



BRDP based Address Autoconfiguration

Teco Boot - 18 November 2008

Ad-Hoc Network Autoconfiguration (autoconf)

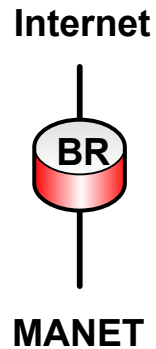
History and status

- ❖ Finding solution for scalable MANETs by using a backbone
- ❖ Connected MANETs have their problems:
 - Addressing
 - Multi-homing
- ❖ Attempt to combine MANET and NEMO technology
 - Proposal not in line with Autoconf charter
 - I-D.boot-autoconf-nemo4manet (put on hold)
- ❖ New attempt to get I-D in line with Autoconf charter and problem statement
 - Current: [draft-boot-autoconf-brdp-01.txt](#)
 - Any mismatch with charter and PS will be rectified

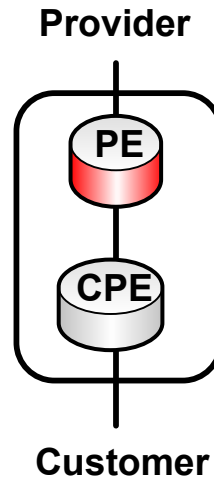
Related work

- ❖ **Routing in multi-homed edge network: BRDP Based Routing**
 - Solves ingress filtering problems
 - Supports make-before-brake BR handover
 - Supports load distribution
 - Draft: I-D.boot-brdp-based-routing
 - Presented in MANET, maybe in RRG
- ❖ **Source address selection in multi-homed edge network:**
 - Currently partly addressed in autoconf-brdp I-D
 - Separate document: work in progress

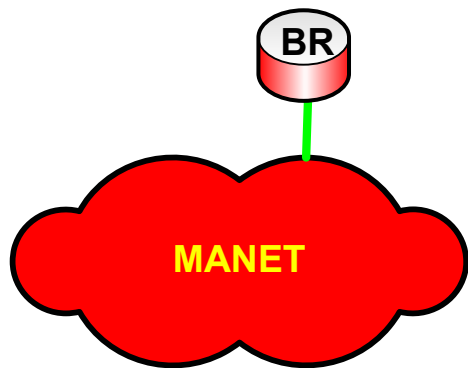
My illustrations are simplified



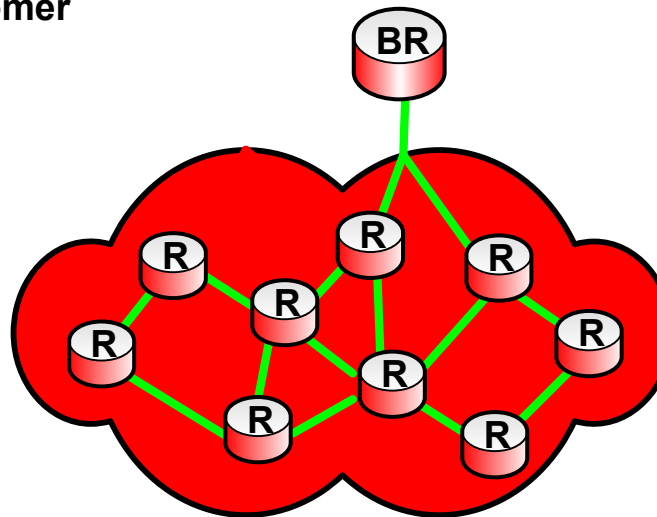
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- Border Router is a router connecting the MANET to an ISP
- In practice, there is a Provider Edge (PE) and Customer Premises Equipment (CPE) router
- CPE – PE protocols are out of scope for this presentation
- PE may (should!) have ingress filter

