

Article

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How to update result reference range and abnormal flag accordingly using HL7

In this article I will demonstrate the following :

- Update ReferencesRange(OBX:7) against ObservationIdentifier(OBX:3.1)[TestCode] from database by using custom utility function
- Update Abnormal Flag(OBX:8) against ObservationIdentifier(OBX:3.1)[TestCode] and ObservationValue(OBX:5)[Result] from database utility function
- Route Message based on Abnormal Flag(OBX:8)

Below is the primary and transformed HL7 2.5 ORUR01 message:

5	OBX	1	NM	1000	^	TotalProtein		4.3	gm/dl						E
6	OBX	2	NM	1001	^	Albumin		3.7	gm/dl						E
7	OBX	3	NM	1002	^	Globulin		3.9	gm/dL						E
8	OBX	4	NM	1003	^	A/G Ratio		1.2							E
9	OBX	5	NM	1004	^	Glucose		71	mg/dL						E
10	OBX	6	NM	1005	^	Sodium		134	mmol/L						E
11	OBX	7	NM	1006	^	Potassium		4.3	mmol/L						E
12	OBX	8	NM	1007	^	Chloride		96	mmol/L						E
13	OBX	9	NM	1008	^	CO2		24	mmol/L						E
14	OBX	10	NM	1009	^	BUN		17	mg/dl						E
15	OBX	11	NM	1010	^	Creatinine		1.1	mg/dl						E
16	OBX	12	NM	2000	^	BUN/CreatRatio		15.5							E
17	OBX	13	NM	2001	^	Calcium		8.9	mg/dl						E
18	OBX	14	NM	2002	^	UricAcid		6.2	mg/dl						E
19	OBX	15	NM	2003	^	Iron		87	mcg/dl						E
20	OBX	16	NM	2004	^	Bilirubin.Total		0.6	mg/dl						E
21	OBX	17	NM	2005	^	LDH		190	u/l						E
22	OBX	18	NM	2006	^	AlkPhos		63	u/l						E
23	OBX	19	NM	2007	^	AST(SGOT)		33	u/l						E
24	OBX	20	NM	3000	^	Phosphorous		2.8	mg/dl						E
25	OBX	21	NM	3001	^	ALT(SGPT)		35	u/L						E
26	OBX	22	NM	3002	^	Gá□□GTP		33	u/L						E

5	OBX	1	NM	1000	^	TotalProtein		4.3	gm/dl		5.9-8.4		L			E
6	OBX	2	NM	1001	^	Albumin		3.7	gm/dl		3.2-5.2					E
7	OBX	3	NM	1002	^	Globulin		3.9	gm/dL		1.7-3.7		H			E
8	OBX	4	NM	1003	^	A/G Ratio		1.2			1.1-2.9					E
9	OBX	5	NM	1004	^	Glucose		71	mg/dL		70-99					E
10	OBX	6	NM	1005	^	Sodium		134	mmol/L		133-145					E
11	OBX	7	NM	1006	^	Potassium		4.3	mmol/L		3.3-5.3					E
12	OBX	8	NM	1007	^	Chloride		96	mmol/L		96-108					E
13	OBX	9	NM	1008	^	CO2		24	mmol/L		21-29					E
14	OBX	10	NM	1009	^	BUN		17	mg/dl		7-25					E
15	OBX	11	NM	1010	^	Creatinine		1.1	mg/dl		0.6-1.3					E
16	OBX	12	NM	2000	^	BUN/CreatRatio		15.5			10-28					E
17	OBX	13	NM	2001	^	Calcium		8.9	mg/dl		8.4-10.4					E
18	OBX	14	NM	2002	^	UricAcid		6.2	mg/dl		2.4-7					E
19	OBX	15	NM	2003	^	Iron		87	mcg/dl		30-160					E
20	OBX	16	NM	2004	^	Bilirubin.Total		0.6	mg/dl		1-1					E
21	OBX	17	NM	2005	^	LDH		190	u/l		94-250					E
22	OBX	18	NM	2006	^	AlkPhos		63	u/l		39-120					E
23	OBX	19	NM	2007	^	AST(SGOT)		33	u/l		0-37					E
24	OBX	20	NM	3000	^	Phosphorous		2.8	mg/dl		2.6-4.5					E
25	OBX	21	NM	3001	^	ALT(SGPT)		35	u/L		0-40					E
26	OBX	22	NM	3002	^	Gá□□GTP		33	u/L		7-51					E

Step 1: First of all we need to save reference ranges in database, for this I used TestRanges Persistent class:

Table: resultVer.TestRanges ☐ Table Info ☒ Fields ☐ Maps

Field Name	Datatype	Column #	Required	Unique
ID	%Library.BigInt	1	Yes	Yes
TestCode	%Library.Integer	2	No	No
MinRange	%Library.Double	3	No	No
MaxRange	%Library.Double	4	No	No

Step 2 :We need to create a custom function to get reference range, for this I created GetReferenceRange() ClassMethod function in utility class. Please note this class should be Extends from EnsRule.FunctionSet

```
// Get reference ranges from TestRanges table against test code
Debug this method
ClassMethod GetReferenceRange(TestCode As %String) As %String
{
    &sql(SELECT MinRange, MaxRange into :minRange,:maxRange
    FROM resultVer.TestRanges where TestCode = :TestCode)
    set minRange = $DECIMAL(minRange,3)
    set maxRange = $DECIMAL(maxRange,3)

    Set refRange = minRange _ "-" _ maxRange
    //Set refRange = "Test"
    Return refRange
}
```

We need to create an other function to set Abnormal Flag, for this I created SetAbnormalFlag() ClassMethod function in utility class

```
// Get Abnormal flag based on Test Code and Result
Debug this method
ClassMethod SetAbnormalFlag(TestCode As %String, Result As %Decimal) As %String
{
    &sql(SELECT MinRange, MaxRange into :minRange,:maxRange
    FROM resultVer.TestRanges where TestCode = :TestCode)
    //Set Flag to L in case of Low Range
    if Result < minRange
    {
        Return "L"
    }
    //Set Flag to H in case of High Range
    elseif Result > maxRange
    {
        Return "H"
    }
    //Return empty strign in case of normal result
    Return ""
}
```

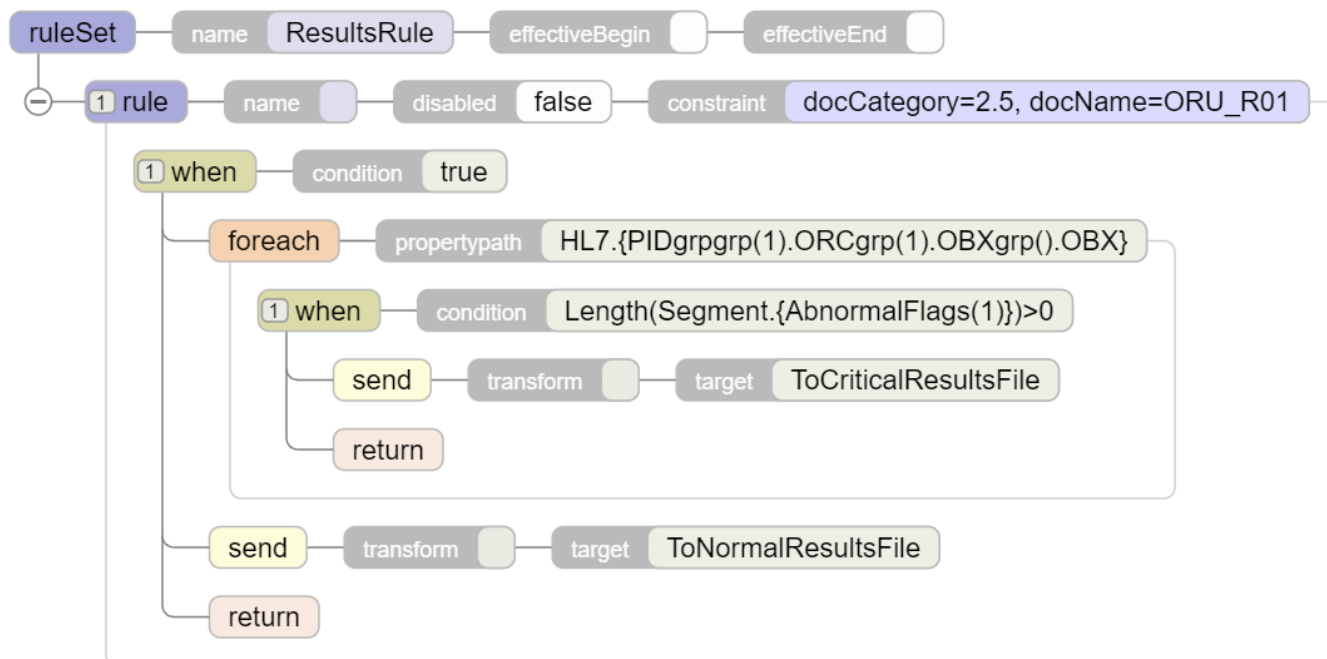
Step 3: Now we will use these functions in Data Transformation (UpdateReferenceRangesDTL). We need to use foreach loop against the repeating segments:

