Realtime Hierarchies using ABAP CDS Views

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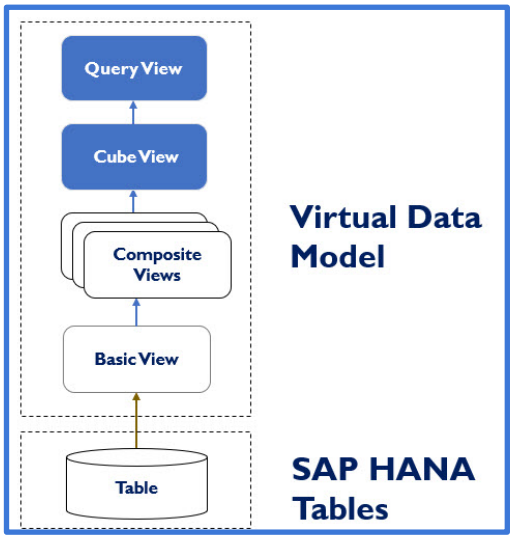
Abstract

SAP S/4 HANA offers many advanced capabilities over its previous system versions, one of these is Embedded Analytics. The tools like ABAP CDS views, SET hierarchies and real time hierarchy replication i.e., HRRP_REP help to enable real time operational reporting. For Financial Accounting Business users who work to produce the Quarterly financial results of an organization, having the ability to report on real time data is a key requirement. SET based hierarchies with realtime replication tools help Financial reporting achieve quick turnaround and easy maintenance.

Keywords: SAP S/4 HANA, Embedded Analytics, Operational Reporting, ABAP CDS Views, SET Hierarchies, CDS based virtual hierarchies, HRRP.

1 Introduction: The main purpose of a hierarchy in analytics is to aggregate facts and provide a high-level overview with the option to drill into the lower hierarchy branches and nodes. Facts are represented as CDS analytical views, which are identified by the analytical data category CUBE provided as CDS view annotation. Custom SET Hierarchies can be maintained using transactions GS01/02/03, while the standard dimensions like cost center, profit center and G/L Account hierarchies are maintained using KSH1/2/3, KCH1/2/3, and OB58 respectively. They are replicated using transaction HRRP_REP and stored in database tables HRRP_NODE and HRRP_DIRECTORY. This is then consumed via Hierarchy CDS views to be in turn consumed in the Virtual data model CUBE view.

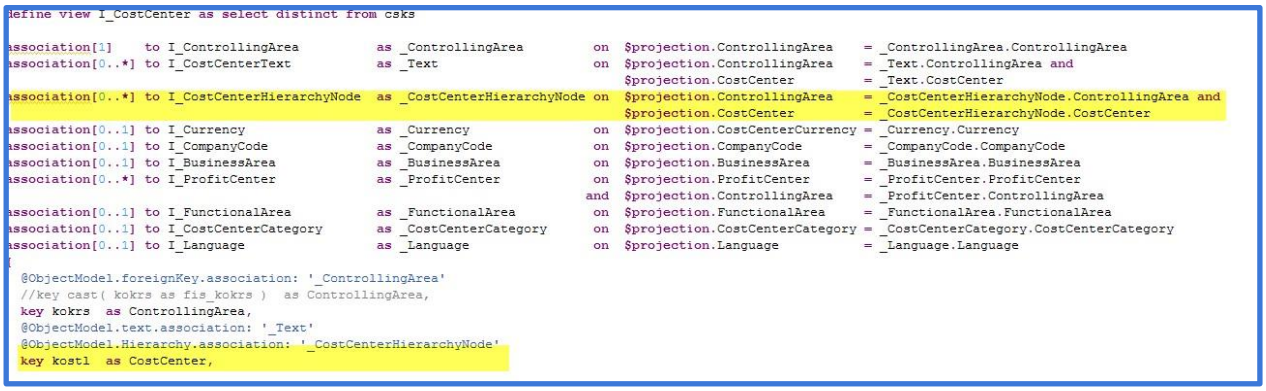


2 Architecture of Hierarchy CDS views: There are three main types of CDS views for Hierarchies, apart from the text views which can be attached additionally to the Hierarchy views.

- A Dimension CDS view as the master data for the characteristic.
- A Hierarchy Node CDS view to define the hierarchy structure from HRRP_NODE.

- A Hierarchy Directory CDS view to define the available hierarchy names from table HRRP_DIRECTORY.

