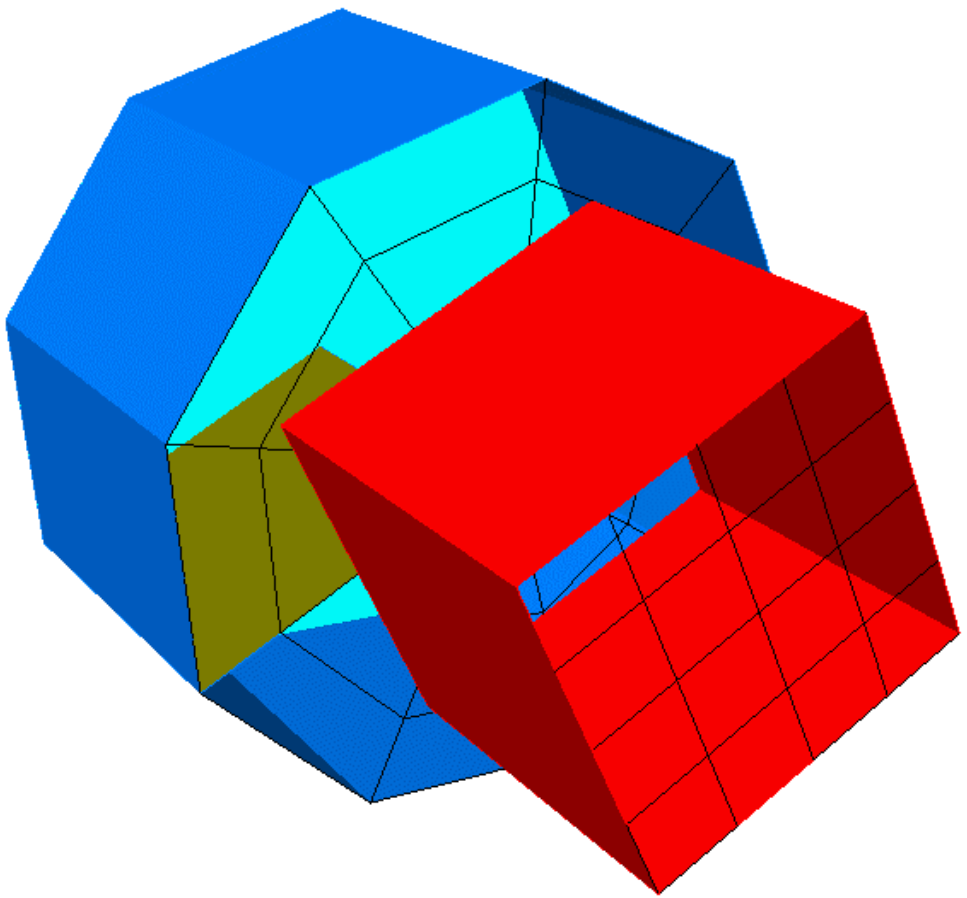
Presentation Overview

- Compare PLOT3D and CGNS Formats
  - Simple cube/cylinder example
  - PLOT3D code
  - CGNS code
  - Timings and file size
- Enhancing the Data with CGNS
  - Documentation
  - Coordinate systems
  - Connectivity
  - Boundary Conditions
  - Solution Data
- What Else Can You Do ?

Example

- Cylinder attached to a cube



Example – Initialization Code


```
      include 'cgnslib_f.h'

      mach    = 0.5
      alpha   = 0
      re      = 0
      time    = 0

C---- zone 1 - cube
      do n=1,3
        idim1(n,1) = 5
        idim1(n,2) = 4
        idim1(n,3) = 0
      enddo
      do i=1,5
        do j=1,5
          do k=1,5
            r1(i,j,k,1) = i - 3
            r1(i,j,k,2) = j - 3
            r1(i,j,k,3) = k - 5
            do n=1,5
              q1(i,j,k,n) = n
            enddo
          enddo
        enddo
      enddo
```

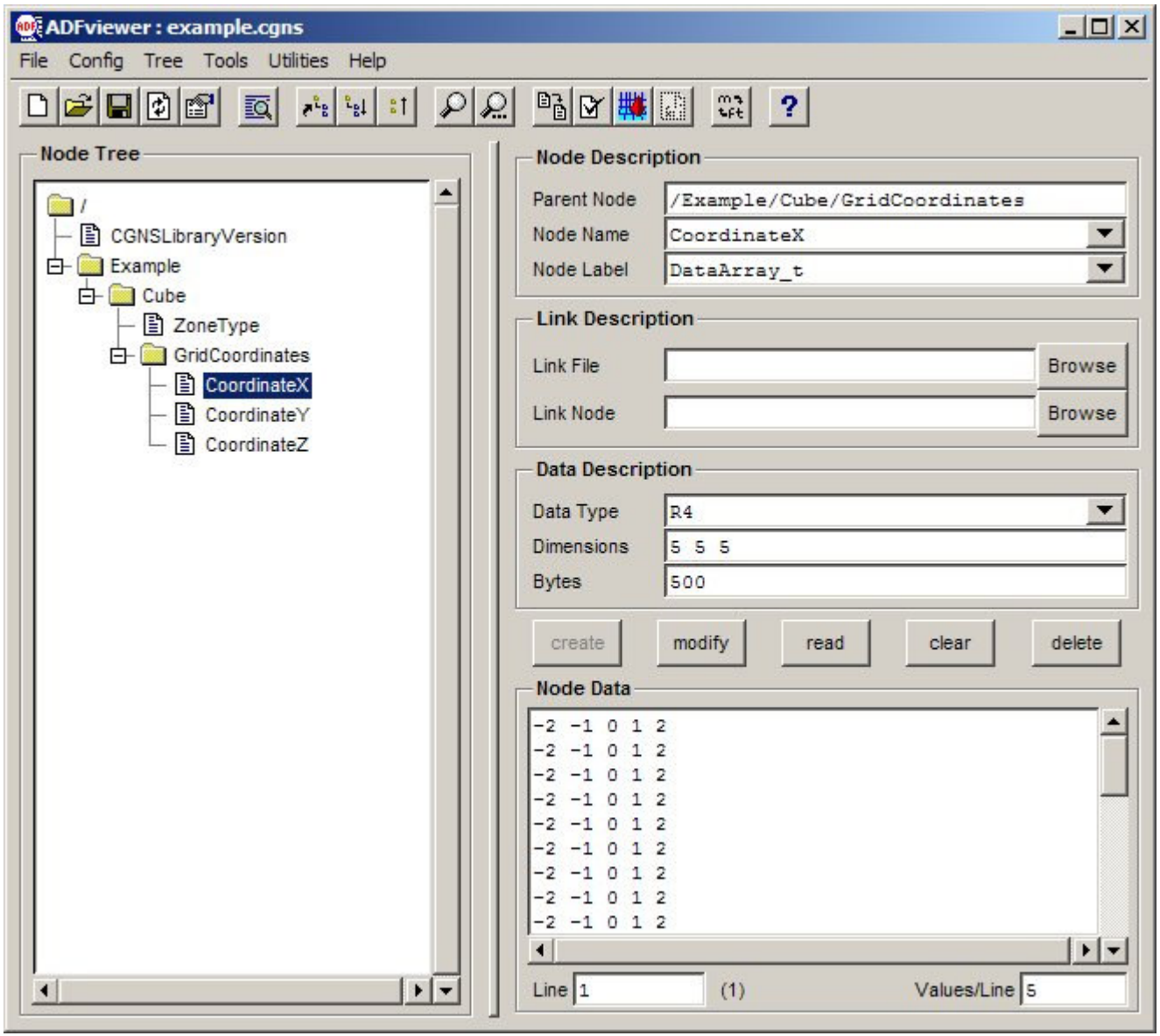
```
C---- zone 2 - cylinder
      do n=1,3
        idim2(n,1) = 5
        idim2(n,2) = 4
        idim2(n,3) = 0
      enddo
      idim2(2,1) = 10
      idim2(2,2) = 9
      do i=1,5
        do j=1,10
          do k=1,5
            rad = i - 1
            ang = 0.6981317*(j - 1)
            r2(i,j,k,1) = rad * cos(ang)
            r2(i,j,k,2) = rad * sin(ang)
            r2(i,j,k,3) = k - 1
            do n=1,5
              q2(i,j,k,n) = n
            enddo
          enddo
        enddo
      enddo
```

Example – PLOT3D Code


```
c---- write PLOT3D xyz file

      iunit = 11
      open(iunit,file='example.xyz',form='unformatted')
      write(iunit) 2
      write(iunit) (idim1(i,1),i=1,3),(idim2(i,1),i=1,3)
      write(iunit) ((((r1(i,j,k,n),i=1,5),j=1,5),k=1,5),n=1,3)
      write(iunit) ((((r2(i,j,k,n),i=1,5),j=1,10),k=1,5),n=1,3)
      close(iunit)

c---- write PLOT3D q file

      open(iunit,file='example.q',form='unformatted')
      write(iunit) 2
      write(iunit) (idim1(i,1),i=1,3),(idim2(i,1),i=1,3)
      write(iunit) mach,alpha,re,time
      write(iunit) ((((q1(i,j,k,n),i=1,5),j=1,5),k=1,5),n=1,5)
      write(iunit) ((((q2(i,j,k,n),i=1,5),j=1,10),k=1,5),n=1,5)
      close(iunit)
```

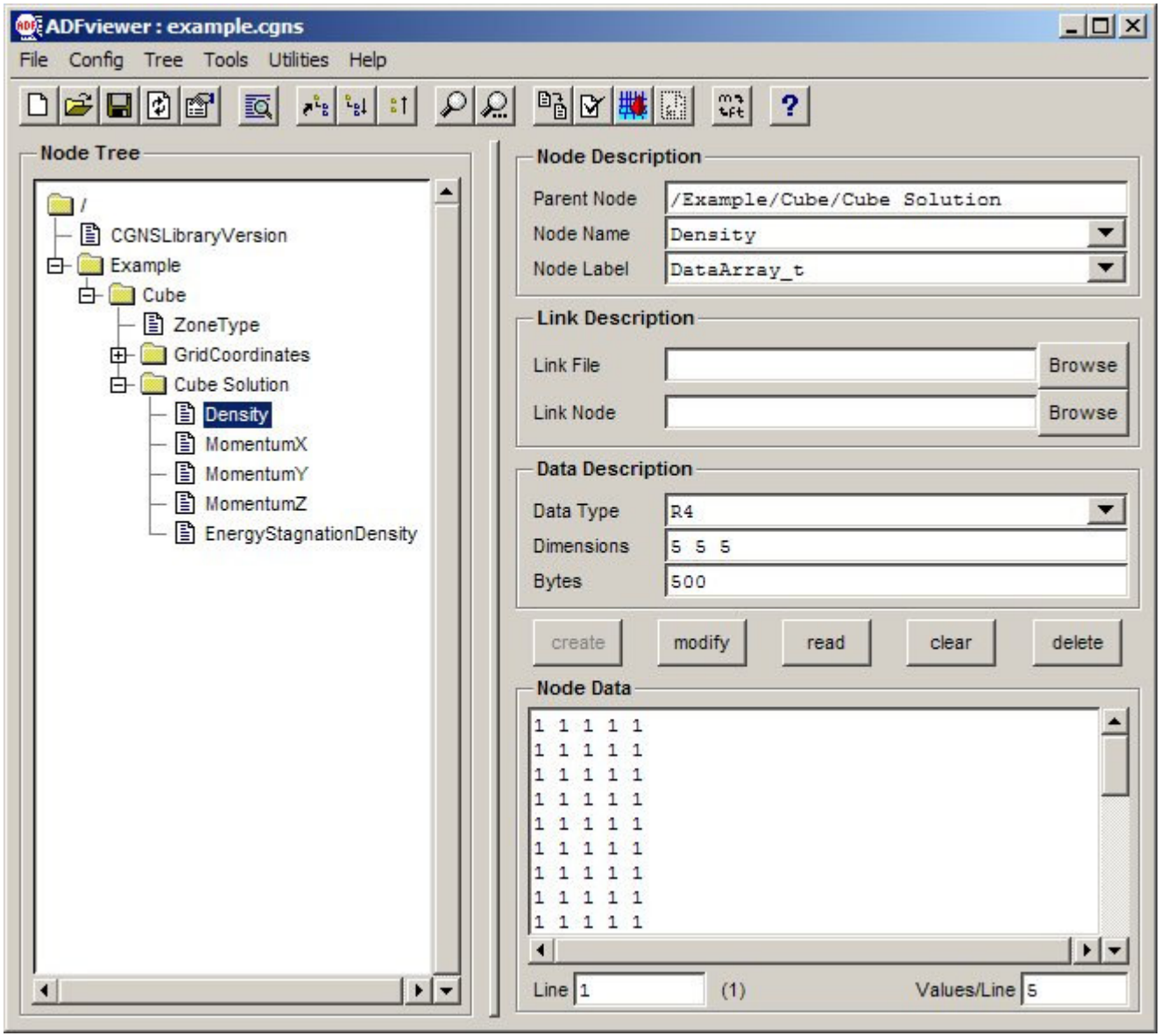
Example – CGNS Code


```
c---- open file and create base
      call cg_open_f('example.cgns',MODE_WRITE,ifile,ierr)
      if (ierr .ne. CG_OK) call cg_error_exit_f

      call cg_base_write_f(ifile,'Example',3,3,ibase,ierr)

c---- zone 1 - cube

      call cg_zone_write_f(ifile,ibase,'Cube',idim1,
     &                     Structured,izone,ierr)


      call cg_coord_write_f(ifile,ibase,izone,RealSingle,
     &                      'CoordinateX',r1(1,1,1,1),icoord,ierr)
      call cg_coord_write_f(ifile,ibase,izone,RealSingle,
     &                      'CoordinateY',r1(1,1,1,2),icoord,ierr)
      call cg_coord_write_f(ifile,ibase,izone,RealSingle,
     &                      'CoordinateZ',r1(1,1,1,3),icoord,ierr)
```


