

2024



## 29<sup>th</sup> Eurofiling Conference

5<sup>th</sup> and 6<sup>th</sup> June 2024 | Central Bank of Ireland | Dublin, Ireland

***BIRD with executable regulatory  
transformations***

Neil Mackenzie – BIRD Software Solutions

## What is BIRD?

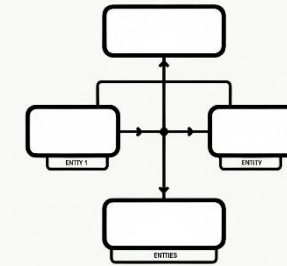
**The Banks' Integrated Reporting Dictionary (BIRD)** is a collaboration to create an Open Data Model, and Transformations (from Data Model to submittable reports) for European regulations

Who?

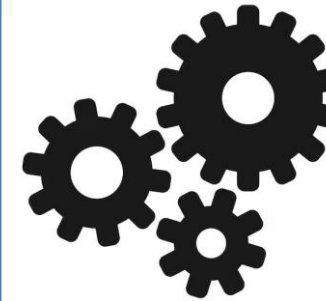
- 30+ banks , 7 central banks, 40+ vendors and Consultancies
- Coordination by BIRD team at the ECB

Key points

- Single place for feedback, feedback is not siloed to closed commercial implementations.
- Not mandatory, but drives the model of IREF Statistical reporting which will be mandatory in 2027.
- Scope Finrep/COREP/IREF , provides a harmonised base for all for banks and regulatory authorities
- Not restrictive in technology choices => **transformations not executable**



BIRD  
Data Model



BIRD  
Transformations

Category	Item	Amount (in 000s)
Assets	Cash	5000
Assets	Loans	20000
Assets	Securities	15000
Liabilities	Deposits	25000
Liabilities	Loans	10000
Liabilities	Other Liabilities	5000
Equity	Total Equity	5000
Revenue	Interest Income	2000
Revenue	Fee Income	500
Expenses	Interest Expense	1000
Expenses	Operating Expense	800
Net Income	Total Net Income	700

European Regulatory Reports



## What is BIRD (continued)

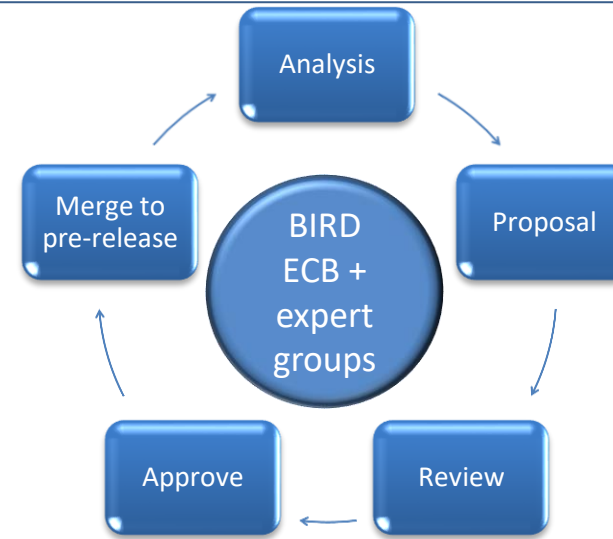
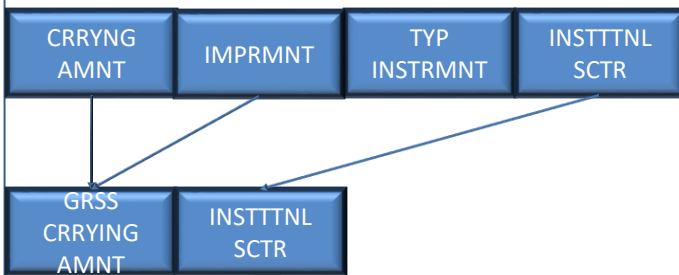
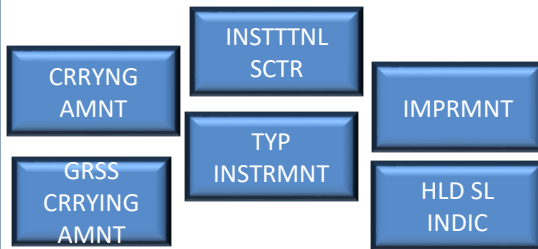
### Machine Readable Artefacts (BIRD/SDD)



**SMCubes:** A flexible cube based methodology for describing BIRD and SDD artefacts

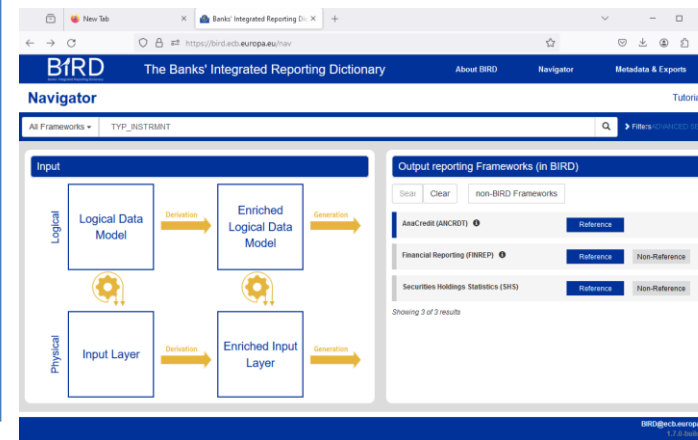
**ECB Single Data Dictionary (SDD):** The mature building blocks of AnaCredit, ECB Analysis, and BIRD

**BIRD:** SDD Building blocks put into structures, and the transformation of these structures required to make regulatory reports



