VAS Experts

Stingray Service Gateway

Advanced DPI Solution

- Analysis
- Control
- Management

Index

About VAS Experts

VAS Experts

- Over 1000 installations on ISPs in Russia, Europe and Asia
- More than 25 Tbps
- 10M+ users

Latest Installations:

- Lebanon
- Cyprus
- Turkey
- Moldova

Our portfolio

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Deep Packet Inspection 01		QoE 02	
BNG 03	CG-NAT 04	DLP 05	

Key Features

Analytics

- IoT, DDoS, BotNet
- NetFlow, Interception
- QoE metrics

Subscriber Management

- Prioritization, policing
- Block/Allow lists
- BNG, CG-NAT

VAS for ISP

- Subscriber’s profiling and marketing campaigns
- Parental control
- Mini-Firewall

Own DPI Engine

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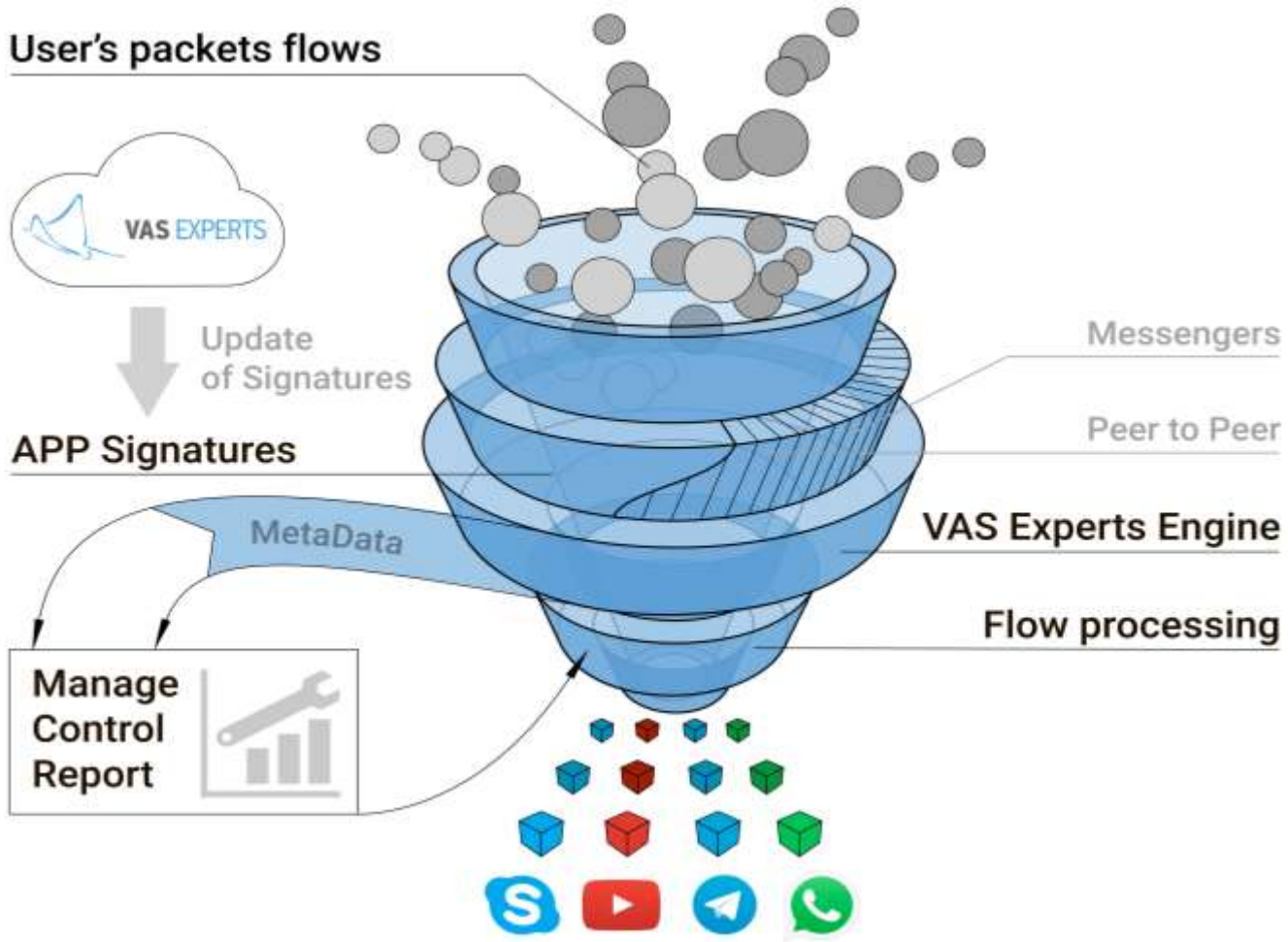
History

2013 – DPI
2016 – CG-NAT
2017 – L3 BNG DualStack IPv4/IPv6
2018 – Lawful Interception
2019 – L2 BNG DualStack IPv4/IPv6
2020 – Mobile Networks Support
2021 - Border

VAS Experts DPI can compete with

- Sandvine
- Allot
- Cisco SCE
- A10 Network
- Ericsson SE



Multi-functionality

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Investment Protection

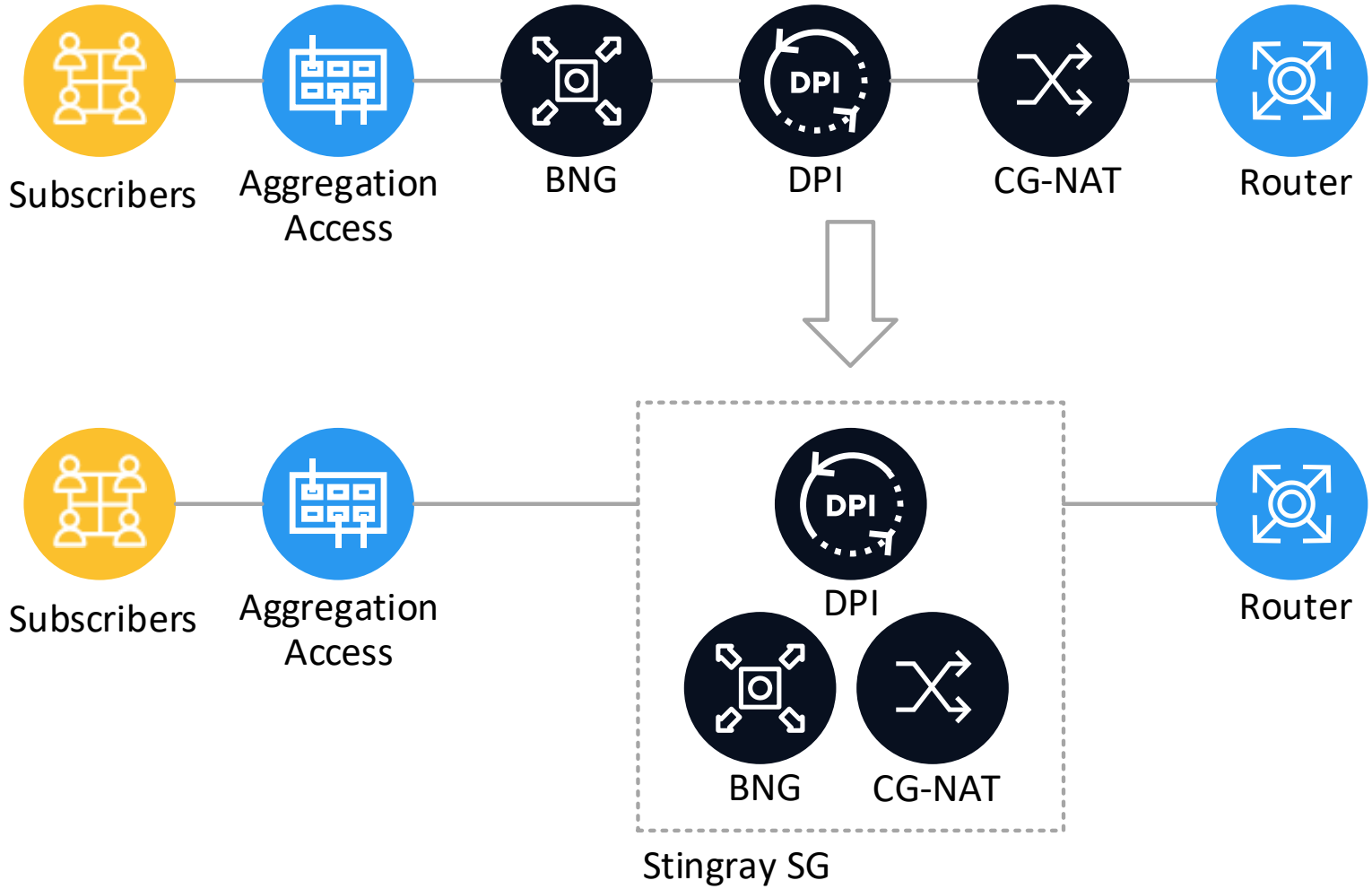
License:

- Upgrade
- Merge
- Split
- Transfer

License Manager:

- Reservation
- Oversubscription
- VAS (additional services)
- Testing
- Virtualization

