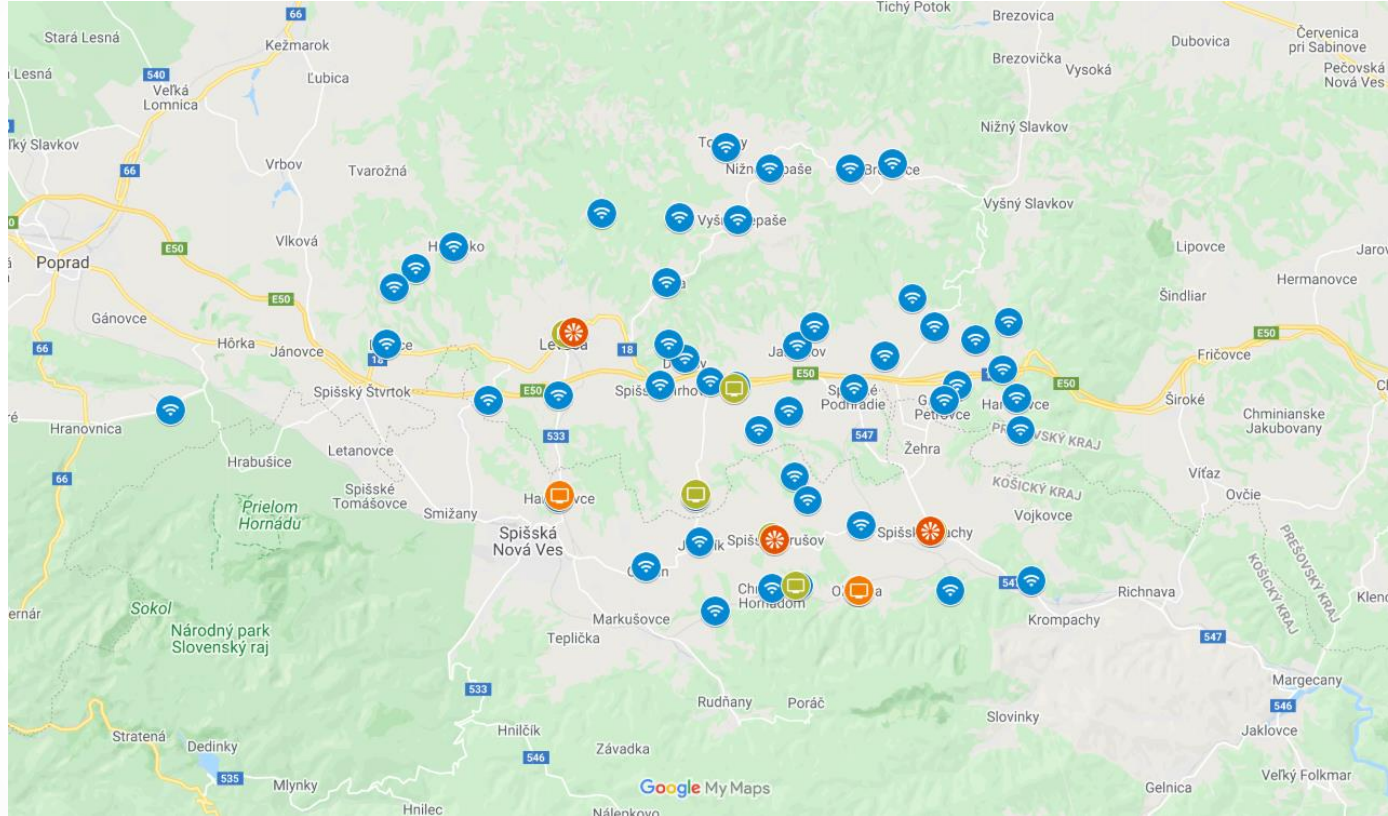


IPv6 rýchlo a ľahko: u lokálneho ISP za jeden deň

Blažej Krajňák | Svět bez IPv4 | 4.6.2020



LEVONET (AS50242)

- FTTH / FTTB, 5 GHz
- optická chrbtica, synchrónne rádia
- IPTV – multicast + OTT
- káblová televízia, DVB-T vysielateľ
- vlastné multihomed AS

Ciel'

