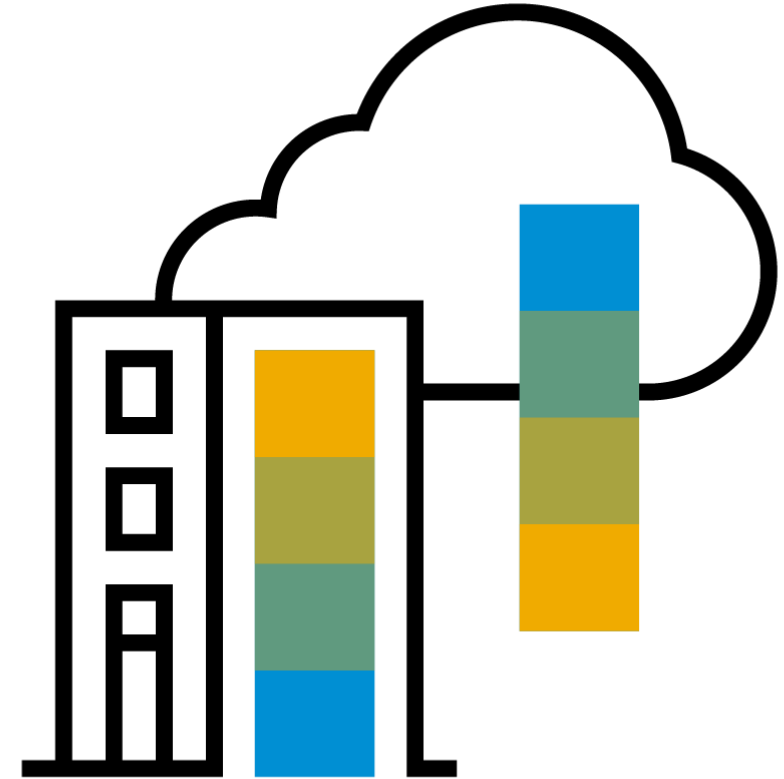# OData service development options

Be prepared for the ABAP RESTful Programming Model

ABAP Platform Product Management, SAP
Andre Fischer, SAP SE
March, 2020

THE BEST RUN SAP

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All forward-looking statements are subject to various risks and uncertainties that could cause actual results to differ materially from expectations. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only as of their dates, and they should not be relied upon in making purchasing decisions.

ODATA V2 DEVELOPMENT OPTIONS - SAP Business Suite & SAP S/4HANA

ABAP RESTFUL PROGRAMMING MODEL

ODATA V2 DEVELOPMENT OPTIONS - SAP S/4HANA 1909 & SAP Cloud Platform, ABAP environment

ODATA V4

WHERE IT IS SAFE TO INVEST NOW?

OData
development
options

OData service development options on the ABAP Platform

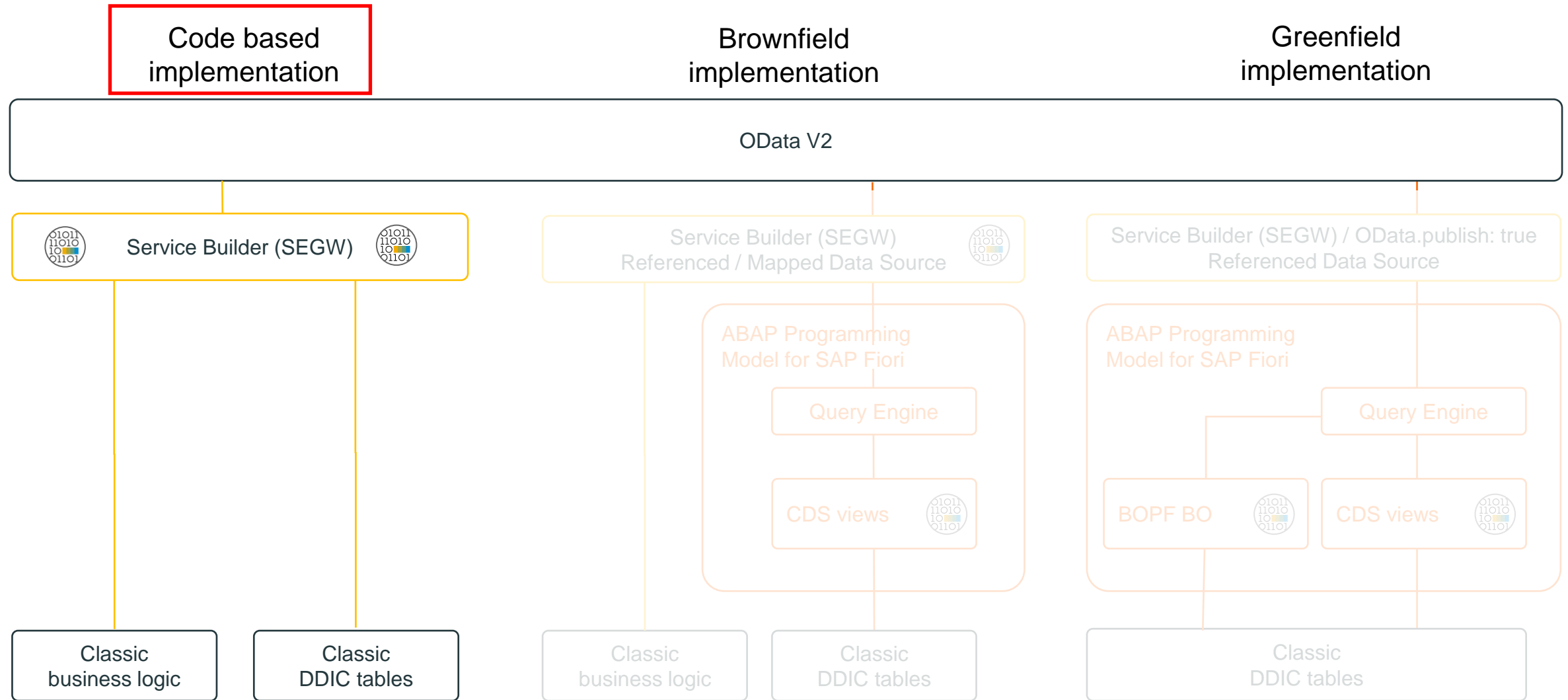|		On-Premise SAP Business Suite & SAP S/4HANA		SAP Cloud Platform ABAP Environment	
		OData V2	OData V4	OData V2	OData V4
Code-based implementation	--	SUPPORTED [1]	SUPPORTED [2]	N/A	N/A
ABAP Programming Model for SAP Fiori	GREENFIELD	SUPPORTED [3]	N/A	N/A	N/A
	BROWNFIELD	SUPPORTED [1]	N/A	N/A	N/A
ABAP RESTful Programming Model [4]	GREENFIELD	PLANNED	PLANNED	SUPPORTED	PLANNED
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OData V2 service development options – SAP BS 7 & SAP S/4HANA

Code based
implementation

Brownfield
implementation

Greenfield
implementation

OData V2

Service Builder (SEGW)

Service Builder (SEGW)
Referenced / Mapped Data Source

Service Builder (SEGW) / OData.publish: true
Referenced Data Source

ABAP Programming
Model for SAP Fiori

ABAP Programming
Model for SAP Fiori

Query Engine

Query Engine

CDS views

BOPF BO

CDS views

Classic
business logic

Classic
DDIC tables

Classic
business logic

Classic
DDIC tables

Classic
DDIC tables

Custom code

SAP Gateway
Code-based service development

CODE-BASED IMPLEMENTATION OF CRUD ODATA API METHODS

- Create → <Entity_Set>_CREATE_ENTITY

- Read → <Entity_Set>_GET_ENTITY

- Query → <Entity_Set>_GET_ENTITYSET

- Update → <Entity_Set>_UPDATE_ENTITY

- Delete → <Entity_Set>_DELETE_ENTITY

CODE BASED IMPLEMENTATION OF ADVANCED ODATA FEATURES

- Offline scenarios ($deltatoken, $skiptoken)

