

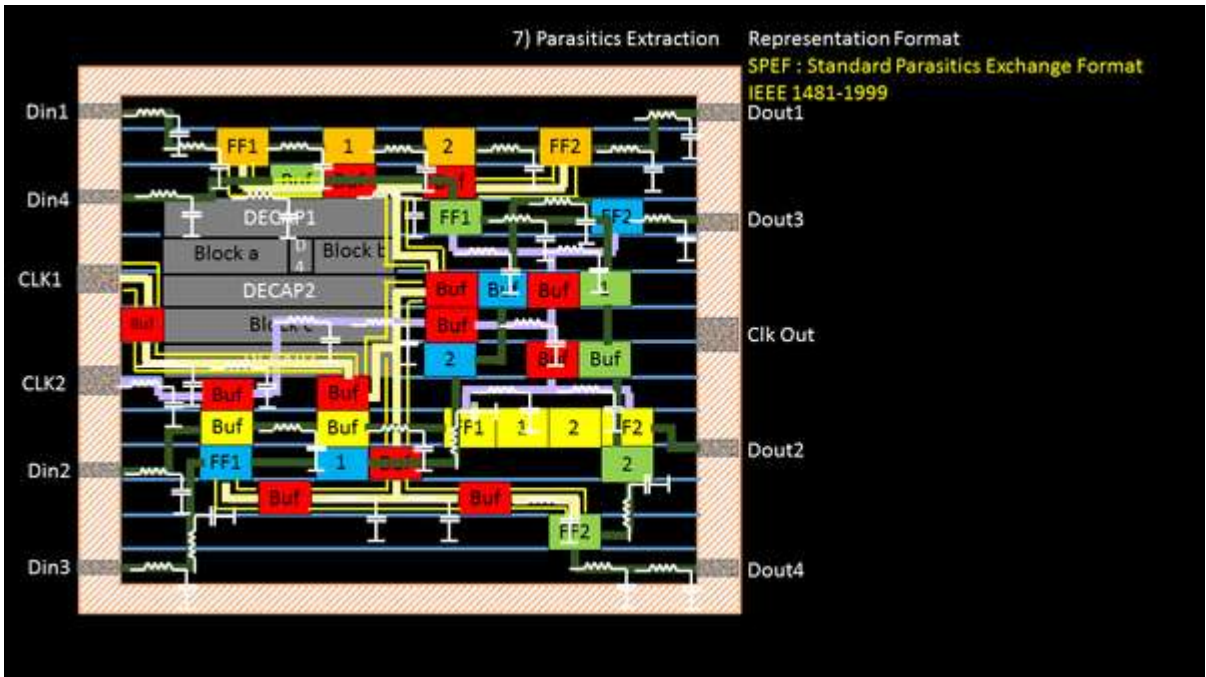


Standard Parasitic Exchange Format (SPEF) Format

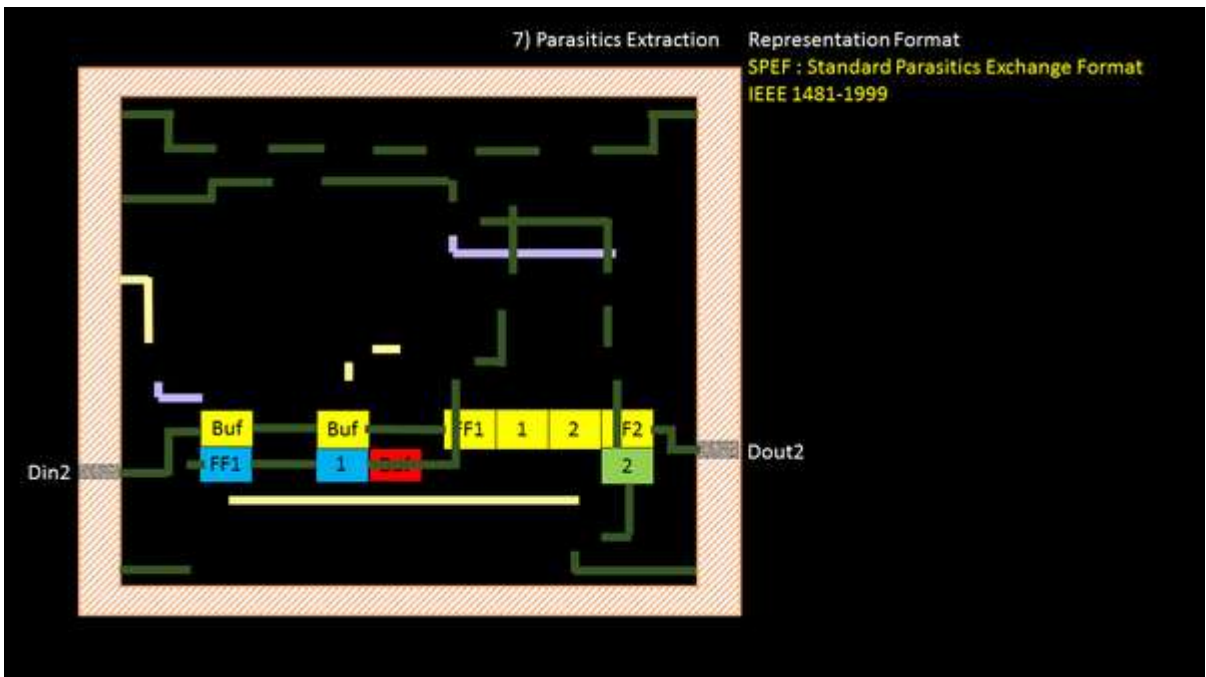
Kunal Ghosh

We might be curious to know what is the **IEEE SPEF format**, what does various attributes of SPEF file represent, how to generate spef file, etc.... So, here you go.

