

SFA

0.1.0

Generated by Doxygen 1.8.13

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Chapter 1

Class Index

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File Index

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Chapter 3

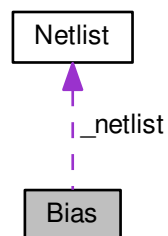
Class Documentation

3.1 Bias Class Reference

A vector of Mosfet.

```
#include <Bias.h>
```

Collaboration diagram for Bias:



Public Member Functions

- `Bias ()`=default
Default Constructor.
- `Bias (IndexType netId, const Netlist &netlist)`
Constructor for Bias.
- `const std::vector< IndexType > & bias () const`
Get entire bias group.
- `const std::vector< IndexType > & driver () const`
Get the driver group.
- `bool valid () const`
- `void init ()`

Private Attributes

- [IndexType](#) _netId
- const [Netlist](#) & _netlist
- std::vector< [IndexType](#) > _bias
- std::vector< [IndexType](#) > _driver

3.1.1 Detailed Description

A vector of Mosfet.

This class stores a group of Mosfet Id that are bias circuits.

3.1.2 Constructor & Destructor Documentation

3.1.2.1 Bias() [1/2]

```
Bias::Bias ( ) [explicit], [default]
```

Default Constructor.

3.1.2.2 Bias() [2/2]

```
Bias::Bias (
    IndexType netId,
    const Netlist & netlist ) [inline], [explicit]
```

Constructor for [Bias](#).

Sequence of Ids does not matter. pattern is set according to input.

Parameters

<i>netId</i>	Gate netId.
<i>netlist</i>	Netlist class object.

3.1.3 Member Function Documentation

3.1.3.1 bias()

```
const std::vector<IndexType>& Bias::bias ( ) const [inline]
```

Get entire bias group.

3.1.3.2 driver()

```
const std::vector<IndexType>& Bias::driver ( ) const [inline]
```

Get the driver group.

3.1.3.3 init()

```
PROJECT_NAMESPACE_BEGIN void Bias::init ( )
```

3.1.3.4 valid()

```
bool Bias::valid ( ) const [inline]
```

3.1.4 Member Data Documentation

3.1.4.1 _bias

```
std::vector<IndexType> Bias::_bias [private]
```

3.1.4.2 _driver

```
std::vector<IndexType> Bias::_driver [private]
```

3.1.4.3 _netId

```
IndexType Bias::_netId [private]
```

3.1.4.4 `_netlist`

```
const Netlist& Bias::_netlist [private]
```

The documentation for this class was generated from the following files:

- [src/db/Bias.h](#)
- [src/db/Bias.cpp](#)

3.2 `Netlist::InitDataObj` Struct Reference

Instantiate [Netlist](#) class.

```
#include <Netlist.h>
```

Public Attributes

- `std::vector< InitNet > netArray`
- `std::vector< InitInst > instArray`

3.2.1 Detailed Description

Instantiate [Netlist](#) class.

See also

[init\(InitDataObj &\).](#)

3.2.2 Member Data Documentation

3.2.2.1 `instArray`

```
std::vector<InitInst> Netlist::InitDataObj::instArray
```

3.2.2.2 `netArray`

```
std::vector<InitNet> Netlist::InitDataObj::netArray
```

The documentation for this struct was generated from the following file:

- [src/db/Netlist.h](#)

3.3 Netlist::InitInst Struct Reference

[Inst](#) for instantiation.

```
#include <Netlist.h>
```

Public Attributes

- [InstType](#) type = [InstType::OTHER](#)
- [std::vector](#)< [IndexType](#) > netIdArray
- [std::string](#) name
- [RealType](#) wid = 0
- [RealType](#) len = 0

3.3.1 Detailed Description

[Inst](#) for instantiation.

3.3.2 Member Data Documentation

3.3.2.1 len

```
RealType Netlist::InitInst::len = 0
```

3.3.2.2 name

```
std::string Netlist::InitInst::name
```

3.3.2.3 netIdArray

```
std::vector<IndexType> Netlist::InitInst::netIdArray
```

3.3.2.4 type

```
InstType Netlist::InitInst::type = InstType::OTHER
```

3.3.2.5 wid

```
RealType Netlist::InitInst::wid = 0
```

The documentation for this struct was generated from the following file:

- [src/db/Netlist.h](#)

3.4 Netlist::InitNet Struct Reference

[Net](#) for instantiation.

```
#include <Netlist.h>
```

Public Attributes

- `std::string` [name](#)
- `IndexType` [id](#) = [INDEX_TYPE_MAX](#)

3.4.1 Detailed Description

[Net](#) for instantiation.

3.4.2 Member Data Documentation

3.4.2.1 id

```
IndexType Netlist::InitNet::id = INDEX_TYPE_MAX
```

3.4.2.2 name

```
std::string Netlist::InitNet::name
```

The documentation for this struct was generated from the following file:

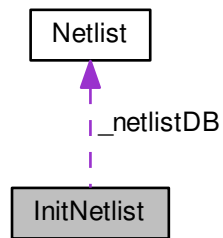
- [src/db/Netlist.h](#)

3.5 InitNetlist Class Reference

[InitNetlist](#) class.

```
#include <InitNetlist.h>
```

Collaboration diagram for InitNetlist:



Public Member Functions

- [InitNetlist](#) ()=default
Default Constructor.
- [InitNetlist](#) ([Netlist](#) &netlist)
Constructor with initialization.
- bool [read](#) (const std::string &filename)
Parse file and build netlist.

Private Attributes

- [Netlist](#) & [_netlistDB](#)

3.5.1 Detailed Description

[InitNetlist](#) class.

3.5.2 Constructor & Destructor Documentation

3.5.2.1 InitNetlist() [1/2]

```
InitNetlist::InitNetlist ( ) [explicit], [default]
```

Default Constructor.

3.5.2.2 InitNetlist() [2/2]

```
InitNetlist::InitNetlist (
    Netlist & netlist ) [inline], [explicit]
```

Constructor with initialization.

3.5.3 Member Function Documentation

3.5.3.1 read()

```
PROJECT_NAMESPACE_BEGIN bool InitNetlist::read (
    const std::string & filename )
```

Parse file and build netlist.

Input files should follow same format generated through scripts/create_init_obj.py. Sample input files for c++ are under benchmarks. The python scripts take standardized hspice/spectre netlist files as inputs.

Parameters

<i>filename</i>	Input file to parse.
-----------------	----------------------

3.5.4 Member Data Documentation

3.5.4.1 _netlistDB

```
Netlist& InitNetlist::_netlistDB [private]
```

The documentation for this class was generated from the following files:

- src/parser/InitNetlist.h
- src/parser/InitNetlist.cpp

3.6 Inst Class Reference

Inst class.

```
#include <Inst.h>
```

Public Member Functions

- [Inst](#) ()=default
Default constructor.
- [Inst](#) (const std::string &name, [InstType](#) type, [IndexType](#) id)
Constructor for [Inst](#).
- [Inst](#) (const std::string &name, [InstType](#) type, [IndexType](#) id, [RealType](#) wid, [RealType](#) len)
Constructor for [Inst](#).
- const std::string & [name](#) () const
Return type of [Inst](#).
- [InstType](#) type () const
Return type of [Inst](#).
- [IndexType](#) id () const
Return Id of [Inst](#).
- const std::vector< [IndexType](#) > & [pinIdArray](#) () const
Return the index array for pins of the [Inst](#).
- [RealType](#) wid () const
Return width of [Inst](#).
- [RealType](#) len () const
Return length of [Inst](#).
- void [addPinId](#) ([IndexType](#) pinId)
Add pin index to [Inst](#).
- void [setWid](#) ([RealType](#) wid)
Assign width of [Inst](#).
- void [setLen](#) ([RealType](#) len)
Assign length of [Inst](#).

Private Attributes

- std::string [_name](#)
- [InstType](#) [_type](#)
- [IndexType](#) [_id](#)
- std::vector< [IndexType](#) > [_pinIdArray](#)
- [RealType](#) [_wid](#)
- [RealType](#) [_len](#)

3.6.1 Detailed Description

[Inst](#) class.

3.6.2 Constructor & Destructor Documentation

3.6.2.1 [Inst](#)() [1/3]

```
Inst::Inst ( ) [explicit], [default]
```

Default constructor.

3.6.2.2 `Inst()` [2/3]

```
Inst::Inst (
    const std::string & name,
    InstType type,
    IndexType id ) [inline], [explicit]
```

Constructor for [Inst](#).

Constructor for netlist instances that does not have width and length attributes.

Parameters

<i>name</i>	Name of Inst .
<i>type</i>	Type of Inst . Member of InstType.

See also

[type.h](#)

Parameters

<i>id</i>	Id of Inst .
-----------	------------------------------

3.6.2.3 `Inst()` [3/3]

```
Inst::Inst (
    const std::string & name,
    InstType type,
    IndexType id,
    RealType wid,
    RealType len ) [inline], [explicit]
```

Constructor for [Inst](#).

Constructor for netlist instances that have width and length attributes.

Parameters

<i>name</i>	Name of Inst .
<i>type</i>	Type of Inst . Member of InstType.
<i>id</i>	Id of Inst .
<i>wid</i>	Width of Inst .
<i>len</i>	Length of Inst .

3.6.3 Member Function Documentation

3.6.3.1 addPinId()

```
void Inst::addPinId (
    IndexType pinId ) [inline]
```

Add pin index to [Inst](#).

Parameters

<i>pinId</i>	Added pin Id.
--------------	---------------

3.6.3.2 id()

```
IndexType Inst::id ( ) const [inline]
```

Return Id of [Inst](#).

3.6.3.3 len()

```
RealType Inst::len ( ) const [inline]
```

Return length of [Inst](#).

3.6.3.4 name()

```
const std::string& Inst::name ( ) const [inline]
```

Return name of [Inst](#).

3.6.3.5 pinIdArray()

```
const std::vector<IndexType>& Inst::pinIdArray ( ) const [inline]
```

Return the index array for pins of the [Inst](#).

3.6.3.6 setLen()

```
void Inst::setLen (
    RealType len ) [inline]
```

Assign length of [Inst](#).

3.6.3.7 setWid()

```
void Inst::setWid (
    RealType wid ) [inline]
```

Assign width of [Inst](#).

3.6.3.8 type()

```
InstType Inst::type ( ) const [inline]
```

Return type of [Inst](#).

See also

[InstType](#)

3.6.3.9 wid()

```
RealType Inst::wid ( ) const [inline]
```

Return width of [Inst](#).

3.6.4 Member Data Documentation

3.6.4.1 _id

```
IndexType Inst::_id [private]
```

3.6.4.2 `_len`

```
RealType Inst::_len [private]
```

3.6.4.3 `_name`

```
std::string Inst::_name [private]
```

3.6.4.4 `_pinIdArray`

```
std::vector<IndexType> Inst::_pinIdArray [private]
```

3.6.4.5 `_type`

```
InstType Inst::_type [private]
```

3.6.4.6 `_wid`

```
RealType Inst::_wid [private]
```

The documentation for this class was generated from the following file:

- [src/db/Inst.h](#)

3.7 MosPair Class Reference

A pair of Mosfet with MosPattern.

```
#include <MosPair.h>
```

Public Member Functions

- [MosPair](#) ()=default
Default Constructor.
- [MosPair](#) ([IndexType](#) mosId1, [IndexType](#) mosId2, [MosPattern](#) pattern)
Constructor for [MosPair](#).
- [IndexType](#) mosId1 () const
Get mosId1.
- [IndexType](#) mosId2 () const
Get mosId2.
- bool [valid](#) () const
Return if valid search pair.
- [MosPattern](#) pattern () const
Get pattern.
- [PinType](#) srchPinType1 () const
Get PinType on how DFS reached mosId1 of the pair.
- [PinType](#) srchPinType2 () const
Get PinType on how DFS reached mosId1 of the pair.
- void [inVld](#) ()
Invalidate pair.
- void [setSrchPinType1](#) ([PinType](#) type)
set reached PinType.
- void [setSrchPinType2](#) ([PinType](#) type)
set reached PinType.
- [PinType](#) nextPinType1 ()
Return next PinType to search for mosId1.
- [PinType](#) nextPinType2 ()
Return next PinType to search for mosId2.
- bool [isEqual](#) (const [MosPair](#) &right) const
Equal operator.

Private Attributes

- [IndexType](#) _mosId1
- [IndexType](#) _mosId2
- [MosPattern](#) _pattern
- bool _valid
- [PinType](#) _srchPinType1
- [PinType](#) _srchPinType2

3.7.1 Detailed Description

A pair of Mosfet with MosPattern.

This class stores a pair of Mosfet Id and also assists DFS in [SymDetect.h](#). This class has no reference to netlist, pattern needs to be set at construction.

3.7.2 Constructor & Destructor Documentation

3.7.2.1 MosPair() [1/2]

```
MosPair::MosPair ( ) [explicit], [default]
```

Default Constructor.

3.7.2.2 MosPair() [2/2]

```
MosPair::MosPair (
    IndexType mosId1,
    IndexType mosId2,
    MosPattern pattern ) [inline], [explicit]
```

Constructor for [MosPair](#).

Sequence of Ids does not matter. pattern is set according to input.

Parameters

<i>mosId1</i>	Id for Mos1
<i>mosId2</i>	Id for Mos2

< valid is set true as default.

< reached [Pin](#) set as SOURCE default.

3.7.3 Member Function Documentation**3.7.3.1 inVld()**

```
void MosPair::inVld ( ) [inline]
```

Invalidate pair.

3.7.3.2 isEqual()

```
PROJECT_NAMESPACE_BEGIN bool MosPair::isEqual (
    const MosPair & right ) const
```

Equal operator.

Two pairs are equal if Id are equal. Sequence of Id does not matter.

3.7.3.3 mosId1()

```
IndexType MosPair::mosId1 ( ) const [inline]
```

Get mosId1.

3.7.3.4 mosId2()

```
IndexType MosPair::mosId2 ( ) const [inline]
```

Get mosId2.

3.7.3.5 nextPinType1()

```
PinType MosPair::nextPinType1 ( ) [inline]
```

Return next PinType to search for mosId1.

3.7.3.6 nextPinType2()

```
PinType MosPair::nextPinType2 ( ) [inline]
```

Return next PinType to search for mosId2.

3.7.3.7 pattern()

```
MosPattern MosPair::pattern ( ) const [inline]
```

Get pattern.

3.7.3.8 setSrchPinType1()

```
void MosPair::setSrchPinType1 (
    PinType type ) [inline]
```

set reached PinType.

This is how mosId1 of the pair is reached through DFS search.

3.7.3.9 setSrchPinType2()

```
void MosPair::setSrchPinType2 (
    PinType type ) [inline]
```

set reached PinType.

This is how mosId2 of the pair is reached through DFS search.

