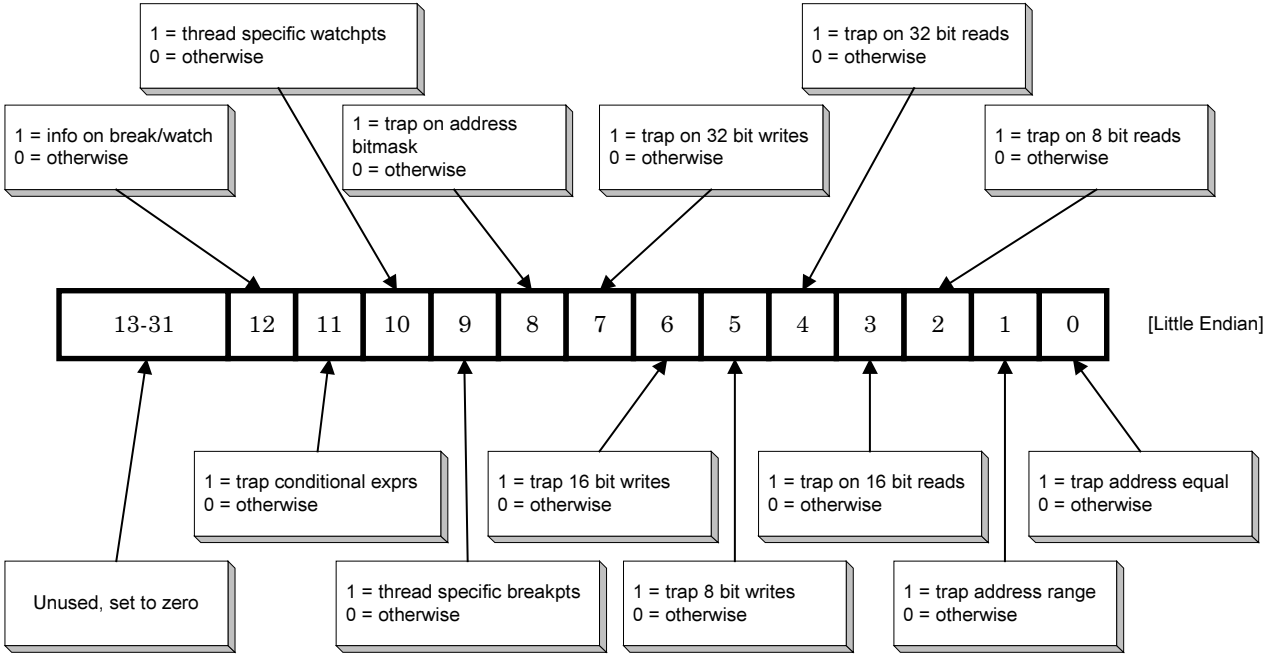
(Info_Points , UINT32 status, UINT32 breakinfo) = ADP_ Info(Info_Points)

Parameters:

status	Adp_ok to indicate OK, or non-zero to indicate some sort of error
breakinfo	Described in more detail below

Description:

Returns a 32-bit wide bitset of breakpoint and watchpoint features supported by the target debug agent. Breakinfo is a word with the following bits defined:



2.4.2.4 ADP_Info_Step

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **3**

Signature:

VAL Info_Step IS 3(UINT32):

(Info_Step , UINT32 status, UINT32 stepinfo) = ADP_ Info(Info_Step)

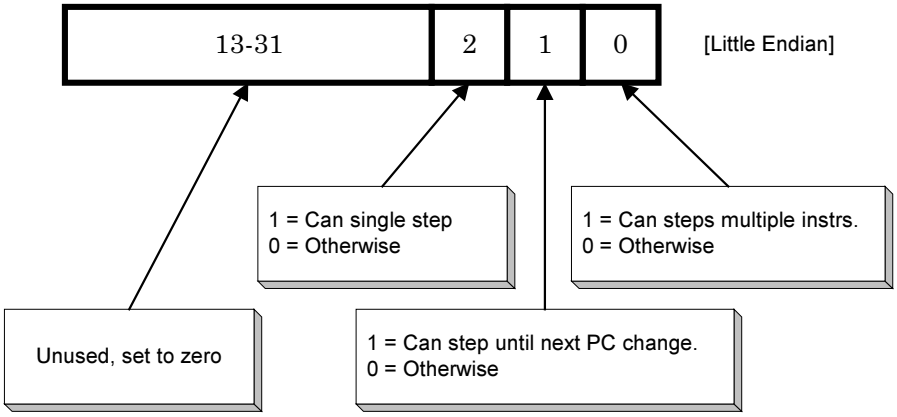
Parameters:

status Adp_ok to indicate OK, or non-zero to indicate some sort of error

stepinfo Described in more detail below

Description:

Returns a 32-bit wide bitmask of the single-stepping capabilities of the target debug agent.



2.4.2.5 ADP_Info_MMU

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **4**

Signature:

VAL Info_MMU IS 4(UINT32):

(Info_MMU , UINT32 status, UINT32 meminfo) = ADP_ Info(Info_MMU)

Parameters:

status Adp_ok to indicate OK, or non-zero to indicate some sort of error

meminfo A 32-bit unique ID, or zero if there is no MMU support on the target

Description:

Returns information about the memory management system (if any). The only ID code currently defined is 0, indicating that no MMU is active. Please contact ARM for more information on this, as this is likely to change in the near future.

2.4.2.6 ADP_Info_SemiHosting

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **5**

Signature:

VAL Info_SemiHosting IS 5(UINT32):

(Info_ SemiHosting, UINT32 status, UINT32 meminfo) =

ADP_ Info(Info_SemiHosting)

Parameters:

status Adp_ok if semihosting info calls are available, non-zero otherwise

Description:

This message is used to check whether semihosting info calls are available on the target. These calls are described in Section 3 “C Library Remote Procedure Calls”.

2.4.2.7 ADP_Info_CoPro

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **6**

Signature:

VAL Info_CoPro IS 6(UINT32):

(Info_CoPro, UINT32 status, UINT32 meminfo) = ADP_ Info(Info_CoPro)

Parameters:

status Adp_ok if CoProcessor info calls are available, non-zero otherwise.

Description:

This message checks whether CoProcessor info calls are supported.

2.4.2.8 ADP_Info_Cycles

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **7**

Signature:

VAL Info_Cycles IS 7(UINT32):

(Info_Cycles, UINT32 status, UINT32 ninstr, scycles, ncycles, icycles, ccycles, fcycles) = ADP_ Info(Info_Cycles)

Parameters:

status	Adp_ok to indicate success, or non-zero if there is no target support for gathering cycle count information
ninstr	The number of instructions executed
scycles	The number of S-cycles executed: sequential
ncycles	The number of N-cycles executed: nonsequential
icycles	The number of I-cycles executed: internal
ccycles	The number of C-cycles executed: coprocessor
fcycles	The number of F-cycles executed: fast memory

Description:

Returns the number of instructions and cycles executed since the target was initialized. Please refer to the datasheets of the ARM core in use for more precise definitions of these terms.

2.4.2.9 ADP_Info_DescribeCoPro

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **8**

Signature:

VAL Info_DescribeCoPro IS 8(UINT32):

RECORD CoprocessorDesc IS

(BYTE copro, rmin, rmax, nbytes, access, r0, r1, w0, w1):

(Info_DescribeCoPro, UINT32 status) =

ADP_Info(Info_DescribeCoPro, []RECORD CoprocessorDesc desc)

Parameters:

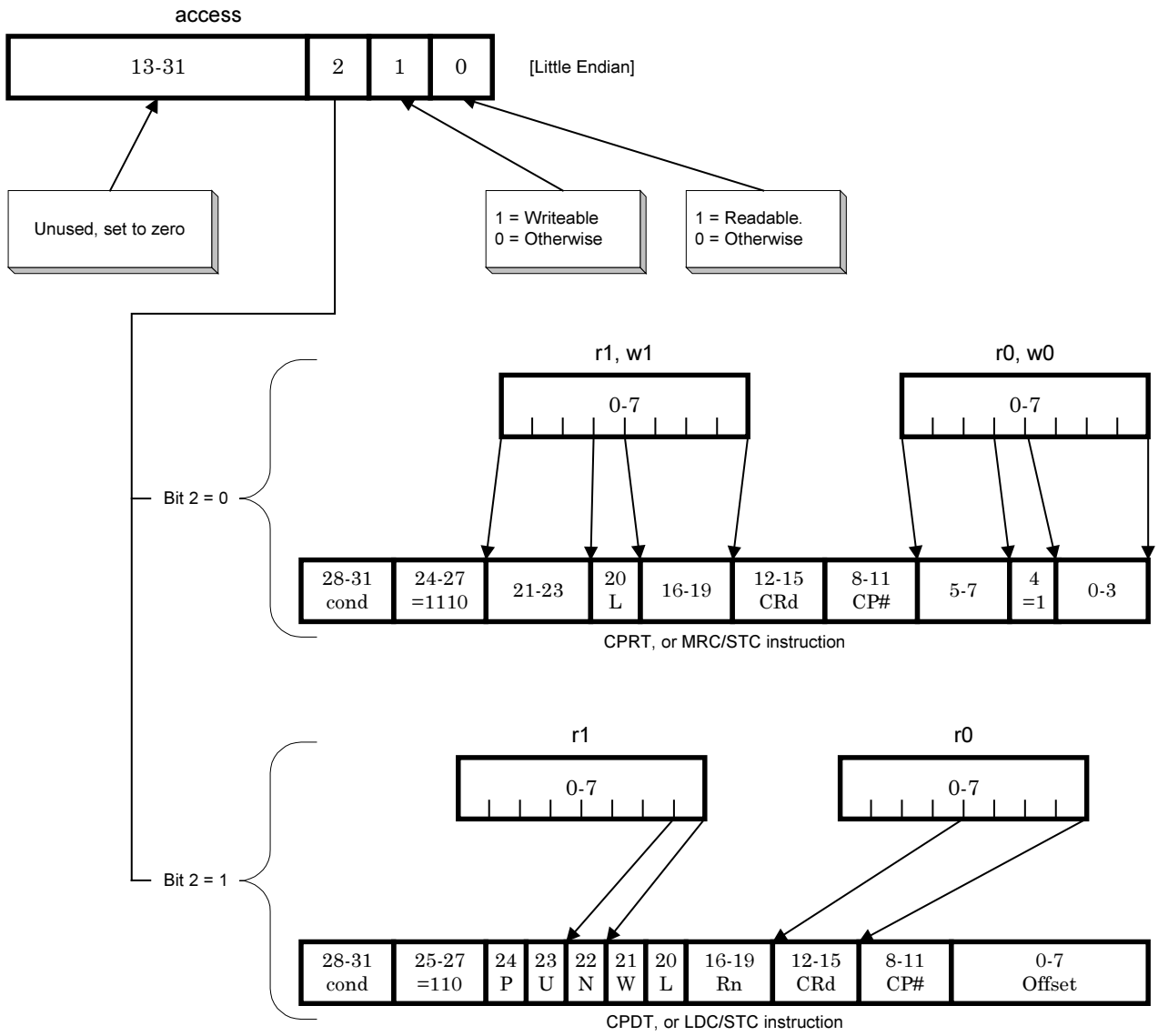
status	Adp_ok to indicate success or non-zero to indicate an error
cpno	The number of the coprocessor to be described
rmin	The bottom of a range of registers with the same description
rmax	The top of a range of registers with the same description
nbytes	The size of the register
access	Describes access to the register and is described in more detail below
r0, r1, w0, w1	See below

Description:

Note *The access and descriptor functions for coprocessors are now depreciated, and may be dropped or radically changed in future revisions of ADP. Any users of these functions should make their use known to the Angel and Debugger groups at ARM.*

Describe the registers of a coprocessor. Use only if ADP_Info_CoPro returns Adp_ok. The CoprocessorDesc array is terminated by a single byte (value 0xff) in "copro", without the rest of that record. The array must fit in a single ADP packet.

