Geocaching, Waypoints and Linux

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Overview

- My Background
- What is Geocaching
- GPS Tools for Linux
- Geocaching Tools for Linux
- GeoQO: My Software
- Questions
My Background

- Long time listener, first time visitor
- Unix since 1988
- Linux since 1996ish?
  - Slackware -> RedHat 7 -> ... -> Fedora 8
  - KDE
  - XEmacs
- Geocaching since Dec 27, 2003
  - Wife: “I got you a GPS so you would stop calling me saying that you are lost in some city.”
- Real Work: Internet Protocol Security
Open Source Projects

- **Projects Started:**
  - Net-SNMP
  - OpenSNMP
  - Net-Policy
  - DNSSEC-Tools
  - Makerelease
  - **GeoQO**

- **Contributed to:**
  - Many more

- **Perl Modules**
  - NetSNMP::*
  - SNMP
  - QWizard
  - Net::DNS::SEC::Tools
  - Getopt::GUI::Long
  - Net::DNS::ZoneFile::Fast
  - **GeoDB**
Open Source Projects

- Fedora Package Manager:
  - dnssec-tools
  - **GeoQO**
  - Perl-Crypt-OpenSSL-AES, Bignum, DSA, PKCS10
  - Perl-Crypt-OpenSSL-RSA, Random, X509
  - perl-Digest-SHA
  - perl-Getopt-GUI-Long
  - perl-Net-DNS-SEC
  - perl-QWizard
What is Geocaching?

- Geocaching:
  - Uses Million Dollar Military Hardware...
What is Geocaching?

- Geocaching:
  - Uses Million Dollar Military Hardware...

  ...To find tupperware in the woods
What is Geocaching

• Before May 1, 2000
  – GPS satellites sent signals with errors
  – More accurate signals were protected by encryption
  – Rough accuracy was greater than 100 ft

• The first president Clinton removed errors
  – Accuracy became closer to 20 ft
  – WAAS signals now bring it down to about 9 ft
Well, I did it, created the first stash hunt stash and here are the coordinates:

N 45 17.460
W122 24.800
Geocaching Listing Websites

- http://www.geocaching.com/
  - The most popular
    - (with popularity comes politics and monopolistic practices)
  - 519022 geocaches on 2/11/08
  - All information in this talk is from geocaching.com

- http://www.terracaching.com/
  - Second most popular

  - Contains a list of all the listing sites
Geocaching

- Enter coordinates into your GPS receiver
- Have it direct you to that spot
- Find the hidden container
- Sign the Log Book
- Trade Toys
  - Kids love this part
Geocache Sizes

• Containers:
  – Micro ~Film Canister
  – Medium ~Altoids Tin
  – Regular ~Rubbermaid Container
  – Large ~Anything Larger
Geocache Types

Traditional: Just the box
Multi-Cache: Multiple stops or boxes
Puzzle: Solve a puzzle to get the box coordinates
Virtual: No box, just questions to answer
Webcam: The box takes your picture
Events: No box, just like-minded-geeks
Earthcache: Answer questions about the earth
Locationless: Take a picture of something in a category
(now “waymarks”: www.waymarking.com)
Geocaching Difficulty

- **Difficulty**: 1-5
  - 1 = in plain sight
  - 3 = quite hard
  - 5 = impossible

- **Terrain**: 1-5
  - 1 = wheelchair accessible
  - 3 = very steep hill
  - 5 = requires special equipment
Why Go Geocaching?

Location, Location, Location

Geocaching **WILL** take you to amazing places you never knew existed.
Why Go Geocaching?

To meet lots of interesting people
Why Go Geocaching?

For The Challenge
Starter Local Geocaches

• Roughly 180 or so Geocaches within Davis
• You can likely find these without a GPS:
  − XXX
Local Geocaches
Local Geocaches
Linux Tools

Oh... right... this is a *linux* talk. Whoops.
(got carried away there for a second)
GPS Receivers

- GPS Receiver Types:
  - Driving
  - Not-Driving (hiking, boating, ...)

