

# Bit::Vector

## 1. CLASS METHODS

```
Version
    $version = Bit::Vector->Version();

Word_Bits
    $bits = Bit::Vector->Word_Bits(); # bits in a machine word

Long_Bits
    $bits = Bit::Vector->Long_Bits(); # bits in an unsigned long

new
    $vector = Bit::Vector->new($bits); # bit vector constructor

    @veclist = Bit::Vector->new($bits,$count);

new_Hex
    $vector = Bit::Vector->new_Hex($bits,$string);

new_Bin
    $vector = Bit::Vector->new_Bin($bits,$string);

new_Dec
    $vector = Bit::Vector->new_Dec($bits,$string);

new_Enum
    $vector = Bit::Vector->new_Enum($bits,$string);

Concat_List
    $vector = Bit::Vector->Concat_List(@vectors);
```

## 2. OBJECT METHODS

```
new
    $vec2 = $vec1->new($bits); # alternative call of constructor

    @veclist = $vec->new($bits,$count);

Shadow
    $vec2 = $vec1->Shadow(); # new vector, same size but empty

Clone
    $vec2 = $vec1->Clone(); # new vector, exact duplicate
```

**Concat**

```
$vector = $vec1->Concat($vec2);
```

**Concat\_List**

```
$vector = $vec1->Concat_List($vec2,$vec3,...);
```

**Size**

```
$bits = $vector->Size();
```

**Resize**

```
$vector->Resize($bits);  
$vector->Resize($vector->Size()+5);  
$vector->Resize($vector->Size()-5);
```

**Copy**

```
$vec2->Copy($vec1);
```

**Empty**

```
$vector->Empty();
```

**Fill**

```
$vector->Fill();
```

**Flip**

```
$vector->Flip();
```

**Primes**

```
$vector->Primes(); # Sieve of Erathostenes
```

**Reverse**

```
$vec2->Reverse($vec1);
```

**Interval\_Empty**

```
$vector->Interval_Empty($min,$max);
```

**Interval\_Fill**

```
$vector->Interval_Fill($min,$max);
```

**Interval\_Flip**

```
$vector->Interval_Flip($min,$max);
```

**Interval\_Reverse**

```
$vector->Interval_Reverse($min,$max);
```

**Interval\_Scan\_inc**

```
if (($min,$max) = $vector->Interval_Scan_inc($start))
```

**Interval\_Scan\_dec**

```
if (($min,$max) = $vector->Interval_Scan_dec($start))
```

**Interval\_Copy**

```
$vec2->Interval_Copy($vec1,$offset2,$offset1,$length);

Interval_Substitute
    $vec2->Interval_Substitute($vec1,$off2,$len2,$off1,$len1);

is_empty
    if ($vector->is_empty())

is_full
    if ($vector->is_full())

equal
    if ($vec1->equal($vec2))

Lexicompere (unsigned)
    if ($vec1->Lexicompere($vec2) == 0)
    if ($vec1->Lexicompere($vec2) != 0)
    if ($vec1->Lexicompere($vec2) < 0)
    if ($vec1->Lexicompere($vec2) <= 0)
    if ($vec1->Lexicompere($vec2) > 0)
    if ($vec1->Lexicompere($vec2) >= 0)

Compare (signed)
    if ($vec1->Compare($vec2) == 0)
    if ($vec1->Compare($vec2) != 0)
    if ($vec1->Compare($vec2) < 0)
    if ($vec1->Compare($vec2) <= 0)
    if ($vec1->Compare($vec2) > 0)
    if ($vec1->Compare($vec2) >= 0)

to_Hex
    $string = $vector->to_Hex();

from_Hex
    $vector->from_Hex($string);

to_Bin
    $string = $vector->to_Bin();

from_Bin
    $vector->from_Bin($string);

to_Dec
    $string = $vector->to_Dec();

from_Dec
    $vector->from_Dec($string);

to_Enum
    $string = $vector->to_Enum(); # e.g. "2,3,5-7,11,13-19"
```

```
from_Enum
    $vector->from_Enum($string);

Bit_Off
    $vector->Bit_Off($index);

Bit_On
    $vector->Bit_On($index);

bit_flip
    $bit = $vector->bit_flip($index);

bit_test
contains
    $bit = $vector->bit_test($index);
    $bit = $vector->contains($index);
    if ($vector->bit_test($index))
    if ($vector->contains($index))

Bit_Copy
    $vector->Bit_Copy($index,$bit);

LSB (least significant bit)
    $vector->LSB($bit);

MSB (most significant bit)
    $vector->MSB($bit);

lsb (least significant bit)
    $bit = $vector->lsb();

msb (most significant bit)
    $bit = $vector->msb();

rotate_left
    $carry = $vector->rotate_left();

rotate_right
    $carry = $vector->rotate_right();

shift_left
    $carry = $vector->shift_left($carry);

shift_right
    $carry = $vector->shift_right($carry);

Move_Left
    $vector->Move_Left($bits); # shift left "$bits" positions

Move_Right
    $vector->Move_Right($bits); # shift right "$bits" positions
```

**Insert**

```
$vector->Insert($offset,$bits);
```

**Delete**

```
$vector->Delete($offset,$bits);
```

**increment**

```
$carry = $vector->increment();
```

**decrement**

```
$carry = $vector->decrement();
```

**inc**

```
$overflow = $vec2->inc($vec1);
```

**dec**

```
$overflow = $vec2->dec($vec1);
```

**add**

```
$carry = $vec3->add($vec1,$vec2,$carry);  
($carry,$overflow) = $vec3->add($vec1,$vec2,$carry);
```

**subtract**

```
$carry = $vec3->subtract($vec1,$vec2,$carry);  
($carry,$overflow) = $vec3->subtract($vec1,$vec2,$carry);
```

