Florida Permanent Reference Network
FPRN

Real Time Connection and Support

Best Practices

Thank you and Welcome to FPRN Real Time Connection and Support.

We will be discussing the best practices for selecting a FPRN product, Planned Network Improvements, and Support Options.

A few things have to be considered before deciding what type of FPRN product you wish to use.

Intended Use
Sensor Language
Protocol
Type of Network Solution
FPRN Products
And
If you choose Single Baseline will you use zoning

Before we get started with the decision making lets talk about a very important number.

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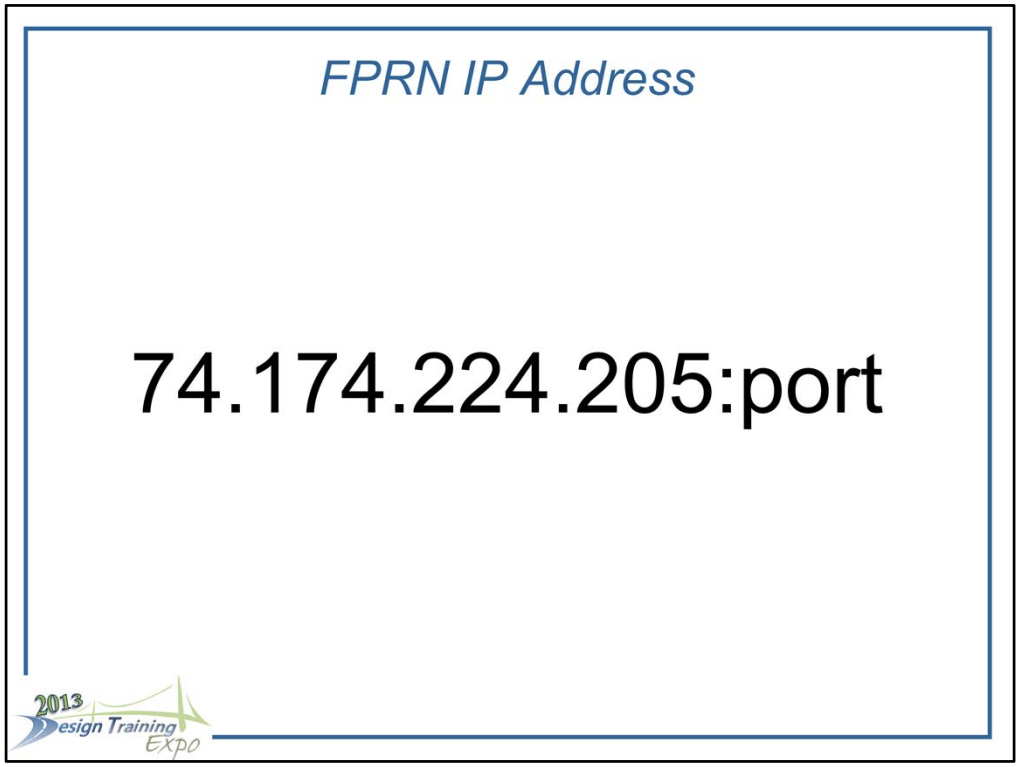

That number is the End-User IP Address.

This number is constant and will not change, at least until we migrate the FPRN servers, which we will talk about later.

The IP address is the primary connection for receiving Real Time Data.

The port number indicates the FPRN Product type.

For example a user may connect to 74.174.224.205:5401 with a mount point of VRSRTCM3

This is a connection for performing topography using the Radio Technical Commission for Maritime Service (RTCM) version 3.1, an automatic Virtual Reference System (VRS) Network Solution.

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What would be the best practice for locating control?

Use a network solution ?

Or

Use a single baseline solution?

Control should be located using single baseline from multiple stations and multiple satellite constellations.

I would locate the control by taking multiple readings, at least 5, from multiple stations, at least 4, using multiple satellite constellations, at least 2. Giving a total of 40 readings at each control point. This would require each point to be visited twice.

