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PROGRESS REPORT ON THE INTERFACE BETWEEN ASTROPHYSICAL  
DATASETS AND DISTRIBUTED DATABASE MANAGEMENT SYSTEMS (DAVID) P. 11

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## **1. Introduction**

This report gives a status report on the progress of the DAVID project being carried out at Louisiana State University, Baton Rouge, LA. The objective of this project is to implement an interface between Astrophysical datasets and DAVID. This report discusses the design details and implementation specifics of the generalized interface between the DAVID (Distributed Access View Integrated Database Management System) and Astrophysical datasets.

## **2. Project Details**

Our thrust here is to interface the Astrophysical Datasets to the DAVID system. The motivation is to allow the DAVID users to use the DAVID primitives to operate on the astrophysical datasets. The main purpose of this interface is to simulate DAVID primitives and apply them on flat files as if they were applied to a database. Given the syntactical details, the application framework, interfacing specifications and a definition of the GSQL data manipulation language for the DAVID system, here is the design and implementation specs of a reliable software system which can synthesize, compile and execute queries on the astrophysical dataset system for data manipulation.

The details on the implementation are provided in the following sections.

### **2.1 An Overview of the Astrophysical Dataset Interface**

As shown in the attached schematic (Figure 1) our software system includes code for interpreting and executing the following generic DAVID routines : ff\_asgcluster, ff\_trfirst, ff\_trnext, ff\_trdelete, ff\_dasgcluster, ff\_trupdate, ff\_trprevious and ff\_trlast. (working under 4.3 BSD UNIX on the VAX 11/780). The target framework for exploiting the interface capability is as follows. On receiving a query from the DAVID host, the query scheduler on determining that the query is on an external database would pass

control to the Resident GSQL primitive package( module 9 ) , the DAVID interface handler. Upon determining that the query is for the Astrophysical dataset, the package would invoke our system to execute the query on the flat file representing the Astrophysical dataset.

## 2.2 Files and data structures used in the Interface

Tapes containing the N30 data is read and transferred onto a disk file which has the following format.

Bytes	Description	Format
4	Record number	A4
1	Deleted flag	A1
88	Record read from tape as per specifications (see footnote*)	A88

This would be the flat file on which the Interface would operate on. The record number field as shown above indicates the record number relative to zero in the file. The deleted flag field indicates that this record has been deleted from the file. A '1' in this field indicates that this record has been marked deleted.

Structures like the CCA and TCA are used to store information to be passed to and from the interface and DAVID. To be more specific the CCA structure holds the flat file name and the flat file pointer. The TCA structure uses the buf\_ptr field to get the contents of the tape and pass it on to DAVID and is also used to transfer information onto a specific record of the flat file. Details of the CCA and TCA structures are as shown in figures A1 and A2.

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\* Documentation for Machine-Readable version of the Catalog of 5,268 Standard Stars, 1950.0  
Based on the Normal System N30

### 2.3 Process

The following is a brief write-up on the primitives used in the interface. These routines have been coded and tested.

- a) **FLAT FILE Install** : This procedure is called to install a FLAT FILE onto the DAVID system. Here hand coding of the create-cluster is used.
- b) **FLAT FILE Drop Cluster** : This procedure is used to delete a flat file containing DAVID cluster data. The name of the flat file is got from the gsql\_row and the unix unlink command is used to delete the file.
- c) **FLAT FILE Define Cluster** : This procedure creates a FLAT FILE capable of holding data from a DAVID cluster. Here the C creat command is used to create the file and the name is inserted in the arbi\_file\_name field of the gsql\_row.
- d) **FLAT FILE Table Row Update** : This procedure is used to simulate a DAVID table-row update on a flat file. The address of the data buffer of the TCA is obtained by making a call to a macro called DATA which has the following format :  