- Complex transactional behavior
  (SoftState, DeepInsert, ChangeSets in $batch)
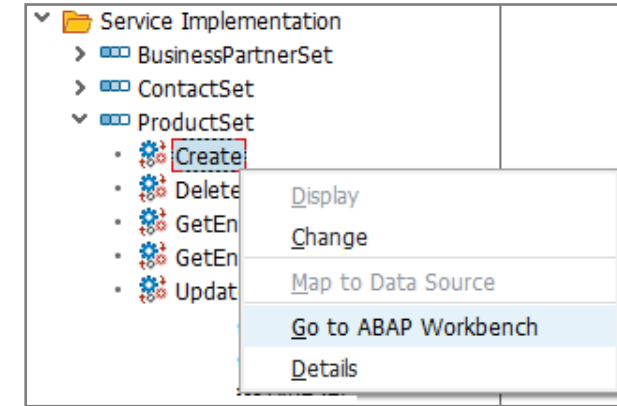

```abap
METHOD productset_get_entityset.

  DATA: lv_source_entity_set_name TYPE /iwbep/mgw_tech_name.

  lv_source_entity_set_name = io_tech_request_context->get_source_entity_set_name( ).

  IF lv_source_entity_set_name IS INITIAL.
    prod_get_entityset(
      EXPORTING
        io_tech_request_context = io_tech_request_context
      IMPORTING
        et_entityset            = et_entityset
        es_response_context     = es_response_context ).
```

OData service development options on the ABAP Platform

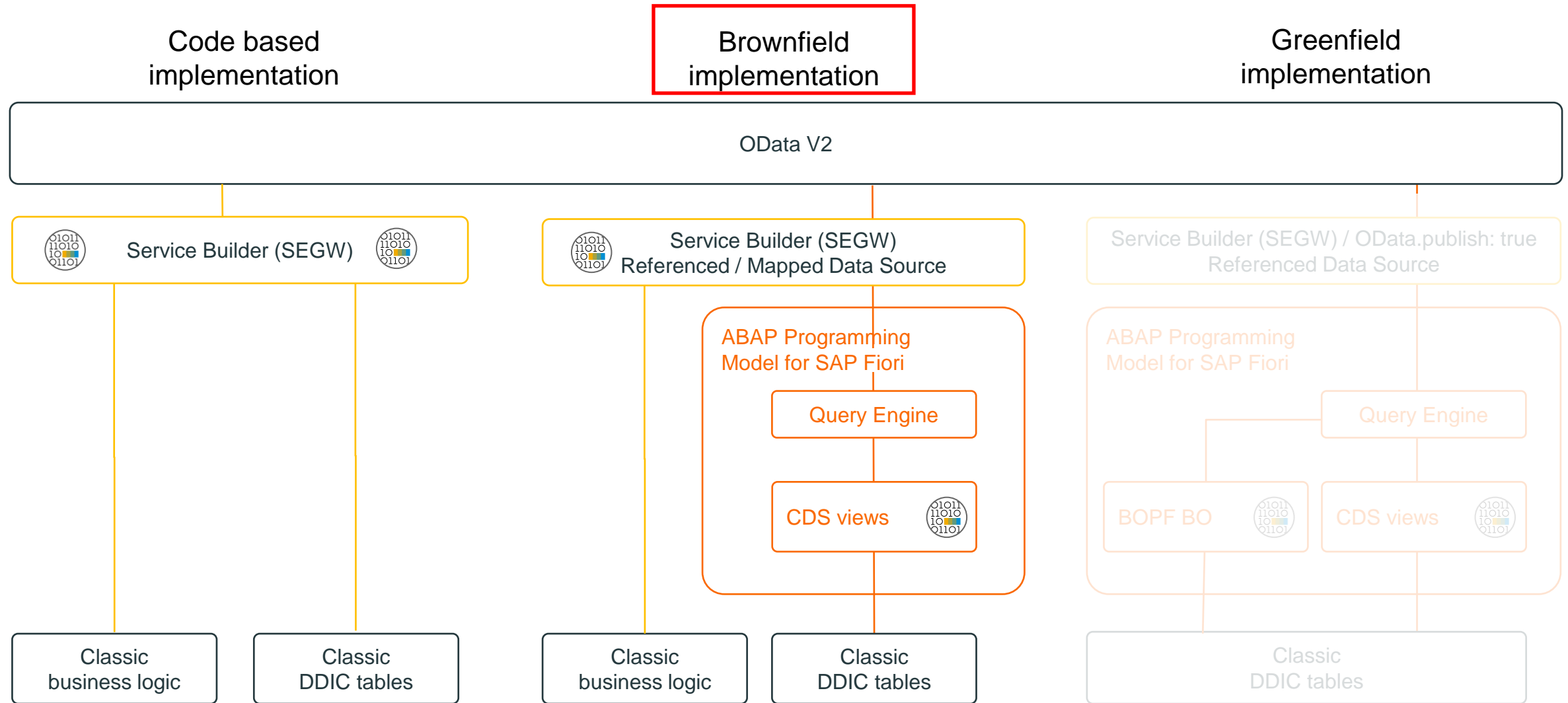|		On-Premise SAP Business Suite & SAP S/4HANA		SAP Cloud Platform ABAP Environment	
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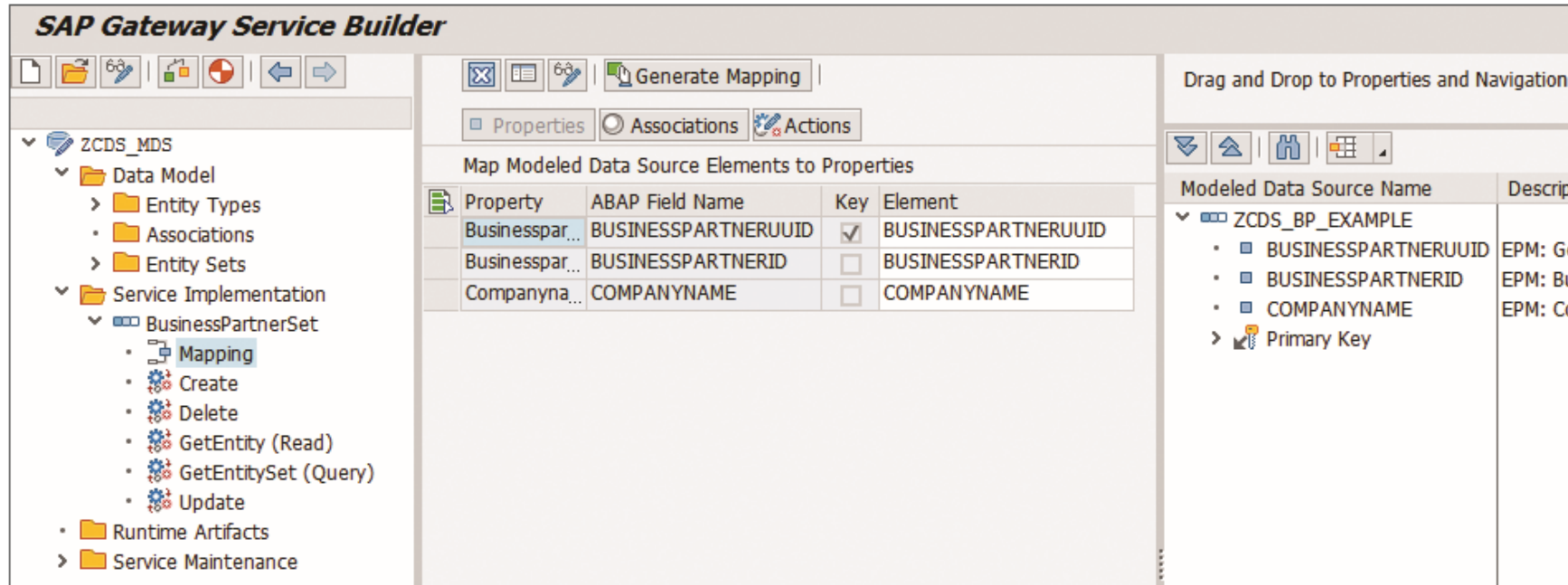[2] Odata V4 Model & Data Provider Class (DPC)
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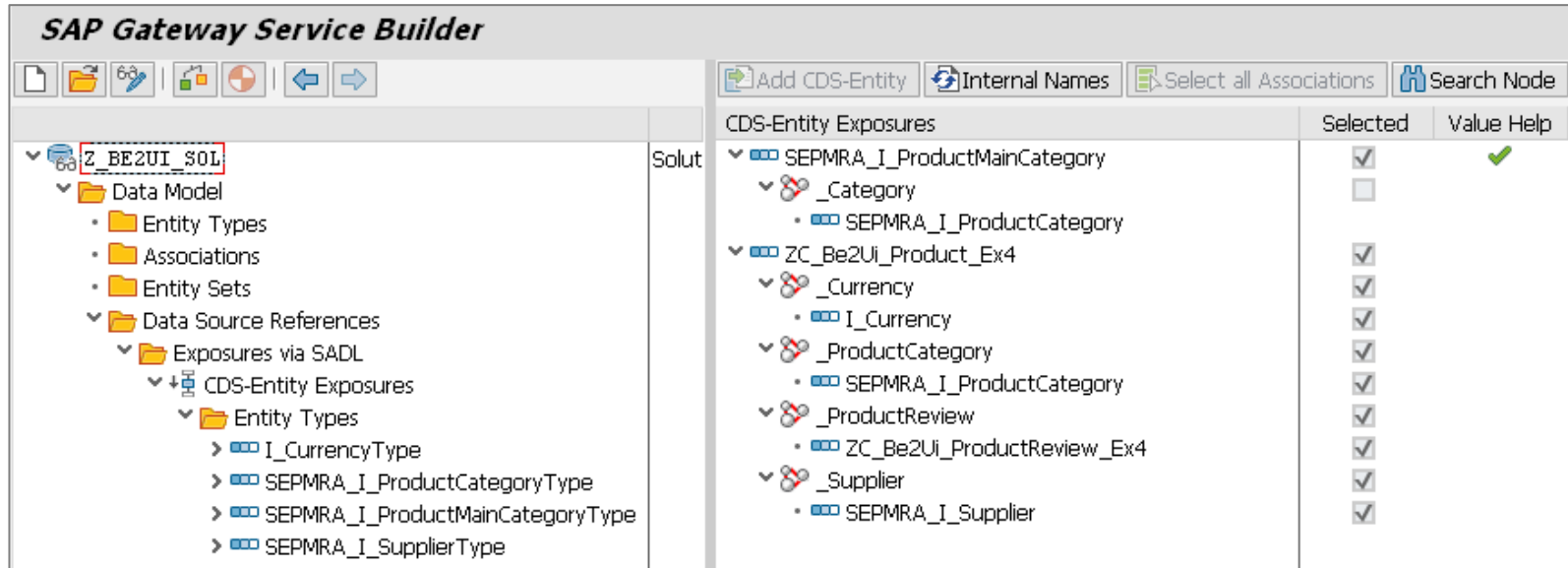Classic
DDIC tables

