INF1343, Winter 2011

Data Modeling and Database Design

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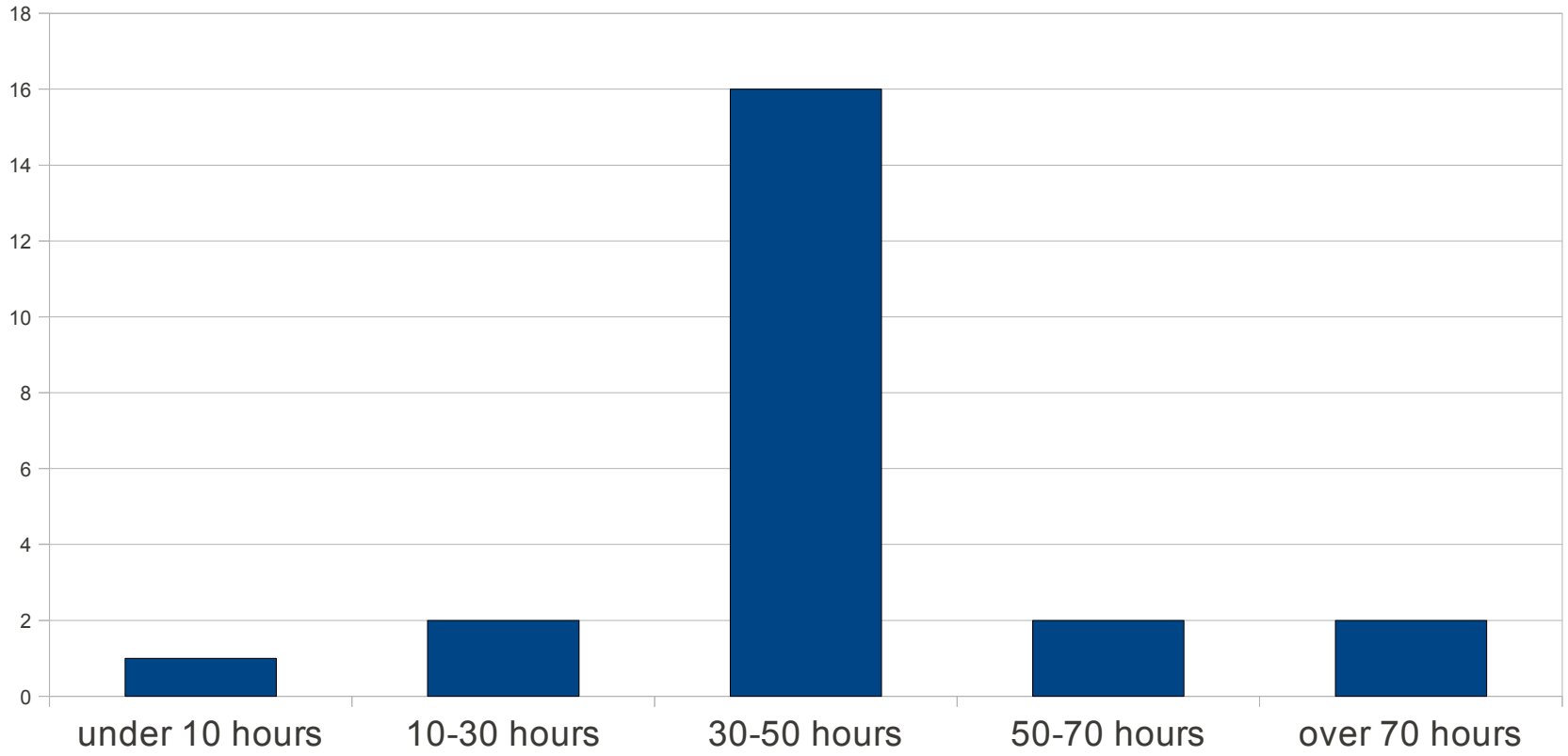
Week 7

Embedded SQL

The Survey


18
16
14
12
10
8
6
4
2
0
under 10 hours
10-30 hours
30-50 hours
50-70 hours
over 70 hours

The Final Project

(See the handout on the website)