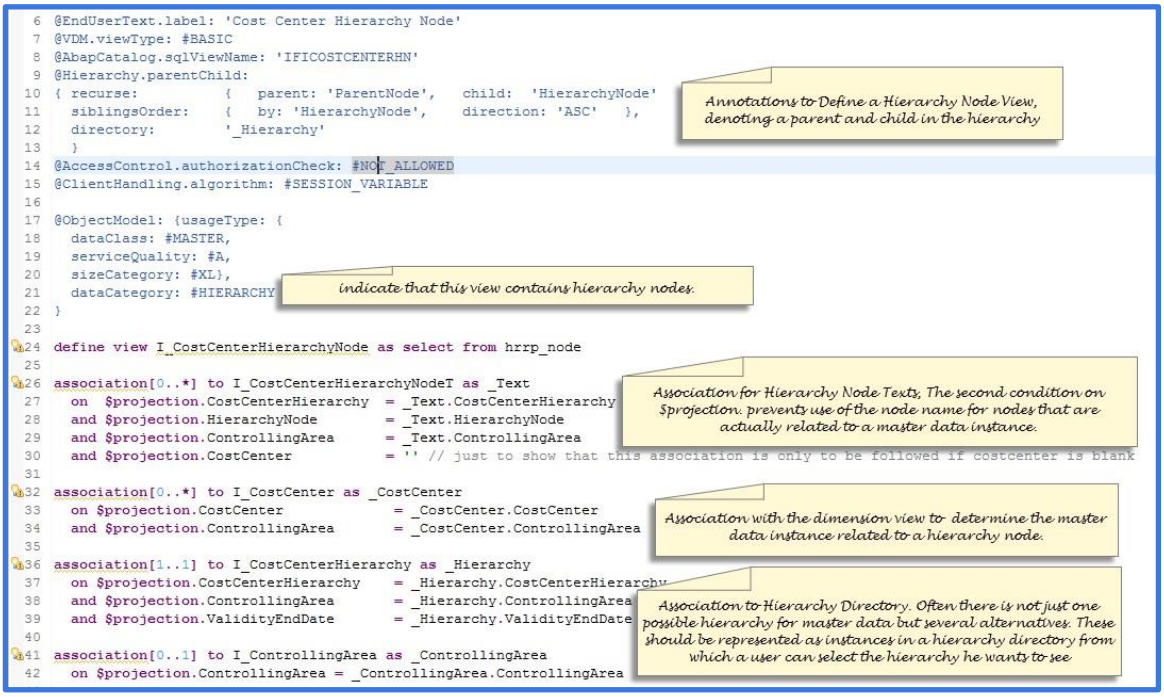
2.1 Dimension view: This view contains the master data of the characteristic in discussion. Example below is the Cost Center Dimension view which contains the master data for the cost center field from table CSKS. It also has an association to the Hierarchy Node view as well, highlighted in the picture. This is how the hierarchy information is connected with the master data information of the particular dimension.



```
define view I_CostCenter as select distinct from csks

association[1]    to I_ControllingArea          as _ControllingArea          on  $projection.ControllingArea    = _ControllingArea.ControllingArea
association[0..*] to I_CostCenterText           as _Text                     on  $projection.ControllingArea    = _Text.ControllingArea and
                                                                                 $projection.CostCenter        = _Text.CostCenter
association[0..*] to I_CostCenterHierarchyNode  as _CostCenterHierarchyNode on  $projection.ControllingArea    = _CostCenterHierarchyNode.ControllingArea and
                                                                                 $projection.CostCenter        = _CostCenterHierarchyNode.CostCenter
association[0..1] to I_Currency                 as _Currency                 on  $projection.CostCenterCurrency = _Currency.Currency
association[0..1] to I_CompanyCode              as _CompanyCode              on  $projection.CompanyCode        = _CompanyCode.CompanyCode
association[0..1] to I_BusinessArea             as _BusinessArea             on  $projection.BusinessArea       = _BusinessArea.BusinessArea
association[0..*] to I_ProfitCenter             as _ProfitCenter             on  $projection.ProfitCenter       = _ProfitCenter.ProfitCenter
                                                                             and $projection.ControllingArea    = _ProfitCenter.ControllingArea
association[0..1] to I_FunctionalArea           as _FunctionalArea           on  $projection.FunctionalArea     = _FunctionalArea.FunctionalArea
association[0..1] to I_CostCenterCategory       as _CostCenterCategory       on  $projection.CostCenterCategory = _CostCenterCategory.CostCenterCategory
association[0..1] to I_Language                 as _Language                 on  $projection.Language           = _Language.Language
{
  @ObjectModel.foreignKey.association: '_ControllingArea'
  //key cast( kokrs as fis_kokrs )  as ControllingArea,
  key kokrs  as ControllingArea,
  @ObjectModel.text.association: '_Text'
  @ObjectModel.Hierarchy.association: '_CostCenterHierarchyNode'
  key kostl  as CostCenter,
```