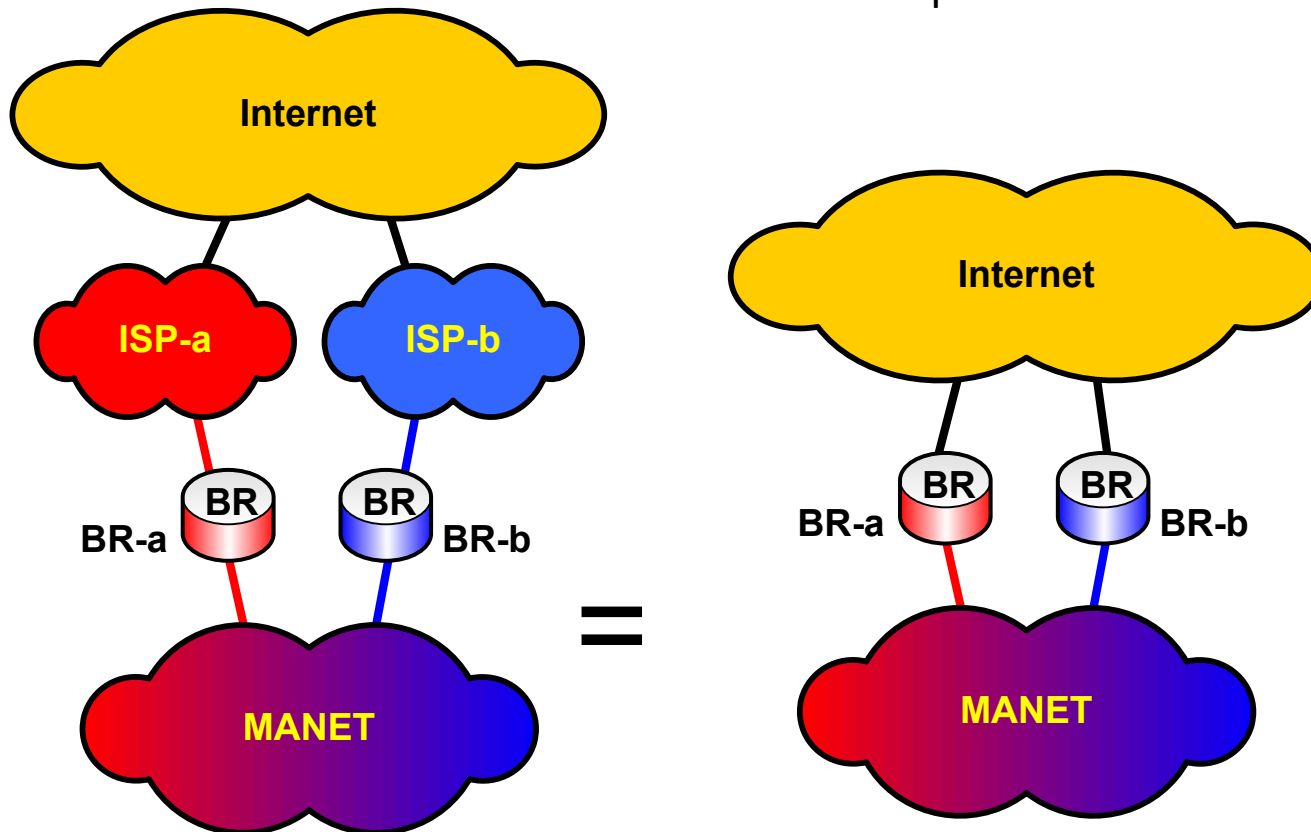


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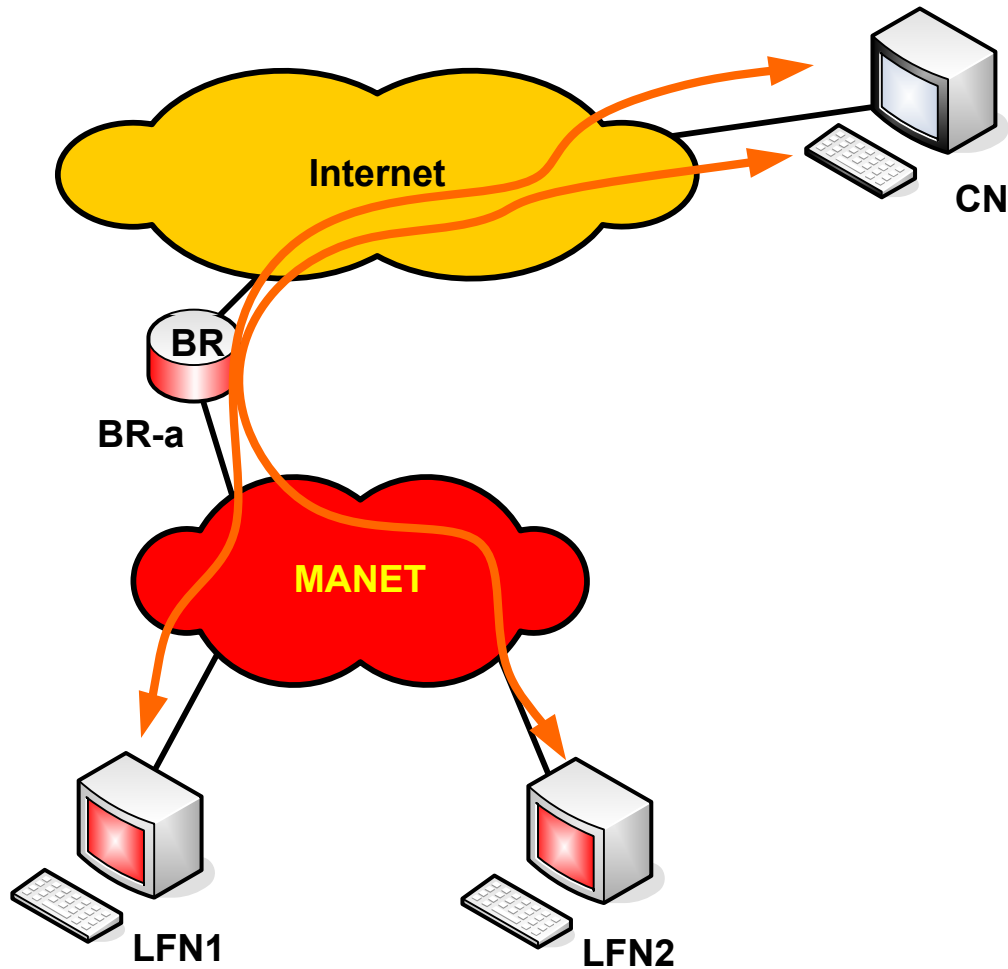


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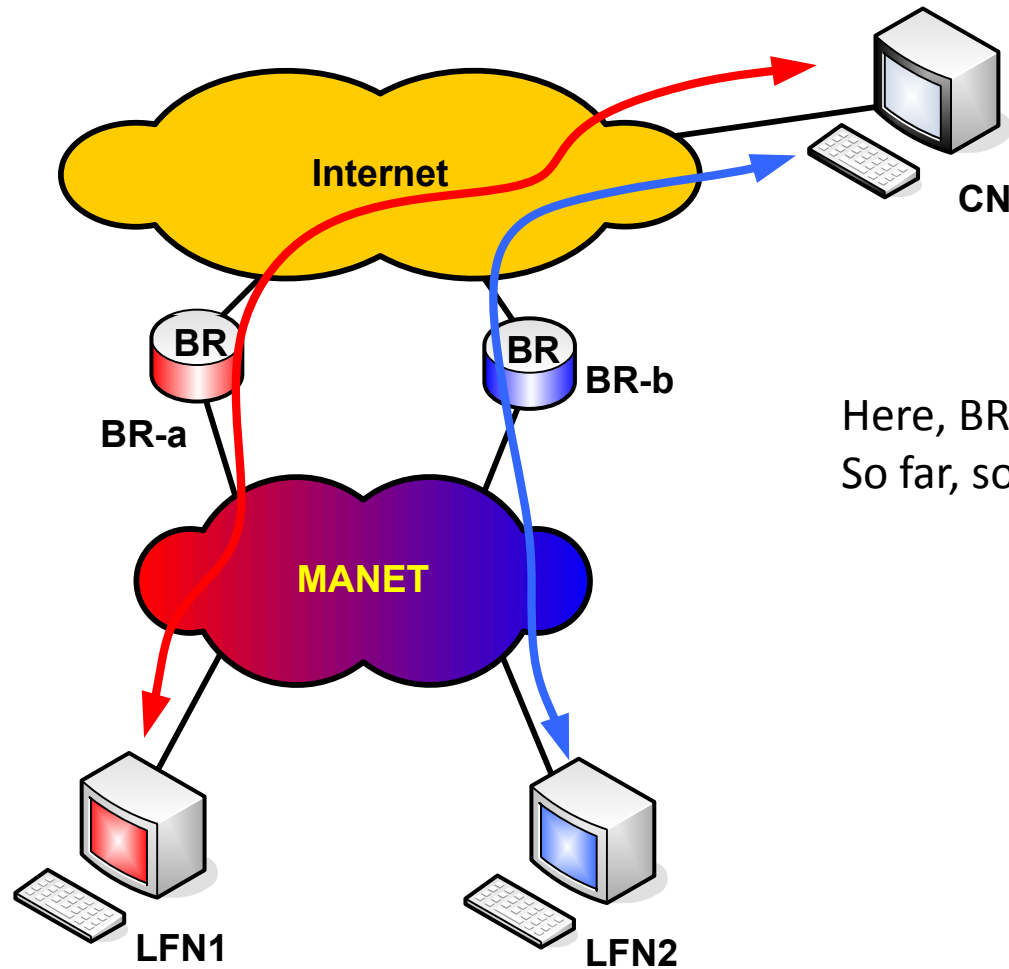
- ISPs have their networks. Details on this are not important for BRDP
- Note the colors: Provider A is red, provider B is blue



