

CGNS

(CFD General Notation System)

Summary for Open Meeting, May 1999

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CGNS System – General Description

**Standards for CFD data specification,
storage and I/O**

Open software implementing the standards

Developed under AST contract by:

Boeing Seattle

NASA--Langley

Boeing St. Louis

NASA--Ames

ICEM CFD

NASA--Glenn

Participation by:

WPAFB

NPARC Alliance

Purpose:

**Exchange data easily between groups and sites,
and across computing platforms**

**Archive data in self–documenting, machine independent
form**

**Exchange data directly between "applications" codes
(i.e., grid generators, flow solvers, post–processors)**

Make applications themselves interchangeable

Reduce time to incorporate new capabilities

**Allow applications engineers to choose methods based
on technical requirements**

Allow developers to focus on added value rather than I/O

**Facilitate the development of infrastructure and
general utilities for manipulating CFD data**

CGNS System – Standardized Data and I/O for CFD

Scope:

Pointers to CAD Geometry

Multi-block structured grids (all types)

Unstructured grids

Field properties

Boundary conditions

Connection information

**Units, non-dimensionalization, turbulence models,
equation sets, etc.**

CGNS System – Standardized Data and I/O for CFD

Implementation:

Incorporate CGNS I/O into existing or new applications codes

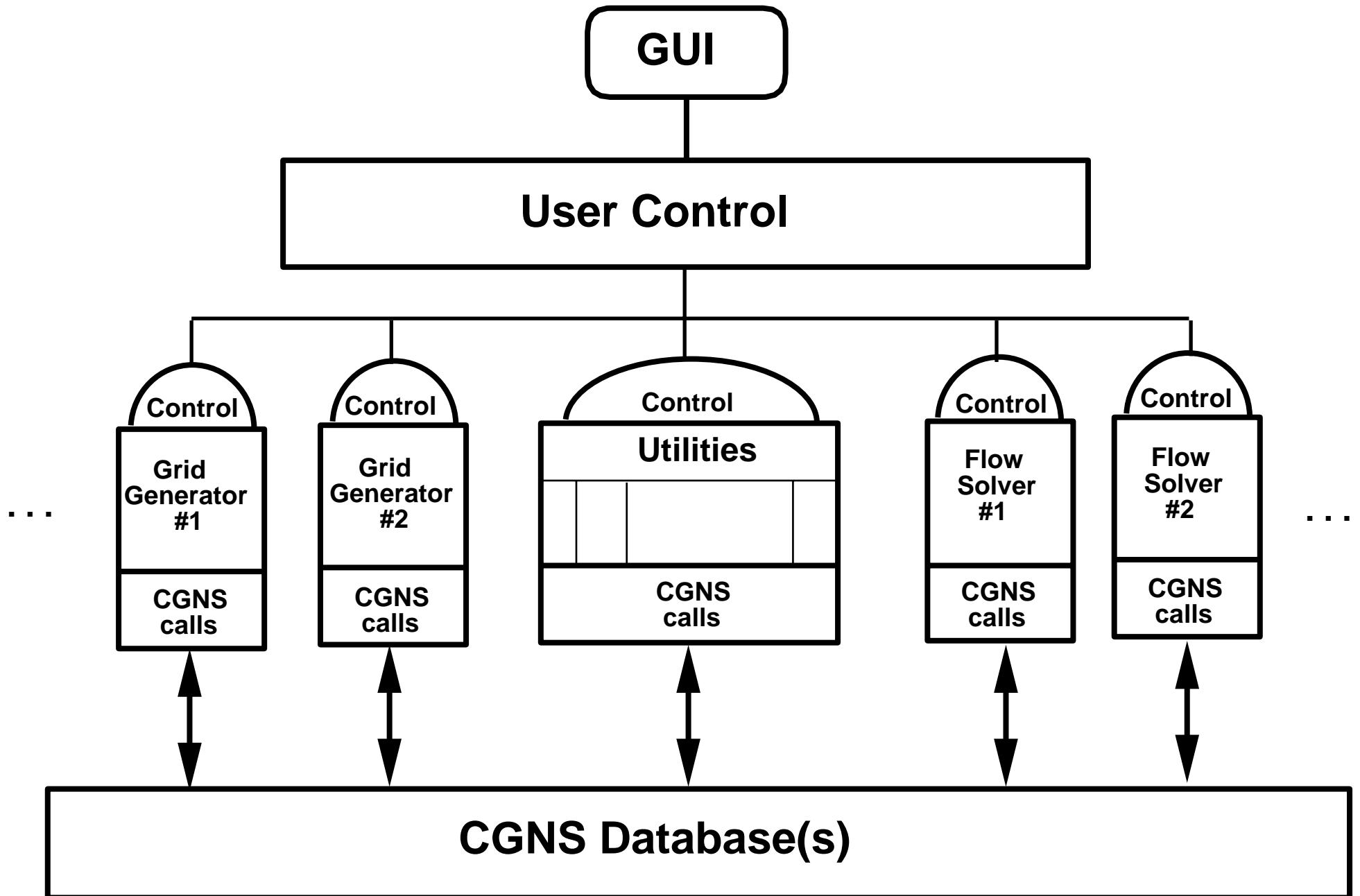
Codes share information using the file system as a data bus

