RTK Networks – What, Why, Where?

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Background (1)

RTK (Real-Time Kinematic) – a proven method of positioning in real-time at the cm-level. Invented in the early 1990's.

RTK makes GPS/GNSS a very efficient tool for some tasks such as construction staking, machine control, topographic surveys and many others where precise real-time positioning is valuable.

Traditional RTK is a single-baseline solution between a base station and a rover unit.

Background (2)

Critical components for successful RTK operations:

RTK-capable GPS/GNSS receiver

Lots of satellite observables.

Solid, reliable communication between base and rover.

Background (3)

By the late 1990's, RTK became a reliable, mainstream technology for surveying and construction.

The CORS (Continually Operating Reference Station) concept was growing.

Users were individually buying a lot of reference stations to support their RTK operations and most were operating in metropolitan areas.

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- All of the reference stations in the Cluster are managed by a single entity.
- The reference stations in the Cluster are typically owned by the managing entity and/or by cooperative partners who want to utilize the Cluster.
- The user must select which reference station in the Cluster they wish to use. This is typically the reference station closest to the user to minimize distance-dependent errors.

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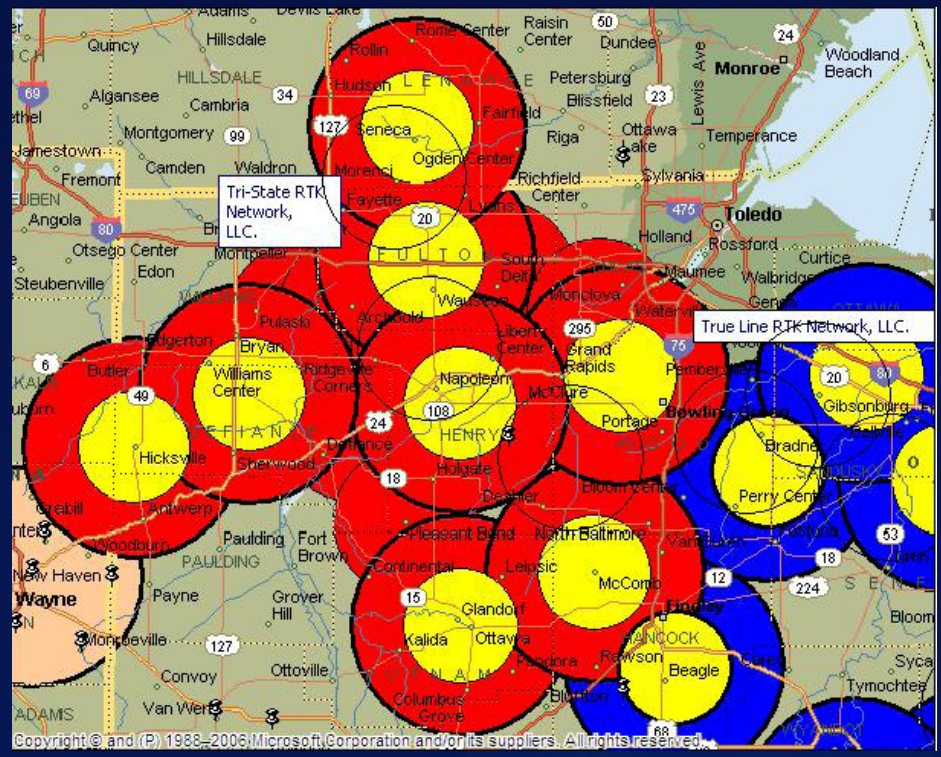
- To the right is a typical RTK Cluster located in the US that is used for agriculture.
- The operator states that users will experience ~1 inch accuracy within the yellow circles (~6 mi.) and 1-2 inch accuracy within the red circles (~12 mi.)



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3. Significantly reduces the capital equipment cost of implementing high precision GPS especially when field work is spread out over a wide area.
4. Hundreds of millions of acres of land are now covered by RTK Clusters. One of the largest RTK Clusters in the US covers over 8M acres.

RTK Networks

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Outwardly, they appear similar to RTK Clusters.
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3. RTK Network (software) largely mitigates distant-dependent variables such as the ionosphere, troposphere and orbit errors.

RTK Networks (cont.)

4. RTK Network infrastructure (hardware and software) is much more complex than an RTK Cluster.

   Reference station data is processed

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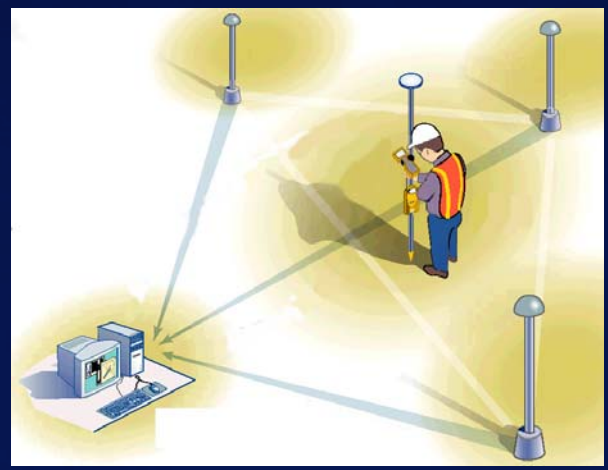

