                            TFTP Blocksize Option

Status of this Memo

Abstract

   The Trivial File Transfer Protocol [1] is a simple, lock-step, file
   transfer protocol which allows a client to get or put a file onto a
   remote host. One of its primary uses is the booting of diskless
   nodes on a Local Area Network. TFTP is used because it is very
   simple to implement in a small node's limited ROM space. However,
   the choice of a 512-byte blocksize is not the most efficient for use
   on a LAN whose MTU may 1500 bytes or greater.

   This document describes a TFTP option which allows the client and
   server to negotiate a blocksize more applicable to the network
   medium. The TFTP Option Extension mechanism is described in [2].

Blocksize Option Specification

   The TFTP Read Request or Write Request packet is modified to include
   the blocksize option as follows:

```
    +-------+---~---+---+---~---+---+---~---+---+---~---+---+
    |  opc  |filename| 0 |  mode | 0 | blksize| 0 | #octets| 0 |
    +-------+---~---+---+---~---+---+---~---+---+---~---+---+
```

   opc
      The opcode field contains either a 1, for Read Requests, or 2,
      for Write Requests, as defined in [1].

   filename
      The name of the file to be read or written, as defined in [1].
      This is a NULL-terminated field.

mode
   The mode of the file transfer: "netascii", "octet", or "mail",
   as defined in [1]. This is a NULL-terminated field.

blksize
   The Blocksize option, "blksize" (case insensitive). This is a
   NULL-terminated field.

#octets
   The number of octets in a block, specified in ASCII. Valid
   values range between "8" and "65464" octets, inclusive. This
   is a NULL-terminated field.

For example:

```
+-------+--------+---+--------+---+--------+---+--------+---+
|   1   | foobar | 0 | binary | 0 | blksize| 0 |  1432  | 0 |
+-------+--------+---+--------+---+--------+---+--------+---+
```
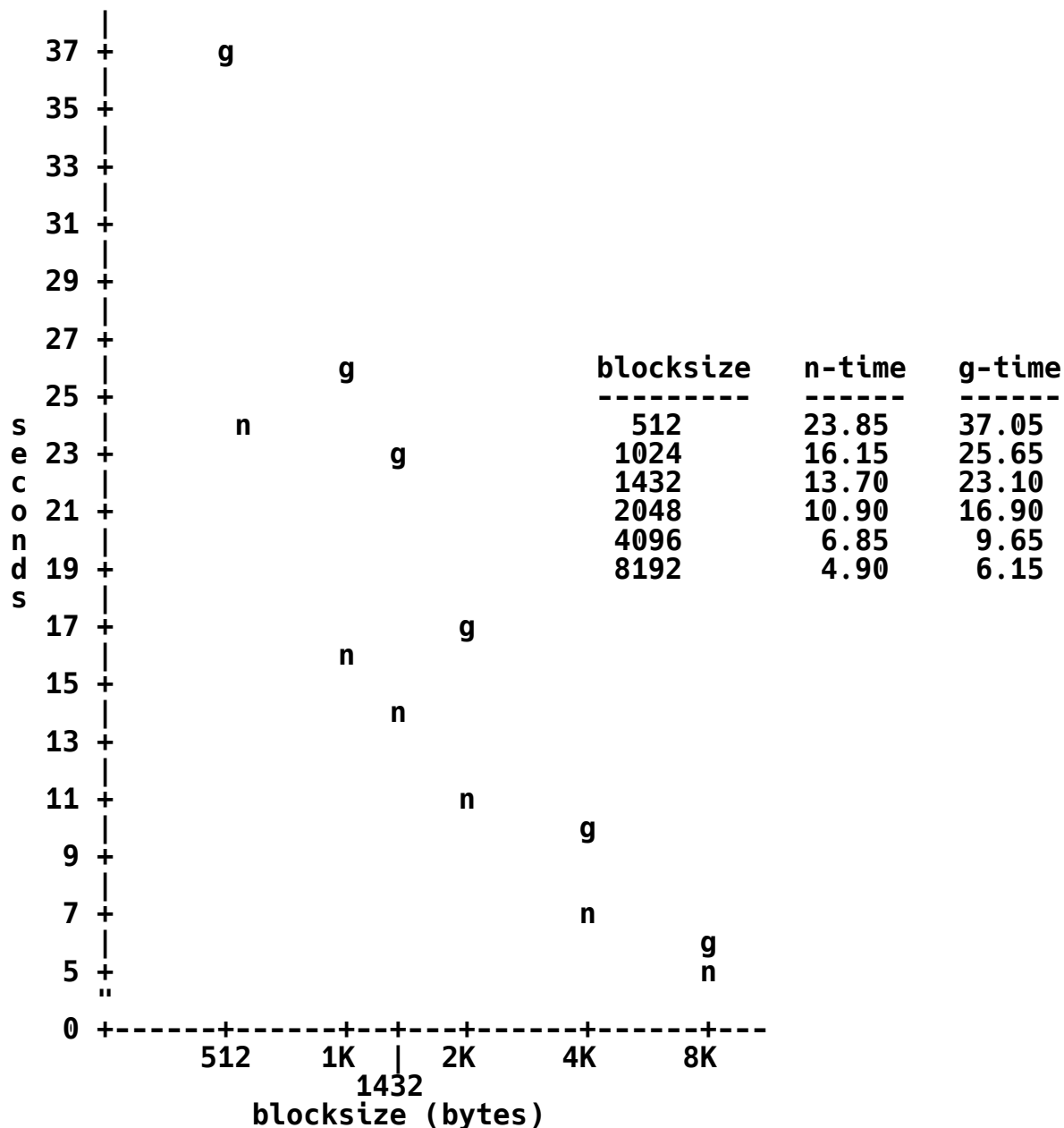
is a Read Request, for the file named "foobar", in binary transfer
mode, with a block size of 1432 bytes (Ethernet MTU, less the UDP and
IP header lengths).

