Understanding fork() Call

How a fork() call works?

P*parent*

```
int main(){
 ➡ fork();
   foo();
}
```

OS

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OS

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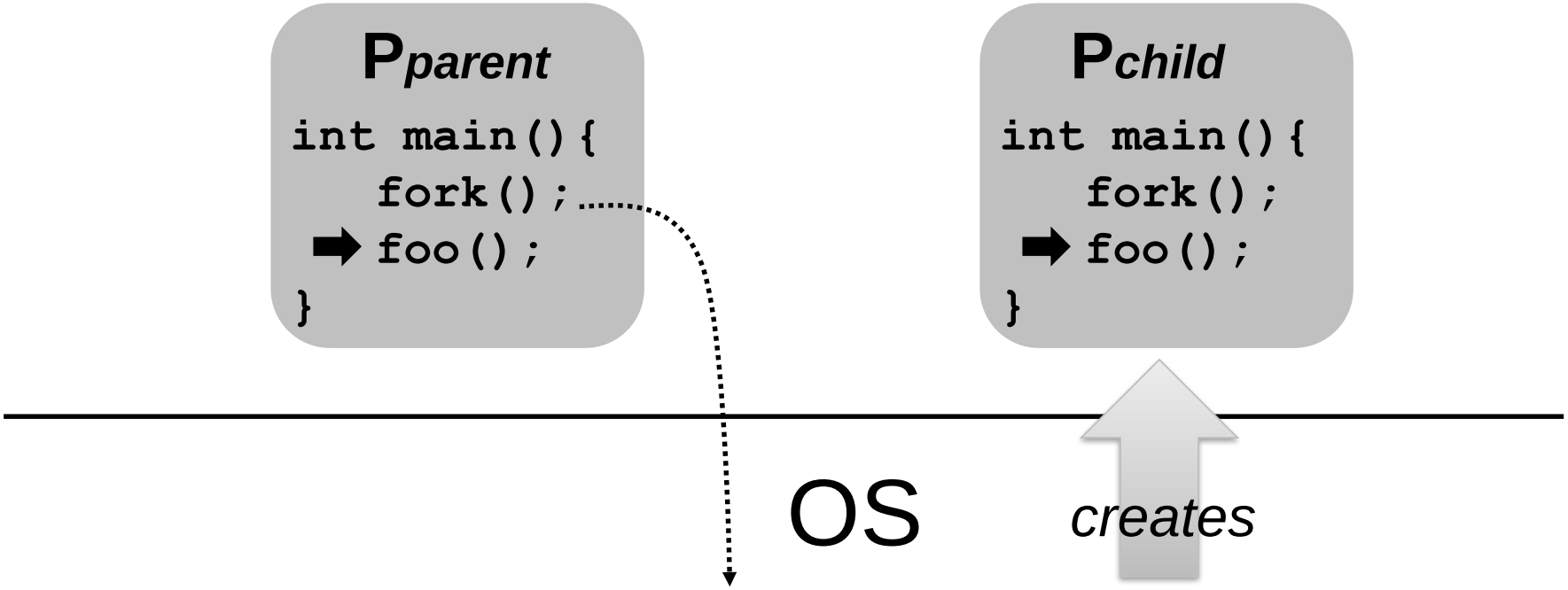