- GPS Receiver Companies:
  - Garmin
  - Magellan
  - TomTom
  - And others
Linux Tools

• Maps:
  – Data Sources
  – Tools for transferring data to and from a GPS

• Waypoints and Tracks:
  – What are waypoints and tracks
  – Tools for transferring data to and from a GPS
  – Geocaching specific tools
Maps: Data Sources

- **Map Data Types:**
  - Topographical: Different Scales
  - Water: Water ways and markers
  - Street: Routable and non-routable

- **Map Data Sources:**
  - Proprietary
    - All GPS vendors use commercial data repositories
  - Open
    - Tiger Census: [http://www2.census.gov/geo/tiger/](http://www2.census.gov/geo/tiger/)
    - User Created: [http://www.openstreetmaps.org/](http://www.openstreetmaps.org/)
Maps: Tools for manipulating

- There are no good map transfer tools for linux
  - Windows: GPS Software (Garmin: Mapsource)
  - Mac: Very limited (empty promises)
  - Linux: Almost nothing

- There are some tools for transferring data
  - If you know the file name and have pulled it off before
  - I do transfer my TomTom files around with cp
    - Once I've installed them the first time via Windows

- I believe there may be some map creation tools
Waypoints and Tracks

• Waypoints:
  – Geographical Coordinate Set and other data
    • ID, names, cache difficulty, restaurant phone number, ...
    • For external data, most GPSrs take only:
      – ID, Name, Coordinates

• Tracks:
  – Linked list of Waypoints
  – GPSrs record tracks so you can analyze them later
    • How fast was I moving
    • Plot my track overlayed on a map
Waypoint File Formats

● Gazillions exist

● Two most common:
  – GPX: A standardized XML format for geographical waypoint information.
    • Extended upon by many databases.
    • E.G. geocaching.com
  – LOC/GEO: A smaller XML data format
    • Just the facts: name, latitude/longitude

● Geocaching.com:
  – LOC for everyone
  – GPX “pocket queries” for paying members
Waypoint Formats: LOC

<?xml version="1.0" encoding="utf-8"?>
<loc version="1.0" src="GeoQO">
  <waypoint>
    <name id="GCP9TP">Z-Cache: The Adventures of Base Dentura by Yamar, Unknown Cache (3.5/1.5)</name>
    <coord lat="38.557783" lon="-121.67105" />
    <type>Geocache</type>
    <link text="Cache Details">http://www.geocaching.com/seek/cache_details.aspx?guid=f178868d-
    fe61-4fc9-bbba-7beee0bb9862</link>
  </waypoint>
  <waypoint>
    <name id="GCPA10">Z-Cache: Bonus cache by Yamar, Unknown Cache (4/1.5)</name>
    <coord lat="38.55855" lon="-121.67105" />
    <type>Geocache</type>
  </waypoint>
</loc>
Waypoint Formats: GPX

<?xml version="1.0" encoding="utf-8"?>
<gpx xmlns="http://www.topografix.com/GPX/1/0" ...>
  <name>geoqo-export</name>
  <desc>Geocaches exported by GeoDB</desc>
  <author>GeoDB</author>
  <email>geodb-users@lists.sourceforge.net</email>
  <time>2008-02-17T21:59:27.00000000-07:00</time>
  <keywords>cache, geocache, geodb</keywords>
  <wpt lat="38.557783" lon="-121.67105">
    <time>2005-07-05T00:00:00.00000000-07:00</time>
    <name>GCP9TP</name>
    <desc>Z-Cache: The Adventures of Base Dentura by Yamar, Unknown Cache (3.5/1.5)</desc>
    <urlname>Z-Cache: The Adventures of Base Dentura</urlname>
    <sym>Geocache</sym>
    <type>Geocache|Unknown Cache</type>
  </wpt>
  <groundspeak:cache id="GCP9TP" available="True" archived="False"
xmlns:groundspeak="http://www.groundspeak.com/cache/1/0">
    <groundspeak:name>Z-Cache: The Adventures of Base Dentura</groundspeak:name>
    <groundspeak:placed_by>Yamar</groundspeak:placed_by>
    <groundspeak:owner id="183928">Yamar</groundspeak:owner>
    <groundspeak:type>Unknown Cache</groundspeak:type>
    <groundspeak:container>Regular</groundspeak:container>
    <groundspeak:difficulty>3.5</groundspeak:difficulty>
    <groundspeak:terrain>1.5</groundspeak:terrain>
    <groundspeak:country>United States</groundspeak:country>
  </groundspeak:cache>
</gpx>
Tools: GPSBabel

