

TK.AIExecute API Reference

Reference for `TK.AIExecute` — the server-side script API that calls Local AI atomically (one-shot, stateless, no transcript, no tool dispatch).

[AI Integration](#) [Local AI](#) [TK.AIExecute API Reference](#)

What it is

`TK.AIExecute` is a static method on the FrameworkX `TK` Toolkit class. A server-domain script calls it with a query string and gets back a SPEC reply envelope JSON. Every call is an independent one-shot LLM round-trip — no transcript, no caching, no tool dispatch, no hooks. The atomic counterpart to the operator-facing `ChatRequest` `Display` action.

Use it for: alarm probable-cause narration, message translation, text rephrase, classification, summarization, and any other "run this through an LLM and give me the answer" task that does not need follow-up turns.

Signatures

```
// Synchronous – returns the full reply envelope JSON.
string TK.AIExecute(string query);

// Async overload – for native async/await scripts.
Task<string> TK.AIExecuteAsync(string query);
```

Parameter	Type	Notes
query	string	Either a plain text question, or a structured query JSON with <code>system / user / context / metadata</code> fields. See Query format below.

Returns	Notes
string (JSON)	The reply envelope. Always well-formed JSON, parseable with <code>JObject.Parse</code> . See Local AI Reply Envelope Schema .

Where it can be called from

`TK.AIExecute` is a Toolkit static — callable from any script context. But the resolution and execution happen in whichever process is running the calling code, and meaningful execution requires a server-domain `ObjectServer`. Practical surface:

Context	Works?	Notes
Server.Class method	Yes	The canonical caller. Class methods invoked from Server-domain trigger contexts (alarm callbacks, dataset cycles, custom server logic) execute in <code>TServer</code> with full server-side state.
Server-trigger Script.Task	Yes	Tasks running under <code>ScriptTaskServer</code> have a server-side <code>ObjectServer</code> .
Report generator (server-side report rendering)	Yes	<code>ReportServer</code> hosts a server-side <code>ObjectServer</code> ; reports may call <code>TK.AIExecute</code> to add narrative summaries.
Alarm-event callback (server-domain)	Yes	Alarm callbacks fire under <code>TServer</code> .
Display CodeBehind (WPF or HTML5 client)	No (returns error envelope)	<code>Display CodeBehind</code> runs at the client. The ambient <code>ObjectServer</code> is the client-side instance; secret resolution short-circuits, the LLM endpoint URL may not be reachable, and the call falls back to a normal HTTP-error envelope. Use the <code>ChatRequest</code> <code>Display</code> action to talk to Local AI from a <code>Display</code> .

The platform does NOT add a runtime gate that blocks client-side callers — instead, the existing platform safety nets ensure no silent secret leak. A misrouted client-side call returns `status="error"` with an HTTP-error warning, never a successful POST with degraded credentials.

Query format

Two accepted shapes — the simple form and the structured form.

Simple form (plain text)

Pass any plain string. The platform wraps it as the user message of a single-turn LLM exchange:

```
string reply = TK.AIExecute("Translate to French: Pump 1 is offline.");
```

Structured form (JSON object)

Pass a JSON object with any combination of these top-level fields:

Field	Required?	Role
user	Required when using structured form	The user-role message — the actual question or instruction.
system	Optional	The system-role message — sets the LLM's persona, voice, output constraints.
context	Optional	Arbitrary structured data the LLM should consider when answering. Typically a JSON object holding tag values, sensor readings, or domain context. Serialized into the LLM prompt.
metadata	Optional	Reserved for caller-side annotation; the platform does not currently consume it.

```
var query = new JObject
{
    ["system"] = "You are a SCADA alarm-message translator. Preserve tag names and " +
                "numeric values verbatim. Keep replies operator-friendly.",
    ["user"]   = "Translate to French: Pump 1 is offline.",
    ["context"] = new JObject { ["targetLanguage"] = "fr" }
};

string reply = TK.AIExecute(query.ToString());
```

Reply envelope

Every call returns the same JSON shape. Field reference and status semantics: [Local AI Reply Envelope Schema](#).

