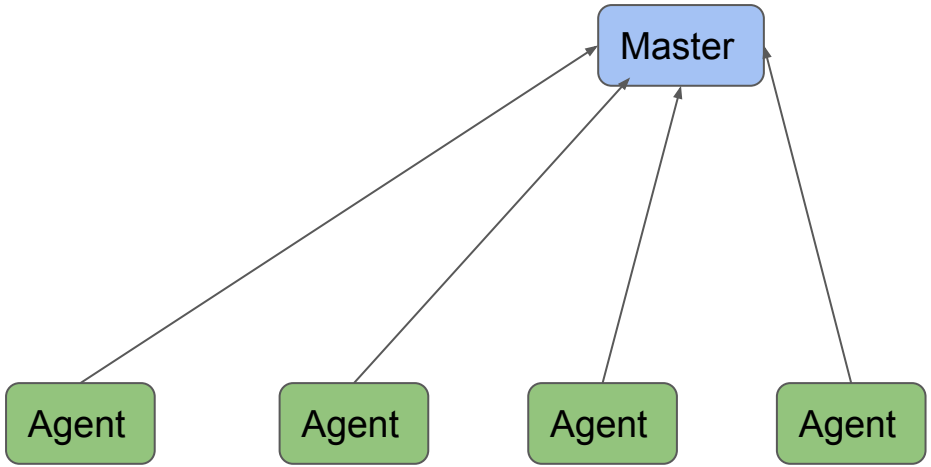
Glow Introduction

A map reduce system for Golang

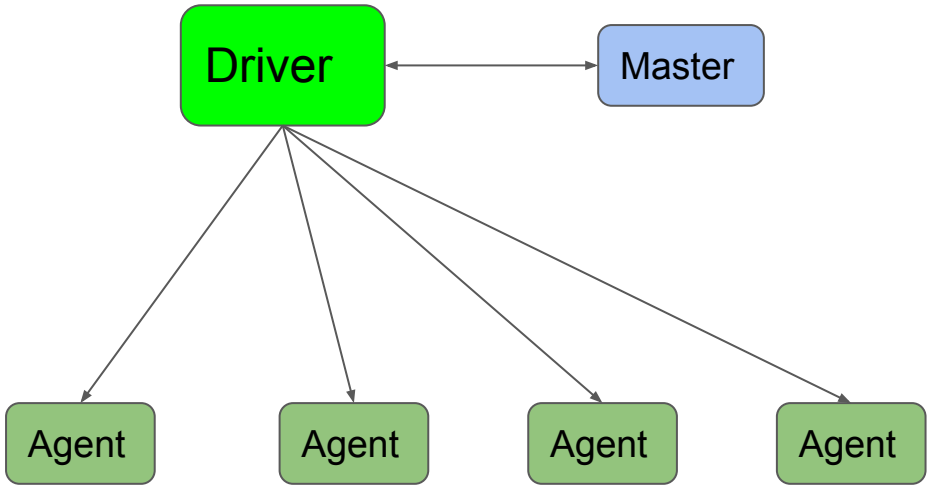
Architecture: Resource Management

1. Agents run on each server.
2. Agents report resources to master via heartbeats.



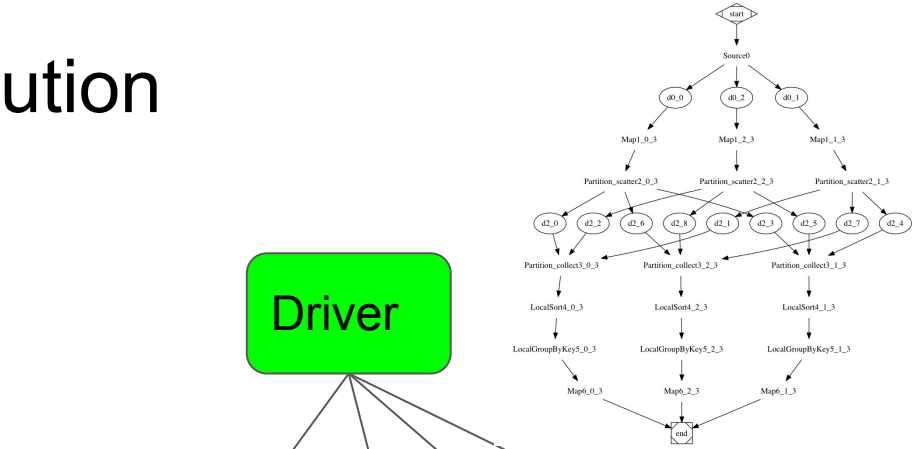
