

Exercise 3: Find Function to be re-generated

Goal

When you change an Internal Function in CA 2E or CA Plex RPG, you need to regen and compile External Functions that calls the Internal Function directory or in-directory.

We want to get list of Function to be regen and rebuild by changing an Internal Function

Could you define an approach of finding the answer for above?

Pre-definition

Node: Function

Boolean Property IsInternal indicate if the function is Internal or External

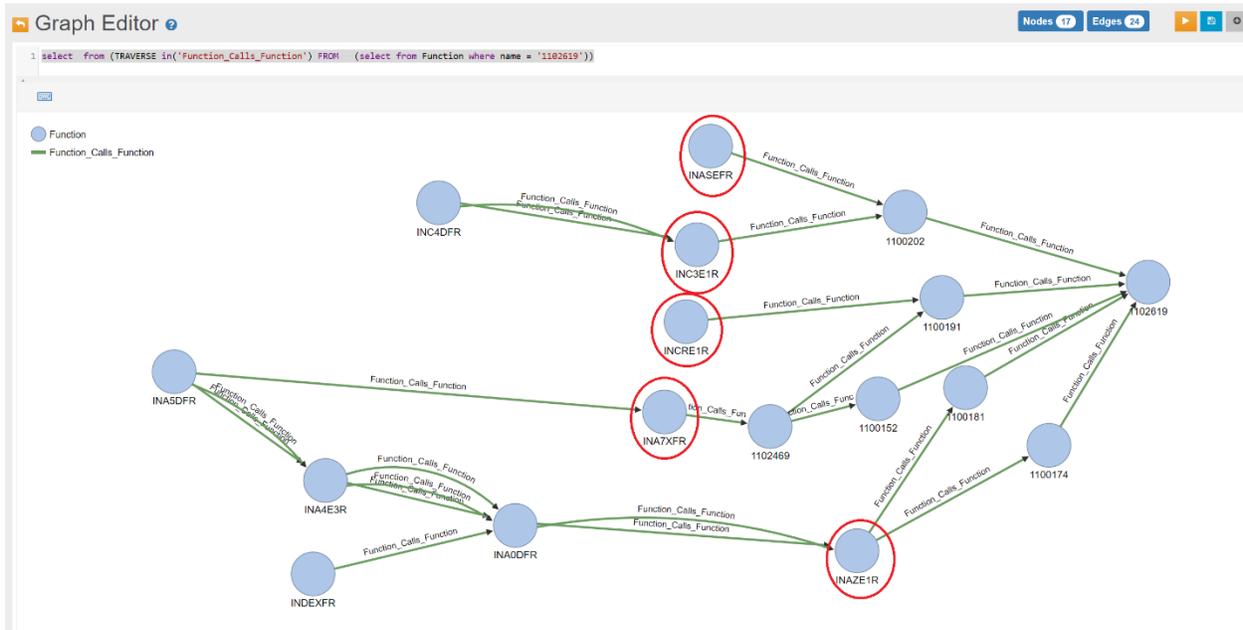
- True: Internal Function
- False: External function

The Internal Function's name is numeric as well

Edge: Function_Calls_Function

Functions are connected with Function_Calls_Function Edge

Use Function '1102619' as a modified Internal Function (start point)
 And find out how to get 'Red Circled' Functions



To do

Please document or draw how you approach to get the answer

There could be multiple answers and answer doesn't be necessary produce exact result.

- Database Query approach
- Programming approach

Hint: On Graph Viewer, execute bellow SQL, you get entire backward call graph from the Function '1102619'. (Internal Function names are numeric.) as like above image.

```
select from (TRAVERSE in('Function_Calls_Function') FROM (select from Function where name = '1102619'))
```

Help for available SQL

[SQL Reference · OrientDB Manual](#)

