Block 1

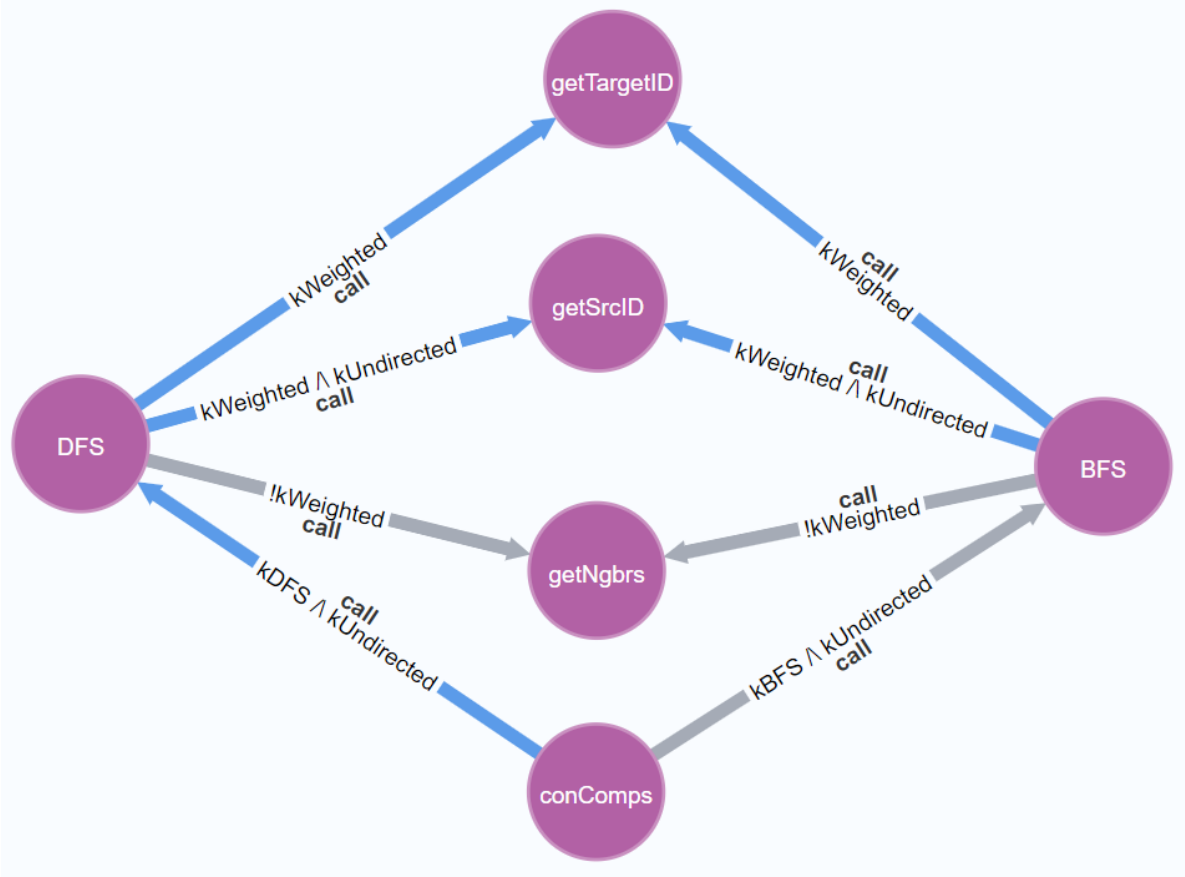
Q14. In this questionnaire, you will be asked to perform 12 tasks that are similar to those that you performed at the first stage of the study. For these tasks, you will not have to run any query. Instead, we will provide you an image of the nodes and links for each task. Purple nodes represent functions and orange nodes represent variables.

As in the previous stage of the study, you will be asked to identify links that represent program statements/actions that may execute in certain program variants. Recall that if a feature is not mentioned in a link's presence condition, then the feature's status (enabled or disabled) plays no role in whether the link can execute.

The bar at the top of the page shows your progress through the questionnaire.

Stripes filters

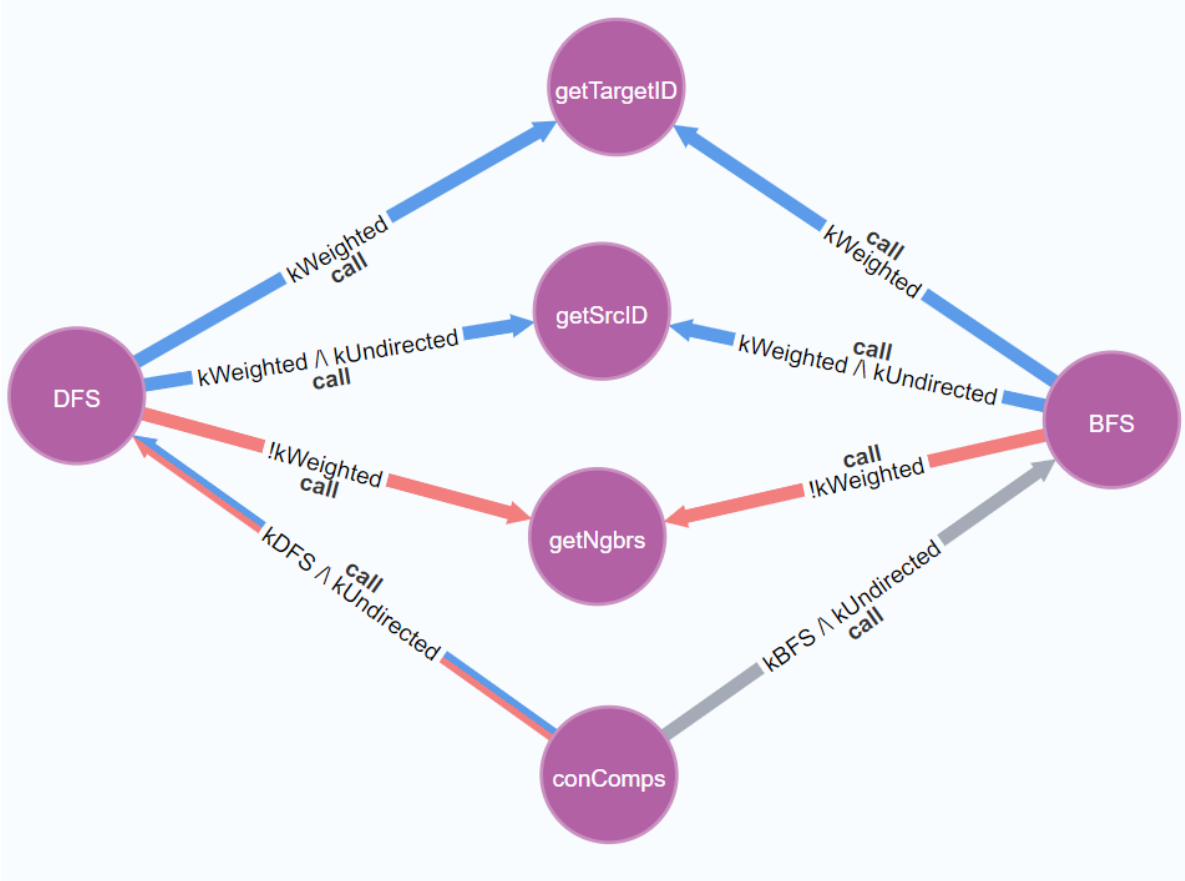
Stripes filter 1.