ADFviewer : example.cgns
File Config Tree Tools Utilities Help
Node Tree
/
CGNSLibraryVersion
Example
Cube
ZoneType
GridCoordinates
CoordinateX
CoordinateY
CoordinateZ
Node Description
Parent Node /Example/Cube/GridCoordinates
Node Name CoordinateX
Node Label DataArray_t
Link Description
Link File Browse
Link Node Browse
Data Description
Data Type R4
Dimensions 5 5 5
Bytes 500
create modify read clear delete
Node Data
-2 -1 0 1 2
Line 1 (1) Values/Line 5

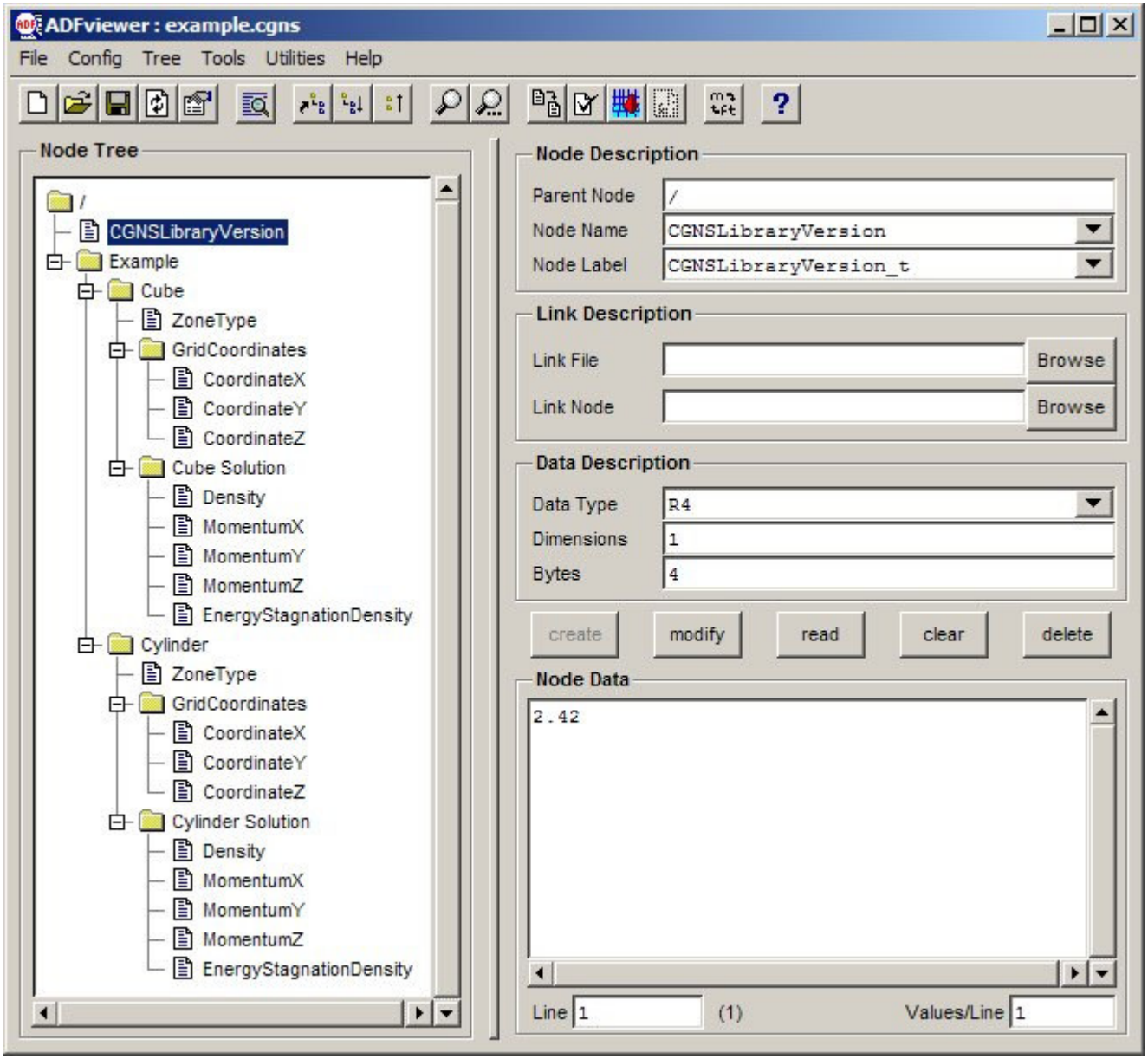
Example – CGNS Code (cont'd)


```
 call cg_sol_write_f(ifile,ibase,izone,'Cube Solution',
&                    Vertex,isol,ierr)


 call cg_field_write_f(ifile,ibase,izone,isol,RealSingle,
&                      'Density',q1(1,1,1,1),ifld,ierr)
 call cg_field_write_f(ifile,ibase,izone,isol,RealSingle,
&                      'MomentumX',q1(1,1,1,2),ifld,ierr)
 call cg_field_write_f(ifile,ibase,izone,isol,RealSingle,
&                      'MomentumY',q1(1,1,1,3),ifld,ierr)
 call cg_field_write_f(ifile,ibase,izone,isol,RealSingle,
&                      'MomentumZ',q1(1,1,1,4),ifld,ierr)
 call cg_field_write_f(ifile,ibase,izone,isol,RealSingle,
&                      'EnergyStagnationDensity',q1(1,1,1,5),
&                      ifld,ierr)
```


ADFviewer : example.cgns
File Config Tree Tools Utilities Help
Node Tree
/
CGNSLibraryVersion
Example
Cube
ZoneType
GridCoordinates
Cube Solution
Density
MomentumX
MomentumY
MomentumZ
EnergyStagnationDensity
Node Description
Parent Node /Example/Cube/Cube Solution
Node Name Density
Node Label DataArray_t
Link Description
Link File Browse
Link Node Browse
Data Description
Data Type R4
Dimensions 5 5 5
Bytes 500
create modify read clear delete
Node Data
1 1 1 1 1
Line 1 (1) Values/Line 5

Example – CGNS Code (cont'd)


```
c---- zone 2 - cylinder

      call cg_zone_write_f(ifile,ibase,'Cylinder',idim2,
     &                     Structured,izone,ierr)
      do n=1,3
        call cg_coord_write_f(ifile,ibase,izone,RealSingle,
     &                        cnames(n),r2(1,1,1,n),icoord,ierr)
      enddo
      call cg_sol_write_f(ifile,ibase,izone,'Cylinder Solution',
     &                    Vertex,isol,ierr)
      do n=1,5
        call cg_field_write_f(ifile,ibase,izone,isol,RealSingle,
     &                        snames(n),q2(1,1,1,n),ifld,ierr)
      enddo

c---- close file

      call cg_close_f(ifile,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Cube
ZoneType
GridCoordinates
CoordinateX
CoordinateY
CoordinateZ
Cube Solution
Density
MomentumX
MomentumY
MomentumZ
EnergyStagnationDensity
Cylinder
ZoneType
GridCoordinates
CoordinateX
CoordinateY
CoordinateZ
Cylinder Solution
Density
MomentumX
MomentumY
MomentumZ
EnergyStagnationDensity
Node Description
Parent Node
/
Node Name
CGNSLibraryVersion
Node Label
CGNSLibraryVersion_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
R4
Dimensions
1
Bytes
4
create
modify
read
clear
delete
Node Data
2.42
Line
1
(1)
Values/Line
1

What Do We Have ?

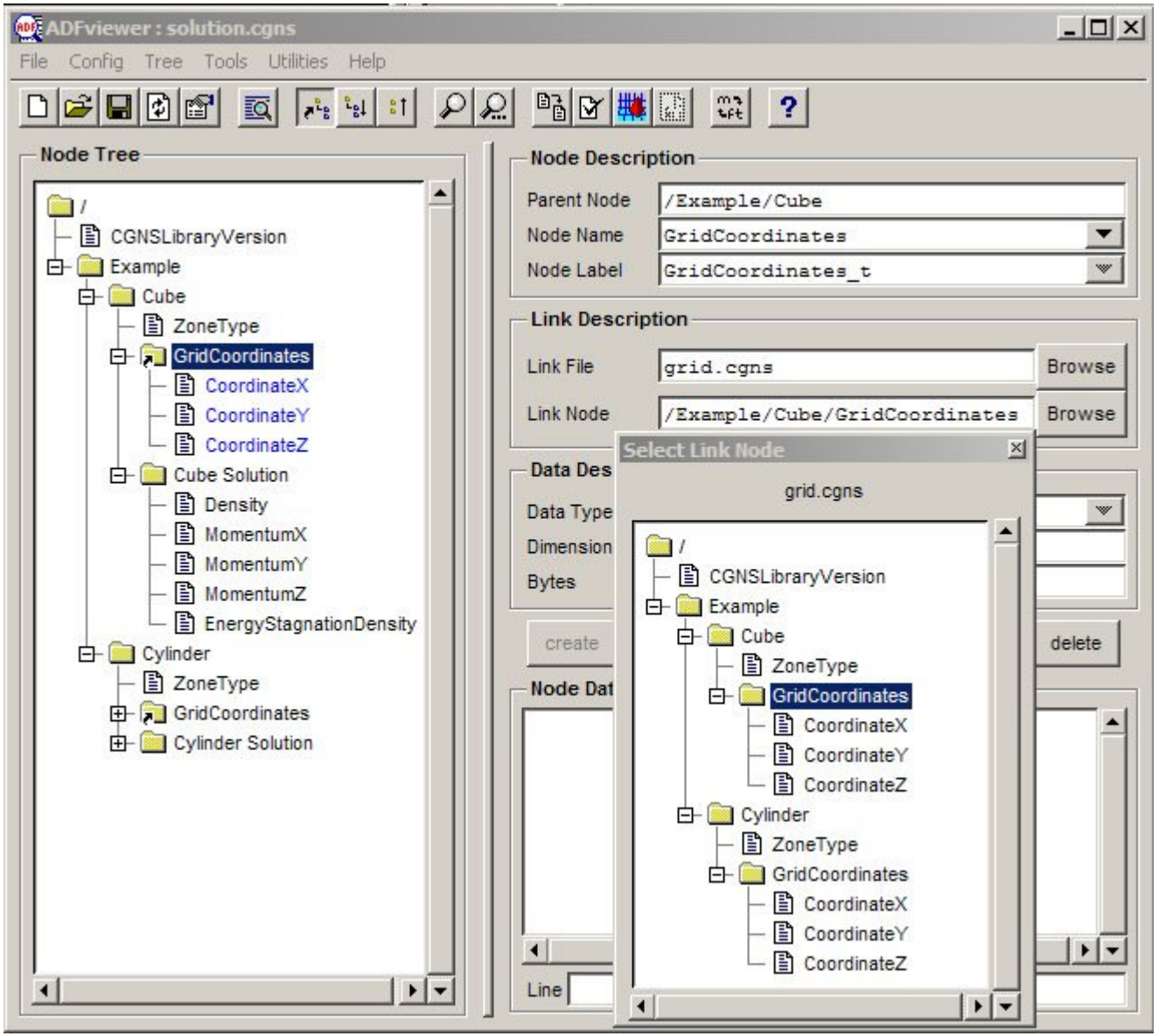
- Mesh Coordinates and Conserved Variables at Vertices
- PLOT3D
  - Two files which are non-portable unless ASCII or machines are binary compatible
  - Need to know format (i.e. single/double precision, single/multi-block, planar/whole, iblank or none)
- CGNS
  - Completely machine independent and portable
  - Self-contained, with inquiry functions to determine content
  - Utilities available to convert to and from PLOT3D format

But I Want Separate Files

- Write the Grid File
  - Create Base, Zone and Write Coordinates
- Write the Solution File
  - Create Base, Zone and Write Solution
- Link to Coordinates in Grid File

