



# A Policy Management Framework for Flow Distribution on Multihomed End Nodes

Koshiro Mitsuya <[mitsuya@sfc.wide.ad.jp](mailto:mitsuya@sfc.wide.ad.jp)>

**Romain Kuntz** <[kuntz@lsiit.u-strasbg.fr](mailto:kuntz@lsiit.u-strasbg.fr)>

Shinta Sugimoto <[shinta@sfc.wide.ad.jp](mailto:shinta@sfc.wide.ad.jp)>

Ryuji Wakikawa <[ryuji@sfc.wide.ad.jp](mailto:ryuji@sfc.wide.ad.jp)>

Jun Murai <[jun@wide.ad.jp](mailto:jun@wide.ad.jp)>

# Table of Contents

- Motivations
- Scenario
- Requirements
- Current Situation
- New Framework
- Conclusion

# Motivations

*Contemplated multihomed environment*

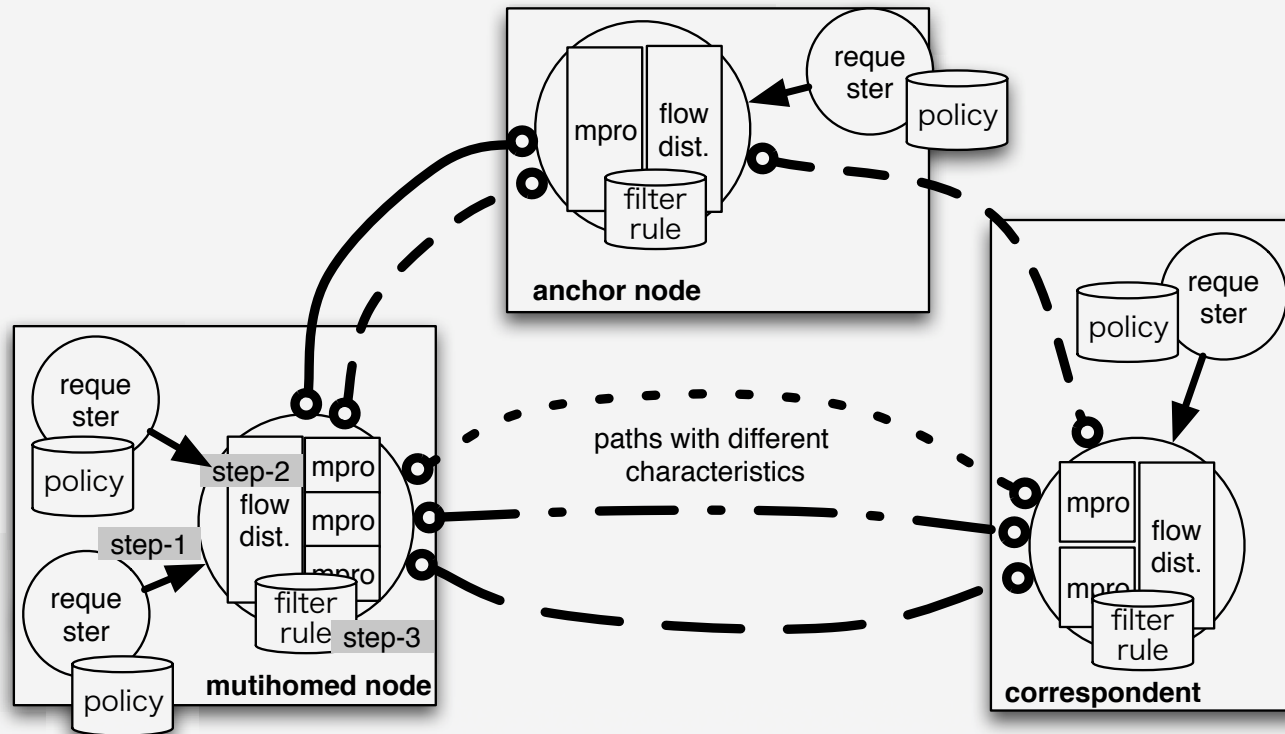
- Node equipped with **multiple (wireless) network accesses**
  - Especially true in **mobile environment**
  - **multiple communication paths,**
- Maintained by **one or multiple multihoming protocols** (MIP6/MCoA, SHIM6, SCTP, etc.)
  - Each has multiple goals and benefits,
  - Ubiquitous access, fault tolerance, load sharing, ...
- **Flow Distribution:** distribute flow via multiple available paths

