

Simulação NanoSatc-Br2

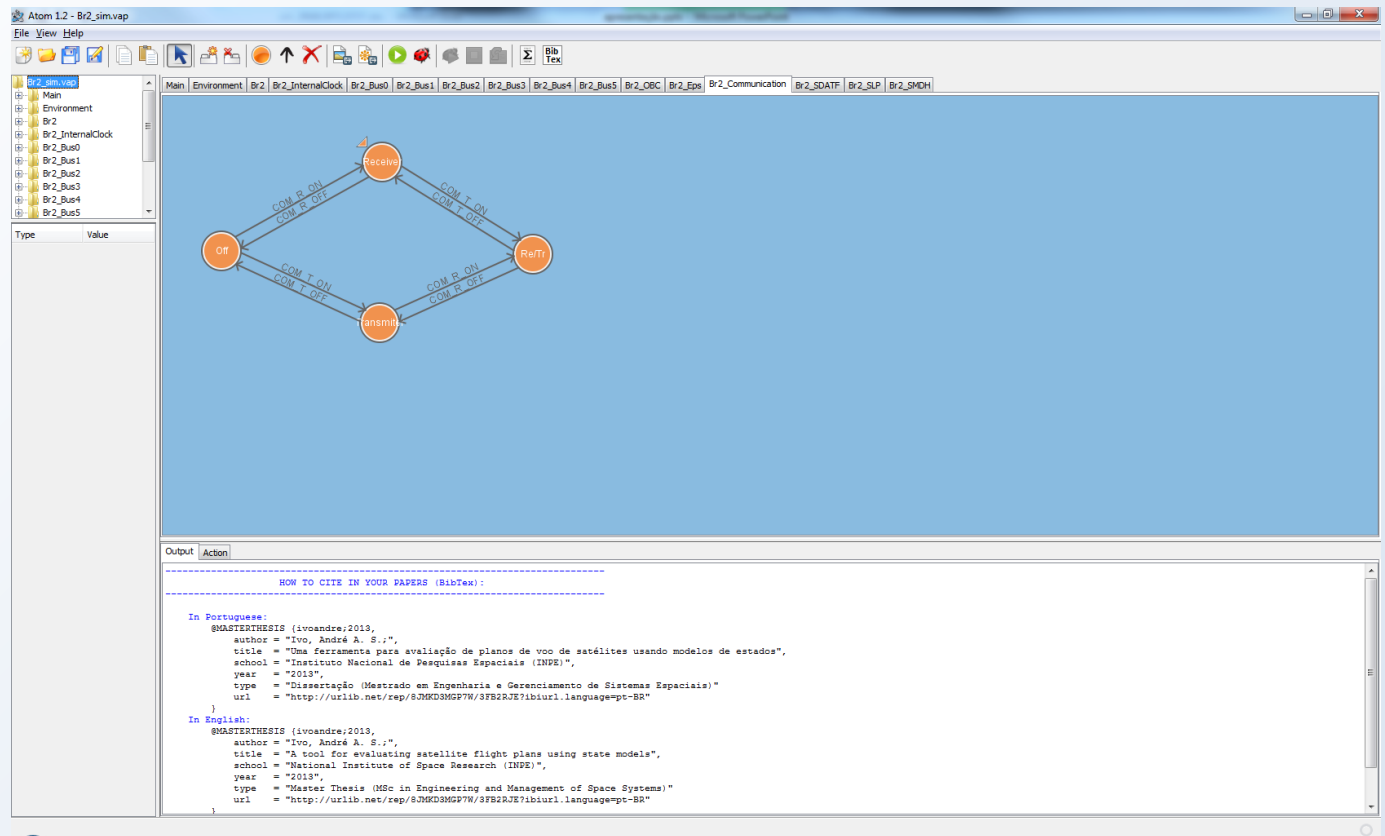
Grupo 1

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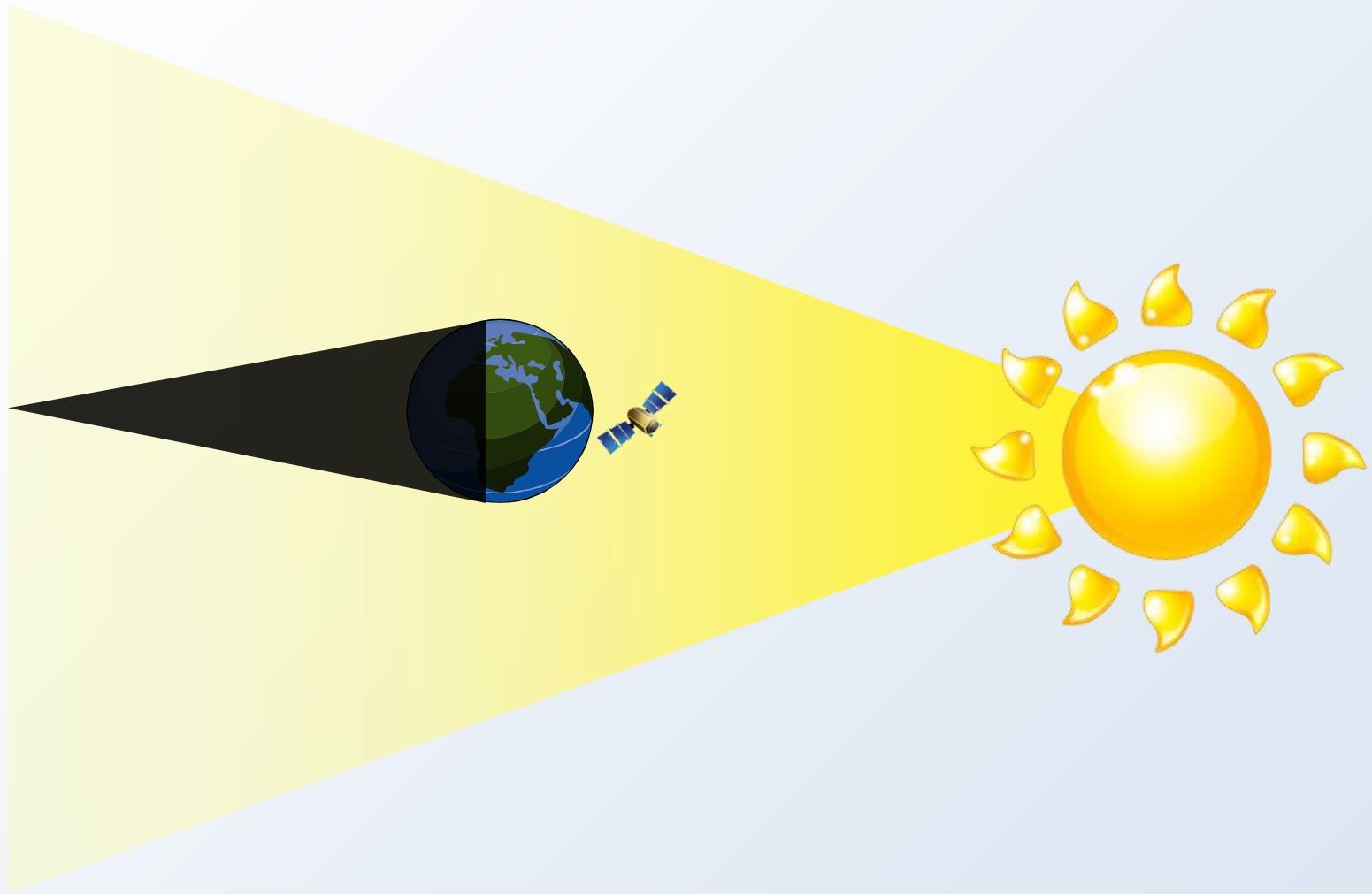
São José dos Campos, São Paulo
10/12/2018

- **Simulador Atom**
- **Preparação da Simulação**
- **MEFs geradas para o sistema**
 - **Sistema Ambiental**
 - **Nanosatc-Br2**
- **Domínio do sistema**
- **Domínio Lógico**
- **Simulação – Análise**
- **Manual do usuário**

Simulador de máquina de estados (<https://github.com/andreivo/Atom>)