The interpretation of the bytes r0, r1, w0, w1 depends on bit 2 in the access byte, as shown in the diagram below. In the case bit 2 = 0, the byte pair r0, r1 us used when reading the coprocessor, and w0, w1 when writing to it. In the case bit 2 = 1, the values of w0, w1 are irrelevant, and r0, r1 are used for both reads and writes.


access
13-31
2
1
0
[Little Endian]
Unused, set to zero
1 = Writeable
0 = Otherwise
1 = Readable.
0 = Otherwise
Bit 2 = 0
r1, w1
0-7
r0, w0
0-7
28-31
cond
24-27
=1110
21-23
20
L
16-19
12-15
CRd
8-11
CP#
5-7
4
=1
0-3
CPRT, or MRC/STC instruction
Bit 2 = 1
r1
0-7
r0
0-7
28-31
cond
25-27
=110
24
P
23
U
22
N
21
W
20
L
16-19
Rn
12-15
CRd
8-11
CP#
0-7
Offset
CPDT, or LDC/STC instruction

2.4.2.10 ADP_Info_RequestCoProDesc

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **9**

Signature:

VAL Info_ RequestCoProDesc IS 9(UINT32):

RECORD CoprocessorDesc IS (BYTE copro, rmin, rmax, nbytes, access):

(Info_ RequestCoProDesc, UINT32 status, []RECORD CoprocessorDesc desc) =

ADP_ Info(Info_ RequestCoProDesc, BYTE cpno)

Parameters:

status	Adp_ok to indicate success or non-zero to indicate an error
cpno	The number of the coprocessor to describe
rmin	The bottom of a range of registers with the same description
rmax	The top of a range of registers with the same description
nbytes	The size of the register(s)
access	Describes access to the register and is described in more detail in DescribeCoPro, above

Description:

Note *The access and descriptor functions for coprocessors are now depreciated, and may be dropped or radically changed in future revisions of ADP. Any users of these functions should make their use known to the Angel and Debugger groups at ARM.*

Requests a description of the registers of a coprocessor.

Use only if ADP_Info_CoPro returns Adp_ok.

2.4.2.11 ADP_Info_AngelBufferSize

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **10**

Signature:

VAL Info_AngelBufferSize IS 10(UINT32):

(Info_AngelBufferSize, UINT32 status,UINT32 defaultsize, maxsize) =

ADP_Info(Info_AngelBufferSize)

Parameters:

status	Adp_ok to indicate success or non-zero to indicate an error.
defaultsize	The default Angel ADP buffer size in bytes; this must be at least 256 bytes.
maxsize	The largest Angel ADP buffer size in bytes. This must be greater than or equal to defaultsize. The target will accept ADP messages of up to this length for the ADP_Write packet type.

Description:

This call returns the Angel data packet sizes. This is the amount that the target should transmit in a single operation. This information is also given in the ADP_Booted message.

Note *The value returned should be the size of the data which can be transported in a packet, not the size of the packet itself. This is needed to ensure that the transport protocol information can be wrapped around the data.*

Note *Packets larger than defaultsize cannot be used for target-to-host messages with the ARM Host code in SDT2.11a or before. In addition, the same ARM targets can only handle one large packet at a time.*

2.4.2.12 ADP_Info_ChangeableSHSWI

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **11**

Signature:

VAL Info_ChangeableSHSWI IS 11(UINT32):

(Info_ChangeableSHSWI, UINT32 status) = ADP_ Info(Info_ChangeableSHSWI)

Parameters:

status	Adp_ok to indicate that it is possible to change which SWI is used for semihosting, or non-zero otherwise

Description:

This message is used to check whether it is possible to change which SWI's are used for semihosting.

2.4.2.13 ADP_Info_ CanTargetExecute

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **12**

Signature:

VAL Info_CanTargetExecute IS 12(UINT32):

(Info_CanTargetExecute, UINT32 status) = ADP_Info(Info_CanTargetExecute)

Parameters:

status	Adp_ok to indicate that the target is not executing application code but could do so if asked. Other values indicate why it cannot execute.

Description:

This message is used to see if the target is currently in an executable state. Typically this is called after the debugger initializes. If a adp_ok is returned then the user is allowed to ‘go’ immediately.

2.4.2.14 ADP_Info_ AgentEndianess

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **13**

Signature:

VAL Info_AgentEndianess IS 13(UINT32):

(Info_AgentEndianess, UINT32 status) = ADP_ Info(Info_AgentEndianess)

Parameters:

status See below

Description:

This message is used to determine the endianess of the debug agent (as opposed to the target). There could be a difference in the case that the debug agent is running on a distinct processor from the target (for example, with an EmbeddedICE unit).

Status should be RDIError_LittleEndian or RDIError_BigEndian; any other value indicates the target does not support this request so the debugger will have to make a best guess.

2.4.2.15 ADP_Info_CanAckHeartbeat

Channel: **CI_HADP**

Reason Code: **1**

Subreason Code: **14**

Signature:

VAL Info_CanAckHeartbeat IS 14(UINT32):

(Info_CanAckHeartbeat, UINT32 status) = ADP_ Info(Info_CanAckHeartbeat)

Parameters:

status Adp_ok to indicate heartbeats are acknowledged, non-zero otherwise

Description:

This message checks whether heartbeat messages sent from the host are acknowledged (by sending a heartbeat message to the host). Heartbeat acknowledgements are part of the channel level protocol, but were not implemented in the versions of Angel prior to 1.03 (EmbeddedICE 2.03).

If the target supports heartbeats but they are not enabled by default, this call will enable them as well.

Angel 1.04 and EmbeddedICE 2.07 support heartbeats by default; the call simply returns adp_ok.

2.4.3 ADP_Control

Channel: **CI_HADP**

Reason Code: **2**

Description:

This message allows for the state of the debug agent to be manipulated by the host.

The following are subreason codes to ADP control; the first parameter is the subreason code which defines the format of subsequent parameters.

2.4.3.1 ADP_Ctrl_NOP

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **0**

Signature:

VAL Ctrl_NOP IS 0(UINT32):

(Ctrl_NOP, UINT32 status) = ADP_ Control(Ctrl_NOP)

Parameters:

status	Adp_ok to indicate if ADP_Control messages are supported, non-zero otherwise

Description:

This message is used to check that ADP_Ctrl messages are supported.

2.4.3.2 ADP_Ctrl_VectorCatch

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **1**

Signature:

VAL Ctrl_VectorCatch IS 1(UINT32):

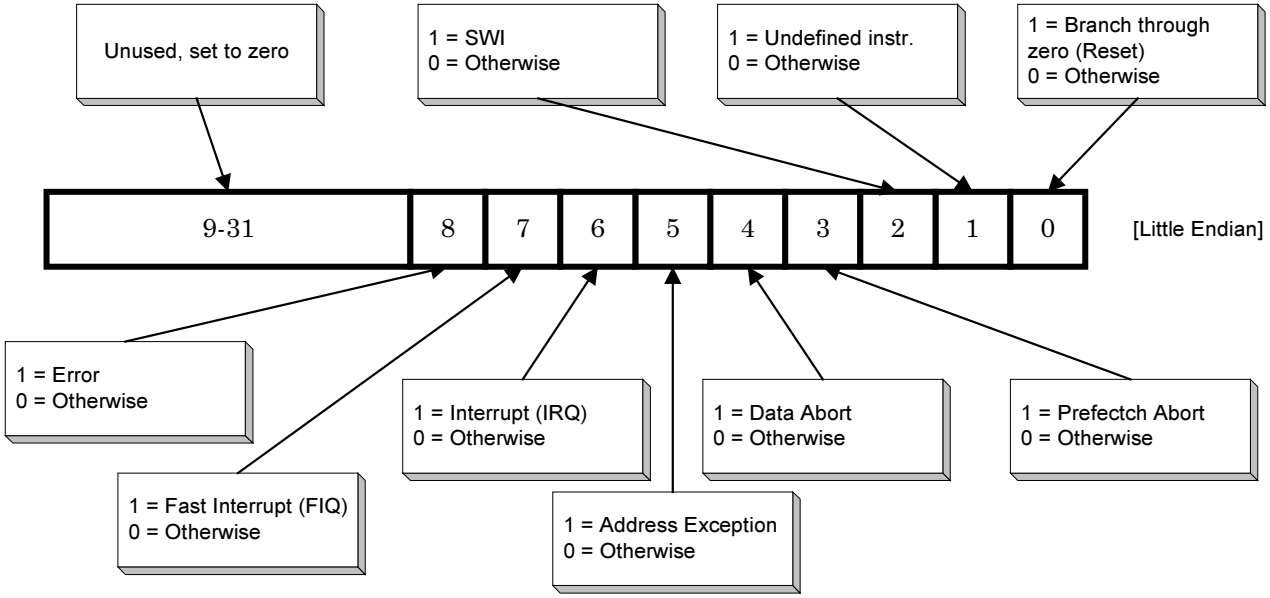
(Ctrl_VectorCatch, UINT32 status) =
ADP_Control(Ctrl_VectorCatch, UINT32 bitmap)

Parameters:

status	Adp_ok if the target has completed the request and will report the requested exceptions.
bitmap	A bit mask of exceptions to be reported, described in more detail below.

Description:

Specifies which hardware exceptions should be reported to the debugger; a set bit in 'bitmap' indicates that the exception should be reported to the debugger, a clear bit indicates that the corresponding exception vector should be taken.



2.4.3.3 ADP_Ctrl_PointStatus_Watch

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **2**

Signature:

VAL Ctrl_PointStatus_Watch IS 2(UINT32):
(Ctrl_PointStatus_Watch, UINT32 status, hwresource, type) =
ADP_Control(Ctrl_PointStatus_Watch, UINT32 handle)

Parameters:

handle	A handle to a watchpoint
status	Adp_ok to indicate success or non-zero to indicate an error
hwresource	The hardware resource number
type	The type of the resource

Description:

Returns the hardware resource number and the type of that resource when given a watchpoint handle. Should only be called if the value returned by ADP_Info_Points had bit 12, “info on break/watch” set.

2.4.3.4 ADP_Ctrl_PointStatus_Break

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **3**

Signature:

VAL Ctrl_PointStatus_ Break IS 3(UINT32):

(Ctrl_PointStatus_ Break, UINT32 status, hwresource, type) =

ADP_Control(Ctrl_PointStatus_ Break, UINT32 handle)

Parameters:

handle	A handle to a breakpoint
status	Adp_ok to indicate success or non-zero to indicate an error
hwresource	The hardware resource number
type	The type of the resource

Description:

Returns the hardware resource number and the type of that resource when given a breakpoint handle. Should only be called if the value returned by ADP_Info_Points had bit 12, “info on break/watch” set.

2.4.3.5 ADP_Ctrl_SemiHosting_SetState

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **4**

Signature:

VAL Ctrl_SemiHosting_SetState IS 4(UINT32):

(Ctrl_SemiHosting_SetState, UINT32 status) =

ADP_Control(Ctrl_SemiHosting_SetState, UINT32 semihostingstate)

Parameters:

semihostingstate	If zero, semihosting is enabled, otherwise it is disabled
status	Adp_ok to indicate success or non-zero to indicate an error

Description:

Sets whether or not semihosting is enabled. If semihosting is disabled, the debug agent must treat semihosting calls (for example, to open a file) as undefined exceptions.

Disabling semihosting does not imply disabling all support for SWI calls from the application: in Angel, the ReportException and EnterSVC calls are still permitted (indeed, Angel requires EnterSVC for it's own operation).

This should only be called if ADP_Info_SemiHosting returns a status of Adp_ok.

2.4.3.6 ADP_Ctrl_SemiHosting_GetState

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **5**

Signature:

VAL Ctrl_SemiHosting_GetState IS 5(UINT32):

(Ctrl_SemiHosting_GetState, UINT32 status, UINT32 semihostingstate) =

ADP_Control(Ctrl_SemiHosting_GetState)

Parameters:

semihostingstate	If zero, semihosting is enabled, otherwise it is disabled
status	Adp_ok to indicate success, or non-zero to indicate an error

Description:

Reads whether or not semihosting is enabled.

Note *This should only be called if ADP_Info_SemiHosting returns a status of Adp_ok.*

2.4.3.7 ADP_Ctrl_SemiHosting_SetVector

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **6**

Signature:

VAL Ctrl_SemiHosting_SetVector IS 6(UINT32):

(Ctrl_SemiHosting_SetVector, UINT32 status) =

ADP_Control(Ctrl_SemiHosting_SetVector, UINT32 semihostingvector)

Parameters:

semihostingvector	The value to which the semihosting vector is to be set.
status	Adp_ok to indicate success, or non-zero to indicate an error

Description:

Sets the semihosting vector. The normal vector to use would be the SWI vector, at address 8.

Note *This should only be called if ADP_Info_SemiHosting returns a status of Adp_ok.*

2.4.3.8 ADP_Ctrl_SemiHosting_GetVector

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **7**

Signature:

VAL Ctrl_SemiHosting_GetVector IS 7(UINT32):

(Ctrl_SemiHosting_GetVector, UINT32 status, UINT32 semihostingvector) =
ADP_Control(Ctrl_SemiHosting_GetVector)

Parameters:

semihostingvector	The current value of the semihosting vector
status	Adp_ok to indicate success, or non-zero to indicate an error

Description:

Gets the value of the semi-hosting vector.

