You Need to Know

Everything About AWS CloudWatch

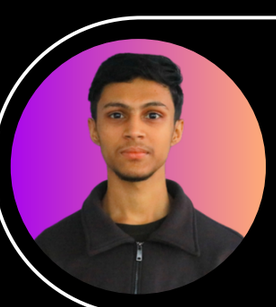
Why Monitoring is important

- **Proactive Problem Detection:** Monitoring allows you to identify potential issues with the application's performance (latency) or stability (outages) before they become severe enough for users to notice.

- **Reduced User Complaints:** By catching problems early, you can prevent them from causing outages or slowdowns that would lead to user frustration and complaints.

- **Continuous Learning:** Monitoring data provides valuable insights into application behavior. By analyzing trends and performance metrics, you can identify areas for improvement and make data-driven decisions about future deployments and optimizations.

In essence, monitoring empowers you to move beyond simply reacting to user complaints and towards a preventative approach that ensures a smooth and efficient user experience.



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AWS CloudWatch

Amazon CloudWatch is a service specifically designed to address the **monitoring needs** you outlined. Here's a breakdown of how CloudWatch fits in:

- **Unified Monitoring:** CloudWatch collects metrics, logs, and events from all your AWS resources in one place.
- **Alarms and Optimization:** Set alarms to catch issues and optimize resource usage based on monitoring data.
- **Troubleshooting:** Logs and metrics help you troubleshoot and identify root causes of problems.
- **Custom Dashboards:** Visualize key metrics and logs for quick issue identification.

In short, CloudWatch provides a comprehensive monitoring solution that empowers you to proactively manage the health, performance, and cost-efficiency of your AWS applications and resources.

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CloudWatch Metrics

- **Monitor Everything:** CloudWatch tracks a wide range of metrics for all your AWS services.
- **Track What Matters:** Metrics like CPU utilization and NetworkIn provide insight into resource performance.
- **Organized by Service:** Metrics are grouped by namespaces (e.g., EC2, S3) for easier navigation.
- **Add Context:** Dimensions (like instance ID or environment) provide additional details for specific metrics.
- **Up to 30 Details:** You can add up to 30 dimensions to each metric for a granular view.
- **Track Over Time:** Timestamps allow you to see changes in metrics and identify trends.
- **Visualize Your Data:** Create CloudWatch dashboards to see key metrics at a glance.

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CloudWatch Custom Metrics

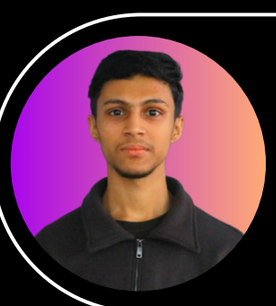
- **Track More Than AWS Metrics:** Monitor things beyond what AWS services provide (memory usage, disk space, logged in users).

- **Send Your Own Data:** Use the PutMetricData API call to send custom data to CloudWatch.

- **Add Labels for Clarity:** Organize your custom metrics with labels (dimensions) like instance ID or environment.

- **Choose How Often to Store Data:** Select standard (1 minute) or high resolution (more frequent, incurs cost) for storing your data.

- **Data Freshness Matters:** CloudWatch accepts data points from the past two weeks and up to two hours in the future. Ensure your EC2 instance time is accurate for proper data collection.



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CloudWatch Logs

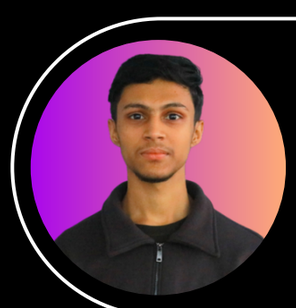
- **Log groups:** Arbitrary name, usually representing an application

- **Log stream:** Instances within application / log files / containers

- Can define log expiration policies (never expire, 1 day to 10 years)

- CloudWatch Logs can send logs to:

- Logs are encrypted by default
- Can setup KMS-based encryption with your own keys



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CloudWatch Logs Sources

- **SDK, CloudWatch Logs Agent, CloudWatch Unified Agent**
- **Elastic Beanstalk:** Collection of logs from application
- **ECS:** Collection from containers
- **AWS Lambda:** Collection from function logs
- **VPC Flow Logs:** VPC specific logs
- **API Gateway**
- **CloudTrail** based on filter
- **Route53:** Log DNS queries

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CloudWatch Logs Insights

- **Unlock Your Logs:** Analyze log data stored in CloudWatch Logs to find specific information or troubleshoot issues.

