SystemVerilog Arrays

Array is collection of same data type variable.

Types of an array

1. **Fixed-size array in SystemVerilog**
2. **Single dimensional array**
3. **Multidimensional array**
   a. **Two-dimensional array.**
   b. **Three-dimensional array**
4. **Packed and Unpacked array in SystemVerilog**
5. **Dynamic array in SystemVerilog**
6. **Associative array in SystemVerilog**

1. Fixed- size array in System Verilog :

Fixed-size array(static array) :-

Memory is allocated at compile time,size is fixed through out the simulation.

- **Fixed-size array can be packed and unpacked array.**
- **Can be multidimensional array.**

Code :1

```
module tb;
int array;
initial begin
        array = 8'b0101010101;
        for(i=0;i<size(array);i++)begin
        $display("value of arr_data[i]);

        end
end
endmodule
```

Packed array in SystemVerilog :

A SystemVerilog packed array is treated as both an array and a single value. It is stored as a contiguous set of bits with no unused space. unlike an unpacked array.

- **The packed bit and array dimensions are specified as part of the type. before the variable name.**
- **These dimensions must bespecifiedin the [msb: 1sb] format. not [s i ze] .**

CODE -2 **Declare bit packed print assign a random value**

```
module packed_array;
  bit [4:0]array;
  int i;
  initial begin
    foreach (array[i]) begin
      array[i]= $urandom_range(5,10);
    $display("array[%0d] = %0d", i, array[i]);
    end
  end
endmodule
```

CODE -3 **Declare bit unpacked array compare and print assign a random value of 2-bit variable**

```
module unpackedArray;
bit intA1[1:0];
bit intA2[1:0];
 initial begin
  for(int i=0; i<3; i++) begin
  intA1[i] = $random;
  intA2[i] = $random;
  end
  $display("intA1=%p, intA2=%p", intA1,intA2);
   if(intA1 == intA2)
     $display("array matched");
   else
     $display("array not matched");
end
endmodule
```

CODE-4

Various in-built Array methods:

```
module top;
int array1[9:0];
int array2[9:0];
int array3[9:0];
int array4[9:0];

initial begin
            array1='{0,1,2,3,4,5,6,7,8,9};
            array1='{10,15,20,30,40,50,60,70,80,90};
            array1='{0,1,2,3,4,5,6,7,8,9};
            array1='{5,6,7,8,9,10,11,12,13,14};
end
            $display("Reverse_Method");
    $display("\t value Before Reverse: %p",array1);
    array1.reverse();
    $display("\t value After Reverse: %p \n",array1);
     $display("sort_Method");
    $display("\t value Before sort: %p",array1);
    array1.sort();
    $display("\t value After sort: %p \n",array1);
    $display("Shuffle_method");
    $display("\t value Before shuffle: %p",array1);
    array1.shuffle();
    $display("\t value After shuffle: %p \n",array1);

endmodule
```