### SDD/BIRD Change Management

Controlled policy to ensure non-redundant information

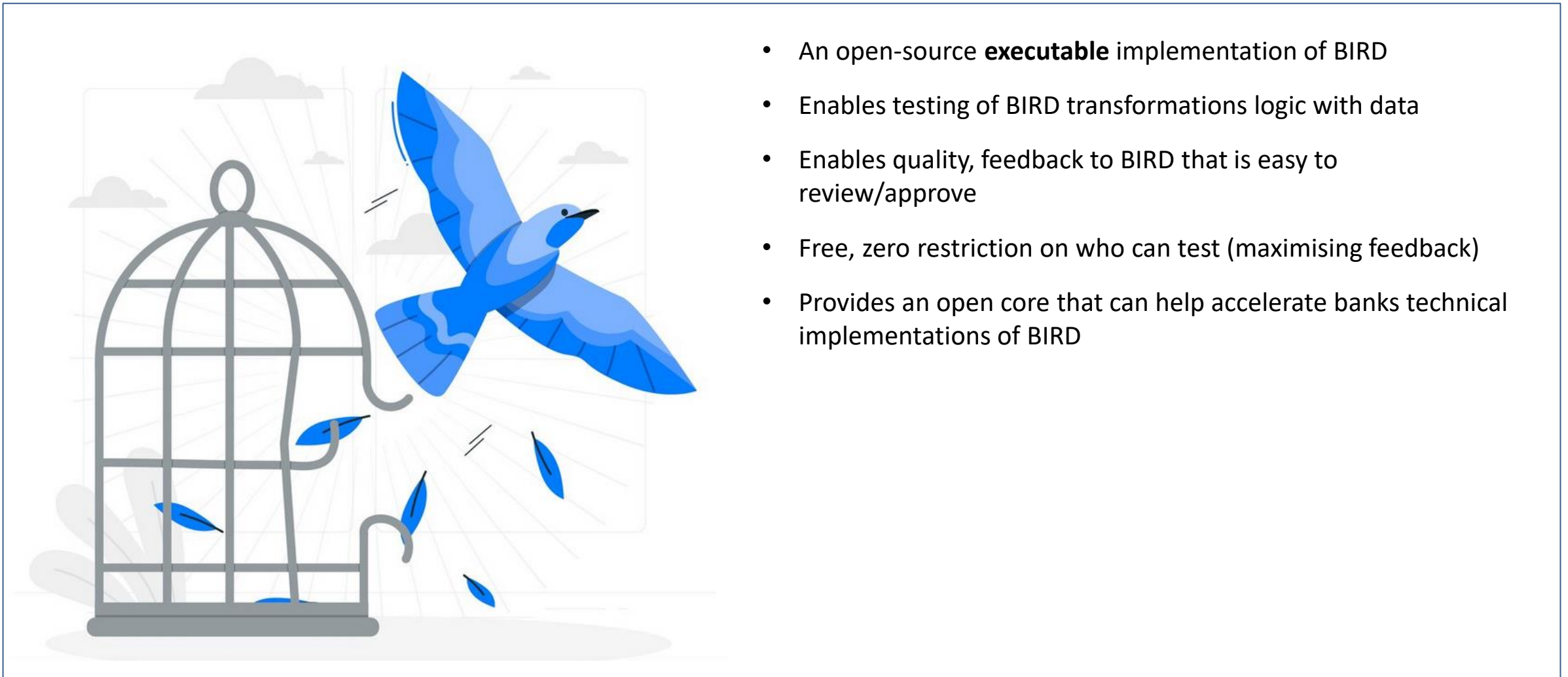


### BIRD SDD Publication

Released Approximately quarterly

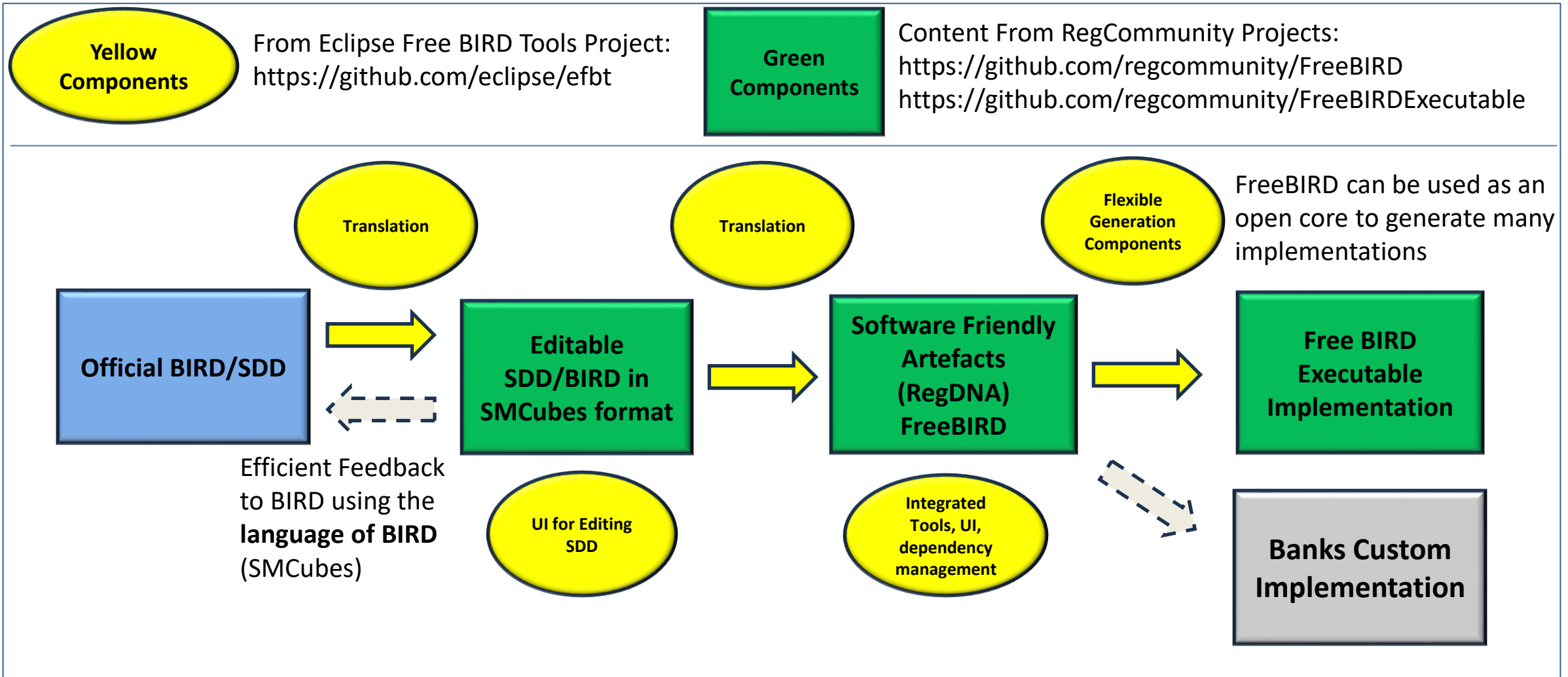
Easy navigation of **read-only** artefacts of BIRD/SDD

## Eclipse Free BIRD Tools + Free BIRD repository



- An open-source **executable** implementation of BIRD
- Enables testing of BIRD transformations logic with data
- Enables quality, feedback to BIRD that is easy to review/approve
- Free, zero restriction on who can test (maximising feedback)
- Provides an open core that can help accelerate banks technical implementations of BIRD

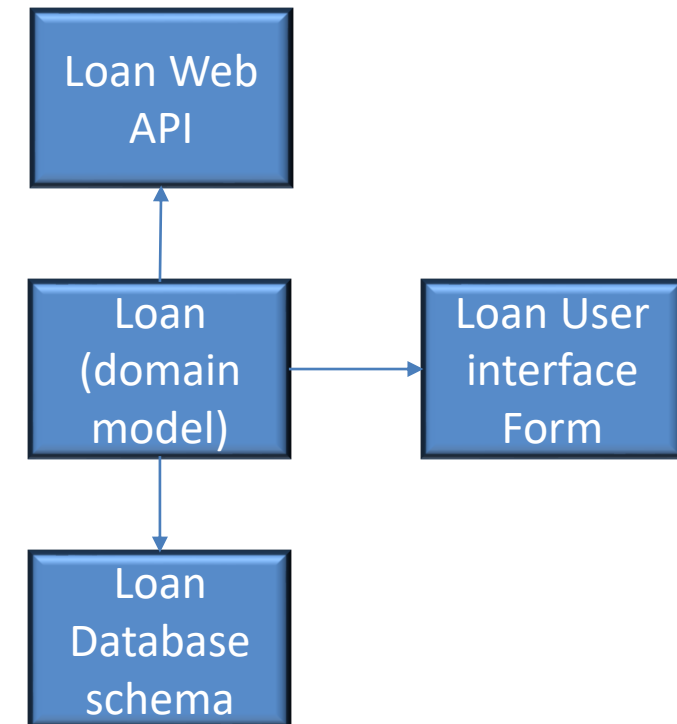
## Open-Source Component Overview



## RegDNA

- Close to modern approaches to software development
- Consistent with common object-oriented and relational concepts of modern adopted software frameworks
- DRY principle (Don't Repeat Yourself)
- Edit a domain model, generate datastore, UI, WebAPI components
- Examples following this principle: Python Django, Eclipse Ecore, Java Spring, Microsoft's Entity Framework
- Code you write, you must maintain (generate code , don't write it!)

Don't write code, generate it!