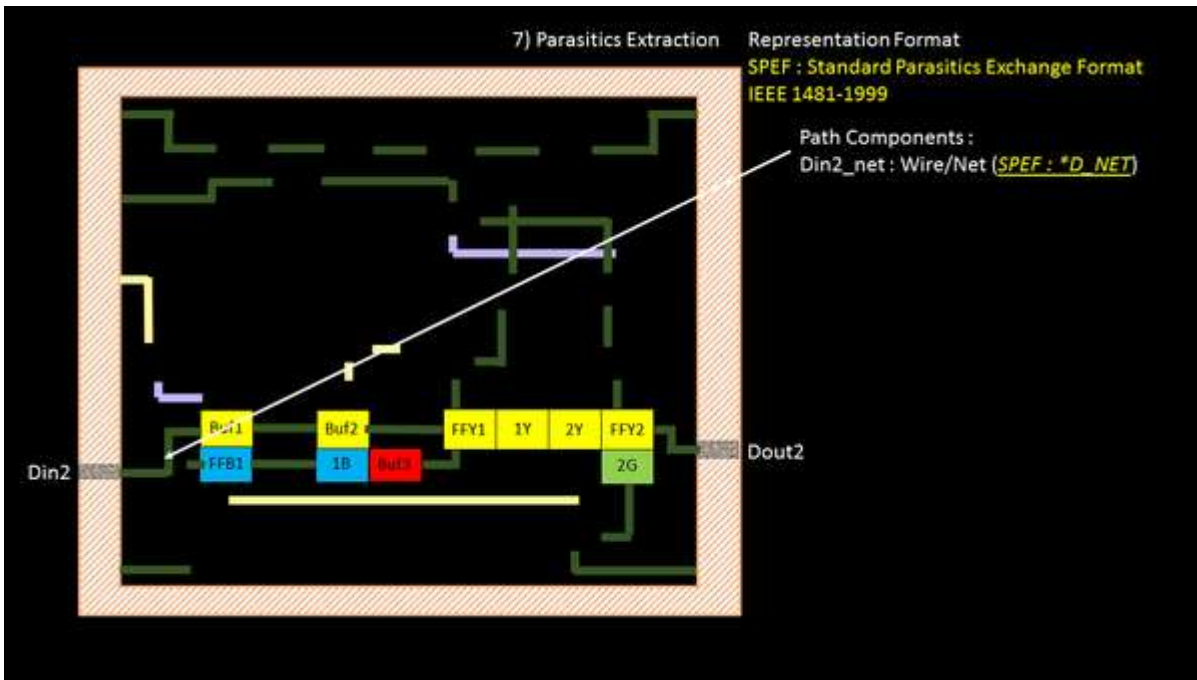
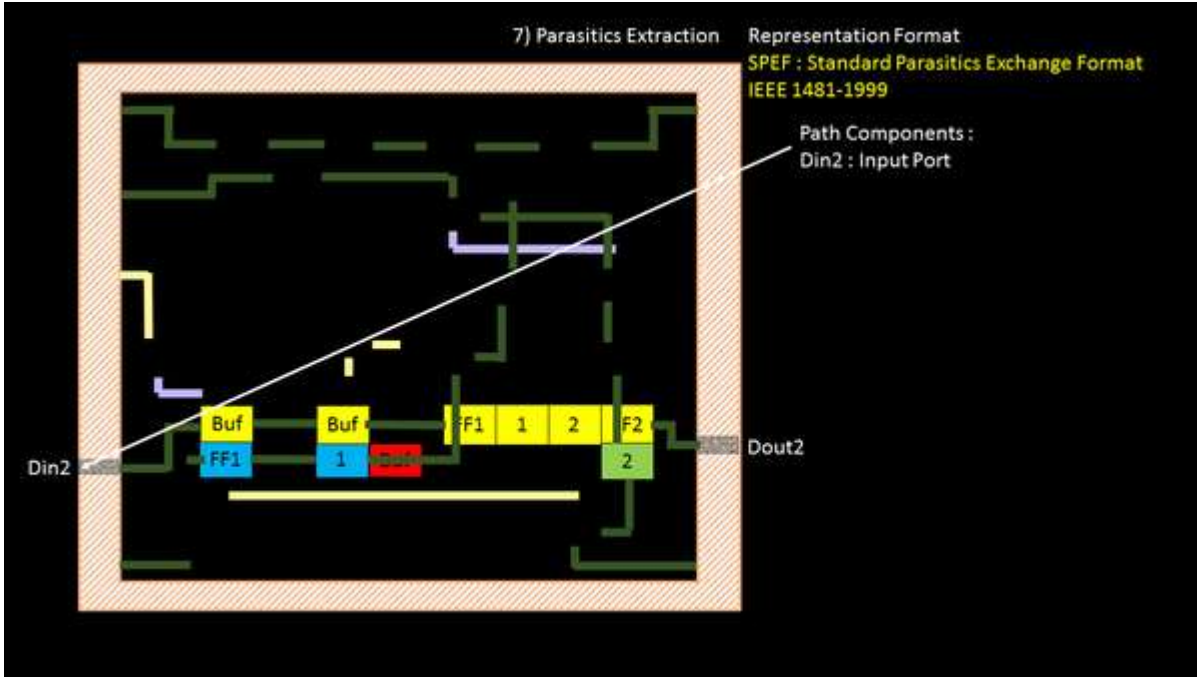
Finally got time to make video on IEEE SPEF format. Let's nail this down, with below example design, which I have been using on Udemy