SaaS | PaaS



Performance per platform

FEATURE	SSG-6	SSG-20	SSG-40	SSG-80	SSG-100	SSG-120
Performance, Gbps	6	20	40	80	100	120
Number of subscribers	400 K	2 M	4 M	8 M	10 M	12 M
Maximum number of session	4 M	16 M	32 M	64 M	80 M	96 M
Number of new sessions	100 K	250 K	350 K	400 K	500 K	600 K
Application protocols	6000+					
Ports	2x10GbE SFP+	4x10GbE SFP+	8x10GbE SFP+	16x10GbE SFP+	16x10GbE / 6x40GbE / 6x25GbE SFP+ / QSFP / QSFP28	20x10GbE / 8x40GbE / 8x25GbE SFP+ / QSFP / QSFP28
Latency (average value), µc	30					
Platform	1U, 19”					

Redundancy

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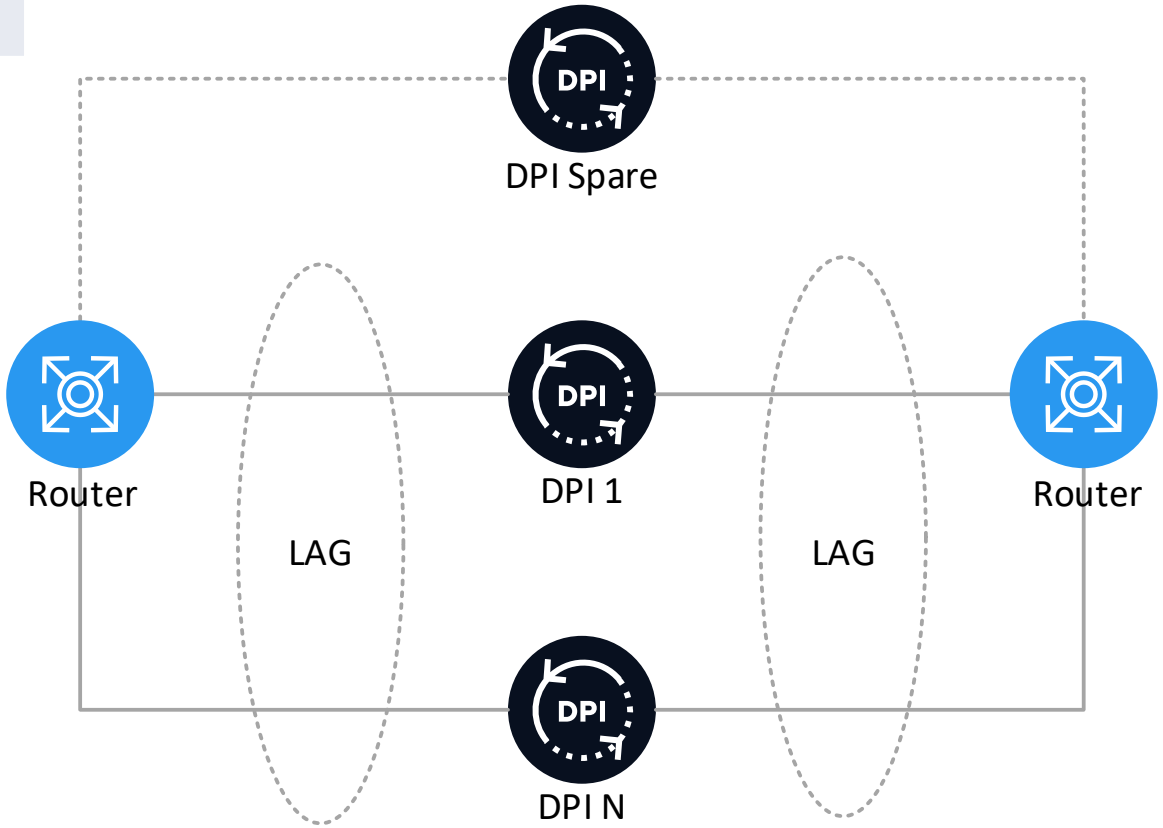
- Hash IPsrc/IPdst balancing in Link Aggregation Group
- Spare DPI on the alternative route
- Special low license price for Spare DPI



Platform scalability

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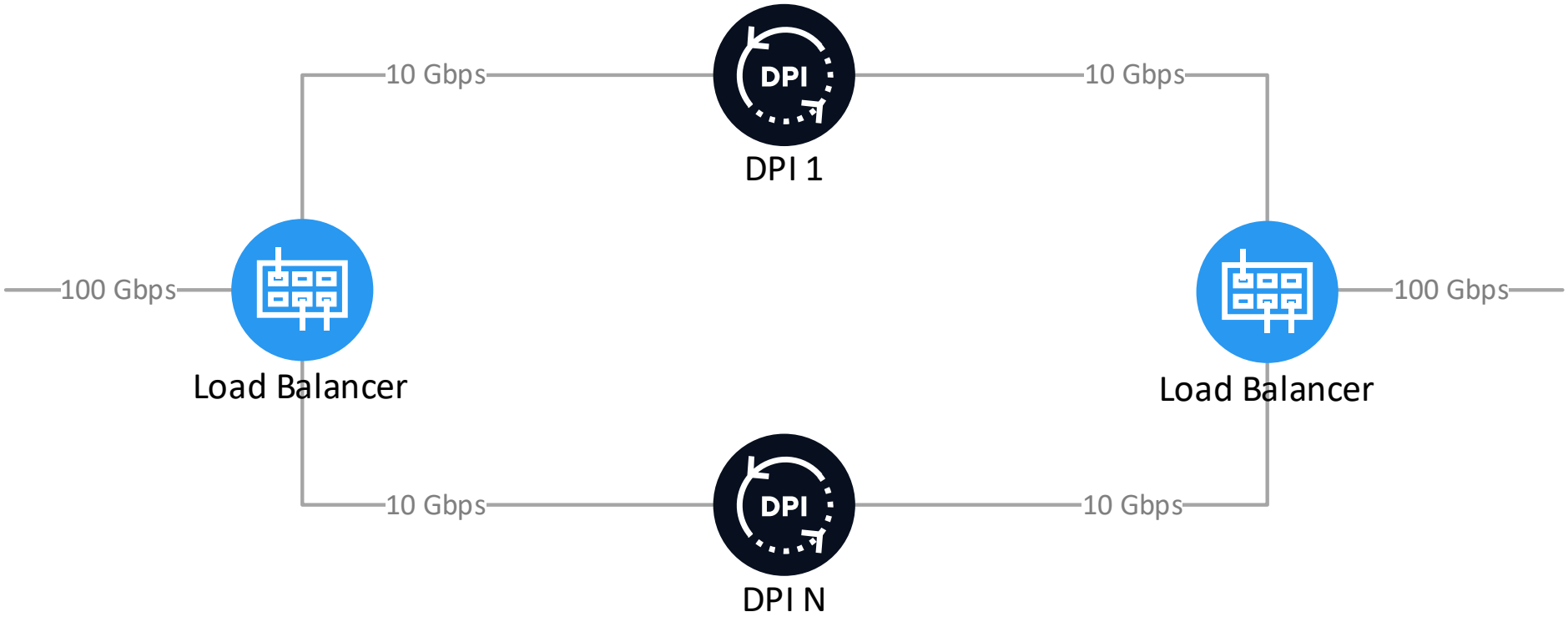
Support of 100Gbps links with using load balancer

Ability to scale up to 3.84 Tbps



Platform Architecture

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Hardware Factors

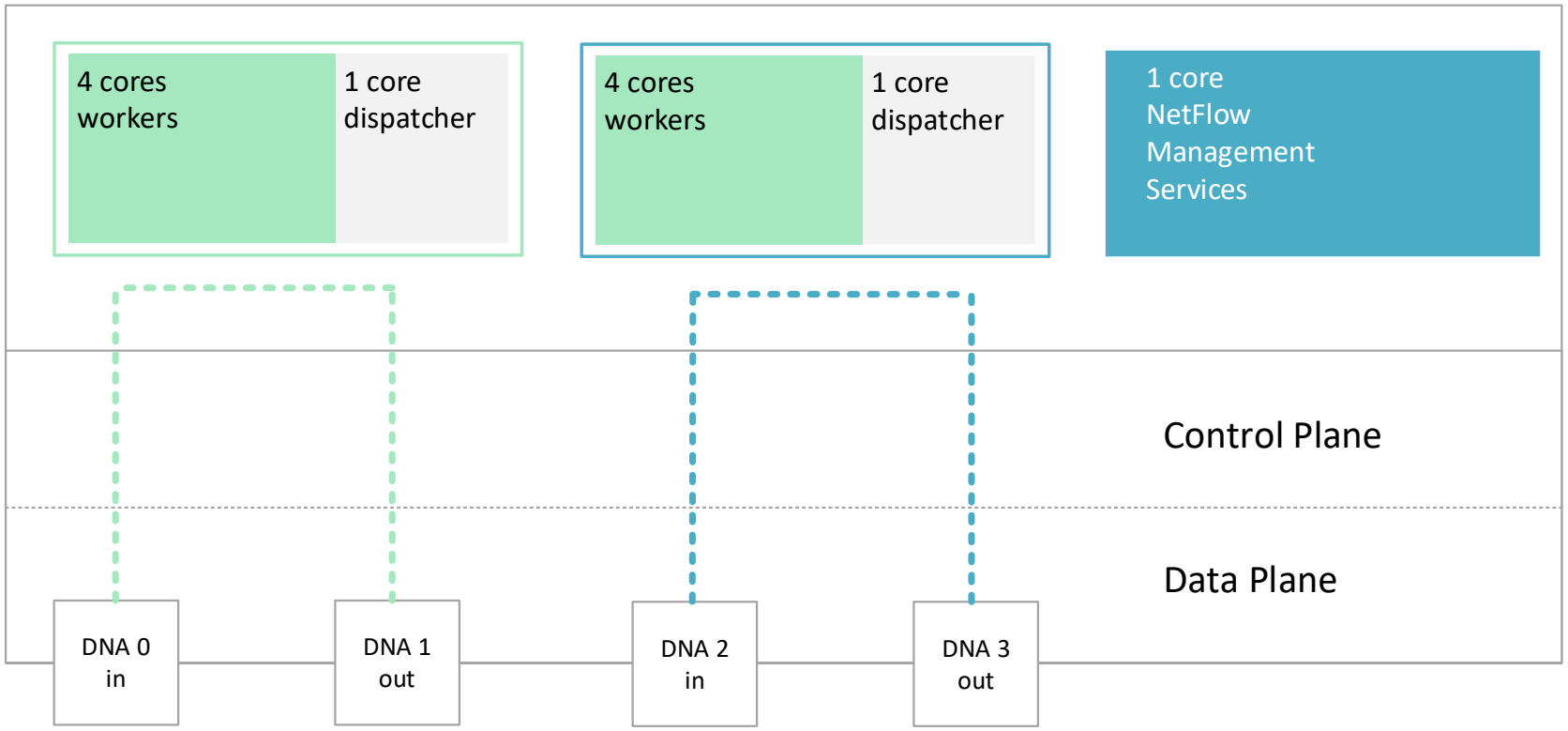
- x86 servers
- High performance
- Soft limits
- Scalability
- Available platform
- Self-upgrade
- Continuous growth