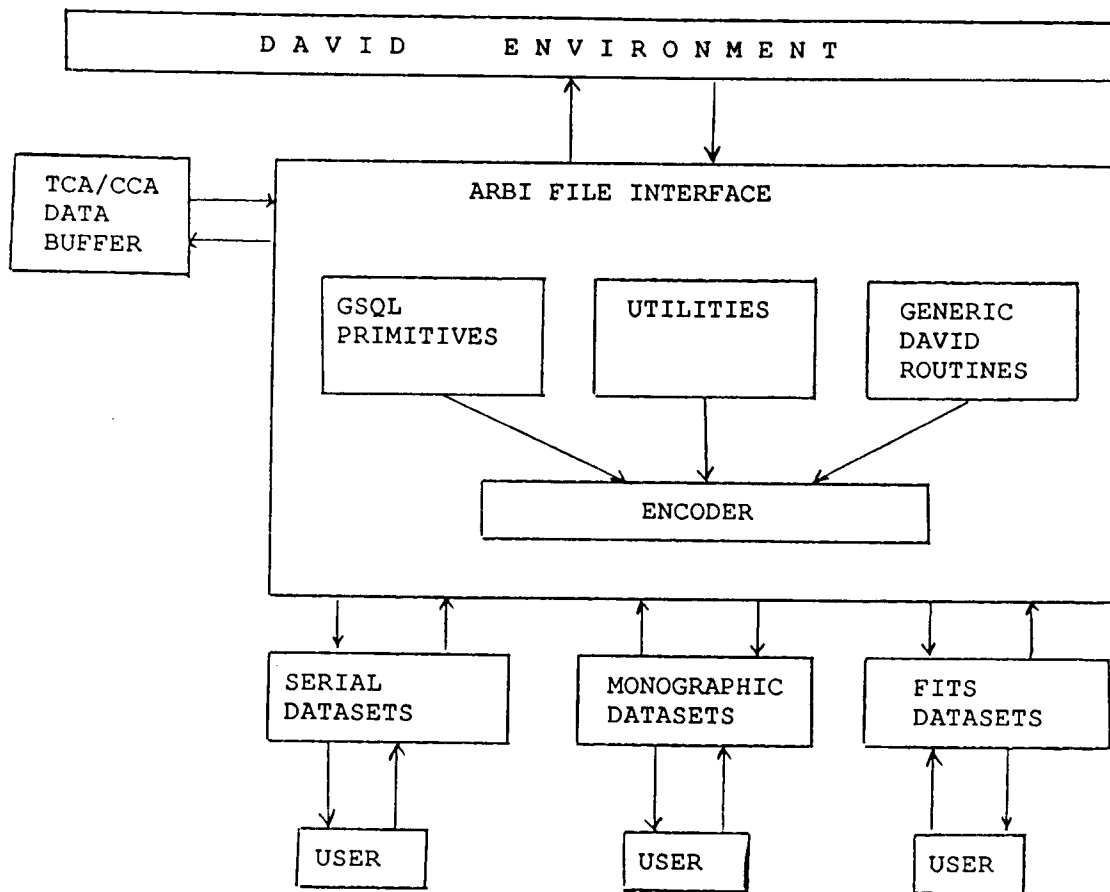
d1 = DATA (t1) The d1 is a pointer returned by DATA which points to the buffer in TCA from where the data is taken and written over the current record in the flat file.
- e) **FLAT FILE Asgncluster** : This procedure is used to open a flat file so that it can be read by DAVID. Here the file specified in the res\_name of CCA is opened. The res\_file\_ptr field in the CCA is assigned to the file pointer obtained by opening the file.
- f) **FLAT FILE Table Row First** : This procedure is used to simulate a DAVID table-row first. The address of the data buffer of the TCA where the data read is stored is obtained by making a call to a macro called DATA. The record read is the first record of the flat file specified by the res\_file\_ptr field of the CCA.
- g) **FLAT FILE Table Row Last** : This procedure is used to simulate a DAVID table-

row last. The address of the data buffer of the TCA where the data read is stored is obtained by making a call to a macro called DATA. The record read is the last record of the flat file specified by the res\_file\_ptr field of the CCA.

