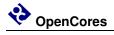


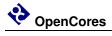
# Random Number Generator Library User Guide

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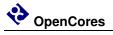


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#### **Revision History**

| Rev. | Date     | Author      | Description   |
|------|----------|-------------|---------------|
| 1.0  | 02/09/04 | Geir Drange | First version |



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#### Introduction

When writing test benches, it is often useful to include a degree of randomness in the simulation. Typical examples are:

- Random data generation
- Adding noise to signals
- Generate random delays
- Clock jitter generation
- Etc

VHDL does not have any built-in functions for random numbers (yet). The Random Number Generator Library can easily be included in a test bench to supply random number functions.

Note that this library will NOT synthesize. It is intended for test bench use only.



## Using the library

To use the library, add the following line to the test bench:

```
use work.rng_lib.all;
```

A random variable is defined by a record, and must be initialized before use. There is a separate initialization function for each type of distribution. Example:

```
r_uni := init_uniform(0, 0, 0, 0.0, 200.0);
```

will initialize a uniform distributed variable with values between 0 and 200. The random variable (real) is accessed by the .rnd member of the record:

```
r := r_uni.rnd; -- r is a real
i := integer(r uni.rnd); -- i is an integer
```

Generate a new number with the rand() function:

```
r_uni := rand(r_uni);
```

#### 2.1 Seeds

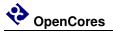
The first 3 parameters (a, b, c) for the initialization functions are seeds for the Tausworthe generators. If a seed is set to zero, a predefined seed will be used. Predefined seeds will also be used if a < 3, b < 9 or c < 17.



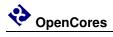
# **Example test**

The file tb\_rng.vhd will generate 10000 numbers of each of the distributions, and make simple plots in the log window:

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| Gaussian distribution:    |
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| Exponential distribution: |
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### **Know issues**

The library will not work with Symphony EDA Sonata simulator. Due to bad floating point support?