



# **pyCGNS.PAT/Manual**

***Release 4.0.1***

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January 07, 2011



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## 5 CGNS.PAT.cgnserrors

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The module to create and manipulate SIDS/Python trees. PAT has a *cgnslib* module with functions to create SIDS/Python compliant data structures. PAT defines all the CGNS types, names, enumerates or any other CGNS keyword.



# SIDS PATTERNS

This module contains all the CGNS/SIDS structures using CGNS.PAT as API.





# THE PYTHONISH CGNS LIB

The so-called *CGNS lib* or *MLL* or *Mid-level* library, is set of functions for used to read/write/modify a set of nodes matching a CGNS/SIDS type. The Pythonish flavour of this library declares a set of functions with more or less the same interface but with Python values.



# CGNS KEYWORDS

Instead of generating a new doc from a file, the file itself is included here. The purpose of *cgnskeywords.py* is to declare all constants as Python variables. This leads to several advantages:

- You cannot make a typo on a name. For example, if you use “ZoneGridConnectivity” as a plain string you may mistype it as “Zonegridconnectivity” or “ZoneGridConectivity” and this may silently produce a bad CGNS tree.
- You can handle enumerate as lists. For example you have lists for units: MassUnits\_1, LengthUnits\_1, AllDimensionalUnits\_1, AllUnits\_1
- You can identify what is a CGNS reserved or recommended name or not.

```
# -----
# pyCGNS.PAT - Python package for CFD General Notation System - PATternMaker
# See license.txt file in the root directory of this Python module source
# -----
# $Release: v4.0.1 $
# -----

# -----
# TYPES, ENUMERATES, CONSTANTS, NAMES from CGNS/SIDS v2.5.3
#
# [1] A CGNS/SIDS string constant is postfixed with _s
# 'ZoneType' is ZoneType_s
#
# [2] A CGNS/SIDS string constant repersenting a type has _ts
# 'ZoneType_t' is ZoneType_ts
#
# [3] A list of possible values for a given type has _l
# ZoneType_l is [Structured_s,Unstructured_s,Null_s,UserDefined_s]
# which is same as ["Structured","Unstructured","Null","UserDefined"]
#
# [4] An enumerate mapping of a list of values is not prefixed
# ZoneType is {'Unstructured':3,'Null':0,'Structured':2,'UserDefined':1}
#
# [5] The reverse dictionnary of the previous one is postfixed with _
# ZoneType_ is {0:'Null',1:'UserDefined',2:'Structured',3:'Unstructured'}
#
# -----
#
import CGNS.pyCGNSconfig

# ----- MLL numeric constants
try:
    CGNS_VERSION = int(float(CGNS.pyCGNSconfig.MLL_VERSION))
    CGNS_DOTVERS = CGNS_VERSION/1000.
except TypeError:
    CGNS_VERSION = 2520
    CGNS_DOTVERS = 2.52
```

```
MODE_READ   = 0
MODE_WRITE  = 1

if (CGNS_VERSION<3000):
    MODE_MODIFY = 3
    MODE_CLOSED = 2
else:
    MODE_MODIFY = 2
    MODE_CLOSED = 3

CG_OK          = 0
CG_ERROR       = 1
CG_NODE_NOT_FOUND = 2
CG_INCORRECT_PATH = 3
CG_NO_INDEX_DIM = 4

Null           = 0
UserDefined    = 1

CG_FILE_NONE   = 0
CG_FILE_ADF    = 1
CG_FILE_HDF5   = 2
CG_FILE_XML    = 3

# -----
# --- ADF Datatypes
#
(C1,I4,I8,R4,R8,MT,LK)=( 'C1','I4','I8','R4','R8','MT','LK' )

# ----- (NOT SIDS)
# --- CGNS/Python mapping extensions
#
CGNSTree_ts      = 'CGNSTree_t'
CGNSTree_s       = 'CGNSTree'

# --- Type with weird (coming from outer space) names
#
Transform_ts      = 'Transform_t'
DiffusionModel_ts = 'DiffusionModel_t'
EquationDimension_ts = 'EquationDimension_t'
InwardNormalIndex_ts = 'InwardNormalIndex_t'

# --- Add legacy strings for translation tools
#
Transform_ts2      = '"int[IndexDimension]"'
DiffusionModel_ts2 = '"int[1+...+IndexDimension]"'
EquationDimension_ts2 = '"int"'
InwardNormalIndex_ts2 = '"int[IndexDimension]"'

# ----- (SIDS)
# SIDS
#
Null_s = "Null"
UserDefined_s = "UserDefined"

# -----
Kilogram_s = "Kilogram"
Gram_s     = "Gram"
Slug_s     = "Slug"
PoundMass_s = "PoundMass"
MassUnits_1 = [Kilogram_s, Gram_s, Slug_s, PoundMass_s,
               Null_s, UserDefined_s]
```

```

# -----
Meter_s      = "Meter"
Centimeter_s = "Centimeter"
Millimeter_s = "Millimeter"
Foot_s       = "Foot"
Inch_s       = "Inch"
LengthUnits_1 = [Meter_s, Centimeter_s, Millimeter_s, Foot_s, Inch_s,
                  Null_s, UserDefined_s]

# -----
Second_s     = "Second"
TimeUnits_1  = [Second_s, Null_s, UserDefined_s]

# -----
Kelvin_s     = "Kelvin"
Celcius_s    = "Celcius"
Rankine_s    = "Rankine"
Fahrenheit_s = "Fahrenheit"
TemperatureUnits_1 = [Kelvin_s, Celcius_s, Rankine_s, Fahrenheit_s,
                      Null_s, UserDefined_s]

# -----
Degree_s     = "Degree"
Radian_s     = "Radian"
AngleUnits_1 = [Degree_s, Radian_s, Null_s, UserDefined_s]

# -----
Ampere_s     = "Ampere"
Abampere_s   = "Abampere"
Statampere_s = "Statampere"
Edison_s     = "Edison"
auCurrent_s  = "auCurrent"
ElectricCurrentUnits_1 = [Ampere_s, Abampere_s, Statampere_s, Edison_s, auCurrent_s,
                           Null_s, UserDefined_s]

# -----
Mole_s       = "Mole"
Entities_s    = "Entities"
StandardCubicFoot_s = "StandardCubicFoot"
StandardCubicMeter_s = "StandardCubicMeter"
SubstanceAmountUnits_1 = [Mole_s, Entities_s, StandardCubicFoot_s, StandardCubicMeter_s,
                           Null_s, UserDefined_s]

# -----
Candela_s    = "Candela"
Candle_s     = "Candle"
Carcel_s     = "Carcel"
Hefner_s     = "Hefner"
Violle_s     = "Violle"
LuminousIntensityUnits_1 = [Candela_s, Candle_s, Carcel_s, Hefner_s, Violle_s,
                             Null_s, UserDefined_s]

DimensionalUnits_s = "DimensionalUnits"
AdditionalUnits_s  = "AdditionalUnits"
AdditionalExponents_s = "AdditionalExponents"

AllDimensionalUnits_1 = TimeUnits_1+MassUnits_1+LengthUnits_1\
                        +TemperatureUnits_1+AngleUnits_1
AllAdditionalUnits_1  = LuminousIntensityUnits_1+SubstanceAmountUnits_1\
                        +ElectricCurrentUnits_1
AllUnits_1           = AllDimensionalUnits_1+AllAdditionalUnits_1

