Practical Google App Engine Applications in Python

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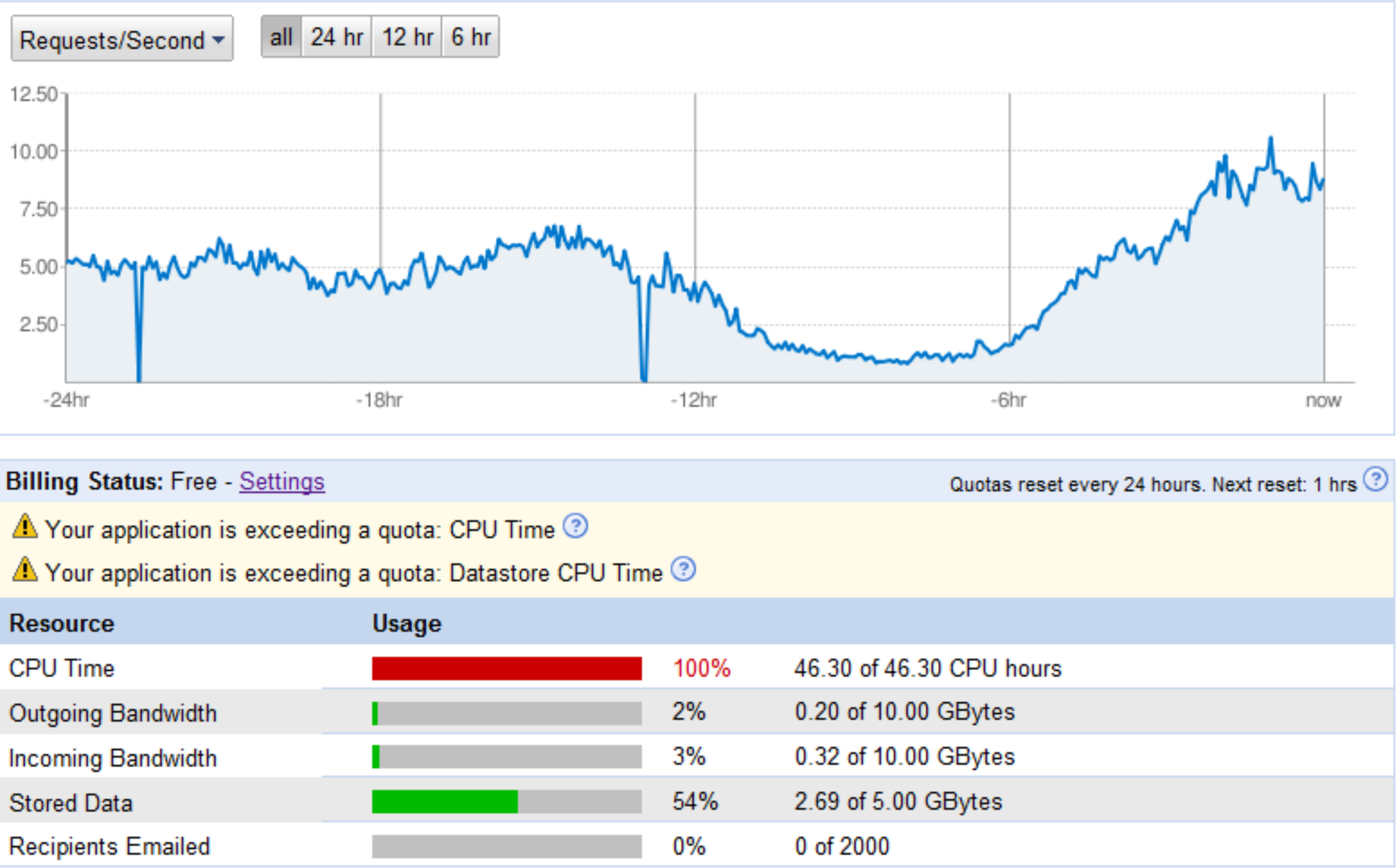
COSCUP 2009

http://tinyurl.com/coscup-appengine

Outline

- Effective Datastore API
- Data Manipulation Efficiency
- Effective Memcache
- Zip Import & Zip Serve
- Conclusion

