# Truffaldino & Smeraldina

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# Contents

- General description and Features
- Improvements to Truffaldino
- Tutorial on using Smeraldina
- Some examples on using Smeraldina

- Running program can be shown during discussion or breaks

# System Layout

- basis
  - analytical formulae for probes, power supply, ...
  - multipole presentation of magnetic fields
  - numerical methods only if required (e.g. integrator)
- for each object more  than one model e.g:  ConstantPowerSupply, RampingPowerSupply

- Implemented in Python http://www.python.org
- Object Oriented
- Extendable

- originally for rotating coil probs in DC magnets
- extended to static/rotating probes in AC magnets
- could be extended for Hall Probes, SSW, ...

# Package Layout

- Truffaldino: The object library which allows to model the system
- Smeraldina: The graphical interface
- MTALib: The analysis library originally developed by L. Deniau.
  Adapted for the simulation requirements.

Package License : GPL

External Packages:

- matplotlib for plotting
- nodenet for Simple Visual Programming Interface
- wxpython for GUI

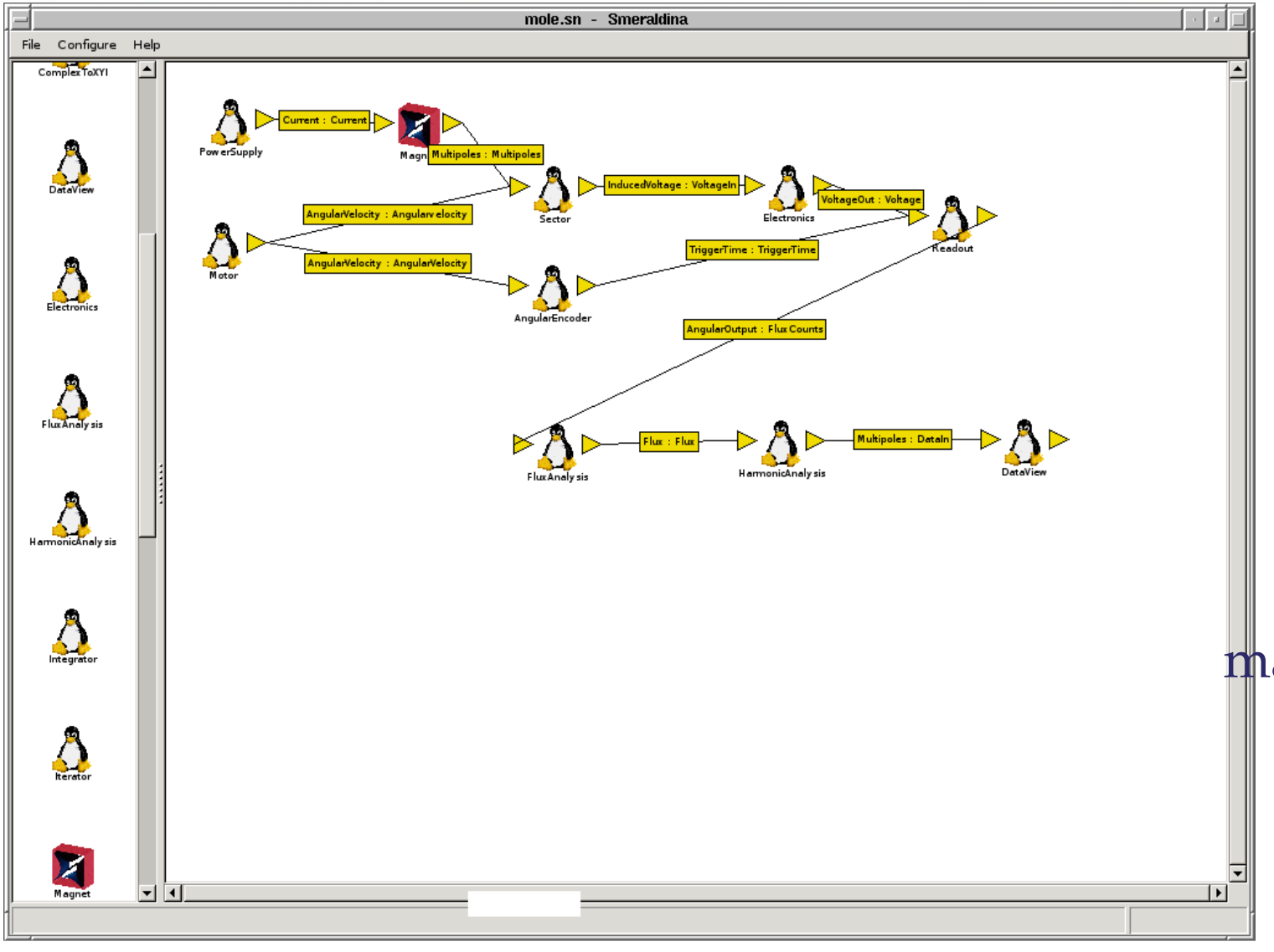
# Truffaldino Improvements

- Analysis Objects
  Flux
  Harmonics

- Reimplementation of CPU intensive tasks in C

- Ramping Magnets  plus Support  Objects

# Main Window




main window
nodes list
node net

# Configuring Objects



- "Visual Programming Environment" : necessary for the flexibility
  - left pane:  different nodes
  - right pane: "network" shows dataflow

- mouse buttons:
  - left:

