ArcGIS Apps and GPS GNSS Connections
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Agenda

• ArcGIS Apps and high accuracy data
• The importance of high accuracy data
• Making connections to external receivers
• Bringing it all together in Collector
• The importance of GNSS Metadata
• Common troubleshooting
• Future Developments
The importance of high accuracy data

- Improve existing data
- Modernize field workflows
- Precise field data collection
- Less post collection cleanup
- Project requirements
  - State or Local government projects may require:
    - Sub-meter accuracy for all points collected
    - 95% confidence interval
    - All spatial data collected in NAD83 datum
Choosing your Receiver

- A wide selection of GPS receivers on today’s market
- Receiver must support the output of NMEA sentences
- Most are supported with Android and Windows; iOS is more restrictive
- Vary in cost, complexity, and accuracy levels
Examples of 3rd Party Applications

- GNSS Status (Trimble)
- EOS Tools Pro (Arrow)
- Bad Elf GPS Utility (Bad Elf)
Making Connections to External Receivers

1. Install 3rd party app
2. Pair with receiver
3. Configure receiver in 3rd party app
Bringing it all Together in Collector

Launch Collector

Set receiver as Location Provider

Open map to verify location
Configuring your External Receiver for use in Collector
Adding and Understanding GNSS Metadata

- Why is GNSS Metadata important?
- Adding the GNSS Metadata fields
- Situations for populating certain fields
- Using the Metadata to troubleshoot data collection issues
- Capturing altitude values
Common Troubleshooting

My data is not as accurate as I expected
- Required location accuracy
  - Check GNSS Metadata

I am not getting a position
- Go outside
- Avoid buildings and trees
- Give device more time
- Verify position in other software

My position is moving, but I am not
- Remember this follows the receiver and not your device
- Your position will adjust over time

My accuracy reading differs between Collector & 3rd party app
- Check confidence interval setting in Collector
- Switching between apps takes time

My data is offset or appearing in the wrong location
- Try it now GNSS Capture Web Map
  - Removes your data and Web Map from the equation
- Testing GNSS Metadata field population

My data is offset or appearing in the wrong location
- Verify with a NGS landmark
- Check Location Profile, especially if using corrections
Troubleshooting Offset Data
Other Applications

Survey123 for ArcGIS
- Supports the use of high accuracy receivers. However, there is no user interface that can be used to configure the receiver in Survey123. Subsequently, the GNSS metadata cannot be extracted and there may be limitations with how accuracy is displayed.

Workforce for ArcGIS
- High Accuracy workflows can be utilized by App Integration with Collector or Survey123

Navigator for ArcGIS
- Non-professional grade receivers can be used for navigation and nonauthoritative data collection activities

Collector (Aurora Release)
- Currently in beta with a full release coming in Q3 of 2018. The addition of Direct support for \( z \)-values within Feature Classes will be added.
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Key Takeaways

- Importance of high accuracy data
- Guidelines for choosing and configuring your external receiver with Collector
- The role of GNSS Metadata
- Key troubleshooting approaches and examples
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**Helpful abbreviations**

- GPS = Global Positioning System
- GNSS = Global Navigation Satellite System
- RTK = Real Time Kinematic (real time corrections)
- NMEA = Nation Marine Electronics Association
Accuracy vs Precision

The term GPS accuracy is a rather over-used term. However it can be said that the levels of GPS accuracy are extremely high these days, even for civilian use GPS units. It is also worth defining the difference between accuracy and precision:

GPS accuracy - The accuracy refers to the degree of closeness the indicated readings are to the actual position.

GPS precision - Is the degree to which the readings can be made. The smaller the circle of unknown the higher the precision.
Selecting a receiver

- Ensure the device supports the output of NMEA 0183 sentences
- See other requirements and a list of tested receivers here:
Making Connections to external receivers: Trimble R1

- Install the GNSS status app to the device
- Turn on the external receiver and switch to pairing mode
- Pair the GNSS device with the phone/tablet using Bluetooth
- GNSS Status app (3rd party app)
  - Check for error messages and lights while pairing
- Take the devices outside.
- Working with the GNSS Status app:
  - Home Screen. Shows a question mark if a GNSS signal is not being picked up.
  - It shows the accuracy of the signal (metrics vs. USA can be changed in App Settings. It shows the battery power of the device.
  - Detailed Status. This is filled out when a GNSS signal is received.
  - Real-time Config. Uncorrected is the Default. Please refer to device instructions and base station for configuring real time corrections
Bringing it all together in Collector

1. Once the phone or tablet is communicating successfully with the device, it can be configured in Collector.

2. Configuring Collector to use the external GPS device
- Follow the directions outlined in the Collector documentation here:
Common Troubleshooting

• Use GNSS Metadata to gather info regarding receiver, fix type, and accuracy
  - Try It now account before logging into Collector

• Initial setup:
  - Go outdoors to an open area, away from tall buildings and trees. Acquiring satellite signals may take several minutes or more on a cold start of the device
  - Verify position in other software

• Remember your location follows the external receiver, not your phone/device

• Accuracy readings different in Collector vs 3rd party app
  - Accuracy readings may appear worse in Collector if using 95% confidence interval
Common Troubleshooting cont.

• Known issues:
  - Workflow BUG-000112562 - After selecting the Trimble R2 on Collector for ArcGIS (iOS) as the location provider, then setting the location profile, the location may not display until Collector is force closed, then GNSS Status Utility is reopened before Collector.
  - When using RTK on Android with Eos Pro tools - Both Collector and Eos Tools Pro cannot connect to the receiver at the same time.

• TIP: If using RTK, set a required accuracy in Collector so it will not collect data if you lose this connection and drop to SBAS, etc.

• Troubleshooting offsets in data collected: RTK and Location profiles
Datum Transformations:
For reference when setting up a Location Profile

DT1 - Web Layers to Geodatabase Feature layers
The web map has a coordinate system that is defined by the basemap that you use. ArcGIS Online basemaps use the Web Mercator coordinate system and reference WGS84. You can use your own base maps which reference other coordinate systems, but this must be taken into consideration.

DT2 - Web Map to Web Layer (Feature Service)
When Collector synchronizes edits it checks the coordinate system of the feature service layer and the web map and if required will project GIS features into the coordinate system defined within the feature service. All feature service layers may not have the same coordinate system as it is not required but good practice to do so.

DT3 - Web Layers to Geodatabase Feature Layers
The feature service coordinate system is set by the coordinate system of the active data frame in ArcMap when it is published. This may be different than the coordinate system of the geodatabase.
Issues connecting to a receiver

- Ensure device is configured to capture NMEA sentences
- **For Windows only:** Collector is a UWP (universal windows platform) application and cannot access a COM or serial port directly. You will need to install a third party application to work around this that maps these communications to a Windows GPS Sensor (location sensor) for Windows applications to be GPS sensor-aware. [GPS direct](https://www.gpsdirect.com) is an example of this type of software.