




Trimble

Multi-purpose and Multi-users Real Time Network...


May 19, 2011
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Agenda

- **Modern GNSS Infrastructure**
 - Adoption of RTN is *fait accompli*
 - Modern Geodetic backbone for Surveyors
 - New geocentric customers emergence and adoption
- **Emerging Economies and RTN:**
 - Different realities
 - Different needs
- **3rd Generation RTN solution**
 - More scalability of accuracy → More users
 - More applications → More users²
 - → Lower cost per user

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Infrastructure & GNSS Infrastructure



“Without a stable foundation a building will collapse”

Infrastructure Examples:

- Cellular Towers
- Interstate Highway Network
- Power Grids
- Fiber Optic Backbone
- GPS is the 9th Utility!



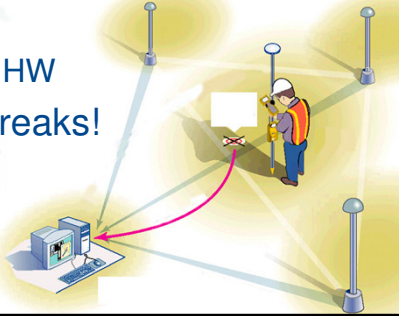

*Infrastructure systems are enabling technologies
...and economies!*

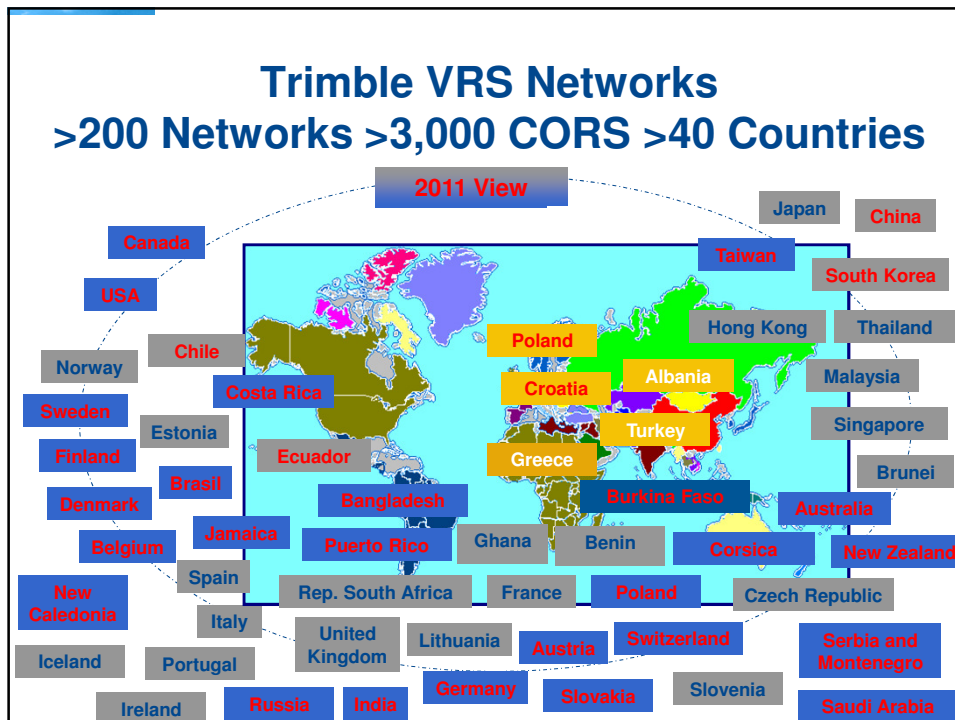



Lessons Learned

- Emergence of RTK network in Europe (DE) in the 90s
 - IT to compute complex solutions
 - IONO modeling & low IONO conditions
 - LAN communication to CORS
 - Wireless revolution
 - Reliable CORS L1/L2 HW
- ...Quite a few lucky breaks!

