
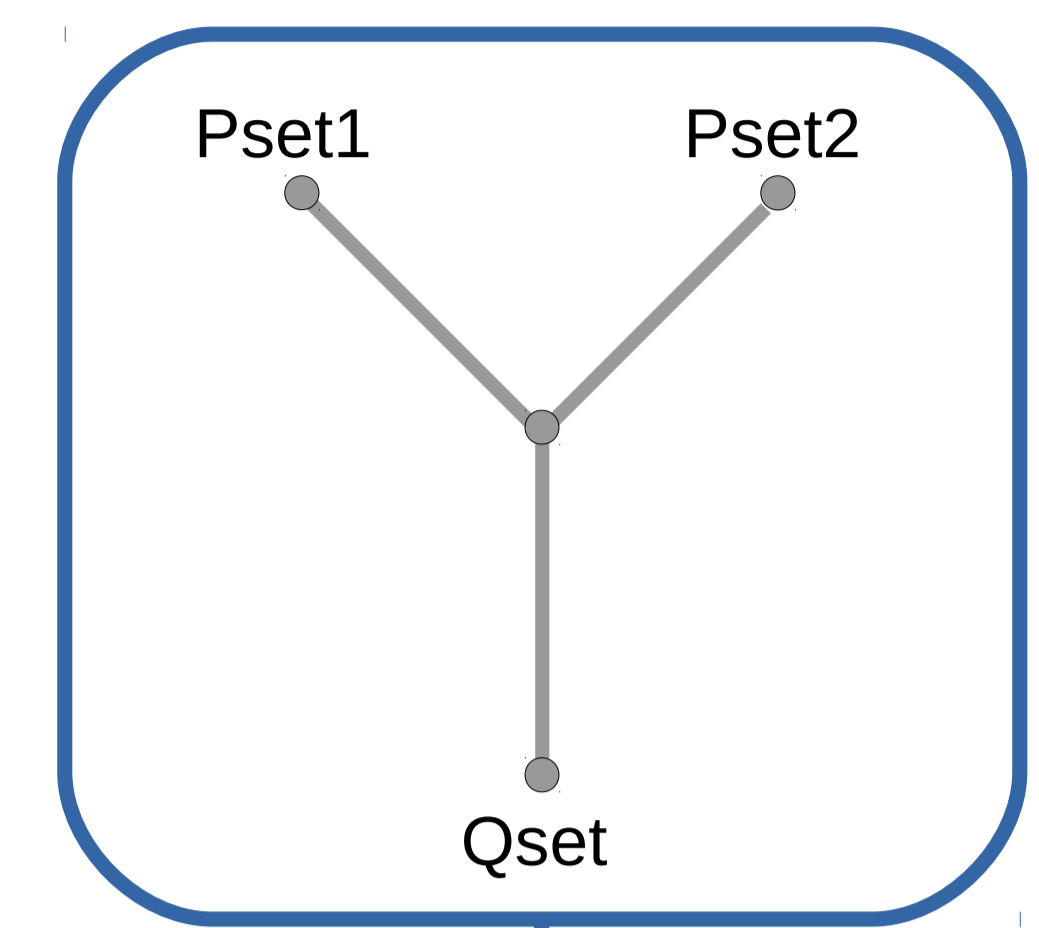


MYNTS Translator

- Part of **MYNTS**  : Multi-phYsics NeTwork Simulator
- Developed by Fraunhofer SCAI: Institute for Algorithms and Scientific Computing
- Formulation of network problems as translation between two Domain Specific Languages (DSL)
- DSL1: a network description language, used by network simulation community (e.g., NetList)
- DSL2: a problem description language, understood by generic non-linear solvers (e.g., IPOPT, AMPL, Mathematica, Matlab, ...)

Example 1: water network



GUI

Translation model for water networks with laminar flow (TM)

```
# variables with start values
class=n, var=P, var0=1
class=e, type=p, var=Q, var0=0

# Kirchhoff law
class=n, type=demand, eq="[sumadj][Q]"
class=n, type=qset, eq="[sumadj][Q]-[qset]"
class=n, type=pset, eq="[P]-[pset]"

# equations of elements (linear resistors)
class=e, type=p,
eq="[P@node1]-[P@node2]-[R]*[Q]"
```

&

Water network description (NET)

```
# nodes
class=n,name=n1,type=pset,pset=7
class=n,name=n2,type=pset,pset=5
class=n,name=n3,type=demand
class=n,name=n4,type=qset,qset=30
# edges
class=e,name=p1,type=p,node1=n1,node2=n3,R=0.3
class=e,name=p2,type=p,node1=n2,node2=n3,R=0.05
class=e,name=p3,type=p,node1=n3,node2=n4,R=0.1
```

MYNTS Translator

Water network problem description (PRO)

```
7 7 #nvars,neqs
v0-7 #eq0
v1-5 #...
v4+v5-v6
v6-30
v0-v2-0.3*v4
v1-v2-0.05*v5 #...
v2-v3-0.1*v6 #eq6
```

Encoding table

+	o0
-	o1
*	o2
neg	o16
sum	o54
...	

