I2RS working group
Internet-Draft
Intended status: Standards Track
Expires: March 30, 2015

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September 26, 2014

# An Information Model for Basic Network Policy
## draft-hares-i2rs-bnp-info-model-00

Abstract

This document contains three information Models: Basic Network Policy (BNP IM). ACLs do not provide all the policy support required by BGP, Policy Based Routing (PBR), SFC Topology Information Model (SF-Topo IM), Service Forwarding Chaing IM (SFC IM), and and flow specification filtering. The BNP IM has the following top-down levels of Policy Hierarchy: Policy Set, Policy Group, Policy Rule, and conditional actions within the policy rule (conditional match and Actions). These can be used in PBR-RIB or BGP to provide an ordered set of policy rules grouped with a Policy Group via operators (AND, OR, etc.) and ordered by a combination of priority and precedence. The Policy is an ordered set of Policy Groups.

The BNP IM is based on the concept of an extensible information model for representing policies. This concept is also found in the Policy Core Information Model (PCIM) (RFC3060) and the Quality of Service (QoS) Policy Information Model (QPIM)(RFC3644) and policy based routing.

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## 1. Introduction

The Interface to the Routing System (I2RS) provides read and write access to the information and state within the routing process within routing elements. The I2RS client interacts with one or more I2RS agents to collect information from network routing systems.

Processing of collected information at the I2RS agent may require the I2RS Agent to filter certain information or group pieces of information in order to reduce the data flow through the network to the I2RS client. Some applications that that utilize the services of I2RS client may also wish to require specific data in response to network events or conditions based on pre-established rules. This functionality is necessary to meet the requirements of i2rs enabled services which include service-layer routing improvements, and control of traffic flows and exit points.

This document introduces a Basic Network Policy information model (BNP IM) to handle policies related to the network. This basic policy model can be easily extended beyond the basic functions. The [I-D.ietf-i2rs-architecture] suggests that associated with the I2RS RIB model there will be "Policy-based Routing (ACLs)" and RIB "policy controls". These basic policy functions can operate as part of this functional blocks providing the basic model for policy operators. This model can also be considered as the substance of the policy templates.

The BNP IM is extensible allowing other extensions to make the BNP IM policy adaptable to specific I2RS protocol features. This policy model can be linked with other information models such as the following:

- Policy Base Routing Information model (PBR-IM) (Model in section 4),
- I2RS RIB Informational Model (RIB IM) (see section 6) ([I-D.ietf-i2rs-rib-info-model])
- BGP Informational Model (BGP IM) (see section 6) ([I-D.hares-i2rs-bgp-im])
- Service Topology (see section 6) ([I-D.hares-i2rs-info-model-service-topo])
- Service Forwarding Chaining Filters Information Mode (SFC IM) (see section 6) (ietf-hares-dunbar-i2rs-sfc-policy-im-00.txt)

The BNP IM model is a product of the industry approach to I2RS that standardizes on a few basic network functions to obtain quick deployment of initial I2RS RIB modules, and build on this success to create network functions. Additional I2RS modules add I2RS interfaces to policy-based routing, BGP, Service topology creation, Service Chaining functions, and policy templates.

This information model leveraged previous work done on extensible information model for representing policies. This work included the Policy Core Information Model (PCIM) [RFC3060] [RFC3060], and an extension to this model to address the need for QoS management, called the Quality of Service (QoS) Policy Information Model (QPIM) [RFC3644] [RFC3644].

Most policy within routing and forwarding systems has become hierarchical with individual specific policies being grouped as a policy set. The hierarchical policy rule definition enhances policy readability and reusability. Groups of network policies have labels to aid operational use. Named groups of policy are easily identified and reused as blocks.

The Basic Network Policy information model contains the following three components:

Policy Group

Policy is described by a set of policy rules that may be grouped into subsets. A Policy group is used to provide a hierarchical policy definition that provides the model context or scope for sub-rule actions. The model context includes identity, scope, role, precedence, priority and security model. In a policy group policy rules and policy groups can be nested within other policy rules.

Policy Set

A Policy Set is a set of Policy Groups identified by a Policy Set Name.

Policy Rule

A Policy Rule is represented by the semantics "If Condition then Action".

This draft contains the Basic Network-Policy Information Model (BNP IM). BNP IM is a generic network policy model. It can be thought of as a coherent set of rules to administer, manage, and control access to network resources and defines a network policy at its most general level of abstraction. It models aspects such as actions and conditions that constitute a policy element relationship, as well as operators contained in the both condition and action that can either be used to overwrite an old value of the variable or imply match relationship.