```
 call cg_zone_write_f(ifile,ibase,'Cube',idim1,
&                     Structured,izone,ierr)

 call cg_goto_f(ifile,ibase,ierr,'Zone_t',izone,'end')
 call cg_link_write_f('GridCoordinates','grid.cgns',
&                     '/Example/Cube/GridCoordinates',ierr)
```

- No Apparent Difference Between Solution File and Combined File to an Application Reading the Solution


ADFviewer : solution.cgns
File Config Tree Tools Utilities Help
Node Tree
/
CGNSLibraryVersion
Example
Cube
ZoneType
GridCoordinates
CoordinateX
CoordinateY
CoordinateZ
Cube Solution
Density
MomentumX
MomentumY
MomentumZ
EnergyStagnationDensity
Cylinder
ZoneType
GridCoordinates
Cylinder Solution
Node Description
Parent Node
/Example/Cube
Node Name
GridCoordinates
Node Label
GridCoordinates_t
Link Description
Link File
grid.cgns
Browse
Link Node
/Example/Cube/GridCoordinates
Browse
Data Des
Data Type
Dimension
Bytes
create
delete
Node Dat
Line
Select Link Node
grid.cgns
/
CGNSLibraryVersion
Example
Cube
ZoneType
GridCoordinates
CoordinateX
CoordinateY
CoordinateZ
Cylinder
ZoneType
GridCoordinates
CoordinateX
CoordinateY
CoordinateZ

Timings and File Size

Mesh Size File Size	100x100x100 30.5 MB	200x200x200 244 MB	400x400x400 1.90 GB
PLOT3D	2.32 (3.62) secs	16.0 (45.8) secs	126 (216) secs
CGNS (1 file) (+ 6K bytes)	2.48 (0.63) secs	17.2 (7.9) secs	129 (40) secs
CGNS (2 files) (+ 14K bytes)	2.34 (0.67) secs	17.4 (8.1) secs	164 (41) secs

- You've already benefited from CGNS !

Enhancing the Data

- Documentation
  - Descriptors
  - Units
  - Data Class
  - Reference State
  - Simulation Type
  - Flow Equations and Models
- Coordinate Systems
- Connectivity
  - One to One Matching
  - Mismatched Abutting
- Boundary Conditions
- Solution Data
  - Cell-Centered
  - Ghost Cells (rind)

Documentation

- Adding a Descriptor Node

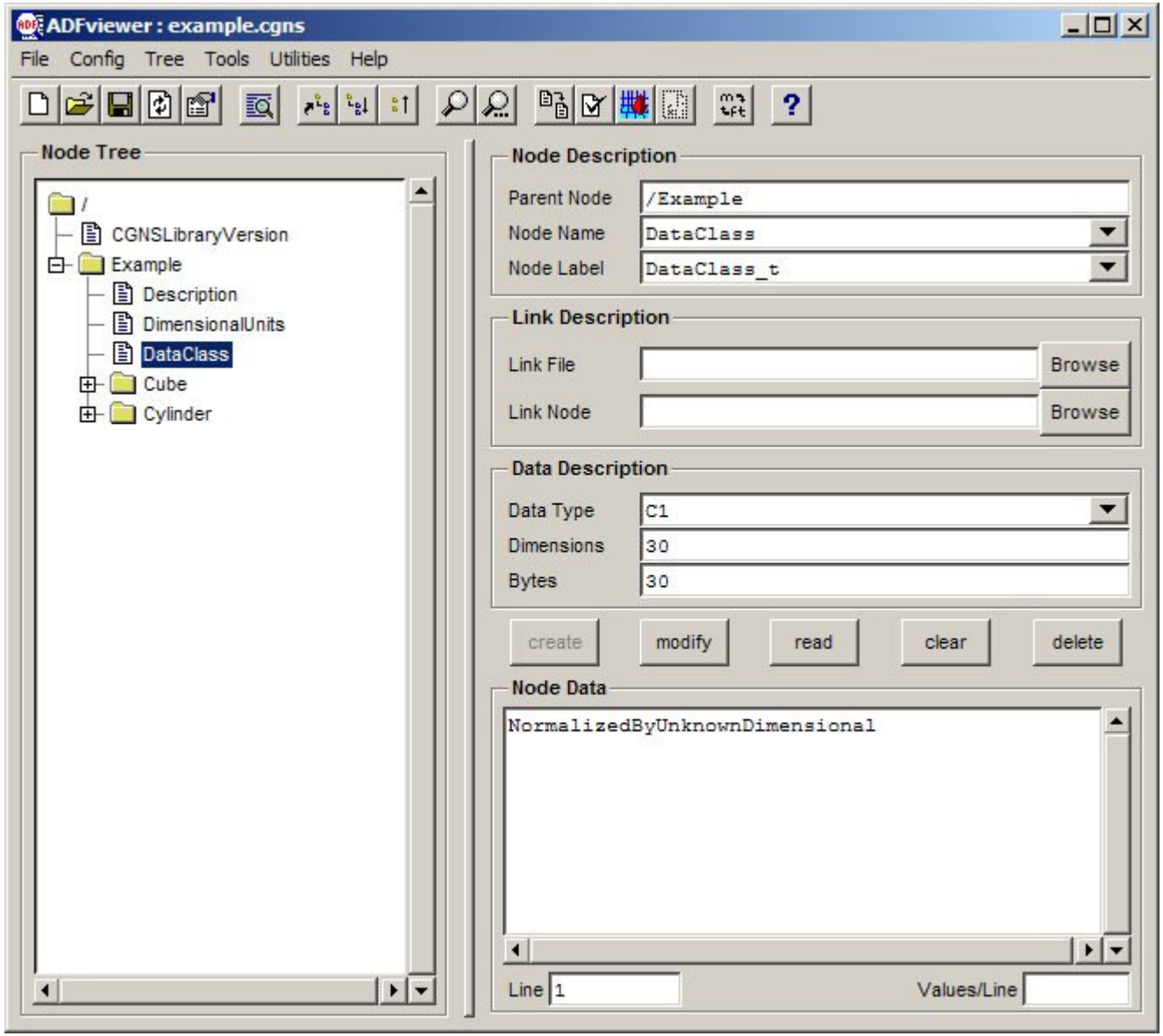
```
call cg_goto_f(ifile,ibase,ierr,'end')
text = 'This is a simple example of a cube and cylinder'
call cg_descriptor_write_f('Description',text,ierr)
```

- Defining the Units

```
call cg_units_write_f(Kilogram,Meter,Second,Kelvin,Degree,ierr)

call cg_unitsfull_write_f(Kilogram,Meter,Second,Kelvin,Degree,
&                         Ampere,Mole,Candela,ierr)
```

- Defining the Data Class

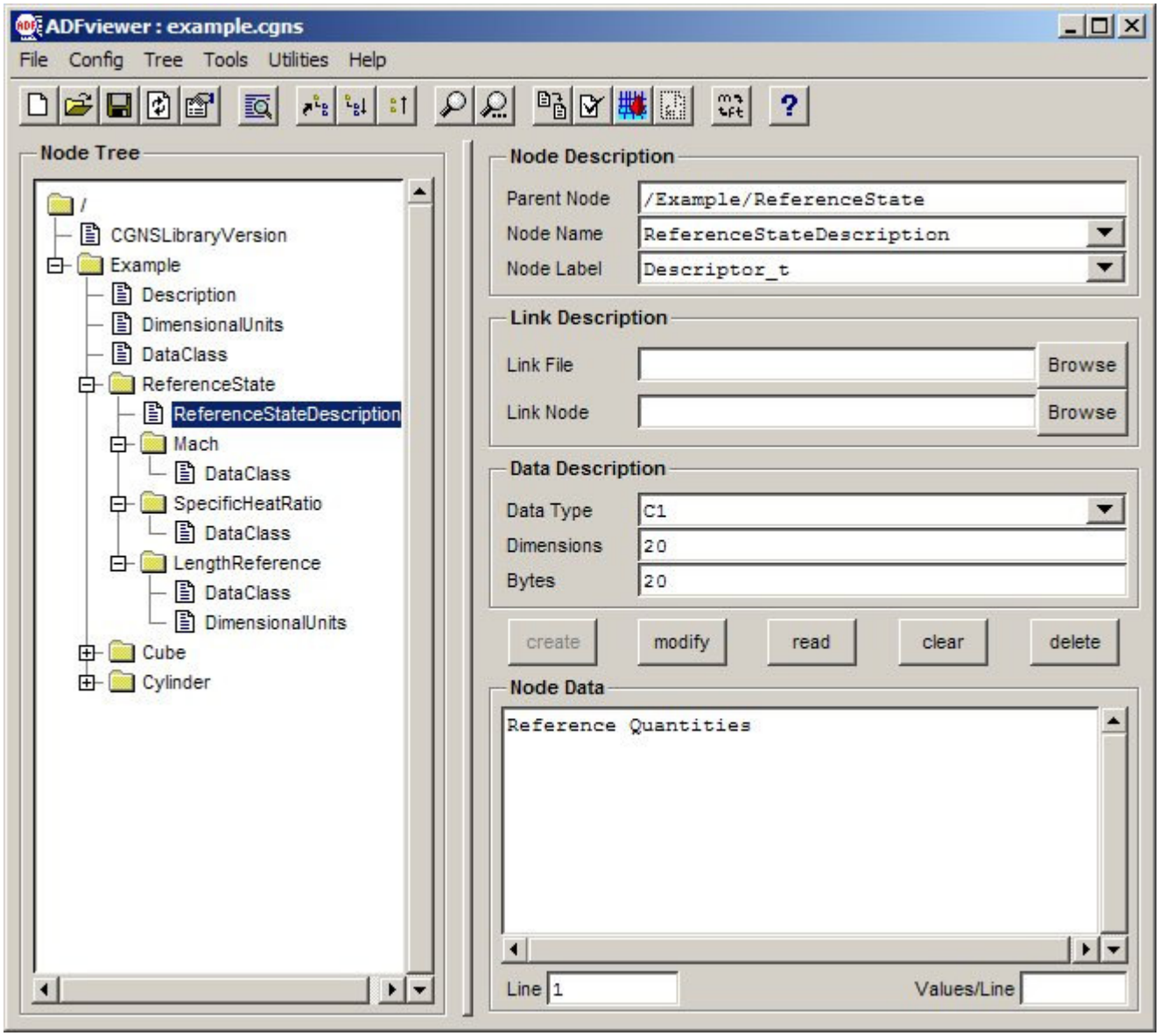
```
call cg_dataclass_write_f(NormalizedByUnknownDimensional,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
Cube
Cylinder
Node Description
Parent Node
/Example
Node Name
DataClass
Node Label
DataClass_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
30
Bytes
30
create
modify
read
clear
delete
Node Data
NormalizedByUnknownDimensional
Line
1
Values/Line

Documentation (cont'd)

