The basics

Three moves against a service that answers anything you ask it: **one read**, **a schema gate on the answer**, and **a send built from the validated value** -- with a deliberate failure and a retry in between. At the end you have a project on your machine, an instance serving a UI, a schema it holds, and a pipeline that asks, refuses an answer that has moved, and sends onward only what passed.

> **This is the first half of a two-part course**
>
> Nothing here assumes you have seen dirigent, or a pipeline orchestrator, before. Every step shows the document, the command, what the terminal printed, and what the UI shows. The second half, **the DHIS2 tutorial**, makes exactly these three moves against a real DHIS2 instance, so do this one first and you will recognise every step of it.
>
> A printable copy of this page: **basics.pdf**.

Everything below was run against Postman Echo, a public service that answers with the request you sent it: `/get` gives back the query arguments, `/post` gives back the body, and `/status/<code>` answers with that status and nothing else. That makes it a stand-in for any system you have not got yet -- you decide what the answer is, which is exactly what you want while you are learning the shape of a pipeline rather than the shape of somebody else's API.

What you need: Python 3.13, uv, `jq`, outbound HTTPS, and two terminals. Every command below is run in the project directory. Nothing needs Docker, PostgreSQL, or a credential of any kind.

Where these documents live

Dirigent ships a corpus of documents that every instance carries and `dg examples list` reads, and its tests hold every one of them to the catalog. This page's documents are not in it: one of them is wrong on purpose, and a corpus that carries a broken document is a corpus you cannot trust. So they live here, in full, and you write them into your own project as you go.

1. A project and an instance

`dg init` writes a uv project and the instance the project addresses -- both, in one directory:

```
uv tool install dirigent-cli
dg init basics --template local --password "the one you will use"
cd basics
uv sync
```

```
2026-09-22T00:54:25.030+02:00 [info    ] initialised                    [instance.initialised]
directory=/home/you/basics state=.dirigent/state schema=0001_baseline admin=admin template=local
version=0.18.0
```

It creates the state directory, migrates the schema, creates the first admin, and mints that admin one token -- shown once, and written to the project's `.env`, where the `local` profile reads it. Nothing has to be pasted anywhere. `uv sync` then builds the project's environment from the `pyproject.toml` it wrote, so every `uv run dg` below is the runtime this project pins rather than whatever is on the path.

The last lines it prints are about the other thing it wrote into that `.env`:

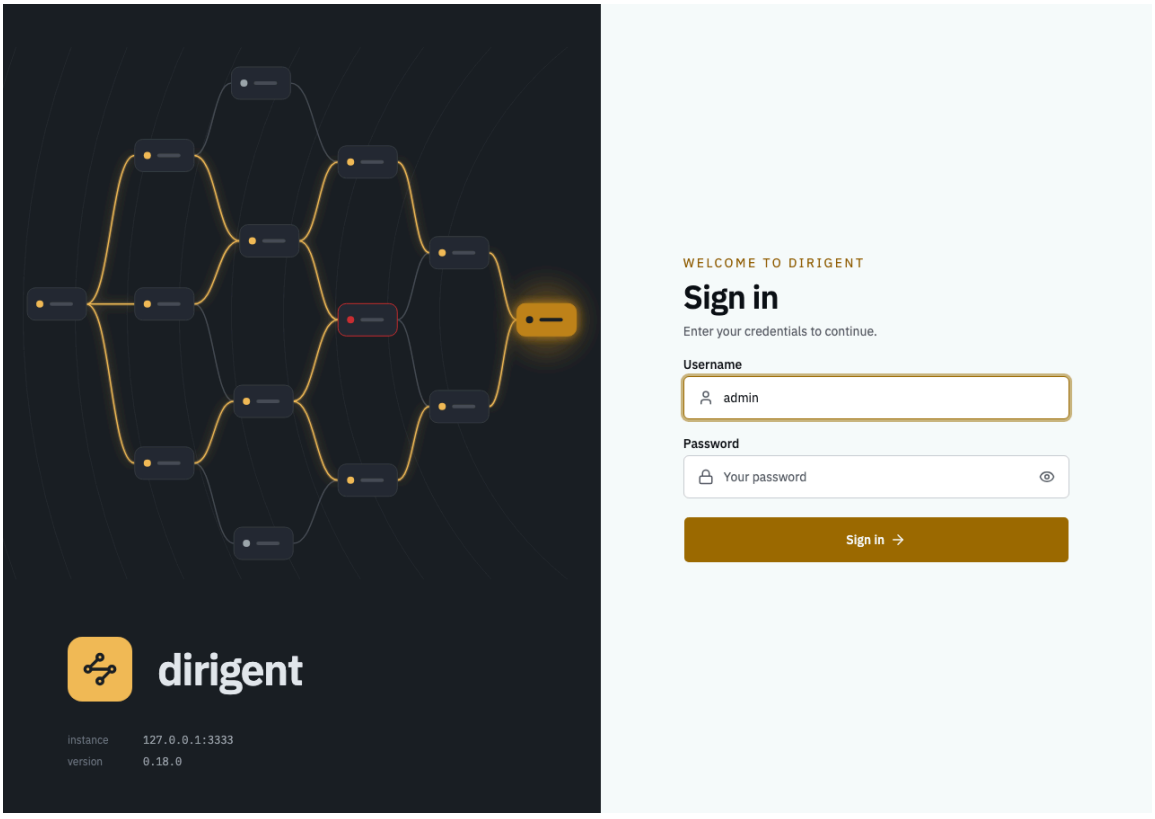
```
DIRIGENT_SECRET_KEY is in .env beside it, and every command run in
this directory reads it: it is what connection secrets are sealed with, and
under another key the instance cannot open what it stored.
```

A project's `.env` is a settings layer, so that key is in force for every command run in this directory, `dg dev` included, and there is nothing to export. Keep the file: a connection secret is sealed under the key that was set when it was stored, and an instance running under a different key cannot open it. Nothing on this page stores a credential, but the instance is ready for the moment you do.

Start the instance in a second terminal, in this directory:

```
uv run dg dev
```

`dg dev` is one process holding the API, the web UI, the scheduler, one worker and a SQLite file under `.dirigent/state/`. It keeps running; leave it. The UI is at `http://127.0.0.1:3333`, and `admin` logs in there with the password you just gave:



The instance serves its own UI. The pane on the left says which instance and which version.

2. What a document is

A **pipeline** is a document. Not a script, not a class: a YAML file that says what should happen and in what order, which an instance stores and a worker executes. Write this one at the project root as `hello.yaml`:

```yaml
# The smallest document worth writing: one step makes a value, the next one reads it.

format: dirigent/v1
kind: pipeline
code: hello
name: Hello
description: One step emits a value, and the step after it writes that value into the run's log.

steps:
  # Each key under steps: is a step's name, and the name is how everything else refers to it.
  make:
    block: value.const
    config:
      value: hello from dirigent

  say:
    block: log.write
    # This edge is what makes it a pipeline rather than two commands.
    depends_on: [make]
    config:
      message: "the step before me said: ${steps.make.output.value}"
```

Five things, and they are the whole language:

- `format` says which document language this is, and `kind` which sort of document. Every document dirigent reads opens with those two lines.
- `code` is the key the pipeline is addressed by: constrained, unique on the instance, and what every command and every URL uses. `name` is a human title with no identity at all, and `description` is long-form.
- `steps` is a map, and each key is a **step's name**. A step names a **block** -- one unit of work the instance knows how to do -- and hands it a `config`.
- `depends_on` names the steps this one waits for. Those edges are the pipeline: dirigent works out the order from them, and runs whatever is not waiting on anything in parallel.
- `${steps.make.output.value}` is a **reference**: at the moment `say` is about to run, it is replaced by what the step named `make` actually produced. `steps.<name>.output` is that step's output object, and every dot after it walks into it -- an array index is a dot too, so `...output.value.rows.0.id` is the first row's id. `${params.<name>}` is the other one, and section 3 uses it.