## 2. Definitions and Acronyms

IGP: Interior Gateway Protocol

Information Model: An abstract model of a conceptual domain, independent of a specific implementations or data representation

CLI: Command Line Interface

SNMP: The Simple Network Management Protocol

NETCONF: The Network Configuration Protocol

RBNF: Routing Backus-Naur Form

INSTANCE: Routing Code often has the ability to spin up multiple copies of itself into virtual machines. Each Routing code instance or each protocol instance is denoted as Foo_INSTANCE in the text below.

## 3. Basic Network Policy Information Model (BNP IM)

### 3.1. BNP IM Overview

I2RS needs its own implicit and explicit policy. This section provides an overview of the network policy model. The network policy model is defined by the following components, whose relationship is roughly depicted in the figure below.

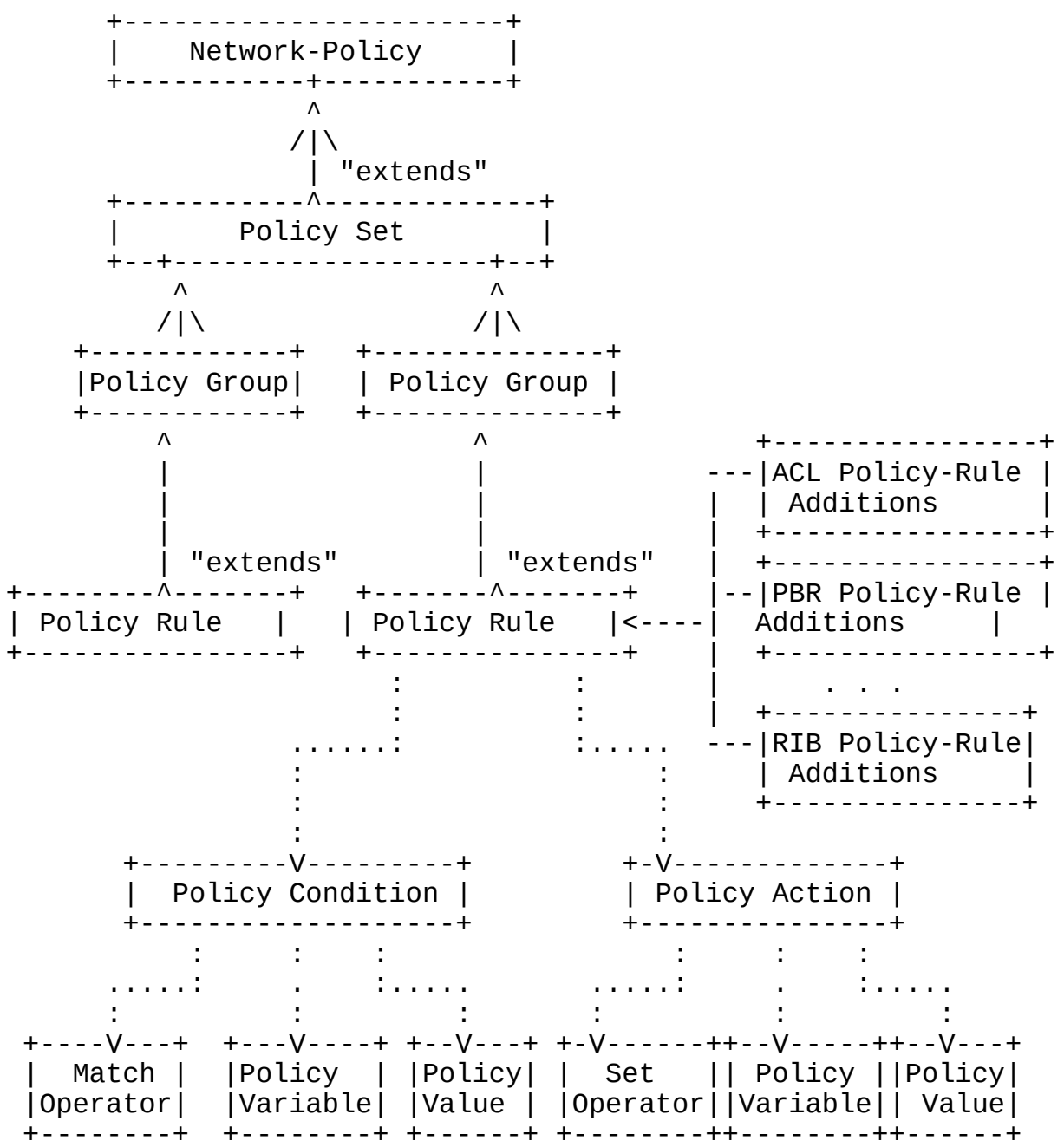



Figure 1: Overall model BNP IM structure

Network-Policy - contains sets of policies.