3.7.3.10 srchPinType1()

```
PinType MosPair::srchPinType1 ( ) const [inline]
```

Get PinType on how DFS reached mosId1 of the pair.

3.7.3.11 srchPinType2()

```
PinType MosPair::srchPinType2 ( ) const [inline]
```

Get PinType on how DFS reached mosId1 of the pair.

3.7.3.12 valid()

```
bool MosPair::valid ( ) const [inline]
```

Return if valid search pair.

See also

[SymDetect::inVldDiffPairSrch](#)

3.7.4 Member Data Documentation

3.7.4.1 _mosId1

```
IndexType MosPair::_mosId1 [private]
```

3.7.4.2 `_mosId2`

```
IndexType MosPair::_mosId2 [private]
```

3.7.4.3 `_pattern`

```
MosPattern MosPair::_pattern [private]
```

3.7.4.4 `_srchPinType1`

```
PinType MosPair::_srchPinType1 [private]
```

3.7.4.5 `_srchPinType2`

```
PinType MosPair::_srchPinType2 [private]
```

3.7.4.6 `_valid`

```
bool MosPair::_valid [private]
```

The documentation for this class was generated from the following files:

- [src/db/MosPair.h](#)
- [src/db/MosPair.cpp](#)

3.8 Net Class Reference

[Net](#) class.

```
#include <Net.h>
```

Public Member Functions

- [Net](#) ()=default
- [Net](#) (const std::string &name, [IndexType](#) id)
Constructor of [Net](#).
- const std::string & [name](#) () const
- [IndexType](#) id () const
- const std::vector< [IndexType](#) > & [pinIdArray](#) () const
- void [addPinId](#) ([IndexType](#) pinId)
- [NetType](#) [netType](#) () const
Return net type.

Private Attributes

- `std::string _name`
- `IndexType _id`
- `std::vector< IndexType > _pinIdArray`

3.8.1 Detailed Description

`Net` class.

3.8.2 Constructor & Destructor Documentation

3.8.2.1 `Net()` [1/2]

```
Net::Net ( ) [explicit], [default]
```

Default constructor.

3.8.2.2 `Net()` [2/2]

```
Net::Net (
    const std::string & name,
    IndexType id ) [inline], [explicit]
```

Constructor of `Net`.

Parameters

<i>name</i>	Name of <code>Net</code> .
<i>id</i>	Id of <code>Net</code> .

3.8.3 Member Function Documentation

3.8.3.1 `addPinId()`

```
void Net::addPinId (
    IndexType pinId ) [inline]
```

Connect a pin to the net.

3.8.3.2 id()

```
IndexType Net::id ( ) const [inline]
```

Return Id of [Net](#).

3.8.3.3 name()

```
const std::string& Net::name ( ) const [inline]
```

Return name of [Net](#).

3.8.3.4 netType()

```
NetType Net::netType ( ) const
```

Return net type.

See also

[NetType](#).

Return netType of net based on name. Currently supported Power/Ground names are limited to conventional VD↔D/VSS. Add unsupported names for Power/Ground filtering to POWER_NET_NAMES and GROUND_NET_NAMES to /db/Net.cpp.

3.8.3.5 pinIdArray()

```
const std::vector<IndexType>& Net::pinIdArray ( ) const [inline]
```

Return index array of connected pins.

3.8.4 Member Data Documentation

3.8.4.1 _id

```
IndexType Net::_id [private]
```

3.8.4.2 _name

```
std::string Net::_name [private]
```

3.8.4.3 `_pinIdArray`

```
std::vector<IndexType> Net::_pinIdArray [private]
```

The documentation for this class was generated from the following files:

- [src/db/Net.h](#)
- [src/db/Net.cpp](#)

3.9 Netlist Class Reference

[Netlist](#) class.

```
#include <Netlist.h>
```

Classes

- struct [InitDataObj](#)
Instantiate [Netlist](#) class.
- struct [InitInst](#)
[Inst](#) for instantiation.
- struct [InitNet](#)
[Net](#) for instantiation.

Public Member Functions

- [Netlist](#) ()=default
Default Constructor.
- void [init](#) ([InitDataObj](#) &obj)
Initialize [Netlist](#) class.
- void [print_all](#) () const
- bool [isMos](#) ([InstType](#) instType) const
Return true if [InstType](#) is a Mosfet. NMOS and PMOS are Mosfets.
- bool [isPasvDev](#) ([InstType](#) instType) const
Return true if [InstType](#) is passive device. RES and CAP are passive devices.
- bool [isSignal](#) ([IndexType](#) netId) const
Return true if corresponding net [NetType::Signal](#).
- [MosType](#) [mosType](#) ([IndexType](#) mosId) const
Return MosType of corresponding instance id.
- [IndexType](#) [instNetId](#) ([IndexType](#) instId, [PinType](#) pinType) const
Return Id of [Net](#) connected to [Inst](#) by certain [PinType](#).
- [IndexType](#) [instPinId](#) ([IndexType](#) instId, [PinType](#) pinType) const
Return Id of [Pin](#) with [PinType](#) connected to [Inst](#).
- [IndexType](#) [srcNetId](#) ([IndexType](#) mosId) const
Return Source [Net](#) Id of [Inst](#) mosId. Equivalent as [instNetId](#)(mosId, [PinType::SOURCE](#));.
- [IndexType](#) [drainNetId](#) ([IndexType](#) mosId) const
Return Drain [Net](#) Id of [Inst](#) mosId. Equivalent as [instNetId](#)(mosId, [PinType::DRAIN](#));.
- [IndexType](#) [gateNetId](#) ([IndexType](#) mosId) const

- Return Gate *Net* Id of *Inst* mosId. Equivalent as `instNetId(mosId, PinType::GATE);`.
- `PinType getPinTypeInstPinConn (IndexType instId, IndexType pinId) const`
 Get *PinType* of a pin such that *Inst* and *Pin* are connected through this pin.
- `PinType getPinTypeInstNetConn (IndexType instId, IndexType netId) const`
 Get *PinType* of a pin such that *Inst* and *Net* are connected through this pin.
- `void getInstNetConn (std::vector< IndexType > &instArray, IndexType netId) const`
 Get all *Inst* that are connected to *netId*.
- `void getInstPinConn (std::vector< IndexType > &instArray, IndexType pinId) const`
 Get all *Inst* that are connected to *pinId*(through some net).
- `void rmvInstHasPin (std::vector< IndexType > &instArray, IndexType pinId) const`
 Remove from array, *Inst* that has *pinId*.
- `void fltrInstPinConnPinType (std::vector< IndexType > &instArray, IndexType pinId, PinType connPinType) const`
 Filter *instArray*. Remove *Inst* that are connected to *pinId* through *connPinType*.
- `void fltrInstNetConnPinType (std::vector< IndexType > &instArray, IndexType netId, PinType connPinType) const`
 Filter *instArray*. Remove *Inst* that are connected to *netId* through *connPinType*.
- `void fltrInstMosType (std::vector< IndexType > &instArray, MosType mosType) const`
 Filter *instArray*. Remove Mosfet *Inst* whose type are not *mosType*.
- `void fltrInstType (std::vector< IndexType > &instArray, InstType type) const`
 Filter *instArray*. Remove *Inst* whose type are not *type*.
- `const Pin & pin (IndexType id) const`
 Return *Pin* of *Id*.
- `const Net & net (IndexType id) const`
 Return *Net* of *Id*.
- `const Inst & inst (IndexType id) const`
 Return *Inst* of *Id*.
- `IndexType numPin () const`
 Return number of *Pin*.
- `IndexType numNet () const`
 Return number of *Net*.
- `IndexType numInst () const`
 Return number of *Inst*.
- `void addPin (Pin &pin)`
 Add *Pin* to *Netlist*.
- `void addNet (Net &net)`
 Add *Net* to *Netlist*.
- `void addInst (Inst &inst)`
 Add *Inst* to *Netlist*.

Private Attributes

- `std::vector< Net > _netArray`
- `std::vector< Pin > _pinArray`
- `std::vector< Inst > _instArray`

3.9.1 Detailed Description

[Netlist](#) class.

3.9.2 Constructor & Destructor Documentation

3.9.2.1 Netlist()

```
Netlist::Netlist ( ) [explicit], [default]
```

Default Constructor.

3.9.3 Member Function Documentation

3.9.3.1 addInst()

```
void Netlist::addInst (
    Inst & inst ) [inline]
```

Add [Inst](#) to [Netlist](#).

3.9.3.2 addNet()

```
void Netlist::addNet (
    Net & net ) [inline]
```

Add [Net](#) to [Netlist](#).

3.9.3.3 addPin()

```
void Netlist::addPin (
    Pin & pin ) [inline]
```

Add [Pin](#) to [Netlist](#).

3.9.3.4 drainNetId()

```
IndexType Netlist::drainNetId (
    IndexType mosId ) const [inline]
```

Return Drain [Net](#) Id of [Inst](#) mosId. Equivalent as instNetId(mosId, PinType::DRAIN);.

See also

[instNetId](#)

3.9.3.5 fltrInstMosType()

```
void Netlist::fltrInstMosType (
    std::vector< IndexType > & instArray,
    MosType mosType ) const
```

Filter instArray. Remove Mosfet [Inst](#) whose type are not mosType.

Removed instId if mosType(instId) != mosType. O(n) complexity. Similar implementation of std::remove().

See also

[getPinTypeInstNetConn.](#)

3.9.3.6 fltrInstNetConnPinType()

```
void Netlist::fltrInstNetConnPinType (
    std::vector< IndexType > & instArray,
    IndexType netId,
    PinType connPinType ) const
```

Filter instArray. Remove [Inst](#) that are connected to netId through connPinType.

Removed instId if getPinTypeInstNetConn(instId, pinId) == connPinType. O(n) complexity. Similar implementation of std::remove().

See also

[getPinTypeInstNetConn.](#)

3.9.3.7 `fltrInstPinConnPinType()`

```
void Netlist::fltrInstPinConnPinType (
    std::vector< IndexType > & instArray,
    IndexType pinId,
    PinType connPinType ) const
```

Filter instArray. Remove `Inst` that are connected to pinId through connPinType.

Removed instId if `getPinTypeInstPinConn(instId, pinId) == connPinType`. O(n) complexity. Similar implementation of `std::remove()`.

See also

[getPinTypeInstPinConn](#).

3.9.3.8 `fltrInstType()`

```
void Netlist::fltrInstType (
    std::vector< IndexType > & instArray,
    InstType type ) const
```

Filter instArray. Remove `Inst` whose type are not type.

Removed instId if `InstType` of instance is different from input type.

3.9.3.9 `gateNetId()`

```
IndexType Netlist::gateNetId (
    IndexType mosId ) const [inline]
```

Return Gate `Net` Id of `Inst` mosId. Equivalent as `instNetId(mosId, PinType::GATE);`.

See also

[instNetId](#).

3.9.3.10 `getInstNetConn()`

```
void Netlist::getInstNetConn (
    std::vector< IndexType > & instArray,
    IndexType netId ) const
```

Get all `Inst` that are connected to netId.

Parameters

out	<i>instArray</i>	Array of the returned Inst Id.
in	<i>netId</i>	Id of net.

3.9.3.11 `getInstPinConn()`

```
void Netlist::getInstPinConn (
    std::vector< IndexType > & instArray,
    IndexType pinId ) const
```

Get all [Inst](#) that are connected to pinId(through some net).

The instance that pinId itself belongs to is not returned.

Parameters

out	<i>instArray</i>	Array of the returned Inst Id.
in	<i>pinId</i>	Id of pin.

3.9.3.12 `getPinTypeInstNetConn()`

```
PinType Netlist::getPinTypeInstNetConn (
    IndexType instId,
    IndexType netId ) const
```

Get PinType of a pin such that [Inst](#) and [Net](#) are connected through this pin.

Example: Suppose pin[0] of inst[1] is connected to net[2]. `getPinTypeInstNetConn(1,2)` would return PinType of pin[0]. This function allows us to query for connection types and determine future search directions.

By definition this pin must belong to instId and be connected to netId. If no such pin exists [PinType::OTHER](#) is returned.

Parameters

<i>instId</i>	Id of Inst that returned pin is connected.
<i>netId</i>	Id of Net that returned pin is connected.

3.9.3.13 `getPinTypeInstPinConn()`

```
PinType Netlist::getPinTypeInstPinConn (
```

```

IndexType instId,
IndexType pinId ) const

```

Get PinType of a pin such that [Inst](#) and [Pin](#) are connected through this pin.

Example: Suppose pin[0] of inst[1] is connected to pin[2] (through some net). `getPinTypeInstPinConn(1,2)` would return PinType of pin[0]. This function allows us to query for connection types and determine future search directions.

By definition this pin must belong to instId and be connected to pinId through some net. If no such pin exists [PinType::OTHER](#) is returned.

Parameters

<i>instId</i>	Id of Inst that returned pin is connected.
<i>pinId</i>	Id of Pin that returned pin is connected.

3.9.3.14 init()

```

void Netlist::init (
    InitDataObj & obj )

```

Initialize [Netlist](#) class.

3.9.3.15 inst()

```

const Inst& Netlist::inst (
    IndexType id ) const [inline]

```

Return [Inst](#) of Id.

3.9.3.16 instNetId()

```

IndexType Netlist::instNetId (
    IndexType instId,
    PinType pinType ) const

```

Return Id of [Net](#) connected to [Inst](#) by certain PinType.

Example: `instNetId(0, PinType::DRAIN)` would return the net index connected to inst[0] through a pin which [PinType::DRAIN](#). Or this returns inst[0] drain net. If the [Inst](#) does not have a PinType connected, `INDEX_TYPE_MAX` would be returned. Use at risk and only if InstType is known.

Parameters

<i>instId</i>	Id of Inst .
<i>pinType</i>	Returned Net Id connected to this PinType.

3.9.3.17 instPinId()

```

IndexType Netlist::instPinId (
    IndexType instId,
    PinType pinType ) const

```

Return Id of [Pin](#) with PinType connected to [Inst](#).

Example: instPinId(0,PinType::DRAIN) would return the pin index connected to inst[0] which is [PinType::DRAIN](#). Or this returns inst[0] drain pin index. If [Inst](#) does not have a PinType connected, INDEX_TYPE_MAX would be returned. Use at risk and only if InstType is known.

Parameters

<i>instId</i>	Id of Inst .
<i>pinType</i>	Returned Pin Id should be this PinType.

3.9.3.18 isMos()

```

bool Netlist::isMos (
    InstType instType ) const

```

Return true if InstType is a Mosfet. NMOS and PMOS are Mosfets.

3.9.3.19 isPasvDev()

```

bool Netlist::isPasvDev (
    InstType instType ) const

```

Return true if InstType is passive device. RES and CAP are passive devices.