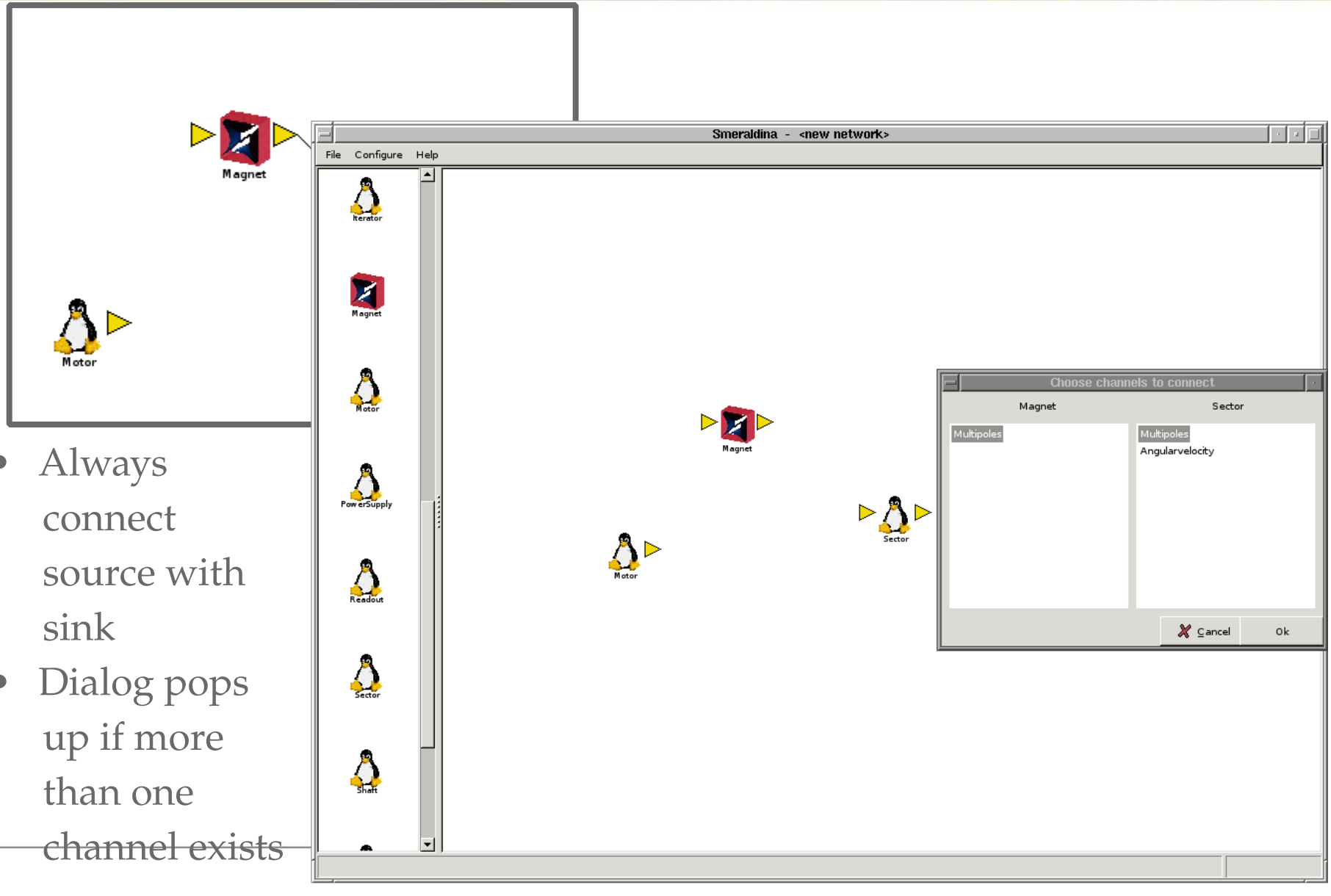
    drag and drop (from left to right)

    arrange nodes
  - right:

    single click: object summary

    double click: configuration for the object

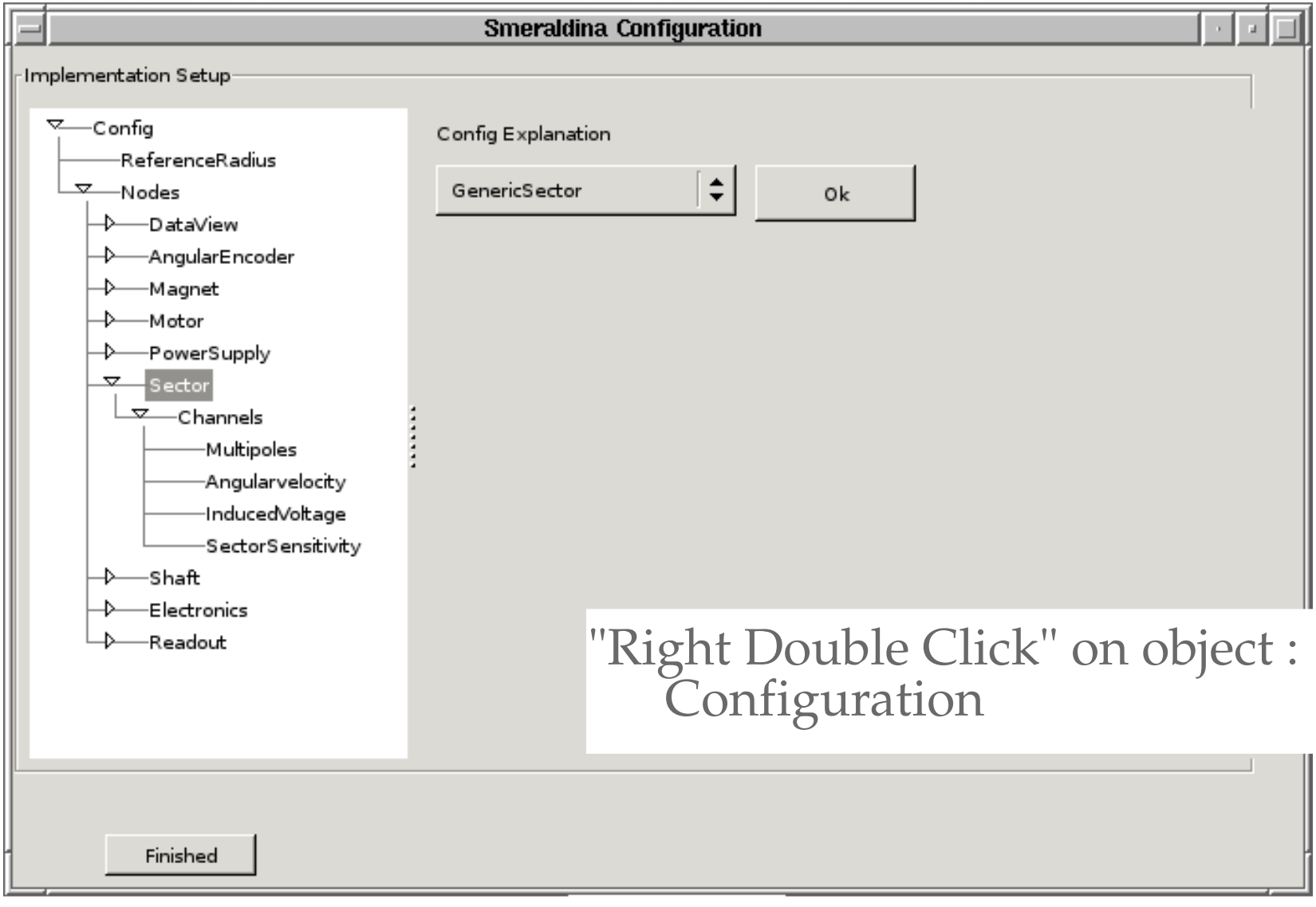
# Connecting Objects




- Always connect source with sink
- Dialog pops up if more than one channel exists