```

```
# -----
Dimensional_s          = "Dimensional"
NormalizedByDimensional_s = "NormalizedByDimensional"
NormalizedByUnknownDimensional_s = "NormalizedByUnknownDimensional"
NondimensionalParameter_s = "NondimensionalParameter"
DimensionlessConstant_s = "DimensionlessConstant"
DataClass_l=[Dimensional_s,NormalizedByDimensional_s,
              NormalizedByUnknownDimensional_s,NondimensionalParameter_s,
              DimensionlessConstant_s,Null_s,UserDefined_s]

DataClass_ts = "DataClass_t"
DataClass_s  = "DataClass"

# -----
Vertex_s      = "Vertex"
CellCenter_s  = "CellCenter"
FaceCenter_s  = "FaceCenter"
IFaceCenter_s = "IFaceCenter"
JFaceCenter_s = "JFaceCenter"
KFaceCenter_s = "KFaceCenter"
EdgeCenter_s  = "EdgeCenter"

GridLocation_s = "GridLocation"

GridLocation_l = [CellCenter_s,Vertex_s,FaceCenter_s,
                  IFaceCenter_s,JFaceCenter_s,KFaceCenter_s,
                  EdgeCenter_s,Null_s,UserDefined_s]

# -----
DirichletData_s = "DirichletData"
NeumannData_s   = "NeumannData"
Dirichlet_s     = "Dirichlet"
Neumann_s       = "Neumann"

PointList_s      = "PointList"
PointListDonor_s = "PointListDonor"
PointRange_s     = "PointRange"
PointRangeDonor_s = "PointRangeDonor"
ElementRange_s   = "ElementRange"
ElementList_s    = "ElementList"
CellListDonor_s  = "CellListDonor"

FullPotential_s  = "FullPotential"
Euler_s          = "Euler"
NSLaminar_s      = "NSLaminar"
NSTurbulent_s    = "NSTurbulent"
NSLaminarIncompressible_s = "NSLaminarIncompressible"
NSTurbulentIncompressible_s = "NSTurbulentIncompressible"

Ideal_s          = "Ideal"
VanderWaals_s    = "VanderWaals"
Constant_s       = "Constant"
PowerLaw_s       = "PowerLaw"
SutherlandLaw_s  = "SutherlandLaw"
ConstantPrandtl_s = "ConstantPrandtl"
EddyViscosity_s  = "EddyViscosity"
ReynoldsStress_s = "ReynoldsStress"
Algebraic_s      = "Algebraic"
BaldwinLomax_s   = "BaldwinLomax"
ReynoldsStressAlgebraic_s = "ReynoldsStressAlgebraic"
Algebraic_BaldwinLomax_s = "Algebraic_BaldwinLomax"
Algebraic_CebeciSmith_s = "Algebraic_CebeciSmith"
HalfEquation_JohnsonKing_s = "HalfEquation_JohnsonKing"
```

---

```

OneEquation_BaldwinBarth_s      = "OneEquation_BaldwinBarth"
OneEquation_SpalartAllmaras_s   = "OneEquation_SpalartAllmaras"
TwoEquation_JonesLaunder_s     = "TwoEquation_JonesLaunder"
TwoEquation_MenterSST_s        = "TwoEquation_MenterSST"
TwoEquation_Wilcox_s           = "TwoEquation_Wilcox"
CaloricallyPerfect_s           = "CaloricallyPerfect"
ThermallyPerfect_s             = "ThermallyPerfect"
ConstantDensity_s              = "ConstantDensity"
RedlichKwong_s                 = "RedlichKwong"
Frozen_s                       = "Frozen"
ThermalEquilib_s               = "ThermalEquilib"
ThermalNonequilib_s            = "ThermalNonequilib"
ChemicalEquilibCurveFit_s      = "ChemicalEquilibCurveFit"
ChemicalEquilibMinimization_s  = "ChemicalEquilibMinimization"
ChemicalNonequilib_s           = "ChemicalNonequilib"
EMElectricField_s              = "EMElectricField"
EMMagneticField_s              = "EMMagneticField"
EMConductivity_s               = "EMConductivity"
Voltage_s                      = "Voltage"
Interpolated_s                 = "Interpolated"
Equilibrium_LinRessler_s       = "Equilibrium_LinRessler"
Chemistry_LinRessler_s         = "Chemistry_LinRessler"

FamilySpecified_s              = "FamilySpecified"

Integer_s                      = "Integer"
RealSingle_s                   = "RealSingle"
RealDouble_s                   = "RealDouble"
Character_s                     = "Character"

NODE_s                         = "NODE"
BAR_2_s                        = "BAR_2"
BAR_3_s                        = "BAR_3"
TRI_3_s                        = "TRI_3"
TRI_6_s                        = "TRI_6"
QUAD_4_s                       = "QUAD_4"
QUAD_8_s                       = "QUAD_8"
QUAD_9_s                       = "QUAD_9"
TETRA_4_s                     = "TETRA_4"
TETRA_10_s                    = "TETRA_10"
PYRA_5_s                      = "PYRA_5"
PYRA_14_s                     = "PYRA_14"
PENTA_6_s                     = "PENTA_6"
PENTA_15_s                    = "PENTA_15"
PENTA_18_s                    = "PENTA_18"
HEXA_8_s                      = "HEXA_8"
HEXA_20_s                     = "HEXA_20"
HEXA_27_s                     = "HEXA_27"
MIXED_s                       = "MIXED"
NGON_n_s                      = "NGON_n"

# -----
Overset_s                      = "Overset"
Abutting_s                     = "Abutting"
Abutting1tol_s                 = "Abutting1tol"

GridConnectivityType_1 = [Overset_s, Abutting_s, Abutting1tol_s,
                          Null_s, UserDefined_s]

# -----
Structured_s                    = "Structured"
Unstructured_s                 = "Unstructured"
ZoneType_s                     = "ZoneType"

```

---

```
ZoneType_1      = [Structured_s,Unstructured_s,Null_s,UserDefined_s]

# -----
TimeAccurate_s  = "TimeAccurate"
NonTimeAccurate_s = "NonTimeAccurate"
SimulationType_ts = "SimulationType_t"
SimulationType_s = "SimulationType"
SimulationType_1 = [TimeAccurate_s,NonTimeAccurate_s,Null_s,UserDefined_s]

# -----
ConstantRate_s      = "ConstantRate"
VariableRate_s      = "VariableRate"
NonDeformingGrid_s  = "NonDeformingGrid"
DeformingGrid_s     = "DeformingGrid"
RigidGridMotionType_1 = [Null_s,ConstantRate_s,VariableRate_s,UserDefined_s]

RigidGridMotionType_s="RigidGridMotionType"
RigidGridMotionType_ts="RigidGridMotionType_t"

Generic_s          = "Generic"
BleedArea_s        = "BleedArea"
CaptureArea_s      = "CaptureArea"
AverageAll_s        = "AverageAll"
AverageCircumferential_s = "AverageCircumferential"
AverageRadial_s     = "AverageRadial"
AverageI_s          = "AverageI"
AverageJ_s          = "AverageJ"
AverageK_s          = "AverageK"
CGNSLibraryVersion_s = "CGNSLibraryVersion"
GridCoordinates_s   = "GridCoordinates"
ZoneGridConnectivity_s = "ZoneGridConnectivity"
CoordinateNames_s   = "CoordinateNames"
CoordinateX_s        = "CoordinateX"
CoordinateY_s        = "CoordinateY"
CoordinateZ_s        = "CoordinateZ"
CoordinateR_s        = "CoordinateR"
CoordinateTheta_s    = "CoordinateTheta"
CoordinatePhi_s      = "CoordinatePhi"
CoordinateNormal_s    = "CoordinateNormal"
CoordinateTangential_s = "CoordinateTangential"
CoordinateXi_s       = "CoordinateXi"
CoordinateEta_s      = "CoordinateEta"
CoordinateZeta_s     = "CoordinateZeta"
CoordinateTransform_s = "CoordinateTransform"
InterpolantsDonor_s  = "InterpolantsDonor"
ElementConnectivity_s = "ElementConnectivity"
ParentData_s         = "ParentData"
VectorX_ps           = "%sX"
VectorY_ps           = "%sY"
VectorZ_ps           = "%sZ"
VectorTheta_ps       = "%sTheta"
VectorPhi_ps         = "%sPhi"
VectorMagnitude_ps    = "%sMagnitude"
VectorNormal_ps       = "%sNormal"
VectorTangential_ps   = "%sTangential"
Potential_s           = "Potential"
StreamFunction_s      = "StreamFunction"
Density_s             = "Density"
Pressure_s            = "Pressure"
Temperature_s         = "Temperature"
EnergyInternal_s      = "EnergyInternal"
```