GNSS Infrastructure makes centimeters ubiquitous!



Lessons Learned

- Trimble VRS™ Network deployments
 - Gradual adoption: Central Europe → AM → Asia
 - Based on Cadastral Reform – Digital World (CN)
 - Follows Industrial Comm. Networks Deployment
 - As Cadastral implementation appears in new Emerging Economies, similar RTN requirements exist

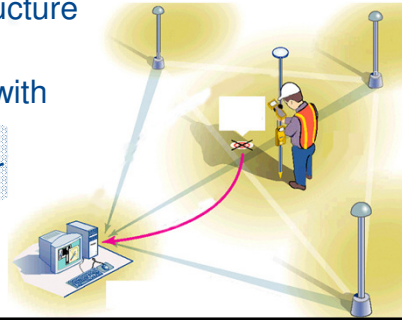
But required IT communication infrastructure are lacking so *Made in Germany* will not work in most African countries on day 1






How to replicate elsewhere?

- Evidence is that a singular unified RTN backbone network is critical to successfully implement and maintain a cadastre
- But the EU, AM and Asia models are not always possible in Emerging Economies:
 - Lack of basic infrastructure
 - Legislations
 - Skill and experience with modern technologies
 - Accuracy needs differ



How to replicate elsewhere?

- The value of the land and of its use defines the accuracy of its cadastral registration.
 - “Germany” cm accuracy is not always needed nor justifiable
 - Accepting and implementing sub-meter accuracy reference backbone provided the scalability towards cm-accuracy is planned from the beginning is a better plan!



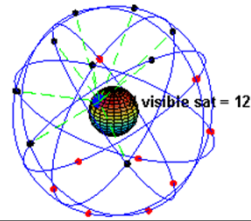


Trimble VRS³Net

- 3rd Gen. RTN technology – more scalability

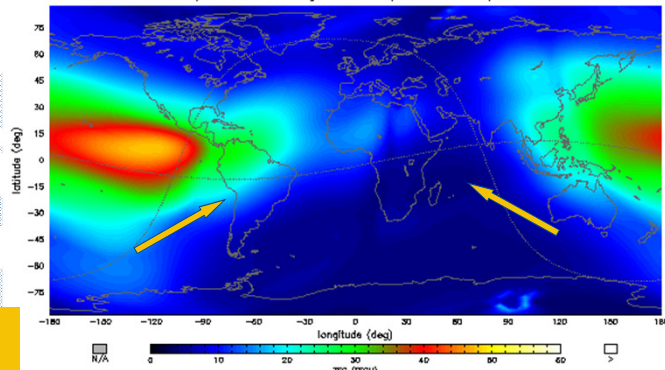
The first step – 3 steps → Accuracy:

1. Today Sparse CORS model with periodical upload and post-processing (AFREF model)
2. To Sparse VRS @ >150Km station spacing producing 10 cm (Horizontal)
 - IONO Dependant



Inter-Station spacing = a function of the IONO activity

TEC MAP (height= 450.0 km) at 1998/07/16,01:00:00
 eeo/eeoc CP: vertical integration over Chapman Profile model 49 stat



Developing regions are most affected

Vertical Total Electron Content on a global map, as derived from GPS base station observations in a calm ionosphere (1998)



Trimble VRS³Net

- 3rd Gen. RTN technology – more scalability

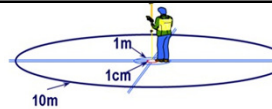
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1. Today Sparse CORS model with periodical upload and post-processing (AFREF model)
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 1. IONO Dependant
3. To regional (island) densification @ 50Km to achieve 2-3 cm accuracy

GNSS Infrastructure makes centimeters ubiquitous...eventually!



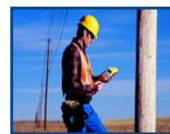
Positioning Applications



Construction



Surveying



GIS



In-vehicle Navigation



Infrastructure



Agriculture



Wireless Infrastructure



Asset & Fleet Management



Portable Devices



For the few or the many?

