

# 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.

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## 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).

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## 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/`.

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## 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_IS0>/`) 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)
```

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## 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 }
  ]
}
```

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## 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.
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## 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"
}

```

```
    }  
]  
}
```