- http://www.gpsbabel.org/
- **The** tool for converting data
  - To and from every type of file
  - Waypoints and Tracks both
  - To and from GPS devices
- Also handles many other functions
  - Filters (eg, waypoint near a route)
- Portable: *nix, Windows, MacOS
- Used by every commercial database product
  - (they really owe this project part of their profits)
GPSBabel: Usage

gpsbabel -i INTYPE -f INFILE_OR_DEVICE \ 
-o OUTTYPE -F OUTFILE_OR_DEVICE

gpsbabel -i geo -f geocaches.gpx \ 
-o garmin -F /dev/ttyUSB0

• Windows has a GUI form-fillout tool
Tools: GEO-*

- http://geo.rkkda.com/
- A slew of tools to manipulate and search Waypoint data.
  - I admit: I haven't used them
  - Hard to figure out “where to get started”
  - Looks fairly powerful
  - Written in sh, awk, etc...
  - Calls gpsbabel for many tasks
Tools: GeoQO

- [http://www.geoqo.org/](http://www.geoqo.org/)
- An extensible waypoint management database
  - SQLite storage by default
  - Written in perl
- Handles data from:
  - geocaching.com
  - waymarking.com
  - geodining.com
  - wigle.net
GeoQO: Command Line Usage

• Importing files:
  - geoqo -i *.gpx

• Searching and Listing:
  - geoqo -s cache:owner_name=Yamar -l

1   GCQWPA   Payback's A Ditch
2   GCP9TP   Z-Cache: The Adventures of Base Dentura
3   GCPH36   Lost Lake of Davis
4   GCMGTY   Gardens of Delight: East
5   GCMGTW   Gardens of Delight: West
6   GCVPVT   Nooks and Crannies
7   GCM9JR   Penguins on Caffeine II
8   GCPA10   Z-Cache: Bonus cache
9   GCQV9A   The 1000 Club
10  GCNNNGK  Ho Ho Ho and a Bottle of Rum
11  GCM599   Lampost Pinball
12  GCJYPW   Hoppin' mad about Davis
13  GCJGRO   Beneficial cache
GeoQO: Searching

• Searching can be very powerful:
  – Boolean logic:  && ||
  – with grouping: ()
  – Internally translated to SQL expressions

• All caches I've found that are owned by “Spelunk” or “Ocelot”:

  geoqo -s '(cache:owner_name=Spelunk|| cache:owner_name=ocelot) && log:finder=Yamar' -l

  1   GC10THT   A Cache Odyssey
  2   GC1504H   Mysterious Object
  3   GC2C01    The Library
  4   GCJVTR    Hereâs to Your Health Cache
  5   GCJY4V    Sumac Grove Cache

  ...
GeoQO: Yes, but is it fast?

- `time geoqo -s ...Same arguments...
  - 0.766u 0.474s 0:01.68 73.2%`

- `geoqo -d stats:
  - Waypoints: 21845
  - Geocaches: 20516
  - Waymarks: 484
  - Geodinings: 125
  - Wigles: 0
  - Logs: 203653
  - Sets: 239
  - Tags: 1717`
GeoQO: Yes but is it easy to use?

GeoQO Top Level

GeoQO has a much more powerful command line interface, but this GUI interface should be enough to get you started.

See the documentation at http://www.geoqo.org/wiki/ for further details.

Prepare and Plan:
- Import Waypoints from a file (gpx ...)
- List Waypoints in your Database
- Solve Geocaching Unknown/Puzzles
- Calculate Statistics

Head out:
- Export Waypoints to a file (gpx ...)

