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# 🌐 Synthetic Network Monitoring

> **Series:** SYNTH | **Notebook:** 5 of 6 | **Created:** December 2025

## Network Availability, DNS, and ICMP Monitoring

This notebook covers Dynatrace Synthetic Network Availability Monitors,
including ICMP (ping), DNS, and TCP port monitoring capabilities introduced
in recent Dynatrace releases.

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## Table of Contents

1. Network Monitoring Overview
2. ICMP (Ping) Monitors
3. DNS Monitors
4. TCP Port Monitors
5. Multi-Protocol Monitors
6. Use Cases and Patterns
7. Analyzing Network Results

## Prerequisites

- ✅ Access to a Dynatrace environment with Synthetic Monitoring
- ✅ Completed SYNTH-01 through SYNTH-04
- ✅ Private synthetic locations (for internal network monitoring)



## 1. Network Monitoring Overview

### Synthetic Network Availability Monitors

Dynatrace provides network-level synthetic monitoring to verify:

| Protocol | Purpose | Use Case |
|----------|---------|----------|
| **ICMP** | Host reachability | Server availability |
| **DNS** | Name resolution | DNS infrastructure health |
| **TCP** | Port connectivity | Service port availability |

### Why Network Monitoring?

Network monitors complement application-level monitoring by testing at
different layers of the stack:
```

![Network Layers]
(
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```
### Benefits

- **Root Cause Isolation**: Distinguish network vs application issues
- **Infrastructure Validation**: Verify network paths are operational
- **DNS Health**: Monitor critical DNS infrastructure
- **Low Overhead**: Minimal resource consumption
- **High Frequency**: Run every minute if needed

## 2. ICMP (Ping) Monitors

### What ICMP Monitors Test

| Metric | Description |
|--------|-------------|
| **Reachability** | Host responds to ping |
| **Latency** | Round-trip time (RTT) |
| **Packet Loss** | Percentage of lost packets |
| **Jitter** | Latency variation |

### Configuration Options

| Setting | Description | Typical Value |
|---------|-------------|---------------|
| **Target** | IP address or hostname | `192.168.1.1` or `server.example.com`
|
| **Packet Count** | Pings per execution | 3-10 |
| **Timeout** | Wait time per packet | 5 seconds |
| **Frequency** | Execution interval | 1-60 minutes |

### Creating an ICMP Monitor

**Dynatrace menu → Synthetic → Create synthetic monitor → Create network
availability monitor → ICMP**

### Metrics Captured

![ICMP Monitor Results]
(
ciIHZpZXdCb3g9IjAgMCA1MDAgMzQwIj4KICA8ZGVmcz4KICAgIDxsaW5lYXJHcmFkaWVudCBpZD0
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````


````
```dql
// ICMP monitor results (last 24h)
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*icmp*") OR matchesValue(event.type,
"*ping*")
| fields timestamp,
         monitor = dt.entity.synthetic_test,
         location = dt.entity.synthetic_location,
         availability = synthetic.availability,
         latency_ms = toDouble(synthetic.response_time),
         packet_loss = toDouble(synthetic.packet_loss_pct)
| sort timestamp desc
| limit 100
```

```dql
// ICMP latency statistics by target
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*icmp*") OR matchesValue(event.type,
"*ping*")
| filter synthetic.availability == true
| summarize {
    avg_latency_ms = avg(toDouble(synthetic.response_time)),
````
````

```
    min_latency_ms = min(toDouble(synthetic.response_time)),
    max_latency_ms = max(toDouble(synthetic.response_time)),
    p95_latency_ms = percentile(toDouble(synthetic.response_time), 95),
    executions = count()
  }, by: {dt.entity.synthetic_test}
| sort avg_latency_ms desc
| limit 20
```

3. DNS Monitors

What DNS Monitors Test

Check	Description
Resolution	Hostname resolves to IP
Response Time	DNS query duration
Expected IP	Resolves to correct address
Record Type	A, AAAA, CNAME, MX, etc.

Configuration Options

Setting	Description	Example
Hostname	Domain to resolve	`api.example.com`
DNS Server	Specific resolver (optional)	`8.8.8.8`
Record Type	DNS record type	A, AAAA, CNAME
Expected IP	Validation (optional)	`10.0.0.50`
Timeout	Query timeout	10 seconds

DNS Record Types

Type	Purpose	Example
`A`	IPv4 address	192.168.1.1
`AAAA`	IPv6 address	2001:db8::1
`CNAME`	Canonical name	www → app.example.com
`MX`	Mail exchanger	mail.example.com
`TXT`	Text records	SPF, DKIM
`NS`	Name servers	ns1.example.com

```dql
// DNS monitor results (last 24h)
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*dns*")
| fields timestamp,
         monitor = dt.entity.synthetic_test,
```

```
         location = dt.entity.synthetic_location,
         availability = synthetic.availability,
         response_time_ms = toDouble(synthetic.response_time),
         resolved_ip = synthetic.dns_resolved_ip
| sort timestamp desc
| limit 100
```

