A look under the hood of the Airflow logging subsystem

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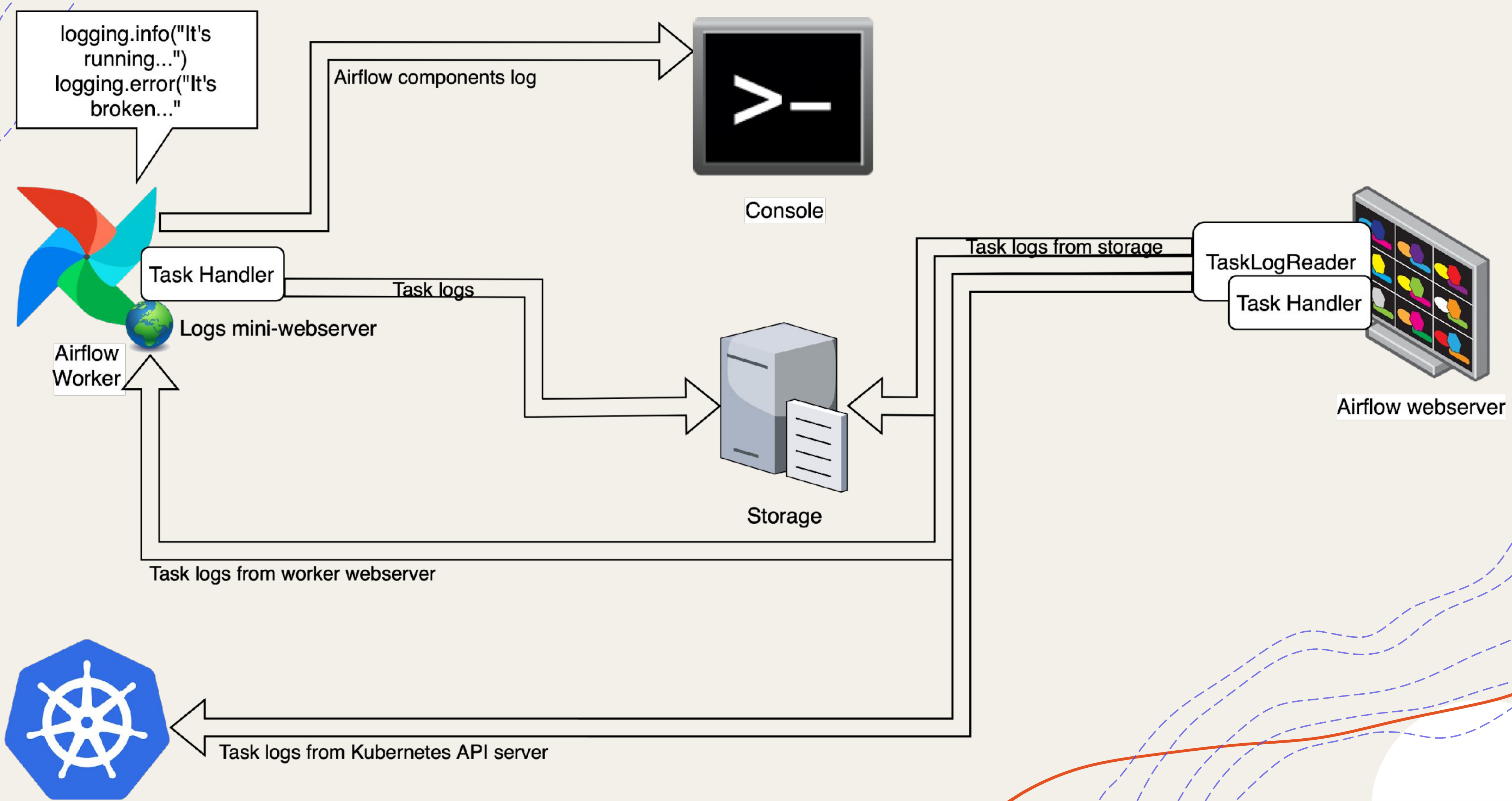
What is covered

- Logging in Airflow at a high level
- Default file-based logging process
- Remote logging to object storage
- Remote logging to dedicated services
- Roll your own task log handler