3.9.3.20 isSignal()

```

bool Netlist::isSignal (
    IndexType netId ) const [inline]

```

Return true if corresponding net NetType::Signal.

3.9.3.21 mosType()

```
MosType Netlist::mosType (
    IndexType mosId ) const
```

Return MosType of corresponding instance id.

3.9.3.22 net()

```
const Net& Netlist::net (
    IndexType id ) const [inline]
```

Return Net of Id.

3.9.3.23 numInst()

```
IndexType Netlist::numInst ( ) const [inline]
```

Return number of Inst.

3.9.3.24 numNet()

```
IndexType Netlist::numNet ( ) const [inline]
```

Return number of Net.

3.9.3.25 numPin()

```
IndexType Netlist::numPin ( ) const [inline]
```

Return number of Pin.

3.9.3.26 pin()

```
const Pin& Netlist::pin (
    IndexType id ) const [inline]
```

Return Pin of Id.

3.9.3.27 print_all()

```
void Netlist::print_all ( ) const
```

Print netlist.

3.9.3.28 rmvInstHasPin()

```
void Netlist::rmvInstHasPin (
    std::vector< IndexType > & instArray,
    IndexType pinId ) const
```

Remove from array, [Inst](#) that has pinId.

O(n) complexity guaranteed. Similar implementation of std::remove().

Parameters

<i>instArray</i>	Reference to instance Id array.
<i>pinId</i>	Id of pin.

3.9.3.29 srcNetId()

```
IndexType Netlist::srcNetId (
    IndexType mosId ) const [inline]
```

Return Source [Net](#) Id of [Inst](#) mosId. Equivalent as instNetId(mosId, PinType::SOURCE);.

See also

[instNetId](#).

3.9.4 Member Data Documentation**3.9.4.1 _instArray**

```
std::vector<Inst> Netlist::_instArray [private]
```

3.9.4.2 _netArray

```
std::vector<Net> Netlist::_netArray [private]
```


3.9.4.3 _pinArray

```
std::vector<Pin> Netlist::_pinArray [private]
```

The documentation for this class was generated from the following files:

- [src/db/Netlist.h](#)
- [src/db/Netlist.cpp](#)

3.10 NetPair Class Reference

A pair of [Net](#) that are symmetric.

```
#include <NetPair.h>
```

Public Member Functions

- [NetPair](#) ()=default
Default Constructor.
- [NetPair](#) ([IndexType](#) netId1, [IndexType](#) netId2)
Constructor for [NetPair](#).
- [IndexType](#) netId1 () const
Get netId1.
- [IndexType](#) netId2 () const
Get netId2.

Private Attributes

- [IndexType](#) _netId1
- [IndexType](#) _netId2

3.10.1 Detailed Description

A pair of [Net](#) that are symmetric.

This class stores a pair of [Net](#) Id. A pair of net are symmetric if all [Inst](#) connected could be grouped to form [MosPair](#). This also contains self symmetry pairs that are connected to DIFF_SOURCE.

3.10.2 Constructor & Destructor Documentation

3.10.2.1 NetPair() [1/2]

```
NetPair::NetPair ( ) [explicit], [default]
```

Default Constructor.

3.10.2.2 NetPair() [2/2]

```
NetPair::NetPair (
    IndexType netId1,
    IndexType netId2 ) [inline], [explicit]
```

Constructor for [NetPair](#).

Sequence of Ids does not matter.

Parameters

<i>netId1</i>	Id for Net1
<i>netId2</i>	Id for Net2

3.10.3 Member Function Documentation

3.10.3.1 netId1()

```
IndexType NetPair::netId1 ( ) const [inline]
```

Get netId1.

3.10.3.2 netId2()

```
IndexType NetPair::netId2 ( ) const [inline]
```

Get netId2.

3.10.4 Member Data Documentation

3.10.4.1 `_netId1`

```
IndexType NetPair::_netId1 [private]
```

3.10.4.2 `_netId2`

```
IndexType NetPair::_netId2 [private]
```

The documentation for this class was generated from the following file:

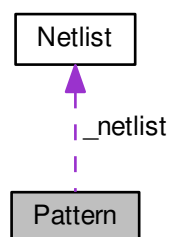
- `src/db/NetPair.h`

3.11 Pattern Class Reference

`Pattern` class.

```
#include <Pattern.h>
```

Collaboration diagram for `Pattern`:



Public Member Functions

- `Pattern` (const `Netlist` &netlist)
Constructor.
- `MosPattern pattern` (`IndexType` mosId1, `IndexType` mosId2) const
Return pattern for pair of mosfets.

Private Member Functions

- bool [matchedType](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if [Inst](#) pair have same [InstType](#).
- bool [matchedSize](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if [Inst](#) pair have same size attributes.
- bool [diffPairInput](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if fits [MosPattern::DIFF_SOURCE](#).
- bool [diffPairCascocode](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if fits [MosPattern::DIFF_CASCADE](#).
- bool [validPairCascocode](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if fits [MosPattern::CASCADE](#).
- bool [validPairLoad](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if fits [MosPattern::LOAD](#).
- bool [crossPairCascocode](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if fits [MosPattern::CROSS_CASCADE](#).
- bool [crossPairLoad](#) ([IndexType](#) mosId1, [IndexType](#) mosId2) const
Return true if fits [MosPattern::CROSS_LOAD](#).

Private Attributes

- const [Netlist](#) & [_netlist](#)

3.11.1 Detailed Description

[Pattern](#) class.

3.11.2 Constructor & Destructor Documentation

3.11.2.1 [Pattern\(\)](#)

```
Pattern::Pattern (
    const Netlist & netlist ) [inline], [explicit]
```

Constructor.

Parameters

<i>netlist</i>	Netlist for pattern search.
----------------	---

3.11.3 Member Function Documentation

3.11.3.1 crossPairCascode()

```
bool Pattern::crossPairCascode (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if fits [MosPattern::CROSS_CASCADE](#).

3.11.3.2 crossPairLoad()

```
bool Pattern::crossPairLoad (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if fits [MosPattern::CROSS_LOAD](#).

3.11.3.3 diffPairCascode()

```
bool Pattern::diffPairCascode (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if fits [MosPattern::DIFF_CASCADE](#).

3.11.3.4 diffPairInput()

```
bool Pattern::diffPairInput (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if fits [MosPattern::DIFF_SOURCE](#).

3.11.3.5 matchedSize()

```
bool Pattern::matchedSize (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if [Inst](#) pair have same size attributes.

3.11.3.6 matchedType()

```
PROJECT_NAMESPACE_BEGIN bool Pattern::matchedType (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if [Inst](#) pair have same InstType.

3.11.3.7 pattern()

```
MosPattern Pattern::pattern (
    IndexType mosId1,
    IndexType mosId2 ) const
```

Return pattern for pair of mosfets.

Valid patterns have same InstType. Currently they also have same size attribute.

TODO Add ratio pair detection in future.

See also

[MosPattern](#).

Parameters

<i>mosId1</i>	Id for mosfet.
<i>mosId2</i>	Id for mosfet.

3.11.3.8 validPairCascode()

```
bool Pattern::validPairCascode (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if fits [MosPattern::CASCODE](#).

3.11.3.9 validPairLoad()

```
bool Pattern::validPairLoad (
    IndexType mosId1,
    IndexType mosId2 ) const [private]
```

Return true if fits [MosPattern::LOAD](#).

3.11.4 Member Data Documentation

3.11.4.1 _netlist

```
const Netlist& Pattern::_netlist [private]
```

The documentation for this class was generated from the following files:

- src/sym_detect/[Pattern.h](#)
- src/sym_detect/[Pattern.cpp](#)

3.12 Pin Class Reference

[Pin](#) class.

```
#include <Pin.h>
```

Public Member Functions

- [Pin](#) ()=default
- [Pin](#) ([IndexType](#) id, [IndexType](#) instId, [IndexType](#) netId, [PinType](#) type)
Constructor for [Pin](#).
- [IndexType](#) id () const
- [IndexType](#) instId () const
- [IndexType](#) netId () const
- [PinType](#) type () const
Return type of [Pin](#).

Static Public Member Functions

- static [PinType](#) nextPinType ([PinType](#) type)
Return the next search [PinType](#) for DFS.
- static bool isPasvDev ([PinType](#) type)

Private Attributes

- [IndexType](#) _id
- [IndexType](#) _instId
- [IndexType](#) _netId
- [PinType](#) _type

3.12.1 Detailed Description

[Pin](#) class.

3.12.2 Constructor & Destructor Documentation

3.12.2.1 Pin() [1/2]

```
Pin::Pin ( ) [explicit], [default]
```

Default Constructor.

3.12.2.2 Pin() [2/2]

```
Pin::Pin (
    IndexType id,
    IndexType instId,
    IndexType netId,
    PinType type ) [inline], [explicit]
```

Constructor for [Pin](#).

Parameters

<i>id</i>	Id of Pin .
<i>instId</i>	Id of connected Inst .
<i>netId</i>	Id of connected Net .
<i>type</i>	Type of Pin .

3.12.3 Member Function Documentation

3.12.3.1 id()

```
IndexType Pin::id ( ) const [inline]
```

Return id of [Pin](#).

3.12.3.2 instId()

```
IndexType Pin::instId ( ) const [inline]
```

Return id of connected [Inst](#).

3.12.3.3 isPasvDev()

```
bool Pin::isPasvDev (
    PinType type ) [static]
```

Return true if PinType belongs to a passive device.

A pin is said to belong to a passive device if the PinType is [PinType::THIS](#) or [PinType::THAT](#).

3.12.3.4 netId()

```
IndexType Pin::netId ( ) const [inline]
```

Return id of connected [Net](#).

3.12.3.5 nextPinType()

```
PROJECT_NAMESPACE_BEGIN PinType Pin::nextPinType (
    PinType type ) [static]
```

Return the next search PinType for DFS.

Parameters

<i>type</i>	Query the next search PinType.
-------------	--------------------------------

See also

[PinType](#)

The DFS search for symmetry relies on [Pin::nextPinType](#) to define the search path direction. For example, if a Mosfet was reached through a source then the DFS algorithm would search for connected [Inst](#) of the drain. Currently supported search paths:

Input PinType	nextPinType
SOURCE	DRAIN
GATE	DRAIN
DRAIN	SOURCE
THIS	THAT
THAT	THIS

3.12.3.6 type()

```
PinType Pin::type ( ) const [inline]
```

Return type of [Pin](#).

See also

[PinType](#)

3.12.4 Member Data Documentation

3.12.4.1 `_id`

```
IndexType Pin::_id [private]
```

3.12.4.2 `_instId`

```
IndexType Pin::_instId [private]
```

3.12.4.3 `_netId`

```
IndexType Pin::_netId [private]
```

3.12.4.4 `_type`

```
PinType Pin::_type [private]
```

The documentation for this class was generated from the following files:

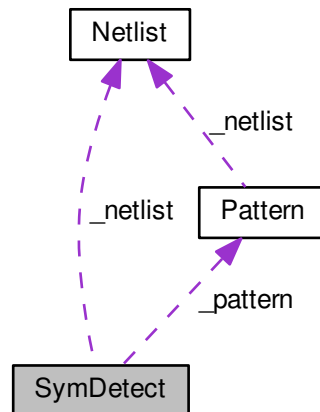
- [src/db/Pin.h](#)
- [src/db/Pin.cpp](#)

3.13 SymDetect Class Reference

[SymDetect](#) class.

```
#include <SymDetect.h>
```

Collaboration diagram for SymDetect:



Public Member Functions

- [SymDetect](#) (const [Netlist](#) &netlist)
Constructor Only needs netlist as input. [Pattern](#) class inherently constructed.
- void [print](#) () const
Print symGroup for netlist.
- void [dumpSym](#) (const std::string file) const
Dump symmetry constraint to file.
- void [dumpNet](#) (const std::string file) const
Dump symmetry net to file.

Private Member Functions

- [MosPattern MosPairPtrn](#) ([MosPair](#) &obj) const
Return pattern of [MosPair](#).
- bool [existPair](#) (std::vector< [MosPair](#) > &library, [IndexType](#) instId1, [IndexType](#) instId2) const
Check if pair already reached.
- bool [existPair](#) (std::vector< [MosPair](#) > &library, [IndexType](#) instId) const
- bool [existNetPair](#) (std::vector< [NetPair](#) > &library, [IndexType](#) netId1, [IndexType](#) netId2) const
Check if already contains [NetPair](#) in library.
- bool [existNetPair](#) (std::vector< [NetPair](#) > &library, [IndexType](#) netId) const
Check if self symmetry [Net](#) in library.
- bool [endSrch](#) ([MosPair](#) &obj) const

- Return true if end of search path.*
- bool `validSrchObj` (`IndexType` instld1, `IndexType` instld2, `IndexType` srchPinld1, `IndexType` srchPinld2) const
Return true if a valid pair.
- bool `validDiffPair` (`IndexType` instld1, `IndexType` instld2, `IndexType` srchPinld1, `IndexType` srchPinld2) const
Return true if a valid DIFF_SOURCE gate connected.
- bool `validNetPair` (`IndexType` netld1, `IndexType` netld2) const
Return true if a valid symmetry NetPair.
- void `pushNextSrchObj` (std::vector< `MosPair` > &dfsVstPair, std::vector< `MosPair` > &dfsStack, `MosPair` &currObj, std::vector< `MosPair` > &diffPairSrc) const
Push next valid MosPair to dfsStack.
- bool `comBias` (`MosPair` &currObj) const
Return true if currObj have common gate connection.
- void `addBiasSym` (std::vector< `MosPair` > &dfsVstPair, `MosPair` &currObj) const
A special case where a symmetry pair is formed in the bias group.
- void `getPatrnNetConn` (std::vector< `MosPair` > &diffPair, `IndexType` netld, `MosPattern` srchPatrn) const
Get srchPatrn MosPair connected to netld.
- void `getDiffPair` (std::vector< `MosPair` > &diffPair) const
Get valid DFS source of netlist.
- void `dfsDiffPair` (std::vector< `MosPair` > &dfsVstPair, `MosPair` &diffPair, std::vector< `MosPair` > &diffPair←
Srch, std::vector< `NetPair` > &netPair) const
DFS search with given source. Visited MosPair are stored.
- void `inVldDiffPairSrch` (std::vector< `MosPair` > &diffPairSrch, `MosPair` &currPair) const
Invalidate visited pairs from sources.
- void `getVldDrainMos` (std::vector< `IndexType` > &vldMos, `IndexType` netld) const
Get valid drain connected mosfet to netld.
- void `selfSymSrch` (std::vector< `MosPair` > &dfsVstPair, `MosPair` &diffPair) const
Iteratively search for self symmetry given diffPair.
- void `addSelfSym` (std::vector< `MosPair` > &dfsVstPair) const
Top function to call to add self symmetry to already searched symmetry group.
- void `addSymNet` (std::vector< `NetPair` > &netPair, `MosPair` &currObj) const
Based on currObj symmetry Inst pair, valid symmetry nets are appended to netPair.
- void `flattenSymGroup` (std::vector< std::vector< `MosPair` >> &symGroup, std::vector< `MosPair` > &flatPair) const
Flatten symmetry group hierarchy into a single vector.
- void `biasGroup` (std::vector< `MosPair` > &flatPair, std::vector< `Bias` > &biasGroup) const
Find all bias groups. All MosPair in flattened symmetry group are first searched as source. For all valid bias search source that is comBias, bias groups would be saved to biasGroup.
- void `biasMatch` (std::vector< `Bias` > &biasGroup, std::vector< std::vector< `MosPair` >> &symGroup, std::vector< `MosPair` > &flatPair) const
Search for symmetry pairs in each group.
- void `hiSymDetect` (std::vector< std::vector< `MosPair` >> &symGroup, std::vector< `NetPair` > &netPair) const
Hierarchy symmetry detection.

Private Attributes

- const `Netlist` & _netlist
- `Pattern` _pattern
- std::vector< `NetPair` > _symNet
Symmetry nets of netlist.
- std::vector< std::vector< `MosPair` >> _symGroup
Symmetry groups of netlist.
- std::vector< `MosPair` > _flatPair
- std::vector< `Bias` > _biasGroup

3.13.1 Detailed Description

[SymDetect](#) class.

3.13.2 Constructor & Destructor Documentation

3.13.2.1 SymDetect()