List the name of the function(s) that may be called directly or indirectly by function

conComps in a variant with the following configuration: *kDFS /\ !kBFS /\ kUndirected /\ kWeighted* (blue)

Stripes filter 2.

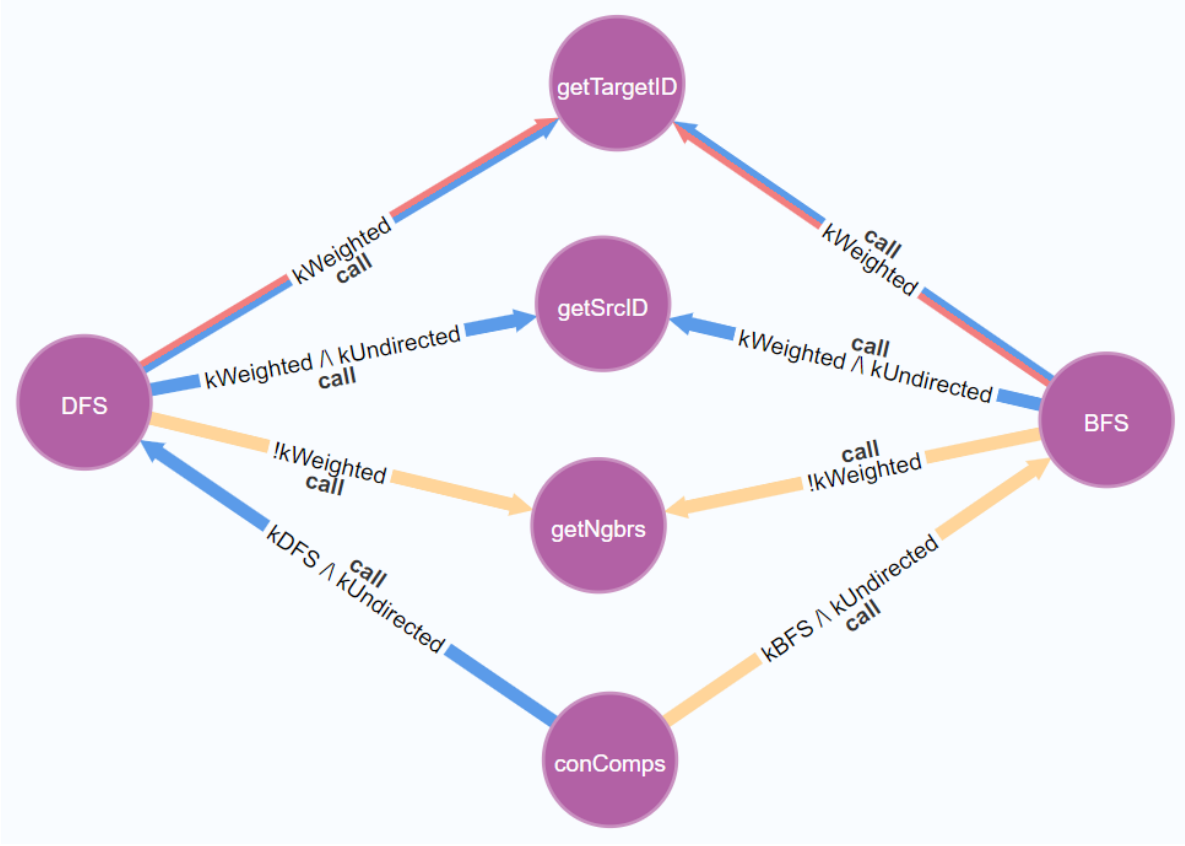


V1 (blue): kDFS /\ !kBFS /\ kUndirected /\ kWeighted
V2 (red): kDFS /\ !kBFS /\ kUndirected /\ !kWeighted

Which of the call chain(s) may execute in V1 but not in V2? Select all options that apply.

- [ ] conComps->DFS->getNgbrs
- [ ] conComps->DFS->getSrcID
- [ ] conComps->DFS->getTargetID

Stripes filter 3.