Custom code

Mapped Data Source

- ► OData Model has to be modelled in SEGW

- ► Manual mapping of READ and QUERY methods

- ► New fields are not automatically included

- ► Code based implementation of CREATE, UPDATE, and DELETE methods

- ► Available as of 740

Referenced Data Source

▶ OData Model references selected CDS views and associations

▶ New fields are automatically included

▶ Code based implementation of CREATE, UPDATE, and DELETE methods

▶ Available as of 750

OData service development options on the ABAP Platform

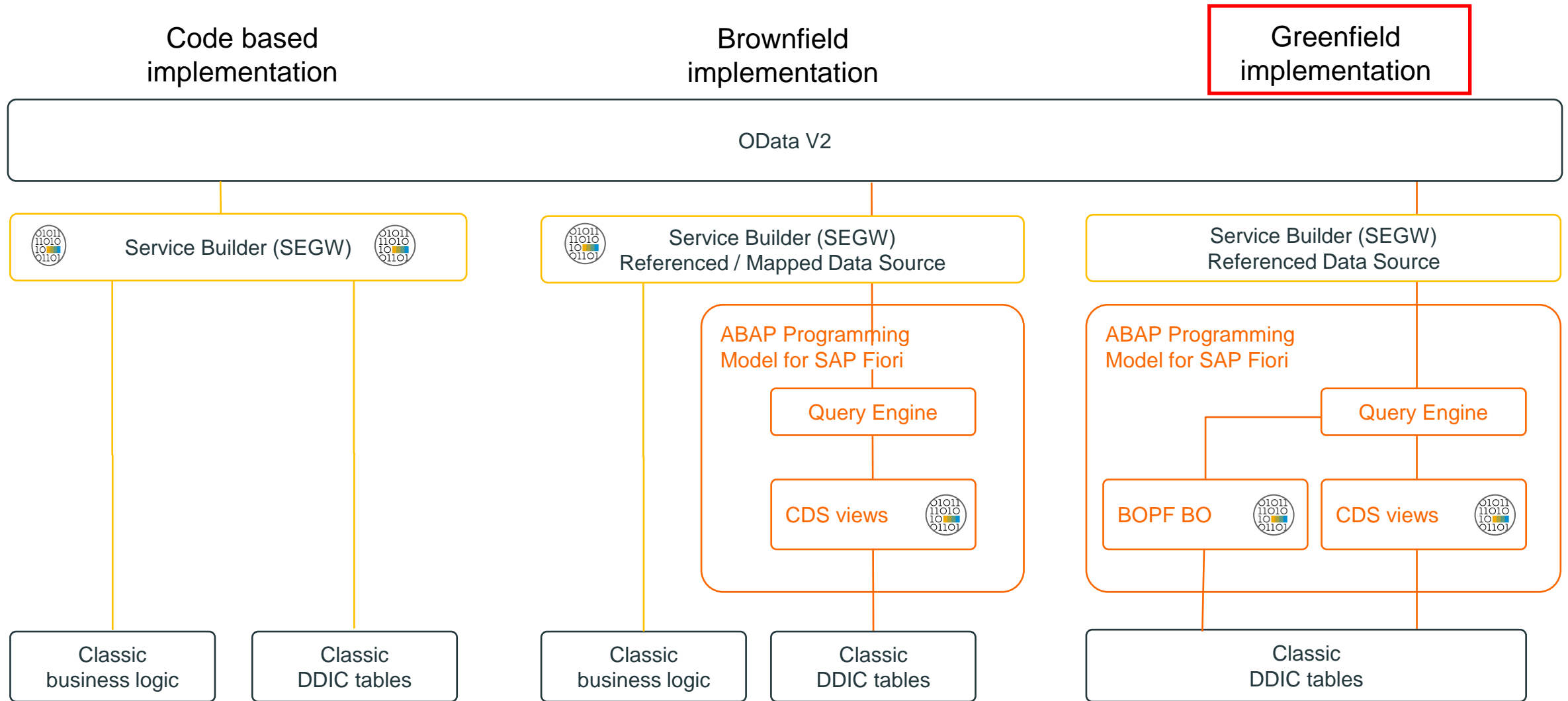|		On-Premise SAP Business Suite & SAP S/4HANA		SAP Cloud Platform ABAP Environment	
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Custom code

