VAS Experts

Stingray Service Gateway

Advanced DPI Solution

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About VAS Experts

VAS Experts is a telecom software developer. Since 2013 we have carried out more than **2000 installations** in Russia, CIS and Europe that are using our Stingray Service Gateway.

Our team has **over 25 years work experience** in telecommunication software development and wide knowledge in technologies.

20M+

users

More than

35 Tbps

Latest Installations:

- Lebanon
- India
- Turkey
- Peru
- Congo
- Brazil

Our products

For telecom operators:

DPI

Multifunctional platform for traffic management

QoE analytics

Traffic Monitoring and Analysis System

Load Balancer

Traffic balancer

BNG/BRAS

Scalable and Cost-Effective Software Gateway

CG-NAT

Providing transparent network address and protocol translation

VEOS

Operating system

For mobile operators:

PCEF

Flexible tariff plans and QoS policies. Integration by Diameter protocol

EPDG

Solution for launching Wi-Fi Calling (VoWiFi)

LBS

Module for detection of subscriber's location

Own DPI Engine

History

2013 — DPI

2016 — CG-NAT

2017 — L3 BRAS/BNG DualStack IPv4/IPv6

2018 — Lawful Interception

2019 — L2 BRAS/BNG DualStack IPv4/IPv6

2020 — Mobile Networks Support, LBS

2021 — Border Router

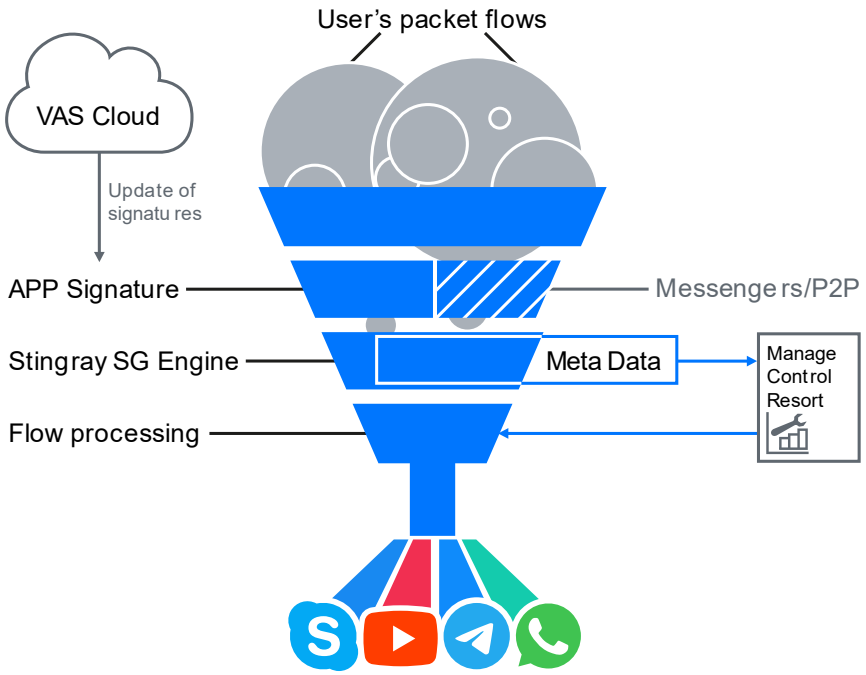
2022 — VAS Cloud Services

2023 — VEOS, On-Stick, EPDG

2024 — PCEF, Diameter

Stingray SG can compete with:

- Sandvine
- Allot
- Cisco SCE
- A10 Network
- Cisco ASR
- Juniper MX
- MikroTik
- Ericsson SE



Investment Protection

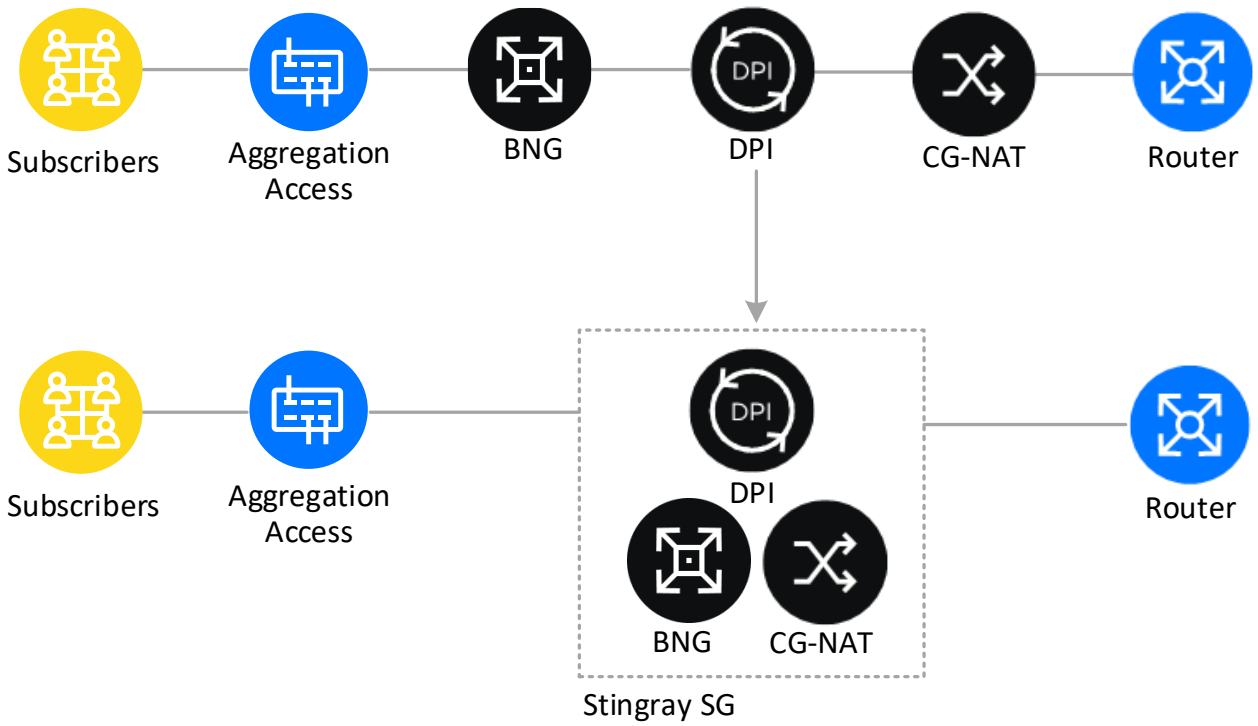
Our SSG software system can be installed on any server hardware and migrated to another server in the future with a license upgrade option.

So you can just expand the license depending on the emerging tasks and save on the purchase of additional hardware.