# Motivations

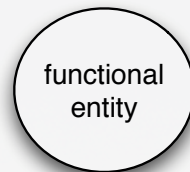
*How to achieve flow distribution*

- User/Application creates its **desired policies**,
  - Described in term of cost, bandwidth, delay, jitter, etc.
- The policy management framework confronts them to the characteristics of each available path
  - Resulting the **filter rules**,
- Filter rules used as input to the OS-specific **filtering framework**,
  - Filter rules **exchanged** among peer hosts.

# Example Scenario



## Legend:



mpro = multihoming protocol stack  
 flow dist. = flow distribution mechanism

# Requirements

*for the policy management framework*

**R1: Policy description:** language definition

R1.1 Makes the relation between flow and path characteristics,

R1.2 Multihoming protocol independent.

**R2: Multiple requesters** (local or remote) management

**R3: Policy resolution** to filter rules and error management

**R4: Filter rules description,**

**R5: Filter rules transport,**

**R6: Multiple filter rules processing,**

**R7: Transport security**

# Current Situation

## *Summary of existing specifications*

	<i>Multihoming protocol principles</i>	<i>Multihoming Protocol specifications</i>	<i>Flow distribution in implementations</i>
Mobile-IPv6 based (MIPv6, NEMO)	Multiple CoA binded to a single HoA	MCoA, Flow Binding, Flow distribution	Ipfilter, PF, Netfilter
SHIM6 based	Upper Layer ID (ULID) mapped to one or more locators	Policy DB in the SHIM6 IP sub-layer, Multihoming SHIM API	SHIM6 API, Netfilter
HIP based	Host ID (HI, public key) mapped to one or several IP addresses	Multihoming SHIM API	impossible
SCTP based	Transport layer protocol	SCTP socket API	Socket API, library

# Current Situation

## *Main Principles*

- **Identifier/locator separation** concept,
- Flow Distribution achieved by **choosing proper locator,**
- Locator set by **configuring filter rules** (via Socket API, OS-specific framework, etc.),



# Current Situation

## *Main Issues*

- Usually associates the flow to a system or protocol-oriented path ID (eg: BID for MCoA),
  - ▶ **Protocol-dependent**
- Usually **do not exchange filter rules** among hosts (HIP, SHIM6, SCTP).
  - ▶ **Cannot specify e.g. round-trip path**
- Flow distribution **tightly depends on the OS** on which the implementation is running
  - ▶ **Hard to define** a generic flow distribution architecture.

# New Framework

## *Main Principles*

- ➔ **Unified Policy management framework** on top of the various flow distribution mechanisms,
- ➔ Using the **existing mechanisms** given by the OS.

# New Framework

## *Main Principles*

- **Policy Data Set:**

- Describes flow in terms of costs, bandwidth, delay, jitter, etc.

- **Policy Management Framework:**

- Confront the policy data set against the interfaces' characteristics,
- Produce filter rules,
- Install / send filter rules to peer hosts.

