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1. Randomized Meal Generator

```
class meals;
 rand bit [15:0] main_dish_calories;
 rand bit [15:0] side_dish_calories;
 rand bit [15:0] dessert_calories;
 rand bit [2:0] main_dish_type; // 1 = Veg, 2 = Non-Veg
 rand bit [2:0] side_dish_type; // 1 = Veg, 2 = Non-Veg
 constraint calories_constraint {
  main_dish_calories + side_dish_calories + dessert_calories < 1500;
 }
 constraint dish_type_constraint {
  main_dish_type inside {1, 2};
  side_dish_type inside {1, 2};
  main_dish_type == 1 -> side_dish_type == 1;
 }
 function void display_meal();
  $display("Main Dish Calories: %0d", main_dish_calories);
  $display("Side Dish Calories: %0d", side_dish_calories);
  $display("Dessert Calories: %0d", dessert_calories);
  $display("Main Dish Type: %0d (1 = Veg, 2 = Non-Veg)", main_dish_type);
  $display("Side Dish Type: %0d (1 = Veg, 2 = Non-Veg)", side_dish_type);
  $display("Total Calories: %0d", main_dish_calories + side_dish_calories + dessert_calories);
 endfunction
endclass
module meal_generator;
 initial begin
  meals meal = new();
  for (int i = 0; i < 3; i++) begin
   assert(meal.randomize()) else $error("Randomization failed.");
   $display("\nMeal %0d", i + 1);
   meal.display_meal();
  end
 end
endmodule
```

Output :

```
Meal 1
Main Dish Calories: 57
Side Dish Calories: 108
Dessert Calories: 1115
Main Dish Type: 2 (1 = Veg, 2 = Non-Veg)
Side Dish Type: 2 (1 = Veg, 2 = Non-Veg)
Total Calories: 1280

Meal 2
Main Dish Calories: 721
Side Dish Calories: 100
Dessert Calories: 582
Main Dish Type: 1 (1 = Veg, 2 = Non-Veg)
Side Dish Type: 1 (1 = Veg, 2 = Non-Veg)
Total Calories: 1403

Meal 3
Main Dish Calories: 9
Side Dish Calories: 104
Dessert Calories: 307
Main Dish Type: 2 (1 = Veg, 2 = Non-Veg)
Side Dish Type: 1 (1 = Veg, 2 = Non-Veg)
Total Calories: 420
```

2. Movie Schedule Randomizer

```
class movie_schedule;
typedef enum {COMEDY, DRAMA, ACTION} movie_genre_t;
rand bit [4:0] movie_start_time;
 rand bit [3:0] movie_duration;
 rand   movie_genre_t movie_genre;
 constraint genre_constraint {
  if (movie_genre == "Comedy") movie_start_time >= 12;
 }
constraint time_constraint {
  movie_start_time >= 18;
 }
constraint no_overlap {
  movie_start_time + movie_duration <= 24;
 }
function void display_schedule();
  $display("Movie Genre: %s", movie_genre);
  $display("Start Time: %0d:00", movie_start_time);
  $display("Duration: %0d hours", movie_duration);
  $display("End Time: %0d:00", movie_start_time + movie_duration);
 endfunction
endclass
module schedule_randomizer;
 initial begin
  movie_schedule schedule;
  schedule = new();
 for (int i = 0; i < 5; i++) begin
   assert(schedule.randomize()) else $error("Randomization failed.");
   $display("\nMovie Schedule %0d", i + 1);
   schedule.display_schedule();
  end
  end
endmodule
```

Output :

```
Movie Schedule 1
Movie Genre: DRAMA
Start Time: 20:00
Duration: 2 hours
End Time: 22:00

Movie Schedule 2
Movie Genre: DRAMA
Start Time: 21:00
Duration: 1 hours
End Time: 22:00

Movie Schedule 3
Movie Genre: COMEDY
Start Time: 18:00
Duration: 2 hours
End Time: 20:00

Movie Schedule 4
Movie Genre: COMEDY
Start Time: 19:00
Duration: 2 hours
End Time: 21:00

Movie Schedule 5
Movie Genre: DRAMA
Start Time: 20:00
Duration: 0 hours
End Time: 20:00
```