Architecture: Resource Allocation

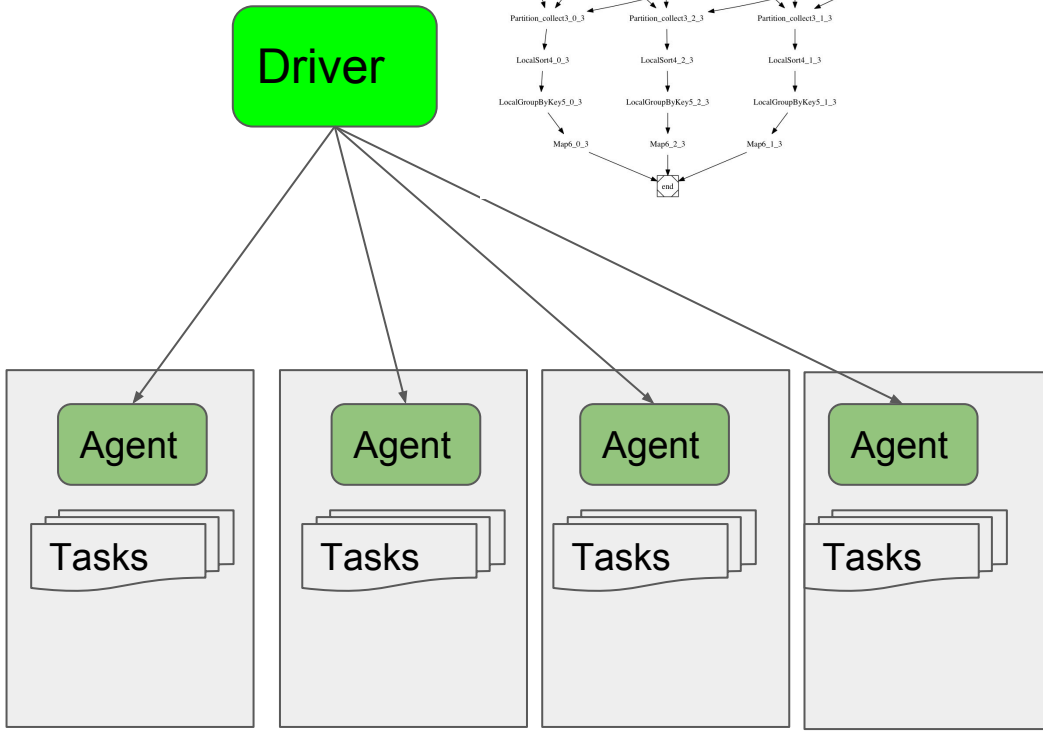
1. Driver asks Master for agents with resources
2. Driver asks assigned agents to run tasks



Architecture: DAG execution

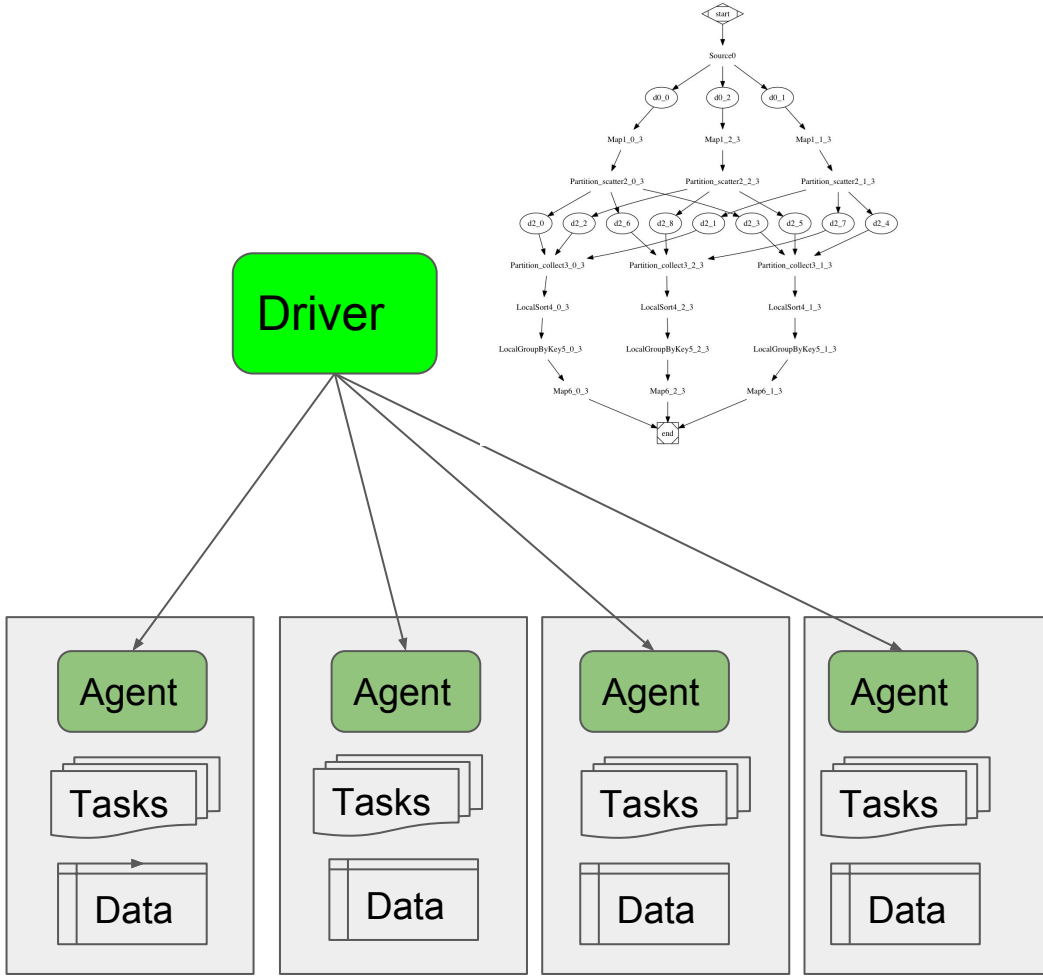
1. Driver divides tasks into DAG
2. One group of tasks is assigned to one agent