Run it without a server at all:

```
uv run dg run --local hello.yaml
```

```
2026-09-22T00:54:54.204+02:00 [info    ] started                       [run] pipeline=hello run_id=01a0ad18-
3220-76eb-8df9-e50dacb275d9 local=true scratch=file:///tmp/dirigent-local-8tksuueg/artifacts/runs/01a0ad18-
3220-76eb-8df9-e50dacb275d9 root=/tmp/dirigent-local-8tksuueg
2026-09-22T00:54:54.200+02:00 [info    ] queued                        [step make] block=value.const
attempt=1
2026-09-22T00:54:54.244+02:00 [info    ] finished                      [log make] duration_ms=0
output_bytes=31
2026-09-22T00:54:54.239+02:00 [info    ] succeeded                     [step make] block=value.const
attempt=1 duration_ms=9
2026-09-22T00:54:54.297+02:00 [info    ] the step before me said: hello from dirigent [log say]
2026-09-22T00:54:54.297+02:00 [info    ] succeeded                     [step say] block=log.write attempt=1
duration_ms=4
2026-09-22T00:54:54.394+02:00 [info    ] succeeded                     [run] pipeline=hello run_id=01a0ad18-
3220-76eb-8df9-e50dacb275d9 exit_code=0
steps
┌──────┬─────────────┬───────────┬───────┬──────────┬──────────────────────────┐
│ step │ block       │ outcome   │ after │ duration │ output                   │
├──────┼─────────────┼───────────┼───────┼──────────┼──────────────────────────┤
│ make │ value.const │ succeeded │ -     │ 0.0s     │ value=hello from dirigent │
│ say  │ log.write   │ succeeded │ make  │ 0.0s     │ -                        │
└──────┴─────────────┴───────────┴───────┴──────────┴──────────────────────────┘
```

There is the reference, resolved, in the middle of the stream: `the step before me said: hello from dirigent`. `--local` applies and runs the document in a throwaway instance in a temporary directory and deletes it on the way out -- same apply, same engine, same worker loop, no server. It is the fast loop, and the rest of this page leans on it.

`hello.yaml` is at the project root rather than in `pipelines/`, so the instance never sees it. `pipelines/` is where the documents an instance should hold live, and that is where the next one goes.

The terminal decides the output

Every command renders tables and colour when its stdout is a terminal, and writes NDJSON -- one record per line -- when it is a pipe, a container's log or a CI job. The tables on this page are the rendering; `--json` asks for the records at a terminal, and `dg format` renders a stream that was piped or kept. Nothing is lost either way: a table is a rendering of a record.

3. The first request

The smallest useful read: ask Postman Echo for one station's reading. Write `pipelines/echo-reading.yaml`:

```yaml
# Ask Postman Echo for one station's reading.
#
# http.request is the generic HTTP call. url: is an absolute address, which is all this needs;
# a call that repeats against one host names a connection instead.

format: dirigent/v1
kind: pipeline
code: echo-reading
name: The basics pipeline
description: Ask Postman Echo for one station's reading, and read what it answers.

tags: [basics, tutorial]

requires:
  blocks:
    - http.request

params:
  type: object
  properties:
    station:
      type: string
      default: bergen-florida
      description: The station the reading is asked for.

steps:
  ask:
    block: http.request
    config:
      url: https://postman-echo.com/get
      method: GET
      query:
        station: ${params.station}
        reading: "12.4"
```

Three things are new.

`requires` is the document saying what it needs of an instance -- here, one block id. An instance missing something a document requires refuses the document rather than failing halfway through a run.

`params` is a JSON Schema over the run's parameters, and `${params.station}` reads one. A parameter with a `default` may be left out; one without must be given. `dg run ... -p station=oslo-blindern` overrides it for one run, and a value the schema refuses stops the run before a single call is made.

`url` is an absolute address, which is all a one-off call needs. The alternative is a **connection**: a coded record the *instance* holds, carrying a base URL, its credential, its TLS setting and its timeout, which the step names with `connection:` and a `path:`. That is what you reach for the moment two steps call the same host, or the host needs a password -- a document naming a connection code carries no secret and applies unchanged to staging and to production. This page never needs one.

Check it offline first -- no server, no network:

```
uv run dg validate pipelines/echo-reading.yaml
```

```
2026-09-22T00:56:26.109+02:00 [info    ] valid                          [validation] code=echo-reading
document=pipelines/echo-reading.yaml checked="document, offline"
  each step under the last one it waits for
    ask  (http.request)
2026-09-22T00:56:26.111+02:00 [info    ] valid                          [validated] documents=1 invalid=0
```

Then store it on the instance and run it:

```
uv run dg apply
uv run dg run echo-reading --watch
```

```
create echo-reading  version 1 (/home/you/basics/pipelines/echo-reading.yaml)
```

`dg apply` sends every document under `pipelines/` and stores each as an immutable version; applying an unchanged document again is not a new version. `dg run --watch` streams the step transitions and settles with the run:

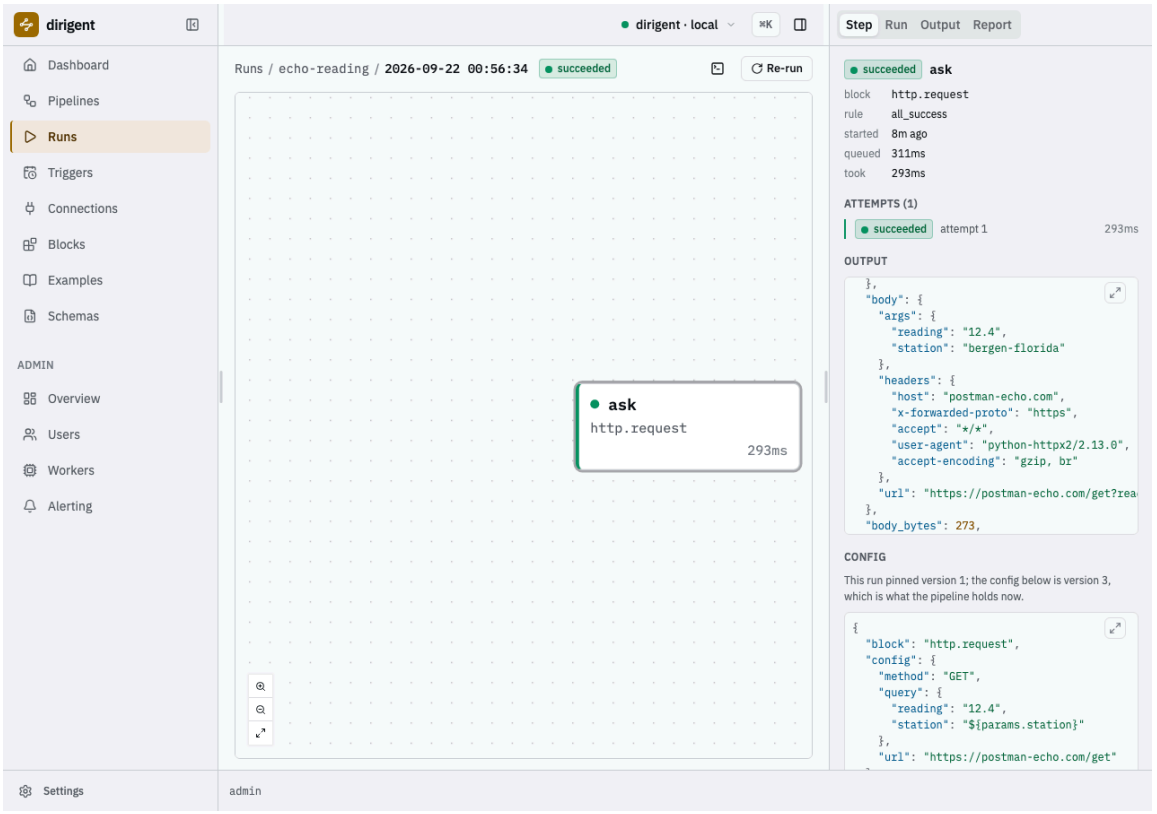
```
run 01a0ad18-60eb-7566-8497-7f16384117ed
pipeline      echo-reading (version 1)
status        succeeded
triggered by  admin (token init)
duration      0.3s
items         -

steps
┌──────┬──────────────┬──────────┬───────┬──────────┬──────────┬───────┐
│ step │ block        │ outcome  │ after │ attempts │ duration │ error │
├──────┼──────────────┼──────────┼───────┼──────────┼──────────┼───────┤
│ ask  │ http.request │ succeeded │ -     │ 1        │ 0.3s     │ -     │
└──────┴──────────────┴──────────┴───────┴──────────┴──────────┴───────┘

outputs
┌──────┬──────────────────────────────────────────────────────────────────────────────────┐
│ step │ output                                                                           │
├──────┼──────────────────────────────────────────────────────────────────────────────────┤
│ ask  │ status=200  headers={12 keys}  body={3 keys}  body_bytes=273  duration_ms=256 │
└──────┴──────────────────────────────────────────────────────────────────────────────────┘
```