- **Search with Ease:** Use a built-in query language to pinpoint data (e.g., find a specific IP address).

- **Powerful Analysis:**
  - Count errors, filter events, calculate statistics, and sort results.
  - Discover fields automatically for AWS services and JSON logs.

- **Save and Share:** Save frequently used queries and add them to dashboards for easy monitoring.

- **Broad Reach:** Query logs across multiple log groups, even in different accounts.

- **Not Real-Time:** Designed for in-depth analysis, not for live monitoring.

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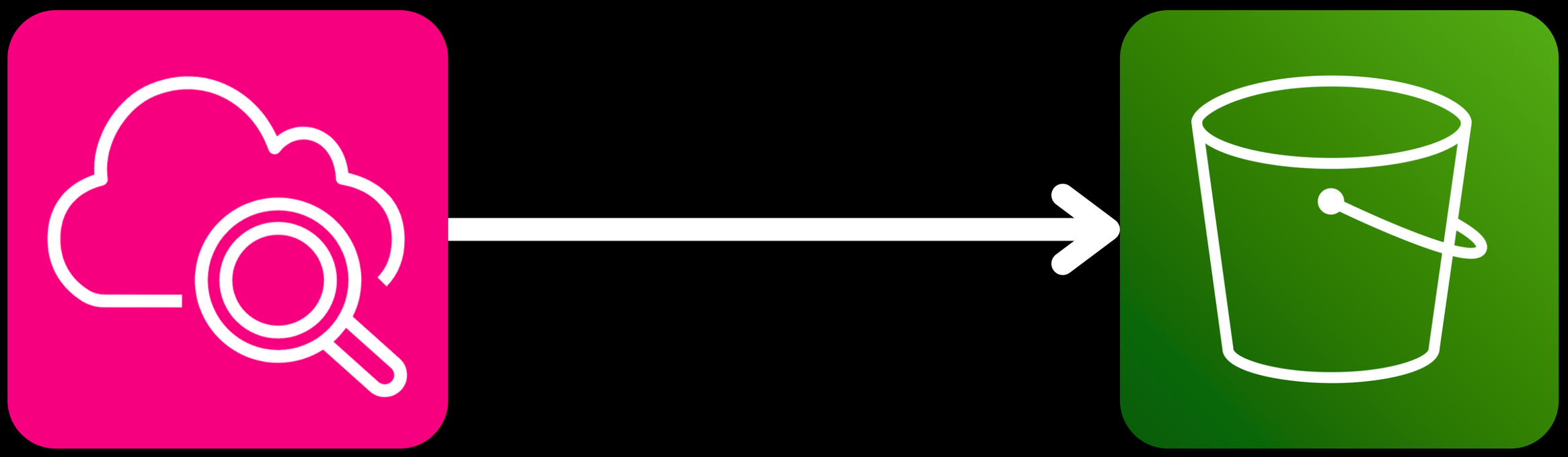
CloudWatch Logs S3 Export

- **Export Your Logs:** Move your CloudWatch logs to an S3 bucket for long-term storage and further analysis.

- **Not Instantaneous:** Exported logs may take up to 12 hours to appear in S3.

- **For Archiving, Not Monitoring:** Use CloudWatch Logs Subscriptions for near real-time log delivery if you need to monitor logs actively.