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Intended Use

- Control

Order	Survey activities	Maximum base error (95% confidence limit)	Maximum Line-length dependent error (95% confidence limit)
AA	Global-regional dynamics; deformation measurements	3 mm	1:100,000,000 (0.01 ppm)
A	NSRS primary networks	5 mm	1:10,000,000 (0.1 ppm)
B	NSRS secondary networks; high-precision engineering surveys	8 mm	1:1,000,000 (1 ppm)
C	NSRS terrestrial; dependent control surveys for mapping, land information, property, and engineering requirements	1st: 1.0 cm 2nd-I: 2.0 cm 2nd-II: 3.0 cm 3rd: 5.0 cm	1st: 1:100,000 2nd-I: 1:50,000 2nd-II: 1:20,000 3rd: 1:10,000

If you are trying to reach 95% confidence level for Class B, 8mm (0.026 ft), up to 5 % of measurements can be excluded if greater than .026 ft. from average.

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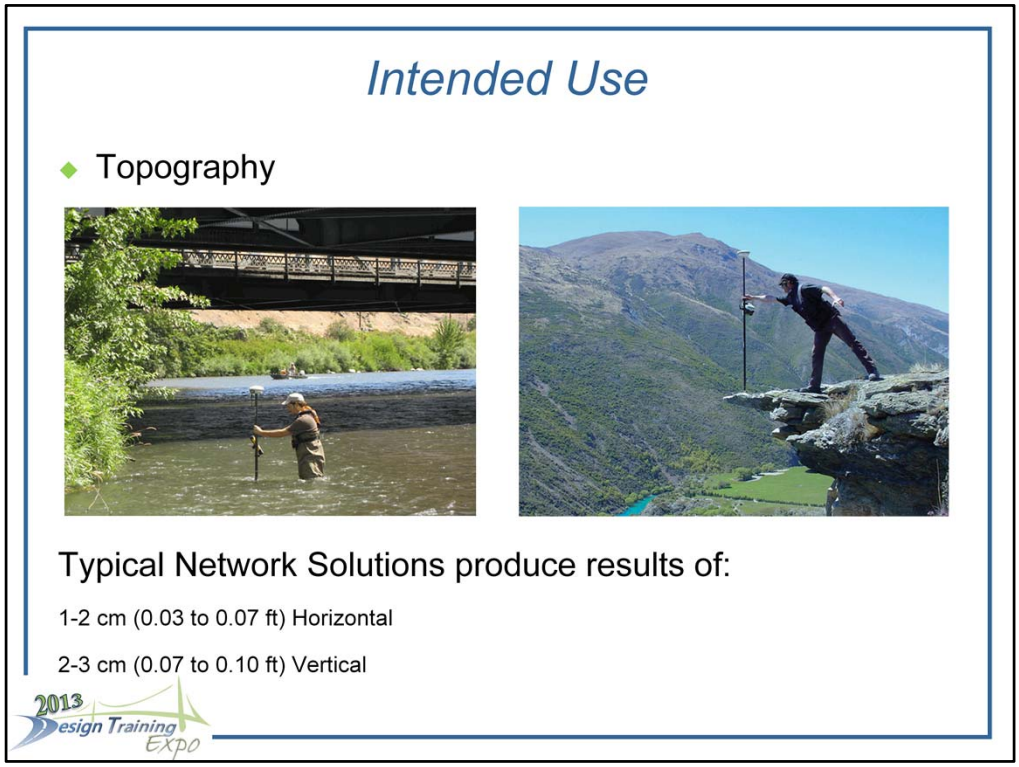

What would be the best product for performing topography?

Use a network solution ?

Or

Use a single baseline solution?

Actually this is a trick question.

The type of product would depend on the proximity to the reference station.

If your entire project is close to a reference station I would use single baseline.

If your project lies in between reference stations then I would use a network solution.

Typical Network Solutions produce results of:
1-2 cm (0.03 to 0.07 ft) Horizontal
2-3 cm (0.07 to 0.10 ft) Vertical