Note *This should only be called if ADP_Info_SemiHosting returns a status of Adp_ok.*

2.4.3.9 ADP_Ctrl_Log

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **8**

Signature:

VAL Ctrl_Log IS 8(UINT32):

(Ctrl_Log, UINT32 status, UINT32 logbits) = ADP_Control(Ctrl_Log)

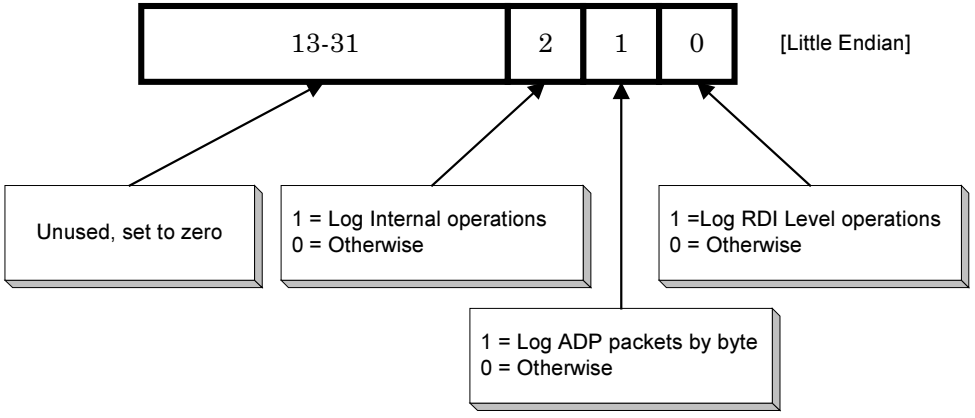
Parameters:

logbits	A bitmap specifying the current level of protocol logging
status	Adp_ok to indicate success, or non-zero to indicate an error

Description:

Returns the logging state for code running on the host.

'logsetting' is a bitmap specifying the level of logging desired. The state is a combination of the following bits.



2.4.4 ADP_Ctrl_SetLog

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **9**

Signature:

VAL Ctrl_Log IS 9(UINT32):

(Ctrl_Log, UINT32 status) = ADP_Control(Ctrl_Log, UINT32 logbits)

Parameters:

logbits	A bitmap specifying the current level of protocol logging. See ADP_Ctrl_Log above for details
status	Adp_ok to indicate success or non-zero to indicate an error

Description:

Sets the logging state for code running on the host. See above for details of the bits which can be set.

Note *The ARM debuggers do not issue the set log command until several packets into the boot sequence; if the default log state for the host is to log nothing, then no logging information will be added to the log for the open sequence and initial packet transfers.*

2.4.4.1 ADP_Ctrl_SemiHosting_SetARMSWI

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **10**

Signature:

VAL Ctrl_ SemiHosting_SetARMSWI IS 10(UINT32):

(Ctrl_ SemiHosting_SetARMSWI, UINT32 status) =

ADP_Control(Ctrl_SemiHosting_SetARMSWI, UINT32 swinumber)

Parameters:

swinumber	The new SWI number
status	Adp_ok to indicate success, or non-zero to indicate an error

Description:

Sets the number of the ARM SWI used for semihosting The debug agent will interpret ARM SWI's with the SWI number specified as semihosting SWI's.

The Angel libraries supplied with the toolkit, and the Angel ROM's installed on ARM Development Boards, use SWI number 0x123456 in ARM code and 0xAB in Thumb code.

Note *This should only be called if ADP_Info_ChangeableSHSWI does not return an error.*

2.4.4.2 ADP_Ctrl_SemiHosting_GetARMSWI

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **11**

Signature:

VAL Ctrl_ SemiHosting_GetARMSWI IS 11(UINT32):
(Ctrl_SemiHosting_GetARMSWI, UINT32 status, UINT32 swinumber) =
ADP_Control(Ctrl_ SemiHosting_GetARMSWI)

Parameters:

swinumber	The current SWI number
status	Adp_ok to indicate success or non-zero to indicate an error

Description:

Returns the number of the ARM SWI used for semihosting.

This should only be called if ADP_Info_SemiHosting returns a status of Adp_ok.

2.4.4.3 ADP_Ctrl_SemiHosting_SetThumbSWI

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **12**

Signature:

VAL Ctrl_SemiHosting_SetThumbSWI IS 12(UINT32):
(Ctrl_SemiHosting_SetThumbSWI, UINT32 status) =
ADP_Control(Ctrl_SemiHosting_SetThumbSWI, UINT32 swinumber)

Parameters:

swinumber	The current SWI number.
status	Adp_ok to indicate success, or non-zero to indicate an error

Description:

The debug agent will interpret Thumb SWI's with the SWI number specified as semihosting SWI's.

The Angel libraries supplied with the toolkit, and the Angel ROM's installed on ARM Development Boards, use SWI number 0x123456 in ARM code and 0xAB in Thumb code.

Note *This should only be called if ADP_Info_ChangeableSHSWI returns a status of Adp_ok.*

2.4.4.4 ADP_Ctrl_SemiHosting_GetThumbSWI

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **13**

Signature:

VAL Ctrl_SemiHosting_GetThumbSWI IS 13(UINT32):
(Ctrl_SemiHosting_GetThumbSWI, UINT32 status, UINT32 swinumber) =
ADP_Control(Ctrl_ SemiHosting_GetThumbSWI)

Parameters:

swinumber	The current SWI number
status	Adp_ok to indicate success or non-zero to indicate an error

Description:

Reads the number of the Thumb SWI used for semihosting.

Note *This should only be called if ADP_Info_SemiHosting returns a status of Adp_ok.*

2.4.4.5 ADP_Ctrl_Download_Supported

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **14**

Signature:

VAL Ctrl_Download_Supported IS 14(UINT32):

(Ctrl_Download_Supported, UINT32 status) =
ADP_Control(Ctrl_Download_Supported)

Parameters:

status	Adp_ok to indicate that download is possible or non-zero otherwise.

Description:

Asks whether a new Debug Agent can be downloaded. Use ADP_Ctrl_Download_Agent to initiate the actual download.

2.4.4.6 ADP_Ctrl_Download_Data

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **15**

Signature:

VAL Ctrl_Download_Data IS 15(UINT32):

(Ctrl_Download_Data, UINT32 status) =

ADP_Control(Ctrl_Download_Data, UINT32 nbytes, [nbytes]BYTE data)

Parameters:

status	Adp_ok to indicate that download is possible or non-zero otherwise
nbyes	The number of bytes of configuration data
data	The configuration data

Description:

Loads configuration data to the debug agent. The message follows ADP_Ctrl_Download_Agent.

Note *nbytes must not cause the packet size to exceed the standard packet size (256 bytes).*

Should only be used if ADP_ICEM_AddConfig didn't return an error.

2.4.4.7 ADP_Ctrl_Download_Agent

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **16**

Signature:

VAL Ctrl_Download_Data IS 16(UINT32):

(Ctrl_Download_Data, UINT32 status) =
ADP_Control(Ctrl_Download_Agent, UINT32 loadadress, UINT32 size)

Parameters:

loadaddress	The address where the new debug agent code should be loaded
size	The number of bytes of debug agent code to be loaded
status	Adp_ok to indicate success, non-zero otherwise

Description:

Prepares debug agent to receive configuration data which it should interpret as a new version of the debug agent code.

The message follows ADP_Ctrl_Download_Supported. The data will be downloaded using one or more ADP_Ctrl_Download_Data messages. The new agent is started with ADP_Ctrl_Start_Agent.

2.4.4.8 ADP_Ctrl_Start_Agent

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **17**

Signature:

VAL Ctrl_Download_Data IS 17(UINT32):

(Ctrl_Download_Data, UINT32 status) =
ADP_Control(Ctrl_Download_Agent, UINT32 startaddress)

Parameters:

startaddress	the address where the new debug agent should begin execution.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

Instruct the debug agent to begin execution of new agent, which has previously been downloaded by ADP_Ctrl_Download_Agent and ADP_Ctrl_Download_Data.

The startaddress must satisfy the condition:

(loadaddress <= startaddress <= (loadaddress + size))

where *loadaddress* and *size* were specified in the ADP_Ctrl_Download_Agent message.

Note *Immediately after sending the host should reinitialise it's buffers and sequence numbers and wait for the target to boot. There should be a timeout on this waiting period of at least 2 seconds.*

2.4.4.9 ADP_Ctrl_SetTopMem

Channel: **CI_HADP**

Reason Code: **2**

Subreason Code: **18**

Signature:

VAL Ctrl_SetTopMem IS 18(UINT32):

(Ctrl_SetTopMem, UINT32 status) =
ADP_Control(Ctrl_SetTopMem, UINT32 memtop)

Parameters:

memtop	The address where the new debug agent should begin execution
status	Adp_ok to indicate success, non-zero otherwise

Description:

Sets the top of target memory in systems where the debug agent is distinct from the target, and thus doesn't know the target memory layout. This enables the C Library to allocate the stack and heap in the correct place on startup (via the SYS_HEAPINFO system calls).

This request is supported by EmbeddedICE, and not by debug agents running on the target which should return an error such as HADPUnrecognised.

2.4.5 ADP_Read

Channel: **CI_HADP**

Reason Code: **3**

Signature:

(UINT32 status, mbytes, [mbytes]BYTE data) =
ADP_Read(INT32address, UINT32 nbytes)

Parameters:

address	The target address from which memory transfer should start
nbytes	The number of bytes to transfer
status	Adp_ok to indicate success, non-zero otherwise
mbytes	Holds the number of requested bytes *not* read (ie. zero indicates success, non-zero a partial success or failure)
data	The data requested, less “mbytes” at the end

Description:

This is a request by the host for a transfer of memory contents from the target to the debugger. The debug agent is free to perform this transfer in whatever way it chooses. That is, it should not be assumed that the transfer will use target byte or half-word writes, even when reading single bytes or half words. However, it should stop reading data as soon as it can if a data abort occurs.

The call returns the number of bytes which the debug agent has definitely not read, rounded up so that the read data is definitely correct. It is possible that the agent may have actually read more data, but is not able to determine how much (for example, it was reading the data using LDM instructions).

Transfers of 1, 2 and 4 bytes should be written to the destination memory as a single byte, short and word quantity, architecture permitting.

2.4.6 ADP_Write

Channel: **CI_HADP**

Reason Code: **4**

Signature:

(UINT32 status, mbytes) =
ADP_Write(INT32address, UINT32 nbytes, [nbytes]BYTE data)

Parameters:

address	The target address from which memory transfer should start
nbytes	The number of bytes to transfer
status	Adp_ok to indicate success, non-zero otherwise
mbytes	Holds the number of requested bytes *not* written (that is, zero indicates success, non-zero a partial success or failure). Note that this field is only present if status is *not* adp_ok.
data	The bytes of data to write.

Description:

This is a request by the host for a transfer of memory contents from the debugger to the target. The debug agent is free to perform this transfer in whatever way it chooses. That is, it should not be assumed that the transfer will use target byte or half-word writes, even when writing single bytes or half words. However, it should stop writing data as soon as it can if a data abort occurs.

The call returns the number of bytes which the debug agent has definitely not written, rounded up to the unit of data transfer. It is possible that the agent may have actually written more data, but is not able to determine how much (for example, it was writing the data using STM instructions).

Transfers of 1, 2 and 4 bytes should be written to the destination memory as a single byte, short and word quantity, architecture permitting.

2.4.7 ADP_CPUread

Channel: **CI_HADP**

Reason Code: **5**

Signature:

(UINT32 status, []BYTE data) = ADP_CPUread(BYTE mode, UINT32 mask)

Parameters:

mode	Defines the processor mode from which the transfer should be made. It is described in more detail below.
mask	Indicates which registers should be transferred. Setting a bit to one will cause the designated register to be transferred. The details of mask are specified below.
status	Adp_ok to indicate success, non-zero otherwise.

data — Holds the values of the registers on successful completion. The lowest numbered register is transferred first. Note that data must not cause the buffer size to exceed the maximum allowed buffer size.