CloudWatch

AWS S3

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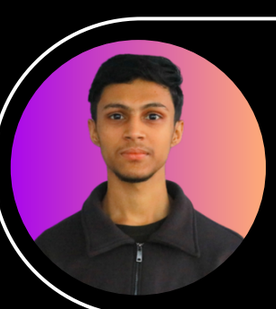
CloudWatch Logs Subscriptions

- **Real-Time Logs, Delivered:** Get instant access to your CloudWatch logs for further processing and analysis.

- **Pick Your Destination:** Send your logs to Kinesis Data Streams, Firehose, or Lambda functions for real-time processing.

- **Filter What You Send:** Use subscription filters to define which log events get delivered, focusing only on the data you need.



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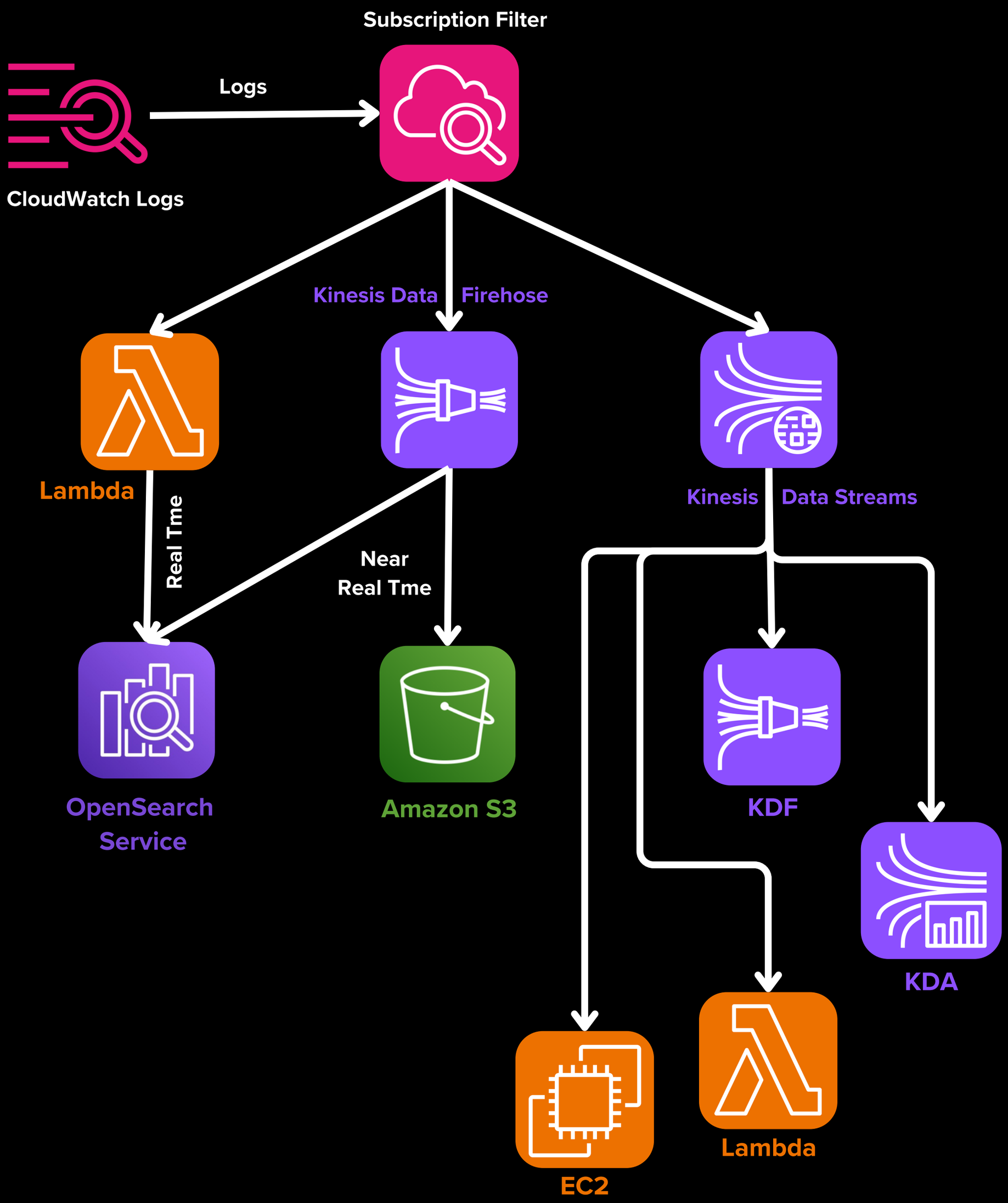
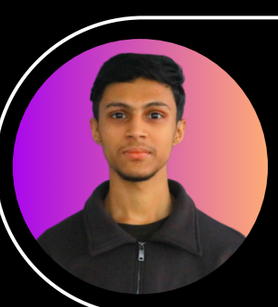
CloudWatch Logs Subscriptions





