MCP When the Network Disappears

Designing Agents for Intermittent Connectivity

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Agenda

1. **The problem**
   When the network disappears
2. **The pattern**
   Cache · Defer · Resume · Reconcile
3. **In the field**
   An offline voice assistant, live
4. **Test it**
   Cut the network, check the workflow

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About EqualyzAI

We develop and deploy African-language voice AI infrastructure for internet and non-internet channels.

Voice AI

- **Customer service** — Local languages and dialects
- **Information access** — Online or offline
- **Automated assistance** — Built on African-language data

DELIVERY CHANNELS

- **Voice calls** — Feature phones
- **Web interfaces** — Apps and websites
- **Business APIs** — Integrations
- **Offline delivery** — On-device AI

SERVICE MODELS

- **Usage-based API access**
- **Enterprise deployment**

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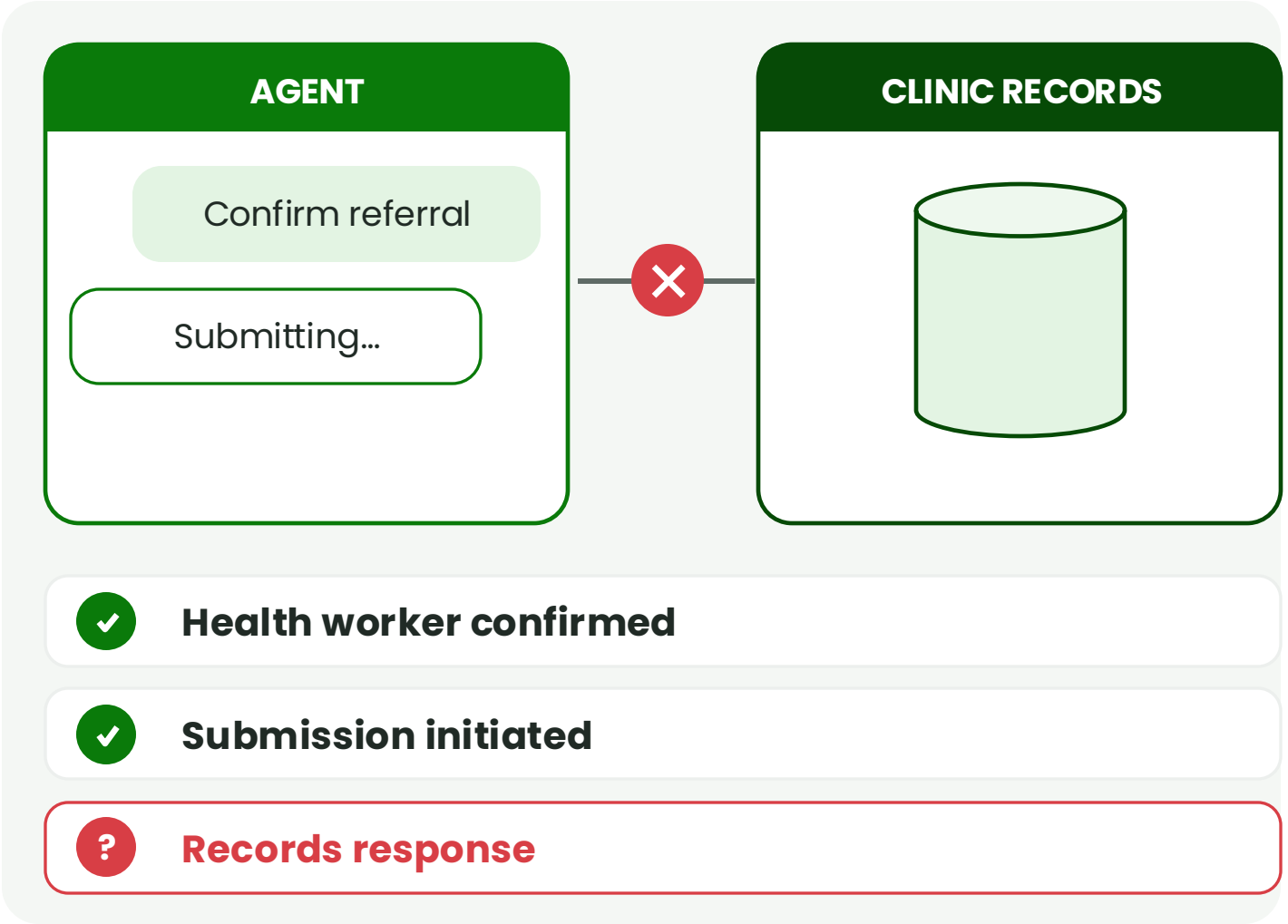
The network just disappeared.

