Azure AI Observability Architecture

Enterprise-Grade Monitoring for AI Applications
OpenTelemetry-Based Distributed Tracing & Analytics

OpenTelemetry 1.27.0   Azure Monitor 1.6.0+   Semantic Kernel

Azure Application Insights

Distributed Traces
End-to-end request tracing across AI pipelines, LLM calls, and microservices

Custom Metrics
Business KPIs, model performance, token usage, and cost tracking

Structured Logs
Correlated log events with rich context and AI-specific metadata

Live Stream
Real-time telemetry for immediate debugging and monitoring

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OpenTelemetry Integration

Auto-Instrumentation
HTTP, Logging, Database

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Azure Monitor Bridge
Native Integration

→

Semantic Conventions
Standardized Attributes

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AI Application Layer

Semantic Kernel
Microsoft's AI orchestration framework with built-in observability hooks

Azure OpenAI
GPT models, embeddings, and fine-tuning with native telemetry

AI Agents & Tools
Multi-agent workflows, MCP servers, tool calling, and RAG pipelines

Vector Search
Azure AI Search with embedding and retrieval monitoring

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Python Libraries & Dependencies

Core Telemetry Foundation

opentelemetry-api (1.27.0)
Purpose: Core OTEL API definitions and interfaces
Usage: Tracing, metrics, and logging API contracts

opentelemetry-sdk (1.27.0)
Purpose: Reference implementation of OTEL API
Usage: TracerProvider, MeterProvider, processors

opentelemetry-semantic-conventions (0.55b0)
Purpose: Standardized attribute names and values
Usage: HTTP, RPC, DB, messaging semantic conventions

Azure Integration Layer

azure-monitor-opentelemetry (1.6.0+)
Purpose: Azure Application Insights OTEL exporter
Usage: Send traces, metrics, logs to App Insights

applicationinsights (0.11.10)
Purpose: Legacy Azure App Insights SDK
Usage: Backward compatibility, custom telemetry

azure-identity (1.15.0+)
Purpose: Azure authentication and credential management
Usage: DefaultAzureCredential, service principal auth

Auto-Instrumentation

opentelemetry-instrumentation-requests (0.55b0)
Purpose: HTTP requests library instrumentation
Usage: Automatic tracing of outbound HTTP calls

opentelemetry-instrumentation-logging (0.55b0)
Purpose: Python logging module instrumentation
Usage: Automatic log record correlation with traces