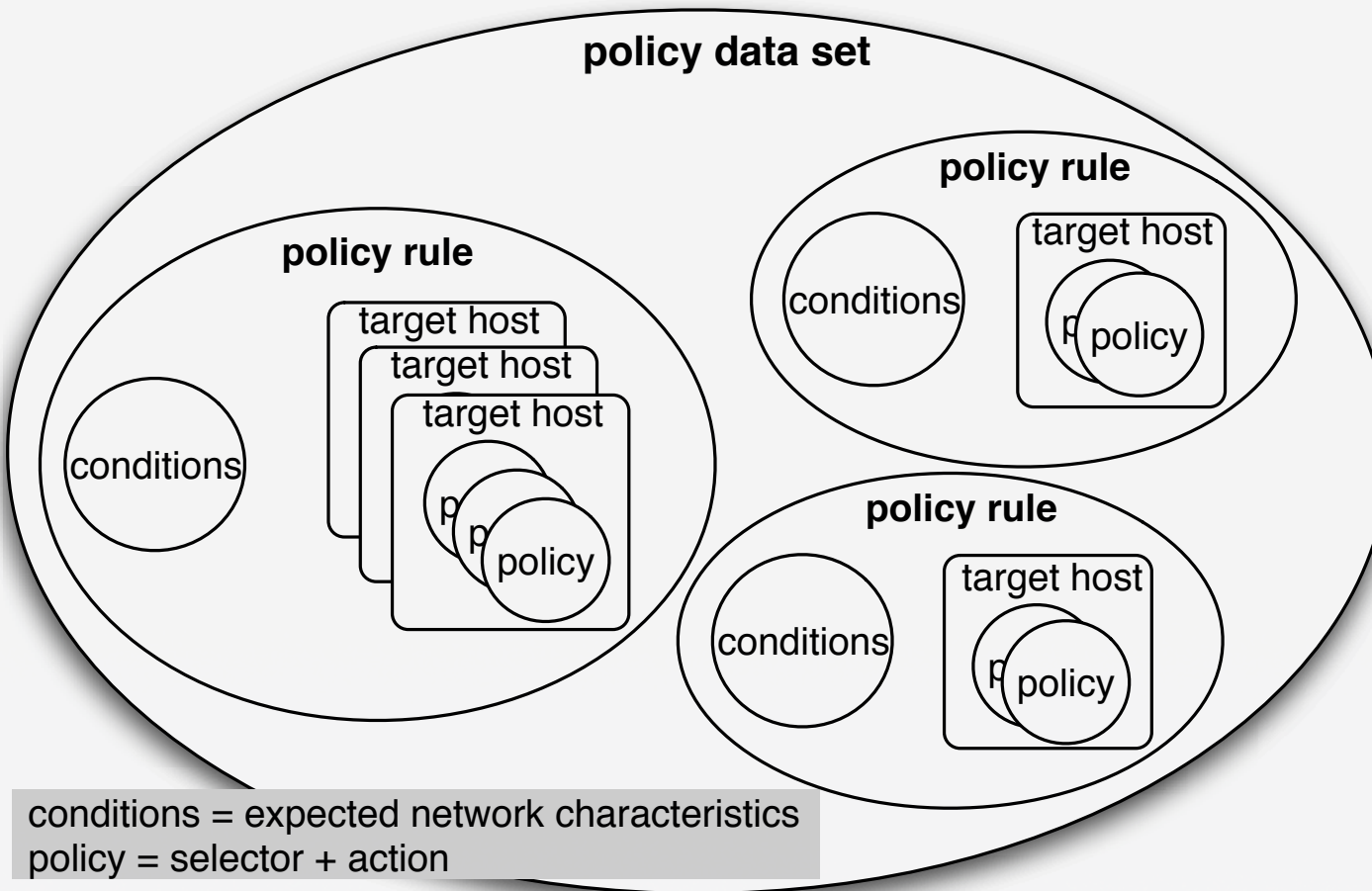
# New Framework

## *The Policy Data Set*

- Generic language to define a common policy data set whatever the multihoming protocol or OS is running on the node **(RI.2)**,
- Set of **Policy Rules**:
  - Tells which policy (flow + action) to apply when some **conditions** are met **(RI.1)**.