- h) FLAT FILE Table Row Previous : This procedure is used to simulate a DAVID table-row previous. The address of the data buffer of the TCA where the data read is stored is obtained by making a call to a macro called DATA. The record read is the previous record of the flat file specified by the res\_file\_ptr field of the CCA. Here the record number is used to locate the previous record in the flat file.
- h) FLAT FILE Table Row Delete : This procedure is used to simulate a DAVID table-row delete. The address of the data buffer of the TCA where the data read is stored is obtained by making a call to a macro called DATA. The record is marked deleted by setting '1' in the deleted flag field of the flat file.
- i) FLAT FILE Dasgncluster : This procedure is used to close a flat file. The pointer to the file is obtained from the res\_file\_ptr field of the CCA and then closed.

### **3. Future Directions**

Presently a driver has been written to read from a tape containing the Normal System N30 catalogue data and create the flat file in the format specified above. This driver would be enhanced to handle data from other tapes containing data in different formats viz., AGK3 Star Catalogue. Certain consideration would be given to specify tape format and content details to the driver.



GENERALIZED INTERFACE SCENARIO FOR HETEROGENOUS  
ASTROPHYSICAL DATASETS

FIGURE A1 and A2

```

/* type vca.h */
/* vca.h - vca */
#ifndef VCA_H
#define VCA_H
#define DTLENGTH 20
#define CLUSTER_HDG_LEN NODE_LEN + USER_LEN + FILE_NAME_LEN + \
    NAME_LEN + 3
typedef char TRANID[15];
typedef struct daddr {
    unsigned        page_no;
    USHORT         record_no;
} DADDR;

typedef struct constraint
{ char        conid[12];        /* Unique id of the constraint KW*/
  char        contype[4];      /* GD, GK,... KW*/
  char        operations[3];   /* Insert/Update/Delete KW*/
  char        imm_proc[8];     /* Immediate Checking procedure name KW*/
  char        def_prof[8];     /* Deferred checking procedure KW*/
  STRING      sdef;           /* Constraint definition in string form KW*/
  struct constraint *next;    /* pointer to next constraint */
} CONSTRAINT;

typedef struct privilege /* R: read, W: write, E: execute, D: delete */
{ char        group[4];        /* group id or * */
  char        member[4];      /* member id or * */
  char        type[4];        /* R/W/E/D */
  struct privilege *next;
} PRIVILEGE;

typedef struct bind_info {
    POINTER destination;
    USHORT length;
    USHORT type;
    struct bind_info *next;
} BIND_INFO; /*KW*/

typedef struct field
{ char        name[NAME_LEN]; /* Name of FIELD */
  USHORT     id;              /* system assigned id of field */
  USHORT     type;           /* Type of FIELD int, real,...*/
  USHORT     length;        /* Length of FIELD */
  STRING     help;          /* Help text for the FIELD */
  BIND_INFO *bind;         /* Pointer to bind table */
  struct field *next;
} FIELD;

typedef struct argument
{ char        name[NAME_LEN]; /* Name of argument */
  char        type[DTLENGTH]; /* Type of argument; int, real,...*/
  USHORT     length;        /* Length of argument */
  STRING     help;         /* Help text for the argument */
  STRING     value;        /* Argument value */
  struct argument *next;
} ARGUMENT;

typedef struct anode {
    USHORT     depth;        /* Recursive depth */
    USHORT     sib_id;      /* Child ID */
    char        *buf_ptr;   /* buffer to store table row */
}