---

```

Enthalpy_s           = "Enthalpy"
Entropy_s            = "Entropy"
EntropyApprox_s      = "EntropyApprox"
DensityStagnation_s  = "DensityStagnation"
PressureStagnation_s = "PressureStagnation"
TemperatureStagnation_s = "TemperatureStagnation"
EnergyStagnation_s   = "EnergyStagnation"
EnthalpyStagnation_s = "EnthalpyStagnation"
EnergyStagnationDensity_s = "EnergyStagnationDensity"
VelocityX_s          = "VelocityX"
VelocityY_s          = "VelocityY"
VelocityZ_s          = "VelocityZ"
VelocityR_s          = "VelocityR"
VelocityTheta_s      = "VelocityTheta"
VelocityPhi_s        = "VelocityPhi"
VelocityMagnitude_s  = "VelocityMagnitude"
VelocityNormal_s     = "VelocityNormal"
VelocityTangential_s = "VelocityTangential"
VelocitySound_s      = "VelocitySound"
VelocitySoundStagnation_s = "VelocitySoundStagnation"
MomentumX_s          = "MomentumX"
MomentumY_s          = "MomentumY"
MomentumZ_s          = "MomentumZ"
MomentumMagnitude_s = "MomentumMagnitude"
RotatingVelocityX_s  = "RotatingVelocityX"
RotatingVelocityY_s  = "RotatingVelocityY"
RotatingVelocityZ_s  = "RotatingVelocityZ"
RotatingMomentumX_s = "RotatingMomentumX"
RotatingMomentumY_s = "RotatingMomentumY"
RotatingMomentumZ_s = "RotatingMomentumZ"
RotatingVelocityMagnitude_s = "RotatingVelocityMagnitude"
RotatingPressureStagnation_s = "RotatingPressureStagnation"
RotatingEnergyStagnation_s = "RotatingEnergyStagnation"
RotatingEnergyStagnationDensity_s = "RotatingEnergyStagnationDensity"
RotatingEnthalpyStagnation_s = "RotatingEnthalpyStagnation"
EnergyKinetic_s      = "EnergyKinetic"
PressureDynamic_s    = "PressureDynamic"
SoundIntensityDB_s   = "SoundIntensityDB"
SoundIntensity_s     = "SoundIntensity"
VorticityX_s         = "VorticityX"
VorticityY_s         = "VorticityY"
VorticityZ_s         = "VorticityZ"
VorticityMagnitude_s = "VorticityMagnitude"
SkinFrictionX_s      = "SkinFrictionX"
SkinFrictionY_s      = "SkinFrictionY"
SkinFrictionZ_s      = "SkinFrictionZ"
SkinFrictionMagnitude_s = "SkinFrictionMagnitude"
VelocityAngleX_s     = "VelocityAngleX"
VelocityAngleY_s     = "VelocityAngleY"
VelocityAngleZ_s     = "VelocityAngleZ"
VelocityUnitVectorX_s = "VelocityUnitVectorX"
VelocityUnitVectorY_s = "VelocityUnitVectorY"
VelocityUnitVectorZ_s = "VelocityUnitVectorZ"
MassFlow_s           = "MassFlow"
ViscosityKinematic_s = "ViscosityKinematic"
ViscosityMolecular_s = "ViscosityMolecular"
ViscosityEddyDynamic_s = "ViscosityEddyDynamic"
ViscosityEddy_s      = "ViscosityEddy"
ThermalConductivity_s = "ThermalConductivity"
PowerLawExponent_s   = "PowerLawExponent"
SutherlandLawConstant_s = "SutherlandLawConstant"
TemperatureReference_s = "TemperatureReference"
ViscosityMolecularReference_s = "ViscosityMolecularReference"

```

---

```
ThermalConductivityReference_s = "ThermalConductivityReference"
IdealGasConstant_s             = "IdealGasConstant"
SpecificHeatPressure_s         = "SpecificHeatPressure"
SpecificHeatVolume_s           = "SpecificHeatVolume"
ReynoldsStressXX_s             = "ReynoldsStressXX"
ReynoldsStressXY_s             = "ReynoldsStressXY"
ReynoldsStressXZ_s             = "ReynoldsStressXZ"
ReynoldsStressYY_s             = "ReynoldsStressYY"
ReynoldsStressYZ_s             = "ReynoldsStressYZ"
ReynoldsStressZZ_s             = "ReynoldsStressZZ"
LengthReference_s              = "LengthReference"
MolecularWeight_s              = "MolecularWeight"
MolecularWeight_ps             = "MolecularWeight%s"
HeatOfFormation_s              = "HeatOfFormation"
HeatOfFormation_ps             = "HeatOfFormation%s"
FuelAirRatio_s                 = "FuelAirRatio"
ReferenceTemperatureHOF_s      = "ReferenceTemperatureHOF"
MassFraction_s                 = "MassFraction"
MassFraction_ps                = "MassFraction%s"
LaminarViscosity_s             = "LaminarViscosity"
LaminarViscosity_ps            = "LaminarViscosity%s"
ThermalConductivity_ps         = "ThermalConductivity%s"
EnthalpyEnergyRatio_s          = "EnthalpyEnergyRatio"
CompressibilityFactor_s        = "CompressibilityFactor"
VibrationalElectronEnergy_s     = "VibrationalElectronEnergy"
VibrationalElectronTemperature_s = "VibrationalElectronTemperature"
SpeciesDensity_s               = "SpeciesDensity"
SpeciesDensity_ps              = "SpeciesDensity%s"
MoleFraction_s                 = "MoleFraction"
MoleFraction_ps                = "MoleFraction%s"
ElectricFieldX_s               = "ElectricFieldX"
ElectricFieldY_s               = "ElectricFieldY"
ElectricFieldZ_s               = "ElectricFieldZ"
MagneticFieldX_s               = "MagneticFieldX"
MagneticFieldY_s               = "MagneticFieldY"
MagneticFieldZ_s               = "MagneticFieldZ"
CurrentDensityX_s              = "CurrentDensityX"
CurrentDensityY_s              = "CurrentDensityY"
CurrentDensityZ_s              = "CurrentDensityZ"
LorentzForceX_s                = "LorentzForceX"
LorentzForceY_s                = "LorentzForceY"
LorentzForceZ_s                = "LorentzForceZ"
ElectricConductivity_s         = "ElectricConductivity"
JouleHeating_s                 = "JouleHeating"
TurbulentDistance_s            = "TurbulentDistance"
TurbulentEnergyKinetic_s       = "TurbulentEnergyKinetic"
TurbulentDissipation_s         = "TurbulentDissipation"
TurbulentDissipationRate_s     = "TurbulentDissipationRate"
TurbulentBBReynolds_s          = "TurbulentBBReynolds"
TurbulentSANuTilde_s           = "TurbulentSANuTilde"
Mach_s                          = "Mach"
Mach_Velocity_s                = "Mach_Velocity"
Mach_VelocitySound_s           = "Mach_VelocitySound"
Reynolds_s                     = "Reynolds"
Reynolds_Velocity_s            = "Reynolds_Velocity"
Reynolds_Length_s              = "Reynolds_Length"
Reynolds_ViscosityKinematic_s  = "Reynolds_ViscosityKinematic"
Prandtl_s                      = "Prandtl"
Prandtl_ThermalConductivity_s  = "Prandtl_ThermalConductivity"
Prandtl_ViscosityMolecular_s   = "Prandtl_ViscosityMolecular"
Prandtl_SpecificHeatPressure_s = "Prandtl_SpecificHeatPressure"
PrandtlTurbulent_s             = "PrandtlTurbulent"
SpecificHeatRatio_s            = "SpecificHeatRatio"
```

