PhoeniX Software
Solutions for Micro and Nano Technologies

PDAFlow Foundation
The emerging standard for electronics, photonics and fluidics

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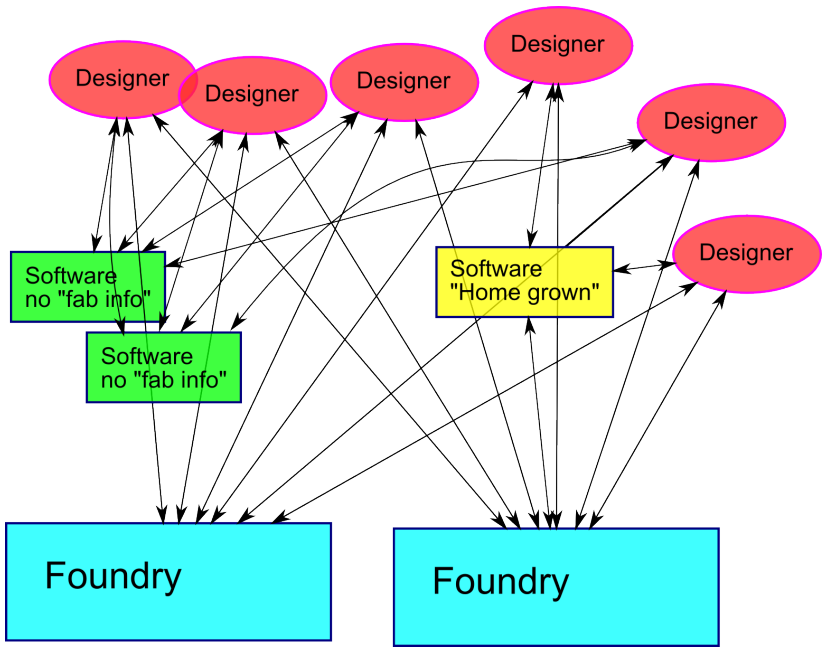
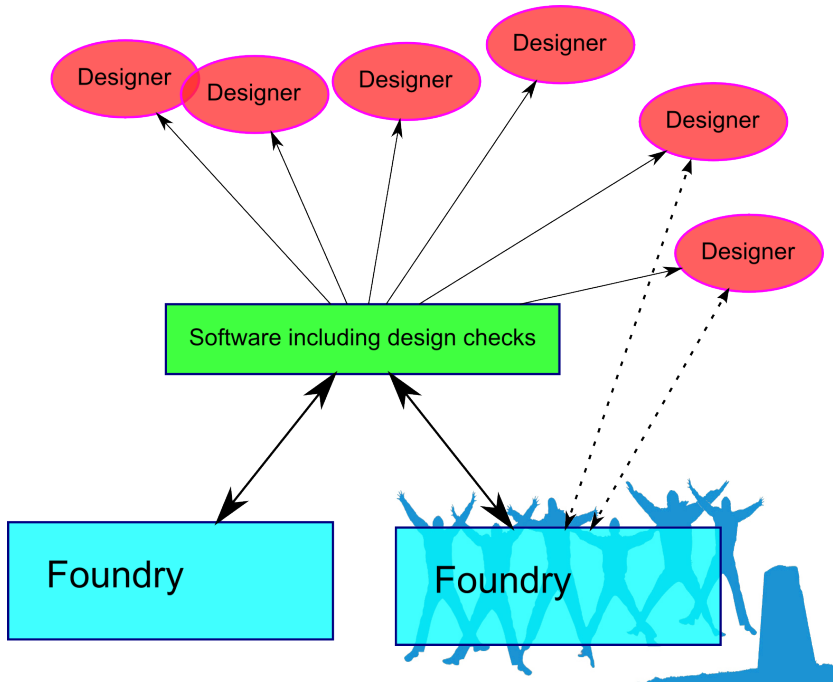
Plat4M and SPTAB meeting
Brussel