3. Gift Distribution

```
class gift_distribution;
  rand int person_id;
  rand int gift_id;
  rand bit premium_gift;
static int premium_count = 0;
constraint unique_gift { person_id != gift_id; }
  constraint premium_ratio { premium_gift dist {1 := 20, 0 := 80}; }
```

```
 function void display_distribution();
   $display("Person ID: %0d | Gift ID: %0d | Premium: %s",
            person_id, gift_id, premium_gift ? "Yes" : "No");
  endfunction
endclass
module gift_distribution_simulator;
  initial begin
    gift_distribution distribution = new();
    int gift_tracking[string];
 for (int i = 0; i < 20; i++) begin
      do begin
        assert(distribution.randomize()) else $error("Randomization failed.");
      end while (gift_tracking.exists($sformatf("%0d", distribution.gift_id)));
  gift_tracking[$sformatf("%0d", distribution.gift_id)] = 1;
 if (distribution.premium_gift)
        gift_distribution::premium_count++;
 $display("\nGift Distribution %0d:", i + 1);
      distribution.display_distribution();
    end
  if (gift_distribution::premium_count < 1)
      $error("Premium gift requirement not met!");
  end
endmodule
```

Output :

```
Gift Distribution 1:
Person ID: -344253299 | Gift ID: 1098141017 | Premium:  No

Gift Distribution 2:
Person ID: 103042879 | Gift ID: 1303428995 | Premium:  No

Gift Distribution 3:
Person ID: 429523545 | Gift ID: -1624305127 | Premium:  No

Gift Distribution 4:
Person ID: 687859098 | Gift ID: -1560080186 | Premium:  No
```

Gift Distribution 5:
Person ID: -819503168 | Gift ID: 388321626 | Premium: No

Gift Distribution 6:
Person ID: 973734206 | Gift ID: 1369918327 | Premium: No

Gift Distribution 7:
Person ID: -41284336 | Gift ID: 1580589264 | Premium: No

Gift Distribution 8:
Person ID: 1033288839 | Gift ID: -429889763 | Premium: No

Gift Distribution 9:
Person ID: 887909198 | Gift ID: -1485077026 | Premium: No

Gift Distribution 10:
Person ID: 1478609146 | Gift ID: -1368702245 | Premium: No

Gift Distribution 11:
Person ID: 475321315 | Gift ID: 2140246959 | Premium: No

Gift Distribution 12:
Person ID: -731048801 | Gift ID: 35944098 | Premium: No

Gift Distribution 13:
Person ID: -1096162856 | Gift ID: -1208022585 | Premium: No

Gift Distribution 14:
Person ID: 1979026950 | Gift ID: 882402840 | Premium: No

Gift Distribution 15:
Person ID: 73921154 | Gift ID: -2046428548 | Premium: No

Gift Distribution 16:
Person ID: 955945238 | Gift ID: -386693909 | Premium: No

Gift Distribution 17:
Person ID: -824189097 | Gift ID: 628912133 | Premium: No

Gift Distribution 18:
Person ID: 1947510711 | Gift ID: -372432455 | Premium: Yes

Gift Distribution 19:
Person ID: -1256595680 | Gift ID: 1905328251 | Premium: No

Gift Distribution 20:
Person ID: -615466807 | Gift ID: -498152257 | Premium: No

1. AXI Transaction Generator.

```
class AXI_Transaction;
 rand int addr;
 rand int data;
 rand int burst_type;
 rand int len;
 rand int id;
 static int used_ids[$];
 constraint addr_alignment { addr % (len * 4) == 0; }
 constraint burst_valid { burst_type inside {1, 2}; }
 constraint len_range { len inside {[1:16]}; }
 constraint unique_id { !(id inside {used_ids}); }
 function void display();
  $display("ID: %0d | Addr: 0x%0h | Data: 0x%0h | Burst: %0d | Len: %0d",
       id, addr, data, burst_type, len);
 endfunction
endclass
module AXI_Transaction_Generator;
 initial begin
  AXI_Transaction txn;
  int addr_tracking[string];
 for (int i = 0; i < 10; i++) begin
   txn = new();
   do begin
    assert(txn.randomize()) else $error("Randomization failed.");
   end while (addr_tracking.exists($sformatf("%0d", txn.addr)));
addr_tracking[$sformatf("%0d", txn.addr)] = 1;
   AXI_Transaction::used_ids.push_back(txn.id);
 $display("\nTransaction %0d:", i + 1);
   txn.display();
  end
 end  endmodule
```

