ABAP on HANA Interview questions

Q. What is SAP HANA?

Ans. HANA is defined as High Performance Analytical Appliance, a full transactional RDBMS system given by SAP consisting of IMCE (In-Memory Computing Engine) which combine row based and column based architecture. It is capable of doing both OLTP and OLAP in a single box which includes both Hardware and Software Innovations. It is also knows as Hybrid Database System.

Hardware innovation
- Reduction in memory and Chip (CPU) price
- Multi core Processors
- Operating systems are now available with high bit size 64 bit

  8084 16 bit Address Bus

  $2^n - 2$

Software Innovation
- Column Store v/s Row Store
- Table Partitioning
- High Compression of data
- Parallel Processing

Q. What is the difference between Row Storage and Column Storage?

Row Store	Column Store
Choosing table as Row Store is not as restrict as column	If you see there is large amount of data and having non-unique (Repeating e.g. Material group, Material Clas.. In MARA)
If there is a data set where you have unique values(distinct)	Aggregation of data is required (sales order table)
Not applying any aggregation on table.	Always selecting FEW columns in your programs out of so many columns in table.
No Aggregation like org data, configuration	
SELECTING all column all time.	

Q. What is a Schema in SAP HANA?

Ans. A Schema is a dedicated area of database which can be used to store database objects like table, packages, folders, procedures.
It provides a namespace for systems which connects to Database.

Q. What are the improvements in NW 7.5 to leverage the strength of HANA?
1. Code to Data paradigm (code-pushdown)
2. Massive Parallel Processing
3. Data Encoding
4. Columnar Store
5. Run Complex Algorithms
6. Transparent Optimization (order in which select query will be written and executed which is done by DB abstraction layer – converts OPEN SQL from ABAP to Native SQL which is understood by DB)

Q. Benefits of SAP NW 7.5?
Ans.
1. Transparent Optimization
   a. SELECT QUERY : NetWeaver creates a query plan : Plan based Optimizer & Cost Based Optimizer , which decides the order/sequence in which query will be processed.
   b. Allows more complex joins
   c. Open SQL Enhancement
   d. Extended the static code check and SQL performance analysis
   e. Fast Data Access, Optimized data access
2. Reuse Components, ALV ,Fuzzy Search
3. Extension to open SQL
4. Features specific to HANA related artifacts
5. Standard programming guidelines by SAP
6. ABAP/ Fiori Applications

Q. Points to be considered when Migrating to HANA?
1. Native SQL statements will not work – it will result into Runtime error - Dumps

   EXEC SQL.
           -Native Queries
           SELECT ROWNUM, MATNR FROM SAPECC6.MARA;
   ENDSQL.
2. If you have some indication to Database – not showstopper.
           Db hits: '%_HINTS MSSQLNT '&prefer_join&'
3. Select orderid from table where amount < 300.
           If you are doing a search based on non-pk columns in data based and you have not used ORDER BY clause in SQL statement, it can produce problems.
4. Direct access to database cluster/pool tables
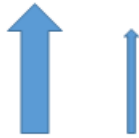   Code Inspector: SCI – Quality checks of our code

When you release a transport from your dev. System a code inspector check is executed automatically.
Prio 1, 2, 3

Q. What are the Guidelines to be followed for SQL performance on ABAP on HANA?

SQL Performance Guidelines

Keep Result set Small — Discard the rows based on check, exit statements in a Loop
Use proper where clause to minimize the dataset

Minimize the number of data transfer — Make use of Joins, Sub queries
Use select FOR ALL ENTRIES...

Minimize the amount of data transfer — Never do select * , Put columns which you want to read
Aggregate function SUM, MIN, MAX, AVG, COUNT

Minimize the search overhead on database — Try to read db tables based on index

Don't overhead db with unnecessary — Redundant storage
Sort data in program
Use buffering

Q. What are different categories of Database Statements?
Ans. Database statements categories:

- DDL – Data Definition language – Mainly used to create/change/delete new database objects.
    SE11 – Data Dictionary which automatically produces the DDL statements for you.
    CREATE, ALTER, DROP...
- DML – Data Manipulation Language – statements which are used to manipulate data.
    INSERT, UPDATE, DELETE, MODIFY
- DQL – Data Query Language – SELECT statement, GET
- TCL – Transaction Control Statements (ACID) - COMMIT, Rollback
- DCL – DATA Control Language – Security and access of data
    GRANT, REVOKE ....

Q. What is Normalization in ABAP on HANA?
Ans. Normalization concept means to reduce the redundancy of data.

Q. What is ABAP Test Cockpit in ABAP on HANA?

Ans. Code inspector/ATC checks are static code findings against guidelines. These findings won't help you to prioritize your list of improvements. You need real-time performance data to find which is the first program to fix.

Q. How to do performance testing in PRD system? What are pre-requisites?

Ans. With SAP Netweaver 7.5 SP05 you can do performance trace in PRD system without much overhead, in two steps: 1st: Administor the SQLM (tcode) – start and stop the trace. 2nd: Data: SQLMD (tcode) in the order of the potentially expensive statement.

In order to find performance trace priority list : use tcode : SWLT (SQL Performance tuning worklist)

Q. Class to calculate runtime in ABAP on HANA?

Ans: CL_ABAP_RUNTIME

Q. How to specify client field in Native Query?

Ans: Using SELECT DISTINCT / CLIENT SPECIFIED / USING CLIENT

Q. Tcode for EPM scenario?

Ans: SEPM_DG – Data Generator

Q. What are different Code-pushdown techniques?

Ans:

1. SQL Queries _ imperative and declarative logic (use literals, arithmetic, logical expression inside the queries and using expressions like CEIL, FLOOR, ABS, TRUNC, FRAC can be part of Open SQL statements),
2. CDS Views,
3. AMDP : ABAP Managed Data Procedures,
4. Information Models and consuming those in ABAP using proxy object techniques

Q. What are Entry points?

Ans: Different ways in which an SQL query is getting called are called Entry points. Eg. Program, Background job, Function Module .. etc

Q. What does NW 7.4 SP 05/NW 7.5 SP 02 offers in ABAP?

Ans: Enhancements in ABAP and OPEN SQL:

Provides Database Abstraction: - can connect to any db, where the database abstraction layer converts the OPEN SQL statements into Native SQL

Improvements in OPEN SQL Enhancements:

1. Escaping of HOST Variables: eg- ":" colon , "@"

2. Comma separated select list: SELECT col1, col2, col3 … , you have to use escape symbol for host variable
3. Right outer join available
4. Possible to provide bracketing for joins
5. New functionality in ON condition of joins
6. Number of tables which can participate in joins are now 50, earlier we can include only 9 tables in a join
7. Maximum no of subqueries has been also increased to 50 from 9
8. We can use USING CLIENT keyword instead of CLIENT SPECIFIED

Q. What are inline declarations in ABAP on HANA?

Ans: Inline declarations is a new way of declaring variables and field symbols at operand positions.