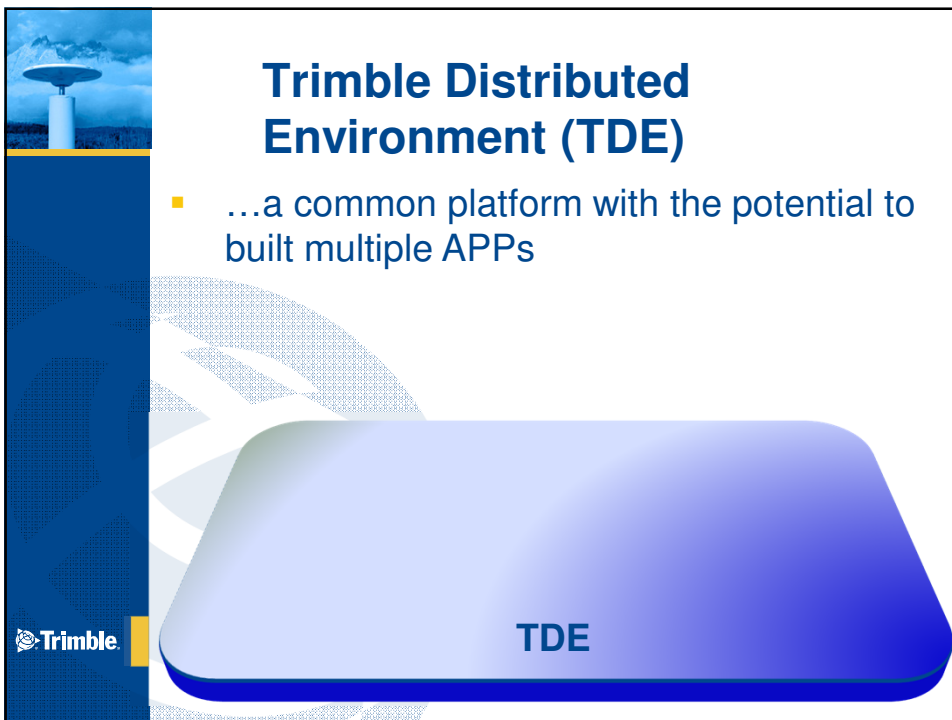
- Barrier to RTN deployment - cost vs. number of users
- So ↘ cost – simply ↗ # of potential users
- How? Simply ↗ the number and type of applications (APPs) on a common platform

The next significant step - TDE

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GNSS Infrastructure makes centimeters ubiquitous!

This slide features a vertical sidebar on the left with two images: a GNSS antenna on a tower and a surveyor with a total station. The background has a faint globe graphic.



Trimble Distributed Environment (TDE)

- ...a common platform with the potential to built multiple APPs

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TDE

This slide features a vertical sidebar on the left with a GNSS antenna image and the Trimble logo. A large blue rounded rectangle at the bottom contains the text 'TDE'. The background has a faint globe graphic.