Standardization
Objectives



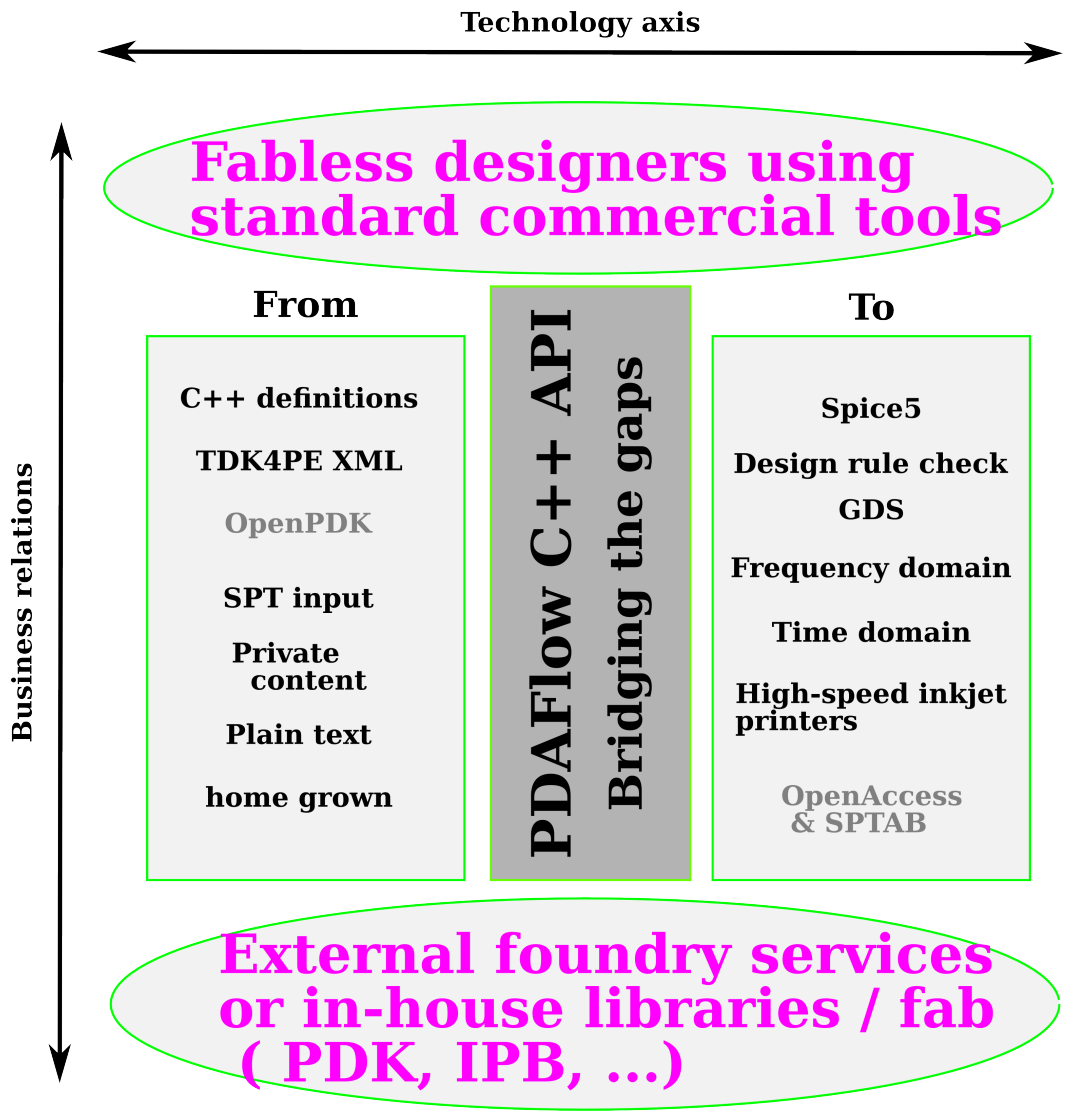
- Large variety of software
- Results in
  - high cost
  - incompatible libraries
  - data transfer errors
  - Nomenclature inconsistencies

- Standardize design flow
- Interoperate software
- Maintain advantages of each method / software
- Simplify training



