Introduction

The N-Squared Voucher Server (N2VS) is a software system for the management and real-time redemption of printed and virtual/on-demand vouchers.

The N2VS solution leverages a modern NoSQL database engine, data sharding, and replication to provide both high availability and linear horizontal scalability. Deployed on Linux and commodity x86-64 hardware, N2VS provides a robust solution with both low hardware and minimal third-party licensing costs. The result is a cost-effective deployment which can be easily scaled in response to future business growth.

The base configuration of N2VS supports the storage of up to 20m vouchers and up to 300 transactions per second. The solution can be scaled with the addition of further hardware nodes.

Vouchers are generated in batches that are assigned cost and redemption details based on a voucher type definition. Voucher PINs are generated and encrypted using configurable hash functions, and when exported for distribution are encrypted using public/private key encryption.

The Voucher Server integrates with the N-Squared Online Charging Server (N2OCS) to perform voucher redemption against N2OCS accounts, or to other third-party systems via the N2VS RESTful API and outbound JSLEE services (including both Diameter and HTTPS protocols). Supported voucher redemption scenarios include:

1. Voucher redeemed by pre-existing PIN (e.g. pre-printed voucher).
2. On-the-fly PIN generation, and e-Voucher redemption without PIN.
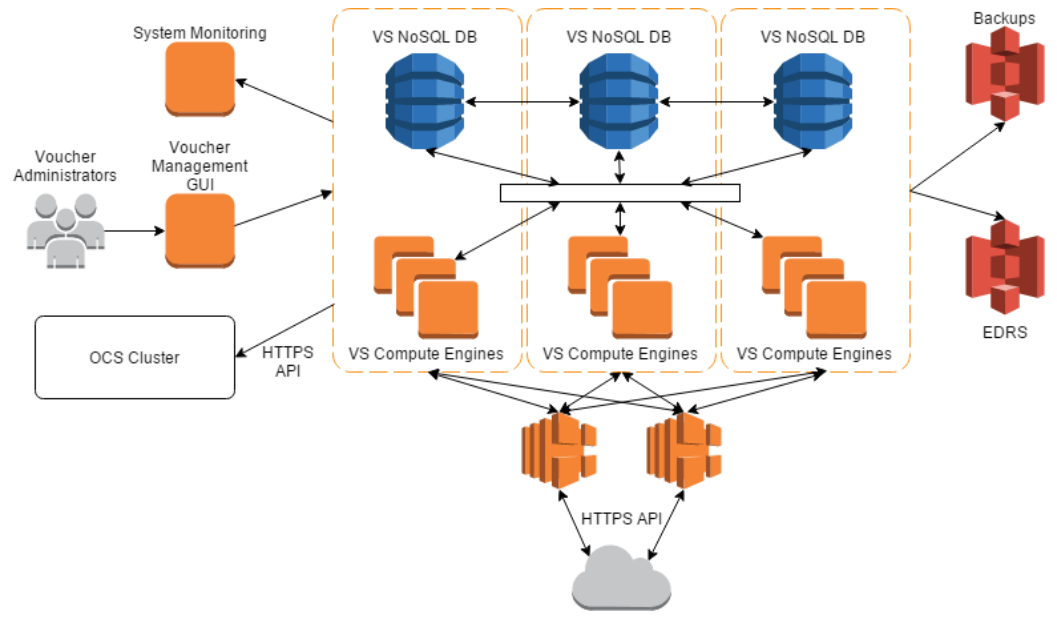
Architecture

Figure 1 – N2VS High Level Architecture

The N2VS can be deployed either in-premises and self-hosted, or cloud-based as a third-party virtualized solution. Clustering across multiple mid-range servers provides high-availability through data replication and redundancy at an optimum price/functionality.

A richly featured RESTful HTTP API provides the integration point for upstream BSS components.

Voucher Management Features

The N2VS stores voucher details, consisting of:

- Voucher value, include multiple money and non-monetary values such as data & time.
- A voucher PIN, generally encrypted with a secure one-way hash such as HMAC SHA256.
- Serial numbers for tracking vouchers.
- Extended voucher attributes, including distributor and reseller information.
- Customisable voucher lifecycles, allowing vouchers to be flagged, or removed from circulation.

Voucher Redemption

The N2VS integrates with the N-Squared OCS and other third-party systems for voucher redemption.

During redemption, the voucher server reserves the voucher, redeems the value of the voucher against the appropriate account, then commits or rolls back the voucher reservation. Voucher redemption is transaction-safe against re-use or accidental loss-of-value.

User Interfaces

The voucher server includes a web-based GUI for voucher management, including the ability to:

- Create and maintain voucher types.
- Generate, export, and encrypt voucher batches.
- Import externally generated voucher batches into the voucher server.
- View and update voucher status.
- Update extended voucher attributes including distributor information in bulk.
- Directly redeem vouchers against an N2OCS account.
- Login access to the user interface via Active Directory, OAuth 2.0, and other AuthN services.
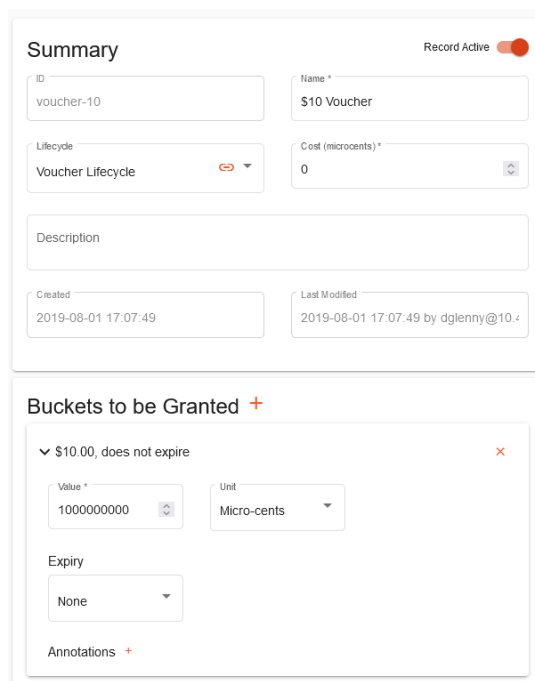
Extensibility

The N-Squared Voucher Server offers multiple extensibility hook points, including configuration for standard features, scripting for advanced functionality, and programmable plugin hooks for full control. The hook points include hooks for custom voucher PIN generation and custom voucher redemption.

Other Features

N2VS provides all key management features, including:

- Generating file and non-file based EDRs for administrative and voucher redemption events.
- Publishing statistics to external third-party monitoring tools such as Prometheus.
- Generating alarms to system logs on unexpected errors.
- Full API documentation for third-party system integration.