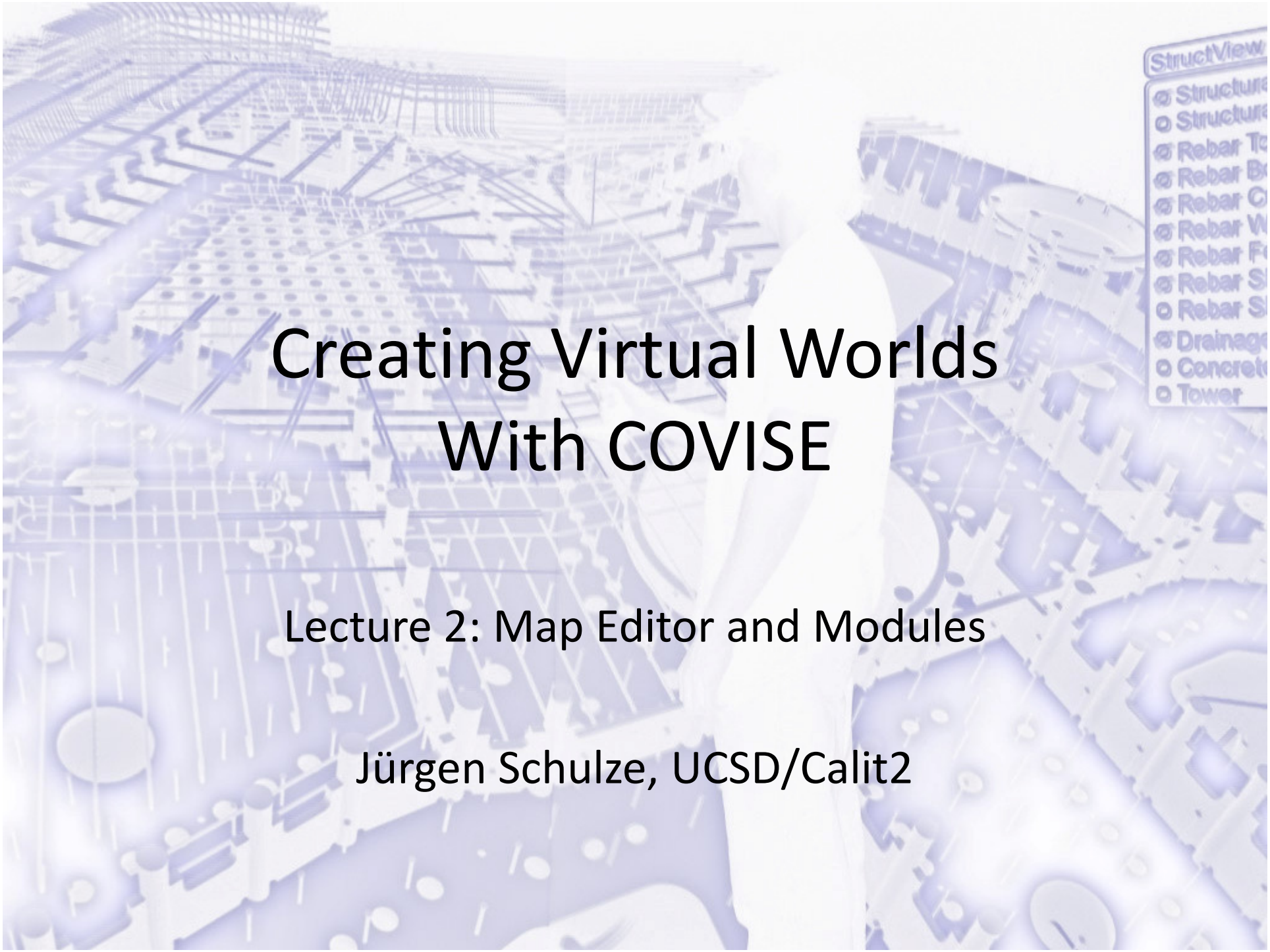



# Creating Virtual Worlds With COVISE

Lecture 2: Map Editor and Modules

Jürgen Schulze, UCSD/Calit2

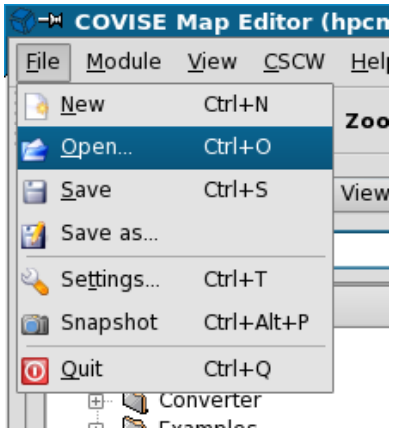
# Course Overview

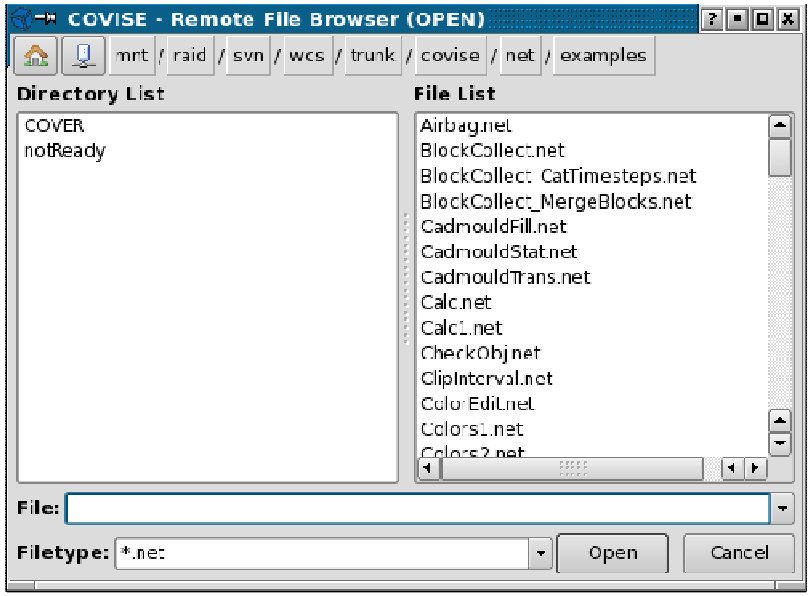
- Lecture 1: COVISE Overview
- Lecture 2: Map Editor and Modules
- Lecture 3: OpenCOVER and Plugins
- Lecture 4: OpenSceneGraph
- Lecture 5: User Interaction
- Lecture 6: Collaborative Applications

