

Labcourse “Routerlab”

Pimp my WRT

OpenWRT

- Free Linux distribution for Linksys WRT and similar devices
- Based on original firmware
- Stable Version: “White Russian”
- Web management frontend: “x-wrt”
- Homepage: <http://www.openwrt.org>

Installation of OpenWRT

- Default case: Download firmware image from Website, use the “Firmware Upgrade” functionality of the device to install
- Recovery: Push firmware image with tftp during the 1 second boot-wait phase
- Packages: ipkg system. Just install additional software.

Comparison:

OpenWRT – Desktop Linux

- Space constraints:
8 MB Flash, 16MB RAM
- Slow CPU:
Software is cross-compiled
- Stripped down:
No graphics, only necessary software, tools in minimal version with few options
- Default installation:
~1GB Disk, 512+ MB RAM
- Fast CPU:
Prebuilt software is built on target system
- Full featured:
Desktop, many servers, Graphical interface, tools with full feature set

Why OpenWRT?

- Direct shell access (ssh)
- Many tools. For this course:
 - tcpdump: packet capturing
 - fprobe: Cisco style Netflow collector
 - Horst: Simple wireless analyzer
 - olsrd: Wireless routing daemon
 - (Next assignment: IPv6)

What is a flow?

- Set of packets with *common characteristics, e.g.*
 - IP src/dst address
 - Src/dst ports
 - Transport layer protocol
 - Type of Service (TOS) field
 - ...
- *Abstraction* used for traffic measurement
 - Set of IP packets passing an observation point

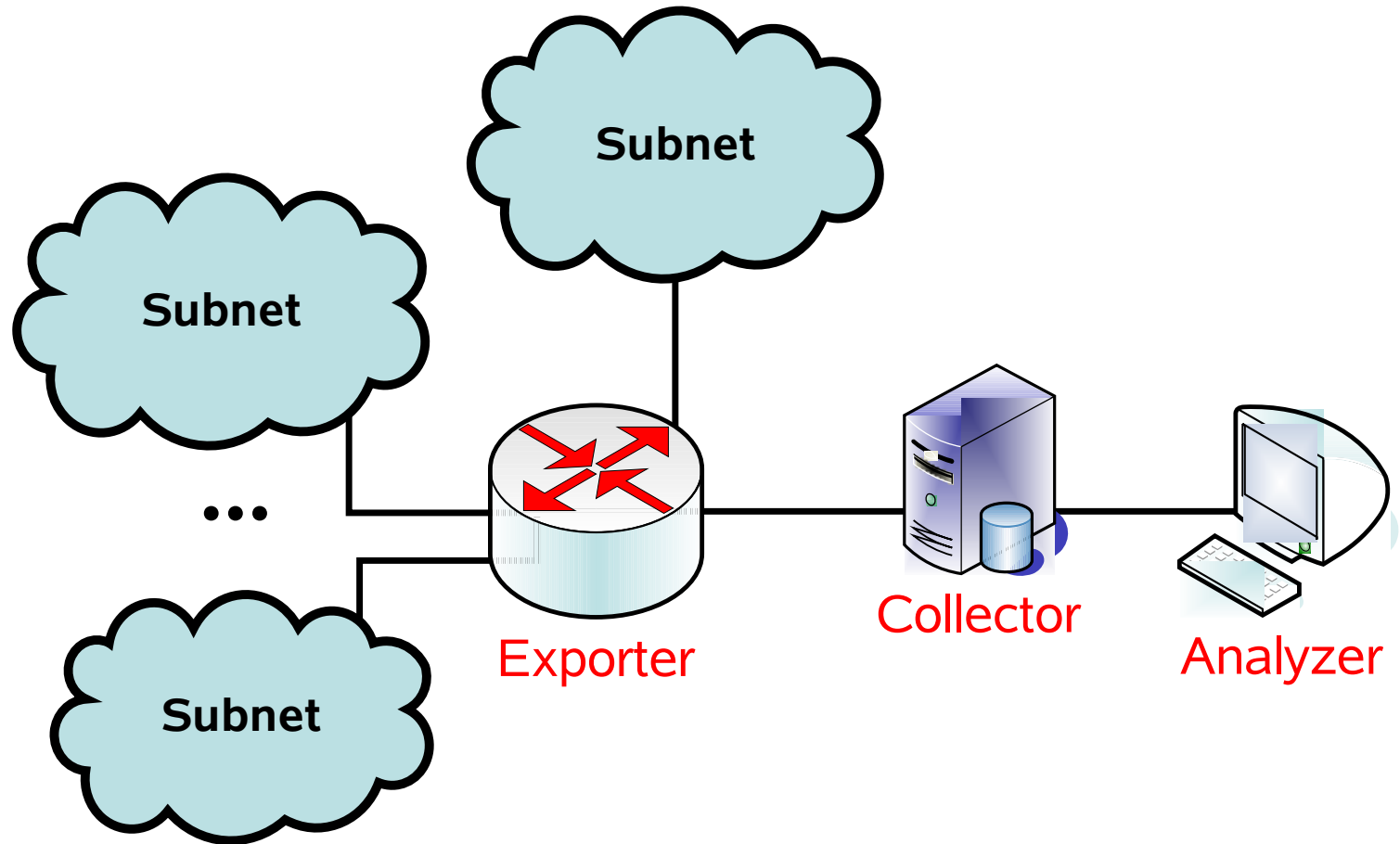
Why to collect flow info?