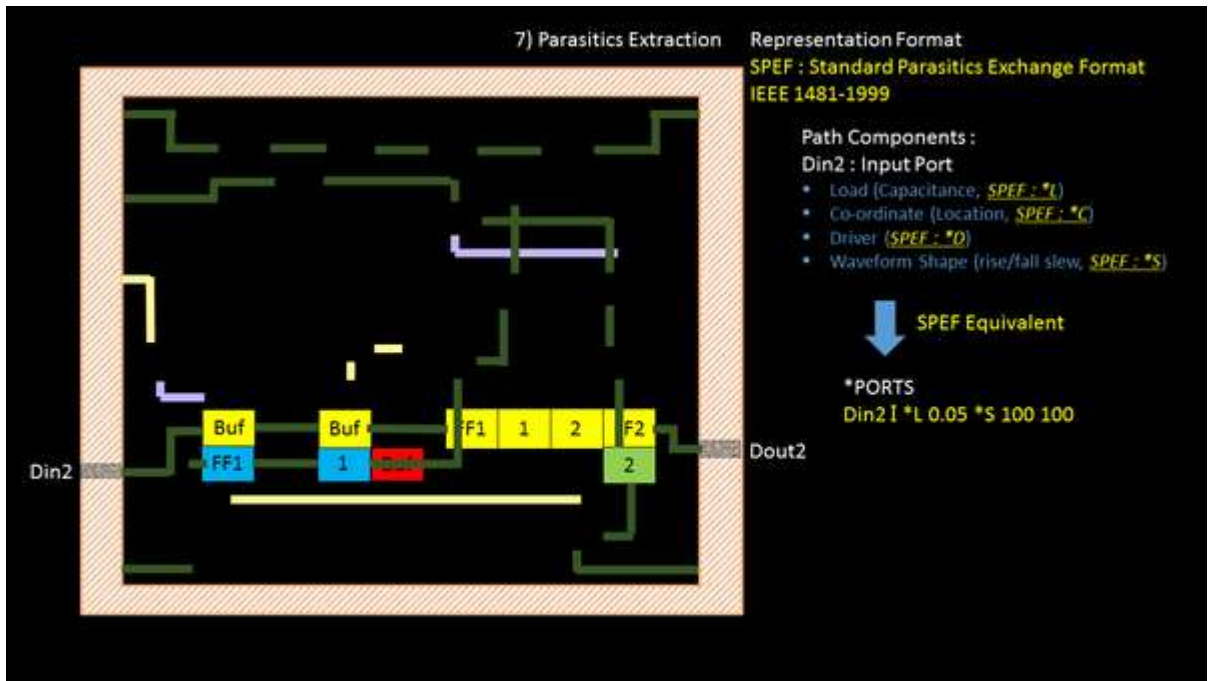


We will take a piece of the circuit and write the SPEF file for a piece of input port and net