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CloudWatch Logs Aggregation

Account A
Region 1

CloudWatch Logs

Subscription Filter

Account B
Region 2

CloudWatch Logs

Subscription Filter

Account B
Region 3

CloudWatch Logs

Subscription Filter

Kinesis Data Streams

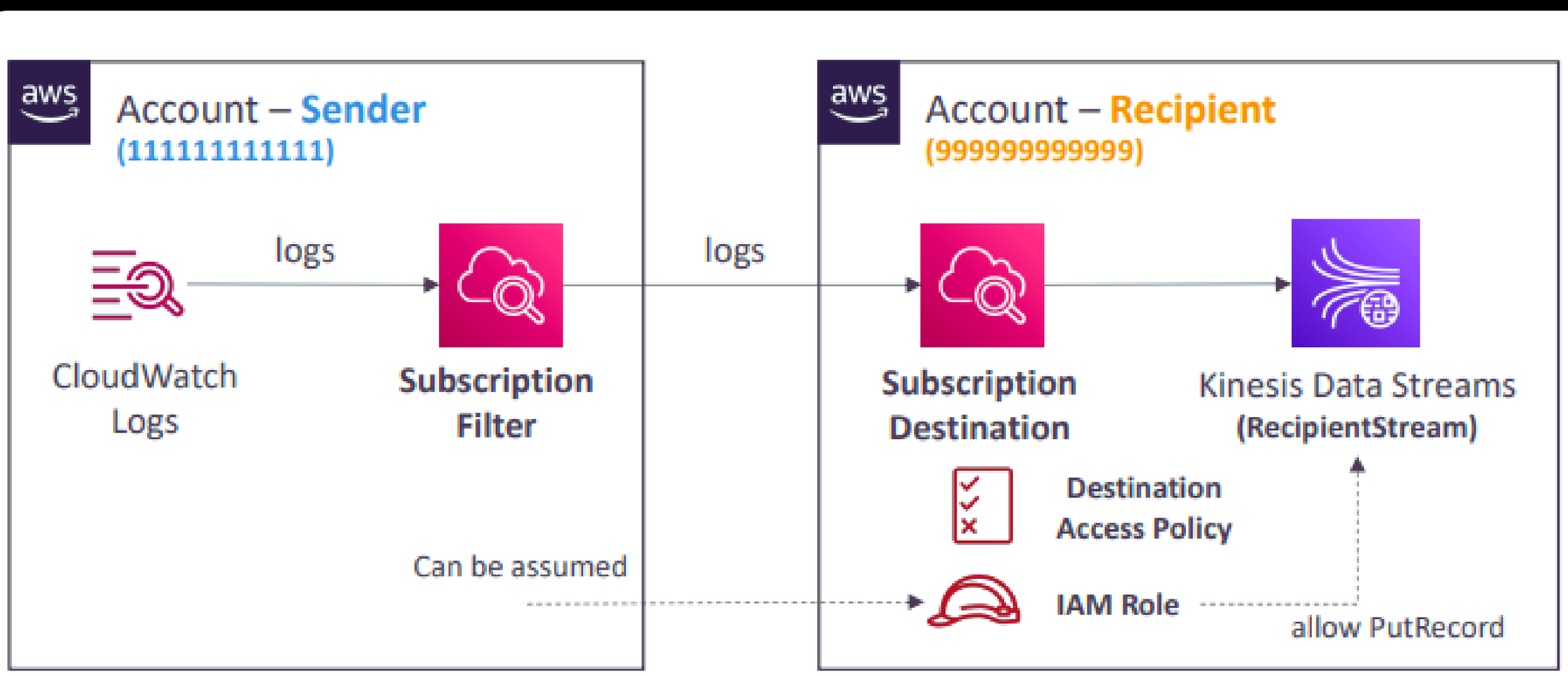
Kinesis Data Firehose

Near Real Time

Amazon S3

CloudWatch Logs Subscription

Cross-Account Subscription: Send log events to resources in a different AWS account (KDS, KDF)



IAM Role (Cross Account)

```
{
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "kinesis:PutRecord",
      "Resource": "arn:aws:kinesis:us-east-1:
999999999999:stream/RecipientStream"
    }
  ]
}
```

