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Tremor Language Reference

Tremor contains a number of related domain specific languages that are designed to simplify development and operations of event based production systems.

Tremor provides an expression oriented scripting language that is optimized for transforming nested heirarchic data structures with a rich suite of data transformation operations on nominal (named) record (object), array (list, set) and primitive (string, integral, floating point, boolean) data types.

Tremor provides a statement oriented query like language that embeds the scripting language that is flow oriented. Tremor queries are compiled to directed-acyclic graphs represent streaming transformations based on builtin operations such as `select` queries, or custom user defined scripted operations via the `script` operator.

Tremor provides a statement oriented deployment language that embeds the query and scripting langauges allows complex flows composed of query pipelines, and connectors to external data sources and streams to be interconnected and deployed into the tremor runtime.

High Level Overview

```
graph LR
    D[troy] -->|Embeds| Q(snot)
    Q[trickle] --> |Embeds| S{Let me think}
    S[tremor]
```

UNIX philosophy

Tremor follows UNIX philosophy. The scripting langauge encapsulates the computation and manipulation of events. The query language composes multiple

streams of events into event processing graphs. The deployment language connects the outside world to event flow applications in units of deployment called a flow.

Scripting

The simplest useful operation in an event based system is to pass an inbound event in real time from some stream of origin to some target stream preserving the event data.

In the scripting language this is a 1 line program:

```
event
```

The `event` keyword in tremor represents the current event being processed.

Querying

In the query language, this is also a 1 line program:

```
select event from in into out;
```

Visually, this might render as follows:

```
graph LR
    input[in] -->|from| process(event)
    process[event] --> |into| output
    output[out]
```

The event originates at a standard builtin stream called `in` and is distributed to a standard builtin stream called `out`.

Deploying

In the deployment language, this is slightly longer:

```
###
### A simple console echo application
### Given json input line by line on stdin
### Produces json input line by lin on stdout
### Preserving order of events in distribution order
###

define flow main
flow
  # Define a pipeline with our passthrough logic
  define pipeline passthrough
  pipeline
    select event from in into out;
```

```
  end;

  # Define a connector that can read from stdin, write to stdio
  # and expects line delimited json messages
  define connector console from stdio
  with
    codec = "json",
    preprocessors = ["lines"],
    postprocessors = ["lines"],
  end;

  create connector out from console;       # Our output to `stdout`
  create connector in from console;        # Our input from `stdin`
  create pipeline main from passthrough;   # Our application

  connect /connector/in to /pipeline/main;  # Connect stdout to the app
  connect /pipeline/main to /connector/out; # Connect the app to stdout

end;

# The deploy command does all the work
deploy flow main;
```

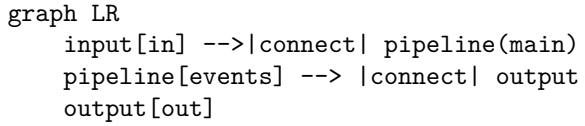
Although the command that instructs tremor to deploy our 2 instances of the `stdio` connector and our query application pipeline is a single line, the flow `main` is a reusable template. So we can store our flow in a separate file and reuse the definitions.

In fact, we have much more flexibility than this. We could further modularise by separating the definitions of `pipeline`s and `connector`s from their use in `flow` definitions.

This would enable us to have the same logic with different connectivity. Perhaps instead of the console (useful for developing and debugging) we might wish to use kafka connectors. Perhaps our kafka configuration will be different depending on whether we're in a staging, development or production environment. Perhaps we are migrating from a legacy kafka cluster to a high performance `redpanda` Kafka compatible cluster.

We can compose many different variants and reuse the parts as appropriate.

All of these possible `flow` variants have a similar structure:



Running

```
$ tremor server run echo.troy
> tremor version: 0.12
> tremor instance: tremor
> rd_kafka version: 0x000002ff, 1.8.2
> allocator: snmalloc
> Listening at: http://0.0.0.0:9898
> 1
< 1
> {}
< {}
> "snot"
< "snot"
```

Modularity

All tremor DSLs share a common set of compiler and runtime infrastructure.

The module system is itself defined as a tremor-module DSL.

The primary domain specific languages are:

Guide	Description	Extension
[tremor-module	- The tremor module system.	`none`
tremor-deploy	- The tremor deployment language.	troy
tremor-query	- The tremor query language.	trickle
tremor-script	- the tremor scripting language.	script

Module system

The DSLs in tremor share a common module system. The module system allows multiple modular scripts to be loaded via one or many mount points. Each mount point provides a heirarchy of modules where nesting and namespacing is indicated by the relative folder structure, including the file's basename.

Scripts can load other scripts. Queries can load scripts, and other queries. Deployments can load queries, can load scripts and can load other deployments.

```
graph LR
    A[troy] -->|Uses| D(module system)
    B[trickle] --> |Uses| D
    C[tremor] --> |Uses| D
    A[troy] -->|Embeds| B
    B[trickle] --> |Embeds| C
```