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```

SpecificHeatRatio_Pressure_s = "SpecificHeatRatio_Pressure"
SpecificHeatRatio_Volume_s   = "SpecificHeatRatio_Volume"
CoefPressure_s               = "CoefPressure"
CoefSkinFrictionX_s          = "CoefSkinFrictionX"
CoefSkinFrictionY_s          = "CoefSkinFrictionY"
CoefSkinFrictionZ_s          = "CoefSkinFrictionZ"
Coef_PressureDynamic_s       = "Coef_PressureDynamic"
Coef_PressureReference_s     = "Coef_PressureReference"
Vorticity_s                  = "Vorticity"
Acoustic_s                   = "Acoustic"
RiemannInvariantPlus_s       = "RiemannInvariantPlus"
RiemannInvariantMinus_s      = "RiemannInvariantMinus"
CharacteristicEntropy_s      = "CharacteristicEntropy"
CharacteristicVorticity1_s    = "CharacteristicVorticity1"
CharacteristicVorticity2_s    = "CharacteristicVorticity2"
CharacteristicAcousticPlus_s  = "CharacteristicAcousticPlus"
CharacteristicAcousticMinus_s = "CharacteristicAcousticMinus"
ForceX_s                     = "ForceX"
ForceY_s                     = "ForceY"
ForceZ_s                     = "ForceZ"
ForceR_s                     = "ForceR"
ForceTheta_s                 = "ForceTheta"
ForcePhi_s                   = "ForcePhi"
Lift_s                       = "Lift"
Drag_s                       = "Drag"
MomentX_s                    = "MomentX"
MomentY_s                    = "MomentY"
MomentZ_s                    = "MomentZ"
MomentR_s                    = "MomentR"
MomentTheta_s                = "MomentTheta"
MomentPhi_s                  = "MomentPhi"
MomentXi_s                   = "MomentXi"
MomentEta_s                  = "MomentEta"
MomentZeta_s                 = "MomentZeta"
Moment_CenterX_s             = "Moment_CenterX"
Moment_CenterY_s             = "Moment_CenterY"
Moment_CenterZ_s             = "Moment_CenterZ"
CoefLift_s                   = "CoefLift"
CoefDrag_s                   = "CoefDrag"
CoefMomentX_s                = "CoefMomentX"
CoefMomentY_s                = "CoefMomentY"
CoefMomentZ_s                = "CoefMomentZ"
CoefMomentR_s                = "CoefMomentR"
CoefMomentTheta_s            = "CoefMomentTheta"
CoefMomentPhi_s              = "CoefMomentPhi"
CoefMomentXi_s               = "CoefMomentXi"
CoefMomentEta_s              = "CoefMomentEta"
CoefMomentZeta_s             = "CoefMomentZeta"
Coef_PressureDynamic_s       = "Coef_PressureDynamic"
Coef_Area_s                  = "Coef_Area"
Coef_Length_s                = "Coef_Length"
TimeValues_s                 = "TimeValues"
IterationValues_s            = "IterationValues"
NumberOfZones_s              = "NumberOfZones"
NumberOfFamilies_s           = "NumberOfFamilies"
DataConversion_s              = "DataConversion"

ZonePointers_s               = "ZonePointers"
FamilyPointers_s             = "FamilyPointers"
RigidGridMotionPointers_s    = "RigidGridMotionPointers"
ArbitraryGridMotionPointers_s = "ArbitraryGridMotionPointers"
GridCoordinatesPointers_s     = "GridCoordinatesPointers"
FlowSolutionsPointers_s      = "FlowSolutionsPointers"

```

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```
PointerNames_l = [ZonePointers_s,FamilyPointers_s,RigidGridMotionPointers_s,
                  ArbitraryGridMotionPointers_s,GridCoordinatesPointers_s,
                  FlowSolutionsPointers_s]

OriginLocation_s           = "OriginLocation"
RigidRotationAngle_s       = "RigidRotationAngle"
Translation_s              = "Translation"
RotationAngle_s            = "RotationAngle"
RigidVelocity_s            = "RigidVelocity"
RigidRotationRate_s        = "RigidRotationRate"
GridVelocityX_s            = "GridVelocityX"
GridVelocityY_s            = "GridVelocityY"
GridVelocityZ_s            = "GridVelocityZ"
GridVelocityR_s            = "GridVelocityR"
GridVelocityTheta_s        = "GridVelocityTheta"
GridVelocityPhi_s          = "GridVelocityPhi"
GridVelocityXi_s           = "GridVelocityXi"
GridVelocityEta_s          = "GridVelocityEta"
GridVelocityZeta_s         = "GridVelocityZeta"

ArbitraryGridMotion_ts     = "ArbitraryGridMotion_t"
ArbitraryGridMotion_s      = "ArbitraryGridMotion"
ArbitraryGridMotionType_l  = [Null_s,NonDeformingGrid_s,
                              DeformingGrid_s,UserDefined_s]

ArbitraryGridMotionType_s  = "ArbitraryGridMotionType"
ArbitraryGridMotionType_ts = "ArbitraryGridMotionType_t"

Area_ts                    = "Area_t"
Area_s                     = "Area"
AreaType_ts                = "AreaType_t"
AreaType_s                 = "AreaType"
SurfaceArea_s              = "SurfaceArea"
RegionName_s               = "RegionName"
AverageInterface_ts        = "AverageInterface_t"
Axisymmetry_ts             = "Axisymmetry_t"
Axisymmetry_s              = "Axisymmetry"
AxisymmetryReferencePoint_s = "AxisymmetryReferencePoint"
AxisymmetryAxisVector_s    = "AxisymmetryAxisVector"
AxisymmetryAngle_s         = "AxisymmetryAngle"
BCDataSet_ts               = "BCDataSet_t"
BCData_ts                  = "BCData_t"
BCData_s                   = "BCData"

BCProperty_ts              = "BCProperty_t"
BCProperty_s               = "BCProperty"
BC_ts                       = "BC_t"

BaseIterativeData_ts       = "BaseIterativeData_t"
BaseIterativeData_s        = "BaseIterativeData"

CGNSBase_ts                = "CGNSBase_t"
CGNSLibraryVersion_ts      = "CGNSLibraryVersion_t"

# -----
ConvergenceHistory_ts       = "ConvergenceHistory_t"
ZoneConvergenceHistory_s    = "ZoneConvergenceHistory"
GlobalConvergenceHistory_s  = "GlobalConvergenceHistory"

ConvergenceHistory_l        = [ZoneConvergenceHistory_s,
                              GlobalConvergenceHistory_s]
```

