

PowerDNS Recursor

Fast. Secure. Intelligent. Recursive DNS.

The Challenge

Recursive DNS resolvers are on the critical path of virtually every Internet transaction. Internet service providers, telecommunications operators, enterprises, and others must process millions of DNS queries while delivering low latency, high availability, strong security, and uninterrupted service.

But, modern recursive DNS must do far more than simply resolve domain names. Today's resolvers are expected to validate DNSSEC signatures, enforce security policies, block malicious domains, and provide the operational visibility required for automated, cloud-native environments.

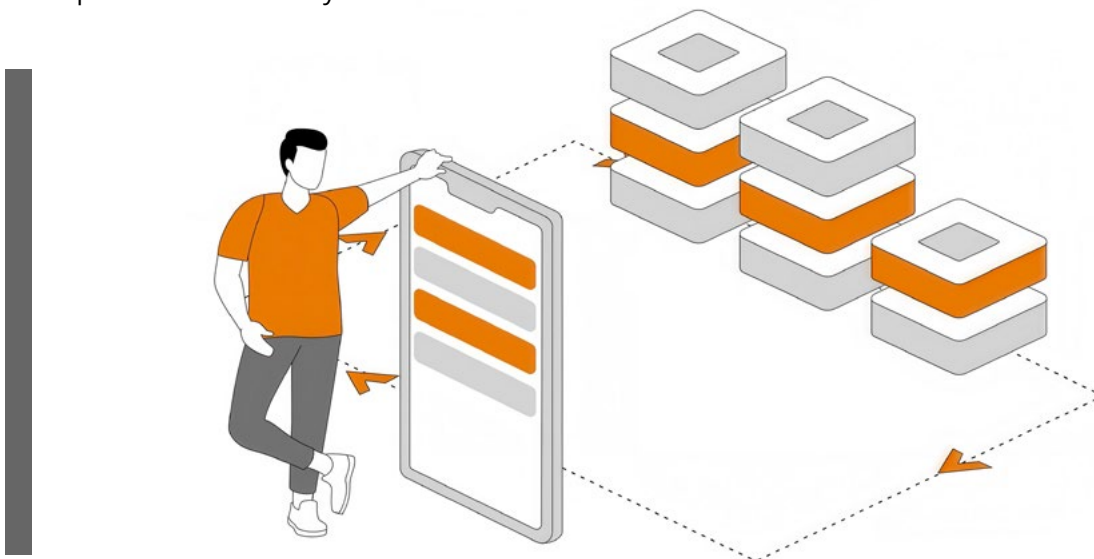
Traditional DNS resolvers often struggle to combine high performance with modern security capabilities, flexible policy enforcement, and operational scalability.

The Solution

PowerDNS Recursor is a high-performance, open-source recursive DNS resolver designed for modern Internet, network and enterprise infrastructures. It combines exceptional query performance with advanced caching, comprehensive DNSSEC validation, programmable policy enforcement, and extensive observability.

Its modular architecture enables organizations to build secure, scalable, and highly automated recursive DNS services while seamlessly integrating with monitoring systems, orchestration platforms, and cloud-native deployments.

Whether serving millions of broadband subscribers or protecting enterprise users, PowerDNS Recursor delivers reliable recursive DNS resolution at Internet scale.



Key Capabilities

High-Performance Recursive Resolution

PowerDNS Recursor is engineered for high-performance recursive DNS resolution using an asynchronous, event-driven architecture designed to handle very high query volumes with minimal latency. Intelligent cache utilization, efficient resource management, and excellent multi-core scalability ensure reliable performance for enterprise, cloud, and service provider DNS infrastructures.

- ✓ **High query throughput**
- ✓ **Low-latency responses**
- ✓ **Asynchronous, event-driven architecture**
- ✓ **Intelligent multi-layer caching**
- ✓ **Optimized upstream server selection**
- ✓ **Efficient resource utilization**
- ✓ **Excellent multi-core scalability**

Advanced DNSSEC Validation

PowerDNS Recursor validates DNSSEC signatures to protect users against spoofed or manipulated DNS responses. Features include:

- ✓ **Full DNSSEC validation**
- ✓ **Automatic trust anchor management**
- ✓ **RFC-compliant validation**
- ✓ **Configurable validation policies**

YAML-Based Configuration

PowerDNS Recursor supports a modern, structured YAML configuration format that simplifies deployment, configuration management, and automation.

The YAML format improves readability, reduces configuration complexity, and integrates seamlessly with Infrastructure as Code (IaC), configuration management tools, and cloud-native deployment workflows. Benefits include:

- ✓ **Structured, human-readable configuration**
- ✓ **Simplified configuration management**
- ✓ **Improved automation and version control**
- ✓ **Better integration with Kubernetes and container platforms**
- ✓ **Consistent deployments across environments**
- ✓ **Powerful Lua scripting for customizations**

Aggressive NSEC Caching

PowerDNS Recursor supports Aggressive Use of DNSSEC-Validated Cache (RFC 8198). By using previously validated DNSSEC information, the resolver can answer many negative queries directly from its cache without contacting authoritative servers. This reduces upstream traffic, improves response times, and increases overall resolver efficiency.

Serve Stale

PowerDNS Recursor supports Serve Stale (RFC 8767) to improve service availability. When authoritative servers become temporarily unavailable, expired cache entries can continue to be served while fresh data is retrieved in the background. This increases resilience during outages and helps maintain uninterrupted DNS service.