EXAMPLES:

```
Before 7.40
DATA text TYPE string.
text = `…`.
With 7.40
DATA(text) = `…`.
```

Declaration of table work areas

```
Before 7.40
DATA wa like LINE OF itab.
LOOP AT itab INTO wa.
  ...
ENDLOOP.
With 7.40
LOOP AT itab INTO DATA(wa).
  ...
ENDLOOP.
```

Declaration of a helper variable

```
Before 7.40
DATA cnt TYPE i.
FIND … IN … MATCH COUNT cnt.
With 7.40
FIND … IN … MATCH COUNT DATA(cnt).
```

Declaration of a result

```
Before 7.40
DATA xml TYPE xstring.
CALL TRANSFORMATION … RESULT XML xml.
With 7.40
CALL TRANSFORMATION … RESULT XML DATA(xml).
```

Declaration of actual parameters

```
Before 7.40
DATA a1 TYPE …
DATA a2 TYPE …
oref->meth( IMPORTING p1 = a1
            IMPORTING p2 = a2
```

```
                    … )
With 7.40
oref->meth( IMPORTING p1 = DATA(a1)
            IMPORTING p2 = DATA(a2)
            … ).
```

Declaration of reference variables for factory methods

```
Before 7.40
DATA ixml            TYPE REF TO if_ixml.
DATA stream_factory TYPE REF TO
if_ixml_stream_factory.
DATA document        TYPE REF TO if_ixml_document.
ixml            = cl_ixml=>create( ).
stream_factory = ixml->create_stream_factory( ).
document        = ixml->create_document( ).
With 7.40
DATA(ixml)           = cl_ixml=>create( ).
DATA(stream_factory) = ixml->create_stream_factory(
).
DATA(document)       = ixml->create_document( ).
```

Field Symbols

For field symbols there is the new declaration operator FIELD-SYMBOL(…) that you can use at exactly three declaration positions.

```
ASSIGN … TO FIELD-SYMBOL(<fs>).
LOOP AT itab ASSIGNING FIELD-SYMBOL(<line>).
…
ENDLOOP.

READ TABLE itab ASSIGNING FIELD-SYMBOL(<line>) …

TYPES t_itab TYPE TABLE OF i WITH EMPTY KEY.

DATA(itab) = VALUE t_itab( ( 1 ) ( 2 ) ( 3 ) ).
```

Q. When do you use "GROUPBY" clause in HANA SQL statements?
Ans: while using aggregate functions in a SELECT QUERY, all the columns that do not belong to aggregate-functions should be put in GROUP BY Clause.

Q. What is the significance of "HAVING" clause in SQL statement?
Ans: In order to apply further filter for the aggregation function, HAVING clause can be used in the SELECT statement which is used with GROUPBY clause being mandatory. Eg. It is like applying where condition on the aggregated column.
When an aggregation is used with CASE statement, it has to be mentioned in the GROUPBY clause

Q. What is the symbol to do "concatenation" operation in NW ABAP 7.4 ?
Ans. Pipe Symbol - |

Q. What is constructor expression in NW ABAP 7.4?

Ans. It is used to create a Table in ABAP by specifying symbol #

```
Ex:
struct2 = CORRESPONDING #( struct1 ).
itab = VALUE #( ( 1 ) ( 2 ) ( 3 ) ).
```

Q. What is the transaction code to check Schema name?
Ans. DBACOCKPIT

Q. Can multiple ABAP systems connect to ABAP Database?
Ans. Yes. HANA 1.0 SP09 onwards

Q. What is a Catalog in SAP HANA?
Ans. A Catalog is collection of Database Schemas in HANA. Schema: grouping of all database objects, Schema is a mandatory database object allows companies to use same database keeping data from multiple system where DCL and DB constraints can be managed at schema level

Q. What is difference between SAP User and DB user?
Ans. Schema user , i.e the database user is used to access the data with certain authorization levels.

Q. What is Information Model and why is it required?
Ans. Information Model: main purpose is to hide the technicalities to select data and make it easier for business users to model their data which can be pulled w/o technical knowledge just db functional knowledge is sufficient.

An information model: (purpose was to hide the complexity and to overcome some setbacks with the queries)
- Used to convert linear structure to a multi dimension structure w/o knowing technical language.
- Are Process of converting source data (in tables) into business understandable format.
- They also make use of Hardware advancements in HANA.
- If we define information models inside HANA DB, We can also reduce the data transfer b/w DB and App layer.
- Complex logic as well as transformation executed in DB layer.

Q. What are different types of views in HANA?
Ans. 1. Attribute view
      2. Analytic view
      3. Calculation View
      4. Decision Table
For the purpose of taking business informed decisions and they run on top of HANA DB doing code-pushdown or functional pushdown to the DB layer

Q. What is the function of SQL optimizer?

http://anubhavtrainings.com
Prepared by : Charu Borkar charusb@gmail.com
SAP UI5, Fiori, ABAP on HANA Consultant, Australia
Referenced from Training delivered by Anubhav Oberoy (anubhav.abap@gmail.com) on ABAP on HANA
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Ans. SQL optimizer function is to process and optimize the SQL queries submitted to HANA and finally executed by the SQL engine in SAP HANA

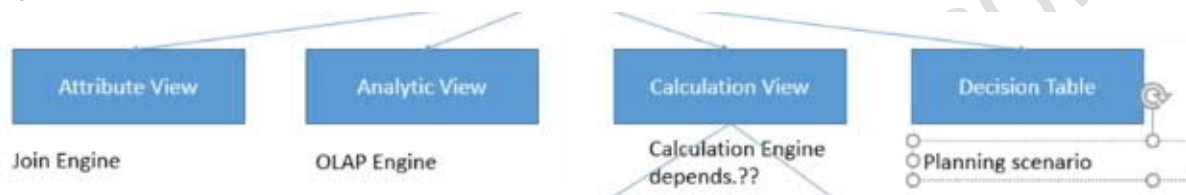Q. What are the other three engines which are part of SAP HANA?
Ans. Calculation Engine: index-server architecture: procedural logic
   Join Engine: regular SQL using joins
   OLAP Engine: aggregation

Q. Processing of models in the engine?
Ans.

Q. What are different techniques of creating a Calculation view?
Ans. Graphical Editor and SQL Script Editor

Q. What is a Star Schema in ABAP on HANA?
Ans. When we combine data of dimension (master) with measure (transaction), it becomes Star Schema. And to join two or more Star Schemas, it is done by Calculation View.

Q. What is the limitation of Analytical view?
Ans. This view can have only one measure. It cannot have multiple measure. Basically one fact table in an Analytical view. Ideally only one Fact Table should only be used with Analytical view since Fact Table requires an aggregate.