That is the block's whole output, summarised: `status`, `headers`, `body`, `body_bytes`, `duration_ms`. The answer itself is in the run rather than on the screen, and because every command writes records into a pipe, the whole of it is one `jq` away:

```
uv run dg runs show 01a0ad18-60eb-7566-8497-7f16384117ed --json \
  | jq '.fields.attempts[] | select(.step_name == "ask") | .output.body'
```

```
{
  "args": {
    "reading": "12.4",
    "station": "bergen-florida"
  },
  "headers": {
    "host": "postman-echo.com",
    "x-forwarded-proto": "https",
    "accept": "*/*",
    "user-agent": "python-httpx2/2.13.0",
    "accept-encoding": "gzip, br"
  },
  "url": "https://postman-echo.com/get?reading=12.4&station=bergen-florida"
}
```


The query arguments came back under `args`, with the parameter's default in `station`. The same run is on the Runs screen of the UI, and choosing a step opens what it produced:



The run's only step, its one attempt, and the answer it stored.

4. The gate

A read is a contract with a system you do not control. Write the contract down, and a payload that has moved stops at the step it arrived in rather than turning into something strange three steps later.

A **schema** is a JSON Schema describing a payload, and `validate.schema` is the step that holds a value to one. A schema is a document section, keyed by code. Add it above `steps:`, with `validate.schema` in `requires`, and a step that names it:

```yaml
requires:
  blocks:
    - http.request
    - validate.schema

schemas:
  echo-reading:
    title: The reading, as Postman Echo answers it
    type: object
    required: [args, url]
    properties:
      args:
        type: object
        required: [station, reading]
        properties:
          station:
            type: string
            minLength: 1
          reading:
            type: string
        additionalProperties: false
      url:
        type: string

steps:
  # ... ask, unchanged ...

  check:
    block: validate.schema
    depends_on: [ask]
    config:
      input: ${steps.ask.output.body}
      schema: echo-reading
```

`type`, `required` and `properties` are the three keywords that carry most of the weight: `required` is about presence, `properties` about shape, and `additionalProperties: false` closes the door on anything you did not name. The rest of the language is JSON Schema.

Now apply it:

```
uv run dg apply
```

```
2026-09-22T00:56:55.458+02:00 [error   ] this document carries its own schemas (echo-reading), which an
instance will not store: create them with `dg schema create` and let the document name them in
requires.schemas [error] status=422 title="Unprocessable Content" code=server.document_refused params=
{"detail":"this document carries its own schemas (echo-reading), which an instance will not store: create them
with `dg schema create` and let the document name them in requires.schemas"} instance=/api/v1/pipelines/$apply
  - this document carries its own schemas (echo-reading), which an instance will not store: create them with
`dg schema create` and let the document name them in requires.schemas
```

Every refusal reads that way: the sentence, then `code`, the stable dotted name of the refusal, `params`, what the sentence was built from, and the `problems` list rendered under it.

That refusal is the rule worth learning early: **a server stores no schema a document carries**, exactly as it stores no connection a document carries. A schema is a thing the instance holds and a document names, so that two pipelines gating on the same shape are gating on the same shape.

A carried schema is still worth having, because a local run seeds what the document brought, and a local run is the fast loop:

```
uv run dg run --local pipelines/echo-reading.yaml
```

```
steps
┌──────┬─────────────────┬──────────┬───────┬──────────┬──────────────────────────────────────────────────────────────┐
│ step │ block           │ outcome  │ after │ duration │ output                                                       │
├──────┼─────────────────┼──────────┼───────┼──────────┼──────────────────────────────────────────────────────────────┤
│ ask  │ http.request    │ succeeded │ -     │ 0.2s     │ status=200  headers={12 keys}  body={3 keys}  body_bytes=273  duration_ms=234 │
│ check │ validate.schema │ succeeded │ ask   │ 0.0s     │ value={3 keys}                                               │
└──────┴─────────────────┴──────────┴───────┴──────────┴──────────────────────────────────────────────────────────────┘
```

Break it

The gate is only worth what it catches, so catch something. Tighten one line -- `reading` is a number, surely -- and run the same document again:

```
          reading:
            type: number
```

```
steps
┌──────────────┬─────────────────┬──────────┬───────┬──────────┬──────────────────────────────┐
│ step         │ block           │ outcome  │ after │ duration │ output                       │
├──────────────┼─────────────────┼──────────┼───────┼──────────┼──────────────────────────────┤
│ ask          │ http.request    │ succeeded │ -     │ 0.2s     │ status=200  headers={12 keys}  │
│              │                 │          │       │          │ body={3 keys}  body_bytes=273  │
│              │                 │          │       │          │ duration_ms=198              │
│ check  1 warn │ validate.schema │ failed   │ ask   │ 0.0s     │ -                            │
└──────────────┴─────────────────┴──────────┴───────┴──────────┴──────────────────────────────┘

check failed  validate.schema, attempt 1, rejected
  at $.args.reading: '12.4' is not of type 'number'
  last log lines:
    error: failed
```

Postman Echo answered 200. The read succeeded. The answer was simply not the answer this schema was written against, and the gate says so in one line with the path in it: `$.args.reading`, `'12.4' is not of type 'number'`.

The lesson under the lesson is worth keeping: **a query argument arrives as text**. There are no numbers in a query string, so a reading that travelled that way is a string at the far end however numeric it looks. The fix is not to give up on checking it -- it is to check what a decimal written as text looks like:

```
          reading:
            type: string
            pattern: "^-?[0-9]+(\\.[0-9]+)?$"
```

It passes again, and now it would catch `warm`.

