Important & Valuable Things You Can Do with SAS® Metadata DICTIONARY Tables and SASHELP Views

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Abstract

SAS® users can easily and quickly access metadata content with a number of read-only SAS data sets called DICTIONARY tables or their counterparts, SASHELP views. During a SAS session, information (known as metadata) is captured including SAS system options along with their default values, assigned librefs, table names, column names and attributes, formats, indexes, and more. This presentation explores how metadata can be used as input into a SAS code generator or a SAS macro to produce the desired results, the application of specific DICTIONARY table and SASHELP view content, examples related to the creation of dynamic code, and the creation of a data dictionary.

Introduction

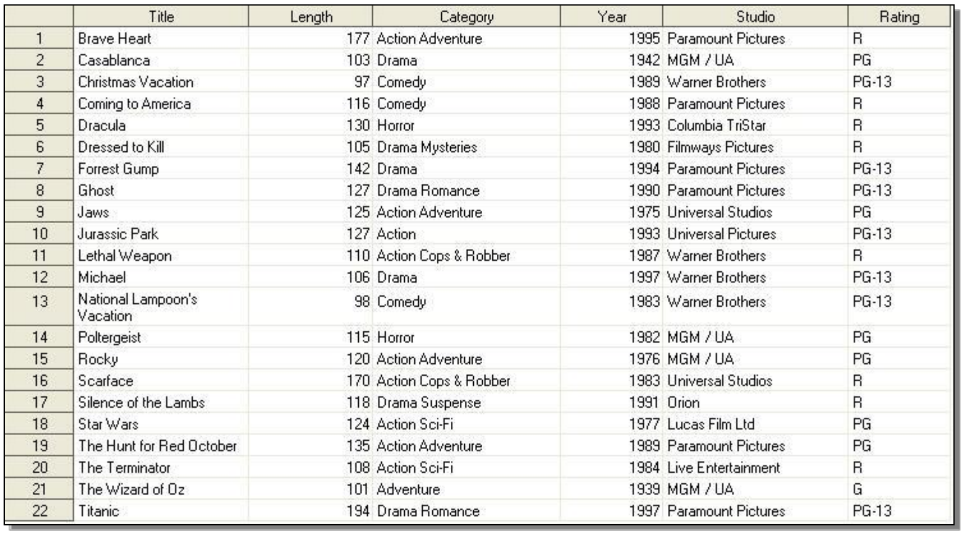
The SAS System collects and populates valuable information ("metadata") about SAS libraries, data sets (tables), catalogs, indexes, macros, system options, titles, views and a collection of other read-only tables called dictionary tables. Dictionary tables serve a special purpose by providing system-related information about the current SAS session's SAS databases and applications. When a query is requested against a Dictionary table, SAS automatically launches a discovery process at runtime to collect information pertinent to that table. This information is made available any time after a SAS session is started.

Dictionary tables and SASHELP views contents permit a SAS session's activities to be easily accessed and monitored. This becomes particularly useful in the design and construction of software applications since the information can be queried and the results acted upon in a specific task such as in the allocation of filerefs or librefs.

Tables Used in Examples

The data used in all the examples in this paper consists of a selection of movies that I've viewed over the years, along with actors. The Movies table consists of six columns: title, length, category, year, studio, and rating. Title, category, studio, and rating are defined as character columns with length and year being defined as numeric columns. The data stored in the Movies table is illustrated below.