What happens to the agent?

A referral was being submitted.
The health worker had confirmed.
The response never arrived.



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Reconnecting is not resuming.

A restored connection does not restore workflow certainty.

01



Connected?

Can we reach the server again?

02



Completed?

Did the previous operation succeed?

03



Safe?

Can we continue without duplicating effects?

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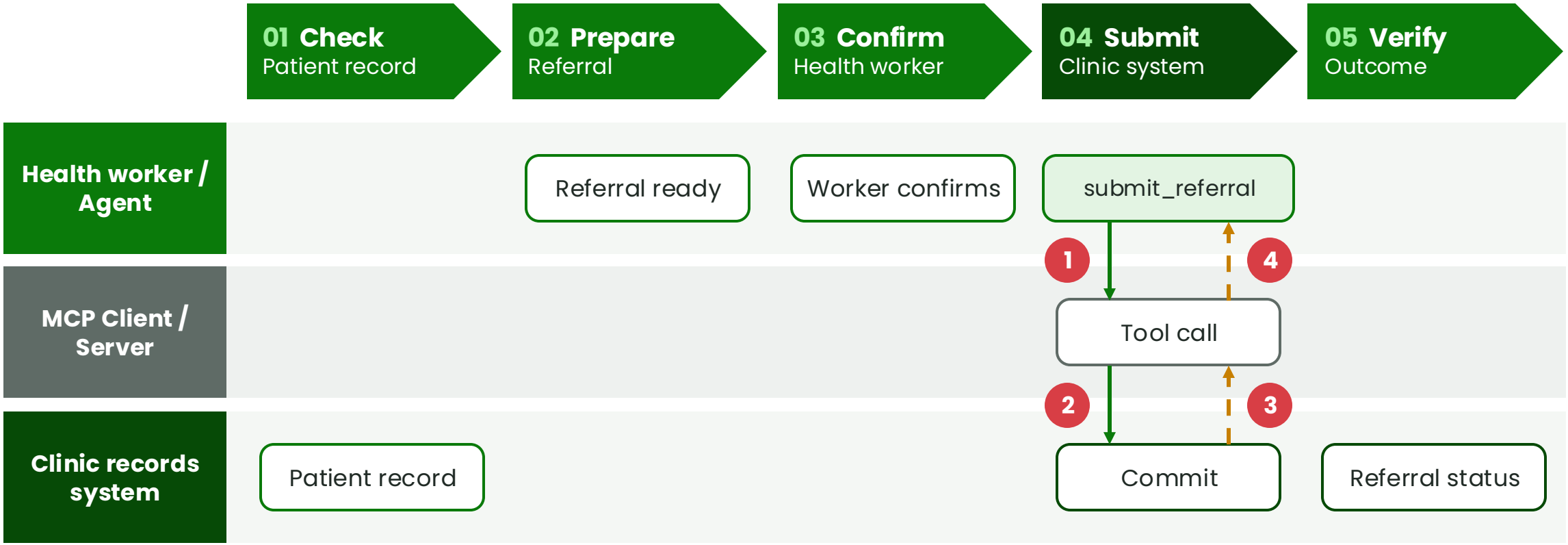
One workflow. Multiple failure boundaries.



1 Before the request is sent

2 Request in flight

3 Committed, response lost

4 Response received, not persisted

Network interruption: request sent, response unknown, workflow state uncertain.

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The recovery pattern

01



CACHE

Preserve useful data

02



DEFER

Postpone safely

03



RESUME

Continue from state

04



RECONCILE

Verify actual outcomes

Not four features. One pattern.

