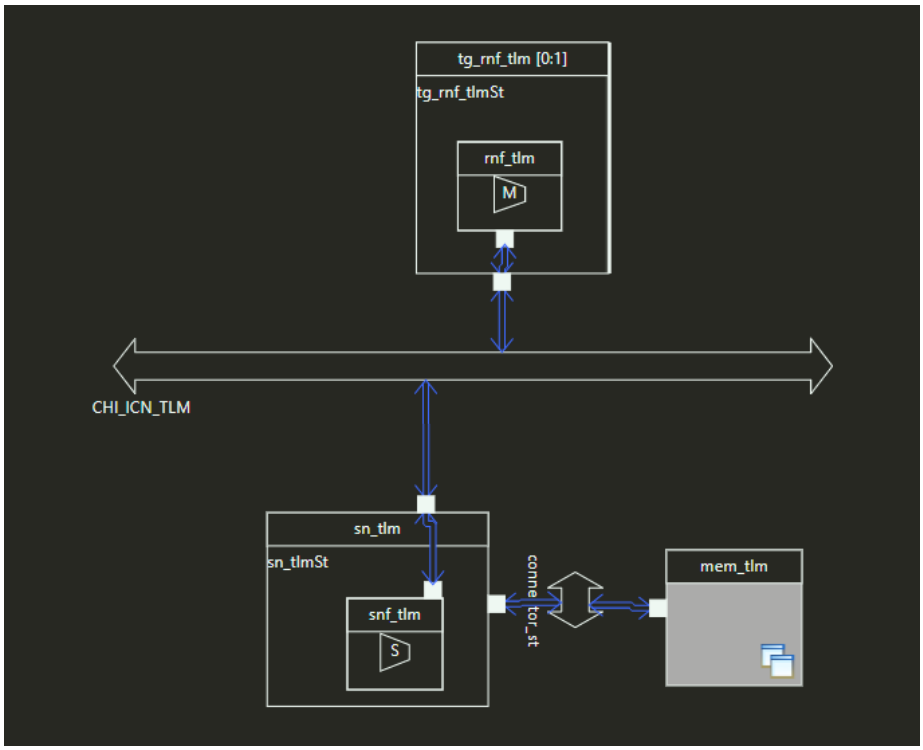
CHI interconnect SoC model

model information

- **This model simulates a simple SoC with CHI bus protocol. The rn-fs generate memory requests. The requests are transformed to CHI protocol form and sent to memory by CHI bus. The memory processes requests and finally responds to rn-fs.**
- **All components are connected by systemC and TLM2.0 interface.**
- **components**
    - RN-F: Generate TLM generic payloads and CHI transactions, initializing data requests.
    - HN-F: Receive request message from RN-Fs, then snoop/proceed with replying on the transaction as required/generate a transaction downstream towards SN-F.
    - SN-F: Receive TLM generic payloads containing an attached CHI attributes extension, and generate non-CHI transactions towards memory.sn_tlm(slave node) : A CHI node. It receives CHI transactions and transforms them to non-chi form. Then it initiates transformed requests to downstream memory.
    - mem_tlm : A simulated memory module. It receives non-CHI TLM generic payload and serves as a common memory
- **the full model looks like this**



environment dependency

- os : ubuntu 20.04 or higher
- compiler : gcc >= 7.5

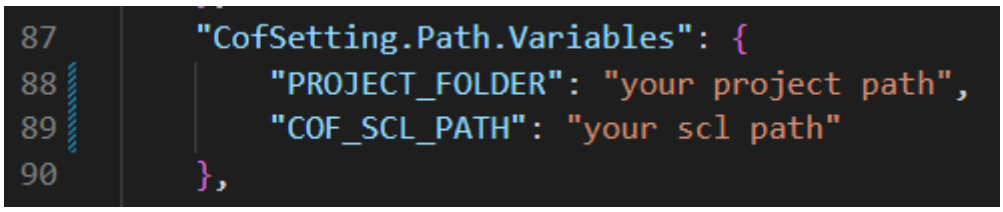
get model

```
git clone https://github.com/CharlesChenGitHub/cofluent_soc_plf_tlm.git
```

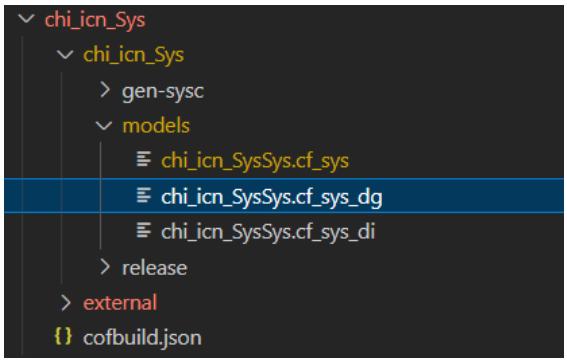
the model is under chi_icn_sys/

run model

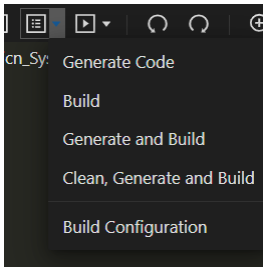
- first, open model folder(chi_icn_sys/) in your workspace
- modify cofluent path varibles in cofbuild.json. input your project path and cof_scl path. for example: `~/cof-workspace/cofluent_soc_plf_tlm/chi_icn_Sys` and `~/cof-pack/cof-scl-isim-9.1.0-221024_nolic`