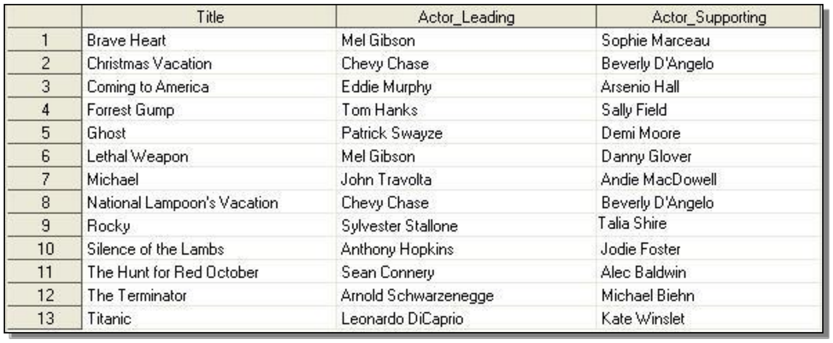
MOVIES Table



	Title	Length	Category	Year	Studio	Rating
1	Brave Heart	177	Action Adventure	1995	Paramount Pictures	R
2	Casablanca	103	Drama	1942	MGM / UA	PG
3	Christmas Vacation	97	Comedy	1989	Warner Brothers	PG-13
4	Coming to America	116	Comedy	1988	Paramount Pictures	R
5	Dracula	130	Horror	1993	Columbia TriStar	R
6	Dressed to Kill	105	Drama Mysteries	1980	Filmways Pictures	R
7	Forrest Gump	142	Drama	1994	Paramount Pictures	PG-13
8	Ghost	127	Drama Romance	1990	Paramount Pictures	PG-13
9	Jaws	125	Action Adventure	1975	Universal Studios	PG
10	Jurassic Park	127	Action	1993	Universal Pictures	PG-13
11	Lethal Weapon	110	Action Cops & Robber	1987	Warner Brothers	R
12	Michael	106	Drama	1997	Warner Brothers	PG-13
13	National Lampoon's Vacation	98	Comedy	1983	Warner Brothers	PG-13
14	Poltergeist	115	Horror	1982	MGM / UA	PG
15	Rocky	120	Action Adventure	1976	MGM / UA	PG
16	Scarface	170	Action Cops & Robber	1983	Universal Studios	R
17	Silence of the Lambs	118	Drama Suspense	1991	Orion	R
18	Star Wars	124	Action Sci-Fi	1977	Lucas Film Ltd	PG
19	The Hunt for Red October	135	Action Adventure	1989	Paramount Pictures	PG
20	The Terminator	108	Action Sci-Fi	1984	Live Entertainment	R
21	The Wizard of Oz	101	Adventure	1939	MGM / UA	G
22	Titanic	194	Drama Romance	1997	Paramount Pictures	PG-13

The data stored in the ACTORS table is illustrated below.

ACTORS Table



	Title	Actor_Leading	Actor_Supporting
1	Brave Heart	Mel Gibson	Sophie Marceau
2	Christmas Vacation	Chevy Chase	Beverly D'Angelo
3	Coming to America	Eddie Murphy	Arsenio Hall
4	Forrest Gump	Tom Hanks	Sally Field
5	Ghost	Patrick Swayze	Demi Moore
6	Lethal Weapon	Mel Gibson	Danny Glover
7	Michael	John Travolta	Andie MacDowell
8	National Lampoon's Vacation	Chevy Chase	Beverly D'Angelo
9	Rocky	Sylvester Stallone	Talia Shire
10	Silence of the Lambs	Anthony Hopkins	Jodie Foster
11	The Hunt for Red October	Sean Connery	Alec Baldwin
12	The Terminator	Arnold Schwarzenegge	Michael Biehn
13	Titanic	Leonardo DiCaprio	Kate Winslet

Exploring SAS Metadata DICTIONARY Tables and SASHELP Views

SAS users can quickly and conveniently obtain useful information about their SAS session with a number of read-only SAS system tables called DICTIONARY tables. At any time during a SAS session, DICTIONARY tables can be accessed using the libref DICTIONARY in the FROM clause of a PROC SQL SELECT statement to capture information related to currently defined libnames, table names, column names and attributes, formats, and much more. SASHELP views can be accessed using any of your favorite procedures or in the DATA step.

SAS 9.1 software supported 22 Dictionary tables and SASHELP views, SAS 9.2 supported 29 Dictionary tables and SASHELP views, SAS 9.3 supported 30 DICTIONARY tables and SASHELP views, and SAS 9.4 supports 32 DICTIONARY tables and SASHELP views as is illustrated below.