Description:

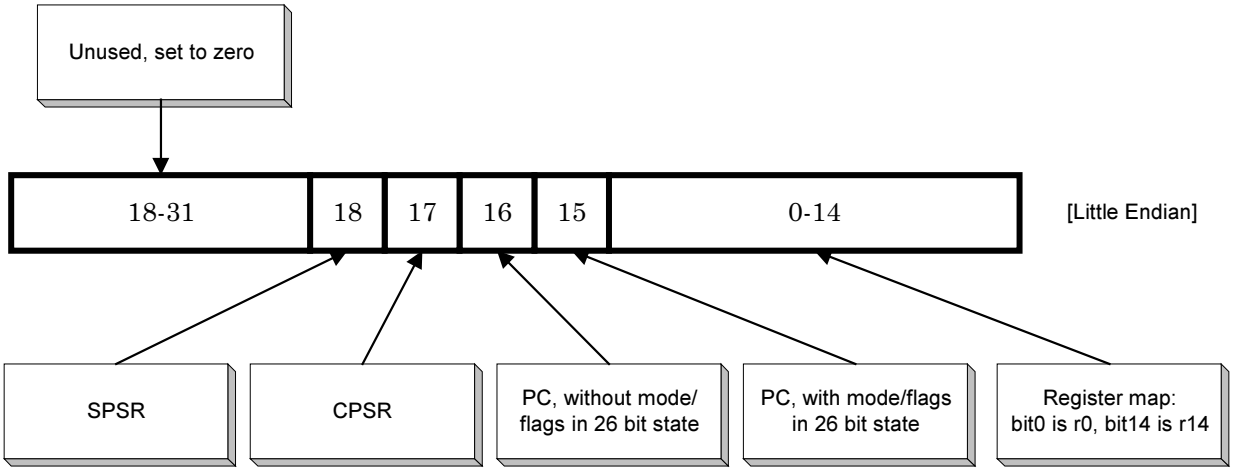
This is a request to read values in the CPU for the application task when it was last running. These values must be saved as part of the execution interrupt sequence (caused either by a breakpoint, single step, unhandled exception, application exit or debugger interrupt request).

The mode number is the same as the mode number used by an ARM CPU core (in the PSR) with the exception that a value of 0xFF indicates the current mode. It is valid to make multiple CPUread requests,although for efficiency this should be kept to a minimum.

Name	Code	Description
ADP_CPUmode_Current	0xFF	Used to specify the current mode.
ADP_CPUread_26bitUser	0x0	26-bit User mode.
ADP_CPUread_26bitFIQ	0x1	26-bit FIQ mode.
ADP_CPUread_26bitIRQ	0x2	26-bit IRQ mode.
ADP_CPUread_26bitSVC	0x3	26-bit Supervisor mode.
ADP_CPUread_32bitUser	0x10	32-bit User mode.
ADP_CPUread_32bitFIQ	0x11	32-bit FIQ mode.
ADP_CPUread_32bitIRQ	0x12	32-bit IRQ mode.
ADP_CPUread_32bitSVC	0x13	32-bit Supervisor mode.
ADP_CPUread_32bitAbort	0x17	32-bit Abort mode.
ADP_CPUread_32bitUndef	0x1B	32-bit Undefined mode.
ADP_CPUread_32bitSystem	0x1F	32-bit System mode.

Note *32-bit System mode was added in Architecture 4 ARM CPU cores eg.ARM7TDMI. Some CPU cores (e.g. StrongARM) do not implement the 26 bit modes.*

The bitmask is defined as follows:



2.4.8 ADP_CPUwrite

Channel: **CI_HADP**

Reason Code: **6**

Signature:

(UINT32 status) = ADP_CPUwrite(BYTE mode, UINT32 mask, []BYTE data)

Parameters:

mode	Defines the processor mode from which the transfer should be made. It is described in more detail in ADP_CPUread.
mask	indicates which registers should be transferred. Setting a bit to one will cause the designated register to be transferred. The details of mask are specified below.
status	Adp_ok to indicate success, non-zero otherwise.
data	Holds the values of the registers on successful completion. The lowest numbered register is transferred first. Note that data must not cause the buffer size to exceed the maximum allowed buffer size.

Description:

This is a request to write values to the CPU register block for the application task. When the debugger next requests the application execute (using ADP_Execute), these values will be loaded into the CPU registers.

If made, multiple CPUwrite requests are cumulative. It is not defined[1] what state the application task registers are in when the target is initialised; the debugger should write all registers which the application is likely to care about.

2.4.9 ADP_CPread

Channel: **CI_HADP**

Reason Code: **7**

Signature:

(UINT32 status, []BYTE data) = ADP_CPread(BYTE cpno, UINT32 mask)

Parameters:

cpno	The number of the co-processor to transfer values from.
mask	Specifies which registers to transfer and is co-processor specific.
status	Adp_ok to indicate success, non-zero otherwise.
data	holds the registers specified in 'mask' if successful, otherwise just rubbish. The lowest numbered register is transferred first.

Description:

This message requests a co-processors internal state. The only coprocessor currently defined by ARM is the system coprocessor, in which the bits of 'mask' relate directly to the registers of the coprocessor, starting with the least significant bit being register 0.

The semantics of reading coprocessor register values are as for reading the CPU registers in ADP_CPUread; the request reads the registers as they were when the application stopped. [2]

Note *The size of the 'data' array must not cause the buffer size to exceed the maximum allowed buffer size.*

---

[1] Angel 1.04 initialises the CPSR to USR mode. Future versions of Angel may initialise the CPSR to SVC mode instead. Interrupts are disabled.

[2] If the debug agent knows that the coprocessor state cannot change as a result of its activity, it can optimise application context switching by reading from and writing to the coprocessor directly.

2.4.10 ADP_CPwrite

Channel: **CI_HADP**

Reason Code: **8**

Signature:

(UINT32 status) = ADP_CPread(BYTE cpno, UINT32 mask, []BYTE data)

Parameters:

cpno	The number of the coprocessor to transfer values to.
mask	specifies which registers to transfer and is coprocessor specific.
status	Adp_ok to indicate success, non-zero otherwise.
data	holds the registers specified in 'mask' if successful. The lowest numbered register is transferred first.

Description:

This message requests a write to a coprocessors internal state. See the comments for ADP_Cpread for the coprocessor definition.

The semantics of writing coprocessor register values are as for writing the CPU registers in ADP_CPUwrite; the request writes (cumulatively) to a store of the registers which will be restored to the coprocessor when the application is (re)started.

Note *The size of the 'data' array must not cause the buffer size to exceed the maximum allowed buffer size.*

2.4.11 ADP_SetBreak

Channel: **CI_HADP**

Reason Code: **9**

Signature:

(UINT32 status, pointhandle, raddress, rbound) =
ADP_SetBreak(UINT32 address, BYTE type, UINT32 bound)

Parameters:

address	The address of the instruction to set the breakpoint on.
type	Specifies the sort of breakpoint and is described in more detail below.
bound	Only present in the message if the least significant 4 bits of 'type' are set to 5 or above.

status	Adp_ok to indicate success, non-zero otherwise.
pointhandle	Returns a handle to the breakpoint, it will be valid if bit 7 of ‘type' is set.
raddress	Valid depending on ‘type' (see below, always included).
rbound	Valid depending on ‘type' (see below, always included).

Description:

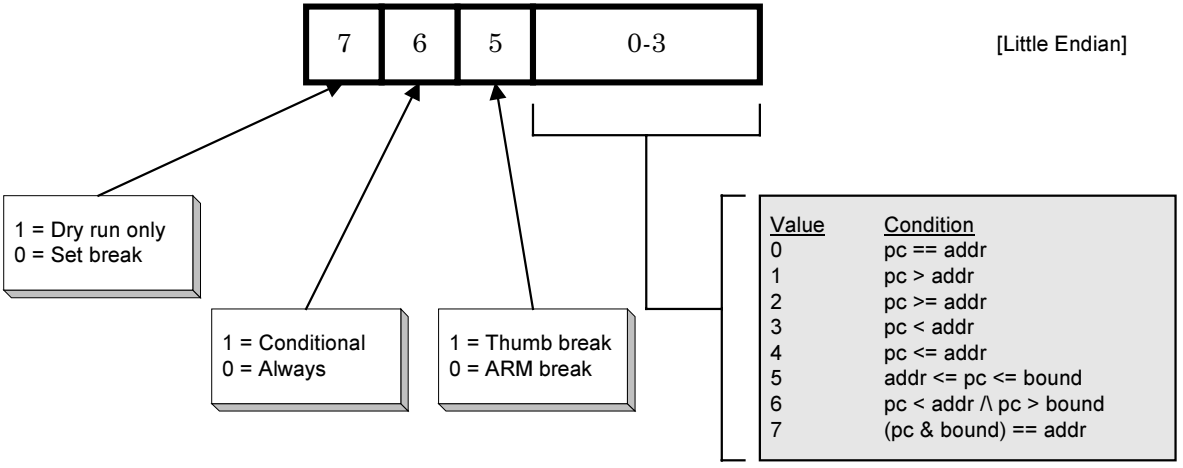
Sets a breakpoint at the specified address. If the debug agent allows multiple application threads and the requests DebugID is set to a valid thread identifier, it should selectively place the breakpoint only when that thread is running.

The interpretation of “type” is as shown in the figure below. Bits 5,6 and 7 are used as follows :

- Bit 5 set indicates that the breakpoint is on a 16-bit (Thumb) instruction rather than a 32-bit (ARM) instruction.
- Bit 6 set indicates that the breakpoint should be conditional (execution halts only if the breakpointed instruction is executed, not if it is conditionally skipped). If not set, execution halts whenever the breakpointed instruction is reached (whether executed or skipped).
- Bit 7 set requests a dry run: the breakpoint is not set, and the ‘raddress', and if appropriate the ‘rbound', that would be used, are returned (for comparison and range breakpoints the address and bound used need not be exactly as requested).

A returned adp_ok status indicates that resources are currently available to set the breakpoint, non-zero indicates an error, while the error code RDIError_NoMorePoints indicates that the required breakpoint resources are not currently available

Note *It is possible that a NoMorePoints error could occur because watchpoints are using the required resources.*



If a breakpoint is set on a location which already has a breakpoint, the first breakpoint will be removed before the new breakpoint is set.

2.4.12 ADP_ClearBreak

Channel: **CI_HADP**

Reason Code: **10**

Signature:

(UINT32 status) = ADP_ClearBreak(UINT32 pointhandle)

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.
pointhandle	A handle to the breakpoint returned from a previous call to ADP_SetBreak.

Description:

Clears a breakpoint, releasing whatever resources it was using. Once completed, ‘pointhandle’ becomes invalid.

2.4.13 ADP_SetWatch

Channel: **CI_HADP**

Reason Code: **11**

Signature:

(UINT32 status, UINT32 pointhandle, raddress, rbound) =

ADP_ SetWatch(UINT32 address, BYTE type, BYTE datatype, UINT32 bound)

Parameters:

address	The address at which to set the watchpoint.
type	The type of watchpoint to set and is described in detail below.
datatype	Defines the sort of data access to watch for and is described in more detail below.
bound	Included depending on the value of type (see description of type below).
status	Adp_ok to indicate success, non-zero otherwise.
pointhandle	Valid depending on the value of type (see description of type below).
raddress	Valid depending on the value of type (see description of type below).
rbound	Valid depending on the value of type (see description of type below).

Description:

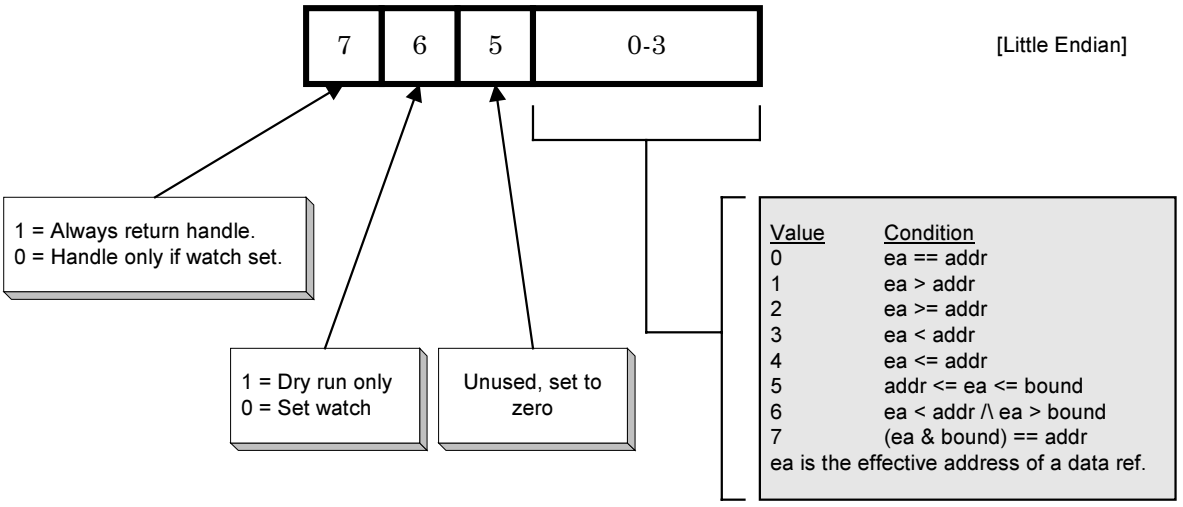
This call sets a watchpoint. If the debug agent allows multiple application threads and the requests DebugID is set to a valid thread identifier, it should place the watchpoint only when that thread is running.