- Traffic engineering
- Billing, accounting
- Network planning
- Discovery of usage and application patterns
 - Who talks to whom?
 - What applications are used?
- ...

Cisco Netflow

- Open, but proprietary protocol
- Supported even by non-Cisco platforms
- Multiple versions, e.g.,
 - V5: most used version
 - V9: official standard (RFC 3954)
- Components of Netflow architecture
 - Exporter
 - Collector
 - Analyzer

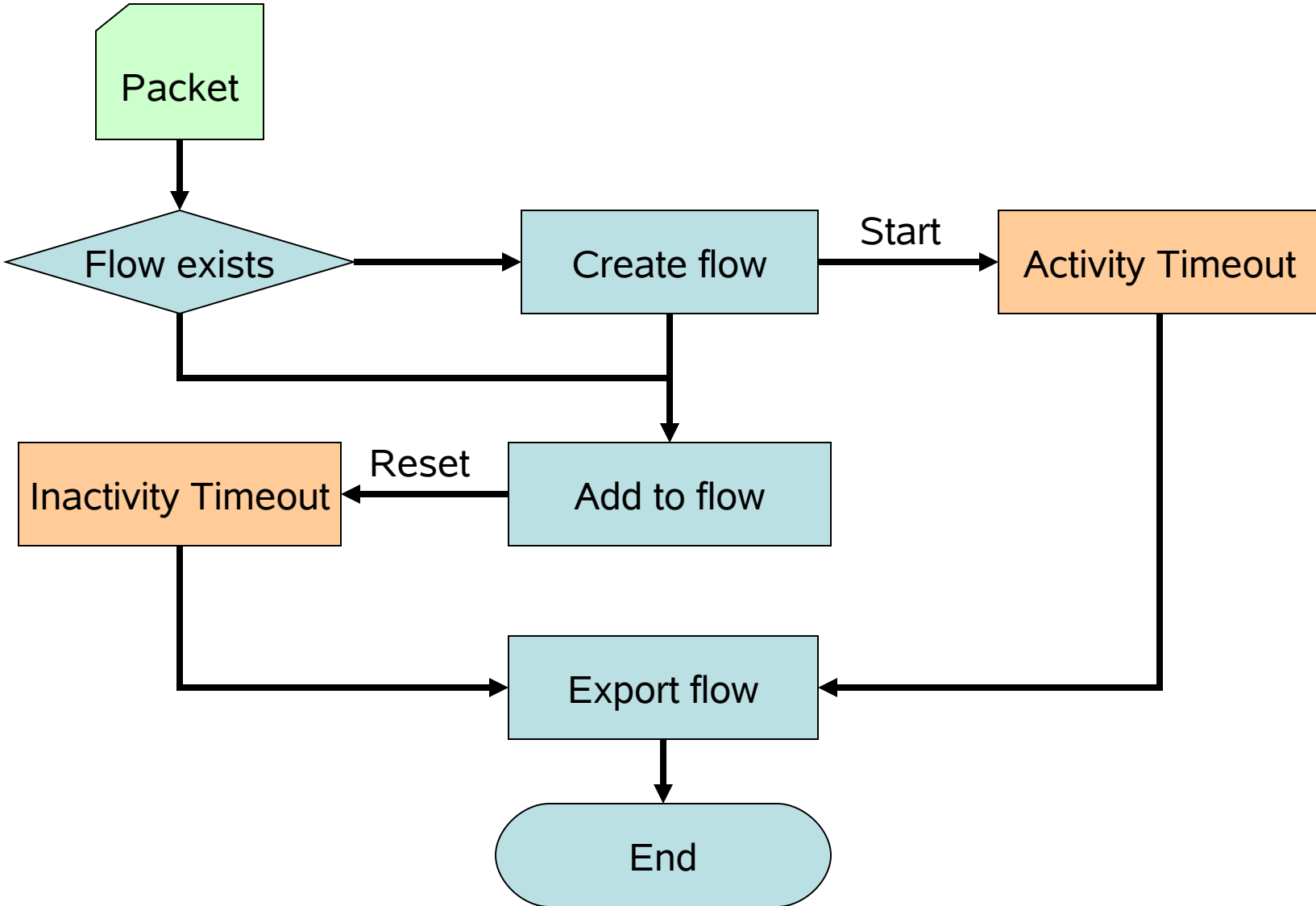
Netflow architecture



Cisco Netflow – What is collected?

- **Keys (7-tuple)**
 - Source + destination IP
 - Source + destination port
 - IP protocol
 - Input interface
 - TOS
- **Netflow record, e..g,**
 - Timestamps for flow start and finish time
 - Number of bytes/packets observed in the flow
 - For TCP: Union of all TCP flags observed
 - ...