Output :

```
Transaction 1:
ID: -546646651 | Addr: 0x4fc0e654 | Data: 0xe91ad7b9 | Burst: 1 | Len: 5

Transaction 2:
ID: 1667267839 | Addr: 0xbd3bdf64 | Data: 0xa311a307 | Burst: 2 | Len: 5

Transaction 3:
ID: -1010355716 | Addr: 0xcdbbb30 | Data: 0xdc1c6b6b | Burst: 2 | Len: 4

Transaction 4:
ID: -2016136444 | Addr: 0xf0f35110 | Data: 0xca8e4e56 | Burst: 2 | Len: 9

Transaction 5:
ID: 1332673407 | Addr: 0xada04878 | Data: 0xcd944349 | Burst: 2 | Len: 2

Transaction 6:
ID: -563465928 | Addr: 0x911be72c | Data: 0x76760997 | Burst: 1 | Len: 13

Transaction 7:
ID: -494490307 | Addr: 0x55c11d68 | Data: 0x94527ab4 | Burst: 1 | Len: 2

Transaction 8:
ID: 1038254959 | Addr: 0x404dc4b0 | Data: 0xf14299af | Burst: 1 | Len: 2

Transaction 9:
ID: 1589674064 | Addr: 0xcc15b780 | Data: 0x9f65d921 | Burst: 1 | Len: 8

Transaction 10:
ID: 1385437543 | Addr: 0xc63a9110 | Data: 0x95c8305e | Burst: 2 | Len: 4
```

2. Cache Line Generator for a CPU

```
module CacheLineGenerator;
typedef struct {
  string tag;
  bit [6:0] index;
  int data[0:7];
  bit valid_bit;
 } CacheLine;
 CacheLine cache_lines[0:127];
 initial begin
  int i, j;
  int temp_data[0:7];
  bit [127:0] used_indices = 128'b0;
 int used_data[256];
  string unique_tag;
for (i = 0; i < 128; i++) begin
```

```
      do begin
        cache_lines[i].index = $urandom % 128;
      end while (used_indices[cache_lines[i].index]);
      used_indices[cache_lines[i].index] = 1;
 unique_tag = $sformatf("TAG_%0d", i);
      cache_lines[i].tag = unique_tag;
for (j = 0; j < 256; j++) used_data[j] = 0;
 for (j = 0; j < 8; j++) begin
        do begin
          temp_data[j] = $urandom % 256;
        end while (used_data[temp_data[j]]);
        used_data[temp_data[j]] = 1;
      end
      cache_lines[i].data = temp_data;
      cache_lines[i].valid_bit = 1;
    end
for (i = 0; i < 128; i++) begin
      $display("Cache Line %0d:", i);
      $display("  Tag: %s", cache_lines[i].tag);
      $display("  Index: %0d", cache_lines[i].index);
      $display("  Data: %p", cache_lines[i].data);
      $display("  Valid Bit: %0d\n", cache_lines[i].valid_bit);
    end
  end
endmodule
```