Preparação da Simulação

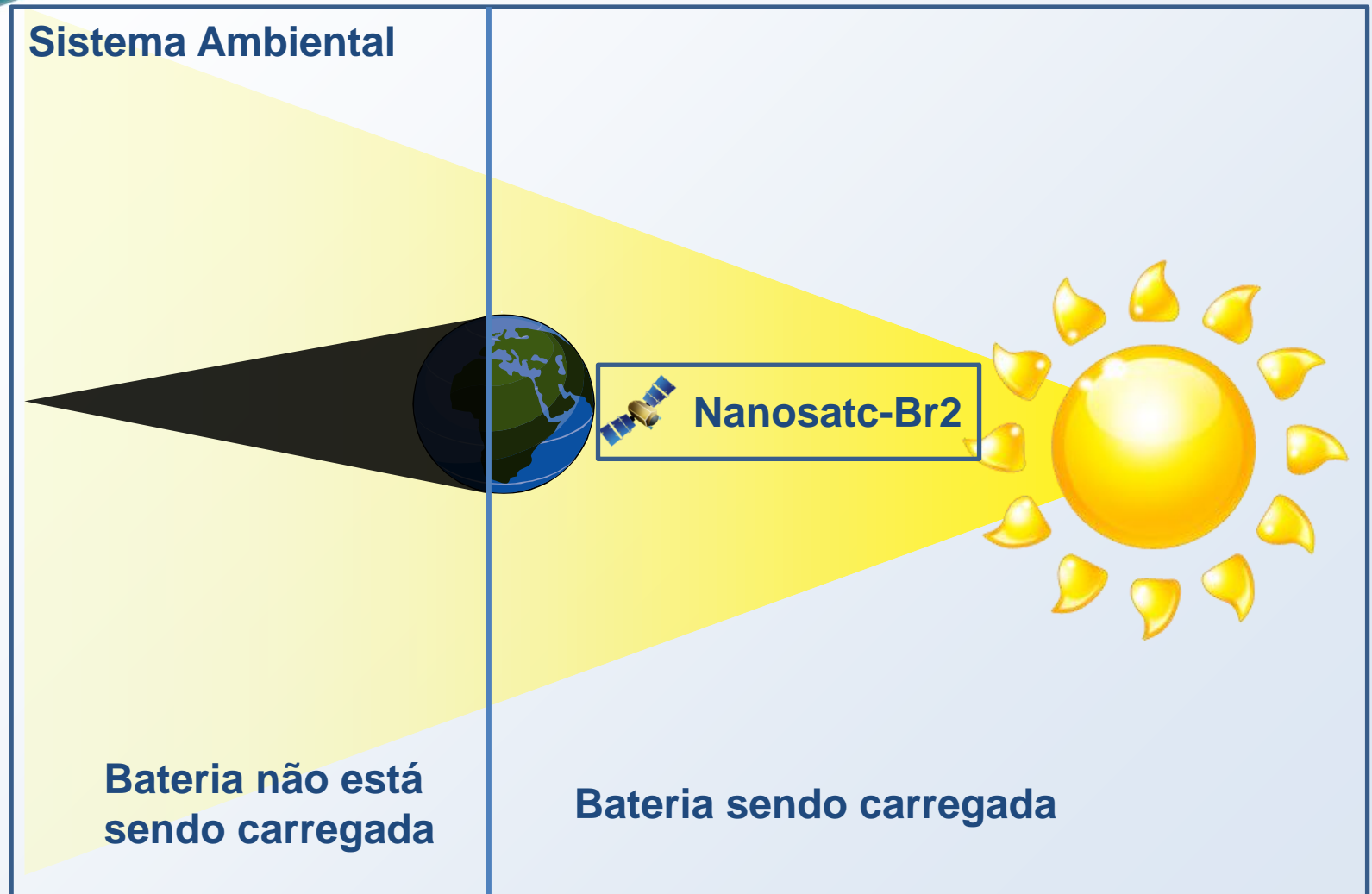


Preparação da Simulação

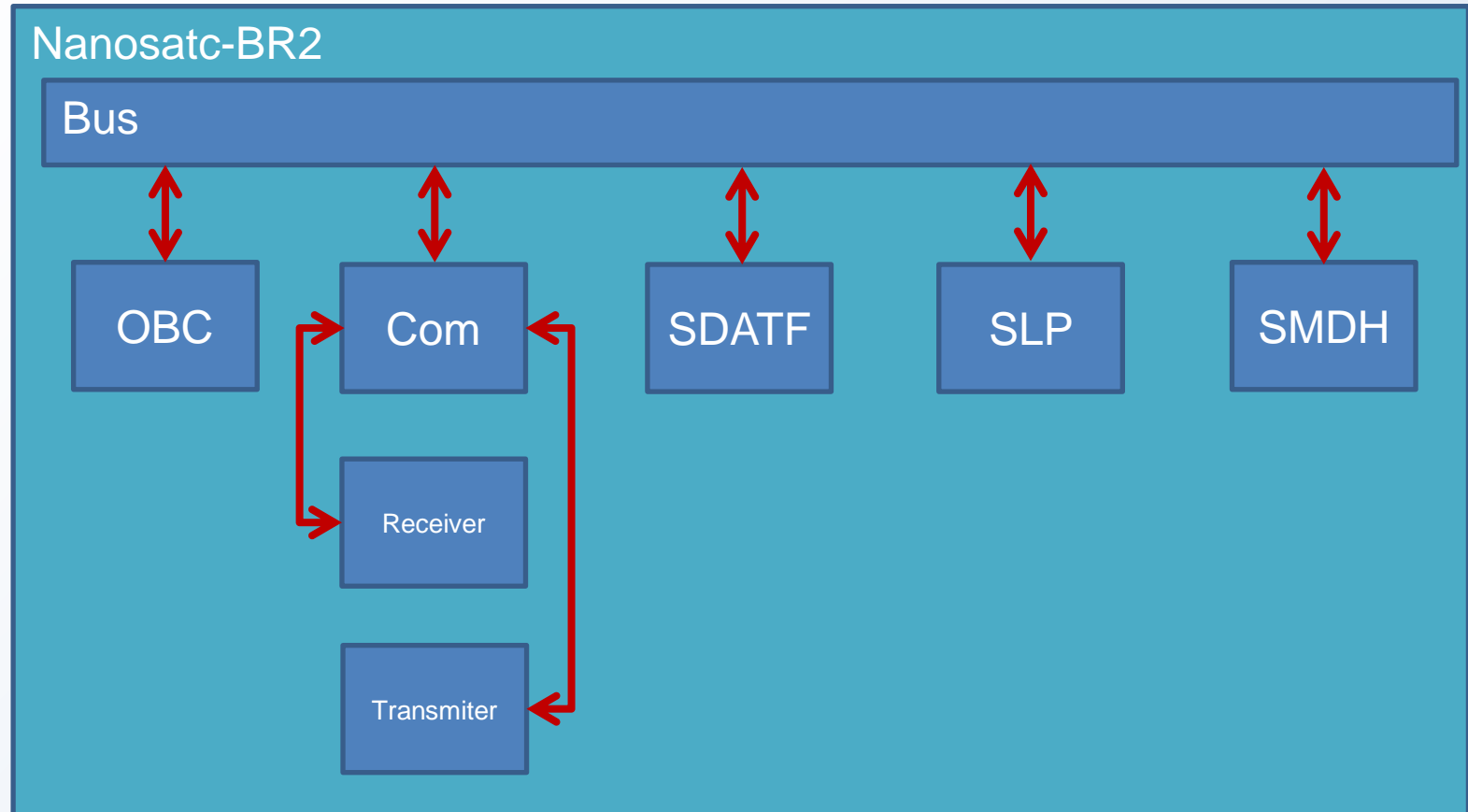
Sistema Ambiental



Preparação da Simulação



Preparação da Simulação



Preparação da Simulação

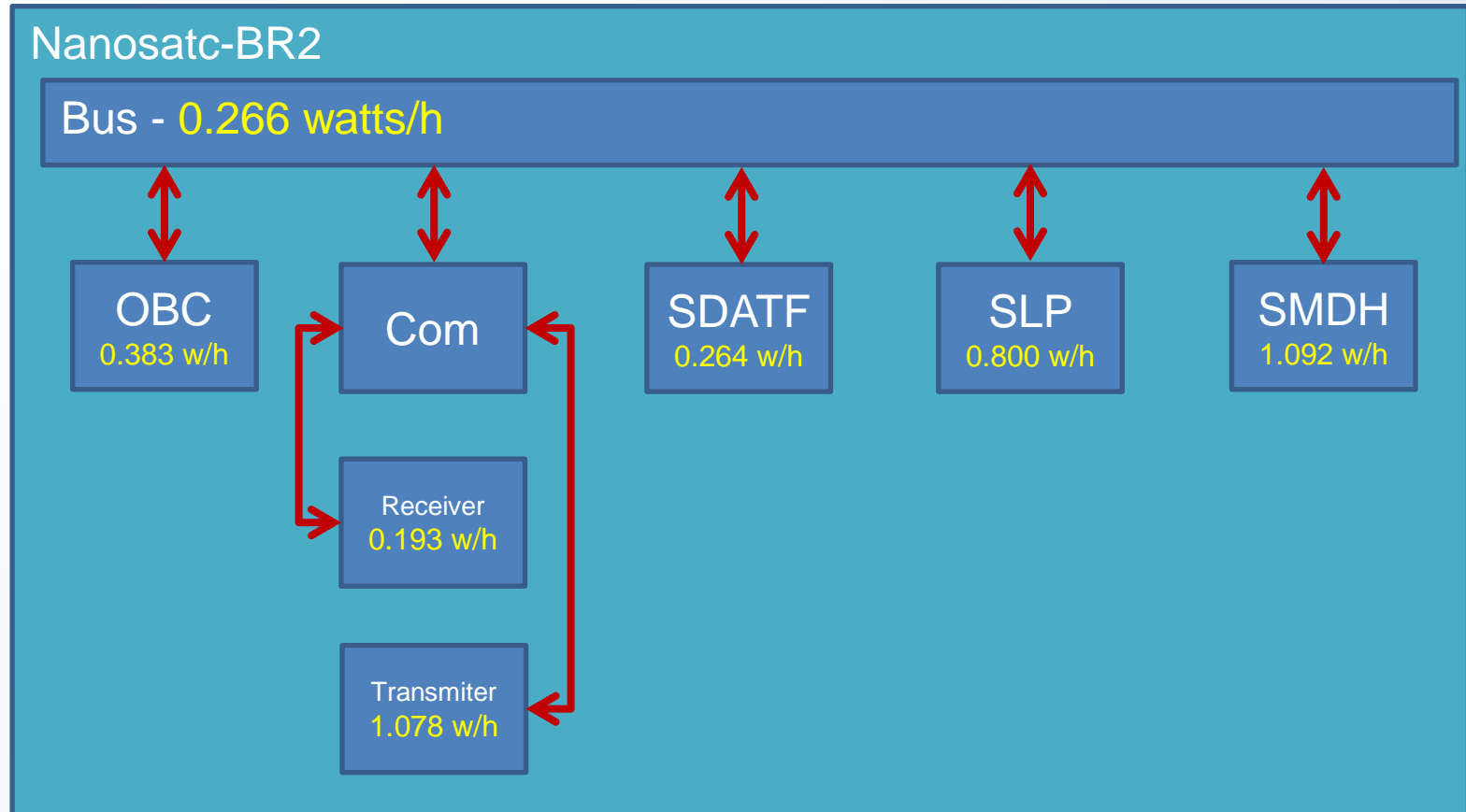
Subsystem	Supply Voltage (V)	Current (mA)	Power (W)
OBC	3.3	116	0.383
Receiver	7	27.5	0.193
<u>Transmitter</u>	7	154	1.078
<u>SDATF</u>	3.3	80	0.264
SLP	5	160	0.800
SMDH	3.3	331	1.092
Magnetometer	3.3	4.7	0.016
iMTQ	5	194	0.970
EPS			0.250