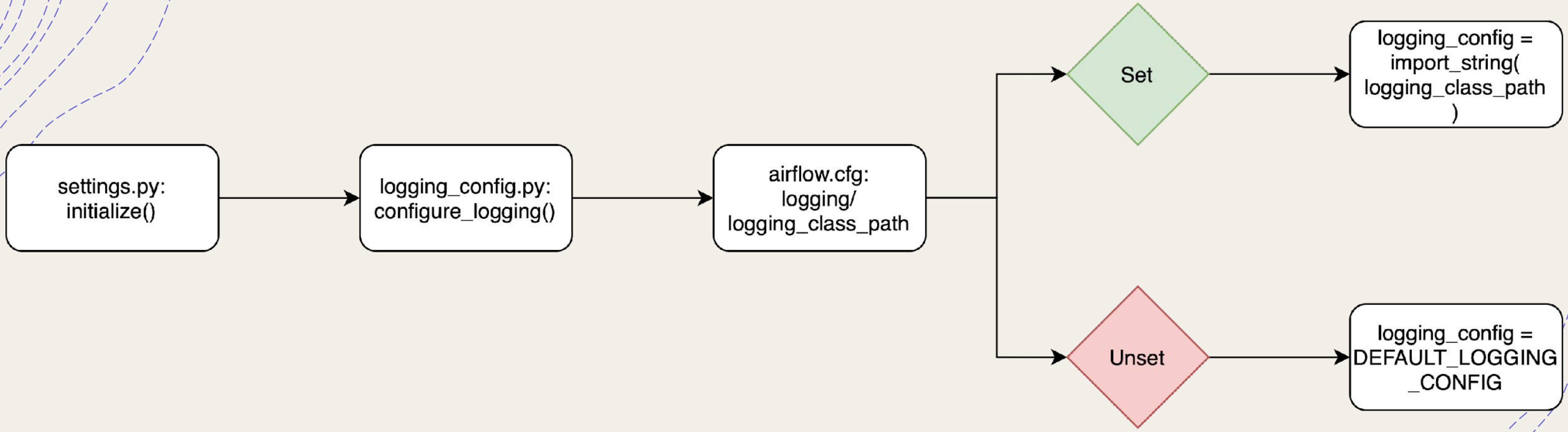
Airflow logging at a high level



Airflow logging core concepts

+ Leverages the stdlib *logging* module
+ Everything is really configured through *airflow_local_settings.py*
+ Defines three loggers: *airflow.processor*, *airflow.task*, *flask_appbuilder,* along with the root logger.
+ Logs retrieval is provided by implementing a `read(...)` method in task handlers (not part of the stdlib spec!)
+ Logs display in the webserver is implemented through the `TaskLogReader` class.