---

```

NormDefinitions_s           = "NormDefinitions"

DataArray_ts                = "DataArray_t"
DataConversion_ts           = "DataConversion_t"
Descriptor_ts               = "Descriptor_t"

# -----
DimensionalExponents_ts     = "DimensionalExponents_t"
DimensionalExponents_s     = "DimensionalExponents"
DimensionalUnits_ts        = "DimensionalUnits_t"
AdditionalUnits_ts         = "AdditionalUnits_t"
AdditionalExponents_ts     = "AdditionalExponents_t"

DiscreteData_ts            = "DiscreteData_t"
DiscreteData_s             = "DiscreteData"
Elements_ts                = "Elements_t"

FamilyBC_s                 = "FamilyBC"
FamilyBC_ts                = "FamilyBC_t"

FamilyName_ts              = "FamilyName_t"
FamilyName_s               = "FamilyName"
Family_ts                  = "Family_t"
Family_s                   = "Family"
FlowEquationSet_ts         = "FlowEquationSet_t"
FlowEquationSet_s          = "FlowEquationSet"
FlowSolution_ts            = "FlowSolution_t"
GasModel_ts                = "GasModel_t"
GasModel_s                 = "GasModel"
#
GeometryEntity_ts          = "GeometryEntity_t"
GeometryFile_ts            = "GeometryFile_t"
GeometryFile_s             = "GeometryFile"

#chapter 12.7
GeometryFormat_s           = "GeometryFormat"
GeometryFormat_ts          = "GeometryFormat_t"
# not supported '-'
NASAIGES_s                 = "NASA-IGES"
SDRC_s                     = "SDRC"
Unigraphics_s              = "Unigraphics"
ProEngineer_s              = "ProEngineer"
ICEMCFD_s                  = "ICEM-CFD"
GeometryFormat_l           = [Null_s, NASAIGES_s, SDRC_s, Unigraphics_s,
                              ProEngineer_s, ICEMCFD_s, UserDefined_s]

GeometryReference_ts       = "GeometryReference_t"
GeometryReference_s        = "GeometryReference"

Gravity_ts                 = "Gravity_t"
Gravity_s                  = "Gravity"
GravityVector_s            = "GravityVector"

GridConnectivity1tol_ts    = "GridConnectivity1tol_t"
GridConnectivityProperty_ts = "GridConnectivityProperty_t"
GridConnectivityProperty_s = "GridConnectivityProperty"
GridConnectivityType_ts    = "GridConnectivityType_t"
GridConnectivityType_s     = "GridConnectivityType"
GridConnectivity_ts        = "GridConnectivity_t"

GridCoordinates_ts         = "GridCoordinates_t"
GridLocation_ts            = "GridLocation_t"
IndexArray_ts              = "IndexArray_t"

```

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|                             |   |
|-----------------------------|---|
| IndexRange_ts               | = "IndexRange_t"                                    |
| IntegralData_ts             | = "IntegralData_t"                                  |
| InwardNormalList_ts         | = "InwardNormalList_t"                              |
| InwardNormalList_s          | = "InwardNormalList"                                |
| InwardNormalIndex_s         | = "InwardNormalIndex"                               |
| Ordinal_ts                  | = "Ordinal_t"                                       |
| Ordinal_s                   | = "Ordinal"   |
| Transform_s                 | = "Transform"                                       |
| OversetHoles_ts             | = "OversetHoles_t"                                  |
| OversetHoles_s              | = "OversetHoles"                                    |
| Periodic_ts                 | = "Periodic_t"                                      |
| Periodic_s                  | = "Periodic"  |
| ReferenceState_ts           | = "ReferenceState_t"                                |
| ReferenceState_s            | = "ReferenceState"                                  |
| ReferenceStateDescription_s | = "ReferenceStateDescription"                       |
| RigidGridMotion_ts          | = "RigidGridMotion_t"                               |
| RigidGridMotion_s           | = "RigidGridMotion"                                 |
| Rind_s                      | = "Rind"  |
| Rind_ts                     | = "Rind_t"  |
| RotatingCoordinates_s       | = "RotatingCoordinates"                             |
| RotatingCoordinates_ts      | = "RotatingCoordinates_t"                           |
| RotationRateVector_s        | = "RotationRateVector"                              |
| RotationCenter_s            | = "RotationCenter"                                  |
| GoverningEquations_s        | = "GoverningEquations"                              |
| GoverningEquations_ts       | = "GoverningEquations_t"                            |
| GoverningEquationsType_l    | = [Euler_s, NSLaminar_s, NSTurbulent_s]             |
| GoverningEquationsType_s    | = "GoverningEquationsType"                          |
| GoverningEquationsType_ts   | = "GoverningEquationsType_t"                        |
| BCType_s                    | = "BCType"  |
| BCType_ts                   | = "BCType_t"  |
| BCTypeSimple_s              | = "BCTypeSimple"                                    |
| BCTypeSimple_ts             | = "BCTypeSimple_t"                                  |
| BCAxisymmetricWedge_s       | = "BCAxisymmetricWedge"                             |
| BCDegenerateLine_s          | = "BCDegenerateLine"                                |
| BCDegeneratePoint_s         | = "BCDegeneratePoint"                               |
| BCDirichlet_s               | = "BCDirichlet"                                     |
| BCExtrapolate_s             | = "BCExtrapolate"                                   |
| BCFarfield_s                | = "BCFarfield"                                      |
| BCGeneral_s                 | = "BCGeneral"                                       |
| BCInflow_s                  | = "BCInflow"  |
| BCInflowSubsonic_s          | = "BCInflowSubsonic"                                |
| BCInflowSupersonic_s        | = "BCInflowSupersonic"                              |
| BCNeumann_s                 | = "BCNeumann"                                       |
| BCOutflow_s                 | = "BCOutflow"                                       |
| BCOutflowSubsonic_s         | = "BCOutflowSubsonic"                               |
| BCOutflowSupersonic_s       | = "BCOutflowSupersonic"                             |
| BCSymmetryPlane_s           | = "BCSymmetryPlane"                                 |
| BCSymmetryPolar_s           | = "BCSymmetryPolar"                                 |
| BCTunnelInflow_s            | = "BCTunnelInflow"                                  |
| BCTunnelOutflow_s           | = "BCTunnelOutflow"                                 |
| BCWall_s                    | = "BCWall"  |
| BCWallInviscid_s            | = "BCWallInviscid"                                  |
| BCWallViscous_s             | = "BCWallViscous"                                   |
| BCWallViscousHeatFlux_s     | = "BCWallViscousHeatFlux"                           |
| BCWallViscousIsothermal_s   | = "BCWallViscousIsothermal"                         |
| BCTypeSimple_l              | = [Null_s, BCGeneral_s, BCDirichlet_s, BCNeumann_s, |

```

BCExtrapolate_s,BCWallInviscid_s,BCWallViscousHeatFlux_s,
BCWallViscousIsothermal_s,BCWallViscous_s,BCWall_s,
BCInflowSubsonic_s,BCInflowSupersonic_s,BCOutflowSubsonic_s,
BCOutflowSupersonic_s,BCTunnelInflow_s,BCTunnelOutflow_s,
BCDegenerateLine_s,BCDegeneratePoint_s,BCSymmetryPlane_s,
BCSymmetryPolar_s,BCAxisymmetricWedge_s,FamilySpecified_s,
UserDefined_s]
BCTypeCompound_l = [BCInflow_s,BCOutflow_s,BCFarfield_s,
Null_s,UserDefined_s]
BCType_l = BCTypeSimple_l+BCTypeCompound_l

ThermalConductivityModel_ts = "ThermalConductivityModel_t"
ThermalConductivityModel_s = "ThermalConductivityModel"
ThermalConductivityModelType_l = [Null_s,ConstantPrandtl_s,PowerLaw_s,
SutherlandLaw_s,UserDefined_s]
ThermalConductivityModelType_s = "ThermalConductivityModelType"
ThermalConductivityModelType_ts = "ThermalConductivityModelType_t"
ThermalConductivityModelIdentifier_l = [(Prandtl_s),(PowerLawExponent_s),
(SutherlandLawConstant_s),
(TemperatureReference_s),
(ThermalConductivityReference_s)]

TurbulenceClosure_ts = "TurbulenceClosure_t"
TurbulenceClosure_s = "TurbulenceClosure"
TurbulenceClosureType_l = [Null_s,EddyViscosity_s,ReynoldsStress_s,
ReynoldsStressAlgebraic_s,UserDefined_s]
TurbulenceClosureType_s = "TurbulenceClosureType"
TurbulenceClosureType_ts = "TurbulenceClosureType_t"
TurbulenceClosureIdentifier_l = [PrandtlTurbulent_s]

TurbulenceModel_ts = "TurbulenceModel_t"
TurbulenceModel_s = "TurbulenceModel"
TurbulenceModelType_l = [Null_s,Algebraic_BaldwinLomax_s,
Algebraic_CebeciSmith_s,
HalfEquation_JohnsonKing_s,
OneEquation_BaldwinBarth_s,
OneEquation_SpalartAllmaras_s,
TwoEquation_JonesLaunder_s,
TwoEquation_MenterSST_s,TwoEquation_Wilcox_s]
TurbulenceModelType_s = "TurbulenceModelType"
TurbulenceModelType_ts = "TurbulenceModelType_t"

DiffusionModel_s = 'DiffusionModel'
EquationDimension_s = 'EquationDimension'

ViscosityModel_ts = "ViscosityModel_t"
ViscosityModel_s = "ViscosityModel"
ViscosityModelType_l = [Constant_s,PowerLaw_s,SutherlandLaw_s,
Null_s,UserDefined_s]
ViscosityModelType_s = "ViscosityModelType"
ViscosityModelType_ts = "ViscosityModelType_t"
ViscosityModelIdentifier_l = [(PowerLawExponent_s),(SutherlandLawConstant_s),
(TemperatureReference_s),
(ViscosityMolecularReference_s)]

GasModelType_l = [Null_s,Ideal_s,VanderWaals_s,CaloricallyPerfect_s,
ThermallyPerfect_s,ConstantDensity_s,RedlichKwong_s,
UserDefined_s]
GasModelType_s = "GasModelType"
GasModelType_ts = "GasModelType_t"
GasModelIdentifier_l = [IdealGasConstant_s,SpecificHeatRatio_s,
SpecificHeatVolume_s,SpecificHeatPressure_s]