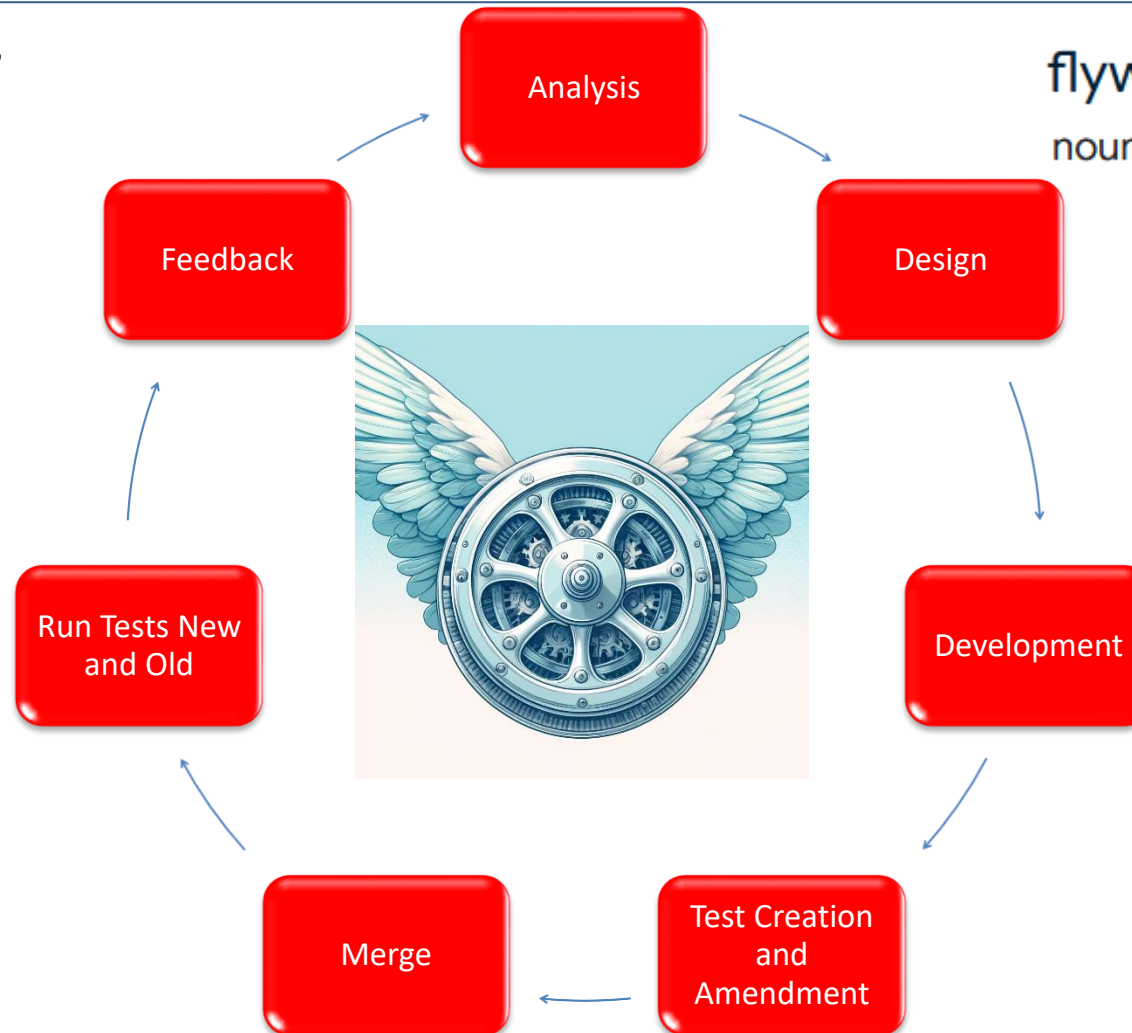


## FlyWheel Methodology

Applying a modern, agile, tool supported, software development cycle, to produce a testable, executable implementation of BIRD

With test cases!

Process focusses on removing any blockers to progress



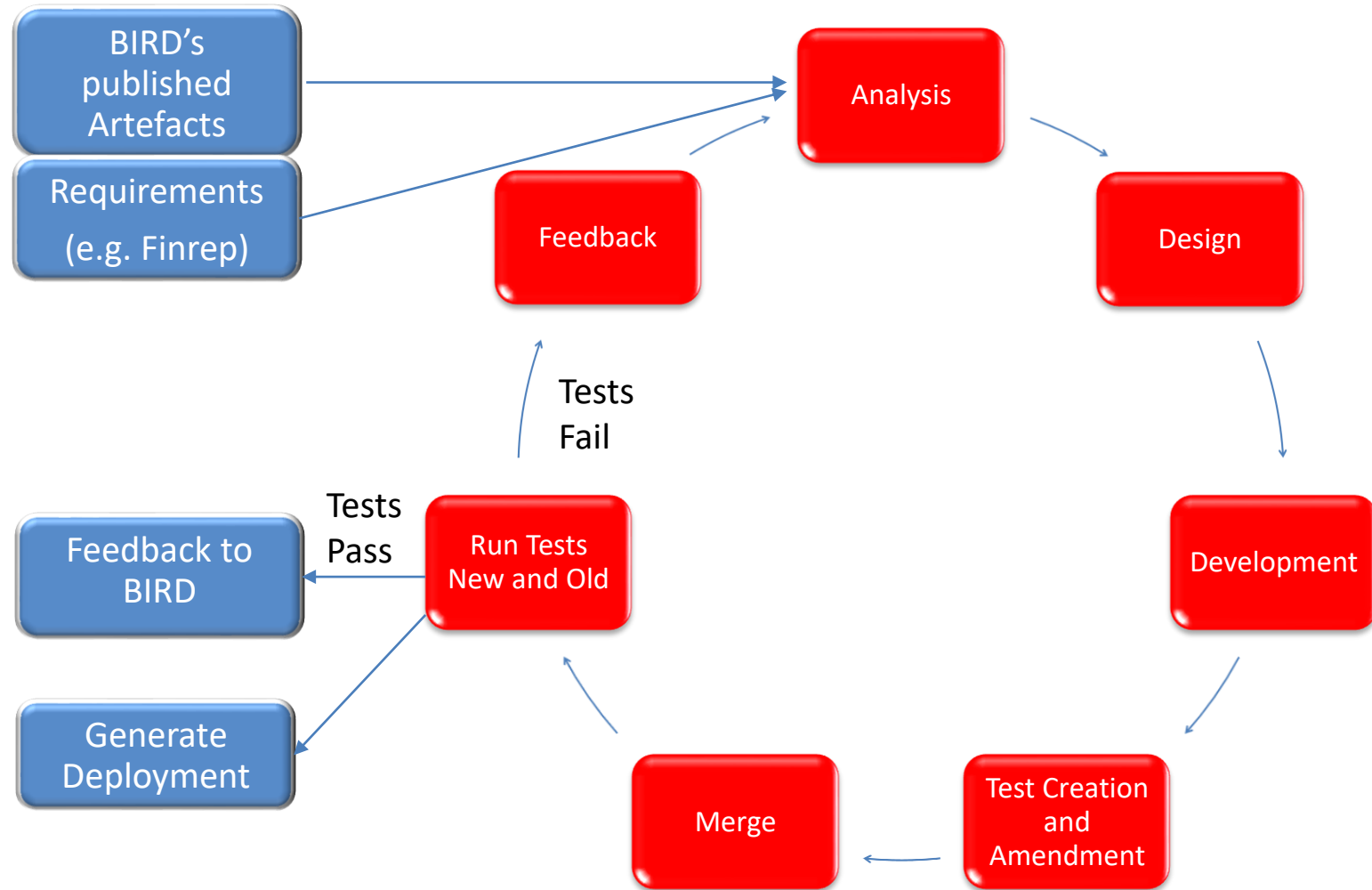
flywheel :

noun. a heavy wheel that stores kinetic energy



## Interaction/Feedback to BIRD

High quality Feedback to BIRD happens only **after** concrete testing with data to support feedback