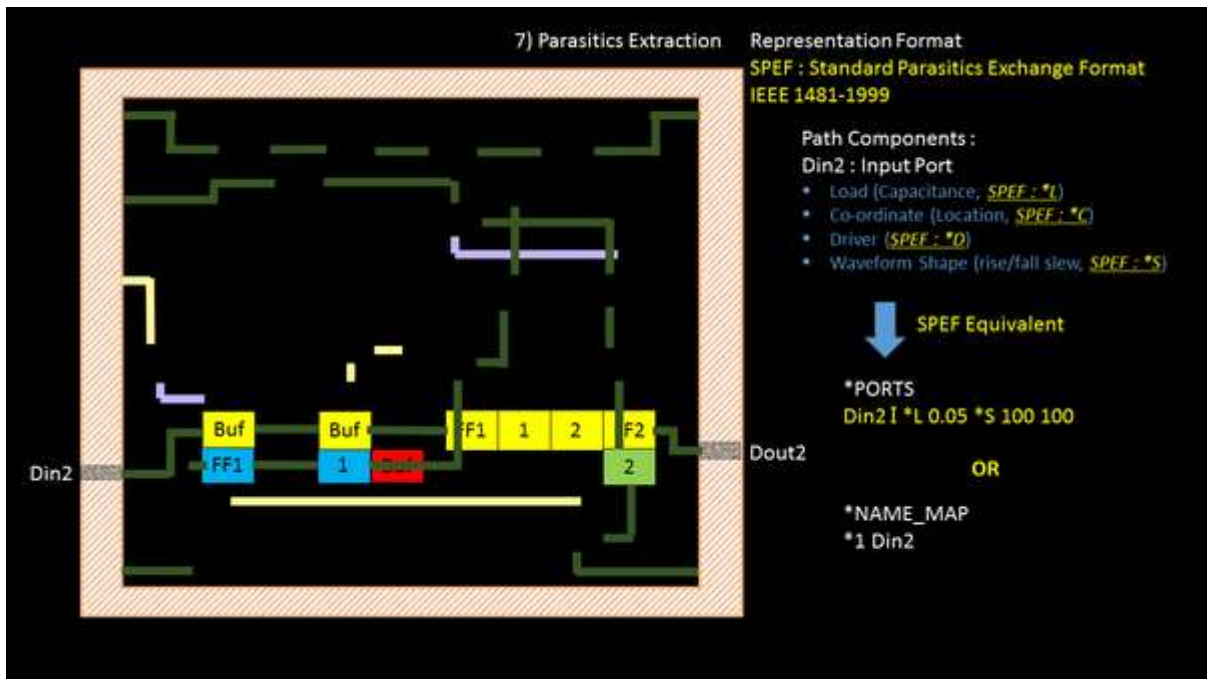
Let's write down the path components of Input port Din2 in SPEF format, which will also be a part of large SPEF file





In the above SPEF equivalent “I” represents input port

We can also map the Din2 port with a number, (say *1, as in below example), and use *1 as reference for Input Port Din2. So, wherever, we have *1 in SPEF file, it is nothing but Din2 port. This technique greatly reduces SPEF file size



7) Parasitics Extraction

Representation Format
SPEF : Standard Parasitics Exchange Format
IEEE 1481-1999

Path Components :

Din2 : Input Port

- * Load (Capacitance, *SPEF : *L*)
- * Co-ordinate (Location, *SPEF : *C*)
- * Driver (*SPEF : *D*)
- * Waveform Shape (rise/fall slew, *SPEF : *S*)

↓ SPEF Equivalent

```
*PORTS
Din2 I *L 0.05 *S 100 100

OR

*NAME_MAP
*1 Din2

*PORTS
*1 I *L 0.05 *S 100 100
```

This becomes one part of the SPEF file

7) Parasitics Extraction

```
*NAME_MAP
*1 Din2

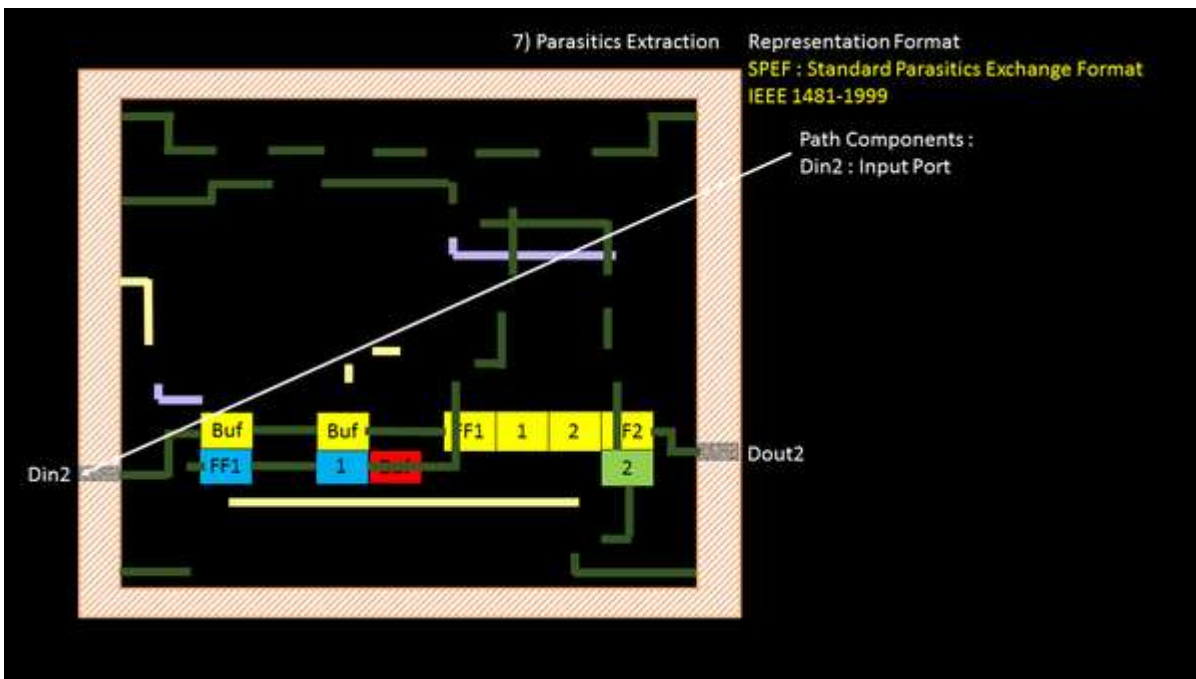
*PORTS
*1 I *L 0.05 *S 100 100
```