2.2 Hierarchy Node view: The second view in the set is the Hierarchy Node view. The annotation @ObjectModel.dataCategory: #HIERARCHY specifies the CDS view contains hierarchy nodes. The source of this CDS view is the HRRP_NODE table which stores the information of the nodes in a parent-child relation format. This view has association with the text view of the hierarchy nodes as well to fetch all the text information. The association with the Master data dimension view connects this information with all the possible values of this characteristic available in the master data table.

Here is the example of the Hierarchy Node text view which is fetching the text information from the text table of the Node table i.e., HRRP_NODET.



```
@EndUserText.label: 'Cost Center Hierarchy Node'
@VDM.viewType: #BASIC
@AbapCatalog.sqlViewName: 'IFICOSTCENTERHN'
@Hierarchy.parentChild:
{ recurse:          {   parent: 'ParentNode',   child:  'HierarchyNode'
  siblingsOrder:    {   by: 'HierarchyNode',    direction: 'ASC'   },
  directory:        '_Hierarchy'
  }
@AccessControl.authorizationCheck: #NOT_ALLOWED
@ClientHandling.algorithm: #SESSION_VARIABLE

@ObjectModel: {usageType: {
  dataClass: #MASTER,
  serviceQuality: #A,
  sizeCategory: #XL},
  dataCategory: #HIERARCHY
}

define view I_CostCenterHierarchyNode as select from hrrp_node

association[0..*] to I_CostCenterHierarchyNodeT as _Text
  on  $projection.CostCenterHierarchy  = _Text.CostCenterHierarchy
  and $projection.HierarchyNode        = _Text.HierarchyNode
  and $projection.ControllingArea      = _Text.ControllingArea
  and $projection.CostCenter           = '' // just to show that this association is only to be followed if costcenter is blank

association[0..*] to I_CostCenter as _CostCenter
  on $projection.CostCenter            = _CostCenter.CostCenter
  and $projection.ControllingArea      = _CostCenter.ControllingArea

association[1..1] to I_CostCenterHierarchy as _Hierarchy
  on $projection.CostCenterHierarchy   = _Hierarchy.CostCenterHierarchy
  and $projection.ControllingArea      = _Hierarchy.ControllingArea
  and $projection.ValidityEndDate      = _Hierarchy.ValidityEndDate

association[0..1] to I_ControllingArea as _ControllingArea
  on $projection.ControllingArea = _ControllingArea.ControllingArea
```

Annotations to Define a Hierarchy Node View, denoting a parent and child in the hierarchy

indicate that this view contains hierarchy nodes.

Association for Hierarchy Node Texts, The second condition on $projection. prevents use of the node name for nodes that are actually related to a master data instance.

Association with the dimension view to determine the master data instance related to a hierarchy node.

Association to Hierarchy Directory. Often there is not just one possible hierarchy for master data but several alternatives. These should be represented as instances in a hierarchy directory from which a user can select the hierarchy he wants to see

2.3 Hierarchy Directory View: The third view in the hierarchy CDS view architecture is the Directory view. This is a Basic view (@VDM.viewType: #BASIC) pulling the information from the table HRRP_DIRECTORY. This provides information about all the hierarchies defined for the Cost Center

dimension. A user can select between the hierarchies to be displayed in the report. This view also has a text view associated with it which is pulling the information from the text table as below.