Quota Limit on App Engine



Billing Status: Free - Settings

Quotas reset every 24 hours. Next reset: 1 hrs

⚠ Your application is exceeding a quota: CPU Time

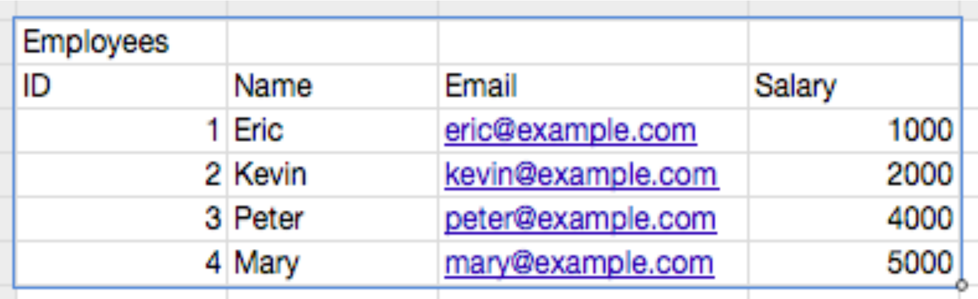
⚠ Your application is exceeding a quota: Datastore CPU Time

Resource	Usage		
CPU Time	🟥	100%	46.30 of 46.30 CPU hours
Outgoing Bandwidth		2%	0.20 of 10.00 GBytes
Incoming Bandwidth		3%	0.32 of 10.00 GBytes
Stored Data		54%	2.69 of 5.00 GBytes
Recipients Emailed		0%	0 of 2000

from: http://www.flickr.com/photos/kevin814/3587610731/

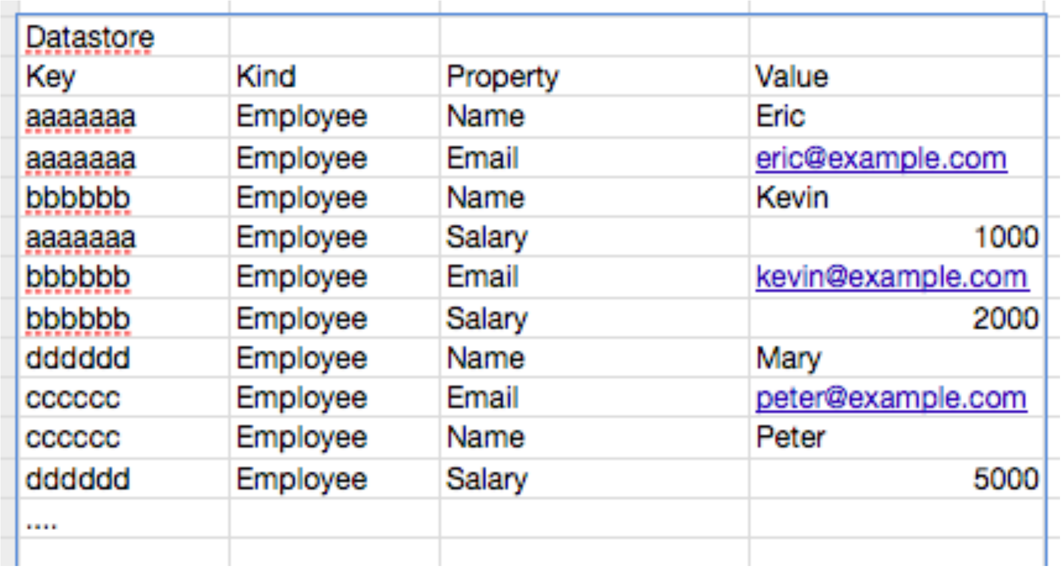
What's Datastore

- Datastore is a kind of **key-value database** built on GFS.
  - scalable
  - Kind-based data entities. (not table-based)
  - add/remove properties dynamically



Employees			
ID	Name	Email	Salary
1	Eric	eric@example.com	1000
2	Kevin	kevin@example.com	2000
3	Peter	peter@example.com	4000
4	Mary	mary@example.com	5000

Relational DB Table



Datastore			
Key	Kind	Property	Value
aaaaaaa	Employee	Name	Eric
aaaaaaa	Employee	Email	eric@example.com
bbbbbb	Employee	Name	Kevin
aaaaaaa	Employee	Salary	1000
bbbbbb	Employee	Email	kevin@example.com
bbbbbb	Employee	Salary	2000
dddddd	Employee	Name	Mary
cccccc	Employee	Email	peter@example.com
cccccc	Employee	Name	Peter
dddddd	Employee	Salary	5000
....			