License:

- Upgrade
- Merge
- Split
- Transfer
- Test license

Multi-functionality



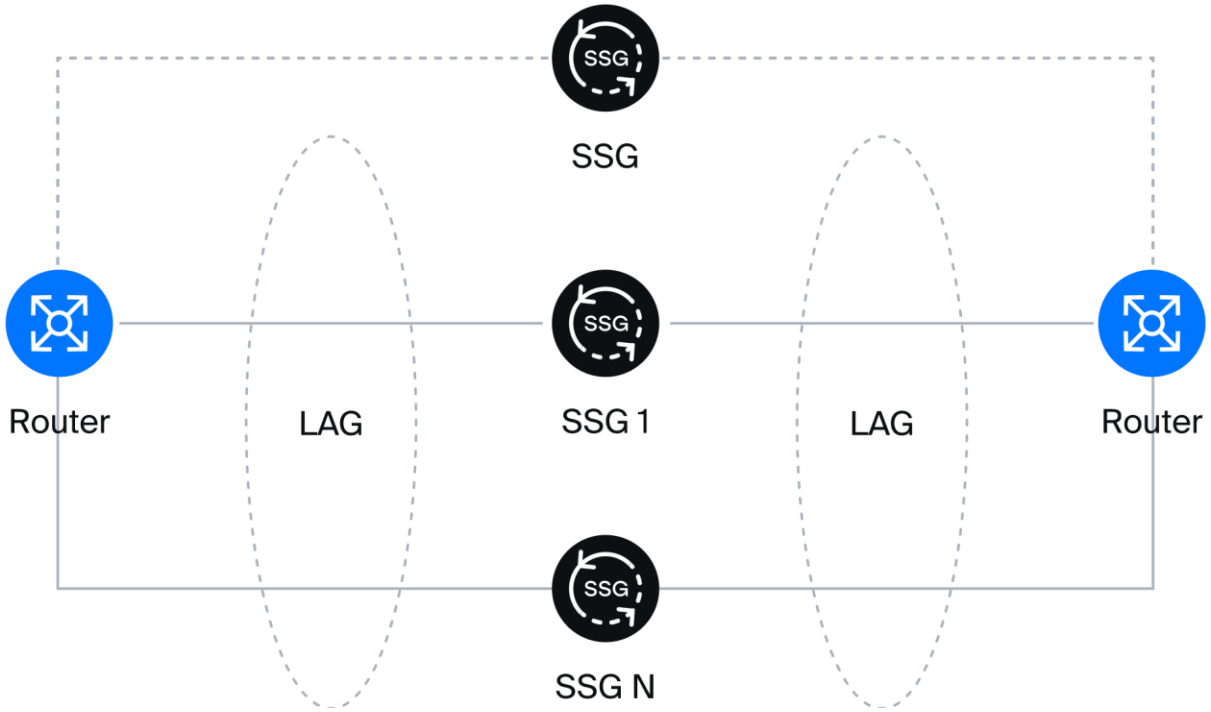
Installed on a regular x86 server, the multifunctional SSG platform replaces a set of disparate network equipment.

This simplifies administration, maintenance, and scaling processes.

Performance Per Platform

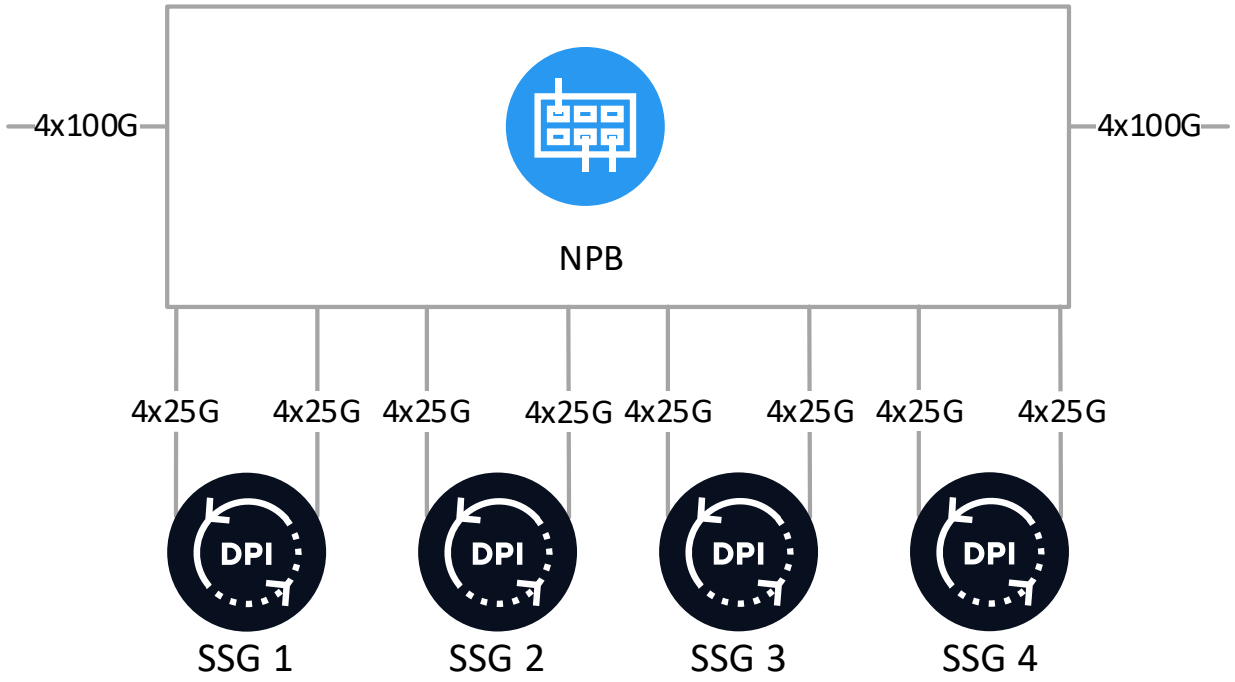
FEATURE	SSG-6	SSG-20	SSG-40	SSG-80	SSG-100	SSG-120	SSG-240
Performance, Gbps	6G	20G	40G	80G	100G	120G	240G
Number of subscribers (2Mbps per subscriber)	1500 K	10 000 K	20 000 K	40 000 K	50 000 K	60 000 K	120 000 K
Maximum number of session	4 M	16 M	32 M	64 M	80 M	96 M	96 M
Number of new sessions	100 K	250 K	350 K	400 K	500 K	600 K	600 K
Ports, GbE	2x10G	4x10G	8x10G	16x10G	16x10G 6x25G 6x40G	20x10G 8x25G 8x40G 4x100G	16x25G 14x40G 8x100G
Latency (average value), µs	30						
Platform	1-2U, 19”						
Application protocols	6000+						