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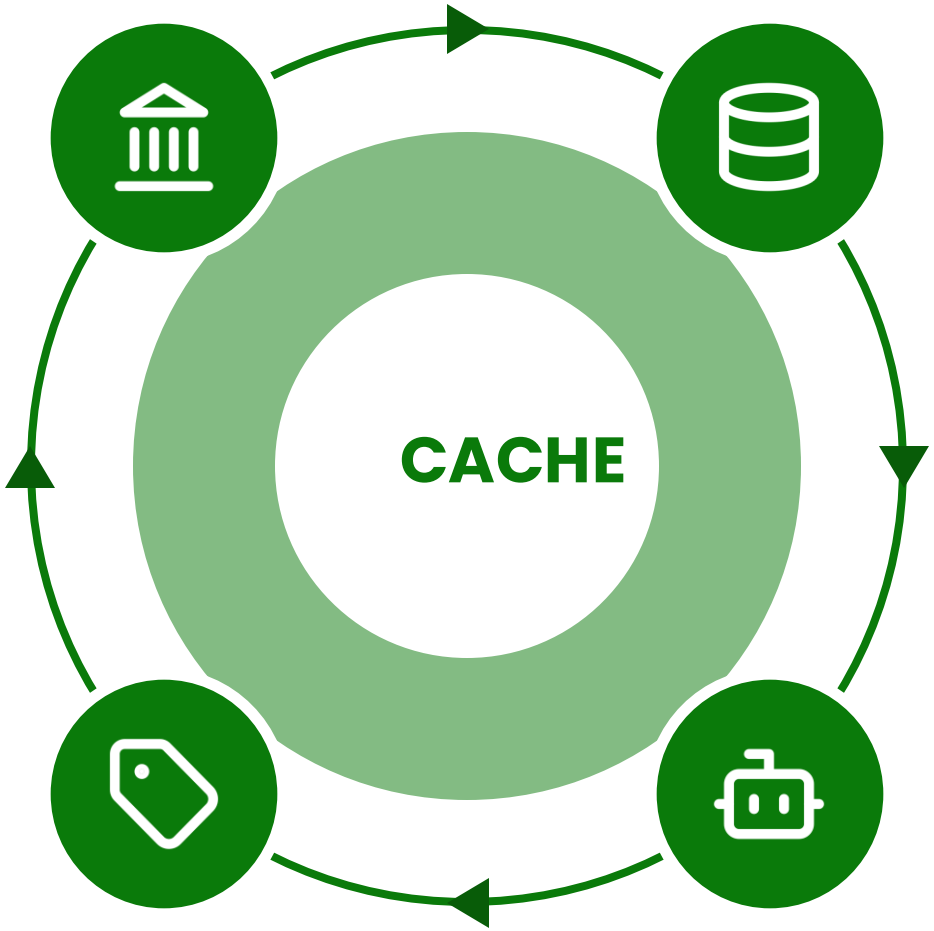
CACHE: Keep what is useful.

Authoritative source

Clinic records system

Local cache

Data + metadata



Metadata

`source · fetched_at`
`expires_at · version`

Agent

Uses cached context

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Cached doesn’t mean current.

Cache information. Never cache authority.



FRESH

Within validity window

Safe to use for the decision it was cached for.

STALE

Expired, but perhaps usable with caution

Revalidate, and tell the user if you rely on it.

INVALID

Must not be used for this decision

Fetch again from the authoritative source.

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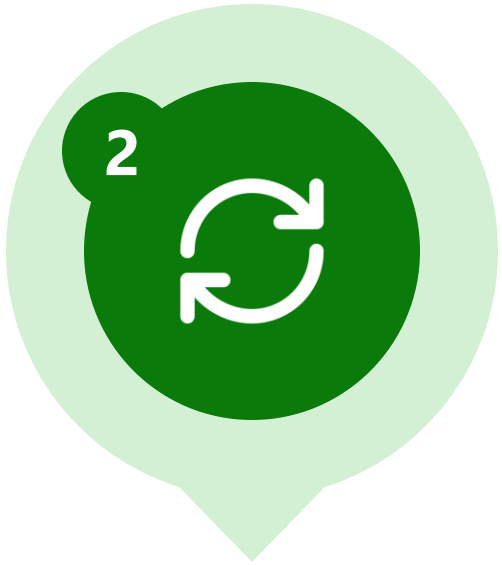
Not every tool call belongs in a queue.