# New Framework

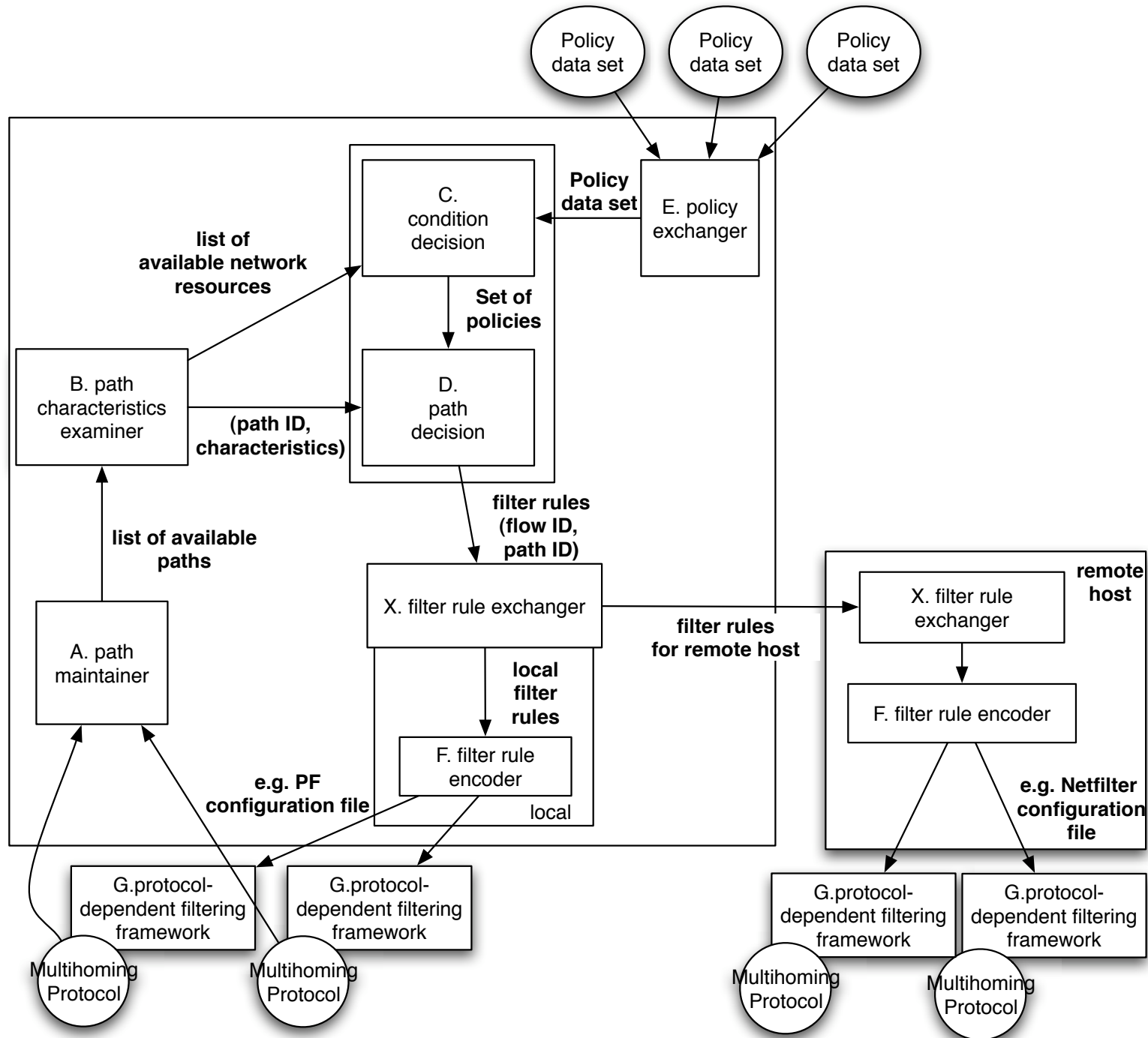
## *The Policy Data Set*



# New Framework

## *Policy Management Framework*

- Processes the Policy Data Sets from multiple sources **(R2)**,
- Confront the user policies with the actual path's characteristics to produce filter rules **(R3, R4)**,
- Uses the existing filtering framework to install the rules on local host **(R6)**,
- Send the filter rules for remote host **(R5, R7)**



# Conclusion

- Defined requirements for a policy management framework,
- Draft framework working on top of several multihoming protocols,
- **Next steps:**
  - Grammar definition for the Policy Data Set,
    - *draft-mitsuya-monami6-flow-distribution-policy*
  - Framework implementation and evaluation.





Thank you,  
Any questions?

Romain Kuntz <[kuntz@lsiit.u-strasbg.fr](mailto:kuntz@lsiit.u-strasbg.fr)>