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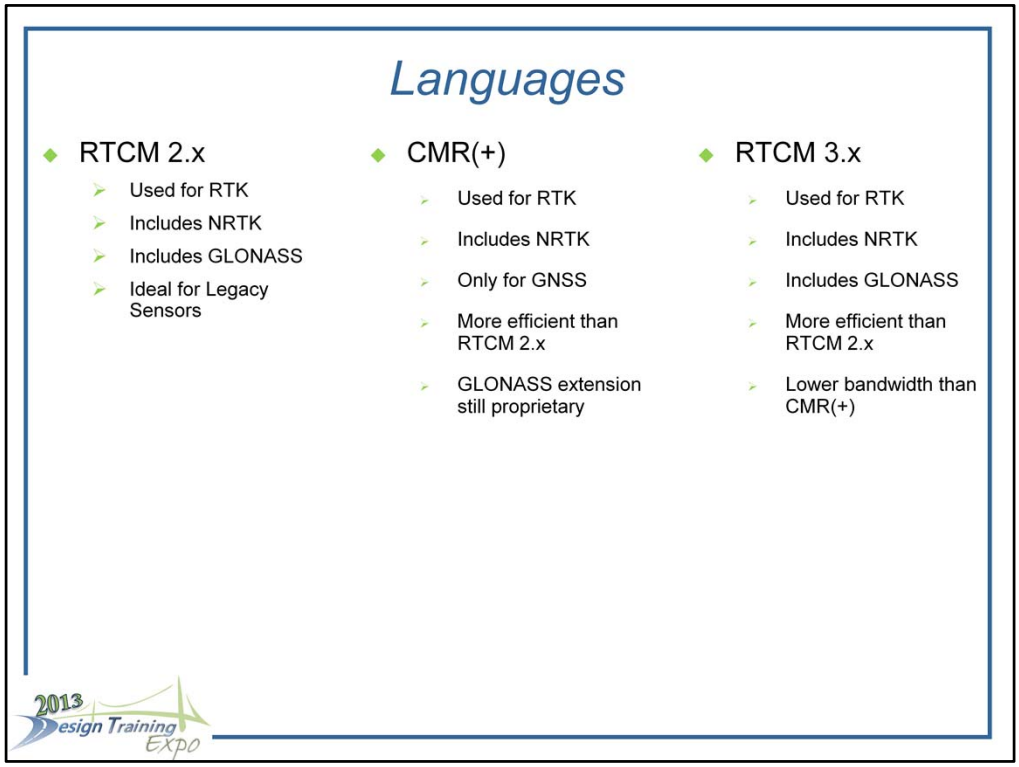

The Three common languages are:

Radio Technical Commission for Maritime Services (RTCM 2.x)

Compact Measurement Record (CMR or CMR+)

And RTCM 3.x

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All are used for Real Time Kinematic (RTK)

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All include Network RTK (NRTK)

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Both RTCM formats include Glonass Data

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RTCM 2.x is ideal for legacy sensors.

CMR+ was developed by Trimble

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It only includes GNSS data

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It is more efficient than RTCM 2.x

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However the Glonass extension is still proprietary

Is more efficient than RTCM 2.x and

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Has a lower bandwidth than CMR+

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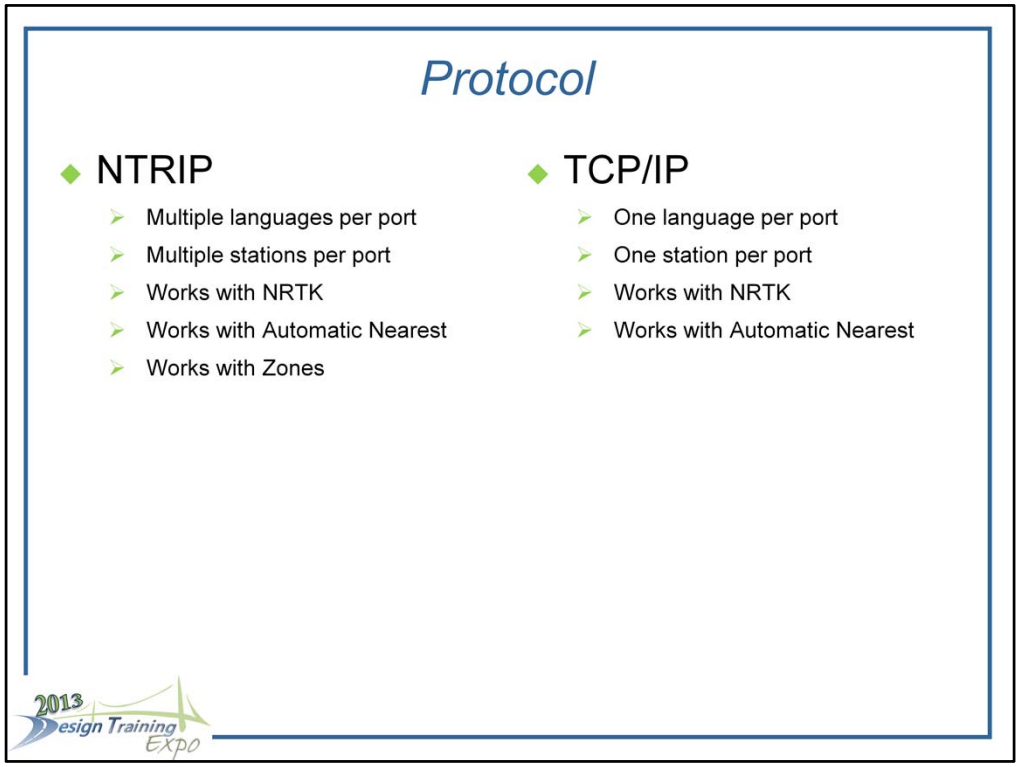