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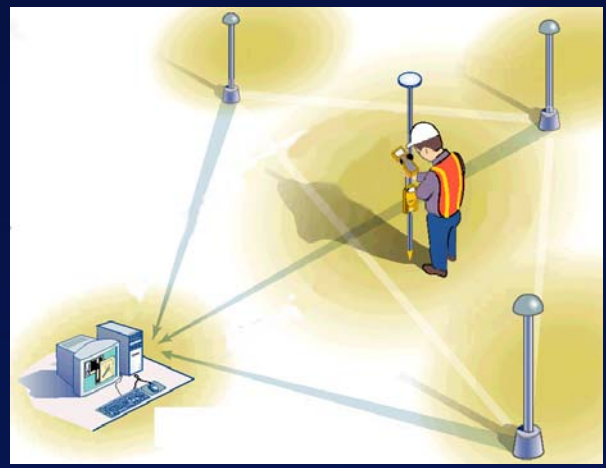

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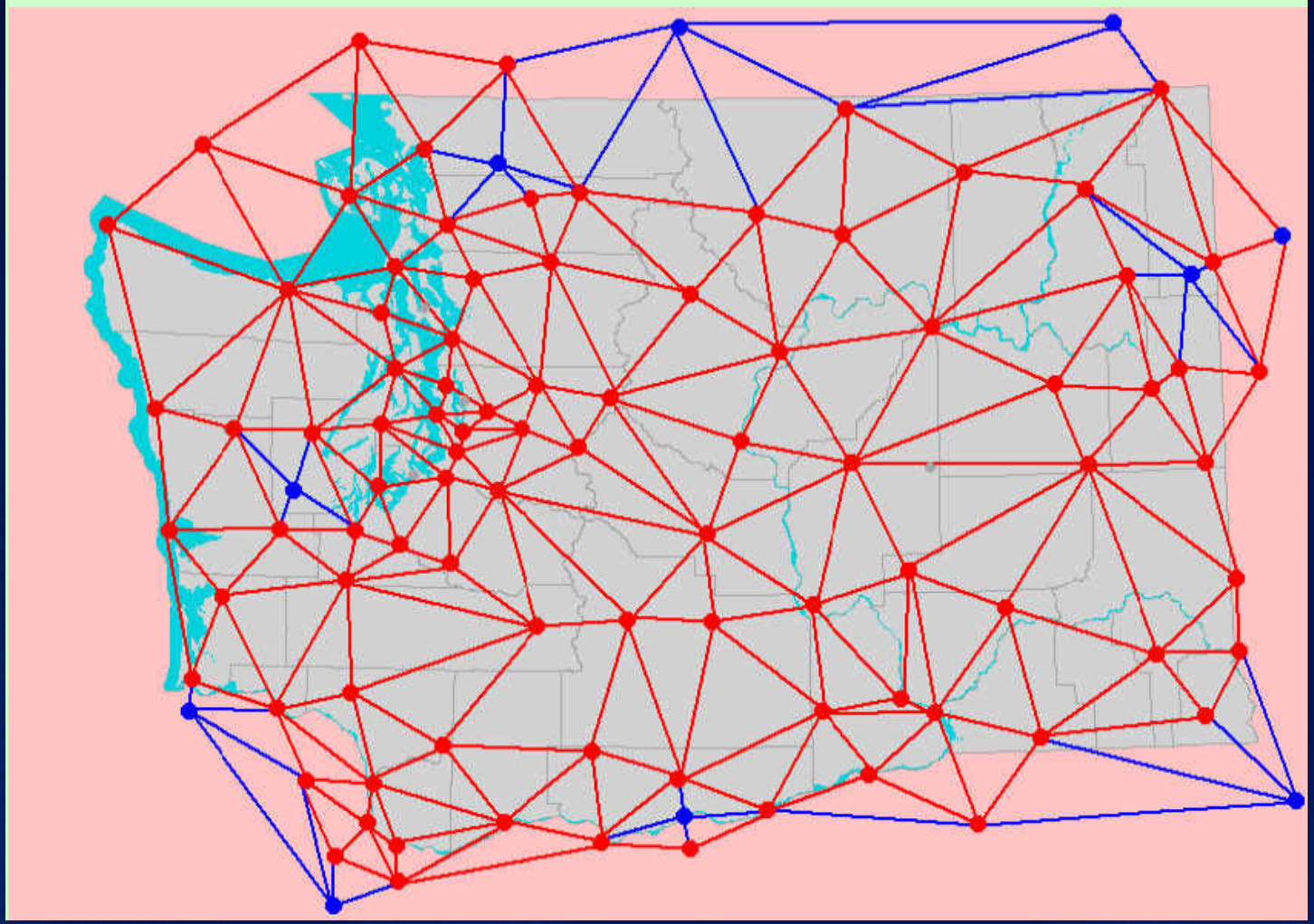
5. Communications to the rovers are completely different. RTK Clusters typically use UHF/VHF/Spread spectrum radio technology. RTK Networks typically use mobile phone wireless networks for communications.

Washington State Reference Network



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• GSM/CDMA wireless networks -

Pro: wide area coverage, license-free.

Con: coverage may not exist in work area, dropped calls, cost.

WiFi/WiMax???

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- Increasingly, public and public/commercial partnerships are building RTK Networks and leveraging off of existing infrastructure.

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- Newer Networks such as the State of Iowa network are built and marketed to accommodate both survey engineering users as well as agriculture users.

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• On the other hand, Networks are increasingly being funded, built and managed by government entities. In February 2009, the Iowa Department of Transportation began operating a statewide RTK Network that is free of charge to all users. Other US states are and are planning to offer the same. Some government-funded country-wide Networks like Croatia and Turkey are subscription-based.

Take Away Messages

- RTK is a proven technology for precise positioning.
- RTK Networks/Clusters reduce equipment cost and increase productivity for RTK users.
- RTK Clusters will eventually phase out in favor of RTK Networks.
- Increasingly, publicly funded Networks are being built and managed by public entities with many offering free subscriptions.

Questions?

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