# Getting Started

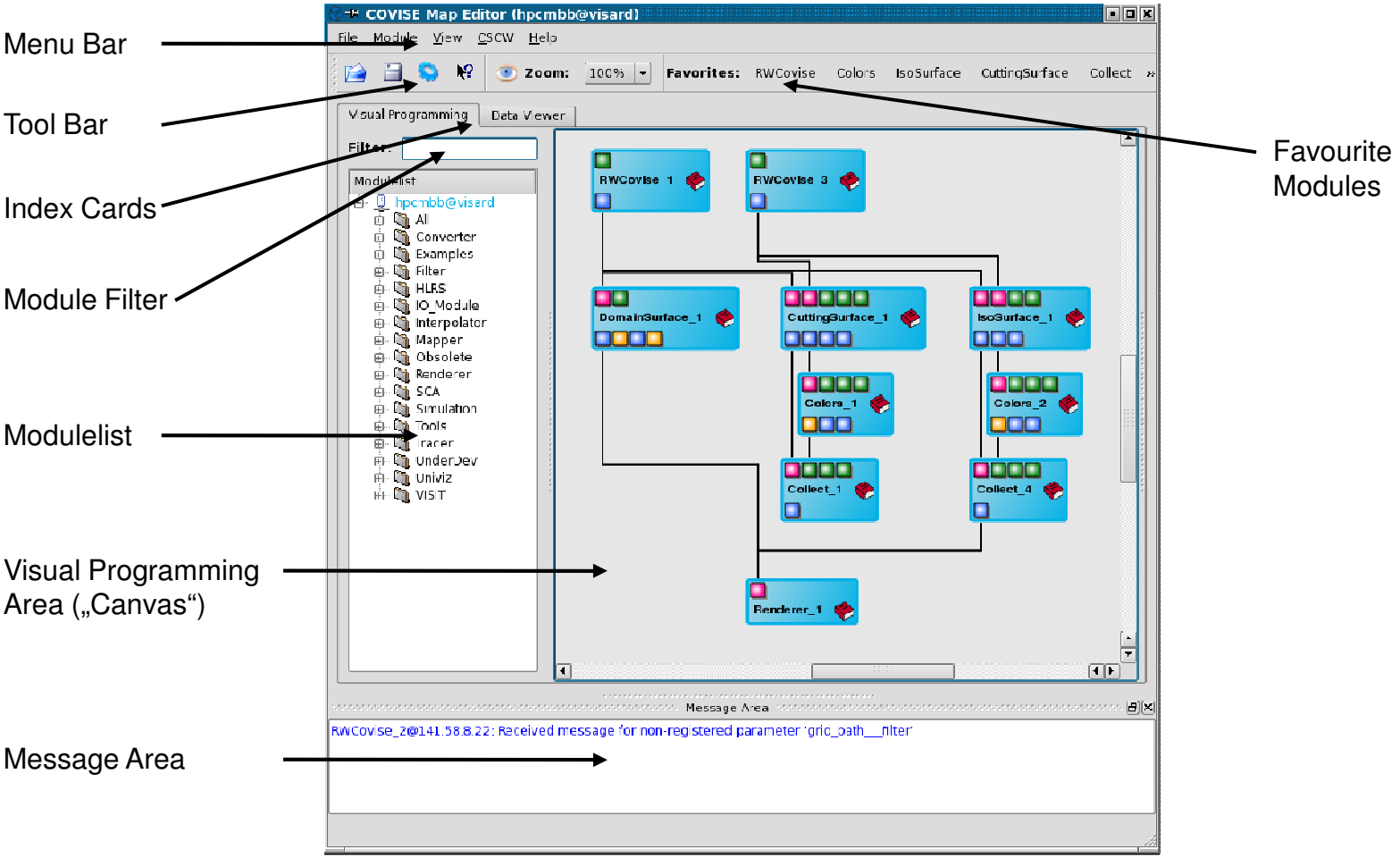
- Start up COVISE:
  ```
  > covise
  ```

- Load a map (network of modules):



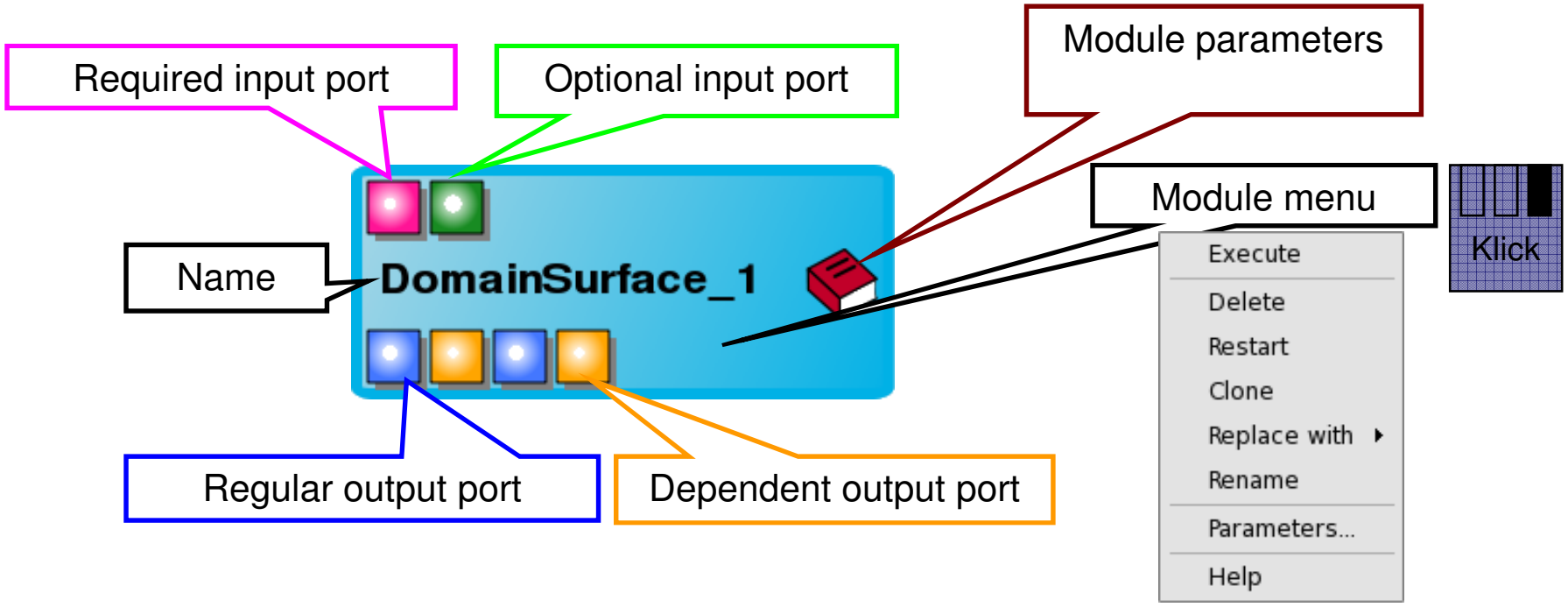



# COVISE User Interface – Map Editor



# Modules

- Each step in the visualization pipeline is a module
- Each module runs as a separate process
- Modules have input and output ports
- Modules have parameters
- Connections between modules control the data flow