Actions					
#	Action	Condition	Property	Value	Key / Transform
1	for each ▼		source.{PIDgrpgrp()}		k1
2	for each ▼		source.{PIDgrpgrp(k1).ORCgrp()}		k2
3	for each ▼		source.{PIDgrpgrp(k1).ORCgrp(k2).OBXgrp()}		k3
4	set		target.{PIDgrpgrp(k1).ORCgrp(k2).OBXgrp(k3)...}	##class(resultVer.Utility).GetReferenceRang...	""
5	set		target.{PIDgrpgrp(k1).ORCgrp(k2).OBXgrp(k3)...}	##class(resultVer.Utility).SetAbnormalFlag(...	""
6	endeach				
7	endeach				

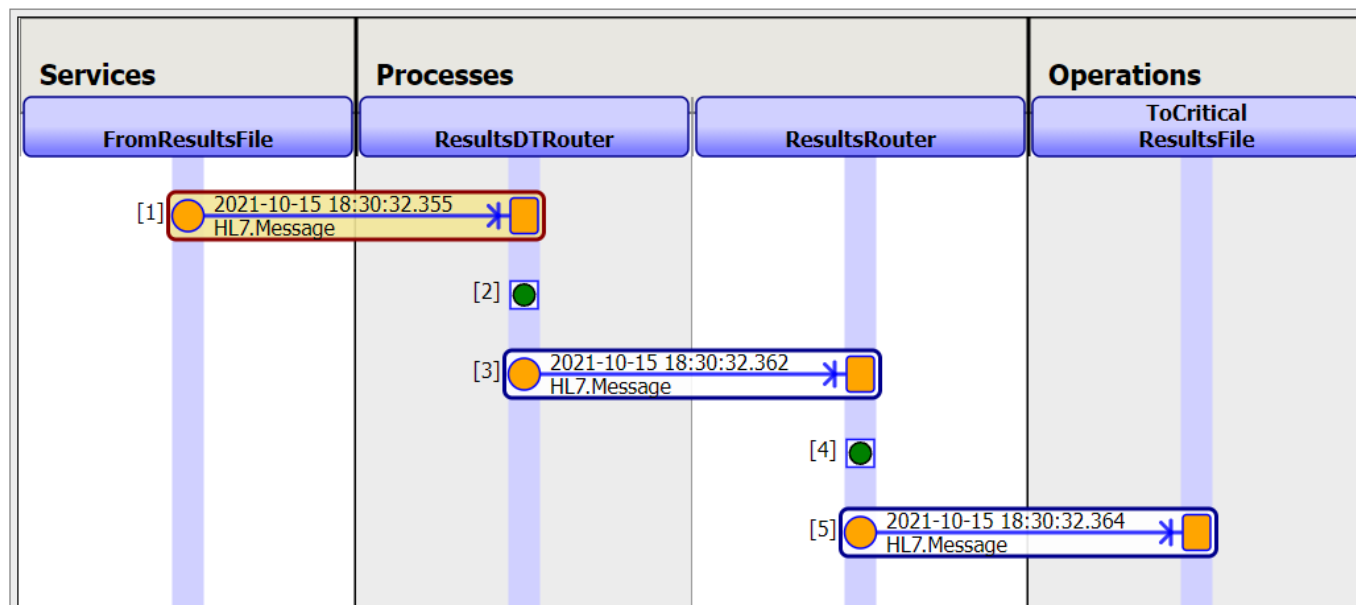
Action
set ▼
Property
target.{PIDgrpgrp(k1).ORCgrp(k2).OBXgrp(k3).OBX:ReferencesRange}
Property whose value will be set. Double-clicking on a target property in the diagram will place that property in this field.
Value
##class(resultVer.Utility).GetReferenceRange(source.{PIDgrpgrp(k1).ORCgrp(k2).OBXgrp(k3).OBX:ObservationIdentifier.Identifier})
Value to assign to the property. Double-clicking on a property in the diagram will place that property in this field.

Please note that in order to get Abnormal flag we have to pass OBX:ObservationValue (Result) along with OBX:ObservationIdentifier(TestId)

Step 4: We will transform the message from "ResultsDTRule" Business rule and send message to "ResultsRule" Business rule again to send message to "ToCriticalResultsFile" operation in case of Abnormal flag is set otherwise if will send to "ToCriticalResultsFile" operation:



Following Visual Trace Below Visual Trace is for the message successfully send to "ToCriticalResultsFile" Operation



Thanks

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Source
 URL: <https://community.intersystems.com/post/how-update-result-reference-range-and-abnormal-flag-accordingly-using-hl7>