DevOps Shack

Top 100 Prometheus Interview Questions And Answers

1. **What is Prometheus?**
    - **Answer: Prometheus is an open-source monitoring and alerting toolkit designed for reliability and scalability. It collects and stores metrics as time-series data, allowing users to query, visualize, and alert on it.**

2. **What are the key features of Prometheus?**
    - **Answer:**
        - **Multi-dimensional data model with key-value labels.**
        - **Powerful query language (PromQL).**
        - **Efficient time-series database.**
        - **Service discovery and dynamic configuration.**
        - **Push and pull-based metrics collection.**
        - **Built-in alerting via Alertmanager.**

3. **How does Prometheus collect metrics?**
    - **Answer: Prometheus scrapes metrics from instrumented targets at defined intervals using HTTP endpoints. It fetches data in a pull-based mechanism.**

4. **What is the default port for Prometheus?**
    - **Answer: The default port is 9090.**

5. **How does Prometheus store data?**

- Answer: Prometheus stores data as time-series metrics in its own local on-disk database, optimized for fast retrieval.

6. What is PromQL?
   - Answer: PromQL (Prometheus Query Language) is used to query and retrieve data from Prometheus. It enables filtering, aggregation, and transformations.

7. What is the difference between counters, gauges, and histograms in Prometheus?
   - Answer:
     - Counter: A metric that only increases (e.g., number of HTTP requests).
     - Gauge: A metric that can increase or decrease (e.g., memory usage).
     - Histogram: A metric that samples observations and counts their frequency distribution.

8. What is an exporter in Prometheus?
   - Answer: Exporters expose metrics from third-party systems (e.g., MySQL, Nginx, Kubernetes) in a Prometheus-compatible format.

9. What is the function of `pushgateway` in Prometheus?
   - Answer: Pushgateway is used for short-lived jobs that cannot be scraped directly, allowing them to push metrics to Prometheus.

10. What is the role of `Alertmanager` in Prometheus?

- Answer: Alertmanager handles alerts sent by Prometheus, manages deduplication, grouping, and routing to various notification channels (e.g., Slack, Email, PagerDuty).

11. **How do you install Prometheus on Linux?**

Answer:

```
wget
https://github.com/prometheus/prometheus/releases/latest/dow
nload/prometheus-linux-amd64.tar.gz
tar xvf prometheus-linux-amd64.tar.gz
cd prometheus-linux-amd64
./prometheus --config.file=prometheus.yml
```

12. **How do you configure a Prometheus job to scrape metrics?**

Answer: Add a job in `prometheus.yml`:

```
scrape_configs:
  - job_name: 'myapp'
    static_configs:
      - targets: ['localhost:9090']
```

13. **What are relabeling rules in Prometheus?**
    - **Answer: Relabeling is used to filter, modify, or drop labels before storing metrics.**

14. **How can you monitor a Kubernetes cluster with Prometheus?**
    - **Answer: Use the Prometheus Helm chart or the Prometheus Operator.**

15. **What is federation in Prometheus?**
    - **Answer: Federation allows scraping metrics from another Prometheus server, useful for scaling.**

16. What is the difference between Push and Pull metrics collection?
    - Answer: Prometheus primarily uses pull mode, but pushgateway allows push-based metrics collection.

17. How do you set up alerting rules in Prometheus?

Answer: Define rules in `alerts.yml`:

```
groups:
  - name: example
    rules:
      - alert: HighCPUUsage
        expr: process_cpu_seconds_total > 80
        for: 2m
        labels:
          severity: critical
        annotations:
          summary: "High CPU usage detected"
```

18. How can you visualize Prometheus data?
    - Answer: Using Grafana.

19. How do you scale Prometheus?
    - Answer: Use sharding, federation, remote storage backends (Thanos, Cortex).

20. What is Thanos in Prometheus?
    - Answer: Thanos extends Prometheus by enabling high availability and long-term storage.