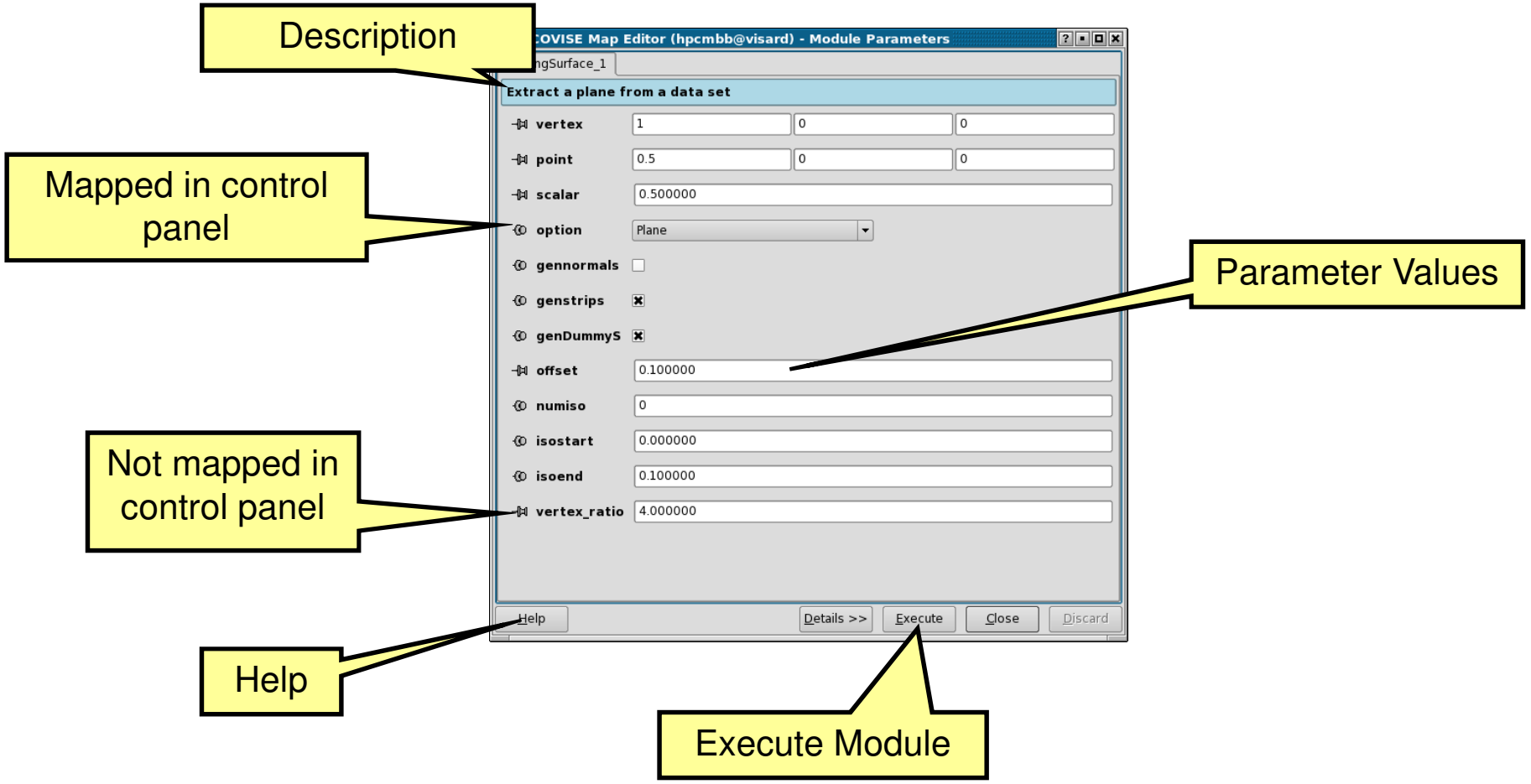
# Port Data Types

- Structured and unstructured grids with
  - Scalar data
  - Vector data
- Geometrical primitives
- Geometry containers (Primitive + Colors + Normals + Textures)
- Container for:
  - Time steps
  - Multiple objects

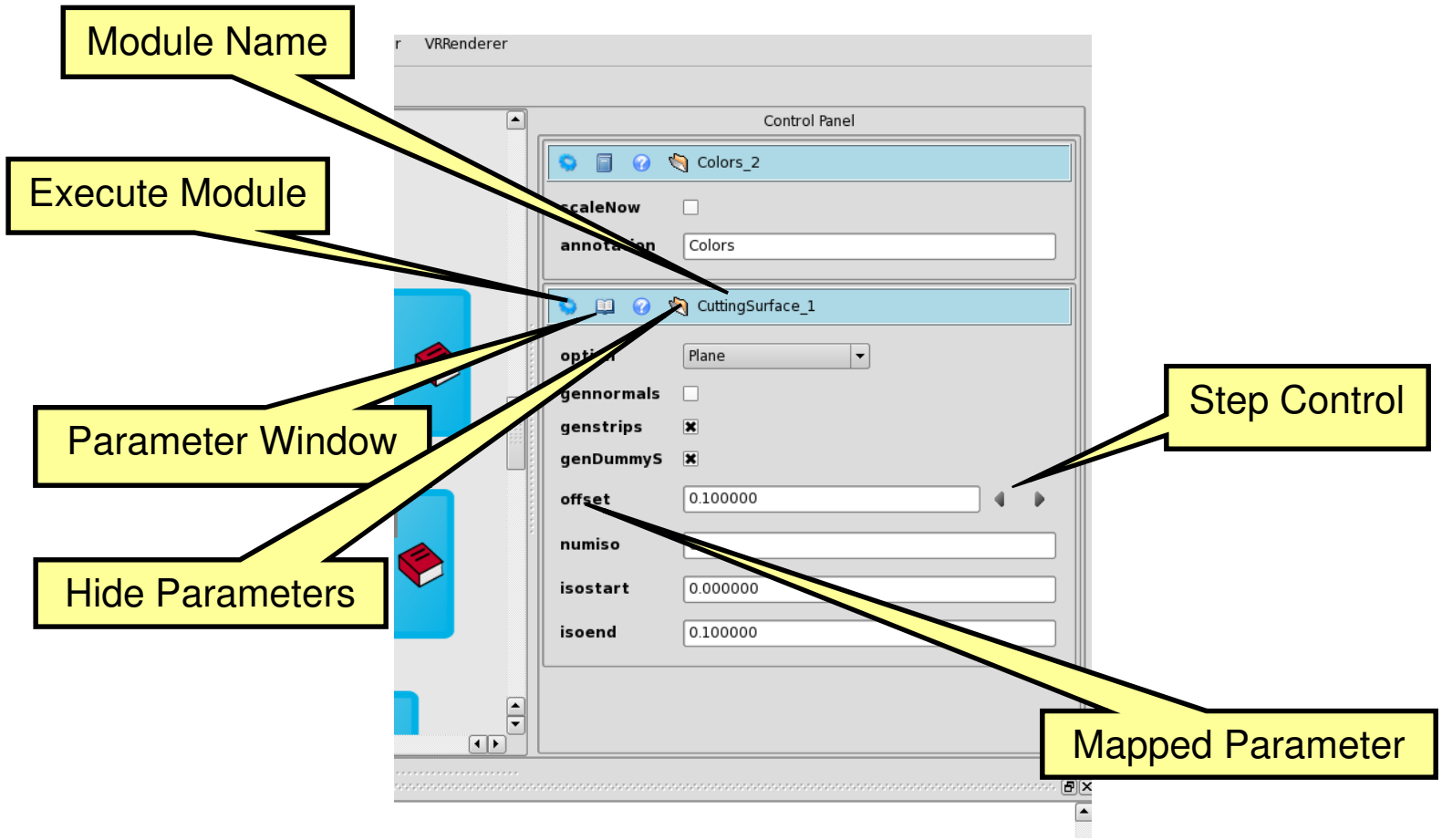
# Parameters

- Almost all modules have parameters the user can change in the module parameters window
- Supported parameter types:
  - Boolean
  - Scalar Integer / Float (with or without slider)
  - Vector Integer / Float
  - Choice (List box)

