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HRVATSKA AKADEMSKA I ISTRAŽIVAČKA MREŽA
CROATIAN ACADEMIC AND RESEARCH NETWORK

IPv6 Address space administration

Croatian Academic and Research Network

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Outline

- CARNet institution
- CARNet Network
- CARNet as RIPE LIR
- IPv6@CARNet overview
- IPv6 addressing scheme
- IPv6 address space administration and management
- Future goals and Improvements
- Conclusion

CARNet institution

- Croatian Academic and Research Network
- Provides private network for Croatian education, academic, scientific and research community
- Offers wide range of services:

  - Internet Access (13)

  - Education (17)   - Multimedia (4)

  - Internet Services (21)   - Computer Security (7)

                                      - Help and Support (4)

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CARNet member institutions

- 3089 member institutions locations
- 2233 connected institutions:
  - Academic and scientific institutions
  - Primary and secondary schools
  - Students and pupils' dormitories
  - Hospitals

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CARNet Network

- Private WAN network (star topology)

- 4 main network nodes (Zagreb, Split, Rijeka, Osijek)

- IPv4 & IPv6 dual-stack network Core (OSPFv2 & OSPFv3)

- Internet connectivity through pan-European research network GEANT and CIX (BGPv4 peerings)
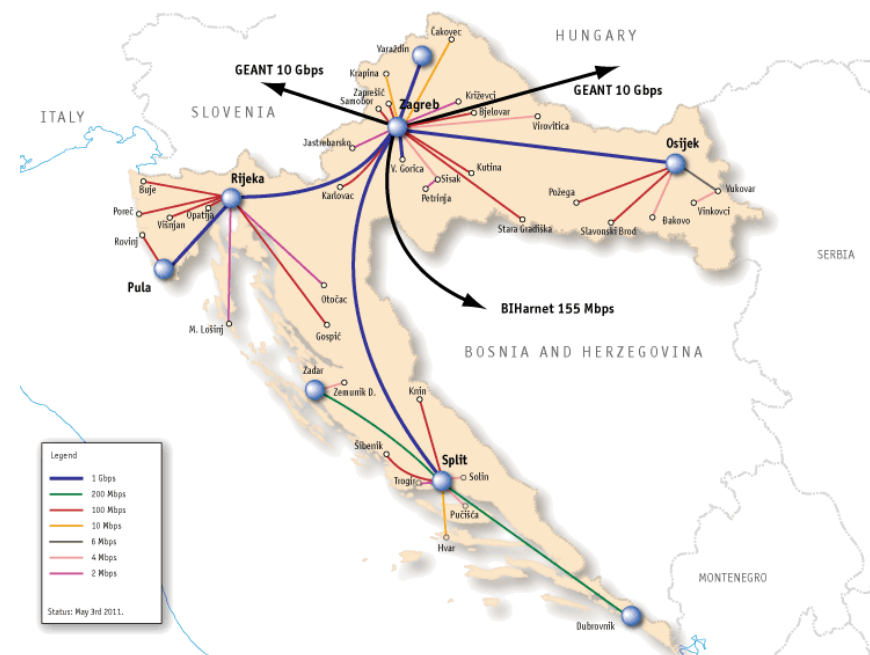
CARNet – RIPE LIR

- Local Internet Registry from **1992.**
- CARNet's IPv4 address space allocation:
  - Prefixes: 3x /16 and 1x /17 (**229,376 IPv4 addresses)**

```
----------------------------------------------------------------
Reg file Alloc    Database Allocation            a s s i g n e d
                                           %      No.    free   total
----------------------------------------------------------------
193.198/16        193.198.0.0 - 193.198.255.255  78.8%  51627  13909  65536
161.53/16         161.53.0.0 - 161.53.255.255    82.4%  54001  11535  65536
82.132/17         82.132.0.0 - 82.132.127.255    47.8%  15650  17118  32768
31.147/16         31.147.0.0 - 31.147.255.255    52.7%  34560  30976  65536
----------------------------------------------------------------

Total number of addresses in allocation              229376
Total assigned addresses in allocation:      67.9%   155838
Total assigned for infrastructure in alloc:  22.8%    52368
Total unused addresses in allocation:        32.1%    73538
```

- **2003.** – new IPv6 address prefix: **2001:B68::/32**
  - 2^{96} **IPv6 addresses**

