

ACCESS & NETWORK

i2i BNG

A software BNG on DPDK for PPPoE termination, carrier-grade NAT and dual-stack service

Live sessions					ILLUSTRATIVE
SUBSCRIBER	ACCESS	GATEWAY	IP	STATUS	
FTTH-44120	PPPoE	bng-01	100.64.18.23	Authorised	
FTTH-51877	PPPoE	bng-02	100.64.22.140	Authorised	
ENT-2209	IPoE	bng-01	203.0.113.14	Authorised	
WIFI-GUEST-88	Hotspot	ap-lobby	10.20.4.77	Captive portal	
FTTH-39002	PPPoE	bng-02	–	Rejected: expired plan	
4 authorised · 1 rejected					IP logs retained · Trace

ILLUSTRATIVE SCREEN

OVERVIEW

i2i BNG is a software broadband network gateway that runs on standard x86 servers under Debian. It terminates PPPoE subscribers, authorises each one through RADIUS and applies the speed and policy the plan calls for. It supports dual-stack IPv4 and IPv6 service tiers and traffic security controls, and it runs carrier-grade NAT, either on the gateway or as a separate appliance in front of another BNG.

The forwarding engine is a customised VPP with DPDK network drivers, so packets are processed in user space rather than in the kernel. Operators work through a hierarchical command line with set, show, commit and rollback, a web interface, SNMP and Prometheus metrics. There is no proprietary hardware to buy.

THE CHALLENGE

Subscriber edges were built on dedicated routers with fixed session and feature limits. Operators also face IPv4 exhaustion, which pushes them into carrier-grade NAT with its logging duties, while services move to dual-stack IPv4 and IPv6. They need a secure edge that runs on servers they can buy and replace, takes its policy from the RADIUS system they already have and can be operated and audited from a clear command line.

AT A GLANCE

- ✓ Dual-stack IPv4 and IPv6 service tiers on standard x86 servers
- ✓ Speed and policy applied from RADIUS, changed live by CoA
- ✓ Traffic security controls and stateful CGNAT with NAT logs
- ✓ Commit, rollback and signed upgrades with auto-rollback

Capabilities

User-space fast path

Forwarding runs in VPP on DPDK network drivers. At every boot and commit the system tunes worker threads, hugepages, buffers, receive queues, NUMA placement and interrupt affinity for the hardware it finds.

- NIC role change without reboot
- Receive-queue auto-rebalance
- Hardware capacity profiler

PPPoE termination

Discovery and session handling follow RFC 2516 and include VLAN support and service-name filtering. Operators choose how duplicate sessions are handled, and the gateway can blacklist MACs after repeated authentication failures and detect rogue PPPoE servers.

RADIUS integration

PPPoE authentication uses PAP or CHAP against RADIUS, with local CHAP users also possible. Accounting sends Start, Interim and Stop records. CoA and Disconnect are received on port 3799. Behaviour when RADIUS is unreachable is set by policy.

Vendor attributes

A vendor dictionary carries VRF, NAT public address and ports, QoS policy, per-tier and overall speed and ACL policy, so plan logic stays in RADIUS.

Multi-tier QoS

Per-session policers limit each subscriber. Speed tiers can differ by destination prefix or DSCP, for upload and download, with a per-user override from RADIUS.

Carrier-grade NAT

Dynamic NAT44 and deterministic NAT run in a separate daemon, with static mappings, session limits and timeouts. Logs leave as syslog and IPFIX. A standalone appliance image provides CGNAT without subscriber termination.

Operations interface

The command line supports set, show, commit, commit confirmed and rollback, with JSON output for scripts. The web interface gives dashboard, sessions, interfaces, CGNAT, hardware, logs, metrics and configuration history, with roles and per-user interface scope.

Monitoring and audit

SNMP v2c and v3 include a custom MIB and an alarm framework with traps, email and webhook. Prometheus metrics cover CGNAT. Structured logs, an audit trail and configuration backup by SCP are included.

Technical summary

FORWARDING ENGINE	Customised VPP with DPDK network drivers, on standard x86 servers
SUBSCRIBER PROTOCOLS	PPPoE (RFC 2516); IPoE code present but disabled in the shipped build
RADIUS	PAP and CHAP authentication, accounting with Interim updates, CoA and Disconnect on 3799; RFC 2865, 2866, 3162 and 4818
NAT	Dynamic NAT44 and deterministic NAT; syslog and IPFIX (RFC 7422, RFC 8158) event logs
MANAGEMENT	Command line, web interface with HTTPS, SNMP v2c and v3, Prometheus endpoint
OPERATING SYSTEM	Debian 12 on bare metal, from an installation image or signed upgrade package
HARDWARE	Intel, Mellanox and Broadcom network cards supported; hardware profiler included
SCALING	Add nodes; each node has a fixed PPPoE session ceiling set by the protocol

Standards and interfaces

Protocols

- PPPoE, RFC 2516
- RADIUS, RFC 2865 and 2866
- RADIUS IPv6 attributes, RFC 3162 and 4818
- RADIUS dynamic authorisation on port 3799

Logging and management

- Syslog, RFC 5424
- IPFIX, RFC 7422 and RFC 8158
- SNMP v2c and v3

Related modules

Modules operators often run alongside i2i BNG. Each is a separate module; the integrations that exist are listed in the technical summary above.



Where it is used

PPPoE gateway for a regional ISP

An ISP places two or more x86 gateways at its aggregation site. Each subscriber logs in over PPPoE, RADIUS returns the plan speed, and support changes a speed with CoA when a customer upgrades. Capacity is added by adding another node.

Local and international speed tiers

A plan gives full speed to peering and local destinations and a lower cap to international traffic. Multi-tier QoS applies separate limits by destination prefix or DSCP, and a per-user tier override arrives from RADIUS.

CGNAT under IPv4 exhaustion

An operator with few public addresses puts subscribers behind deterministic NAT, so each subscriber maps to a known address and port block. NAT events go out as syslog or IPFIX to a log store such as i2i Trace for later lookups.

See i2i BNG on your network

Talk to our team about your operator type, your network and where to start. We will show you the module and answer the technical questions.

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