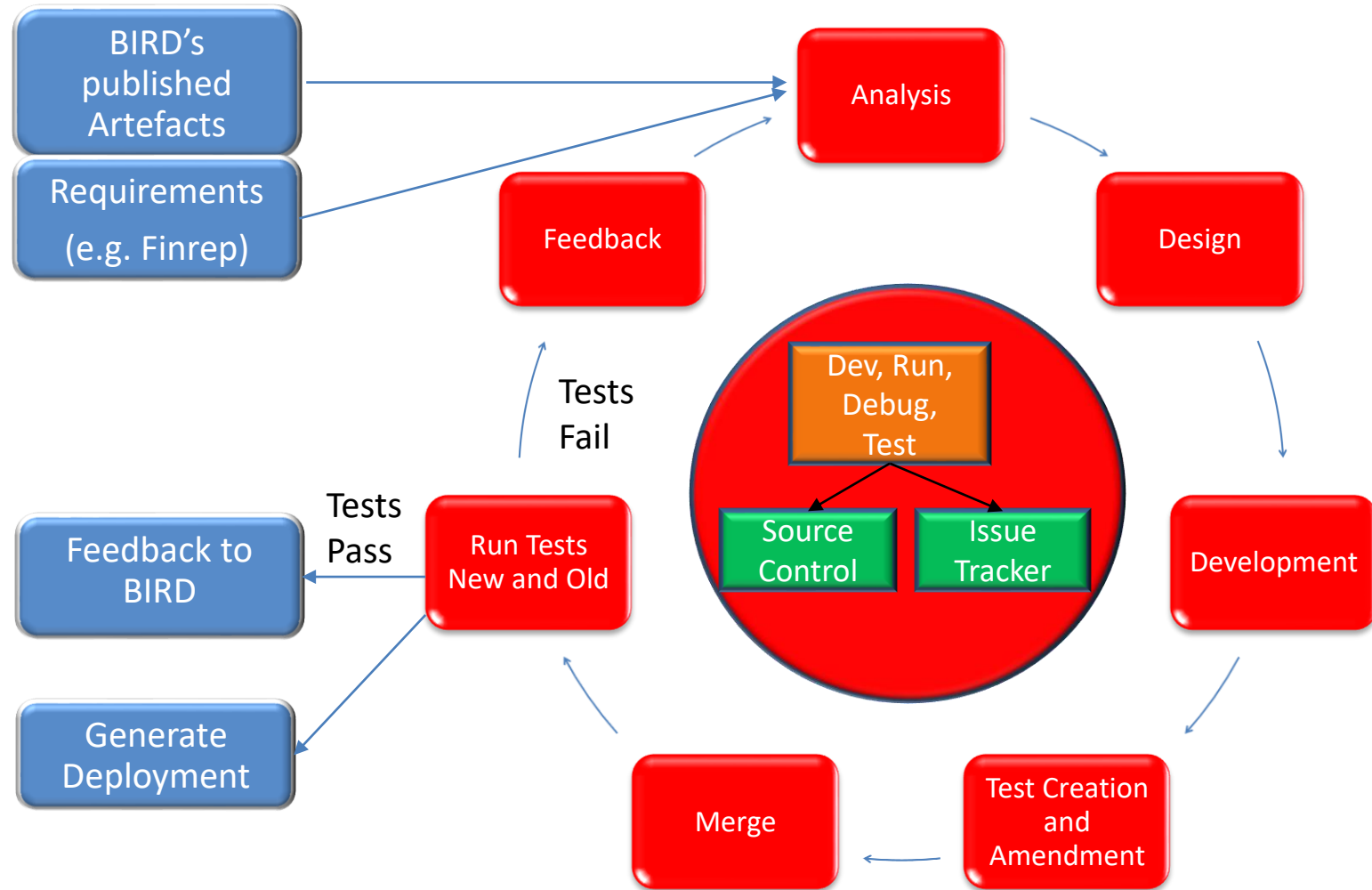




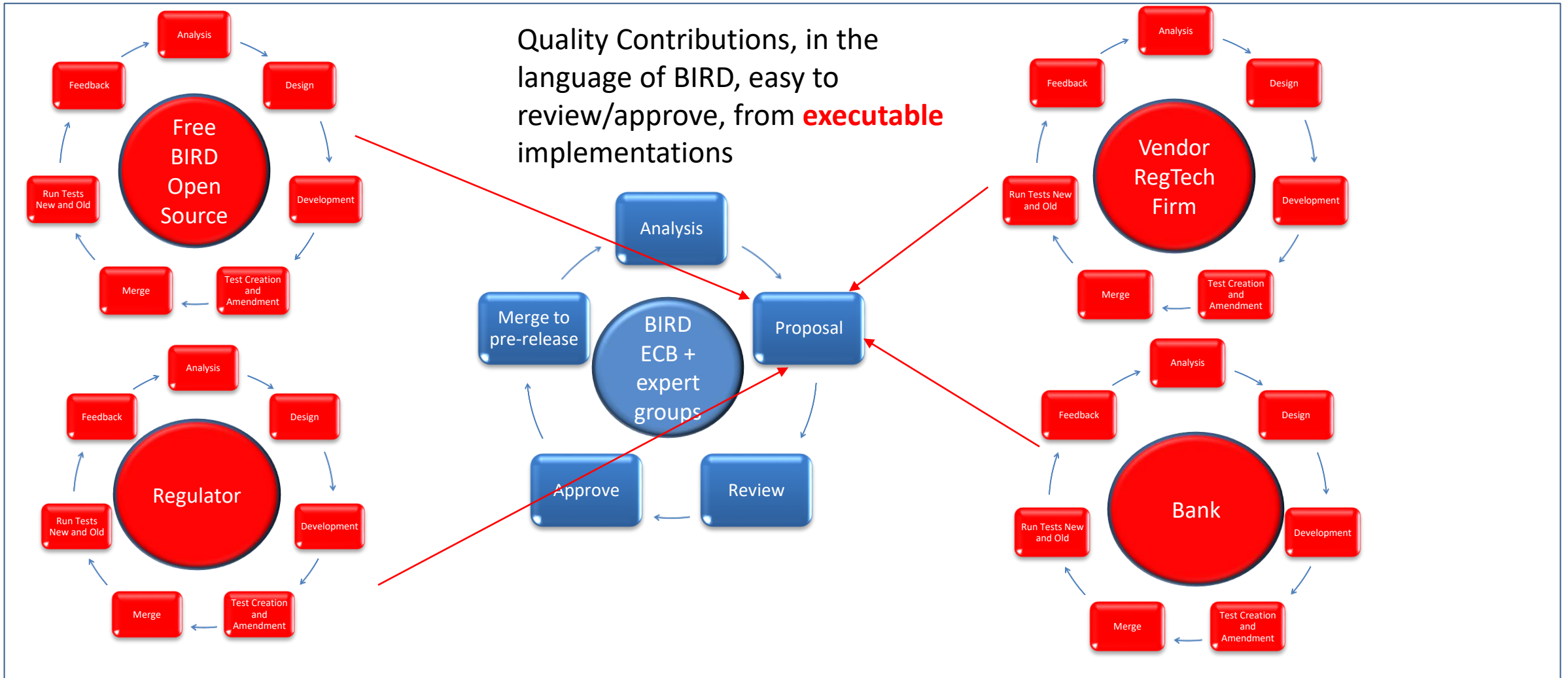
## Tool Support for FlyWheel Methodology

Methodology Has Tool support from **Eclipse Free BIRD Tools** and **RegCommunity's Issue Tracker** and Source Control

These both build on top of mature open support for the software lifecycle in Github/Gitlab and Eclipse IDE

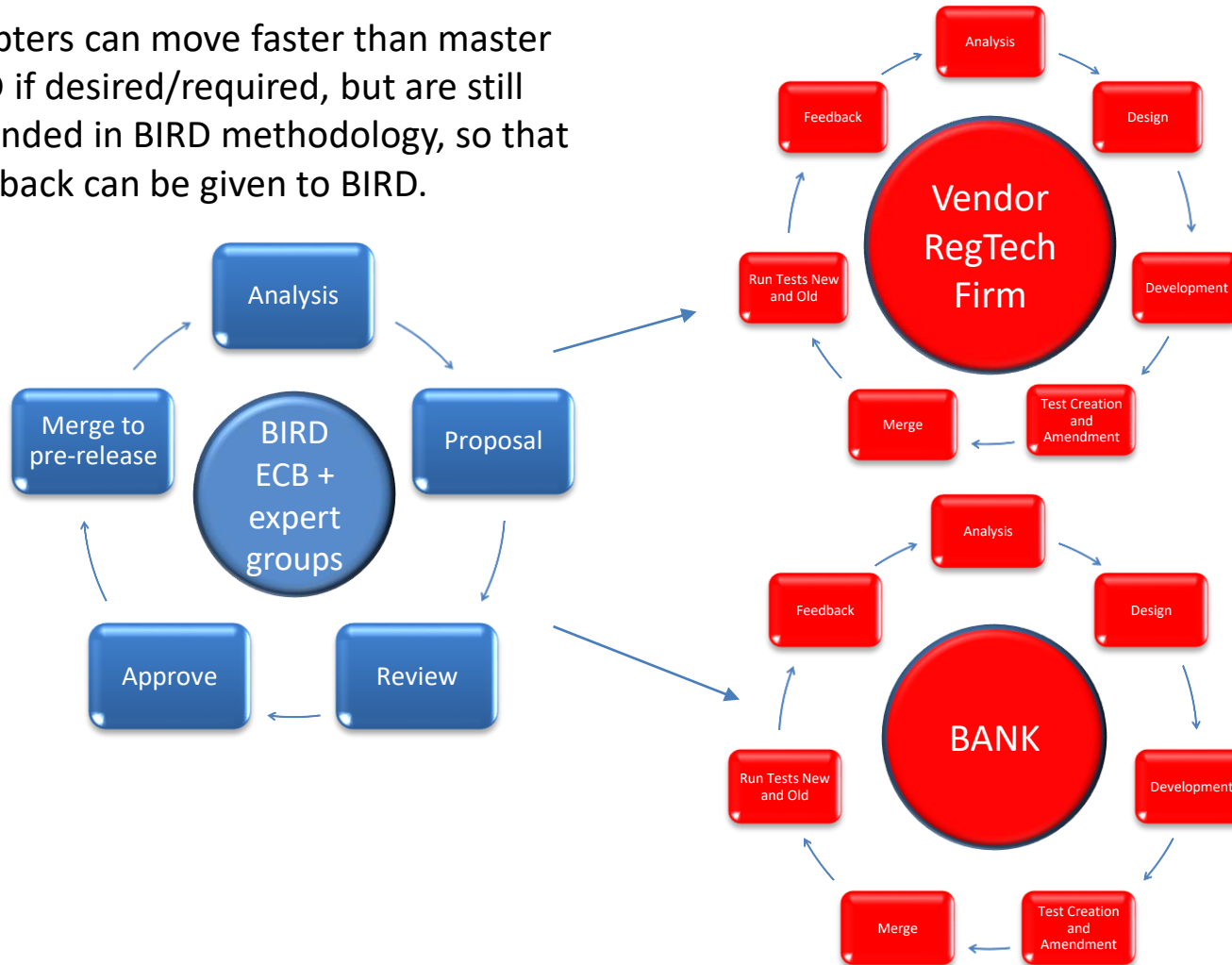


## Feedback from multiple tested executable versions, to non-executable master version of BIRD



## Fast Forward

Adopters can move faster than master BIRD if desired/required, but are still grounded in BIRD methodology, so that feedback can be given to BIRD.