The type byte is interpreted as shown in the figure below. Bits 6 and 7 are used as follows:

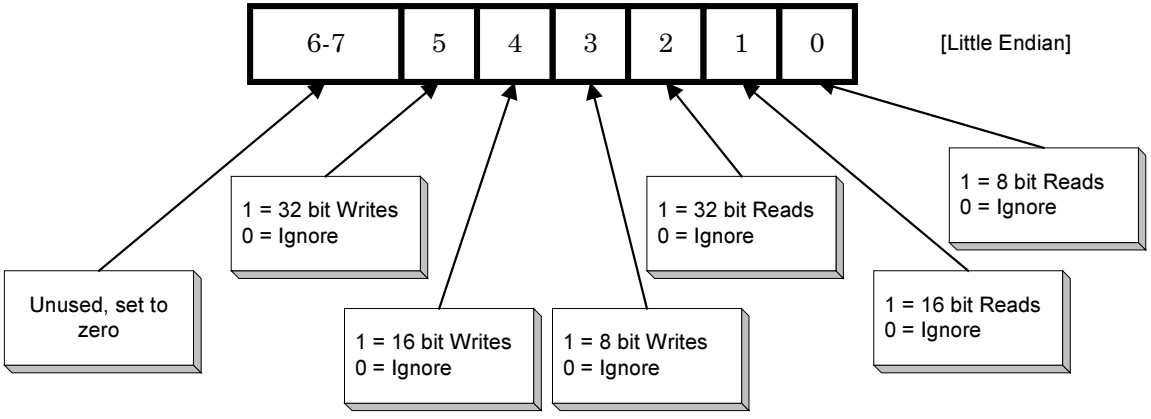
- Bit 6 set requests a dry run: the watchpoint is not set, and the ‘address' and, if appropriate, the ‘bound', that would be used are returned (for range and comparison watchpoints, the ‘address' and 'bound' used need not be exactly as requested). A adp_ok status indicates that resources are currently available to set the watchpoint; RDIError_NoMorePoints indicates that the required watchpoint resources are not currently available.
- Bit 7 set requests that a handle should be returned for the watchpoint by which it will be identified subsequently. If bit 7 is set, a handle will be returned (‘pointhandle'), whether or not the request succeeds or fails (but, obviously, it will only be meaningful if the request succeeds).

Note *Bits 6 and 7 must not be simultaneously set. Note also that the ‘dry run’ bit is in a different place in the byte from that used for breakpoints.*

The 'type' argument is laid out as shown:



The 'datatype' argument defines the sort of data access to watch for:



On successful completion an Adp_ok status byte is returned. If the request fails, Angel returns the value RDIError_NoMorePoints if there are no more watchpoint registers of the requested type, or a non-zero error code byte.

If a watchpoint is set on a location which already has a watchpoint, the first watchpoint will be removed before the new watchpoint is set.

2.4.14 ADP_ClearWatch

Channel: **CI_HADP**

Reason Code: **12**

Signature:

(UINT32 status) = ADP_ClearWatch(UINT32 pointhandle)

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.
pointhandle	A handle to the watchpoint returned from a previous call to ADP_SetWatch.

Description:

Clears a watchpoint.

2.4.15 ADP_Execute

Channel: **CI_HADP**

Reason Code: **13**

Signature:

(UINT32 status) = ADP_ Execute()

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.

Description:

This message requests that the target starts executing from the stored CPU state (set with ADP_CPUwrite and possibly ADP_CPwrite). The target must respond immediately with the ADP_Execute reply message before initiating execution.

Execution will stop when allowed system events occur. This will be one of:

1. The application terminated normally and returned control to the debugger
2. The application caused an exception (e.g. a data abort) which it provided no handler for
3. The debugger requested the debug agent to interrupt the application
4. The application hit a predefined watchpoint or breakpoint

The host will be notified that the application has stopped executing via a ADP_Stopped message (described below), even in the case of an interrupt request from the debugger. The CPU registers and, if appropriate the coprocessor state, at the point the application stopped should be stored ready for examination by the debugger via subseuent calls to ADP_CPUread and ADP_CPUread.

Note *Execution may cause the processor to enter any legal CPU state, and may cause the processor to enter illegal states as well (such as the PC or SP pointing at aborting memory, the CPSR specifying an undefined mode). The effect of these situations should be considered carefully.*

2.4.16 ADP_Step

Channel: **CI_HADP**

Reason Code: **14**

Signature:

(UINT32 status) = ADP_Step(UINT32 ninstr)

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.
ninstr	The number of instructions to execute.

Description:

Execute ‘ninstr' instructions.

The number of instructions to execute should be interpreted starting at the address currently loaded into the CPU program counter. If ‘ninstr’ is zero, the target should execute instructions up to the next instruction that explicitly alters the Program Counter. ie. a branch or ALU operation with the PC as the destination.

If the debug agent only supports stepping by one instruction at a time, it is permissible to return the HADP_Unrecognised reply when ‘ninstr’ is non-zero. In this case however the debug agent must return 0 in the ‘can step multiple instructions’ bit for an ADP_Info_Step.

The ADP_Step function will *always* return an acknowledging reply immediately. A subsequent ADP_Stopped message will be delivered from the target to the host when the ADP_Step operation has completed.

See ADP_Execute for comments on how the application can return control to the debug agent.

2.4.17 ADP_InterruptRequest

Channel: **CI_HADP**

Reason Code: **15**

Signature:

(UINT32 status) = ADP_InterruptRequest()

Parameters:

status Adp_ok to indicate success, non-zero otherwise

Description:

This requests the debug agent interrupt execution of the target. It must only be called between an ADP_Execute or ADP_Step request and the corresponding ADP_Stopped message from the target.

Once execution of the target program has halted, the reply message (type ADP_InterruptRequest) to the interrupt must be sent. Some time after this, the target must send an ADP_Stopped message which indicates that execution has completed.

`Note` *It is possible that a debug agent might receive an ADP_InterruptRequest after sending an ADP_Stopped message resulting from a target breakpoint or exception. If this happens, the InterruptRequest should just return the error RDIError_NoError.*

2.4.18 ADP_HW_Emulation

Channel: **CI_HADP**

Reason Code: **16**

Description:

The first parameter to ADP_HW_Emulation is a Reason Subcode, and subsequent parameters are defined by that subcode.

2.4.18.1 ADP_HW_Emul_Supported

Channel: **CI_HADP**

Reason Code: **16**

Subreason Code: **0**

Signature:

VAL HWEm_Supported IS 1(UINT32):

(HWEm_Supported, UINT32 status) = ADP_ HW_Emulation(HWEm_Supported)

Parameters:

status	Adp_ok to indicate that the messages are available, non-zero otherwise.

Description:

This request enquires whether the four messages MemoryAccess, MemoryMap, Set_CPUspeed and ReadClock are understood.

2.4.18.2 ADP_HW_Emul_MemoryAccess

Channel: **CI_HADP**

Reason Code: **16**

Subreason Code: **1**

Signature:

VAL HWEm_MemoryAccess IS 0(UINT32):

(HWEm_MemoryAccess, UINT32 status,

UINT32 nreads, nwrites, sreads, swrites, nsecs, secs) =

ADP_ HW_Emulation(HWEm_MemoryAccess, UINT32 handle)

Parameters:

handle	A handle to a memory block.
status	Adp_ok to indicate success, non-zero otherwise.
nreads	The number of non-sequential reads.
nwrites	The number of non-sequential writes.
sreads	The number of sequential reads.
swrites	The number of sequential writes.
nsecs	Time in nano seconds.

secs Time in seconds.

Description:

Get memory access information for memory block with specified handle.

2.4.19 ADP_HW_Emul_MemoryMap

Channel: **CI_HADP**

Reason Code: **16**

Subreason Code: **2**

Signature:

VAL HWEm_ MemoryMap IS 2(UINT32):

RECORDRegionInfo IS (UINT32 handle, start, limit, BYTE width, access,
UINT32 nread_ns, nwrite_ns, sread_ns, swrite_ns):

(HWEm_ MemoryMap, UINT32 status) =
ADP_ HW_Emulation(HWEm_ MemoryMap,
UINT32 nregions, [nregions]RECORD RegionInfo regions)

Parameters:

nregions	The number of memory regions in the memory map.
handle	A handle to the region.
start	The start of this region.
limit	The end (limit) of this region.
width	The memory width, described in detail below.
access	Described in detail below.
nread_ns	The access time for non-sequential read cycles in nano seconds.
nwrite_ns	The access time for non-sequential write cycles in nano seconds.
sread_ns	The access time for sequential read cycles in nano seconds.
swrite_ns	The access time for sequential write cycles in nano seconds.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

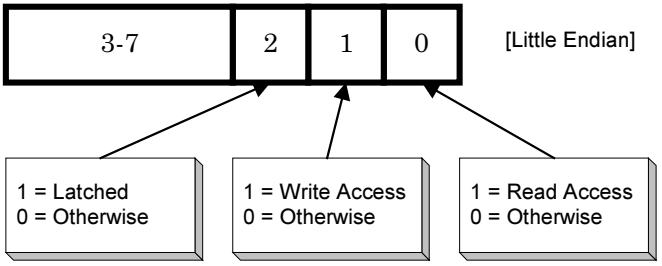
Sets memory characteristics for the given area of memory.

Width should be one of:

Name	Code	Description
MemoryMap_Width8	0	8 bit memory width.

MemoryMap_Width16	1	16 bit memory width.
MemoryMap_Width32	2	32 bit memory width.

Access is some combination of:



2.4.19.1 ADP_HW_Emul_SetCPUSpeed

Channel: **CI_HADP**

Reason Code: **16**

Subreason Code: **3**

Signature:

VAL HWEm_ SetCPUSpeed IS 3(UINT32):

(HWEm_ SetCPUSpeed, UINT32 status) =
ADP_ HW_Emulation(HWEm_ SetCPUSpeed, UINT32 speed)

Parameters:

speed	The speed of the CPU core in nano-seconds per clock cycle.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

Sets the speed of the CPU, for use when returning clock time.

2.4.19.2 ADP_HW_Emul_ReadClock

Channel: **CI_HADP**

Reason Code: **16**

Subreason Code: **4**

Signature:

VAL HWEm_ReadClock IS 4(UINT32):

(HWEm_ReadClock, UINT32 status, UINT32 ns, s) = ADP_ HW_Emulation(HWEm_ReadClock)

Parameters:

ns	The time in nano-seconds.
s	The time in seconds.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

Reads the time in seconds and nano-seconds since some arbitrary starting point.

2.4.20 ADP_ICEbreakerHADP

Channel: **CI_HADP**

Reason Code: **17**

Description:

The first parameter to ADP_ICEbreaker is a Reason Subcode, and subsequent parameters are defined by that subcode.

2.4.20.1 ADP_ICEB_Exists

Channel: **CI_HADP**

Reason Code: **17**

Subreason Code: **0**

Signature:

VAL ICEB_Exists IS 0(UINT32):

(ICEB_Exists, UINT32 status) = ADP_ ICEbreakerHADP(ICEB_Exists)

Parameters:

status	Adp_ok to indicate there is an Embedded ICE unit (or equivalent), non-zero otherwise.

Description:

Determines if the target debug agent is using the ARM hardware EmbeddedICE debug unit or not, and thus whether the ADP_ICEB calls are implemented.

2.4.20.2 ADP_ICEB_GetLocks

Channel: **CI_HADP**

Reason Code: **17**

Subreason Code: **1**

Signature:

VAL ICEB_GetLocks IS 1(UINT32):

(ICEB_GetLocks, UINT32 status, locked) =
ADP_ ICEbreakerHADP(ICEB_GetLocks)

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.
locked	A bitmap of the Embedded ICE registers locked against use by the debug agent (because they are being explicitly written by the user).

Description:

Returns which Embedded ICE registers are locked. Bit n of the bitmap ‘locked’ represents hardware breakpoint unit n, and if set the unit is locked.

This request may be used in conjunction with ADP_ICEB_SetLocks by a user or by the debug agent to reserve breakpoint units against use by the debugger.

Note *Should only be used if ADP_ICEB_Exists does not return an error.*

2.4.20.3 ADP_ICEB_SetLocks

Channel: **CI_HADP**

Reason Code: **17**

Subreason Code: **2**

Signature:

VAL ICEB_ SetLocks IS 2(UINT32):

(ICEB_SetLocks, UINT32 status) =
ADP_ICEbreakerHADP(ICEB_SetLocks, UINT32 locked)

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.
locked	A bitmap of the Embedded ICE breakpoint registers

Description:

Sets which Embedded ICE registers are locked. Bit n of the bitmap 'locked' represents hardware breakpoint unit n, and if set the unit is to be locked against use by the debug agent.

