Oregon Real-Time GPS Network

Oregon GPS Users Group
Civil GPS Service Interface Committee
Bend, OR

Ken Bays, PLS
ODOT Geometronics Unit
15 June 2007
Oregon Real-time GPS Network (ORGN)
Seven HP-360 Servers in new State Data Center

Partner Stations

Spider Network Server
Spider Proxy Server

Spider Site Server 1:
Spider Site Server 2

Spider Remote Client (Ken’s PC; not in SDC)

Spider Cluster Server 1
Spider Cluster Server 2
Spider Cluster Server 3

ODOT stations

GTPS
CTPT
ASHL
ORGN Users

► Administrator
► Partners
► Subscribers
► Major Cooperators
Administrator

- Oregon Department of Transportation
- Geometronics Unit
- Program Management: Ron Singh
- Technical Administration: Ken Bays
Administrator Responsibilities

► Network quality control
► Network software operation
► Network software maintenance and upgrades
► Network listserv and maintenance
► User support
Partners

- Partners will provide sites, GPS equipment, and other infrastructure to the network.
  - Government agencies
    - Inter-Governmental Agreements
  - Private entities
    - Public-Private Partnerships
Some, but not all, of our Interested Partners

<table>
<thead>
<tr>
<th>OBEC Consulting Engineers</th>
<th>Yamhill County</th>
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</thead>
<tbody>
<tr>
<td>Polk County</td>
<td>City of Salem</td>
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<tr>
<td>Deschutes County</td>
<td>Clackamas County</td>
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<tr>
<td>EWEB</td>
<td>Marion County OR</td>
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<td>City of Beaverton</td>
<td>Jackson County</td>
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<td>City of Newberg</td>
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<tr>
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<td>Oregon State University</td>
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<td>City of Wilsonville</td>
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<td>City of Bend</td>
<td>Clatsop County</td>
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<tr>
<td>Linn County</td>
<td>Douglas County</td>
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<tr>
<td>David Evans &amp; Associates</td>
<td>Portland Water Bureau</td>
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<tr>
<td>Lincoln County</td>
<td>Benton County</td>
</tr>
<tr>
<td>Multnomah County</td>
<td>Oregon Parks and Recreation Department</td>
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</tbody>
</table>
Subscribers

► Anyone who is not a partner wanting access to the RTK corrector data that is delivered via cell modem

► Must have ORGN rover account set up
  ▪ No cost for beta mode rover accounts in 2007

► May pay a subscription fee starting in 2008

► Fee will be minimum – Cost recovery for maintenance/upgrades of network
Major Cooperators: Other Networks

- UNAVCO Plate Boundary Observatory
- Washington State Reference Network
  - Exchange raw data streams across the Columbia River.
- California and Idaho as our network develops
Oregon Department of Transportation - Geometronics

Overview

The Oregon DOT Geometronics Unit is developing a state Global Positioning System (GPS) reference station network. We are partnering with state and local governments, federal agencies, and educational institutions to develop the network.

The ODOT Geometronics Unit is responsible for enhancing and maintaining the vertical and horizontal geodetic control infrastructure across the state of Oregon. The establishment and operation of this permanent GPS CORS network in Oregon will help us accomplish our mission.

This GPS network will consist of GPS Continuously Operating Reference Stations (CORS) that will provide real-time kinematic (RTK) corrections via cellular phone and radio networks. GPS users that are properly equipped to take advantage of these corrections can survey in the field to the one centimeter accuracy level in real time.

Scope of Network

ODOT initially plans to establish three sub-networks of GPS reference stations in Oregon during the 05-07 biennium. Each sub-network will consist of four to five stations spaced at approximately 70 km.

The northwest Oregon sub-network will extend from I-5 to the coast and from the Columbia River to the southern Willamette Valley. It will provide vital geodetic control to ODOT Region One and its partners to support the Interstate 5 Columbia River Crossing bridge project.