DICTIONARY Tables and SASHELP Views

DICTIONARY Table	SASHELP View	Purpose
CATALOGS	**VCATALG**	SAS Catalogs and Catalog-specific Information.
CHECK_CONSTRAINTS	**VCHKCON**	Check Constraints information.
COLUMNS	**VCOLUMN**	Columns from All Tables.
CONSTRAINT_COLUMN_USAGE	**VCNCOLU**	Constraint Column Usage.
CONSTRAINT_TABLE_USAGE	**VCNTABU**	Constraint Table Usage.
DATAITEMS	**VDATAIT**	Information Map Data Items.
DESTINATIONS	**VDEST**	Open ODS Destinations.
DICTIONARIES	**VDCTNRY**	DICTIONARY Tables and their Columns.
ENGINES	**VENGINE**	Available Engines.
EXTFILES	**VEXTFL**	Implicitly-defined File Definitions and Files Defined in FILENAME statements.
FILTERS	**VFILTER**	Information Map Filters.
FORMATS	**VFORMAT**	Available SAS and User-defined Formats and Informats.

FUNCTIONS	**VFUNC**	Available Functions.
GOPTIONS	**VGOPT**	SAS/GRAPH Software Graphics Options.
INDEXES	**VINDEX**	Information related to Defined Indexes.
INFOMAPS	**VINFOMP**	Information Maps.
LIBNAMES	**VLIBNAM**	Information related to SAS Data Libraries.
LOCALES	**VLOCALE**	Available Locales, Regions, Languages and Currency Symbols.
MACROS	**VMACRO**	Information about Defined Macros.
MEMBERS	**VMEMBER**	Information about SAS Defined Tables, Catalogs and Views.
OPTIONS	**VOPTION**	Information about SAS Default System Options.
PROMPTS	**VPROMPT**	Information about Information Map Prompts.
PROMPTSXML	**VPRMXML**	Information Map Prompts XML.
REFERENTIAL_CONSTRAINTS	**VREFCON**	Information about Referential Constraints.
REMEMBER	**VREMEMB**	All Remembered Information.
STYLES	**VSTYLE**	Information about All Styles.
TABLES	**VTABLE**	SAS Tables and Table-specific Information.
TABLE_CONSTRAINTS	**VTABCON**	Information about Table Constraints.
TITLES	**VTITLE**	Information about Defined Titles.
VIEWS	**VVIEW**	Views and View-specific Information.
VIEW_SOURCES	**VSVIEW**	Sources Referenced by View.
XATTRS	**VXATTR**	Extended Attributes.

Displaying DICTIONARY Table Definitions

A dictionary table's definition can be displayed by specifying a DESCRIBE TABLE statement. The results of the statements and clauses used to create each dictionary table can be displayed on the SAS Log. For example, a DESCRIBE TABLE statement is illustrated below to display the CREATE TABLE statement used in building the OPTIONS dictionary table containing current SAS System option settings.

PROC SQL Code

```
PROC SQL;
  DESCRIBE TABLE
    DICTIONARY.OPTIONS;
QUIT;
```

SAS Log Results

```
create table DICTIONARY.OPTIONS
  (
   optname char(32) label='Option Name',
   setting char(1024) label='Option Setting',
   optdesc char(160) label='Option Description',
   level char(8) label='Option Location'
  );
```

Note: The information contained in dictionary tables is also available to DATA and PROC steps outside the SQL procedure. Referred to as SASHELP views, each view is prefaced with the letter “V” and may be shortened with abbreviated names. SASHELP views can be accessed by referencing the view by its name in the SASHELP library. Please refer to the SAS Procedures Guide for further details on accessing and using dictionary views in the SASHELP library.

The DICTIONARIES Table and VDCTNRY SASHELP View

SAS users can identify any new Dictionary table release by accessing the read-only DICTIONARIES Dictionary table or VDCTNRY SASHELP view. The contents of the DICTIONARIES Dictionary table and VDCTNRY SASHELP view reveals the names of supported tables and views. The following PROC SQL query uses the UNIQUE keyword to generate a listing of existing Dictionary tables.