Policy-Set: Provides an ordered list of Policy Groups according to the priority and precedence of the rules. rules. it is inserted into the inheritance hierarchy above both Policy-Group and Policy-Rule.

Policy-Group: Defines the basic network policy Group model which combines the a list of Policy-Rules.

Policy Rule: Represents the semantics of "If Condition then Action".

- Condition models the elementary match operation "<variable> match <value>".

- Action models the elementary set operation. "SET <variable> TO <value>".

In the Condition model, the 'Match' operator is usually implied while in the action model, the 'Set' operator is explicitly used.

Policy-Sets, Policy-Groups, and Policy-Rules have basic functionality (Policy-Basic IM) plus extensions defined by specific Information Models such as:

The PBR Information Model (PBR IM) (contained in this document),

The I2RS_Local_Policy Model (LP IM) (contained in this document),

The RIB Information Model (RIB IM) ([I-D.ietf-i2rs-rib-info-model]),

The BGP Information Model (BGP-IM) ([I-D.hares-i2rs-bgp-im]),

The Traffic Steering Information Model ([I-D.hares-i2rs-info-model-service-topo]),

The SFC Information Model (SFC IM) (ietf-hares-dunbar-i2rs-sfc-policy-im-00.txt)

The MPLS LDP Information Model (MPLS LDP IM) (TBD) .

I2RS Client-Agents Information Models MAY support only the Policy-Basic IM, or MAY support any additional specific information models.

Each level of the Policy hierarchy (Policy-Set, Policy-Group, and Policy-Rules have both a read and write scope

## 3.2. The Policy Set

### 3.2.1. Policy Set Overview

The Policy-Set structure has the following elements:

- Policy-Set_Name - Unique Name for Policy Set

- o Policy-Set is introduced to provide an abstraction for a set of rules. It is derived from Policy, and it is inserted into the inheritance hierarchy above both PolicyGroup and PolicyRule. This reflects the additional structural flexibility and semantic capability of both subclasses.

### 3.2.2. Policy-Set RBNF

Figure 2 - Policy Set RBNF

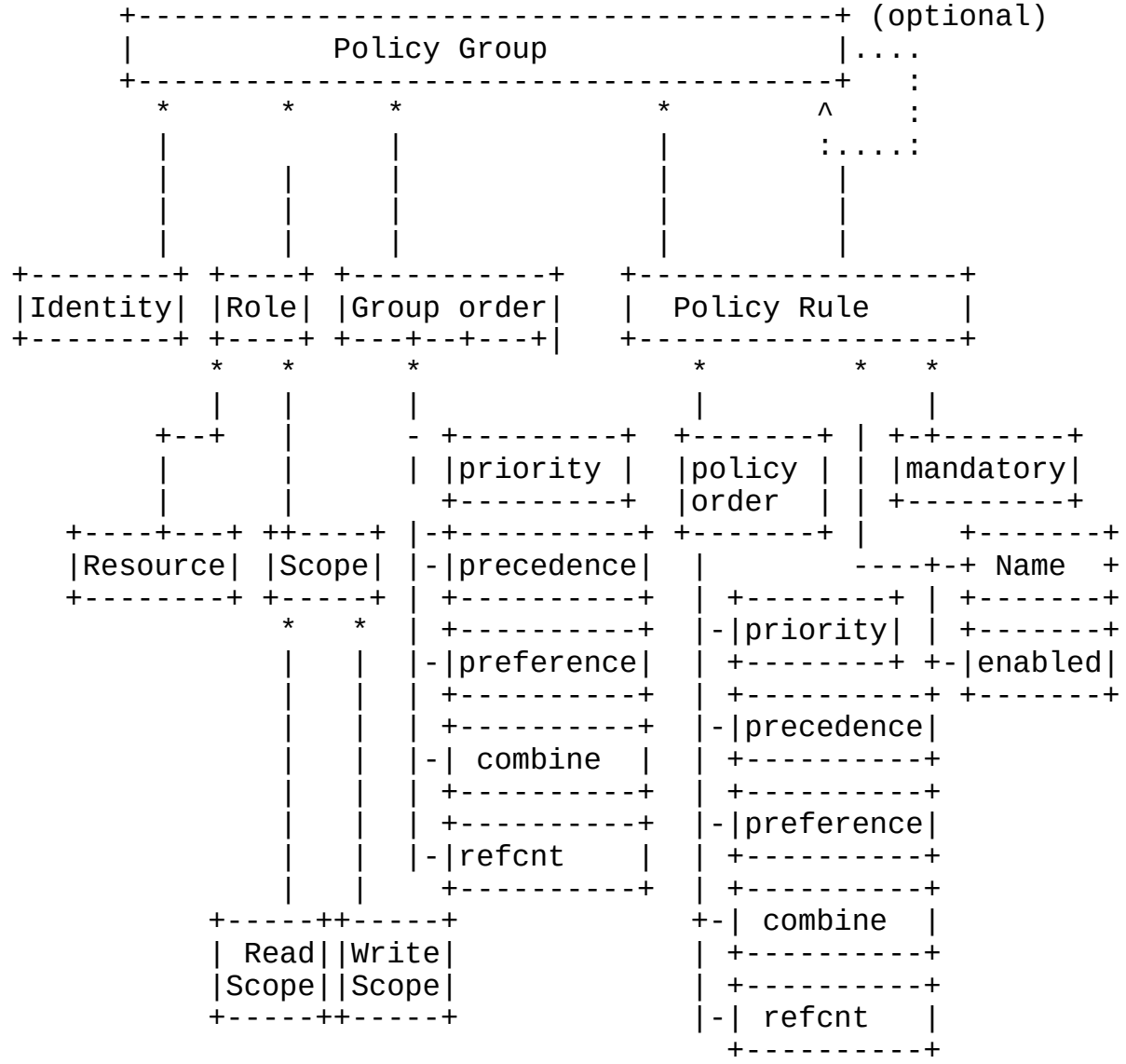
```
<Network_policy> ::= (<Policy_Set> ...)
<Policy-Set> ::= <Policy-Set-Name> <Policy_Group_list>
                 <PG_Priority< <PG_precedence>
<Policy-Group_list> ::= (<Policy-Group> ...)
```