# Configuring Objects

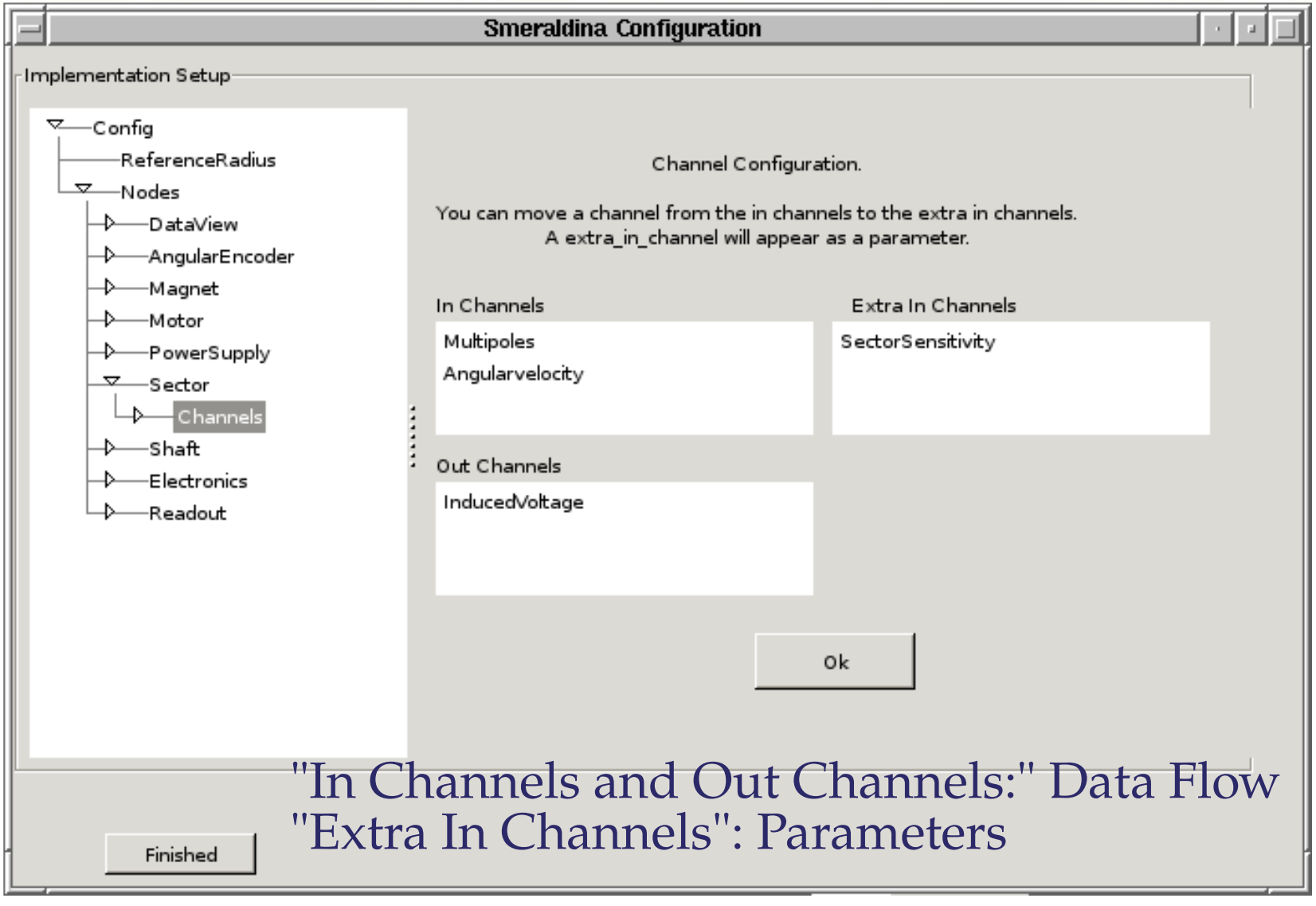





"Right Double Click" on object : Configuration

# Configuring Objects

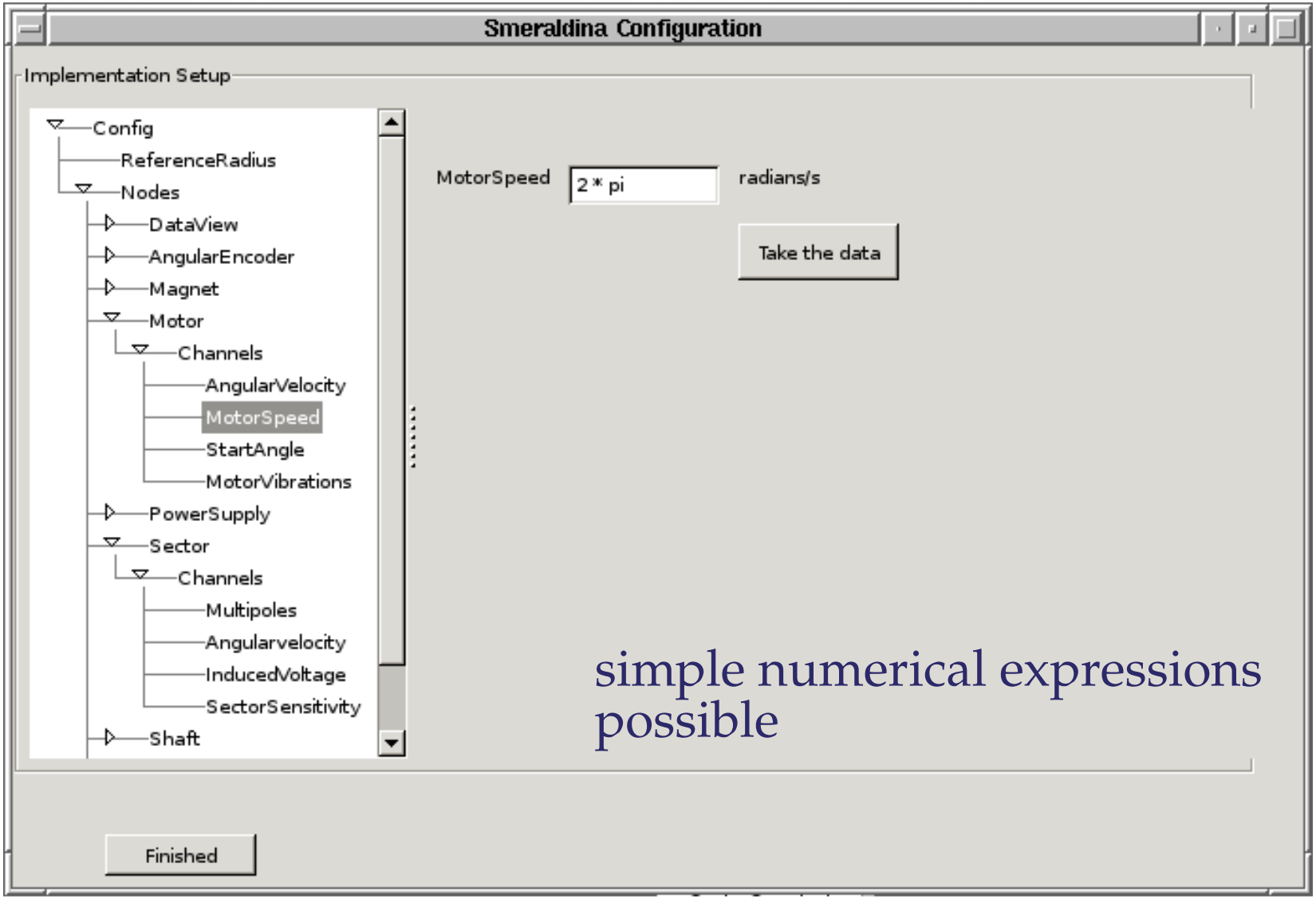





"In Channels and Out Channels:" Data Flow
"Extra In Channels": Parameters

# Configuring Objects

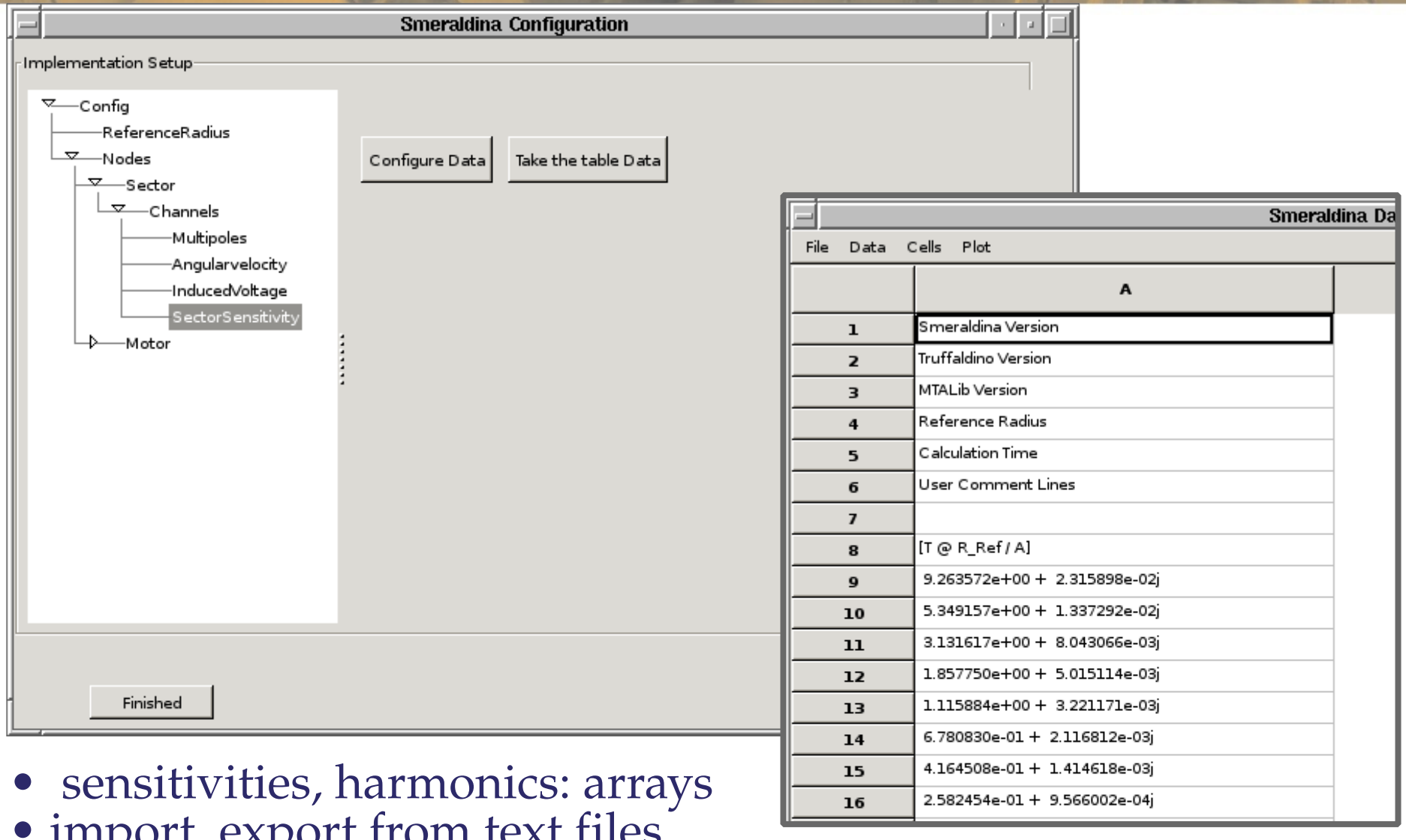
III / IV




simple numerical expressions possible

# Configuring Objects

IIII/IV

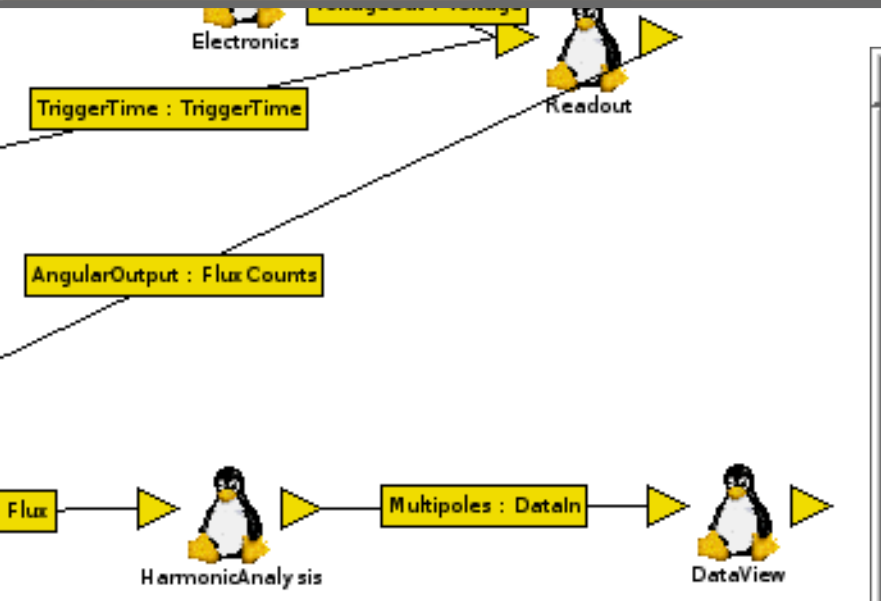



| | A |
|---|---|
| 1 | Smeraldina Version |
| 2 | Truffaldino Version |
| 3 | MTALib Version |
| 4 | Reference Radius |
| 5 | Calculation Time |
| 6 | User Comment Lines |
| 7 | |
| 8 | [T @ R_Ref / A] |
| 9 | 9.263572e+00 + 2.315898e-02j |
| 10 | 5.349157e+00 + 1.337292e-02j |
| 11 | 3.131617e+00 + 8.043066e-03j |
| 12 | 1.857750e+00 + 5.015114e-03j |
| 13 | 1.115884e+00 + 3.221171e-03j |
| 14 | 6.780830e-01 + 2.116812e-03j |
| 15 | 4.164508e-01 + 1.414618e-03j |
| 16 | 2.582454e-01 + 9.566002e-04j |