PROC SQL Code:

```
PROC SQL;
  SELECT UNIQUE MEMNAME
    FROM DICTIONARY.DICTIONARIES;
QUIT;
```

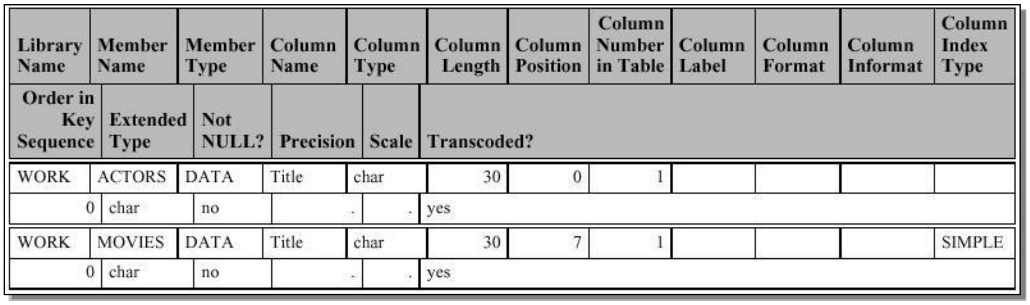
Dictionary.COLUMNS

Retrieving information about the columns in one or more data sets or tables is easy with the COLUMNS dictionary table. Similar to the results of the CONTENTS procedure, users are able to capture column-level information including column name, type, length, position, label, format, informat, and indexes, as well as produce cross-reference listings containing the location of columns in a SAS library. For example, the following code requests a cross-reference listing of the tables containing the TITLE column in the WORK library. **Note:** Care should be used when specifying multiple functions on the WHERE clause since the SQL Optimizer is unable to optimize the query resulting in all allocated SAS session librefs being searched. This can cause the query to run much longer than expected.

PROC SQL Code

```
PROC SQL;
  SELECT *
    FROM DICTIONARY.COLUMNS
      WHERE UPCASE(LIBNAME)=”WORK” AND
            UPCASE(NAME)=”TITLE”;
QUIT;
```

Results



Library Name	Member Name	Member Type	Column Name	Column Type	Column Length	Column Position	Column Number in Table	Column Label	Column Format	Column Informat	Column Index Type
WORK	ACTORS	DATA	Title	char	30	0	1				
WORK	MOVIES	DATA	Title	char	30	7	1				SIMPLE

Order in Key Sequence	Extended Type	Not NULL?	Precision	Scale	Transcoded?
0	char	no	.	.	yes
0	char	no	.	.	yes

Dictionary.TABLES

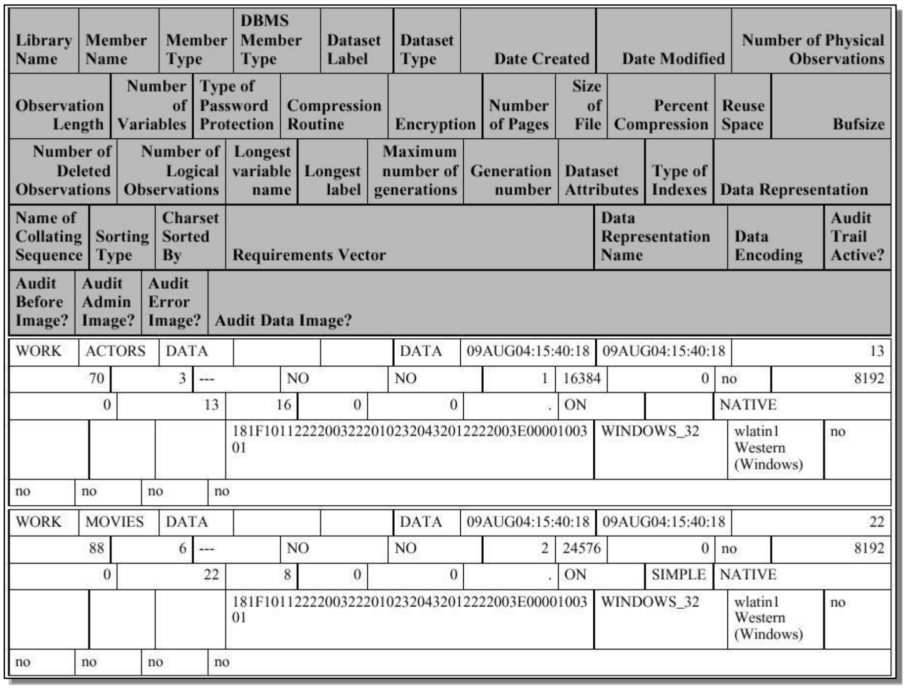
When users need more information about SAS files consider using the TABLES dictionary table. The TABLES dictionary table provides detailed information about the library name, member name and type, date created and last modified, number of observations, observation length, number of variables, password protection, compression, encryption, number of pages, reuse space, buffer size, number of deleted observations, type of indexes, and requirements vector. For example, to obtain a detailed list of files in the WORK library, a PROC SQL SELECT query can be constructed as follows.