- Reference State

```
      call cg_state_write_f('Reference Quantities',ierr)

      call cg_goto_f(ifile,ibase,ierr,'ReferenceState_t',1,'end')
      call cg_array_write_f('Mach',RealSingle,1,1,mach,ierr)

      call cg_goto_f(ifile,ibase,ierr,'ReferenceState_t',1,
     &               'DataArray_t',1,'end')
      call cg_dataclass_write_f(NondimensionalParameter,ierr)

      call cg_goto_f(ifile,ibase,ierr,'ReferenceState_t',1,'end')
      call cg_array_write_f('LengthReference',RealSingle,1,1,
     &                      reflen,ierr)
      call cg_goto_f(ifile,ibase,ierr,'ReferenceState_t',1,
     &               'DataArray_t',3,'end')

      call cg_dataclass_write_f(Dimensional,ierr)
      call cg_units_write_f(Null,Foot,Null,Null,Null,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
ReferenceStateDescription
Mach
DataClass
SpecificHeatRatio
DataClass
LengthReference
DataClass
DimensionalUnits
Cube
Cylinder
Node Description
Parent Node
/Example/ReferenceState
Node Name
ReferenceStateDescription
Node Label
Descriptor_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
20
Bytes
20
create
modify
read
clear
delete
Node Data
Reference Quantities
Line
1
Values/Line

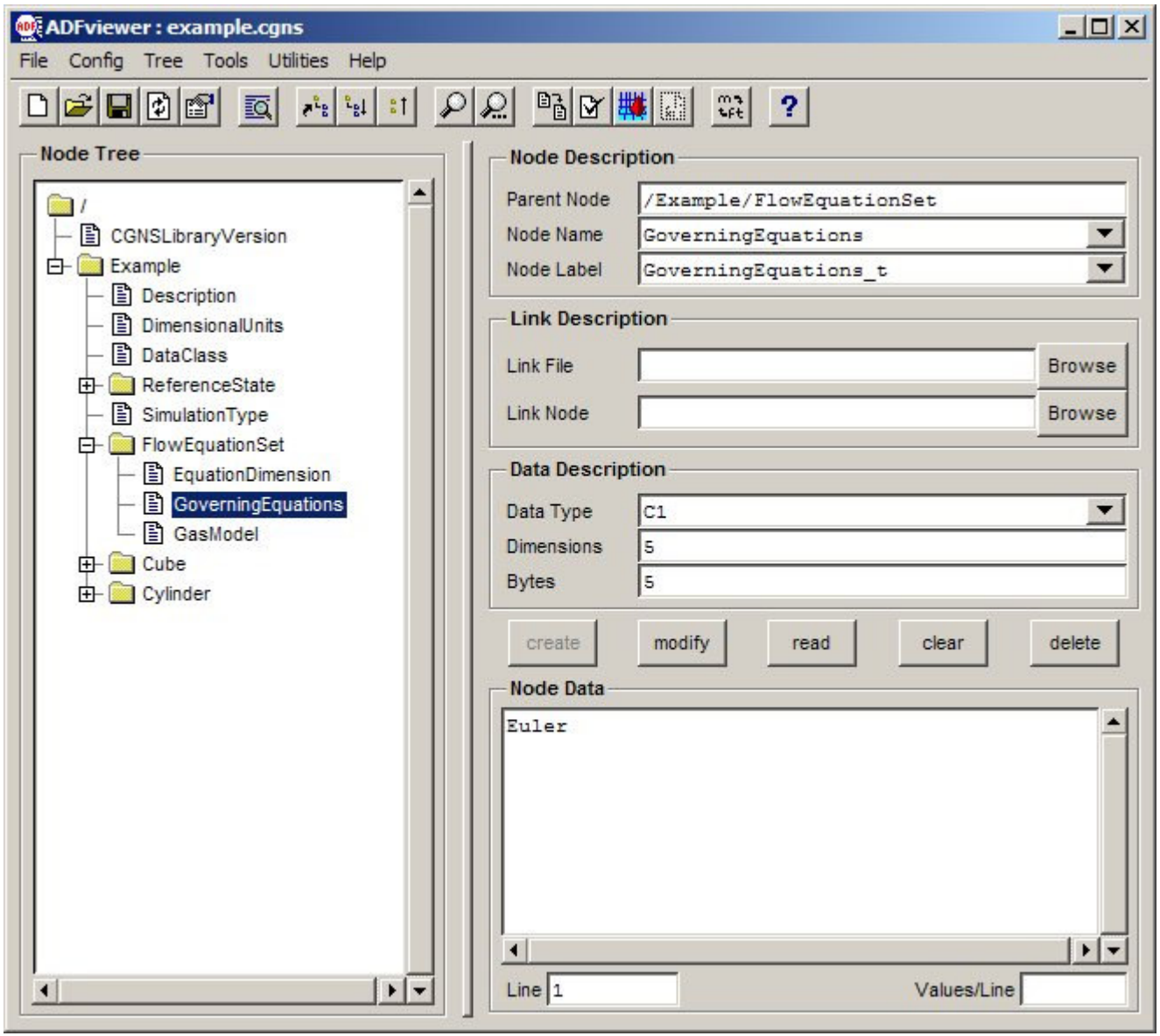
Documentation (cont'd)

- Simulation Type

```
 call cg_simulation_type_write_f(ifile,ibase,
&                                NonTimeAccurate,ierr)
```

- Equation Set and Numerical Models

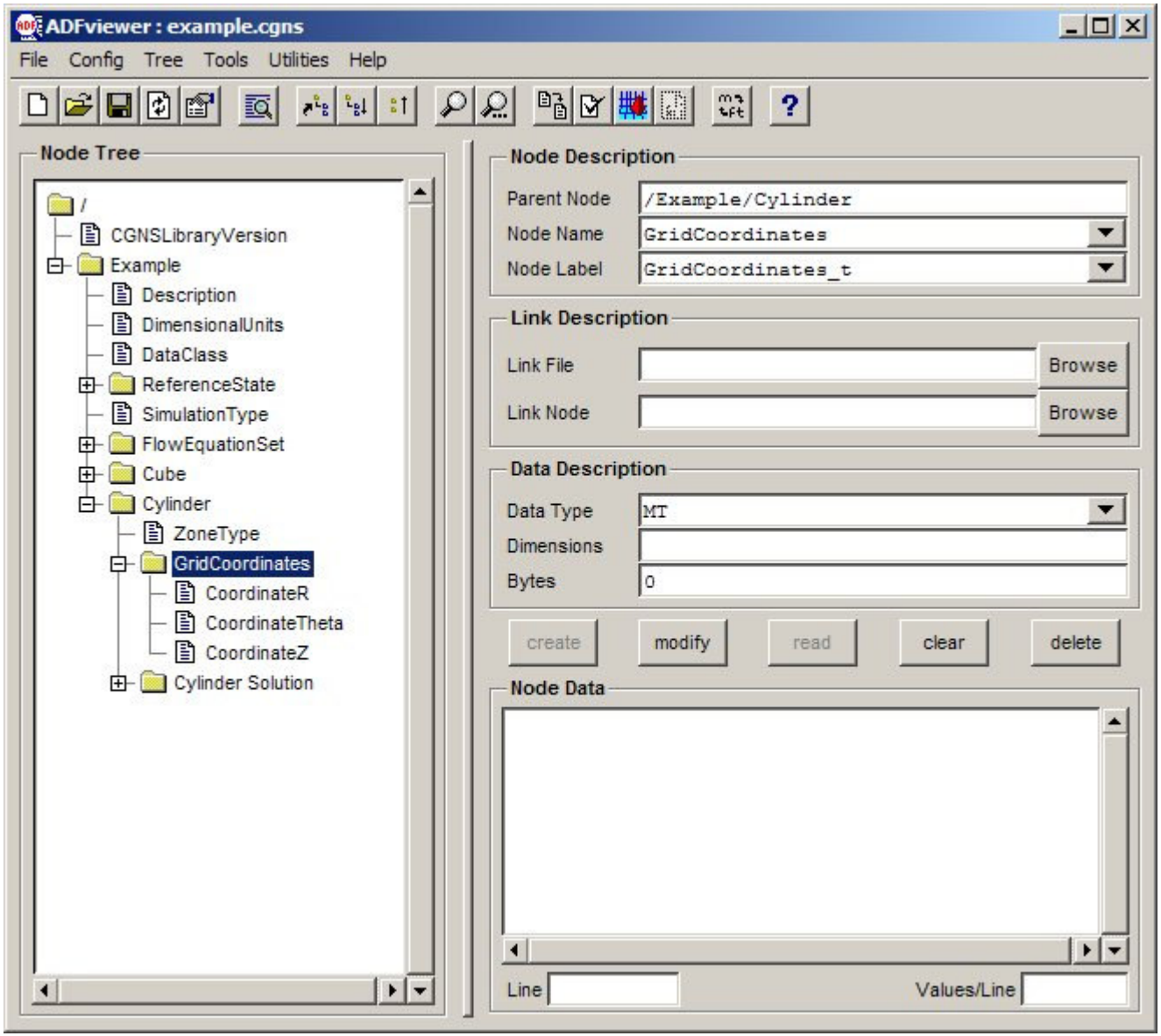
```
 call cg_goto_f(ifile,ibase,ierr,'end')
 call cg_equationset_write_f(5,ierr)

 call cg_goto_f(ifile,ibase,ierr,'FlowEquationSet_t',1,'end')
 call cg_governing_write_f(Euler,ierr)
 call cg_model_write_f('GasModel_t',Ideal,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
EquationDimension
GoverningEquations
GasModel
Cube
Cylinder
Node Description
Parent Node
/Example/FlowEquationSet
Node Name
GoverningEquations
Node Label
GoverningEquations_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
5
Bytes
5
create
modify
read
clear
delete
Node Data
Euler
Line
1
Values/Line