CDS based BOPF Objects – managed scenario

- ▶ OData Model definition via CDS views

- ▶ Code based implementation of Determinations, Validations and Actions

- ▶ Managed scenario - Query engine (SADL) orchestrates all CRUD-Q calls to the SAP Gateway (OData) framework

- ▶ Reference Data Source approach is used to publish the OData Service

SAP S/4HANA 1909 & SAP Cloud Platform, ABAP environment

ABAP RESTful Programming Model

ABAP RESTful Programming Model – Support for ABAP developers

The **ABAP RESTful PROGRAMMING MODEL** is a framework of …

- CONCEPTS
- TECHNOLOGIES
- TOOLS
- BEST PRACTISES

… for the efficient development of ENTERPRISE GRADE APPLICATIONS

OData service development
- SAP Fiori UI services
- Web APIs

Universally usable programming model
- Extensions
- New developments

Available on premise and in the cloud
- SAP S/4HANA®
- SAP Cloud Platform, ABAP environment

ABAP RESTful Programming Model - big picture

SERVICE CONSUMPTION

SAP Fiori UI	Web API

BUSINESS SERVICES PROVISIONING

SERVICE BINDING
Bind the service to OData protocol

SERVICE DEFINITION
Define scope to be exposed

DATA MODELING & BEHAVIOR

BUSINESS OBJECTS

Data modeling with CDS

Behavior definition

Behaviour implementation

QUERIES

Data modeling with CDS
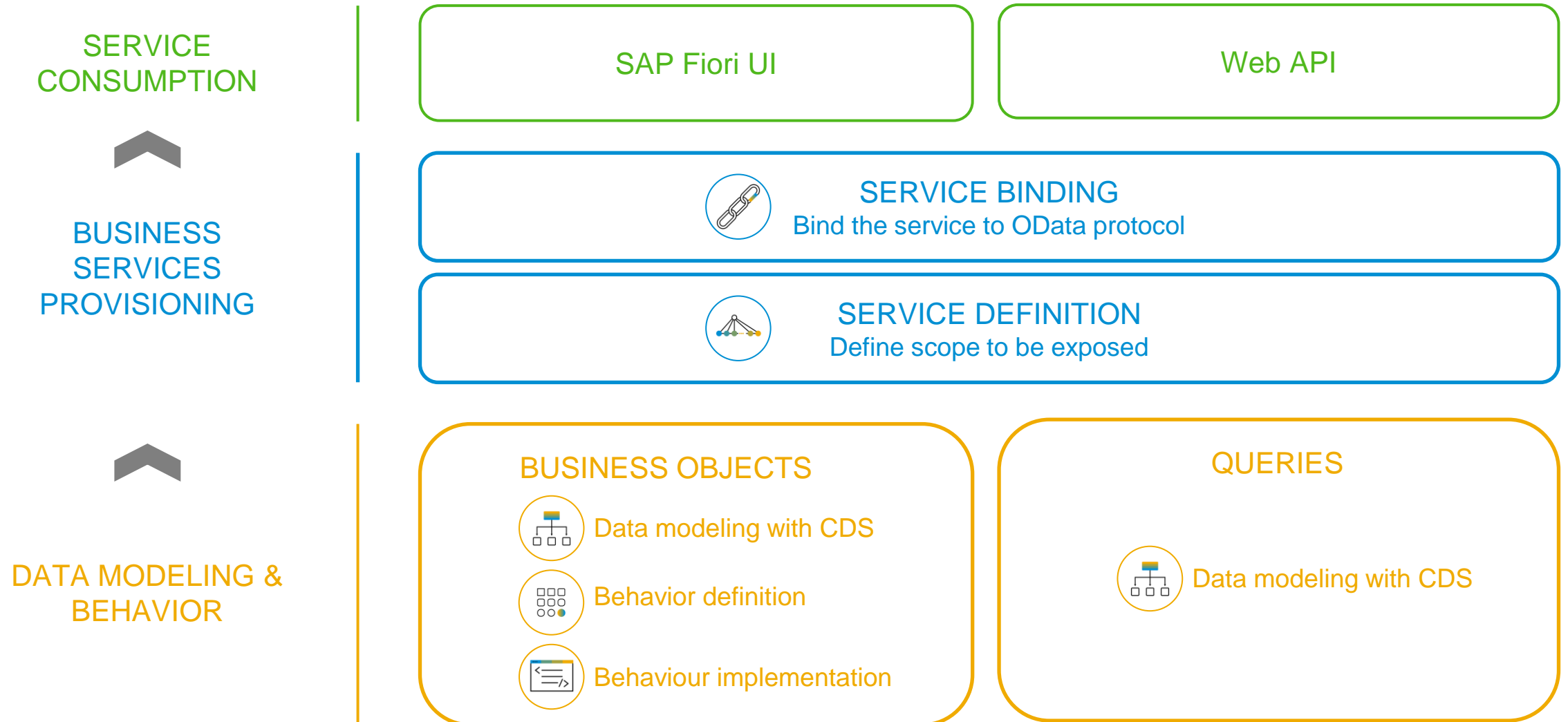
CDS views are used to define business objects

```
define root view /DMO/I_Travel_U
  as select from /dmo/travel as Travel
-- the travel table is the data source for this view

  composition [0..*] of /DMO/I_Booking_U as _Booking

  association [0..1] to /DMO/I_Agency     as _Agency
    on $projection.AgencyID      = _Agency.AgencyID

  association [0..1] to /DMO/I_Customer  as _Customer
    on $projection.CustomerID      = _Customer.CustomerID

  association [0..1] to I_Currency        as _Currency
    on $projection.CurrencyCode    = _Currency.Currency
```
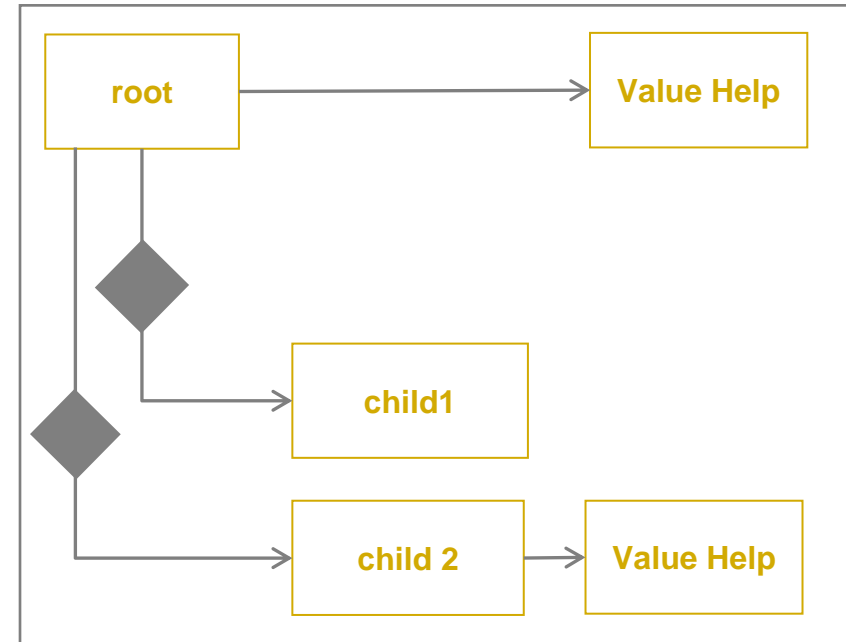
```
define view /DMO/I_Booking_U
  as select from /dmo/booking as Booking

  association to parent /DMO/I_Travel_U      as _Travel
    on $projection.TravelID = _Travel.TravelID
```