Q. what are steps to create an Attribute view?
Ans. Steps to create an attribute view in HANA Studio since graphical representation is not available in ABAP on Eclipse:
   1. Name and description of attribute view
   2. Table and Join
   3. Hierarchies, Transformation, restricted and calculated columns
   4. Save and Activate
   5. Data Preview

Q. what is the limitation of an Attribute view?
Ans. Attribute view cannot be used with aggregate functions.

Q. What is Content in SAP HANA?
Ans. Content is collection of development packages where we add different development objects including Information Models: which are HANA specific data type.

Q. What is a Package in SAP HANA?

Ans. It provides a name space for your development object. Once an information model is activated, it creates a view in the HANA DB and it is stored inside the schema.

      Eg. <packagename>::<viewName> ➔ schema

It allows you to transport all logically related development objects. Grouping development artefacts together known as Delivery Unit.

Q. Why Fact Table should not be added in an Attribute View?

Ans. It is recommended to use an Attribute View with only Master Table because of performance criteria. It is advisable that Fact/Transaction Table used with Analytical view, and not be used with Attribute view due to performance implication since Attribute View is processed in the join Engine of SAP HANA, it is not processed by OLAP Engine which is equipped to do aggregation.

Statement: To expose a View/Model to the user, you create a select query on top of your view and create an OData on your query and create a fiori app to expose it to the user…sap.viz OR use ALV grid

Q. What is View Proxy in ABAP?

Ans. View Proxy is used to pull the data from a view in ABAP. To expose a Data Model to the application layer (ABAP Layer), SAP NW7.4 SP02 onwards, provides a feature called View Proxy which allows SAP HANA data models to communicate with the ABAP Layer using ADT in eclipse and lock the objects in a Delivery unit to transport the objects.

Q. What is Hierarchy?

And. Hierarchy is used to realize data based on relation of data characteristics.

      Click on Semantics -> Hierarchy Tab ->
      Two types of hierarchy

> ➢ Level based hierarchy – Relation between master data w.r.t. groups, these groups can come from multiple tables.
> ➢ Parent-child hierarch – the relation works as self-relation. In this the table has a relation with itself and mark one of the column as parent and another a child. E.g. manager employee relation.

Q. What are different types of JOINS in SAP HANA?

Ans.

Inner	This join type returns all rows when there is at least one match in both the database tables. In short. join between 2 tables must fulfill the join criteria
Left Outer	This join type returns all rows from the left table, and the matched rows from the right table.
Right Outer	This join type returns all rows from the right table, and the matched rows from the left

	Joins the tables as like inner join, additionaly it will include the record of the table in-direction for which no corresponding records available in transaction table.
Referential	This join type is similar to inner join type, but assumes referential integrity is maintained for the join tables. Its smart inner join. If we have 2 tables connected via ref. join and a query is written on Attr. View and do not include the join column or the column on master check table. Essentially you are just selecting data from main table, The join will be "pruned" (exclude – don't care). When you also apply an filter on data model, the ref. join also acts like inner join
Text Join	This join type is used to obtain language-specific data from the text tables using a language column.
Full Outer Joins	This join type displays results from both left and right outer joins and returns all (matched or unmatched) rows from the tables on both sides of the join clause.
Text Join	A join between master table and its text table with language key
Temporal Join	join for timeframe – also known as Equi-join. BETWEEN condition in select query. ** applicable only on Analytical Views
Star join	Its only used in calculation views, it is used to combine multiple fact table directly.
Spatial Join	used to join coordinates table

Q. What is an Analytical View?

Ans. When a Fact table to be connected to multiple dimensions, we use analytical view. The Analytical views are built to perform complex Aggregations(SUM, MIN, MAX, AVG, COUNT) on measure. These views are processed by OLAP engine in SAP HANA. They are used to build so called STAR schema. Also has capabilities to define calculated columns, restricted columns, filters, import parameters, complex conversions.

It is important that In an analytical view, we must mark attributes and measures at the end in semantic. Because an aggregation will be applied only on measure.

Q. How do you achieve currency conversion in Analytical view?
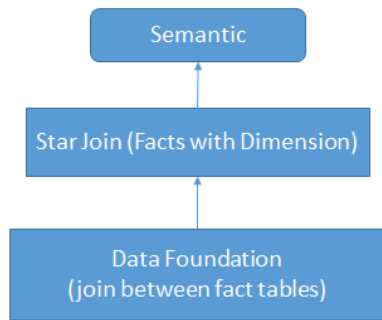
Ans. Use calculated columns and define the semantics.

Q. What are components of a View Scenario?

Q. What is a Calculation View?

Ans. To include multiple facts as part of data model, we can go for calculation view, these views are processed by Calculation Engine in SAP HANA. They are suitable for more complex calculation. CVs can be created in two ways: Graphical and SQL Script (to achieve parallelization). SQL scripting in Calculation view can be implemented in two ways: CE functions (to get better performance) or pure SQL

Q. Define Calculation Engine Architecture?
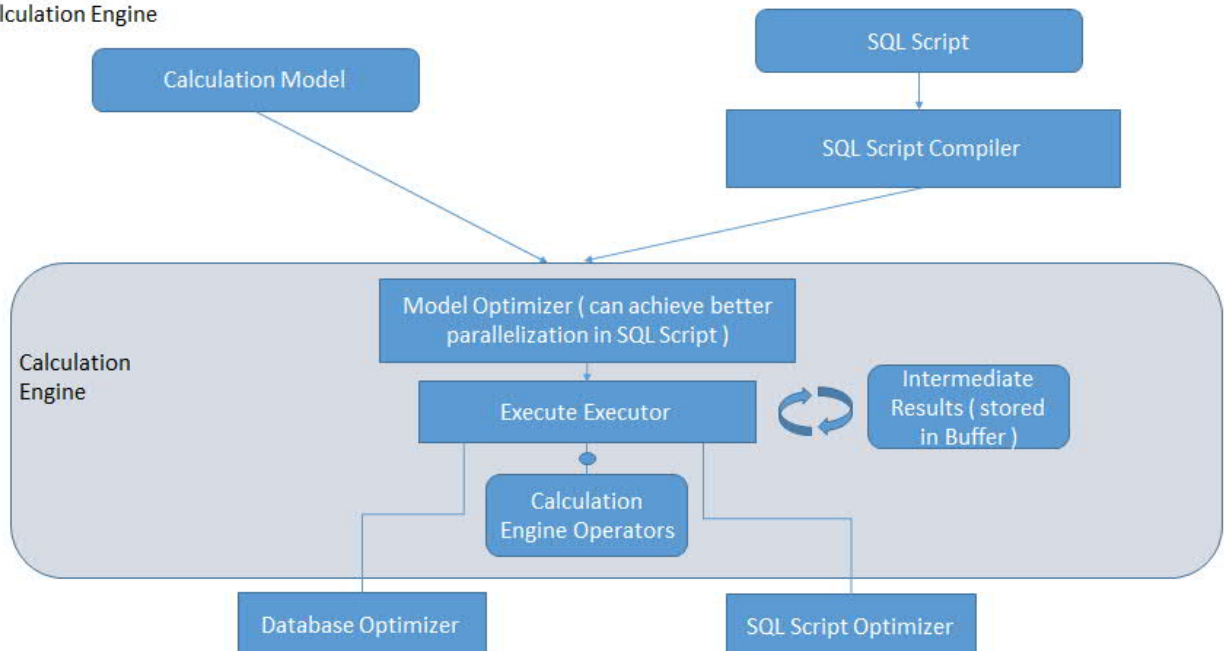
Q. What are CE functions?

Ans. SAP HANA Provides ready-made functions which are implemented inside Calculations engine and executed with in the engine with enhanced performance for common tasks like :