Note: Because the TABLE Dictionary table produces a considerable amount of information, users should consider specifying a WHERE clause when accessing this table.

PROC SQL Code

```
PROC SQL;
  SELECT *
    FROM DICTIONARY.TABLES
      WHERE UPCASE(LIBNAME)=”WORK”;
QUIT;
```

Results



Library Name	Member Name	Member Type	DBMS Member Type	Dataset Label	Dataset Type	Date Created	Date Modified	Number of Physical Observations
WORK	ACTORS	DATA			DATA	09AUG04:15:40:18	09AUG04:15:40:18	13
WORK	MOVIES	DATA			DATA	09AUG04:15:40:18	09AUG04:15:40:18	22

Observation Length	Number of Variables	Type of Password Protection	Compression Routine	Encryption	Number of Pages	Size of File	Percent Compression	Reuse Space	Bufsize
70	3	---	NO	NO	1	16384	0	no	8192
88	6	---	NO	NO	2	24576	0	no	8192

Number of Deleted Observations	Number of Logical Observations	Longest variable name	Longest label	Maximum number of generations	Generation number	Dataset Attributes	Type of Indexes	Data Representation
0	13	16	0	0	.	ON		NATIVE
0	22	8	0	0	.	ON	SIMPLE	NATIVE

Name of Collating Sequence	Sorting Type	Charset Sorted By	Requirements Vector	Data Representation Name	Data Encoding	Audit Trail Active?
			181F10112222003222010232043201222200 3E0000100301	WINDOWS_32	wlatin1 Western (Windows)	no
			181F10112222003222010232043201222200 3E0000100301	WINDOWS_32	wlatin1 Western (Windows)	no

Audit Before Image?	Audit Admin Image?	Audit Error Image?	Audit Data Image?
no	no	no	no
no	no	no	no

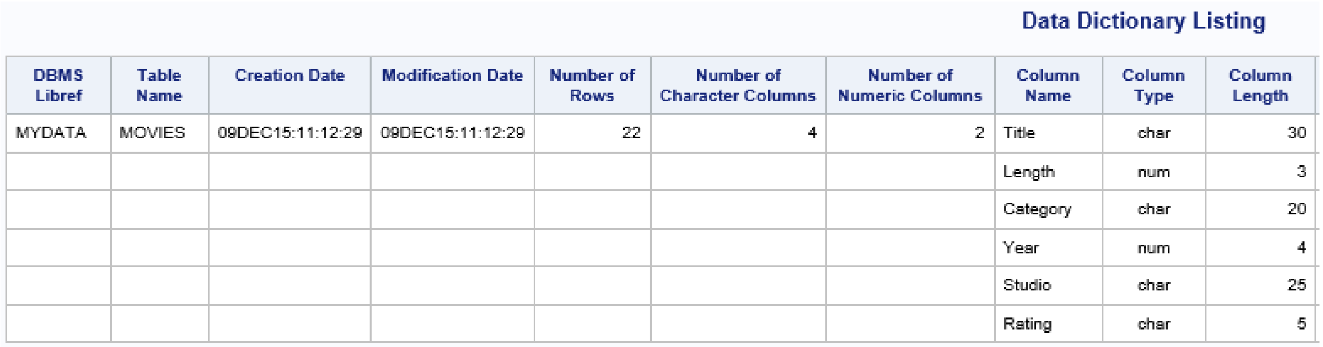
Creation of a “Custom” Data Dictionary

SAS users can access the contents of the TABLES (or VTABLE) and COLUMNS (or VCOLUMN) Dictionary tables to create a “custom” data dictionary. The following code collects summary-level information on the numeric variables in the MOVIES data set; joins the contents of the TABLES and COLUMNS Dictionary tables with the STATS table; and then builds a “custom” report using PROC REPORT.