Behaviour definition language

```
implementation unmanaged;

// behavior defintion for the TRAVEL root entity
define behavior for /DMO/I_Travel_U alias travel
implementation in class /DMO/BP_TRAVEL_U unique
etag LastChangedAt

{
    field (read only) TravelID;

    field (mandatory) AgencyID, CustomerID,
    BeginDate, EndDate;

    create;
    update;
    delete;

    action ( features : instance )
    set_status_booked result [1] $self;

    association _Booking { create; }

}
```

Standard ⌄

	Travel ID:	Agency ID:	Customer ID:
Search 🔍			

Adapt Filters   Go

Travels (4,136) Standard ⌄   Set to Booked   Delete + ⚙

	Travel ID	Agency ID	Customer ID	Starting Date	End Date	Travel Status
○	1	Maxitrip (70041)				
○	2	Hot Socks Travel (				

< Travel

<Unnamed Object>

Travel

Travel ID: [   ]   *End Date:
                                               MMM d, y

*Agency ID: Booking Fee:
[   ]   [   ]

*Customer ID: Total Price:
[   ]   [   ]

*Starting Date: Comment:
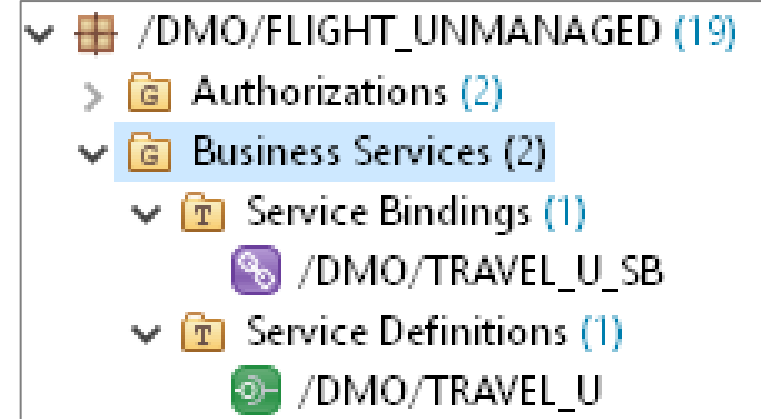MMM d, y 📅   [   ]

Service Definition

```
@EndUserText.label: 'Service Definition for Managing Travels'
define service /DMO/TRAVEL_U {
  expose /DMO/I_Travel_U as Travel;
  expose /DMO/I_Booking_U as Booking;
  expose /DMO/I_BookingSupplement_U as BookingSupplement;
  expose /DMO/I_Supplement as Supplement;
  expose /DMO/I_SupplementText as SupplementText;
  expose /DMO/I_Customer as Passenger;
  expose /DMO/I_Agency as TravelAgency;
  expose I_Currency as Currency;
  expose I_Country as Country;
  expose /DMO/I_Carrier as Airline;
  expose /DMO/I_Connection as FlightConnection;
  expose /DMO/I_Flight as Flight;
}
```

> /DMO/FLIGHT_UNMANAGED (19)
  > Authorizations (2)
  ∨ Business Services (2)
    ∨ Service Bindings (1)
        /DMO/TRAVEL_U_SB
    ∨ Service Definitions (1)
        /DMO/TRAVEL_U

Service Binding

Service Binding

OData service development options on the ABAP Platform

		On-Premise SAP Business Suite & SAP S/4HANA		SAP Cloud Platform ABAP Environment	
		OData V2	OData V4	OData V2	OData V4
Code-based implementation	--	SUPPORTED [1]	SUPPORTED [2]	N/A	N/A
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23

OData V2 service development options – SAP S/4HANA 1909 and higher

Brownfield implementation

Greenfield implementation

OData V2

planned

ABAP RESTful Programming Model

Query Engine

Unmanaged RAP BO

CDS views

ABAP RESTful Programming Model

Query Engine

Managed RAP BO

CDS views

Custom implementation

Classic business logic

Classic DDIC tables

Classic DDIC tables

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Custom code

Unmanaged scenario – Behavior definition and implementation

```
implementation unmanaged;
define behavior for /DMO/I_Travel_U alias travel
implementation in class /DMO/BP_TRAVEL_U unique
etag LastChangedAt
{
  field ( read only ) TravelID;
  field ( mandatory ) AgencyID, CustomerID, BeginDate, EndDate;
  create;
  update;
  delete;
  action ( features : instance ) set_status_booked result [1]
$self;
  association _Booking { create; }
  mapping for /dmo/travel control /dmo/s_travel_intx
  {
    AgencyID      = agency_id;
    BeginDate     = begin_date;
    BookingFee    = booking_fee;
    CurrencyCode  = currency_code;
    CustomerID    = customer_id;
    EndDate       = end_date;
    LastChangedAt = lastchangedat;
    Memo          = description;
    Status        = status;
    TotalPrice    = total_price;
    TravelID      = travel_id;
  }
}
```

- TRL_EN_SAPCOM [TRL, 100, CB0000000304, EN]
  - Favorite Packages (1,922)
    - /DMO/FLIGHT_MANAGED (30) *Flight Reference Scenario: TX managed E2E Guide*
    - /DMO/FLIGHT_UNMANAGED (19) *Flight Reference Scenario: TX unmanaged E2E Guide*
      - Business Services (1)
        - Service Definitions (1)
      - Core Data Services (11)
        - Behavior Definitions (2)
          - /DMO/C_TRAVEL_U *Behavior for /DMO/C_TRAVEL_U*
          - /DMO/I_TRAVEL_U *Behavior for /DMO/I_TRAVEL_U*
            - Behavior Implementations
              - /DMO/BP_BOOKINGSUPPLEMENT_U *Behavior Pool for Handling Booking Su*
              - /DMO/BP_BOOKING_U *Behavior Pool for Handling Bookings*
              - /DMO/BP_TRAVEL_U *Behavior Pool for Handling Travels*
                - LHC_TRAVEL
                  - TT_TRAVEL_UPDATE
                  - CBA_BOOKING
                  - CREATE_TRAVEL
                  - DELETE_TRAVEL
                  - GET_FEATURES
                  - READ_BOOKING_BA
                  - READ_TRAVEL
                  - SET_TRAVEL_STATUS
                  - UPDATE_TRAVEL
                - LSC_SAVER
        - Data Definitions (6)
        - Metadata Extensions (3)
    - Dictionary (3)
    - Source Code Library (4)

