Introduction

The N-Squared High-Performance Proxy (N2HPP) is a robust, flexible solution for the intelligent relay and manipulation of messages between client and server endpoints for Diameter, SMPP, and HTTP.

Built for high TPS and low latency service environments, the N2HPP scales to handle thousands of transactions a second per virtual machine. Able to be deployed as individual or clustered nodes, the N2HPP supports common HA deployment patterns out of the box.

With support for customized functionality, unique site-specific features can be developed in:

- Lua, for when accessible, dynamic, iterative development is important, or
- The JVM core, for when performance is most critical.

Built-in support for message transfer through Redis allows the N2HPP to integrate with IT systems and external scripts via protocol-neutral technologies.

Architecture

The N2HPP is JVM based software which can be deployed either in-premises and self-hosted, or cloud-based as a third-party virtualized solution. Deployed on Linux-based operating systems, the N2HPP is packaged for modern Linux environments. As a JVM based solution, the N2HPP targets both OpenJDK and Oracle's commercial JVM.

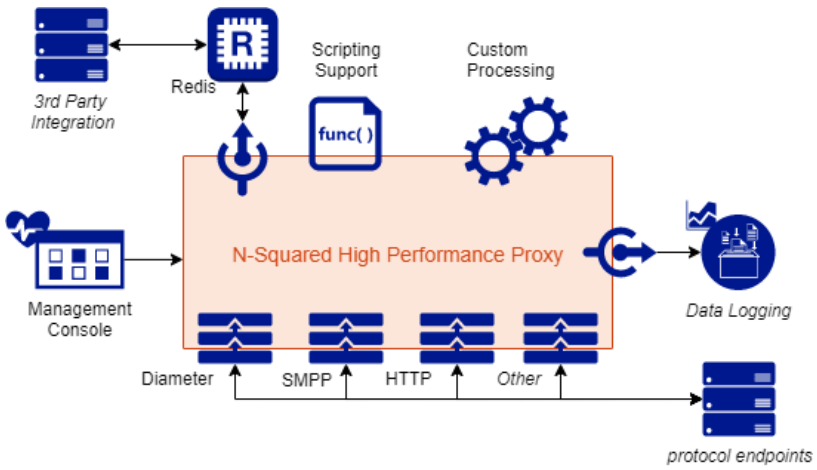


Figure 1 – N2HPP High Level Architecture

Each N2HPP node can be managed as an individual high-performance proxies, or as components in a network linked cluster of nodes. Each deployment structure has benefits:

	Individual Proxies	**Networked Cluster**
Performance	Higher performance. No cluster communication overhead.	Cluster management overhead incurs a loss of performance.
Session Management	No shared memory between individual nodes. In-progress sessions are lost on node shutdown.	In cluster memory. Individual nodes may be shut down without loss of in-progress sessions.

A deployment may utilize both models, with individual external-facing nodes fronting a node cluster with additional business logic and routing responsibilities.

Standard Deployment Models

The N2HPP supports three core deployment models. Each is designed for a different protocol:

SMS Gateway	The SMS Gateway supports the intelligent proxying of SMPP messages between ASP and MC endpoints, MC to MC relay, and SMS notification submission by IT systems via JSON. Supporting a comprehensive range of text encodings, the N2HPP SMPP implementation handles secure SMPP connectivity, delivery receipts, and custom SMPP TLVs.
Diameter Relay/Proxy	The N-Squared Diameter proxy and relay agent supports the management of Diameter traffic within LTE environments. Implemented against RFC3588, the N2HPP can load share inbound Diameter requests between clients and servers.
HTTP Proxy	The N2HPP is delivered with a web-services component for the proxy of HTTP based REST and SOAP requests. Connections may be configured with both server and client SSL certificates for point-to-point encrypted communication.

All deployment models support the use of Redis as a protocol agnostic I/O message bus and relay system. 3rd party software and scripts may integrate with the N2HPP over Redis, providing a low barrier of entry for the asynchronous submission of requests over supported protocols.

Performance

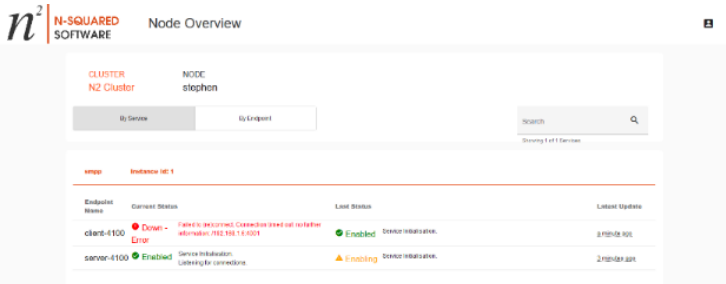
As a high-performance proxy, N2HPP is designed for efficient and fast message delivery. Built with a modern event-based message delivery model, each node is vertically scalable, using all server cores and CPU threads available to it. Horizontal scalability is achieved with multiple N2HPP nodes as no shared data storage is required.

Extensibility and Customisation

The N2HPP is built on N-Squared's composable JSLEE software stack and supports transaction and message manipulation through scripting. First-class support for Lua allows engineering teams to develop proxy extensions for complicated use-cases. For simpler scenarios, a comprehensive JSON-based translation engine supports message manipulation with no direct programming required.

Operational Management

The N2HPP operational management console is available over secure communication channels (including HTTPS and SSH) on each cluster node.



A broad spectrum of cluster management capabilities, including support for the enabling, quiescing and re-configuration endpoints and nodes is available through the operational console.

Protocol endpoints may be configured to generate detailed text EDRs for proxied transactions for external data warehousing to disk or direct to other storage sinks. Comprehensive system statistics are published and may be aggregated and displayed through external third-party monitoring tools such as Prometheus or Graphite.