Redundancy



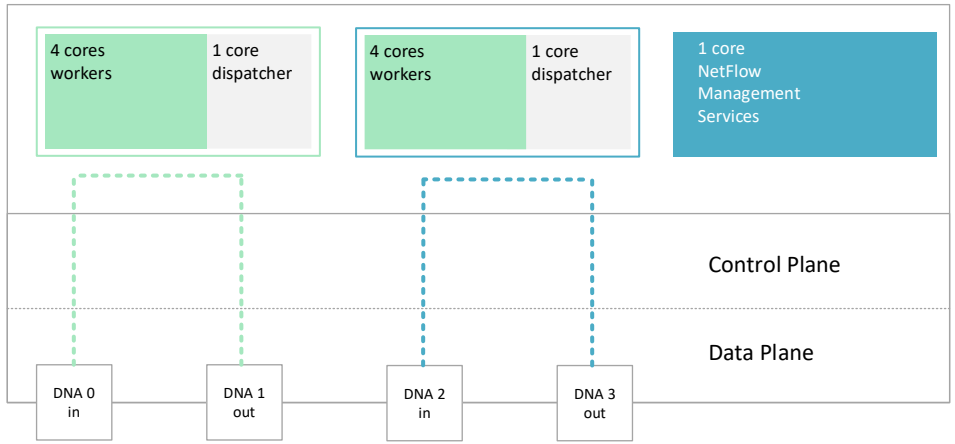
- L2 Bridge mode is used for combining multiple devices into a LAG and balancing sessions between them
- Bypass cards and external Bypass are used in DPI scenario
- Backup server to alternate route is used for BRAS L3 IPoE
- VRRP is used for BRAS L2 IPoE
- Special price for backup license

Platform Scalability



Up to 4.6 Tbps per cluster using third-party Network Packet Broker

Platform Architecture



Performance up to **240 Gbps** per platform

Hardware Factors

- Available platforms
- x86 servers
- High performance
- Soft limit
- Scalability
- Hands-On Upgrade
- Continuous growth

