Random mystery

Module 2

Self study material

Operating systems 2019

1DT044, 1DT096 and 1DT003

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Pseudorandom number generator

A pseudorandom number generator (PRNG), also known as a **deterministic** random bit generator is an **algorithm** for generating a sequence of numbers whose properties approximate the properties of sequences of random numbers.

Pseudorandom number generator

- ★ A PRNG-generated sequence is not truly random, because it is completely determined by a relatively small set of initial values, called the PRNG's **seed** (which may include truly random values).
- ★ A PRNG algorithm will always produce the same sequence from a given starting point (seed).
- ★ Good statistical properties are a central requirement for the output of a PRNG.

Source: https://en.wikipedia.org/wiki/Pseudorandom_number_generator 2016-01-25

Parent Process

Seed the PRNG

Use PRNG to generate a "random" number.

Use fork() to create child n processes.

A parent process seeds the PRNG and generates a "random" number. Next the parent forks n child processes, each generating a "random" number.

Child Process 1

Use PRNG to generate a "random" number.

Child Process 2

Use PRNG to generate a "random" number.

Child Process 3

Use PRNG to generate a "random" number.

•
•
•

Child Process n

Use PRNG to generate a "random" number.

Parent Process

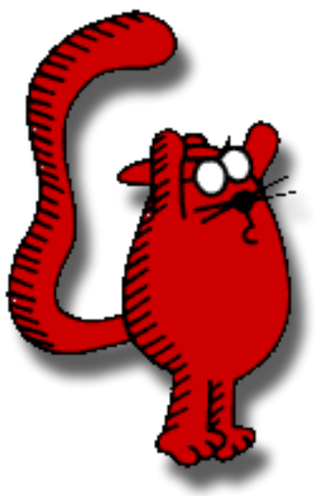
```
Seed the PRNG

Use PRNG to generate a
“random” number.

Use fork() to create
child n processes.
```

127

The parent and all children generates the same “random” number - why?