Control Plane

- CentOS 8

Data Plane

- DPDK – Direct NIC Access technology



Vertical scalability with multiprocessor systems up to **400 Gbps** on a single unit.

Solution Architecture

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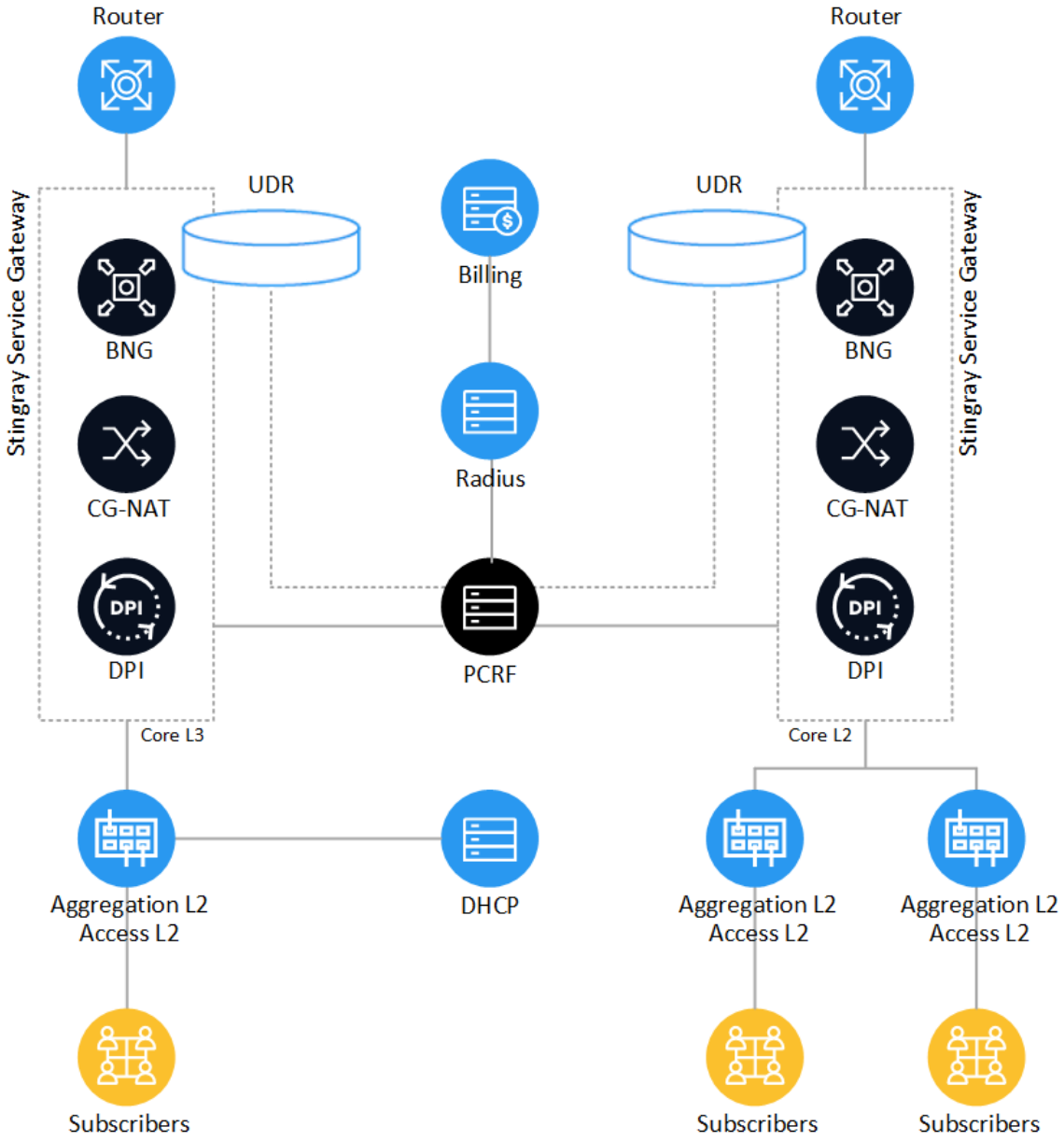
- Modes L2/L3 BNG support
- Combine on the platform BRAS/CG-NAT/DPI/ URL-Filtering
- Full RADIUS (CoA) support
- High availability with PCRF
- Hot start from local UDR



BRAS operating modes

SSH-managed BNG L3 IPoE	IP and tariff plans preloading. In case of dynamic IP distribution a Radius monitor or complete implementation of Radius is needed	
Radius-managed BNG L3 IPoE	Authorization via Radius-server for the subscribers who already have an IP	Supporting VLAN/Q-in-Q tags
BNG L2 DHCP Relay agent	Subscriber authorization via MAC-address at Radius-server. A DHCP-server is used for IP distribution	ARP proxy, ARP authorization, supporting VLAN/Q-in-Q tags
BNG L2 DHCP Radius Proxy	Subscriber authorization via MAC-address at Radius-server. Instead of DHCP-server a Radius-server is used. DHCP is replaced by combining FastDPI + FasrPCRF	Option 82 in the DHCP request, ARP proxy, ARP authorization, supporting VLAN/Q-in-Q tags
BNG L2 PPPoE	PAP, CHAP, MS-CHAPv2, MAC-address authorization protocols are supported	Supporting VLAN/Q-in-Q tags

BNG Characteristics

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- The combination of L2 (PPPoE, DHCP) and L3 modes (IPoE)
- Implementing traffic termination (PPPoE, Q-in-Q, VLAN)
- Multi-user support (one Login is multiple IP)
- Dual Stack IPv4/IPv6
- White list support based on hostname or URL, including *.domain mask
- Increasing the speed of local resources or peer-to-peer networks regardless of the speed of the tariff plan
- Prioritization Video, Online games, Web traffic
- Traffic coloring (VLAN, IP, MPLS) and work with already colored traffic
- Mini-Firewall

PCRF

- Proxying requests between BNG and Radius server
- Dynamic management of policies and services of subscribers by Radius (CoA)
- Synchronize multiple BNG operations and provide redundancy
- Using separate accounting for AS or protocols