Data Plane

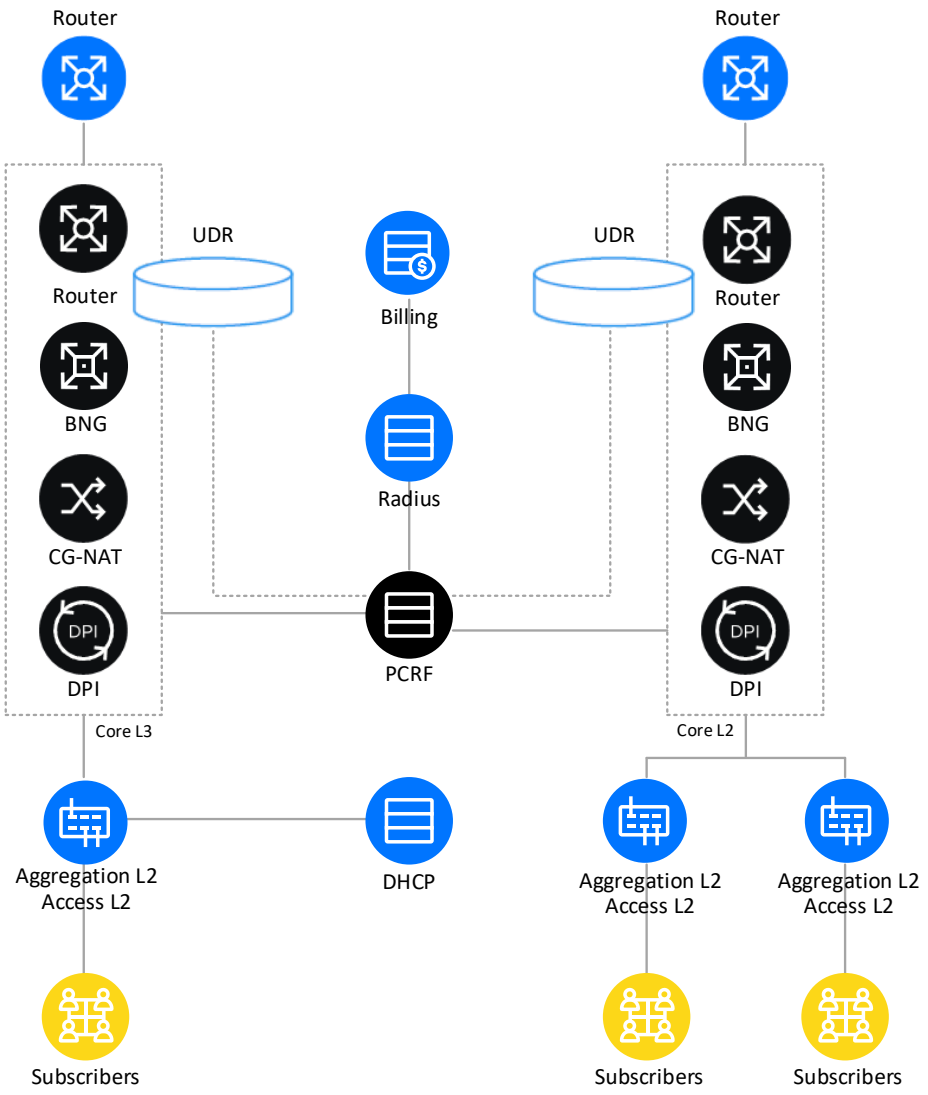
DPDK – Direct
NIC Access technology

Control Plane

VEOS is a proprietary operating system with support for VAS Experts

BNG Solution Architecture

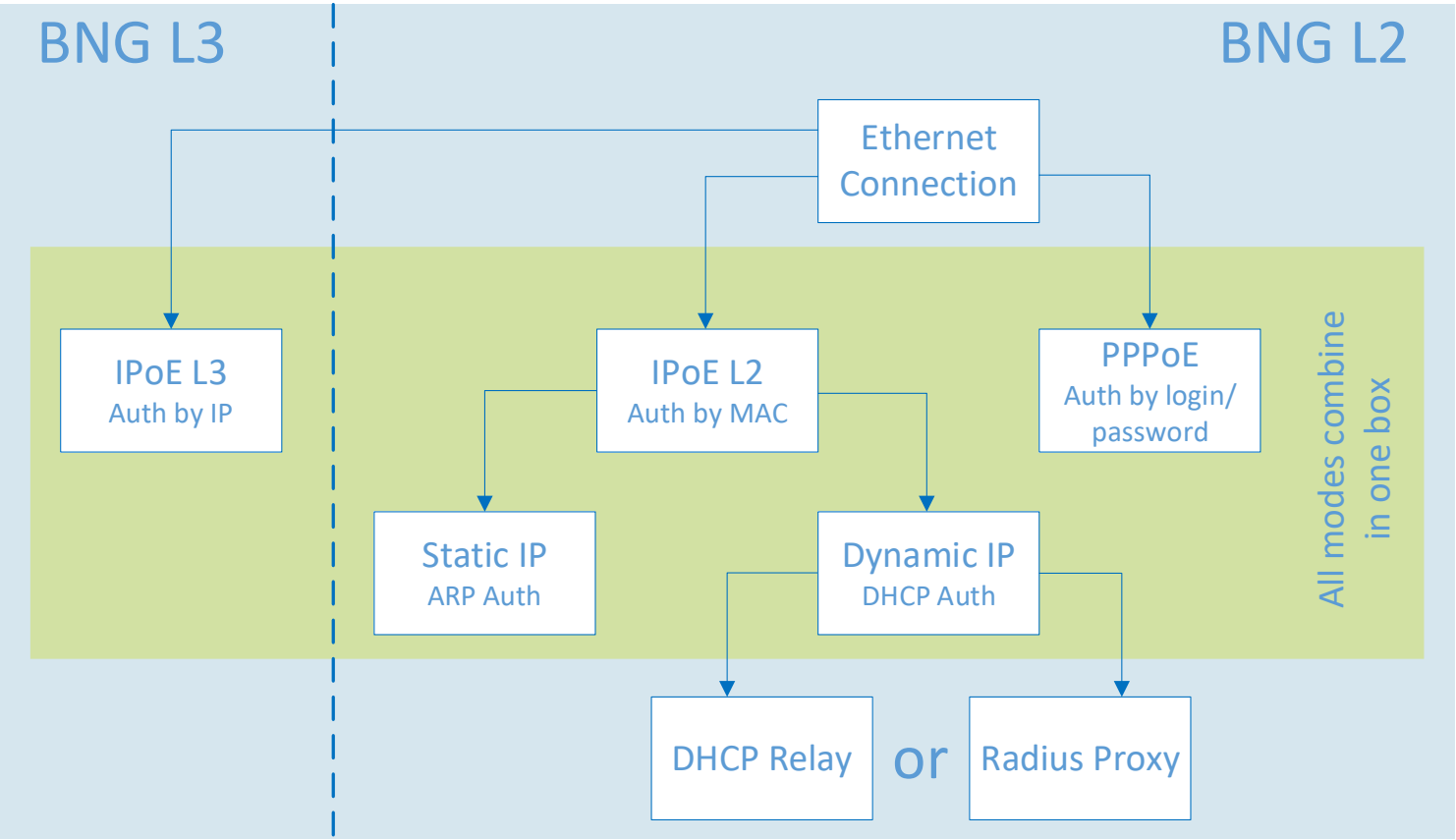
- Modes L2/L3 BRAS/BNG support
- Combine on the platform BRAS / CG-NAT / DPI / URL-Filtering
- Full RADIUS (CoA) support
- High availability with PCRF
- Hot start from local UDR



BRAS/BNG Operating Modes

SSH-managed BRAS/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 BRAS/BNG L3 IPoE	Authorization via Radius-server for the subscribers who already have an IP	Supporting VLAN/Q-in-Q tags
BRAS/BNG L2 IPoE DHCP Relay agent	Subscriber authorization via MAC-address at Radius-server. DHCP-server is used for IP distribution.	ARP proxy, supporting VLAN/Q-in-Q tags
BRAS/BNG L2 IPoE 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 + FastPCRF	Option 82 in the DHCP request, ARP proxy, supporting VLAN/Q-in-Q tags
BRAS/BNG L2 PPPoE	PAP, CHAP, MS-CHAPv2, MAC-address authorization protocols are supported	Supporting VLAN/Q-in-Q tags
BRAS/BNG L2 L2TP	LAC+LNS server	Supporting VLAN/Q-in-Q tags

BRAS/BNG Operating Modes



BRAS/BNG Main Options

- The combination of L2 (DHCP, PPPoE, L2TP) 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

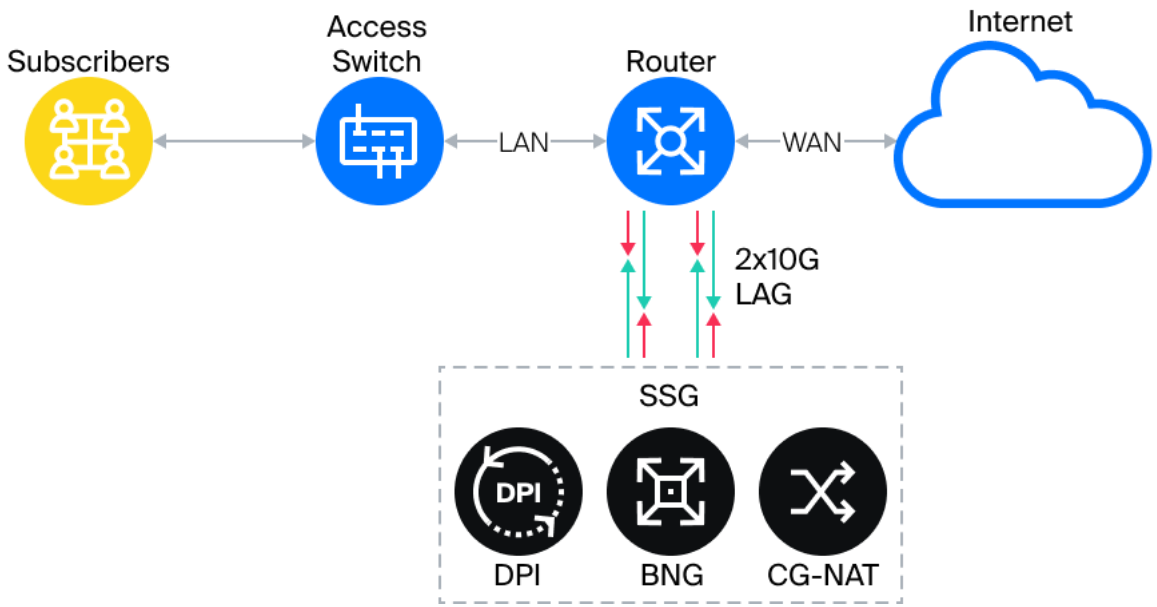
- Prioritization Video,Online games, Web traffic
- Increasing the speed of local resources or certain services (messengers, social networks) outside the tariff plan
- Traffic coloring (VLAN, IP, MPLS) and work with already colored traffic
- Mini Firewall service for increased network security