- užitočne využiť voľný piatok 😊
- pripraviť adresný plán
- sprístupniť verejné služby na IPv6
- poskytnúť IPv6 konektivitu pre nových zákazníkov
- pripraviť adresné priestory pre firemných zákazníkov

```

2a02:6ca3: X: Y::Z
            0: PUBLIC SERVICES
            0: 1::Z - SRV LE
              2::Z - SRV SNV

...

10: SITES
10: 0::SS - Loopbacks
    SS::Z - Future use - site devices mng

20: BACKBONE
20: 1::Z - Backbone LE
    SSSS::Z - PTP1
    SSSS::Z - PTP2

21: VIRTUAL SRV MNG
21: 1::Z - SRV LE
    2::Z - SRV SNV

22: L3 CUST PTP
22: Y::Z -

30: CPE PTP
30: SS::Z - /64 CPE PTP link

```

```

00ff: Y::Z

```

DELEGATIONS

```

2a02:6ca3:SS00
2a02:6ca3:0100 - SITE1
2a02:6ca3:0200 - SITE2

```

...

```

2a02:6ca3:fc00/38 - L3 CUSTOMERS /48 delegations
                |
2a02:6ca3:ff00/38 - L3 CUSTOMERS /56 delegations

```

Adresný plán

- /29 od RIPE NCC
- plán na /32
- 100 vysielačov - /40 delegačný prefix
- /56 pre SOHO
- /48 pre firmy
- /64 PTP

EGP

- AS5578 & AS31117 plná podpora dual-stack
- /64 prepoje
- nezabudnúť filtrovať
- predvolene filtrovaný traffic z vonku siete

EGP – RPKI



RIPE NCC
RIPE NETWORK COORDINATION CENTRE

Manage IPs and ASNs > Analyse > Participate > Get Support > Publications > About Us >

Home > ... > LIR Portal

You are editing **LEVONET, s.r.o.**

RPKI Dashboard 4 CERTIFIED RESOURCES ALERTS ARE SENT TO 2 ADDRESSES

8 BGP Announcements 13 ROAs

8 Valid 0 Invalid 0 Unknown 13 OK 0 Causing problems

BGP Announcements Route Origin Authorisations (ROAs) History 2a02:6ca3::

Discard Changes Delete ROAs Causing Problems Not Causing Problems + New ROA

AS number	Prefix	Most specific length allowed	Affected announcements
AS50242	2a02:6ca3::/32	32	1

Show 25

Home | Sitemap | Contact Us | Service Announcements | Privacy Statement | Legal | Cookies | Copyright Statement | Terms of Service

IGP

- OSPFv3
- /64 PTP
- router-id z IPv4 adresného plánu
- zákaznícke CPE na PPPoE + Mikrotik koncentrátor + RADIUS
- koncentrátor per site

Interné služby

Adresovanie VM

- 2 serverové lokality, Debian virtuálne stroje
- Quagga, dummy interface, /32 prefixy pre služby
- primárne aj sekundárne IP služieb majú obe lokality
- zvýhodnenie pomocou OSPF cost

```
!  
! Zebra configuration saved from vty  
! 2020/05/08 23:32:32  
!  
!  
interface dummy1  
ip address 172.20.1.2/32  
ip address 172.20.1.3/32  
ip address 172.20.1.5/32  
ip address 172.20.1.6/32  
ip address 172.20.1.15/32  
ip address 172.20.1.16/32  
ip address 109.236.119.2/32  
ip address 109.236.119.3/32  
ip address 109.236.119.5/32  
ip address 192.168.11.7/32  
ip address 192.168.17.7/32  
ip address 172.20.2.2/32  
ip address 172.20.2.3/32  
ip address 10.202.254.1/32  
ip address 109.236.120.2/32  
ip address 109.236.120.3/32  
ip address 172.20.1.17/32  
ip address 87.244.194.34/32  
ip address 109.236.119.4/32  
ip address 109.236.120.4/32  
!  
interface ens192  
!  
interface ens224  
!  
interface ens256  
!  
interface lo
```

zebra

```
!  
! Zebra configuration saved from vty  
! 2020/04/28 11:18:38  
!  
!  
!!  
interface dummy1  
ip ospf cost 200 10.202.254.1  
ip ospf cost 700 109.236.120.2  
ip ospf cost 700 109.236.120.3  
ip ospf cost 700 109.236.120.4  
ip ospf cost 700 172.20.2.2  
ip ospf cost 700 172.20.2.3  
ip ospf cost 700 192.168.17.7  
!  
interface ens192  
ip ospf priority 0  
!  
interface ens224  
!  
interface ens256  
!  
interface lo  
!  
router ospf  
ospf router-id 172.20.11.2  
passive-interface default  
no passive-interface ens192  
network 10.202.254.1/32 area 0.0.0.0  
network 87.244.194.34/32 area 0.0.0.0  
network 109.236.119.0/28 area 0.0.0.0  
network 109.236.120.0/28 area 0.0.0.0  
network 172.20.1.0/26 area 0.0.0.0  
network 172.20.2.0/26 area 0.0.0.0  
network 172.20.11.0/26 area 0.0.0.0  
network 192.168.11.7/32 area 0.0.0.0  
network 192.168.17.7/32 area 0.0.0.0  
!
```

ospfd

Adresovanie VM – v6

- OSPFv3 sa spúšťa na celý interface
- nie je možné modifikovať cost iba jednej IP