CG-NAT Characteristics

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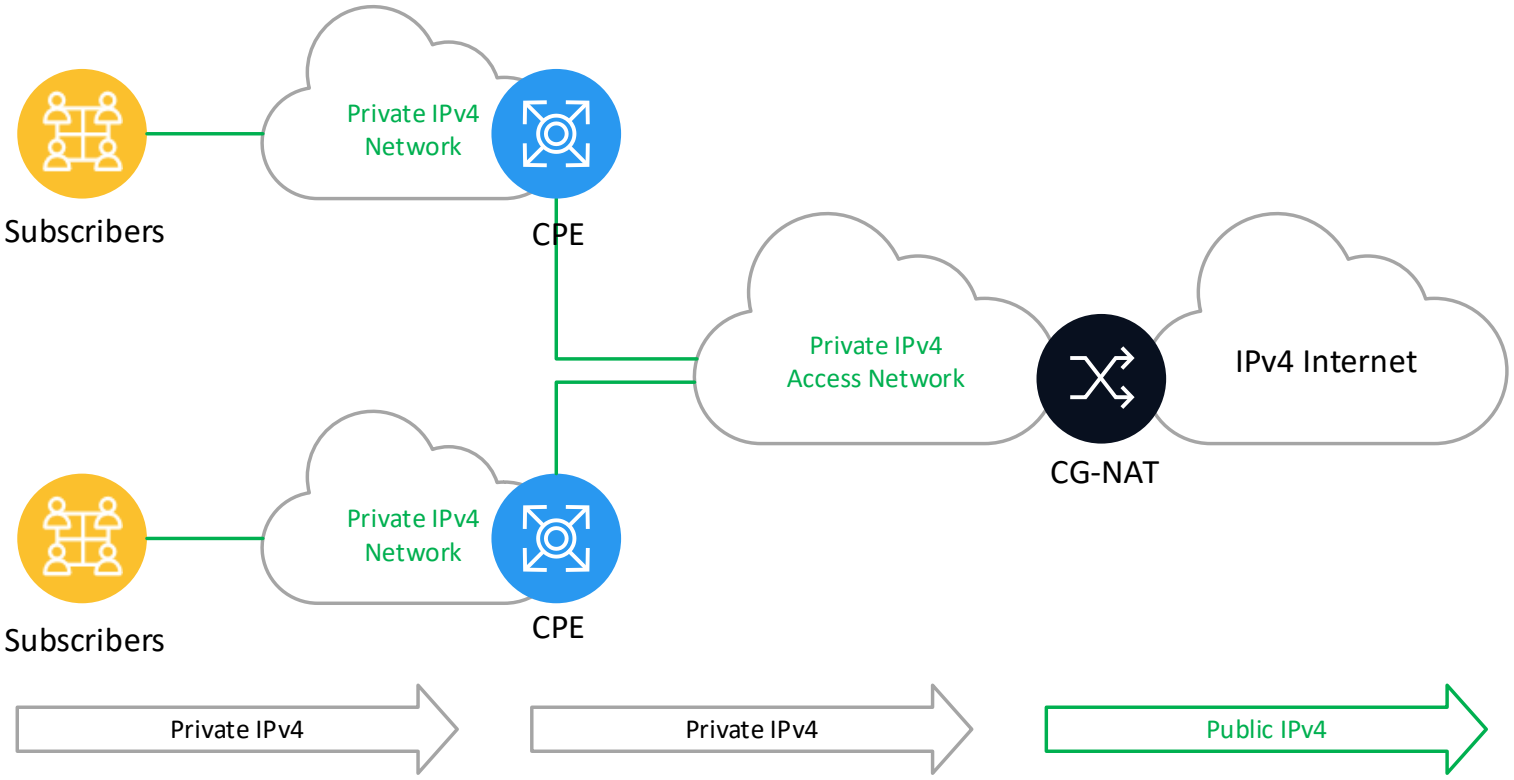
- **Full Cone** – Provides transparent operation of peer-to-peer protocols (torrents, games)
- **Paired IP address pooling** – Subscriber sessions are tied to a single external IP address for the subscriber
- **Hairpinning** – Inside NAT Subscribers communicate with each other without address translation.
- **Limits** – there is a limit of TCP and UDP connections for each pool of IP addresses
- **NAT flows export** – text file or NetFlow v10



Flexible tariff plans

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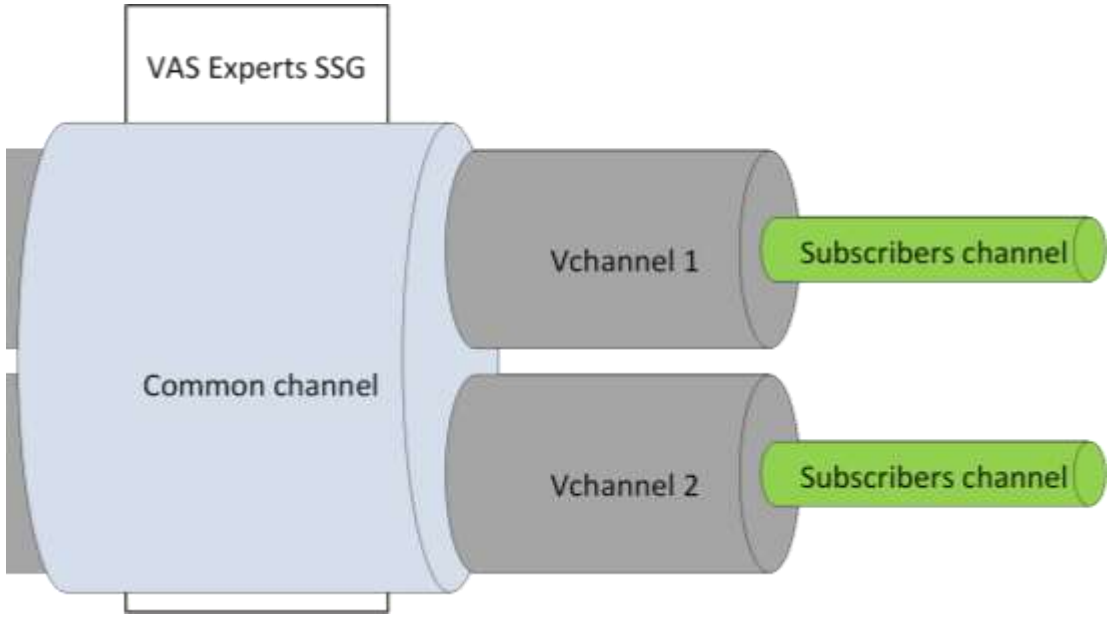
Task:

Outbound Torrent Limit
Maximum speed on local resources
Increase speed to

- Messengers and SIP
- HTTP, HTTPS, QIUC
- Game service like world of tanks

```
htb_inbound_root=rate 50mbit
htb_inbound_class0=rate 20mbit ceil 50mbit
htb_inbound_class1=rate 1mbit ceil 50mbit
htb_inbound_class2=rate 8bit ceil 50mbit
htb_inbound_class3=rate 8bit ceil 50mbit
htb_inbound_class4=rate 8bit ceil 1mbit
htb_inbound_class5=rate 100mbit static
htb_inbound_class6=rate 8bit ceil 50mbit
htb_inbound_class7=rate 8bit ceil 50mbit
```



Classes (cs):

cs0 dns, icmp, AS world of tanks
cs1 http, https, quic
cs3 default
cs4 viber, whatsapp, skype, sip
cs5 AS local IP, peering
cs6 tcp_unknown
cs7 Bittorrent

```
htb_root=rate 50mbit
htb_class0=rate 20mbit ceil 50mbit
htb_class1=rate 1mbit ceil 50mbit
htb_class2=rate 8bit ceil 50mbit
htb_class3=rate 8bit ceil 50mbit
htb_class4=rate 8bit ceil 1mbit
htb_class5=rate 100mbit static
htb_class6=rate 8bit ceil 5mbit
htb_class7=rate 8bit ceil 5mbit
```

IPv6

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We recommend Dual Stack: private IPv4 + public IPv6

Why now is the time?

- Implementation takes a long time (experience, equipment replacement, CPE) = 3 years,

Suddenly you will need it urgently - you won't manage

- IOT IPv6 only devices
- Professionals (admins, webmasters) - access to ipv6 resources (internal / corporate networks)
- Corporate: communication branches, redundancy uplink
- New network standards
- Retention of subscribers (a few other ipv6 providers)

Problems

Old equipment:

- CPE
- TV
- SIP phones
- Gaming and TV set-top boxes

Advantage IPv6

- No CPE NAT
- Improved P2P
- Access to home resources (NAS)

Option: Bypass Support

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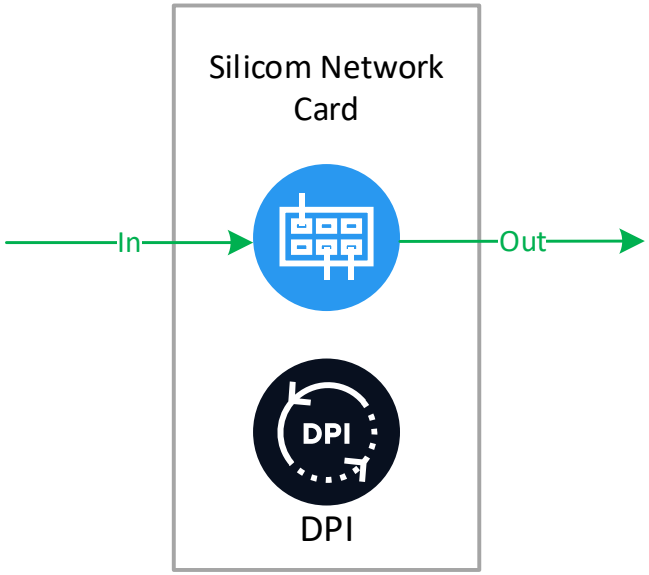
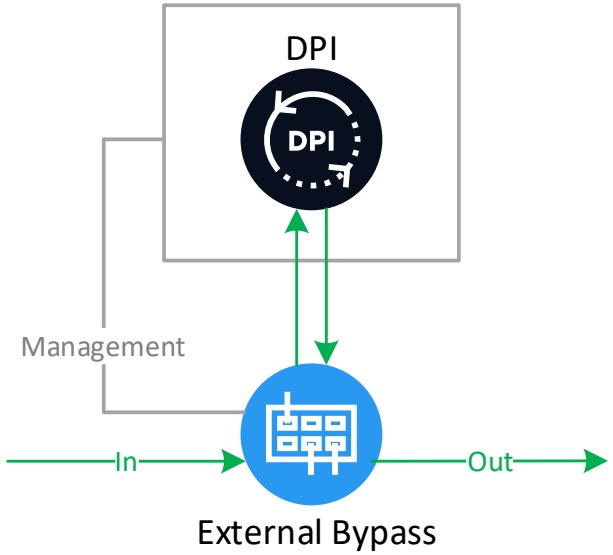
Bypass allows to ensure the network operability incase of installation of the system in series or asymmetrically, in the following situations:

- Equipment malfunction
- Software errors
- Preventive maintenance
- Power cut

Internal bypass produced by Silicom



External bypass by any manufacturer managed by DPI



Option: Filtering by blocklist

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Filtration allows you to block a specific URL for the http protocol from a page hosted, including social networks such as Facebook, Youtube, Wikipedia and resources considered extremist.