OData service development options on the ABAP Platform

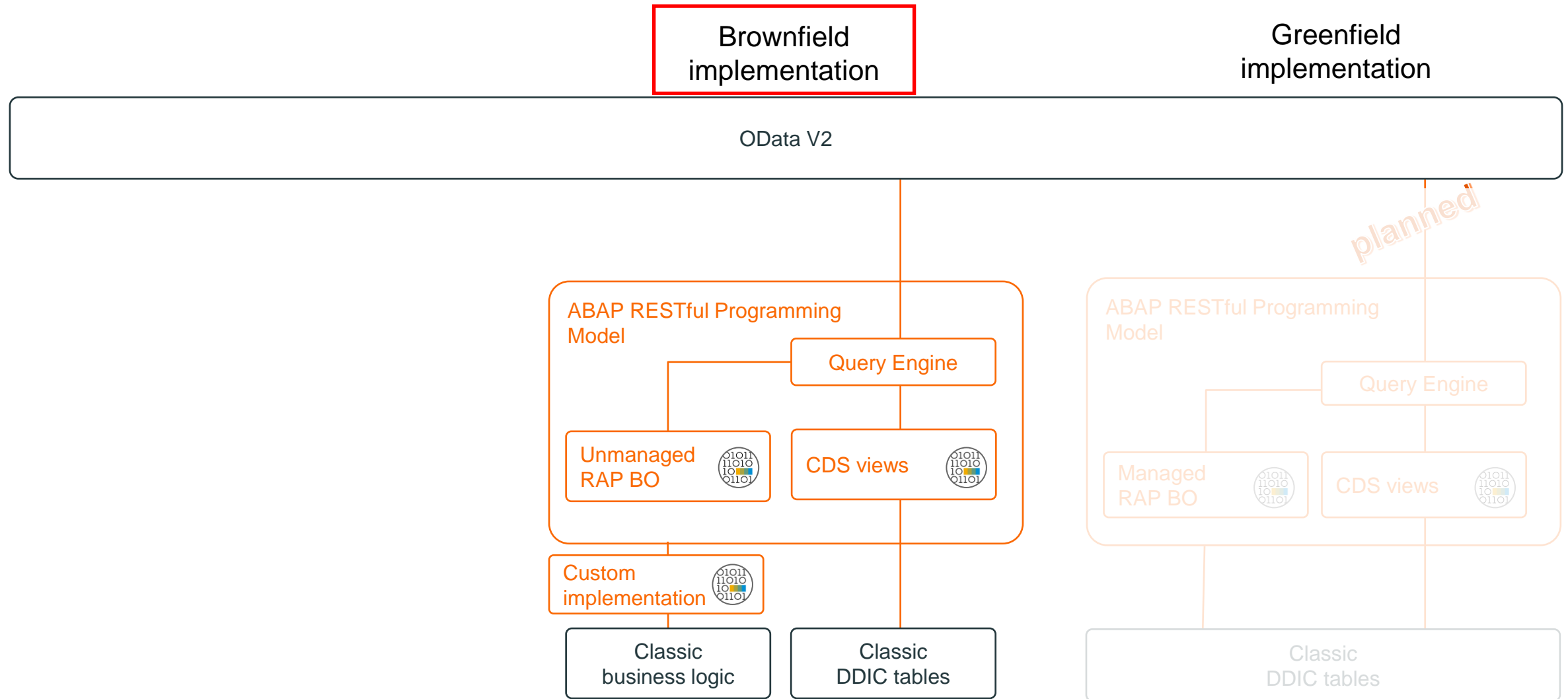|		On-Premise SAP Business Suite & SAP S/4HANA		SAP Cloud Platform ABAP Environment	
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Greenfield implementation

OData V2

planned

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CDS views

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ABAP RESTful Programming Model

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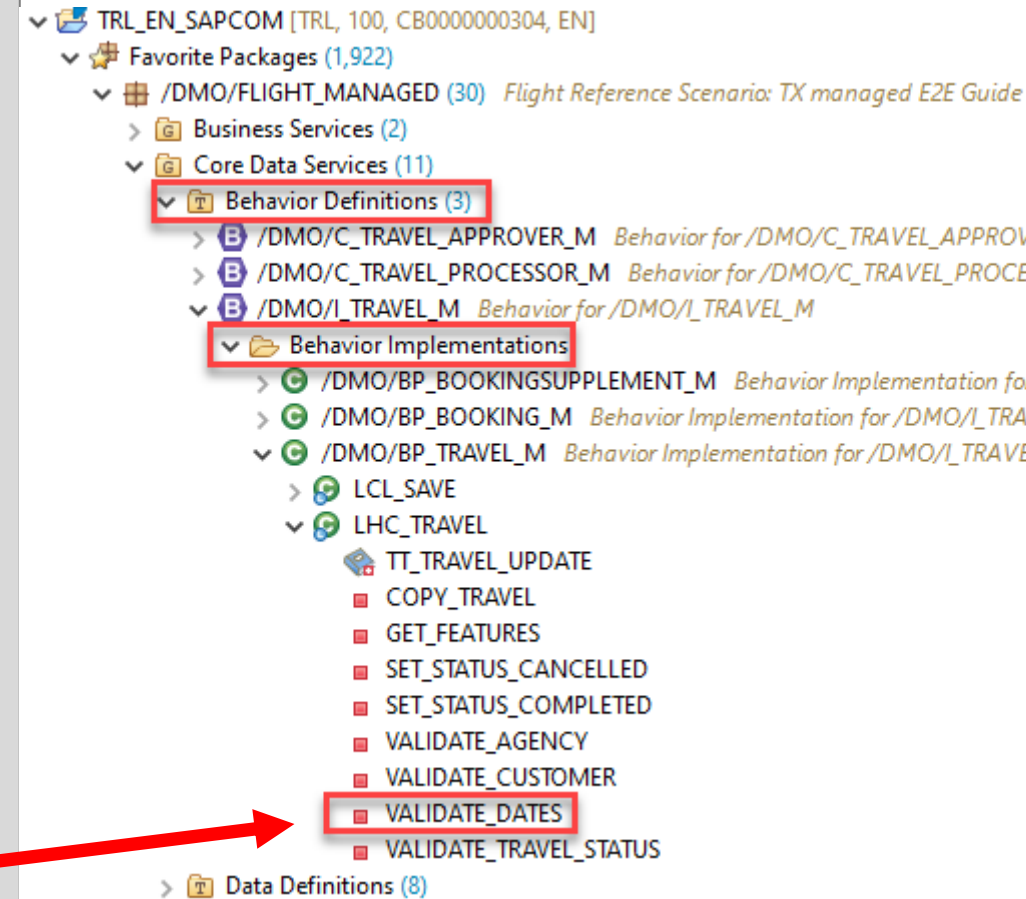# Managed scenario – Behavior definition and implementation

```
managed;

define behavior for /DMO/I_Travel_M alias travel
implementation in class /DMO/BP_TRAVEL_M unique
persistent table /DMO/TRAVEL_M
with additional save
etag last_changed_at
lock master
//authorization master(instance)

{
  field ( readonly ) last_changed_at, last_changed_by, created_at, created_by;
  field ( mandatory ) agency_id, overall_status, booking_fee, currency_code;
  field (features : instance ) travel_id;
  mapping for /DMO/TRAVEL_M corresponding;
  create;
  update;
  delete;
  action  ( features: instance ) acceptTravel result [1] $self;
  action  ( features: instance ) rejectTravel result [1] $self;
  action createTravelByTemplate result [1] $self;
  validation validateCustomer on save { field customer_id; }
  validation validateAgency   on save { field agency_id; }
  validation validateDates    on save { field begin_date, end_date; }
  validation validateStatus   on save { field overall_status; }
  association _Booking { create; }
}
```

- TRL_EN_SAPCOM [TRL, 100, CB0000000304, EN]
  - Favorite Packages (1,922)
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          - /DMO/C_TRAVEL_PROCESSOR_M *Behavior for /DMO/C_TRAVEL_PROCE*
          - /DMO/I_TRAVEL_M *Behavior for /DMO/I_TRAVEL_M*
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              - /DMO/BP_BOOKING_M *Behavior Implementation for /DMO/I_TRA*
              - /DMO/BP_TRAVEL_M *Behavior Implementation for /DMO/I_TRAVE*
                - LCL_SAVE
                - LHC_TRAVEL
                  - TT_TRAVEL_UPDATE
                  - COPY_TRAVEL
                  - GET_FEATURES
                  - SET_STATUS_CANCELLED
                  - SET_STATUS_COMPLETED
                  - VALIDATE_AGENCY
                  - VALIDATE_CUSTOMER
                  - VALIDATE_DATES
                  - VALIDATE_TRAVEL_STATUS
      - Data Definitions (8)