Airflow logging initialization



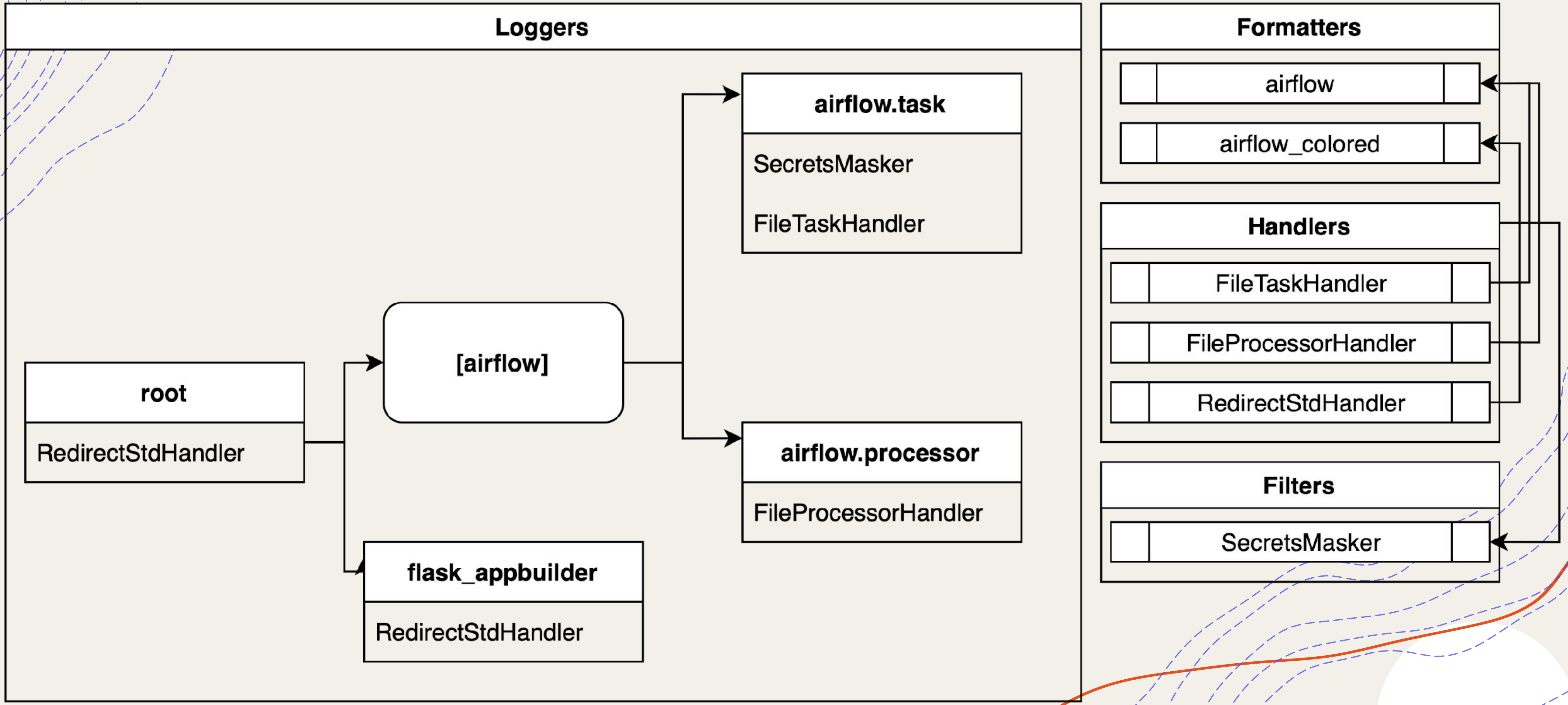
dictConfig schema details

```
{
  version,  # must be 1
  formatters,
  filters,
  handlers,
  loggers,
  root,
  incremental,  # if False: replaces the existing configuration
  disable_existing_loggers,   # disables existing loggers
}
```

Out of the box

- `DEFAULT_LOGGING_CONFIG` dictionary passed to `logging.config.dictConfig`
- *Handlers:* **`RedirectStdHandler`** (root), **`FileTaskHandler`** (task logs), **`FileProcessorHandler`** (dag processor logs)
  - `File…Handlers` wrap `NonCachingFileHandler` which inherits from stdlib's `FileHandler`
  - `RedirectStdHandler` outputs to *`sys.stderr/stdout`*