=>

- 2x dummy interface
 - primárny – primárne IP služieb
 - sekundárny – sekundárne IP služieb, zvýšený cost

DNS - Bind

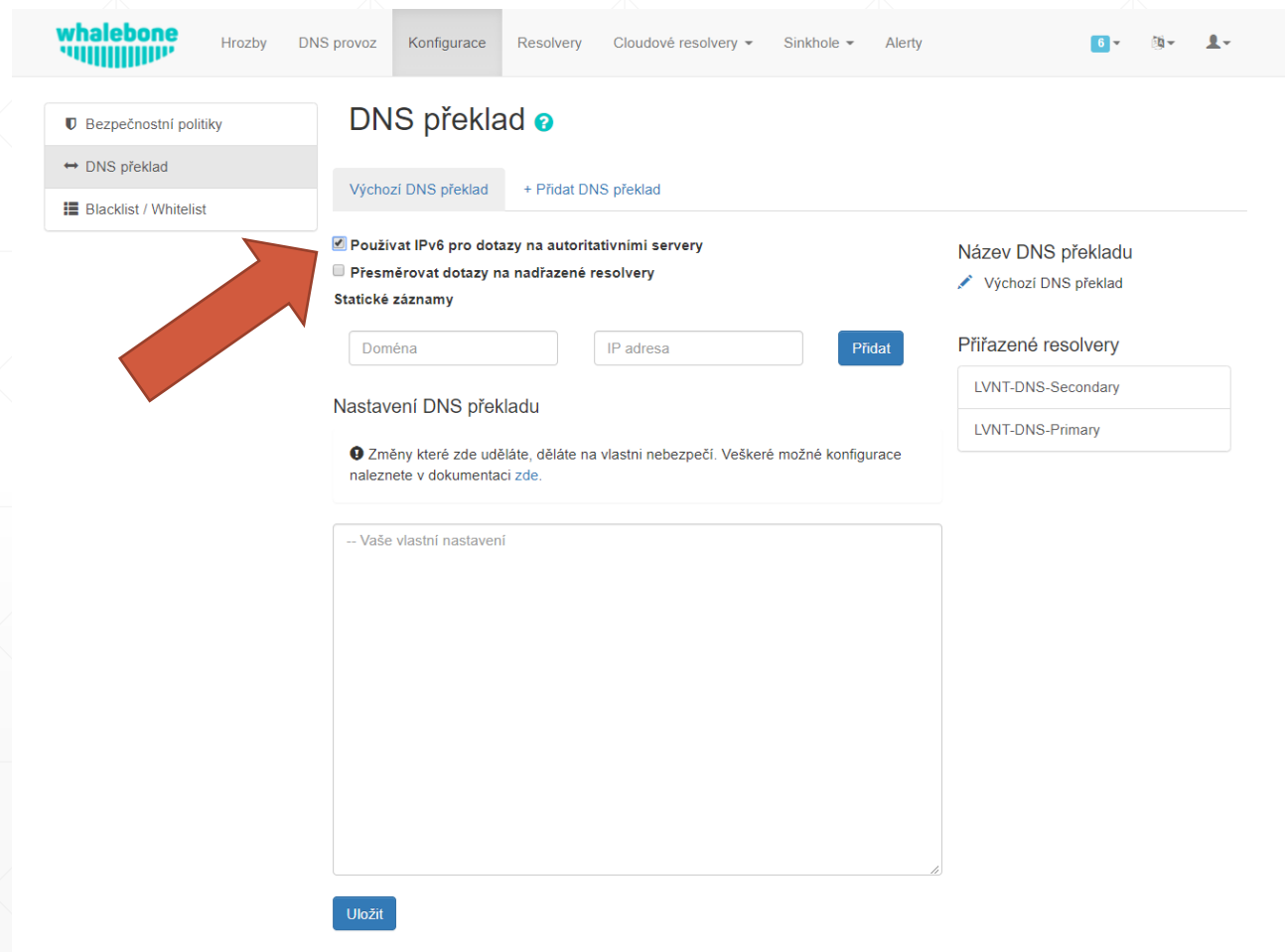
`/etc/default/bind9`

```
# run resolvconf?  
RESOLVCONF=no  
  
# startup options for the server  
OPTIONS="-u -4 bind"
```