Blocklisting by category is supported and it is possible to use a combination of categories. Categorized lists are loaded automatically.

Characteristic	Description
Using your own operator list	Yes
Using centralized private operator's list for a cluster of servers	Yes
Connection Diagrams Support	In-line, asymmetric, mirroring
Ability to control filtering by specific users and subnets for the organization of filtering services for downstream operators	Yes
Traffic blocking http/https	Yes
Blocking https by SNI, CN	Yes
Redirect support for http to info page	Yes
Ability to collect statistics on blocked pages	Yes
Ability to monitor loading lists and filtering work	Yes
Maximum list size	Up to 4 billion URL

Option: Filtering by blocklist

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Blacklisting by category is supported and it is possible to use a combination of categories. Categorized lists are loaded automatically.

DESCRIPTION	CHARACTERISTIC
✓	Using your own operator list
✓	Using centralized private operator's list for a cluster of servers
In-line, asymmetric, mirroring	Connection Diagrams Support
✓	Ability to control filtering by specific users and subnets for the organization of filtering services for downstream operators
✓	Traffic blocking http/https
✓	Blocking https by SNI, CN
✓	Redirect support for http to info page
✓	Ability to collect statistics on blocked pages
✓	Ability to monitor loading lists and filtering work
Up to 4 billion URL	Maximum list size

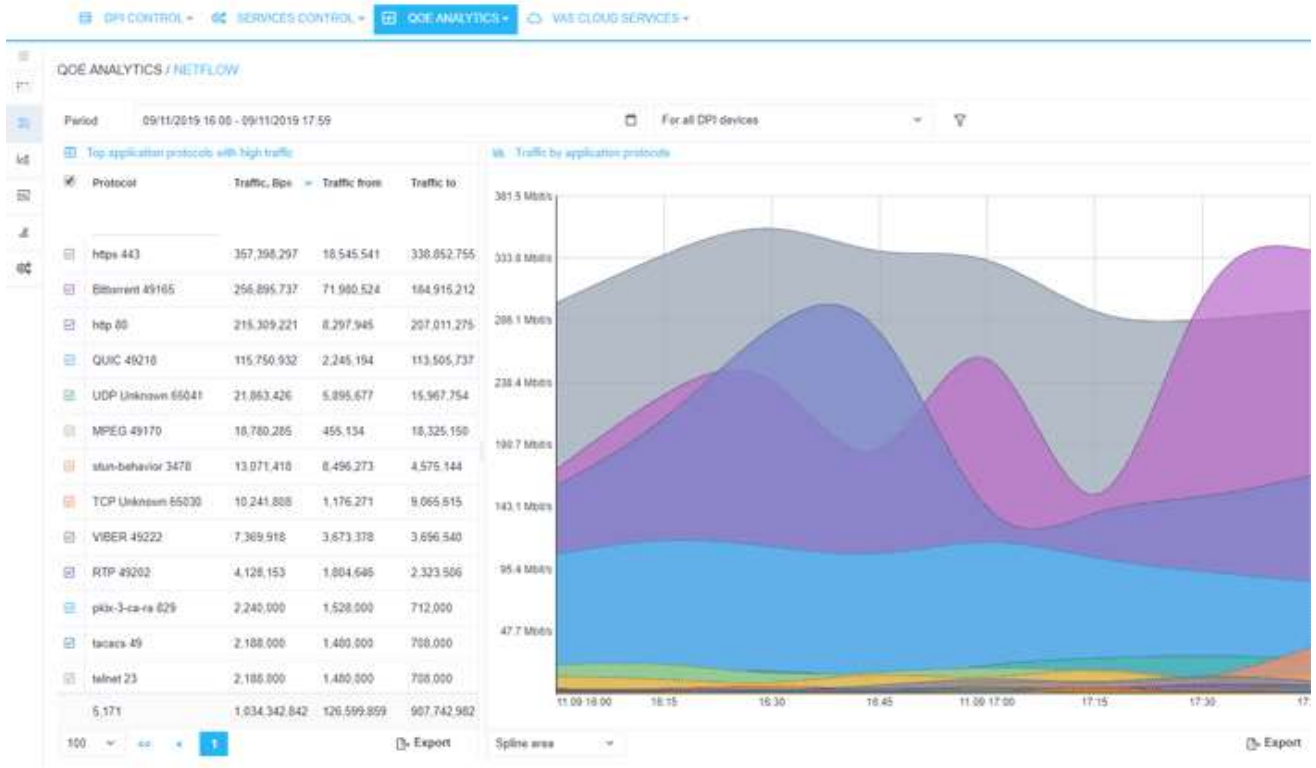
Option: Analytics

NetFlow analytical information is provided for the following characteristics:

1. Distribution of the band for application protocols
2. Distribution of the band to autonomous systems (AS)
3. Downloading summary information of billing by class for each subscriber
4. Downloading Full NetFlow by subscribers

All specified modes can work simultaneously.

Using aggregate information for billing by classes for each subscriber allows you to separately rate sip, skype and bittorrent traffic.



Top application protocols with high traffic

Option: Traffic prioritization

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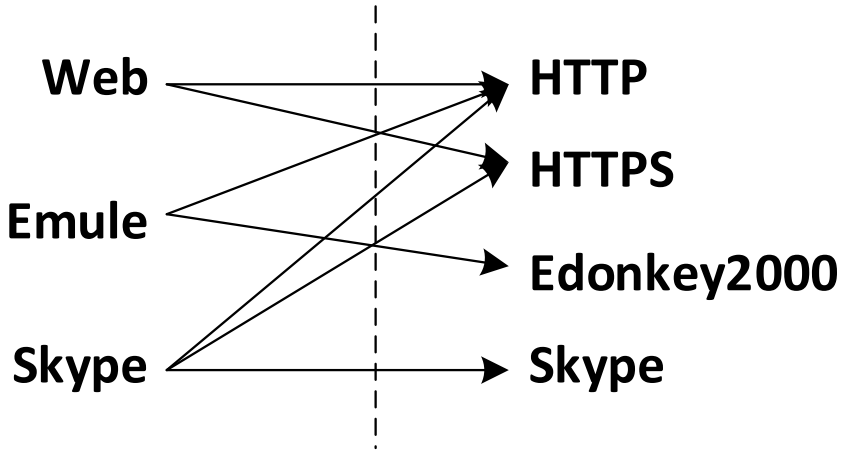
By protocol / application



By direction

- Registered AS
- Customized AS

By the Uplink

- VLAN
- Pair of physical ports

Per user

- IP
- Login

Option: Allow list and Captive portal

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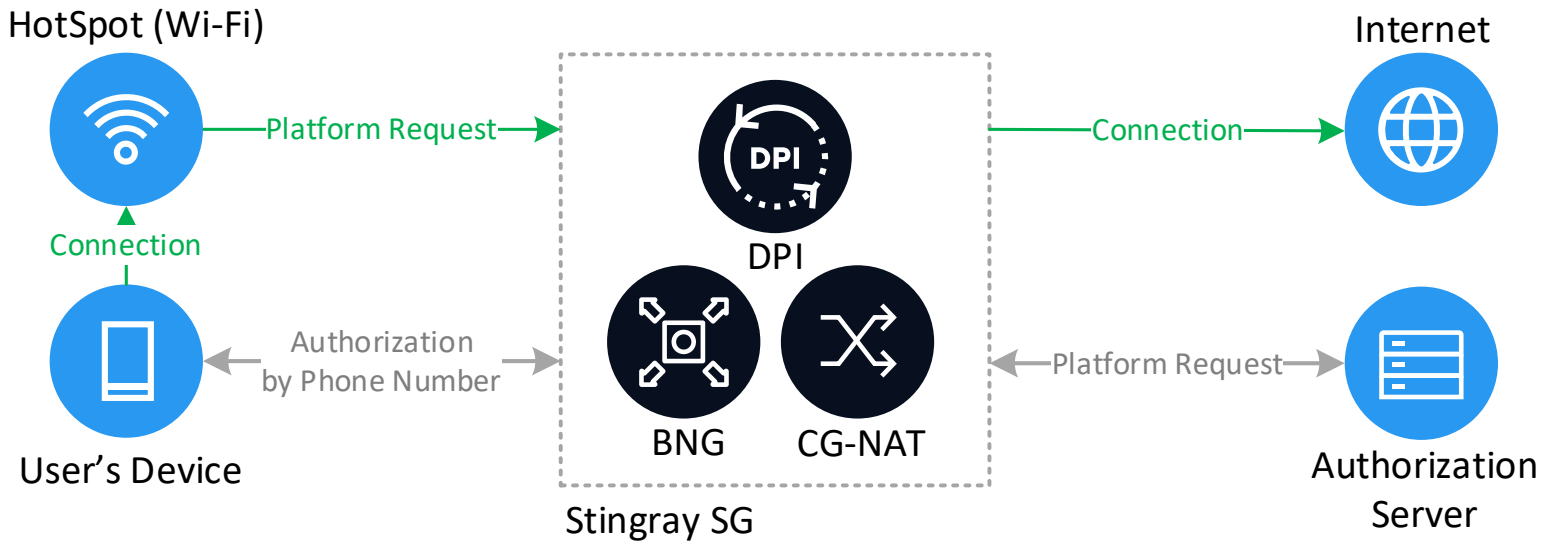
The Allow List makes it possible to limit the sites and pages available to the subscriber and to redirect the subscriber to the specified page when trying to go outside this list.