STANDARDIZATION & KEEPING FOCUS

DUAL-AXIS MODEL



Non traditional

- CMOS
- Manhattan

Add

- Functionality
- Variability
- Multi-domain physics

Objectives & development

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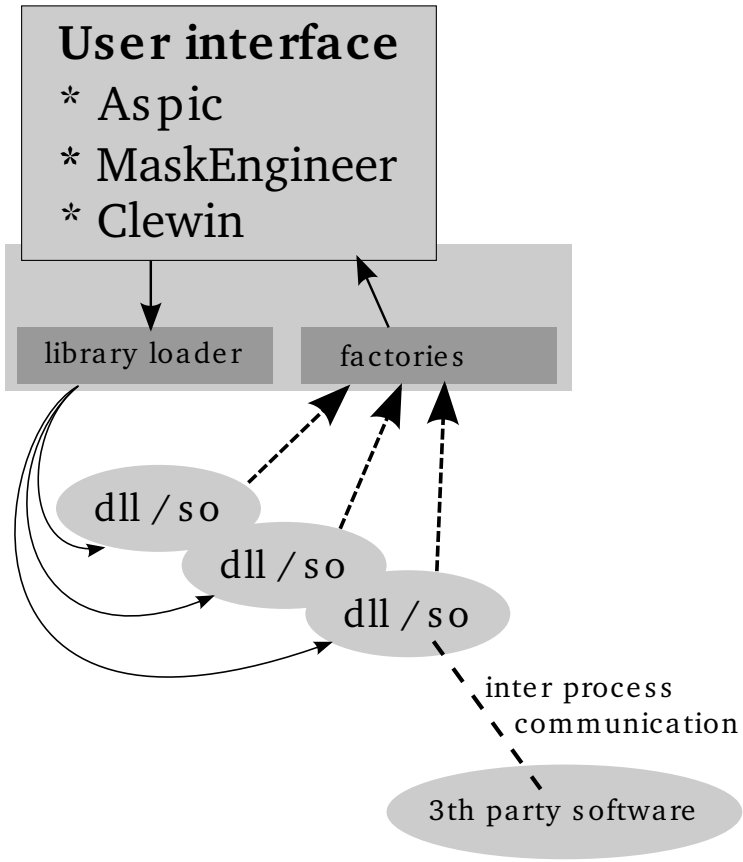
- Allow (photonics) software co-operation
- Single "foundry" definition in PDK
- Support IP-blocks
- "Plug-in" libraries
- Extend software capabilities using eg. co-simulation, mask layout post processing
- API defined in ("basic") C++
- Joint development via SubVersion (svn)
- STICHTING PDAFLOW FOUNDATION



Objective
Software & integration

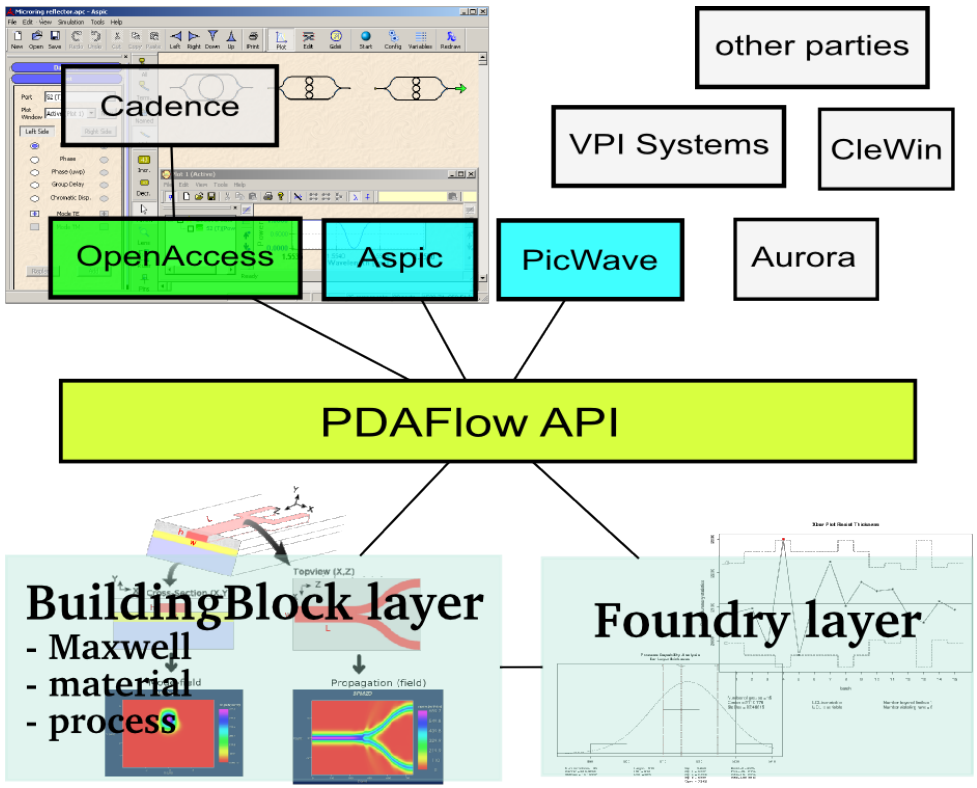
Solutions for Micro and Nano Technologies

