

Deterministic Execution

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Discussion

Deterministic Execution is execution in which the same controlled inputs, initial conditions, rules, and processing sequence produce the same defined result or an equivalent result within specified tolerances.

The controlled inputs may include source revisions, dependencies, configuration, tool versions, environment characteristics, credentials, provider capabilities, and execution parameters.

Deterministic Execution reduces unintended variation by eliminating or controlling implicit defaults, mutable references, interactive choices, timing-dependent behavior, and unrecorded environmental influences.

Within Crucible, [Version Pinning](#), a [Pull Lock](#), declarative inputs, structured logging, and non-interactive operation support Deterministic Execution.

Definition

execution in which the same controlled inputs, initial conditions, rules, and processing sequence produce the same defined result or an equivalent result within specified tolerances

Source

Generalized from software engineering, reproducible-build, workflow automation, systems engineering, and computational-process usage and specialized for the Crucible architecture and operational model.

Note

Deterministic Execution does not require every generated identifier, timestamp, network address, or provider-assigned value to remain identical. The applicable criteria determine which outputs must be identical and which may be equivalent.

Deterministic Execution supports [Reproducibility](#), but Reproducibility may also require preservation of inputs, tools, environments, and evidence over time.

Example

A Crucible Image Build uses the same pinned repositories, installation medium, package snapshot, tool versions, configuration, and execution rules to produce equivalent hardened Machine Images across repeated pipeline executions.

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