Use cases:

- Subscriber blocking in case of low balance, with the possibility of payment via authorized payment systems
- Organization of user identification in WiFi networks, provision of certain user actions in a WiFi network to provide access.



Option: Mini Firewall

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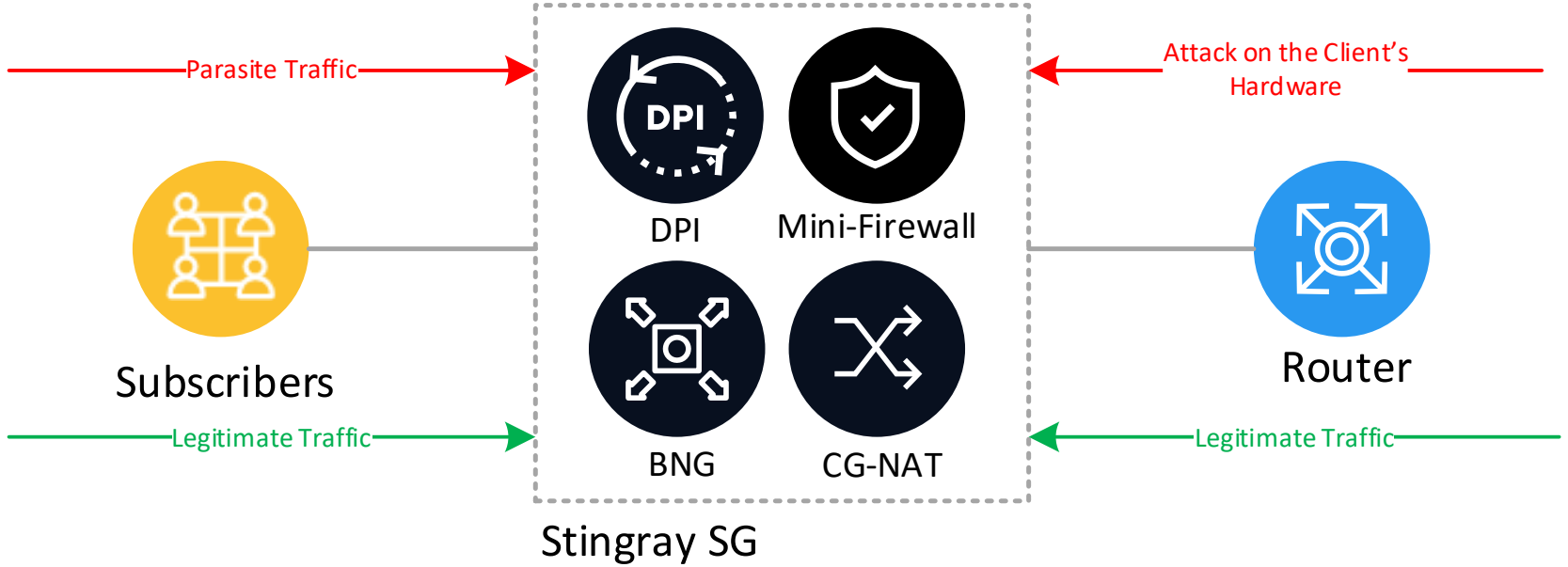
The tasks are:

- Preventing hacking of user devices by system ports
- Blocking malicious activity from the subscriber - SPAM, BotNet

Recommendations:

- Utilize statistics from QoE module in user's account
- Announcement to the client warning him of his problem and offer antivirus service



Option: DDOS attacks protection

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1. Protection against TCP SYN Flood:

- Detects an attack on exceeding a specified threshold of requests not confirmed by the client SYN
- Independently, instead of the protected site, responds to SYN requests
- Organizes a TCP session with the protected site after confirmation of the request by the client.

Depending on the settings, Stingray SG may be activated manually, automatically or to be in constant protection mode against this type of attack.

2. Fragmented UDP Flood Protection

This type of attack is carried out by fragmented UDP packets, usually of a short size. The attacked platform is forced to spend a lot of resources for assembling and analyzing them.

For protection, protocols that are irrelevant for the protected site are dropped or hard-limited by the bandwidth.

For example, for WEB-sites the protocols HTTP, HTTPS are used. In this case, legacy protocols can be dropped by configuring DPI.

3. Protection (LOIC, etc.) based on Turing test (Human Detection)

When the limit value of requests is exceeded (e.g., the number of requests per second that can be processed by the site), protection is activated and the user must enter information from the CAPTCHA to confirm that he is not a part of the botnet.

After that access to the site will be allowed. This test determines who the user of the system is - a person or a computer.

Option: Inserting ads into web-pages

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- Advertisement placement and subscriber notification
- Earning from every click
- Conducting and monitoring of marketing campaigns
- Black and white lists
- AdBlock on the network level

Formats

- Desktop and mobile
- Interactive
- Fullscreen
- Heading
- Native advertising
- Video
- Menu and filling out the form

Operating scheme for Ads

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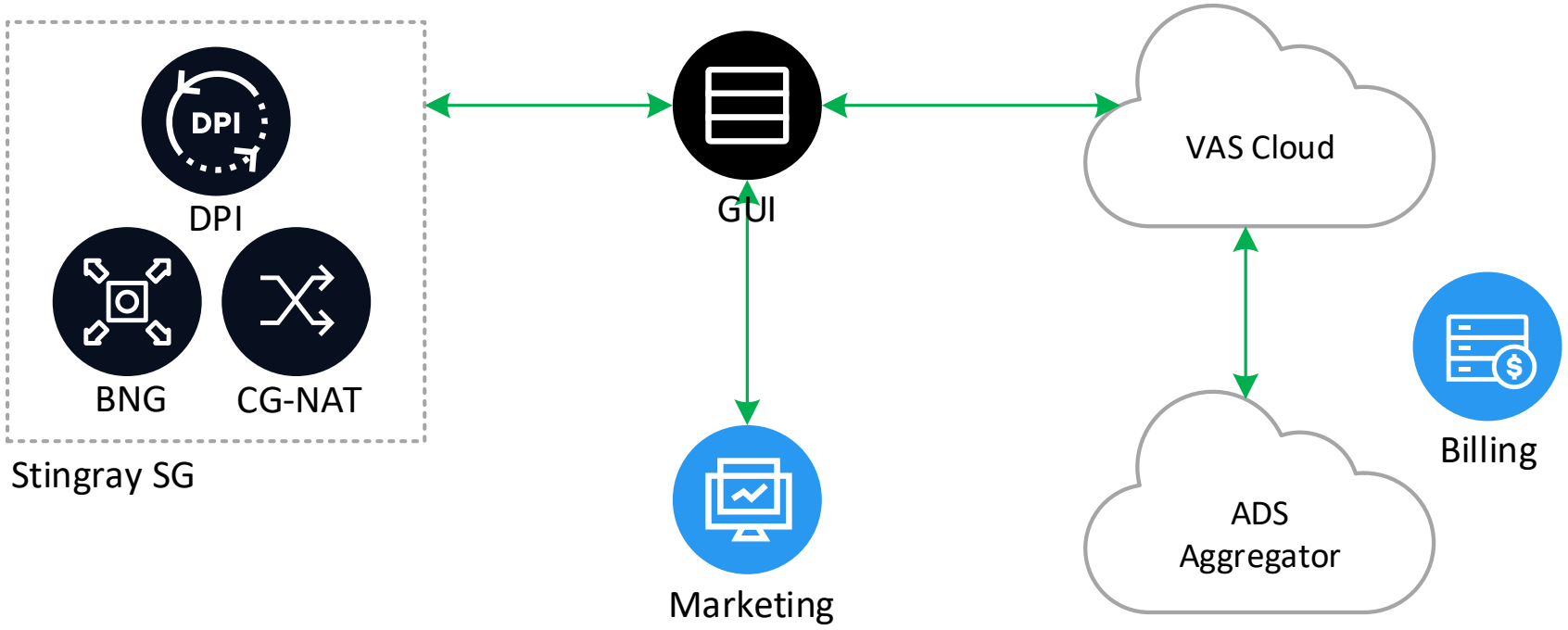
Advantages

- Activation in a click
- Automatic billing
- Thoughtful targeting
- Quick implementation

ISP's interest is calculated per click/impression. It is handled in operator's personal account and doesn't need additional settings.