```

```
ThermalRelaxationModel_ts      = "ThermalRelaxationModel_t"
ThermalRelaxationModel_s      = "ThermalRelaxationModel"
ThermalRelaxationModelType_l  = [Null_s, Frozen_s, ThermalEquilib_s,
                                ThermalNonequilib_s, UserDefined_s]
ThermalRelaxationModelType_s  = "ThermalRelaxationModelType"
ThermalRelaxationModelType_ts = "ThermalRelaxationModelType_t"

ChemicalKineticsModel_ts      = "ChemicalKineticsModel_t"
ChemicalKineticsModel_s      = "ChemicalKineticsModel"
ChemicalKineticsModelType_l  = [Null_s, Frozen_s, ChemicalEquilibCurveFit_s,
                                ChemicalEquilibMinimization_s,
                                ChemicalNonequilib_s,
                                UserDefined_s]
ChemicalKineticsModelType_s  = "ChemicalKineticsModelType"
ChemicalKineticsModelType_ts = "ChemicalKineticsModelType_t"
ChemicalKineticsModelIdentifier_l = [FuelAirRatio_s, ReferenceTemperatureHOF_s]

EMElectricFieldModel_s        = "EMElectricFieldModel"
EMElectricFieldModel_ts      = "EMElectricFieldModel_t"
EMElectricFieldModelType_l  = [Null_s, Constant_s, Frozen_s,
                                Interpolated_s, Voltage_s, UserDefined_s]
EMElectricFieldModelType_s  = "EMElectricFieldModelType"
EMElectricFieldModelType_ts = "EMElectricFieldModelType_t"

EMMagneticFieldModel_s        = "EMMagneticFieldModel"
EMMagneticFieldModel_ts      = "EMMagneticFieldModel_t"
EMMagneticFieldModelType_l  = [Null_s, Constant_s, Frozen_s,
                                Interpolated_s, UserDefined_s]
EMMagneticFieldModelType_s  = "EMMagneticFieldModelType"
EMMagneticFieldModelType_ts = "EMMagneticFieldModelType_t"

EMConductivityModel_s        = "EMConductivityModel"
EMConductivityModel_ts      = "EMConductivityModel_t"
EMConductivityModelType_l  = [Null_s, Constant_s, Frozen_s,
                                Equilibrium_LinRessler_s,
                                Chemistry_LinRessler_s, UserDefined_s]
EMConductivityModelType_s  = "EMConductivityModelType"
EMConductivityModelType_ts = "EMConductivityModelType_t"
EMConductivityModelIdentifier_l = [ElectricFieldX_s, ElectricFieldY_s,
                                    ElectricFieldZ_s, MagneticFieldX_s,
                                    MagneticFieldY_s, MagneticFieldZ_s,
                                    CurrentDensityX_s, CurrentDensityY_s,
                                    CurrentDensityZ_s, ElectricConductivity_s,
                                    LorentzForceX_s, LorentzForceY_s,
                                    LorentzForceZ_s, JouleHeating_s]

AverageInterfaceType_s      = "AverageInterfaceType"
AverageInterfaceType_ts    = "AverageInterfaceType_t"
AverageInterfaceType_l    = [Null_s, AverageAll_s, AverageCircumferential_s,
                              AverageRadial_s, AverageI_s, AverageJ_s, AverageK_s,
                              UserDefined_s]
AverageInterface_s        = "AverageInterface"
AverageInterface_ts      = "AverageInterface_t"

Element_ts                = "Element_t"
ElementType_ts           = "ElementType_t"
ElementType_s            = "ElementType"
Element_s                 = "Element"
ElementType_l            = [Null_s, NODE_s, BAR_2_s, BAR_3_s,
                            TRI_3_s, TRI_6_s, QUAD_4_s, QUAD_8_s, QUAD_9_s,
                            TETRA_4_s, TETRA_10_s, PYRA_5_s, PYRA_14_s,
                            PENTA_6_s, PENTA_15_s, PENTA_18_s,
                            HEXA_8_s, HEXA_20_s, HEXA_27_s, MIXED_s, NGON_n_s,
```



```
        UserDefined_s]

#

WallFunction_ts          = "WallFunction_t"
WallFunction_s           = "WallFunction"
WallFunctionType_ts      = "WallFunctionType_t"
WallFunctionType_s       = "WallFunctionType"
ZoneBC_ts                = "ZoneBC_t"
ZoneBC_s                 = "ZoneBC"
ZoneGridConnectivity_ts  = "ZoneGridConnectivity_t"
ZoneIterativeData_ts     = "ZoneIterativeData_t"
ZoneIterativeData_s      = "ZoneIterativeData"
ZoneType_ts              = "ZoneType_t"
Zone_ts                  = "Zone_t"

UserDefinedData_ts       = "UserDefinedData_t"

# ---
cgnsnames=[k for k in dir() if (k[-2:]=='_s')]
cgnstypes=[k for k in dir() if (k[-3:]=='_ts')]
cgnsenums=[k for k in dir() if (k[-2:]=='_l')]
#
# --- last line
```



# CGNS TYPES

---

## 4.1 AdditionalExponents\_t

- Name
    - AdditionalExponents
  - Data-Type: R4 R8
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.2 AdditionalUnits\_t

- Name
    - AdditionalUnits
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.3 ArbitraryGridMotion\_t

- Name
    - {UserDefined}
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
-

- *UserDefinedData\_t* ({UserDefined})
  - *GridLocation\_t* (GridLocation)
  - *Rind\_t* (Rind)
  - *DataArray\_t* ({UserDefined})
- 

## 4.4 AreaType\_t

- Name
    - AreaType
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
- 

## 4.5 Area\_t

- Name
    - Area
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *AreaType\_t* (AreaType)
    - *DataArray\_t* (SurfaceArea)
    - *DataArray\_t* (RegionName)
- 

## 4.6 AverageInterfaceType\_t

- Name
    - AverageInterfaceType
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
-

## 4.7 AverageInterface\_t

- Name
    - AverageInterface
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *AverageInterfaceType\_t* (AverageInterfaceType)
- 

## 4.8 Axisymmetry\_t

- Name
    - Axisymmetry
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *DataArray\_t* (AxisymmetryReferencePoint)
    - *DataArray\_t* (AxisymmetryAxisVector)
    - *DataArray\_t* (AxisymmetryAngle)
    - *DataArray\_t* (CoordinateNames)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.9 BCDataSet\_t