Output :

```
Cache Line 0:
 Tag: TAG_0
 Index: 54
 Data: '{60, 125, 226, 11, 223, 64, 247, 166}
 Valid Bit: 1

Cache Line 1:
 Tag: TAG_1
 Index: 27
 Data: '{181, 250, 78, 21, 125, 114, 150, 49}
 Valid Bit: 1

Cache Line 2:
 Tag: TAG_2
 Index: 68
 Data: '{170, 196, 207, 79, 244, 23, 136, 241}
 Valid Bit: 1

Cache Line 3:
 Tag: TAG_3
 Index: 44
```

```
  Data: '{206, 5, 203, 140, 26, 55, 96, 95}
  Valid Bit: 1

Cache Line 4:
  Tag: TAG_4
  Index: 122
  Data: '{162, 240, 201, 220, 65, 63, 18, 244}
  Valid Bit: 1

Cache Line 5:
  Tag: TAG_5
  Index: 95
  Data: '{197, 215, 148, 136, 1, 49, 41, 214}
  Valid Bit: 1

Cache Line 6:
  Tag: TAG_6
  Index: 116
  Data: '{217, 79, 0, 221, 210, 166, 89, 67}
  Valid Bit: 1

Cache Line 7:
  Tag: TAG_7
  Index: 69
  Data: '{242, 162, 161, 253, 234, 193, 32, 199}
  Valid Bit: 1

Cache Line 8:
  Tag: TAG_8
  Index: 32
  Data: '{225, 151, 198, 207, 205, 23, 153, 73}
  Valid Bit: 1

Cache Line 9:
  Tag: TAG_9
  Index: 56
  Data: '{28, 223, 230, 26, 206, 140, 236, 182}
  Valid Bit: 1

Cache Line 10:
  Tag: TAG_10
  Index: 59
  Data: '{165, 23, 203, 50, 225, 131, 150, 14}
  Valid Bit: 1

Cache Line 11:
  Tag: TAG_11
  Index: 110
  Data: '{87, 51, 205, 98, 136, 123, 230, 65}
  Valid Bit: 1
```

```
Cache Line 12:
  Tag: TAG_12
  Index: 45
  Data: '{38, 238, 156, 149, 167, 184, 131, 15}
  Valid Bit: 1

Cache Line 13:
  Tag: TAG_13
  Index: 74
  Data: '{236, 181, 141, 216, 47, 111, 234, 76}
  Valid Bit: 1

Cache Line 14:
  Tag: TAG_14
  Index: 53
  Data: '{65, 242, 78, 137, 216, 120, 241, 13}
  Valid Bit: 1

Cache Line 15:
  Tag: TAG_15
  Index: 86
  Data: '{213, 8, 12, 222, 169, 29, 160, 174}
  Valid Bit: 1

Cache Line 16:
  Tag: TAG_16
  Index: 25
  Data: '{245, 83, 216, 122, 76, 212, 184, 84}
  Valid Bit: 1

Cache Line 17:
  Tag: TAG_17
  Index: 55
  Data: '{195, 201, 123, 163, 113, 43, 180, 80}
  Valid Bit: 1

Cache Line 18:
  Tag: TAG_18
  Index: 84
  Data: '{34, 149, 223, 23, 201, 65, 128, 43}
  Valid Bit: 1

Cache Line 19:
  Tag: TAG_19
  Index: 112
  Data: '{186, 74, 169, 127, 19, 30, 18, 168}
  Valid Bit: 1

Cache Line 20:
  Tag: TAG_20
  Index: 2
```

```
 Data: '{3, 61, 113, 230, 150, 137, 198, 70}
 Valid Bit: 1

Cache Line 21:
 Tag: TAG_21
 Index: 35
 Data: '{73, 121, 9, 211, 204, 108, 102, 111}
 Valid Bit: 1

Cache Line 22:
 Tag: TAG_22
 Index: 70
 Data: '{253, 30, 128, 239, 224, 221, 64, 216}
 Valid Bit: 1

Cache Line 23:
 Tag: TAG_23
 Index: 41
 Data: '{55, 216, 160, 239, 155, 126, 245, 68}
 Valid Bit: 1

Cache Line 24:
 Tag: TAG_24
 Index: 114
 Data: '{250, 111, 132, 241, 28, 195, 99, 120}
 Valid Bit: 1

Cache Line 25:
 Tag: TAG_25
 Index: 80
 Data: '{213, 232, 157, 55, 16, 71, 123, 69}