DPI licensing

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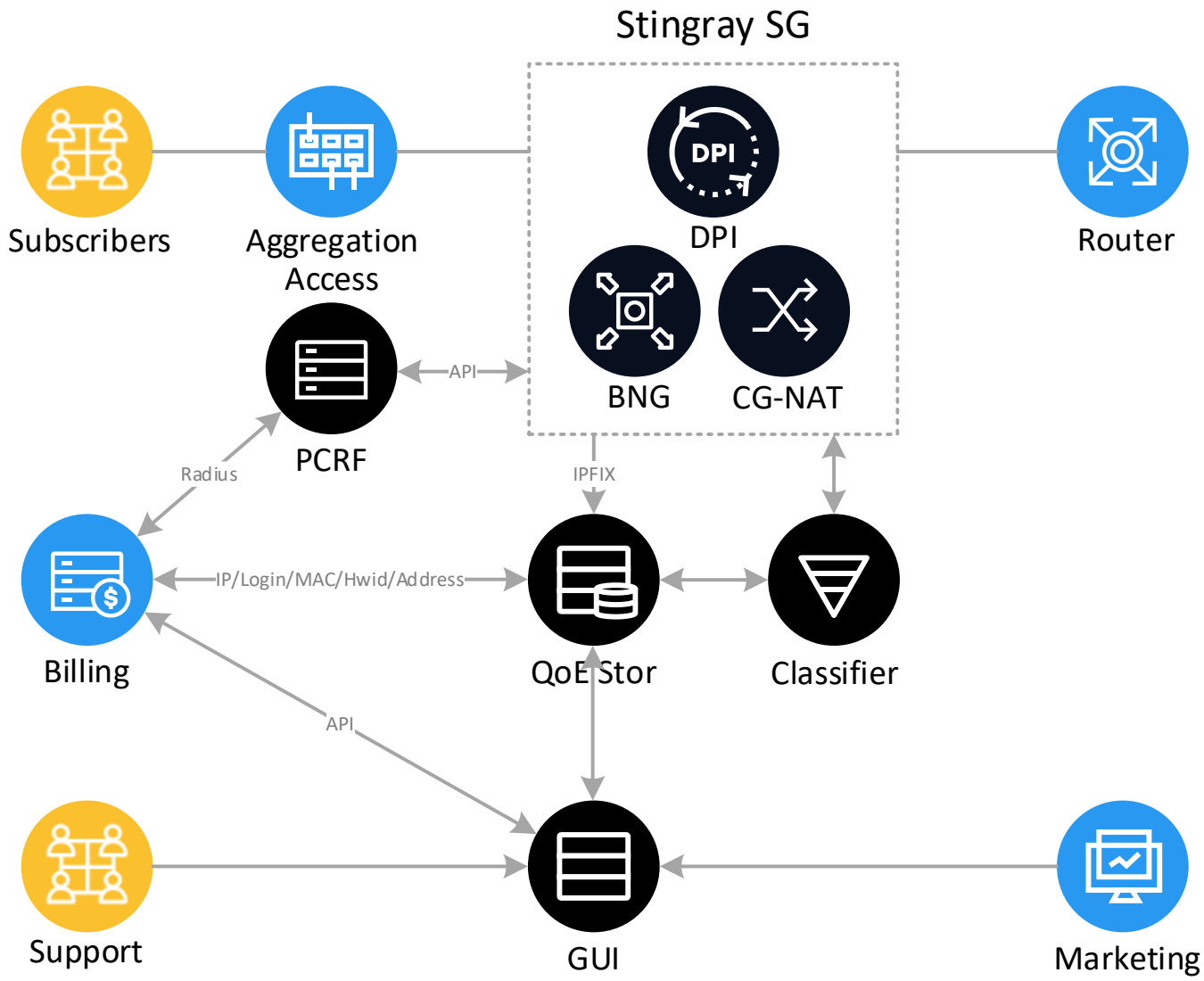
STINGRAY SERVICE GATEWAY FEATURES	BNG/BRAS	BASE	COMPLETE
Bypass Support	Yes	Yes	Yes
Statistics gathering and analysis on protocols and directions	Yes	Yes	Yes
Traffic prioritization depending on a protocol and direction	Yes	Yes	Yes
Common and virtual channels policing	Yes	Yes	Yes
Subscriber notification and marketing campaigns	Yes	Yes	Yes
Subcribers channel policing for IPv4 and IPV6	Yes	-	Yes
Allow Lists and Captive Portal	Yes	-	Yes
BNG/BRAS L3 (IPoE), Dual Stack IPv4/IPv6, Radius with CoA	Yes	-	Yes
BNG/BRAS L2 (PPPoE, DHCP), Dual Stack IPv4/IPv6	Yes	-	Yes
Carrier Grade-NAT	Yes	-	Yes
Ads blocking and replacing	Optional	-	Yes
Mini-Firewall for blocking on certain ports	Optional	-	Yes
Protection against DOS and DDOS attacks	Optional	-	Yes
REGULATORY COMPLIANCE			
Filtering by the blocklisted Internet sites	-	Yes	Yes
Lawful Interception (LI)	-	Optional	Yes
ADDITIONAL MODULES AND SERVICES			
URL Classifier Local version	-	Yes	Optional
URL Classifier Cloud version	Optional	Yes	Optional
GUI (Graphical User Interface) Base version	Yes	Yes	Yes
GUI (Graphical User Interface) Global version	-	Yes	Optional
QoE (Quality of Experience) module Base version	Yes	Yes	Yes
QoE (Quality of Experience) module Standard version	Optional	Optional	Optional
Adding banners to HTTP recourses	Subscription		
Creating custom signatures	Subscription		
Signatures SDK	Subscription		
Extended signatures packs	Subscription		
RESERVE LICENSE			
Stand-by License	25% from main license		

Quality of Experience module

QoE is a software product responsible for statistic gathering and viewing subscribers' perception of services.

The statistics is transferred to special metrics which allow to define users' experience. It provides the operator with information about what kind of problems does he or she encounter.

The data obtained allows the operator to take action and to improve the services quality. The result is increasing customer loyalty.



QoE metrics

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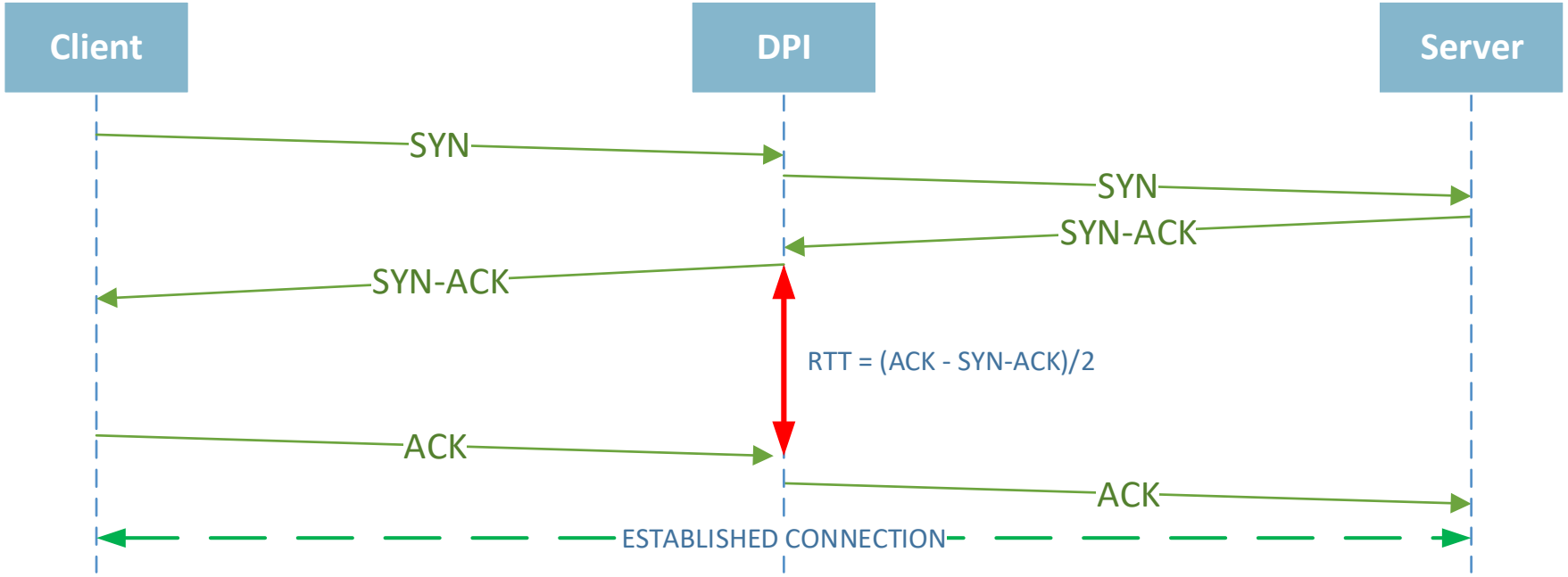
1. Round-trip-time (RTT);
2. Indicators of retries number;
3. The number of sessions, devices, agents, IP-addresses per subscriber;
4. Traffic distribution by application and transport protocols;
5. Traffic distribution by autonomous system (AS) numbers;
6. Clickstream for each subscriber.



How to use QoE metrics?