```dql
// DNS resolution time by location
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*dns*")
| filter synthetic.availability == true
| summarize {
    avg_resolution_ms = avg(toDouble(synthetic.response_time)),
    p95_resolution_ms = percentile(toDouble(synthetic.response_time), 95),
    executions = count()
  }, by: {dt.entity.synthetic_test, dt.entity.synthetic_location}
| sort avg_resolution_ms desc
| limit 30
```

4. TCP Port Monitors

What TCP Monitors Test

Check	Description
Port Open	TCP connection succeeds
Connect Time	Time to establish connection
SSL Handshake	TLS negotiation (if applicable)

Common Ports to Monitor

Port	Service	Use Case
22	SSH	Server management access
80	HTTP	Web server (plain)
443	HTTPS	Web server (secure)
3306	MySQL	Database connectivity
5432	PostgreSQL	Database connectivity
6379	Redis	Cache connectivity
9200	Elasticsearch	Search connectivity
27017	MongoDB	Database connectivity

Configuration

````
| Setting | Description | Example |
|---------|-------------|---------|
| **Host** | Target server | `db.example.com` |
| **Port** | TCP port number | `5432` |
| **Timeout** | Connection timeout | 10 seconds |
| **TLS** | Enable TLS check | true/false |

```dql
// TCP port monitor results (last 24h)
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*tcp*") OR matchesValue(event.type,
"*port*")
| fields timestamp,
         monitor = dt.entity.synthetic_test,
         location = dt.entity.synthetic_location,
         availability = synthetic.availability,
         connect_time_ms = toDouble(synthetic.response_time)
| sort timestamp desc
| limit 100
```

```dql
// TCP connection time statistics
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*tcp*") OR matchesValue(event.type,
"*port*")
| filter synthetic.availability == true
| summarize {
    avg_connect_ms = avg(toDouble(synthetic.response_time)),
    min_connect_ms = min(toDouble(synthetic.response_time)),
    max_connect_ms = max(toDouble(synthetic.response_time)),
    executions = count()
  }, by: {dt.entity.synthetic_test}
| sort avg_connect_ms desc
| limit 20
```

## 5. Multi-Protocol Monitors

### Combining Network Checks

Create comprehensive monitoring by combining multiple protocol checks:

```
Multi-Protocol Monitor Example:
````
````

```
Target: db.example.com

Step 1: DNS Resolution
    ├── Query: db.example.com
    └── Expected: 10.0.1.50

Step 2: ICMP Ping
    ├── Target: 10.0.1.50
    └── Check: Host reachable

Step 3: TCP Port Check
    ├── Target: 10.0.1.50:5432
    └── Check: PostgreSQL port open
```

Monitoring Strategy by Layer

Layer	Monitor Type	Purpose
DNS	DNS Monitor	Name resolution works
Network	ICMP Monitor	Host reachable
Transport	TCP Monitor	Service port open
Application	HTTP Monitor	Service responding

6. Use Cases and Patterns

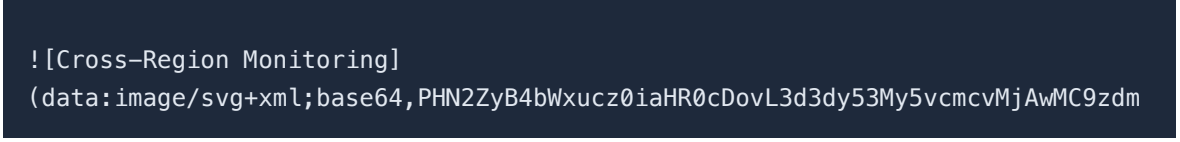
Infrastructure Monitoring

Component	Monitor Type	Target
Load Balancer	TCP/443	VIP address
Database Cluster	TCP/5432	Each node
Cache Layer	TCP/6379	Redis instances
Message Queue	TCP/5672	RabbitMQ nodes

DNS Infrastructure

Scenario	Configuration
Primary DNS	Query internal DNS server
Secondary DNS	Query backup DNS server
External DNS	Query public resolvers
Record validation	Verify expected IP

Multi-Region Connectivity



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Jyb3cgKGJvdHRvbSkgLS0+CiAgPGxpbmUgeDE9IjE4MCIgeTE9IjE5MCIgeDI9IjQxMCIgeTI9IjE
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b3dQdXJwbGUpIi8+CiAgPHJlY3QgeD0iMjU1IiB5PSIxNzciIHdpZHRoPSI3MCIgaGVpZ2h0PSIyM
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YiIHN0cm9rZS13aWR0aD0iMSIvPgogIDx0ZXh0IHg9IjI5MCIgeT0iMTkxIiBmaWxsPSIjOGI1Y2Y
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ExlZ2VuZCAtLT4KICA8ZyB0cmFuc2Zvcm09InRyYW5zbGF0ZSgxODAsIDI0NSkiPgogICAgPGNpcm
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SIxMzUiIGN5PSIwIiByPSI1IiBmaWxsPSIjZjU5ZTBiIi8+CiAgICA8dGV4dCB4PSIxNDciIHk9Ij
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tc2l6ZT0iMTAiPkROUyBSZXNvbHV0aW9uPC90ZXh0PgoKICAgIDxjaXJjbGUgY3g9IjI1NSIgY3k9
IjAiIHI9IjUiIGZpbGw9IiM4YjVjZjYiLz4KICAgIDx0ZXh0IHg9IjI2NyIgeT0iNCIgZmlsbD0iI
zk0YTNiOCIgZm9udC1mYW1pbHk9InN5c3RlbS11aSwgc2Fucy1zZXJpZiIgZm9udC1zaXplPSIxMC