The southern Oregon sub-network will be in the vicinity of Jackson County and the Deschutes sub-network will be in the vicinity of Deschutes County. We expect to expand the network to include a major
## Oregon Real-time GPS Network Current Station Status

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Spider Reference No.</th>
<th>Location</th>
<th>Partner</th>
<th>Site Possibilities</th>
<th>Latitude</th>
<th>Longitude</th>
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<tbody>
<tr>
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<td>PBO</td>
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<td>KF</td>
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<td>P412</td>
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</tbody>
</table>
ORGN Rover Account Requests

Overview

The Oregon Real-time GPS Network (ORGN) is producing real-time correctors of various types and in various formats as described on the Products and Services page. These correctors are streamed from an ORGN server to the internet to users with valid Rover Accounts.

During a beta test period until the end of the 2007 calendar year, Oregon DOT is authorizing Rover Accounts for ORGN at no direct charge to the user. During this data test period, use of the ORGN and its products will be at the user's own risk. It is the responsibility of the user to verify the accuracy of surveys they perform using the ORGN and its products.

During this beta test period, Oregon DOT will evaluate ongoing maintenance and upgrade costs for the GPS Network. In 2008 and after, Oregon DOT may charge reasonable subscription fees for rover accounts based upon cost recovery of the maintenance and upgrade for the ORGN; however, rover accounts for partners will continue to be provided at no charge.

Disclaimer of Liability and Reliability

In preparation of this RTCM broadcast service, ODOT has endeavored to offer current, correct, and clearly expressed information. Nevertheless, errors may occur. ODOT expressly disclaims any liability, of any kind, or for any reason, that might arise out of any use of the RTCM information broadcast provided by this service or any other product or service of the ORGN. In particular, but without limiting its disclaimer, ODOT disclaims any responsibility for typographical errors or inaccuracies of the information provided or contained within the broadcast message. ODOT makes no warranties or representations whatsoever regarding the quality, content, completeness, suitability, adequacy, sequence, accuracy, or timeliness of the information and data provided by this service.

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If misleading, inaccurate or otherwise inappropriate information is discovered ODOT asks that it be brought to ODOT's attention so that efforts may be made to fix or remove it.

On-line Rover Account Request Form

Please submit the on-line Rover Account Request form to request a Rover Account that will authorize you to receive RTCM corrections from the ORGN. Once you submit the form, you will be sent an RTK Users Agreement to sign so you can be issued a rover account with a log in name and password.
Rover Login Requests

On-Line Form

The ORGN is currently running in a beta test mode. Please submit this on-line Rover Account Request form to request a Rover Account that will authorize you to receive RTCM corrections from the ORGN in a beta test mode. Once you submit the form, you will be sent an RTK Users Agreement to sign and then you will be issued a rover account with a log in name and password.

* Indicates Required Fields

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>Title</td>
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</tr>
<tr>
<td>Company/Agency</td>
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</tr>
<tr>
<td>Street Address</td>
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<tr>
<td>City, State, Zip</td>
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<tr>
<td>Email Address</td>
<td>User Name &amp; Passwords will be sent here.</td>
</tr>
<tr>
<td>Phone</td>
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<tr>
<td>Mobile Phone</td>
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<tr>
<td>FAX</td>
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<tr>
<td>Rover Sensor Brand</td>
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<tr>
<td>Rover Sensor Model</td>
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<td>Data Collector Model</td>
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<td>Data Collector Software</td>
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<td>Data Collector Software Version</td>
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<td>Is Rover NTRIP-capable?</td>
<td>Yes</td>
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<td>What version of RTCM is your rover capable of receiving?</td>
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<tr>
<td>Cell Data Provider</td>
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</table>
Network correctors:
1. MAX (RTCM 3.0) (Master-Auxiliary)
2. i-MAX (RTCM 2.3)

Single base correctors:
1. Nearest_site (RTCM 2.3)
ORGN RINEX data: provided at no direct cost to user

**General Information**

**Data Storage:** One hour RINEX files collected at a 5 second epoch rate are available on-line for one month, after which they will be archived off-line. Archived RINEX files older than one month may be obtained by contacting ORGN Support.