If the server is willing to accept the blocksize option, it sends an
Option Acknowledgment (OACK) to the client. The specified value must
be less than or equal to the value specified by the client. The
client must then either use the size specified in the OACK, or send
an ERROR packet, with error code 8, to terminate the transfer.

The rules for determining the final packet are unchanged from [1].
The reception of a data packet with a data length less than the
negotiated blocksize is the final packet. If the blocksize is
greater than the size of the packet, the first packet is the final
packet. If amount of data to be transfered is an integral multiple
of the blocksize, an extra data packet containing no data is sent to
end the transfer.

Proof of Concept

   Performance tests were run on the prototype implementation using a
   variety of block sizes. The tests were run on a lightly loaded
   Ethernet, between two HP-UX 9000, in "octet" mode, on 2.25MB files.
   The average (5x) transfer times for paths with (g-time) and without
   (n-time) a intermediate gateway are graphed as follows:

```
       |
    37 +       g
       |
    35 +
       |
    33 +
       |
    31 +
       |
    29 +
       |
    27 +
       |           g               blocksize    n-time    g-time
    25 +                           ---------    ------    ------
  s    |       n                      512       23.85     37.05
  e 23 +           g                 1024       16.15     25.65
  c    |                             1432       13.70     23.10
  o 21 +                             2048       10.90     16.90
  n    |                             4096        6.85      9.65
  d 19 +                             8192        4.90      6.15
  s    |
    17 +           g
       |         n
    15 +
       |          n
    13 +
       |
    11 +           n
       |             g
     9 +
       |
     7 +            n
       |               g
     5 +               n
       "
     0 +------+------+--+---+------+------+---
           512    1K  |  2K    4K     8K
                    1432
            blocksize (bytes)
```

The comparisons between transfer times (without a gateway) between
the standard 512-byte blocksize and the negotiated blocksizes are:

```
1024      2x    -32%
1432    2.8x    -42%
2048      4x    -54%
4096      8x    -71%
8192     16x    -80%
```

As was anticipated, the transfer time decreases with an increase in
blocksize. The reason for the reduction in time is the reduction in
the number of packets sent. For example, by increasing the blocksize
from 512 bytes to 1024 bytes, not only are the number of data packets
halved, but the number of acknowledgement packets is also halved
(along with the number of times the data transmitter must wait for an
ACK). A secondary effect is the efficiency gained by reducing the
per-packet framing and processing overhead.

Of course, if the blocksize exceeds the path MTU, IP fragmentation
and reassembly will begin to add more overhead. This will be more
noticable the greater the number of gateways in the path.

Security Considerations

Security issues are not discussed in this memo.

References

[1] Sollins, K., "The TFTP Protocol (Revision 2)", STD 33, RFC 1350,
    MIT, July 1992.

[2] Malkin, G., and A. Harkin, "TFTP Option Extension", RFC 1782,
    Xylogics, Inc., Hewlett Packard Co., March 1995.

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