```
SymDetect::SymDetect (
    const Netlist & netlist ) [inline], [explicit]
```

Constructor Only needs netlist as input. [Pattern](#) class inherently constructed.

Parameters

<i>netlist</i>	Netlist class.
----------------	--------------------------------

3.13.3 Member Function Documentation

3.13.3.1 addBiasSym()

```
void SymDetect::addBiasSym (
    std::vector< MosPair > & dfsVstPair,
    MosPair & currObj ) const [private]
```

A special case where a symmetry pair is formed in the bias group.

3.13.3.2 addSelfSym()

```
void SymDetect::addSelfSym (
    std::vector< MosPair > & dfsVstPair ) const [private]
```

Top function to call to add self symmetry to already searched symmetry group.

Iteratively searches for self symmetry instances for [MosPattern::DIFF_SOURCE](#) pairs in dfsVstPair. Valid self symmetry instances will be appended. This function is called at the end of every DFS search for symmetry pairs.

Parameters

<i>dfsVstPair</i>	Symmetry group.
-------------------	-----------------

See also

[selfSymSrch](#)
[hiSymDetect](#)

3.13.3.3 addSymNet()

```
void SymDetect::addSymNet (
    std::vector< NetPair > & netPair,
    MosPair & currObj ) const [private]
```

Based on currObj symmetry [Inst](#) pair, valid symmetry nets are appended to netPair.

Valid symmetry net that are connected to symmetry [Inst](#) pair currObj would be added to vector.

See also

[validNetPair](#)

Parameters

<i>netPair</i>	Symmetry Net appended to this vector.
<i>currObj</i>	Current symmetry Inst pair.

3.13.3.4 biasGroup()

```
void SymDetect::biasGroup (
    std::vector< MosPair > & flatPair,
    std::vector< Bias > & biasGroup ) const [private]
```

Find all bias groups. All [MosPair](#) in flattened symmetry group are first searched as source. For all valid bias search source that is comBias, bias groups would be saved to biasGroup.

See also

[comBias](#)

Parameters

<i>flatPair</i>	Input flattened symmetry group.
<i>biasGroup</i>	Saved bias groups to vector.

3.13.3.5 biasMatch()

```
void SymDetect::biasMatch (
    std::vector< Bias > & biasGroup,
    std::vector< std::vector< MosPair >> & symGroup,
    std::vector< MosPair > & flatPair ) const [private]
```

Search for symmetry pairs in each group.

New symmetry pairs are searched in the biasGroup.

Parameters

<i>biasGroup</i>	A vector of bias group.
<i>symGroup</i>	Results appended to symGroup.
<i>flatPair</i>	Used to check for redundancy.

3.13.3.6 comBias()

```
bool SymDetect::comBias (
    MosPair & currObj ) const [private]
```

Return true if currObj have common gate connection.

This function is used to check if a [MosPair](#) needs to search for a bias group. [MosPair](#) should have following attributes: (1) [MosPattern::LOAD](#) or CASCODE (2) Both mosId are of [MosType::DIFF](#) (3) Have common gate connection

3.13.3.7 dfsDiffPair()

```
void SymDetect::dfsDiffPair (
    std::vector< MosPair > & dfsVstPair,
    MosPair & diffPair,
    std::vector< MosPair > & diffPairSrch,
    std::vector< NetPair > & netPair ) const [private]
```

DFS search with given source. Visited [MosPair](#) are stored.

Search for symmetry patterns in DFS manner with search source as diffPair. Store visited valid [MosPair](#) at dfsVstPair. diffPairSrch are needed as input to invalidate reached sources. dfsVstPair would be in the same hierarchy symmetry group. All symmetry nets would be appended to netPair vector.

See also

[pushNextSrchObj](#)

Parameters

out	<i>dfsVstPair</i>	Vector to store all visited MosPair
in	<i>diffPair</i>	DFS search source
in	<i>diffPairSrch</i>	Vector of all stored DFS search source
out	<i>netPair</i>	Symmetry Nets.

3.13.3.8 dumpNet()

```
void SymDetect::dumpNet (
    const std::string file ) const
```

Dump symmetry net to file.

3.13.3.9 dumpSym()

```
PROJECT_NAMESPACE_BEGIN void SymDetect::dumpSym (
    const std::string file ) const
```

Dump symmetry constraint to file.

3.13.3.10 endSrch()

```
bool SymDetect::endSrch (
    MosPair & obj ) const [private]
```

Return true if end of search path.

Current end search terminations: (1) Connected PASSIVE (2) DIFF_SOURCE reached through DRAIN (3) LOAD, CROSS_LOAD (4) gate connected pairs

3.13.3.11 existNetPair() [1/2]

```
bool SymDetect::existNetPair (
    std::vector< NetPair > & library,
    IndexType netId1,
    IndexType netId2 ) const [private]
```

Check if already contains [NetPair](#) in library.

3.13.3.12 existNetPair() [2/2]

```
bool SymDetect::existNetPair (
    std::vector< NetPair > & library,
    IndexType netId ) const [private]
```

Check if self symmetry [Net](#) in library.

3.13.3.13 existPair() [1/2]

```
bool SymDetect::existPair (
    std::vector< MosPair > & library,
    IndexType instId1,
    IndexType instId2 ) const [private]
```

Check if pair already reached.

3.13.3.14 existPair() [2/2]

```
bool SymDetect::existPair (
    std::vector< MosPair > & library,
    IndexType instId ) const [private]
```

Check if self symmetry pair already reached.

3.13.3.15 flattenSymGroup()

```
void SymDetect::flattenSymGroup (
    std::vector< std::vector< MosPair >> & symGroup,
    std::vector< MosPair > & flatPair ) const [private]
```

Flatten symmetry group hierarchy into a single vector.

3.13.3.16 getDiffPair()

```
void SymDetect::getDiffPair (
    std::vector< MosPair > & diffPair ) const [private]
```

Get valid DFS source of netlist.

Iterate all signal nets for getPatrnNetConn. Commonly srchPatrn are DIFF_SOURCE and CROSS_LOAD. This would return all DFS sources.

See also

getDiffPairNetConn

Parameters

<i>diffPair</i>	Store the output vector
-----------------	-------------------------

3.13.3.17 getPatrnNetConn()

```
void SymDetect::getPatrnNetConn (
    std::vector< MosPair > & diffPair,
    IndexType netId,
    MosPattern srchPatrn ) const [private]
```

Get srchPatrn MosPair connected to netId.

Find MosPair that follow srchPatrn. These MosPair are appended to diffPair. Used to get valid DFS source. srch← Patrn inputs commonly are DIFF_SOURCE and CROSS_LOAD. Currently pairs should follow: (1) Have MosPattern srchPatrn (2) source connected to netId (3) MosType::DIFF

Parameters

<i>netId</i>	Source should be connected to netId.
<i>diffPair</i>	Stored output vector.

3.13.3.18 getVldDrainMos()

```
void SymDetect::getVldDrainMos (
    std::vector< IndexType > & vldMos,
    IndexType netId ) const [private]
```

Get valid drain connected mosfet to netId.

Valid Mosfets must be connected to netId through PinType::DRAIN, it should also have MosType::DIFF. This is used to search self symmetric pairs connected to MosPattern::DIFF_SOURCE.

Parameters

<i>vldMos</i>	Vector to store valid Mosfet.
<i>netId</i>	Id of connected net.

3.13.3.19 hiSymDetect()

```
void SymDetect::hiSymDetect (
    std::vector< std::vector< MosPair >> & symGroup,
    std::vector< NetPair > & netPair ) const [private]
```

Hierarchy symmetry detection.

Output would contain 2 levels of hierarchy. symGroup is a vector of std::vector<MosPair> oneGroup. Where one← Group is a group of MosPair in the same symmetry group. Each MosPair should follow a MosPattern, or it should be of self symmetry. This funtion has been also updated to contain basic passive pair symmetry.

Symmetry Nets would be added to vector netPair.

Parameters

<i>symGroup</i>	Detected symmetry groups of netlist.
-----------------	--------------------------------------

See also

[MosPattern](#)[MosPair](#)

3.13.3.20 inVldDiffPairSrch()

```
void SymDetect::inVldDiffPairSrch (
    std::vector< MosPair > & diffPairSrch,
    MosPair & currPair ) const [private]
```

Invalidate visited pairs from sources.

If a [MosPair](#) have already been visited and is a DFS source, it should be invalidated as a DFS search source to avoid revisiting.

Parameters

<i>diffPairSrch</i>	Vector of all DFS sources.
<i>currPair</i>	MosPair to invalidate.

3.13.3.21 MosPairPtrn()

```
MosPattern SymDetect::MosPairPtrn (
    MosPair & obj ) const [private]
```

Return pattern of [MosPair](#).

3.13.3.22 print()

```
void SymDetect::print ( ) const
```

Print symGroup for netlist.

3.13.3.23 pushNextSrchObj()

```
void SymDetect::pushNextSrchObj (
    std::vector< MosPair > & dfsVstPair,
    std::vector< MosPair > & dfsStack,
    MosPair & currObj,
    std::vector< MosPair > & diffPairSrc ) const [private]
```

Push next valid [MosPair](#) to dfsStack.

This function push valid pairs that could be reached from currObj to dfsStack. It also removes reached DIFF_SOURCE [MosPair](#) from diffPairSrc. A pair is valid either a valid load or a valid second stage input DIFF_SOURCE.

See also

[inVldDiffPairSrch](#)
[validSrchObj](#)
[validDiffPair](#)

Parameters

<i>dfsVstPair</i>	All current visited MosPair
<i>dfsStack</i>	Stack to store to visit MosPair
<i>currObj</i>	Current MosPair under visit
<i>diffPairSrc</i>	All DFS sources

3.13.3.24 selfSymSrch()

```
void SymDetect::selfSymSrch (
    std::vector< MosPair > & dfsVstPair,
    MosPair & diffPair ) const [private]
```

Iteratively search for self symmetry given diffPair.

diffPair should be of [MosPattern::DIFF_SOURCE](#). Valid self symmetric instances are added to dfsVstPair. Redundancy is also removed from dfsVstPair.

Parameters

<i>dfsVstPair</i>	Self symmetric pairs will be added to this vector.
<i>diffPair</i>	MosPattern::DIFF_SOURCE pair to begin self symmetry search.

See also

[getVldDrainMos](#)

3.13.3.25 validDiffPair()

```
bool SymDetect::validDiffPair (
    IndexType instId1,
    IndexType instId2,
    IndexType srchPinId1,
    IndexType srchPinId2 ) const [private]
```

Return true if a valid DIFF_SOURCE gate connected.

This funtion is used to expand symmetry groups through DRAIN to GATE connections like searching for 2 stage OTAs. Since validSrchObj funtion blocks all gate connections, this funtion is used to check for DIFF_SOURCE second stage "input" pairs.

Valid pairs have following attributes: (1) Reached through gate (2) DIFF_SOURCE pattern type.

See also

[validSrchObj](#)

Parameters

<i>instId1</i>	Reached pair instId1
<i>instId2</i>	Reached pair instId2
<i>srchPinId1</i>	instId1 reached by srchPinId1.
<i>srchPinId2</i>	instId2 reached by srchPinId2.

3.13.3.26 validNetPair()

```
bool SymDetect::validNetPair (
    IndexType netId1,
    IndexType netId2 ) const [private]
```

Return true if a valid symmetry [NetPair](#).

A [NetPair](#) is a pair of symmetry nets. Symmetry nets connected [Inst](#) need to be all grouped into symmetry pairs. The current implementation is very naive and only checks that pin numbers are equal.

See also

[NetPair](#)

Parameters

<i>netId1</i>	Id of Net1.
<i>netId2</i>	Id of Net2.

3.13.3.27 validSrchObj()

```
bool SymDetect::validSrchObj (
    IndexType instId1,
    IndexType instId2,
    IndexType srchPinId1,
    IndexType srchPinId2 ) const [private]
```

Return true if a valid pair.

Valid pairs have following attributes: (1) Any mosfet pairs not reached by PASSIVE (2) Reached through same PinType (3) Not reached through gate (4) Valid MosPattern

Parameters

<i>instId1</i>	Reached pair instId1
<i>instId2</i>	Reached pair instId2
<i>srchPinId1</i>	instId1 reached by srchPinId1.
<i>srchPinId2</i>	instId2 reached by srchPinId2.

3.13.4 Member Data Documentation

3.13.4.1 _biasGroup

```
std::vector<Bias> SymDetect::_biasGroup [private]
```

3.13.4.2 _flatPair

```
std::vector<MosPair> SymDetect::_flatPair [private]
```

3.13.4.3 _netlist

```
const Netlist& SymDetect::_netlist [private]
```

3.13.4.4 _pattern

```
Pattern SymDetect::_pattern [private]
```

3.13.4.5 _symGroup

```
std::vector<std::vector<MosPair> > SymDetect::_symGroup [private]
```

Symmetry groups of netlist.

3.13.4.6 _symNet