- sensitivities, harmonics: arrays
- import, export from text files

# Calculation






Double Left Click on "DataView" opens spread-sheet

- Data Export
- Data Import

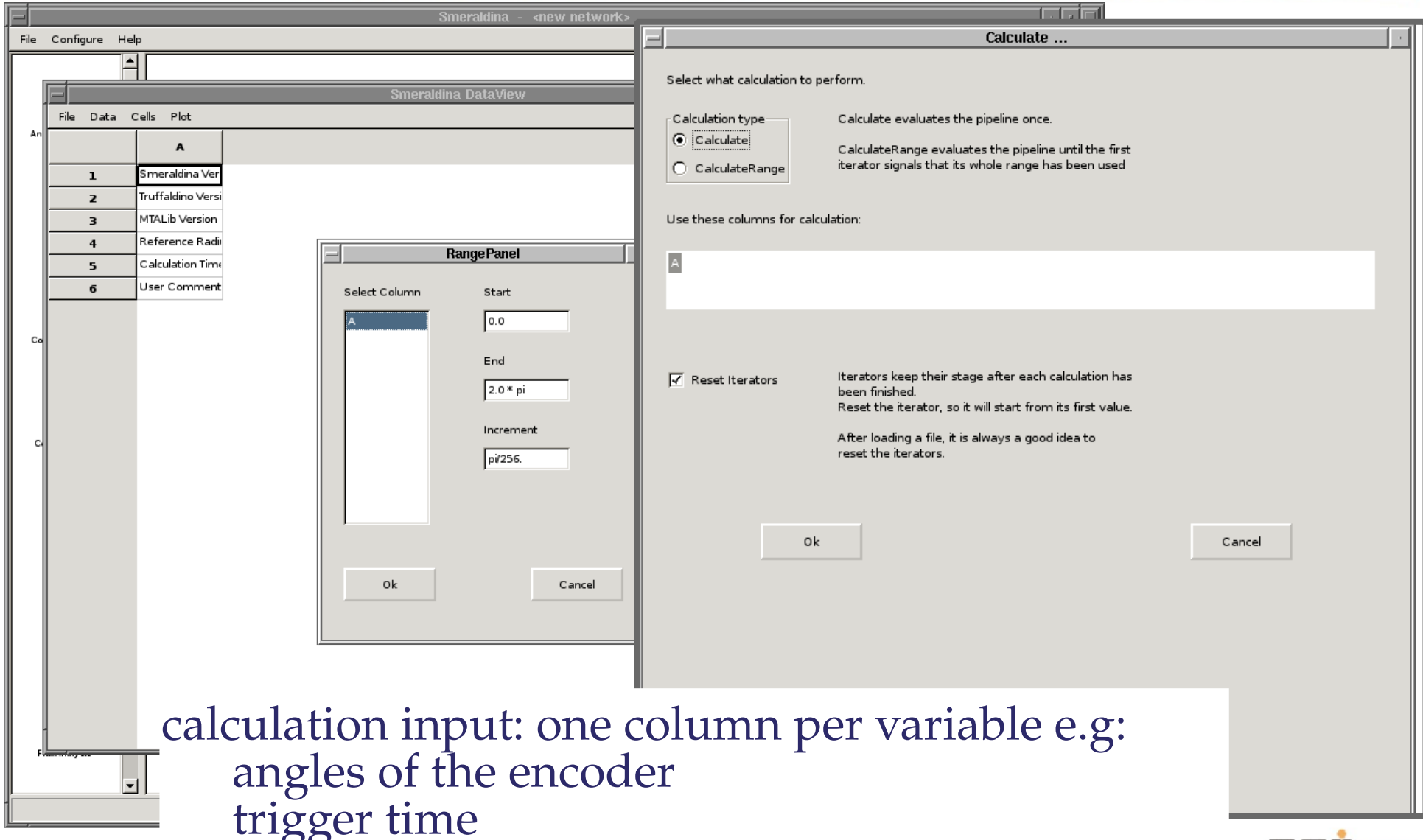
Smeraldina D

File Data Cells Plot

| | A | B | C | D |
|---|---|---|---|---|
| 1 | Smeraldina Ver | 0.0.0 | | |
| 2 | Truffaldino Versi | 0.1.0 | | |
| 3 | MTALib Version | 0.1.0 | | |
| 4 | Reference Radi | 25.0 | mm | |
| 5 | Calculation Time | Sun Jun 22 18:0 | | |
| 6 | User Comment | 0 | | |
| 7 | 0.000000e+00 | 3.906250e-03 | 0.000000e+00 | 1.039552e-04 |
| 8 | 1.227185e-02 | 3.906250e-03 | 1.227185e-02 | 2.766174e-04 |
| 9 | 2.454369e-02 | 3.906250e-03 | 2.454369e-02 | 4.491131e-04 |
| 10 | 3.681554e-02 | 3.906250e-03 | 3.681554e-02 | 6.213382e-04 |
| 11 | 4.908739e-02 | 3.906250e-03 | 4.908739e-02 | 7.931890e-04 |
| 12 | 6.135923e-02 | 3.906250e-03 | 6.135923e-02 | 9.645620e-04 |
| 13 | 7.363108e-02 | 3.906250e-03 | 7.363108e-02 | 1.135354e-03 |
| 14 | 8.590292e-02 | 3.906250e-03 | 8.590292e-02 | 1.305462e-03 |
| 15 | 9.817477e-02 | 3.906250e-03 | 9.817477e-02 | 1.474784e-03 |
| 16 | 1.104466e-01 | 3.906250e-03 | 1.104466e-01 | 1.643217e-03 |