## 3.3. The Policy Group

### 3.3.1. Policy Group Overview

In order to provide hierarchical policy definition and associate policy rule with other constraint, the basic policy group model needs to be defined. The corresponding extensions are introduced in a component, whose structure is informally depicted in the following diagram.

Figure 2 - Policy Group




The basic information model works as follows: Within the policy group information model, hierarchy is used to model context or scope for the sub-rule actions. A policy group contains Identity, role, and group ordering information. The ordering is the variables priority, precedence, preference, combination operators (AND plus OR), and reference count (refcnt) for the policy group. The same ordering information is kept at the rule level.

The elements of the Policy Group information model are as follows:

o An identity contains the name of the Policy group

- A role which identifies a resource (E.g. PBR-RIB, or BGP Neighbor) and a read/write scope. A policy group may have read scope, write scope, or both.

- A policy group has ordering that includes priority, precedence, preference (within global route table) and combinational ordering (combine). A group can have only one priority, precedence, and preference. The default mechanism for establishing order to order first on priority, and if matched to use precedence to order, and if precedence ties, to use preference. Other priorities may be used and the signalling of these is not covered at this revision. The policy group reference count is a read-only variable on the number of times this policy-group has been associated with an I2RS interface to a protocol or a RIB (RIB or PBR RIB)

- A policy rule has policy condition for matching, actions, and the same ordering values as the policy group which include: priority, precedence, preference, and combination ordering. Policy rules can be ordered within a RIB such as the PBR-RIB or within the a rules set associated with a protocol. Please note that ACLS wit their condition for matching, the DENY/ACCEPT action, and the preference setting form one type of policy group.

- The mandatory flag indicates that this rule is mandatory to be satisfied for this policy group. (This feature is still under discussion within the group of authors.)

- The enabled flag indicates that this rule is enabled. The lack of the flag allows rules to be inserted into a policy set without being enabled.

- A policy rule can inherit scope and ordering from the policy group or use its own values. A policy rule also can have its own properties, e.g., enabled, mandatory, usage. Rules

- The policy rule policy group elements can be extended with policy-specific components (policy-extensions, policy-group-extension respectively). One such extension is the inheritance of the ACL specific rule as policy rules.