7) Parasitics Extraction

```
*NAVIE_MAP
*1 Din2

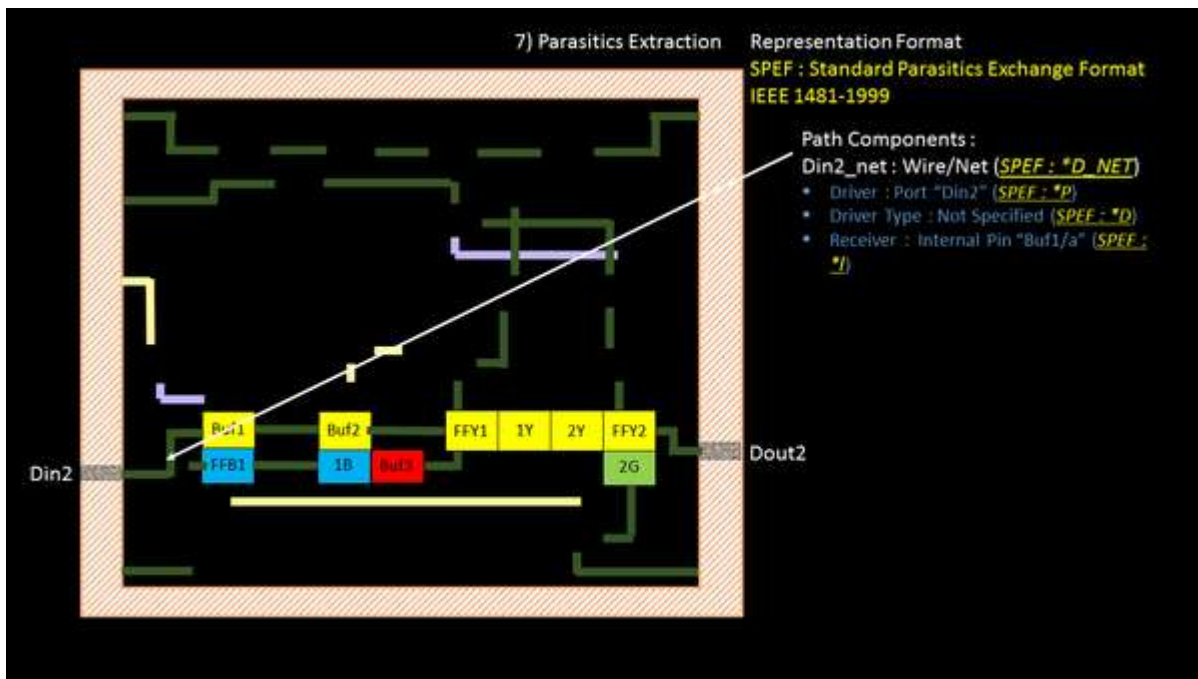
*PORTS
*1 [ *L 0.05 *S 100 100
```

In the next post, we will extract the net connected to Din2 (shown below) and write a SPEF format of the same