Preparação da Simulação

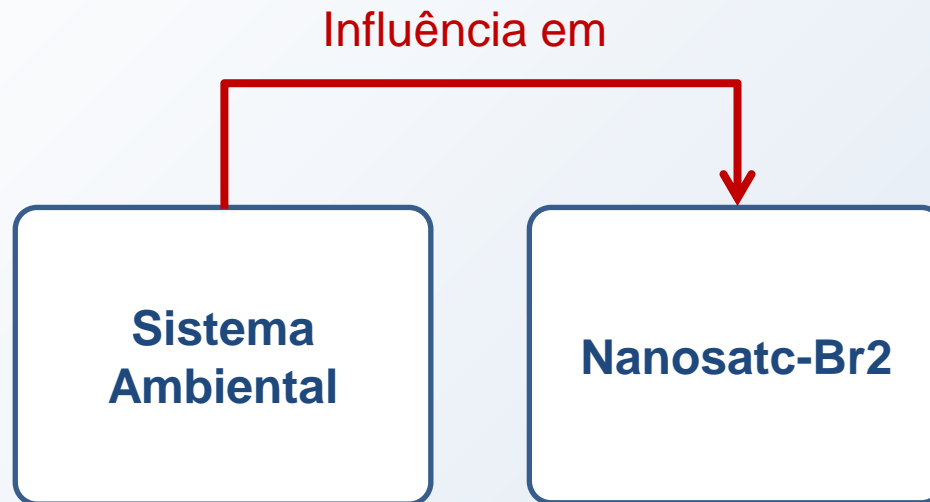
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* - Didaticamente esses três subsistemas foram considerados como BUS do satélite
Para a simulação o iMTQ será considerado Zero, pois seu acionamento é esporádico

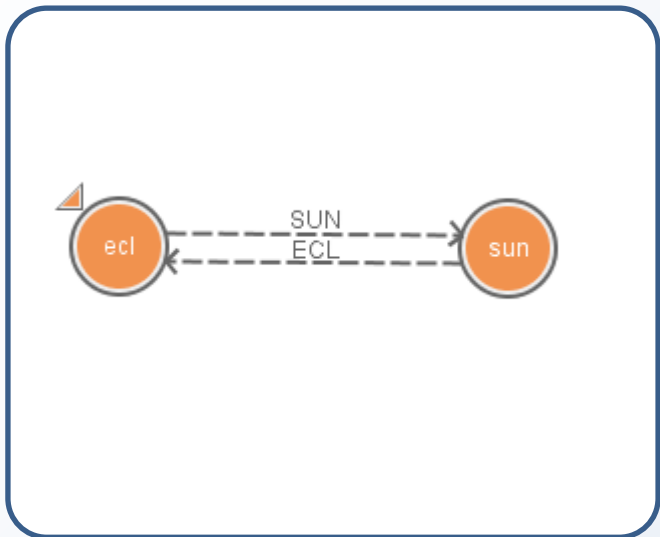
Preparação da Simulação



Máquinas de estado Finitos



MEF – Sistema Ambiental



Período orbital do Nanosatc-Br2 é de 5926 segundos

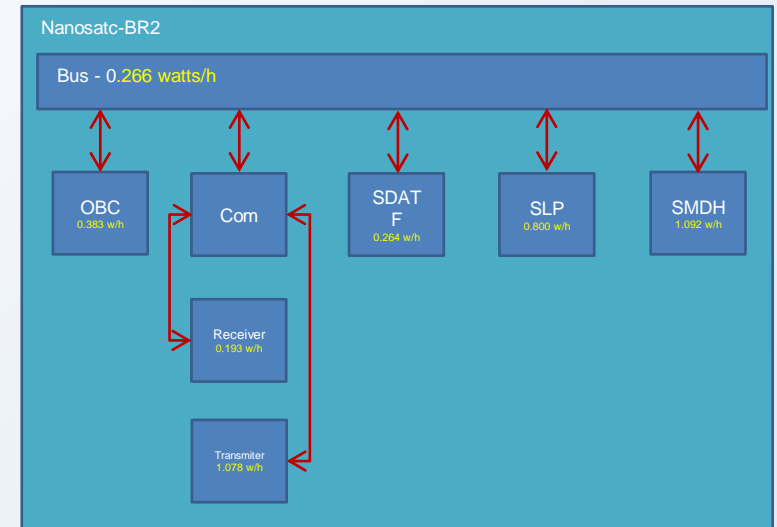
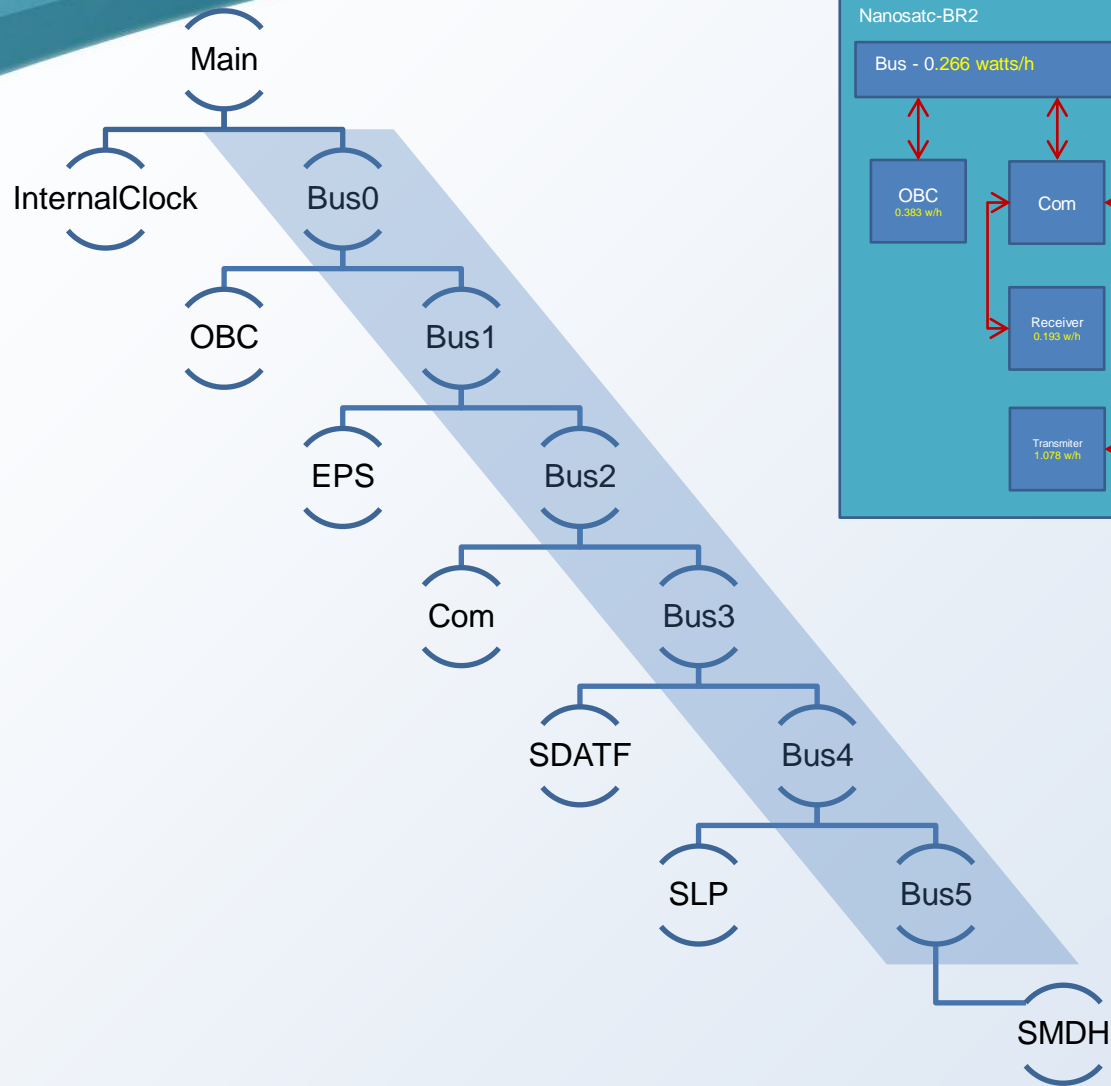
2/3 do período orbital com SOL = 3951 s