# Calculation






calculation input: one column per variable e.g:

- angles of the encoder
- trigger time

# Calculation



Smeraldina DataView

File Data Cells Plot

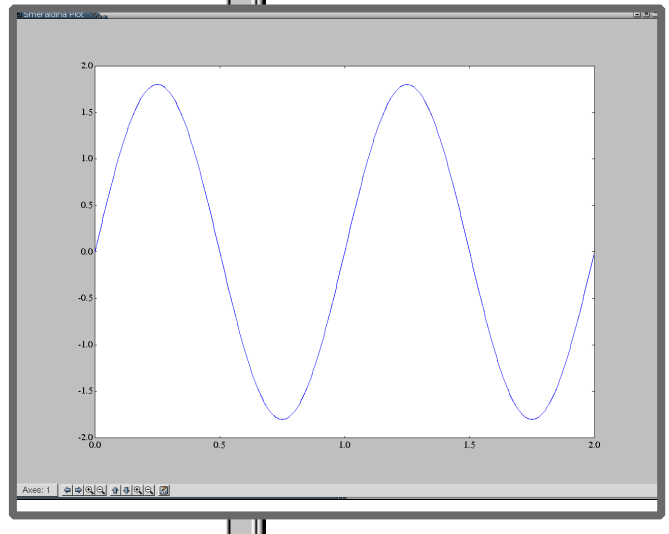
| | A | B | C |
|---|---|---|---|
| 1 | Smeraldina | 0.0.0 | |
| 2 | Truffaldino | 0.1.0 | |
| 3 | MTALib Ve | 0.1.0 | |
| 4 | Reference | 25.0 | mm |
| 5 | Calculation | Mon Sep 1 | |
| 6 | User Com | 0 | |
| 7 | 0.000000e | 0.000000e | 4.504199e |
| 8 | 3.906250e | 3.906250e | 4.871819e |
| 9 | 7.812500e | 7.812500e | 9.290283e |
| 10 | 1.171875e | 1.171875e | 1.370315e |
| 11 | 1.562500e | 1.562500e | 1.810777e |
| 12 | 1.953125e | 1.953125e | 2.250147e |
| 13 | 2.343750e | 2.343750e | 2.688162e |
| 14 | 2.734375e | 2.734375e | 3.124558e |
| 15 | 3.125000e | 3.125000e | 3.559072e |
| 16 | 3.515625e | 3.515625e | 3.991442e |
| 17 | 3.906250e | 3.906250e | 4.421408e |
| 18 | 4.296875e | 4.296875e | 4.848711e |
| 19 | 4.687500e | 4.687500e | 5.273092e |
| 20 | 5.078125e | 5.078125e | 5.694298e |
| 21 | 5.468750e | 5.468750e | 6.112073e |