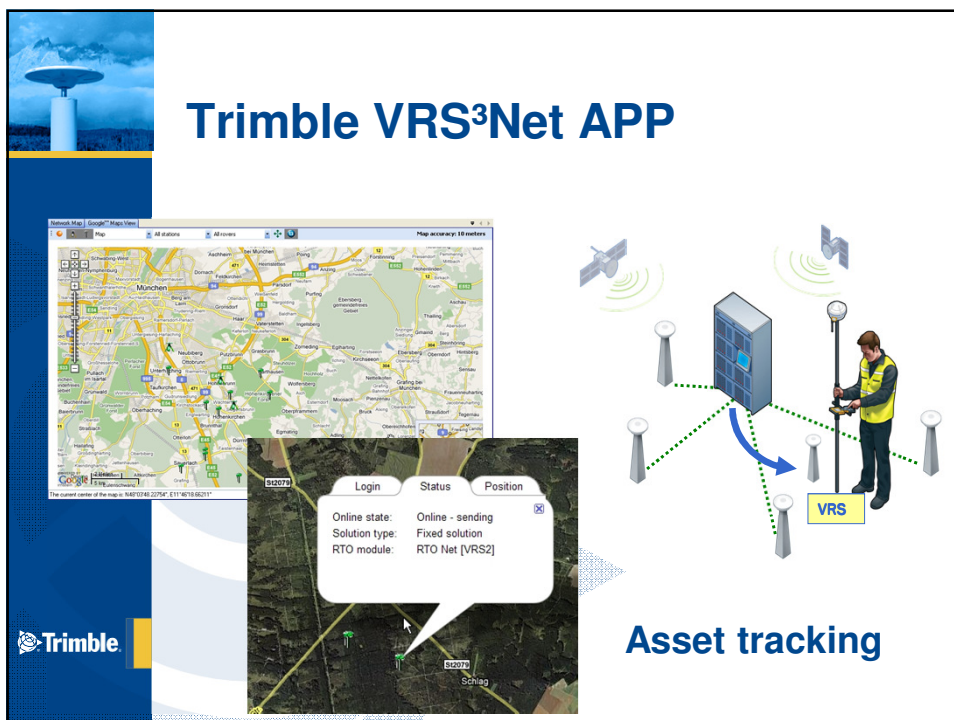


Monitoring APP

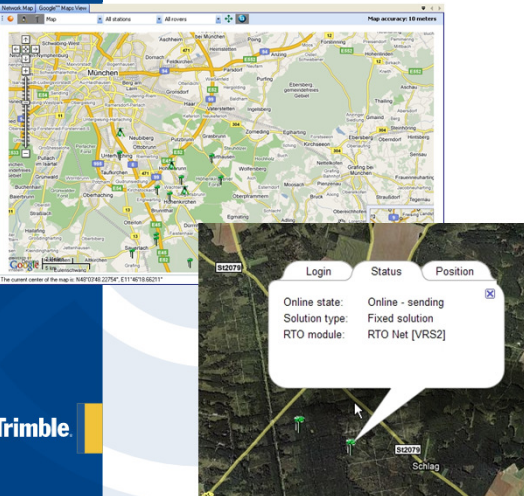

- **Trimble 4D Control**
 - Small and mid scale monitoring applications
 - Dam, Mines, Bridges
- **Trimble Integrity Manager**
 - Lager scale monitoring applications
 - Tectonic plates, GNSS networks




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Trimble VRS³Net APP

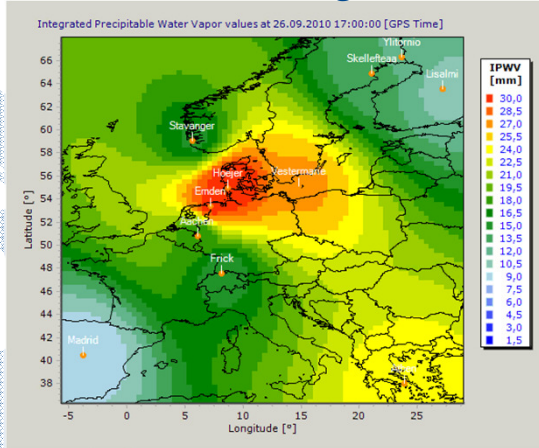
Asset tracking

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Atmosphere APP

Precise IPWV for *nowcasting* weather model



Integrated Precipitable Water Vapor (IPWV)



Conclusion

- Most *Western World* is covered with RTN
- Emerging Economies – Different needs

Solution: Trimble **VRS³Net**

- 3rd generation RTN
- Platform to build new APPs
- A fully scalable solution:
 - Variable accuracy at variable density
 - Increased # of applications
 - Increased # of users
- Reduced cost per users/department