1/3 do período orbital com Sombra = 1975 s

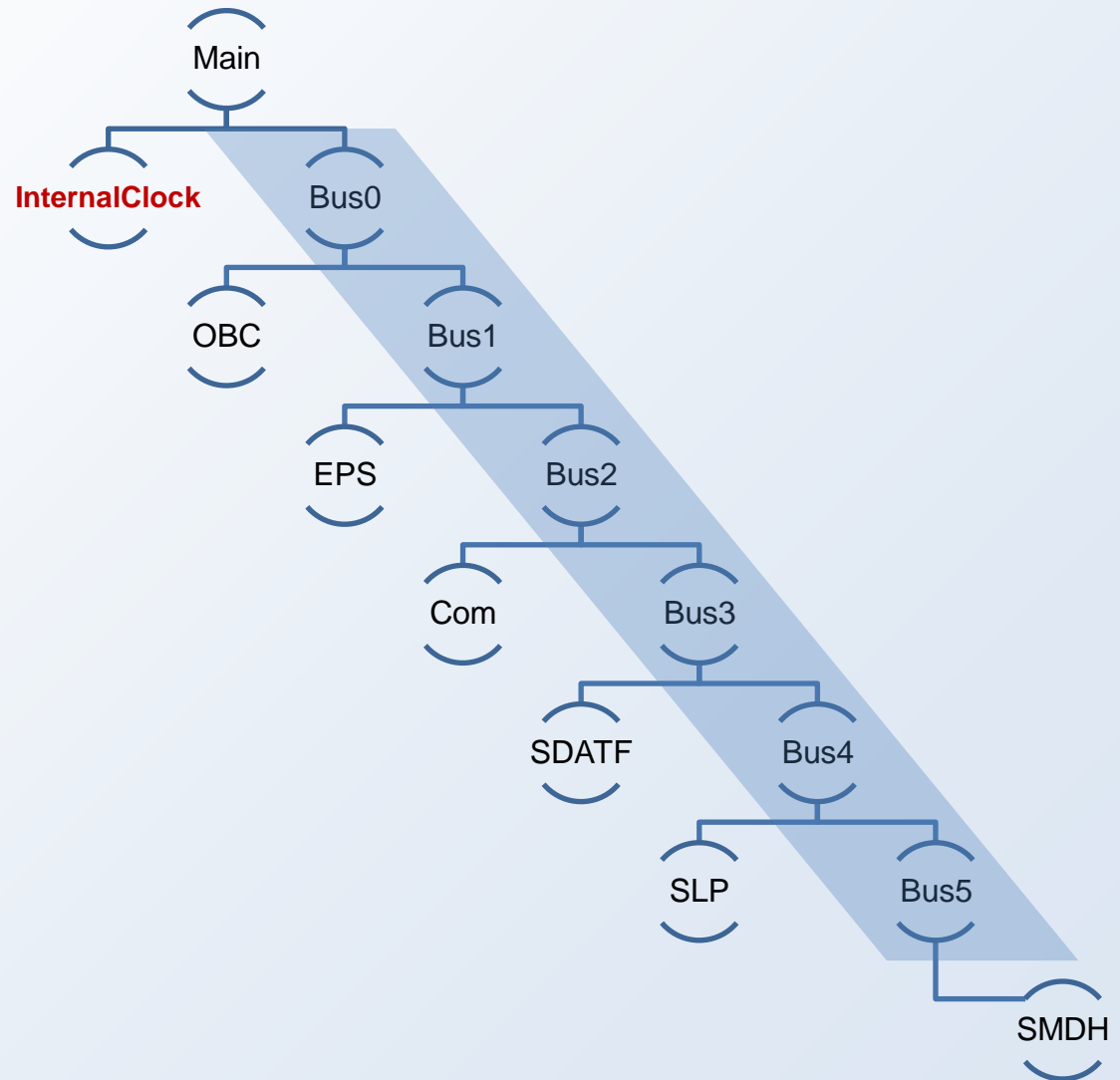
Timeout SUN = 1975 s (no estado ecl)

Timeout ECL = 3951 s (no estado sun)