### 3.3.2. Policy-Group RBNF

A more formal depiction in RBNF format follows below

Figure 4 - Policy-Group RBNF

```
<Policy-Group> ::= <Policy-Group_Identity>
```

```
                    <Policy-Group_Roles>
                    <Policy-Group_order>
                    (<Policy-Rule* list>)
                    [<Supporting-Policy-Group_list>]
                    [<Policy-Group-Extension>]

        <Policy-Group-Roles> ::= (<Policy-Group-Role> ...)
        <Policy-Group-Role> ::=<Node-RESOURCES> | <Policy-Group-Scope>
        <Node-RESOURCES> ::= [<I2RS_AGENT_RESOURCE>]

        <Policy-Group-Scope> ::= (<READ_SCOPE> <Policy-Group_Read_Scope>)
                          | (<WRITE_SCOPE> <Policy-Group_Write_Scope>)

        <Policy-Group_Identity> ::= STRING;
        <Policy-Group-Order> ::= <Policy-Group-Priority>
                       <Policy-Group_precedence>
                       <Policy-Group_preference>
                       <Policy-Group_combine>
                       <Policy-Group_refcnt>

        <Policy-Group-priority> ::= <PRIORITY>
        <Policy-Group-precedence> ::= <PRECEDENCE>
        <Policy-Group-preference> ::= <PREFERENCE>
        <Policy-Group_Combine> ::= <COMBO-OPERATORS>
        <Policy-Group-refcnt> ::= <REFCNT>

        <PRIORITY> :: =  INTEGER;
        <PRECEDENCE> :: = INTEGER:
        <PREFERENCE> ::= INTEGER;
        <COMBO-OPERATORS> :: = [AND] | OR| NULL;
        <REFCNT> :: = INTEGER;
        <Policy-Rule-list> ::= <Policy-Rule>*


        [Xpath in Yang may or may not be able to replace the definitions bel
ow ]

        <Policy-Group_Read_Scope> ::= <Policy-Group_Read_Scope_Type>
                                      [<RIB-IM_READ_list>]
                                      [<BGP-IM-READ_list>]

        <Policy-Group_Read_Scope_Type> ::= <RIB-IM_READ_SCOPE_TYPE>
                                      |  <BGP-IM_READ_SCOPE_TYPE>

        <Policy-Group_Write_Scope> ::= <Policy-Group_Write_Scope_Type>
                                        [<RIB-IM_WRITE_list>]
                                        [<BGP-IM-WRITE_list>]

        <Policy-Group_Write_Scope_Type> ::= <RIB-IM_WRITE_SCOPE_TYPE>
```

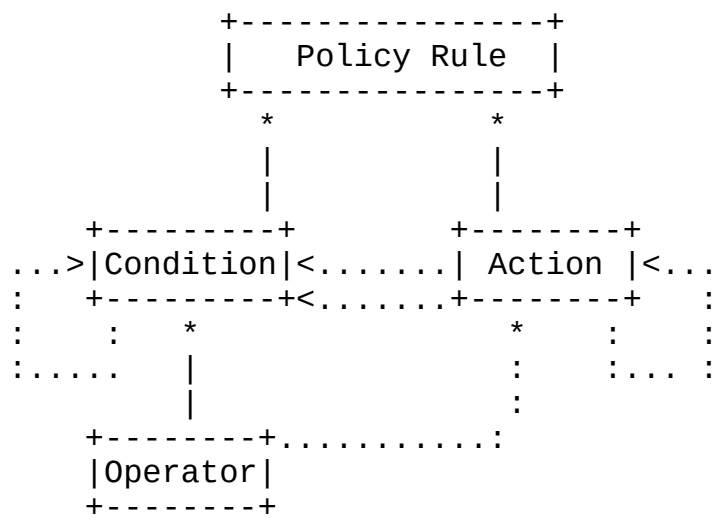
```
                                | <BGP-IM_WRITE_SCOPE_TYPE>

      <Supporting-Policy-Group> ::= <SUPPORT-POLICY-GROUP> (
                                          <Policy-Group> ...)

      <Policy-Group-Extension> ::= ...    /* Vendor Specific Policy */
```

## 3.4. The Policy Rule

### 3.4.1. Policy-Rule Overview

The following diagram contains an informal graphical depiction of the main elements of the information model:

Figure 5 - Policy Rule




Roughly speaking, the basic information model works as follows: A policy rule must identity, match conditions and actions; and it may contain policy rule ordering and status information. A operator connects variable and value in the action or condition. Condition can map onto and be supported by other condition, while action can map onto and be supported by other actions.

The elements of the Policy Rule information model are as follows:

- A policy can in turn be part of a hierarchy of policies Each policy is distinguished via a policy-identity.

- Policy rule inherit scope from policy group. A policy role has a certain scope(read/write). This scope is intended to capture the unique I2RS read or write functionality of the role. This is a place-holder for this function of the I2RS ROLE. Hopefully, policy scope can be deleted.

- Furthermore, a policy rule contains conditions and actions, each captured in their own list. The logic presented is a compromise between the simple logical AND and the complicated negation.

- A condition contains a variable and a value and use a match operator, to connect variable with value. Also condition may be specific to a particular Info-Module like BGP IM. The list Policy-Rule_Condition_Extensions specifies these conditions which are unique to the protocol.

- An action contains a variable and a value. An action uses the Set operator to connect a variable with a value. An action may be specific to a particular Info-Module like BGP IM. The list Policy-Rule_Action_Extensions specifies these conditions which are unique to the protocol. This is captured in list Policy-Rule_Action_Extensions

- The policy, condition, action and operator elements can be extended with policy-specific components (policy-extensions, condition-extension, action-extension and operator-extension respectively) that are specific to other informational models.