 Valid Bit: 1

Cache Line 26:
 Tag: TAG_26
 Index: 98
 Data: '{106, 245, 135, 110, 166, 154, 27, 157}
 Valid Bit: 1

Cache Line 27:
 Tag: TAG_27
 Index: 52
 Data: '{31, 183, 127, 159, 202, 102, 166, 9}
 Valid Bit: 1

Cache Line 28:
 Tag: TAG_28
 Index: 63
 Data: '{202, 71, 198, 14, 52, 114, 13, 62}
 Valid Bit: 1
```

```
Cache Line 29:
  Tag: TAG_29
  Index: 21
  Data: '{107, 31, 24, 58, 199, 189, 132, 195}
  Valid Bit: 1

Cache Line 30:
  Tag: TAG_30
  Index: 3
  Data: '{210, 4, 144, 186, 126, 135, 172, 28}
  Valid Bit: 1

Cache Line 31:
  Tag: TAG_31
  Index: 51
  Data: '{205, 152, 200, 151, 24, 4, 67, 159}
  Valid Bit: 1

Cache Line 32:
  Tag: TAG_32
  Index: 97
  Data: '{91, 15, 4, 204, 221, 182, 42, 165}
  Valid Bit: 1

Cache Line 33:
  Tag: TAG_33
  Index: 23
  Data: '{199, 111, 160, 223, 238, 222, 52, 2}
  Valid Bit: 1

Cache Line 34:
  Tag: TAG_34
  Index: 30
  Data: '{44, 230, 117, 216, 12, 192, 217, 1}
  Valid Bit: 1

Cache Line 35:
  Tag: TAG_35
  Index: 64
  Data: '{226, 182, 204, 249, 143, 46, 82, 113}
  Valid Bit: 1

Cache Line 36:
  Tag: TAG_36
  Index: 67
  Data: '{89, 239, 198, 109, 168, 152, 155, 206}
  Valid Bit: 1

Cache Line 37:
  Tag: TAG_37
  Index: 102
  Data: '{192, 79, 107, 131, 198, 214, 33, 97}
  Valid Bit: 1

Cache Line 38:
  Tag: TAG_38
  Index: 108
  Data: '{85, 10, 175, 137, 139, 29, 155, 202}
  Valid Bit: 1

Cache Line 39:
  Tag: TAG_39
  Index: 79
  Data: '{112, 32, 211, 204, 95, 176, 243, 27}
  Valid Bit: 1

Cache Line 40:
  Tag: TAG_40
  Index: 4
  Data: '{160, 47, 178, 21, 100, 73, 187, 146}
  Valid Bit: 1

Cache Line 41:
  Tag: TAG_41
  Index: 126
  Data: '{107, 224, 218, 240, 143, 163, 160, 82}
  Valid Bit: 1

Cache Line 42:
  Tag: TAG_42
  Index: 17
  Data: '{143, 159, 155, 73, 140, 211, 32, 131}
  Valid Bit: 1

Cache Line 43:
  Tag: TAG_43
  Index: 48
  Data: '{101, 39, 173, 216, 11, 242, 60, 166}
  Valid Bit: 1

Cache Line 44:
  Tag: TAG_44
  Index: 31
  Data: '{118, 32, 218, 177, 191, 201, 176, 162}
  Valid Bit: 1

Cache Line 45:
  Tag: TAG_45
  Index: 115
  Data: '{231, 91, 243, 131, 13, 249, 218, 227}
  Valid Bit: 1
```

```
Cache Line 46:
  Tag: TAG_46
  Index: 118
  Data: '{105, 76, 210, 146, 132, 3, 181, 222}
  Valid Bit: 1

Cache Line 47:
  Tag: TAG_47
  Index: 50
  Data: '{248, 226, 244, 144, 206, 158, 223, 209}
  Valid Bit: 1

Cache Line 48:
  Tag: TAG_48
  Index: 37
  Data: '{90, 27, 155, 233, 83, 85, 123, 252}
  Valid Bit: 1

Cache Line 49:
  Tag: TAG_49
  Index: 14
  Data: '{199, 85, 107, 231, 181, 180, 235, 43}
  Valid Bit: 1

Cache Line 50:
  Tag: TAG_50
  Index: 43
  Data: '{26, 206, 110, 39, 97, 54, 23, 184}
  Valid Bit: 1