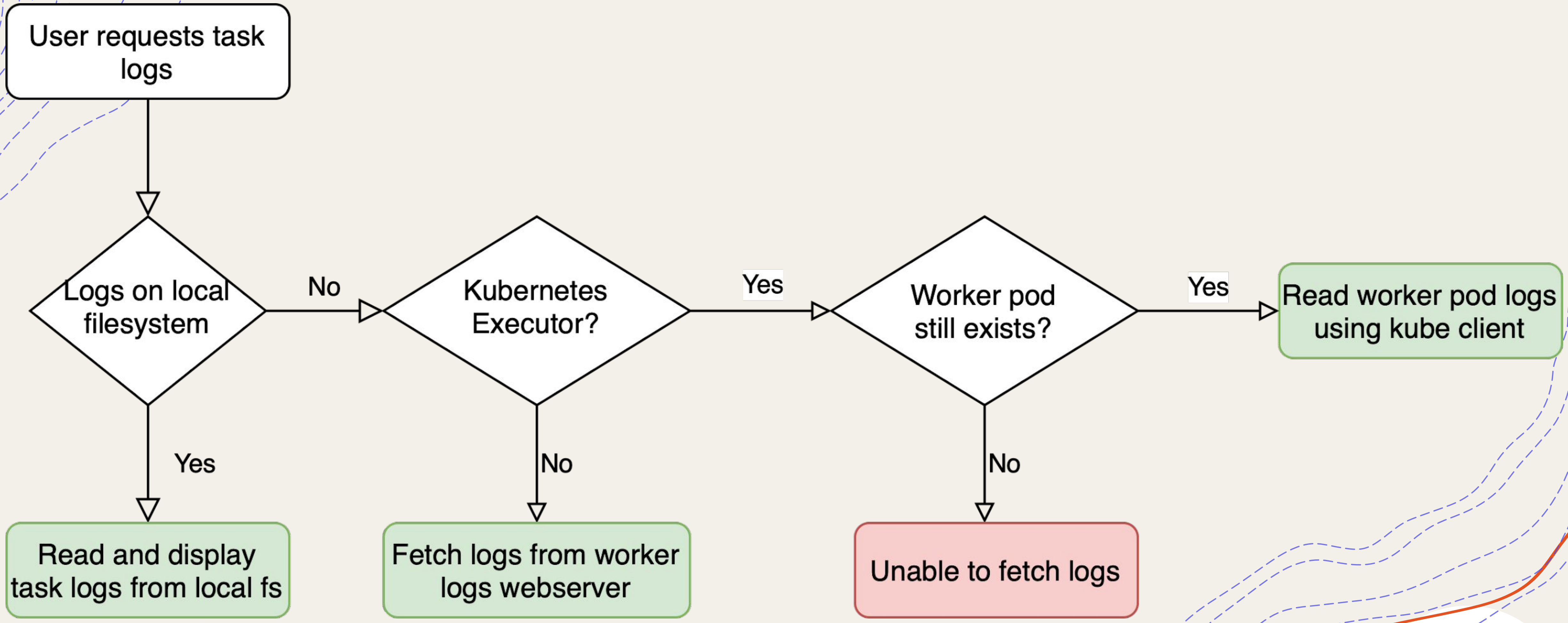
Default logging graph



Writing logs using FileTaskHandler

+ Writes to local filesystem.
+ Delegates to FileHandler.emit(...)
+ Logs routed to proper file according to template defined in `airflow.cfg log_filename_template (_render_filename)`
+ Log directory and permissions created via `_init_file`