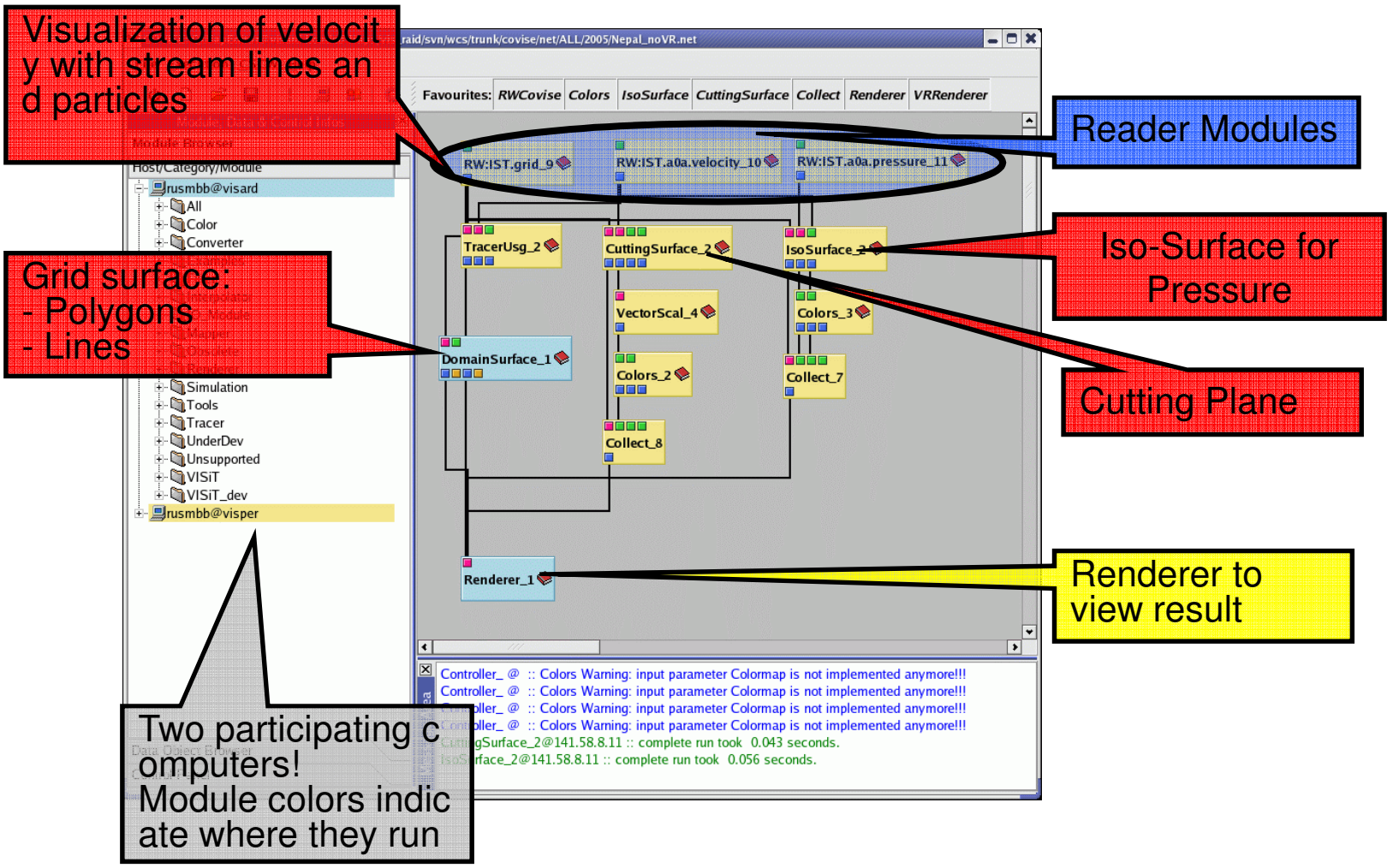
# Module Parameter Window



# Control Panel

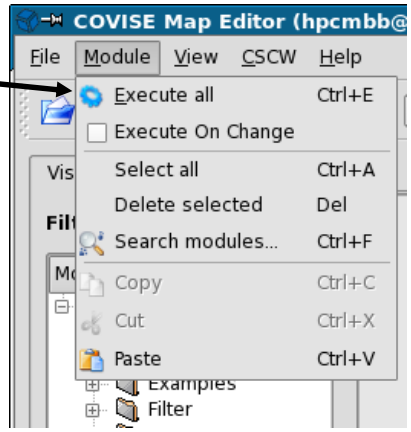


# COVISE Module Pipeline



# Execute Module Pipeline

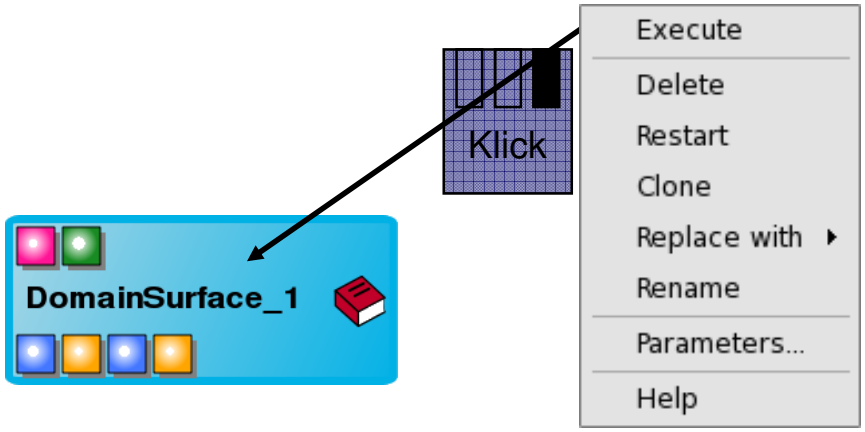
- Module menu




- Toolbar icon

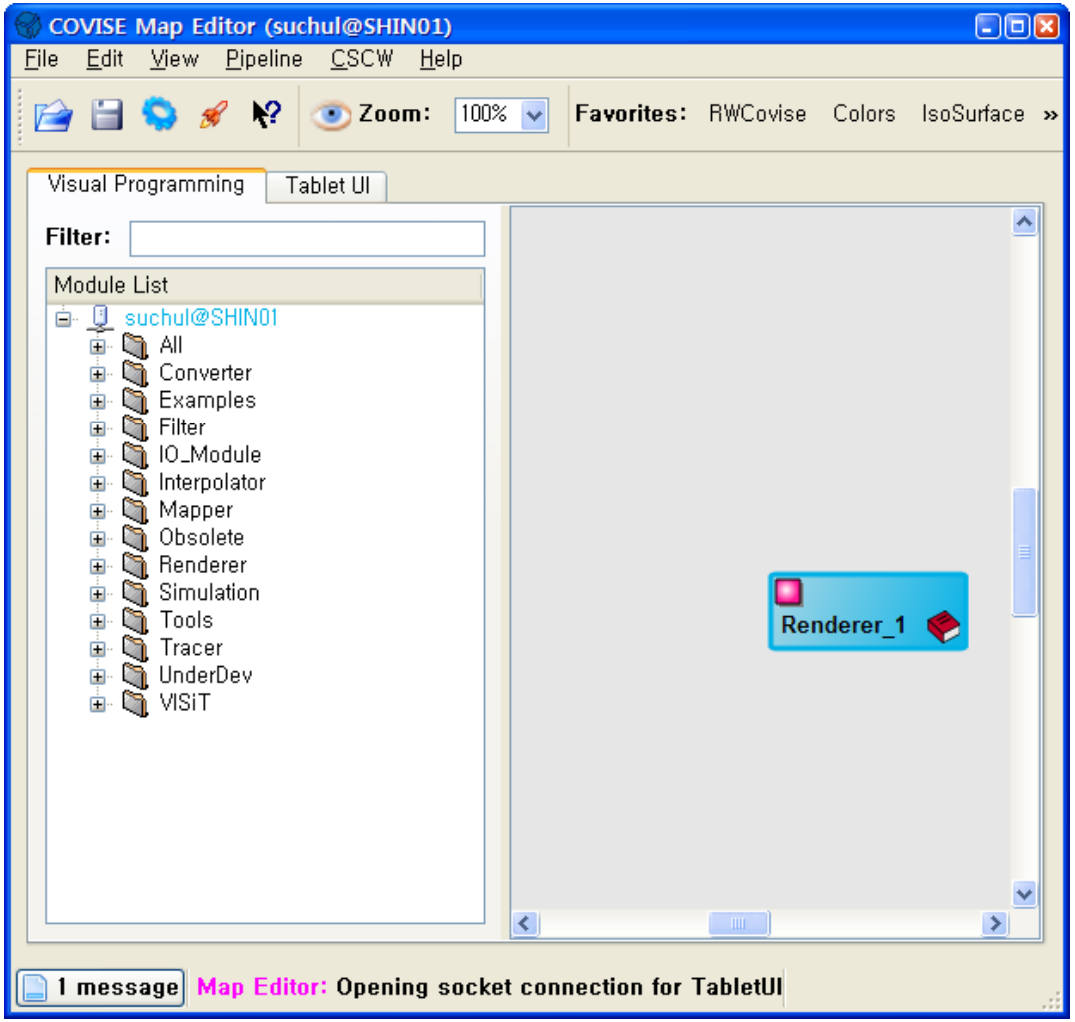
- Alt-E

- Run pipeline starting with a specific module



# Module Overview

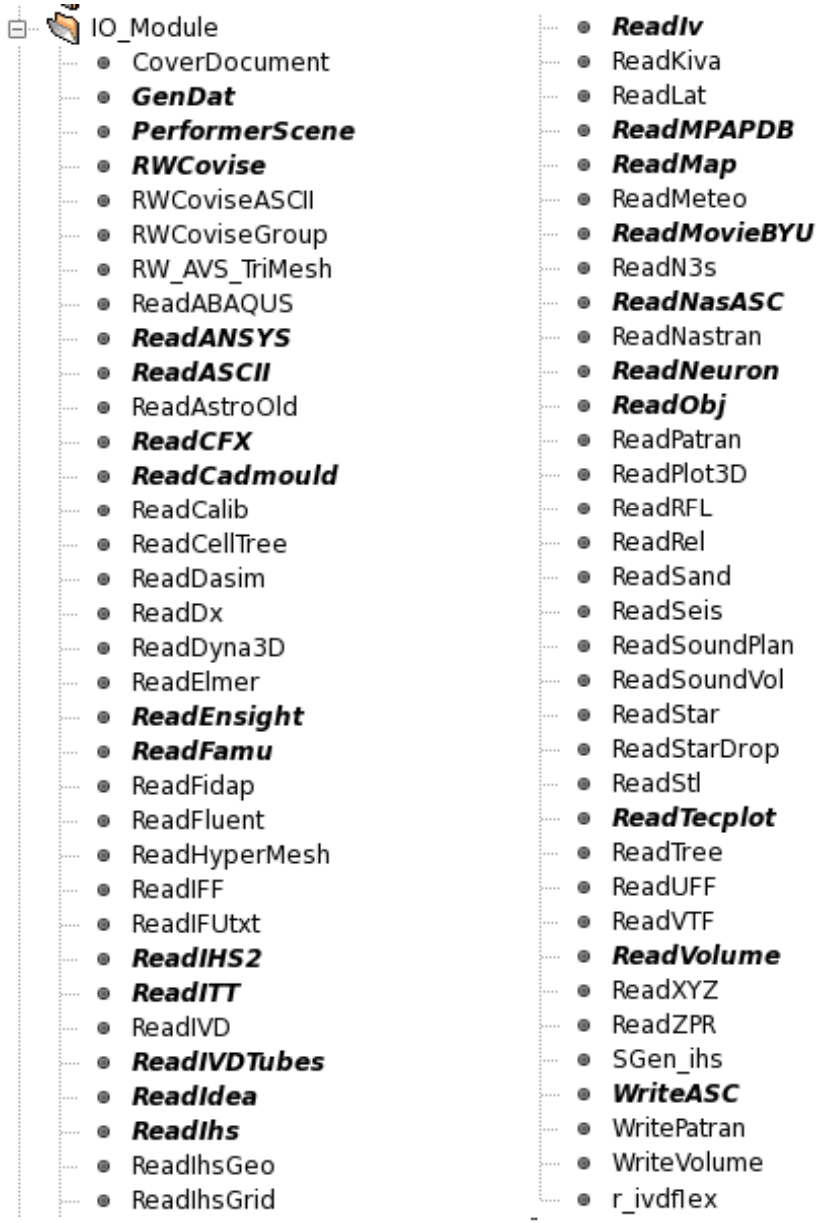
- Module categories:
