

The UDP Checksum:

Before Starting.

1. Segment is divided into consecutive 16 bit words
2. The words are summed up using 1's complement addition
3. The final sum from step 2 is then complemented. The resulting 16 bit word is the Checksum.

What is 1's complement addition?

1. Sum the numbers normally
2. The carry of the sum is whatever bits are to the left of the rightmost 16 bits.
3. If carry=0 then the normal sum is the 1's complement sum.
If carry!=0 then add the carry back into normal sum to get 1's complement sum.
4. Examples below use 8 bits
5. 1's complement is actually a way of adding signed numbers (but we will not discuss this)

1 0 0 0 1 0 0 1 Word 1
1 0 1 1 1 0 0 0 Word 2

1 0 1 0 0 0 0 1 Normal Sum (note carry to remove)
 1 Remove carry and add it back

0 1 0 0 0 0 1 0 1's complement sum

0 0 1 0 1 0 0 1 Word 1
1 0 1 1 1 0 0 0 Word 2

1 1 1 0 0 0 0 1 1's complement sum

Checksum example

1 0 0 0 1 0 0 1 Input Word 1

1 1 1 1 0 0 0 0 Input Word 2

0 0 1 1 1 1 0 0 Input Word 3

1 0 1 0 0 0 0 1 Input Word 4

1 0 0 0 1 0 0 1 W1

1 1 1 1 0 0 0 0 W2

1 0 1 1 1 1 0 0 1 Normal sum
 1 Carry

0 1 1 1 1 0 1 0 1's Comp sum W1, W2

0 0 1 1 1 1 0 0 W3

1 0 1 1 0 1 1 0 1's Comp sum W1, W2, W3

1 0 1 0 0 0 0 1 W4

1 0 1 0 1 0 1 1 1 Normal sum
 1 Carry

0 1 0 1 1 0 0 0 1's Comp sum W1, W2, W3, W4

1 0 1 0 0 1 1 1 complement

= checksum of W1-W4