- projection (selection of some columns)
- Joins (connect two data object)
- Selection (where clause)
- Join with a Fact Table
- Selection of data from column table
- Unions

- Aggregations
- CE_*

St. In case of CE functions the call/execution remains in the CE engine, where as in case of SQL Scripts, it has to go outside of the Caln Engine to SQL Script Optimizer to execute the function leading to a drop in performance.

Q. What are the cases when can you use different views for different requirements?
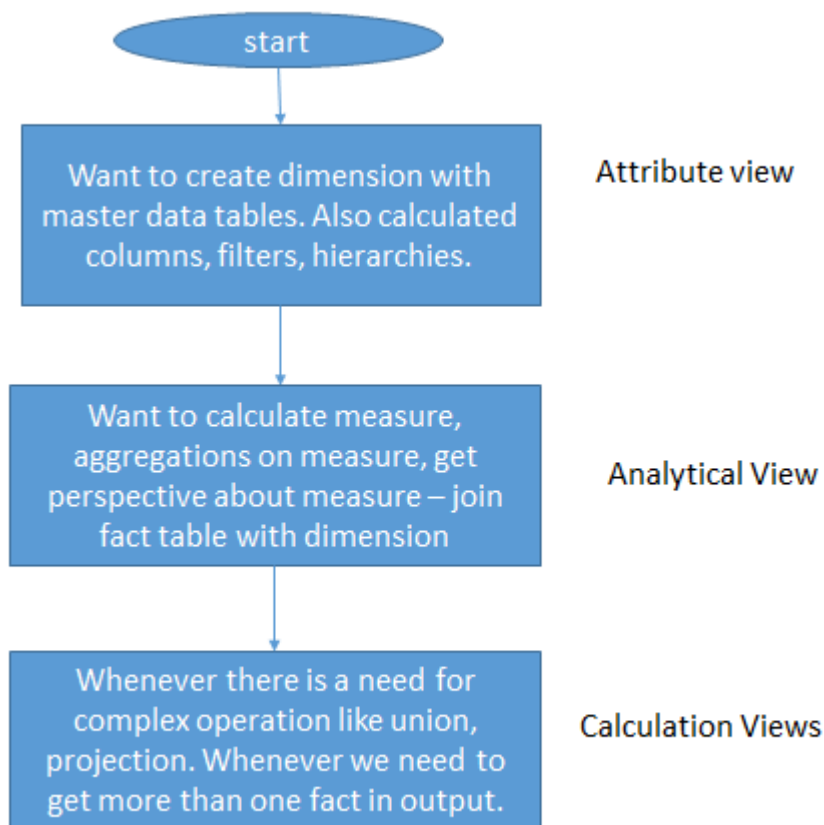
Q. What is an alternate to View proxy?
Ans. Alternate to View Proxy is CDS view due to synchronization of transport objects.

Q. What is ADBC?

Ans. ADBC stands for ABAP Database Connectivity. It is used to run HANA related queries directly using ABAP code. ADBC APIs are available since NW 7.4 to call the queries using simplified interface. ADBC can be used when:

1. Your system does not have ABAP ADT available, you cannot create proxy object.
2. When HANA DB running as Secondary DB (Side Car Scenario)

Q. What is a Decision Table?
Ans. A Decision Table is used for planning scenarios, that allows business users to model business rules with less/no technical knowhow and apply the rules to see the results with read data.

     2 types of DT

1. Decision table with update value: We can update the data of a specific column in SAP HANA by defining business rule.
2. Decision table with Return Value: In this we have the result as an additional updated column. (preferred for use business cases: not changing the actual data in the DB)

Once a decision table is activated, it creates a stored procedure in the DB

Q. What is BRMS System?
Ans. A Business Rule Management system manages set of rules which are frequently changing in the business.

Q. Syntax to call a PROCEDURE in HANA?
Ans. CALL "<procedure_name>"(?)

Q. What is the difference between Procedural (Scripting) Vs Programming Language?
Ans.   Programming language are independent products, they generate their own executables.
    Code is compiled by programming language and converted to machine code / OS code.
    Eg: Compile a .java file it create a .class
    Scripting languages are embedded on programming language. They rely on the APIs of programming language.

In SAP HANA, we have SQL scripting which is a Procedural Language.

Q. What are the disadvantages of using Views?
Ans.

- Cannot debug a views
- Decomposing complex business logic, Intermediate results from the views cannot be store.
- No possibility to express business logic – if, else, case, looping
- SQL queries can only return one value and has no chaining.
- Imperative logic.

Q. What is SQL Script in HANA?
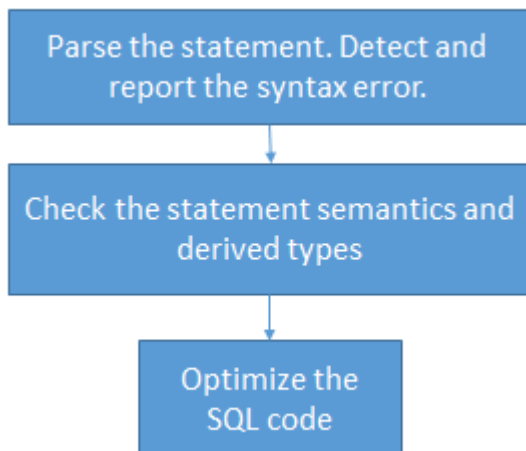Ans. SQL script is a collection of extension to SQL (DML, DDL, DQL, DCL)

Allows developer to write performance-intensive logic inside database. One of the technique used in code-to-data paradigm.