```

```

    struct anode *sib_ptr;
    struct anode *successor;
} ANODE; /* KW */

typedef struct sort_field{
    FIELD          *field;      /* pointer to a field */
    USHORT         id;          /* sort field index: 1,2,3 etc major to minor */
    struct sort_field *next;    /* link */
} SORT_FIELD; /* KW */

typedef struct tca_link {
    struct tca      *tca_ptr;   /* pointer to next TCA
                                ON DISK VERSION THIS SHOULD BE name
                                char [20] the TABLE NAME KW */
    USHORT         id;          /* index of parent or child: 1,2,3 etc KW*/
    struct tca_link *next;
} TCA_LINK;

typedef struct tca {
    char           name[NAME_LEN]; /* Name of table */
    unsigned       id;             /* system assigned unique id of table SS*/
    char           type[DTLENGTH]; /* Table type INDEX, CHAINED, BLOCKED,...*/
    char           structure;      /* i=index,$=$table KW */
    USHORT         nfields;        /* # of fields */
    USHORT         size_of_row;    /* size of row with pointers */
    USHORT         nchildren;      /* Number of children KW */
    USHORT         nparents;      /* Number of Ancestors KW */
    USHORT         nconstraints;   /* Number of constraints */
    USHORT         nlptrs;         /* number of logical (box 6) pointers */
    USHORT         npptrs;        /* number of physical (box 7) pointers */
    DADDR          special_row;    /*addr of spec.row containing
                                q/tbase tables w/0 prnts KW*/
    DADDR          cur_tsmap;      /* disk pointer to current tsmap */
    DADDR          sav_tsmap;     /* disk pointer to committed tsmap */
    BOOL           rdrn;          /* reuse deleted record number flag */
    USHORT         nsort_fields;  /* number of sort fields KW*/
    char           sort_method;   /*'A' (ascend) 'D' (desc) or blank (none) KW*/
    struct curptr {
        unsigned   page;         /* current page index used in walking */
        USHORT     record;      /* through table pages SS */
        USHORT     index;
    } curptr;
    STRING         help;         /* Help text for the table */
    BIND_INFO      *bind;
    SORT_FIELD     *sort_fields; /* Pointer to sort fields KW*/
    struct tca     *ctca;        /* points to tca of chain parent */
    char           *buf_ptr;     /* pointer to current table buffer */
    ANODE          *aux_bufs;    /* Ptr to auxilliary buffers */
    FIELD          *field;       /* Field control areas */
    TCA_LINK       *children;    /* Child table control areas KW */
    TCA_LINK       *parents;     /* Ancestor table contrpol areas KW */
    CONSTRAINT     *constraints; /* pointer to table of constraints KW*/
    struct tca     *next;        /* pointer to next tca */
} TCA;

typedef struct fca_link {
    struct fca      *fca_ptr;    /* KW */
    struct fca_link *next;
} FCA_LINK;

typedef struct fca {
    char           name[NAME_LEN]; /* Name of function */
    char           type[10];       /* Function type */
    USHORT         nargs;          /* # of arguments */

```



```

unsigned      nconsts;    /* Number of constraints */
DADDR        physfca;    /* Future use */
STRING       help;       /* Help text for the function */
ARGUMENT     *argument;  /* Argument control areas */
CONSTRAINT   *constr;    /* Function constraints */
FCA_LINK     *next;      /* Successor function control areas */
FCA_LINK     *before;    /* Ancestor function control areas */

} FCA;

typedef struct path {
    USHORT    altno;      /* 0,1,2,.. 0 is the primary path */
    struct path *next;
    struct fnodes *fnode_ptr; /* KW */
} PATH;

typedef struct fnodes
{ char      id[20];      /* Unique id for the function execution */
  char      name[20];   /* Function name */
  char      type[6];    /* Procedure/command/function */
  char      parent[20]; /* Parent tree. Used only for root */
  char      from[100];  /* node that the function came from */
  char      to[100];   /* destination node */
  struct    variables

/* This table is used only if the type
of the function is PROCEDURE. This table
basically contains the local variables
used within the procedure's scope.
*/
    { char      name[30];
      char      type[10];
      unsigned length[3];
      STRING    value;
    } variable;

STRING     arglist;    /* Argument list separated by comma */
struct     names
    { STRING *name;
      struct names *next;
    } *clusters; /* Name of the clusters assigned */
USHORT     priority;  /* Priority assigned */
struct     times      /* Performance measures */
    { char      arrived[15]; /* Time queued */
      char      start[15];  /* Time of execution start */
      char      stop[15];   /* Time of execution stop */
      struct    times *next;
    } *time;

char       status[2]; /* The status of execution */
unsigned   size;      /* Operation size */
PATH      *next;     /* Next function to be executed */
PATH      *before;   /* Function to be executed before */
} FNODES;

typedef struct file_control {
    char      file_name[FILE_NAME_LEN]; /* name of file */
    unsigned  sfile_ptr; /* .system file pointer */
    struct file_control *next;
} FILE_CONTROL;

typedef struct ptr_alloc {
    char      *ptr;      /* ptr to allocated area for assigned stuff */
    struct ptr_alloc *next; /* pointer to next entry */
} PTR_ALLOC; /* KW */

typedef struct cca

