Disco: Getting Down with Big Data

SciPy 2010: Austin, TX

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big data

many huge (giga/terascale) datasets consist of lots of homogenous data records

- data is collected incrementally, and never deleted
- samples from an experiment or survey
- e.g. server logs, netflix training set, wikipedia, dna sequencing

many analyses operate on subsets of data for which some property holds

- operations can be sped up by precomputing indices for properties of interest
- e.g. requests from N900, movies rated by customer, articles modified on date, reads containing substring

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mapreduce

input | map | partition/sort | reduce | output

M \{ k1, v \\
| k2, v \\
| \ldots \\
| k2, v \\
| k1, v \}

N \{ k1, v \\
| k1, v \\
| \ldots \\
| k2, v \\
| k2, v \}

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disco

- erlang for orchestrating control
- python for operating on data
- batteries included:
  - utilize favorite python libraries
  - includes additional goodies to make working with distributed data easier

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an example

```python
# key    0.6
# key2   0.4
# key    0.4

def map(entry, params):
    fields = entry.split(' \t ')
    yield fields[0], float(fields[1])

def reduce(iterator, out, params):
    from disco.util import kvgroup
    from numpy import var
    for k, vs in kvgroup(iterator):
        out.add(k, var(list(vs)))

# key    0.01
# key2   0
```

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disco distributed "filesystem" (ddfs)

- distribute data:
  - increase storage capacity by adding nodes
  - processing can be scheduled on nodes without transferring data
- replicate data:
  - fault-tolerance
  - more options for scheduler

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**discoddb**

- lightning-fast key -> values mapping
- low-level C data structure
- Python wrapper: api = dict + cnf
- immutable + persistent
  - write once to a file
  - read using memory-map

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discodex

- disco + ddfs + discodb
- simple ReSTful interface
- random access in real-time
- as-lazy-as-possible evaluation
- heterogeneous k/v scale (bytes to gigabytes)

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def parser(fd, size, url, params):
    import csv, re
    from discodex.mapreduce import Record

def format_date(date, date_re=r'(?P<month>\d+)/(?P<day>\d+)/(?P<year>\d+)'):
    match = re.match(date_re, date)
    return '%04d-%02d-%02d' % (int(match.group('year')),
                               int(match.group('month')),
                               int(match.group('day')))

for n, row in enumerate(csv.reader(fd)):
    if any(row):
        if n == 0:
            source = row[0].strip().replace(',','
        for type in ('Air', 'Oil', 'Sediment', 'Water'):
            if type in source:
                break
        elif n == 1:
            fieldnames = [str(name.lower()) for name in row if name]
        elif n > 1:
            fields = [str(field.decode('utf-8', 'ignore')) for field in row]
            record = Record(n=n,
                             source=source,
                             type=type,
                             **dict(zip(fieldnames, fields)))
            if hasattr(record, 'date'):
                record.date = format_date(record.date)
            yield record
live demo!

load data

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questions?

more information at www.discoproject.org

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