`Note` *Should only be used if ADP_ICEB_Exists does not return an error.*

2.4.20.4 ADP_ICEB_CC_Exists

Channel: **CI_HADP**

Reason Code: **17**

Subreason Code: **3**

Signature:

VAL ICEB_ CC_Exists IS 3(UINT32):

(ICEB_ CC_Exists, UINT32 status) = ADP_ ICEbreakerHADP(ICEB_ CC_Exists)

Parameters:

status	Adp_ok to indicate there is a Debug Comms Channel, non-zero otherwise.

Description:

Asks whether there is an EmbeddedICE Debug Comms Channel (DCC).

Note *Should only be used if ADP_ICEB_Exists does not return an error.*

2.4.20.5 ADP_ICEB_CC_Connect_ToHost

Channel: **CI_HADP**

Reason Code: **17**

Subreason Code: **4**

Signature:

VAL ICEB_ CC_Connect_ToHost IS 4(UINT32):

(ICEB_ CC_Connect_ToHost, UINT32 status) =

ADP_ ICEbreakerHADP(ICEB_ CC_Connect_ToHost, BYTE connect)

Parameters:

status	Adp_ok to indicate there is a Comms Channel, non-zero otherwise.
connect	1 or 0; controls transmission of messages from EmbeddedIce to the host.

Description:

Connect Comms Channel in ToHost direction. If ‘connect’ is true, the debug agent must enable transmission of data read from the DCC into the debug agent on to the host over the TDCC channel. If it is false, it should disable such transmission.

Note *Should only be used if ADP_ICEB_CC_Exists does not return an error.*

2.4.20.6 ADP_ICEB_CC_Connect_FromHost

Channel: **CI_HADP**

Reason Code: **17**

Subreason Code: **5**

Signature:

VAL ICEB_ CC_Connect_FromHost IS 5(UINT32):

(ICEB_ CC_Connect_FromHost, UINT32 status) =

ADP_ ICEbreakerHADP(ICEB_ CC_Connect_FromHost, BYTE connect)

Parameters:

status	Adp_ok to indicate there is a Comms Channel, non-zero otherwise.
connect	1 or 0; controls transmission of messages from EmbeddedIce to the host.

Description:

Connect Comms Channel in FromHost direction. If ‘connect’ is true, the debug agent must enable forwarding of data from the host TDCC channel to the target over DCC. If it is false, it should disable such transmission.

Note *Should only be used if ADP_ICEB_CC_Exists does not return an error.*

2.4.21 ADP_ICEman

Channel: **CI_HADP**

Reason Code: **18**

Description:

The first parameter to ADP_ICEman is a reason subcode, and subsequent parameters are defined by that subcode.

The requests allow the manipulation of “configurations” held within the EmbeddedICE unit. A configuration is used to describe the ARM CPU which the unit will expect to see on the end of the JTAG link. In current ARM EmbeddedICE units, two types are defined: ARM7DI and ARM7TDMI.

The configuration block format is not published.

2.4.21.1 ADP_ICEM_AddConfig

Channel: **CI_HADP**

Reason Code: **18**

Subreason Code: **0**

Signature:

VAL ICEM_AddConfig IS 0(UINT32):

(ICEM_AddConfig, UINT32 status) =
ADP_ ICEman(ICEM_AddConfig, UINT32 nbytes)

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.
nbytes	The number of bytes in the complete configuration block.

Description:

Prepares target to receive configuration data block. The data must follow in blocks described by the ADP_Ctrl_DownloadData request; it is complete when the length of data read in the DownloadData blocks equals the 'nbytes' value provided in the AddConfig request.

2.4.21.2 ADP_ICEM_SelectConfig

Channel: **CI_HADP**

Reason Code: **18**

Subreason Code: **1**

Signature:

VAL ICEM_SelectConfig IS 1(UINT32):
(ICEM_SelectConfig, UINT32 status, UINT32 version_sel) =
ADP_ICEman(ICEM_SelectConfig, BYTE aspect, namelen, matchtype,
UINT32 version_req, [namelen]BYTE name)

Parameters:

aspect	One of two values defined below.
namelen	The number of bytes in 'name'.
matchtype	Specifies how the selected version must match that specified, and takes one of the values defined below.
version_req	The requested version of the named configuration.
name	The name of the configuration.
status	Adp_ok to indicate success, non-zero otherwise.
version_sel	The version number of the configuration selected on success.

Description:

Selects one of the sets of configuration data blocks and reinitialises to use the new configuration. Aspect defines what the scope of the configuration data is, and is one of the following constants[1]:

Description	Code
Configure CPU	0

[1] Current ARM EmbeddedICE units do not implement the Configure System request.

Configure System	1

Matchtype defines whether any version of the configuration is acceptable, or whether a particular revision is needed. Version numbers are compared numerically using unsigned comparison. Select one of:

Description	Code
Match Any	0
Match Exactly	1
Match No Earlier	2

The version actually selected is returned.

2.4.21.3 ADP_ICEM_ConfigCount

Channel: **CI_HADP**

Reason Code: **18**

Subreason Code: **2**

Signature:

VAL ICEM_ConfigCount IS 2(UINT32):

(ICEM_ConfigCount, UINT32 status, UINT32 count) =
ADP_ICEman(ICEM_ConfigCount)

Parameters:

count	Returns the number of configurations if status is zero.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

Return number of known ICEman configurations. The details can be retrieved with the ADP_ICEM_ConfigNth request.

2.4.21.4 ADP_ICEM_ConfigNth

Channel: **CI_HADP**

Reason Code: **18**

Subreason Code: **3**

Signature:

VAL ICEM_ ConfigNth IS 3(UINT32):

(ICEM_ ConfigNth, UINT32 status, UINT32 version, BYTE namelen, [namelen]BYTE name) =

ADP_ ICEman(ICEM_ ConfigNth, UINT32 confignum)

Parameters:

confignum	The number of the configuration, starting at 1.
status	Adp_ok to indicate success, non-zero otherwise.
version	The configuration version number.
namelen	The number of bytes in ‘name'.
name	The name of the configuration.

Description:

Gets the name of the n^{th} processor configuration. See ICEM_ConfigCount to determine the number of available configurations and thus the range of confignum.

2.4.22 ADP_Profile

Channel: **CI_HADP**

Reason Code: **19**

Description:

The first parameter to ADP_Profile is a reason subcode, and subsequent parameters are defined by that subcode.

The Profiling codes are used to control the code profiling abilities of the debug agent. A possible sequence of events would be:

```
if (profile_supported())
        profile_writemap()
        profile_start()
        <<wait for event>>
        profile_stop()
```

profile_readmap()
profile_clearcounts()

2.4.22.1 ADP_Profile_Supported

Channel: **CI_HADP**

Reason Code: **19**

Subreason Code: **0**

Signature:

VAL Profile_Supported IS 0(UINT32):
(Profile_Supported, UINT32 status) = ADP_ Profile(Profile_Supported)

Parameters:

status Adp_ok to indicate profiling is supported, non-zero otherwise.

Description:

Checks whether profiling is supported.

Note *Can also be determined using Info_Target.*

2.4.22.2 ADP_Profile_Stop

Channel: **CI_HADP**

Reason Code: **19**

Subreason Code: **1**

Signature:

VAL Profile_Stop IS 1(UINT32):
(Profile_Stop, UINT32 status) = ADP_ Profile(Profile_Stop)

Parameters:

status Adp_ok to indicate profiling has been stopped, non-zero otherwise.

Description:

Stops collecting application profile data, leaving the results in the count array intact.

Note *There is no mechanism for the debugger to signal that the profiling data is no longer required, and that the memory used for the address map and count arrays (map[] and c[]) can be reclaimed, although the arrays may be reused.*

2.4.22.3 ADP_Profile_Start

Channel: **CI_HADP**

Reason Code: **19**

Subreason Code: **2**

Signature:

VAL Profile_ Start IS 2(UINT32):

(Profile_ Start, UINT32 status) = ADP_ Profile(Profile_Start, UINT32 interval)

Parameters:

status	Adp_ok to indicate profiling is supported, non-zero otherwise.
interval	The period of PC sampling in microseconds.

Description:

Starts profiling. The map of PC interval values must have been written to the debug agent first using the ADP_Profile_WriteMap request.

2.4.22.4 ADP_Profile_WriteMap

Channel: **CI_HADP**

Reason Code: **19**

Subreason Code: **3**

Signature:

VAL Profile_WriteMap IS 3(UINT32):

(Profile_WriteMap, UINT32 status) =

ADP_Profile(Profile_WriteMap, UINT32 len, size, offset, []UINT32 map_data)

Parameters:

len	The number of elements in the entire map array being downloaded.
size	The number of words being downloaded in this message, ie. the length of map_data.

offset	The offset into the entire map array which this message starts from, in words.
map_data	Consists of size words of map data.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

Downloads (part of) a PC interval map array, which describes the instruction address ranges for profiling. The whole profile map will be sent as a number of WriteMap messages.

Each map entry represents the PC value for the start of a code block to be profiled; the end address is assumed to be just before the next start address. There should therefore be an extra entry to mark the end of the last routine in a block.

Note The map as a whole *must* be in ascending address order.

Once the address map entries map[x] to map[x+n] are written, the equivalent counts c[x] to c[x+n] are zeroed. It is thus possible to:

1. selectively zero counts in the map (ADP_Profile_ClearCounts will clear all count values)
2. selectively add to or change the profile map, on the fly if necessary.

During application execution, if at some time (map[x] <=PC < map[x+1) where PC represents the address of an executed instruction at that time, the value c[x] is incremented.

The count array can be zeroed as a whole with ADP_Profile_ClearCounts and read by the host with ADP_Profile_ReadMap.

2.4.22.5 ADP_Profile_ReadMap

Channel: **CI_HADP**

Reason Code: **19**

Subreason Code: **4**

Signature:

VAL Profile_ReadMap IS 4(UINT32):

(Profile_ReadMap, UINT32 status, [size]UINT32 counts) =

ADP_Profile(Profile_ReadMap, UINT32 offset, size)

Parameters:

offset	The offset in the profile data array to begin reading, in words.
size	The number of words to read (<= 54).
status	Adp_ok to indicate success, non-zero otherwise.
counts	The size words of profile counts.

Description:

Uploads a set of profile counts to the host. The number of words transferred must not cause the message size to exceed 256 bytes, which limits the number of words to 54.

The offsets within the returned array correspond to the current profile map, as loaded into the target with ADP_Profile_WriteMap.

2.4.22.6 ADP_Profile_ClearCounts

Channel: **CI_HADP**

Reason Code: **19**

Subreason Code: **5**

Signature:

VAL Profile_ClearCounts IS 5(UINT32):

(Profile_ClearCounts, UINT32 status) = ADP_Profile(Profile_ClearCounts)

Parameters:

status	Adp_ok to indicate success, non-zero otherwise.

Description:

Requests that profiling sample counts be set to zero. This would typically be used to start a new profiling session.

2.4.23 ADP_InitialiseApplication

Channel: **CI_HADP**

Reason Code: **20**

Signature:

(UINT32 status) = ADP_InitialiseApplication()

Parameters:

status Adp_ok to indicate success, non-zero otherwise.

Description:

Requests the debug agent or target operating system to set up the “application” (typically a task or thread) so that it can be executed.

2.4.24 ADP_End

Channel: **CI_HADP**

Reason Code: **21**

Signature:

(UINT32 status) = ADP_End()

Parameters:

status Adp_ok to indicate success, non-zero otherwise.

Description:

Sent by the host to tell the target debug agent this debugging session is finished. The debug agent should free any session-related resources and make ready to resume with a new session.

Note *After ADP_End has been processed, the ARM debuggers (Angel, EmbeddedICE and Remote_A) explicitly reset the communications link back to default values, but only where there are negotiated parameters to change. Consequently, connections using Serial or Serial/Parallel devices where the baud rate chosen is not 9600 baud finish with ADP_End, ParameterNegotiate and LinkCheck, while those using the Ethernet device always finish with just ADP_End.*

2.4.25 ADP_ReadExt [ADP 1.1 Only]

Channel: **CI_HADP**

Reason Code: **22**

Signature:

(UINT32 status, mbytes, [mbytes]BYTE data) =

ADP_Read(INT32address, UINT32 nbytes, UINT32 access)

Parameters:

address	The target address from which memory transfer should start
nbytes	The number of bytes to transfer
status	Adp_ok to indicate success, non-zero otherwise
mbytes	Holds the number of requested bytes *not* read (ie. zero indicates success, non-zero a partial success or failure)
data	The data requested, less “mbytes” at the end
access	The memory access method, from the following table:

Symbolic Name	Value	Description
ADP_Data	0	Access a range of data memory of arbitrary size: the debugger does not mind what granularity of access is used.
ADP_Data8	1	Access data 1 byte at a time, using LDRB or equivalent.
ADP_Data16	2	Access data 2 bytes at a time, using LDRH or equivalent.
ADP_Data32	3	Access data 4 bytes at a time, using LDR or equivalent.
ADP_Data64	4	Access data 8 bytes at a time.
ADP_Code	8	Access a range of code memory of arbitrary size: the debugger does not mind what granularity of access is used.
ADP_Code8	9	Access code 1 byte at a time, using LDRB or equivalent.
ADP_Code16	10	Access code 2 bytes at a time, using LDRH or equivalent.
ADP_Code32	11	Access code 4 bytes at a time, using LDR or equivalent.