Datastore

Avoid Heavily-Indexing

- Datastore will create index on each property.
  - If there're many properties in your data, **indexing will downgrade performance**.
  - If a property is not used for filtering nor ordering, add indexed=False to the data model declaration.

```
class Foo(db.Model):
    name = db.StringProperty(required=True)
    bar = db.StringProperty(indexed=False)
```

Minimize Datastore API Calls

- CRUD data entities by keys:
  - Ineffective Way:

    ```
    keys = [key1, key2, key3, ..., keyN]
    products = []
    for key in keys:
        products.append(db.get(key))
    ...
    ```

  - Effective Way:

    ```
    keys = [key1, key2, key3, ..., keyN]
    products = db.get(keys)
    ```

  - Same as `db.put()`, `db.delete()`.

Re-bind GqlQuery Object

- Use prepared `GqlQuery` data:
  - Ineffective way:

```
conds = [['abc', 'def'], ['123', '456'], ...]
for cond in conds:
    query = db.GqlQuery('SELECT * FROM Foo WHERE first = :
first, second = :second', first=cond[0], second=cond[1])
    ....
```

  - Effective way:

```
conds = [['abc', 'def'], ['123', '456'], ...]
prepared_query = db.GqlQuery('SELECT * FROM Foo WHERE first
= :first, second = :second')
for cond in conds:
    query = prepared_query.bind(first=cond[0], second=cond
[1])
    ....
```

Avoid Disjunctions

- `IN` or `!=` operator generates more queries.
    - `SELECT * FROM Foo WHERE a IN ('x', 'y') and b != 3` splits into 4 queries
        - `SELECT * FROM Foo WHERE a == 'x'`
        - `SELECT * FROM Foo WHERE a == 'y'`
        - `SELECT * FROM Foo WHERE b < 3`
        - `SELECT * FROM Foo WHERE b > 3`
- Fetches all data and filters them manually.