Facebook runs on MySQL

Telnet (1969)

“yoda”, “alice”, “pumpkins”

“alice”, “pumpkins”

ok

“alice@yoda:~$”

“mysql -p”

“mysql -p”

“enter password:”

“enter password:”

FTP (1971)

"yoda", "alice", "pumpkins"

"alice", "pumpkins"

ok

"ftp>"

"get /path/to/ewoks.txt"

"get /path/to/ewoks.txt"

ewoks.txt

the file is saved locally

Anonymous FTP

"yoda", "/path/to/ewoks.txt"

"get /path/to/ewoks.txt"

ewoks.txt

the file is saved locally

ftp://yoda/path/to/ewoks.txt

HTTP (1991)

"yoda", "/path/to/ewoks**.html**"

"GET /path/to/ewoks.html"

the content of ewoks.html

ewoks.html is displayed

http**://**yoda**/**path/to/ewoks.html

HTML

```
<html xmlns="http://www.w3.org/1999/xhtml">
 <head>
  <title>
   Ewoks
  </title>
 </head>
 <body>
  <h1>
   The List of Ewoks
  </h1>
  ...
```

See: http://www.w3schools.com/html/default.asp

On Yoda

1. Put the file in ~/public_html/

2. Let the server see it:

chmod a+r ewoks.html

Locally:
scp ewoks.html kenobio1@yoda.ischool.utoronto.ca:~/public_html/

Remotely:
cd ~/public_html/
chmod a+r ewoks.html

CGI

"yoda", "/path/to/ewoks**.cgi**"

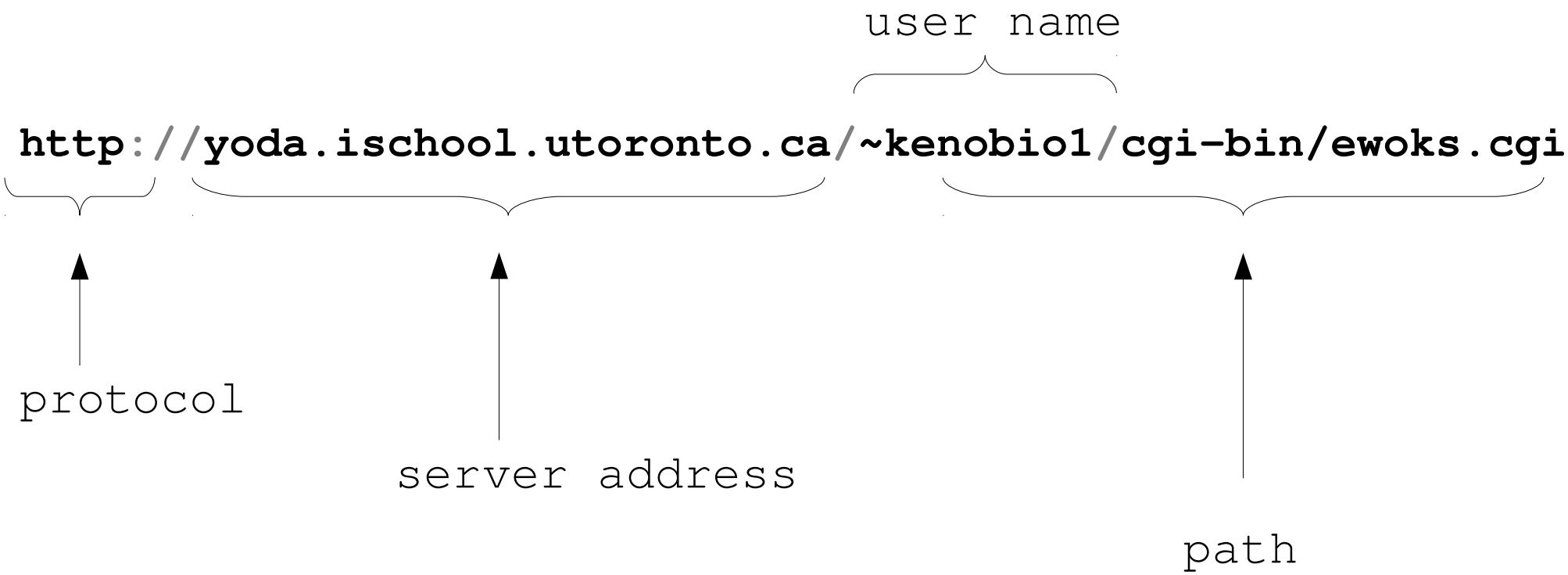
"GET /path/to/ewoks.cgi"