Destination Access Policy

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Sid": "",
      "Effect": "Allow",
      "Principal": {
        "AWS": "111111111111"
      },
      "Action": "logs:PutSubscriptionFilter",
      "Resource": "arn:aws:logs:us-east-1:999999999999:
destination:testDestination"
    }
  ]
}
```

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CloudWatch Logs & Unified Agent

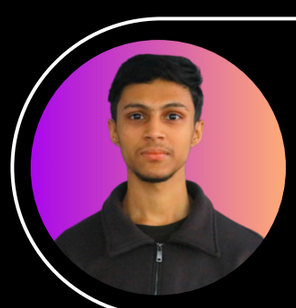
Do you need to send logs from virtual servers (EC2 or on-premise)? Here's a quick guide to CloudWatch agents:

CloudWatch Logs Agent (Legacy):

- **Simpler option:** Designed specifically for sending logs to CloudWatch Logs.
- **Limited functionality:** Focuses solely on log collection.

CloudWatch Unified Agent (Recommended):

- **Do more:** Collects logs and additional system-level metrics (RAM usage, processes).
- **Centralized configuration:** Manage configurations easily using AWS Systems Manager Parameter Store.



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CloudWatch Unified Agent Metrics

Do you need to send logs from virtual servers (EC2 or on-premise)? Here's a quick guide to CloudWatch agents:

- Collected directly on your Linux server / EC2 instance
- **CPU** (active, guest, idle, system, user, steal)
- **Disk metrics** (free, used, total), Disk IO (writes, reads, bytes, iops)
- **RAM** (free, inactive, used, total, cached)
- **Netstat** (number of TCP and UDP connections, net packets, bytes)
- **Processes** (total, dead, bloqued, idle, running, sleep)
- **Swap Space** (free, used, used %)
- **Reminder:** Out-of-the-box metrics for EC2
  - Disk
  - CPU
  - Network (High Level)

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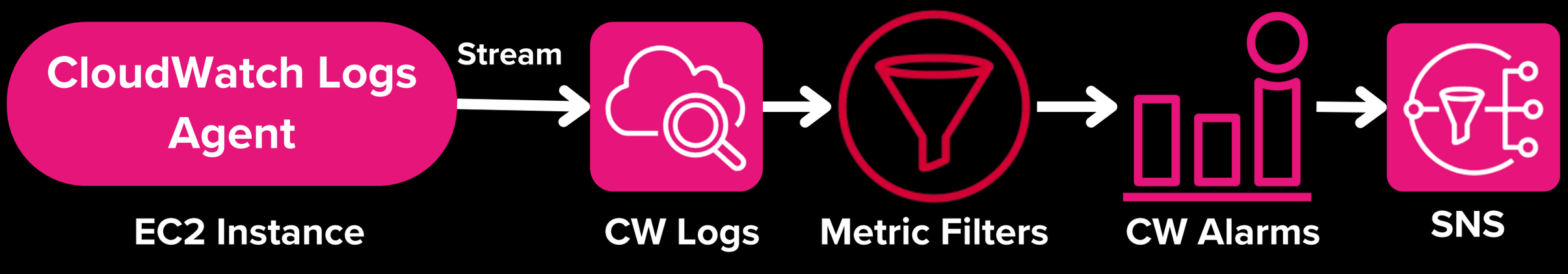
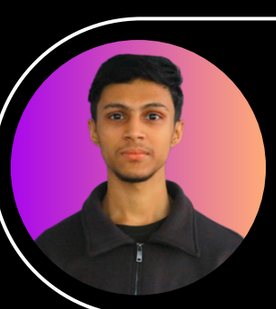
CloudWatch Logs Metric Filter

- CloudWatch Logs can **use filter expressions**