IPv6@CARNet overview

CAR6Net IPv6 testbed
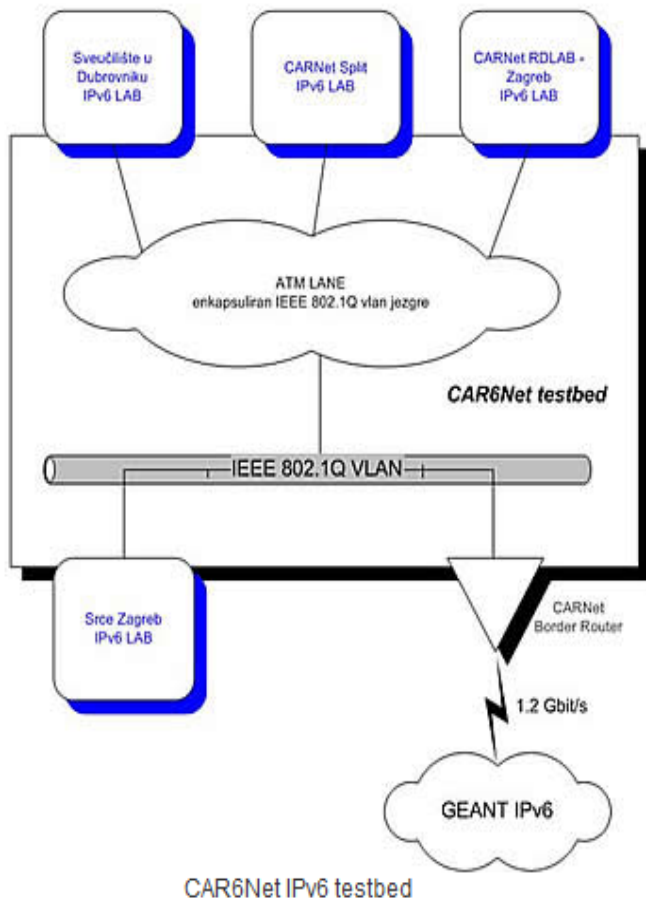
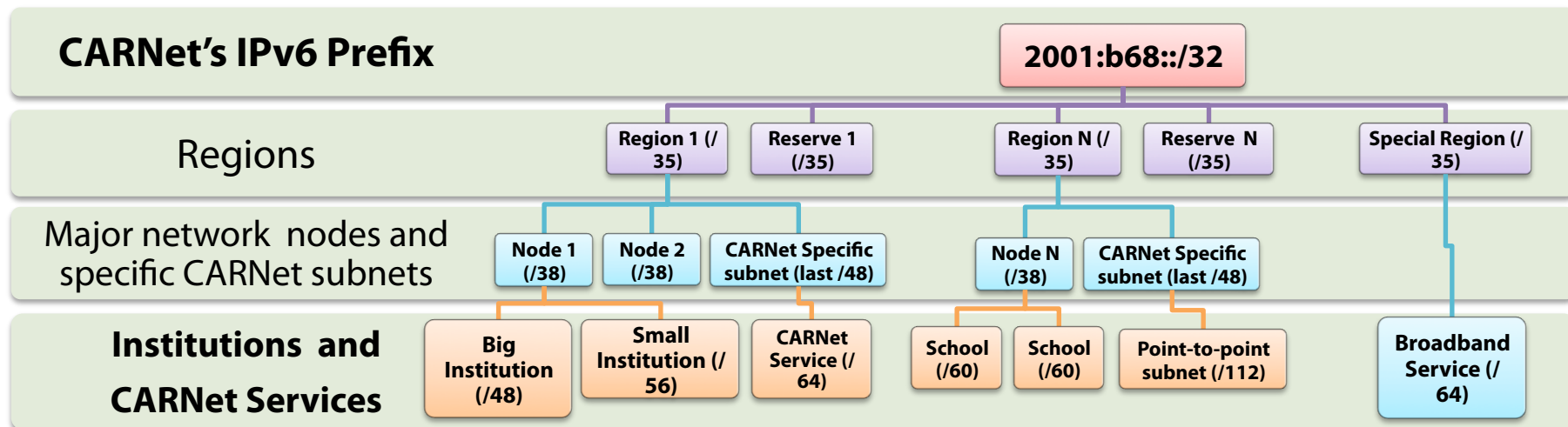**2003. CAR6Net** project (parallel IPv6 network for testing purposes)

2004. Established first IPv6 BGP connection to GEANT network (and commercial Internet)

2008. – 2009. Complete IPv6 migration to production network. Chosen transition mechanism is **dual-stack**.