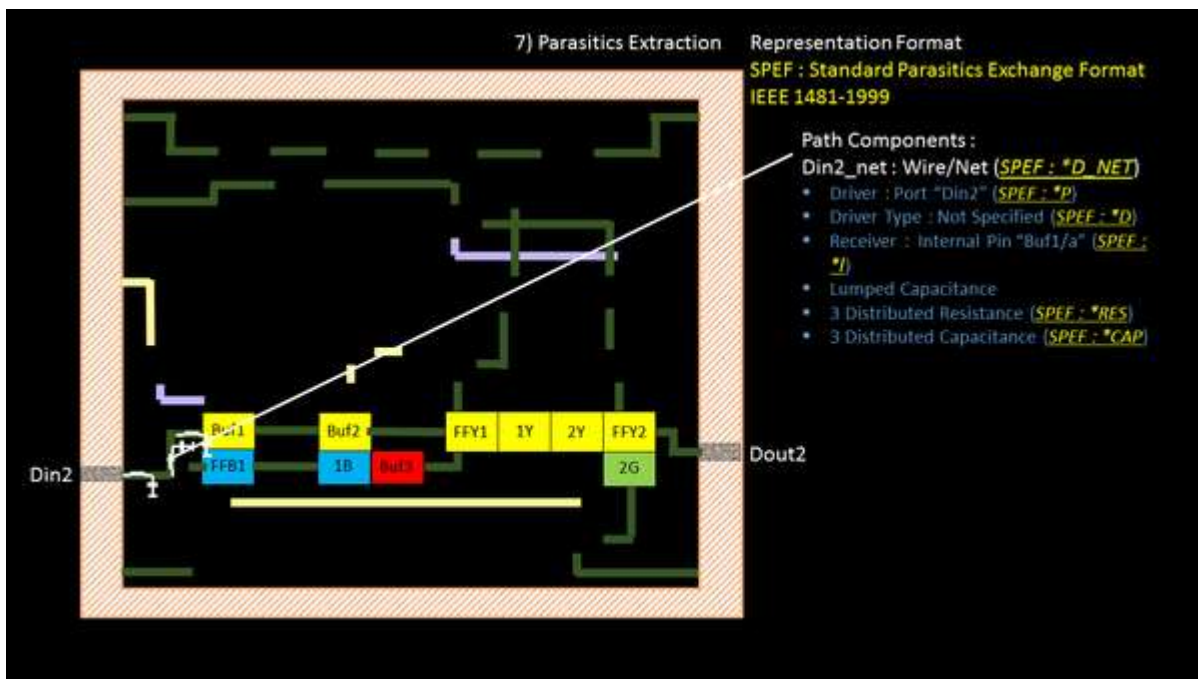


We are not done yet. We need to define header for this file, we need to define units for slew, load, resistance, time., and lot more.

let's move on with identifying the path components of net connected to Din2 port shown below



For now, let's have a distributed RC network representation of the net (shown below). We do have another way of representing RC network in reduced format. I will come back to that in a moment



Now that we know the components of Din2_net, let's write down the SPEF equivalent of this net. Firstly, we will map the name "Din2_net" as "*2" and use "*2" hence forth, to refer to Din2_net.

7) Parasitics Extraction

Representation Format
SPEF : Standard Parasitics Exchange Format
IEEE 1481-1999

Path Components :

Din2_net : Wire/Net (SPEF : *D_NET)

- Driver : Port "Din2" (SPEF : *P)
- Driver Type : Not Specified (SPEF : *D)
- Receiver : Internal Pin "Buf1/a" (SPEF : *I)
- Lumped Capacitance
- 3 Distributed Resistance (SPEF : *RES)
- 3 Distributed Capacitance (SPEF : *CAP)

7) Parasitics Extraction

Representation Format
SPEF : Standard Parasitics Exchange Format
IEEE 1481-1999

Path Components :

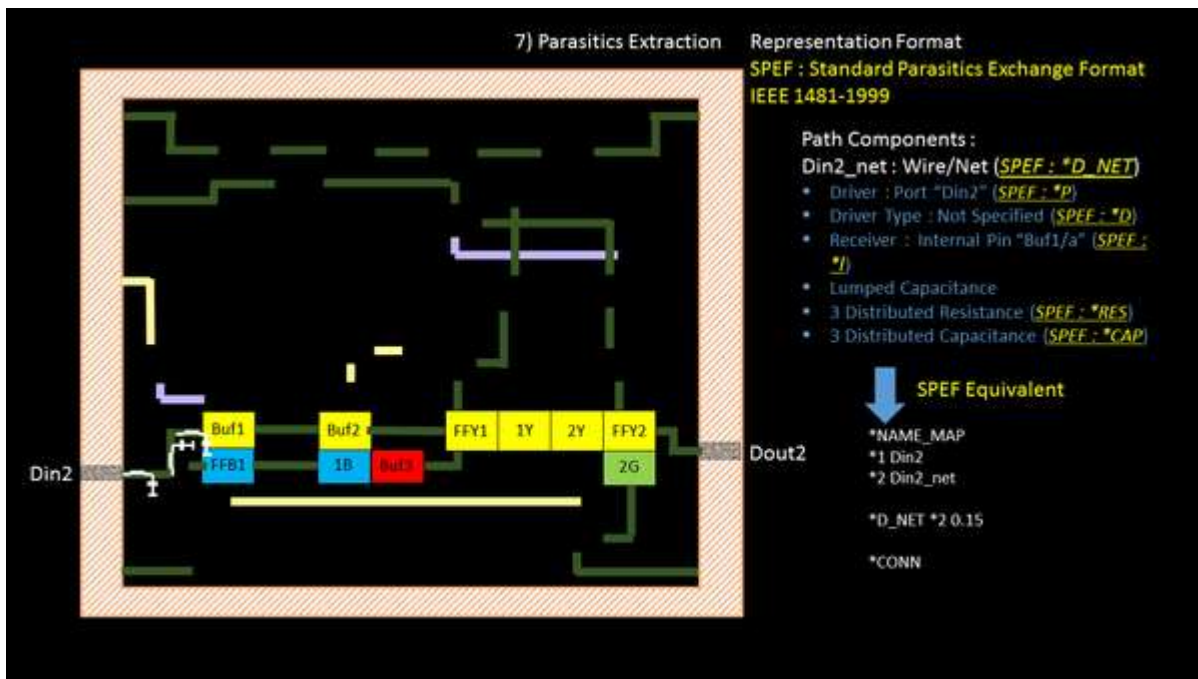
Din2_net : Wire/Net (SPEF : *D_NET)