Focus on design

- Simulation
- Mask layout
- Documentation (including legal aspects)

Using

- Integration via C++ API
- Building block
- Netlist
- Foundry
  - Process flow
  - Crosssection



Functionality
Typical tools

- Main focus is `functionality'
  - Building block and technology definition (PDK)
    Input: OptoDesigner spt, TDK4PE xml, C++, ...
  - Schematic capture & optical circuit simulation (Aspic, ComponentMaker, InterConnect, PicWave)
  - Functional & geometric design rule check (OptoDesigner)
  - Physical layer solvers like optical mode solvers, propagation; RF (FIMMPROP, OptoDesigner)
  - Mask layout generation (CleWin, OptoDesigner)
- ≈ Design file persistance in binary and ascii format
- ⩾ Link with OpenAccess in Plat4M

KEY CLASSES

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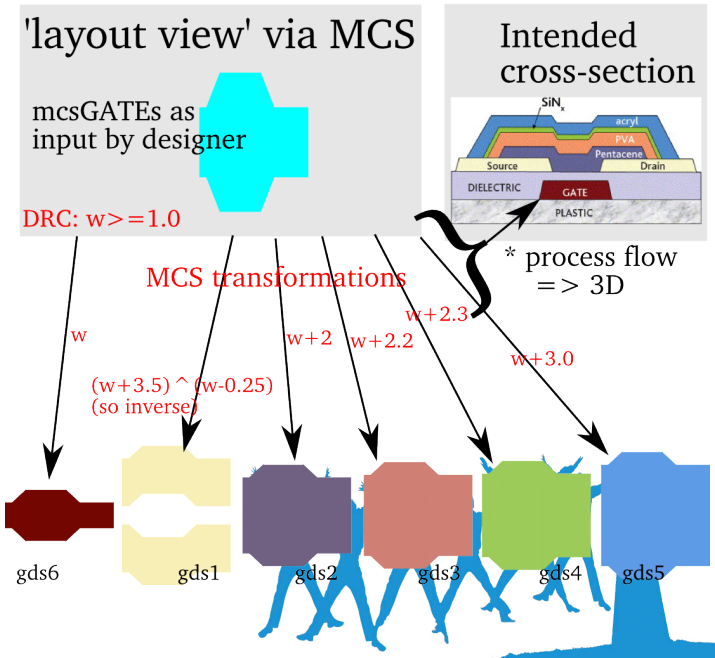
- Using the "Model View Controller" concept
- Content = "attributes" (data) + "VIEW"
- API defines COMPONENT's

BB	models, design rules, layout
NETLIST	BB's + connections + attributes
FOUNDRY	mask layers, technology
PROCESSFLOW	"parametric" crosssection
CROSSSECTION	technology (substrate) model



API: Data & View

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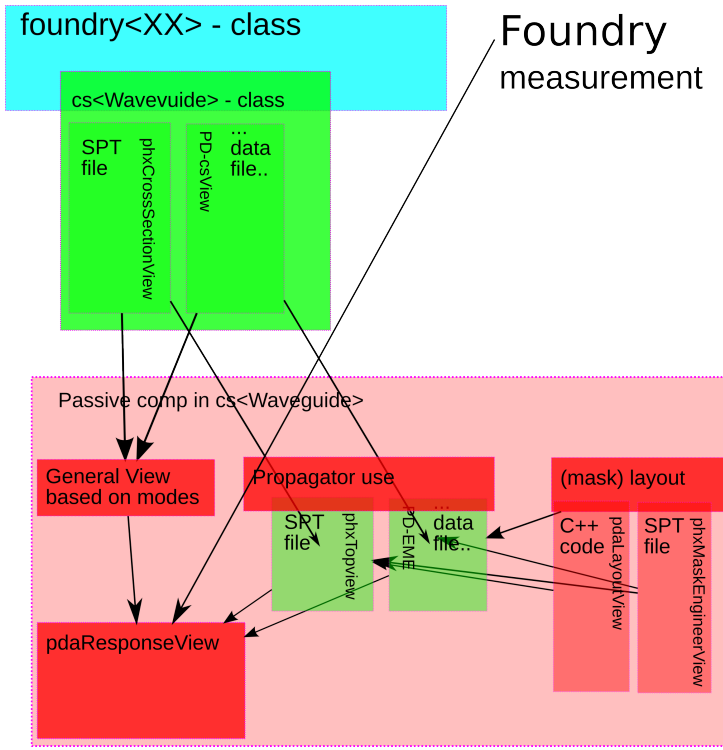
Data Describes the component "fully"