Child Process 1

```
Use PRNG to generate a
“random” number.
```

127

Child Process 2

```
Use PRNG to generate a
“random” number.
```

127

Child Process 3

```
Use PRNG to generate a
“random” number.
```

127

•
•
•

Child Process n

```
Use PRNG to generate a
“random” number.
```

127

Parent

```
srand(time(NULL));

n = rand();

fork();
```

Child

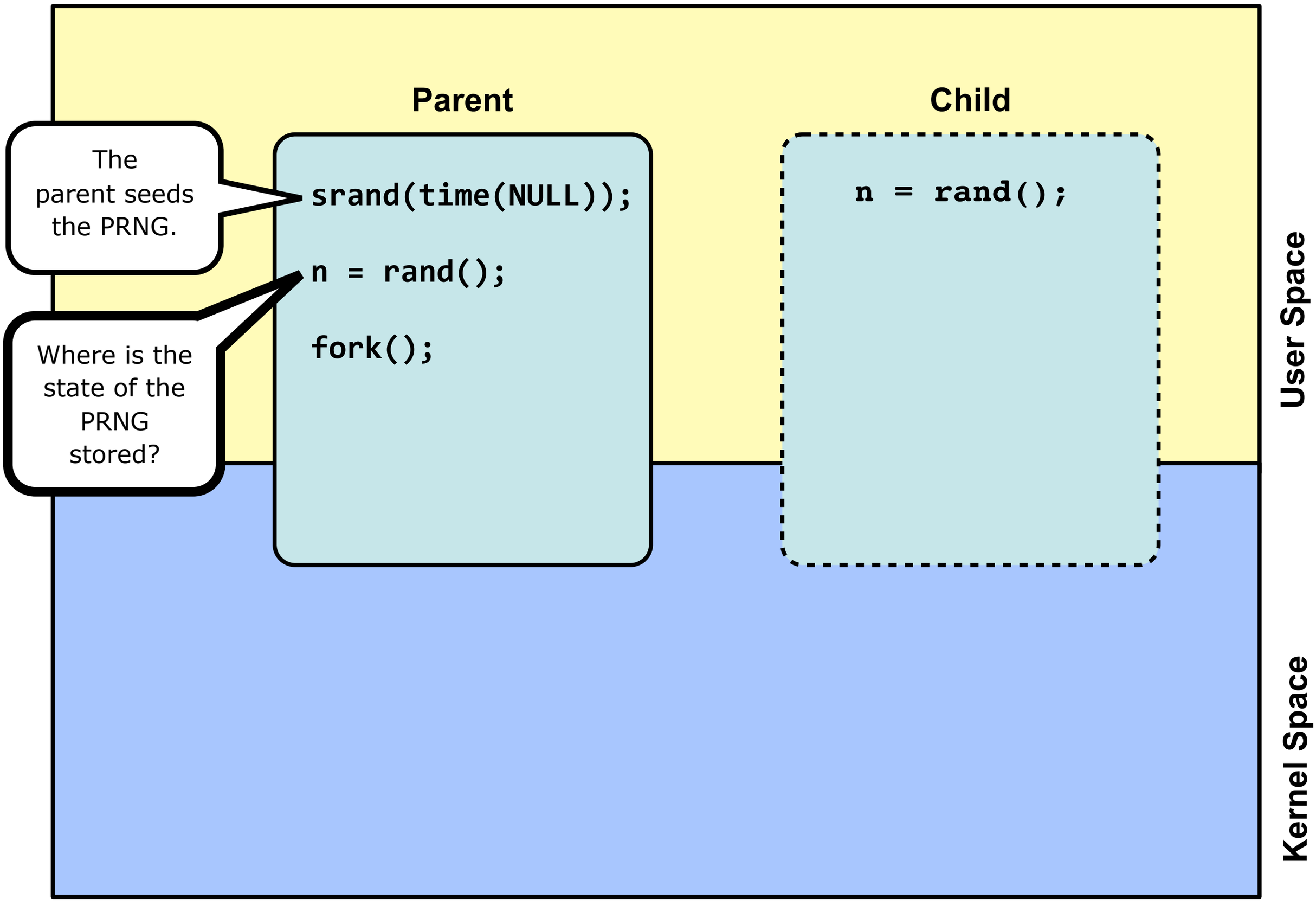
```
n = rand();
```

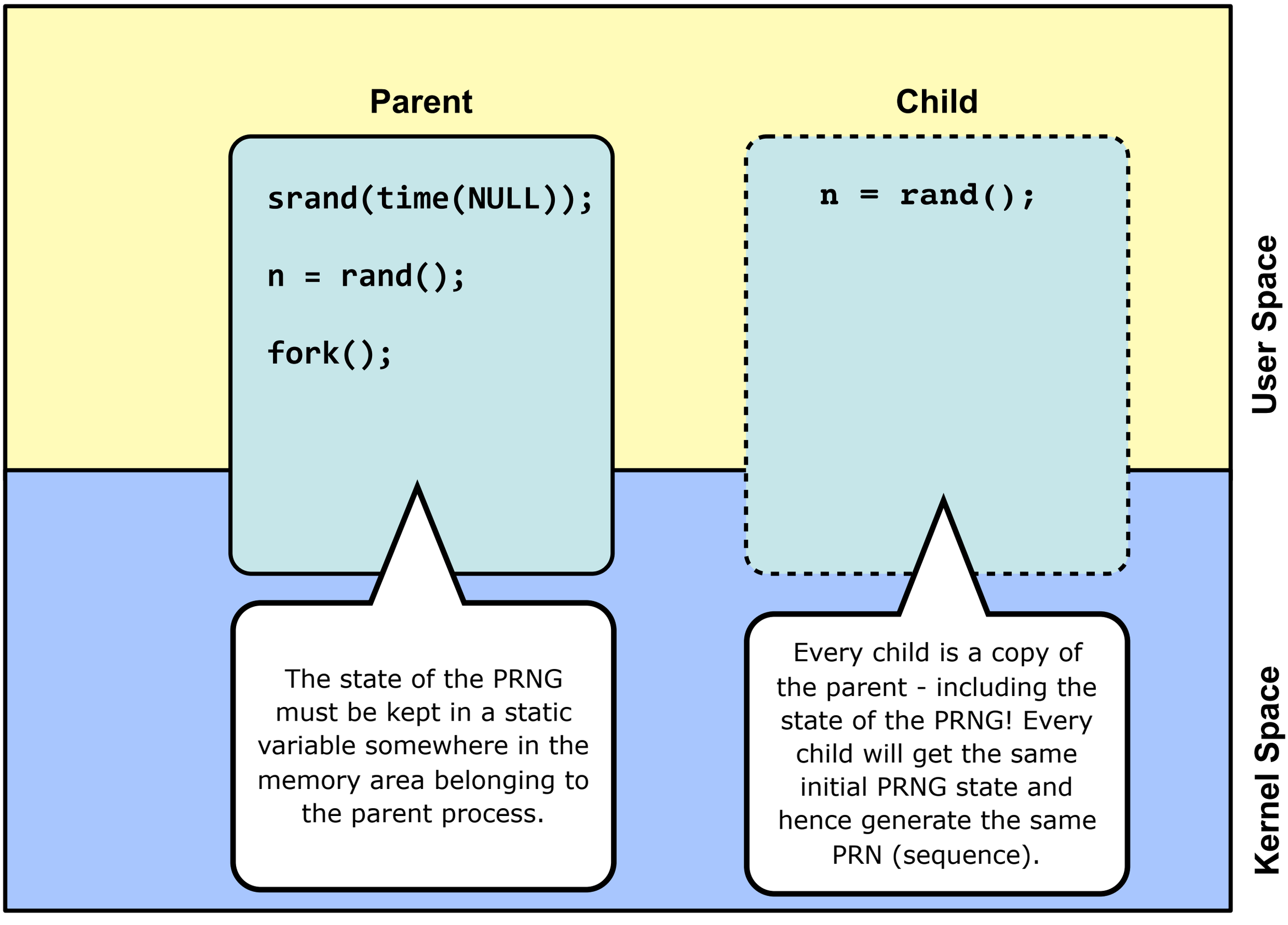

OS creates a new process, a child process

The child process is a copy of the parent
(copy of TEXT, DATA and Resources)

User Space

Kernel Space


Parent
Child
The parent seeds the PRNG.
Where is the state of the PRNG stored?
srand(time(NULL));
n = rand();
fork();
n = rand();
User Space
Kernel Space


Parent
srand(time(NULL));
n = rand();
fork();
Child
n = rand();
The state of the PRNG must be kept in a static variable somewhere in the memory area belonging to the parent process.
Every child is a copy of the parent - including the state of the PRNG! Every child will get the same initial PRNG state and hence generate the same PRN (sequence).
User Space
Kernel Space