21. **What is Grafana?**
    - **Answer: Grafana is an open-source tool for visualizing time-series metrics using dashboards.**

22. **What are Grafana's key features?**
    - **Answer:**
      - **Supports multiple data sources (Prometheus, InfluxDB, MySQL, etc.).**
      - **Customizable dashboards.**
      - **Alerting and notifications.**
      - **User authentication and role-based access.**

23. **What is the default port for Grafana?**
    - **Answer: 3000.**

24. **How do you install Grafana on Linux?**

Answer:

```
wget
https://dl.grafana.com/oss/release/grafana-latest.linux-amd6
4.tar.gz
tar -zxvf grafana-latest.linux-amd64.tar.gz
cd grafana-<version>
./bin/grafana-server
```

25. **How do you integrate Prometheus with Grafana?**
    - **Answer:**
      - **Open Grafana UI (`http://localhost:3000`).**
      - **Go to Configuration → Data Sources.**

- Select Prometheus and enter `http://localhost:9090`.

26. How do you create a dashboard in Grafana?
    - Answer:
        - Click Create → Dashboard.
        - Add a new panel.
        - Select the Prometheus data source.
        - Write a PromQL query.
        - Customize visualizations.

27. What are Grafana panels?
    - Answer: Panels represent visual components like graphs, tables, and alerts.

28. What are Grafana templates and variables?
    - Answer: Templates allow dynamic selection of parameters.

29. How do you set up Grafana alerts?
    - Answer: Alerts are configured in a panel's settings with conditions.

30. What is a Grafana playlist?
    - Answer: A playlist is an automated rotation of dashboards.

31. How do you set up Grafana Loki for logs monitoring?
    - Answer:
        - Install Loki and Promtail for log aggregation.
        - Configure `loki.yml` to ingest logs.
        - Add Loki as a data source in Grafana.
        - Query logs using LogQL in Grafana dashboards.

32. What are the different authentication methods in Grafana?
    - Answer:
        - Basic Authentication (username/password)
        - OAuth (Google, GitHub, Azure AD, etc.)
        - LDAP Authentication
        - SAML-based authentication

33. How do you backup and restore Grafana dashboards?
    - Answer:
        - Use the Grafana API to export and import JSON definitions.
        - Save JSON files manually from the UI under Settings → JSON Model.
        - Backup `/var/lib/grafana` for data persistence.

34. What is the provisioning feature in Grafana?
    - Answer:
        - It allows users to automate dashboard creation and data source configuration using files.
        - Used for version control and infrastructure as code (IaC).

35. What is Grafana's Annotations API?
    - Answer:
        - It allows users to mark important events on dashboards.
        - Can be used to correlate logs, alerts, and incidents in real-time.

36. How do you secure Grafana with SSL?
    - Answer:
        - Obtain an SSL certificate.

Configure Grafana's `grafana.ini`:

```
[server]
```

```
protocol = https

cert_file = /path/to/cert.pem

cert_key = /path/to/key.pem
```

- Restart Grafana service.

37. What is Alertmanager's role in Prometheus-Grafana?
    - Answer:
        - It handles alerts generated by Prometheus.
        - Supports deduplication, silencing, grouping, and sending alerts to various channels (Slack, PagerDuty, Email).

38. How do you handle high cardinality in Prometheus?
    - Answer:
        - Reduce label count and label uniqueness.
        - Use recording rules to pre-aggregate metrics.
        - Offload long-term storage to Thanos, Cortex, or VictoriaMetrics.

39. How do you enable data retention in Prometheus?
    - Answer:

Set retention period in the Prometheus startup flags:

```
--storage.tsdb.retention.time=30d
```

40. What is the difference between Prometheus and Zabbix?
    - Answer:
        - Prometheus is pull-based, optimized for cloud and Kubernetes monitoring.

- Zabbix is push-based, suitable for traditional infrastructure monitoring.

41. How do you scrape multiple targets in Prometheus?

Answer: Define multiple jobs in `prometheus.yml`:

```
scrape_configs:
  - job_name: 'node_exporter'
    static_configs:
      - targets: ['server1:9100', 'server2:9100']
```

42. What are Prometheus service discovery mechanisms?
    - Answer:
      - Static Configuration
      - Kubernetes Service Discovery
      - Consul, AWS EC2, Azure SD
      - File-based service discovery

43. How do you monitor custom applications with Prometheus?
    - Answer:
      - Instrument code with client libraries (Go, Python, Java).
      - Expose a `/metrics` endpoint.
      - Configure Prometheus to scrape the endpoint.

44. What is Prometheus Operator in Kubernetes?
    - Answer:
      - Simplifies Prometheus deployment and management in Kubernetes.

