2.4.2.1 A Proposal for TCP Version 3.1 Header Format

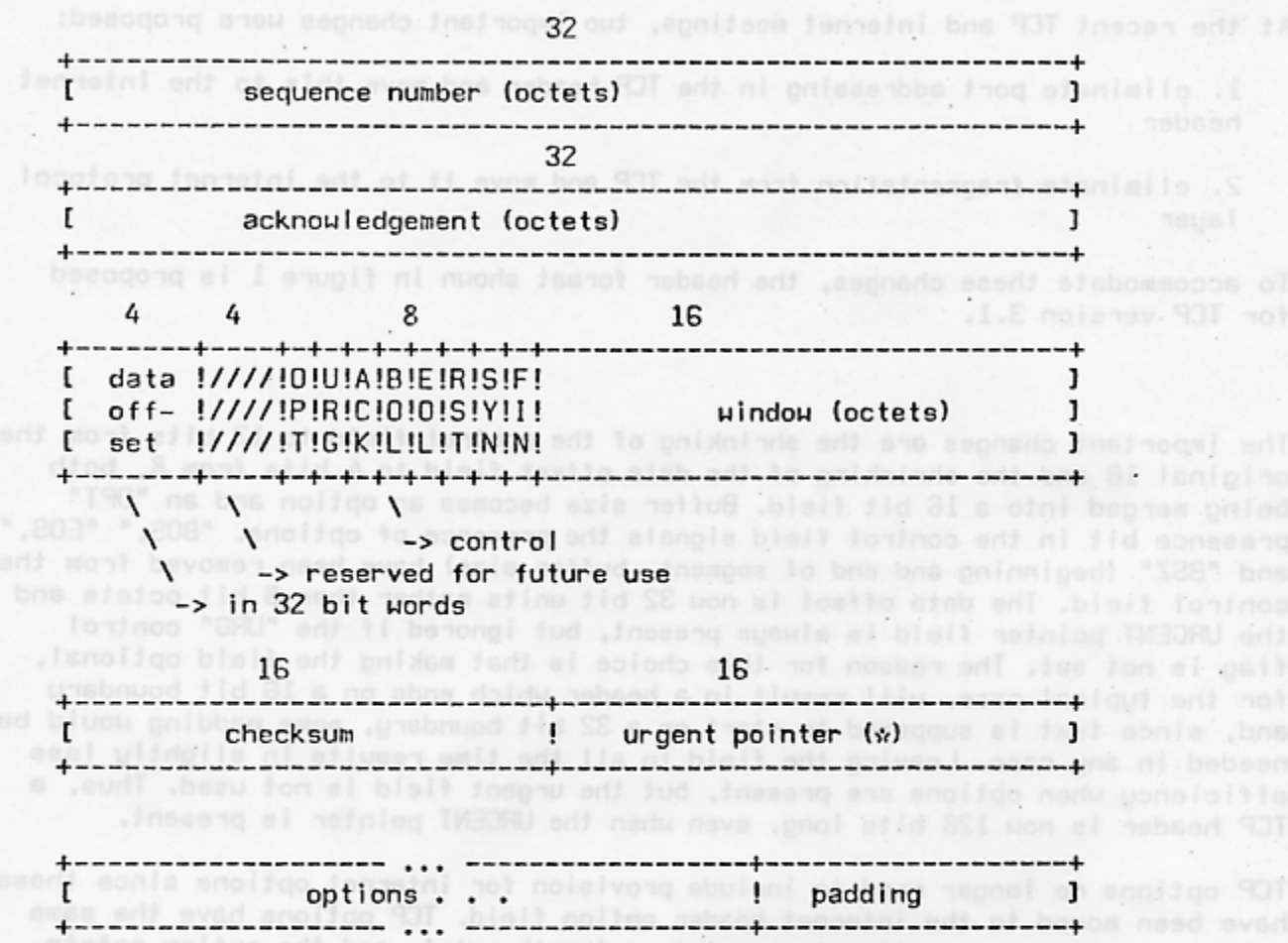At the recent TCP and internet meetings, two important changes were proposed:

1. eliminate port addressing in the TCP header and move this to the internet header

2. eliminate fragmentation from the TCP and move it to the internet protocol layer

To accommodate these changes, the header format shown in figure 1 is proposed for TCP version 3.1.

The important changes are the shrinking of the control field to 12 bits from the original 16 and the shrinking of the data offset field to 4 bits from 8, both being merged into a 16 bit field. Buffer size becomes an option and an "OPT" presence bit in the control field signals the presence of options. "BOS," "EOS," and "BSZ" (beginning and end of segment, buffer size) have been removed from the control field. The data offset is now 32 bit units rather than 8 bit octets and the URGENT pointer field is always present, but ignored if the "URG" control flag is not set. The reason for this choice is that making the field optional, for the typical case, will result in a header which ends on a 16 bit boundary and, since text is supposed to start on a 32 bit boundary, some padding would be needed in any case. Leaving the field in all the time results in slightly less efficiency when options are present, but the urgent field is not used. Thus, a TCP header is now 128 bits long, even when the URGENT pointer is present.

TCP options no longer need to include provision for internet options since these have been moved to the internet header option field. TCP options have the same format as before: an option-type octet, a length octet, and the option octets themselves. The option-type octet has a high order bit indicating whether the option is excluded from the TCP checksum. The currently defined TCP option types and lengths are illustrated in figure 2.

The checksum covers all of the TCP header, test and options, except for those specifically excluded from the checksum. One issue is whether the checksum should be extended to the internet header. If so, it may be essential to exclude some internet options from the checksum. An alternative is an internet checksum of some kind (this seems preferable, from the standpoint of of keeping the protocol layers separated).

```
                                  32
      +----------------------------------------------------------+
      [              sequence number (octets)                    ]
      +----------------------------------------------------------+
                                  32
      +----------------------------------------------------------+
      [              acknowledgement (octets)                    ]
      +----------------------------------------------------------+

        4       4         8              16
      +-------+----+-+-+-+-+-+-+-+-+----------------------------------+
      [ data  !////!O!U!A!B!E!R!S!F!                                  ]
      [ off-  !////!P!R!C!O!O!S!Y!I!        window (octets)          ]
      [ set   !////!T!G!K!L!L!T!N!N!                                  ]
      +-------+----+-+-+-+-+-+-+-+-+----------------------------------+
            \        \    \   -> control
             \        \    -> reserved for future use
              \        -> in 32 bit words

                  16                        16
      +---------------------------+----------------------------------+
      [         checksum          !        urgent pointer (*)        ]
      +---------------------------+----------------------------------+


      +---------------------...------------+----------------------+
      [          options    ...           !        padding        ]
      +---------------------...------------+----------------------+
```

(*) always present, but ignored if "URG" control flag is not set

Proposed New TCP version 3.1 Header Format

Figure 1

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TYPE	LENGTH	
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0	–	End of option list. This option occupies only 1 octet. It has no length octet.
1	–	Padding. This option occupies only 1 octet. It has no length octet.
100	–	Reserved.
101	4	Packet label–sequence number for debugging purposes.
102	4	Secure Open for BCR system use.
103	4	Secure Close for BCR system use.
304	6	Timestamp for diagnostics (not checksummed)
105	4	Buffer size (in octets)

TCP Option Types

Figure 2

The length field includes the type and length octets.