  - Converter
  - Filter
  - Interpolator
  - I/O
  - Mapper
  - Renderer
  - Simulation
  - Tools
  - Tracer
  - Examples



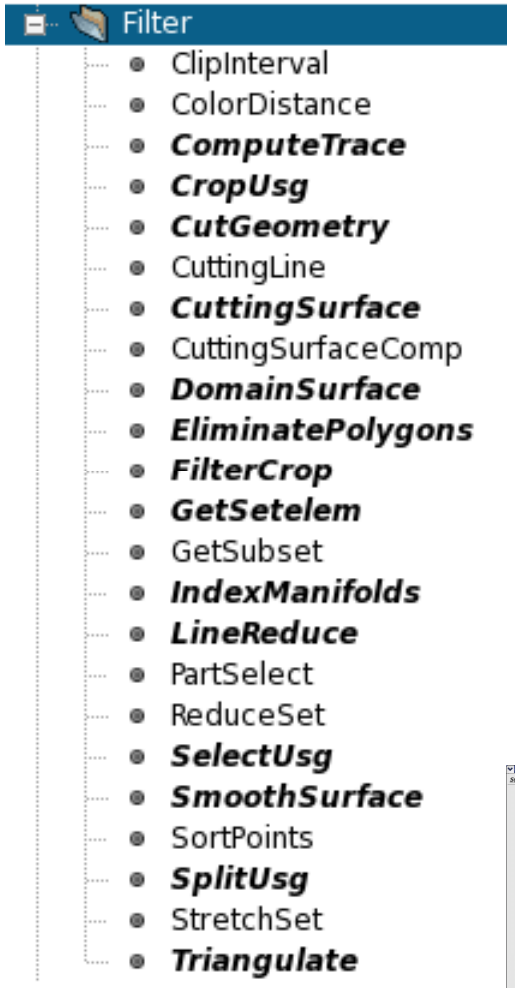
# Module Categories

- IO Module — Read data from file
- Filter — Select sub-set of data
- Mapper — Map data to geometric objects or colors
- Converter — Convert object type
- Tracer — Particle tracer
- Renderer — Display data in 3D
- Tools — Utility modules