PCRF

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

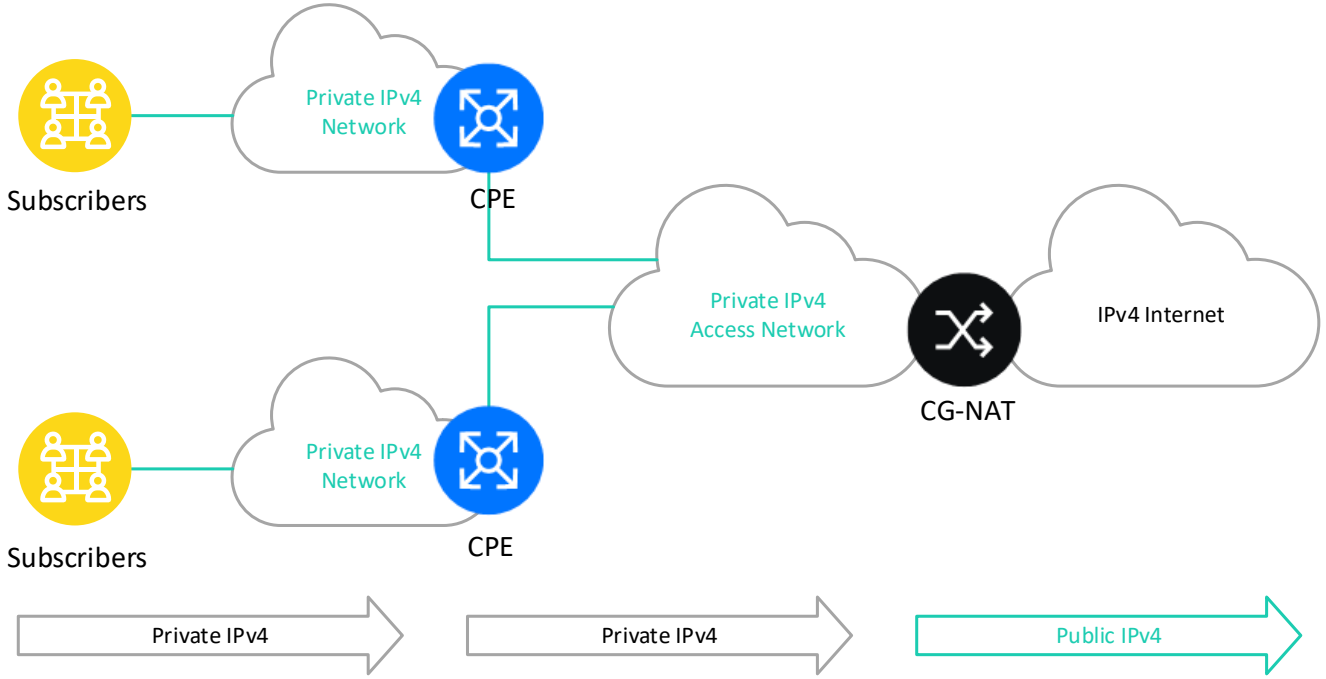
BRAS Main Options

- Support BGP, OSPF, VRF
- On-Stick connection with LAG
- Monitoring via SNMP and Syslog
- TACACS+ integration
- Administration via CLI and GUI



On-Stick installation with port aggregation in the LAG saves physical ports in the network core.

CG-NAT Characteristics



- **NAT flows export** — text file or IPFIX (NetFlow v10)
- **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

Policing levels

Per Session

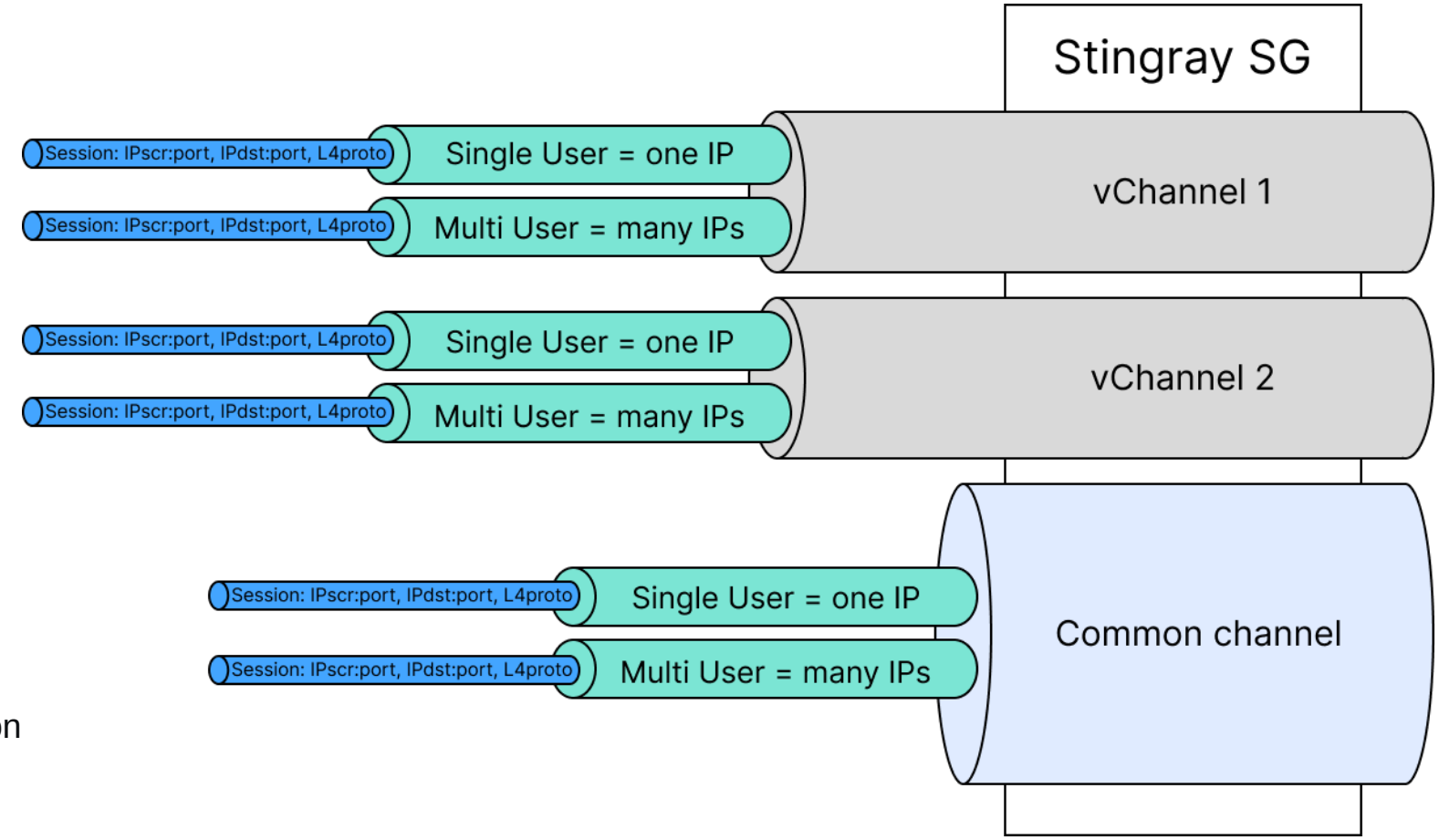
Per session control

Per Subscriber

Prioritized speed limit per subscriber

Per Channel

Channel rate control for congestion management



Flexible Tariff Plans – Policing per IP/Login

Task

1) Outbound Torrent Limit
2) Maximum speed on local resources
3) Increase speed to:

- Messengers and SIP
- HTTP, HTTPS, QIUC
- Game services

Classes (cs):

cs0 dns, icmp (e.g. 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_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
```

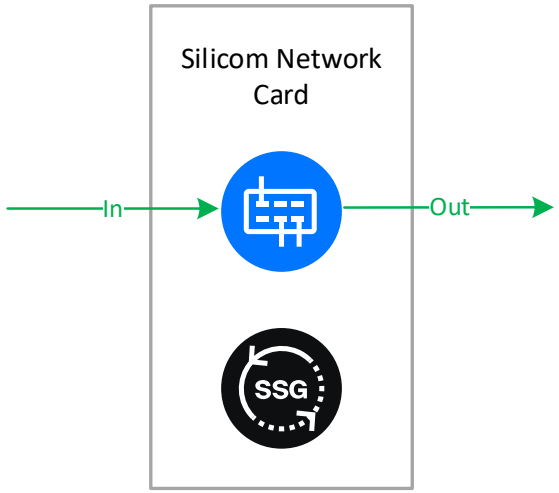
```
htb_root=rate 50mbit
htb_class0=rate 20mbit ceil 50mbit
htb_class1=rate 1mbit ceil 50mbit
htb_class2=rate 8bit ceil 50mbit
htb_class3=rate 8bit ceil 50mbit
htb_class4=rate 8bit ceil 1mbit
htb_class5=rate 100mbit static
htb_class6=rate 8bit ceil 5mbit
htb_class7=rate 8bit ceil 5mbit
```

Bypass Support

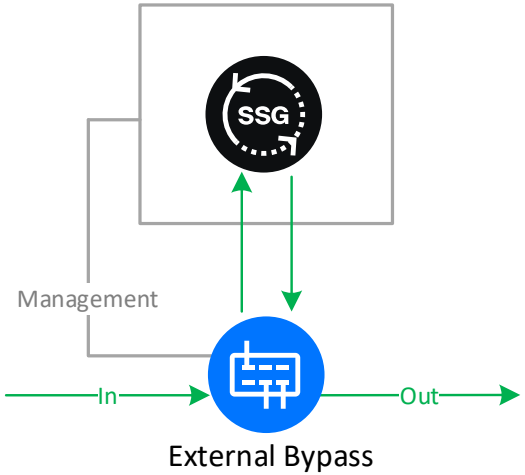
Bypass allows to ensure the network operability in case of installation of the system in series or asymmetrically, in the following situations:

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

Internal bypass produced by Silicom



External bypass by any manufacturer managed by DPI



Filtering By Blocklist and Categories

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
✓	Web Filtering HTTP by URL
✓	Web Filtering HTTPS/QUIC by SNI, CN, IP:port
✓	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

Filtration allows you to block specific URL for the HTTP protocol from a hosted page.

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

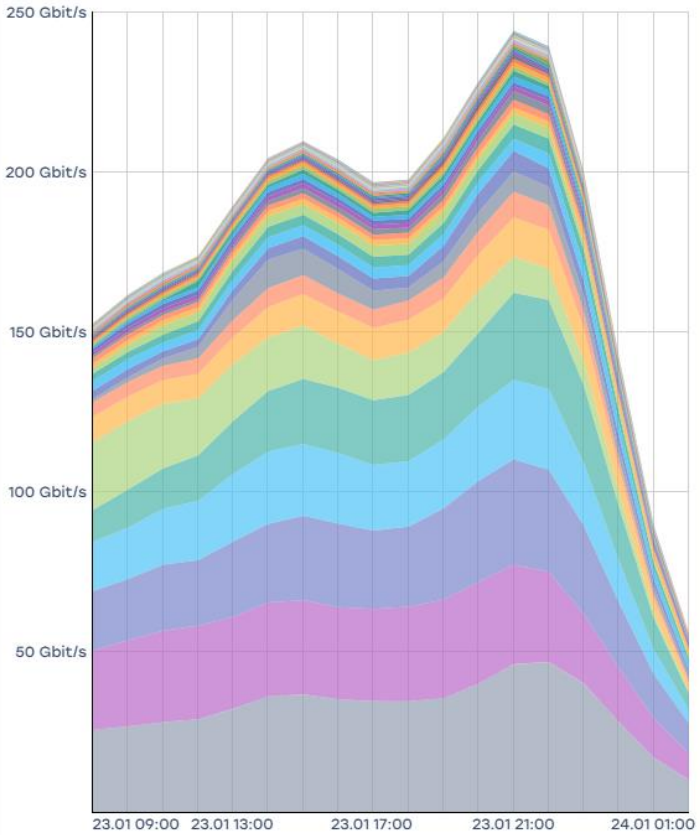
Analytics

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. Billing NetFlow
4. Full NetFlow

All specified modes can work simultaneously

Protocol	Group	Traffic	Traffic
Filter			
tiktok 49264	Video, pictures	34,656,205,61	2,301,284,873
youtube 49227	Video, pictures	27,543,142,911	1,332,700,996
https 443	Web browsing	25,099,189,954	2,716,677,923
http 80	Web browsing	20,122,865,28	990,400,701
netflix 49263	Video, pictures	19,230,789,792	1,008,864,482
fortnite epic 49280	Gaming	13,919,355,017	467,373,401
instagram 49266	Social networks	9,466,406,097	216,686,005
facebook_video 49242	Video, pictures	5,618,589,875	188,273,560