- Name
  - {UserDefined}
- Data-Type: C1
- Dimensions/DimensionValues
- Cardinality: Zero/N
- Child Nodes
  - *BCData\_t* (NeumannData)

- *BCData\_t* (DirichletData)
  - *GridLocation\_t* (GridLocation)
  - *IndexRange\_t* (PointRange)
  - *IndexArray\_t* (PointList)
  - *Descriptor\_t* ({UserDefined})
  - *ReferenceState\_t* (ReferenceState)
  - *DataClass\_t* (DataClass)
  - *DimensionalUnits\_t* (DimensionalUnits)
  - *UserDefinedData\_t* ({UserDefined})
- 

## 4.10 BCData\_t

- Name
    - DirichletData
    - NeumannData
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *dataArray\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.11 BCProperty\_t

- Name
    - BCProperty
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *WallFunction\_t* (WallFunction)
    - *Area\_t* (Area)
-

## 4.12 BC\_t

- Name
    - {UserDefined}
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *ReferenceState\_t* (ReferenceState)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *Ordinal\_t* (Ordinal)
    - *FamilyName\_t* (FamilyName)
    - *IndexArray\_t* (InwardNormalList)
    - *BCDataSet\_t* ({UserDefined})
    - *InwardNormalIndex\_t* (InwardNormalIndex)
    - *IndexArray\_t* (ElementList)
    - *IndexArray\_t* (PointList)
    - *IndexRange\_t* (ElementRange)
    - *IndexRange\_t* (PointRange)
    - *GridLocation\_t* (GridLocation)
    - *BCProperty\_t* (BCProperty)
- 

## 4.13 BaselineData\_t

- Name
    - {UserDefined}
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *DataArray\_t* ({UserDefined})
-

## 4.14 CGNSBase\_t

- Name
    - {UserDefined}
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *Zone\_t* ({UserDefined})
    - *SimulationType\_t* (SimulationType)
    - *BaseIterativeData\_t* ({UserDefined})
    - *IntegralData\_t* ({UserDefined})
    - *ConvergenceHistory\_t* (GlobalConvergenceHistory)
    - *Family\_t* ({UserDefined})
    - *FlowEquationSet\_t* (FlowEquationSet)
    - *ReferenceState\_t* (ReferenceState)
    - *Axisymmetry\_t* (Axisymmetry)
    - *RotatingCoordinates\_t* (RotatingCoordinates)
    - *Gravity\_t* (Gravity)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.15 CGNSLibraryVersion\_t

- Name
    - CGNSLibraryVersion
  - Data-Type: R4
  - Dimensions/DimensionValues
  - Cardinality: One/One
- 

## 4.16 CGNSTree\_t

- Name
  - CGNSTree
  - {UserDefined}
- Data-Type: M T



- Dimensions/DimensionValues
  - Cardinality: One/One
  - Child Nodes
    - *CGNSLibraryVersion\_t* (CGNSLibraryVersion)
    - *CGNSBase\_t* ({UserDefined})
- 

## 4.17 ChemicalKineticsModel\_t

- Name
    - ChemicalKineticsModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.18 ConvergenceHistory\_t

- Name
    - GlobalConvergenceHistory
    - ZoneConvergenceHistory
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *Descriptor\_t* (NormDefinitions)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
-

## 4.19 DataArray\_t

- Name
    - {UserDefined}
  - Data-Type: C1 MT I4 I8 R4 R8 LK
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *DimensionalExponents\_t* (DimensionalExponents)
    - *DataConversion\_t* (DataConversion)
    - *DataClass\_t* (DataClass)
    - *Descriptor\_t* ({UserDefined})
    - *DimensionalUnits\_t* (DimensionalUnits)
- 

## 4.20 DataClass\_t

- Name
    - DataClass
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.21 DataConversion\_t

- Name
    - DataConversion
  - Data-Type: R4 R8
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.22 Descriptor\_t

- Name
    - {UserDefined}
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
-

## 4.23 DiffusionModel\_t

- Name
    - DiffusionModel
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.24 DimensionalExponents\_t

- Name
    - DimensionalExponents
  - Data-Type: R4 R8
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.25 DimensionalUnits\_t

- Name
    - DimensionalUnits
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *AdditionalUnits\_t* (AdditionalUnits)
- 

## 4.26 DiscreteData\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *GridLocation\_t* (GridLocation)
    - *dataArray\_t* ({UserDefined})
    - *Rind\_t* (Rind)
-

- *DataClass\_t* (DataClass)
  - *DimensionalUnits\_t* (DimensionalUnits)
  - *Descriptor\_t* ({UserDefined})
  - *UserDefinedData\_t* ({UserDefined})
- 

## 4.27 EMConductivityModel\_t

- Name
    - EMConductivityModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.28 EMElectricFieldModel\_t

- Name
    - EMElectricFieldModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
-

## 4.29 EMMagneticFieldModel\_t

- Name
    - EMMagneticFieldModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.30 Elements\_t

- Name
    - {UserDefined}
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *IndexRange\_t* (ElementRange)
    - *DataArray\_t* (ElementConnectivity)
    - *DataArray\_t* (ParentData)
    - *Rind\_t* (Rind)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.31 EquationDimension\_t

- Name
    - EquationDimension
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
-

## 4.32 FamilyBC\_t

- Name
    - FamilyBC
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *BCDataSet\_t* ({UserDefined})
- 

## 4.33 FamilyName\_t

- Name
    - FamilyName
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.34 Family\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *Ordinal\_t* (Ordinal)
    - *FamilyBC\_t* ({UserDefined})
    - *GeometryReference\_t* ({UserDefined})
    - *RotatingCoordinates\_t* (RotatingCoordinates)
    - *UserDefinedData\_t* ({UserDefined})
-

## 4.35 FlowEquationSet\_t

- Name
  - FlowEquationSet
- Data-Type: M T
- Dimensions/DimensionValues
- Cardinality: Zero/One
- Child Nodes
  - *GoverningEquations\_t* (GoverningEquations)
  - *EquationDimension\_t* (EquationDimension)
  - *GasModel\_t* (GasModel)
  - *ViscosityModel\_t* (ViscosityModel)
  - *ThermalRelaxationModel\_t* (ThermalRelaxationModel)
  - *ThermalConductivityModel\_t* (ThermalConductivityModel)
  - *TurbulenceModel\_t* (TurbulenceModel)
  - *TurbulenceClosure\_t* (TurbulenceClosure)
  - *ChemicalKineticsModel\_t* (ChemicalKineticsModel)
  - *EMMagneticFieldModel\_t* (EMMagneticFieldModel)
  - *EMElectricFieldModel\_t* (EMElectricFieldModel)
  - *EMConductivityModel\_t* (EMConductivityModel)
  - *Descriptor\_t* ({UserDefined})
  - *DataClass\_t* (DataClass)
  - *DimensionalUnits\_t* (DimensionalUnits)
  - *UserDefinedData\_t* ({UserDefined})

## 4.36 FlowSolution\_t

- Name
  - {UserDefined}
- Data-Type: M T
- Dimensions/DimensionValues
- Cardinality: Zero/N
- Child Nodes
  - *GridLocation\_t* (GridLocation)
  - *DataArray\_t* ({UserDefined})
  - *Rind\_t* (Rind)
  - *DataClass\_t* (DataClass)
  - *DimensionalUnits\_t* (DimensionalUnits)

- *Descriptor\_t* ({UserDefined})
  - *UserDefinedData\_t* ({UserDefined})
- 

## 4.37 GasModel\_t

- Name
    - GasModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.38 GeometryEntity\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
- 

## 4.39 GeometryFile\_t

- Name
    - GeometryFile
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
-