the html output of ewoks.cgi

html output is displayedl

ewoks.cgi contains **code**, but **returns** HTML

ewoks.cgi


user name
http://yoda.ischool.utoronto.ca/~kenobio1/cgi-bin/ewoks.cgi
protocol
server address
path

ewoks.cgi

```
#!/usr/bin/python

print "Content-Type: text/html"
print
print "<h1>Ewoks</h1>"
```

Set permissions to a+rx

Remotely:
cd ~/public_html
mkdir cgi-bin
chmod a+x cgi-bin
cd cgi-bin
cp /play/ewoks.cgi .
chmod a+rx ewoks.cgi

Python Console

On Yoda:

type “python”

Locally:

Install from http://python.org/

Use Python **2.x**, not Python **3** (“2000”).

Elements of Python

Constants and Expressions:

```
5
"Ewoks"
```

Variables:

```
count = 5
count = count + 1
species = "Ewoks"
"Hello, " + species + "!"
```

Elements of Python

Print:

```
print count
print species, count
```

Functions:

```
print str(count)
print str(count)+" "+species
```

Functions in Libraries/Modules:

```
import math
print math.sqrt(2)
```

Python is “Procedural”

(We describe the steps
rather than the results.)

ewoks2.cgi

```
#!/usr/bin/python
import cgitb
cgitb.enable()
print "Content-Type: text/html"
print

species = "Ewoks"
count = 5
print "<h1>", species, "</h1>"
print count, species, "<br/>"
count = count + 1
print count, species, "<br/>"
```

Elements of Python

Lists:

```
names = ["Chirpa","Warok",
                "Wicket"]
print names[1]
print len(names)
```

Loops:

```
for name in names:
    print name
```

ewoks3.cgi

```
#!/usr/bin/python
import cgitb
cgitb.enable()
print "Content-Type: text/html"
print

names = ["Chirpa","Warok","Wicket"]
species = "Ewoks"

print "<h1>", len(names), species
print "</h1>"
for name in names:
    print name, "<br/>"
```

Always the Same?

Parameters

- additional data from the user

Database

- information that we store

MySQLdb

```
import MySQLdb

config = "/home/kenobio1/.my.cnf"
db = MySQLdb.connect(db="starwars",
        read_default_file=config)
print db

cursor=db.cursor()
query = "select * from persona";
cursor.execute(query);
rows = cursor.fetchall()
print len(rows)
print rows[0]
```

Elements of Python

Objects:

```
db = MySQLdb.connect(...)
```

Methods (Objects' Functions):

```
cursor = db.cursor()
cursor.execute(query)
cursor.fetchall()
```

Loops Revisited

A Loop over the Rows:

```
for row in rows:
    print row[0]
```

Nested Loops (Rows, Records):

```
for row in rows:
    print "<tr>"
    for x in [0,1,2]:
        print "<td>",row[x],"</td>"
    print "</tr>"
```

MySQLdb

```
import MySQLdb

config = "/home/kenobio1/.my.cnf"
db = MySQLdb.connect(db="starwars",
       read_default_file=config)

cursor=db.cursor()
query = "select * from persona";
cursor.execute(query);
rows = cursor.fetchall()
print "<table>"
for row in rows:
  print "<tr>"
  for x in [0,1,2]:
    print "<td>", row[x], "</td>"
  print "</tr>"
print "</table>"
```

personas.cgi

```
#!/usr/bin/python
import cgitb
cgitb.enable()
print "Content-Type: text/html;charset=utf-8"
print

import MySQLdb

config = "/home/kenobio1/.my.cnf"
db = MySQLdb.connect(db="starwars",
       read_default_file=config)

cursor=db.cursor()
query = "select * from persona";
cursor.execute(query);
rows = cursor.fetchall()
print "<table>"
for row in rows:
  print "<tr>"
  for x in [0,1,2]:
    print "<td>", row[x], "</td>"
  print "</tr>"
print "</table>"
```