- Driver : Port "Din2" (SPEF : *P)
- Driver Type : Not Specified (SPEF : *D)
- Receiver : Internal Pin "Buf1/a" (SPEF : *I)
- Lumped Capacitance
- 3 Distributed Resistance (SPEF : *RES)
- 3 Distributed Capacitance (SPEF : *CAP)

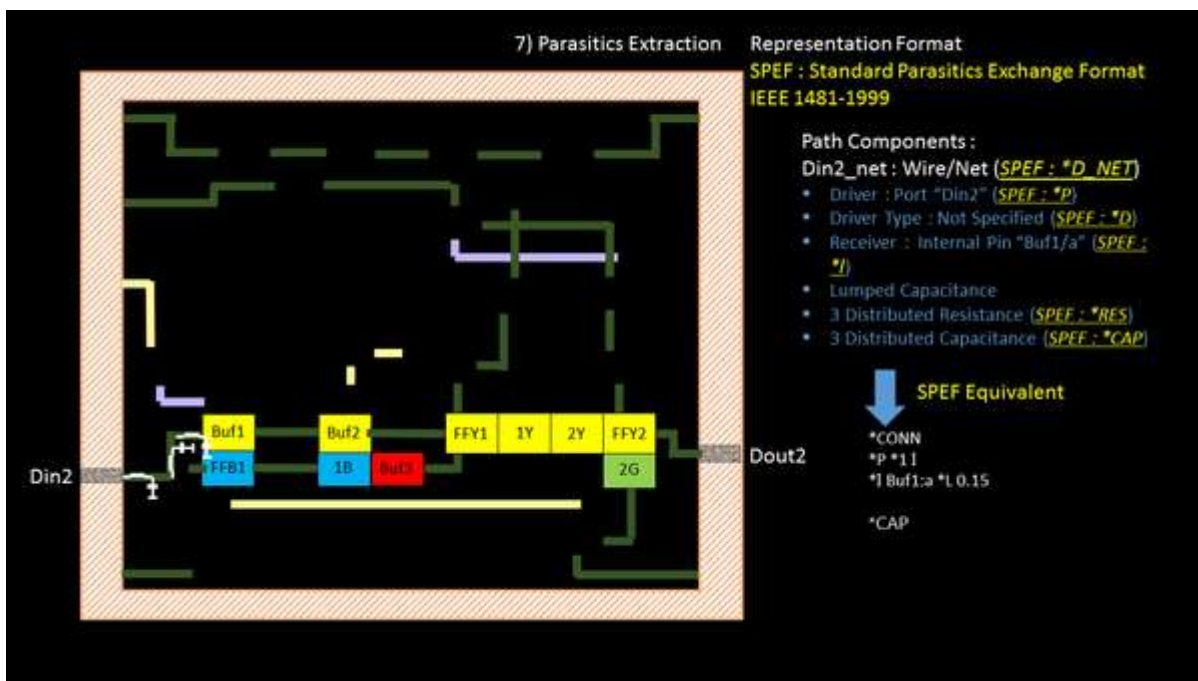
↓ SPEF Equivalent

```
*NAME_MAP
*1 Din2
*2 Din2_net
*D_NET *2 0.15
```

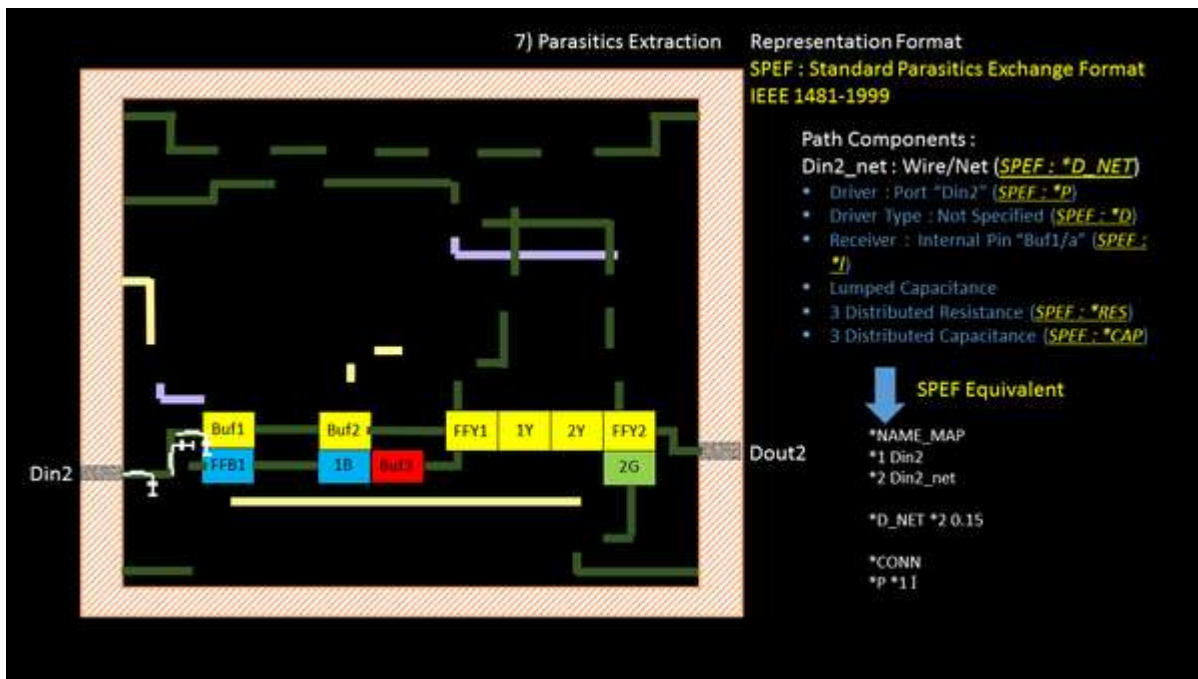
We will come back to how do we calculate the load value of "0.15". *D_NET denotes "distributed net". If we had used a reduced format of the nets, with only single value of resistance and capacitance, it would had been called as "*R_NET". Now let's write down the connectivity information of "Din2_net" or "*2". *CONN section defines connectivity of *2



