Architecture and Dependency Map

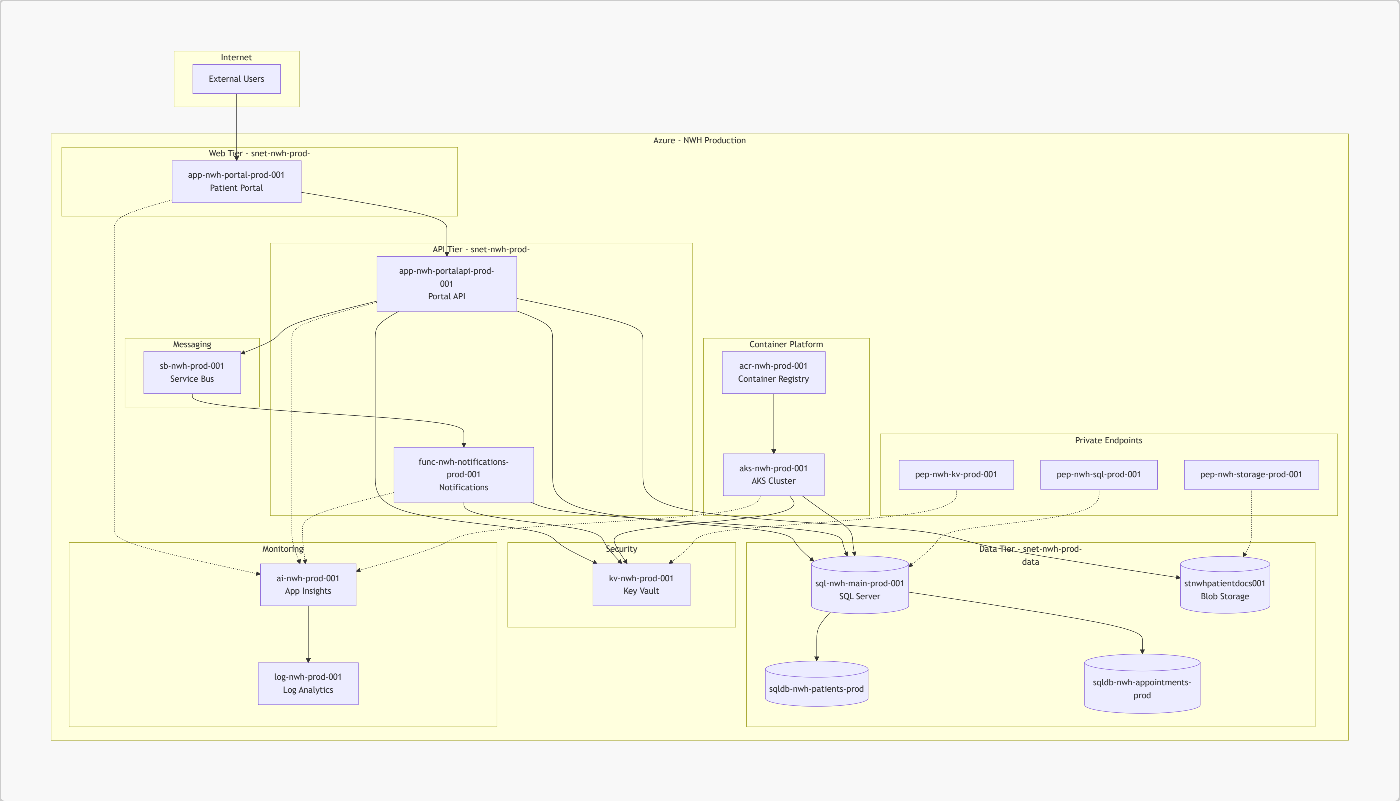
Northwind Health — Production Environment
February 2026

Purpose

This document provides a visual representation of the Northwind Health production Azure environment, illustrating how applications, data services, and infrastructure components interconnect. Understanding these dependencies is essential for:

- **Impact analysis** before making configuration changes
- **Troubleshooting** production issues efficiently
- **Disaster recovery** planning and testing
- **Identifying single points of failure** and resilience gaps

Architecture Diagram



How to Read This Diagram

Notation Guide

Symbol	Meaning
Solid arrow (→)	Direct dependency or data flow
Dashed arrow (⇢)	Monitoring/telemetry or private network connection
Rectangle	Compute resource (App Service, Function, AKS)
Cylinder	Data store (SQL Database, Storage Account)
Grouped box	Logical tier or subnet boundary

Tiers and Layers

The architecture follows a three-tier design:

1. **Web Tier** (`snet-nwh-prod-web`) — External-facing applications
2. **API Tier** (`snet-nwh-prod-api`) — Backend services and APIs
3. **Data Tier** (`snet-nwh-prod-data`) — Databases, storage, and private endpoints

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Critical Data Flows

Patient Portal Flow (Primary Path)

```
External Users → app-nwh-portal-prod-001 → app-nwh-portalapi-prod-001 → sql-nwh-main-prod-001
```

This is the primary user-facing path. Disruption to any component in this chain results in portal unavailability.