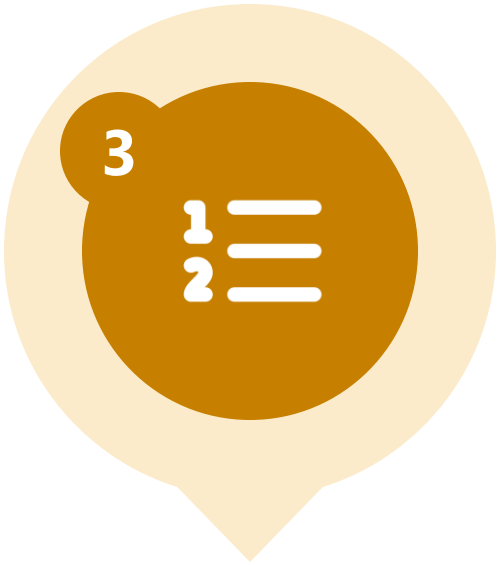
CACHE

Referral guidelines
Read again without contacting the source.



RETRY

Read referral status
Repeat a safe operation.



QUEUE

Save draft referral
Execute later under defined conditions.



NEVER OFFLINE

Patient eligibility check
Requires live authoritative validation.

Design classifications, not properties of an MCP tool.

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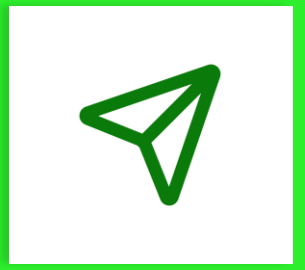
The duplicate action problem

Idempotency prevents duplicate effects.

01



Attempt 1

Submit referral. Clinic records commit it.

02



Failure

Response lost.

03



Attempt 2

Agent submits again. Potential duplicate referral.

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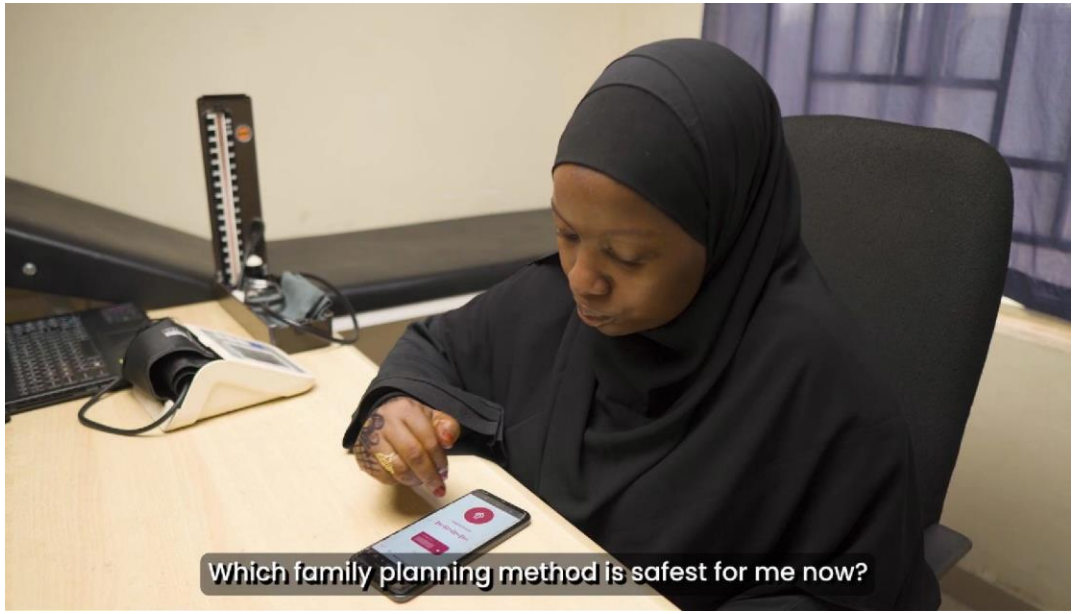
Demo: AI Suitcase. Offline by design.



Family Planning & Health Assistant

Voice-enabled | English + Hausa | 100% offline



Also runs on a single laptop with a built-in GPU, wherever the network is weak or absent.