Architecture: Data Flow

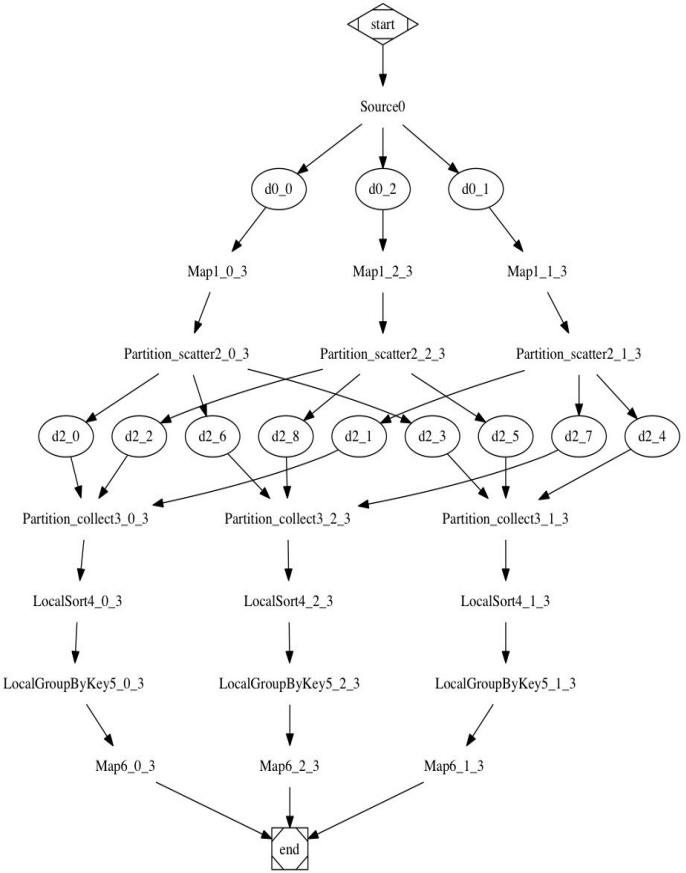
1. Outputs of tasks are saved by local agents
2. Driver remembers all data locations
3. Inputs of next group of tasks are pulled from the specified locations



Architecture: DAG Optimization

Data are streamed to disk only when necessary:

1. when one task produces data for 2 or more tasks
2. when one task consumes data from 2 or more tasks

