



5 March, 2014

**XXV International Federation of
Surveyors Congress, Kuala Lumpur,
Malaysia, 16 – 21 June 2014**



The Reasons to Succeed or to Fail a GNSS Network RTK Project ...

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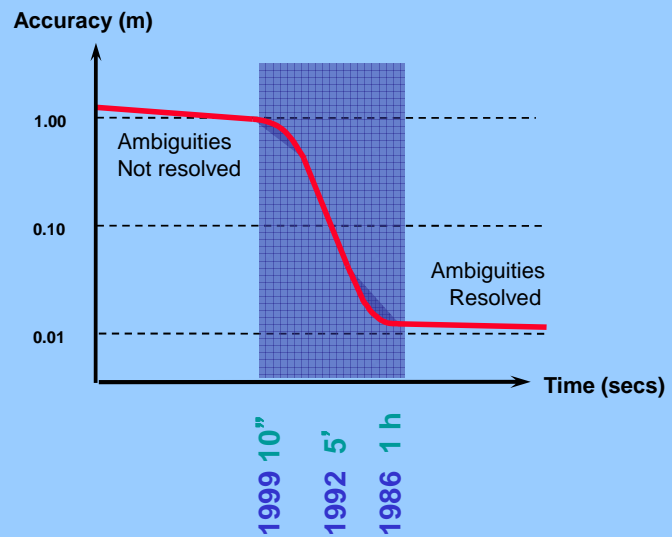
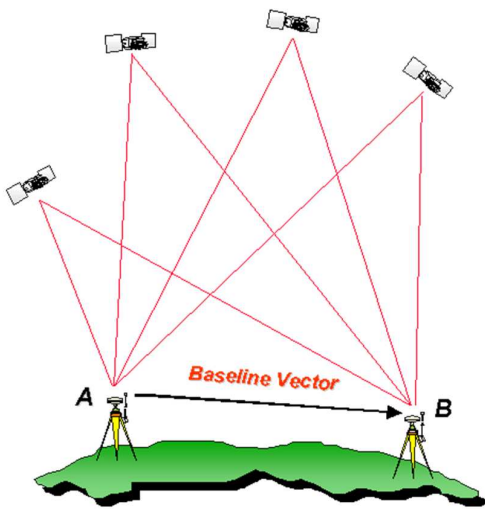
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Scope (Business Plan), Budget
(Financial Plan), Design, Implementation
Final Acceptance, Operations,
Maintenance ...

There are reasons to succeed and
reasons to fail a GNSS Network RTK
project like any other project ...