OData V4

OData service development options on the ABAP Platform

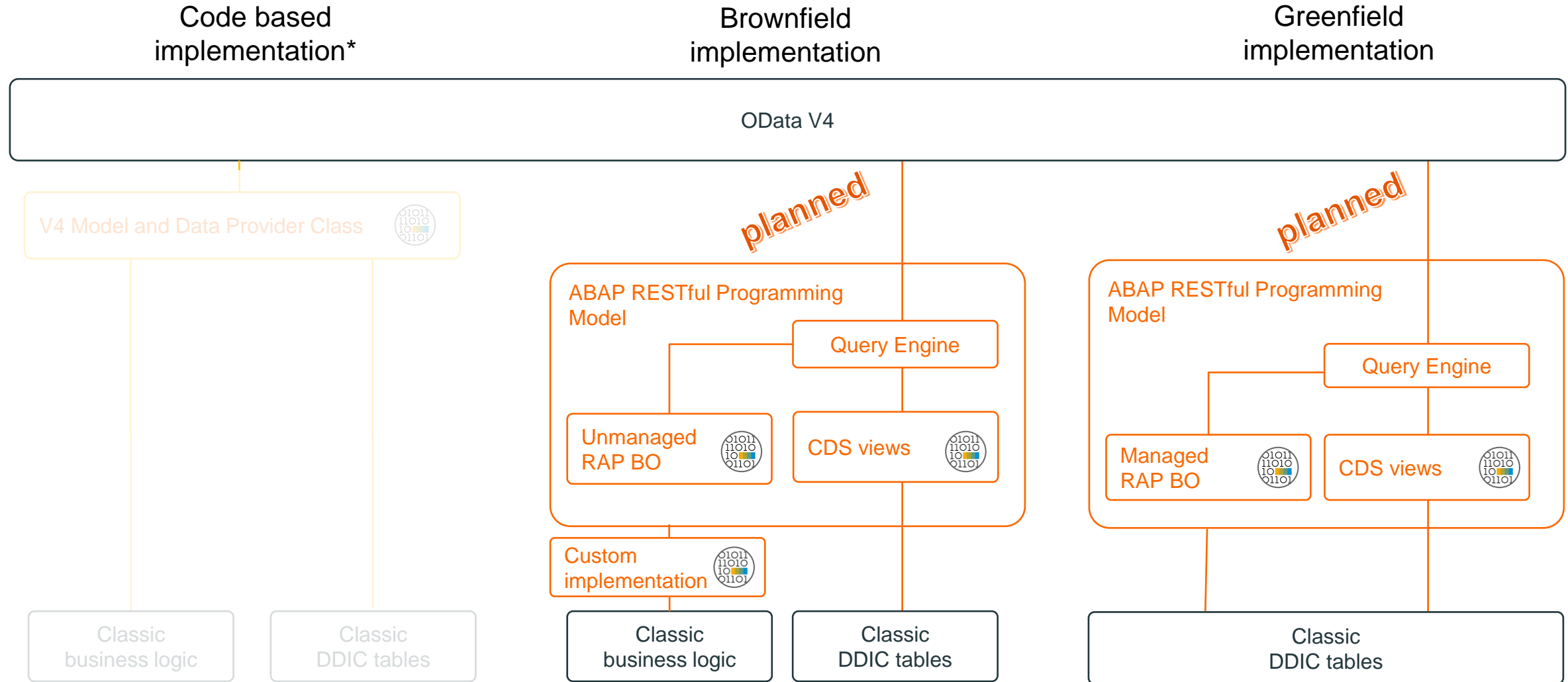|		On-Premise SAP Business Suite & SAP S/4HANA		SAP Cloud Platform ABAP Environment	
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implementation*

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implementation

Greenfield
implementation

OData V4

V4 Model and Data Provider Class

planned

planned

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V4 – Service binding (planned)