MEF – Nanosatc-BR2

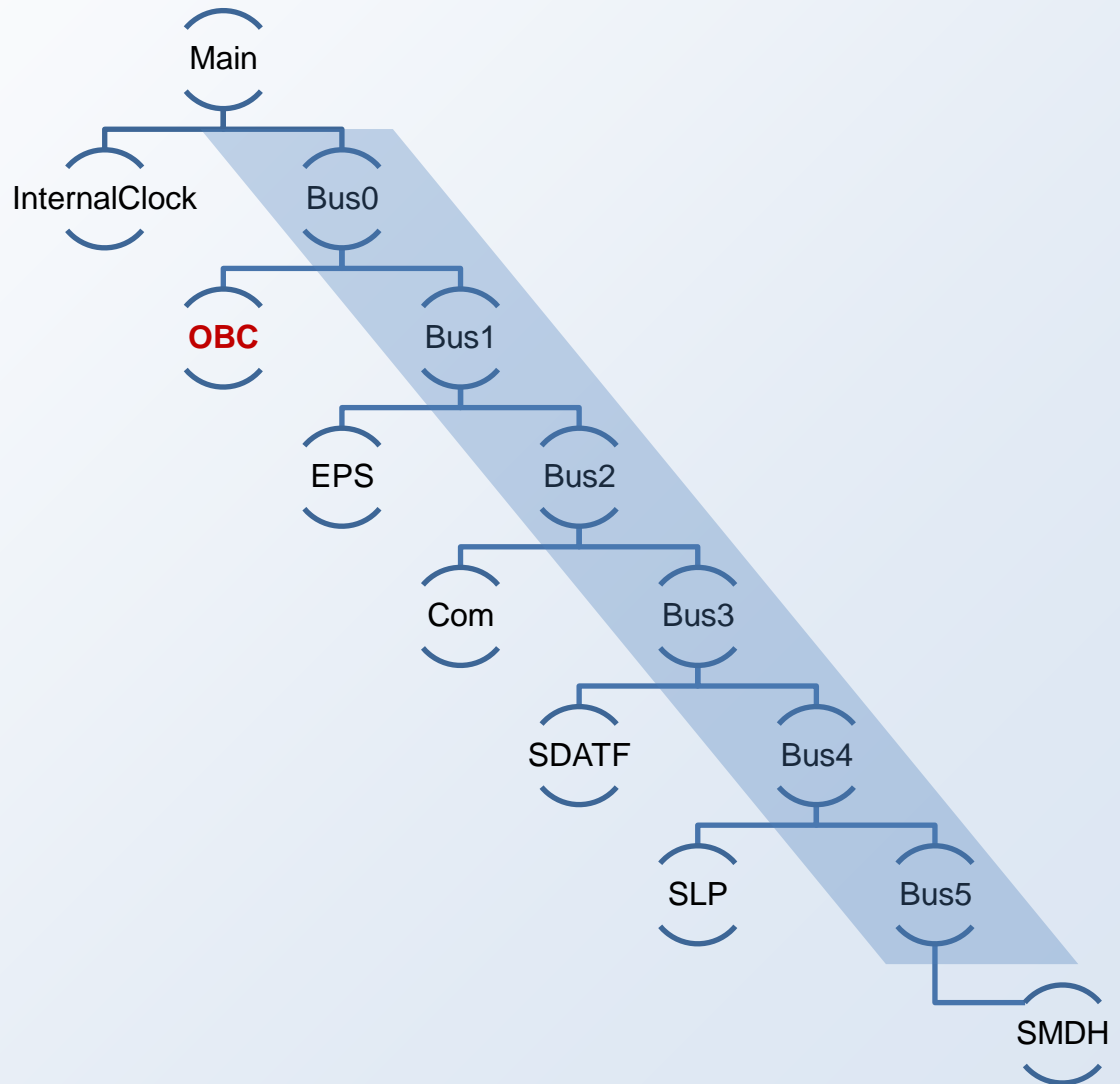


MEF – Nanosatc-BR2

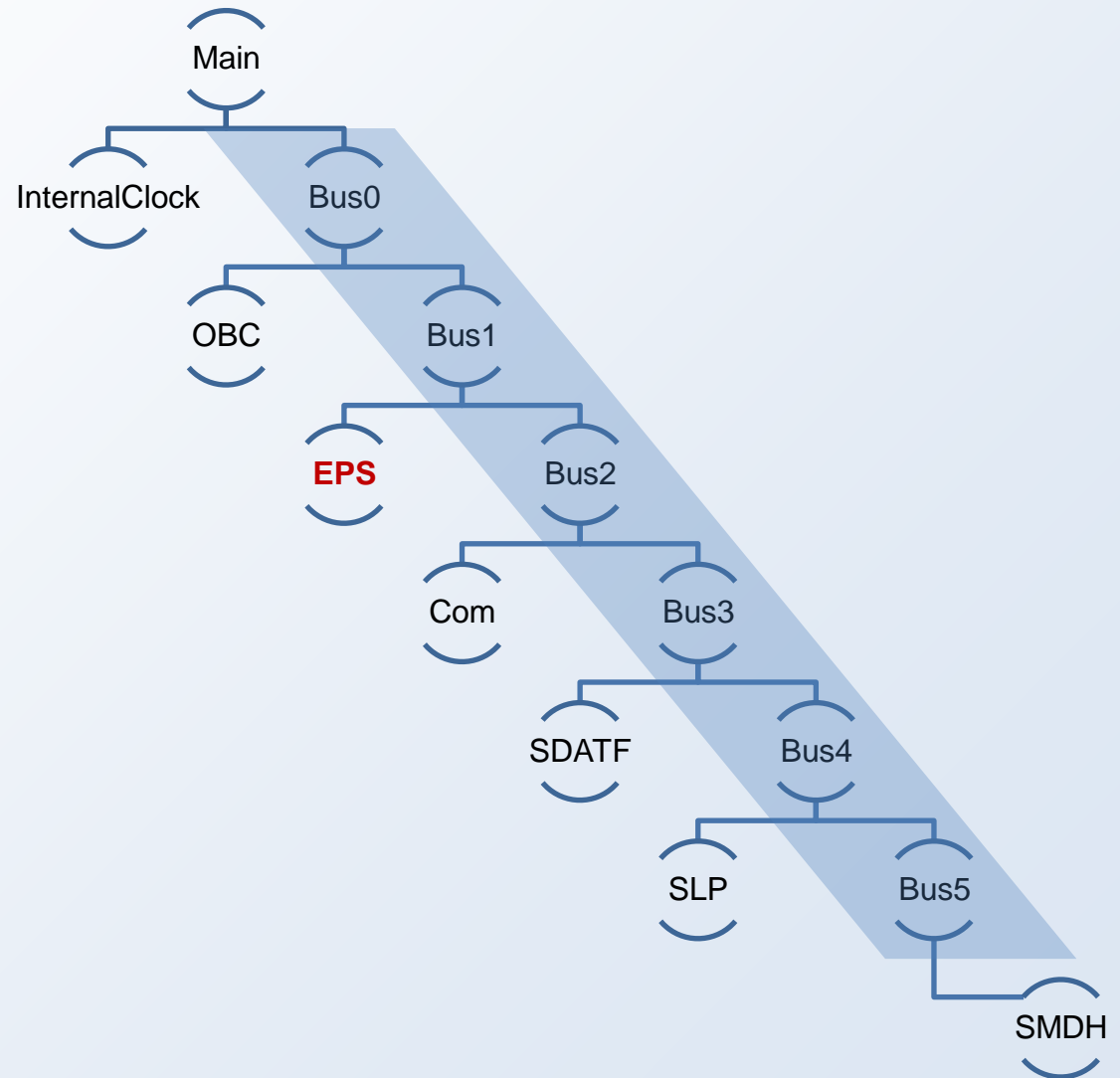


Timeout “timeout” = 1s

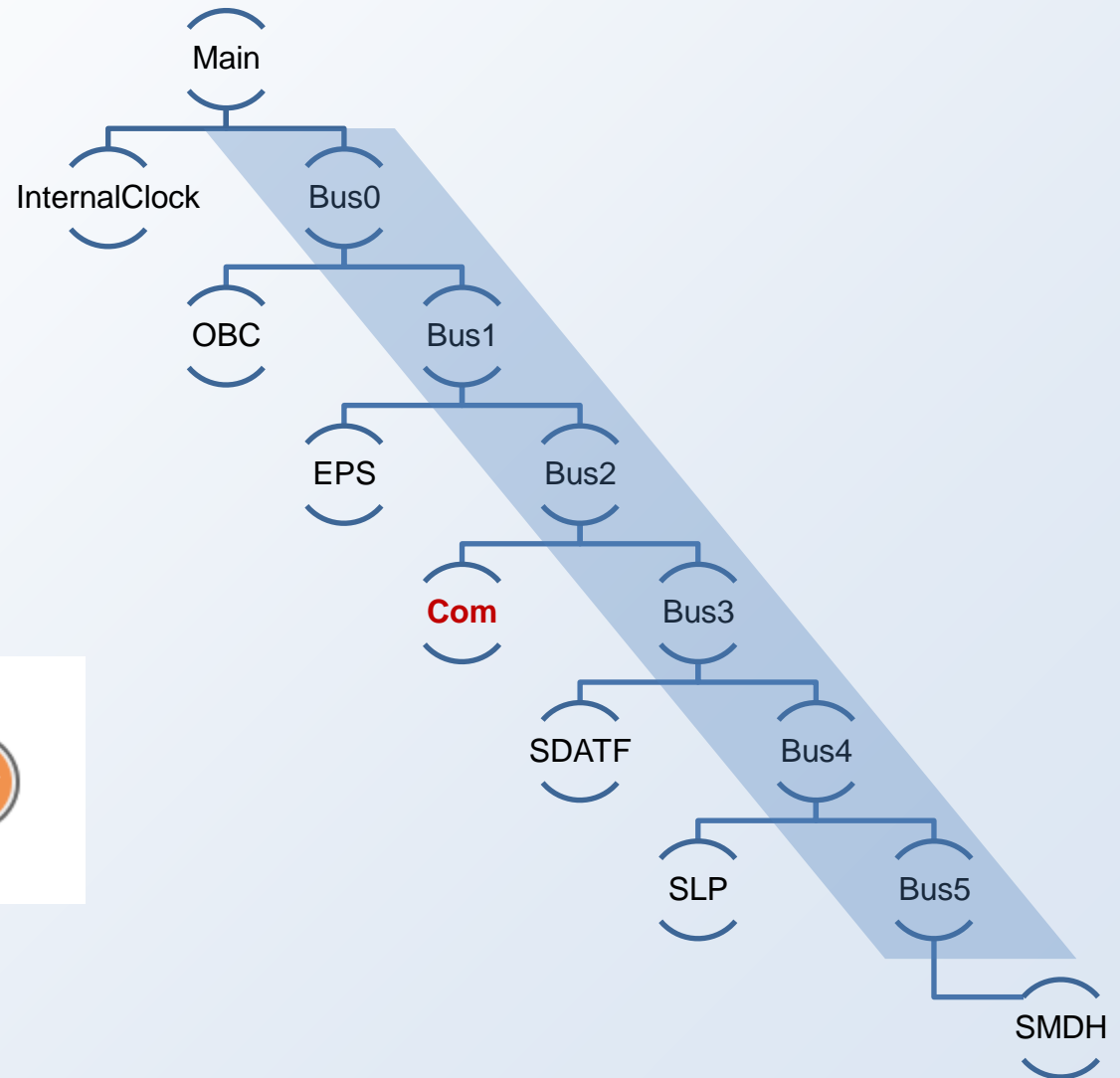
MEF – Nanosatc-BR2



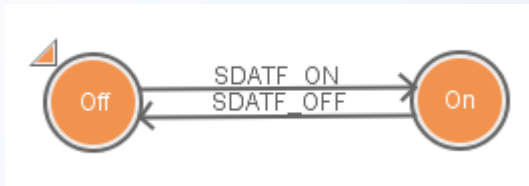
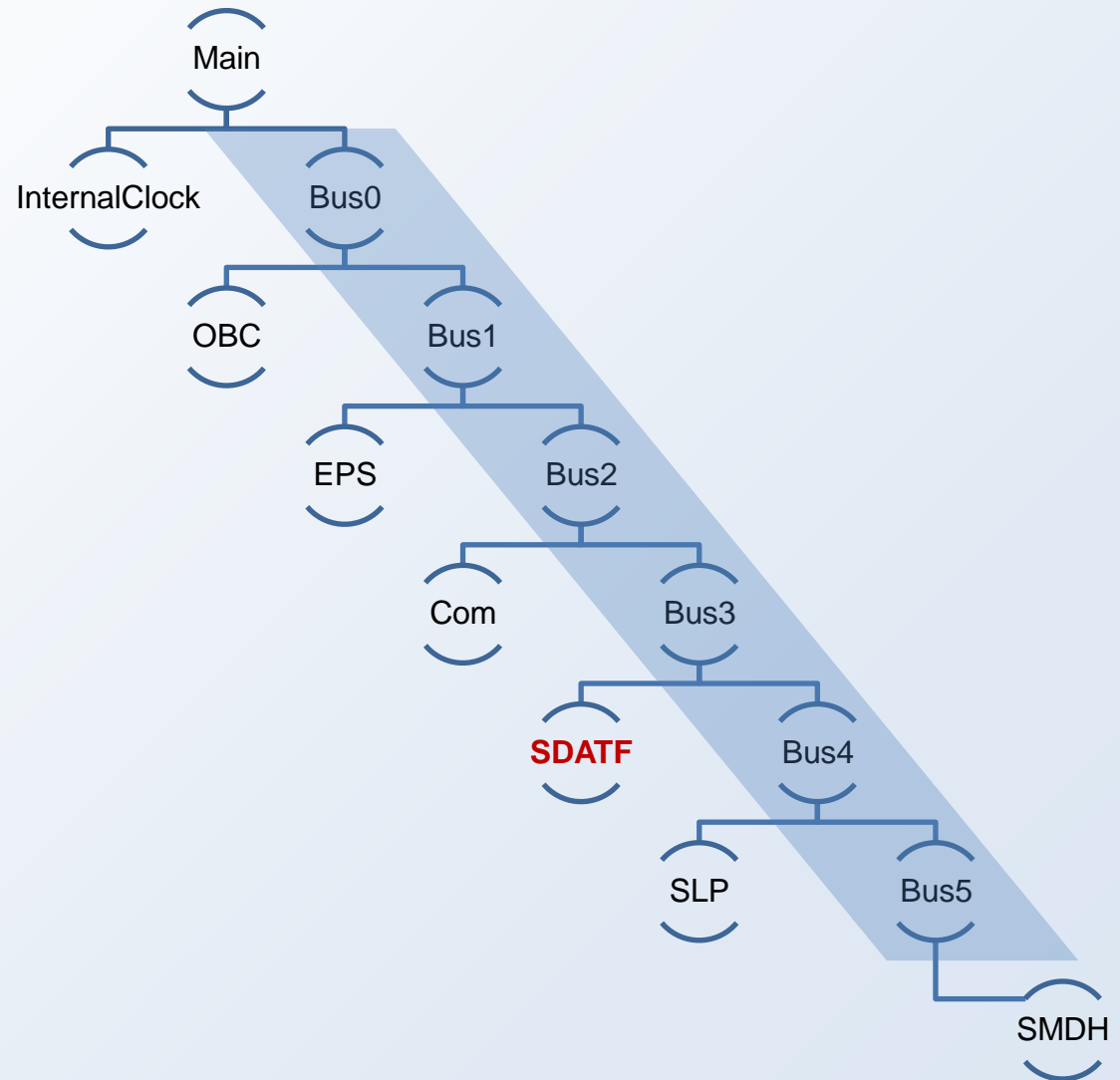
MEF – Nanosatc-BR2