```
I+SFRUUFMgSGVhbHRoPC90ZXh0PgogIDwvZz4KPC9zdmc+Cg==)


```dql
// All network monitor types summary
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*icmp*")
        OR matchesValue(event.type, "*dns*")
        OR matchesValue(event.type, "*tcp*")
        OR matchesValue(event.type, "*ping*")
        OR matchesValue(event.type, "*port*")
| summarize {
    total_executions = count(),
    successful = countIf(synthetic.availability == true),
    failed = countIf(synthetic.availability == false)
  }, by: {event.type}
| fieldsAdd availability_pct = round((successful * 100.0) / total_executions,
decimals: 2)
| sort total_executions desc
```

7. Analyzing Network Results

```dql
// Network monitor availability dashboard
fetch bizevents, from: now() - 7d
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*icmp*")
        OR matchesValue(event.type, "*dns*")
        OR matchesValue(event.type, "*tcp*")
        OR matchesValue(event.type, "*ping*")
        OR matchesValue(event.type, "*port*")
| fieldsAdd hour_bucket = bin(timestamp, 1h)
| summarize {
    success_count = countIf(synthetic.availability == true),
    total_count = count()
  }, by: {event.type, hour_bucket}
| fieldsAdd availability_pct = round((success_count * 100.0) / total_count,
decimals: 2)
| sort hour_bucket desc
```

```dql
// Latency trends for network monitors
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter synthetic.availability == true
```
```

```
| filter matchesValue(event.type, "*icmp*")
        OR matchesValue(event.type, "*dns*")
        OR matchesValue(event.type, "*tcp*")
        OR matchesValue(event.type, "*ping*")
        OR matchesValue(event.type, "*port*")
| makeTimeseries {
    avg_latency_ms = avg(toDouble(synthetic.response_time)),
    p95_latency_ms = percentile(toDouble(synthetic.response_time), 95)
  }, interval: 15m
```

```dql
// Failed network checks with details
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter synthetic.availability == false
| filter matchesValue(event.type, "*icmp*")
        OR matchesValue(event.type, "*dns*")
        OR matchesValue(event.type, "*tcp*")
        OR matchesValue(event.type, "*ping*")
        OR matchesValue(event.type, "*port*")
| fields timestamp,
         event.type,
         monitor = dt.entity.synthetic_test,
         location = dt.entity.synthetic_location,
         error = synthetic.error_message
| sort timestamp desc
| limit 50
```

```dql
// Network health score by monitor
fetch bizevents, from: now() - 24h
| filter event.provider == "dynatrace.synthetic"
| filter matchesValue(event.type, "*icmp*")
        OR matchesValue(event.type, "*dns*")
        OR matchesValue(event.type, "*tcp*")
        OR matchesValue(event.type, "*ping*")
        OR matchesValue(event.type, "*port*")
| summarize {
    total = count(),
    successful = countIf(synthetic.availability == true),
    avg_latency_ms = avg(toDouble(synthetic.response_time))
  }, by: {dt.entity.synthetic_test, event.type}
| fieldsAdd availability_pct = round((successful * 100.0) / total, decimals:
2)
| fieldsAdd health_status = if(availability_pct >= 99.9, "HEALTHY",
                            else: if(availability_pct >= 99.0, "DEGRADED",
```

```
                            else: "CRITICAL"))
| sort availability_pct asc
| limit 30
```

Summary

In this notebook, you learned:

✅ **Network monitoring types** - ICMP, DNS, TCP
✅ **ICMP monitors** - Ping, latency, packet loss
✅ **DNS monitors** - Resolution time, record validation
✅ **TCP monitors** - Port connectivity checks
✅ **Multi-protocol patterns** - Comprehensive infrastructure monitoring
✅ **Use cases** - Infrastructure, DNS, cross-region
✅ **Analysis queries** - Availability, latency, failures

Next Steps

Continue to **SYNTH-06: Analytics & Alerting** to learn about dashboards, SLOs, and alerting strategies.

References

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- [ICMP Monitors](https://docs.dynatrace.com/docs/platform-modules/digital-experience/synthetic-monitoring/network-availability-monitors/icmp-monitors)
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- [TCP Port Monitors](https://docs.dynatrace.com/docs/platform-modules/digital-experience/synthetic-monitoring/network-availability-monitors/tcp-monitors)