« Differential » GPS, GLONASS and BDS is the key for precise positioning



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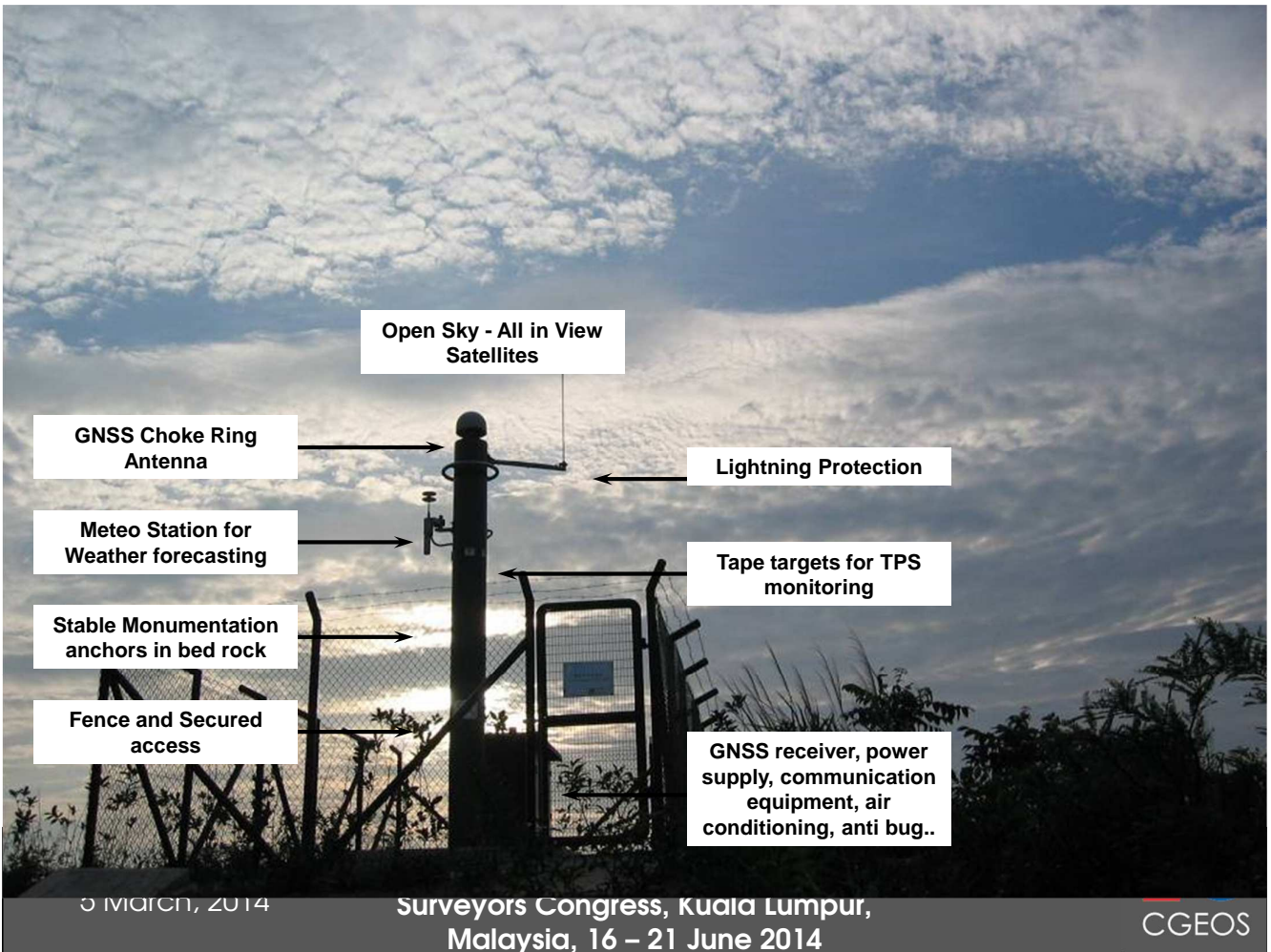
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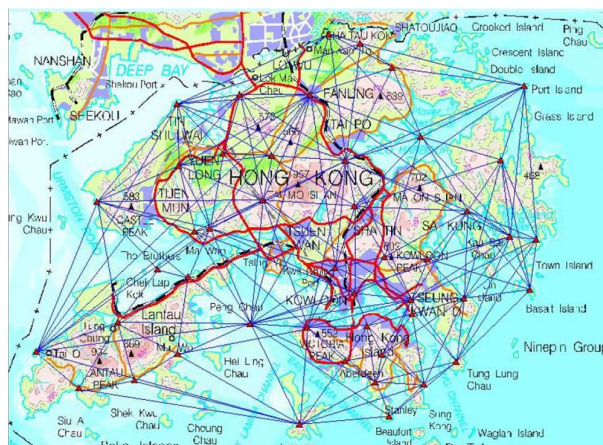
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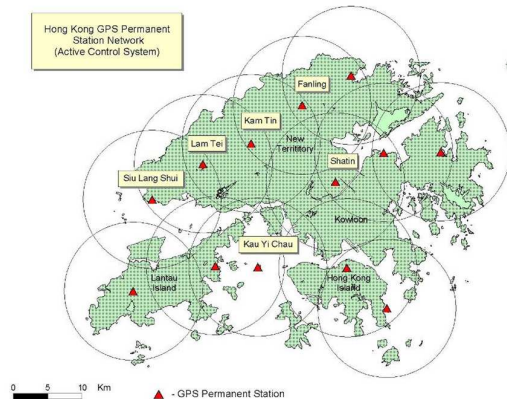


Economical Justification ...



Most of the GNSS Network RTK projects have been developed by the **economical justification that an active geodetic network would reduce the cost of maintaining a traditional geodetic network** where the maintenance of the benchmarks and the control survey were a significant part of the owner's budget.

Economical Justification ...