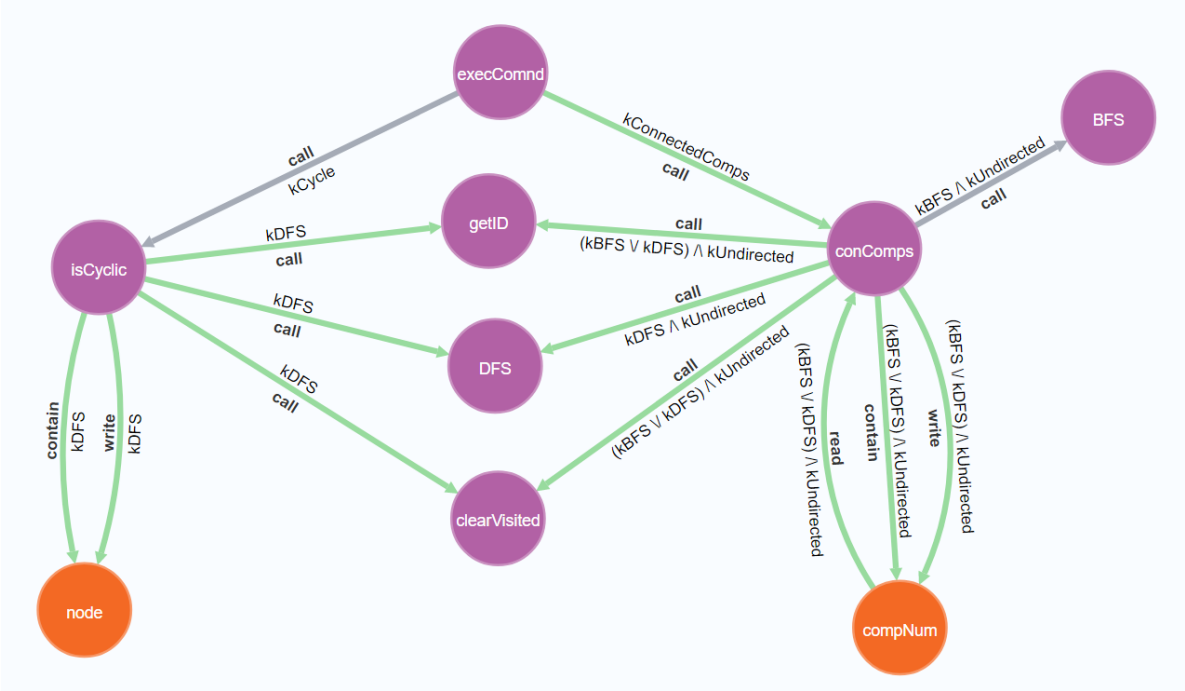


V1 (blue): kUndirected /\ kWeighted /\ kDFS /\ !kBFS
V2 (red): !kUndirected /\ kWeighted /\ kDFS /\ !kBFS
V3 (yellow): kUndirected /\ !kWeighted /\ !kDFS /\ kBFS

Considering the variants above, which variant may not execute any of the call chains starting at the **conComps** function?

Segments filters

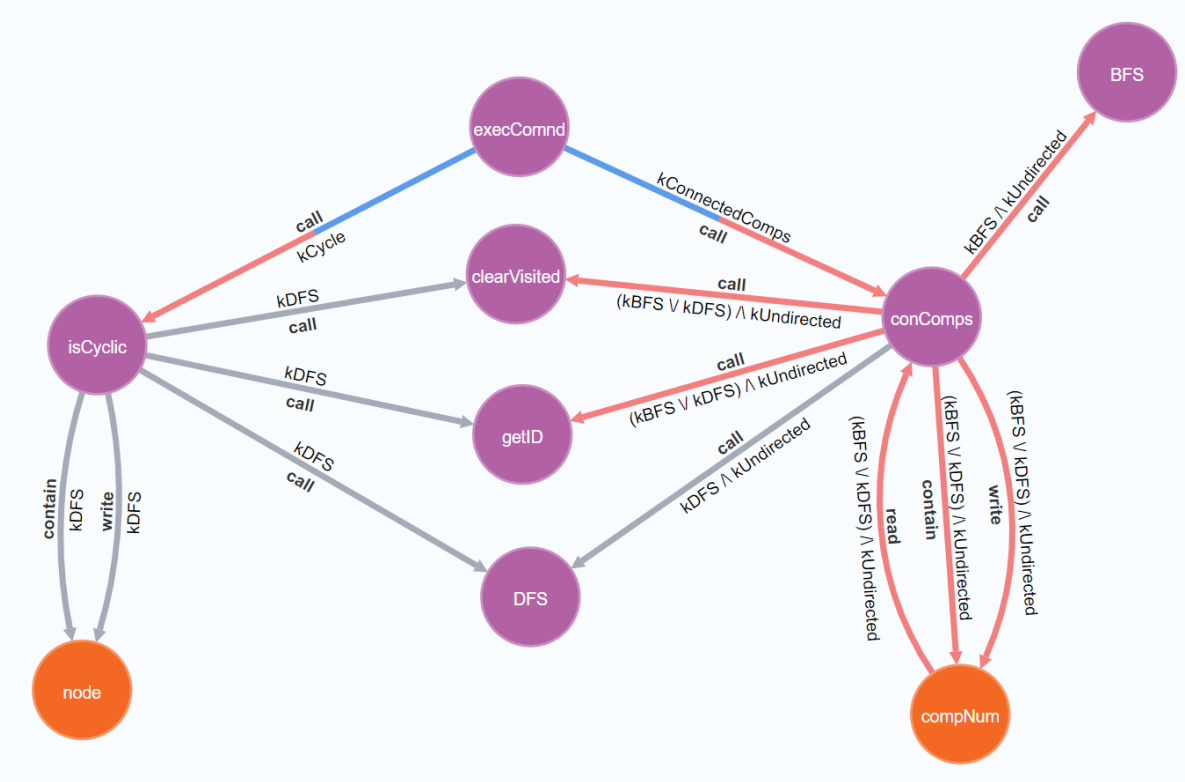
Segments filter 1.



Which path(s) may fully execute in variant *kDFS /\ !kBFS /\ kUndirected /\ !kCycle /\ kConnectedComps* (green)? Select all the options that apply.

- [ ] execComnd->isCyclic->getID
- [ ] execComnd->conComps->BFS
- [ ] execComnd->conComps->getID