  - For example, find a **specific IP** inside of a log
  - Or count **occurrences of “ERROR”** in your logs
  - Metric filters can be used to **trigger alarms**

- **Filters do not retroactively filter data**. Filters only publish the metric data points for events that happen after the filter was created.

- Ability to specify up to **3 Dimensions** for the Metric Filter (optional)





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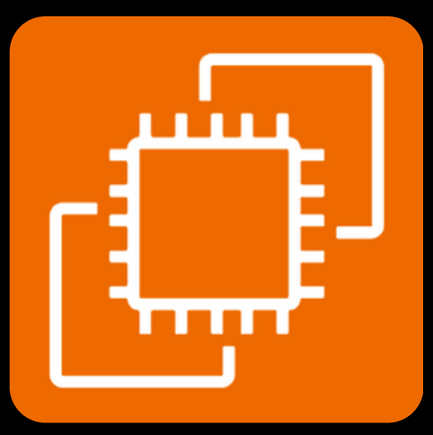
CloudWatch Alarms

- Alarms are used to trigger notifications for any metric
- Various options (sampling, %, max, min, etc...)

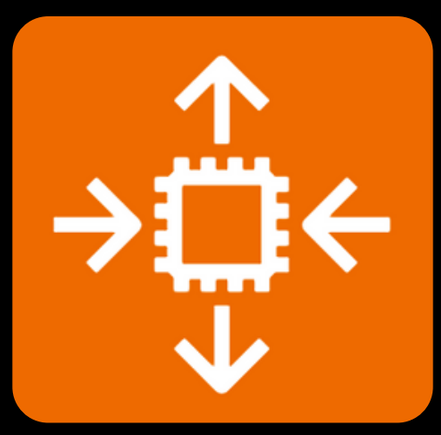
- **Alarm States:**
  - OK
  - INSUFFICIENT_DATA
  - ALARM

- **Period:**
  - Length of time in seconds to evaluate the metric
  - High resolution custom metrics: 10 sec, 30 sec or multiples of 60 sec

CloudWatch Alarm Targates:

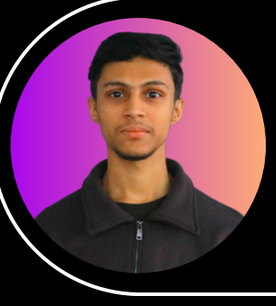


Amazon EC2



EC2 Auto-Scaling

Amazon SNS



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CloudWatch Composite Alarms

Composite CloudWatch Alarms:

- The powerhouses of alarm monitoring!

- Monitor the health of your system by combining the states (OK, ALARM, INSUFFICIENT_DATA) of multiple regular CloudWatch alarms.

- Leverage logical operators (AND, OR) to define complex alerting conditions.

Benefits of Composite Alarms:

- **Reduce Alarm Noise:** By grouping related alarms into a composite, you get notified only when a critical condition arises, preventing alert fatigue.

- **Create Multi-Factor Monitoring:** Monitor the health of your system from different angles by combining metrics from various resources.

- **Improve Troubleshooting Efficiency:** Identify the root cause of issues faster by analyzing the state of multiple alarms within a composite.

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