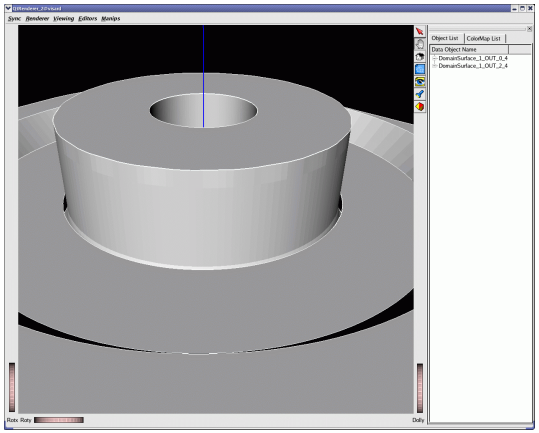
# IO Modules

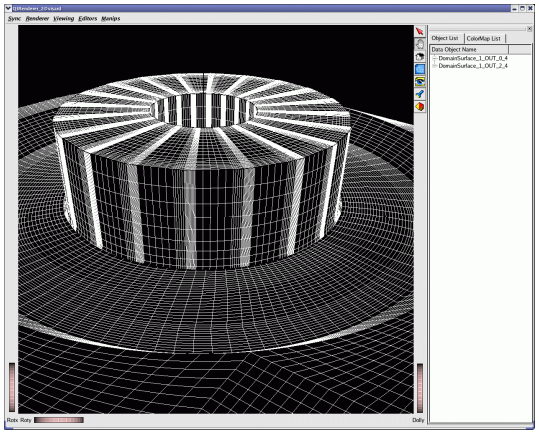

IO_Module
CoverDocument
GenDat
PerformerScene
RWCovise
RWCoviseASCII
RWCoviseGroup
RW_AVS_TriMesh
ReadABAQUS
ReadANSYS
ReadASCII
ReadAstroOld
ReadCFX
ReadCadmould
ReadCalib
ReadCellTree
ReadDasim
ReadDx
ReadDyna3D
ReadElmer
ReadEnsight
ReadFamu
ReadFidap
ReadFluent
ReadHyperMesh
ReadIFF
ReadIFUtxt
ReadIHS2
ReadITT
ReadIVD
ReadIVDTubes
ReadIdea
ReadIhs
ReadIhsGeo
ReadIhsGrid
ReadIv
ReadKiva
ReadLat
ReadMPAPDB
ReadMap
ReadMeteo
ReadMovieBYU
ReadN3s
ReadNasASC
ReadNastran
ReadNeuron
ReadObj
ReadPatran
ReadPlot3D
ReadRFL
ReadRel
ReadSand
ReadSeis
ReadSoundPlan
ReadSoundVol
ReadStar
ReadStarDrop
ReadStl
ReadTecplot
ReadTree
ReadUFF
ReadVTF
ReadVolume
ReadXYZ
ReadZPR
SGen_ihs
WriteASC
WritePatran
WriteVolume
r_ivdflex

# Filter Modules

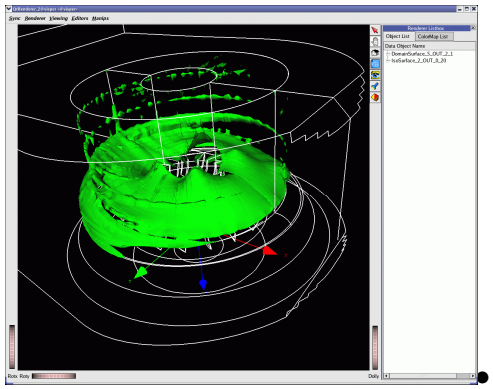


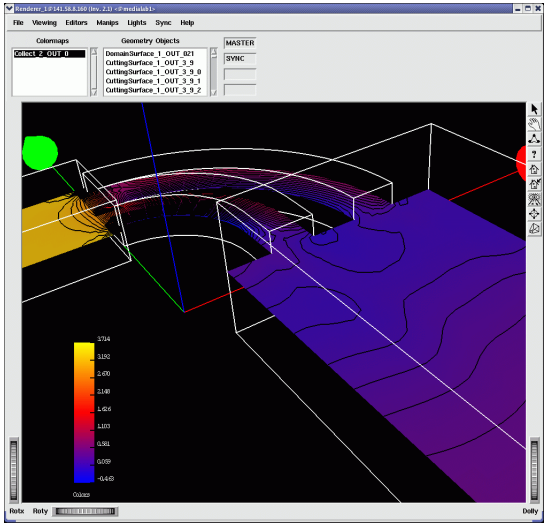

- CuttingSurface
  - Cut through data set: plane, cylinder or sphere
- DomainSurface
  - Grid surface
  - Grid boundary lines
- IndexSurface
  - i/j/k cut through structured data sets
- SelectUsg, SplitUsg, ...



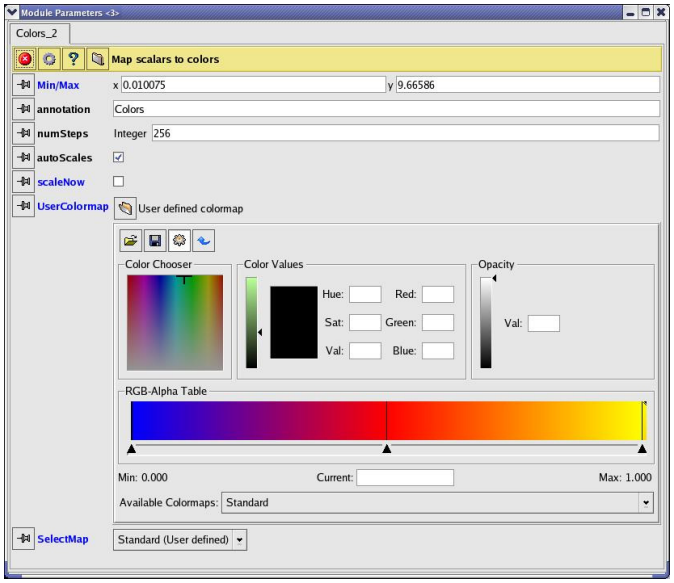


# Mapping Modules

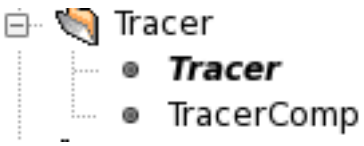





- Isolines
- IsoSurface
  - Connects values of same magnitude
- VectorField
  - Vector arrows
- Colors
  - Map color to scalar data
  - Supports custom color gradients