2010. – 2011. Established IPv6 BGP peerings to four local ISPs through Croatian Internet Exchange
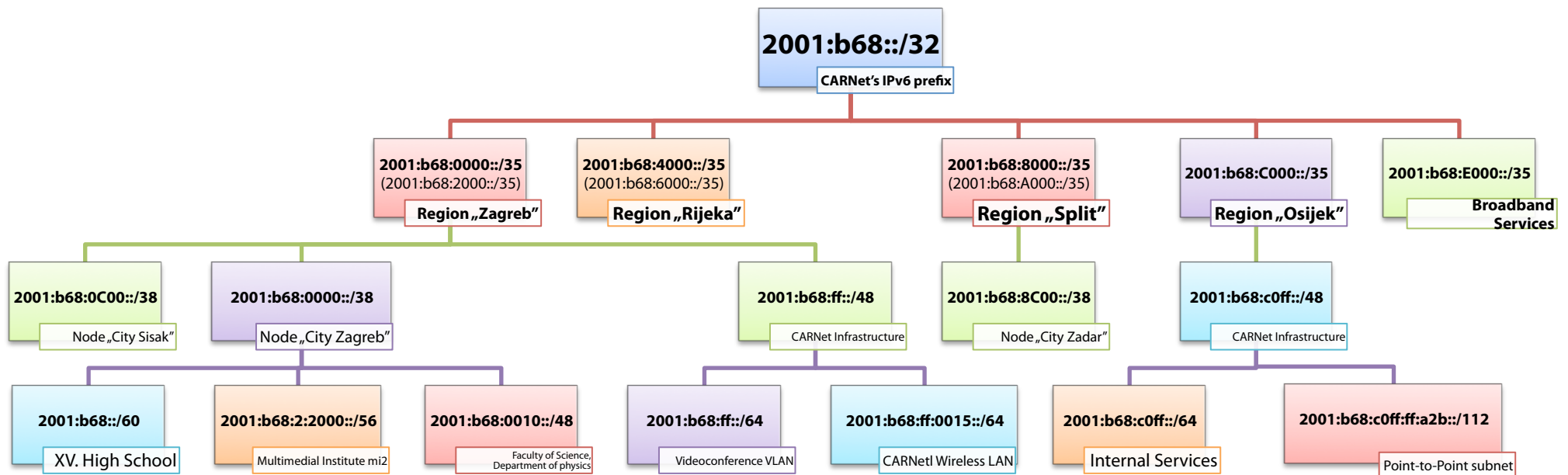
IPv6 addressing scheme and assignment

- In 2008. CARNet implemented new IPv6 addressing scheme and assignment plan
  - based upon best practices from IETF and RIPE.
 - hierarchical, scalable with efficient management

CARNet's IPv6 Prefix		**2001:b68::/32**
Regions	Region 1 (/35) · Reserve 1 (/35)	Region N (/35) · Reserve N (/35) · Special Region (/35)
Major network nodes and specific CARNet subnets	Node 1 (/38) · Node 2 (/38) · CARNet Specific subnet (last /48)	Node N (/38) · CARNet Specific subnet (last /48)
Institutions and CARNet Services	Big Institution (/48) · Small Institution (/56) · CARNet Service (/64)	School (/60) · School (/60) · Point-to-point subnet (/112) · Broadband Service (/64)

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IPv6 addressing scheme (2)