Single-homed MANET: no problems 😊

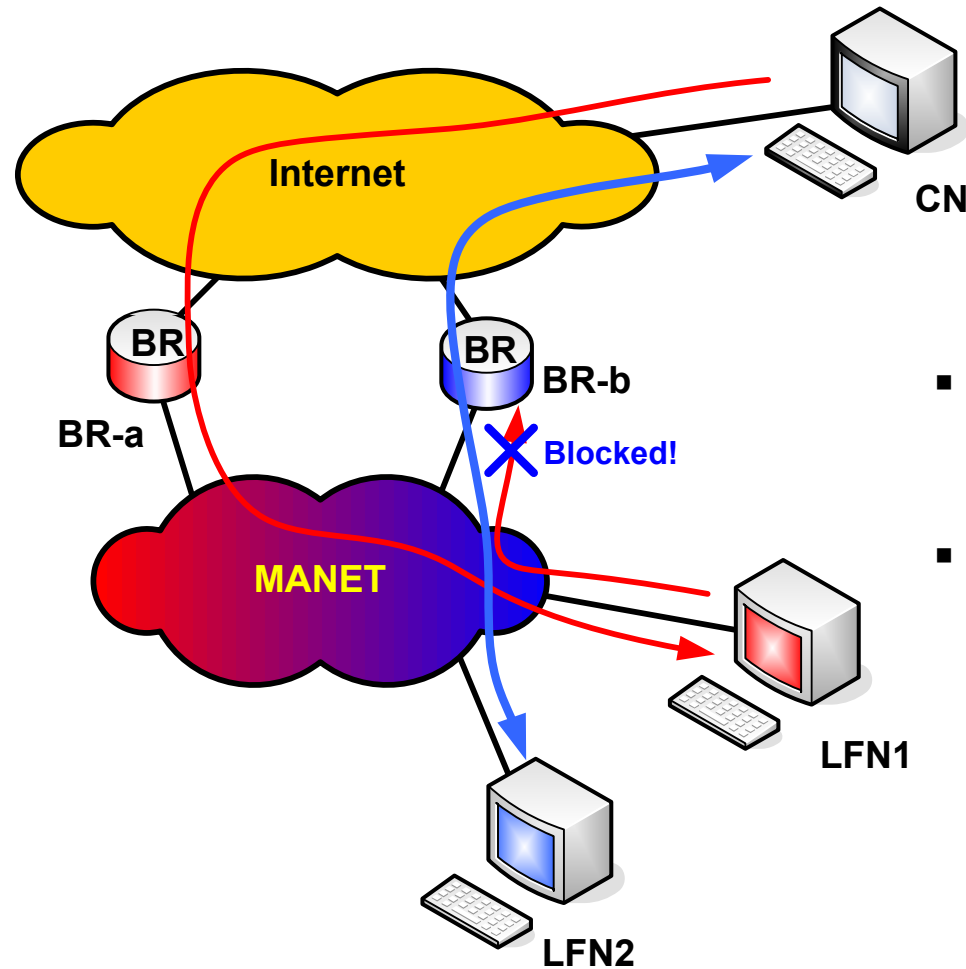


Multi-homed MANET



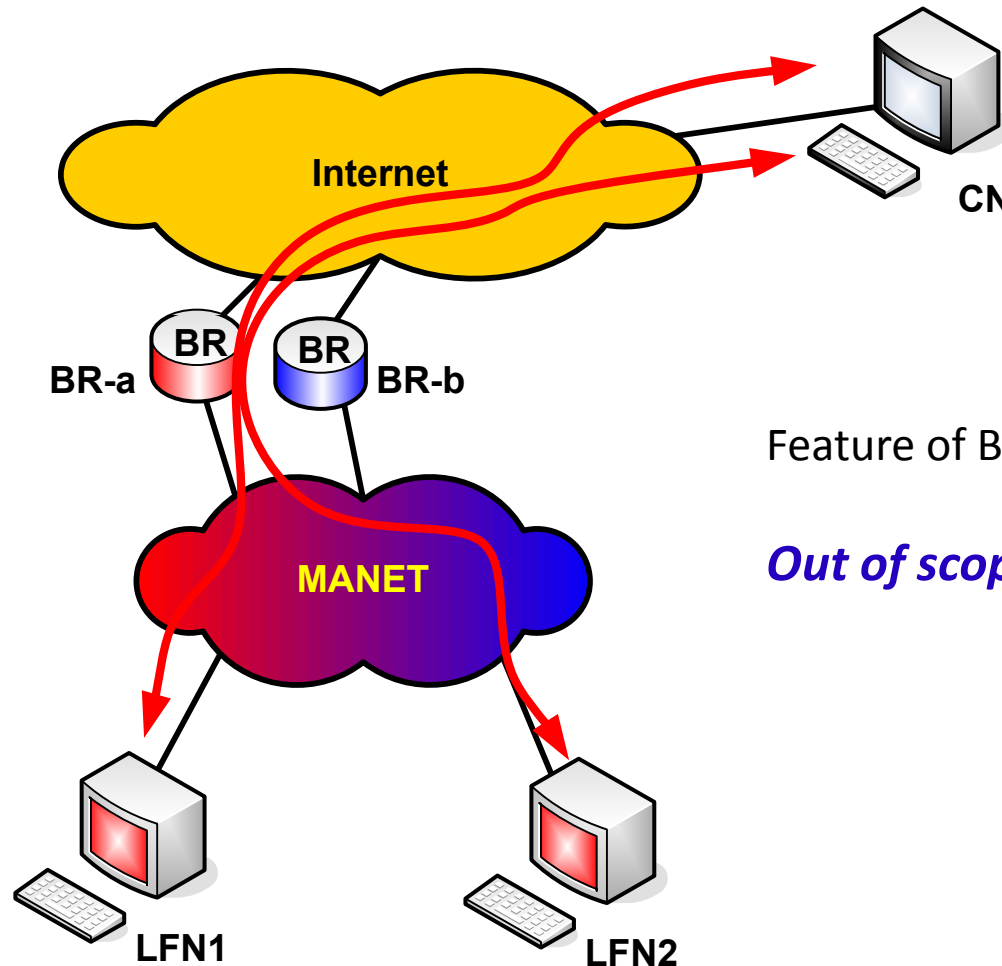
Here, BRDP is born.
So far, so good. **But:**

In a MANET, nodes can move!