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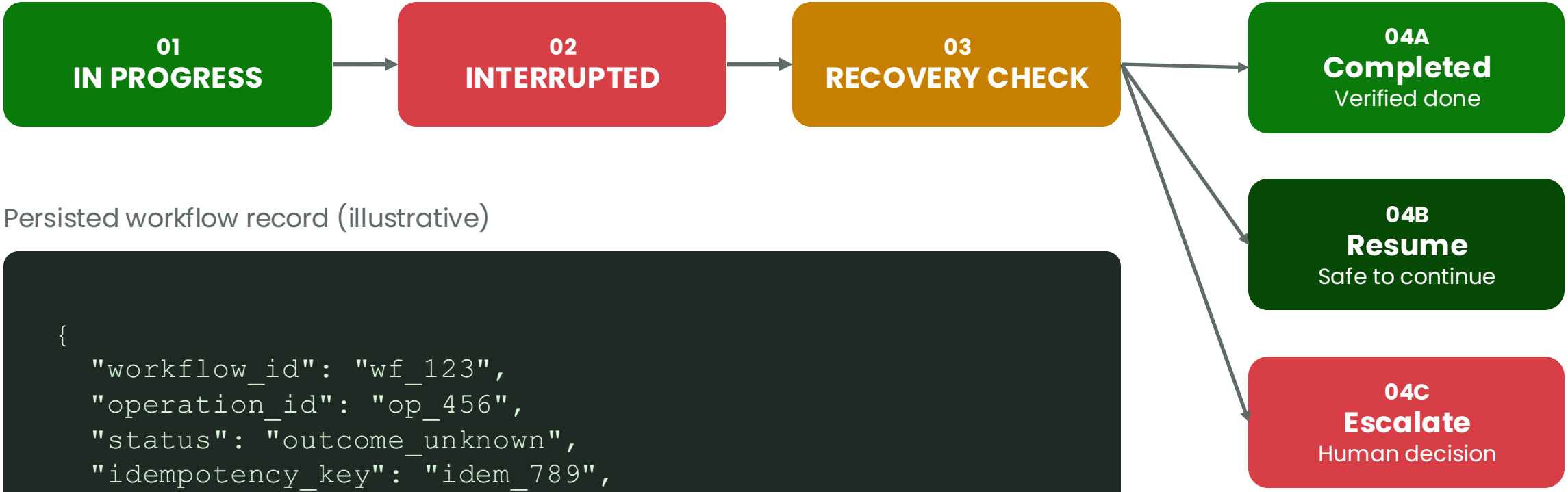
Resume from known state.



Persisted workflow record (illustrative)

```
{
  "workflow_id": "wf_123",
  "operation_id": "op_456",
  "status": "outcome_unknown",
  "idempotency_key": "idem_789",
  "last_confirmed_step": "user_approved"
}
```

`status` decides what happens after reconnecting.

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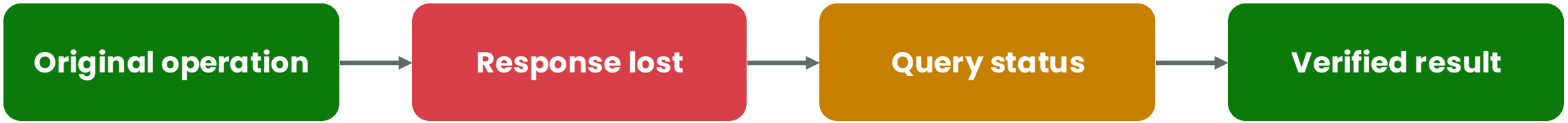
Retry is not replay.

Concept	What it means	Main concern
Retry	Attempt an operation again	Is repetition safe?
Replay	Re-execute a recorded action or event	Are effects duplicated?
Idempotency	Repeated execution has one intended effect	Is deduplication enforced?



Check before executing again.

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WebMCP: Structured tools, browser-bound lifecycle.

Chrome WebMCP · Browser-native structured tools for AI agents

WHAT IT PROVIDES

Structured browser tools

- Imperative JavaScript API
- Declarative HTML forms
- Tool schemas
- Access to live page context

WHAT IT DOESN'T GUARANTEE

Workflow continuity

- Persistent workflow state
- Backend availability
- Successful remote execution
- Recovery after interruption