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Sales and Marketing

- Upselling new service, Wi-Fi equipment, traffic plans
- Work with outflow and analysis of the causes of outflow in the past
- Target advertising with using subscriber profiling

Technical and Support departments

- Deep troubleshooting and monitoring with using Round Trip Time and TCP retransmitting
- Identification of problems with client terminal equipment, Wi-Fi router, access switch and aggregation
- Search for optimal peering points and connections to higher providers.

Graphical user interface

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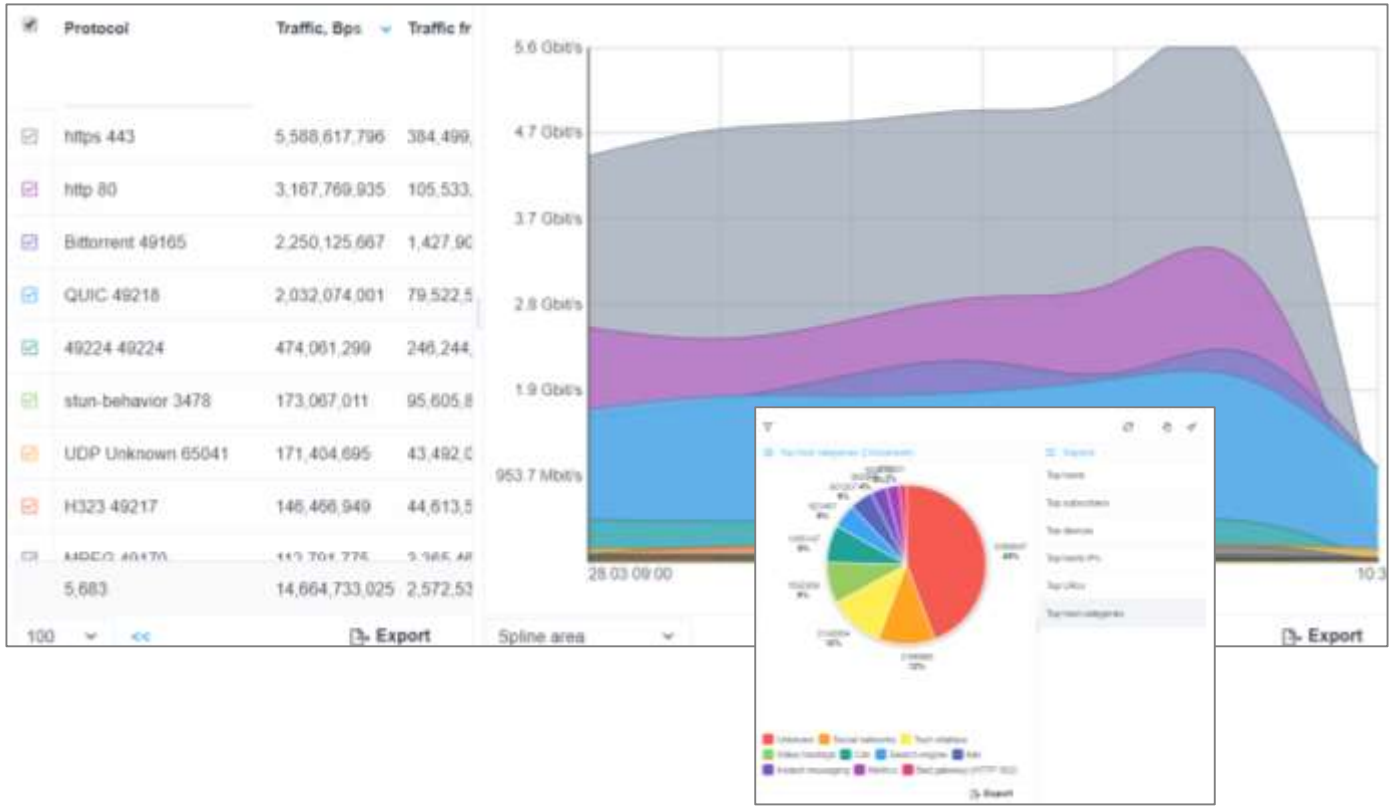
1. Access restriction by role
2. Managing several DPI: monitoring and configuration
3. White and Black lists
4. Managing subscriber tariff plans
5. Creating of NAT-pools
6. HotSpot and Clickwrap option control
7. Work with statistics
8. API support for integration with external systems.



QoE Licensing

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QOE MODULE FEATURES	BASE	STANDART
NetFlow statistics collector with re-export support	Yes	Yes
API support for integration with external systems	Yes	Yes
Full NetFlow and ClickStream statistics visualization	Yes	Yes
Built-in reports of Full NetFlow-based TOP: high RTT, by traffic volume, by number of re-requests, by application protocols, by AS, by subscribers AS, by access switches and aggregation	Yes	Yes
Built-in ClickStream-based TOP reports: URLs, hosts, subscribers, devices, IP resources	Yes	Yes
Reports export in *.xlsx, .*csv, *.pdf and *.png	Yes	Yes
NAT log collector with re-export support	-	Yes
Unloading NAT log from Full NetFlow	-	Yes
GTP collector with re-export support	-	Yes
Reports on web resources categories, updating the list of categories	-	Yes
Full NetFlow and ClickStream reports with detailed information per user	-	Yes
Setting up triggers and actions on events, sending reports by email	-	Yes
DDoS and BotNet detection	-	Yes

Development directions

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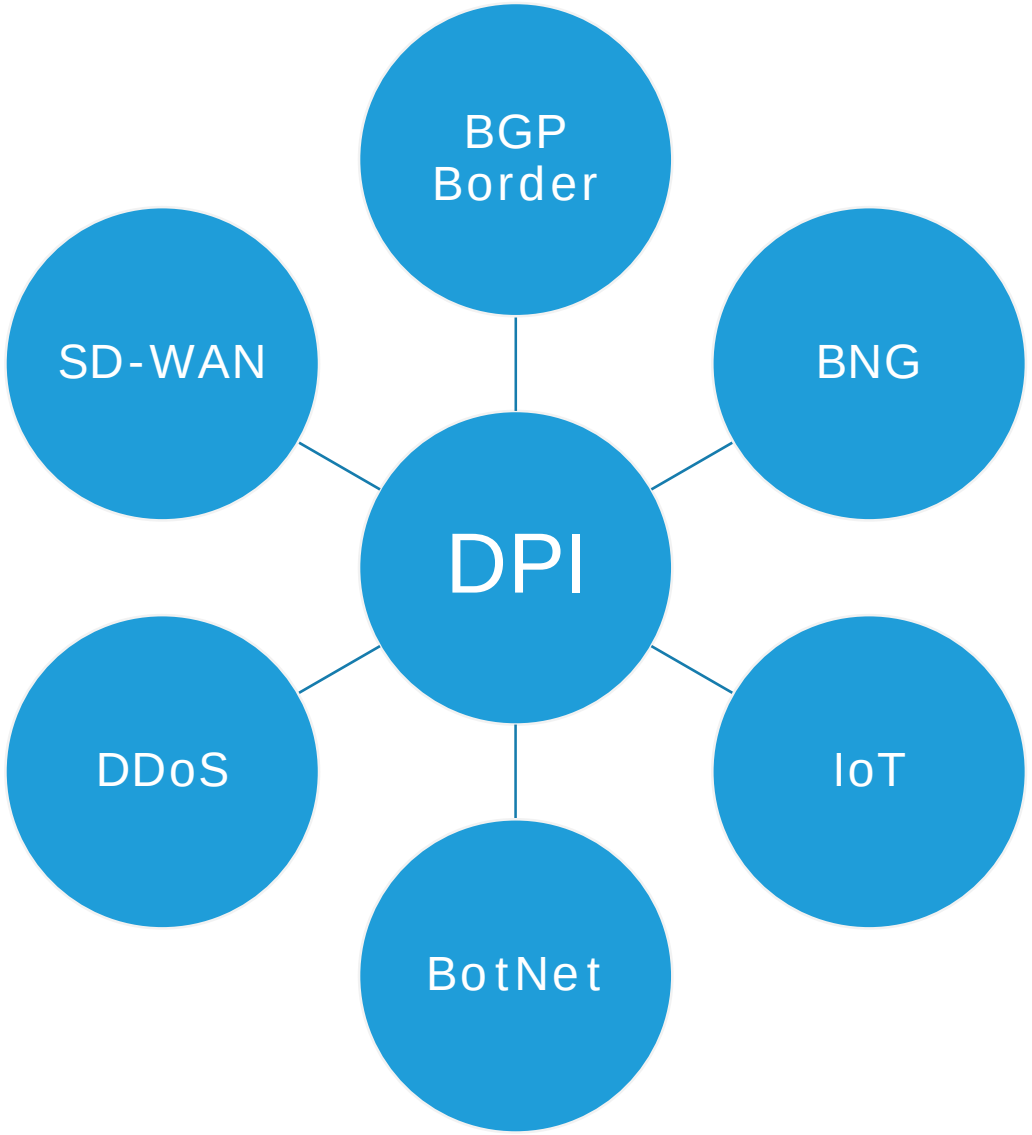
- Routing. BGP, OSPF protocols support
- Various IPv6 prefix length support (currently /64 only)
- Diameter protocol support (Gx, Gy, Gz interfaces)
- Subscriber quota management
- Signatures SDK and definition by SNI (HTTPS) and hostname (HTTP) as a service
- Configurable WEB-resources classifier
- MITM mechanism implementation



Resourses

Stingray Service Gateway

Software based BNG

QoE module

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