Codes are still run under user selection and control

User responsible for file manipulation and directory maintenance

No file "locking"

CGNS Software Relationships



TWO LEVEL SYSTEM

Independent Data Base Manager, ADF

Tree, with links

All nodes in tree are the same:

Labeling information

Dimensioning information

Data (optional): Integer, Real, Character, etc.

Optimized for dense data

Minimal instruction set (ADF Core)

CFD General Notation System (CGNS)

Data stored in ADF files

Accessed by "Mid" level API which understands

CFD

ADF (Advanced Data Format)

Stand-alone general Database Manager

**Stores tree-structured binary data, patterned on
St. Louis' Common File Format (CFF)**

Coded in C, with FORTRAN access

Code and files fully portable

Extensively debugged and tested

Thoroughly documented

In use in place of CFF at St. Louis, and in Wind code

CGNS (CFD General Notation System)

Standards:

SIDS (Standard Interface Data Structures)

Defines the intellectual content of CFD data in detail

File Mapping Conventions

Define the way the content is stored in the ADF file(s)

Software:

CGNS Mid-level Library (API)

Routines to access CFD-related objects stored in ADF files at a level much higher than the ADF Core. Meant to be incorporated into applications code.

CGNS System Current Completion Status (5/99)

SIDS

**File
Mapping**

**Mid-level
Routines**

**CAD
Pointers**

**Agreement achieved 3/27/98
Implementation in V1.1**

**In work,
V1.1**

Structured

**Complete
V1.0**

**Complete
V1.0**

**Complete
V1.0**

Unstructured

**Complete
V1.1**

**Complete
V1.1**

**In work,
V1.1**

Chemistry

**Nomenclature
proposal
on table**

Complete

**No special
code needed**

Moving Grid

Proposals on table

**Some code
needed**

Software Development Status

**Wind (NPARC) converted from CFF to ADF;
conversion to CGNS underway at Boeing (V3.0)**

CFF-to-CGNS Converter

**Done at Boeing S.L. using ADF Core level
CGNS-to-CFF in work at UTRC using API**

Plot3d-to-CGNS Converter

Overflow converted to CGNS (Kiris) -- ADF and API levels

Pegasus-to-CGNS converter (Kiris)

Installation into V5 at MicroCraft

CFL3D converted (non-overset) (Rumsey)

TLNS3D underway (Poirier)

ICEM CFD

Grid Generation, V3 Visualizer, etc.