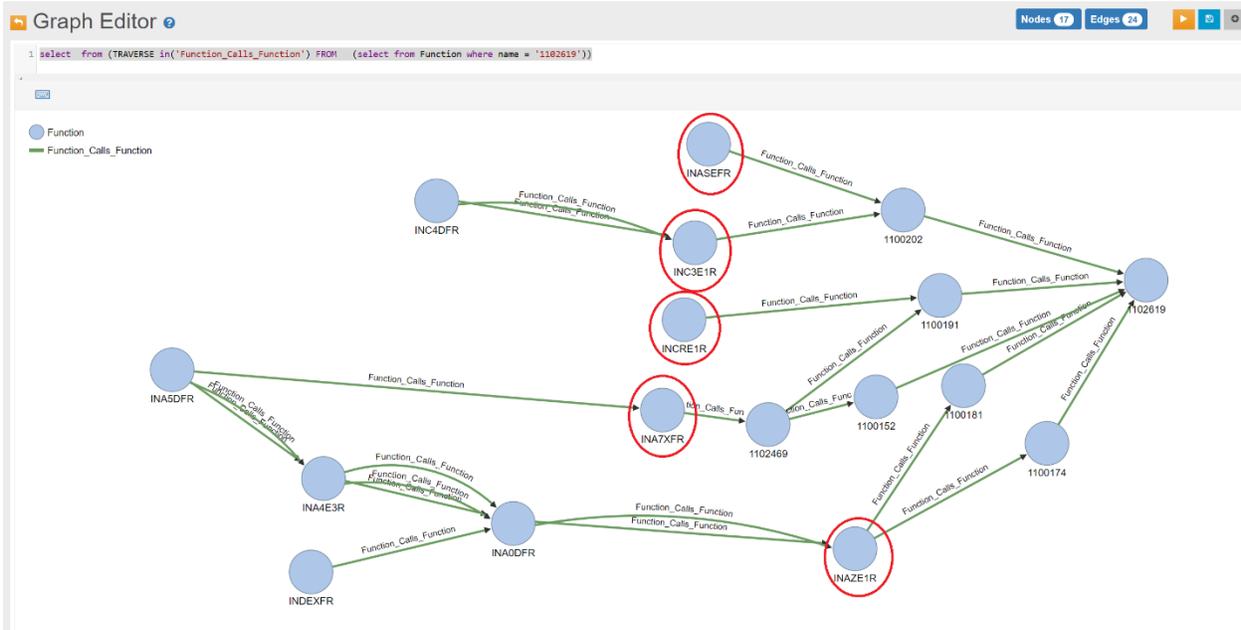
For Programming solution, you may have data as bellow

```
{ name: '1102619', IsInternal = true, caller: ['1100202', '1100191', '1100152', '1100174']}  
{ name: '1100202', IsInternal = true, caller: ['INASEFR', 'INC3E1R']}  
{ name: 'INASEFR', IsInternal = false, caller: null}  
{ name: 'INC3E1R', IsInternal = false, caller: ['INC4DFR']}  
{ name: '1100191', IsInternal = true, caller: ['INCRE1R', '1102469']}  
{ name: 'INCRE1R', IsInternal = false, caller: null}  
{ name: '1102469', IsInternal = true, caller: ['INA7XFR']}  
{ name: 'INA7XFR', IsInternal = false, caller: ['INA5DFR']}  
{ name: '1100152', IsInternal = true, caller: ['1102469']}  
...
```