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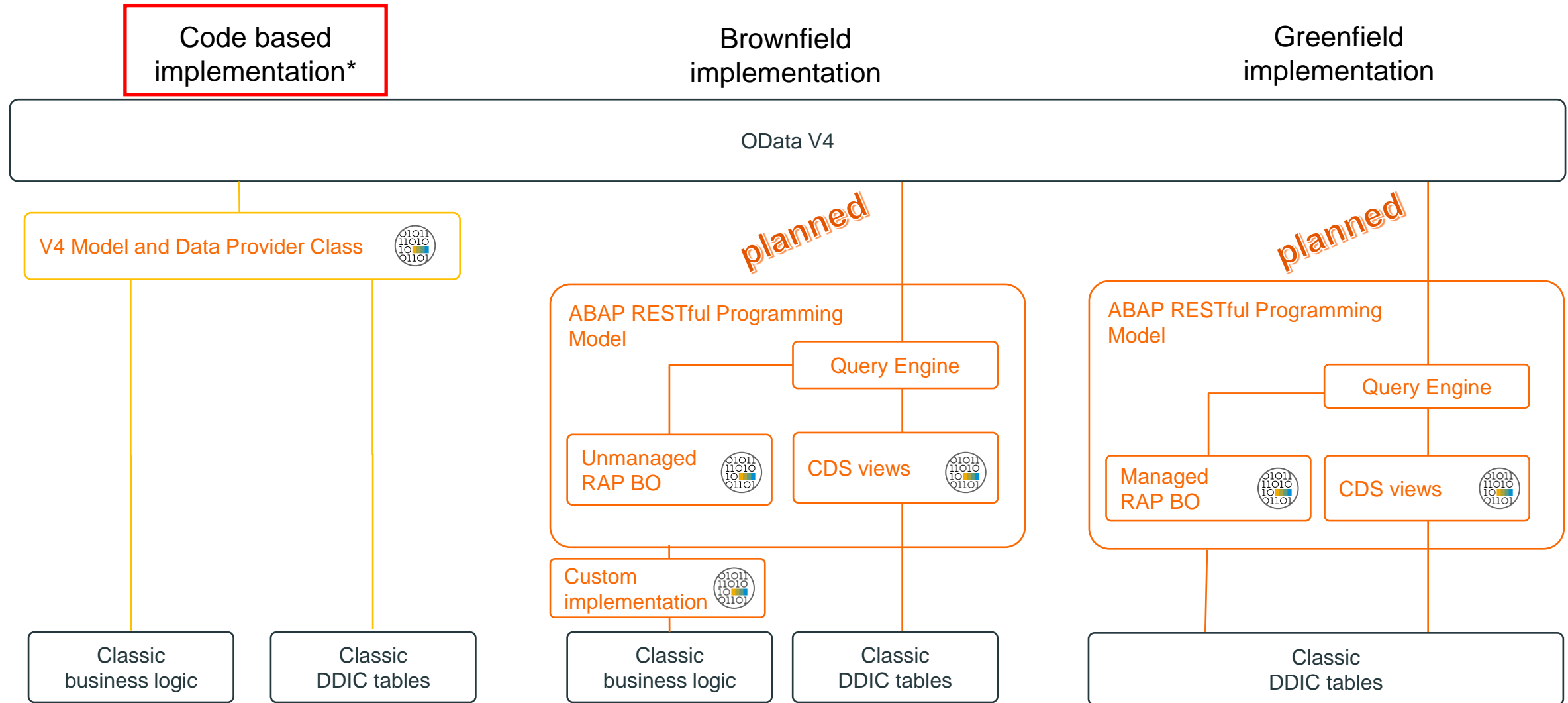|		On-Premise SAP Business Suite & SAP S/4HANA		SAP Cloud Platform ABAP Environment	
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OData V4 – code based implemenation

```abap
CLASS zcl_e2e001_odata_v4_so_data DEFINITION
  PUBLIC
  INHERITING FROM /iwbep/cl_v4_abs_data_provider
  FINAL
  CREATE PUBLIC .

  PUBLIC SECTION.
    INTERFACES zif_e2e001_odata_v4_so_types.
     INTERFACES if_rap_query_provider.
    "basic interface methods
    METHODS /iwbep/if_v4_dp_basic~read_entity REDEFINITION .
    METHODS /iwbep/if_v4_dp_basic~read_entity_list REDEFINITION.
    METHODS /iwbep/if_v4_dp_basic~create_entity REDEFINITION.
    METHODS /iwbep/if_v4_dp_basic~update_entity REDEFINITION.
    METHODS /iwbep/if_v4_dp_basic~delete_entity REDEFINITION.

    "advanced interface methods
    METHODS /iwbep/if_v4_dp_advanced~update_entity REDEFINITION.
. . .

ENDCLASS.
```

```abap
CLASS zcl_e2e001_odata_v4_so_model DEFINITION
  PUBLIC
  INHERITING FROM /iwbep/cl_v4_abs_model_prov
  FINAL
  CREATE PUBLIC .

  PUBLIC SECTION.
    INTERFACES zif_e2e001_odata_v4_so_types.

    METHODS /iwbep/if_v4_mp_basic~define REDEFINITION.

. . .

ENDCLASS.

CLASS zcl_e2e001_odata_v4_so_model IMPLEMENTATION.

  METHOD /iwbep/if_v4_mp_basic~define.
    define_customer( io_model ).
    define_salesorder( io_model ).
    define_salesorderitem( io_model ).
  ENDMETHOD.

. . .

ENDCLASS.
```
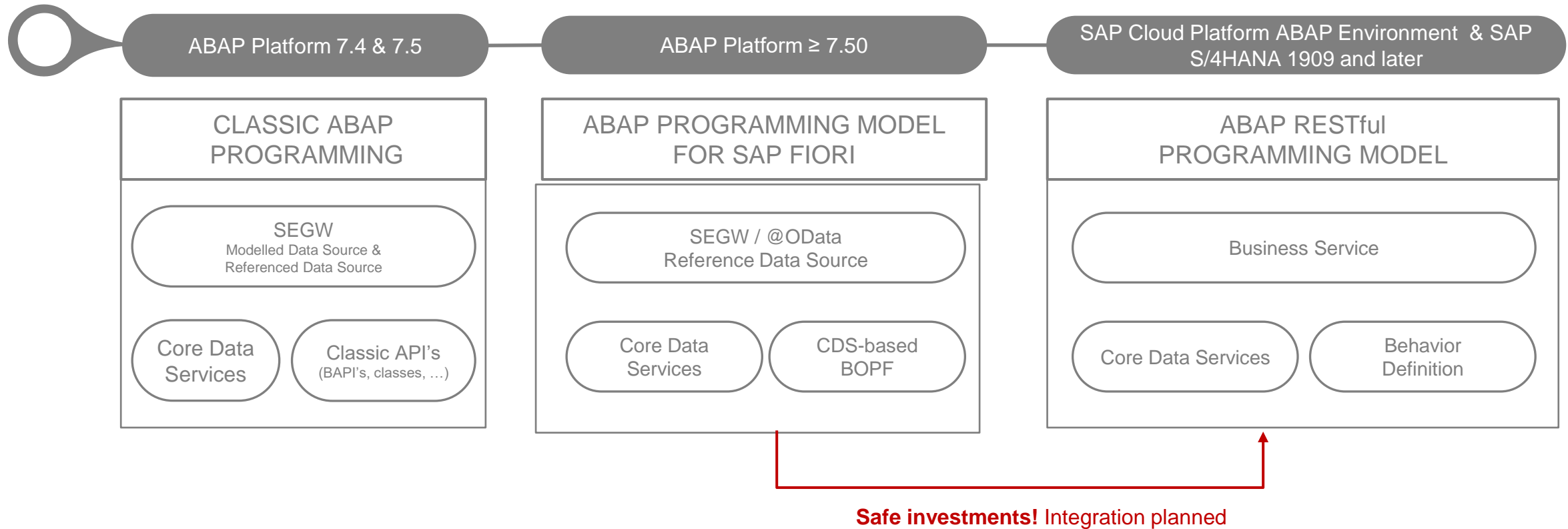
Where it is safe to invest now ?

Evolution of OData Service Development

ABAP Platform 7.4 & 7.5	ABAP Platform ≥ 7.50	SAP Cloud Platform ABAP Environment & SAP S/4HANA 1909 and later

CLASSIC ABAP PROGRAMMING	ABAP PROGRAMMING MODEL FOR SAP FIORI	ABAP RESTful PROGRAMMING MODEL
SEGW Modelled Data Source & Referenced Data Source	SEGW / @OData Reference Data Source	Business Service
Core Data Services	Core Data Services	Core Data Services
Classic API's (BAPI's, classes, …)	CDS-based BOPF	Behavior Definition

Safe investments! Integration planned

* On-premise planned upcoming SAP S/4HANA

Where to invest now to be prepared for the ABAP RESTful Programming Model?

YOU SHOULD

Follow the programming model and [best practices](#) and use…

- Core Data Services (CDS) for database artefacts *
  (≥ 7.40, [Documentation](#))

- CDS Metadata Extensions for UI Annotations *
  (≥ 7.51 SP2, [Documentation](#))

- DCL for read/query instance-based authority checks *
  (≥ 7.50, [Documentation](#))

- BOPF stand-alone
  (≤ 7.40, [Documentation](#), newer releases: CDS/BOPF integration)

- BOPF and CDS integration including draft *
  (≥ 7.51 SP2, [Documentation](#))

- Gateway integration of CDS or BOPF
  (= 7.40, [Documentation](#), newer releases: OData Exposure)

- **OData Exposure of CDS / BOPF for SAP Fiori and future development ***
  (≥ 7.50 SP5, [Documentation](#))

- Floorplan-Manager integration of CDS and BOPF
  (≥ 7.40, [Documentation](#))
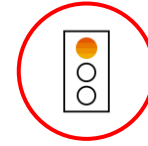
DO NOT

Implement things already solved

- Manual implementation of **read-only calls** to DB

- Business logic mixed with **technical aspects**
  (e.g. locks, authority-check, LUW handling, persistency)

- Business logic mixed with **protocol specific** APIs
  (e.g. PBO/PAI, Gateway classes: DPC_EXT)

BENEFITS

Reuse / prepare your skillset and coding for the future

- Reuse CDS and DCL in SAP S/4HANA

- Lower TCD for the future: Minimal investment on technical protocol level

* Best practice Fiori apps, [E2E documentation](#)

Key Take Aways

Where to safely invest now? …

USE CDS AS THE ONE AND ONLY DATA MODELLING LANGUAGE

Use CDS / BOPF integration and get familiar with BOPF concepts like determinations, validations and actions

Use OData exposure: SEGW / Referenced Data Source for OData V2

Avoid DPC / MPC specific coding if possible

MAKE USE OF THE ABAP PROGRAMMING MODEL FOR SAP FIORI

The ABAP Programming Model for SAP Fiori is available as of AS ABAP 7.5 and is the current best practice in SAP S/4HANA for managed scenarios

BE PREPARED FOR THE ABAP RESTFUL PROGRAMMING MODEL

The ABAP RESTful Programming Model is already available in the SAP Cloud Platform ABAP Environment and in SAP S/4HANA 1909

AVOID ODATA V4 IF NOT MANDATORY FOR YOUR BUSINESS SCENARIO

Odata V4 is planned to be supported with the ABAP RESTful programming model

Code based implementation of OData V4 API's cannot easily be reused.

Thank you.

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