- Resources below indicates the amount of space that the policy might take in the routing instance. The issue is to try to differentiate between the 50 ACL policy group and the 300,000 ACL group.

- Policy Rule scope maps to ROLE Read/Write Concept. This concept is under revision (see i2rs-security-draft) It is intended to restrict even policy to a portion of the Routing tree. Whether this makes policy simpler or more complex is the question.

- RIB-IM-Tree-Match - indicates a match stored as a tree form with the longest match.

### 3.4.2. Policy-Rule RBNF

The information model for the Network-policy component is more formally shown in RBNF below:

Figure 6 Policy Rule RBNF

```
<Policy-Rule> ::= [<Policy-Rule-identity>]
                        [<Policy-Rule-Order>]
                        [<Policy-Rule-Scope]
                        [<Policy-Rule-Status>]
                        <Policy-Match>
                        <Policy-Condition>
                        [<Policy-Rule_rule_extensions>]

<Policy-Rule-Order> ::= <Policy-Group-Priority>
                <Policy-Group_precedence>
                <Policy-Group_preference>
                <Policy-Group_combine>
                <Policy-Group_refcnt>

<Policy-Rule-Status> ::= [<Policy-Rule-Enable>]
                         [<Policy-Rule-Mandatory>]

<Policy-Rule-identity> ::= string;
<Policy-Rule-Priority> ::= <PRIORITY>
<Policy-Rule-precedence> ::= <PRECEDENCE>
<Policy-Rule-preference> ::= <PREFERENCE>
<Policy-Rule-Combine> ::= <COMBO_OPERATORS>
<Policy-Rule-refcnt> ::=<REFCNT>
<Policy-Enable> ::= Boolean;
<Policy-Mandatory> ::=Boolean;



<Policy-Rule_Condition> ::= <Policy-Rule_Match_node>
                                (<Policy-Rule_Match_value> ...)
                                [<Policy-Rule_mode>]
                                [<Policy-Rule_Match_Operator>]
                                [<Policy-Rule_Condition_extension>]

<Policy-Rule_Match_node> ::=  [<Policy-Rule_Match_Node_BNP-IM>]
                        | [<Policy-Rule_Match_node_external]

<Policy-Rule_Match_value> ::=  [<Policy-Rule_Match_Value_BNP-IM>]
                        | [<Policy-Rule_Match_Value_external]

<Policy-Rule_mode> ::= PERMIT | DENY ;
<Policy-Rule_Match_operator_external> ::=
                            [<Policy-Rule_Match_Operator_BNP-IM>]
                            | [<Policy-Rule_Match_Operator_external]

<Policy-Rule-action> ::= <Policy-Rule_Action_variable>
                        <Policy-Rule_Action_value>
                        <Policy-Rule_Set-Operator>
```

```
                          [<Policy-Rule_action-extension> ]

      <Policy-Rule_Security-Model> ::= <First-Matching>
                                        |<All-Matching>]

      <Policy-Rule_rule_extension> ::=
                          <I2RS-LC-policy_rule_extensions>

      <Policy-Rule-action> ::= <Policy-Rule_Action_variable>
                               <Policy-Rule_Action_value>
                               <Policy-Rule_Set-Operator>
                               [<Policy-Rule_action-extension> ]

      <Policy-Rule_Action_variable> ::= <Policy-Rule_Action_var>
                               (<Policy-Rule_Action_value> ...)
                               [<Policy-Rule_Set_Operator>]
                               [<Policy-Rule_Action_extension>]

      <Policy-Rule_Action_var> ::=  [<Policy-Rule_Action_Vars_BNP-IM>]
                                | [<Policy-Rule_Action_external>]

      <Policy-Rule_Action_value> ::=  [<Policy-Rule_Action_Vars_BNP-IM>]
                                | [<Policy-Rule_Action_external>]

      <Policy-Rule_Set_Operator> ::=  [<Policy-Rule_Set_Operator_BNP-IM>]
                                | [<Policy-Rule_Set_Operator_external>]

      <Policy-Rule-action-extension> ::=
                                [<Policy-Rule_act_ext_BNP-IM>]
                                | [<Policy-Rule_act_ext_external>]

      <Policy-Rule-Match-Operator-Policy-IM> ::= <IS-SET-MEMBER'>
                     |<IN-INTEGER-RANGE>
                     |<IP-ADDRESS-AS-RESOLVED-BY-DNS>
                     |<Policy_IM-Match-Operator-extension>

      <Policy-Rule_condition_extension> ::=
                      <Policy_Rule_condition_ext-BNP-IM>
                      [<Policy-Rule_Condition_ext_external>]

      ! Policy Rule scope maps to ROLE Read/Write Concept
      ! This concept is under revision (see i2rs-security-draft)
      ! It is intended to restrict even policy to a portion of the
      ! Routing tree. Whether this makes policy simpler or more
      ! complex is the question.
      <Policy-Rule_Scope> ::= (<READ_SCOPE>
                               <Policy-Rule_Read_scope>)
                             | (<WRITE_SCOPE>
```

```