twitch 49265	Video, pictures	5,134,396,807	335,608,801
udp unknown 65041	Unknown	3,966,260,605	1,836,133,549
telegram 49224	Instant messengers	3,514,382,562	246,259,307
quic 49218	Web browsing	3,368,569,530	286,677,905
bittorrent 49165	P2P	2,999,358,513	821,370,224
google_play 54313	Application servers	1,856,532,022	154,022,306
whatsapp 49223	Instant messengers	1,769,536,134	254,226,257
5,836			



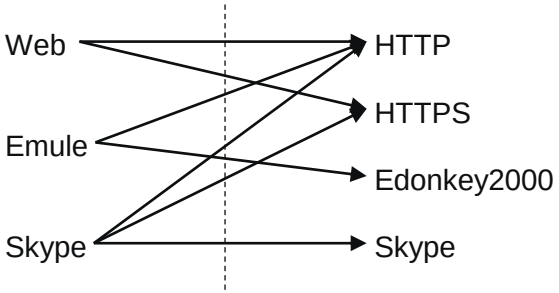
QoE Stor and GUI components are used to work with statistics

Traffic Prioritization

By direction

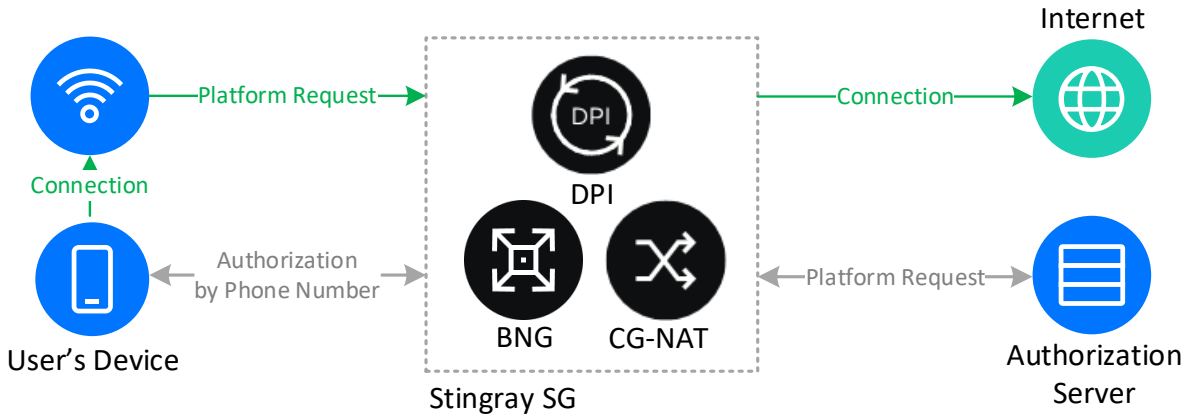
- Registered AS
- Customized AS

By protocol / application



Allow List And Captive Portal

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:

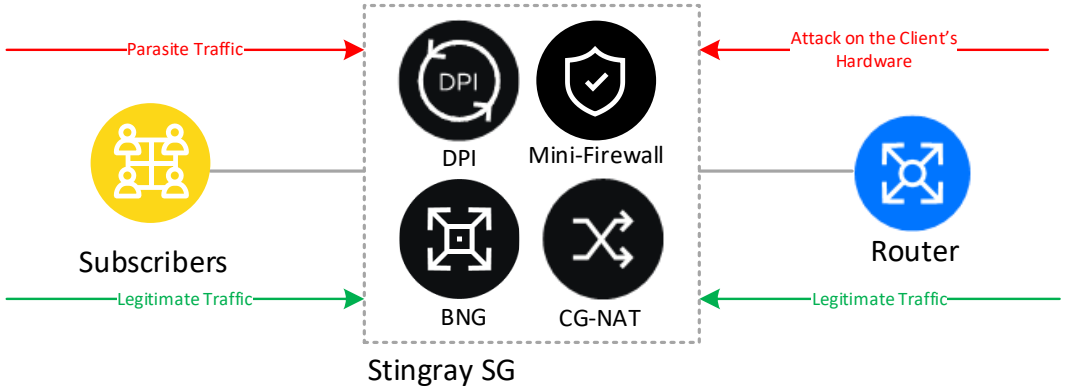
Subscriber blocking in case of low balance, with the possibility of payment via authorized payment systems.

Organization of user identification in Wi-Fi networks, provision of certain user actions in a Wi-Fi network to provide access.

Mini Firewall

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

DDOS Attacks Protection

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.

DDOS Attacks Protection

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.

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

When the limit value of requests is exceeded, 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.

Marketing and notifications

Notification capabilities:

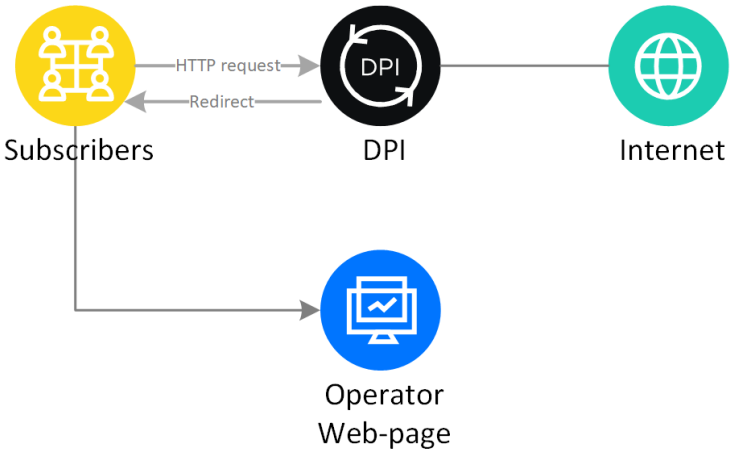
Automatic segmentation of subscriber base according to certain criteria

Customization of notifications in a certain period of time and day of the week

Possibility to run several campaigns simultaneously

Application:

1. Conducting user surveys
2. Warning about network works and communication outages
3. Informing about new services and promotions for subscribers

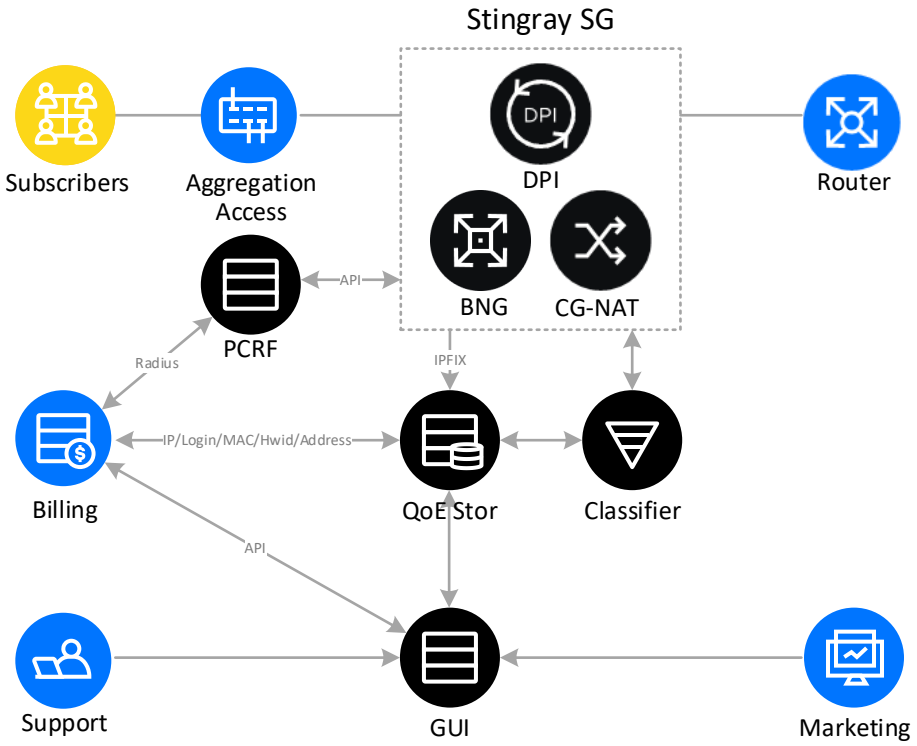