```
std::vector<NetPair> SymDetect::_symNet [private]
```

Symmetry nets of netlist.

The documentation for this class was generated from the following files:

- src/sym_detect/[SymDetect.h](#)
- src/sym_detect/[SymDetect.cpp](#)

Chapter 4

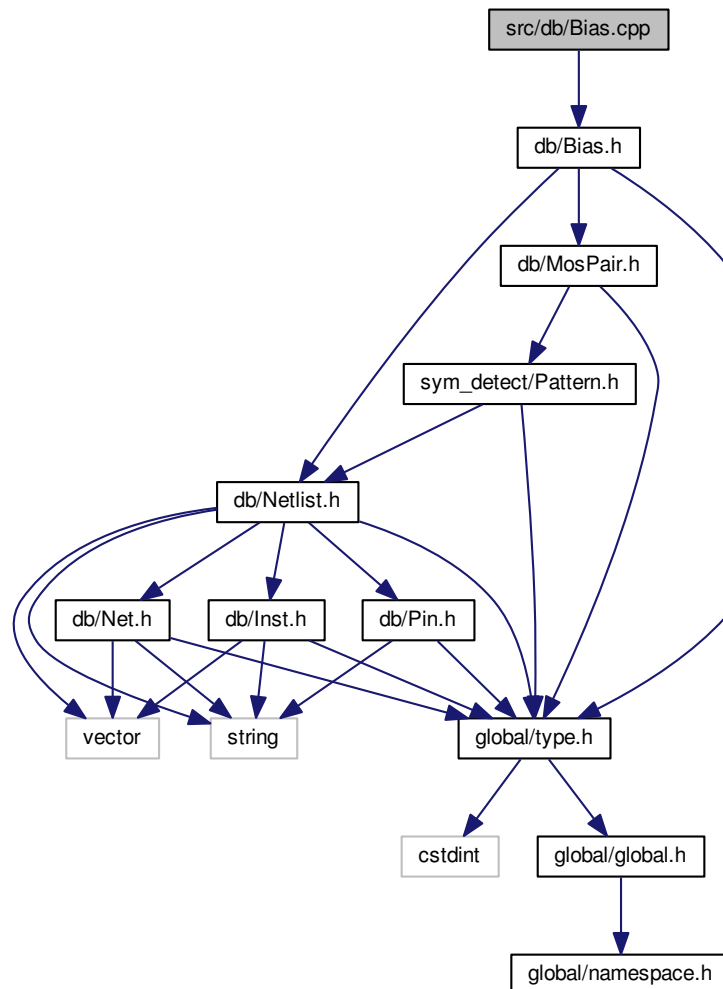
File Documentation

4.1 src/db/Bias.cpp File Reference

[Bias](#) implementation.

```
#include "db/Bias.h"
```

Include dependency graph for Bias.cpp:



4.1.1 Detailed Description

[Bias](#) implementation.

Author

Mingjie Liu

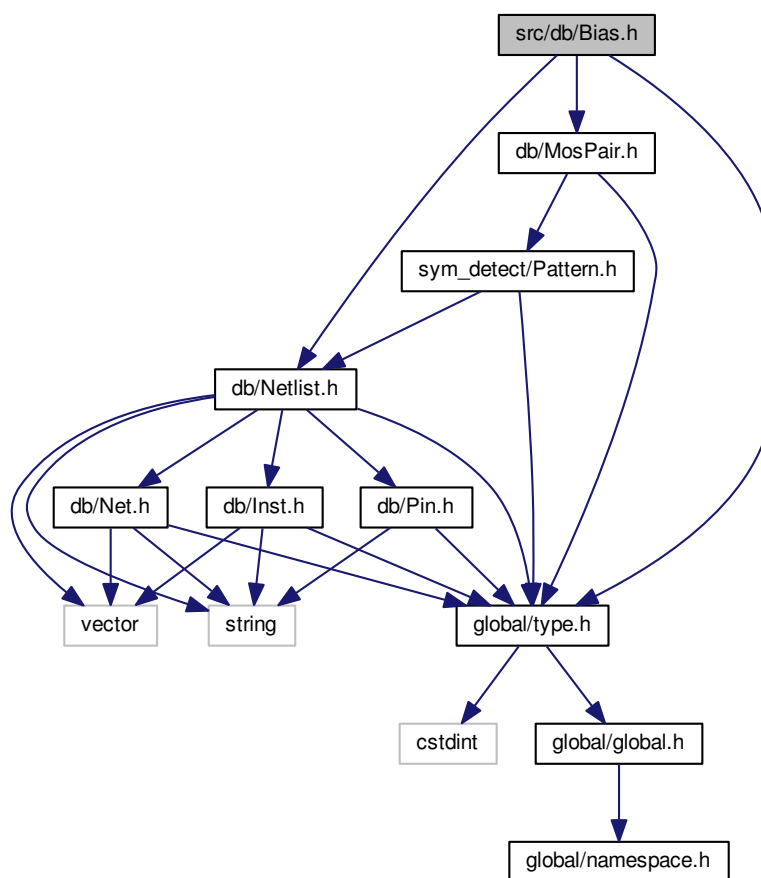
Date

12/11/2018

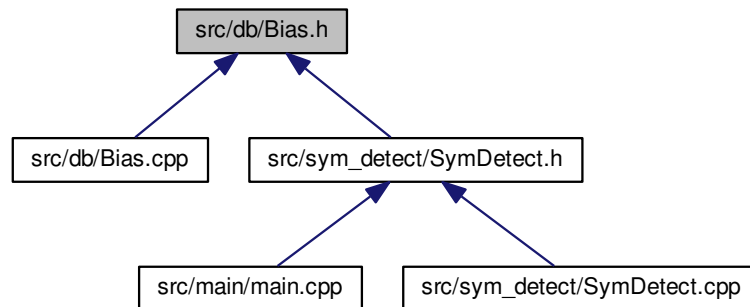
4.2 src/db/Bias.h File Reference

A vector of Mosfet [Bias](#).

```
#include "global/type.h"
#include "db/Netlist.h"
#include "db/MosPair.h"
Include dependency graph for Bias.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Bias](#)
A vector of Mosfet.

4.2.1 Detailed Description

A vector of Mosfet [Bias](#).

Author

Mingjie Liu

Date

12/11/2018

4.3 `src/db/Inst.h` File Reference

Instance class.

```
#include <string>
#include <vector>
```


4.3.1 Detailed Description

Instance class.

Author

Mingjie Liu

Date

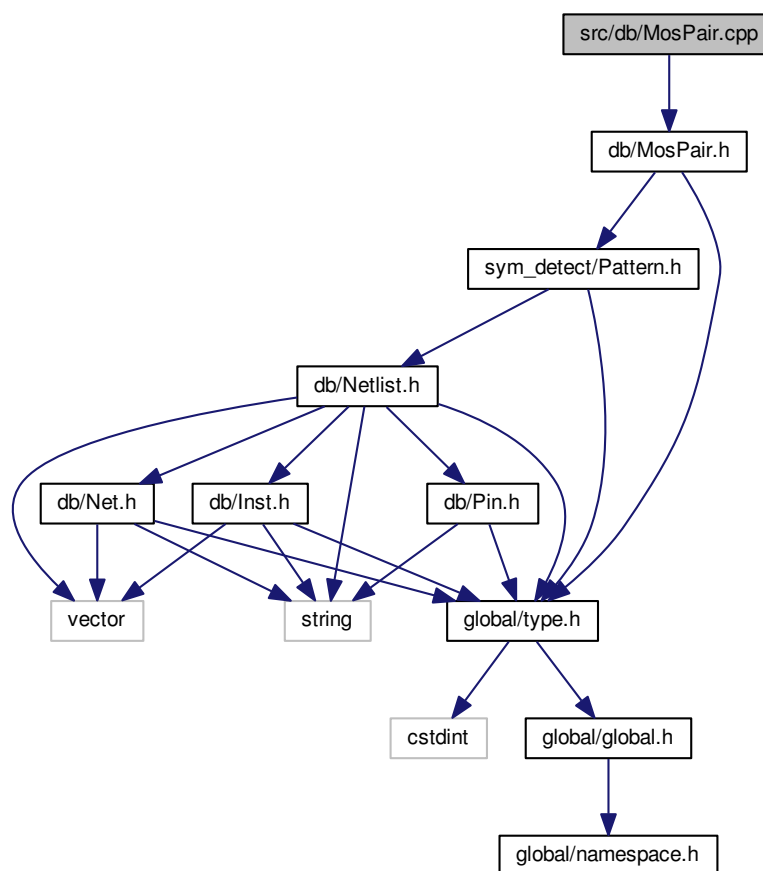
11/24/2018

4.4 src/db/MosPair.cpp File Reference

[MosPair](#) implementation.

```
#include "db/MosPair.h"
```

Include dependency graph for MosPair.cpp:



4.4.1 Detailed Description

[MosPair](#) implementation.

Author

Mingjie Liu

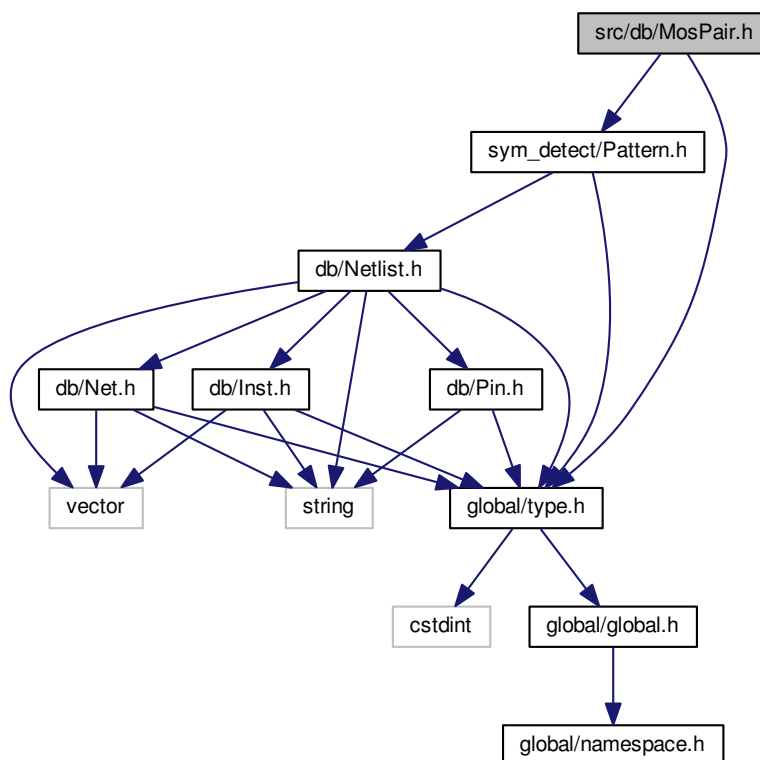
Date

11/27/2018

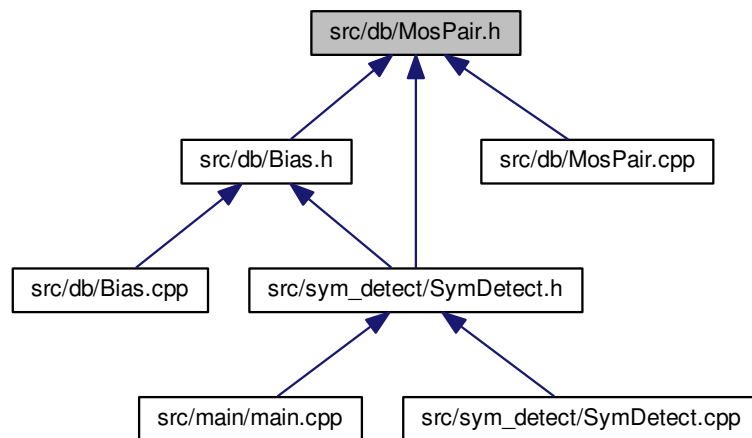
4.5 src/db/MosPair.h File Reference

A pair of Mosfet with MosPattern.

```
#include "global/type.h"
#include "sym_detect/Pattern.h"
Include dependency graph for MosPair.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [MosPair](#)

A pair of Mosfet with MosPattern.

4.5.1 Detailed Description

A pair of Mosfet with MosPattern.

Author

Mingjie Liu

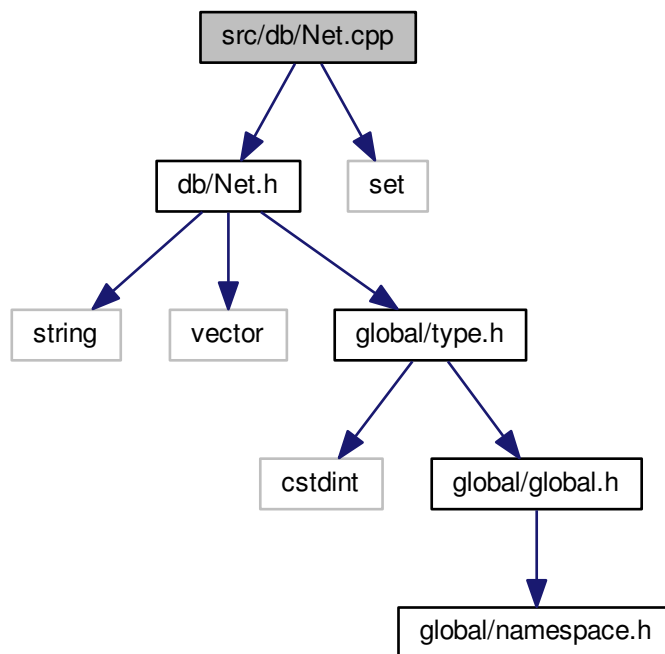
Date

11/27/2018

4.6 src/db/Net.cpp File Reference

[Net](#) class implementation.