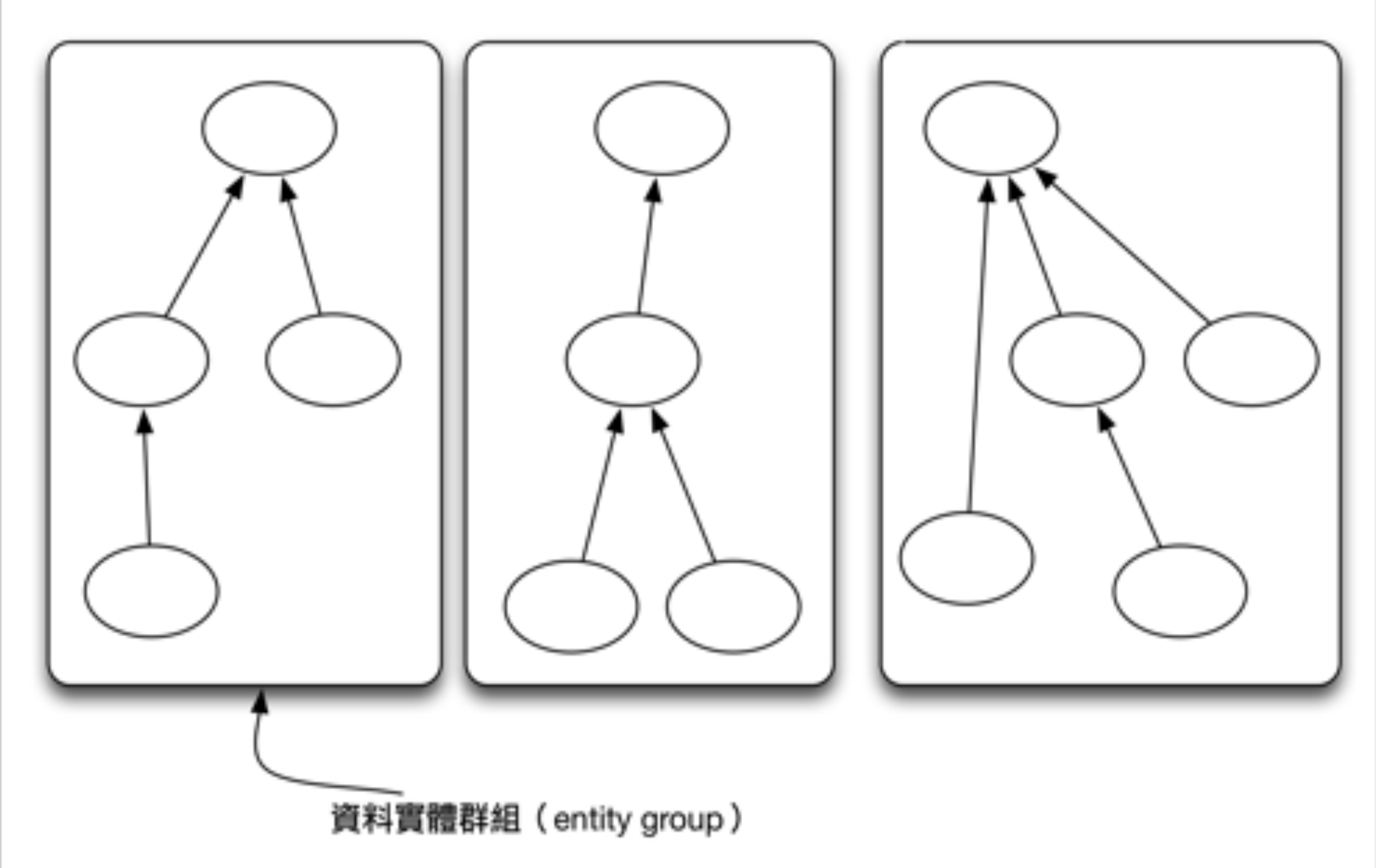
How to Fetch More Than 1000 Results

- Datastore API fetches no more than 1000 results once a call
- Fetches more than 1000 results (SLOW, may cause TLE)

```
data = Foo.gql('ORDER BY __key__').fetch(1000)
last_key = data[-1].key()
results = data

while len(data) == 1000:
    data = Foo.gql('WHERE __key__ > :1 ORDER BY __key__',
last_key).fetch(1000)
    last_key = data[-1].key()
    results.extend(data)
```

Put Data into Entity Group



Put Data into Entity Group (cont.)

- Put data into an entity group:

```
forum = Forum.get_by_key_name('HotForum')
topic = Topic(key_name='Topic1',......, parent=forum).put()
```

- Load data from an entity group:

```
topic = Topic.get_by_key_name('Topic1',
    parent=db.Key.from_path('Forum', 'HotForum'))
```

Sharding Data

- Write data in parallel
  - avoiding write contention
- Sharding data with key_name:

```
class Counter(db.Model):
    name = db.StringProperty()
    count = db.IntegerProperty()
...
def incr_counter(counter_name):
    shard = random.randint(0, NUM_SHARDS - 1)
    counter = Counter.get_or_insert(shard, name=counter_name)
    counter.count += 1
    counter.put()
```

Effective Caching

- Caching page content
  - Without caching

```
....
self.response.out.write(
    template.render('index.html', {})
)
...
```

  - With Caching

```
page_content = memcache.get('index_page_content')
if page_content is None:
    page_content = template.render('index.html',{})
self.response.out.write(page_content)
```

Effective Caching (cont.)

- Caching frequently fetched entities
  - Without caching

    ```
    ....
    products = Product.gql('WHERE price < 100').fetch(1000)
    from django.utils import simplejson
    self.response.out.write(simplejson.dumps(products))
    ```

  - With caching

    ...

    ```
    products = memcache.get('products_lt_100')
    if products is None:
        products = Product.gql('WHERE price < 100').fetch(1000)
    from django.utils import simplejson
    self.response.out.write(simplejson.dumps(products))
    ```

Zipimport & ZipServe

- **ZipImport:**
  Zip your library and then import modules within it.
- **ZipServe:**
  Zip your static/asset files, then serve them with `zipserve`.
- **WHY?**
  You can **ONLY** put 1000 files in your application.

Zipimport

- For example, you want to use Google Data client library in your application.
  - You have to put **`gdata/`** and **`atom/`** packages into your application directory.
  - With zipimport, you can zip them:

```
application/
    app.yaml
    ....
    atom.zip
    gdata.zip
    ....
```

Zipimport (cont.)

- import gdata modules in your script:

```
...
import sys

sys.path.append('atom.zip')
sys.path.append('gdata.zip')
....
from gdata.doc import service
```

Zipserve

- For example, you want to use TinyMCE library
  - You have to put `TinyMCE` library into your directory. However, it contains lots of files.
  - With zipserve, you can zip the library, and configure the `app.yaml`:

    ```
    ...
    - url: /tinymce/.*
      script: $PYTHON_LIB/google/appengine/ext/zipserve
    ```

  - The filename **MUST** be the same as the directory name. In this sample, the TinyMCE library should be zipped into `tinymce.zip`.

Conclusion - How to Write Better GAE Apps?

- Read the Articles on Google App Engine site.
- Trace the source from SDK
  - Maybe you will find the undocumented API.
- Read http://practicalappengine.blogspot.com/ (in Traditional Chinese)
- Develop apps!

台北, Taipei

http://taipei-gtug.org/