Coordinate Systems

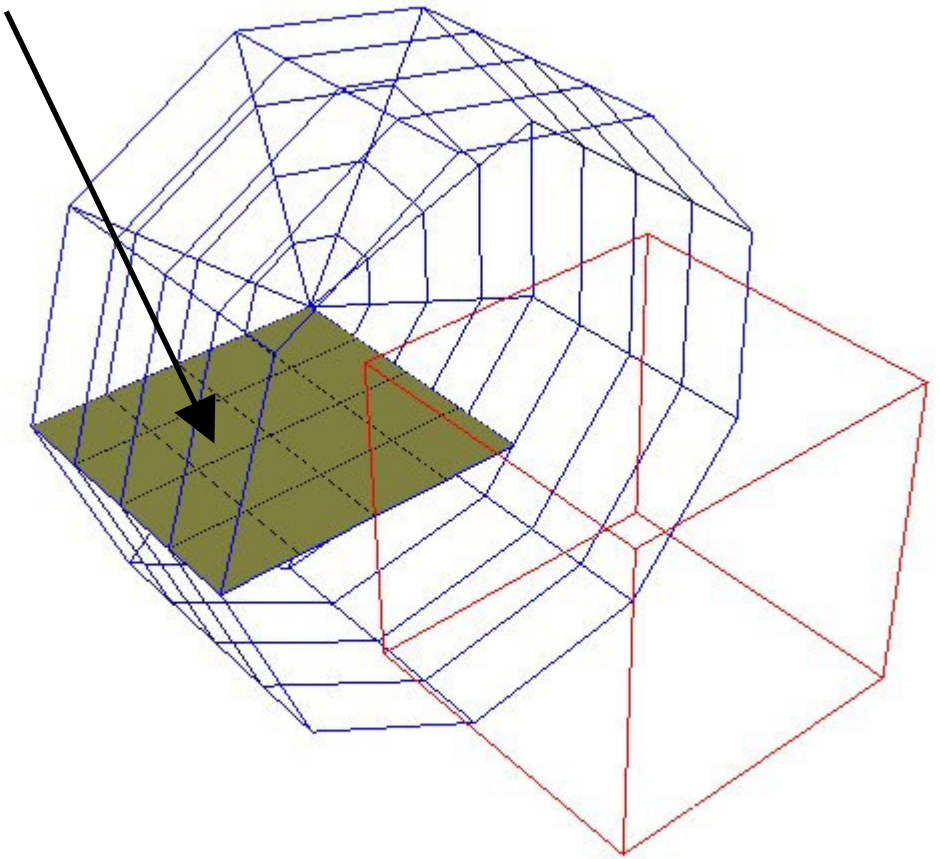
- Four Predefined Coordinate Systems
  - Cartesian (x,y,z)
  - Cylindrical (r,θ,z)
  - Spherical (r,θ,φ)
  - Auxiliary (ξ,η,ζ)
- Write Cylinder coordinates as Cylindrical

```
 call cg_coord_write_f(ifile,ibase,izone,RealSingle,
&                      'CoordinateR',rc(1,1,1,1),icoord,ierr)
 call cg_coord_write_f(ifile,ibase,izone,RealSingle,
&                      'CoordinateTheta',rc(1,1,1,2),icoord,ierr)
 call cg_coord_write_f(ifile,ibase,izone,RealSingle,
&                      'CoordinateZ',rc(1,1,1,3),icoord,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
Cylinder
ZoneType
GridCoordinates
CoordinateR
CoordinateTheta
CoordinateZ
Cylinder Solution
Node Description
Parent Node
/Example/Cylinder
Node Name
GridCoordinates
Node Label
GridCoordinates_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
MT
Dimensions
Bytes
0
create
modify
read
clear
delete
Node Data
Line
Values/Line

Connectivity

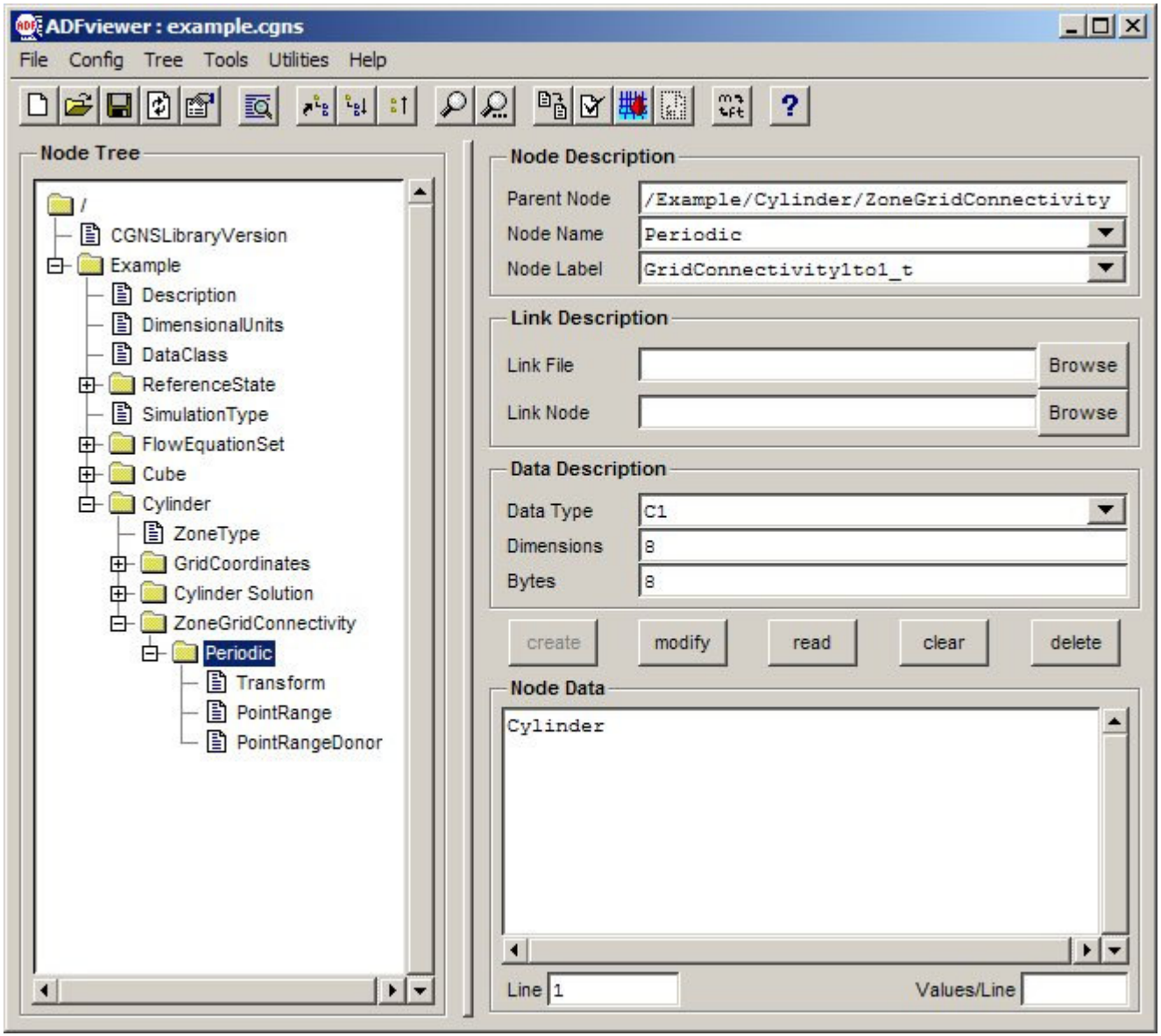
- Cylinder Cut as One to One Connection



Connectivity (cont'd)

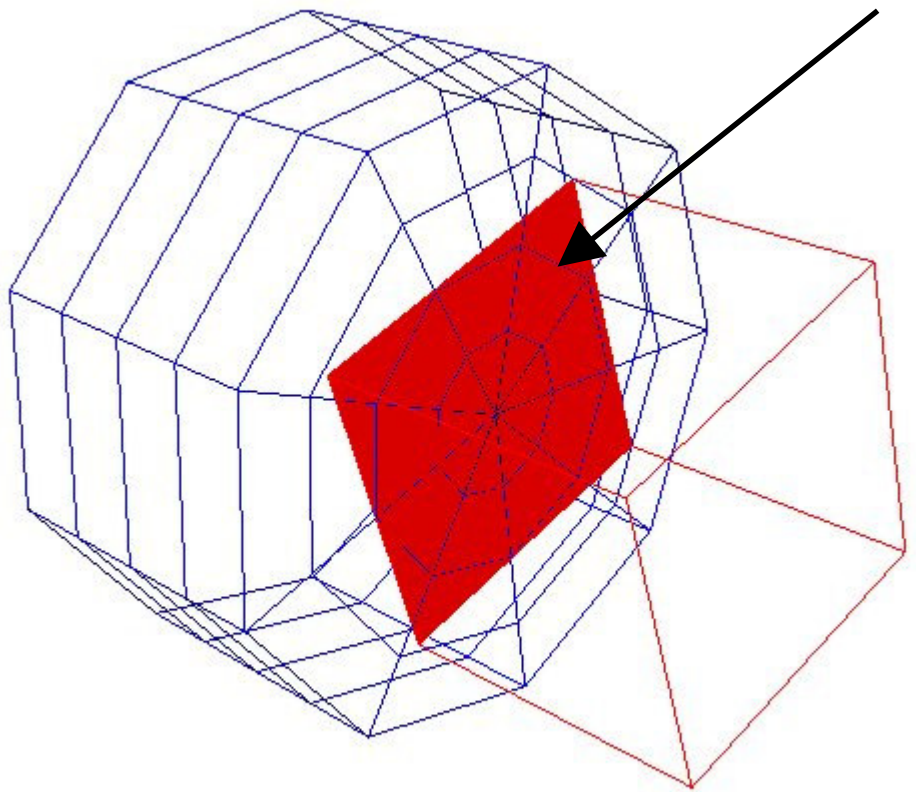
- Cylinder Cut as One to One Connection

```
do n=1,3
  transform(n) = n
  range(n,1)   = 1
  range(n,2)   = 5
  d_range(n,1) = 1
  d_range(n,2) = 5
enddo
range(2,2)   = 1
d_range(2,1) = 10
d_range(2,2) = 10

call cg_1to1_write_f(ifile,ibase,izone,'Periodic',
&    'Cylinder',range,d_range,transform,iconn,ierr)
```


ADFviewer : example.cgns
File Config Tree Tools Utilities Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
Cylinder
ZoneType
GridCoordinates
Cylinder Solution
ZoneGridConnectivity
Periodic
Transform
PointRange
PointRangeDonor
Node Description
Parent Node
/Example/Cylinder/ZoneGridConnectivity
Node Name
Periodic
Node Label
GridConnectivity1to1_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
8
Bytes
8
create
modify
read
clear
delete
Node Data
Cylinder
Line
1
Values/Line

Connectivity (cont'd)

- Cube to Cylinder Abutting Connection



Connectivity (cont'd)

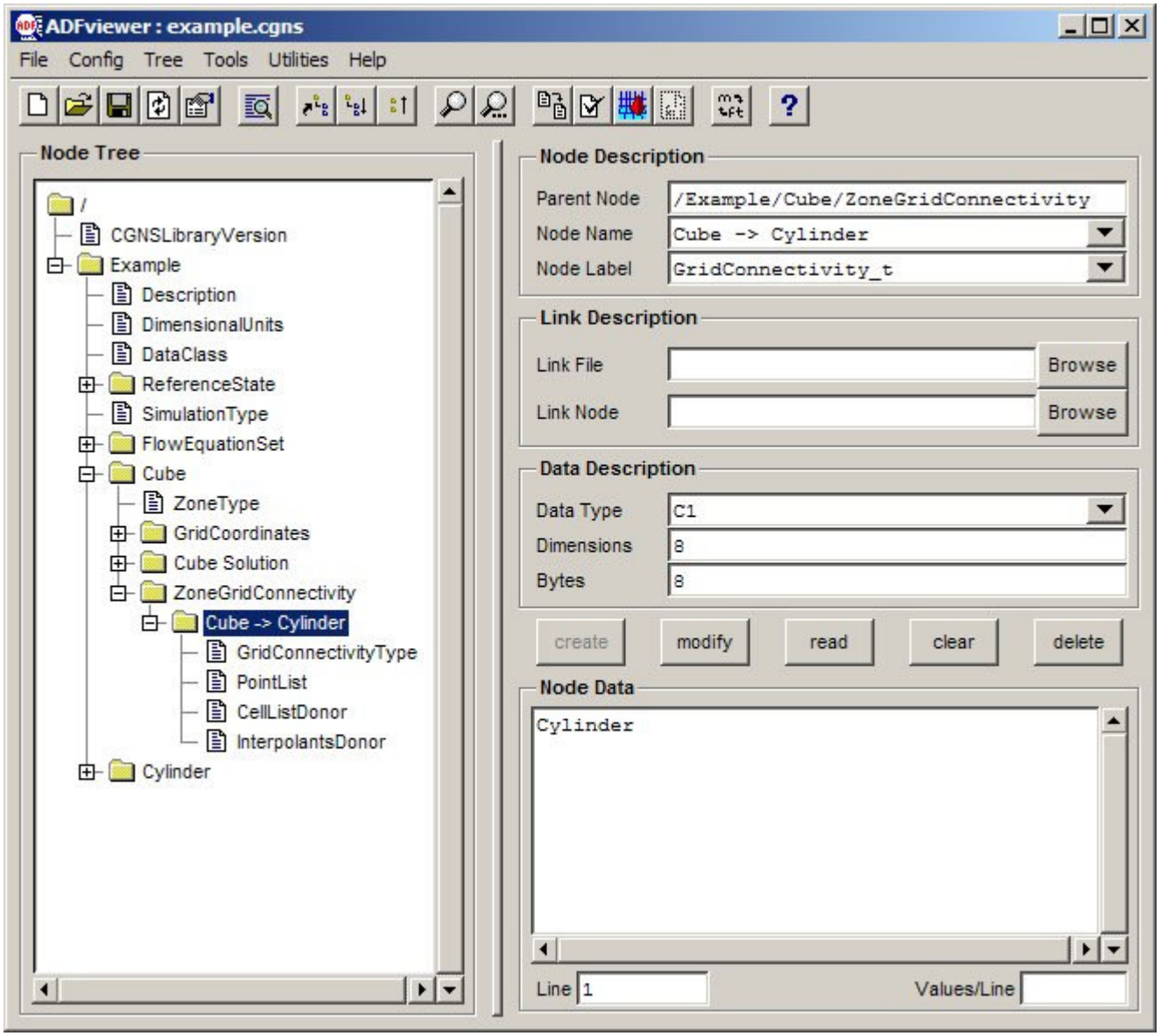
- Cube to Cylinder Abutting Connection

```
n = 0
do j=1,5
  do i=1,5
    rad = sqrt(r1(i,j,5,1)**2 + r1(i,j,5,2)**2)
    ang = atan2(r1(i,j,5,2), r1(i,j,5,1))
    ic  = rad
    if (ic .ge. 4) ic = 3
    if (ang .lt. 0.0) ang = ang + 6.2831853
    ang = ang / 0.6981317
    jc  = ang
    if (jc .ge. 9) jc = 8;
    pts(n+1)    = i;
    pts(n+2)    = j;
    pts(n+3)    = 5;
    d_cell(n+1) = ic + 1;
    d_cell(n+2) = jc + 1;
    d_cell(n+3) = 1;
    interp(n+1) = rad - ic;
    interp(n+2) = ang - jc;
    interp(n+3) = 0.0;
    n = n + 3
  enddo
enddo
```

Connectivity (cont'd)

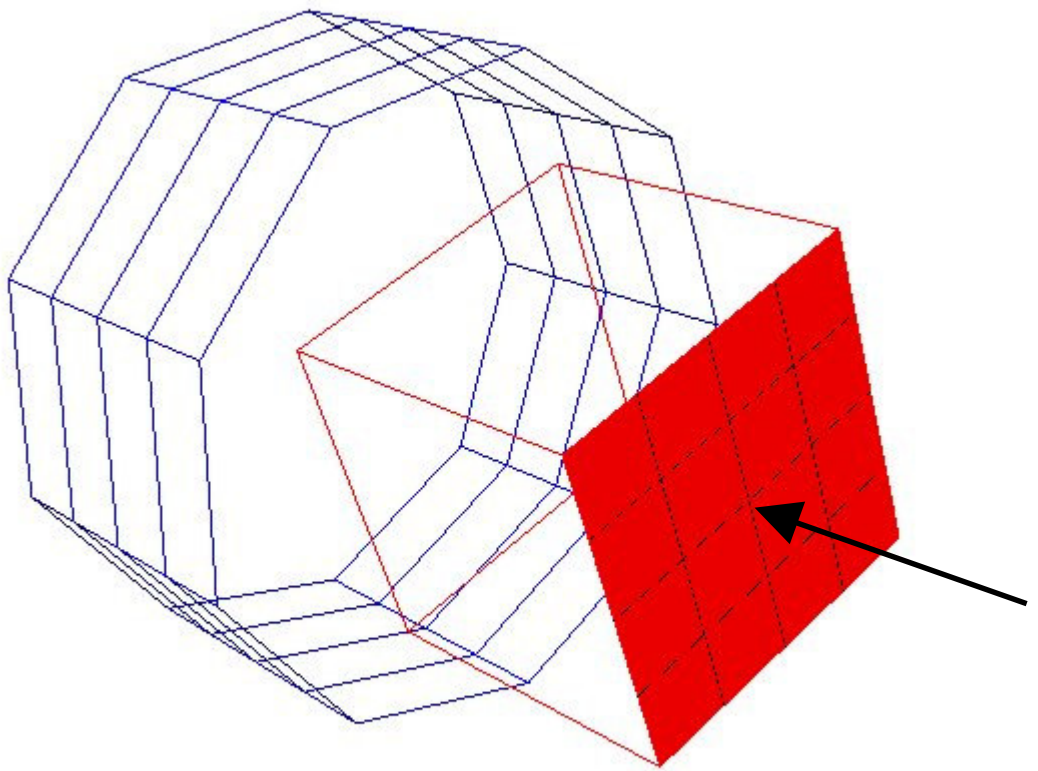
- Cube to Cylinder Abutting Connection