Now lets talk about Protocols.

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The two primary FPRN protocols are Network Transmission of RTCM over Internet Protocol (NTRIP) and Transmission Control Protocol/Internet Protocol (TCP/IP).

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NTRIP allows the FPRN to include multiple products under one IP port.

For example IP 74.174.224.205:5408 transmits the MAX network solution in RTCM 2.x, RTCM 3.x, Topcon, and Leica Proprietary Languages. The end-user simply has to choose the appropriate language mount point.

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While TCP/IP confines the FPRN to one product per IP port.

For example IP 74.174.224.205:5284 transmits the MAX network solution in the RTCM 2.x language,

While IP 74.174.224.205:5291 transmits the MAX network solution in the RTCM 3.x language, and
IP 74.174.224.205:5297 transmits the MAX network solution in the Leica Proprietary language.

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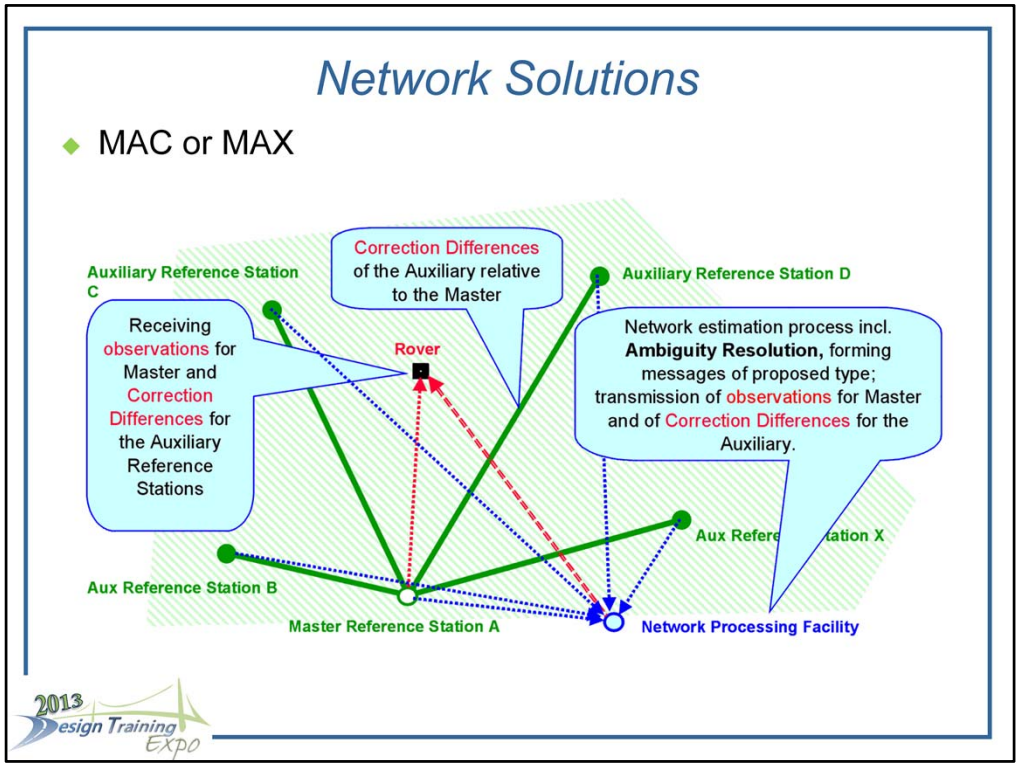

The Master Auxiliary Concept (MAC or MAX) is a network solution developed by Leica.