Q. How does the system process SQL script?

Q. What are different type of Statements in SQL Logic?
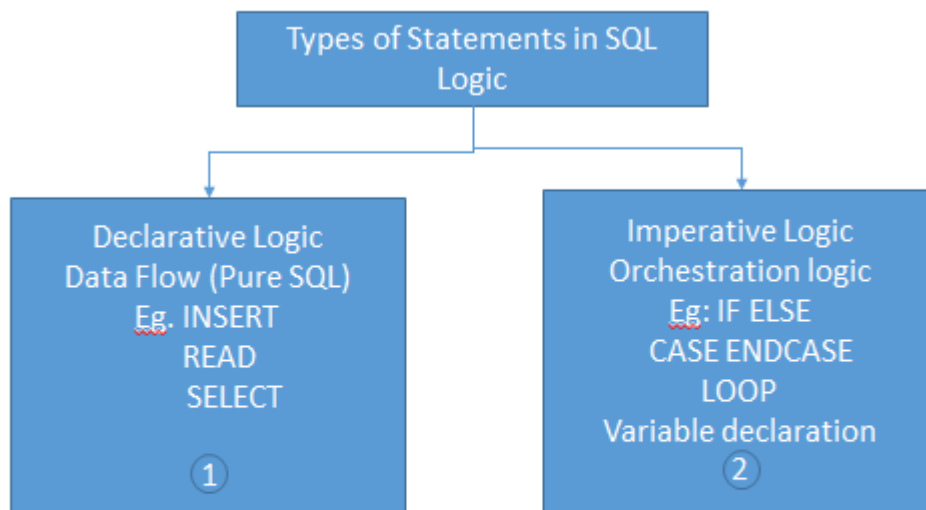
Q. On what all instances SAP HANA comes out of Parallelization mode?
Ans. Instances when HANA comes out of parallel mode:

"Select Statements" are executed in SAP HANA in parallel unless:
- Local scalar parameters and variables are used in containers (procedure).
- Read/write procedure or DDL/DML statements are execute (eg: CREATE, INSERT,UPDATE,MODIFY).
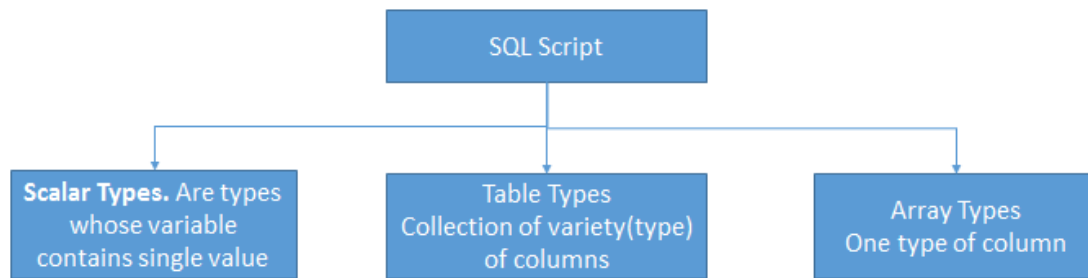- Imperative Logic is used (IF, CASE, LOOP)

- SQL statements which are not assigned to variable. (Eg: Lt_Anubhav = select * from snwd_pd where price > 1000; --Query 1)

Q. What are different types of SQL Scripts?

Q. What are advantages of SQL script?
Ans.

- SQL Script is executed and processed in the calculation engine within the HANA database.
- SQL Script is able to perform complex calculations.
- In SQL Script, a local variable can be declared to hold the interim result.
- SQL Script Procedure can return more result by using "OUTPUT Parameter" while Normal SQL Procedure can return only one.
- In SQL Script, you can define global or local tables types which can be used as parameters.

Q. What are different Data Types in SAP HANA?
Ans. Different Data Types that are called Primitive Data Types in HANA are:

- Numeric : TINYINT, SMALLINT, INT, BIGINT, DECIMAL, SMALL-DECIMAL, DOUBLE
- Characters: VARCHAR, NVARCHAR, ALPHANUM
- Data/time : TIMESTAMP, DATETIME
- Binary type: VARBINARY
- Large obj: CLOB, BLOB, NLOB

Q. What are Containers in SAP HANA?
Ans. Containers are the blocks in which we write the Imperative or Declarative logic.

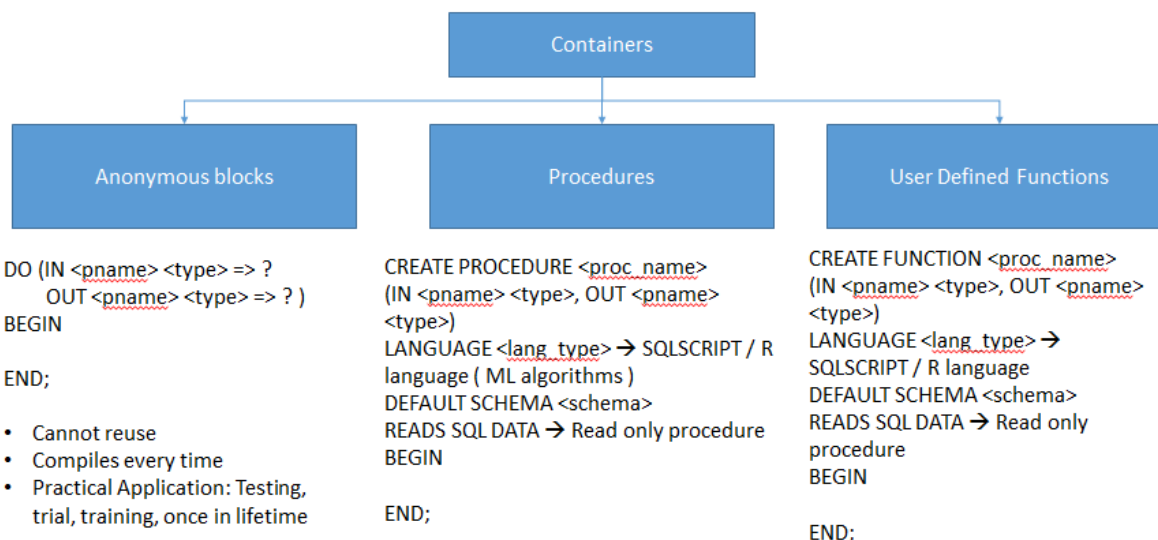Q. What are different types of Blocks (Containers) in SAP HANA?

Ans.