```
      call cg_conn_write_f(ifile,ibase,izone,'Cube -> Cylinder',
     &                     Vertex,Abutting,PointList,n/3,pts,
     &                     'Cylinder',Structured,CellListDonor,
     &                     Integer,n/3,d_cell,iconn,ierr)


c     write the interpolants

      call cg_goto_f(ifile,ibase,ierr,'Zone_t',izone,
     &               'ZoneGridConnectivity_t',1,
     &               'GridConnectivity_t',iconn,'end')
      dims(1) = 3;
      dims(2) = n / 3;
      call cg_array_write_f('InterpolantsDonor',RealSingle,2,dims,
     &                      interp,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
ZoneType
GridCoordinates
Cube Solution
ZoneGridConnectivity
Cube -> Cylinder
GridConnectivityType
PointList
CellListDonor
InterpolantsDonor
Cylinder
Node Description
Parent Node
/Example/Cube/ZoneGridConnectivity
Node Name
Cube -> Cylinder
Node Label
GridConnectivity_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
8
Bytes
8
create
modify
read
clear
delete
Node Data
Cylinder
Line
1
Values/Line

Boundary Conditions

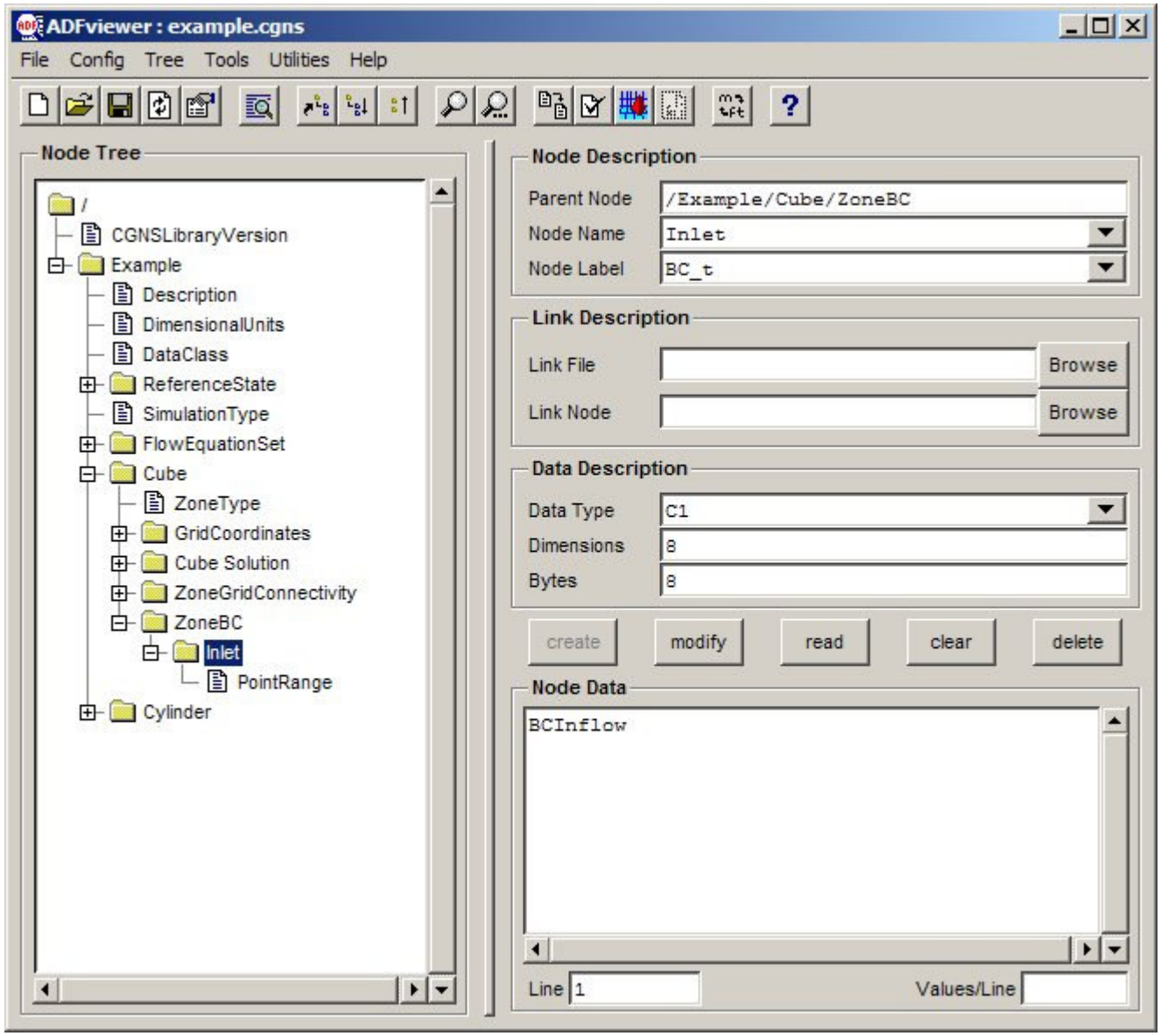
- Inlet on Cube Using Point Range



Boundary Conditions (cont'd)

- Inlet on Cube Using Point Range

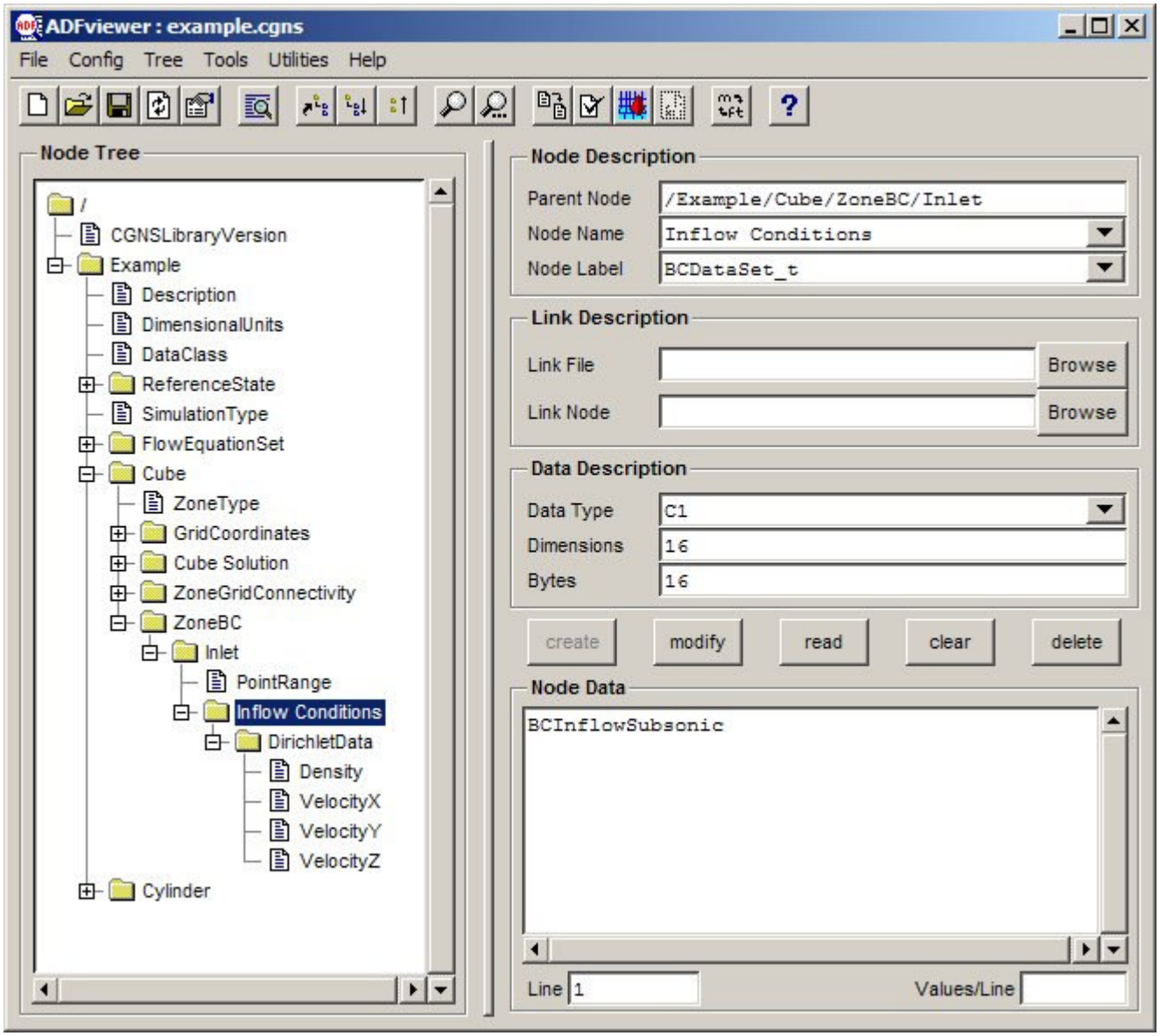
```
do n=1,3
   range(n,1) = 1
   range(n,2) = 5
enddo
range(3,2) = 1

call cg_boco_write_f(ifile,ibase,izone,'Inlet',BCInflow,
&                    PointRange,2,range,ibc,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
ZoneType
GridCoordinates
Cube Solution
ZoneGridConnectivity
ZoneBC
Inlet
PointRange
Cylinder
Node Description
Parent Node
/Example/Cube/ZoneBC
Node Name
Inlet
Node Label
BC_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
8
Bytes
8
create
modify
read
clear
delete
Node Data
BCInflow
Line
1
Values/Line

Boundary Conditions (cont'd)

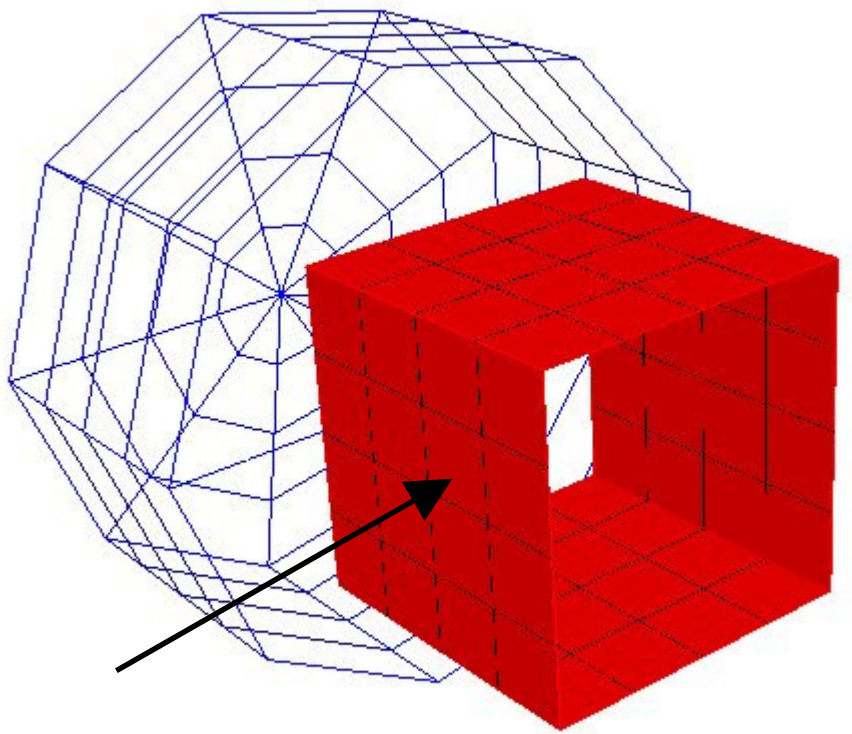
- Defining the Inlet Boundary Condition