`/etc/bind/named.conf.options`

```
options {  
    ...  
    listen-on-v6 { 2a02:6ca3:0:1::2; 2a02:6ca3:0:1::4; };  
    ...  
};
```

DNS - Whalebone



The screenshot shows the Whalebone web interface for DNS configuration. The top navigation bar includes the Whalebone logo and menu items: Hrozby, DNS provoz, Konfigurace, Resolvery, Cloudové resolvery, Sinkhole, and Alerty. The left sidebar contains three items: Bezpečnostní politiky, DNS překlad (highlighted with a red arrow), and Blacklist / Whitelist. The main content area is titled 'DNS překlad' and features a sub-menu with 'Výchozí DNS překlad' and '+ Přidat DNS překlad'. Below this are two checked checkboxes: 'Používat IPv6 pro dotazy na autoritativními servery' and 'Přesměrovat dotazy na nadřazené resolvery'. Under the heading 'Statické záznamy', there are input fields for 'Doména' and 'IP adresa', followed by a 'Přidat' button. A section titled 'Nastavení DNS překladu' contains a warning icon and text: 'Změny které zde uděláte, děláte na vlastní nebezpečí. Veškeré možné konfigurace naleznete v dokumentaci zde.' Below this is a large text area with the placeholder '-- Vaše vlastní nastavení' and an 'Uložit' button at the bottom. On the right side, there are sections for 'Název DNS překladu' (with a dropdown set to 'Výchozí DNS překlad') and 'Přiřazené resolvery' (with a list containing 'LVNT-DNS-Secondary' and 'LVNT-DNS-Primary').

DNS – reverzná zóna

```
$TTL      86400
@         IN      SOA     ns1a.levonet.sk. hostmaster.levonet.sk. (
          2020050805 ; Serial
          28800      ; Refresh
          14400      ; Retry
          3600000    ; Expire
          14400     ) ; Minimum
          IN      NS     ns1a.levonet.sk.
          IN      NS     ns2a.levonet.sk.

2.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     ns1.levonet.sk.
3.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     ntp1.levonet.sk.
4.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     ns1a.levonet.sk.
6.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     mx1.levonet.sk.
7.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     mx5.levonet.sk.
0.1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     webhosting.levonet.sk.
2.1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     mx3.levonet.sk.
3.1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.1.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     mx4.levonet.sk.

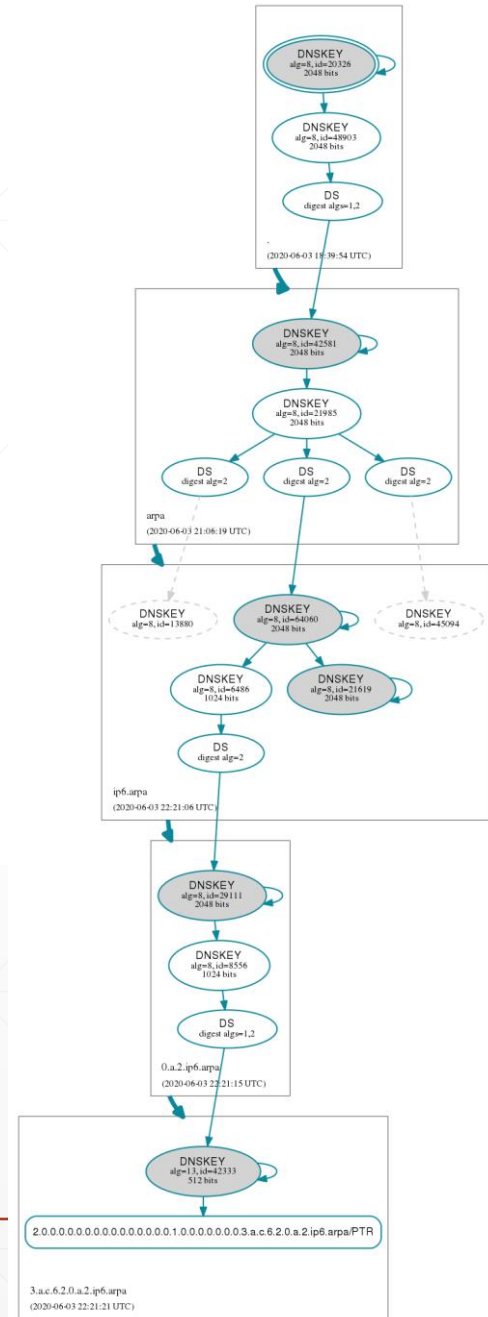
2.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.2.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     ns2.levonet.sk.
3.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.2.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     ntp2.levonet.sk.
4.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.2.0.0.0.0.0.0.0.0.3.a.c.6.2.0.a.2.ip6.arpa. PTR     ns2a.levonet.sk.
```