Containers

Anonymous blocks | Procedures | User Defined Functions

Anonymous blocks

```
DO (IN <pname> <type> => ?
    OUT <pname> <type> => ? )
BEGIN

END;
```

- Cannot reuse
- Compiles every time
- Practical Application: Testing, trial, training, once in lifetime

Procedures

```
CREATE PROCEDURE <proc_name>
(IN <pname> <type>, OUT <pname>
<type>)
LANGUAGE <lang_type> → SQLSCRIPT / R
language ( ML algorithms )
DEFAULT SCHEMA <schema>
READS SQL DATA → Read only procedure
BEGIN

END;
```

User Defined Functions

```
CREATE FUNCTION <proc_name>
(IN <pname> <type>, OUT <pname>
<type>)
LANGUAGE <lang_type> →
SQLSCRIPT / R language
DEFAULT SCHEMA <schema>
READS SQL DATA → Read only
procedure
BEGIN

END;
```

Q. What is the difference between PROCEDURES and USER DEFINED FUNCTIONS in HANA?
Ans.

Procedure	Functions
A procedure is invoked by Call statement	A function is always consumed by select query of imperative statements.
Cannot call procedure in SQL query.	A function can be called in SQL query directly
Can have INOUT parameter	Not possible
We cant use procedure in query	There are readymade function in DB, aggregate function, string function, conversion functions
Direct assignment of output from procedure to scalar parameter is not supported.	From SAP HANA SP08 onwards in SQL script we can assign output of UDF to a scalar variable.

Q. How do you declare variables in SQL script?

Ans.   When we declare variable in SAP HANA SQL Script (Scalar Parameters), These variables are initialized with NULL value. We can explicitly assign value during creation also.

When we want to use a variable in SQL script, we use symbol colon (:) to refer the variable. E.g.

Declare x integer;

:x should be used to refer value of x.

When we want to assign value to x, we don't use colon (:) → x

SQL script is case-insensitive

Every SQL script statement must end with semi-colon (;)

Q. Syntax to declare Scalar Variable?

Ans. DECLARE <vname> <vtype> = <default_value>;

Q. Syntax to Declare an Anonymous Block?

Ans.   DO (in pname ptype => ?, out pname ptype => ?)

BEGIN

        ....

END;

Q. What is advantage of procedure over anonymous block?

- Procedure are pre-compiled containers with name.
- We can call procedure from another procedure.

Q. Syntax to create a Procedure and Call a Procedure?

Ans.   CREATE PROCEDURE <proc_name> (in pname ptype, out pname ptype, inout pname ptype)

LANGUAGE SQLSCRIPT/R
DEFAULT SCHEMA <schema> READS SQL DATA
WITH ENCRYPTION AS
BEGIN
        ----code
END;
CALL <procname>(params);

Q. What does DROP PROCEDURE in SQL do?

Ans. Whenever a New Procedure is created, in order to re-create or replace the existing procedure, it needs to be dropped first. Syntax to Drop Procedure:

DROP PROCEDURE <proname>.

Q. What are different syntaxes in SQL script for different functionalities?

Ans.   If condition

IF <cond> THEN

        .....

ELSE IF <cond> THEN

        ....

END IF;

Loops – iteration
  1.   While Loop
        While <condition> DO

```
                END WHILE;

                BREAK;
        2. For loop
                FOR i IN startIndex..EndIndex DO
                ....
                END FOR;
```

Q. What does "READ SQL DATA" do?
Ans. It tells the system to enter into Parallelization mode.

Q. How to define EXCEPTION in SQL?
Ans.   TRY.

        .....code...
        ......code...
        CATCH ex_class INTO lx_obj.

                ...
        ENDTRY.

        Syntax:
        DECLARE EXIT HANDLER FOR
                1. SQLEXCEPTION –generic exception case
                2. SQL_ERROR_CODE <codeno>
        ---code
        END;

Q. What is the range of Custom Exceptions Error Code?
Ans. 10000 ~ 19999
Syntax:
SIGNAL SQL_ERROR_CODE 10000 SET message_text = 'xyz';

Q. What are Cursors in HANA Database?
Ans. Whenever we want to work with multiple records in DB,
    1. Load all data records in a table parameters, manipulate using table
    2. Cursor – Process records directly from DB table Line By Line
Cursors are used to fetch data records from table row-by-row from result of a query assigned to cursor. We always bind a Query to cursor. It is also possible to parameterize cursor.
NOTE!!: If possible Avoid using Cursors in HANA DB , since HANA cannot optimize or run SQL in Parallel mode.

Q. What steps to process a Cursor?
    1. Declare a cursor and assign to query
        DECLARE CURSOR(<params>) <Name> FOR <select>

2. Open the Cursor (Submit the query to Database) – query submitted to DB and data is loaded in context area (memory)
   OPEN <cursor name>
3. Fetch statement to process/manipulate the data one by one record.
   FETCH <cursor_name> INTO <record>;
4. To access values of fields use: <record>.column_name
5. Close cursor

Q. Syntax to create a Table Type?
Ans. Table types are created to hold multiple columns of different types
       CREATE TABLE TYPE <tabtypename>(col type, col2 type);
       CREATE TYPE <tabtypename> AS TABLE(col type, col2 type);
       Pname TABLE(col type, col2 type....);

Q. What is the syntax to create an Array?
Ans. An Array is a Single column table a one dimension structure to hold multiple values of same type. An Array CANNOT be used in SIGNATURE of a PROCEDURE.
       DECLARE <array_name> < va_type> ARRAY = ARRAY(val1, val2,...)

Q. What is use of UNNEST Function?
Ans. UNNEST function is used to convert one or many arrays into a table.
       Syntax: Table_variable = UNNEST(:array_var) AS (column_name)

Q. What are User Defined Functions in SAP HANA?
Ans. User Defined Functions in SAP HANA are the read only function that means we cannot perform any DDL and DML(insert update and delete) operation inside the body of the function.

Q. What are different types of UDFs (User Defined Functions) ?
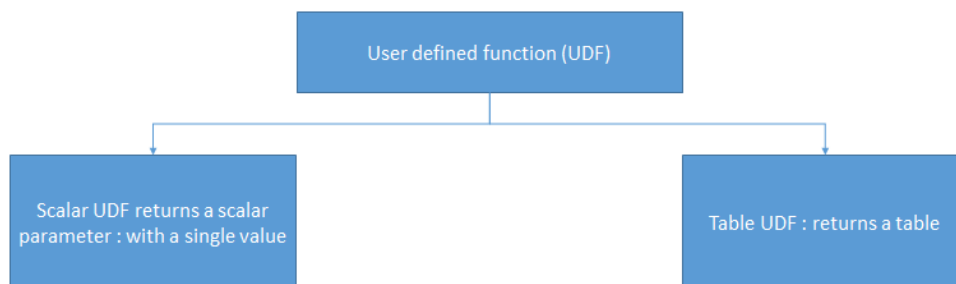
A function will always return one value and that value is a Table.

Q. Things to consider while working with SQL Script Procedures for CODE Pushdown?
Ans.

1. Consider client handling while applying any aggregation on data
2. Since there is no explicit functionality of LUW concept in HANA, it has to be taken care while using SQL scripting
3. There is no implicit locking mechanism, it has to be taken care while working with SQL scripting on DB

Q. What are disadvantages of using ADBC to CALL PROCEDURE?
- Complex coding using SQL interface
- No syntax check at design time.