                                <Policy-Rule_Write_scope>)

      <Policy-Rule_Read_scope> ::= ((<BNP_READ_SCOPE_TYPE>
                                        <BNP_READ_SCOPE_list>) ...)
                                 |  [<Policy-Rule_Read_Scope_External>]

      <Policy-Rule_Write_scope> ::= ((<BNP_WRITE_SCOPE_TYPE>
                                         <BNP_WRITE_SCOPE_list>)...)
                                    [<Policy-Rule_Write_Scope_External>]


      /* these scopes besides RIB IM are defined in each IM */

      <PR_Read_Scope_RIB_IM> ::=<RIB-IM_READ_SCOPE_TYPE>
                                    <RIB-IM_READ_list>

      <PR_Read_Scope_RIB_IM> ::=<RIB-IM_READ_SCOPE_TYPE>
                                    <RIB-IM_READ_list>

      <RIB-IM_READ_list> ::= [<RIB-IM-Tree-Match> ...]
      <RIB-IM_WRITE_list> ::= [<RIB-IM-Tree-Match> ...]
      <RIB-IM-Tree-Match> ::= <RIB-IM-Match-routing-instance>
                                    <RIB-IM-Match-interface-list>
                                    <RIM-IM-Match-rib_list>
                                    <RIB-IM-match-route-list>

      /* extensions to other IM */

      /* External Read and Write Scope */
      <Policy-Rule_Read_Scope_External> ::=
                               [<PR_Read_Scope_RIB_IM>]
                               [<PR_Read_Scope_BGP_IM>]
                               [<PR_Read_Scope_PBR_IM>]
                               [<PR_Read_Scope_I2RSLC_IM>]
                               [<PR_Read_Scope_STopo_IM>]
                               [<PR_Read_Scope_SFC-Policy_IM>]

      <Policy-Rule_Write_Scope_External> ::=
                               [<PR_Write_Scope_RIB_IM>]
                               [<PR_Write_Scope_BGP_IM>]
                               [<PR_WriteScope_PBR_IM>]
                               [<PR_Read_Scope_I2RSLC_IM>]
                               [<PR_Read_Scope_STopo_IM>]
                               [<PR_Read_Scope_SFC-PolicyIM>]

      /* External Rule Conditionals */
      <Policy-Rule_Match_node_external> ::=
                           [<Policy-Rule_Match_Node_RIB-IM>]
```

```
                        | [<Policy-Rule_Match_Node_PBR-IM>]
                        | [<Policy-Rule_match_Node_I2RSLC-IM>]
                        | [<Policy-Rule_Match_Node_BGP-IM>]
                        | [<Policy-Rule_Match_Node_STopo-IM>]
                        | [<Policy-Rule_Match_Node_SFC-Policy-IM>]

      <Policy-Rule_Match_Value_external> ::=
                          [<Policy-Rule_Match_Value_RIB-IM>]
                        | [<Policy-Rule_Match_Value_PBR-IM>]
                        | [<Policy-Rule_Match_Value_I2RSLC-IM>]
                        | [<Policy-Rule_Match_Value_BGP-IM>]
                        | [<Policy-Rule_Match_Value_STopo-IM>]
                        | [<Policy-Rule_Match_Value_SFC-Policy-IM>]

      <Policy-Rule_Match_operator_external> ::=
                          [<Policy-Rule_Match_Operator_RIB-IM>]
                        | [<Policy-Rule_Match_Operator_PBR-IM>]
                        | [<Policy-Rule_Match_Operator_I2RSLC-IM>]
                        | [<Policy-Rule_Match_Operator_BGP-IM>]
                        | [<Policy-Rule_Match_Operator_STopo-IM>]
                        | [<Policy-Rule_Match_Operator_SFC-Policy-IM>]

      <Policy-Rule_Action_value_external> ::=
                          [<Policy-Rule_Action_Values_RIB-IM>]
                        | [<Policy-Rule_Action_Values_PBR-IM>]
                        | [<Policy-Rule_Match_Operator_I2RSLC-IM>]
                        | [<Policy-Rule_Action_Values_BGP-IM>]
                        | [<Policy-Rule_Set_Operator_STopo-IM>]
                        | [<Policy-Rule_Set_Operator_SFC-Policy-IM>]

      <Policy-Rule_Set_Operator_external> ::=
                          [<Policy-Rule_Set_Operator_RIB-IM>]
                        | [<Policy-Rule_Set_Operator_PBR-IM>]
                        | [<Policy-Rule_Match_Operator_I2RSLC-IM>]
                        | [<Policy-Rule_Set_Operator_RIB-IM>]
                        | [<Policy-Rule_Set_Operator_BGP-IM>]
                        | [<Policy-Rule_Set_Operator_STopo-IM>]
                        | [<Policy-Rule_Set_Operator_SFC-Policy-IM>]


      <Policy-Rule_act_ext_external> ::=
                          [<Policy-Rule_extension_RIB-IM>]
                        | [<Policy-Rule_act_ext_PBR-IM>]
                        | [<Policy-Rule_act_ext_I2RSLC-IM>]
                        | [<Policy-Rule_act_ext_RIB-IM>]
                        | [<Policy-Rule_act_ext_BGP-IM>]
                        | [<Policy-Rule_act_ext_STopo-IM>]
                        | [<Policy-Rule_act_ext_SFC-Policy-IM>]
```

```
                        | [<I2RS_Vendor-Rule_act_ext>]/* other I2RS IM */
```