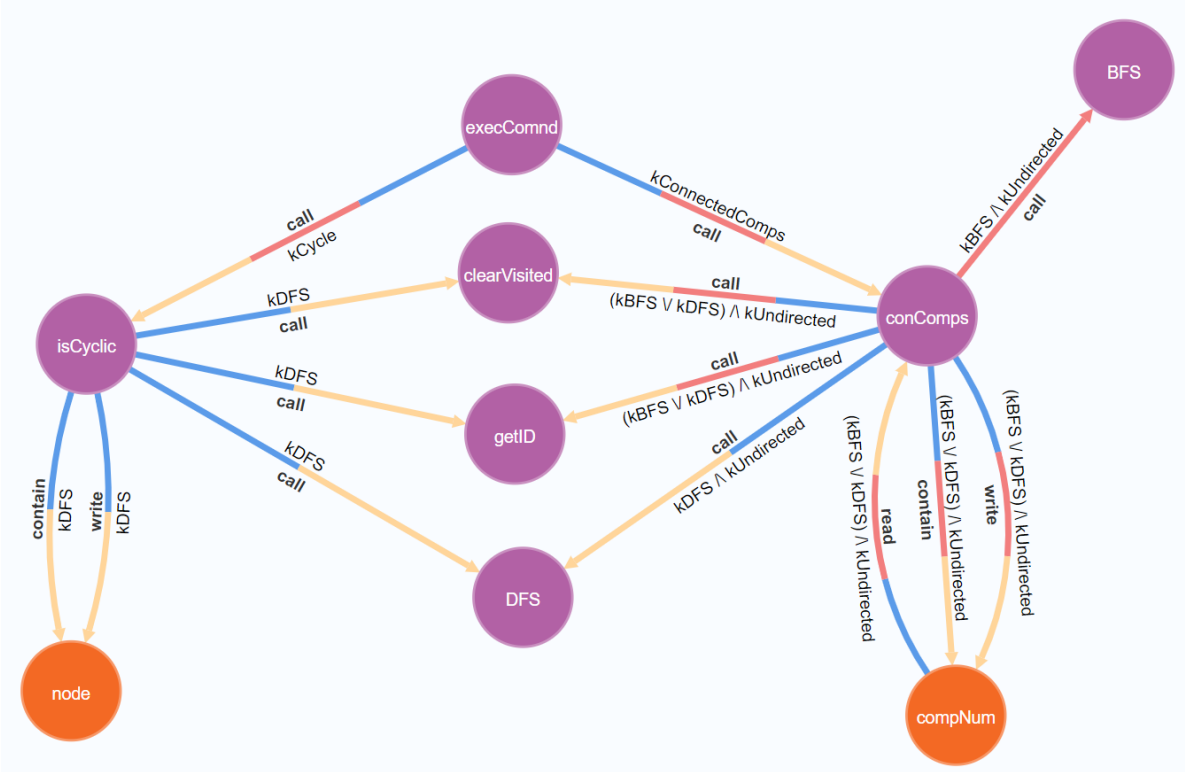
Segments filter 2.



V1 (blue): !kUndirected /\ kConnectedComps /\ kBFS /\ !kDFS
V2 (red): kUndirected /\ kConnectedComps /\ kBFS /\ !kDFS

Considering the variants above, which variant may execute the call path between functions **execCommand** and **BFS**?

Segments filter 3.

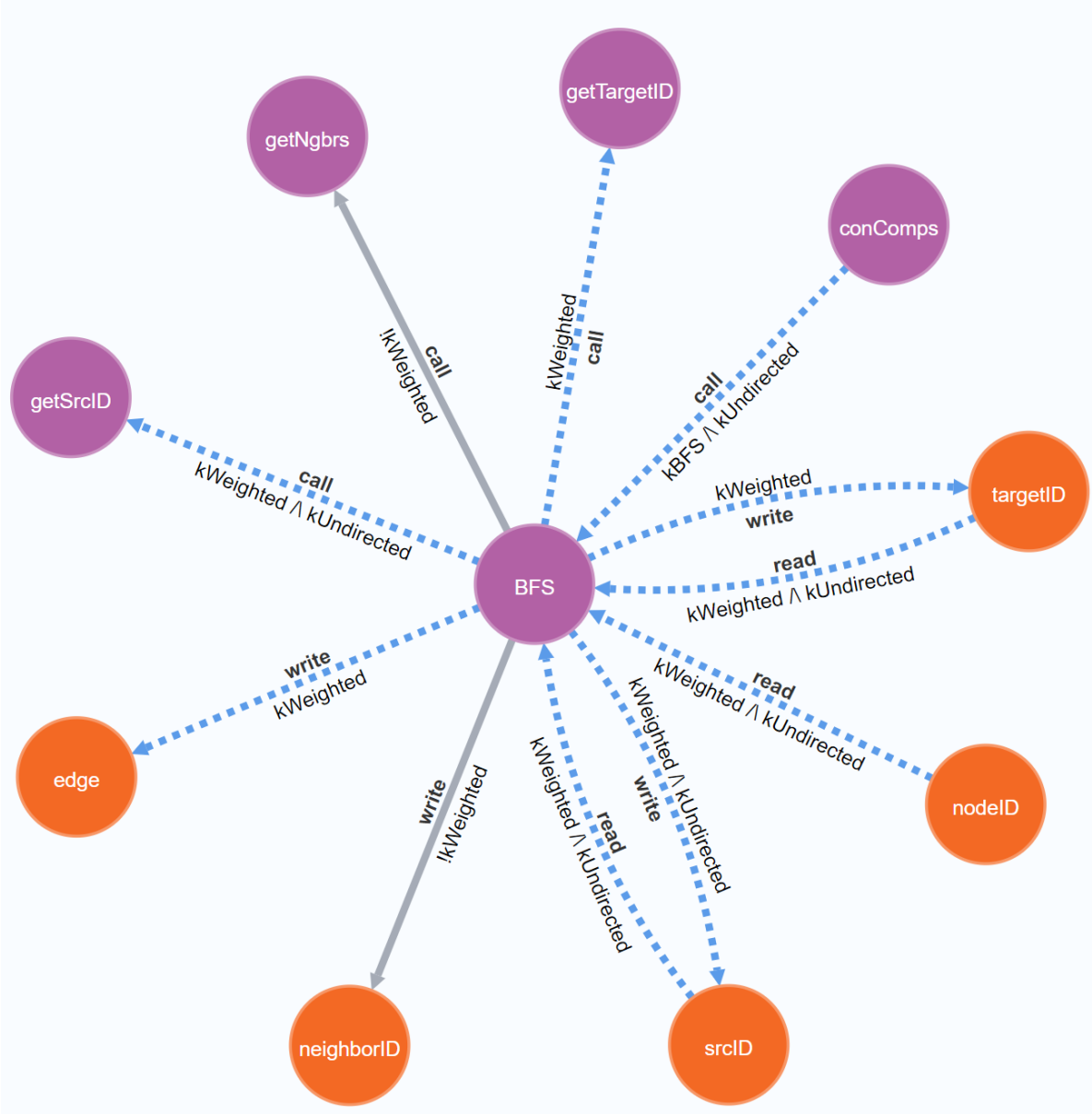


V1 (blue): kUndirected /\ kWeighted /\ kDFS /\ !kBFS
V2 (red): kUndirected /\ !kWeighted /\ !kDFS /\ kBFS
V3 (yellow): kUndirected /\ !kWeighted /\ kDFS /\ !kBFS

Considering the variants above, list the name of functions that may be called by **conComps** in either of the variants above, i.e., the listed functions may be called in V1, V2, and V3.