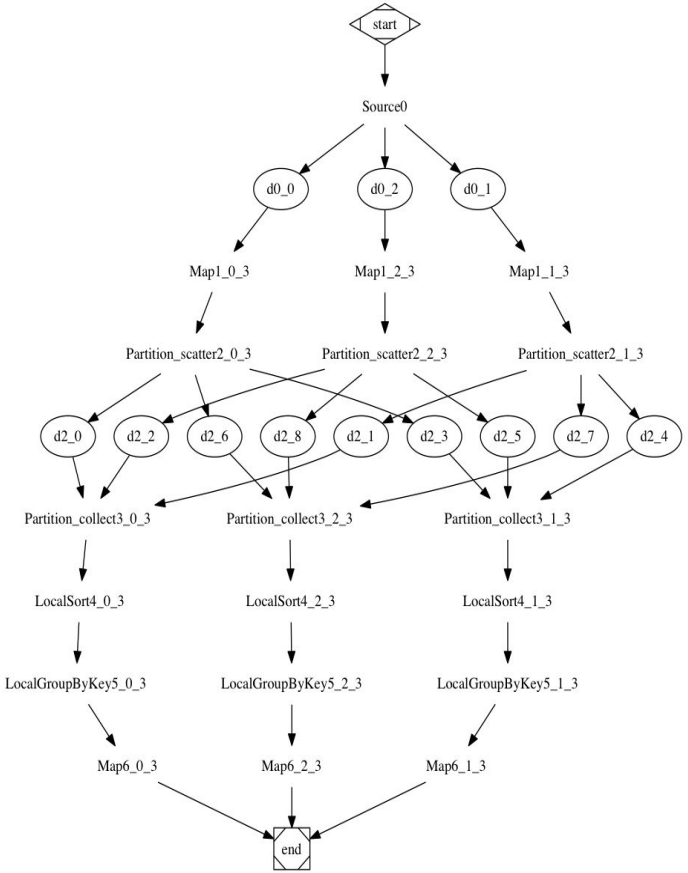


Internal: A lot of channels

Data flow between tasks via Go channels,

Read remote data via Go channels.

Write results to Go channels.



Distributed Mode vs Standalone mode

1. Standalone mode is efficient without disk IO.
    - Parallelize tasks via goroutines.
    - No need for idiomatic but verbose sync/wait, etc
2. Use distributed mode when need to scale up.

Glow can use Channels as inputs

You can pump data via go channel

// declare a channel of any desired type, and feed to the flow

var inputChan chan ***LogLine***

flow.New().Source(inputChan).Map(...).Reduce(...).Run()

On another goroutine:

inputChan <- LogLine{

Text: …,

Time: time.Now(),

}

Glow can use Channels as outputs

You can peek at any dataset via go channel

```
// declare a channel with matching type, add to any dataset
var outChan chan ReducedType
flow.New().Map(...).Reduce(...).AddOutput( outChan ).Run()
```

On another goroutine:

```
for x := range outChan{
  println(x.Value)
}
```

Fluid functional programing without type casting

You may notice Glow does not have any cumbersome type casting. Just the right amount of type information. Not too succinct, not too verbose.

Any functions are normal function. No special casting at all.

You can customize struct type for each dataset.

```
flow.New().Source(func(out chan YourType){...
}).Map(func (a YourType)(key YourKeyType, value YourValueType){
})
```

Supported Functions

Map(), Filter()

Reduce(), ReduceByKey(), LocalReduce(), LocalReduceByKey(), MergeReduce()

Join(), CoGroup()

Sort(), LocalSort(), MergeSorted()

Source(), TextFile(), Slice(), Channel()

Functions: Map()

Map(func(value) (key, value){})

Map(func(key, value) (key, value){})

CoGroup().Map(func(key, leftValues, rightValues){})

Join().Map(func(key, leftValue, rightValue){})

Functions: Map() with a channel output

The channel should be the last input parameter.

*Map(func(input string, **outChan chan someType**){})*

The channel collects Map() outputs.

- Emit 1 or no data for one input: similar to Filter()
- Emit 1 value for one input: common Map()
- Emit multiple values for one input: same as FlatMap()

Functions: CoGroup()

Group values from 2 sources by the same key

```
a.CoGroup(b).Map(func(key KeyType,
    valuesFromA []TypeA, valuesFromB[]TypeB){
    //.....
})
```

Think it as a more generic form of Join()

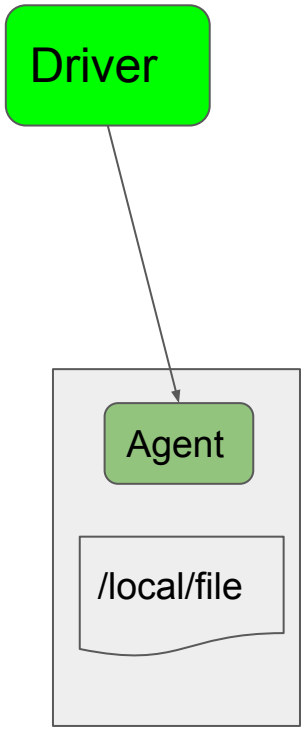
Functions: Source()

Source() is the generic form.

TextFile() is just a convenient function.

Both execute on agents. So TextFile() should read from a local file already exists on agents.

*flow.New().TextFile("**/local/file**").*
Map(func(line string){...})



Functions: Channel()

Channel() is the generic form.

Slice() is just a convenient function.

Both execute on driver!

textChan := make(chan string)

flow.New().Channel(textChan).Map (func(line string){...})