Hand the shape to the instance

Lift the schema out of the document into `schemas/echo-reading.json`. Its own keywords carry its identity: `$id` becomes the code it is addressed by, `title` its name, `description` its body.

```
{
  "$schema": "https://json-schema.org/draft/2020-12/schema",
```

```
  "$id": "echo-reading",
  "title": "The reading, as Postman Echo answers it",
  "description": "A /get answer carrying one station and one decimal reading among its query arguments.",
  "type": "object",
  "required": ["args", "url"],
  "properties": {
    "args": {
      "type": "object",
      "required": ["station", "reading"],
      "properties": {
        "station": { "type": "string", "minLength": 1 },
        "reading": { "type": "string", "pattern": "^-?[0-9]+(\\.[0-9]+)?$" }
      },
      "additionalProperties": false
    },
    "url": { "type": "string" }
  }
}
```

```
uv run dg schema create schemas/echo-reading.json
```

```
stored schema echo-reading
```

Then delete the document's whole `schemas:` section and declare the code instead:

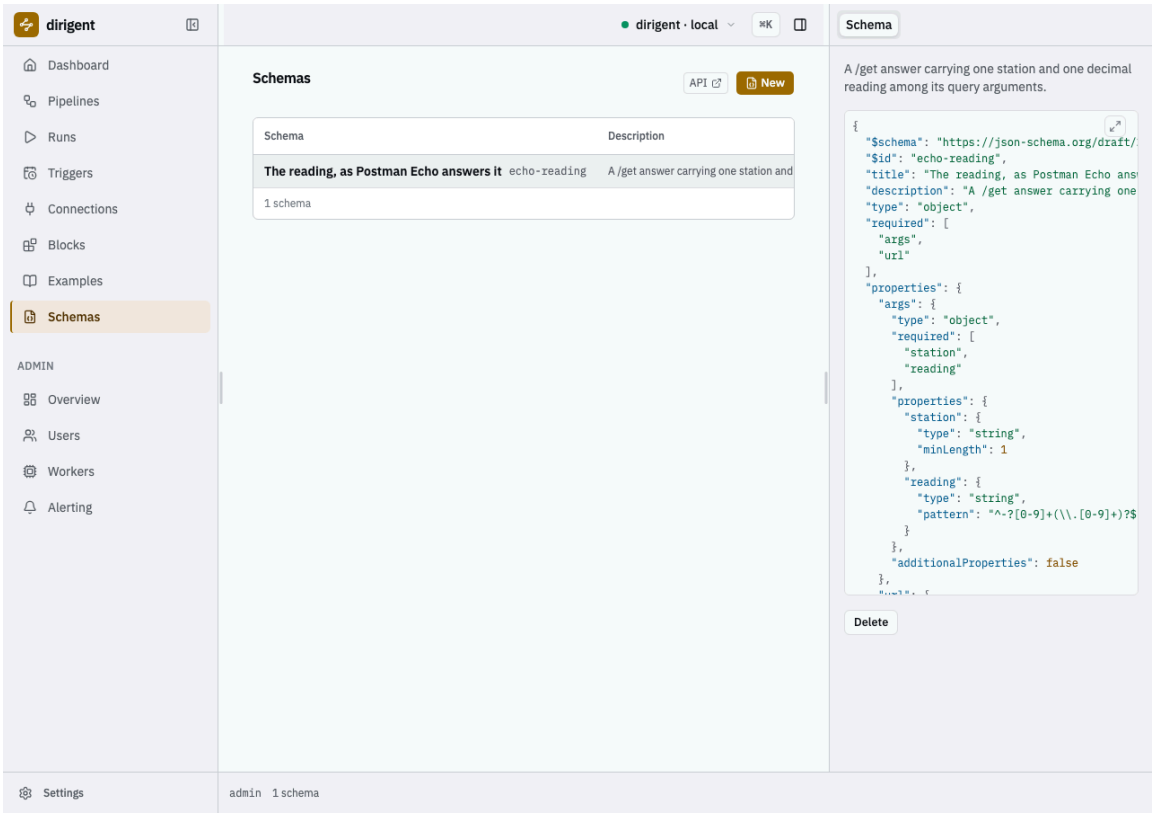
```
requires:
  blocks:
    - http.request
    - validate.schema
  schemas:
    - echo-reading
```

The `check` step does not change: it named the schema by code all along, and the code now resolves to the one the instance holds.

```
uv run dg apply
uv run dg run echo-reading --watch
```

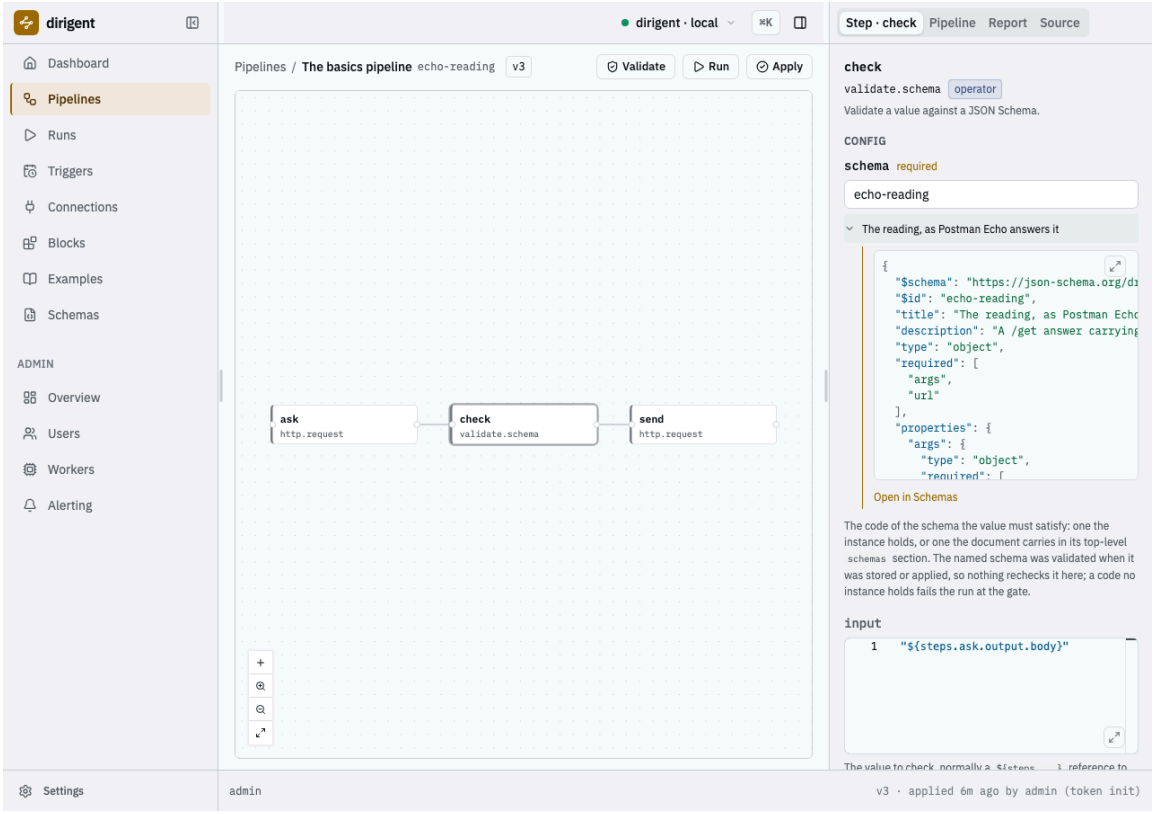
```
update echo-reading  version 2 (/home/you/basics/pipelines/echo-reading.yaml)
  steps added: check
```

```
steps
┌───────┬─────────────────┬───────────┬───────┬──────────┬──────────┬───────┐
│ step  │ block           │ outcome   │ after │ attempts │ duration │ error │
├───────┼─────────────────┼───────────┼───────┼──────────┼──────────┼───────┤
│ ask   │ http.request    │ succeeded │ -     │ 1        │ 0.3s     │ -     │
│ check │ validate.schema │ succeeded │ ask   │ 1        │ 0.0s     │ -     │
└───────┴─────────────────┴───────────┴───────┴──────────┴──────────┴───────┘
```



The shape the instance now holds. Any pipeline on this instance may gate on it by code.

The step's `schema` box shows the same shape: the code it names opens to the body the instance holds.



The code in the box, the shape behind it, and a link to the row it came from.

5. The send

Now send something on -- built from the value the gate passed.