Description:

This is a request by the host for a transfer of memory contents from the target to the debugger.

See ADP_Read for general comments.

This message extends ADP_Read by specifying the method by which the agent is to perform the transfer.

If the data cannot be transferred in the method specified, the error code RDIError_UnimplementedSize must be returned. If access is not one of the values listed in the table above, the error code RDIError_UnimplementedType must be returned.

It may assumed that if ADP_ReadExt is implemented, then ADP_WriteExt is also, and vice versa.

If a target does not implement this call (for example, because it is an ADP1.0 target) then it must return RDIError_UnimplementedMessage [this is the standard return status for any unrecognised call]. Hence, a debugger which wishes to write memory may call ADP_ReadExt with the details, and if it gets back the error RDIError_UnimplementedMessage it should default to using ADP_Read with the same parameters. Once such an error is returned, it can be assumed to last for the complete session.

2.4.26 ADP_WriteExt [ADP 1.1 Only]

Channel: **CI_HADP**

Reason Code: **4**

Signature:

(UINT32 status, mbytes) =
ADP_Write(INT32address, UINT32 nbytes, [nbytes]BYTE data)

Parameters:

address	The target address from which memory transfer should start
nbytes	The number of bytes to transfer
status	Adp_ok to indicate success, non-zero otherwise
mbytes	Holds the number of requested bytes *not* written (that is, zero indicates success, non-zero a partial success or failure). Note that this field is only present if status is *not* adp_ok.
data	The bytes of data to write.
access	The memory access method, from the table given in ADP_ReadExt

Description:

This is a request by the host for a transfer of memory contents from the debugger to the target.

See ADP_Write for general comments. This message extends ADP_Write by specifying the method by which the agent is to perform the transfer.

If the data cannot be transferred in the method specified, the error code RDIError_UnimplementedSize must be returned. If access is not one of the values listed in the table above, the error code RDIError_UnimplementedType must be returned.

It may assumed that if ADP_WriteExt is implemented, then ADP_ReadExt is also, and vice versa.

If a target does not implement this call (for example, because it is an ADP1.0 target) then it must return RDIError_UnimplementedMessage [this is the standard return status for any unrecognised call]. Hence, a debugger which wishes to write memory may call ADP_WriteExt with the details, and if it gets back the error RDIError_UnimplementedMessage it should default to using ADP_Write with the same parameters. Once such an error is returned, it can be assumed to last for the complete session.

2.5 Target ADP Channel Messages

2.5.1 ADP_TADPUnrecognised

Channel: **CI_TADP**

Reason Code: **0**

Signature:

(UINT32 code) = ADP_TADPUnrecognised()

Parameters:

code Reason code which was not recognised.

Description:

This message is unusual in that it is normally sent in reply to another message which is not understood. This is an exception to the normal protocol that a reply must have the same base reason code as the original. There is a single reply parameter which is the reason code which was not understood.

As well as being a reply, this message can also be sent and will return as if this message were unrecognised.

2.5.2 ADP_Stopped

Channel: **CI_TADP**

Reason Code: **1**

Signature:

(UINT32 status) = ADP_Stopped (UINT32 reason, …)

Parameters:

status Adp_ok to indicate success, non-zero otherwise.

Description:

This message is sent to the host when the application stops.

Execution may stop when the end of the application has been reached, or as the result of an exception. It can also be the return from an ADP_Step process, when the requested number of instructions have been executed, or a breakpoint or watchpoint has been hit etc.

The first set of stopped subreason codes are for the ARM hardware vectors. These events will be raised if the ADP_Control_Vector_Catch has been set to enable this (and the exception can be caught).

Name	Code	Description	Parameter
Stopped_BranchThroughZero	0	Vector Exceptions	None.
Stopped_UndefinedInstr	1	Vector Exceptions	None
Stopped_SoftwareInterrupt	2	Vector Exceptions	None
Stopped_PrefetchAbort	3	Vector Exceptions	None
Stopped_DataAbort	4	Vector Exceptions	None
Stopped_AddressException	5	Vector Exceptions	None
Stopped_IRQ	6	Vector Exceptions	None
Stopped_FIQ	7	Vector Exceptions	None
Stopped_BreakPoint	32	Breakpoint was reached	UINT32 Breakpoint handle
Stopped_Watchpoint	33	Watchpoint was reached	UINT32 Watchpoint handle
Stopped_StepComplete	34	End of ADP_Step	None
Stopped_RunTimeErrorUnknown	35	Non-specific fatal runtime support error	None
Stopped_InternalError	36	Angel internal error	UINT32 Error code
Stopped_UserInterruption	37	Host requested interruption	None
Stopped_ApplicationExit	38	Application has exited via exit(), a code of zero indiactes successful termination	UINT32 exit() code
Stopped_StackOverflow	39	Software stack overflow	None
Stopped_DivisionByZero	40	Division by zero	None
Stopped_OSSpecific	41	OS requested that execution stops.	

Note *Stopped_InternalError: An internal error in the debug agent has happened. The error number should be displayed for the user to report to his software supplier. Once this error has been received the internal state of the debug agent can no longer be trusted.*

2.6 Target Debug Comms Channel Messages

2.6.1 ADP_TDCC_ToHost

Channel: **CI_TTDCC**

Reason Code: **0**

Signature:

(UINT32 status) = ADP_TDCC_ToHost(UINT32 nbytes, [nbytes/4]UINT32 data)

Parameters:

nbytes	Number of bytes to be transferred from the target to the host via the Debug Comms channel.
data	Data to be transferred from the target to the host via the Debug Comms channel.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

Transfer data by reading the processor Debug Communications Channel and returning those word(s) to the host. The data being will be in target endianness.

Note *Current implementations only support single word transfers (nbytes = 4).*

2.6.2 ADP_TDCC_FromHost

Channel: **CI_TTDCC**

Reason Code: **1**

Signature:

(UINT32 status, UINT32 nbytes, [nbytes/4]UINT32 data) = ADP_TDCC_FromHost()

Parameters:

nbytes	Number of bytes to be transferred from the target to the host via the Debug Comms channel.
data	Data to be transferred from the target to the host via the Debug Comms channel.
status	Adp_ok to indicate success, non-zero otherwise.

Description:

Transfer data using the processor Debug Communications Channel from the host to the target. The data being sent must be in the correct endianness for the target processor.

Note *Current implementations only support single word transfers (nbytes = 4).*

3 C Support Library Remote Procedure Calls

This section describes the C support library remote procedure calls. These calls mirror the semihosting SWI calls for the semihosting functions which the target debug agent is unable to perform.

3.1 Function Signatures and Packet Formation

These are as described for ADP RPC. It should be noted that C library packets have never had the channel number encoded in the reason word.

3.2 Target to Host Messages

3.2.1 CL_Unrecognised

Channel: **CI_CLIB**

Reason Code: **0**

Signature:

(UINT32 code) = CL_Unrecognised()

Parameters:

code	The reason code which was not understood.

Description:

This message is used as a response to a packet whose message was not understood. The return parameter, code, is the reason code which was not understood.

3.2.2 CL_WriteC

Channel: **CI_CLIB**

Reason Code: **1**

Signature:

(UINT32 status) = CL_WriteC(BYTE char)

Parameters:

char	The character to write.
status	Adp_ok if character write successful.

Description:

This message writes a single character to the debugger's console window, or similar, on the host. The character is encoded in ASCII. Some systems assume that CL_WriteC and CL_Write0 write to the same device or file.

3.2.3 CL_Write0

Channel: **CI_CLIB**

Reason Code: **2**

Signature:

(UINT32 status) = CL_Write0(UINT32 nbytes, [nbytes+1]BYTE string)

Parameters:

string	The string of characters to write.
nbytes	The number of bytes in 'string' excluding the null terminator
status	adp_ok if write successful.

Description:

This message writes a null terminated string to the debugger's console window, or similar, on the host. The number of bytes in the supplied string is nbytes+1, as nbytes is the number of bytes to write. The text is encoded in ASCII.

Some systems assume that CL_WriteC and CL_Write0 write to the same device or file.

3.2.4 CL_ReadC

Channel: **CI_CLIB**

Reason Code: **4**

Signature:

(UINT32 status, BYTE char) = CL_ReadC()

Parameters:

status	Adp_ok if read successful.
char	The character which was read.

Description:

This message reads a single character from the host's keyboard as an ASCII encoded value.

3.2.5 CL_System

Channel: **CI_CLIB**

Reason Code: **5**

Signature:

(UINT32 code, BYTE exitcode) =
CL_System(UINT32 nbytes, [nbytes+1]BYTE command)

Parameters:

nbytes	The length of the command string, excluding the null termination byte.
command	The command string to pass to the host's command interpreter. Null terminated.
exitcode	The exit code returned by the host OS from running 'command'.
char	The character which was read.

Description:

This message invokes the host's command line interpreter in a manner similar to the ANSI function *system()*. The command string is null terminated.

3.2.6 CL_GetCmdLine

Channel: **CI_CLIB**

Reason Code: **16**

Signature:

(UINT32 status, UINT32 nbytes, [nbytes+1]BYTE args) = CL_GetCmdLine()

Parameters:

status	Adp_ok if read successful
nbytes	The length of the command argument string, excluding the null termination byte.
args	The command line arguments used to invoke the program. Null terminated.

Description:

This message reads the null terminated string used to invoke the program. No interpretation is performed on this string. The command string is null terminated.

3.2.7 CL_Clock

Channel: **CI_CLIB**

Reason Code: **97**

Signature:

(UINT32 status, UINT32 ticks) = CL_Clock()

Parameters:

status	Adp_ok if read successful
ticks	The number of clock ticks, in centiseconds.

Description

This request returns the number of centiseconds since the support code's process was started on the host. Only the difference between calls has any meaning, and it should be remembered that over slower communications links, a significant variance can be expected in the results due to packet transmission delays.

3.2.8 CL_Time

Channel: **CI_CLIB**

Reason Code: **99**

Signature:

(UINT32 status, UINT32 time) = CL_Time()

Parameters:

status	Adp_ok if read successful.
time	The time in seconds since 00:00 on the 1 Jan 1970.

Description:

This request returns the time of day, in seconds since the start of January 1st 1970; this is the same as the standard Unix `time()` function. It should be remembered that over slower communications links, a variance can be expected in the results due to packet transmission delays.

Whether the value can exceed 2^31 seconds depends on the implementation of the host C library time() function; if it cannot, the value will wrap around during the year 2038.

3.2.9 CL_Remove

Channel: **CI_CLIB**

Reason Code: **100**

Signature:

(UINT32 status) = CL_ Remove(UINT32 nbytes, [nbytes+1]BYTE filename)

Parameters:

status	Adp_ok if read successful.
filename	The name of the file to delete. Null terminated.
nbytes	The length of filename, excluding the null termination.

Description:

This request deletes the file with the given name from the host's file system.

The null terminated file name is not interpreted in any way, but is limited in length by the ADP packet size.

3.2.10 CL_Rename

Channel: **CI_CLIB**

Reason Code: **101**

Signature:

(UINT32 status) = CL_Rename(UINT32 nbytes1, [nbytes1+1]BYTE filename1, UINT32 nbytes2, [nbytes2+1]BYTE filename2)

Parameters:

status	Adp_ok if read successful
filename1	The old name of the file. Null terminated.
filename2	The new name of the file. Null terminated.
nbytes1	The length of filename1, excluding the null termination.
nbytes2	The length of filename2, excluding the null termination.

Description:

This requests the host to rename filename1 to have the name filename2. Both filenames must be contained within a single ADP packet.

3.2.11 CL_Open

Channel: **CI_CLIB**

Reason Code: **102**

Signature:

(UINT32 handle) =
CL_Open(UINT32 nbytes, [nbytes+1]BYTE filename, UINT32 mode)

Parameters:

handle	The file handle which will be used in subsequent file operations, or zero if the open failed.
mode	The open mode; see below
nbytes	The length of filename1, excluding the null termination
filename	The name of the file to open. Null terminated.

Description:

This message attempts to open the named file in the fashion requested by ‘mode’.

The name “:tt” is used to reference the standard input or standatd output streams on the host (e.g. in “C”, the value of “stdin” or “stdout”. Which of the streams is opened is dependent on the value of “mode”. Implementations for which there is no standard input or output should either treat the name as a file or return a failure code.