If an ORGN partner is already providing RINEX files on-line for their site; i.e., the partner site is a National Geodetic Survey Coop CORS site, we will not duplicate those RINEX files on the ORGN website; however, we will provide a link to the partner’s RINEX data by clicking on the station on our **Station Status** page or by clicking on a station on one of the clickable **ORGN maps**.

RINEX data will be made available at no charge from ORGN.

The nominal epoch rate for ORGN RINEX files if 5 seconds; however, users may request RINEX files with a faster epoch rate on a project-by-project basis, for example, an aerial photography project using airborne GPS control. Contact ORGN Support in advance of your project if you have such a need.

**File Naming:** The zipped RINEX files posted on the ORGN website contain both an observation RINEX file and a navigation RINEX file.

The file naming convention for the zipped file is: **ssassddh_mxx.zip**, where “**sss**” is used to identify the site name, “**dd**” is the Julian day of the year, “**h**” is the hour identifier in UTC time (see chart below), “**mxx**” shows the type of files in the zipped file are RINEX, and “**zip**” is the type of compression used.

Do not be confused by the times listed on the left of the RINEX data page. They are the times that each file was posted onto the FTP server. The 8th character in the file name indicates the hour (UTC) that each hourly file was started, per the following chart:

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |

For example, pdxe041p.mxx.zip is a zipped one hour RINEX file from station PDXA which contains data starting at 18:00 UTC on Julian Day 041 (February 10).

Each zipped RINEX file contains both an observation file and a navigation file from the site and a similar naming convention is used for both unzipped files: **ssassddh_yyyt** where “**ss**” is used to identify the site name, “**dd**” is the Julian day of the year, “**h**” is the hour identifier in UTC (see chart above), “**yy**” is the year, “**t**” is the file type (o=observation, n=navigation). For example, pdx041p.07o is the observation file and pdx041p.07n is the navigation file zipped into the above zipped RINEX file pdxe041p.mxx.zip.

**Resources**

**Station Status** - Shows a full list of station related information, with links to individual station pages and to the RINEX data of ORGN partners.

**RINEX Data index** - A direct link to the zipped downloadable ORGN RINEX files organized in folders according to the following hierarchy: site/year/month/day of month.
Corrector Delivery Methods

► Real-time Correctors
  ▪ Radio
  ▪ **Internet**
    ▶ Cell Modem
    ▶ WIFI (?)

► Post processing Correctors
  ▪ RINEX Data for Post Processing
    ▶ Available for ORGN website: www.theorgn.net
Cell phone signal types

► GSM
  ▪ Cingular
  ▪ Unicel
  ▪ T-Mobile

► CDMA
  ▪ Verizon
  ▪ US Cellular

► Either type will work with ORGN

► Most important: data cellular coverage where you will be working.
Transformation/calibration sets

► ORGN will provide consistent NAD 83 (CORS 96)(Epoch 2002) coordinates.

► You will not necessarily fit the HARN in Oregon or your existing transformation/calibration sets.

► You must do a new transformation/calibration set on your project control while using ORGN.
Contact - ODOT Geometronics Unit

► ORGN Business Manager:
  ▪ Ron Singh, Chief of Surveys, 503-986-3033
  ▪ ranvir.singh@odot.state.or.us

► ORGN Technical Manager:
  ▪ Ken Bays, Lead Geodetic Surveyor, 503-986-3543
  ▪ kenneth.bays@odot.state.or.us

► ORGN Support and Installation:
  ▪ Randy Oberg, Geodetic Survey Associate, 503-986-3041
  ▪ randy.d.oberg@odot.state.or.us