Cache Line 51:
  Tag: TAG_51
  Index: 125
  Data: '{96, 6, 155, 61, 78, 172, 201, 231}
  Valid Bit: 1

Cache Line 52:
  Tag: TAG_52
  Index: 107
  Data: '{59, 47, 241, 246, 132, 81, 184, 203}
  Valid Bit: 1

Cache Line 53:
  Tag: TAG_53
  Index: 28
  Data: '{219, 0, 155, 210, 165, 58, 175, 106}
  Valid Bit: 1

Cache Line 54:
  Tag: TAG_54
  Index: 89
  Data: '{34, 46, 240, 15, 53, 194, 9, 180}
  Valid Bit: 1

Cache Line 55:
  Tag: TAG_55
  Index: 117
  Data: '{190, 177, 138, 130, 139, 186, 236, 37}
  Valid Bit: 1

Cache Line 56:
  Tag: TAG_56
  Index: 9
  Data: '{13, 157, 154, 252, 72, 123, 178, 26}
  Valid Bit: 1

Cache Line 57:
  Tag: TAG_57
  Index: 62
  Data: '{185, 202, 148, 207, 163, 24, 71, 221}
  Valid Bit: 1

Cache Line 58:
  Tag: TAG_58
  Index: 111
  Data: '{182, 120, 121, 33, 57, 166, 159, 44}
  Valid Bit: 1

Cache Line 59:
  Tag: TAG_59
  Index: 85
  Data: '{151, 142, 226, 82, 165, 152, 205, 238}
  Valid Bit: 1

Cache Line 60:
  Tag: TAG_60
  Index: 83
  Data: '{75, 205, 46, 15, 162, 93, 35, 241}
  Valid Bit: 1

Cache Line 61:
  Tag: TAG_61
  Index: 24
  Data: '{170, 175, 28, 47, 243, 191, 160, 98}
  Valid Bit: 1

Cache Line 62:
  Tag: TAG_62
  Index: 105
  Data: '{118, 30, 115, 199, 136, 76, 28, 168}
  Valid Bit: 1
```

```
Cache Line 63:
 Tag: TAG_63
 Index: 75
 Data: '{81, 121, 99, 119, 139, 129, 246, 41}
 Valid Bit: 1

Cache Line 64:
 Tag: TAG_64
 Index: 22
 Data: '{206, 172, 133, 26, 23, 17, 20, 12}
 Valid Bit: 1

Cache Line 65:
 Tag: TAG_65
 Index: 5
 Data: '{117, 67, 222, 33, 175, 171, 83, 240}
 Valid Bit: 1

Cache Line 66:
 Tag: TAG_66
 Index: 66
 Data: '{143, 175, 14, 229, 101, 85, 125, 105}
 Valid Bit: 1

Cache Line 67:
 Tag: TAG_67
 Index: 46
 Data: '{180, 196, 93, 154, 209, 81, 76, 246}
 Valid Bit: 1

Cache Line 68:
 Tag: TAG_68
 Index: 119
 Data: '{254, 3, 20, 153, 240, 156, 143, 34}
 Valid Bit: 1

Cache Line 69:
 Tag: TAG_69
 Index: 15
 Data: '{41, 237, 219, 254, 33, 181, 240, 186}
 Valid Bit: 1

Cache Line 70:
 Tag: TAG_70
 Index: 40
 Data: '{102, 43, 61, 217, 186, 17, 24, 126}
 Valid Bit: 1

Cache Line 71:
 Tag: TAG_71
 Index: 109
```

```
  Data: '{39, 116, 27, 228, 103, 146, 29, 23}
  Valid Bit: 1

Cache Line 72:
  Tag: TAG_72
  Index: 73
  Data: '{43, 208, 202, 203, 58, 241, 190, 209}
  Valid Bit: 1

Cache Line 73:
  Tag: TAG_73
  Index: 20
  Data: '{116, 188, 95, 50, 128, 156, 117, 102}
  Valid Bit: 1

Cache Line 74:
  Tag: TAG_74
  Index: 92
  Data: '{166, 176, 237, 161, 118, 45, 215, 147}
  Valid Bit: 1

Cache Line 75:
  Tag: TAG_75
  Index: 81
  Data: '{231, 169, 24, 175, 14, 80, 197, 128}
  Valid Bit: 1

Cache Line 76:
  Tag: TAG_76
  Index: 124
  Data: '{166, 41, 137, 107, 145, 105, 195, 172}