`validate.schema` hands its input on unchanged as `value`, which makes the gate a **waypoint**: every step past it provably received the shape. So the send does not read the request's answer again, it reads the gate's output:

```
  send:
    block: http.request
    depends_on: [check]
    config:
      url: https://postman-echo.com/post
      method: POST
      # Read out of the gate rather than out of the read: every step past a gate provably
      # received the shape the gate passed.
      body:
        station: ${steps.check.output.value.args.station}
        reading: ${steps.check.output.value.args.reading}
```

```
uv run dg apply
uv run dg run echo-reading --watch
```

```
update echo-reading  version 3 (/home/you/basics/pipelines/echo-reading.yaml)
  steps added: send
```

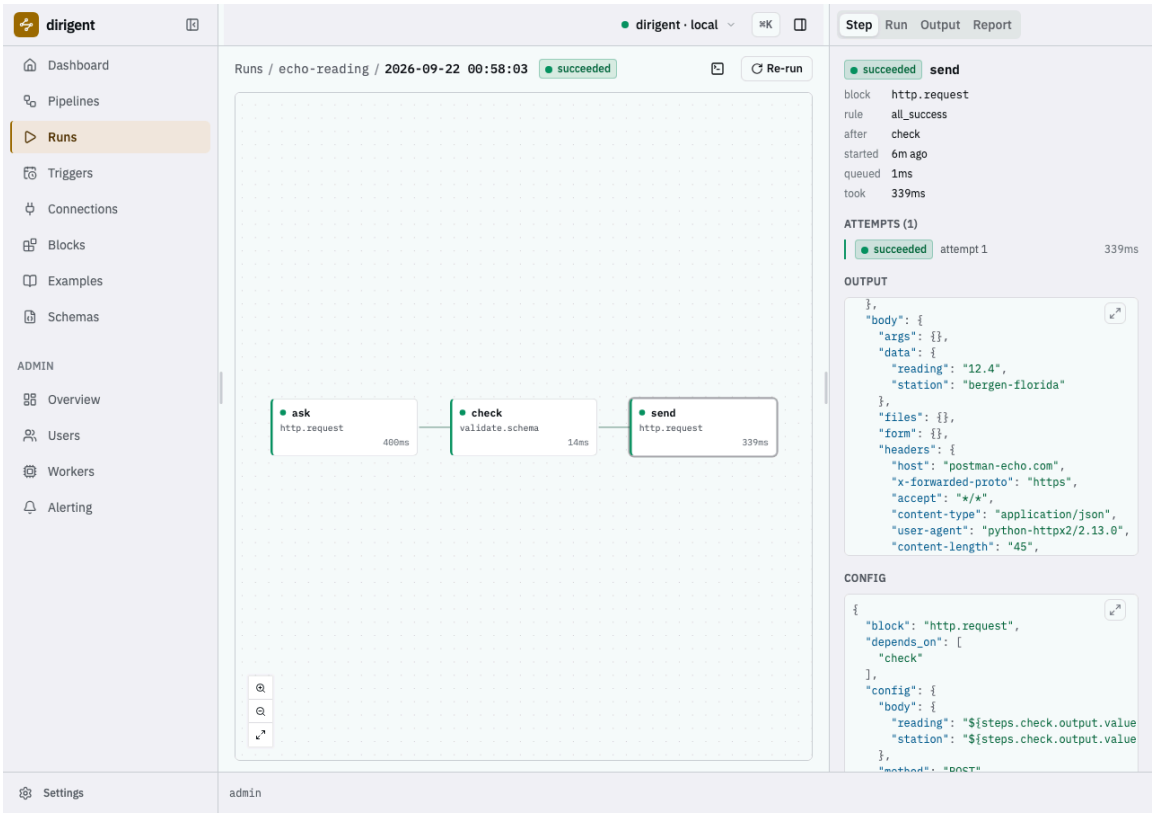
```
steps
┌───────┬─────────────────┬──────────┬─────────┬──────────┬──────────┬─────────┐
│ step  │ block           │ outcome  │ after   │ attempts │ duration │ error   │
├───────┼─────────────────┼──────────┼─────────┼──────────┼──────────┼─────────┤
│ ask   │ http.request    │ succeeded │ -      │ 1        │ 0.2s     │ -       │
│ check │ validate.schema │ succeeded │ ask    │ 1        │ 0.0s     │ -       │
│ send  │ http.request    │ succeeded │ check  │ 1        │ 0.2s     │ -       │
└───────┴─────────────────┴──────────┴─────────┴──────────┴──────────┴─────────┘

outputs
┌───────┬──────────────────────────────────────────────────────────────────────────┐
│ step  │ output                                                                   │
├───────┼──────────────────────────────────────────────────────────────────────────┤
│ ask   │ status=200  headers={12 keys}  body={3 keys}  body_bytes=273  duration_ms=232 │
│ check │ value={3 keys}                                                           │
│ send  │ status=200  headers={12 keys}  body={7 keys}  body_bytes=378  duration_ms=184 │
└───────┴──────────────────────────────────────────────────────────────────────────┘
```

Postman Echo answers a POST with the body it was given, so its answer is the proof of what was sent:

```
uv run dg runs show 01a0ad19-fb7b-7449-94b4-c4fa802d7715 --json \
  | jq '.fields.attempts[] | select(.step_name == "send") | .output.body.json'
```

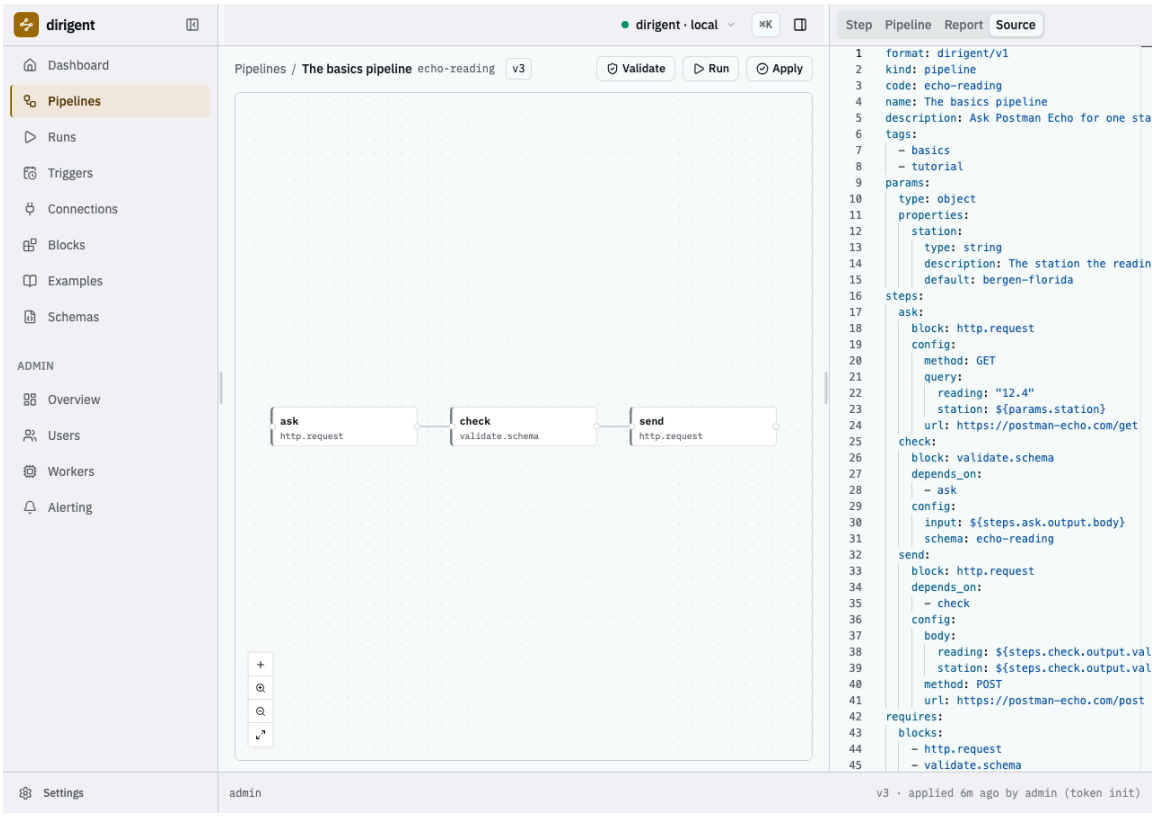
```
{
  "reading": "12.4",
  "station": "bergen-florida"
}
```

The station and the reading made it from the first step's answer, through the gate, into the second step's request -- and neither value was written twice in the document.