- MANET routing protocol converges to reflect the movement
- LFN is not aware of movement

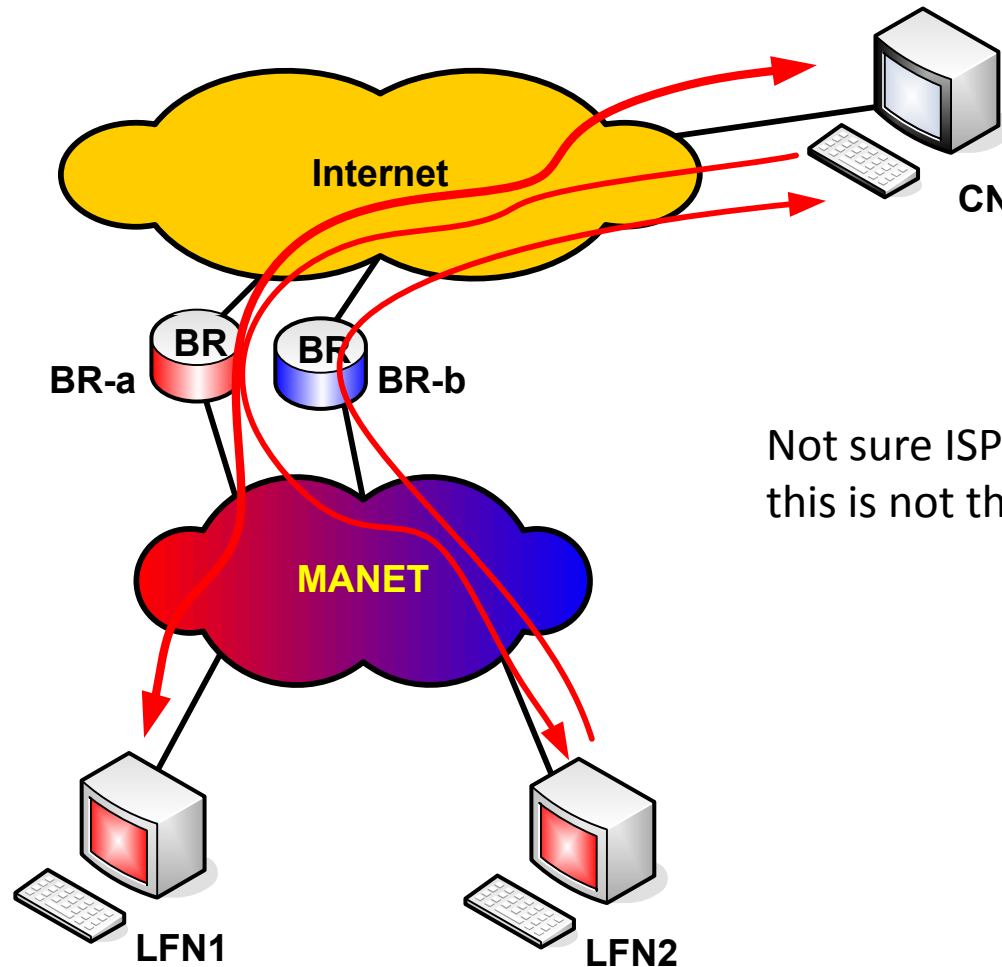
Solution #1: Direct traffic to BR that owns SA prefix



Feature of BRDP Based Routing!

