

Céu: A Reactive language for Embedded Systems

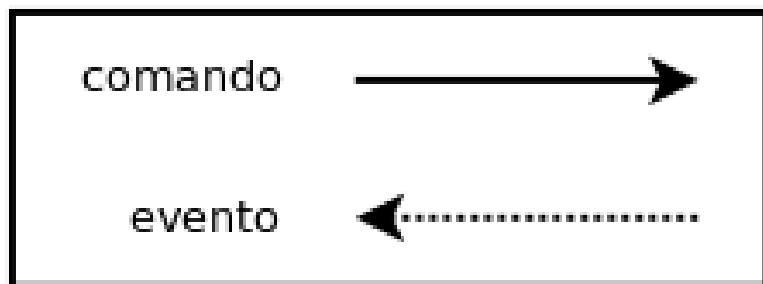


www.ceu-lang.org

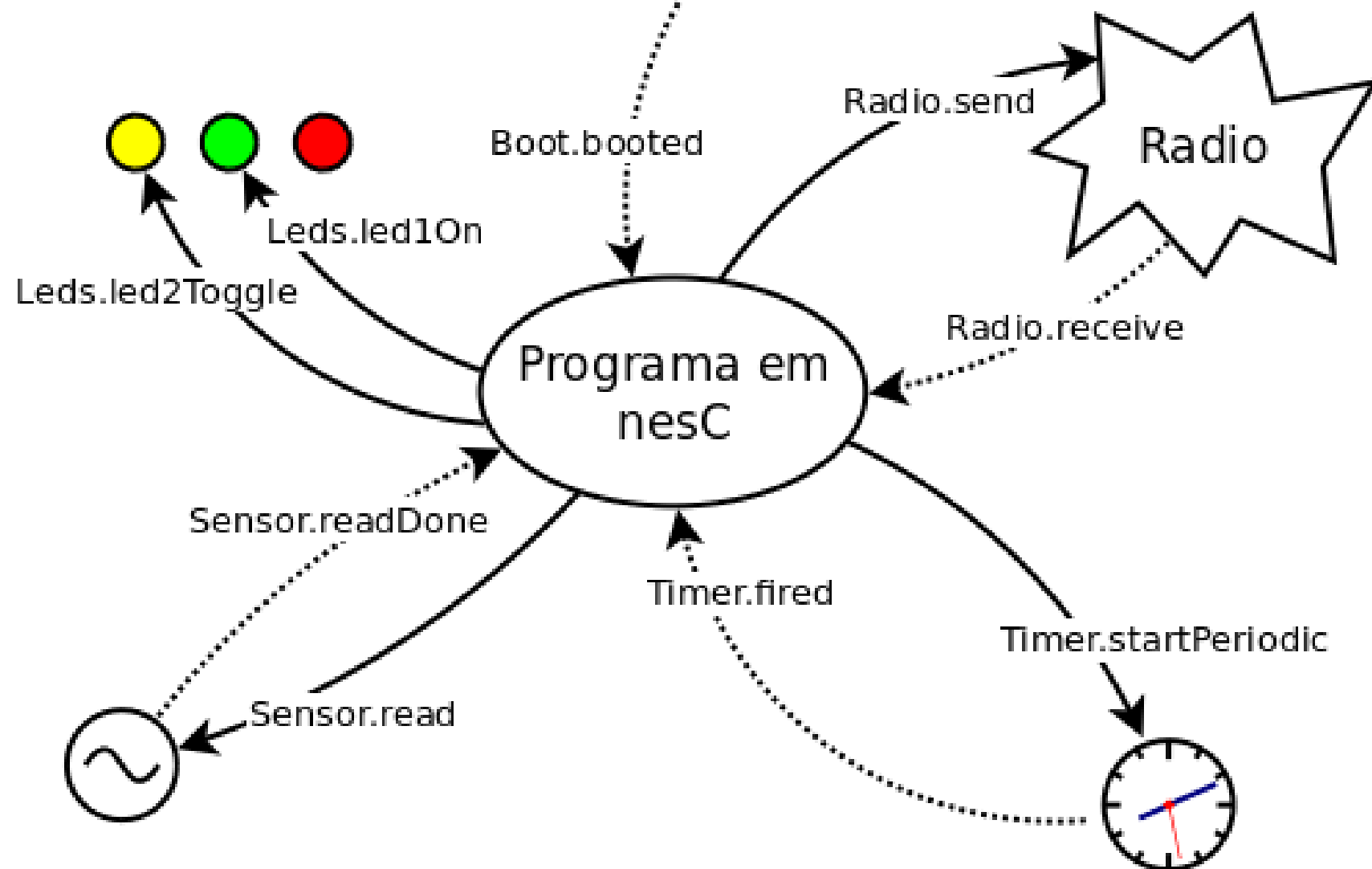
```
par do
    loop do
        await 250ms;
        _Leds_led0Toggle();
    end
with
    loop do
        await 500ms;
        _Leds_led1Toggle();
    end
with
    loop do
        await 1000ms;
        _Leds_led2Toggle();
    end
end
end
```

Overview of Céu

- Reactive
 - environment in control: *events*
- Imperative
 - sequences, loops, assignments
- Concurrent
 - multiple lines of execution: *trails*
- Synchronous
 - trails synchronize at each external event
- Deterministic
 - always yields the same outcome for a given timeline



Ambiente externo



```
input int Photo_readDone;

loop do
    par/or do
        await 250ms;
    with
        _Photo_read();
        int data = await Photo_readDone;
        _Leds_set(data/100);
        await forever;
    end
end
end
```

Céu under TinyOS

- Boot
 - 1st line of code
- Timers
 - await 500ms
- Leds
 - _Leds_led0Toggle(), _Leds_led1On(), _Leds_set(), ...
- Sensor
 - _Photo_read() → await Photo_readDone
- Radio
 - _Radio_start() → await Radio_startDone
 - _Radio_send() → await Radio_sendDone
 - await Radio_receive

Radio - Init

```
loop do
  int err = _Radio_start();
  if err == _SUCCESS then
    err = await Radio_startDone;
    if err == _SUCCESS then
      break;
    end
  else
    await 1s;
  end
end
end
```

Tarefa

<http://www.lua.inf.puc-rio.br/~francisco/ort/wsn/tarefas.html>

```
$ wget http://www.lua.inf.puc-rio.br/~francisco/ort/wsn/ceu_nesc-current.tgz
$ tar xvzf ceu_nesc-current.tgz
$ cd ceu_nesc_2012-03-28/
$ make CEUFILE=radio_echo.ceu micaz
```

- Verifique se a compilação ocorreu sem problemas

Tarefa

- Mesma aplicação que roda em diversos nós
- Cada um com um ID diferente
 - `make CEUFILE=app.ceu micaz install,6 mib510,/dev/ttyUSB0`
- Os nós comunicam o seu próprio ID por broadcast
 - `_TOS_NODE_ID`
- Nó com maior ID, acende o led AMARELO
- Nó com menor ID, acende o led VERMELHO
- Novos nós podem entrar a qualquer momento
- Copiar o arquivo `radio_echo.ceu`