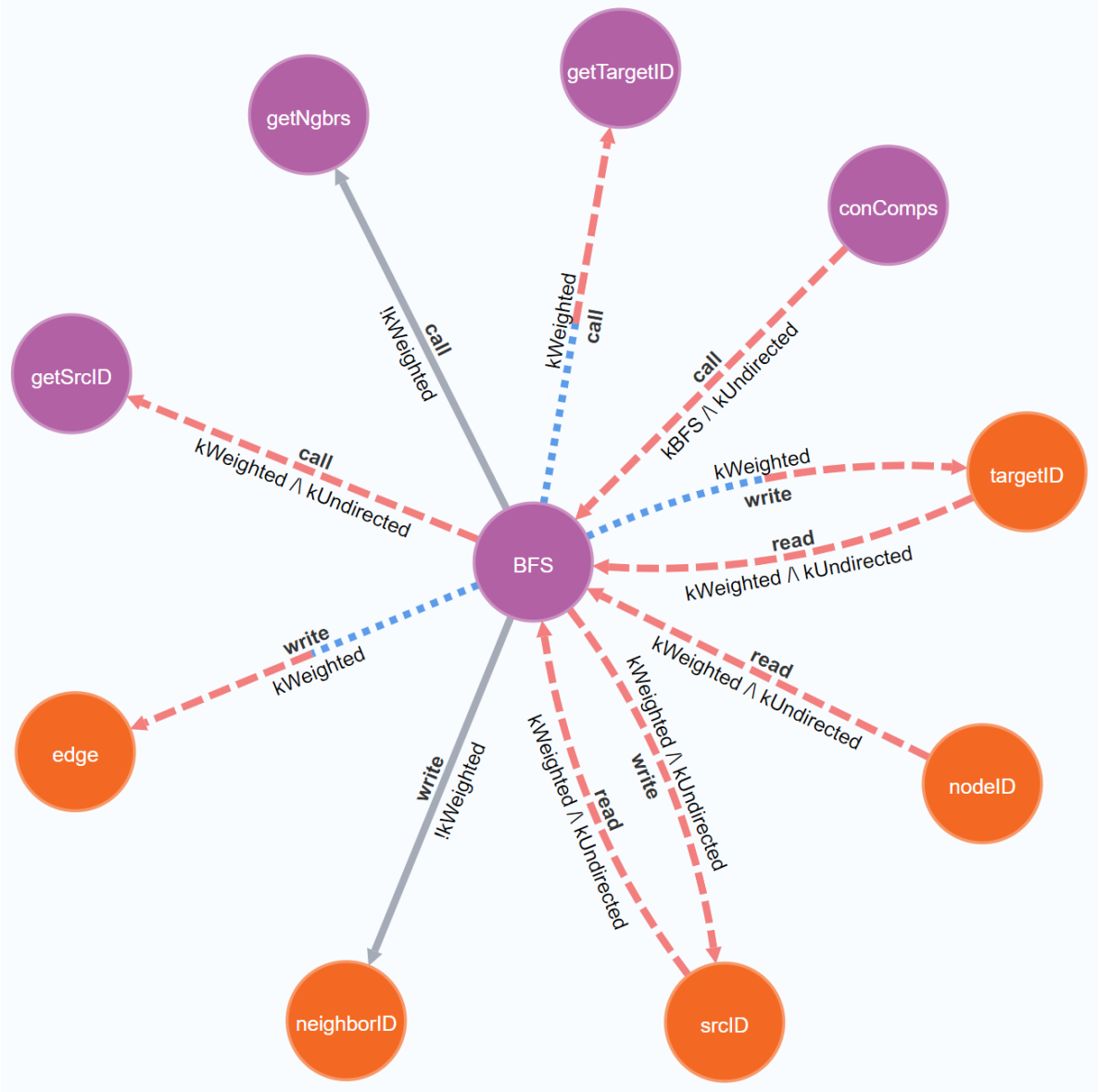
Shape filters

Shape filter 1.



Which variable(s) may be written by **BFS** if the *kWeighted* feature is disabled? The filter highlights links that may execute in variants that includes *kWeighted*.

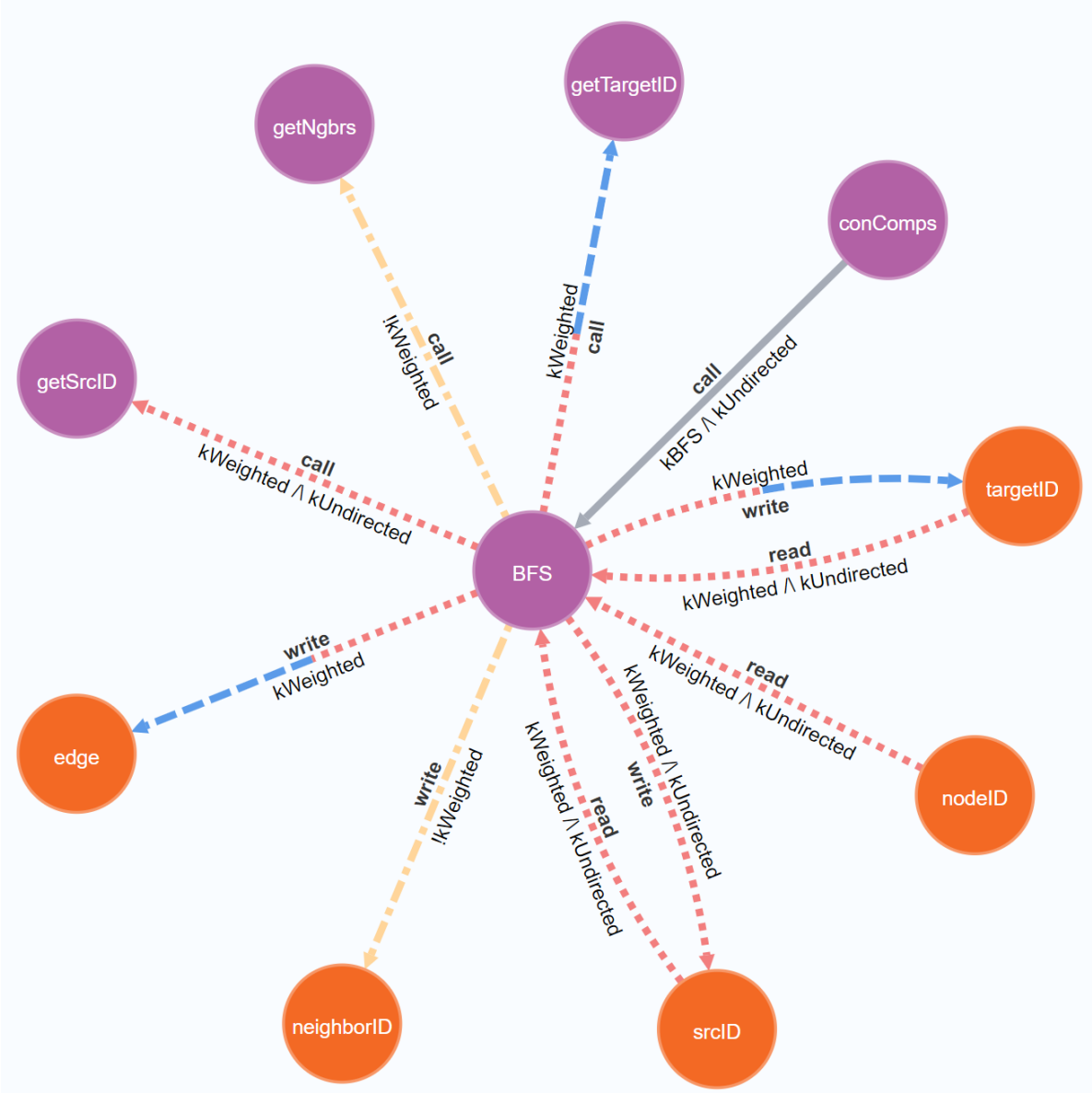
Shape filter 2.