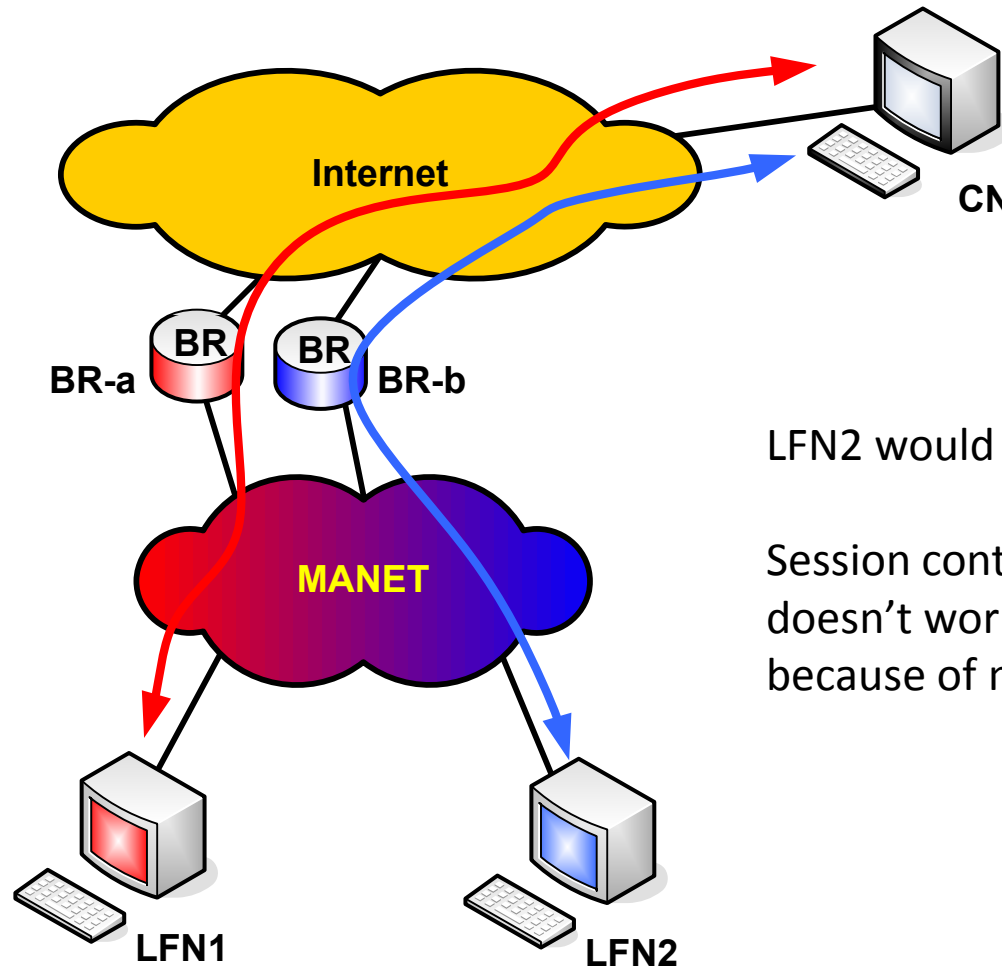
Out of scope for Autoconf

Solution #2: Adjust BR-b ingress filter for prefix BR-a



Not sure ISP is cooperative, so
this is not the goal

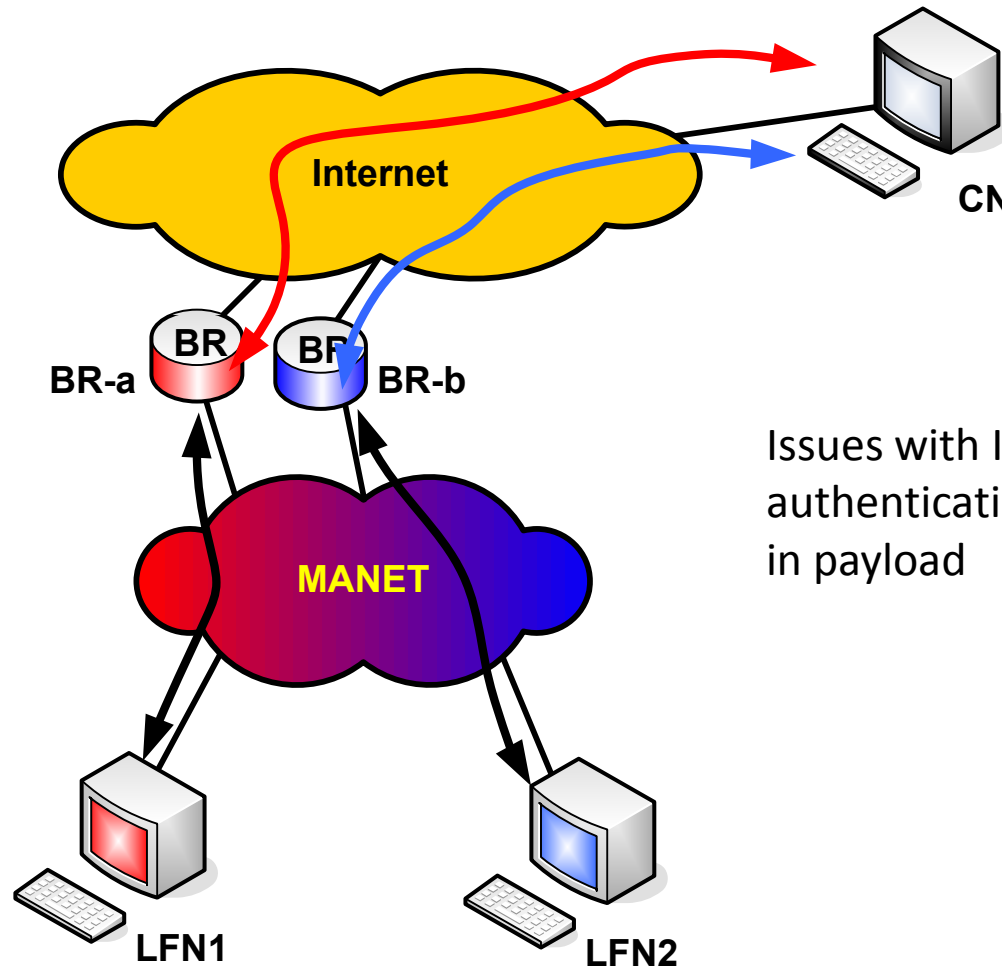
Solution #3: Select SA that corresponds to BR used