The gate's output, referenced by the step after it, and the answer that came back.

The pipeline is three steps now, and the builder draws what the document said:



`ask` to `check` to `send`. The edges are the `depends_on` lines, and the Source tab is the document the instance holds.

6. When it goes wrong

Three failures, and the difference between them is the whole of what a retry policy is for.

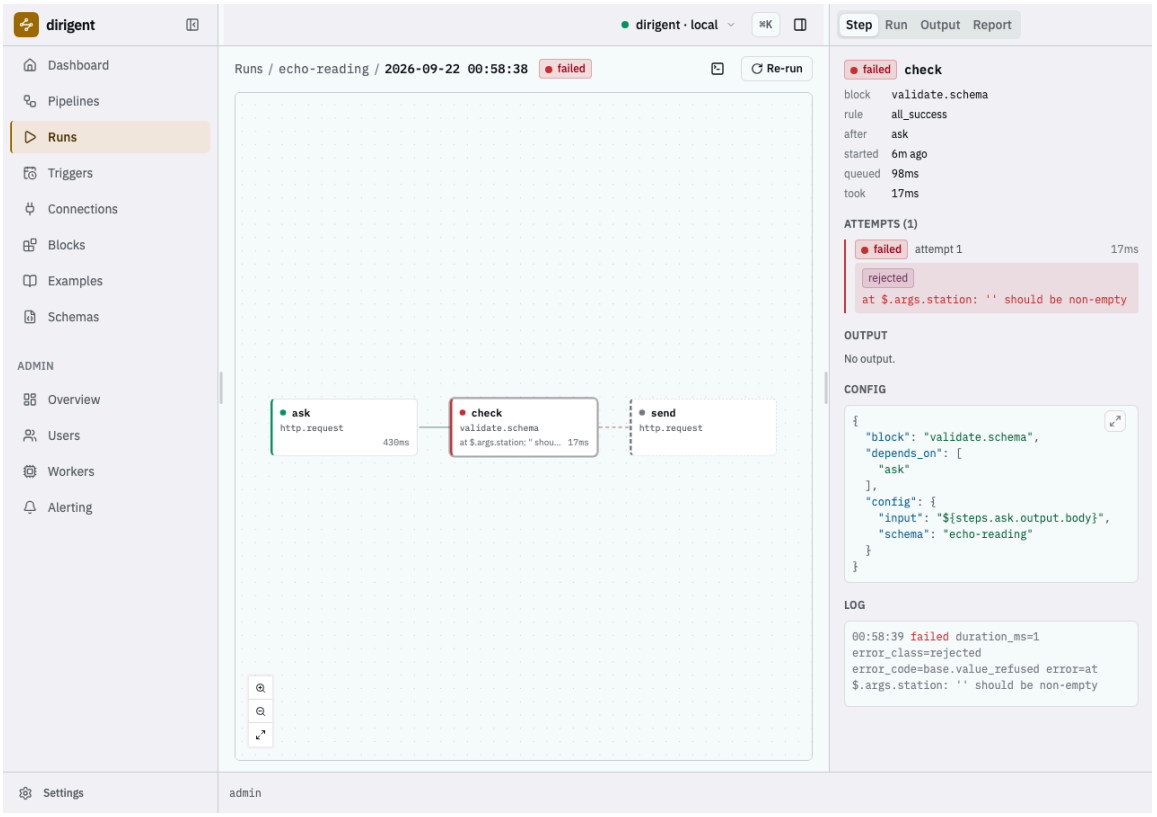
A gate refuses what it was given

The schema is right; give it something that is not the shape. `-p` sets a parameter for one run, and an empty station is a string the schema will not have:

```
uv run dg run echo-reading --watch -p station=
```

```
steps
┏━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━┳━━━━━━━━━━┳━━━━━━━┳━━━━━━━━━━┳━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━━━┓
┃ step        ┃ block         ┃ outcome  ┃ after ┃ attempts ┃ duration ┃ error              ┃
┡━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━╇━━━━━━━━━━╇━━━━━━━╇━━━━━━━━━━╇━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━━━┩
│ ask         │ http.request  │ succeeded │ -     │ 1        │ 0.2s     │ -                  │
│ check  1 warn │ validate.schema │ failed   │ ask   │ 1        │ 0.0s     │ at $.args.station: │
│             │               │          │       │          │          │ '' should be       │
│             │               │          │       │          │          │ non-empty          │
│ send        │ http.request  │ skipped  │ check │ 1        │ -        │ -                  │
└─────────────┴───────────────┴──────────┴───────┴──────────┴──────────┴────────────────────┘

check failed  validate.schema, attempt 1, rejected
  at $.args.station: '' should be non-empty
  last log lines:
    error: failed
```

`send` is **skipped**, not failed: it never ran, because the step it waits for did not succeed. That is the point of a gate -- nothing downstream of it ever sees a value it refused.



A rejected gate, its one attempt, the message with the path in it, and the step that never ran.

A refusal is not retried, an outage is

Note the class on that failure: **rejected**. It decides whether a retry is even attempted, and the clearest way to see it is two steps that fail differently under the same budget. Write `pipelines/echo-failures.yaml`:

```
# Two failures with the same retry budget, to show what the budget is actually for.
#
# Neither step depends on the other, so both run in the same run and the run's table puts
# them side by side.

format: dirigent/v1
kind: pipeline
code: echo-failures
name: Two ways to fail
description: One step is refused and one is unlucky, and only one of them is retried.

tags: [basics, tutorial]

requires:
  blocks:
    - http.request

steps:
  refused:
    block: http.request
    retry:
      max_attempts: 3
      backoff: 2s
```

```
    config:
      # 404 is the service saying the thing is not there. Asking again cannot change that.
      url: https://postman-echo.com/status/404
      method: GET

  unlucky:
    block: http.request
    retry:
      max_attempts: 3
      backoff: 2s
    config:
      # 503 is the service saying it is unwell right now, which is a different sentence.
      url: https://postman-echo.com/status/503
      method: GET
```