Q. What is bottom-up approach in HANA DB while creating proxy?
Ans. Whenever an Information Model or a Procedure is created in HANA DB, a View Proxy or Procedure Proxy is created in ABAP Stack respectively. Which means that an object already exists in a DB and in order to communicate with the DB object from ABAP stack, you need to create a proxy.

Q. What is the disadvantage of using Proxies?
Ans.
1. Lifecycle management of HANA vs ABAP object.
2. No Access Control of Procedure
3. No extensibility

Q. What is AMDP (ABAP Managed Data Procedures)?
Ans. This approach is called top-down approach where a procedure is created in ABAP stack NW 7.4 SP05 which acts like Master for editing , activating and transporting (life-cycle) for the procedure object. When it is called for the 1st time corresponding HANA DB procedure gets created to support code-to-data paradigm or code-pushdown to HANA DB.

Q. What are points to be considered while using AMDP?
- A standard ABAP class (SE24), method used as container for AMDP.
- SQL script code which was earlier done in HANA DB is added to this method
- When we call the AMDP first time, it will create the corresponding DB procedure. Name of that procedure will be classname=>method
- These methods are always called as static method.
- It allows to handle runtime error. CX_AMDP_ERROR
- It will be created in your schema which used for ABAP
- When you call the AMDP, it calls the corresponding HANA DB procedure.

Q. What are pre-requisites before using an AMDP?
Ans. Pre-requisites:
- We must add an interface to a class in ABAP to make it powerful so that it can become a AMDP, IF_AMDP_MARKER_HDB
- An ABAP method parameters has to be passed by Value.
- All the parameters of AMDP has to be table type or scalar parameters, No object or nested tables allowed.
- Methods with Returning parameter cannot be used as AMDP.

Q. what are advantages & dis-advantages of using AMDP?

Advantages:
- Syntax check
- Lifecycle management is completely controlled by ABAP system.

Disadvantage:
- Client handling
- Locking and LUW

Q. What is the syntax to create AMDP in a class-method?

```
METHOD method_name BY DATABASE PROCEDURE
FOR db_name(HDB) LANGUAGE sqlscript OPTIONS READ-ONLY
USING dbtab1 dbtab2 amdpname.
.....
....
...
ENDMETHOD.
```

Q. What is CDS View?

Ans. CDS view is basically an abstraction of ABAP to Database layer which allows you to model semantic rich data models (like Information views on HANA DB) on ABAP Stack and on activation it leads to creation of corresponding Database View in DB. It is an enhancement of SQL which provides us DDL for defining semantically rich data models (table/view) and user define types in Database. It is an extension of SQL : i.e DDL DQL and DCL

St. The objective behind creating CDS Data Model is that , it will be understood by all SAP products viz SAP Fiori, KPI modeler, BO/BI, BOPF, FPM, IDA Native HANA Apps.

Q. What is SQL enhancement (CDS) ?
→ Annotation to enrich the data models with additional details (all annotations starts with symbol @)
→ DB Entities are connected using Association at conceptual level (replacement of join conditions)
→ Expressions – used to code calculation in queries

Q. What are different types of CDS?
1. ABAP CDS
2. HANA CDS

Q. How to Define a CDS view?

Ans. CDS view is defined using CDS data definitions.:-> Also known as CDS document or CDS source code. To create CDS views we need to use ADT.

On activation it creates a CDS SQL view (SE11) and a CDS entity

Q. What are Annotations in CDS?

Ans. Annotations are used to add metadata information to CDS entity. Annotation specifies the properties and semantics of entity and its behavior when it is consumed. There are UI Annotations, Object Model annotations, VDM annotations, Environment Annotation etc.

Q. What is the difference between CDS views and Traditional views?

Parameters	CDS Views	Traditional Views
Code-push down	Yes	No
Complexity	Easy	Not Easy
Outer Join	Yes	No
Complex Expressions, Logic	Yes	No
Analytical Adaption	Yes (analytical annotation)	No
OData Support	Direct from NW 7.5	No
Types	Yes	Yes
Metadata model	Yes	No
Extensions	Yes	No
Built-in function UNIONS	Yes	No
Parameters/ Ready to use system variables	Yes	No

Q. What are two categories of CDS?
Ans. CDS with parameters and CDS without parameters

Q. From semantic point of view of S/4 HANA what are the categories of CDS views?
Ans.

Basic (Interface Views) Private I_	Composite Views (intermediate views having analytical capability CO_	Consumption Views C_ Analytical query
Used to access database tables directly. Dimensions built using these views.	Used to combine multiple views/tables using association concept. Base for building analytics. They are not created directly on top of Fiori App	Final consumption happens via consumption views. For BO/BI reporting purpose. Multiple composite views can be used to create consumption view. Also knows as Façade Design Pattern

Q. What is the concept of Association?

Ans. It represents join where the two columns are used in join where one of the column is a Projection. To make it available in the Data Preview, it has to be exposed to the DB. In S/4 HANA the association is indicated with a name starting underscore. Eg. _Supplier, _BusinessPartner etc.

Q. What is Projection in CDS?
Ans. Columns are indicated using a Projection of a table, We can use $projection in CDS for the same in association join condition.

Q. Techniques to Expose CDS to OData based on NW version ?
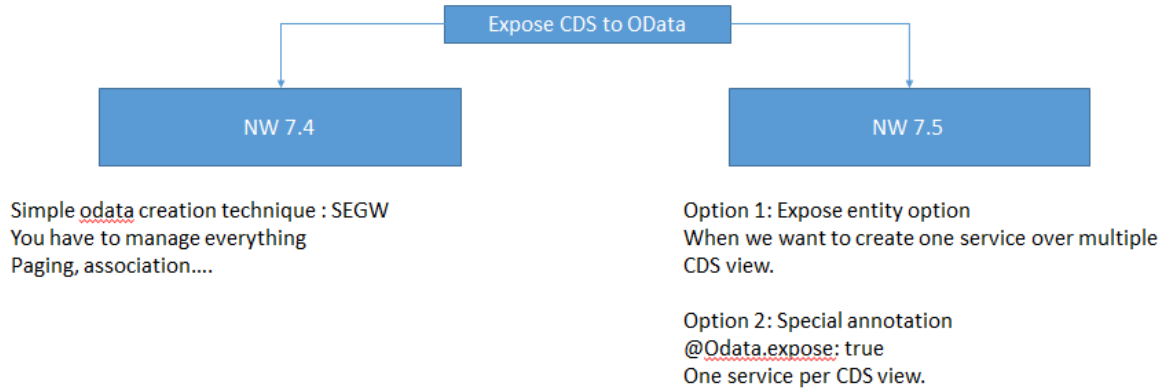
Q. How to create an ALV report in SAP HANA using CDS view?