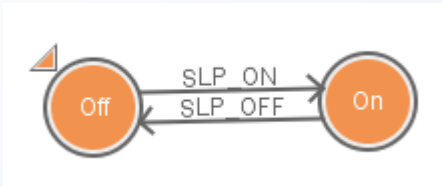
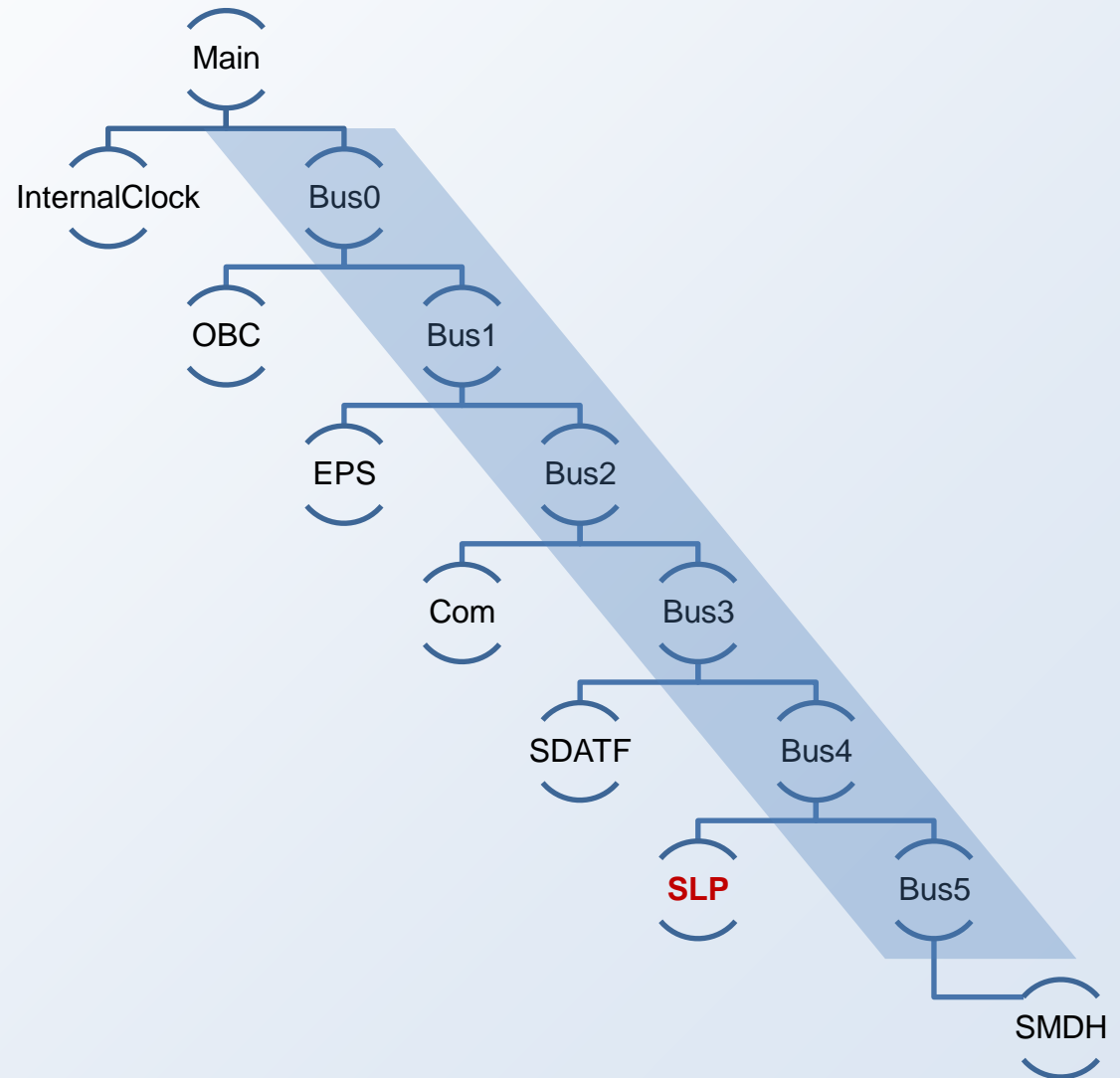
MEF – Nanosatc-BR2



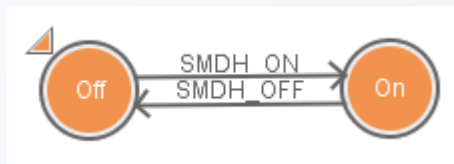
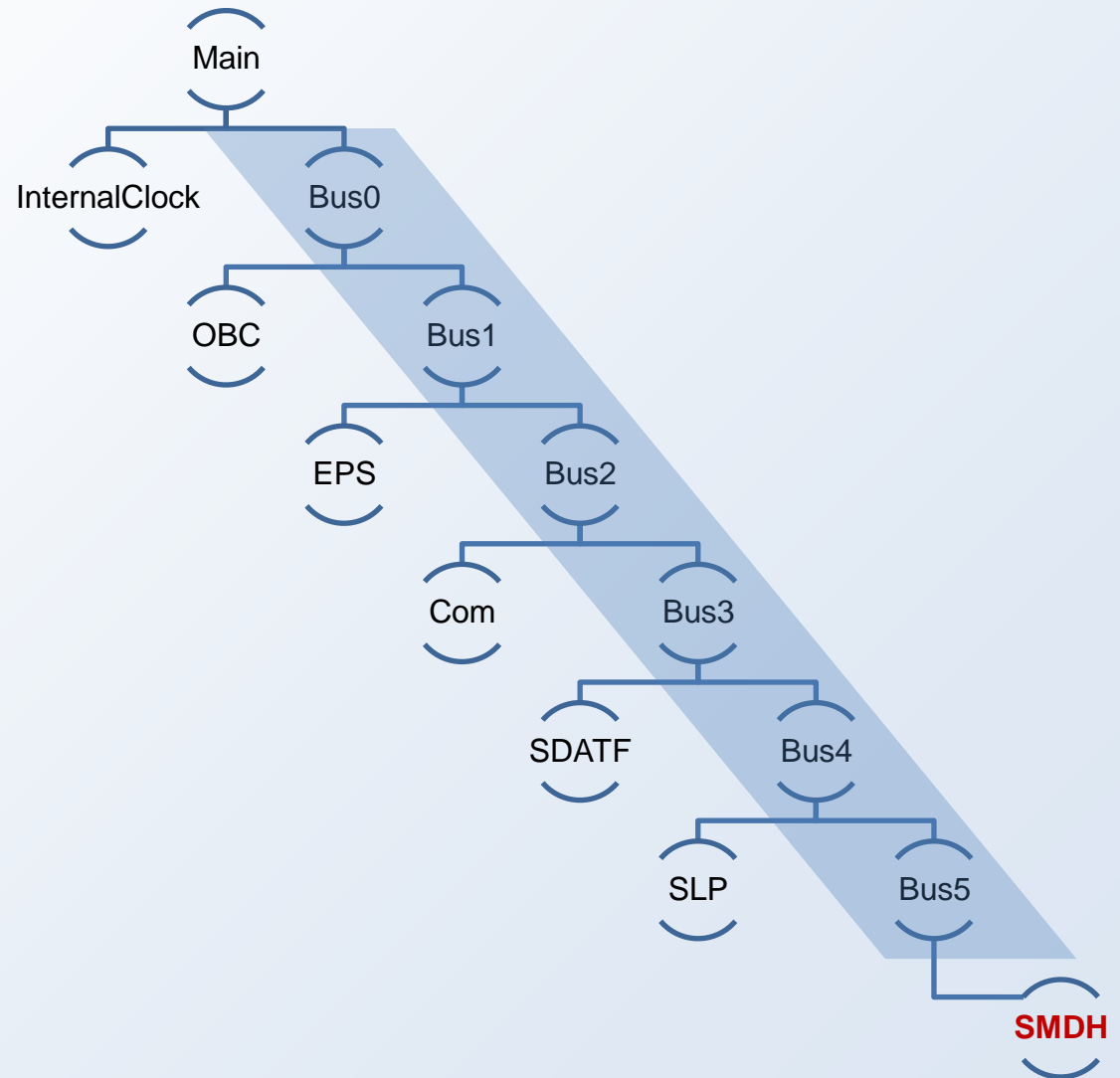
MEF – Nanosatc-BR2



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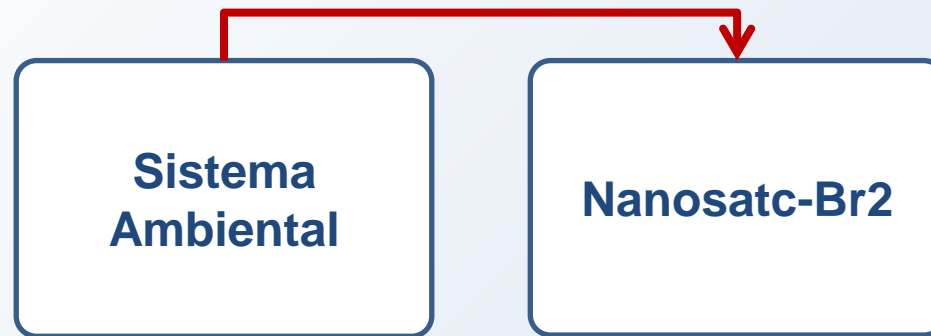