```
#include "db/Net.h"
#include <set>
Include dependency graph for Net.cpp:
```



Variables

- static `PROJECT_NAMESPACE_BEGIN` `const std::set< std::string > POWER_NET_NAMES = {"vdd", "VDD", "Vdd", "VDDA", "vdda", "Vdda"}`
- static `const std::set< std::string > GROUND_NET_NAMES = {"vss", "VSS", "Vss", "VSSA", "vssa", "Vssa", "gnd", "Gnd", "GND"}`

4.6.1 Detailed Description

`Net` class implementation.

Author

Mingjie Liu

Date

11/24/2018

4.6.2 Variable Documentation

4.6.2.1 GROUND_NET_NAMES

```
const std::set<std::string> GROUND_NET_NAMES = {"vss", "VSS", "Vss", "VSSA", "vssa", "Vssa",
"gnd", "Gnd", "GND"} [static]
```

A set of possible ground net names.

4.6.2.2 POWER_NET_NAMES

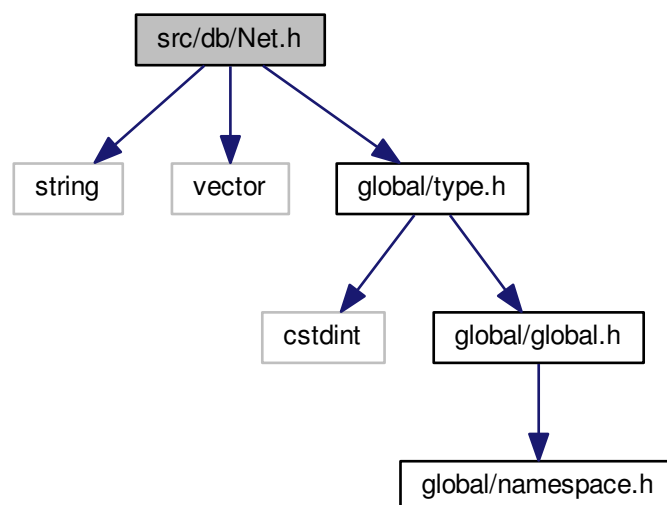
```
PROJECT_NAMESPACE_BEGIN const std::set<std::string> POWER_NET_NAMES = {"vdd", "VDD", "Vdd",
"VDDA", "vdda", "Vdda"} [static]
```

A set of possible power net names.

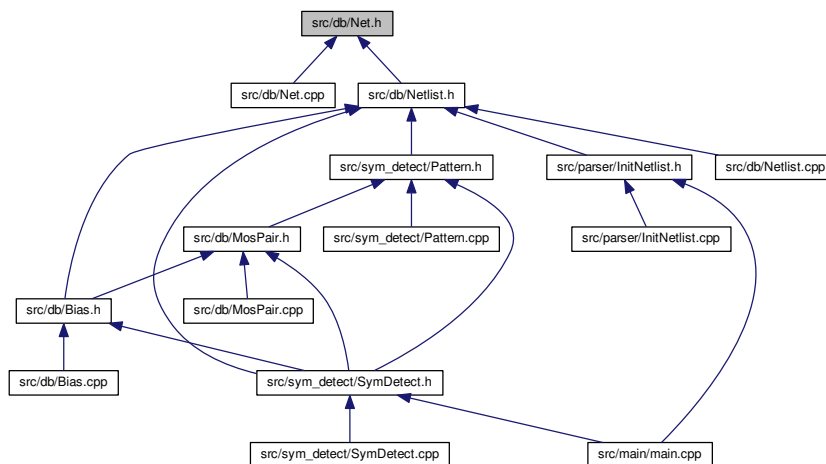
4.7 src/db/Net.h File Reference

[Net](#) class.

```
#include <string>
#include <vector>
#include "global/type.h"
Include dependency graph for Net.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Net](#)
Net class.

4.7.1 Detailed Description

[Net](#) class.

Author

Mingjie Llu

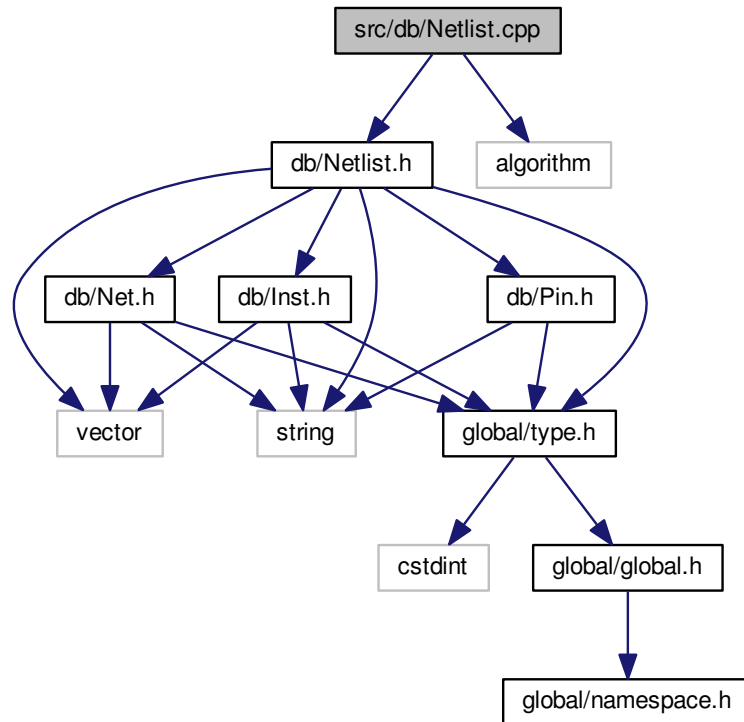
Date

11/24/2018

4.8 src/db/Netlist.cpp File Reference

[Netlist](#) class implementation.

```
#include "db/Netlist.h"
#include <algorithm>
Include dependency graph for Netlist.cpp:
```



Variables

- static `PROJECT_NAMESPACE_BEGIN` const `PinType` `MOS_PIN_TYPE` [4] = {`PinType::DRAIN`, `PinType::GATE`, `PinType::SOURCE`, `PinType::BULK`}
Mos Pin Types.
- static const `PinType` `RES_PIN_TYPE` [3] = {`PinType::THIS`, `PinType::THAT`, `PinType::OTHER`}
Res/Cap Pin Types.

4.8.1 Detailed Description

`Netlist` class implementation.

Author

Mingjie Liu

Date

11/24/2018

4.8.2 Variable Documentation

4.8.2.1 MOS_PIN_TYPE

```
PROJECT_NAMESPACE_BEGIN const PinType MOS_PIN_TYPE[4] = {PinType::DRAIN, PinType::GATE, PinType::SOURCE, PinType::BULK} [static]
```

Mos Pin Types.

4.8.2.2 RES_PIN_TYPE

```
const PinType RES_PIN_TYPE[3] = {PinType::THIS, PinType::THAT, PinType::OTHER} [static]
```

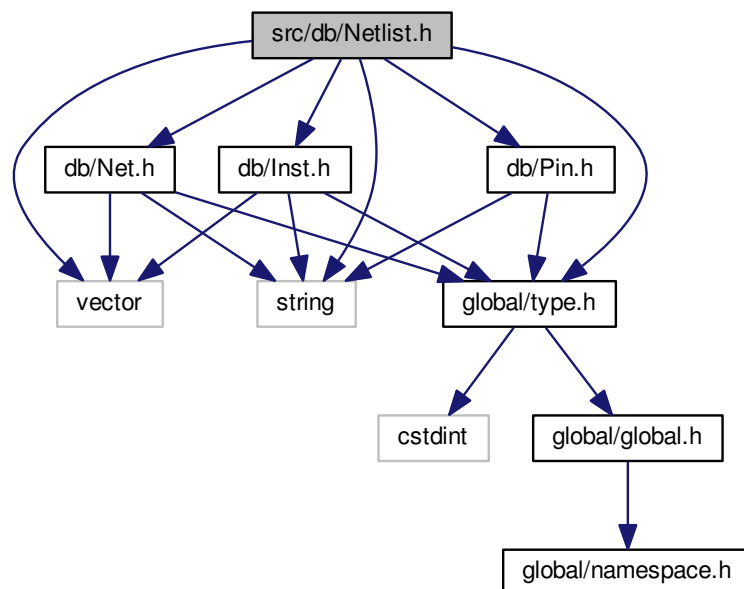
Res/Cap Pin Types.

4.9 src/db/Netlist.h File Reference

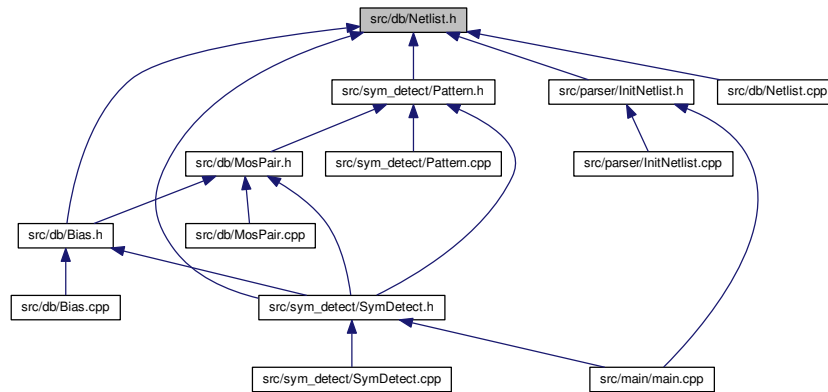
Netlist class.

```
#include <vector>
#include <string>
#include "global/type.h"
#include "db/Net.h"
#include "db/Pin.h"
#include "db/Inst.h"
```

Include dependency graph for Netlist.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [Netlist](#)
Netlist class.
- struct [Netlist::InitNet](#)
Net for instantiation.
- struct [Netlist::InitInst](#)
Inst for instantiation.
- struct [Netlist::InitDataObj](#)
Instantiate *Netlist* class.

4.9.1 Detailed Description

[Netlist](#) class.

Author

Mingjie Liu

Date

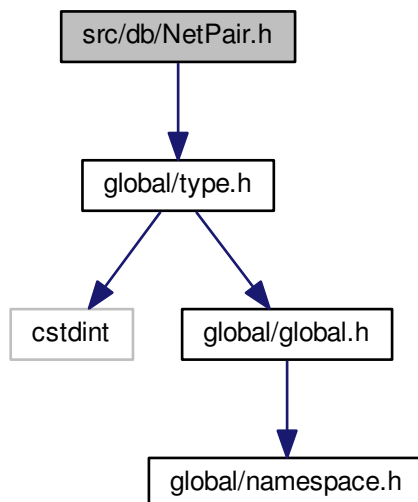
11/24/2018

4.10 src/db/NetPair.h File Reference

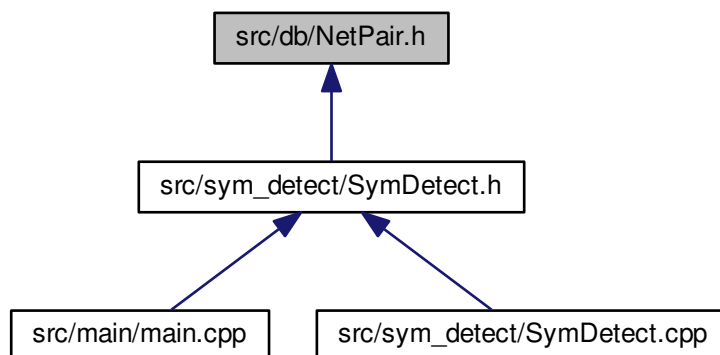
A pair of symmetry nets.

```
#include "global/type.h"
```

Include dependency graph for NetPair.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [NetPair](#)

A pair of [Net](#) that are symmetric.

4.10.1 Detailed Description

A pair of symmetry nets.

Author

Mingjie Liu

Date

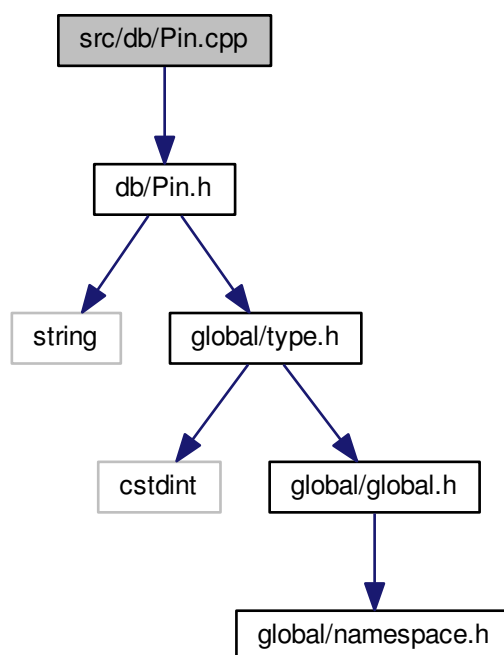
12/06/2018

4.11 src/db/Pin.cpp File Reference

[Net](#) class implementation.

```
#include "db/Pin.h"
```

Include dependency graph for Pin.cpp:



4.11.1 Detailed Description

[Net](#) class implementation.

Author

Mingjie Liu

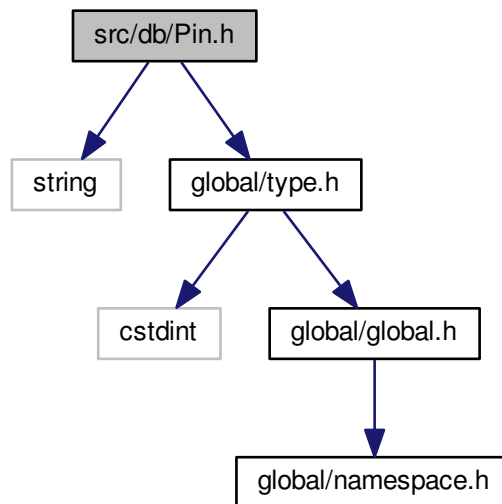
Date

11/24/2018

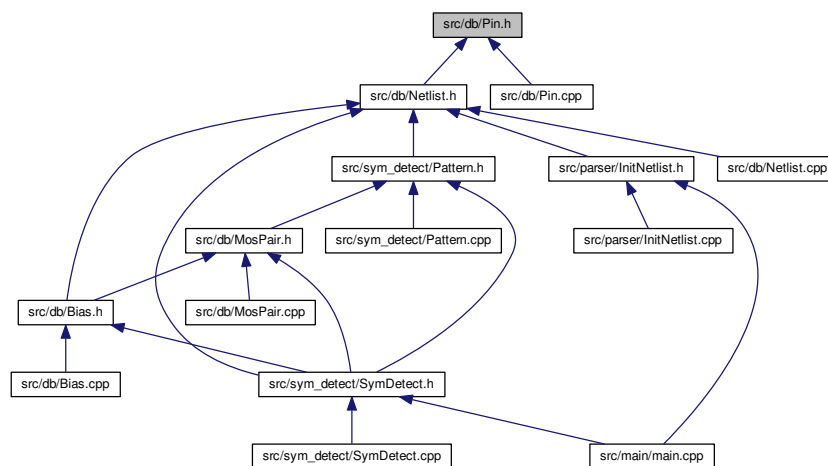
4.12 src/db/Pin.h File Reference

[Pin](#) class.

```
#include <string>
#include "global/type.h"
Include dependency graph for Pin.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Pin](#)
Pin class.

4.12.1 Detailed Description

[Pin](#) class.

Author

Mingjie Liu

Date

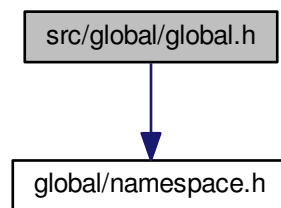
11/24/2018

4.13 src/global/global.h File Reference

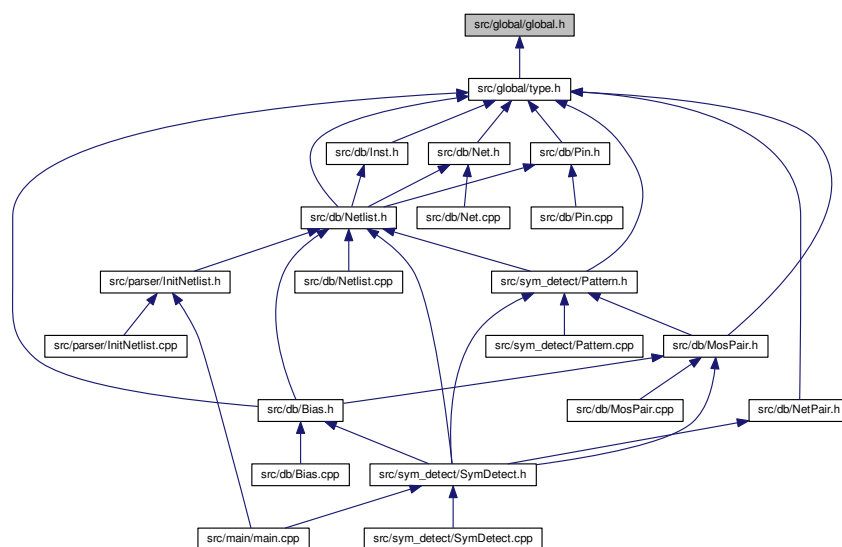
Global header file.