DNS – reverzná zóna

```

domain:          3.a.c.6.2.0.a.2.ip6.arpa
nserver:        ns1a.levonet.sk
nserver:        ns2a.levonet.sk
ds-rdata:       42333 13 1 EF7355536A4477DB1A3A3AA03B07A6F64A1D2854
ds-rdata:       42333 13 2 79BB7ECB928E0F4D562CFD7CC403A2919B4F07D7A0BF3E8E44BA93E1782E11B
admin-c:        LVNA
tech-c:         LVNT
zone-c:         LVNA
mnt-by:         MNT-LEVONET
created:        2020-05-08T17:05:59Z
last-modified: 2020-05-08T17:07:11Z
source:         RIPE
    
```

Update object



Emailový server

/etc/postfix/main.cf

```
smtp_bind_address = 109.236.119.6
smtp_bind_address6 = 2a02:6ca3:0:1::6
mynetworks = 127.0.0.0/8 [::ffff:127.0.0.0]/104 [::1]/128
inet_interfaces = 127.0.0.1, 172.20.11.7, 109.236.119.6, 2a02:6ca3:0:1::6
inet_protocols = all
```

- Nezapadnutí na SPF

Webový server

`/etc/apache2/ports.conf`

```
# Listen on IPs
listen 127.0.0.1:80
listen 109.236.119.10:80
listen [2a02:6ca3:0:1::10]:80

<IfModule ssl_module>
  listen 109.236.119.10:443
  listen [2a02:6ca3:0:1::10]:443
</IfModule>
```

Zákazníci

Mikrotik

- povolit' IPv6 balíček

```
/ipv6 dhcp-client
add add-default-route=yes interface=pppoe-out1 pool-name=pd request=prefix
/ipv6 address
add from-pool=pd interface=bridge
/ipv6 dhcp-server
add address-pool=pd interface=bridge name=server1
/ipv6 nd
add advertise-dns=yes hop-limit=64 interface=bridge other-configuration=yes
ra-interval=10s-1m
```

TP-Link

The screenshot displays the web management interface for a TP-Link Wireless N Router (Model No. TL-WR841N). The interface is divided into a left-hand navigation menu and a main configuration area. The navigation menu includes options such as Status, Quick Setup, Operation Mode, Network, Wireless, Guest Network, DHCP, Forwarding, Security, Parental Controls, Access Control, Advanced Routing, Bandwidth Control, IP & MAC Binding, Dynamic DNS, IPv6 (highlighted), System Tools, and Logout. The IPv6 section is expanded to show sub-options: IPv6 Status, IPv6 WAN, and IPv6 LAN. The main configuration area is titled "IPv6 WAN" and contains the following settings:

- Enable IPv6:
- Connection Type:
- Addressing Type:
- Advanced options: PPPoE same session with IPv4 connection

At the bottom of the configuration area, there is a "Save" button and an "Advance" button with a dropdown arrow.

Dasan ONU H66X

- nastavenia definované cez .xml provisioning
- momentálne SW chyba, nutné povoliť IPv6 ešte manuálne

A čo predsa len zostalo...

Webový server

- monitoring v6 služieb a konektivity
- aktualizovať RIPE Atlas
- migrácia terajších zákazníkov

Ďakujem za pozornosť'

-  Vaša verejná IPv4 adresa sa zdá byť 109.236.11
-  Vaša verejná IPv6 adresa sa zdá byť 2a02:6ca3:800:0:ac34:a
-  Your Internet Service Provider (ISP) appears to be LEVONET
-  Pretože máte IPv6, pridali sme Vám záložku, ktorá ukazuje ak
-  [HTTPS](#) support is now available on this site. [\[viacej informácií\]](#)
-  Your DNS server (possibly run by your ISP) appears to have II

10/10

for your IPv6 stability a