V1(blue): kWeighted /\ !kUndirected
V2(red): kWeighted /\ kUndirected

In which variant the function **BFS** can read values from variables **nodeID, srcID, targetID**?

Shape filter 3.

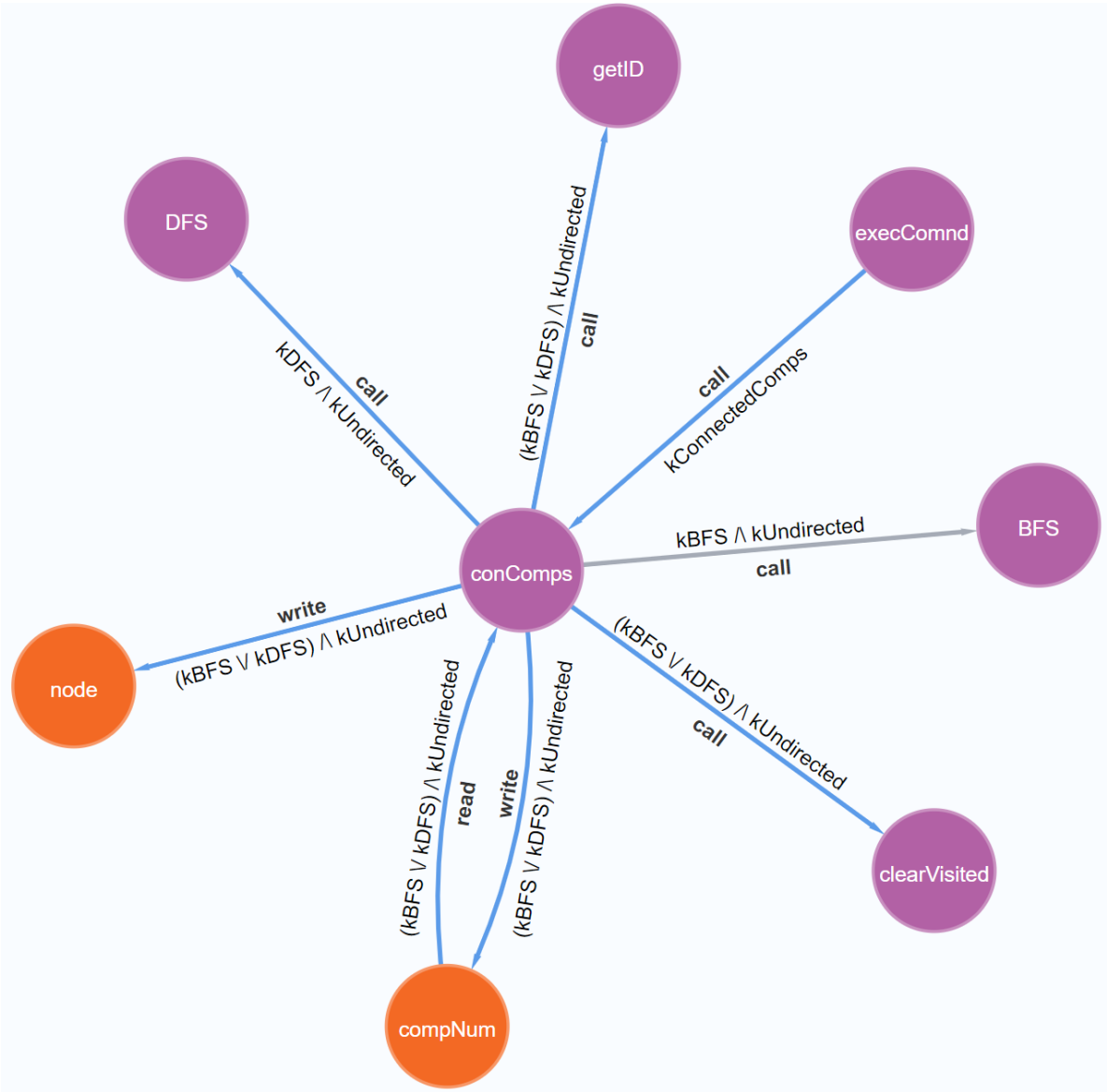


V1 (red): kUndirected /\ kWeighted /\ !kBFS
V2 (blue): !kUndirected /\ kWeighted /\ !kBFS
V3 (yellow): !kUndirected /\ !kWeighted /\ kBFS

Considering the variants above, in which variant does the function **BFS** have fewest relationships with other functions and variables? Please list the name of the nodes interacting with **BFS** in that variant and the type of their relationship.