- Provides CRDs like `ServiceMonitor` and `PodMonitor`.

45. What is remote write and remote read in Prometheus?
    - Answer:
      - Remote write sends time-series data to external storage.
      - Remote read fetches data from an external source.

46. How do you set up Prometheus Federation?
    - Answer:
      - Use the `federate` scrape job in `prometheus.yml`.

Example:

```
scrape_configs:
  - job_name: 'federate'
    honor_labels: true
    metrics_path: '/federate'
    params:
      'match[]': ['{job="node_exporter"}']
    static_configs:
      - targets: ['prometheus-server-1:9090']
```

47. How do you deploy a highly available Prometheus setup?
    - Answer:
      - Run multiple Prometheus instances.

- Use Thanos for HA & storage.
- Federate multiple servers.

48. What are some performance tuning techniques for Prometheus?
    - Answer:
        - Reduce scrape frequency.
        - Use recording rules.
        - Optimize PromQL queries.

49. What is a histogram in Prometheus?
    - Answer:
        - A histogram samples data over a range of values.

Example:

```
histogramVec := prometheus.NewHistogramVec(
    prometheus.HistogramOpts{
        Name:    "http_request_duration_seconds",
        Buckets: prometheus.LinearBuckets(0.1, 0.1, 5),
    },
    []string{"method"},
)
```

50. How do you configure multi-tenancy in Prometheus?
    - Answer:
        - Use Cortex or Thanos to separate tenant data.

51. How do you embed Grafana dashboards into external applications?
    - Answer:
        - Use iframes or the Grafana API.
        - Enable anonymous access for public dashboards.

52. How do you automate Grafana dashboards using Terraform?
    - Answer:

Use Terraform's Grafana provider:

```
resource "grafana_dashboard" "example" {
  config_json = file("dashboard.json")
}
```

53. How do you configure Grafana alerts to Slack?
    - Answer:
        - Set up a Slack webhook in Alertmanager.
        - Configure an alert channel in Grafana.

54. What is Grafana Tempo?
    - Answer:
        - Grafana's distributed tracing system for analyzing request flows.

55. What is Grafana Mimir?
    - Answer:
        - A scalable Prometheus-compatible metrics system.

56. How do you create a custom plugin in Grafana?
    - Answer:

- Use Grafana Toolkit to create a panel plugin.

57. What is JSON Model in Grafana?
    - Answer:
        - JSON representation of a dashboard, used for exporting/importing.

58. How do you use Grafana with MySQL?
    - Answer:
        - Add MySQL as a data source.
        - Write SQL queries for visualization.

59. How do you monitor logs in Grafana?
    - Answer:
        - Use Loki with Promtail for log aggregation.

60. How do you monitor business KPIs using Grafana?
    - Answer:
        - Connect SQL databases.
        - Use Grafana variables for dynamic filtering.

61. How do you handle long-term storage in Prometheus?
- Answer: Use remote storage solutions like Thanos, Cortex, or VictoriaMetrics.

62. How can you reduce Prometheus storage usage?
- Answer:
    - Use lower scrape intervals.
    - Enable data compression.
    - Use recording rules to store only essential metrics.

63. What are some key performance tuning parameters for Prometheus?

- Answer:
  - `--storage.tsdb.retention.time`
  - `--storage.tsdb.min-block-duration`
  - `--storage.tsdb.max-block-duration`

64. What is the role of `Prometheus TSDB` (Time Series Database)?
- Answer: Prometheus TSDB is responsible for storing, retrieving, and compressing time-series data.

65. What are WAL files in Prometheus?
- Answer: Write-Ahead Logs (WAL) temporarily store data before it gets persisted into TSDB blocks.

66. How do you increase Prometheus data retention?

Answer:

```
--storage.tsdb.retention.time=90d
```

67. How do you monitor Prometheus itself?
- Answer: Use the `/metrics` endpoint and set up an exporter for self-monitoring.

68. What are the downsides of high-cardinality metrics in Prometheus?
- Answer:
  - Increased memory usage.
  - Slower query performance.
  - Higher storage costs.