FileTaskHandler read(...) logic



Remote Logging

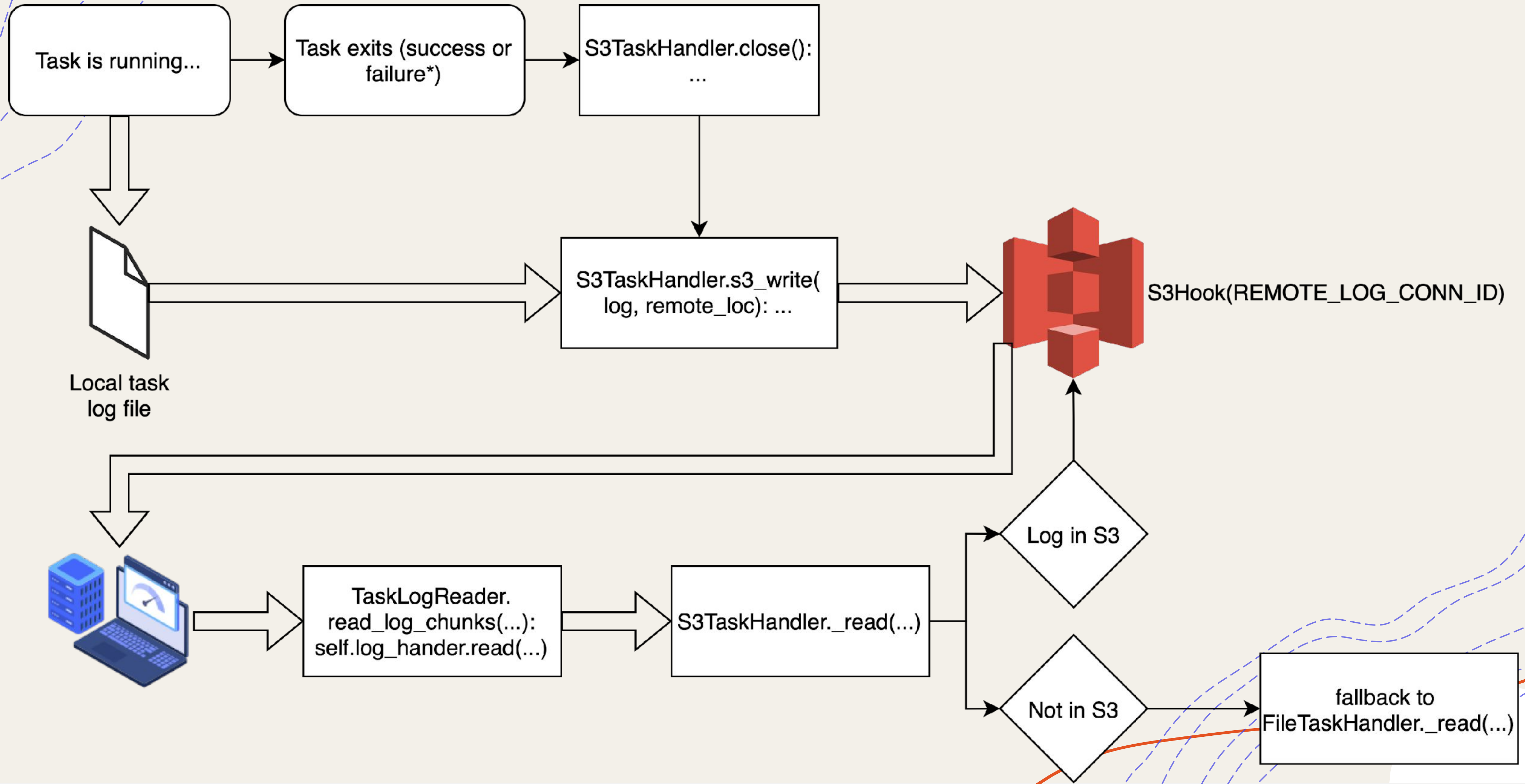
+ Feature enabled through `airflow.cfg (set remote_logging = True)`...
+ ... but actually configured in `airflow_local_settings.py`

```
if REMOTE_LOGGING:
    if REMOTE_BASE_LOG_FOLDER.startswith('gs://’):
        ...
        DEFAULT_LOGGING_CONFIG['handlers'].update(GCS_REMOTE_HANDLERS)
    elif REMOTE_BASE_LOG_FOLDER.startswith('s3://'):
        ...
        DEFAULT_LOGGING_CONFIG['handlers'].update(S3_REMOTE_HANDLERS)
    elif REMOTE_BASE_LOG_FOLDER.startswith('cloudwatch://'):
        ...
        DEFAULT_LOGGING_CONFIG['handlers'].update(CLOUDWATCH_REMOTE_HANDLERS)
```

Remote Logging to Object Storage

- Amazon S3, Google Cloud Storage, Azure Blob Storage mainly.
- Very important to note is that this mechanism only uploads logs to object storage *when the logging handler is closed*, which in normal circumstances only happens when the application (i.e. task in this case) exits.
- This is implemented by overloading the `close(...)` method in the log handler.