Ans. SAP NW 7.4 onwards ABAP list viewer comes with an IDA (Integrated Data Access)
Advantage of Using ALV with IDA:
- Only Selected Columns will be fetched from the DB
- it is possible for tables that contain very large quantities of data to be displayed on the UI which is called Pagination and
- Automatic Query (No need to write a SELECT Statement, since the IDA framework prepares the Query, sends it to the DB, pulls the data and displays it in the ALV. Only Data Source Name needs to be provided to the IDA f/w, this data source can be a CDS View, which leverages the strength of CDS like code pushdown and performance). The results of operations such as sorting, grouping, or filtering are also delivered with a very fast response time.
CLASS NAME: CL_SALV_GUI_TABLE_IDA=>CREATE_FOR_CDS_VIEW().

Q. What is the purpose of Cloud Connector?

Ans. In order to consume the OData service based on CDS, to create a Fiori app, we used concept of Cloud Connector. To communicate securely, over the internet , by S/4 HANA On-premise with the SAP Cloud Platform, we need Cloud Connector.

Q. What are the steps to configure Cloud Connector?

    1. setup your HANA Cloud Platform Trial - SCP hcp.sap.com
    2. download msi
        https://tools.hana.ondemand.com/#cloud
    3. install microsoft 2013 VC++ distributable in CAL server
        https://www.microsoft.com/en-us/download/details.aspx?id=40784
    3. login to sap cc -
        access via https://localhost:8443/
        user: Administrator/manage
    4. add cloud sub account, hcp user password
        expose resources
        user linux exernal ip with port 50000 protocol http
    5. Create handshake between OP and HCC
    6. create destination
        no authentication, on premise
        client, webideenabled, system, usage

Q. What are advantages of CDS views over AMDP?

Ans.
1. Reusability of database artefact.
2. Advanced Features such as Associations and Annotations.
3. Client handling can be achieved in CDS.

Q. What is a CDS entity?

Ans. A CDS entity is enriched by annotations which are used to build end-to-end fiori app utilizing these annotations. To consume a CDS view, instead of consuming it in ABAP program it is advisable to consume it using "CDS entity" since it allows access to metadata.

Q. What is the purpose of UI Annotations in CDS view?

- Ans. In order to Develop CDS view for Analytical tools for BW, VDM – Virtual Data Model – Analytical query can be build using CDS views.
- An Analytical App can be build using a CDS view (Consumption View) on top of a simple CDS view (interface view) using UI annotations.
- Using UI annotations, we can define selection fields, the lines items of table, data points of chart, measures and dimensions for chart and expose this CDS as an odata service and build a Fiori App

Q. What is CDS Table Function?

Ans. CDS Table Function can only be implemented with NetWeaver 7.5 which calls an AMDP (ABAP Managed Data Procedure) using CDS view. Using CDS interface concept, underlying calls an AMDP. This is required in case there is some functionality which CDS cannot achieve -> Eg. Data Type Mismatch, Looping, Conditional Looping and Logic

Q. How can you secure your Data Access using CDS view?

Ans. Right click -> Core Data Services Folder -> Create Access Control -> mention the PFCG Role Name

Q. What are different UI annotation in CDS Views?

Ans.
- Start with VDM Annotation : Define it as Consumption View

@UI.headerInfo – used to set the title of the table

@UI. presentationVariant – to initialize the UI (available only on S/4 HANA systems), define SORT order, group based on fields, define default visualization at the view level

@UI. selectionField – selection parameters

@UI.identification – to define label from a user point of view

@UI.lineItem – to define the position of the line item

@UI.chart   -- need to mark @UI.dataPoint : { title: xyz }

@UI.dataPoint   -- to specify a measure in the chart

> Properties to be defined the fields in selection

Q. What is Full Text Search in SAP HANA?
Ans.
To enable Full Text search – there has to be a FULLTEXT index that needs to be present in the Table, which is a DB specific feature.
Syntax: CREATE FULLTEXT INDEX <indextextvariable> on <table_name(field)> FAST PREPROCESSOR OFF;

Q. What does FAST PREPROCESSOR keyword Indicate?
Ans. HANA does pre-processing to enable searches which are case-sensitive.
It achieves this using following techniques:
- Normalization : converting each letter into its equivalent upper and lower care.
- Tokenization : breaking every statement into words
- It also does linguistic analysis of words: finding equivalent word with the nearest meaning

Q. What is FUZZY search in SAP HANA?

Ans. FUZZY SEARCH in SAP HANA is a Fault Tolerant search which allows a level of accuracy (which can be specified in the WHERE clause as percentage) , and returns the value with an approximate match.
Ex: Query

```
select * from sapa4h.snwd_texts where contains ("TEXT", 'screeen', FUZZY(0.8))
```

Result:

KEY	PARENT_KEY	LANGUAGE	TEXT
2F8A46F1ED5A7B0C1231FD526BE	1241E2F8A46F1ED5A7B0C1231FB866BE	E	32 GB Digital Assistant with high-resolution color screen
2F8A46F1ED5A7B0C1231FD566BE	1241E2F8A46F1ED5A7B0C1231FB8A6BE	E	64 GB Digital Assistant with high-resolution color screen a
2F8A46F1ED5A7B0C1231FD586BE	1241E2F8A46F1ED5A7B0C1231FB8C6BE	E	Ergo Screen E-I
2F8A46F1ED5A7B0C1231FD5C6..	1241E2F8A46F1ED5A7B0C1231FB906BE	E	Ergo Screen E-II
2F8A46F1ED5A7B0C1231FD606BE	1241E2F8A46F1ED5A7B0C1231FB946BE	E	Ergo Screen E-III
2F8A46F1ED5A7B0C1231FE146BE	1241E2F8A46F1ED5A7B0C1231FC486BE	E	Screen clean
2F8A46F1ED5A7B0C1231FE166BE	1241E2F8A46F1ED5A7B0C1231FC4A6..	E	10 separately packed screen wipes
2F8A46F1ED5A7B0C1231FE926BE	1241E2F8A46F1ED5A7B0C1231FCC66..	E	9" LCD Screen, storage holds up to 8 hours, 2 speakers inc
2F8A46F1ED5A7B0C1231FEA66BE	1241E2F8A46F1ED5A7B0C1231FCDA6..	E	10" LCD Screen, storage battery holds up to 8 hours
2F8A46F1ED5A7B0C1231FEAA6BE	1241E2F8A46F1ED5A7B0C1231FCDE6..	E	7" LCD Screen, storage battery holds up to 6 hours!
2F8A46F1ED5A7B0C1231FED66BE	1241E2F8A46F1ED5A7B0C1231FD0A6..	E	10.1-inch Multitouch HD Screen (1280 x 800), 16GB Intern
2F8A46F1ED5A7B0C1231FEDE6BE	1241E2F8A46F1ED5A7B0C1231FD126..	E	6-Inch E Ink Screen, Access To e-book Store, Adjustable Fo