Error rendering macro 'code': Invalid value specified for parameter 'com.atlassian.confluence.ext.code.render.InvalidValueException'

```
{
  "text":      "<the LLM answer text or ' ' on non-ok status>",
  "status":   "ok | error | disabled | truncated",
  "toolTrace": [],
  "latencyMs": 832,
  "warnings": []
}
```

Note: `toolTrace` is always an empty array (`[]`) for atomic calls — the atomic path has no tool surface. This differs from the `ChatRequest` action, which may dispatch tools and populate `toolTrace` with each one.

Exception model — never throws

`TK.AIExecute` never throws. Every failure path — invalid context, model offline, network error, malformed query, gate disabled, internal exception — returns a well-formed reply envelope with `status` set to `error` or `disabled` and an explanatory entry in `warnings[]`.

Failure modes:

Situation	status	warnings entry
Invalid query JSON	error	"Invalid query JSON: <parser message>"
Structured query missing user field	error	"Query missing required field 'user'."
<code>SolutionSettings.ModelEnabled = false</code>	disabled	"Local AI master kill-switch (ModelEnabled) is off."
LLM endpoint URL empty or unresolvable	error	"AI endpoint URL is empty (LocalAIDefaults misconfigured?)."

Wall-clock budget (60s) exceeded	truncated	"LLM POST wall-clock budget (60s) exceeded."
HTTP non-2xx response	error	"LLM endpoint HTTP error: <status code> <reason>"
Network failure (connection refused, DNS, etc.)	error	"LLM endpoint HTTP error: <exception message>"
Other unhandled exception	error	"<exception type>: <message>"

In all cases the envelope is well-formed and parseable. Customer scripts can rely on `JSONObject.Parse(reply)` never throwing on a Local AI reply.

Master gates

The atomic path applies only ONE master gate:

1. `SolutionSettings.ModelEnabled = true` — kill-switch must be ON. Off returns `status="disabled"` immediately, with `latencyMs = 0`.

Atomic does NOT consult `ModelOptions` — the bitmask gates the tool surface, and the atomic path has no tools. A solution with `ModelEnabled = true` and `ModelOptions = 0` (every bit off) can still call `TK.AIExecute("summarize this")` and receive a normal reply.

This asymmetry is deliberate: it lets a solution reserve the tool-equipped chat surface for selected operator panels (master tool bit OFF) while still using `TK.AIExecute` for pure-language tasks like translation and summarization.

Worked examples

Example 1 — Multi-tag root-cause hypothesis on an alarm

When a critical alarm fires, an operator typically scans several related tags to form a hypothesis about the actual cause. This `Server.Class` collects those tags automatically and asks the LLM to correlate them into a probable-cause statement.

```
public void DiagnosePumpHighTemp()
{
    var snapshot = new JObject
    {
        ["alarm"] = "Pump1.HighTempAlarm",
        ["bearingTempC"] = (double)@Tag.Pump1.BearingTemp,
        ["motorCurrentA"] = (double)@Tag.Pump1.MotorCurrent,
        ["dischargePressBar"] = (double)@Tag.Pump1.DischargePress,
        ["suctionPressBar"] = (double)@Tag.Pump1.SuctionPress,
        ["flowRate_m3h"] = (double)@Tag.Pump1.FlowRate,
        ["vibrationMmS"] = (double)@Tag.Pump1.Vibration,
        ["ambientTempC"] = (double)@Tag.WeatherStation.AmbientTemp,
        ["runHoursSinceMaint"] = (int)@Tag.Pump1.RunHoursSinceMaint
    };

    var query = new JObject
    {
        ["system"] = "You are a rotating-equipment reliability engineer. Given a snapshot " +
            "of related sensor readings around a pump high-temperature alarm, " +
            "produce ONE sentence stating the most likely root cause and ONE " +
            "sentence with the next operator action. No preamble.",
        ["user"] = "Diagnose this alarm.",
        ["context"] = snapshot
    };

    string reply = TK.AIExecute(query.ToString());
    string text = JSONObject.Parse(reply).Value<string>("text") ?? "";

    @Tag.Pump1.LastDiagnosisText = text;
    @Tag.Pump1.LastDiagnosisJson = reply;
}
```

Why AI vs. without: a non-AI script could only template a fixed sentence per alarm tag. The LLM correlates the eight numeric inputs against background domain knowledge of pump failure modes and selects the explanation that fits this specific snapshot.