Quality Of Experience Module

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

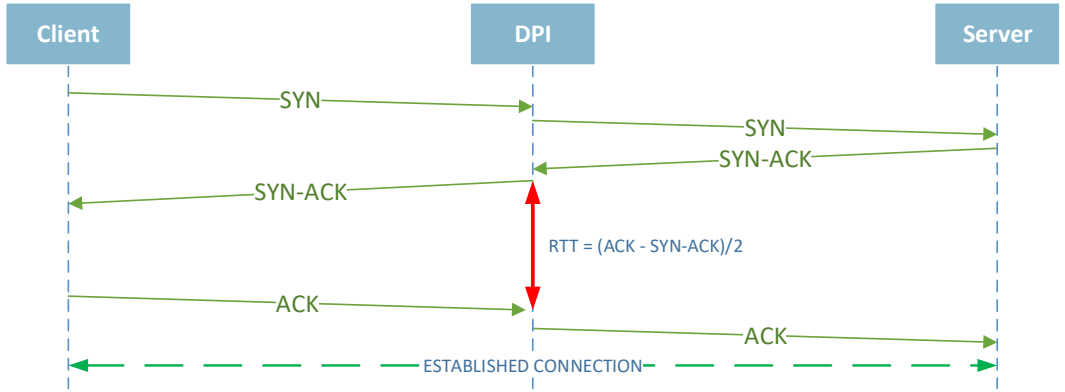
The statistics is transferred to special metrics which allow to define users' experience. It provides the operator with information about what kind of problems does he or she encounter.

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



QoE Metrics

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?

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
- Antivirus for sale

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

How To Use QoE Metrics?

Retention of subscriber base

- Identifying degradation in subscriber service quality and responding promptly
- Working with potential churn and analyzing the reasons for past churn
- Automating surveys after a master visit to a subscriber

Increasing loyalty

- Conducting marketing campaigns on new tariffs, services, and offers, taking into account the interests of subscribers
- Providing information on channel utilization and quality via the subscriber's personal cabinet
- Notifications about BotNet activity in the network (relevant for IoT)
- Notification of virus activity

Graphical User Interface

1. Restricting access by role
2. Logging user actions
3. Managing multiple SSG functions: monitoring and configuration
4. Service management
5. Creating tariff plans
6. Creating NAT pools
7. Working with QoE analytics
8. API integration

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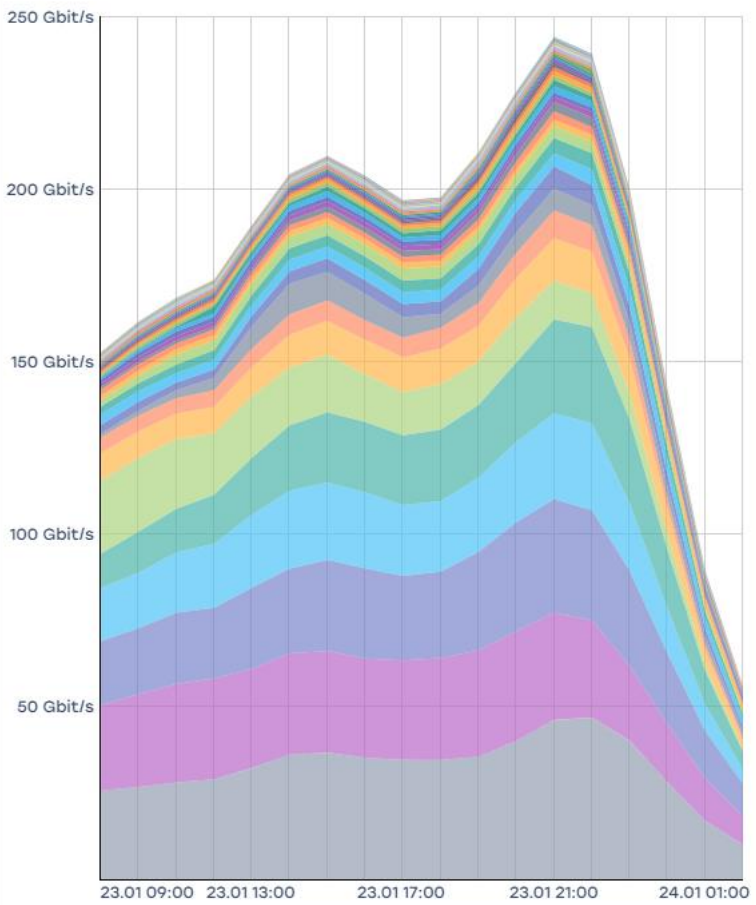
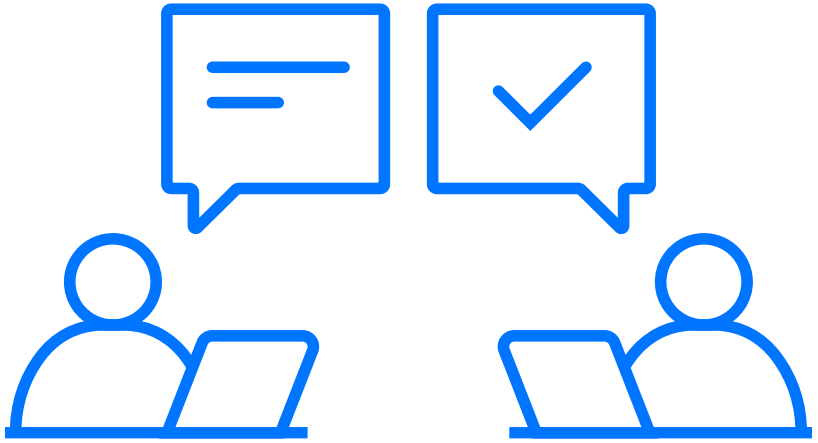


Support at every stage

1. Providing a test version for verifying functionality
2. Offering implementation support and consulting at every stage
3. Providing three levels of support: Next Business Day, 8x5, and 24x7
4. Allowing 24x7 call registration via email and phone



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