```

```

{ char      name[NAME_LEN]; /* Name of the cluster only-no node,*/
  unsigned  id;             /* System assigned unique id of cluster SS*/
  char      type[20];      /* External, Actual, Tree,..*/
  char      created[20];   /* Time of the cluster installation */
  char      updated[20];   /* Last time of the cluster update */
  unsigned  structure;     /* int, corresponding to cluster
                           kind: QBASE, TBASE, DBASE, RBASE, etc */
  DADDR     sav_csmmap;    /* disk address of committed cluster storage map */
  DADDR     cur_csmmap;    /* disk address of current cluster storage map */
  USHORT    ntcas;        /* number of tables */
  STRING    sdef;         /* Text of defintion */
  STRING    help;         /* Help text */
  STRING    space_def;    /* Initial space definition used */
  STRING    res_name;     /* resident data base name */ /*MM*/
  STRING    res_pass1;    /* password for arbi cluster */ /*MM*/
  STRING    res_pass2;    /* password for arbi cluster */ /*MM*/
  STRING    res_pass3;    /* password for arbi cluster */ /*MM*/
  STRING    arbi_file_name; /* File name of arbi format */ /*MM*/
  /* below are memory only fields */
  FILE_CONTROL *file;    /* pointer to file control */
  USHORT    res_file_ptr; /* resident file pointer */
  PRIVILEGE  *privilege; /* Pointer to privilege table */
  char      access[3];    /* Access allowed to this cluster */
  TCA       *tca_ptr;     /* data table control area KW */
  struct cca *next;      /* next cca in vca chain */
  PTR_ALLOC *allocation; /* table of allocated pointers for assign KW */
  PTR_ALLOC *next_allocation; /* ptr where next allocated ptr goes KW */
  TCA       *dollar;     /* pointer to $stable- TEMP only KW */
  char      constraint_flag; /*I (immediate) or D (deferred-default) */
  char      verify[3];    /* contains "cca" to verify that this is
                           an allocated cca */
  char      *wca_ptr;     /* pointer to window control */
} CCA;

```

```
typedef struct process_control
```

```

{ char      pname[30]; /* Name of the process file */
  char      name[20];  /* Name of the process */
  STRING    help;      /* Help text for the process */
  STRING    sdef;      /* String form of the process definition */
  char      created[20]; /* Time of the process installation */
  char      updated[20]; /* Last time of the process update */
  char      compile[20]; /* Name of the compile command file */
  char      link[20];   /* Name of the link command file */
  char      run[20];    /* Name of the run command file */
  USHORT    nfcas;     /* Number of fcas */
  FCA       *fcas;     /* Fcas table */
  PRIVILEGE *privilege; /* Access privilege against groups
                           and their members of the user.
                           ex) {groupid, memberid, priv}
                           ={ 123jH, *, ED } would mean
                           that the members of the group
                           123 are allowed to execute or
                           delete the process. If a wild
                           card is used as the group id, then
                           it would have indicated all the
                           group in entire DAVID network*/

```

```

  struct process_control *next;
} PROCESS_CONTROL;

```

```

typedef struct vca {
  char      username[20]; /* Name of the user */
  char      groupid[20];  /* User's group id */

```

```

char      memberid[20]; /* Member id within the group */
char      viewid[15];  /* Unique id for this view */
char      autocommit_flag[3]; /* On/off */
char      commit_point[5]; /* Last commit point */
char      rollback_point[5]; /* Later than commit_point */
char      sleep_flag[5]; /* awake/temporary sleep/permanent sleep */
unsigned  status; /* Completion status of operation */
char      constraint_flag; /*I(immediate),D(deffered),O(off-def) KW */
struct    synonym
{
    STRING left;
    STRING right;
    struct synonym *next;
} *synonyms; /* Temporary synonyms. Effective for
              this login only */

FILE_CONTROL *files;
CCA          *clusters;
PROCESS_CONTROL *processes;
FNODES      *trees;
} VCA;
#endif

```