```
  call cg_dataset_write_f(ifile,ibase,izone,ibc,
&                 'Inflow Conditions',BCInflowSubsonic,
&                 idset,ierr)

  call cg_bcdata_write_f(ifile,ibase,izone,ibc,idset,
&                        Dirichlet,ierr)


  call cg_goto_f(ifile,ibase,ierr,'Zone_t',izone,
&               'ZoneBC_t',1,'BC_t',ibc,'BCDataSet_t',idset,
&               'BCData_t',Dirichlet,'end')


  call cg_array_write_f('Density',RealSingle,1,1,0.9,ierr)
  call cg_array_write_f('VelocityX',RealSingle,1,1,1.5,ierr)
  call cg_array_write_f('VelocityY',RealSingle,1,1,0.0,ierr)
  call cg_array_write_f('VelocityZ',RealSingle,1,1,0.0,ierr)
```


ADFviewer : example.cgns
File Config Tree Tools Utilities Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
ZoneType
GridCoordinates
Cube Solution
ZoneGridConnectivity
ZoneBC
Inlet
PointRange
Inflow Conditions
DirichletData
Density
VelocityX
VelocityY
VelocityZ
Cylinder
Node Description
Parent Node
/Example/Cube/ZoneBC/Inlet
Node Name
Inflow Conditions
Node Label
BCDataSet_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
16
Bytes
16
create
modify
read
clear
delete
Node Data
BCInflowSubsonic
Line
1
Values/Line

Boundary Conditions (cont'd)

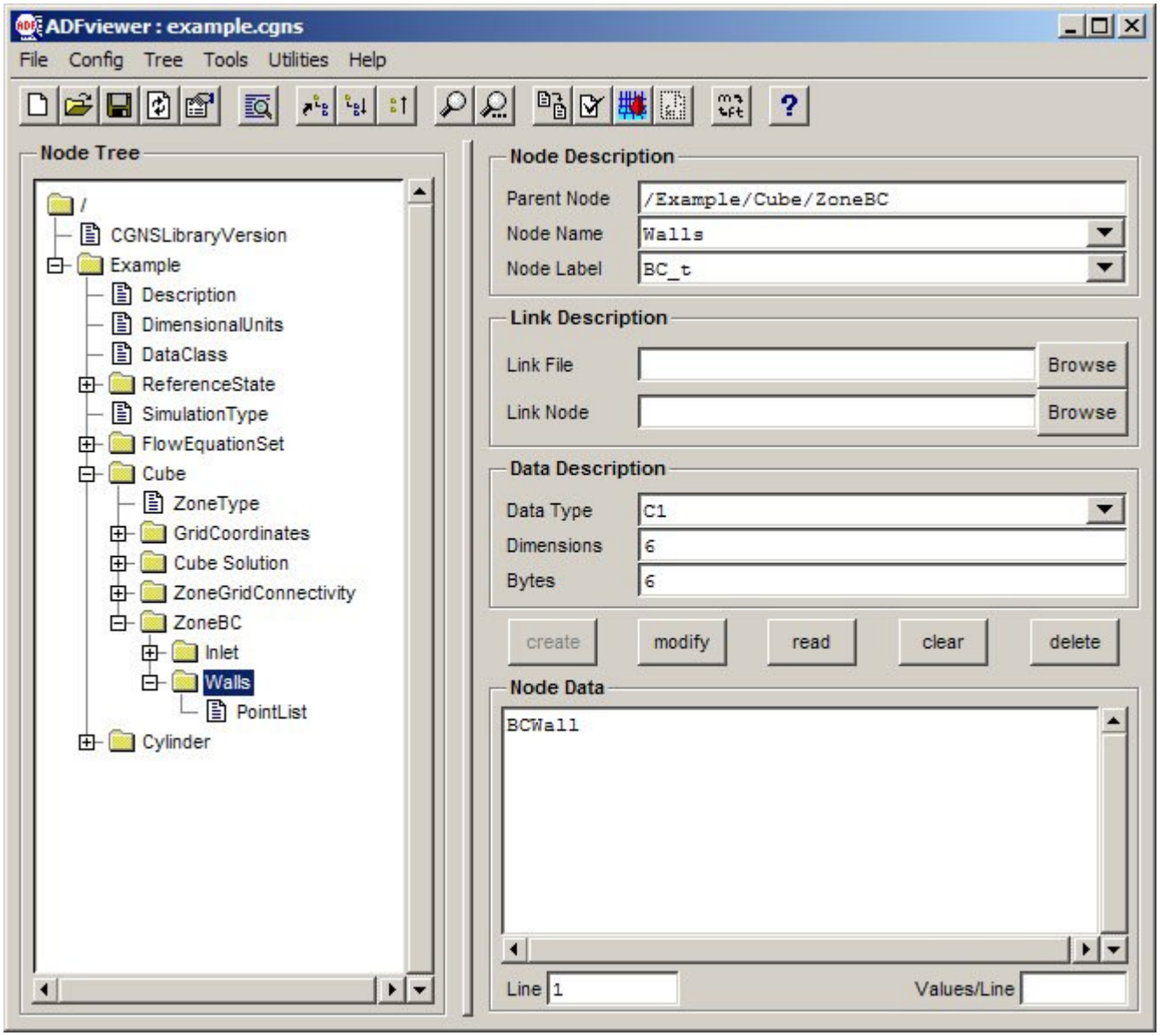
- Walls on Cube using Point List



Boundary Conditions (cont'd)

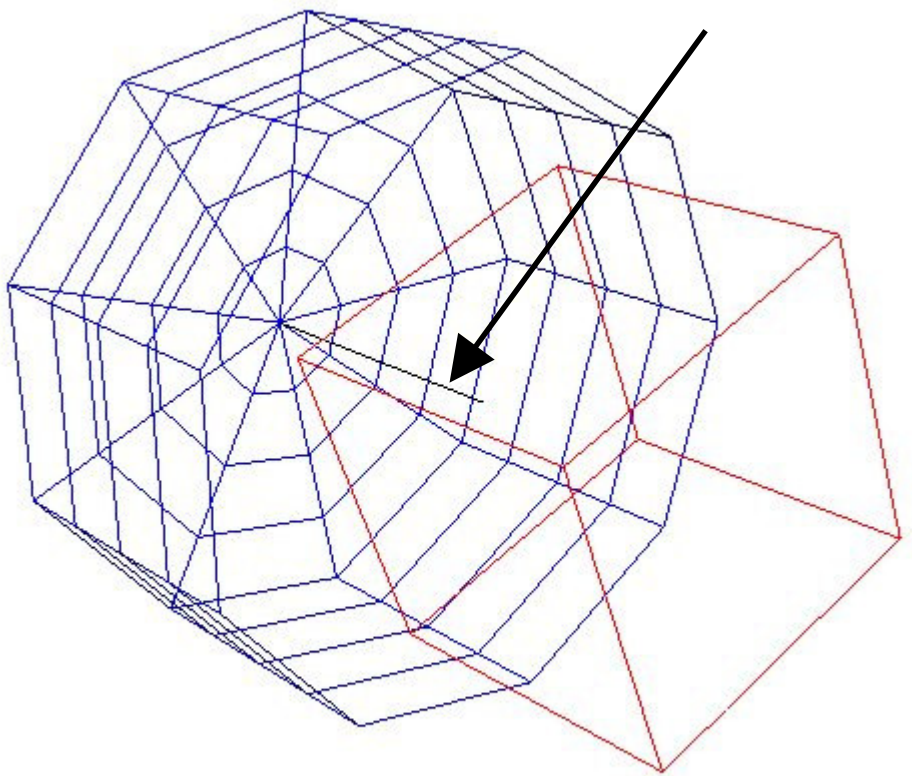
- Walls on Cube using Point List

```
n = 0
do k=1,5
  do i=1,4
    pts(n+1) = i+1
    pts(n+2) = 1
    pts(n+3) = k
    pts(n+4) = i
    pts(n+5) = 5
    pts(n+6) = k
    n = n + 6
  enddo
  do j=1,4
    pts(n+1) = 1
    pts(n+2) = j
    pts(n+3) = k
    pts(n+4) = 5
    pts(n+5) = j+1
    pts(n+6) = k
    n = n + 6
  enddo
enddo
call cg_boco_write_f(ifile,ibase,izone,'Walls',BCWall,
&                    PointList,n/3,pts,ibc,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
ZoneType
GridCoordinates
Cube Solution
ZoneGridConnectivity
ZoneBC
Inlet
Walls
PointList
Cylinder
Node Description
Parent Node
/Example/Cube/ZoneBC
Node Name
Walls
Node Label
BC_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
6
Bytes
6
create
modify
read
clear
delete
Node Data
BCWall
Line
1
Values/Line

Boundary Conditions (cont'd)

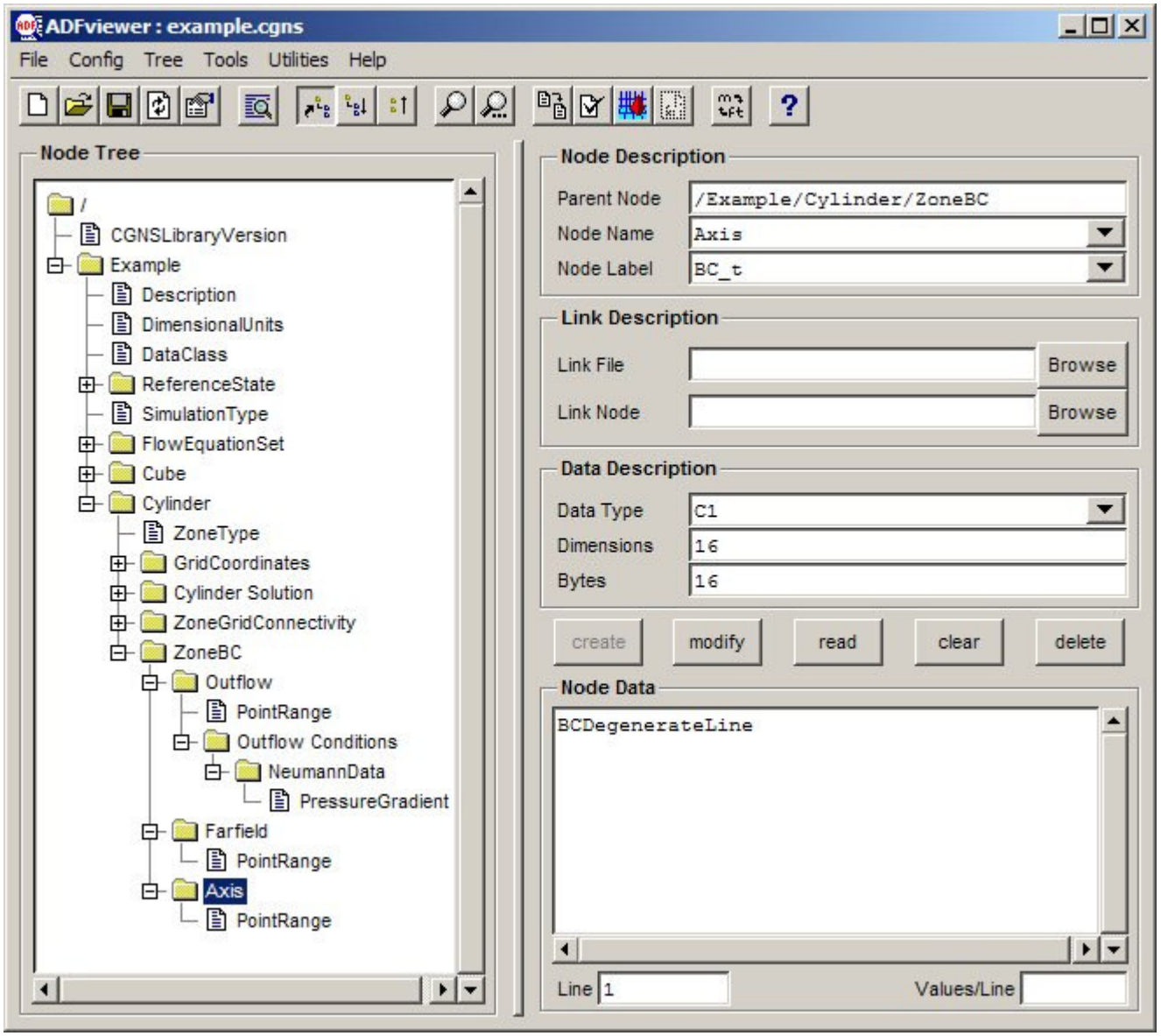
- Cylinder Axis as Degenerate Line



Boundary Conditions (cont'd)