PPNenc

The same encoded in Polish prefix notation (PPN)

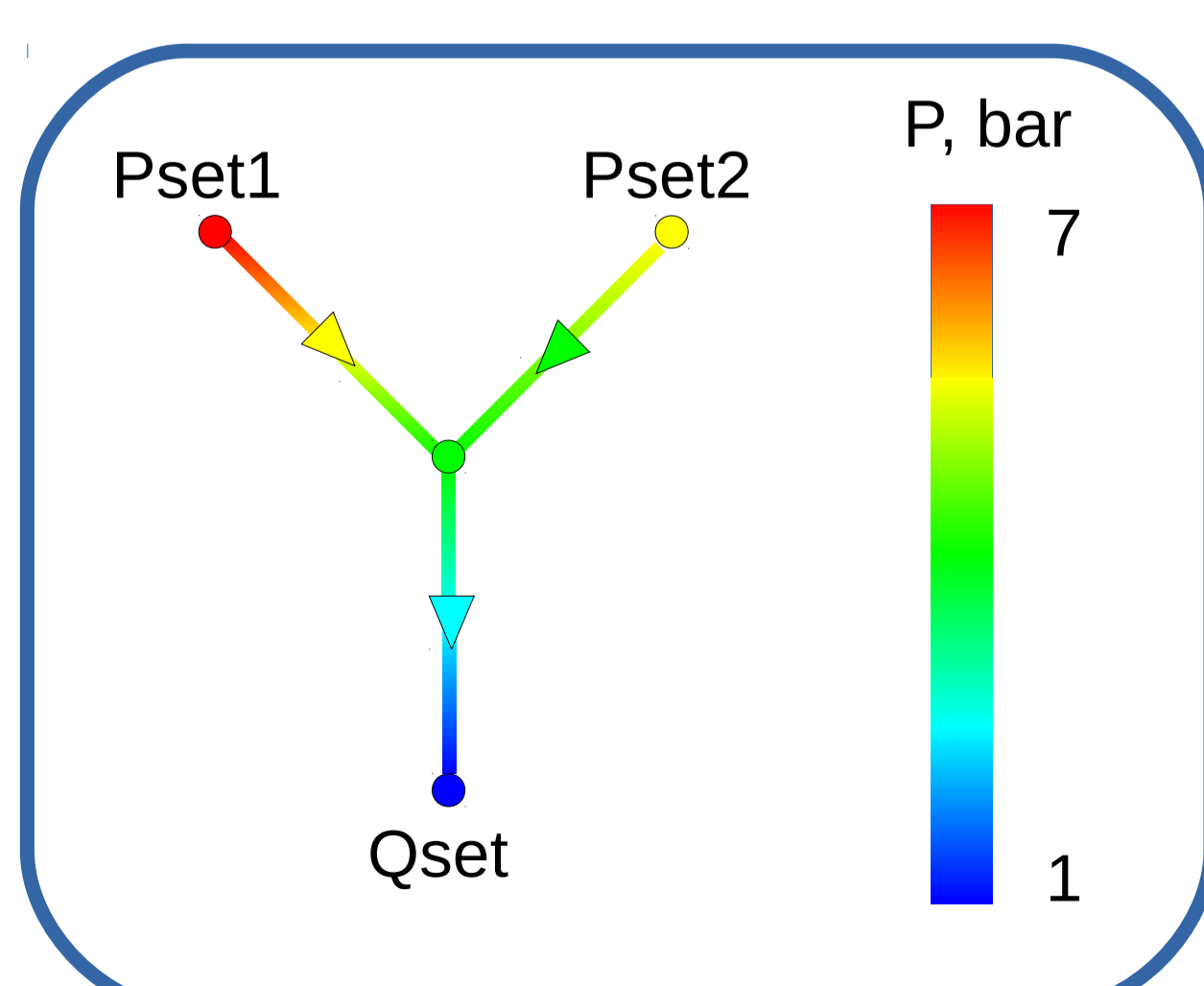
```
7 7 #nvars,neqs
o1 v0 n7 #eq0
o1 v1 n5 #...
o54 3 v4 v5 o16 v6
o1 v6 n30
o1 o1 v0 v2 o2 n0.3 v4
o1 o1 v1 v2 o2 n0.05 v5 #...
o1 o1 v2 v3 o2 n0.1 v6 #eq6
```

IPOPT

Solution

```
name=n1,P=7
name=n2,P=5
name=n3,P=4
name=n4,P=1
name=p1,Q=10
name=p2,Q=20
name=p3,Q=30
```

GUI



Example 2: realistic gas transport networks, performance tests

network	nodes	edges	translation, sec	solution, sec
N1	100	111	0.04	0.02
N2	931	1047	0.15	0.24
N3	4466	5362	0.39	0.42

(timing for 3 GHz Intel i7 CPU 8 GB RAM workstation)