MAX works by creating a network and denoting one of the reference stations within the network as a master station and the remaining stations as Auxiliary stations. Then transmits the observations for the master and correction differences for the auxiliaries to the rover.

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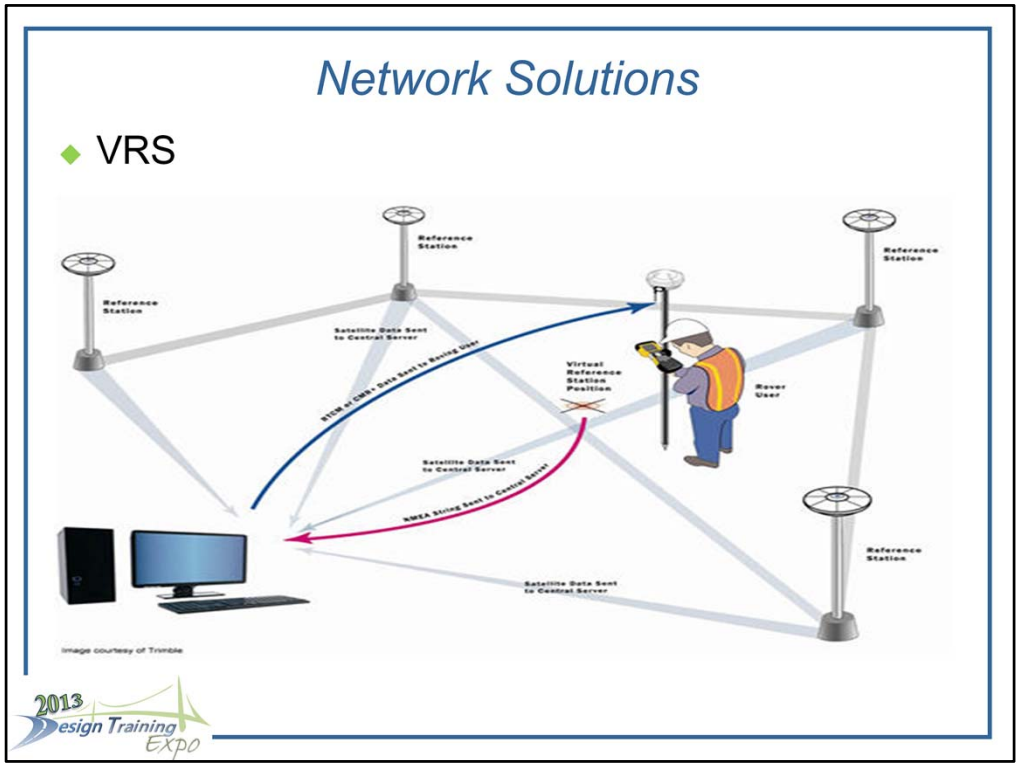

The Virtual Reference System is a network solution developed by Trimble.

VRS works creating a phantom reference station at the original broadcast location of the rover. Then transmits the observations for the phantom reference station to the rover.

What network solution do you think would be the easiest to repeat?

With either network solution what would the end user need to do when collecting topographic data on a project that spans several miles?