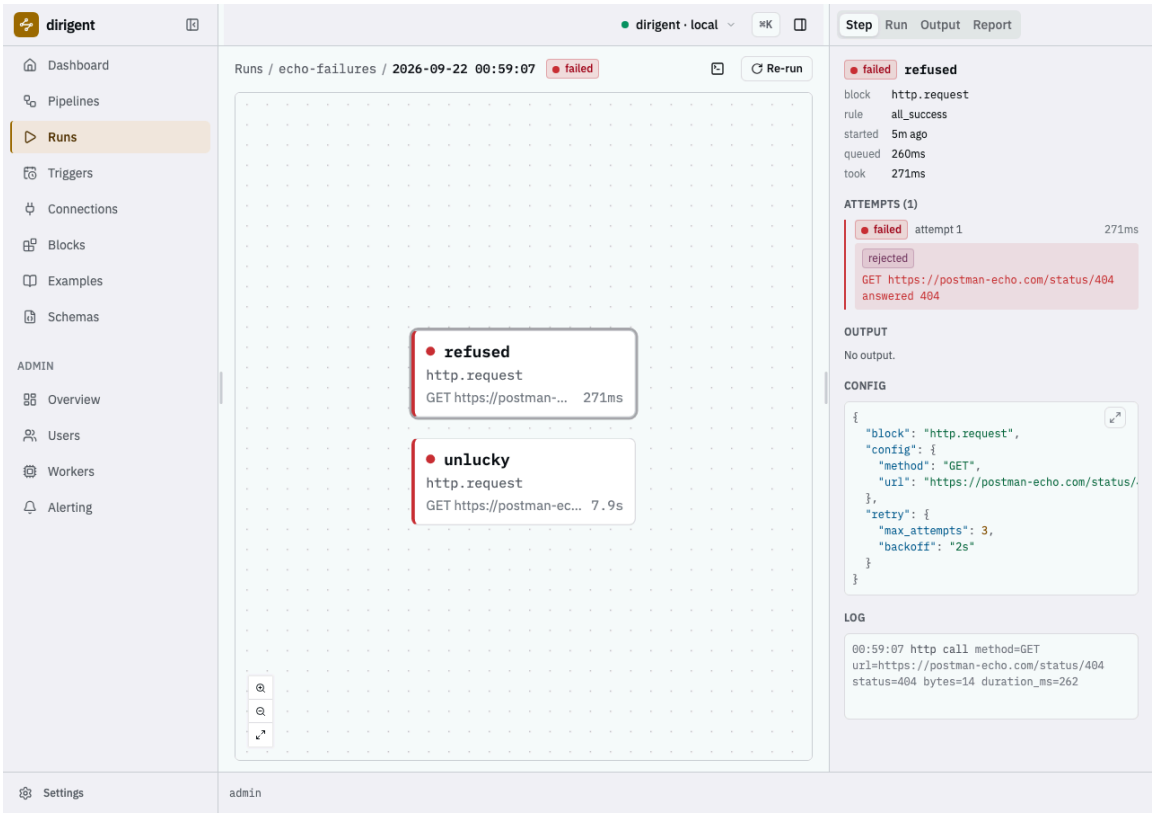
```
uv run dg run --local pipelines/echo-failures.yaml
```

```
steps
┌──────────┬──────────────┬─────────┬───────┬──────────┬────────┐
│ step     │ block        │ outcome │ after │ duration │ output │
├──────────┼──────────────┼─────────┼───────┼──────────┼────────┤
│ refused  │ http.request │ failed  │ -     │ 0.2s     │ -      │
│ unlucky  │ http.request │ failed  │ -     │ 0.2s     │ -      │
│ unlucky  │ http.request │ failed  │ -     │ 0.2s     │ -      │
│ unlucky  │ http.request │ failed  │ -     │ 0.3s     │ -      │
└──────────┴──────────────┴─────────┴───────┴──────────┴────────┘

refused failed  http.request, attempt 1, rejected
  GET https://postman-echo.com/status/404 answered 404
  last log lines:
    info: http call

unlucky failed  http.request, attempt 1, transient
  GET https://postman-echo.com/status/503 answered 503
  last log lines:
    info: http call

unlucky failed  http.request, attempt 2, transient
  GET https://postman-echo.com/status/503 answered 503
  last log lines:
    info: http call

unlucky failed  http.request, attempt 3, transient
  GET https://postman-echo.com/status/503 answered 503
  last log lines:
    info: http call
```

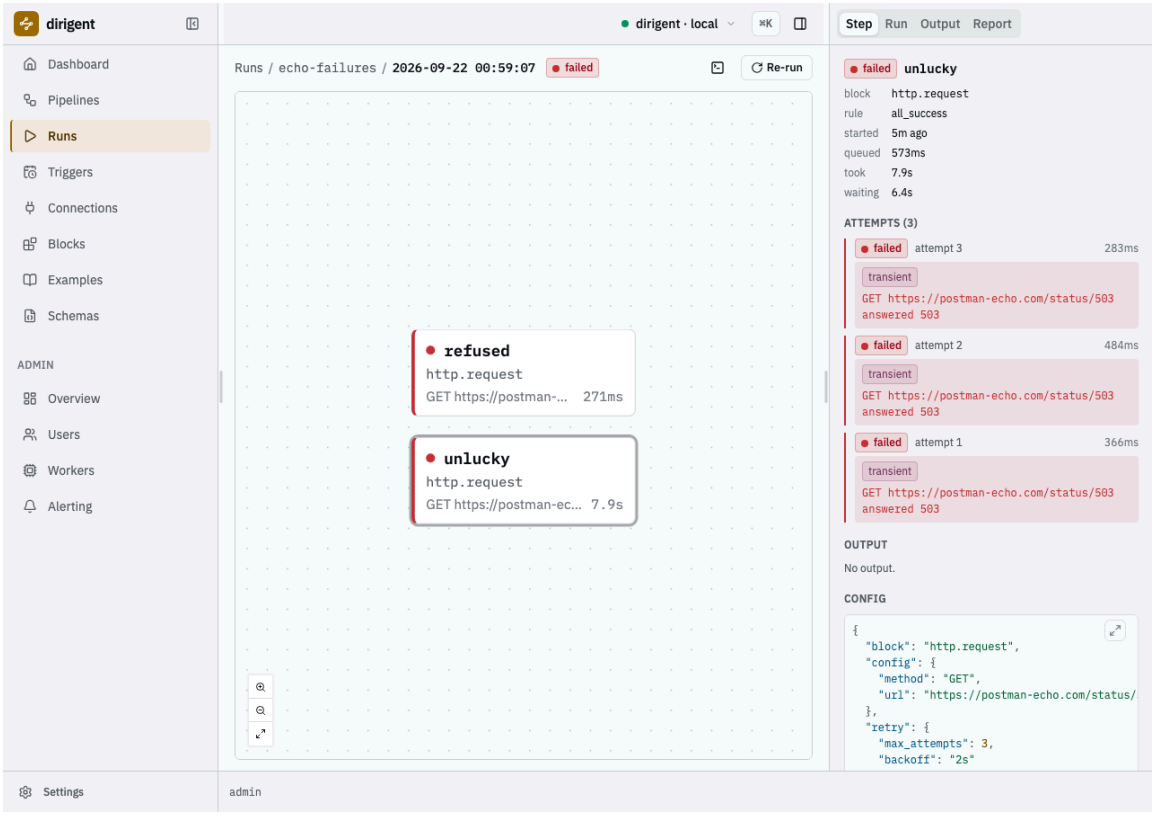
Same budget, one row against three. A **rejected** failure spends no budget, because the service will answer the same way in two seconds and in two hours; a **transient** one spends all of it. The delay between attempts is data rather than a sleep: each failure writes the next attempt's time into the future and the worker moves on, so nothing holds a worker slot for the backoff.

Apply it and run it on the instance too, because the contrast is worth seeing on a screen:

```
uv run dg apply
uv run dg run echo-failures --watch
```



One attempt, with three allowed. A rejected failure never touches the budget.



The same budget, spent. Every attempt is a row of its own, with its own resolved config and its own logs, which is what makes a retry auditable rather than a counter.