Data Dictionary Listing Code:

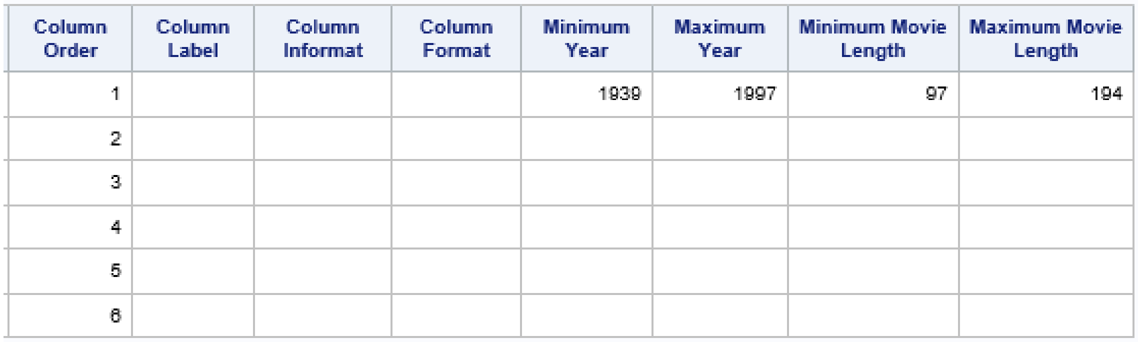
```
proc sql ;
 create table movies_stats as
  select "MYDATA" as libname,
         "MOVIES" as memname,
         min(year) as Min_Year,
         max(year) as Max_Year,
         min(length) as Min_Length,
         max(length) as Max_Length
   from mydata.movies ;

 create table joined_tables_columns as
  select *
   from dictionary.tables  t,
        dictionary.columns c,
        work.movies_stats  s
    where t.libname = "MYDATA" AND
          t.memname = "MOVIES" AND
          c.libname = "MYDATA" AND
          c.memname = "MOVIES" AND
          s.libname = "MYDATA" AND
          s.memname = "MOVIES" ;
quit ;

TITLE  Data Dictionary Listing ;
PROC REPORT DATA=work.joined_tables_columns NOWINDOWS ;
 COLUMNS libname memname crdate modate nobs
         num_character num_numeric name type length varnum
         label informat format min_year max_year
         min_length max_length ;
 DEFINE libname       / ORDER   'DBMS Libref'       WIDTH=30 ;
 DEFINE memname       / ORDER   'Table Name'        WIDTH=30 ;
 DEFINE crdate        / ORDER   'Creation Date'     WIDTH=30 ;
 DEFINE modate        / ORDER   'Modification Date' WIDTH=30 ;
 DEFINE nobs          / ORDER   'Number of Rows'    WIDTH=30 ;
 DEFINE num_character / ORDER   'Number of Character Columns' WIDTH=30 ;
 DEFINE num_numeric   / ORDER   'Number of Numeric Columns'   WIDTH=30 ;
 DEFINE name          / DISPLAY 'Column Name'       WIDTH=30 ;
 DEFINE type          / DISPLAY 'Column Type'       WIDTH=4
                        CENTER ;
 DEFINE length        / DISPLAY 'Column Length'     WIDTH=20 ;
 DEFINE varnum        / DISPLAY 'Column Order'      WIDTH=3 ;
 DEFINE min_length    / ORDER   'Minimum Movie Length'        WIDTH=3 ;
 DEFINE max_length    / ORDER   'Maximum Movie Length'        WIDTH=3 ;
 DEFINE min_year      / ORDER   'Minimum Year'      WIDTH=3 ;
 DEFINE max_year      / ORDER   'Maximum Year'      WIDTH=3 ;
RUN ;
```

Results



Data Dictionary Listing

DBMS Libref	Table Name	Creation Date	Modification Date	Number of Rows	Number of Character Columns	Number of Numeric Columns	Column Name	Column Type	Column Length
MYDATA	MOVIES	09DEC15:11:12:29	09DEC15:11:12:29	22	4	2	Title	char	30
							Length	num	3
							Category	char	20
							Year	num	4
							Studio	char	25
							Rating	char	5



Column Order	Column Label	Column Informat	Column Format	Minimum Year	Maximum Year	Minimum Movie Length	Maximum Movie Length
1				1939	1997	97	194
2							
3							
4							
5							
6							

Conclusion

The SAS System read-only Dictionary tables and corresponding SASHELP views provide valuable information about SAS libraries, data sets, columns and attributes, catalogs, indexes, macros, system options, titles, views, and much more. Users are encouraged to research these powerful resources of information to better understand information about data, for the creation of system documentation and performance tuning, as well as other important application areas.

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