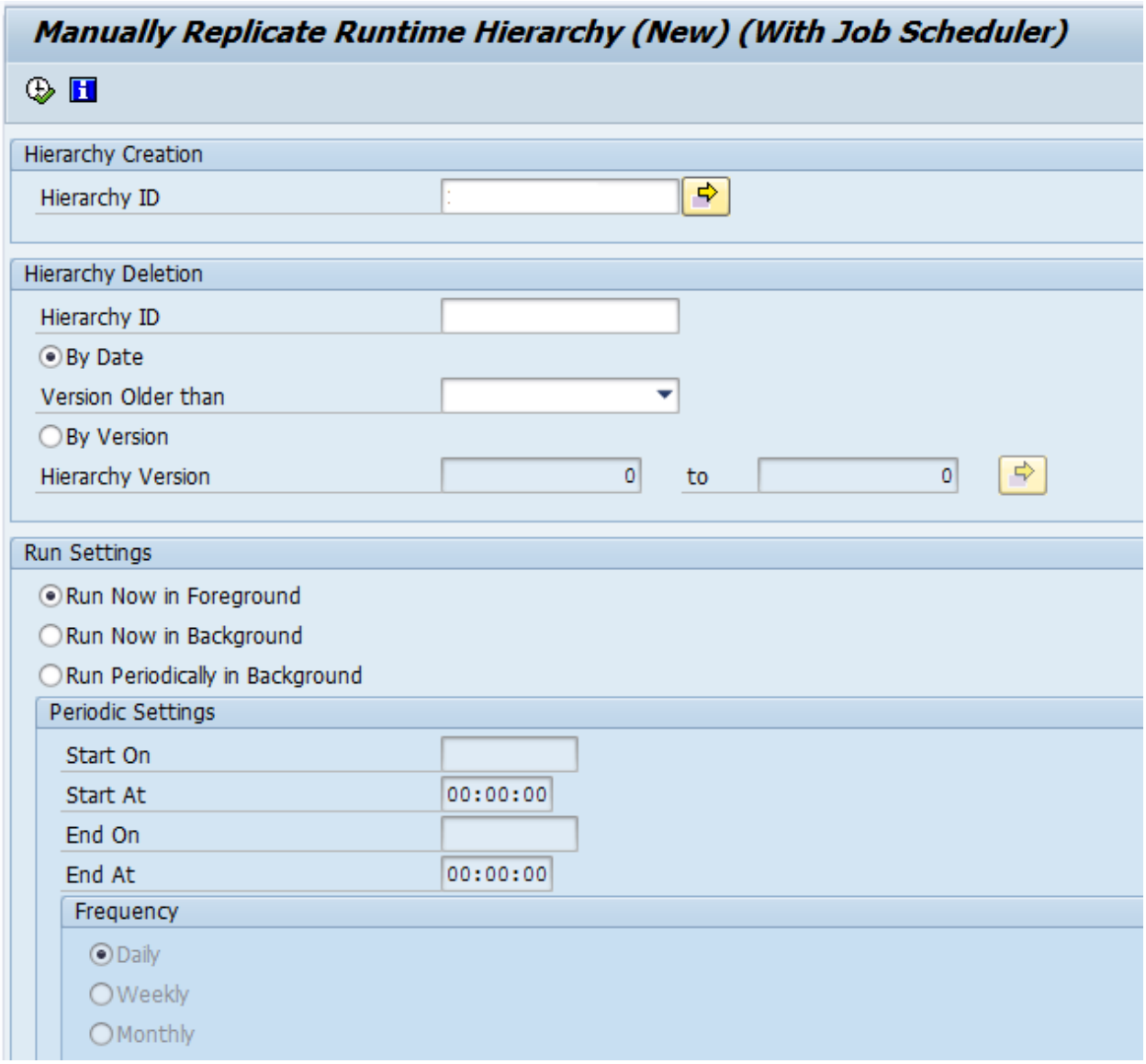
```
@EndUserText.label: 'Cost Center Hierarchy'
@Analytics: { dataCategory: #DIMENSION }
@VDM.viewType: #BASIC
@AbapCatalog.sqlViewName: 'IFICostCenterH'
@AccessControl.authorizationCheck: #CHECK

@ClientHandling.algorithm: #SESSION_VARIABLE
@ObjectModel.usageType: {
  dataClass: #MASTER,
  serviceQuality: #A,
  sizeCategory: #XL
}

define view I_CostCenterHierarchy
  as select from hrrp_directory

  association [1..*] to I_CostCenterHierarchyText as _Text            on  $projection.CostCenterHierarchy = _Text.CostCenterHierarchy
                                                                      and $projection.ControllingArea     = _Text.ControllingArea

  association [0..1] to I_ControllingArea         as _ControllingArea on  $projection.ControllingArea = _ControllingArea.ControllingAr

{

      @ObjectModel.foreignKey.association: '_ControllingArea'
  key cast( substring( hrrp_directory.hryid, 6, 4) as fis_kokrs )      as ControllingArea,
      @ObjectModel.text.association: '_Text'
  key cast(hrrp_directory.hryid as fis_hryid_cctr)                     as CostCenterHierarchy,
      @Semantics.businessDate.to: true
  key cast(hrrp_directory.hryvalto as fis_datbi)                       as ValidityEndDate,
      @Semantics.businessDate.from: true
      cast(hrrp_directory.hryvalfrom as fis_datab)                     as ValidityStartDate,
      @Semantics.user.lastChangedBy: true
      hrrp_directory.upduser                                           as LastChangedByUser,
      @Semantics.systemDate.lastChangedAt: true
      hrrp_directory.updtime                                           as LastChangeTime,
      _Text,
      _ControllingArea

}
```

```
@EndUserText.label: 'Cost Center Hierarchy Text'
@ObjectModel.representativeKey: 'CostCenterHierarchy'
@Analytics: { dataExtraction.enabled: true }
@ObjectModel.dataCategory: #TEXT
@VDM.viewType: #BASIC
@AbapCatalog.sqlViewName: 'IFICOSTCENTERHT'
@AccessControl.authorizationCheck: #NOT_REQUIRED

@ClientHandling.algorithm: #SESSION_VARIABLE
@ObjectModel.usageType: {
  dataClass: #MASTER,
  serviceQuality: #A,
  sizeCategory: #XL
}

define view I_CostCenterHierarchyText as select from hrrp_directoryt

association [0..1] to I_ControllingArea as _ControllingArea
   on $projection.ControllingArea = _ControllingArea.ControllingArea

association [0..1] to I_Language as _Language
   on $projection.Language = _Language.Language

{
    @ObjectModel.foreignKey.association: '_ControllingArea'
    key substring( hrrp_directoryt.hryid, 6, 4)     as ControllingArea,
    key hrrp_directoryt.hryid                       as CostCenterHierarchy,
    @Semantics.businessDate.to: true
    key   hrrp_directoryt.hryvalto                  as ValidityEndDate,
    @Semantics.language
    key   spras                                     as Language,
    @Semantics.businessDate.from: true
    hrrp_directoryt.hryvalfrom                      as ValidityStartDate,
    @Semantics.text
    hrytxt                                          as CostCenterHierarchyName,
    _ControllingArea,
    _Language
};
```