- Four major IPv6 regions
- One IPv6 region for Broadband services

CARNet's IPv6 Network today

Multi-area OSPFv3 with inter-area route summarization
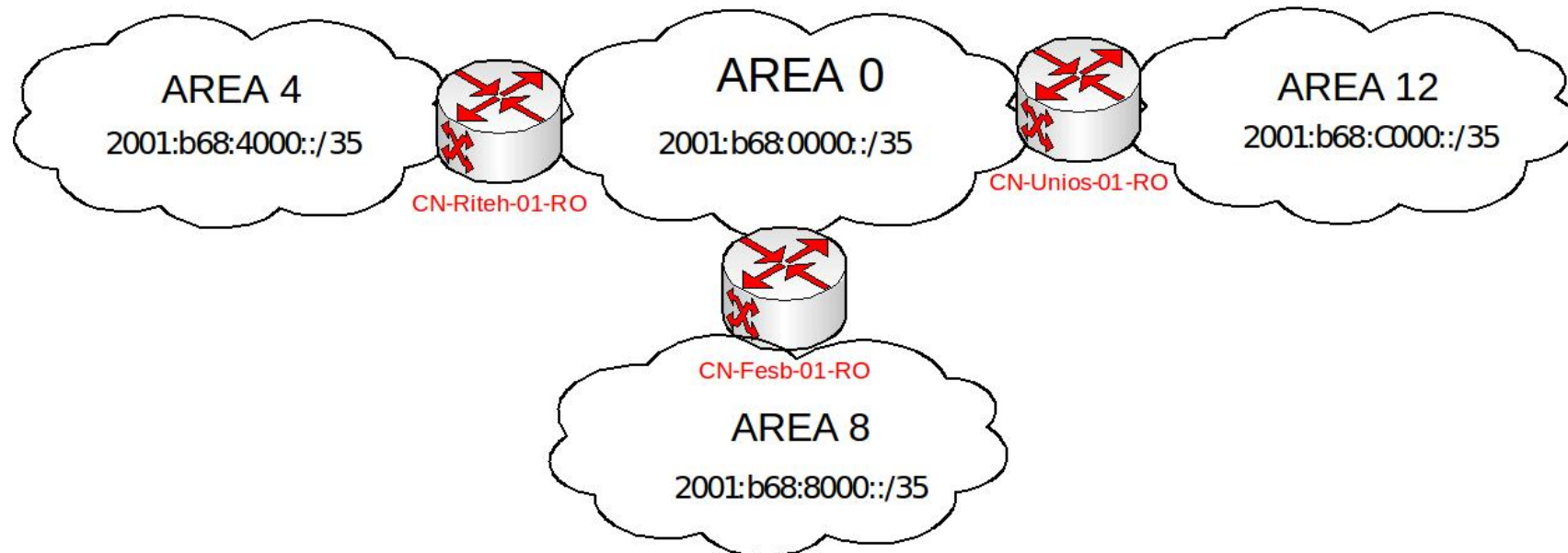
IPv6 address space administration

- Web-based visual tool for (IPv4 and) IPv6 address space administration

- Address space assignment – follows predefined addressing scheme with autoinsertion of prefixes

IPv6 adrese   ✕

Tip: Regija: Čvor: Napomena:
škola ▾   Split ▾   Split ▾   [   ]

Manual insert: ☐

[Dodaj]

Osnovna škola "Valentin Klarin" Preko, Put sv. Mihovila 1

IPv6 adresa	IPv6 tip Naziv	Napomena	Izmjenio

IPv6 address space administration (2)

Manual insertion – overrides autoinsertion

IPv6 address space administration (3)

Graphical overview

Future goals and Improvements

- migrate more CARNet services to IPv6

- ensure IPv6 connectivity to home broadband users (PPPoE/L2TP and IP subscribers). Chosen transition strategy will mostly depend on CPEs.

- **Final goal**: complete migration of core and access network to native IPv6.

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Conclusion

- IPv6 addressing scheme and assignment plan implemented according to best practices

- IPv6 address space administration and assignment via in house developed Web-based visual tool
  - manual address space insertion
  - autoinsertion based on rules

- At this moment, CARNet's core network is almost fully dual-stacked, ready to offer IPv6 connectivity and services to member institutions.

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References

- **[RFC 5375]** "IPv6 Unicast Address Assignment Considerations", G. Van de Velde, C. Popoviciu, T. Chown, O. Bonness, C. Hahn, December 2008, http://tools.ietf.org/html/rfc5375

- **[RFC 6177]** "IPv6 Address Assignment to End Sites", T. Narten, G. Huston, L. Roberts, March 2011, http://tools.ietf.org/html/rfc6177

- [**RFC4291**] "IP Version 6 Addressing Architecture", R. Hinden, S. Deering. February 2006, ftp://ftp.ripe.net/rfc/rfc4291.txt

- [**RIPE**] "IPv6 Address Allocation and Assignment Policy", August 2011, http://www.ripe.net/ripe/docs/ripe-523

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Q & A

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Thank you!

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