Addons, fast experimentation in future requirements (e.g. LCR/FRTB)



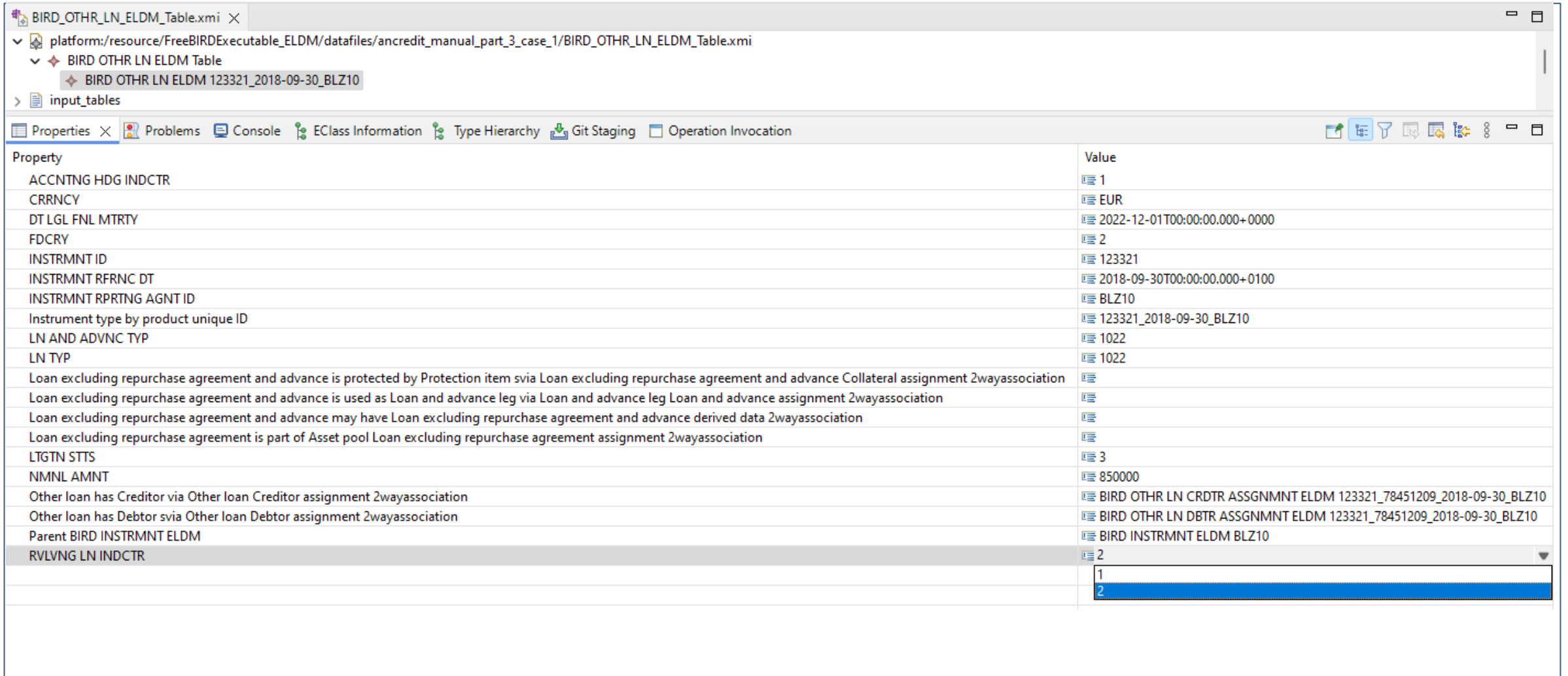
Timely bug fixes for bank specific edge cases (e.g. amortized swaps vs normal swaps)



## FlyWheel methodology, blockers removed

- **Timing:** Contribute when you want/can/need , not when scheduled.
- **Scale:** Contribute a small fix to allow you to submit your reports, or a large addition because you have the resources/budget/requirement.
- **Hidden knowledge/processes:** All analysis and lineage of analysis is public, debatable and discussable. All automated processes are open source.
- **Lack of tools:** Free, open source, **integrated** tool support is available for analysis, design, data-modeling, transformations, test data, execution, debug, lineage, automated testing, and collaboration **tailored** to BIRD...you can also create/adapt new tools.
- **Lack of dependency management:** Change a datamodel, and see **immediately** the transformations and test data items affected. Not models in one tool and transformations in another.
- **Inflexible collaboration process:** Supports multiple collaborators , following well tested online and offline collaboration models from successful open-source projects, with free and ubiquitous collaboration tooling (Github or Gitlab)

## Quickfire Screenshots – Guided test data creation



The screenshot shows an IDE window with the following structure:

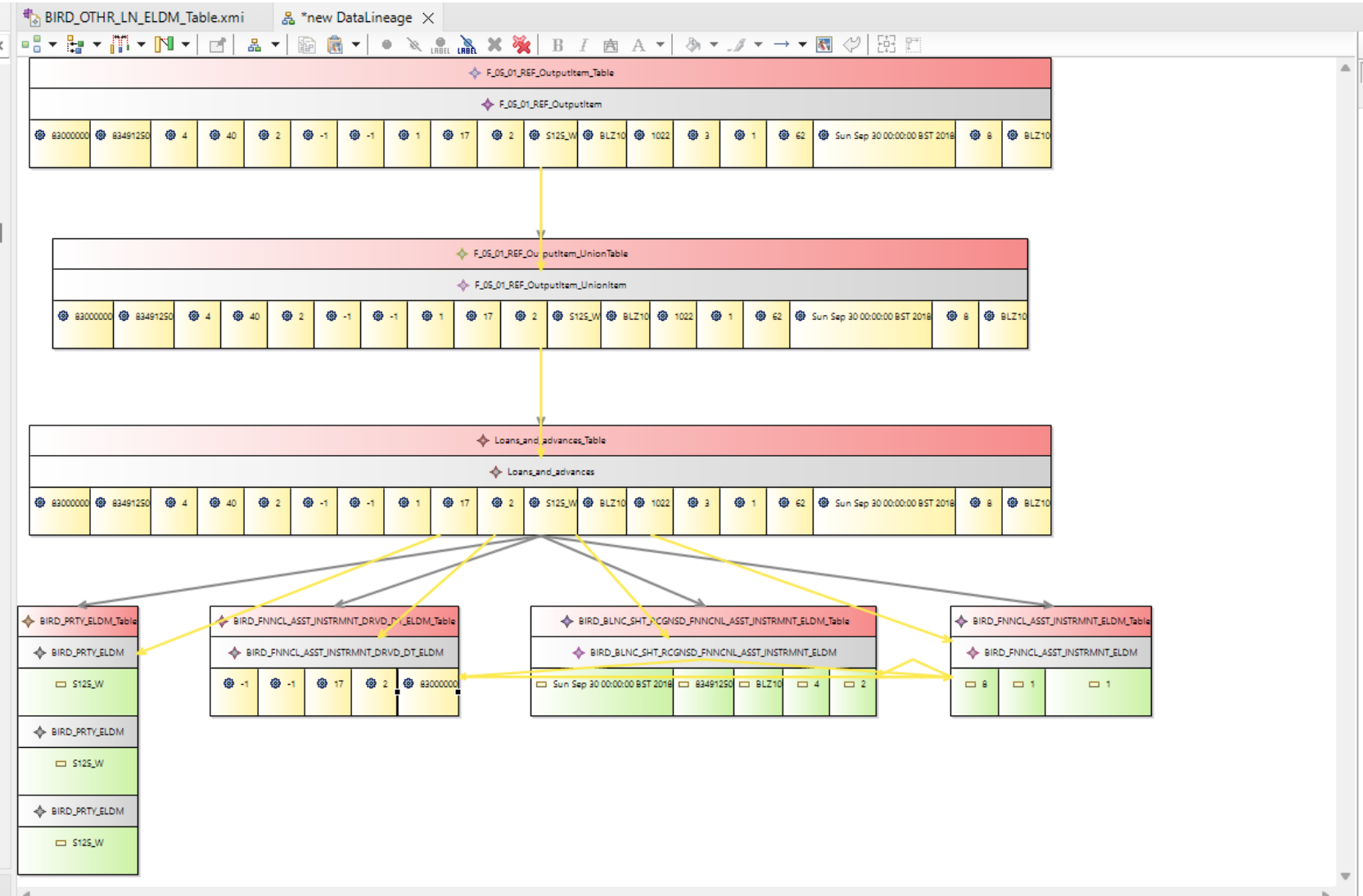
- File Explorer:
  - platform:/resource/FreeBIRDExecutable\_ELDM/datafiles/ancredit\_manual\_part\_3\_case\_1/BIRD\_OTHR\_LN\_ELDM\_Table.xml
  - BIRD OTHR LN ELDM Table
    - BIRD OTHR LN ELDM 123321\_2018-09-30\_BLZ10
    - input\_tables
- Properties View:
 