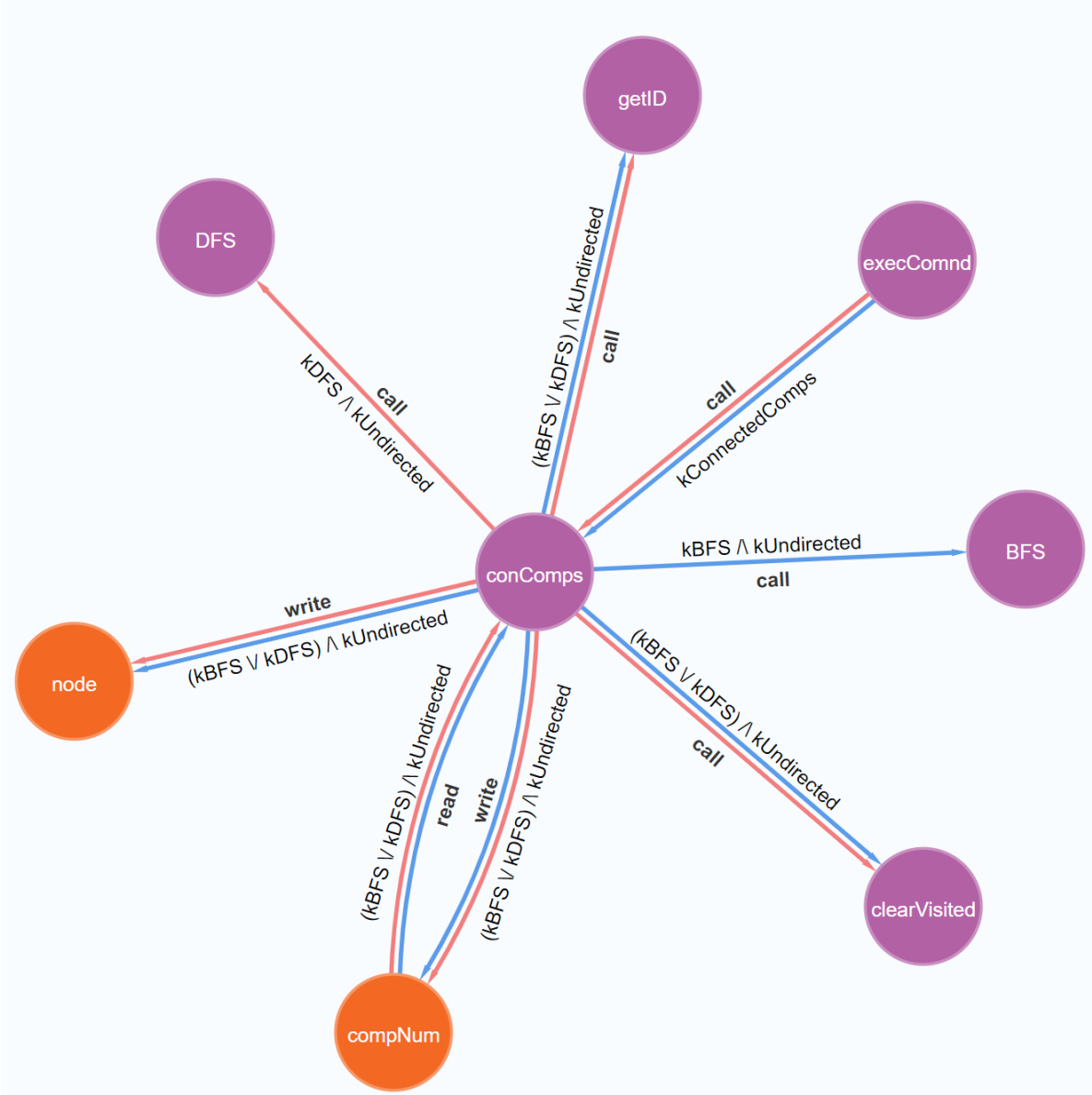
Separate-links filters

Separate-links 1.



Is there any dataflow (read/write relationship) between the variable **node** and the function **conComps** in variant *kDFS /\ !kBFS /\ kUndirected* (blue)?

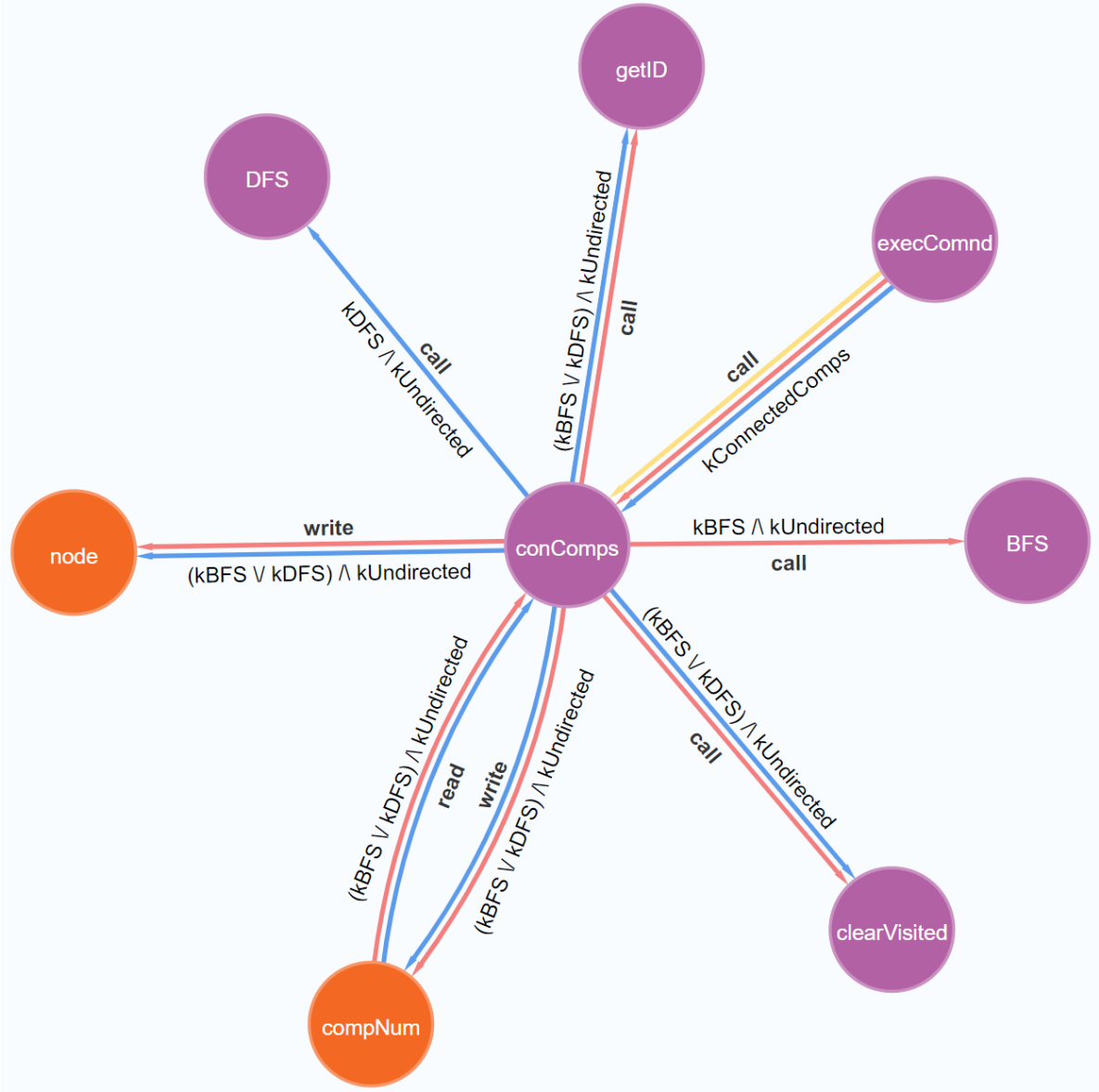
Separate-links 2.



