

Continuous Research Integration (CRI) — Specification (MVP)

Status: Draft (MVP)

Scope: Defines how this repository executes **Continuous Research Integration** (CRI) runs: *ingest* → *machine validation* → *human review* → *commit*.

Goal: Make research updates reproducible, auditable, and falsifiable by construction.

1. Goals & Non-Goals

Goals - Reproducibility: every run writes a timestamped, immutable folder under `runs/`.

- **Falsifiability:** claims must include predictions with tolerances or explicit falsification tests.

- **Human-in-the-loop:** two gates (Scope & Merge) with checklists and recorded approvals.

- **Minimal vendor lock:** local fallbacks work in CI; providers are pluggable later.

Non-Goals (MVP) - No external LLM providers required (local fallbacks only).

- No dataset downloads or networked replication (air-gapped default).

2. Lifecycle (Happy Path)

1. **Trigger:** GitHub Actions workflow `awo-run.yml` (manual or on push).

2. **Run:** `scripts/awo_run.py workflows/<name>.json`

3. **Machine checks:**

- `scope_validate` enforces testability.
- `assert_contains` applies content guardrails.

4. **Scope Gate:** Environment `awo-scope` renders preview summary for human approval.

5. **Merge Gate:** Environment `awo-audit` presents final run facts for approval.

6. **Publish:** Full run directory is committed to `runs/run_YYYY-MM-DDTHH-MM-SSZ/`.

3. Roles (Logical)

- **Proposer:** produces candidate outputs (e.g., simulated fan-out).
 - **Auditor-Static:** deterministic checks (`scope_validate`, `assert_contains`).
 - **Consensus:** reduces multiple outputs to a representative result.
 - **Human Gate:** scope + merge approvals recorded.
 - **Planned:** Refuter (adversarial rounds), Replicator (containerized re-run).
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4. Required Artifacts (Per Run)

Each run directory (`runs/run_<UTC_ISO>/`) includes:

Always - `index.json` — run metadata { `run_id`, `started_at`, `status`, `finished_at?` }.

- `workflow_frozen.json` — exact workflow used.
- `report.md` — human-readable step summary.
- `steps/*.json` — structured logs of each step.
- `scope/summary.json` — scope validation results.
- `scope/claims/*.json` — frozen claim inputs.

Conditional - `gate_decision.yml` — only written if `audit_gate` triggers.

- `approval.json` — only written after merge approval.
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5. File / Folder Contract

```
workflows/
  multimodel.json          # example workflow
scripts/
  awo_run.py               # CRI runner (stdlib only)
.github/workflows/
  awo-run.yml              # CI runner
runs/
  run_YYYY-MM-DDTHH-MM-SSZ/
    index.json
    workflow_frozen.json
    report.md
    steps/
    scope/
      summary.json
      claims/*.json
```

gate_decision.yml	(conditional)
approval.json	(conditional)

6. Step Operations (MVP)

6.1 scope_validate

- **Purpose:** enforce testability.
- **Output:** scope/summary.json, scope/claims/*.json.

Schema (summary.json):

```
{
  "claims_checked": 1,
  "overall_ok": true,
  "details": [
    { "id": "claim-hello-001", "ok": true, "problems": [] }
  ],
  "notes": [],
  "ts": "2025-09-12T01-31-09Z"
}
```

Claim requirements:

```
{
  "id": "string",
  "statement": "string",
  "predictions": [
    { "name": "...", "function": "...", "tolerance": {"metric": "RMSE", "max": 0.05} }
  ],
  "falsification_tests": [
    { "name": "...", "must_pass": true }
  ]
}
```

6.2 fanout_generate

- Simulates multiple models (echo, upper, reverse).
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6.3 consensus_vote

- Normalizes outputs, counts agreement, emits consensus_text.
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6.4 `assert_contains`

- Guards required content.
 - Fails the run if missing.
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6.5 `audit_gate`

- Creates `gate_decision.yml`, halts run with status `pending_review`.
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7. Gates & UX

- **Scope Gate** (`awo-scope`): Preview + approve scope summary.
 - **Merge Gate** (`awo-audit`): Preview + approve final run facts.
 - After approval, the run is auto-committed.
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8. Versioning & Invariants

- Runner always writes `workflow_frozen.json` and `index.json` at start.
 - All timestamps UTC, format `YYYY-MM-DDTHH-MM-SSZ`.
 - Adding ops = backward compatible.
 - Breaking changes → bump minor version + ADR.
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9. Security & Privacy

- No external network calls (MVP).
 - No secrets required.
 - Future adapters must handle secrets via GitHub encrypted secrets.
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10. Roadmap

- **Refuter**: adversarial rounds; halt if unaddressed failures remain.
- **Replicator**: containerized re-run + tolerance diff.

- **Provider adapters (future):** pluggable connectors to external LLM APIs.
Status: not implemented in the MVP. When added, adapters will:
 - run behind a provider interface,
 - log {provider, model, api_version, params, seed, cost_estimate} to steps/*.json,
 - respect repo-wide reproducibility settings (seeds/temps), and
 - be optional—local fallbacks remain the default.
- **Consensus with dissent ledger:** record unresolved objections.

Appendix A — Example Workflow

```
{
  "name": "Multi-model consensus demo (CRI)",
  "steps": [
    {
      "id": "scope_1",
      "op": "scope_validate",
      "args": {
        "claim": {
          "id": "claim-hello-001",
          "statement": "A demo claim asserting the summary mentions battery life and confusing",
          "predictions": [
            {
              "name": "mentions-battery",
              "function": "text-contains('battery lasts all day')",
              "tolerance": {"metric": "boolean", "max": 1}
            }
          ],
          "falsification_tests": [
            { "name": "mentions-ui-confusing", "must_pass": true }
          ]
        }
      }
    },
    {
      "id": "fanout_1",
      "op": "fanout_generate",
      "prompt": "Summarize: The battery lasts all day but the UI is confusing.",
      "models": ["echo", "upper", "reverse"],
      "params": { "seed": 123 }
    },
    {
      "id": "consensus_1",
```

```

        "op": "consensus_vote",
        "inputs_from": "fanout_1"
    },
    {
        "id": "assert_consensus_quality",
        "op": "assert_contains",
        "args": {
            "from_step": "consensus_1",
            "field": "consensus_text",
            "must_include": [
                "battery lasts all day",
                "ui is confusing"
            ]
        }
    },
    {
        "id": "gate_review",
        "op": "audit_gate",
        "args": { "checklist": "templates/audit-checklist.md" }
    },
    {
        "id": "emit_consensus",
        "op": "write_text",
        "args": { "path": "notes/consensus.txt", "from_step": "consensus_1", "field": "consensus_text" }
    }
]
}

```