```
#include "global/namespace.h"
```

Include dependency graph for global.h:



This graph shows which files directly or indirectly include this file:



Global header file.

Author

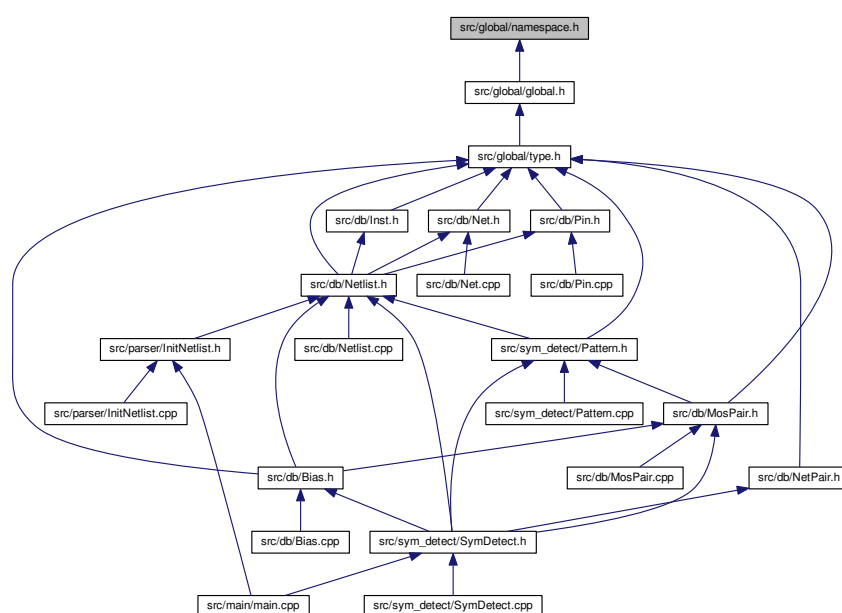
Mingjie Liu

Date

11/24/2018

Namespace header file.

This graph shows which files directly or indirectly include this file:



- #define PROJECT_NAMESPACE SFA
- #define PROJECT_NAMESPACE_BEGIN namespace PROJECT_NAMESPACE {
- #define PROJECT_NAMESPACE_END }

4.14.1 Detailed Description

Namespace header file.

Author

Mingjie Liu

Date

11/24/2018

4.14.2 Macro Definition Documentation

4.14.2.1 PROJECT_NAMESPACE

```
#define PROJECT_NAMESPACE SFA
```

4.14.2.2 PROJECT_NAMESPACE_BEGIN

```
#define PROJECT_NAMESPACE_BEGIN namespace PROJECT_NAMESPACE {
```

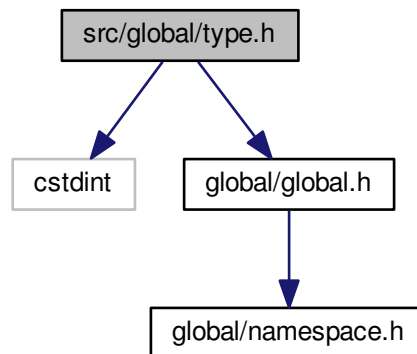
4.14.2.3 PROJECT_NAMESPACE_END

```
#define PROJECT_NAMESPACE_END }
```

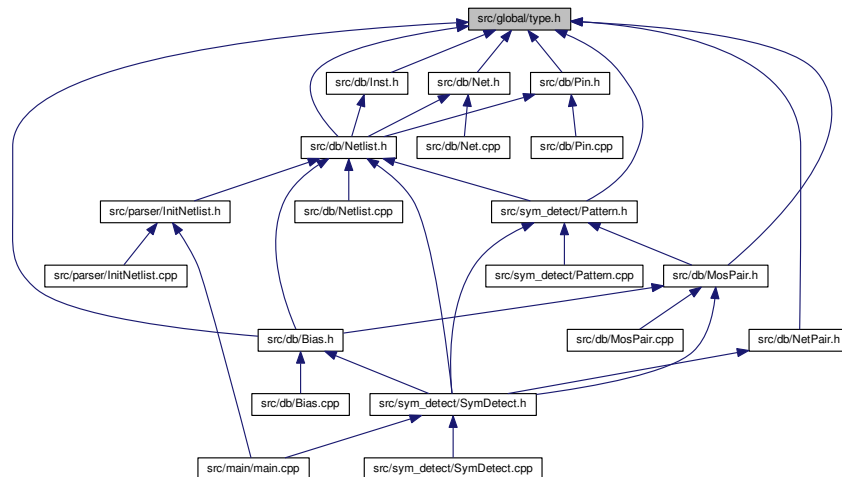
4.15 src/global/type.h File Reference

Type header file.

```
#include <cstdint>
#include "global/global.h"
Include dependency graph for type.h:
```



This graph shows which files directly or indirectly include this file:



Typedefs

- using [IndexType](#) = std::uint32_t
- using [IntType](#) = std::int32_t
- using [RealType](#) = double
- using [Byte](#) = std::uint8_t

Enumerations

- enum `InstType` : Byte {
`InstType::RES`, `InstType::PMOS`, `InstType::NMOS`, `InstType::CAP`,
`InstType::OTHER` }
Type of Inst.
- enum `NetType` : Byte { `NetType::POWER`, `NetType::GROUND`, `NetType::SIGNAL` }
Type of Net.
- enum `PinType` : Byte {
`PinType::SOURCE`, `PinType::DRAIN`, `PinType::GATE`, `PinType::BULK`,
`PinType::THIS`, `PinType::THAT`, `PinType::OTHER` }
Type of Pin.
- enum `MosType` : Byte { `MosType::DIFF`, `MosType::DIODE`, `MosType::CAP`, `MosType::DUMMY` }
Connection type of Mosfet.
- enum `MosPattern` : Byte {
`MosPattern::DIFF_SOURCE`, `MosPattern::DIFF_CASCADE`, `MosPattern::CASCADE`, `MosPattern::LOAD`,
`MosPattern::CROSS_CASCADE`, `MosPattern::CROSS_LOAD`, `MosPattern::PASSIVE`, `MosPattern::SELF`,
`MosPattern::BIAS`, `MosPattern::INVALID` }
Pattern for pair of Mosfet.

Variables

- constexpr `IndexType INDEX_TYPE_MAX` = 1000000000
- constexpr `IntType INT_TYPE_MAX` = 1000000000
- constexpr `IntType INT_TYPE_MIN` = -1000000000
- constexpr `RealType REAL_TYPE_MAX` = 1e100
- constexpr `RealType REAL_TYPE_MIN` = -1e100
- constexpr `RealType REAL_TYPE_TOL` = 1e-6

4.15.1 Detailed Description

Type header file.

Author

Mingjie Liu

Date

11/24/2018

4.15.2 Typedef Documentation

4.15.2.1 Byte

```
using Byte = std::uint8_t
```

4.15.2.2 IndexType

```
using IndexType = std::uint32_t
```

4.15.2.3 IntType

```
using IntType = std::int32_t
```

4.15.2.4 RealType

```
using RealType = double
```

4.15.3 Enumeration Type Documentation

4.15.3.1 InstType

```
enum InstType : Byte [strong]
```

Type of [Inst](#).

Enumerator

RES	Resistor
PMOS	PMos
NMOS	NMos
CAP	Capacitor
OTHER	Other

4.15.3.2 MosPattern

```
enum MosPattern : Byte [strong]
```

[Pattern](#) for pair of Mosfet.

The patterns have been augmented to also handle self symmetry pairs and passive devices. The name retains as legacy.

See also

[Pattern::pattern\(\)](#)

Enumerator

DIFF_SOURCE	Source connected diff pair.
DIFF_CASCADE	Cascode diff pair.
CASCADE	Gate connected cascode pair.
LOAD	Cascode pair with source connected to Power/Ground.
CROSS_CASCADE	Cross coupled cascode pair.
CROSS_LOAD	Cross coupled load.
PASSIVE	Matched passive device.
SELF	Self symmetry Inst.
BIAS	Bias symmetry pair.
INVALID	No pattern detected.

4.15.3.3 MosType

```
enum MosType : Byte [strong]
```

Connection type of Mosfet.

See also

[Netlist::mosType\(\)](#).

Enumerator

DIFF	D/G/S diff
DIODE	G/D connected
CAP	G/S connected
DUMMY	D/S connected

4.15.3.4 NetType

```
enum NetType : Byte [strong]
```

Type of [Net](#).

Enumerator

POWER	Power
GROUND	Ground
SIGNAL	Signal

4.15.3.5 PinType

```
enum PinType : Byte [strong]
```

Type of [Pin](#).

Enumerator

SOURCE	Inst is Mosfet
DRAIN	Inst is Mosfet
GATE	Inst is Mosfet
BULK	Inst is Mosfet
THIS	Inst is Passive
THAT	Inst is Passive
OTHER	Other

4.15.4 Variable Documentation

4.15.4.1 INDEX_TYPE_MAX

```
constexpr IndexType INDEX_TYPE_MAX = 1000000000
```

4.15.4.2 INT_TYPE_MAX

```
constexpr IntType INT_TYPE_MAX = 1000000000
```

4.15.4.3 INT_TYPE_MIN

```
constexpr IntType INT_TYPE_MIN = -1000000000
```

4.15.4.4 REAL_TYPE_MAX

```
constexpr RealType REAL_TYPE_MAX = 1e100
```

4.15.4.5 REAL_TYPE_MIN

```
constexpr RealType REAL_TYPE_MIN = -1e100
```

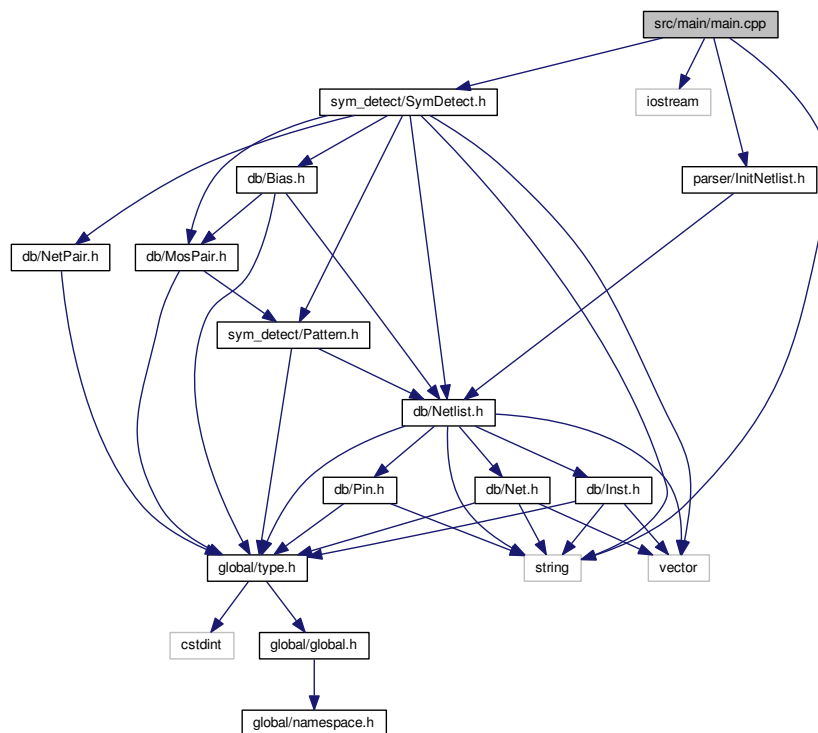
4.15.4.6 REAL_TYPE_TOL

```
constexpr RealType REAL_TYPE_TOL = 1e-6
```

4.16 src/main/main.cpp File Reference

main.cpp

```
#include <string>
#include <iostream>
#include "parser/InitNetlist.h"
#include "sym_detect/SymDetect.h"
Include dependency graph for main.cpp:
```



Macros

- `#define __SFA_TEST__`

Functions

- `int main (int argc, char *argv[])`

4.16.1 Detailed Description

`main.cpp`

Author

Mingjie Llu

Date

11/25/2018

Takes 1 argument input. Parse the file into [Netlist](#). Detect hierarchy symmetry groups and print to command line. Input file should be of certain format. See [parser/InitNetlist.h](#) for details.

4.16.2 Macro Definition Documentation

4.16.2.1 `__SFA_TEST__`

```
#define __SFA_TEST__
```

4.16.3 Function Documentation

4.16.3.1 `main()`

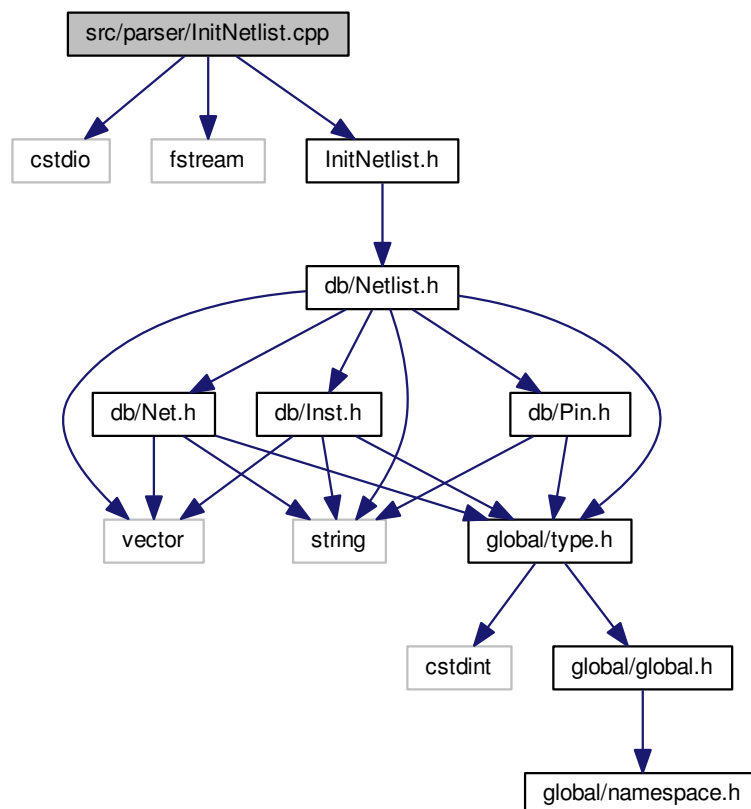
```
int main (  
    int argc,  
    char * argv[] )
```

4.17 src/parser/InitNetlist.cpp File Reference

Parser implementation.