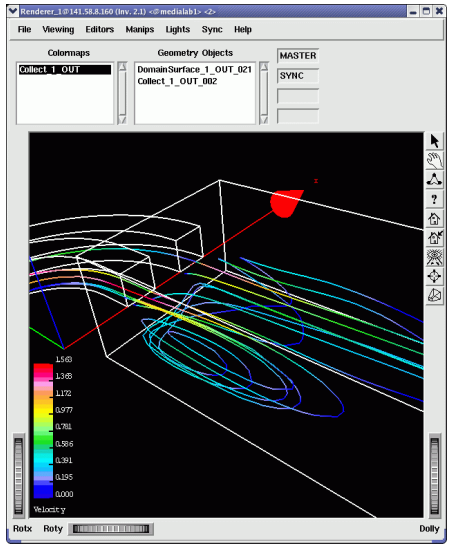


# Tracer

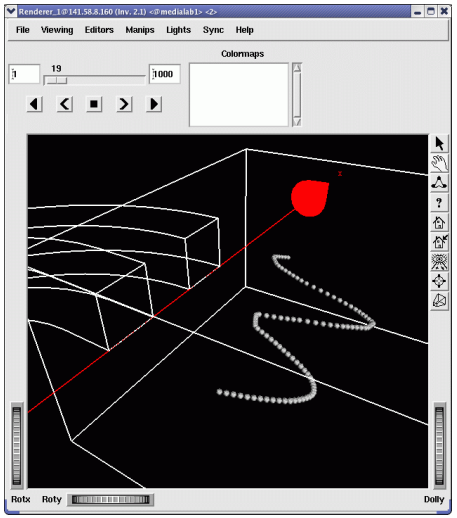



Tracer

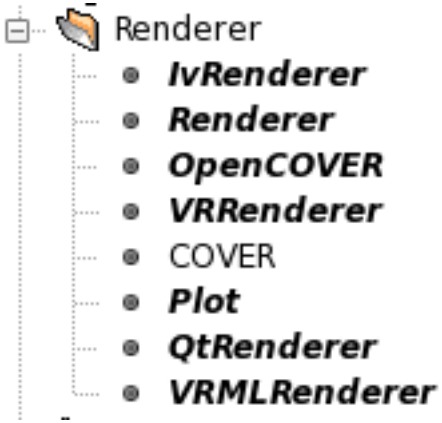
- Stream lines
- Animated particle traces



- Streamlines
  Integration lines along vector field.
- Streaklines
  Like smoke in wind tunnel.
- Pathlines
  Displays path of individual particles.
- Moving Points
  Point cloud starts at given position, moves along vector field.

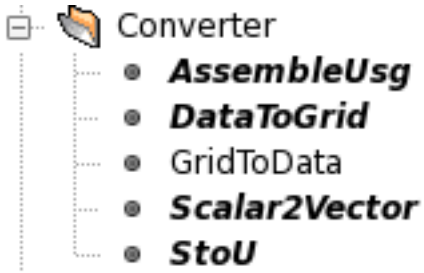


# Renderer

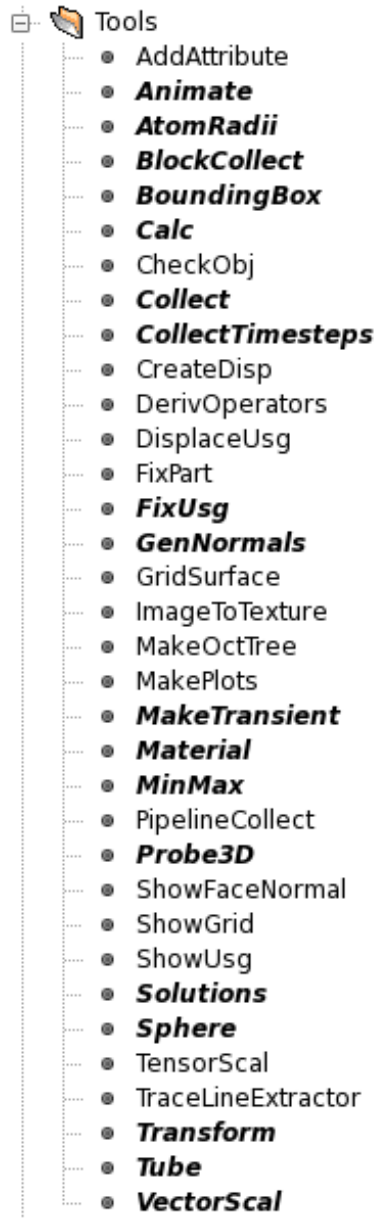



- Renderer / QtRenderer
  - Desktop Renderer
  - OpenInventor based
- COVER
  - Virtual Reality Renderer
  - OpenGL Performer based
- OpenCOVER
  - VR Renderer
  - OpenSceneGraph based
- OpenSG-Renderer
  - OpenSG based
  - Can be integrated into map editor
- Plot
  - 2D graph display

# Converter

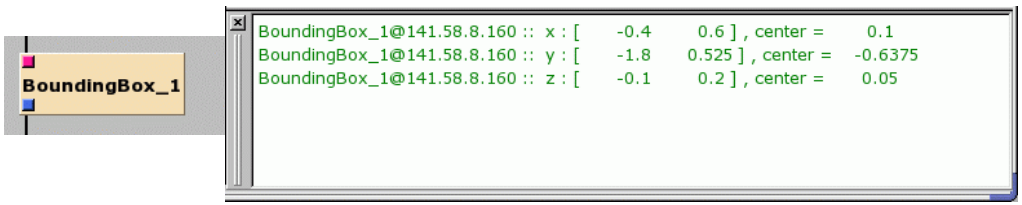



- DataToGrid
  structured data → structured grid
  unstructured data → points
- Scalar2Vector
  Scalar data → Vector data
- Blocks of unstructured grids → Single unstructured grid




# Tools

- DomainSurface
  - Create outer surface of data set
- BoundingBox
  - Compute min/max in 3D

