A Policy-based Network Access Control

draft-ma-opsawg-ucl-acl-00

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Problem Statement

The address and/or ports based access control list (ACL) are often insufficient in the expression of real-world network access.

- Mobile office makes the IP addresses of employees change frequently.
- Different security policies need to be applied to the same set of users under different circumstances (e.g., users' location, users' role, time-of-day, type of network device used).
Solution Overview

• Ensure enforcement of access control policies based on user-group identity:

  During 8am-5pm every workday:
  ➢ Deny source group ID sales to destination youtube.com workday

  During off-hours and weekends:
  ➢ Permit source group ID sales to destination youtube.com non-workday

• What’s a user-group?
  ➢ An identifier that represents the collective identity of a group of users
  ➢ The ones who access the network and consumes specific network services/resources.
UCL Extension to the ACL model

User-group based ACL example

<table>
<thead>
<tr>
<th>src</th>
<th>dst</th>
<th>Finance group</th>
<th>Sales group</th>
<th>10.1.1.0/24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales group</td>
<td>permit</td>
<td>permit</td>
<td>deny</td>
<td></td>
</tr>
<tr>
<td>Visitor group</td>
<td>deny</td>
<td>permit</td>
<td>deny</td>
<td></td>
</tr>
<tr>
<td>10.1.1.1/24</td>
<td>permit</td>
<td>deny</td>
<td>permit</td>
<td></td>
</tr>
</tbody>
</table>

To cover the following types of access control:
- U2U: user-group to user-group access
- N2N: IP address prefix to IP prefix access
- U2N: user-group to IP prefix access.
- N2U: IP prefix to user-group access.

To realize time variant access policies, e.g., restrict access to specific websites during 8am~5pm, every workday.

module: ietf-ucl-acl
  +--rw (user-control-groups)?
  +--:(source-match)
    |  +--rw source-match
    |  +--rw (destination-match)?
    |     +--:(user-group) {match-on-user-group}?
    |     |  +--rw user-group-name? string
    |     +--:(IP-address)
    |     |  +--rw ipv4-network? inet:ipv4-prefix
    |     |  +--rw ipv6-network? inet:ipv6-prefix
    +--:(destination-match)
    +--rw destination-match
    +--rw (destination-match)?
    +--:(user-group) {match-on-user-group}?
    |  +--rw user-group-name? string
    +--:(IP-address)
    |  +--rw ipv4-network? inet:ipv4-prefix
    |  +--rw ipv6-network? inet:ipv6-prefix

augment /acl:acls/acl:acl:acl:aces/acl:ace:
  +--rw time-range
  +--rw (time-range-type)?
  +--:(periodic-range)
    |  +--rw month* lmap:month-or-all
    |  +--rw day-of-month* lmap:day-of-months-or-all
    |  +--rw day-of-week* lmap:weekday-or-all
    |  +--rw hour* lmap:hour-or-all
    +--:(absolute-range)
    |  +--rw start-time? yang:date-and-time
    |  +--rw end-time? yang:date-and-time

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Alternatives to realize group ID to address mapping

<table>
<thead>
<tr>
<th>Group ID</th>
<th>User name</th>
<th>IP address</th>
<th>Login time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alice</td>
<td>10.223.32.96/32</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td>Bob</td>
<td>10.223.32.64/32</td>
<td>...</td>
</tr>
<tr>
<td>2</td>
<td>Cindy</td>
<td>10.223.32.144/32</td>
<td>...</td>
</tr>
</tbody>
</table>

If PEP is also the user authentication device, it already maintains the mapping information.

If PEP has no user group ID information, it queries the mapping from the controller side.

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Comments, Questions, Concerns?