Example 2 — Multi-language alarm message translation

Critical alarm message authored in English; site operators read other languages. Translate while preserving technical terms verbatim.

```

public void LocalizeCriticalAlarm()
{
    string englishText = @Tag.Alarm.LastCriticalMessage;
    string targetLang = @Tag.System.LocaleForOperator;

    if (targetLang == "en" || string.IsNullOrEmpty(englishText))
    {
        @Tag.Alarm.LastCriticalMessageLocalized = englishText;
        return;
    }

    var query = new JObject
    {
        ["system"] = "You are a SCADA alarm-message translator. Translate the user's English " +
                    "alarm into the target language. Preserve tag names, sensor IDs, units, " +
                    "and numeric values verbatim. Keep it short and operator-friendly.",
        ["user"] = englishText,
        ["context"] = new JObject { ["targetLanguage"] = targetLang }
    };

    string reply = TK.AIExecute(query.ToString());
    string status = JObject.Parse(reply).Value<string>("status") ?? "error";
    string text = JObject.Parse(reply).Value<string>("text") ?? "";

    @Tag.Alarm.LastCriticalMessageLocalized = (status == "ok") ? text : englishText;
}

```

Example 3 — Operator note rephrase

Free-text operator notes get filed verbatim, then asynchronously rephrased into a consistent house-style summary for the shift report.

```

public void RephraseOperatorNote()
{
    string raw = @Tag.OperatorNote.LastEntry;
    if (string.IsNullOrWhiteSpace(raw))
    {
        @Tag.OperatorNote.LastEntryRephrased = "";
        return;
    }

    var query = new JObject
    {
        ["system"] = "Rephrase the operator's free-text note into ONE concise sentence in " +
                    "third-person past tense. Preserve every numeric value and tag reference. " +
                    "No editorial commentary.",
        ["user"] = raw
    };

    string reply = TK.AIExecute(query.ToString());
    string text = JObject.Parse(reply).Value<string>("text") ?? raw;

    @Tag.OperatorNote.LastEntryRephrased = text;
}

```

Synchronous vs async

`TK.AIExecute` is synchronous and wraps the async overload via the platform helper `T.Library.tRPC.AsyncHelpers.RunSync`. Use the synchronous form from a `Server.Class` method that needs a result inline; use `TK.AIExecuteAsync` from native async script contexts.

Do NOT use `raw.Result` or `.GetAwaiter().GetResult()` on `TK.AIExecuteAsync` — those patterns deadlock under a `UISynchronizationContext` or surface `AggregateException` instead of unwrapping the inner exception. The synchronous overload handles both correctly via the platform helper.

What `TK.AIExecute` does NOT do

- Does not stream replies. Each call returns one complete envelope when the model finishes.
- Does not maintain a transcript. Every call is independent — the LLM sees only the supplied query.
- Does not dispatch tools. The LLM cannot read tags, browse the namespace, or query alarms during a `TK.AIExecute` call. For tool-equipped chat, use the `ChatRequest Display` action.
- Does not raise `OnBeforeChat` or `OnAfterChatReply` hooks. Hooks are scoped to the chat surface only.
- Does not retry on transient failure. A failed call returns the error envelope immediately; the calling code decides whether to retry.
- Does not throw on failure (see **Exception model**).

See also

- [Local AI](#) — the parent reference, includes a quick-start.
 - [ChatRequest Action Reference](#) — the operator-chat counterpart.
 - [Local AI Configuration](#) — endpoint, master enable, and bitmask configuration.
 - [Local AI Reply Envelope Schema](#) — full reply schema reference.
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