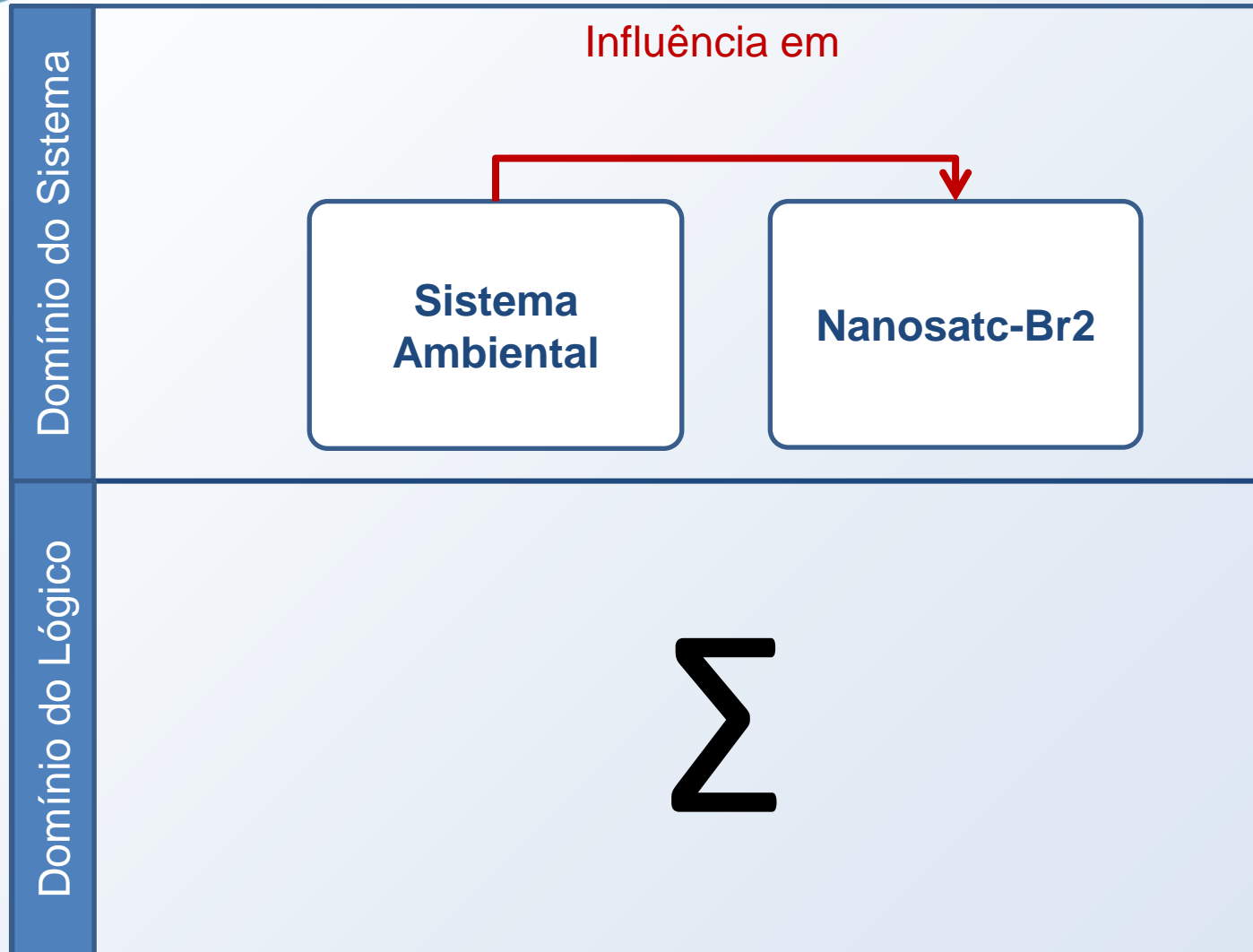
MEF – Nanosatc-BR2



Domínio de Sistema

Influência em





Domínio Lógico



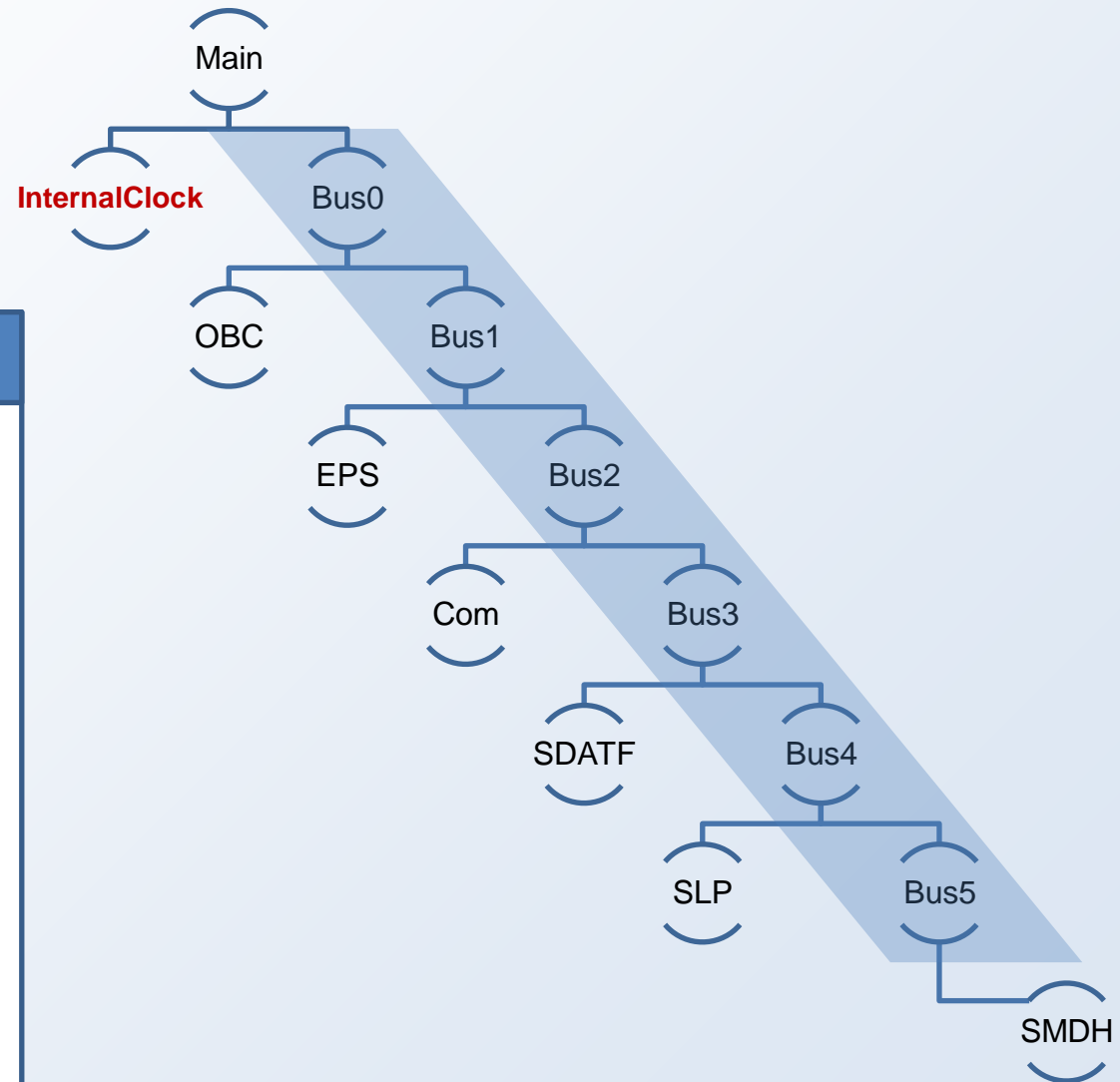
Timeout “timeout” = 1s

OnEnter - Clock

```
incEpsSystem()
decEpsSystem()
internal_time = internal_time+1
internal_time_tmp = internal_time_tmp+1

if Environment_state~=nil then
  -- sunlight is illuminating the system
  if Environment_state:getName() == 'sun' then
    if internal_time_tmp == 3960 then
      internal_time_tmp = 0
      sendEvent('ECL')
    end
  else
    if internal_time_tmp == 1980 then
      sendEvent('SUN')
      internal_time_tmp = 0
    end
  end
end

internalClockWriteAnalysisFile()
```



Domínio Lógico

```
function incEpsSystem()  
  if Br2_Eps_state ~= nil then  
    -- EPS system is on  
    if Br2_Eps_state:getName() == 'On' then  
      if Environment_state~=nil then  
        -- sunlight is illuminating the system  
        if Environment_state:getName() == 'sun' then  
          incBattery()  
        end  
      end  
    end  
  end  
end
```

```
function decEpsSystem()  
  -- power of bus  
  totalDrop = totalDrop + powerDropBus()  
  -- power of OBC  
  totalDrop = totalDrop + powerDropOBC()  
  -- power of communication  
  totalDrop = totalDrop + powerDropCommunication()  
  -- power of SDATF  
  totalDrop = totalDrop + powerDropSDATF()  
  -- power of SLP  
  totalDrop = totalDrop + powerDropSLP()  
  -- power of SMDH  
  totalDrop = totalDrop + powerDropSMDH()  
  
  --print(totalDrop)  
  decBattery(totalDrop)  
end
```