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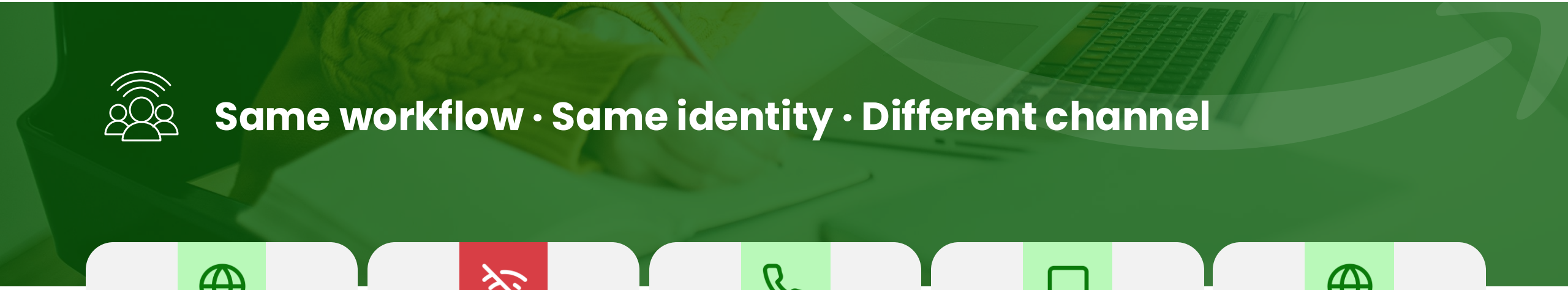
The user doesn’t have to reconnect on the same channel.



Same workflow · Same identity · Different channel

WEB

Initial referral

CONNECTION LOST

Workflow persisted independently

VOICE

Continue by call

SMS

Continue by text

WEB

Continue online

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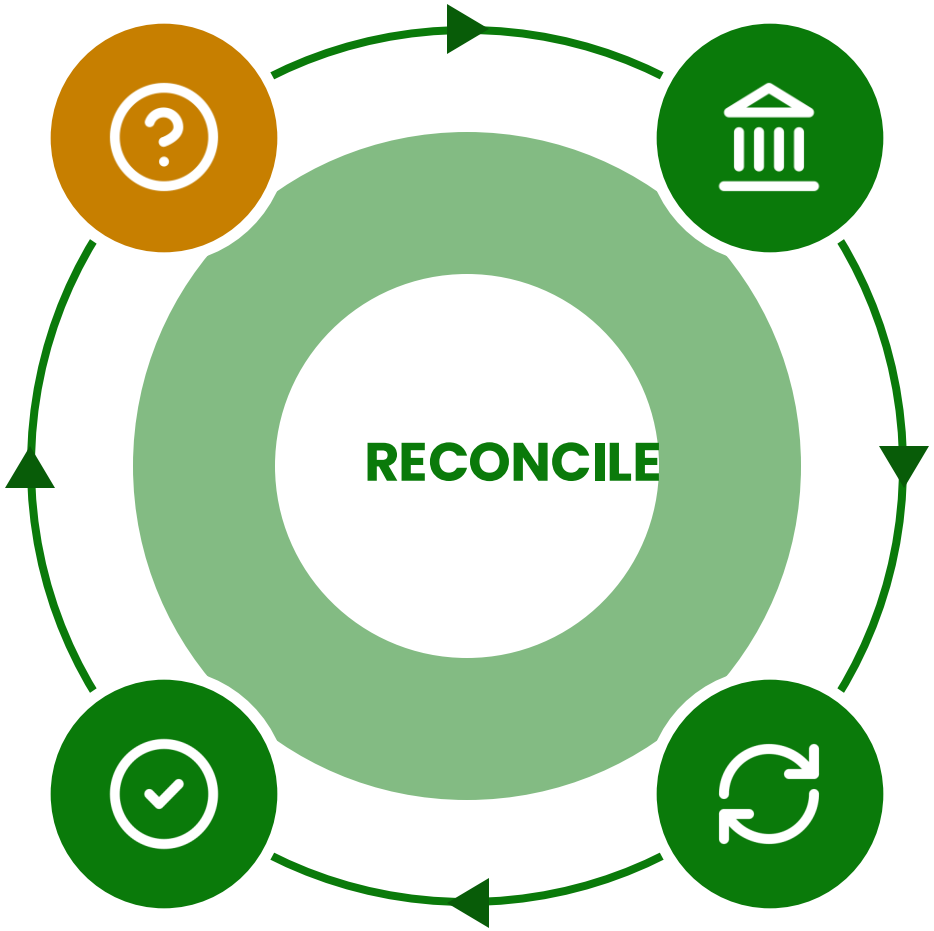
Local belief is not authoritative truth.