Property	Value
ACCNTNG HDG INDCTR	1
CRRNCY	EUR
DT LGL FNL MTRTY	2022-12-01T00:00:00.000+0000
FDCRY	2
INSTRMNT ID	123321
INSTRMNT RFRNC DT	2018-09-30T00:00:00.000+0100
INSTRMNT RPRTRNG AGNT ID	BLZ10
Instrument type by product unique ID	123321_2018-09-30_BLZ10
LN AND ADVNC TYP	1022
LN TYP	1022
Loan excluding repurchase agreement and advance is protected by Protection item svia Loan excluding repurchase agreement and advance Collateral assignment 2wayassociation	
Loan excluding repurchase agreement and advance is used as Loan and advance leg via Loan and advance leg Loan and advance assignment 2wayassociation	
Loan excluding repurchase agreement and advance may have Loan excluding repurchase agreement and advance derived data 2wayassociation	
Loan excluding repurchase agreement is part of Asset pool Loan excluding repurchase agreement assignment 2wayassociation	
LTGTN STTS	3
NMNL AMNT	850000
Other loan has Creditor via Other loan Creditor assignment 2wayassociation	BIRD OTHR LN CRDTR ASSGNMNT ELDM 123321_78451209_2018-09-30_BLZ10
Other loan has Debtor svia Other loan Debtor assignment 2wayassociation	BIRD OTHR LN DBTR ASSGNMNT ELDM 123321_78451209_2018-09-30_BLZ10
Parent BIRD INSTRMNT ELDM	BIRD INSTRMNT ELDM BLZ10
RVLVNG LN INDCTR	2

Model Explorer

type filter text

- BIRD\_FNDMNTL\_RVW\_TRDNG\_BK\_STNDRD\_APPRCH\_RSK\_MSR\_OTC\_PSTNS\_ELDM\_Table
- BIRD\_FNDS\_GNRL\_BNKG\_RSK\_ELDM -> BIRD\_PRVSN\_ELDM
- BIRD\_FNDS\_GNRL\_BNKG\_RSK\_ELDM\_Table
- BIRD\_FNNCL\_ASST\_INSTRMNT\_ELDM -> BIRD\_INSTRMNT\_RL\_ELDM
- BIRD\_FNNCL\_ASST\_INSTRMNT\_ELDM\_Table
- BIRD\_FNNCL\_ASST\_INSTRMNT\_DBTR\_ASSSSD\_ELDM -> BIRD\_PTNTL\_RTL\_EXPSR\_CLSS\_FNNCL\_ASS
- BIRD\_FNNCL\_ASST\_INSTRMNT\_DBTR\_ASSSSD\_ELDM\_Table
- BIRD\_FNNCL\_ASST\_INSTRMNT\_DRVD\_DT\_ELDM
  - long\_name
    - long\_name -> Financial\_asset\_instrument\_derived\_data
      - CRRNT\_LTV\_RT() : EDouble
      - TM\_PST\_DU\_BND() : TM\_INTRVL\_domain
      - ACCMLTD\_TTL\_WRTFFS() : EInt
      - ACCMLTD\_PRTL\_WRTFFS() : EInt
      - PRFRMNG\_STTS() : CRDT\_QLTY\_domain
      - FNNCL\_ASST\_INSTRMNT\_RL\_TYP() : ABSTRCT\_INSTRMNT\_RL\_TYP\_domain
      - DFLT\_STTS\_DRVD() : CRDT\_QLTY\_domain
      - PRFRMNG\_STTS\_RSN() : PRFRMNG\_STTS\_RSN\_domain
      - HLD\_TRDNG\_INDCTR() : HLD\_TRDNG\_INDCTR\_domain
      - HLD\_MTRTY\_INDCTR() : HLD\_MTRTY\_INDCTR\_domain
      - ACCNTNG\_PRTFL\_VLTN\_RL() : VLTN\_RL\_domain
      - ACCNTNG\_FRMWRK() : ACCNTNG\_FRMWRK\_domain
      - GRSS\_CRRYNG\_AMNT() : EInt
        - long\_name
        - dep
          - dep1 -> BIRD\_FNNCL\_ASST\_INSTRMNT\_DRVD\_DT\_ELDM.PRFRMNG\_STTS
          - dep2 -> BIRD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_ELDM.ACCNTNG\_CLSSFC
          - dep3 -> BIRD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_ELDM.ACCMLTD\_IMPRMNT
          - dep4 -> BIRD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_ELDM.CRRYNG\_AMNT
          - dep5 -> BIRD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_ELDM.IMPRMNT\_STTS
          - dep6 -> BIRD\_FR\_VLD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_ELDM.ACCMLTD\_C
          - dep7 -> BIRD\_FR\_VLD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_ELDM.FV
          - dep8 -> BIRD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_NGAAP\_ELDM.GNRL\_ALL
          - dep9 -> BIRD\_BLNC\_SHT\_RCGNSD\_FNNCNL\_ASST\_INSTRMNT\_NGAAP\_ELDM.GNRL\_ALL
          - dep10 -> BIRD\_FNNCL\_ASST\_INSTRMNT\_ELDM.SBJCT\_IMPRMNT\_INDCTR
- GenModel
- FNNCL\_ASST\_INSTRMNT\_RFRNC\_DT : EDate



Outline

1 item selected

Properties

Problems

Console

EClass Information

Type Hierarchy

Git Staging

Operation Invocation

**GRSS\_CRRYNG\_AMNT() : EInt**

Main EType: EInt [int]

Default EExceptions:

## Quickfire Screenshots - Entity Relationship visual editor

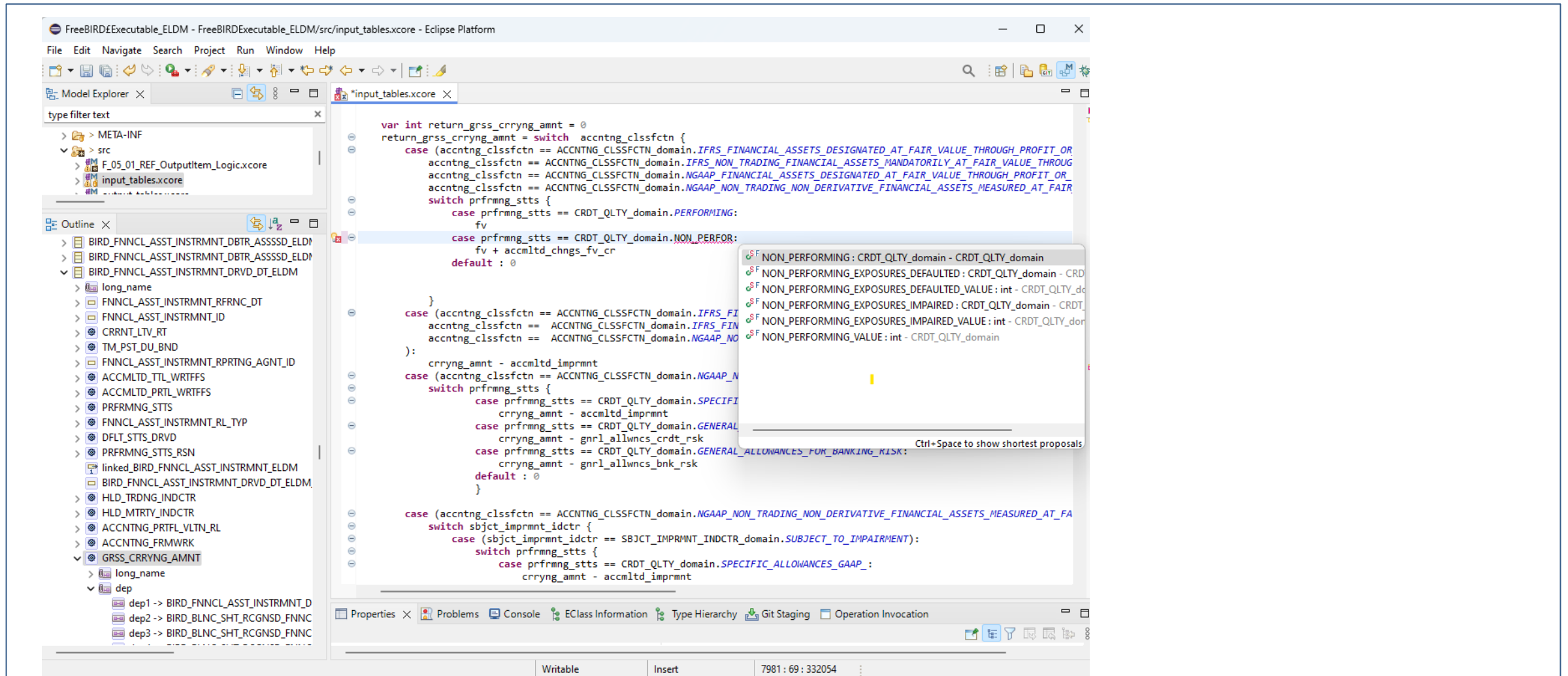
The screenshot displays the Eclipse IDE interface for editing an Entity Relationship Diagram (ERD) for the project 'FreeBIRDExecutable\_ELDM'. The main workspace shows a class diagram with the following elements:

- Class Hierarchy:**
  - BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_DRVD\_DT\_ELDM** (Superclass)
    - ACCMLTD\_CHNG\_NGTV : EInt
    - TM\_SNC\_INTL\_RCGNTN : TM\_INTRVL\_domain = 12
    - CLLTRL\_OBTND\_RPRTNG\_AGNT\_ID : EString
    - CLLTRL\_RCVD\_INSTRMNT\_OBTND\_INSTRMNT\_RFRNC\_DT : EDate
    - CLLTRL\_RCVD\_INSTRMNT\_OBTND\_RPRTNG\_INSTRMNT\_RL\_TYP : ABSTRACT\_INSTRMNT\_RL\_TYP\_domain = 3
    - CLLTRL\_RCVD\_INSTRMNT\_OBTND\_INSTRMNT\_RPRTNG\_AGNT\_ID : EString
    - BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_DRVD\_DT\_ELDM\_uniqueID : EString
  - BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_ELDM** (Subclass)
  - BIRD\_LNG\_SCRTY\_PSTN\_BK\_ASSGNMNT\_ELDM\_Table** (Subclass)
  - BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_DRVD\_DT\_ELDM** (Subclass)
- Relationships:**
  - A relationship between **BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_ELDM** and **BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_DRVD\_DT\_ELDM** with multiplicity **[0..1]** and role **Collateral\_received\_instrument\_obtained\_by\_taking\_ownership\_has\_Collateral\_received\_instrument\_obtained\_by\_taking\_ownership\_derived\_data\_2**.
  - A relationship between **BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_ELDM** and **BIRD\_LNG\_SCRTY\_PSTN\_BK\_ASSGNMNT\_ELDM\_Table**.
  - A relationship between **BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_ELDM** and **BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_DRVD\_DT\_ELDM** with multiplicity **[0..\*]** and role **BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_DRVD\_DT\_ELDM**.

The left sidebar shows the Model Explorer with a tree view of the project's classes. The right sidebar shows the Palette with various modeling elements like Class, Datatype, Enumeration, etc. The bottom status bar shows the selected class: **BIRD\_CLLTRL\_RCVD\_INSTRMNT\_OBTND\_TKNG\_PSSSSN\_DRVD\_DT\_ELDM**.



## Quickfire Screenshots - Code assist editor for detailed logic, code complete, data aware, model aware



The screenshot displays the Eclipse IDE interface with the following components:

- Model Explorer:** Shows a project structure with folders like META-INF, src, and F\_05\_01\_REF\_OutputItem\_Logic.xcore. The file `input_tables.xcore` is selected.
- Outline:** Lists various attributes and methods such as `long_name`, `FNNCL_ASST_INSTRMNT_RFRNC_DT`, and `GRSS_CRRYNG_AMNT`.
- Main Editor:** Contains the following Java code snippet:
 

```

var int return_grss_crryng_amnt = 0
return_grss_crryng_amnt = switch accntng_clssfctn {
    case (accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.IFRS_FINANCIAL_ASSETS_DESIGNATED_AT_FAIR_VALUE_THROUGH_PROFIT_OR
    accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.IFRS_NON_TRADING_FINANCIAL_ASSETS_MANDATORILY_AT_FAIR_VALUE_THROUGH
    accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.NGAAP_FINANCIAL_ASSETS_DESIGNATED_AT_FAIR_VALUE_THROUGH_PROFIT_OR
    accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.NGAAP_NON_TRADING_NON_DERIVATIVE_FINANCIAL_ASSETS_MEASURED_AT_FAIR
    switch prfrmng_stts {
        case prfrmng_stts == CRDT_QLTY_domain.PERFORMING:
            fv
        case prfrmng_stts == CRDT_QLTY_domain.NON_PERFOR:
            fv + accmltd_chngs_fv_cr
            default : 0
    }
    case (accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.IFRS_FI
    accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.IFRS_FI
    accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.NGAAP_NO
):
    crryng_amnt - accmltd Imprmnt
    case (accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.NGAAP_N
    switch prfrmng_stts {
        case prfrmng_stts == CRDT_QLTY_domain.SPECIFI
            crryng_amnt - accmltd Imprmnt
        case prfrmng_stts == CRDT_QLTY_domain.GENERAL
            crryng_amnt - gnrl_allwncs_crdt_rsk
        case prfrmng_stts == CRDT_QLTY_domain.GENERAL_ALLOWANCES_FOR_BANKING_RISK:
            crryng_amnt - gnrl_allwncs_bnk_rsk
            default : 0
    }
    case (accntng_clssfctn == ACCNTNG_CLSSFCTN_domain.NGAAP_NON_TRADING_NON_DERIVATIVE_FINANCIAL_ASSETS_MEASURED_AT_FA
    switch sbjct Imprmnt_idctr {
        case (sbjct Imprmnt_idctr == SBJCT_IMPRMNT_INDCTR_domain.SUBJECT_TO_IMPAIRMENT):
            switch prfrmng_stts {
                case prfrmng_stts == CRDT_QLTY_domain.SPECIFIC_ALLOWANCES_GAAP:
                    crryng_amnt - accmltd Imprmnt
            }
    }

```
- Code Assist:** A tooltip is visible over the `NON_PERFORMING` case, listing several domain constants and their types, such as `NON_PERFORMING_EXPOSURES_DEFAULTED` and `NON_PERFORMING_EXPOSURES_IMPAIRED`.
- Properties:** Shows the file is `Writable` and in `Insert` mode.
- Status Bar:** Displays the cursor position as `7981 : 69 : 332054`.



## Quickfire Screenshots - Human readable model representation, diffable for perfect version control, navigable with tools support