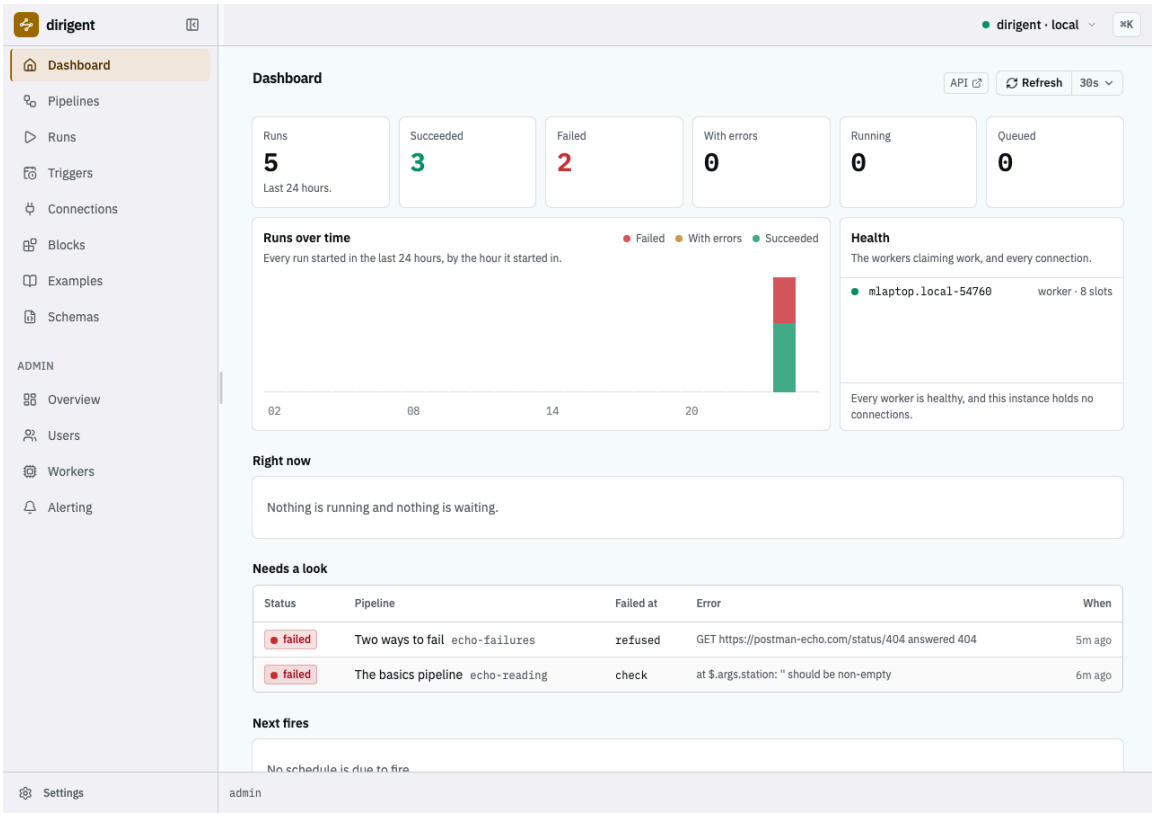
That classification is a block's job, and every block makes it the same way:

What happened	Class	Retried
A connection or read failure on the wire	`transient`	yes
The service answered 5xx	`transient`	yes
The service answered 429, rate limiting	`transient`	yes
The service answered any other 4xx	`rejected`	no
A gate refused the value	`rejected`	no
A config or reference that will not resolve	`rejected`	no

429 is the one client error worth retrying: the service is asking you to come back, and the same call succeeds once the window has passed. That is why `max_attempts` above 1 is worth writing on a step that calls anything over a network at all -- and why it costs nothing on the step that was simply wrong.

7. What you have

An instance on your machine, a schema it holds, a pipeline in three versions, a second pipeline that fails on purpose, and the runs behind them:



The instance after this page: the runs, and the two failures that are still worth looking at.

You have also met, by doing rather than by reading, most of what dirigent is: a document, a step, a block, a reference, a parameter, a schema, a version, a run, an attempt, and an error class. **Concepts** is that vocabulary written down properly, and it is the right next page to read.

Where to go next

- **The DHIS2 tutorial** is the other half of this course: the same three moves -- read, gate, send -- against a real DHIS2 instance, with a pack's blocks instead of raw HTTP.
- **The tutorial** builds one realistic pipeline instead of a small one: a sensor that holds a run until a window opens, a fan-out over a list, an error branch, a schedule and an alert rule -- and a real mistake in the middle.
- `dg examples` is the corpus this instance ships, and the ones tagged `starter` are written to be copied:

```
uv run dg examples list --starter --shelf recipes
```

```
examples
┏━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━┳━━━━━━━━━━━━━━━━━━┳━━━━━━━━━┳━━━━━━━━━┳━━━━━━━━━━━━━━━━━┓
┃ code             ┃ name             ┃ tags             ┃ plugin  ┃ starter ┃ needs           ┃
┡━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━╇━━━━━━━━━━━━━━━━━━╇━━━━━━━━━╇━━━━━━━━━╇━━━━━━━━━━━━━━━━━┩
│ http-fetch-valid… │ Fetch, validate, │ recipes http     │ examples │ *       │ 2 schemas, 3    │
│                  │ transform,       │ transform        │         │         │ blocks          │
│                  │ validate, post   │ validate         │         │         │                 │
│ http-post-report │ POST a batch and │ recipes http     │ examples │ *       │ 2 blocks        │
```

```
|                    | report on it     | transform report  |          |         |                 |
| http-save-body-t… | A response body  | recipes http      | examples | *       | 4 blocks        |
|                    | saved to storage | storage transform |          |         |                 |
| json-to-csv-flat… | Nested JSON to a | recipes storage   | examples | *       | 5 blocks        |
|                    | flat csv         | transform         |          |         |                 |
| ndjson-to-parquet  | Records to       | recipes storage   | examples | *       | 6 blocks        |
|                    | parquet and back | transform parquet |          |         |                 |
| report-built-in    | The built-in     | recipes transform | examples | *       | 2 blocks        |
|                    | report           | report            |          |         |                 |
| report-to-file     | Render a report  | recipes report    | examples | *       | 6 blocks        |
|                    | and write it to  | storage transform |          |         |                 |
|                    | a file           |                   |          |         |                 |
| storage-keep-pas… | Something kept   | recipes http      | examples | *       | 4 blocks        |
|                    | past its run     | storage transform |          |         |                 |
| storage-write-th… | Write to         | recipes storage   | examples | *       | 3 blocks        |
|                    | storage, then    | transform         |          |         |                 |
|                    | read it back     |                   |          |         |                 |
```

```
uv run dg pipeline new http-fetch-validate-transform-validate-post
```

It copies the document into `pipelines/` verbatim -- comments and all -- rewriting the `code:` line, dropping the `starter` tag, and lifting whatever the original carried, a `schemas:` section like the one above included, into `requires:` instead, because an instance stores neither. It then says what the instance still has to hold before it will apply. The Examples screen in the UI is the same catalogue, and it says per document what this instance is missing.

- **The block reference** is every block's config and output, exactly as the catalog publishes them.
- **The command line** is profiles, projects, parameters and the whole command tree.
- **Getting started** is the other shapes an instance comes in, including the three-service production stack.

The documents in full

`pipelines/echo-reading.yaml`:

```yaml
# Ask Postman Echo for one station's reading, hold the answer to a shape, and send the
# validated values back to it.

format: dirigent/v1
kind: pipeline
code: echo-reading
name: The basics pipeline
description: Ask Postman Echo for one station's reading, and hold the answer to a shape.

tags: [basics, tutorial]

requires:
  blocks:
    - http.request
    - validate.schema
  schemas:
    - echo-reading

params:
  type: object
  properties:
    station:
      type: string
      default: bergen-florida
```

```
      description: The station the reading is asked for.

steps:
  ask:
    block: http.request
    config:
      url: https://postman-echo.com/get
      method: GET
      query:
        station: ${params.station}
        reading: "12.4"

  check:
    block: validate.schema
    depends_on: [ask]
    config:
      input: ${steps.ask.output.body}
      schema: echo-reading

  send:
    block: http.request
    depends_on: [check]
    config:
      url: https://postman-echo.com/post
      method: POST
      # Read out of the gate rather than out of the read: every step past a gate provably
      # received the shape the gate passed.
      body:
        station: ${steps.check.output.value.args.station}
        reading: ${steps.check.output.value.args.reading}
```

`schemas/echo-reading.json` is the file `dg schema create` stored, printed in section 4, and `pipelines/echo-failures.yaml` is printed in section 6 in full.

When you are done, the instance is a directory: stop `dg dev` and delete `basics/`, and nothing of it is left behind.