  Valid Bit: 1

Cache Line 77:
  Tag: TAG_77
  Index: 121
  Data: '{117, 128, 40, 148, 89, 172, 29, 127}
  Valid Bit: 1

Cache Line 78:
  Tag: TAG_78
  Index: 42
  Data: '{164, 25, 201, 175, 41, 19, 168, 50}
  Valid Bit: 1

Cache Line 79:
  Tag: TAG_79
  Index: 19
  Data: '{212, 65, 16, 215, 184, 102, 82, 105}
  Valid Bit: 1
```

```
Cache Line 80:
  Tag: TAG_80
  Index: 87
  Data: '{32, 126, 129, 90, 215, 218, 30, 60}
  Valid Bit: 1

Cache Line 81:
  Tag: TAG_81
  Index: 10
  Data: '{65, 218, 102, 53, 80, 183, 98, 142}
  Valid Bit: 1

Cache Line 82:
  Tag: TAG_82
  Index: 13
  Data: '{140, 22, 93, 190, 68, 161, 29, 174}
  Valid Bit: 1

Cache Line 83:
  Tag: TAG_83
  Index: 100
  Data: '{149, 167, 127, 4, 59, 199, 27, 78}
  Valid Bit: 1

Cache Line 84:
  Tag: TAG_84
  Index: 71
  Data: '{123, 246, 89, 178, 139, 146, 64, 127}
  Valid Bit: 1

Cache Line 85:
  Tag: TAG_85
  Index: 6
  Data: '{243, 196, 16, 116, 207, 158, 64, 23}
  Valid Bit: 1

Cache Line 86:
  Tag: TAG_86
  Index: 103
  Data: '{62, 25, 182, 241, 31, 235, 56, 58}
  Valid Bit: 1

Cache Line 87:
  Tag: TAG_87
  Index: 106
  Data: '{170, 15, 72, 231, 132, 95, 205, 118}
  Valid Bit: 1

Cache Line 88:
  Tag: TAG_88
  Index: 72
  Data: '{248, 133, 159, 165, 19, 33, 178, 97}
  Valid Bit: 1

Cache Line 89:
  Tag: TAG_89
  Index: 49
  Data: '{114, 44, 36, 55, 60, 118, 67, 87}
  Valid Bit: 1

Cache Line 90:
  Tag: TAG_90
  Index: 12
  Data: '{123, 245, 208, 175, 167, 110, 5, 13}
  Valid Bit: 1

Cache Line 91:
  Tag: TAG_91
  Index: 96
  Data: '{25, 15, 151, 114, 113, 255, 122, 210}
  Valid Bit: 1

Cache Line 92:
  Tag: TAG_92
  Index: 78
  Data: '{73, 181, 83, 100, 149, 3, 127, 128}
  Valid Bit: 1

Cache Line 93:
  Tag: TAG_93
  Index: 65
  Data: '{46, 215, 119, 172, 145, 148, 131, 121}
  Valid Bit: 1

Cache Line 94:
  Tag: TAG_94
  Index: 0
  Data: '{175, 45, 21, 211, 53, 164, 177, 138}
  Valid Bit: 1

Cache Line 95:
  Tag: TAG_95
  Index: 1
  Data: '{132, 173, 22, 216, 61, 32, 158, 196}
  Valid Bit: 1

Cache Line 96:
  Tag: TAG_96
  Index: 39
  Data: '{2, 15, 166, 26, 215, 92, 177, 145}
  Valid Bit: 1
```

```
Cache Line 97:
  Tag: TAG_97
  Index: 47
  Data: '{94, 226, 138, 133, 212, 36, 154, 147}
  Valid Bit: 1

Cache Line 98:
  Tag: TAG_98
  Index: 76
  Data: '{216, 64, 118, 160, 203, 249, 68, 250}
  Valid Bit: 1

Cache Line 99:
  Tag: TAG_99
  Index: 113
  Data: '{25, 165, 233, 242, 71, 116, 123, 28}
  Valid Bit: 1

Cache Line 100:
  Tag: TAG_100
  Index: 57
  Data: '{84, 111, 137, 58, 184, 24, 26, 50}
  Valid Bit: 1

Cache Line 101:
  Tag: TAG_101
  Index: 8
  Data: '{201, 154, 106, 76, 194, 226, 249, 37}
  Valid Bit: 1

Cache Line 102:
  Tag: TAG_102
  Index: 82
  Data: '{161, 61, 239, 55, 230, 23, 1, 142}
  Valid Bit: 1

Cache Line 103:
  Tag: TAG_103
  Index: 58
  Data: '{224, 202, 148, 24, 84, 189, 109, 207}
  Valid Bit: 1

Cache Line 104:
  Tag: TAG_104
  Index: 60
  Data: '{214, 152, 94, 231, 206, 142, 106, 21}
  Valid Bit: 1

Cache Line 105:
  Tag: TAG_105
  Index: 90
```

```
 Data: '{155, 127, 187, 3, 80, 11, 31, 81}
 Valid Bit: 1

Cache Line 106:
 Tag: TAG_106
 Index: 36
 Data: '{132, 242, 201, 225, 213, 59, 29, 1}
 Valid Bit: 1

Cache Line 107:
 Tag: TAG_107
 Index: 101
 Data: '{42, 248, 255, 243, 162, 85, 224, 220}
 Valid Bit: 1

Cache Line 108:
 Tag: TAG_108
 Index: 88
 Data: '{224, 122, 144, 164, 247, 219, 29, 13}
 Valid Bit: 1

Cache Line 109:
 Tag: TAG_109
 Index: 18
 Data: '{101, 149, 78, 91, 216, 206, 72, 173}
 Valid Bit: 1

Cache Line 110:
 Tag: TAG_110
 Index: 123
 Data: '{129, 27, 207, 1, 222, 156, 251, 28}
 Valid Bit: 1

Cache Line 111:
 Tag: TAG_111
 Index: 94
 Data: '{181, 56, 158, 205, 75, 37, 0, 104}
 Valid Bit: 1

Cache Line 112:
 Tag: TAG_112
 Index: 11
 Data: '{58, 80, 210, 27, 38, 98, 69, 74}
 Valid Bit: 1

Cache Line 113:
 Tag: TAG_113
 Index: 93
 Data: '{31, 139, 253, 17, 173, 224, 87, 107}
 Valid Bit: 1
```

```
Cache Line 114:
 Tag: TAG_114
 Index: 104
 Data: '{24, 144, 65, 14, 142, 109, 139, 150}
 Valid Bit: 1

Cache Line 115:
 Tag: TAG_115
 Index: 26
 Data: '{93, 84, 213, 240, 4, 17, 5, 172}
 Valid Bit: 1

Cache Line 116:
 Tag: TAG_116
 Index: 99
 Data: '{121, 241, 237, 117, 192, 183, 162, 170}
 Valid Bit: 1

Cache Line 117:
 Tag: TAG_117
 Index: 34
 Data: '{51, 67, 215, 8, 177, 35, 237, 97}
 Valid Bit: 1

Cache Line 118:
 Tag: TAG_118
 Index: 77
 Data: '{81, 101, 112, 67, 15, 68, 242, 247}
 Valid Bit: 1

Cache Line 119:
 Tag: TAG_119
 Index: 127
 Data: '{162, 139, 69, 88, 134, 129, 64, 34}
 Valid Bit: 1

Cache Line 120:
 Tag: TAG_120
 Index: 29
 Data: '{219, 81, 143, 116, 238, 87, 123, 164}
 Valid Bit: 1

Cache Line 121:
 Tag: TAG_121
 Index: 120
 Data: '{224, 250, 48, 5, 28, 214, 51, 199}
 Valid Bit: 1

Cache Line 122:
 Tag: TAG_122
 Index: 33
 Data: '{176, 10, 31, 42, 54, 1, 120, 79}
 Valid Bit: 1

Cache Line 123:
 Tag: TAG_123
 Index: 16
 Data: '{62, 88, 209, 78, 54, 92, 11, 127}
 Valid Bit: 1

Cache Line 124:
 Tag: TAG_124
 Index: 91
 Data: '{186, 214, 52, 227, 254, 99, 78, 213}
 Valid Bit: 1

Cache Line 125:
 Tag: TAG_125
 Index: 38
 Data: '{224, 195, 166, 38, 29, 23, 209, 54}
 Valid Bit: 1

Cache Line 126:
 Tag: TAG_126
 Index: 7
 Data: '{90, 120, 230, 237, 91, 53, 147, 168}
 Valid Bit: 1

Cache Line 127:
 Tag: TAG_127
 Index: 61
 Data: '{221, 124, 114, 241, 180, 237, 172, 15}
 Valid Bit: 1
```