Note *The ARM C library will try to open “:tt” three times to generate it’s stdin, stdout and stderr streams on application startup.*

The open mode is one of the values shown below. Other values are undefined:

Mode:	0	1	2	3	4	5	6	7	8	9	10	11
ANSI fopen():	r	rb	r	r+	r+b	w	w+	w+b	a	ab	a+	a+b

The file handle is an opaque integer which is used by the host to identify the file in subsequent read, write etc. operations.

3.2.12 CL_Close

Channel: **CI_CLIB**

Reason Code: **104**

Signature:

(UINT32 status) = CL_Close(UINT32 handle)

Parameters:

status	Adp_ok if close successful.
handle	The file handle to close.

Description:

This message closes a file opened with CL_Open above. The 'handle' should be non-zero. The close operation can fail; the result should always be checked.

3.2.13 CL_Write

Channel: **CI_CLIB**

Reason Code: **105**

Signature:

(UINT32 nwritten) =
CL_Write(UINT32 handle, UINT32 nbtotal, nbytes, [nbytes]BYTE data)

Parameters:

status	Adp_ok if close successful
nbtotal	The total number of bytes to write.
nbytes	The number of bytes in *this* packet.
data	The data to write to the file.
handle	An open, writable file handle.
nwritten	The number of bytes *not* written to the file.

Description:

This message writes a block of data to the file identified by handle.

If the number of bytes to write exceeds the maximum packet size, a number of CL_WriteX packets will follow this packet. If nbtotal is less than the space left in the packet, then nbtotal == nbytes and nwritten is the number of bytes *not* written to the file (ie. nwritten == 0 is a successful write). Otherwise, the return code from CL_Write can be ignored.

The data should be written as a single block of 'nbtotal' bytes wherever possible even when the data is transmitted using CL_WriteX packets.

Note *Both CL_Write and CL_WriteX packets expect acknowledgements from the host for every packet sent.*

3.2.14 CL_WriteX

Channel: **CI_CLIB**

Reason Code: **106**

Signature:

(UINT32 status) = CL_WriteX(UINT32 nbytes, [nbytes]BYTE data)

Parameters:

nbytes	The number of bytes in *this* packet.
data	The data to write to the file.
nwritten	The number of bytes *not* written to the file.
status	Adp_ok if close successful.

Description:

This message continues a write request started with a CL_Write; it is an invalid operation to make this call at any other time than after a CL_Write or CL_WriteX.

If this is the last packet of the write (ie. the accumulated value of nbytes from previous CL_Write and CL_WriteX calls, is equal to the value of nbtotal in the original CL_Write) then the return value nwritten is the number of bytes not written to the file. Otherwise, the value can be ignored.

3.2.15 CL_Read

Channel: **CI_CLIB**

Reason Code: **107**

Signature:

(UINT32 status, nread, nbmore, [nread]BYTE data) =
CL_Read(UINT32 handle, UINT32 nbytes)

Parameters:

status	Adp_ok if close successful.
nread	The number of bytes read in this packet.
nbmore	The number of bytes which are following in CL_ReadX packets.
handle	An open, readable file handle.
data	The data read in this packet.

Description:

This message reads nbytes bytes of data from the file handle provided. If the number of bytes to read is less than the space left in the packet, then the reply packet will contain the bytes read, nread will be this number and nbmore will be zero. Otherwise, nread will be the number of bytes returnable in this reply packet, nbmore will be the number of bytes left to return, and the replies to following CL_ReadX packets will contain the rest of the data.

The reader should never send a CL_ReadX request unless there is data waiting to be sent, as indicated by a previous CL_Read or CL_ReadX reply.

3.2.16 CL_ReadX

Channel: **CI_CLIB**

Reason Code: **108**

Signature:

(UINT32 status, nread, nbmore, [nread]BYTE data) = CL_ReadX()

Parameters:

nread	the number of bytes read in this packet.
nbmore	the number of bytes which are following in CL_ReadX packets.
data	the data read in this packet
status	adp_ok if close successful

Description:

This message continues a read request started with a CL_Read; it is an invalid operation to make this call at any other time than after a CL_Read or CL_ReadX.

If this is the last packet of the read (ie. the value of nbmore from the last CL_Read or CL_ReadX call is zero) then the return value nwritten is the number of bytes *not* written to the file. Otherwise, the value can be ignored.

3.2.17 CL_Seek

Channel: **CI_CLIB**

Reason Code: **109**

Signature:

(UINT32 status) = CL_Seek(UINT32 handle, UINT32 position)

Parameters:

status	Adp_ok if close successful.
handle	An open, seekable file handle.
position	The offset in bytes from the start of the file represented by handle.

Description:

This message positions the file's read/write pointer to 'position' bytes from the start of the file. If the file is shorter than this, or if the position when considered as a signed number is negative, the behavior is host operating system dependant.

3.2.18 CL_FLen

Channel: **CI_CLIB**

Reason Code: **110**

Signature:

(UINT32 status, len) = CL_FLen(UINT32 handle)

Parameters:

status	Adp_ok if close successful.
len	The length of the file.
handle	An open file handle.

Description:

This message returns the length of the file specified by 'handle'. If the file cannot be considered to have a length (eg. a terminal or pipe) then the returned value is -1 (0xFFFFFFFF). If a file larger than 2^31 is examined, the length value is undefined.

3.2.19 CL_IsTTY

Channel: **CI_CLIB**

Reason Code: **111**

Signature:

(UINT32 status) = CL_IsTTY(UINT32 handle)

Parameters:

status	Adp_ok if close successful.
handle	An open file handle.

Description:

This message returns adp_ok if the file handle given represents an interactive device, such as a console or terminal, and non-zero otherwise.

3.2.20 CL_TmpNam

Channel: **CI_CLIB**

Reason Code: **112**

Signature:

(UINT32 status, UINT32 nbytes, [nbytes+1]BYTE filename) =
CL_TmpNam(UINT32 maxlength, UINT32 targetid)

Parameters:

status	Adp_ok if close successful.

Description:

This message returns a temporary host file name. The maximum length of a filename is passed to the host. The TargetID is some identifier from the target for this particular temporary filename. This value could be used directly in the generation of the filename.

If the host cannot create a suitable name, or the generated name is too long, then an error code is returned in status.

4 Error Codes

4.1 ADP Error Codes

ADP Error codes are used to describe errors which relate to the comminucation channel between target and host. Errors relating to the debug agent, or the operation of the application program (for example, reporting an exception) are reported using the ARM RDI error codes, which are reproduced in the next section.

Name	Code	Description
adp_ok	0	Success; no error
adp_failed	256	Generic error
adp_malloc_failure	257	Failed to allocate dynamic memory (host side)
adp_illegal_args	258	Invalid parameter value or combination
adp_device_not_found	259	The device name specified was not found in the list of known devices.
adp_device_open_failed	260	Could not open comms device required
adp_device_already_open	261	Comms device already open, cannot share
adp_device_not_open	262	Operation requested which requires comms with target, but device not opened
adp_bad_channel_id	263	Channel ID provided outside the valid range
adp_callback_already_registered	264	Channel already has a registered callback; it must be removed
adp_write_busy	265	(another) write in progress; cannot write data at this time
adp_bad_packet	266	Bad (e.g. CRC error) packet received
adp_seq_high	267	Packet sequence number invalid – too high
adp_seq_low	268	Packet sequence number invalid – too low
adp_timeout_on_open	269	Couldn't initiate target comms; target failed to respond
adp_abandon_boot_wait	270	On initialisation, the target did not respond to the host. This is an internal code which is translated to
adp_late_startup	271	
adp_new_agent_starting	272	

adp_resend_failed	273	
adp_timeout	274	general timeout
adp_bootmessage	275	Boot message at inappropriate time

4.2 RDI Error Codes

The RDI Error codes defined below are used by the RDI interface on the host, and are described in more detail in the RDI Protocol Specifications. They are also used by the target debug agent to report errors over ADP, saving the host debug agent from having to perform a translation.

Name	Code	Description
RDIError_NoError	0	Success; no error. Alternatively, the 'no' answer of a Yes/No RDI Info question.
RDIError_Reset	1	Processor has hit the Reset vector
RDIError_UndefinedInstruction	2	Processor has hit the Undefined instruction vector
RDIError_SoftwareInterrupt	3	Processor has hit the Software Interrupt vector
RDIError_PrefetchAbort	4	Processor has hit the Prefectch Abort vector
RDIError_DataAbort	5	Processor has hit the Data Abort vector
RDIError_AddressException	6	Processor has hit the Address Exception vector (should only happen on 26 bit systems)
RDIError_IRQ	7	Processor has hit the IRQ vector (may be masked by Angel use of this vector)
RDIError_FIQ	8	Processor has hit the Fast Interrupt vector (may be masked by Angel use of this vector)
RDIError_Error	9	An unclassified error has occurred. Alternatively, the 'no' answer of a Yes/No RDI Info question.
RDIError_BranchThrough0	10	[For Angel]: A prefetch abort occurred.
RDIError_NotInitialised	128	Debug session initiated before Agent initialisation complete.
RDIError_UnableToInitialise	129	[For Angel]: Not used. (e.g. Armulator: no processor specification available)
RDIError_WrongByteSex	130	Debugger asked for initialisation with one byte sex, but the target was another.
RDIError_UnableToTerminate	131	Not currently used.
RDIError_BadInstruction	132	
RDIError_IllegalInstruction	133	

RDIError_BadCPUStateSetting	134	
RDIError_UnknownCoPro	135	Attempt to use a coprocessor which has not been defined, or which is not present in the hardware.
RDIError_UnknownCoProState	136	Attempt to use an undefined coprocessor register.
RDIError_BadCoProState	137	Coprocessor register not writable for read op, or readable for write op.
RDIError_BadPointType	138	Not used in Angel.
RDIError_UnimplementedType	139	Break or Watch-point type (condition or address codes) not implemented.
RDIError_BadPointSize	140	Size of break/watch point not implemented.
RDIError_UnimplementedSize	141	
RDIError_NoMorePoints	142	Limit on the number of watch/break points has been reached.
RDIError_BreakpointReached	143	Program stopped as a result of reaching a breakpoint.
RDIError_WatchpointAccessed	144	Program stopped as a result of reaching a watchpoint.
RDIError_NoSuchPoint	145	Break or Watch-point reference, e.g. in ClearBreak, does not refer to a current watch or breakpoint
RDIError_ProgramFinishedInStep	146	Step over the exit SWI (ADP_Stopped_ApplicationExit) attempted.
RDIError_UserInterrupt	147	User requested an application program interruption, which has now occurred.
RDIError_CantSetPoint	148	The debug agent was unable to set a break or watchpoint.
RDIError_IncompatibleRDILevels	149	A specific RDI definition was requested which the target does not support.
RDIError_CantLoadConfig	150	Response to ADP_Ctrl_DownloadSupported: debug agent cannot load new processor configurations.
RDIError_BadConfigData	151	The processor config data selected by ADP_ICEM_SelectConfig is in error.
RDIError_NoSuchConfig	152	ADP_ICEM_SelectConfig called with a pattern which matches no currently loaded configuration.

RDIError_BufferFull	153	
RDIError_OutOfStore	154	No more memory available for requested operation. This may indicate a system shortage, but many items are allocated from individual memory pools.
RDIError_NotInDownload	155	ADP_Ctrl_DownloadData called without a prior ADP_Ctrl_LoadAgent or ADP_ICEM_AddConfig.
RDIError_PointInUse	156	
RDIError_BadImageFormat	157	Load file not in correct executable image format.
RDIError_TargetRunning	158	Could not stop target to perform requested operation.
RDIError_DeviceWouldNotOpen	159	Requested target communications device found, but failed to open.
RDIError_NoSuchHandle	160	
RDIError_ConflictingPoint	161	
RDIError_LinkTimeout	200	A timeout error occurred on the communications link to the target; the target is not responding.
RDIError_OpenTimeout	201	A timeout error occurred when attempting to contact the target for the first time; is there a target there?
RDIError_LinkDataError	202	A data error (CRC, format etc) occurred for a data packet on the link, and automatic recovery was disabled or not implemented.
RDIError_Interrupted	203	
RDIError_LittleEndian	240	[Not an error]: Initialisation of target succeeded, and the target is now operating little-endian.
RDIError_BigEndian	241	[Not an error]: Initialisation of target succeeded, and the target is now operating big-endian.
RDIError_SoftInitialiseError	242	Recoverable error during initialisation of a (host) debug agent.
RDIError_InsufficientPrivilege	253	Operation not permitted: In Angel, memory read or write to Angel code or data space.
RDIError_UnimplementedMessage	254	Request not implemented by target.
RDIError_UndefinedMessage	255	Request not understood by target.