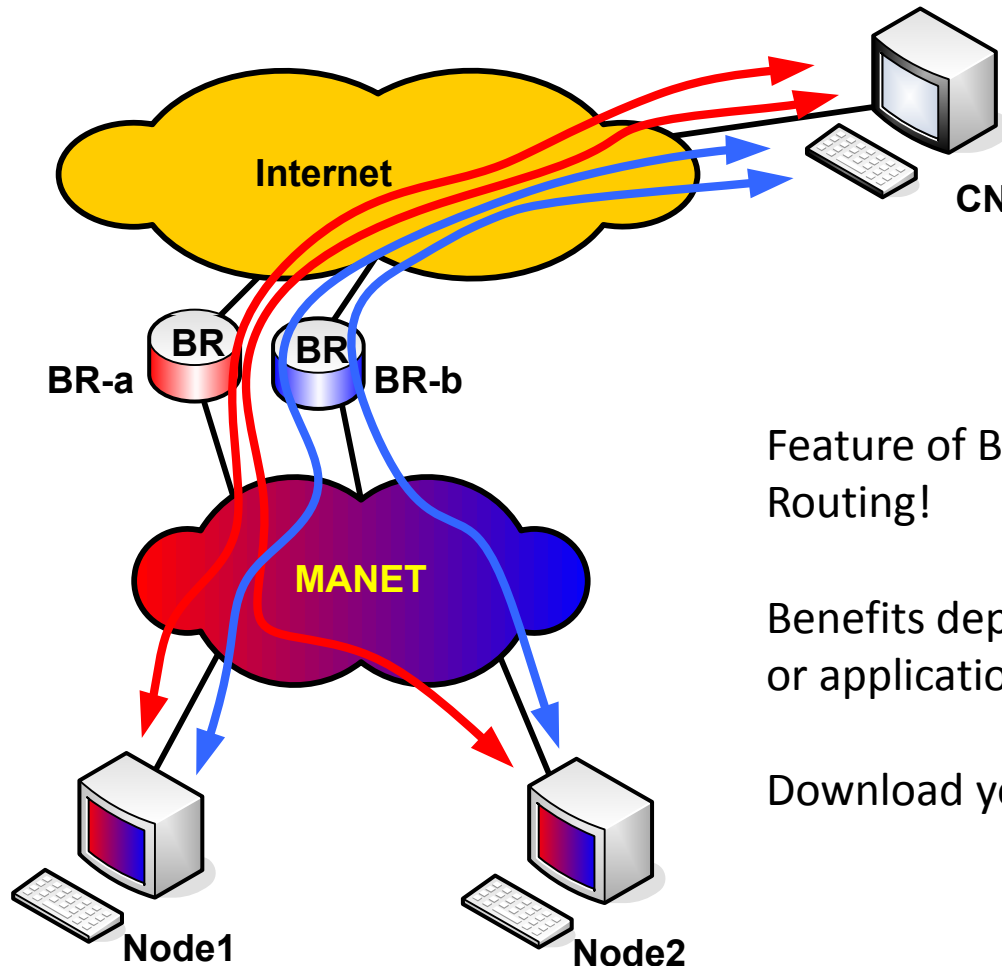
LFN2 would use “metrics” of BRs

Session continuity problems,
doesn't work in a MANET
because of movements

Solution #4: Address translation on BRs



Goal: support for multi-homed edge networks with multi-homed nodes



Feature of BRDP and BRDP Based Routing!

Benefits depend on transport layer or application layer adjustments

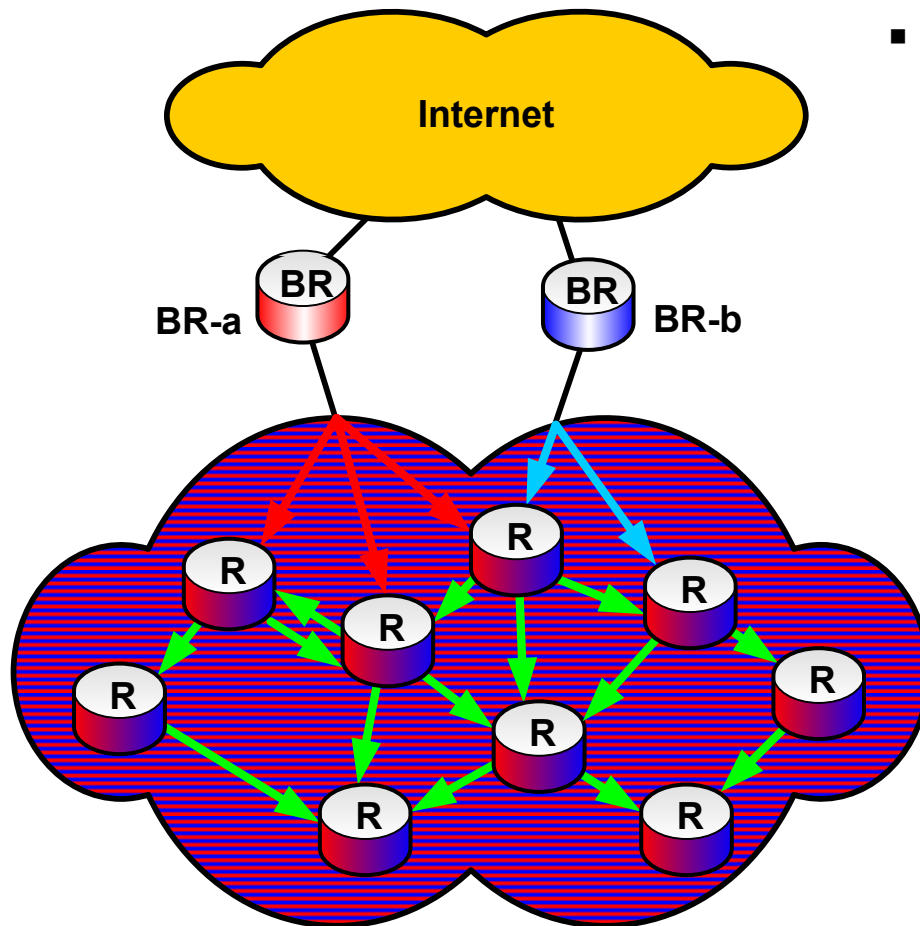
Download your files twice as fast!

How does it work?

Border Router Discovery Protocol (BRDP):

- **Provides valid prefix information to interior routers**
- **Distributes Border Router Information Option (BRIO) via Neighbor Discovery Router Advertisements.**
- **BRIOs are distributed in the MANET**
- **BRIOs provide metrics for paths from and to DFZ (Default-Free Zone)**
- **BRDP uses link metrics from routing protocol or other source**
 - **Use link metrics for both directions**
- **BRIOs provide DHCP relay information**
- **BRDP is a Distance-Vector protocol**