DNS64

PowerDNS Recursor includes native DNS64 support for IPv6-only environments. It automatically synthesizes AAAA records for IPv4-only destinations, enabling seamless communication between IPv6-only clients and IPv4 services without requiring application changes.

REST API

PowerDNS Recursor includes a built-in REST API that enables secure automation, integration, and operational management of recursive DNS services. The API provides access to configuration, runtime statistics, cache management, and operational data, making it easy to integrate with monitoring platforms, orchestration tools, and DevOps workflows.



OpenTelemetry Traces

PowerDNS Recursor supports native OpenTelemetry Traces, providing end-to-end visibility into DNS query processing. Detailed trace information can be exported for selected DNS requests, enabling operators to diagnose performance bottlenecks, analyze resolver behavior, and integrate DNS telemetry into existing observability platforms. Configurable trace conditions allow organizations to capture detailed diagnostics only when required, reducing overhead while supporting efficient troubleshooting and performance analysis. Benefits include:

- ✓ **Deep visibility into the DNS resolution process**
- ✓ **Faster troubleshooting and root cause analysis**
- ✓ **Selective tracing based on configurable conditions**
- ✓ **Native integration with OpenTelemetry ecosystems**
- ✓ **Improved observability for modern cloud-native environments**

Extensive Observability

PowerDNS Recursor provides detailed operational visibility through comprehensive metrics. Integrates with:

- ✓ **Prometheus**
- ✓ **Carbon**
- ✓ **SNMP**
- ✓ **JSON statistics**
- ✓ **External monitoring platforms**

Product Extensions

PowerDNS DNSdist

DNSdist is the intelligent DNS load balancer and traffic manager for PowerDNS deployments. It distributes DNS traffic across Recursor instances while providing health checks, DDoS protection, rate limiting, DNS encryption, traffic steering, and high availability.

PowerDNS Recursor Plexus

Plexus is a PowerDNS Recursor add-on that automatically preserves and restores critical DNS state at resolver restarts. When a Recursor restarts, Plexus immediately repopulates it with runtime data from its peers. This restores operational context, preserves accumulated resolver intelligence, and eliminates the warm-up phase that would otherwise impact performance.

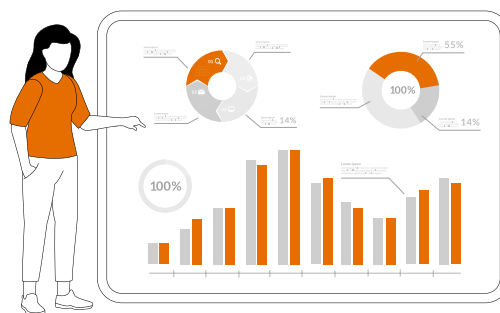


PowerDNS Protect

PowerDNS Protect extends PowerDNS Recursor with DNS-based security and content filtering. PowerDNS Protect for Malware blocks access to malicious domains associated with malware, phishing, ransomware, and other cyber threats. PowerDNS Protect for Families adds flexible parental controls, allowing administrators or subscribers to filter inappropriate content, create individual user profiles, and manage Internet access based on schedules.

PowerDNS dstore

PowerDNS dstore is a high-performance data collection and processing platform. It receives Protocol Buffer (Protobuf) log messages, distributes DNS events to multiple destinations, converts them into various output formats, and aggregates data for reporting and analysis. By providing detailed visibility into DNS traffic, blocked queries, and suspicious activity, PowerDNS dstore simplifies troubleshooting, supports security investigations, and delivers valuable operational insights for large-scale DNS environments.



PowerDNS Cloud Control

PowerDNS Cloud Control is a cloud-native deployment platform for PowerDNS products. It provides a highly scalable and distributed implementation of DNS, while simplifying deployment and scaling for operations teams. By combining containerization, automation, orchestration, lifecycle management, monitoring, and alerting, Cloud Control enables more efficient resource utilization and a cost-effective way to scale DNS deployments as demand grows.

Supported Major Standards & Protocols

- > RFC 4033–4035 (DNSSEC Validation)
- > RFC 8198 (Aggressive NSEC Caching)
- > RFC 8767 (Serve Stale)
- > RFC 7858 (DNS over TLS)
- > RFC 8484 (DNS over HTTPS)
- > RFC 9250 (DNS over QUIC)
- > RFC 6147 (DNS64)

Key Benefits at a Glance



High-performance recursive
DNS resolution



High resilience through Serve
Stale support



Low-latency query processing at
Internet scale



Reduced upstream traffic with
intelligent caching



Comprehensive DNSSEC
validation



Extensive observability and
monitoring



Advanced DNS security and policy
enforcement

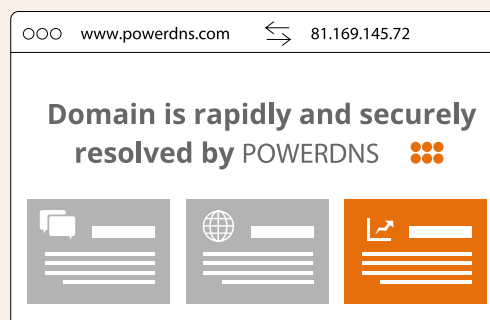


REST API for operational
integration

Are you ready for next generation DNS resolving?

Discover how PowerDNS Recursor combines exceptional performance, intelligent caching, and advanced security to power modern recursive DNS infrastructures. Explore our documentation or contact us to discuss your recursive DNS requirements

[Contact us](#)



docs.powerdns.com