Notification Flow (Async Processing)

```
app-nwh-portalapi-prod-001 → sb-nwh-prod-001 → func-nwh-notifications-prod-001
```

Notifications are processed asynchronously via Service Bus. If this path is disrupted, notifications are delayed but do not impact portal availability.

Document Storage Flow

```
app-nwh-portalapi-prod-001 → stnwhpatientdocs001 (via pep-nwh-storage-prod-001)
```

Patient documents are stored in blob storage, accessed via private endpoint for security.

Security Architecture

Private Endpoint Topology

All data-tier services are accessed via private endpoints, ensuring traffic stays within the Azure backbone and never traverses the public internet:

Service	Private Endpoint	Private DNS Zone
SQL Server	`pep-nwh-sql-prod-001`	`pdnsz-privatelink-sql`
Blob Storage	`pep-nwh-storage-prod-001`	`pdnsz-privatelink-blob`
Key Vault	`pep-nwh-kv-prod-001`	`pdnsz-privatelink-vault`

Secrets Management

All applications retrieve secrets from Key Vault (`kv-nwh-prod-001`) at runtime using managed identities. No connection strings or API keys are stored in application configuration.

Network Topology

Virtual Network

VNet: `vnet-nwh-prod-eastus-001`
Address Space: 10.1.0.0/16

Subnet	CIDR	Purpose
`snet-nwh-prod-web`	10.1.1.0/24	Web tier, App Service integration
`snet-nwh-prod-api`	10.1.2.0/24	API tier, Function App integration
`snet-nwh-prod-data`	10.1.3.0/24	Private endpoints, data services

Single Points of Failure Analysis

Component	Risk Level	Impact if Unavailable	Mitigation Options
SQL Server (`sql-nwh-main-prod-001`)	High	All applications fail	Geo-redundant backup, read replica
Key Vault (`kv-nwh-prod-001`)	High	All applications fail to authenticate	Soft-delete enabled, consider geo-redundancy
Service Bus (`sb-nwh-prod-001`)	Medium	Notifications delayed	Geo-DR pairing available

Component	Risk Level	Impact if Unavailable	Mitigation Options
Storage (`stnwhpatientdocs001`)	Medium	Document access unavailable	GRS replication enabled
App Service Plan	Medium	Portal unavailable	Autoscaling configured

Recommended Resilience Improvements

1. **SQL Database** — Consider adding a read replica in a secondary region for disaster recovery scenarios
2. **Key Vault** — Validate soft-delete and purge protection are enabled; consider backup to secondary region
3. **Service Bus** — Evaluate geo-DR pairing if notification SLA is critical

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Observability

All compute resources send telemetry to Application Insights (`ai-nwh-prod-001`), which exports logs to Log Analytics (`log-nwh-prod-001`).

Monitored Resources

- `app-nwh-portal-prod-001` — Frontend application
- `app-nwh-portalapi-prod-001` — Backend API
- `func-nwh-notifications-prod-001` — Notification processor
- `aks-nwh-prod-001` — Kubernetes cluster

Monitoring Gaps Identified

The legacy VM (`vm-nwh-legacy-001`) does not appear to be sending telemetry to Application Insights. Recommend installing the Azure Monitor agent if this resource is retained.

Recommendations

1. **Document all dependencies** — This diagram should be kept current as architecture evolves
2. **Test failover scenarios** — Conduct tabletop exercises for Key Vault and SQL outage scenarios
3. **Implement health checks** — Ensure all services have appropriate health endpoints monitored
4. **Review DR strategy** — Current architecture has appropriate backups but limited active-active capability
5. **Address legacy VM** — Identify owner and either integrate monitoring or plan decommission

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Appendix: Resource Inventory Summary

Tier	Resource Count	Key Resources
Web	2	Portal App Service, App Service Plan

Tier	Resource Count	Key Resources
API	3	API App Service, Function App, App Service Plan
Data	7	SQL Server, 2 Databases, 2 Storage Accounts, 3 Private Endpoints
Security	2	Key Vault (primary), Key Vault (secondary)
Networking	4	VNet, 3 Subnets
Monitoring	2	App Insights, Log Analytics
Containers	2	Container Registry, AKS Cluster

This diagram reflects the production environment as of the audit date. Architecture changes should trigger an update to this documentation.