Domínio Lógico

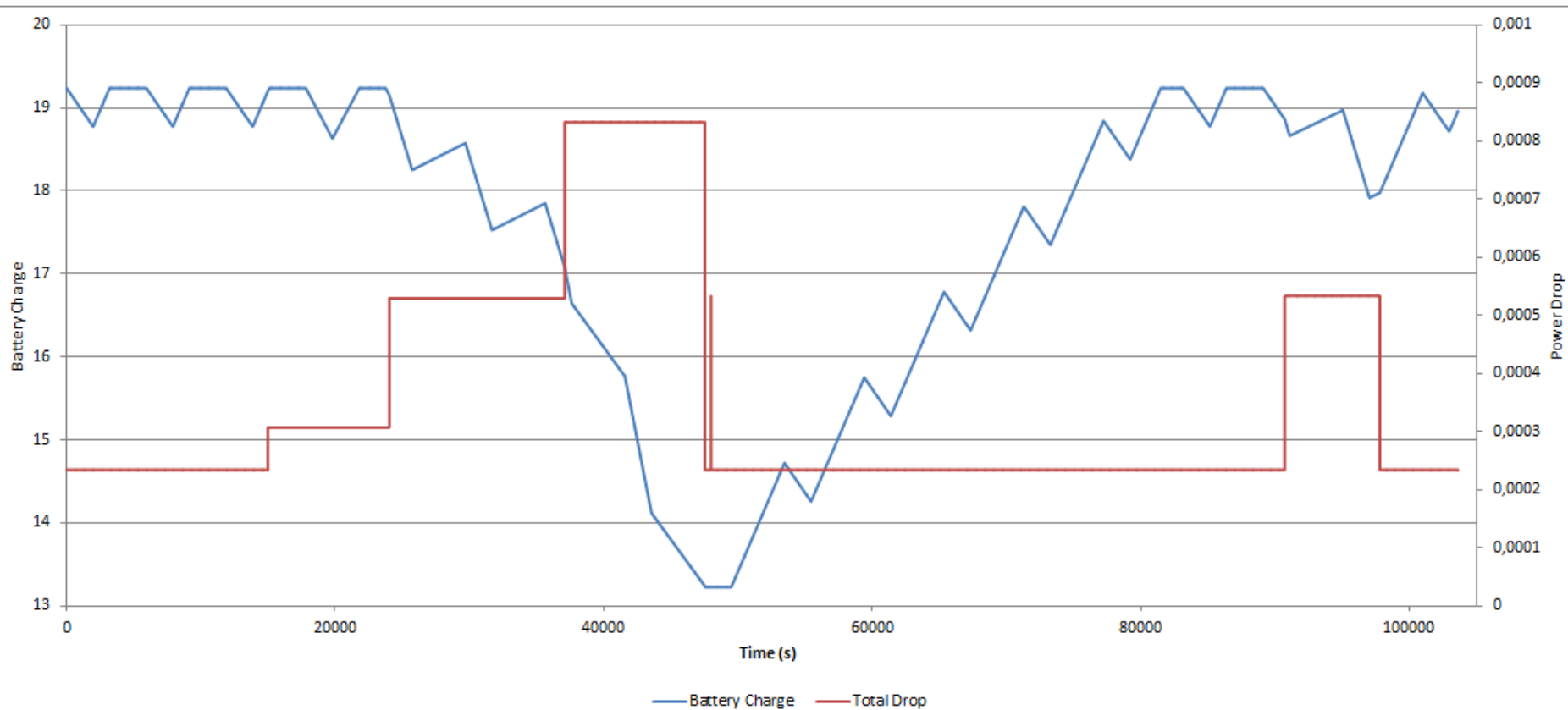
```
function internalClockWriteAnalysisFile()
    obc = '';
    eps = '';
    communication = '';
    sdatf = '';
    slp = '';
    smdh = ''

    if Br2_OBC_state ~= nil then
        obc = Br2_OBC_state:getName()
    end
    if Br2_Eps_state ~= nil then
        eps = Br2_Eps_state:getName()
    end
    if Br2_Communication_state ~= nil then
        communication = Br2_Communication_state:getName()
    end
    if Br2_SDATF_state ~= nil then
        sdatf = Br2_SDATF_state:getName()
    end
    if Br2_SLP_state ~= nil then
        slp = Br2_SLP_state:getName()
    end
    if Br2_SMDH_state ~= nil then
        smdh = Br2_SMDH_state:getName()
    end
    tmp_bat = battery..' '
    tmp_bat = tmp_bat:gsub("(%.)", "%,")
    writeAnalysisFile(internal_time..' '..tmp_bat..' '..obc..' '..eps..' '..communication..' '..sdatf..' '..slp..' '..smdh..'\\n')
end
```

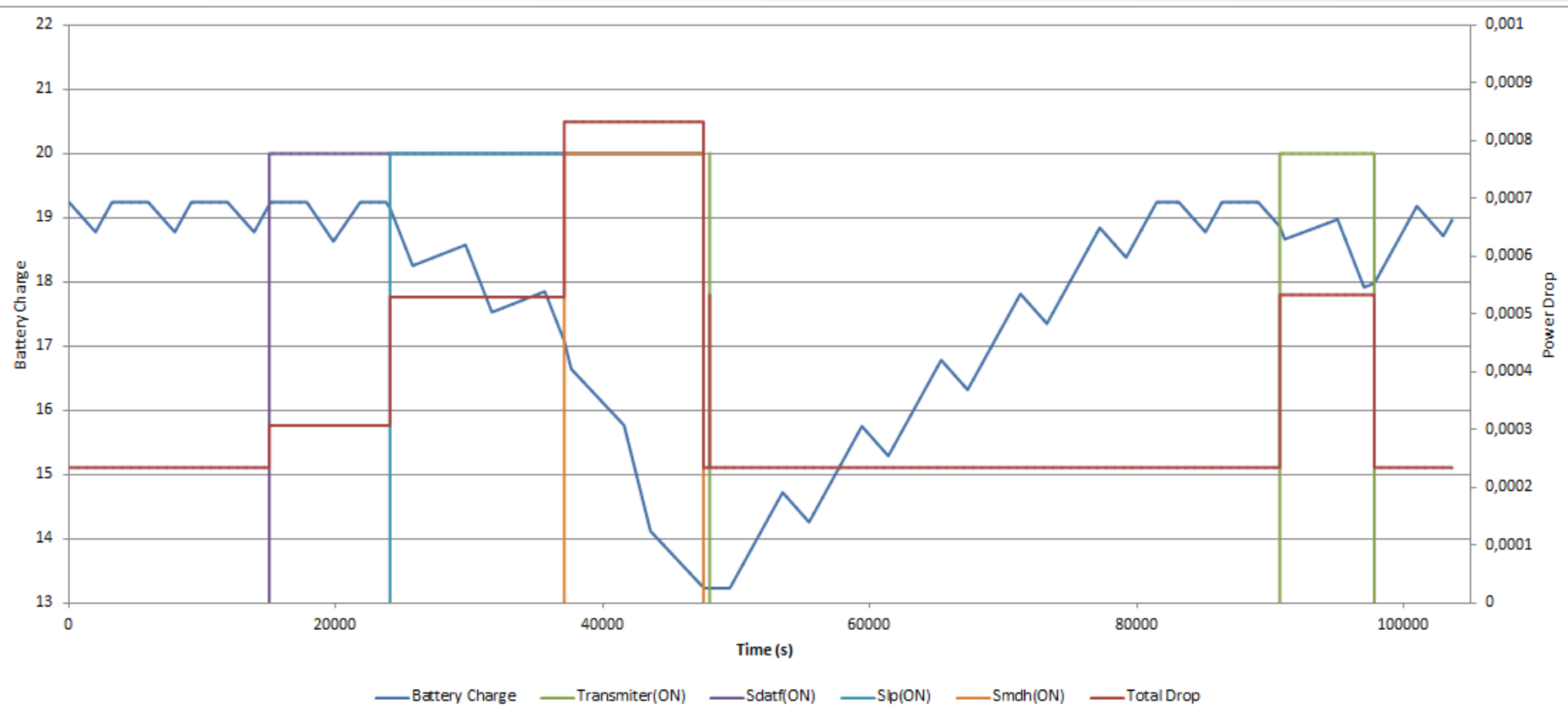
Simulação - Análise

	A	B	C	D	E	F	G	H	I	J
1	time(s)	battery	orbit	obc	eps	communic	sdatf	slp	smdh	total_drop
2	1	19,23993								7,39E-05
3	2	19,23969	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
4	3	19,23946	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
5	4	19,23923	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
6	5	19,23899	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
7	6	19,23876	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
8	7	19,23852	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
9	8	19,23829	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
10	9	19,23805	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
11	10	19,23782	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
12	11	19,23759	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
13	12	19,23735	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
14	13	19,23712	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
15	14	19,23689	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
16	15	19,23665	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
17	16	19,23642	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
18	17	19,23618	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
19	18	19,23595	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
20	19	19,23572	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
21	20	19,23548	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
22	21	19,23525	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
23	22	19,23501	ecl	On	On	Receiver	Off	Off	Off	2,34E-04
24	23	19,23478	ecl	On	On	Receiver	Off	Off	Off	2,34E-04

Simulação - Análise



Simulação - Análise



Manual do usuário

O simulador do sistema de potência do Nanosatc-BR2 foi desenvolvido utilizando a plataforma do Atom.

Para maiores informações sobre a plataforma por favor consulte:

<https://github.com/andreivo/Atom>

O simulador do sistema de potência do Nanosatc-BR2 é bastante simples concentra-se em um conjunto de “telecomandos” para simular o comportamento do Nanosat.

Os Telecomandos básicos são:

1 - OBC

GET_TM : Obtém as telemetrias

REPAIR: Repara o OBC do estado de Alerta

2 - De comunicação:

COM_T_ON: Liga o transmissor

COM_T_ON: Desliga o transmissor

3 - SDATF

SDATF_OFF: Desliga o payload SDATF

SDATF_ON: Liga o payload SDATF

4 - SLP

SLP_OFF: Desliga o payload SLP

SLP_ON: Liga o payload SLP

5 - SMDH

SMDH_OFF: Desliga o payload SMDH

SMDH_ON: Liga o payload SMDH

Manual do usuário

A simulação gera um arquivo do tipo csv, que pode ser aberto no Excel para análise. Este arquivo é gerado no mesmo diretório onde o arquivo de simulação foi salvo.

Com o arquivo é possível gerar análises e montar gráficos, conforme apresentado nesta apresentação.

Obrigado!

[illegible]