Agent's local state

Unknown

Submission response was lost.



Clinic records

Received

Referral exists and is awaiting acceptance.

Local state, updated

Received

Now matches the authority.

Reconcile

Update local workflow state from verified authority.

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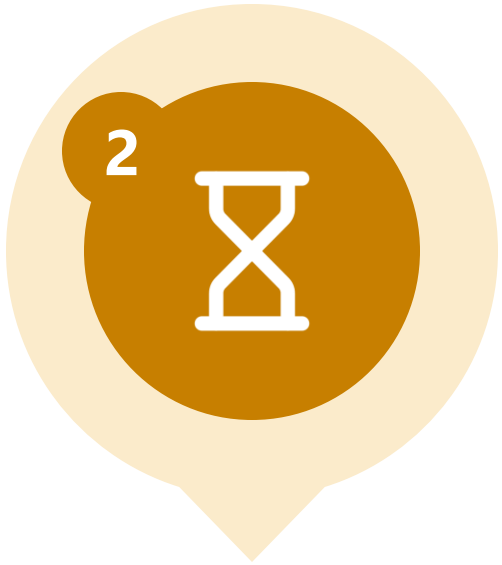
What happens when reality disagrees?



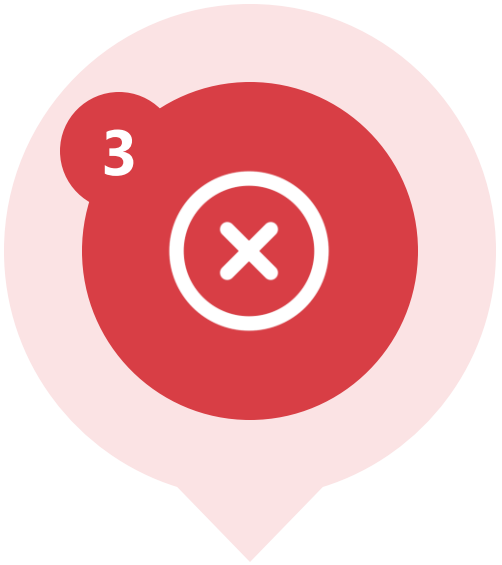
CONFIRMED

Clinic records confirm success.
Mark completed.



PENDING

Operation still processing.
Await outcome.



REJECTED

Authority rejects the operation.
Surface the reason.



ESCALATE

Outcome cannot be established safely.
Request human intervention.

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Cut the network. Test the workflow.

Before request

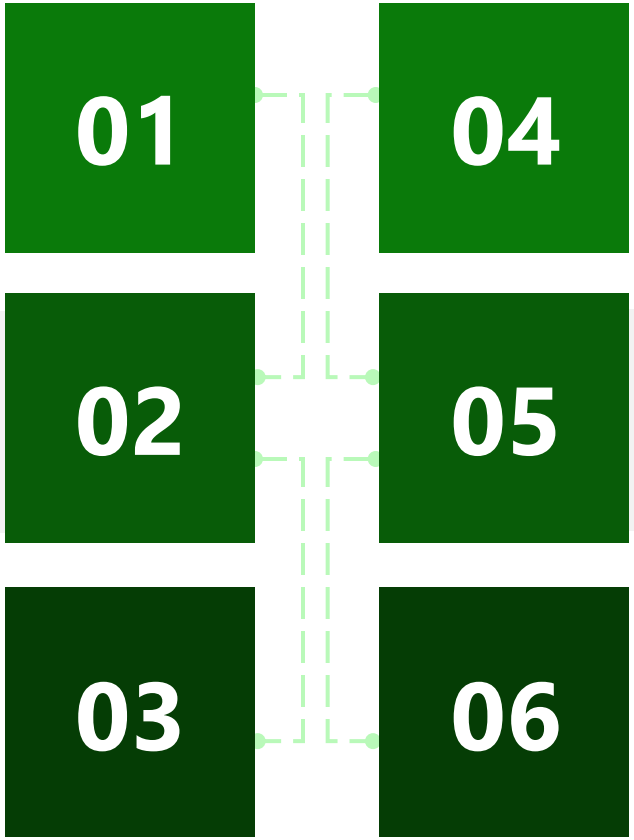
Does the agent preserve the pending operation?