BRIO flooding using Neighbor Discovery Router Advertisements

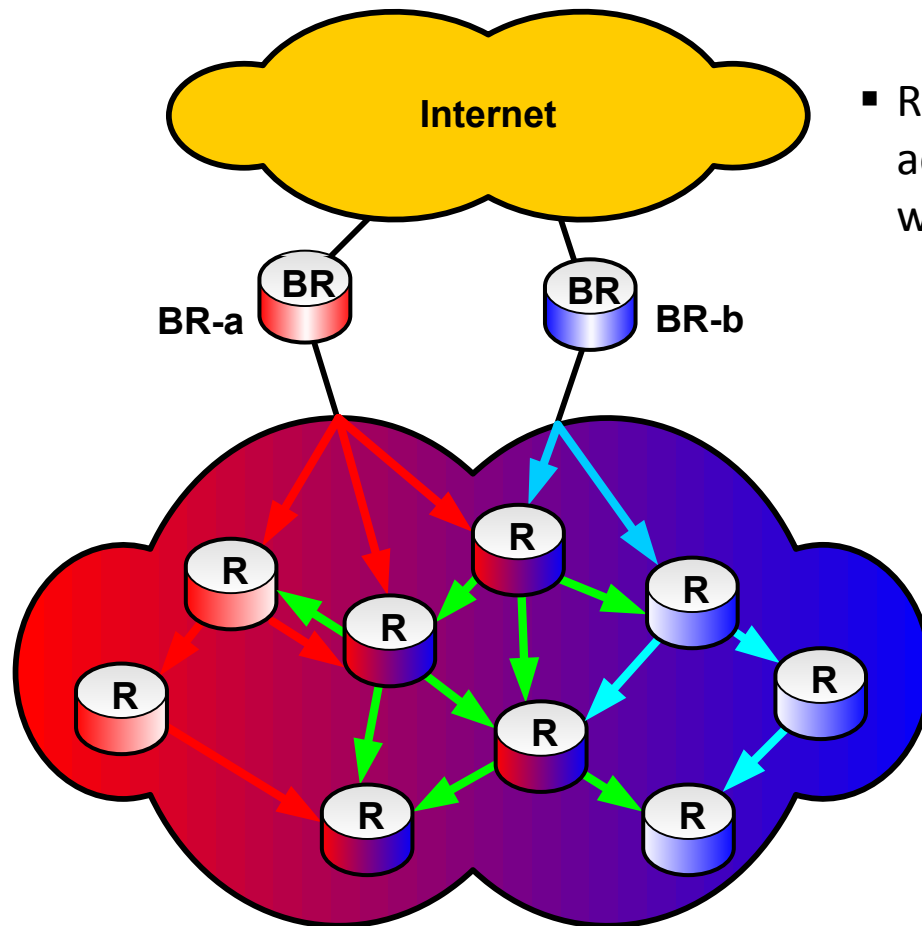


- Routers already send RA
- BRIOs piggy-backed on RA

Results:

1. All routers learn prefixes for BRs, with metric information
2. All routers learn DHCP addresses for relay or prefix delegation

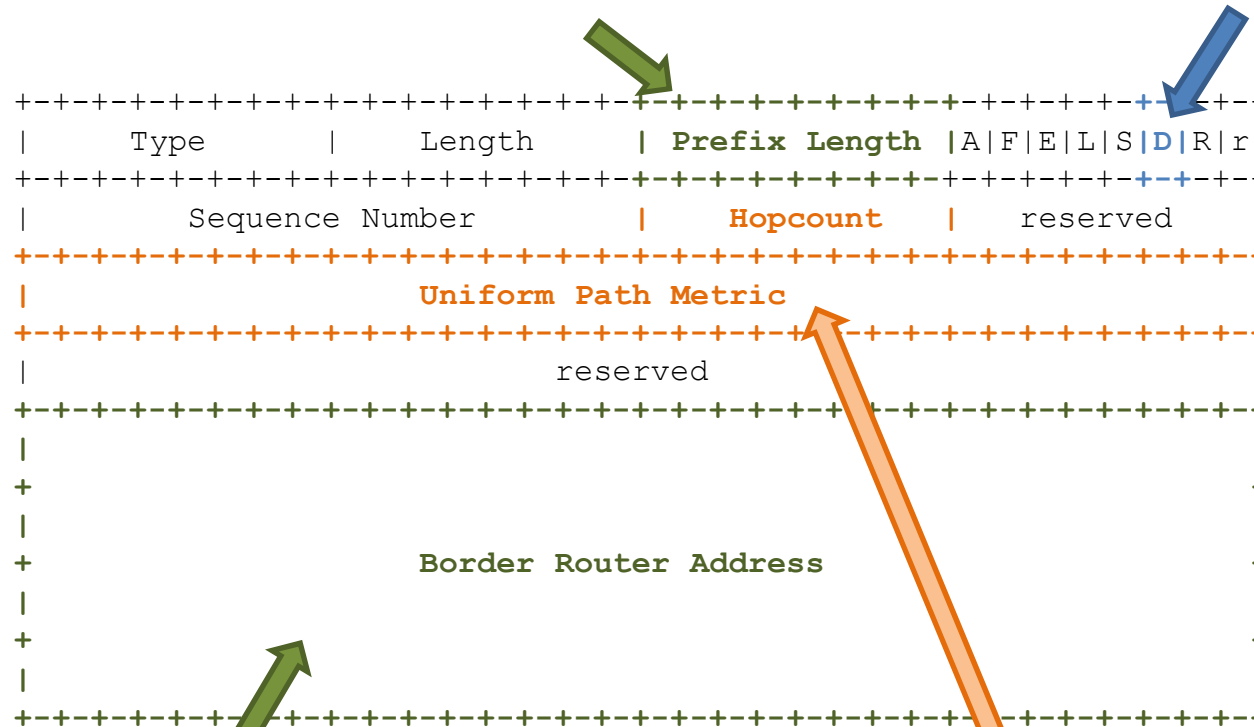
BRIO flooding with scoping (needed in large MANETs)



- Reduction of forwarded BRIO set is acceptable, as only the best paths would be used

BRIO format

D=1: BR is DHCP server or relay



BR address and valid prefix for this BR

Metric for this prefix
Is a bidirectional metric between
DFZ and this BR

RA with Prefix Information and BRIOs

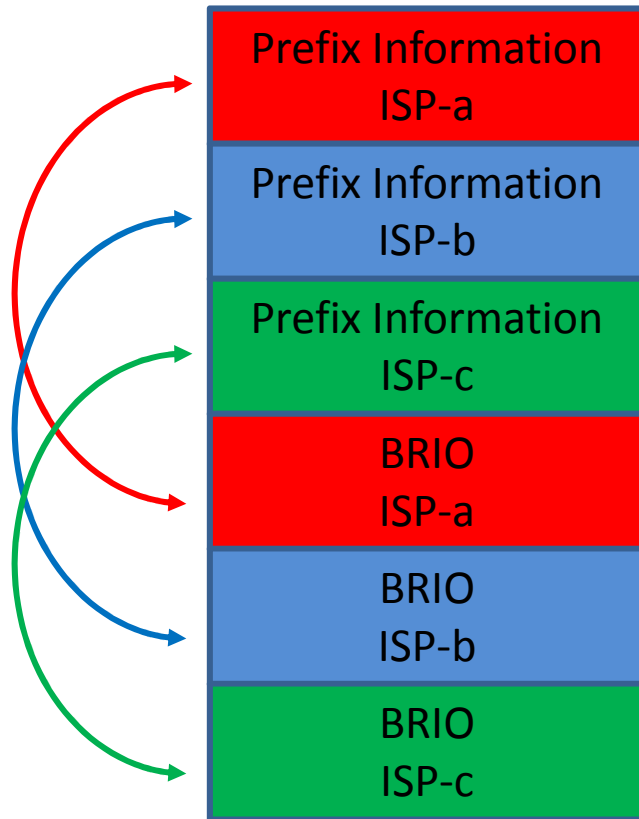
Type	Length	Prefix Length	L	A	Reserved1					
Valid Lifetime										
Preferred Lifetime										
Reserved2										
Prefix										
~										
Type	Length	Prefix Length	A	F	E	L	S	D	R	r
Sequence Number			Hopcount		reserved					
Uniform Path Metric										
reserved										
Border Router Address										

Prefix Information option
Router initiated

BRIO
BR initiated

IETF-73 - BRDP based Address Autoconfiguration

RA in MANET with 3 ISP uplinks



OK, the RA packet size increases.