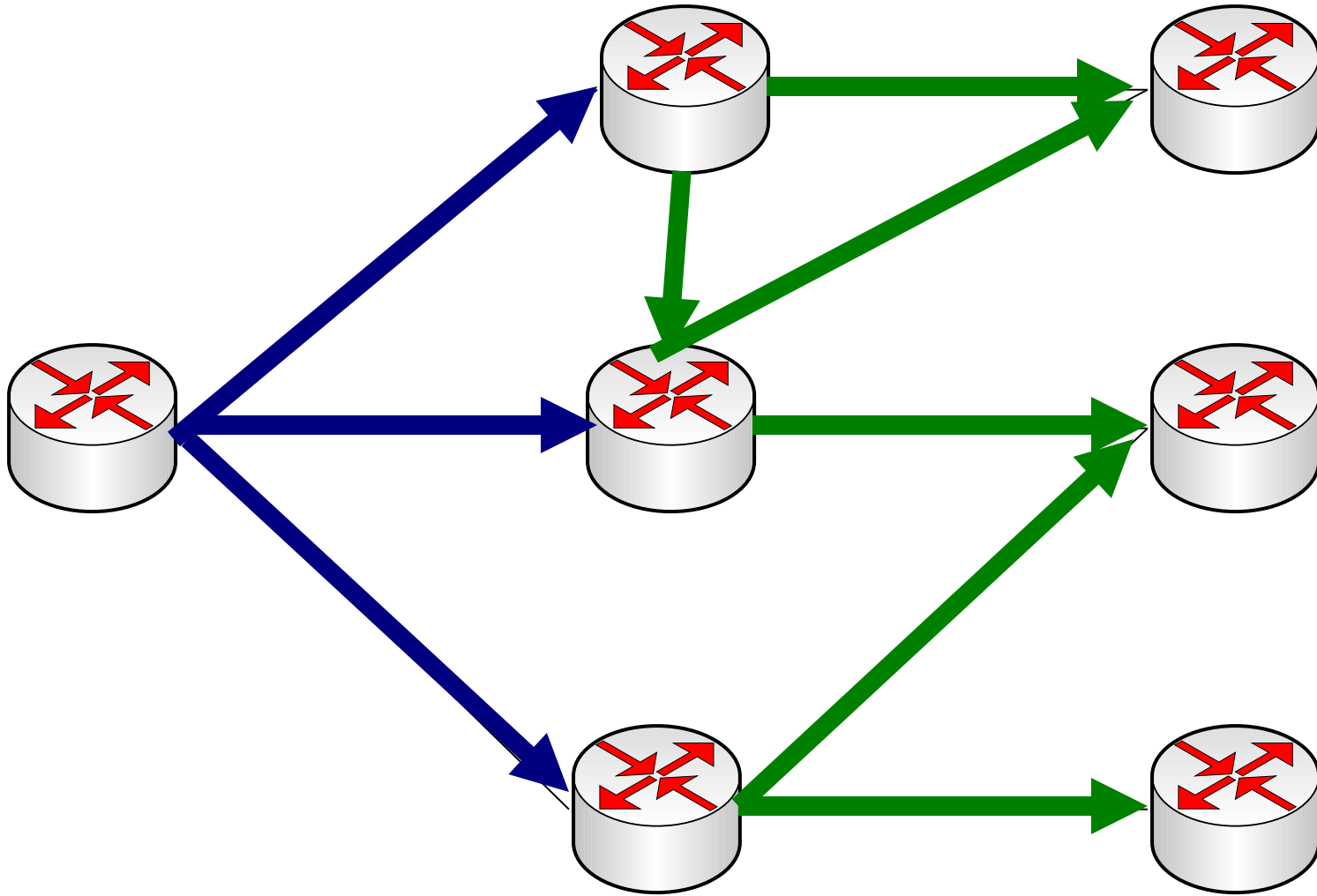
Netflow – how is it collected



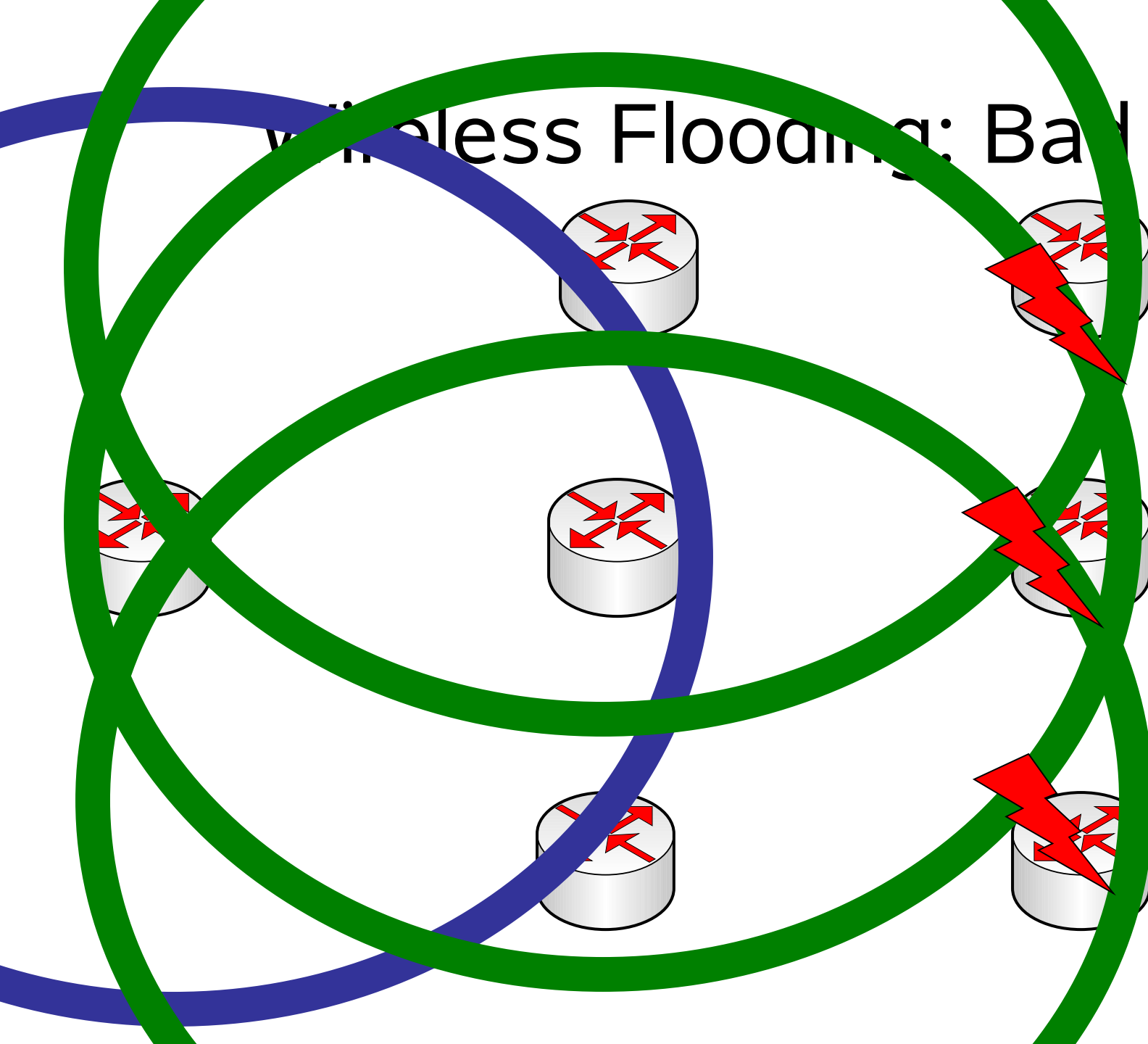
OLSR: Optimized Link State Routing

- Link state routing similar to OSPF
- No areas
- Respects link quality: Packet loss on Wireless
- Optimized flooding algorithm