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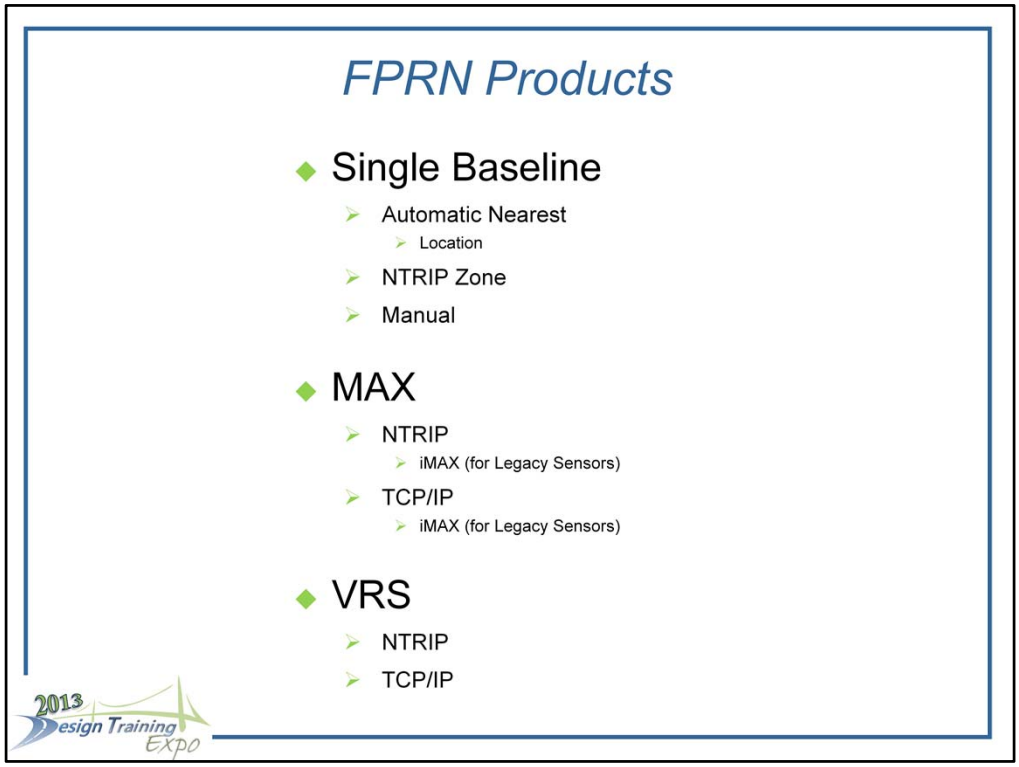

Now lets talk about FPRN Products.

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The Single Baseline product comes in three protocols,

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Automatic Nearest which is based on location

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NTRIP zone which uses the zone map and

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Manual which requires pre-programming of the sensor or the user to carry a list.

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The Max Network solution also comes in two protocols, NTRIP (with iMAX for Legacy Sensors) and TCP/IP (also having iMAX for Legacy Sensors).

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The VRS Network solution also comes in both NTRIP and TCP/IP protocols.