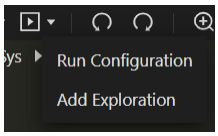
- open `chi_icn_sys/models/chi_icn_sysSys.cf_sys_dg`

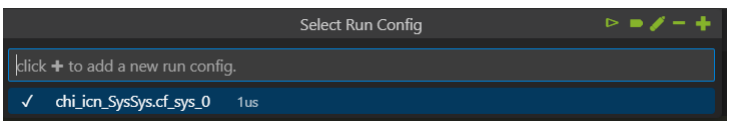


- directly generate and build



- create Run Configuration and run





- **NOTE**
  - Depending on the program you are running, the specified simulation time in cofrun.json may not be long enough. For example, the program takes 16000010ns simulation time , but the "simulationDuration" option in cofrun.json may be shorter than it. Then the test program cannot get the expected result. So you need to modify

"simulationDuration" in cofrun.json to adapt it to the model.

```
100350 ns  RN[0 ] -> HN[20]: 00000000 DVMOp
100350 ns  HN[20] -> XN[0 ]: 00000000 RetryAck
100350 ns  HN[20] -> XN[0 ]: 00000000 PCrdGrant
100350 ns  RN[0 ] -> HN[20]: 00000000 DVMOp
100350 ns  HN[20] -> XN[0 ]: 00000000 DBIDResp
100350 ns  RN[0 ] -> HN[20]: 00000000 NonCopyBackWrData
16000010 ns RN[1 ] -> HN[20]: 00000200 ReadShared
16000010 ns HN[20] -> XN[1 ]: 00000000 RetryAck
16000010 ns HN[20] -> XN[1 ]: 00000000 PCrdGrant
16000010 ns RN[1 ] -> HN[20]: 00000200 ReadShared
[INFO]  1000000000 ns:/> Reached the specified simulation duration:
[INFO]  1000000000 ns:/>   current simulated time:     1000000000 ns
[INFO]  1000000000 ns:/>   host system clock duration: 0 s
[INFO]  1000000000 ns:/>   transaction count:          0
[info]  Shutdown OK
```

```
{
    "runName": "chi_icn_sysSys.cf_sys_0",
    "modelPath": "chi_icn_sys/chi_icn_sys/models/chi_icn_sysSys.cf_sys",
    "executionFilePath": "chi_icn_sys/chi_icn_sys/release/chi_icn_sysSys.cf_sysBuild_0/chi_icn_sysSys.exe",
    "generateTraceFile": false,
    "simulationDuration": "1us",
    "enableAlgorithmProfiling": false,
    "enableArchitectureProfiling": false,
    "verbosityLevel": "info",
    "args": "--cf-gui-connect=yes --cf-gui-ip-address=127.0.0.1 --cf-gui-socket=39000 --cf-gui-time-scale=ns --cf-mon-config=file",
    "active": true,
    "environment": "",
    "workingDirectory": "",
    "isim": {
        "enableISIM": false,
        "instanceName": "",
        "preElaboration": [],
        "postElaboration": [],
        "postSimulation": []
    }
}
```

expected output

When running, the console shows the CHI transactions by CHI bus, like:

```
--------------------------------------------------------------------------------
[100320 ns]

Write : 0x680, length = 4, streaming_width = 4

data = { 0x2, 0x4, 0x5, 0x6, }
--------------------------------------------------------------------------------
[100330 ns]

Read: 0x680, length = 4, streaming_width = 4

Received: { 0x1, 0x2, 0x3, 0x4,  }
Expected: { 0x1, 0x2, 0x3, 0x4,  }
--------------------------------------------------------------------------------
[100340 ns]

100350 ns  RN[0 ] -> HN[20]: 00000000 DVMOp
100350 ns  HN[20] -> XN[0 ]: 00000000 RetryAck
100350 ns  HN[20] -> XN[0 ]: 00000000 PCrdGrant
100350 ns  RN[0 ] -> HN[20]: 00000000 DVMOp
100350 ns  HN[20] -> XN[0 ]: 00000000 DBIDResp
100350 ns  RN[0 ] -> HN[20]: 00000000 NonCopyBackWrData
16000010 ns RN[1 ] -> HN[20]: 00000200 ReadShared
16000010 ns HN[20] -> XN[1 ]: 00000000 RetryAck
16000010 ns HN[20] -> XN[1 ]: 00000000 PCrdGrant
16000010 ns RN[1 ] -> HN[20]: 00000200 ReadShared
[INFO]  1000000000 ns:/> Reached the specified simulation duration:
[INFO]  1000000000 ns:/>   current simulated time:     1000000000 ns
[INFO]  1000000000 ns:/>   host system clock duration: 0 s
[INFO]  1000000000 ns:/>   transaction count:          0
[info]  Shutdown OK
```