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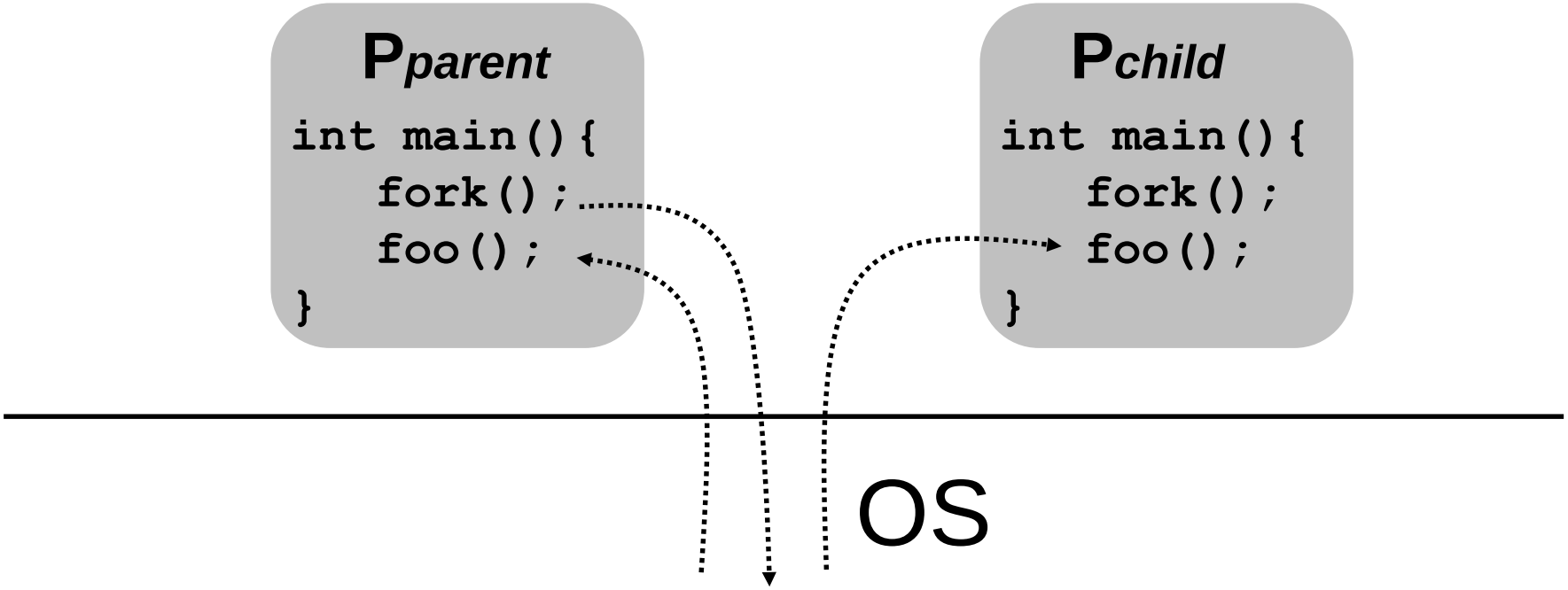

Understanding fork() call

- **fork(), when called, returns twice**
  (to each process @ the next instruction)

```
int main() {
    fork();
    printf("Hello world!\n");
}
```

```
Hello world!
Hello world!
```

Example Program

```
int main() {
   fork();
   fork();
   printf("Hello world!\n");
}
```

```
Hello world!
Hello world!
Hello world!
Hello world!
```

More fork() calls in a series

```
int main() {
   fork();
   fork();
   fork();
   printf("Hello world!\n");
}
```

```
Hello world!
Hello world!
Hello world!
Hello world!
Hello world!
Hello world!
Hello world!
Hello world!
```

return value of fork()

```
typedef int pid_t;

pid_t fork();
```

- system-wide unique process identifier
- child's pid (> 0) is returned in the parent
- value (0) is returned in the child

Using return value of fork() call

```
void fork0() {
   if (fork()==0)
      printf("Hello from Child!\n");
   else
      printf("Hello from Parent!\n");
}

main(){ fork0(); }
```

```
Hello from Child!
Hello from Parent!
```

(or)

```
Hello from Parent!
Hello from Child!
```

Working of fork() - Summary

- **order of execution is non-deterministic**
  - parent and child run concurrently

- **Important: post fork, parent and child are identical but separate!**
  - OS allocates and maintains separate data/state
  - control flow can diverge

Another example program

```
void fork1() {
   int x = 1;
   if (fork()==0){
      printf("Child has x = %d\n", ++x);
   } else {
      printf("Parent has x = %d\n", --x);
   }
}
```

Parent has x = 0
Child has x = 2

Example Program

```
void fork2() {
   printf("L0\n");
   fork();
   printf("L1\n");
   fork();
   printf("Bye\n");
}
```

```
L0
L1
L1
Bye
Bye
Bye
Bye
```