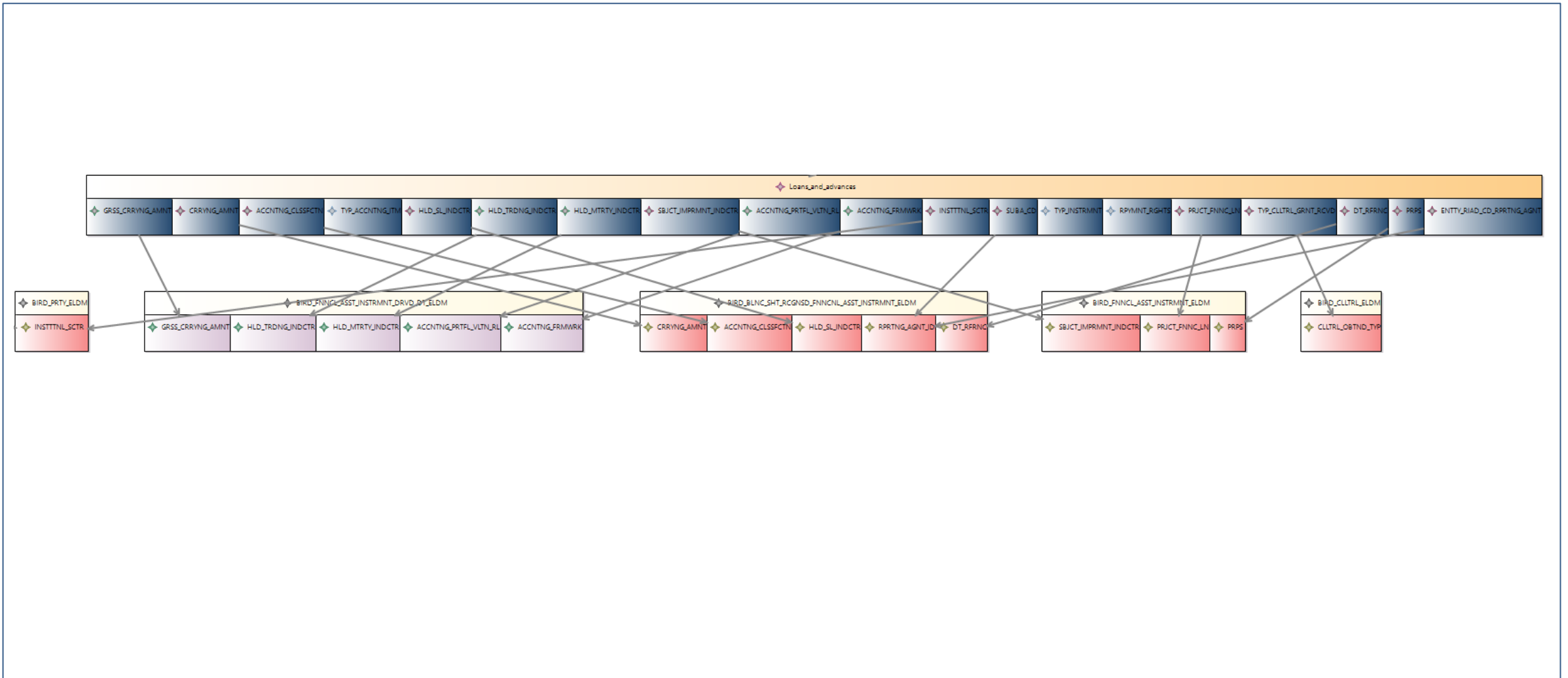
```

input_tables.regdna X
class BIRD_FNNCL_ASST_INSTRMNT_DRVD_DT_ELDM {
    @key(is_primary_key="true")
    @long_name(long_name="Financial_asset_instrument_Reference_date")
    Date FNNCL_ASST_INSTRMNT_RFRNC_DT
    @key(is_primary_key="true")
    @long_name(long_name="Financial_asset_instrument_identifier")
    String FNNCL_ASST_INSTRMNT_ID
    @long_name(long_name="Current_loan_to_value_ratio")
    double CRRNT_LTV_RT
    @long_name(long_name="Time_past_due_band")
    TM_INTRVL_domain TM_PST_DU_BND

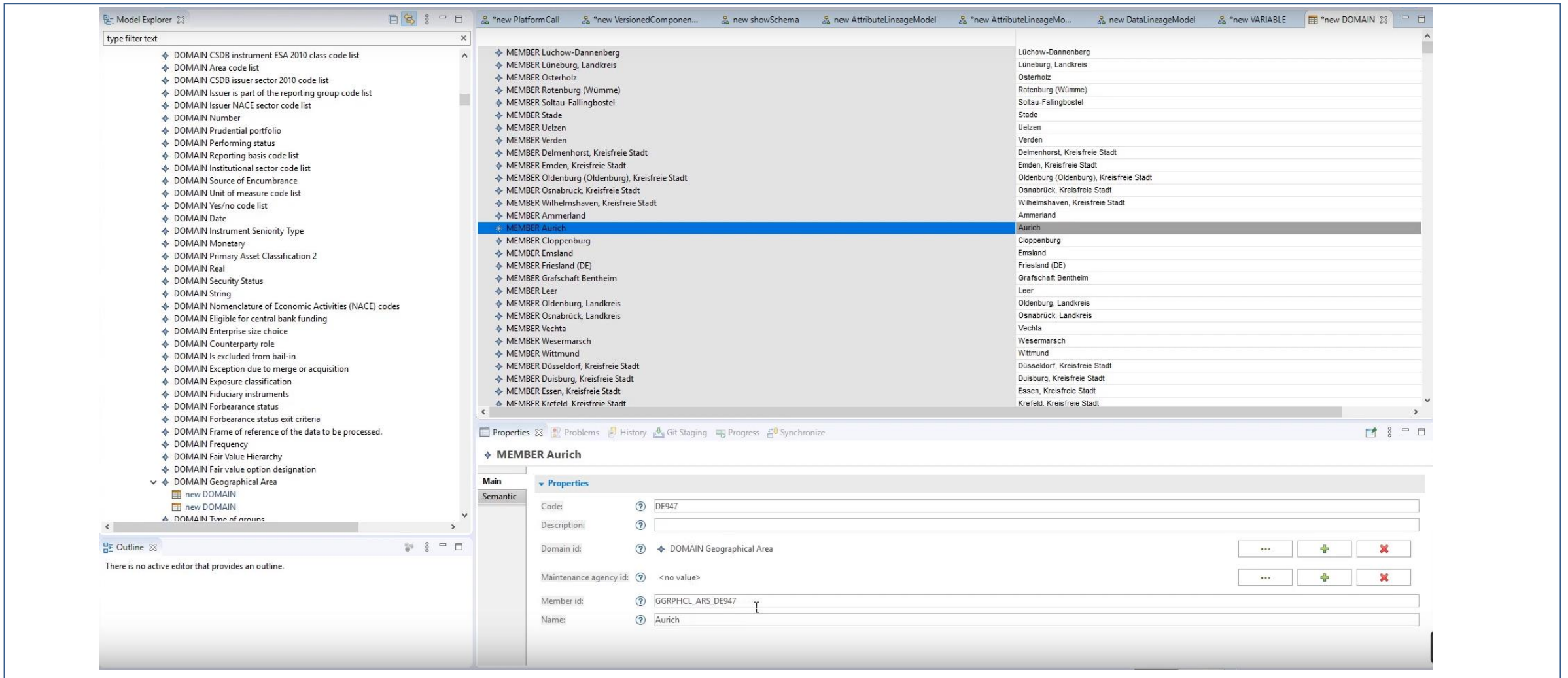
    @key(is_primary_key="true")
    @long_name(long_name="Financial_asset_instrument_Reporting_agent_identifier")
    String FNNCL_ASST_INSTRMNT_RPRTRG_AGNT_ID
    @long_name(long_name="Accumulated_total_write_offs")
    int ACCMLTD_TTL_WRTFFS
    @long_name(long_name="Accumulated_partial_write_offs")
    int ACCMLTD_PRTL_WRTFFS
    @long_name(long_name="Performing_status")
    CRDT_QLTY_domain PRFRMNG_STTS
    @key(is_primary_key="true")
    @long_name(long_name="Financial_asset_instrument_role_type")
    ABSTRCT_INSTRMNT_RL_TYP_domain FNNCL_ASST_INSTRMNT_RL_TYP
    @long_name(long_name="Derived_default_status")
    CRDT_QLTY_domain DFLT_STTS_DRVD
    @long_name(long_name="The_reason_for_the_choice_of_Performing_status")
    PRFRMNG_STTS_RSN_domain PRFRMNG_STTS_RSN
    refers BIRD_FNNCL_ASST_INSTRMNT_ELDM [1..1] linked_BIRD_FNNCL_ASST_INSTRMNT_ELDM opposite BIRD_FNNCL_ASST_INSTRMNT_ELDM
    id String BIRD_FNNCL_ASST_INSTRMNT_DRVD_DT_ELDM_uniqueID
    @long_name(long_name="Gross_carrying_amount")
    @dep (dep1="BIRD_FNNCL_ASST_INSTRMNT_DRVD_DT_ELDM.PRFRMNG_STTS",
        dep2 = "BIRD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_ELDM.ACCNTNG_CLSSFCTN",
        dep3 = "BIRD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_ELDM.ACCMLTD_IMPRMNT",
        dep4 = "BIRD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_ELDM.CRRYNG_AMNT",
        dep5 = "BIRD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_ELDM.IMPRMNT_STTS",
        dep6 = "BIRD_FR_VLD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_ELDM.ACCMLTD_CHNGS_FV",
        dep7 = "BIRD_FR_VLD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_ELDM.FV",
        dep8 = "BIRD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_NGAAP_ELDM.GNRL_ALLWNCS_BNK_RSK",
        dep9 = "BIRD_BLNC_SHT_RCGNSD_FNNCL_ASST_INSTRMNT_NGAAP_ELDM.GNRL_ALLWNCS_CRDT_RSK",
        dep10 = "BIRD_FNNCL_ASST_INSTRMNT_ELDM.SBJCT_IMPRMNT_INDCTR")
    op int GRSS_CRRYNG_AMNT() {}
    @long_name(long_name="Held_for_trading_indicator")
    op HLD_TRDNG_INDCTR_domain HLD_TRDNG_INDCTR() {}
    @long_name(long_name="Held_to_maturity_indicator")
    op HLD_MTRTY_INDCTR_domain HLD_MTRTY_INDCTR() {}
    @long_name(long_name="Accounting_portfolio_valuation_rules")
    op VLTN_RL_domain ACCNTNG_PRTFL_VLTN_RL() {}
    @long_name(long_name="Accounting_Framework")
    op ACCNTNG_FRMWRK_domain ACCNTNG_FRMWRK() {}
}
@long_name(long_name="Financial_asset_instrument_individually_assessed")
class BIRD_FNNCL_ASST_INSTRMNT_INDIVDLY_ASSSSD_ELDM extends BIRD_PTNTL_RTL_EXPSR_CLSS_FNNCL_ASST_INSTRMNT_ELDM {

```

## Quickfire Screenshots - Visual representation of attribute lineage of transformation rules



## Quickfire Screenshots – Editable SDD



The screenshot displays the Eurofiling software interface with the following components:

- Model Explorer (Left):** A tree view showing a list of domains. The 'DOMAIN Geographical Area' is expanded, showing sub-items like 'new DOMAIN' and 'DOMAIN Type of groups'.
- Domain List (Middle):** A list of domain members. The member 'MEMBER Aurich' is selected and highlighted in blue.
- Member Details (Right):** A detailed view of the selected 'MEMBER Aurich' member, showing its properties:
  - Code:** DE947
  - Description:** (empty field)
  - Domain id:** DOMAIN Geographical Area
  - Maintenance agency id:** <no value>
  - Member id:** GGRPHCL\_ARS\_DE947
  - Name:** Aurich
- Outline (Bottom Left):** A panel indicating 'There is no active editor that provides an outline.'



**Thank you for your attention!**

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