## 4.40 GeometryFormat\_t

- Name
    - GeometryFormat
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
- 

## 4.41 GeometryReference\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *GeometryFile\_t* (GeometryFile)
    - *GeometryFormat\_t* (GeometryFormat)
    - *GeometryEntity\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.42 GoverningEquations\_t

- Name
    - GoverningEquations
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DiffusionModel\_t* (DiffusionModel)
    - *UserDefinedData\_t* ({UserDefined})
-

## 4.43 Gravity\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *DataArray\_t* (GravityVector)
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.44 GridConnectivity1to1\_t

- Name
    - {UserDefined}
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *Transform\_t* (Transform)
    - *IndexRange\_t* (PointRange)
    - *IndexRange\_t* (PointRangeDonor)
    - *Ordinal\_t* (Ordinal)
    - *GridConnectivityProperty\_t* (GridConnectivityProperty)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.45 GridConnectivityProperty\_t

- Name
  - GridConnectivityProperty
- Data-Type: M T
- Dimensions/DimensionValues
- Cardinality: Zero/One
- Child Nodes

- *Descriptor\_t* ({UserDefined})
  - *UserDefinedData\_t* ({UserDefined})
  - *Periodic\_t* (Periodic)
  - *AverageInterface\_t* (AverageInterface)
- 

## 4.46 GridConnectivityType\_t

- Name
    - GridConnectivityType
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
- 

## 4.47 GridConnectivity\_t

- Name
    - {UserDefined}
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *GridLocation\_t* (GridLocation)
    - *Ordinal\_t* (Ordinal)
    - *Descriptor\_t* ({UserDefined})
    - *IndexRange\_t* (PointRange)
    - *IndexArray\_t* (PointList)
    - *IndexArray\_t* (PointListDonor)
    - *IndexArray\_t* (CellListDonor)
    - *GridConnectivityProperty\_t* (GridConnectivityProperty)
    - *GridConnectivityType\_t* (GridConnectivityType)
    - *DataArray\_t* (InterpolantsDonor)
-

## 4.48 GridCoordinates\_t

- Name
    - GridCoordinates
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *DataArray\_t* ({UserDefined})
    - *Rind\_t* (Rind)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.49 GridLocation\_t

- Name
    - GridLocation
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.50 IndexArray\_t

- Name
    - PointList
    - PointListDonor
    - CellListDonor
    - InwardNormalList
  - Data-Type: I4 R4 R8
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
-

## 4.51 IndexRange\_t

- Name
    - PointRange
    - PointRangeDonor
    - ElementRange
    - {UserDefined}
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.52 IntegralData\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.53 InwardNormalIndex\_t

- Name
    - InwardNormalIndex
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
-

## 4.54 Ordinal\_t

- Name
    - Ordinal
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.55 OversetHoles\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *IndexArray\_t* (PointList)
    - *GridLocation\_t* (GridLocation)
    - *IndexRange\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.56 Periodic\_t

- Name
    - Periodic
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *DataArray\_t* (RotationCenter)
    - *DataArray\_t* (RotationAngle)
    - *DataArray\_t* (Translation)
-

## 4.57 ReferenceState\_t

- Name
    - ReferenceState
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *Descriptor\_t* (ReferenceStateDescription)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.58 RigidGridMotion\_t

- Name
    - {UserDefined}
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *DataArray\_t* ({UserDefined})
- 

## 4.59 Rind\_t

- Name
    - Rind
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
-

## 4.60 RotatingCoordinates\_t

- Name
    - RotatingCoordinates
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *DataArray\_t* (RotationCenter)
    - *DataArray\_t* (RotationRateVector)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.61 SimulationType\_t

- Name
    - SimulationType
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
- 

## 4.62 ThermalConductivityModel\_t

- Name
    - ThermalConductivityModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
-



## 4.63 ThermalRelaxationModel\_t

- Name
    - ThermalRelaxationModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.64 Transform\_t

- Name
    - Transform
  - Data-Type: I4
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
- 

## 4.65 TurbulenceClosure\_t

- Name
    - TurbulenceClosure
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
-

## 4.66 TurbulenceModel\_t

- Name
    - {UserDefined}
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *dataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DiffusionModel\_t* (DiffusionModel)
- 

## 4.67 UserDefinedData\_t

- Name
    - {UserDefined}
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/N
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *GridLocation\_t* (GridLocation)
    - *IndexRange\_t* (PointRange)
    - *IndexArray\_t* (PointList)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *dataArray\_t* ({UserDefined})
    - *FamilyName\_t* (FamilyName)
    - *UserDefinedData\_t* ({UserDefined})
    - *Ordinal\_t* (Ordinal)
-

## 4.68 ViscosityModel\_t

- Name
    - ViscosityModel
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *DataArray\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.69 WallFunctionType\_t

- Name
    - WallFunctionType
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
- 

## 4.70 WallFunction\_t

- Name
    - WallFunction
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
    - *WallFunctionType\_t* (WallFunctionType)
-

## 4.71 ZoneBC\_t

- Name
    - ZoneBC
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *BC\_t* ({UserDefined})
    - *ReferenceState\_t* (ReferenceState)
    - *DataClass\_t* (DataClass)
    - *DimensionalUnits\_t* (DimensionalUnits)
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.72 ZoneGridConnectivity\_t

- Name
    - ZoneGridConnectivity
  - Data-Type: M T
  - Dimensions/DimensionValues
  - Cardinality: Zero/One
  - Child Nodes
    - *GridConnectivityItoI\_t* ({UserDefined})
    - *GridConnectivity\_t* ({UserDefined})
    - *OversetHoles\_t* ({UserDefined})
    - *Descriptor\_t* ({UserDefined})
    - *UserDefinedData\_t* ({UserDefined})
- 

## 4.73 ZoneliterativeData\_t

- Name
  - {UserDefined}
- Data-Type: M T
- Dimensions/DimensionValues
- Cardinality: Zero/One
- Child Nodes
  - *DataClass\_t* (DataClass)

- *DimensionalUnits\_t* (DimensionalUnits)
  - *Descriptor\_t* ({UserDefined})
  - *UserDefinedData\_t* ({UserDefined})
  - *dataArray\_t* ({UserDefined})
- 

## 4.74 ZoneType\_t

- Name
    - ZoneType
  - Data-Type: C1
  - Dimensions/DimensionValues
  - Cardinality: One/One
- 

## 4.75 Zone\_t

- Name
  - {UserDefined}
- Data-Type: I4
- Dimensions/DimensionValues
- Cardinality: Zero/N
- Child Nodes
  - *GridCoordinates\_t* (GridCoordinates)
  - *GridCoordinates\_t* ({UserDefined})
  - *DiscreteData\_t* ({UserDefined})
  - *Elements\_t* ({UserDefined})
  - *ZoneBC\_t* (ZoneBC)
  - *FlowSolution\_t* ({UserDefined})
  - *ZoneType\_t* (ZoneType)
  - *Ordinal\_t* (Ordinal)
  - *ZoneGridConnectivity\_t* (ZoneGridConnectivity)
  - *ZoneIterativeData\_t* ({UserDefined})
  - *RigidGridMotion\_t* ({UserDefined})
  - *ReferenceState\_t* (ReferenceState)
  - *IntegralData\_t* ({UserDefined})
  - *ArbitraryGridMotion\_t* ({UserDefined})
  - *FamilyName\_t* (FamilyName)
  - *FlowEquationSet\_t* (FlowEquationSet)

- *ConvergenceHistory\_t* (ZoneConvergenceHistory)
- *RotatingCoordinates\_t* (RotatingCoordinates)
- *DataClass\_t* (DataClass)
- *DimensionalUnits\_t* (DimensionalUnits)
- *Descriptor\_t* ({UserDefined})
- *UserDefinedData\_t* ({UserDefined})

# CGNS.PAT.CGNSERRORS

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- *genindex*