Return Home:
- Mark Caches As Found
- Tag and Rate Geocaches and Waypoints

Miscellaneous:
- Preferences
GeoQO: Architecture
GeoQO: Example: Display

- geoqo -s "set:import:near me" \ -d top10:groundspeak_difficulty

Top 10 'groundspeak_difficulty's

<table>
<thead>
<tr>
<th>Num</th>
<th>%</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>187</td>
<td>37</td>
<td>1.5</td>
</tr>
<tr>
<td>111</td>
<td>22</td>
<td>2</td>
</tr>
<tr>
<td>111</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>37</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>33</td>
<td>6</td>
<td>2.5</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>3.5</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>4.5</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>
GeoQO: Finding Good Caches

- `geoqo -s "set:import:near me&&log:text=creative" -d top10:groundspeak_owner_name`

<table>
<thead>
<tr>
<th>Num</th>
<th>%</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>8</td>
<td>schooltch4daz</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>RazzTrakker</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>47Dad47</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>rivercity</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>sailorscodgers</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>2Dee2Dee</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>bobkeenan</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>allenking7624</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Guido 0</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Bob Blaylock</td>
</tr>
</tbody>
</table>
GeoQO: Scripting

• Scripts can be easily written to reproduce frequent tasks:

  \%search
  cache:owner_name=Yamar

  \%display
  list:

  \%display
  top10:groundspeak_container
GeoQO: Scripts

• Geoqo -x scriptfile

1   GCQWPA   Payback's A Ditch
2   GCP9TP   Z-Cache: The Adventures of Base Dentura
3   GCPH36   Lost Lake of Davis
...

Top 10 'groundspreak_container's
Num   %   Value
----------------------------------------
20    50  Micro
13    32  Regular
 5    12  Small
 1     2  Not chosen
 1     2  Other
GeoQO: Scripting GUI

• Scripts can take parameter fields:
  
  %search
  
  cache:owner_name=%[aNameToUse,Yamar,text=Enter an
  owner name:]

  %display
  
  list:

  %display
  
  top10:groundspark_container
GeoQO: Scripts

- Geoqo -x scriptfile
GeoQO: AutoGUI

- The GUI automatically pops up for many things:
- `geoqo -s 'cache:owner_name=Yamar' -d top10`
GeoQO: GUI -- Everything

• Scripting
  – Very Powerful
  – Barely discussed today

• In fact, the main GUI is really just a script
  – geoqo -x gui
GeoQO: Unique Features

- GeoQO does a few very unique things:
  - Single Database Storage
  - Google Earth Cache Density Plots
  - Shared Ratings and Tags
  - Puzzle solving help
    - Equations and value substitutions
    - Automatic equation extraction from the text
  - Firefox Plugin
    - Shows your details on a geocaching.com cache page.
  - Searches for caches based on a GPS Track
- Helps you find caches you'll like
GeoQO: Ratings and Tags

- Tag & Rate caches as you've found them
- Optionally upload/download tags and ratings
  - Search by your ratings and tags
  - Search by other people's ratings and tags
GeoQO: Puzzles

<table>
<thead>
<tr>
<th>Attributes:</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GC14Y05</th>
<th>Geocache</th>
<th>Unknown Cache</th>
<th>radiomom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Or:</td>
<td></td>
<td>replace:N38 (A)(B).(C)</td>
<td>replace:W121 (F)(G).(H)</td>
</tr>
</tbody>
</table>

```
math:2+(C)*2-(E)
7
0
6
2
```
GeoQO: Firefox Plugin

- Modifies cache page's web text:
  - Ratings
  - Tags
  - Attributes
- Inserts log text from GPS track:
  - Time found
  - How long you searched
GeoQO: Todo Items

- Better organized GUI screens with icons
- Native Track Support
- Windows installer
  - Sadly needed
- Linux Package Maintainers (Ubuntu, ...)
- Documentation
  - Plugin docs missing
  - Wiki tutorial good but needs improvements
- Even more plugins
Things not discussed

- Travel Bugs
- Legal Aspects
  - Permission to place
- Politics
  - Disallowed in many parks
- Bad Geocaches
  - Dangerously or poorly placed
  - Badly maintained
- Paperless Geocaching
- Oh so much more....
Questions