Parameters

- additional data from the user

Database

- information that we store

Passing Parameters

Option 1, “GET” (in the URL)

http://yoda.ischool.utoronto.ca/~kenobio1/cgi-bin/personas.cgi?species=Human

.../personas.cgi?species=Human

Option 2, “POST” (invisibly)

(we'll get back to this)

Accessing Parameters

```
#!/usr/bin/python
import cgitb
cgitb.enable()
print "Content-Type: text/html;charset=utf-8"
print

import cgi
form = cgi.FieldStorage()
print form["species"].value
```

1. Save in test_form.cgi. (Set permissions.)
2. Test with .../test_form.cgi?species=Human

Handling an Error

Try just “test_form.cgi” (no parameters). Oops.

```
#!/usr/bin/python
import cgitb
cgitb.enable()
print "Content-Type: text/html;charset=utf-8"
print

import cgi
form = cgi.FieldStorage()
if form.has_key("species") :
  print form["species"].value
else :
  print "No species specified"
```

Dynamic SQL (Wrong)

```
import cgi
form = cgi.FieldStorage()
if form.has_key("species") :
  cursor=db.cursor()
  species = form["species"].value
  query = ( "select * from persona"
            + " where species="
            + "'" + species + "'" )
  print query
  cursor.execute(query);
  rows = cursor.fetchall()
  print "<table>"
  for row in rows:
    print "<tr>"
    for x in [0,1,2]:
      print "<td>", row[x], "</td>"
    print "</tr>"
  print "</table>"
```

Python Templates

```
TEMPLATE = """
select * from persona
where species='%s';
"""

query = TEMPLATE % species
```

Dynamic SQL (Wrong)

```
TEMPLATE = """select * from persona
where species='%s';"""
import cgi
form = cgi.FieldStorage()
if form.has_key("species") :
  cursor=db.cursor()
  species = form["species"].value
  query =  TEMPLATE % species
  print query
  cursor.execute(query);
  rows = cursor.fetchall()
  print "<table>"
  for row in rows:
    print "<tr>"
    for x in [0,1,2]:
      print "<td>", row[x], "</td>"
    print "</tr>"
  print "</table>"
```

Don’t do this!

Here Is Why

http://yoda.ischool.utoronto.ca/~kenobio1/cgi-bin/personas2.cgi?species=Human'%3Binsert+into+persona+(name,species)+values+('X','Human')%3Bselect+*+from+persona+where+'

Dynamic SQL - Right

```
TEMPLATE = """select * from persona
where species='%s';"""
import cgi
form = cgi.FieldStorage()
if form.has_key("species") :
  cursor=db.cursor()
  species = form["species"].value
  query = TEMPLATE % db.escape_string(species)
  print query
  cursor.execute(query);
  rows = cursor.fetchall()
  print "<table>"
  for row in rows:
    print "<tr>"
    for x in [0,1,2]:
      print "<td>", row[x], "</td>"
    print "</tr>"
  print "</table>"
```

HTML Forms

```
<form action="/~kenobio1/cgi-bin/personas3.cgi"
      method="get">
  Please select a species:
  <input type="text" name="species" />
  <input type="submit" />
</form>
```

HTML Forms

```
<form action="/~kenobio1/cgi-bin/personas3.cgi"
      method="get">
  Please select a species:
  <select name="species">
    <option value="Human">Human</option>
    <option value="Ewok">Ewok</option>
    <option value="Wookiee">Wookiee</option>
  </select>
  <input type="submit" />
</form>
```

HTML Forms: POST

```
<form action="/~kenobio1/cgi-bin/personas3.cgi"
      method="post">
  Please select a species:
  <select name="species">
    <option value="Human">Human</option>
    <option value="Ewok">Ewok</option>
    <option value="Wookiee">Wookiee</option>
  </select>
  <input type="submit" />
</form>
```

Questions?