- length, width, technology for a straight
- application independent
- can include valid ranges and distribution

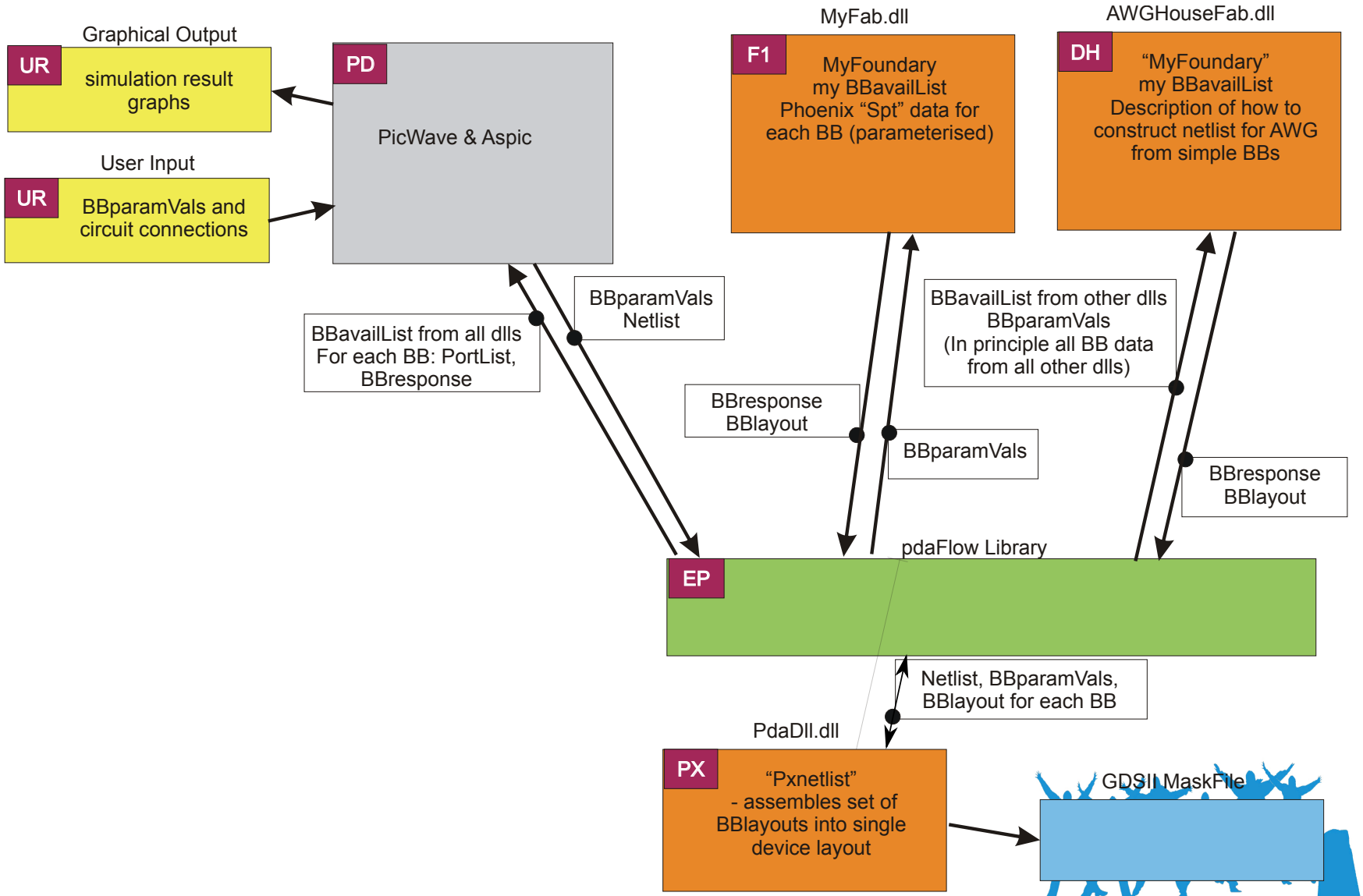
View Use the component to do something; eg. "simulate" or "layout"