Intermediate storage

```
HashMap<string> visited  
HashMap<string> result
```


3. Get direct caller of the result of #2
 - a. Filter only it is External



4. It is an answer

Sample query

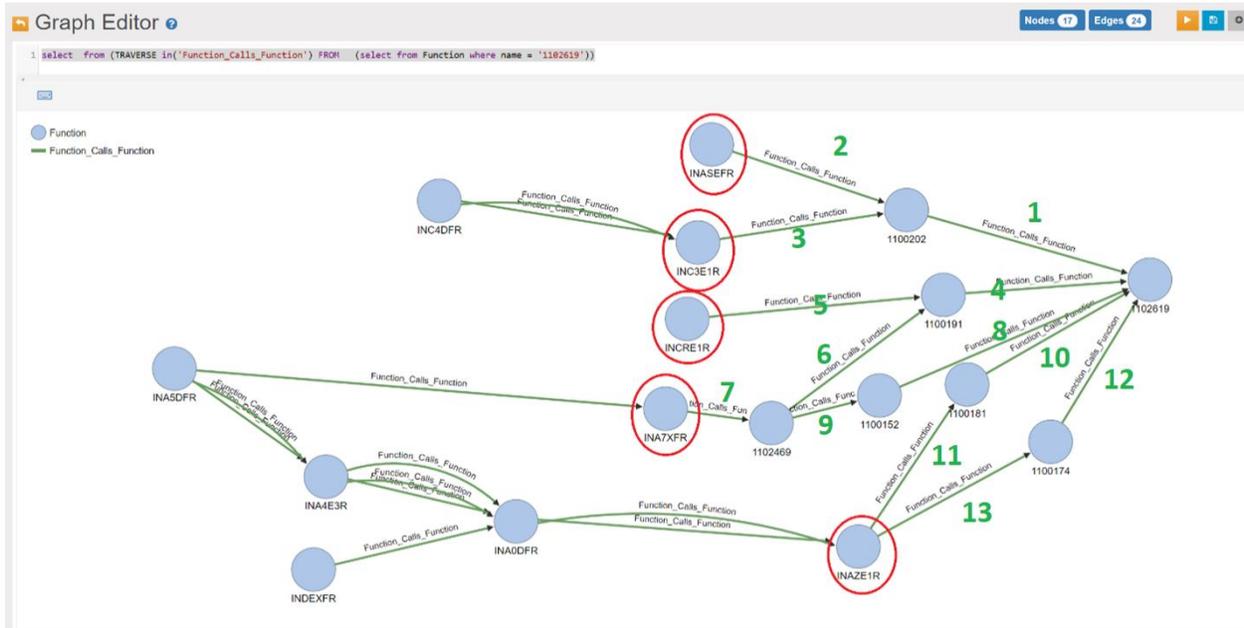
```
select expand($Externals) let $Internals = (TRAVERSE in('Function_Calls_Function') FROM (select from Function where name = '1102619') while ( $Internal = true)), $Externals = (select distinct(name) from (TRAVERSE in('Function_Calls_Function') FROM $Internals MAXDEPTH 1 ) where $Internal = false)
```

By changing below, multiple Function can be checked

```
select expand($Externals) let $Internals = (TRAVERSE in('Function_Calls_Function') FROM (select from Function where name in ['1102619', '1100113'] while ( $Internal = true)), $Externals = (select distinct(name) from (TRAVERSE in('Function_Calls_Function') FROM $Internals MAXDEPTH 1 ) where $Internal = false)
```

Programming answer:

- Using DFS (Depth First Search) algorithm start from '1102619'
- Visit Nodes and check IsInternal value Only when the Node is not visited yet
 - o If true put to result and stop navigation
 - o If false continue next layer



Starts 1102619

1. 1100202 (IsInternal = true) continue
2. **INASEFR** (IsInternal = false) add to result, stop and move back to 1100202
3. **INC3E1R** (IsInternal = false) add to result, stop and move back 1100202 then back to 1102619
4. 1100191 (IsInternal = true) continue
5. **INCRE1R** (IsInternal = false) add to result, stop and move back to 1100191
6. 1102469 (IsInternal = true) continue
7. **INA7XFR** (IsInternal = true) add to result, stop and move back 1102469 then back to 1100191 back to 1102619
8. 1100152 (IsInternal = true) continue
9. **1102469** (IsInternal = true) stop here since 1102569 is already visited at #6, back 1100152 then back to 1102619
10. 1100181 (IsInternal = true) continue
11. **INAZE1R** (IsInternal = false) add to result, stop and move back 1100181 then back to 1102619
12. 1100174 (IsInternal = true) continue
13. **INAZE1R** (IsInternal = false) stop here since INAZE1R is already visited at #11 back 1100174 then back to 1102619
14. End of look up **RED** is the answer