Now that we have seen the architecture of the CDS views involved in the virtual Data Model, let us take a look at the other key aspect of the Hierarchies, which is replication.

3 Replication of Hierarchy Information: Replication of the hierarchy is also referred to as the activation. A hierarchy can only be used in the reporting tools after it is replicated. This also allows developers to have an option of changes in the hierarchy to be made available at a later point in time by scheduling the

replication. There are two main tables which store the hierarchy information once it is replicated, namely **HRRP_DIRECTORY** and **HRRP_NODE**. HRRP_DIRECTORY table stores the information whenever a hierarchy is replicated with hierarchy name, replication date and user information. This table is the source of Information of the Directory CDS view seen in the section 2.3 above. If a new hierarchy is created on the same characteristic, a new entry is created in the HRRP_DIRECTORY table. HRRP_NODE table stores the information of the hierarchy nodes and their parent child relationship. This is the source table for the Hierarchy Node CDS view seen in the section 2.2 above. Both of these tables have their respective text tables namely, HRRP_DIRECTORYT and HRRP_NODET which are used in the respective text CDS views as a source. Transaction code HRRP_REP is used to replicate a hierarchy. You need to enter the hierarchy ID in the field and then execute the transaction code. Once executed, the hierarchy information is stored in the HRRP* tables discussed above which are then in turn ready to be used in the reports. As you can see in the picture below, this transaction code also provides options such as deletion of the hierarchy replication, in case you would like to stop using a hierarchy. Scheduling option helps to schedule the changes in the hierarchy at a later point in time. Prerequisite- the transaction code HRY_REPRELEV is used to make a hierarchy "report relevant" before replicating it in the transaction code HRRP_REP.