MANET Address generation

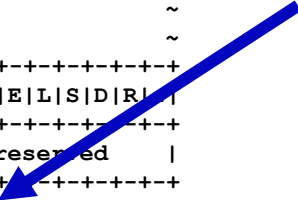
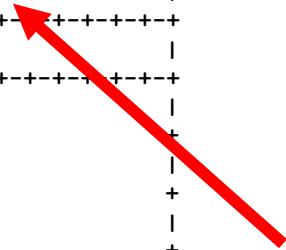
- **Select best Border Router based on metrics**

- **Use already unique Interface Identifiers:**
 - **Use /64 prefixes (as Ethernet, RFC2464)**
 - **Unique 64-bit IIDs:**
 1. **EUI-64 format-based Interface Identifier [RFC4291]**
 2. **Generation of randomized Interface Identifier [RFC4941]**
 3. **Well-distributed hash function [RFC3972]**
 - **Duplicate Address Detection may be used**

- **Source address selection is related to Border Router selection:**
 - **To be addressed in other document**
 - **Work in progress**

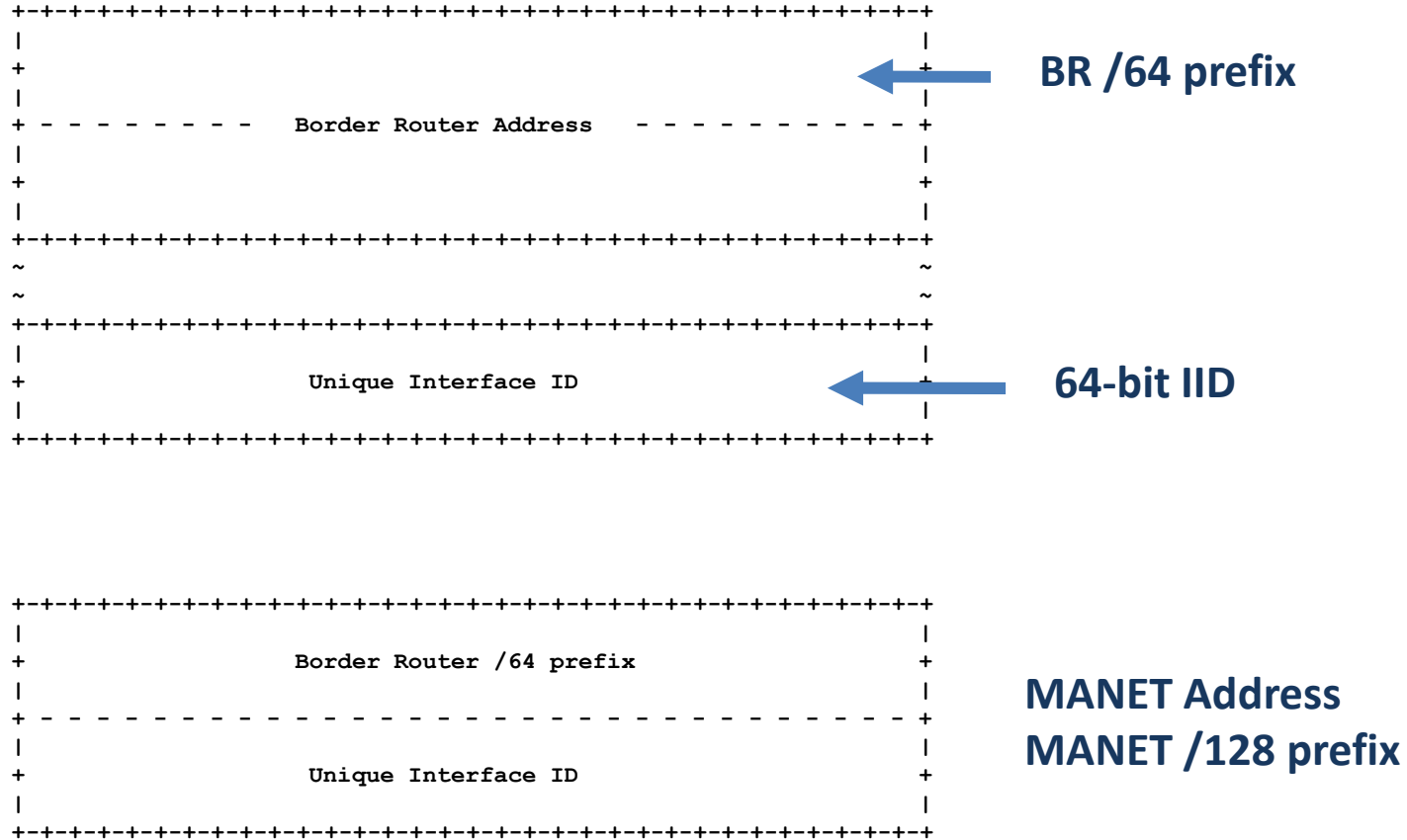
BR selection

Type	Length	Prefix Length	A	F	E	L	S	D	R	r
Sequence Number		Hopcount		reserved						
Uniform Path Metric										
reserved										
BR-a										
Border Router Address										
~										
~										
Type	Length	Prefix Length	A	F	E	L	S	D	R	r
Sequence Number		Hopcount		reserved						
Uniform Path Metric										
reserved										
BR-b										
Border Router Address										



Select best BR

Address generation



Support for DHCP

- **DHCP may be used for configuration parameters or prefix delegation**
- **D-flag in BRIO indicates the BR is DHCP server or relay**
- **MANET Router uses unicast to BR, with generated MANET address as source address**

Next steps

- Support for IPv4 (based on IPv6 connectivity and DHCP)
- Finish BRDP implementation (Linux, Opnet)
- Implement BRDP Based Routing (Linux, Opnet)
- Post document for BRDP based Source Address Selection
- Website:
 - <http://www.inf-net.nl/brdp.html>
- Any help is welcome !
- Any comment is welcome !

Thanks for your attention !