### 3.5. BNP IM Grammar

This section specifies the network policy information model in Routing Backus-Naur Form (RBNF, [RFC5511]). It also provides diagrams of the main entities of which the information model is comprised.

```
        <basic-network_policy_in> ::= (<policy-set> ...)
        <basic-network_policy_out> ::= (<policy-set> ...)
        <network-policy_rules_list> ::= (<policy-rule>...)
```

## 4. Extensions to the Policy IM

### 4.1. Extension to the RIB IM

Figure 11 - RIB Information Model Extensions

```
        <RIB-IM_READ_list> ::= [<RIB-IM-Tree-Match ...]
        <RIB-IM_WRITE_list> ::= [<RIB-IM-Tree-Match ...]
        <RIB-IM-Tree-Match> ::= <RIB-IM-Match-routing-instance>
                                    <RIB-IM-Match-interface-list>
                                    <RIM-IM-Match-rib_list>
                                    <RIB-IM-match-route-list;

        /* BGP Info Module Tree Match */
        <BGP-IM_READ_list> ::= [<BGP-IM-Tree-Match ...]
        <BGP-IM_WRITE_list> ::= [<BGP-IM-Tree-Match ...]

        <BGP-IM-Tree-Match> ::= <BGP-IM-Tree-Match-protocol-instance>
        <BGP-IM-Match-Protocol-instance> ::= (<BGP_protocol> ...)


        <pbr_rib> ::=  <bgp_route_list>

        <bgp_route_list> ::= (<bgp_route> ...)
        <bgp_route> ::= <BGP_ROUTE_TYPE>
                        <bgp_route_prefix>
                        <bgp_attribute_list>
                        <bgp_route_create>
                        <bgp_rt_state_info>

        <basic-network_policy_in> ::= (<policy-set> ...)
        <basic-network_policy_out> ::= (<policy-set> ...)
        <network-policy_rules_list> ::= (<policy-rule>...)
```

## 4.2. Extension from the BGP IM

Figure 12 - BGP Information Model Extensions

```
<BGP-IM_READ_list> ::= [<BGP-IM-Tree-Match ...]
<BGP-IM_WRITE_list> ::= [<BGP-IM-Tree-Match ...]
<BGP-IM-Tree-Match> ::= <BGP-IM-Tree-Match-protocol-instance>
<BGP-IM-Match-Protocol-instance> ::= (<BGP_protocol> ...)
```

## 4.3. Extension from SFC Topology IM

Figure 13 - SFC Topology Information Model Extensions

```
/* what part of the STopo Model can access */

<STopo-IM_READ_list> ::= [<STopo-IM-Tree-Match ...]
<STopo-IM_WRITE_list> ::= [<STopo-IM-Tree-Match ...]
<STopo-IM-Tree-Match> ::= <STopo-IM-Tree-Match-protocol-instance>
<STopo-IM-Match-Protocol-instance> ::= (<STopo_protocol> ...)
```

## 4.4. Extension from the SFC Traffic Filters

Figure 14 - Traffic Steering Information Model Extensions

```
/* what part of the STopo Model can access */

<SFC-Policy-IM_READ_list> ::= [<SF-Policy-IM-Tree-Match ...]
<SFC-Policy-IM_WRITE_list> ::= [<SF-Policy-IM-Tree-Match ...]
<SFC-Policy-IM-Tree-Match> ::= <SF-Policy-IM-Tree-Match-protocol-instanc
e>
<SFC-Policy-IM-Match-Protocol-instance> ::= <SF_instance_list>
```

# 5. IANA Considerations

This draft includes no request to IANA.

# 6. Security Considerations

TBD

# 7. Informative References

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