- View's can have data too
  - grid settings a modelling view
- View's can access the 'owner' (bb, netlist, . . .)
  - Use *length* from the BB
  - Use modesolver *view* on the technology



PDAFlow overview

PDAFlow API as center point



SOURCE SAMPLE
BB DEFINITION

```
class myStraight : public BB {
public:
 pda::String getName() const {return "myStraight";}
public:
 /// Construct
 myStraight(const Foundry* f)
  : BB(f) {
  // Ports
  addPort("in0",pda::EnumList::Optics);
  addPort("out0",pda::EnumList::Optics);
  // Variables
  addAttribute(new Value<pda::Double>("Width",1.5));
  addAttribute(new Value<pda::Double>("Length",100.)
   );
  }
 };
```

SOURCE SAMPLE
MAIN PROGRAM

```
PDAMAIN(argc,argv) {
 pdaInit_setVersion("10");pdaInit_pdaview();
 // Register local BB
 BB::Register<myStraight>();

 // Create the DemoFab.
 if(Foundry* f=Foundry::create("DEMOFAB")) {
   if(BB* bb=BB::create(f,"myStraight")) {
     bb->setDouble("Width",200.);
     pdaCout()<<"Works - BB definition is ready!\n";
     }
   else pdaCout()<<"--myStraight not available\n";
   }
 else pdaCout()<<"--Demofab not available\n";
 //called from PDAMAIN: pdaShowCoutMsg();
 return 0;
```

SOURCE SAMPLE
ADDING A DOC-VIEW

```
class myStraight : public BB,public BBDocView {
public:
 pda::String getName() const {return "myStraight";}
 //-- BBDocView interface --
 pda::String docAuthor() const {
  return "Me!";
  }
 pda::String docVersion() const {
  return "Alpha.";
  }
public:
 /// Construct
 myStraight(const Foundry* f)
  : BB(f),BBDocView(this) {
```

SPICE SIMULATION
ADDING THE VIEW

```
class myStraight : public BB,public phxBBSpiceView {
public:
 pda::String getName() const {return "myStraight";}
 //-- phxBBSpiceView interface --
 void spice_model(std::ostream& os,std::set<pda::
   String>* bbDone) {
  phxBBSpiceView::spice_model(os,bbDone);
  os<<".subckt peSourceAC";
  spice_model_args(os);
  os<<"  V1 out0 gnd AC {Length} SIN(0 {Length} {
   Width})\n"
      ".ends\n\n";
  }
public:
 /// Construct
 myStraight(const Foundry* f)
```

SPICE SIMULATION
USING THE VIEW

```
if(Foundry* f=Foundry::create("DEMOFAB")) {
  if(BB* bb=BB::create(f,"myStraight")) {
    bb->setDouble("Width",200.);
    pdaCout()<<"Works - BB definition is ready!\n";
    if(phxBBSpiceView* vw=bb->getView<
  phxBBSpiceView>()) {
     pdaCout()<<"\n\n----\nSpice view:\n";
     vw->spice_model(pdaCout(),NULL);
     }
    }
  else pdaCout()<<"--myStraight not available\n";
  }
```

DemoFab concept

Where will it produce. . .

- Used for development within PhoeniX Software and by partners
- Demonstrates main concepts using *non NDA / project* information; thus fully open
- As extensive example
  - Designkit, file structure, . . .
  - Mask layout BB's
  - IPBlocks
  - Packaging templates
  - Using a wide variety of Views
  - ≈ Crosssection simulation
  - ≈ Process flow simulation
  - ⩾ Topview / propagation simulation
  - ⩾ Link with PhoeniX `Living Database`
- Or as base for a designkit (by removing a lot)
- Source available for users on svn server