
Algorithm 1: Detector of prefix-based forwarding patterns based on an IP list l and an IP-to-AS mapping tool M .

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1 detector  $\Rightarrow$  Input:  $l, M$ 
2    $db \leftarrow exploration(l, M)$ 
3   for  $AS$  in  $db$  do
4     for  $(i, e)$  in  $db[AS]$  do
5        $\mathcal{P}, \mathcal{R} \leftarrow db[AS][(i, e)]$ 
6        $P, \mathcal{R} \leftarrow prefix\text{-}grouping(\mathcal{P}, \mathcal{R})$ 
7        $R \leftarrow multi\text{-}route\text{-}discovery(P, \mathcal{R}, AS, (i, e), M)$ 
8        $P, R \leftarrow merging(P, R)$ 
9        $forwarding\text{-}pattern[AS][(i, e)] \leftarrow classifier(P, R)$ 

10 prefix-grouping  $\Rightarrow$  Input:  $\mathcal{P}, \mathcal{R}$ 
11    $P \leftarrow \emptyset$ 
12    $\mathcal{R}' \leftarrow set(\mathcal{R})$ 
13   for  $R'$  in  $\mathcal{R}'$  do
14      $\mathcal{P}' \leftarrow \emptyset$ 
15     for  $P, R$  in  $\mathcal{P}, \mathcal{R}$  do
16       if  $R = R'$  then
17          $\mathcal{P}' \leftarrow \mathcal{P}' \cup P$ 
18      $P \leftarrow P \cup \mathcal{P}'$ 
19   return  $P, \mathcal{R}'$ 

20 multi-route-discovery  $\Rightarrow$  Input:  $P, \mathcal{R}, AS, (i, e), M$ 
21    $R \leftarrow \emptyset$ 
22   for  $\mathcal{P}, R$  in  $P, \mathcal{R}$  do
23      $\mathcal{R}' \leftarrow R$ 
24     for  $P$  in  $\mathcal{P}$  do
25       for  $IPA$  in  $P$  do
26          $T \leftarrow trace(IPA)$ 
27          $R' \leftarrow internal\text{-}route(T, AS, (i, e), M)$ 
28          $\mathcal{R}' \leftarrow \mathcal{R}' \cup R'$ 
29      $R \leftarrow R \cup \mathcal{R}'$ 
30   return  $R$ 

31 merging  $\Rightarrow$  Input:  $P = \{\mathcal{P}_1, \dots, \mathcal{P}_r\}, R = \{\mathcal{R}_1, \dots, \mathcal{R}_r\}$ 
32    $j \leftarrow 1$ 
33   while  $j \leq |R| - 1$  do
34      $k \leftarrow 0$ 
35     do
36       if  $\mathcal{R}_j \cap \mathcal{R}_k \neq \emptyset$  then
37          $\mathcal{R}_j \leftarrow \mathcal{R}_j \cup \mathcal{R}_k, \mathcal{P}_j \leftarrow \mathcal{P}_j \cup \mathcal{P}_k$ 
38          $R \leftarrow R \setminus \mathcal{R}_k, P \leftarrow P \setminus \mathcal{P}_k$ 
39          $j \leftarrow j - 1$ 
40       else
41          $k \leftarrow k + 1$ 
42     while  $k \leq j$ 
43      $j \leftarrow j + 1$ 
44   return  $P, R$ 

45 classifier  $\Rightarrow$  Input:  $P, R$ 
46    $prefix\text{-}based \leftarrow 0$ 
47    $s \leftarrow |P|$  or  $s \leftarrow |R|$ 
48   if  $s \geq 2$  then
49      $prefix\text{-}based \leftarrow 1$ 
50   return  $prefix\text{-}based$ 

51  $R$  represents a route,  $\mathcal{R} = \{R_1, \dots, R_n\}$  is a set of routes, and  $R = \{\mathcal{R}_1, \dots, \mathcal{R}_n\}$  is
a set of sets of routes. The same convention is used for prefixes, i.e., we use  $P, \mathcal{P}$ 
and  $P$ , respectively.

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