```
#include <cstdio>
#include <fstream>
#include "InitNetlist.h"
```

Include dependency graph for InitNetlist.cpp:



4.17.1 Detailed Description

Parser implementation.

Author

Mingjie Liu

Date

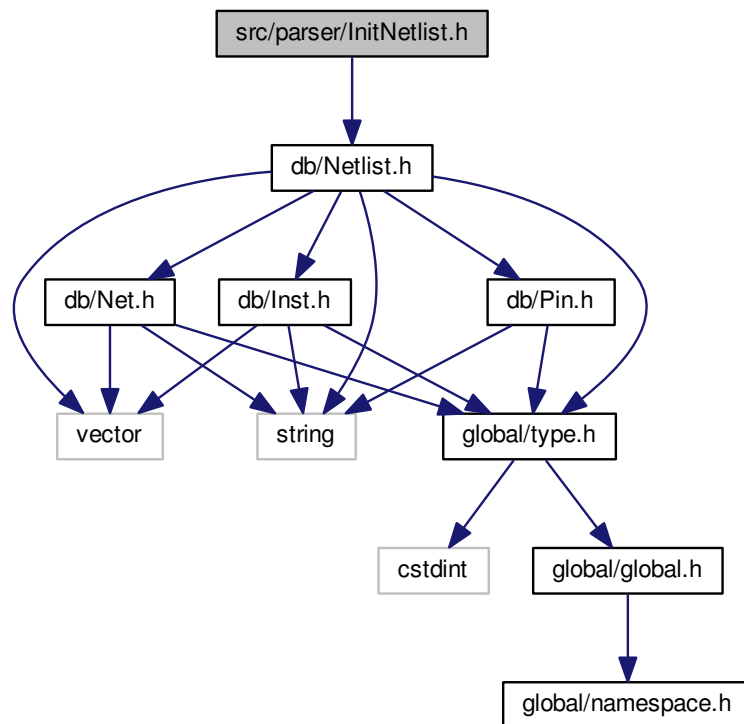
11/24/2018

4.18 src/parser/InitNetlist.h File Reference

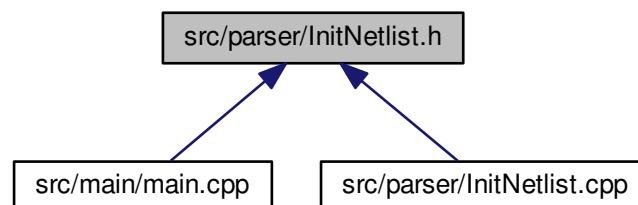
Parser to initialize netlist.

```
#include "db/Netlist.h"
```

Include dependency graph for InitNetlist.h:



This graph shows which files directly or indirectly include this file:



Classes

- class [InitNetlist](#)
InitNetlist class.

4.18.1 Detailed Description

Parser to initialize netlist.

Author

Mingjie Liu

Date

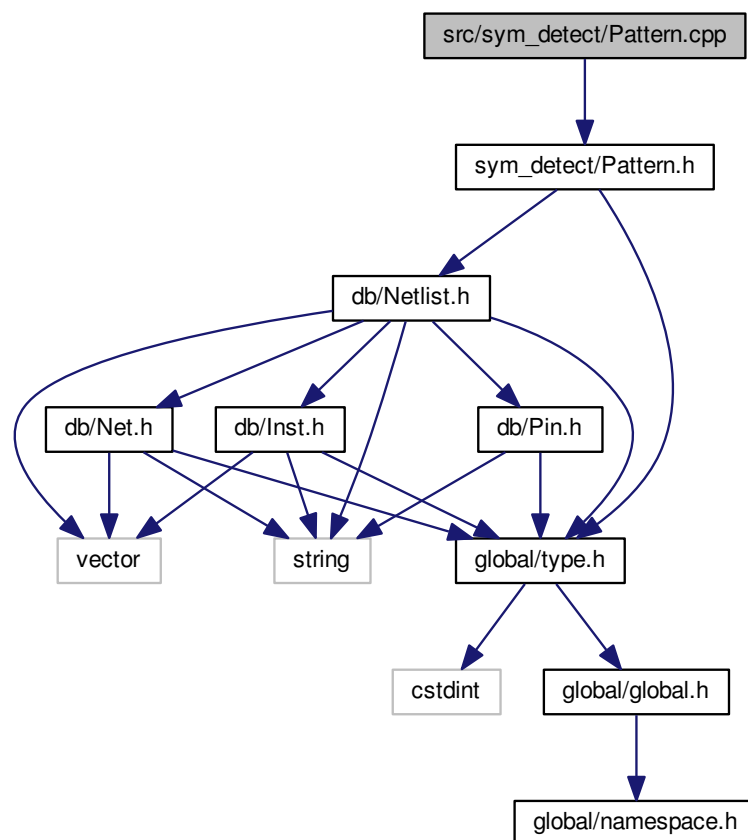
11/24/2018

Input file should follow same format generated through scripts/create_init_obj.py. The python scripts take standardized hspice/spectre netlist files as inputs. Sample input files for c++ are under benchmarks.

4.19 src/sym_detect/Pattern.cpp File Reference

[Pattern](#) definitions.

```
#include "sym_detect/Pattern.h"
Include dependency graph for Pattern.cpp:
```



4.19.1 Detailed Description

[Pattern](#) definitions.

Author

Mingjie Liu

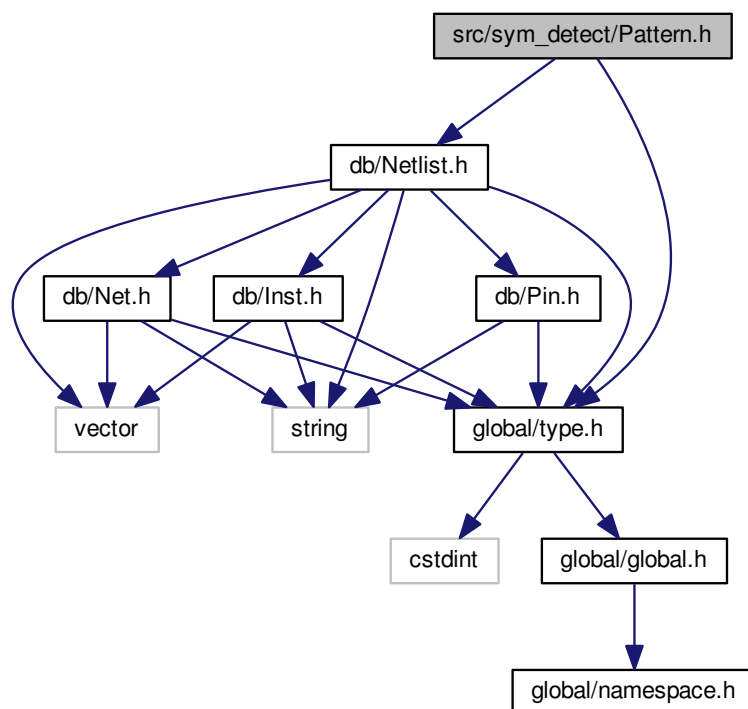
Date

11/24/2018

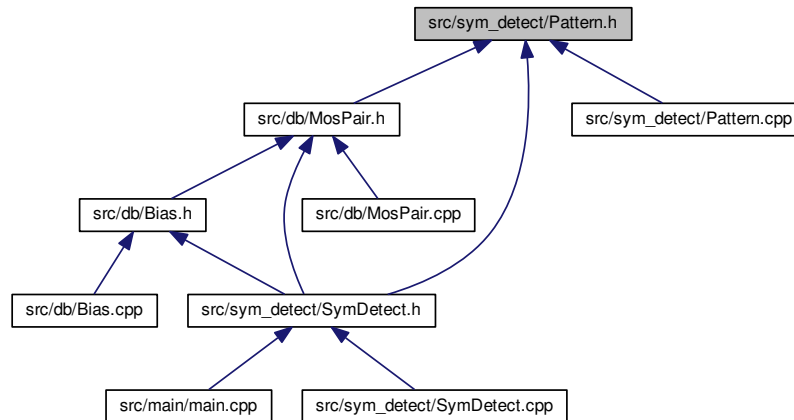
4.20 src/sym_detect/Pattern.h File Reference

Mosfet pair patterns.

```
#include "db/Netlist.h"  
#include "global/type.h"  
Include dependency graph for Pattern.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [Pattern](#)
Pattern class.

4.20.1 Detailed Description

Mosfet pair patterns.

This class has been augmented also to handle passive device matching and self symmetry mosfets. The name remains as legacy.

Author

Mingjie Liu

Date

11/24/2018

4.21 src/sym_detect/SymDetect.cpp File Reference

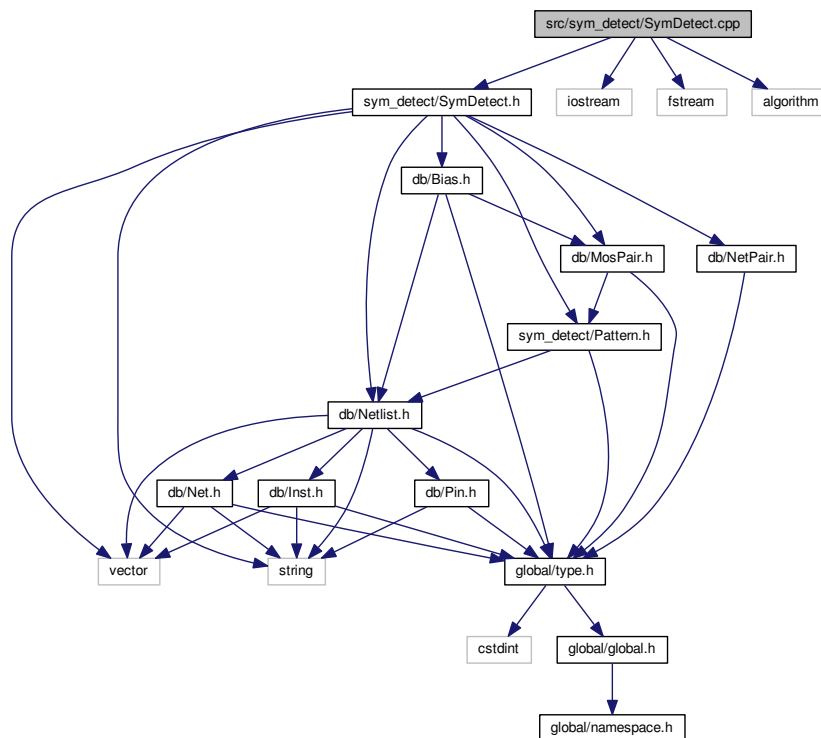
Detect symmetric patterns.

```
#include "sym_detect/SymDetect.h"
#include <iostream>
#include <fstream>
```



```
#include <algorithm>
```

Include dependency graph for SymDetect.cpp:



4.21.1 Detailed Description

Detect symmetric patterns.

Author

Mingjie Liu

Date

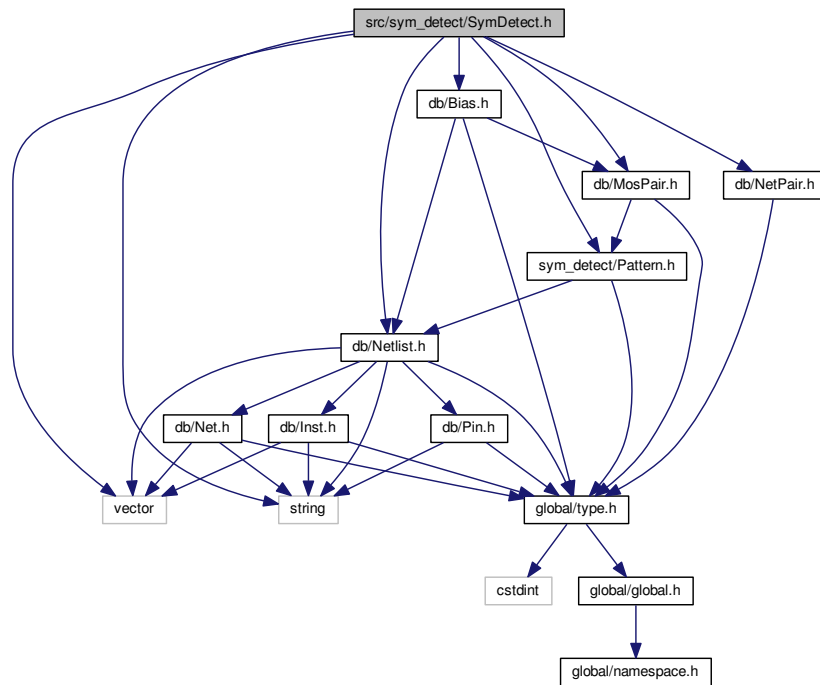
11/24/2018

4.22 src/sym_detect/SymDetect.h File Reference

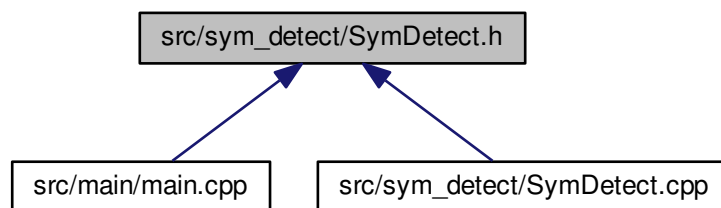
Detect symmetric patterns.

```
#include "db/Netlist.h"
#include "db/MosPair.h"
#include "db/NetPair.h"
#include "db/Bias.h"
#include "sym_detect/Pattern.h"
```

```
#include <vector>
#include <string>
Include dependency graph for SymDetect.h:
```



This graph shows which files directly or indirectly include this file:



Classes

- class [SymDetect](#)
SymDetect class.

4.22.1 Detailed Description

Detect symmetric patterns.

Author

Mingjie Liu

Date

11/24/2018

Index

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- `_biasGroup`
 - `SymDetect`, [56](#)
- `_driver`
 - `Bias`, [7](#)
- `_flatPair`
 - `SymDetect`, [56](#)
- `_id`
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