- Cylinder Axis as Degenerate Line

```
range(1,1) = 1
range(1,2) = 1
range(2,1) = 1
range(2,2) = 10
range(3,1) = 1
range(3,2) = 5

call cg_boco_write_f(ifile,ibase,izone,'Axis',BCDegenerateLine,
&                    PointRange,2,range,ibc,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
Cylinder
ZoneType
GridCoordinates
Cylinder Solution
ZoneGridConnectivity
ZoneBC
Outflow
PointRange
Outflow Conditions
NeumannData
PressureGradient
Farfield
PointRange
Axis
PointRange
Node Description
Parent Node
/Example/Cylinder/ZoneBC
Node Name
Axis
Node Label
BC_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
C1
Dimensions
16
Bytes
16
create
modify
read
clear
delete
Node Data
BCDegenerateLine
Line
1
Values/Line

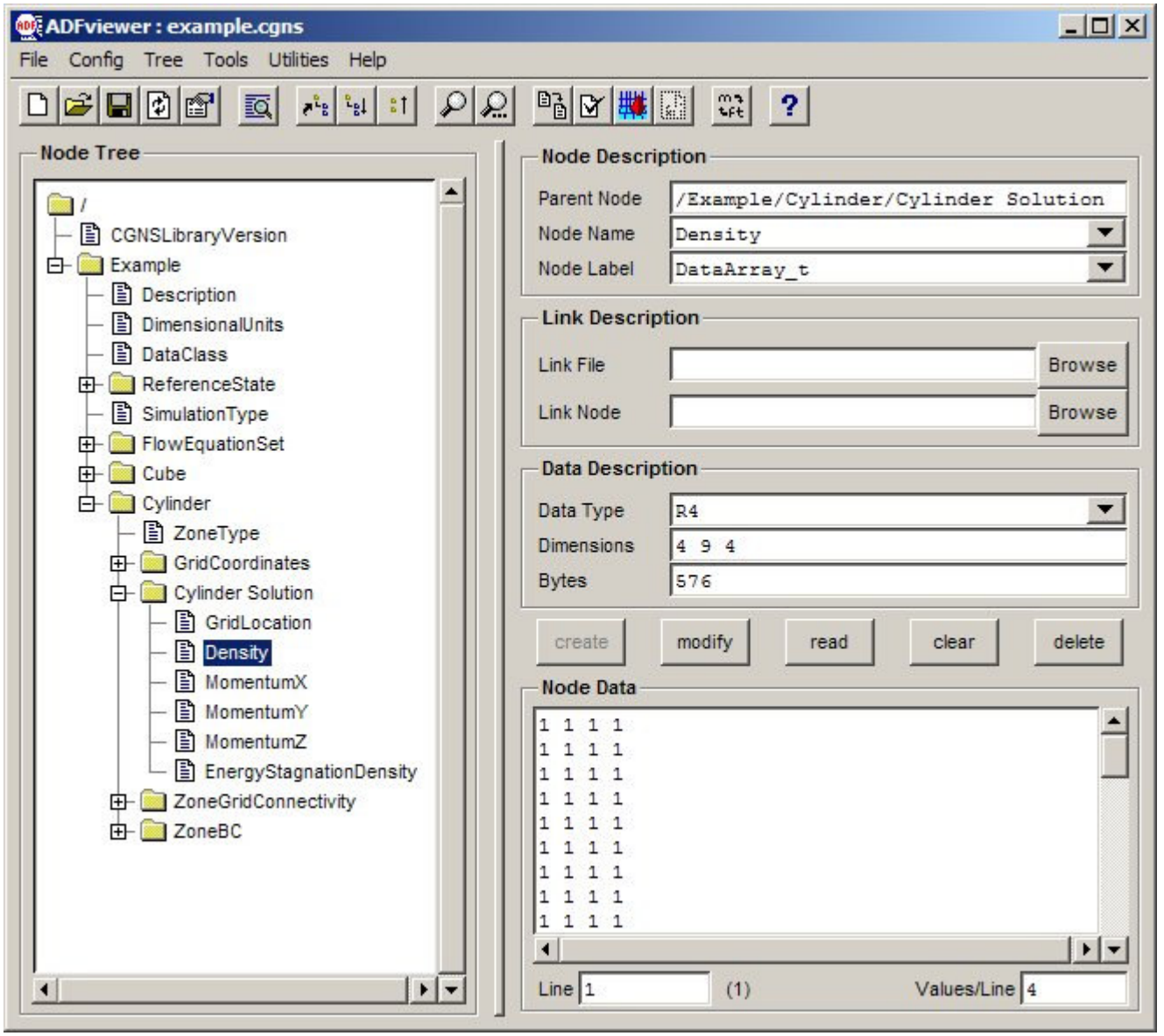
Solution Data

- Cell-Centered Data
  - Change Vertex in

```
 call cg_sol_write_f(ifile,ibase,izone,'Cylinder Solution',
&                    Vertex,isol,ierr)
```

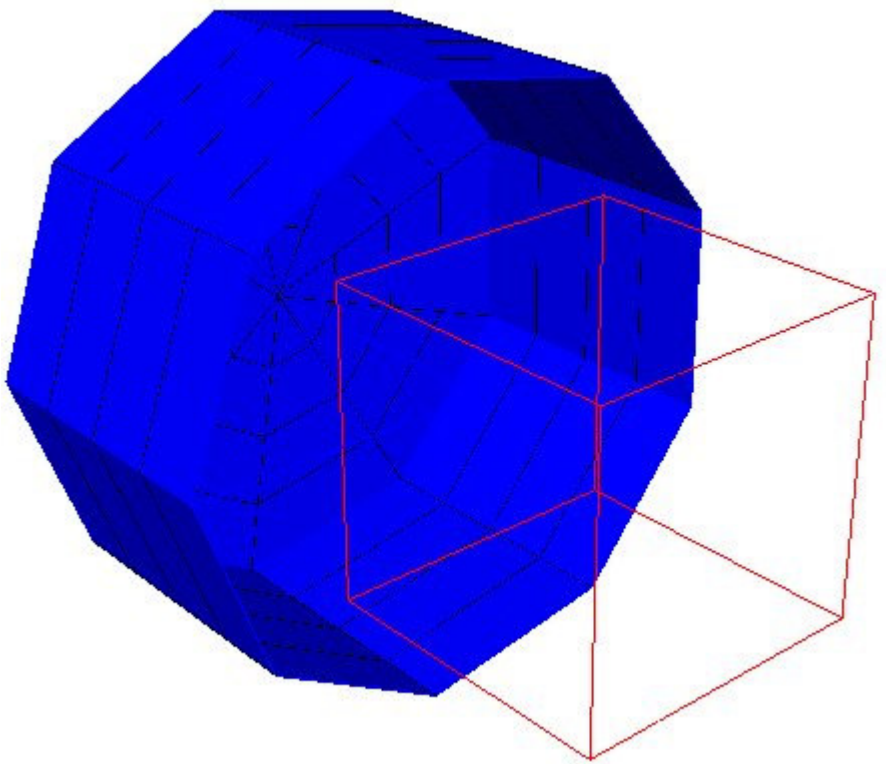
  - To CellCenter

```
 call cg_sol_write_f(ifile,ibase,izone,'Cylinder Solution',
&                    CellCenter,isol,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
Cylinder
ZoneType
GridCoordinates
Cylinder Solution
GridLocation
Density
MomentumX
MomentumY
MomentumZ
EnergyStagnationDensity
ZoneGridConnectivity
ZoneBC
Node Description
Parent Node
/Example/Cylinder/Cylinder Solution
Node Name
Density
Node Label
DataArray_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
R4
Dimensions
4 9 4
Bytes
576
create
modify
read
clear
delete
Node Data
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
1 1 1 1
Line
1
(1)
Values/Line
4

Solutions

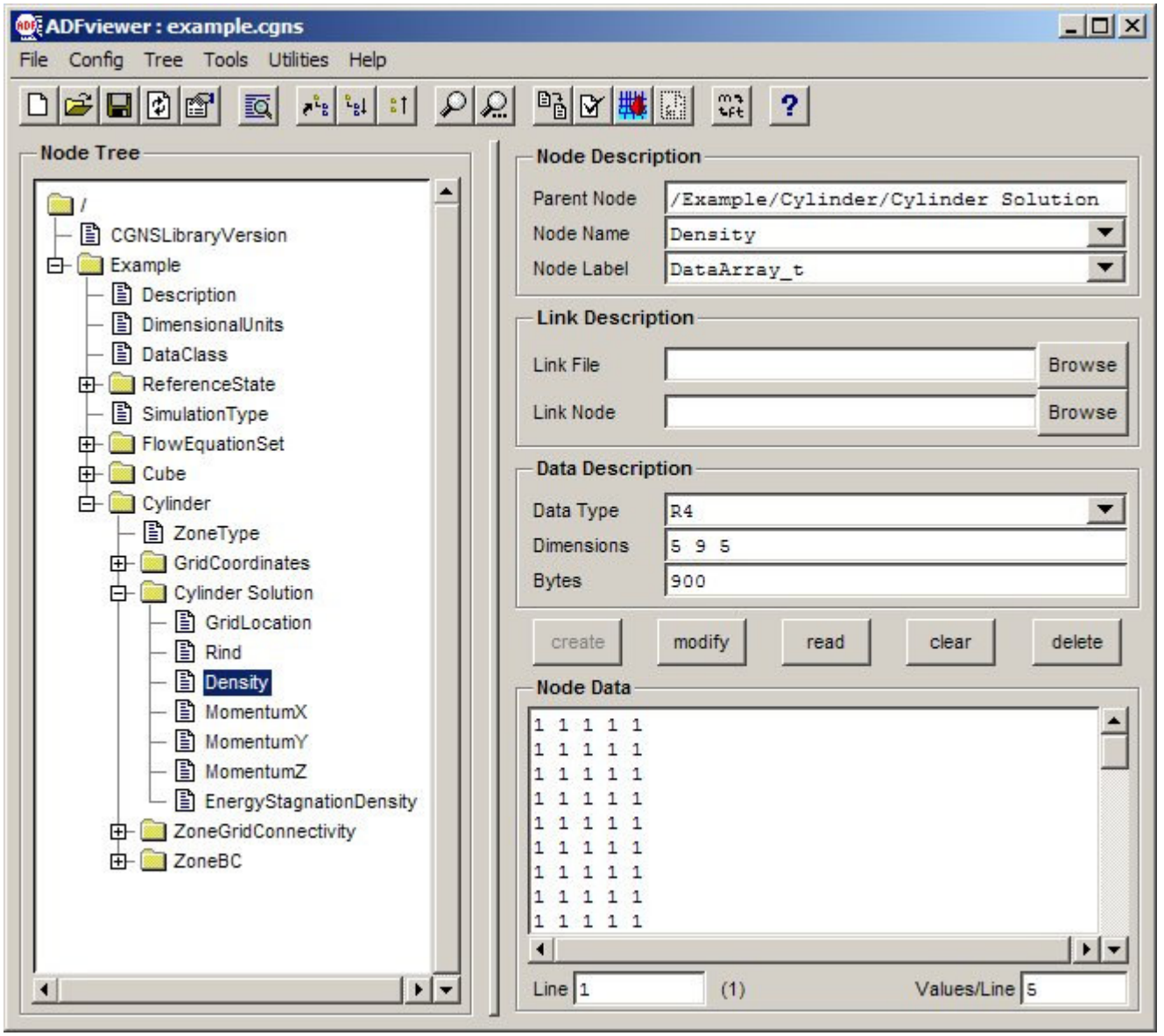
- Ghost Cells (Rind)



Solutions

- Ghost Cells (Rind)

```
 rind(1,1) = 0
 rind(2,1) = 1
 rind(1,2) = 0
 rind(2,2) = 0
 rind(1,3) = 0
 rind(2,3) = 1

 call cg_goto_f(ifile,ibase,ierr,'Zone_t',izone,
&               'FlowSolution_t',isol,'end')

 call cg_rind_write_f(rind,ierr)
```


ADFviewer : example.cgns
File
Config
Tree
Tools
Utilities
Help
Node Tree
/
CGNSLibraryVersion
Example
Description
DimensionalUnits
DataClass
ReferenceState
SimulationType
FlowEquationSet
Cube
Cylinder
ZoneType
GridCoordinates
Cylinder Solution
GridLocation
Rind
Density
MomentumX
MomentumY
MomentumZ
EnergyStagnationDensity
ZoneGridConnectivity
ZoneBC
Node Description
Parent Node
/Example/Cylinder/Cylinder Solution
Node Name
Density
Node Label
DataArray_t
Link Description
Link File
Browse
Link Node
Browse
Data Description
Data Type
R4
Dimensions
5 9 5
Bytes
900
create
modify
read
clear
delete
Node Data
1 1 1 1 1
1 1 1 1 1
1 1 1 1 1
1 1 1 1 1
1 1 1 1 1
1 1 1 1 1
1 1 1 1 1
1 1 1 1 1
1 1 1 1 1
Line
1
(1)
Values/Line
5

What Else Can You Do ?

- Multiple Cases (bases)
- Data Conversions and Dimensional Exponents
- Gravity
- Convergence History
- Moving/Rotating/Axisymmetric Grids
- Time-dependent Solutions
- User-defined Data
- Integral and Discrete Data
- Group by Families
- Geometry References
- Connectivity and Boundary Condition Properties