During request

Can it recover an unknown outcome?

After commit

Can it prevent duplicate side effects?



Before persistence

Can it recover without losing confirmed state?

During stale data

Does it reject expired authority?

During channel handoff

Can it continue without duplicating the workflow?

Verify: no duplicate effects · no unauthorized offline actions · no lost state · no false success or failure

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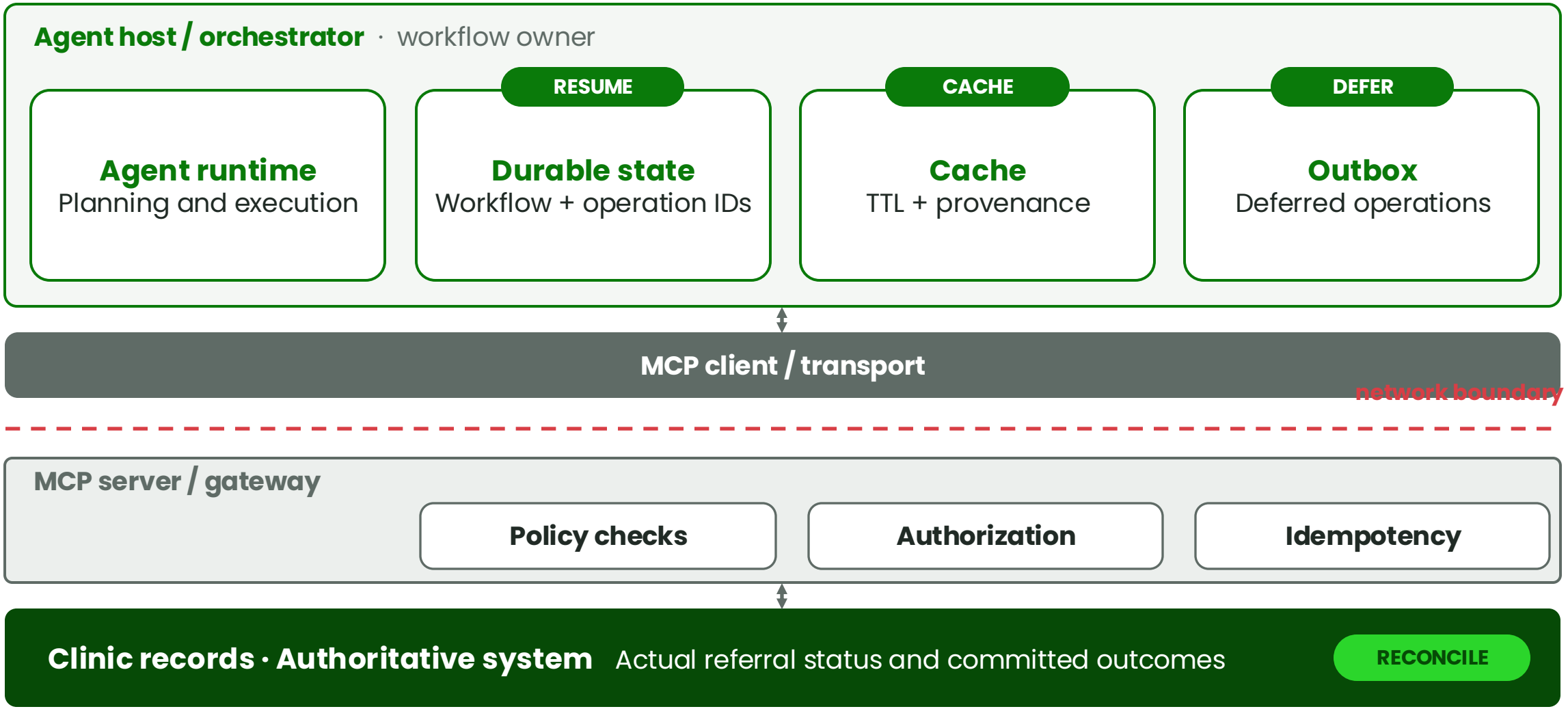
Build for interruption, not just recovery.



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Thank You

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Questions & Discussion

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