69. What is the difference between Thanos and Cortex?

- **Answer:**
  - **Thanos: Ideal for long-term storage with multiple Prometheus instances.**
  - **Cortex: Designed for multi-tenancy and highly scalable Prometheus architecture.**

70. How does Prometheus handle missing data?

- **Answer: By using rate() and absent() functions in PromQL.**

71. How do you calculate the request rate in Prometheus?

Answer:

```
rate(http_requests_total[5m])
```

72. How do you calculate CPU utilization?

Answer:

```
100 * (1 -
avg(rate(node_cpu_seconds_total{mode="idle"}[5m])))
```

73. How do you find the 95th percentile of request latency?

Answer:

```
histogram_quantile(0.95,
rate(http_request_duration_seconds_bucket[5m]))
```

74. How do you count the number of active instances in Prometheus?

Answer:

```
count(up == 1)
```

75. How do you list all metrics in Prometheus?

Answer: Use the Prometheus API:

```
curl http://localhost:9090/api/v1/label/__name__/values
```

76. How do you detect a service outage using PromQL?

Answer:

```
absent(up{job="my-service"} == 1)
```

77. How do you measure error rate percentage in Prometheus?

Answer:

```
(sum(rate(http_requests_total{status_code=~"5.."}[5m])) /
 sum(rate(http_requests_total[5m]))) * 100
```

78. How do you compare metrics over time in Prometheus?

Answer:

```
rate(node_network_receive_bytes_total[5m]) -
rate(node_network_receive_bytes_total offset 1h)
```

79. How do you detect slow API responses?

Answer:

```
rate(http_request_duration_seconds_sum[5m]) /
rate(http_request_duration_seconds_count[5m]) > 1
```

80. How do you display the top 5 CPU-consuming services?

Answer:

```
topk(5, rate(process_cpu_seconds_total[5m]))
```

81. How do you dynamically filter data in Grafana?
- Answer: Use templating variables.

82. How do you link multiple Grafana dashboards?
- Answer: Use dashboard links or annotations.

83. How do you handle role-based access in Grafana?
- Answer:
    - Assign viewer, editor, or admin roles.
    - Use LDAP authentication for enterprise setups.

84. How do you configure Grafana to auto-refresh dashboards?
- Answer: Use refresh intervals in the UI settings.

85. How do you set up an organization-wide alert system in Grafana?
- Answer:
    - Use alerting rules.
    - Integrate Alertmanager or Slack/PagerDuty notifications.

86. How do you use Grafana transformations?
- Answer: They help manipulate data (e.g., filtering, merging, grouping).

87. How do you share a Grafana dashboard?

- **Answer:**
  - **Export as JSON.**
  - **Use public sharing links.**

88. How do you set up Grafana Loki for log monitoring?

- **Answer: Install Loki, configure Promtail, and add Loki as a data source.**

89. How do you visualize business KPIs in Grafana?

- **Answer: Use MySQL or PostgreSQL data sources and write SQL queries.**

90. How do you troubleshoot Grafana dashboard slowness?

- **Answer:**
  - **Optimize PromQL queries.**
  - **Use recording rules in Prometheus.**
  - **Reduce panel refresh rates.**

91. How do you monitor Kubernetes with Prometheus & Grafana?

- **Answer: Use Prometheus Operator or Helm charts.**

92. How do you configure Prometheus and Grafana in Docker?

- **Answer: Use a `docker-compose.yml` file.**

93. How do you monitor a cloud environment (AWS, Azure) with Prometheus?

- **Answer: Use CloudWatch exporter or Azure Monitor exporter.**

94. How do you send Prometheus alerts to Microsoft Teams?

- **Answer: Configure Alertmanager webhook.**

95. How do you create a multi-tenant monitoring setup in Prometheus?

- **Answer: Use Cortex or Thanos.**

96. How do you set up HA (High Availability) in Prometheus?

- Answer: Run multiple Prometheus replicas and use Thanos.

97. How do you enable logging in Grafana?

Answer: Edit `grafana.ini`:

```
[log]
level = debug
```

98. How do you visualize Windows server metrics in Grafana?

- Answer: Use WMI Exporter with Prometheus.

99. How do you monitor databases (MySQL, PostgreSQL) with Prometheus?

- Answer: Use database-specific exporters.

100. How do you deploy a complete monitoring stack (Prometheus, Grafana, Alertmanager, Loki) using Kubernetes?

- Answer: Use Helm charts or Prometheus Operator.