System Demonstration

Grid generated at NASA--Ames using local tools

**Sent to St. Louis; overset connections calculated by G-man,
written in CGNS format**

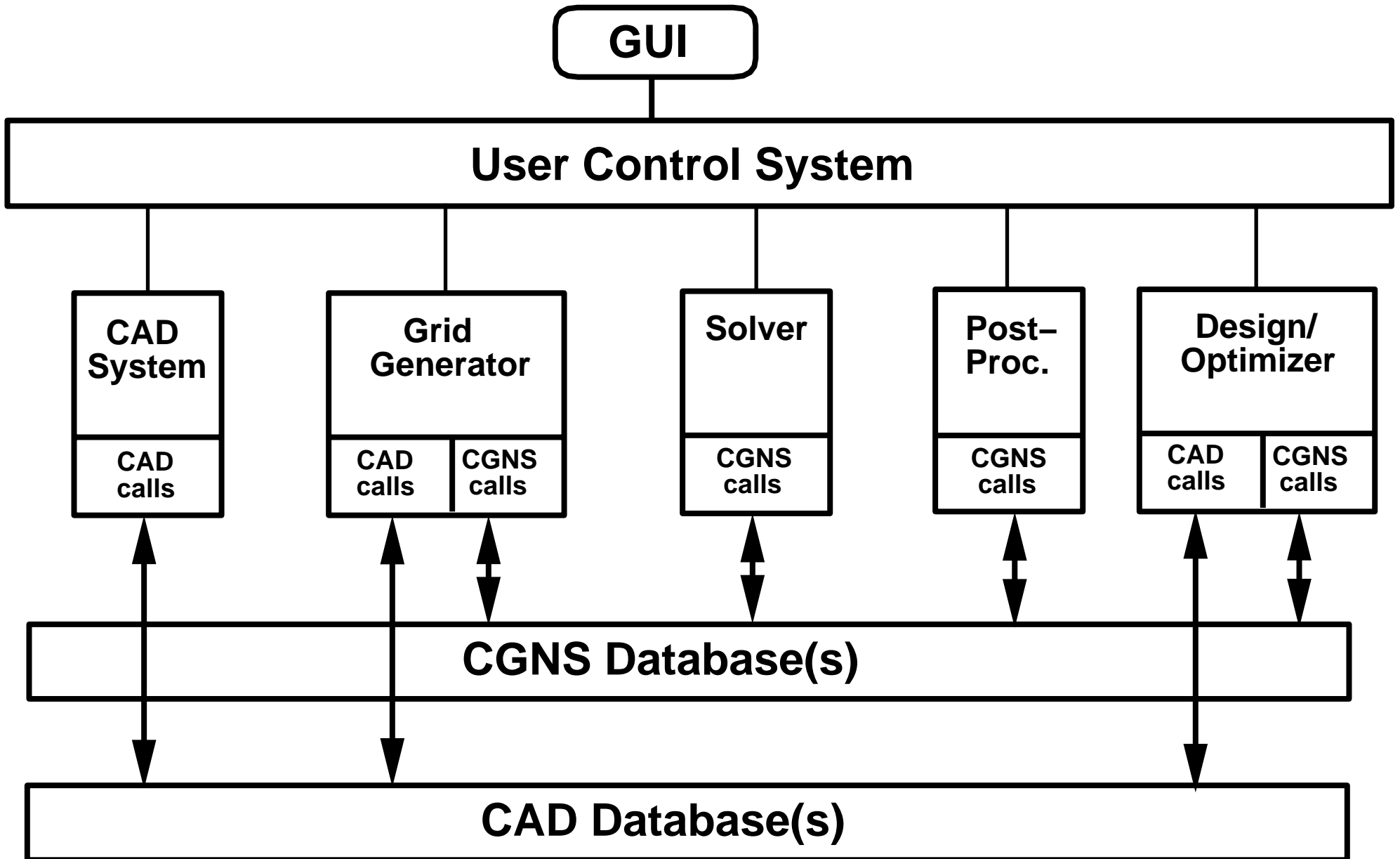
Sent to Ames, run in Overflow

(Runs in CFL3D, but point-match grid only partially complete)

Demonstrated at Team Meeting, March 98:

(Displayed in V3 via ICEM-CFD implementation)

CGNS/CAD Software Relationships



Current CGNS Documentation and Software (V1.0)

- Documents:**
- CGNS Overview**
 - The CGNS System (AIAA 98–3007)**
 - ADF Core User’s Manual**
 - SIDS (Standard Interface Data Structures)**
 - SIDS–to–ADF File Mapping Document**
 - CGNS Mid–level Library Document**
- Software:**
- CGNS Midlevel Library (API)**
 - ADF Core**
- Site:**
- www.CGNS.org**

What's Happening Now

Web Site

120 + registrants

20 + countries

Expansion of Interest

Engine Manufacturers

Software Vendors

Other Industries

Transfer of Control

Open, public forum

Boeing support for ISO standard