Similar to the example of Cost Center CDS views, custom views can be created for any custom Characteristic in the report. Once Hierarchy CDS views are created and replicated, they are ready to be used in the Report by attaching them using the association to the CUBE CDS view of the data model. Below

example shows the CUBE view(Analytics.dataCategory:#CUBE) of the Joint venture Accounting Details, which has the Cost Center Dimension view being used as an Association. This association also needs to be attached to the cost center field using an annotation.

```
        @ObjectModel.foreignKey.association: '_CostCenter'
        rcntr                                                    as CostCenter,
```

```
@EndUserText.label: 'Joint Venture Accounting Detail'
@Analytics.dataCategory: #CUBE
@Analytics.dataExtraction.enabled: true
@VDM.viewType: #BASIC
@AbapCatalog.sqlViewName: 'IPVJVACCTGDETAIL'
@AccessControl.authorizationCheck: #CHECK

@ClientHandling.algorithm: #SESSION_VARIABLE
@ObjectModel.usageType.sizeCategory: #XL
@ObjectModel.usageType.serviceQuality: #D
@ObjectModel.usageType.dataClass: #MIXED

define view I_JointVentureAcctgDetail
  as select from jvsol
  association [0..1] to I_Ledger                    as _Ledger                    on  $projection.Ledger = _Ledger.Ledger
  association [0..1] to I_JVARecordType             as _RecordType                on  $projection.RecordType = _RecordType.JVARecordType
  association [0..1] to I_DebitCreditCode           as _DebitCreditCode           on  $projection.DebitCreditCode = _DebitCreditCode.DebitCreditCode
  association [0..1] to I_SpecialLedgerVersion      as _SpecialLedgerVersion      on  $projection.Ledger               = _SpecialLedgerVersion.Ledger
                                                                                  and $projection.SpecialLedgerVersion = _SpecialLedgerVersion.SpecialLedgerVersion

  association [0..1] to I_Currency                  as _Currency                  on  $projection.Currency = _Currency.Currency
  association [0..1] to I_UnitOfMeasure             as _UnitOfMeasure             on  $projection.UnitOfMeasure = _UnitOfMeasure.UnitOfMeasure
  association [0..1] to I_CompanyCode               as _CompanyCode               on  $projection.CompanyCode = _CompanyCode.CompanyCode
  association [0..1] to I_JVADocumentType           as _DocumentType              on  $projection.DocumentType = _DocumentType.JVADocumentType

  association [0..1] to I_JointVenture              as _JointVenture              on  $projection.CompanyCode  = _JointVenture.CompanyCode
                                                                                  and $projection.JointVenture = _JointVenture.JointVenture
  association [0..1] to I_JointVentureEquityGroup   as _JointVentureEquityGroup   on  $projection.CompanyCode             = _JointVentureEquityGroup.CompanyCode
                                                                                  and $projection.JointVenture            = _JointVentureEquityGroup.JointVenture
                                                                                  and $projection.JointVentureEquityGroup = _JointVentureEquityGroup.JointVentureEquityGroup
  association [0..1] to I_ChartOfAccounts           as _ChartOfAccounts           on  $projection.ChartOfAccounts = _ChartOfAccounts.ChartOfAccounts
  association [0..1] to I_GLAccount                 as _GLAccount                 on  $projection.CompanyCode     = _GLAccount.CompanyCode
                                                                                  and $projection.GLAccount       = _GLAccount.GLAccount
  association [0..1] to I_GLAccountInChartOfAccounts as _GLAccountInChartOfAccounts on  $projection.ChartOfAccounts = _GLAccountInChartOfAccounts.ChartOfAccounts
                                                                                  and $projection.GLAccount       = _GLAccountInChartOfAccounts.GLAccount
  association [0..1] to I_BusinessArea              as _BusinessArea              on  $projection.BusinessArea = _BusinessArea.BusinessArea
  association [0..1] to I_ControllingArea           as _ControllingArea           on  $projection.ControllingArea = _ControllingArea.ControllingArea
  association [0..*] to I_CostCenter                as _CostCenter                on  $projection.ControllingArea = _CostCenter.ControllingArea
                                                                                  and $projection.CostCenter      = _CostCenter.CostCenter
```

Conclusion:

In SAP S/4HANA Embedded Analytics CDS-based Hierarchy Views and the HRRP_REP transaction code are instrumental in establishing and managing reporting hierarchies for operational reporting. ABAP CDS views allow the definition of hierarchical structures directly within the data model that reporting tools can readily consume. The HRRP_REP transaction, known as the FIN Runtime Hierarchy Replicator, is used to replicate runtime hierarchies within the SAP system. This approach enables hierarchies in the reporting tools without any inconsistency as the information is pulled straight from the source and the transaction code allows the deletion and scheduling features which help maintain the hierarchies effectively.

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