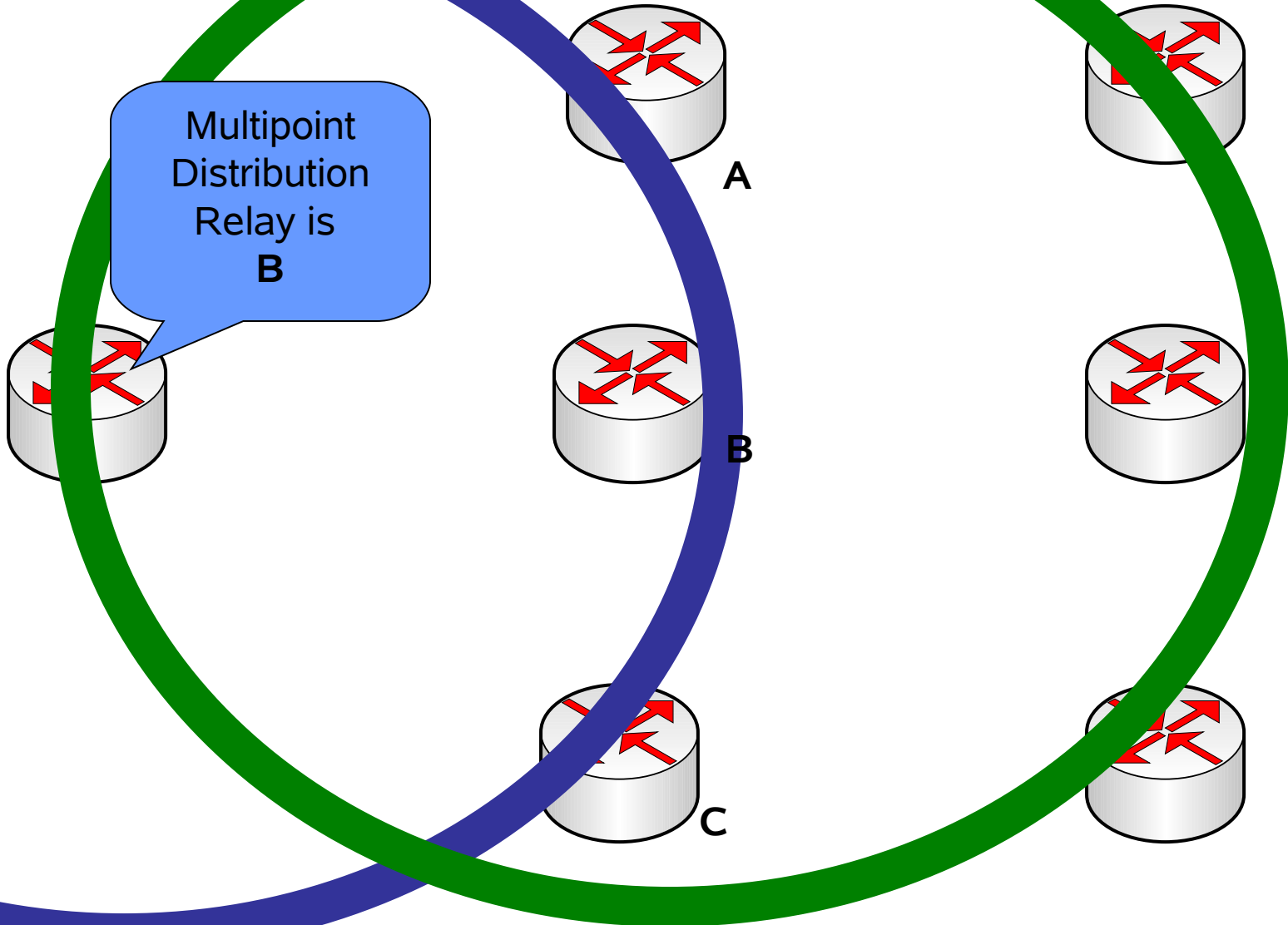
OSPF Flooding



Wireless Flooding: Bad



OLSR Flooding



OLSR:

Further differences to OSPF

- Flooding in Wireless is unreliable
 - Topology can change quickly
- ⇒ Flood topology often (~2 seconds)
- Estimated Transmission Count (ETX):

$$LQ := \frac{Hello_{RCV}}{Hello_{INT}} \quad ETX := \frac{1}{NLQ \cdot LQ}$$

OLSR in the Real World

e.g. Freifunk Berlin:

- 600 Node community network
- Best coverage in Prenzlberg, Weißensee, Mitte, Friedrichshain, Neukölln
- <http://berlin.freifunk.net>