The below says. *2 (Din2_net) is connected to external port (*P), named *1 (port Din2), which has direction “input” (I)



The other end of net “*2” is connected to internal pin “Buf1:a” and having a load (*L) of 0.15 units. I will come back later the “units” section, in my following post



This becomes a part of the SPEF file, so let's put it in a file, that we were maintaining from last post

7) Parasitics Extraction

```

*NAME_MAP
*1 Din2
*2 Din2_net

*PORTS
*1 I *L 0.05 *S 100 100

*D_NET *2 0.15

*CONN
*P *1
*I Buf1:a *I 0.15
  
```

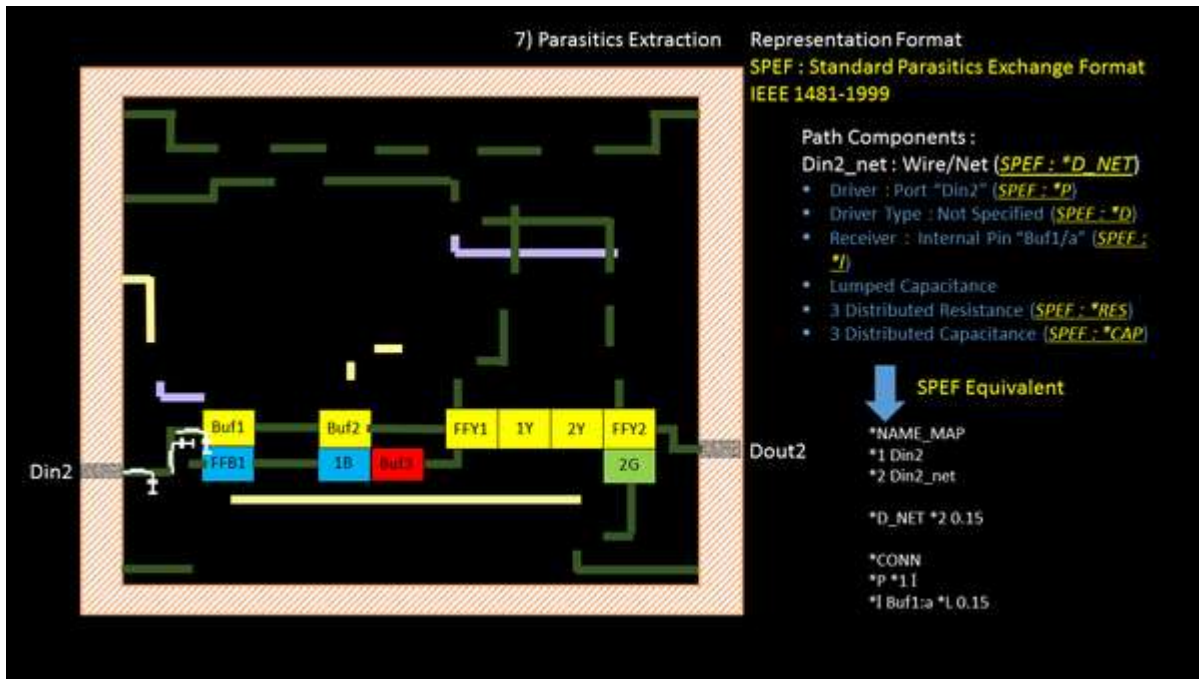
```

*NAME_MAP
*1 Din2
*2 Din2_net

*D_NET *2 0.15

*CONN
*P *1
*I Bu 1:a *I 0.15
  
```

What next? Oh, remember, we have to represent the below distributed RC network in a standard SPEF format as well. So, let's do it!!



OR, let's take a quick break over here. Honestly, we did a lot of work above. So, let's "revise and relearn",