V1(blue): kBFS /\ !kDFS /\ kUndirected
V2(red): !kBFS /\ kDFS /\ kUndirected

List the names of the functions that can be called by **conComps** in both variants

Separate-links 3.



V1 (blue): kUndirected /\ kDFS /\ !kBFS /\ kConnectedComps
V2 (red): kUndirected /\ !kDFS /\ kBFS /\ kConnectedComps
V3 (yellow): !kUndirected /\ kDFS /\ !kBFS /\ kConnectedComps

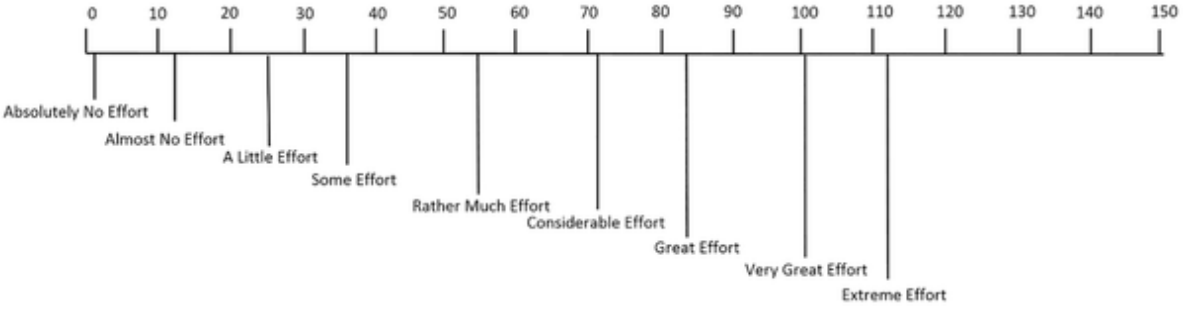
Which variant may **not** execute the following sequence: a call from function **execComnd** to function **conComps** followed by a write between function **conComps** and the variable **compNum**?

Feedback and mental effort

Q1. How much do you agree with the following statements?

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I found that interpreting the coloured filters were unnecessarily complex	○	○	○	○	○
I found the coloured filters very cumbersome to interpret	○	○	○	○	○
I found the coloured filters made it easier to identify the program variant in which a relationship holds	○	○	○	○	○
I needed to learn a lot of things before I could identify the program variant in which a relationship holds	○	○	○	○	○
I found the coloured filters customization was easy to access	○	○	○	○	○
I thought the filter customization was easy to use	○	○	○	○	○
I would imagine that most people would learn to customize the filters very quickly	○	○	○	○	○
I found the coloured filters increased the mental effort to perform the tasks	○	○	○	○	○

Q2. Place a mark on the scale indicating the mental effort you applied for each type of task



	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Find fact on program variant																
Compare two program variants																

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Compare multiple program variants																

Q3. Consider you have $100 dollars to assign to the visualization options that ease your experience of identifying program facts that holds in particular program variants. The amount of dollars assigned to each option represents your preference for them. Distribute your $100 dollars on the list below.

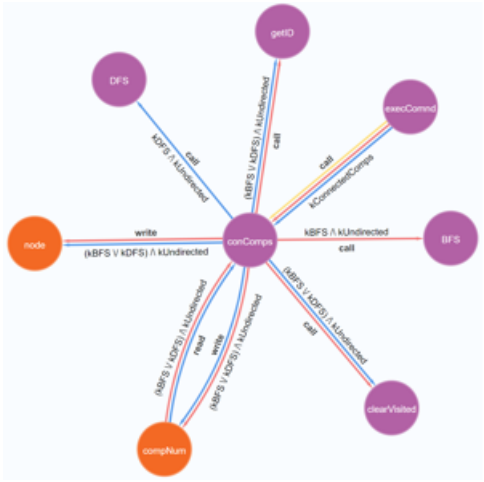
Textual annotations (uncoloured links)

$ 0

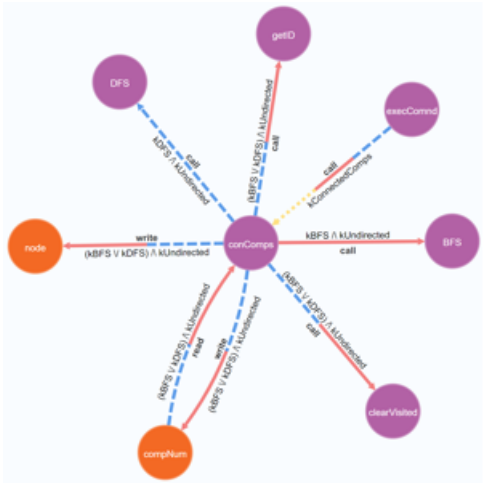
Segments filters

$ 0

Stripes filters $ 0



Separate-links filters $ 0



Shape filters $ 0

Total $ 0

Q47. What is your preferred syntax to represent boolean expressions?

- ○ && (and), || (or)
- ○ /\ (and), \/ (or)
- ○ No preference. I am OK with either of them

Feedback and suggestion

Q1. What are your general impressions of the presented tool?

Q2. Do you have any suggestions for improvements to the presented tool? If so, please describe them below.