**Neg****Negate**

```
$vec2->Neg($vec1);  
$vec2->Negate($vec1);
```

**Abs****Absolute**

```
$vec2->Abs($vec1);  
$vec2->Absolute($vec1);
```

**Sign**

```
if ($vector->Sign() == 0)  
if ($vector->Sign() != 0)  
if ($vector->Sign() < 0)  
if ($vector->Sign() <= 0)  
if ($vector->Sign() > 0)  
if ($vector->Sign() >= 0)
```

**Multiply**

```
$vec3->Multiply($vec1,$vec2);
```

**Divide**

```
$quot->Divide($vec1,$vec2,$rest);
```

**GCD (Greatest Common Divisor)**

```
$vecgcd->GCD($veca,$vecb);  
$vecgcd->GCD($vecx,$vecy,$veca,$vecb);
```

Power

```
$vec3->Power($vec1,$vec2);
```

Block\_Store

```
$vector->Block_Store($buffer);
```

Block\_Read

```
$buffer = $vector->Block_Read();
```

Word\_Size

```
$size = $vector->Word_Size(); # number of words in "$vector"
```

Word\_Store

```
$vector->Word_Store($offset,$word);
```

Word\_Read

```
$word = $vector->Word_Read($offset);
```

Word\_List\_Store

```
$vector->Word_List_Store(@words);
```

Word\_List\_Read

```
@words = $vector->Word_List_Read();
```

Word\_Insert

```
$vector->Word_Insert($offset,$count);
```

Word\_Delete

```
$vector->Word_Delete($offset,$count);
```

Chunk\_Store

```
$vector->Chunk_Store($chunksize,$offset,$chunk);
```

Chunk\_Read

```
$chunk = $vector->Chunk_Read($chunksize,$offset);
```

Chunk\_List\_Store

```
$vector->Chunk_List_Store($chunksize,@chunks);
```

Chunk\_List\_Read

```
@chunks = $vector->Chunk_List_Read($chunksize);
```

Index\_List\_Remove

```
$vector->Index_List_Remove(@indices);
```

Index\_List\_Store

```
$vector->Index_List_Store(@indices);
```

**Index\_List\_Read**

```
@indices = $vector->Index_List_Read();
```

**Or****Union**

```
$vec3->Or($vec1,$vec2);  
$set3->Union($set1,$set2);
```

**And****Intersection**

```
$vec3->And($vec1,$vec2);  
$set3->Intersection($set1,$set2);
```

**AndNot****Difference**

```
$vec3->AndNot($vec1,$vec2);  
$set3->Difference($set1,$set2);
```

**Xor****ExclusiveOr**

```
$vec3->Xor($vec1,$vec2);  
$set3->ExclusiveOr($set1,$set2);
```

**Not****Complement**

```
$vec2->Not($vec1);  
$set2->Complement($set1);
```

**subset**

```
if ($set1->subset($set2)) # true if $set1 is subset of $set2
```

**Norm**

```
$norm = $set->Norm();  
$norm = $set->Norm2();  
$norm = $set->Norm3();
```

**Min**

```
$min = $set->Min();
```

**Max**

```
$max = $set->Max();
```

**Multiplication**

```
$matrix3->Multiplication($rows3,$cols3,  
                        $matrix1,$rows1,$cols1,  
                        $matrix2,$rows2,$cols2);
```

**Product**

```
$matrix3->Product($rows3,$cols3,  
                $matrix1,$rows1,$cols1,  
                $matrix2,$rows2,$cols2);
```

Closure

```
$matrix->Closure($rows,$cols);
```

Transpose

```
$matrix2->Transpose($rows2,$cols2,$matrix1,$rows1,$cols1);
```

### 3. 使用举例

代码：

```
#!/usr/bin/perl

use Bit::Vector;

$vector = Bit::Vector->new_Hex(12,"cc");

$bin_str = $vector->to_Bin();

print "bin_str = $bin_str\n";

$hex_str = $vector->to_Hex();

print "hex_str = $hex_str\n";
```

运行结果：

```
bin_str = 000011001100
hex_str = 0CC
```

需要注意在new\_Hex()时，不能输入0x的样式，只能输入纯16进制部分。

#### 3.1 获取指定bit value

contains 与 bit\_test功能相同

```
$bin8 = "";
foreach $i (0..7) {
    # $bit_value = $vector->contains($i);
    $bit_value = $vector->bit_test($i);
    $bin8 = "$bit_value" . $bin8
}
print "bin8 = $bin8\n";
$vector8 = Bit::Vector->new_Bin(8,$bin8);
$hex_str8 = $vector8->to_Hex();
print "hex_str8 = $hex_str8\n";
```

注：不支持一次性获取多个bit[] 比如想获取 bit 7:0的值，那么需要分别获取bit7 ~ bit0的值，然后再拼凑到一起。作进制转换，创建一个8bit宽的bit vector, 先from\_Bin然后再to\_Hex[]即获取到bit 7:0的hex值。

## 3.2 给指定bit赋值

```
1. $vector->Bit_Copy(0,1);
2. $vector->Bit_Copy(1,1);
3. $vector->Bit_Copy(8,1);
4. $hex_str = $vector->to_Hex();
5. print "$hex_str\n";
```

## 3.3 整个bit vector 取反

执行后整个bit vector序列全部取反

```
1. $vector->Flip();
2. $hex_str = $vector->to_Hex();
3. print "$hex_str\n";
```

## 3.4 指定bit取反

bit vector 指定bit取反，并且返回该bit取反后的值。

```
1. $bit = $vector->bit_flip(0);
2. print "bit = $bit\n";
3. $hex_str = $vector->to_Hex();
4. print "$hex_str\n";
```