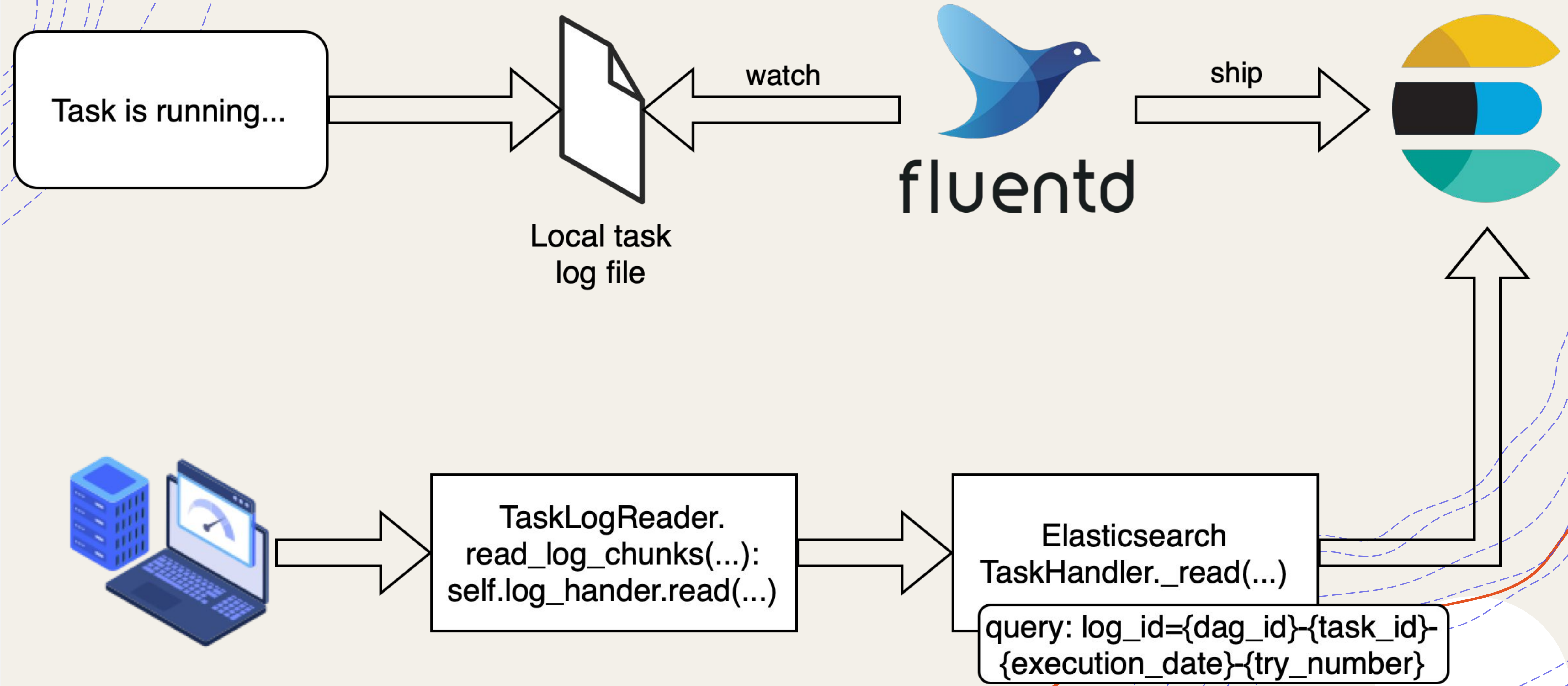
Example: Logging to S3


Task is running...
Task exits (success or failure*)
S3TaskHandler.close(): ...
Local task log file
S3TaskHandler.s3_write(log, remote_loc): ...
S3Hook(REMOTE_LOG_CONN_ID)
TaskLogReader. read_log_chunks(...): self.log_hander.read(...)
S3TaskHandler._read(...)
Log in S3
Not in S3
fallback to FileTaskHandler._read(...)

Remote Logging to external log services

- **Elasticsearch**, **Cloudwatch** Logs, **Stackdriver** (Google Ops Suite)
- ⚠️ These log handlers only implement read functionality, and defer to FileTaskHandler for writing!
- It's necessary to rely upon an external application to ship logs to the remote logging service
- In general, that ends up being **fluentd**, **fluentbit** or **logstash**

Example: Logging to Elasticsearch



Primer on rolling your own

```
class MyTaskHandler(logging.Handler, LoggingMixin):
    def __init__(self):
        super(MyTaskHandler, self).__init__()

    def emit(self, record: logging.LogRecord):
        <Logic to ”stream” logs goes here>

    def close(self):
        <Logic to ship logs in bulk goes here>

    def read(self, task_instance, try_number=None, metadata=None):
        <Logic to fetch logs goes here>
```

Or starting from FileTaskHandler

```python
class MyTaskHandler(FileTaskHandler, LoggingMixin):
    def __init__(self):
        super(MyTaskHandler, self).__init__()

    def emit(self, record: logging.LogRecord):
        ...

    def close(self):
        ...

    def _read(self, task_instance, try_number=None, metadata=None):
        ...
```

Thank you! ❤️

P.S. We brought swag! Come see me! 👕🌈✨