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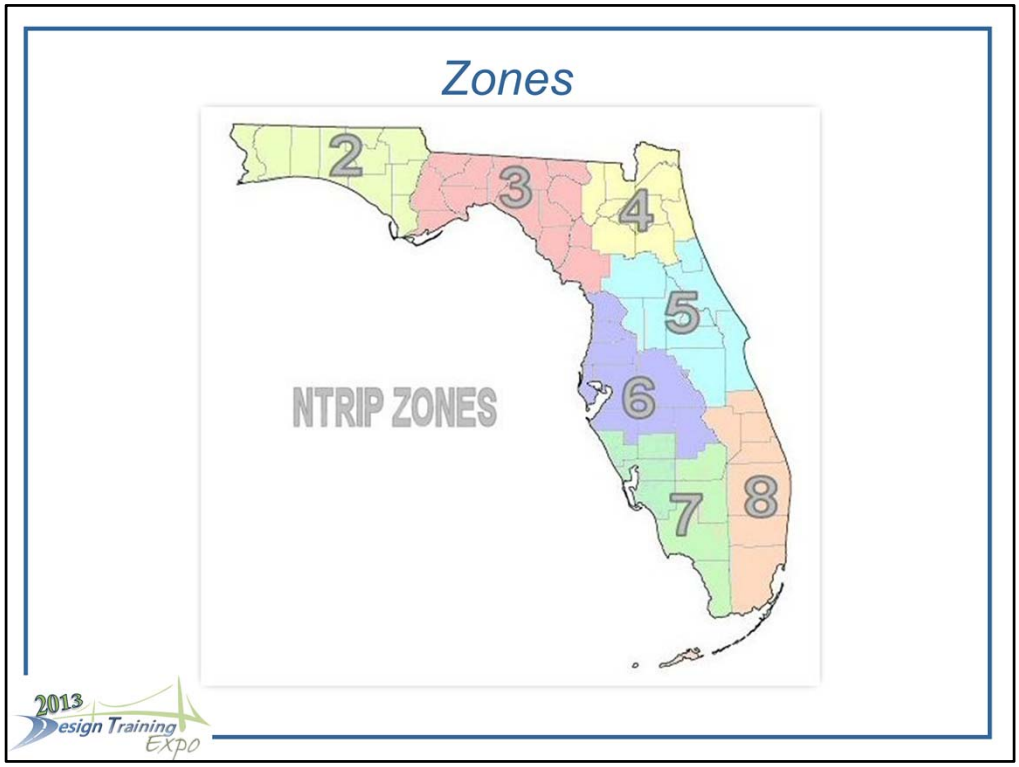
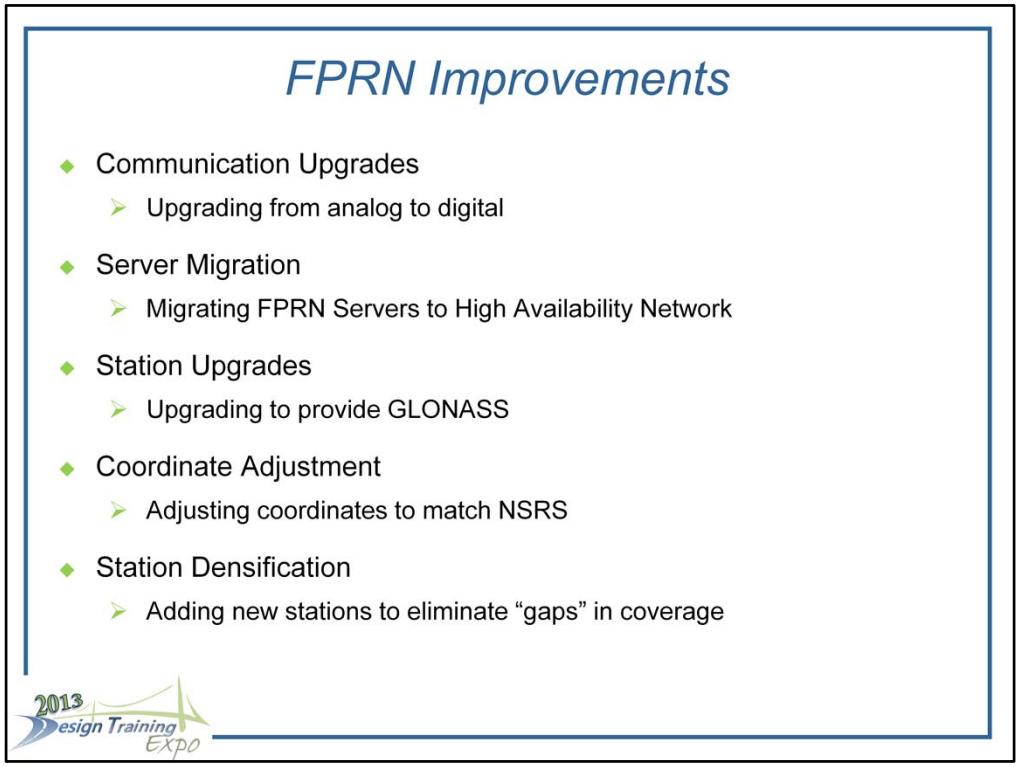


These zones are used in the NTRIP protocol when using the single baseline solution.

For example the end user is using the single baseline solution for locating control on a project.
The user enters IP address 74.174.224.205:5451 for Zone 5, then selects mount points DLND, SNFD, LEES, ORL1, and HULK and records five observations from each mount point. The user returns the point after the satellite constellation changes significantly and repeats the process. This would give 50 observations for the control point.



As you may or may not know the FPRN was created over ten years ago when most of the internet connections were dial up. Now that the primary internet connection is digital we are in the process of converting the reference stations.

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We are in the middle of migrating the FPRN servers to a Shared Resource Center. This takes the day-to-day operation of the FPRN servers out of the hands of the FDOT and allows us to concentrate on service and support.

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We are planning on upgrading all the FDOT controlled reference stations to antennas and sensors that support Glonass and are easily upgradable to support other satellite constellations when they become available.

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In the future we will be doing a State-wide coordinate conversion to bring the FPRN onto the National Spatial Refernce System (NSRS).

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We have been looking into Station densification in order to eliminate “gaps” in coverage.

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And finally let's talk about support.

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The first line of support is the FPRN web page located at www.myfloridagps.com. On the site you will find answers to commonly asked questions and tutorials for equipment setup.

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Second, if you are having problems that are not answered by the FAQ or the tutorials, please send and email to the support desk.

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If none of the above help you out please do not hesitate to call myself or Scott Harper.

Thank you.