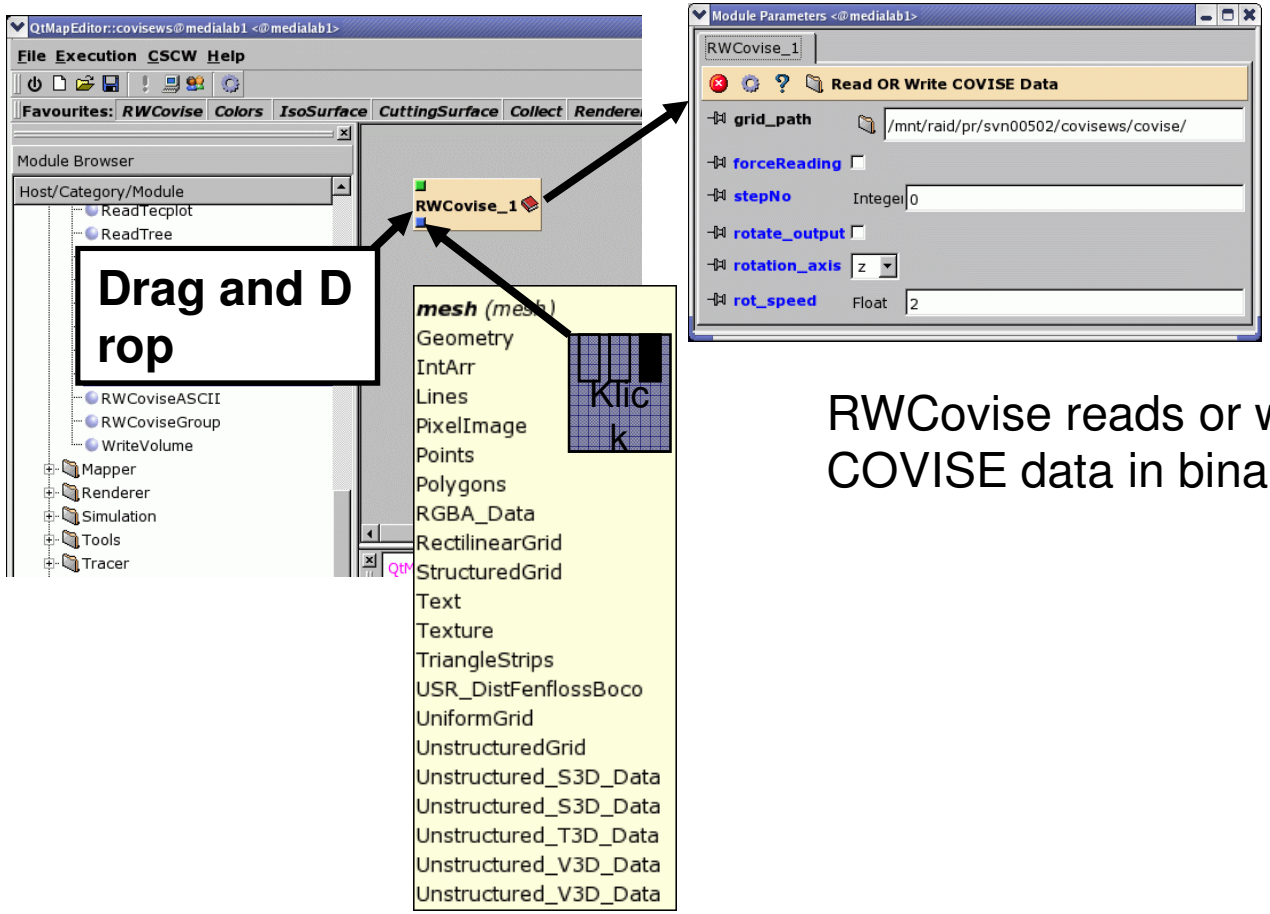



- CutGeometry
  - Cut open geometric objects
- Collect
  - Combine geometry with colors, normals, textures to feed into renderer

# Example

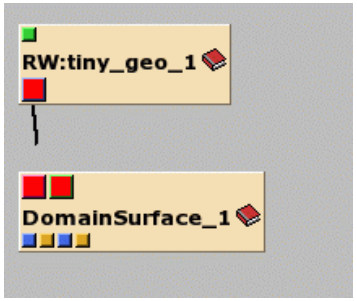
Directory: `~/covise/data/general/tutorial`

Module map: `tiny_geo.covise`



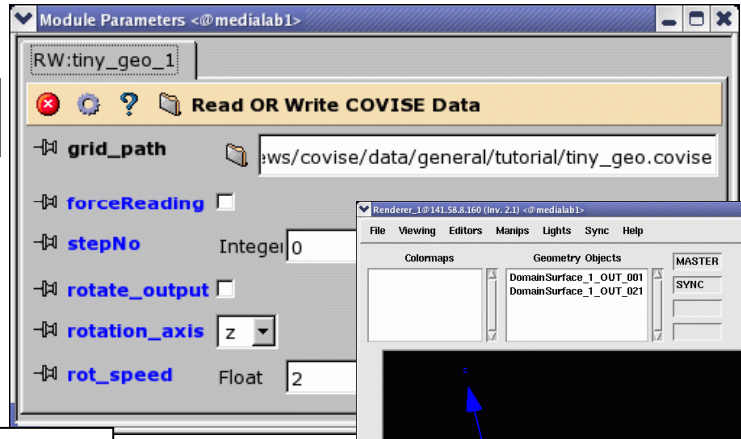

RWCovise reads or writes COVISE data in binary format

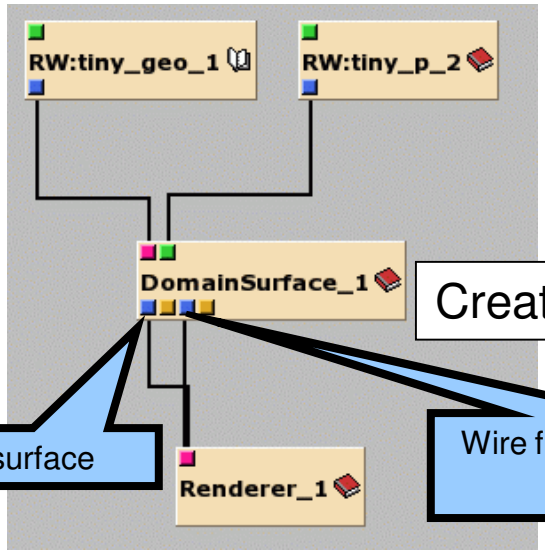
# Read Data and Create Domain Surface




Connect module ports with mouse:
compatible ports are highlighted in red
Right mouse click on port shows parameters

Input path and file name

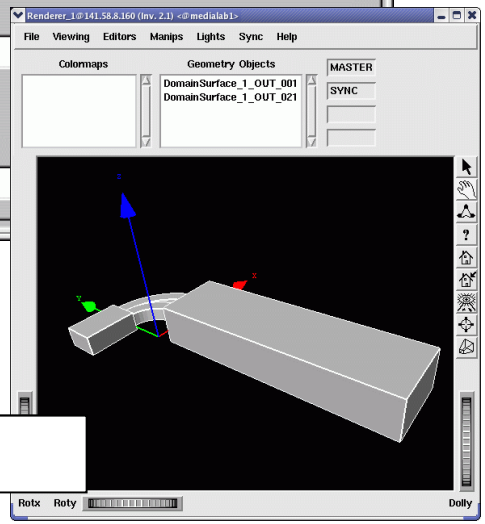



Create module map

Grid surface

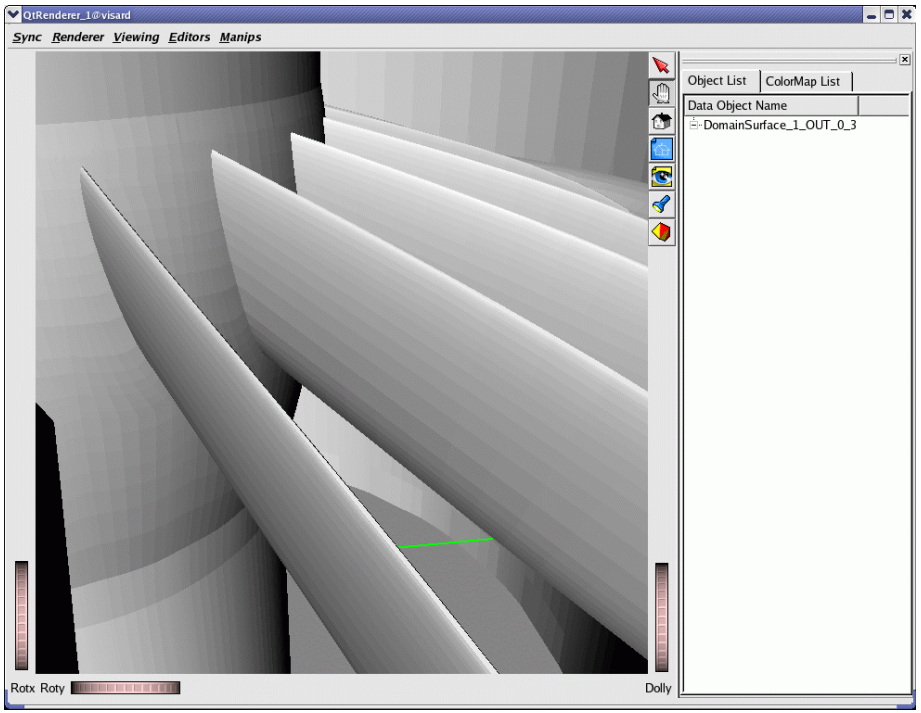
Wire frame of surface outline




Result

# Desktop Renderer

- Mode: select (arrow) or interaction (hand)
- Left mouse button: spin around origin or home position
- Middle mouse button: move
- Mouse wheel: zoom



# More Information

- Covise Online Help

At `covise/doc/pdf`:

- Covise Tutorial (tutorial.pdf)
- Covise Module Reference Guide (refguide.pdf)
- Covise User‘s Guide (usersguide.pdf)