RangePanel

Select Columns to plot

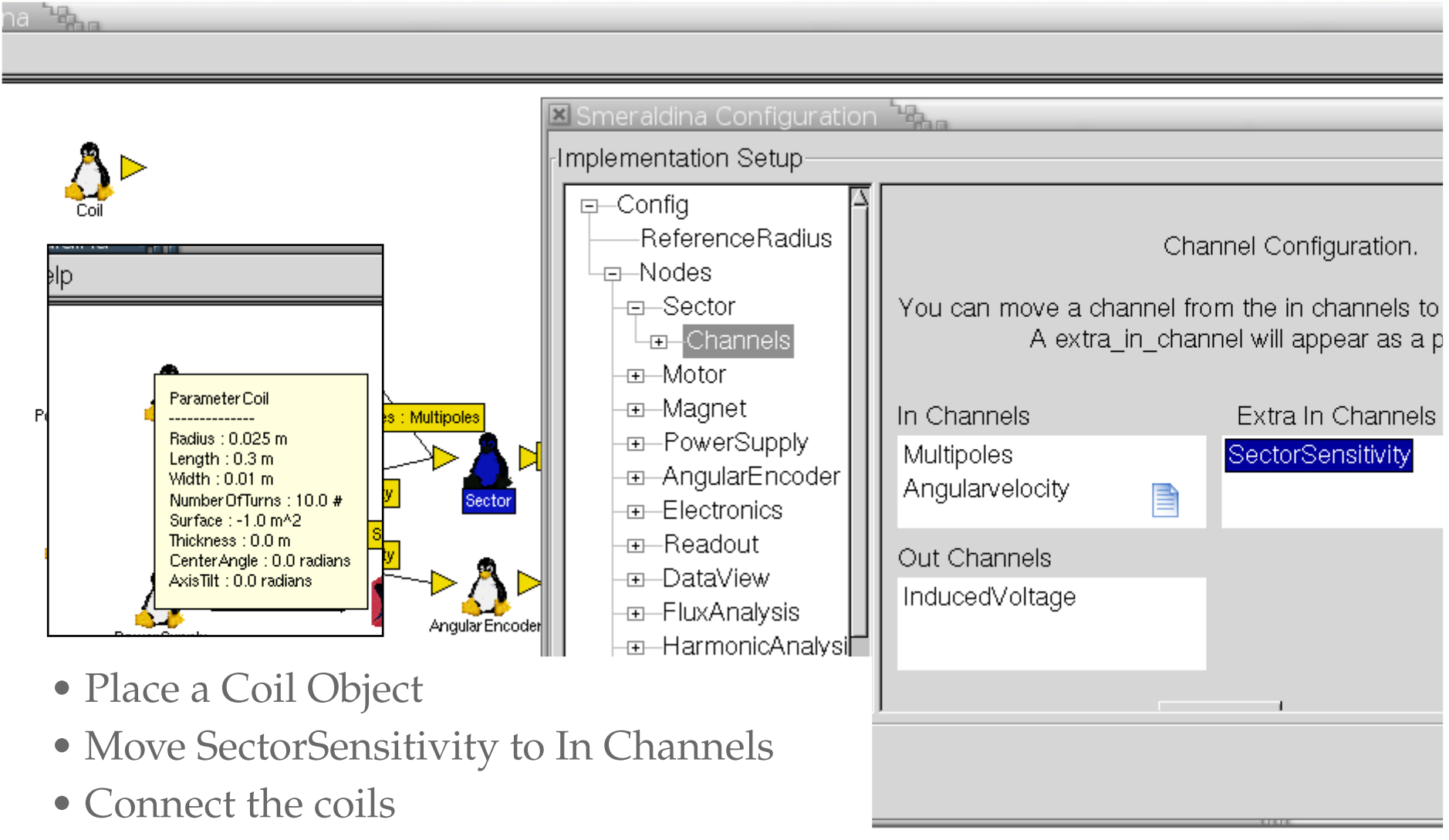
A
B
C

Ok Cancel



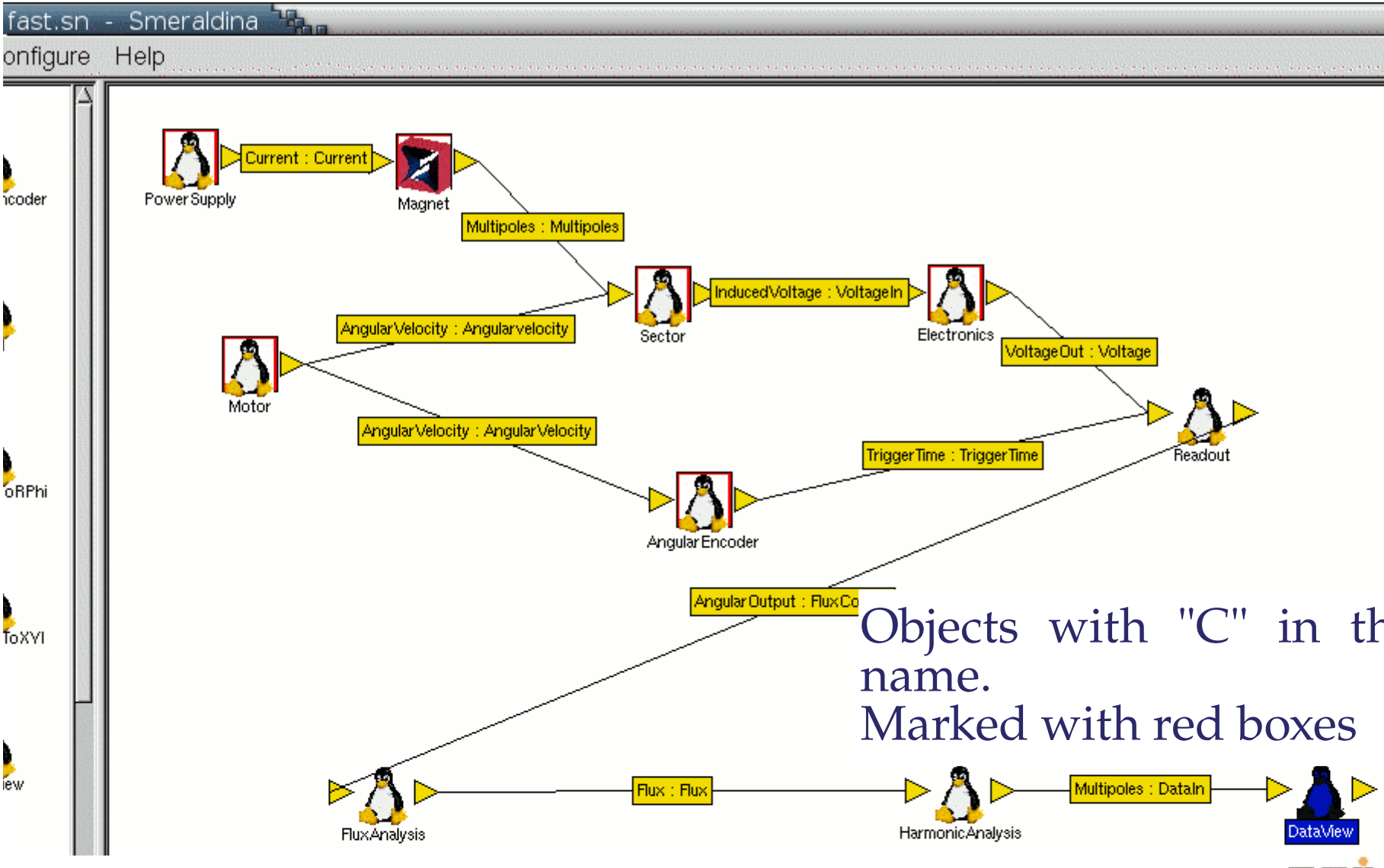
- Mark Columns and Plot them
- Only real values
  - Not Harmonics

# Coil Parameters




- Place a Coil Object
- Move SectorSensitivity to In Channels
- Connect the coils

# Accelerated Objects




Objects with "C" in the name.
Marked with red boxes

# Conclusion

- Short description of the Software
- Tutorial on using Smeraldina

- Further Information at http://truffaldino.sourceforge.net