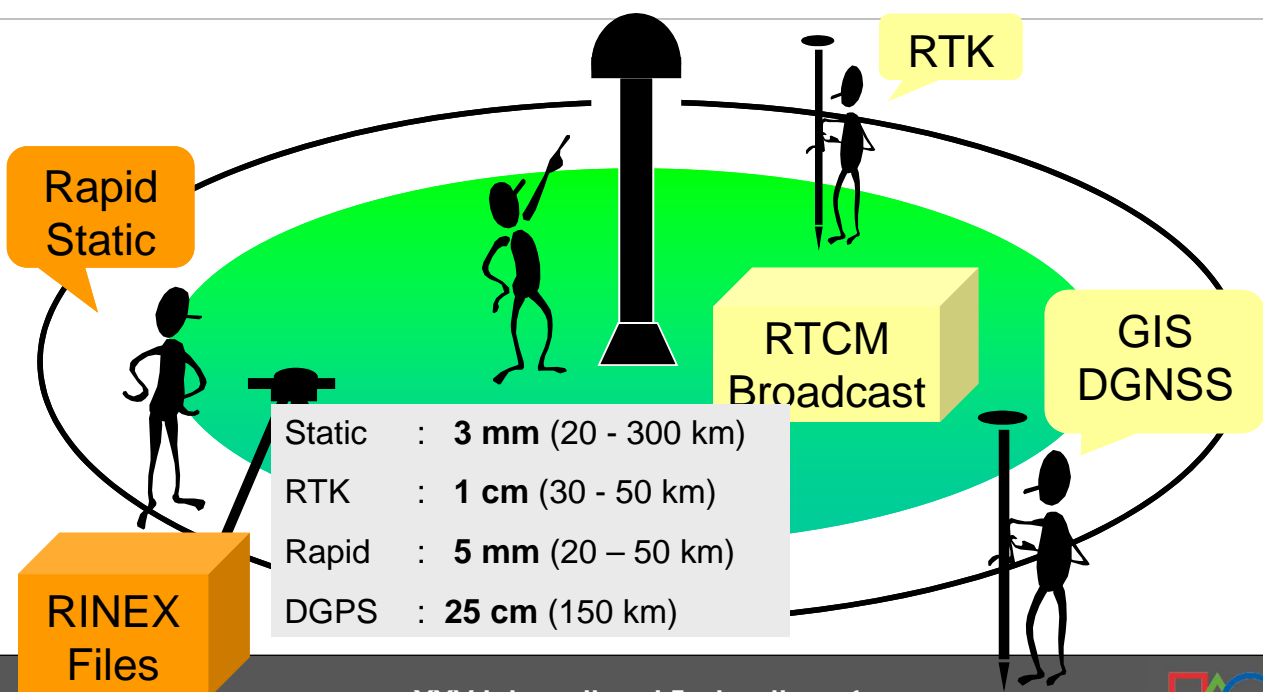
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Single Base GNSS Reference Station Products



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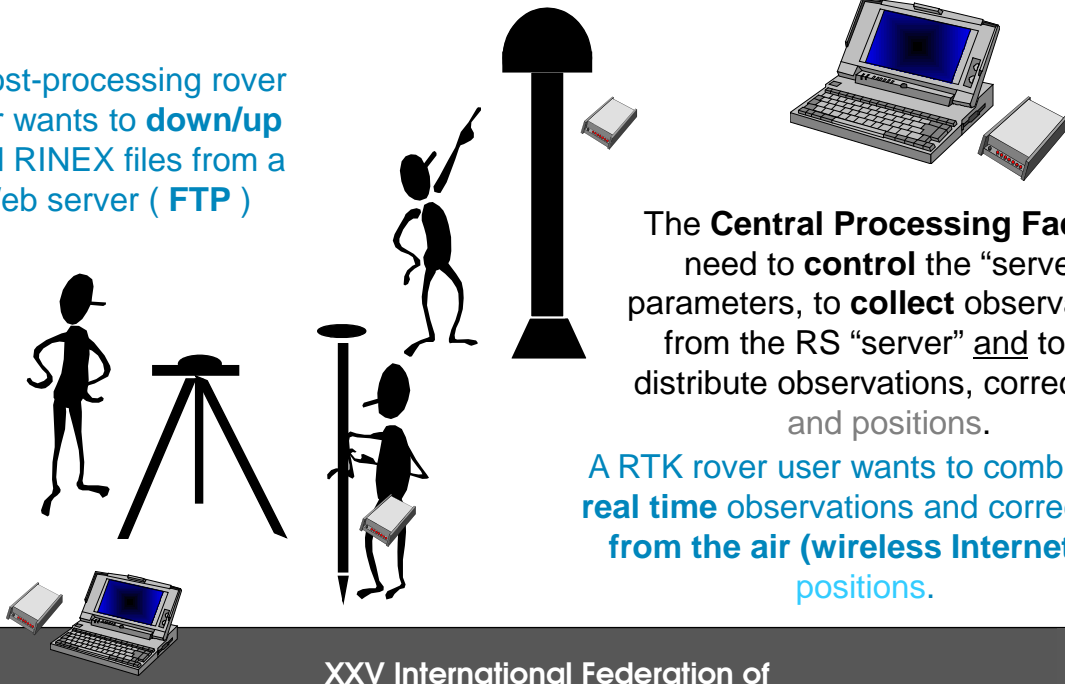
Communication and GNSS Reference Station.

A GNSS Reference Station is a “server” of observations. (GNSS + Tilts + Meteo)

A Post-processing rover user wants to **down/up load RINEX files** from a Web server (**FTP**)

The **Central Processing Facility** need to **control** the “server” parameters, to **collect** observations from the RS “server” and to re-distribute observations, corrections and positions.

A RTK rover user wants to combine in **real time** observations and corrections from the air (**wireless Internet**) or positions.



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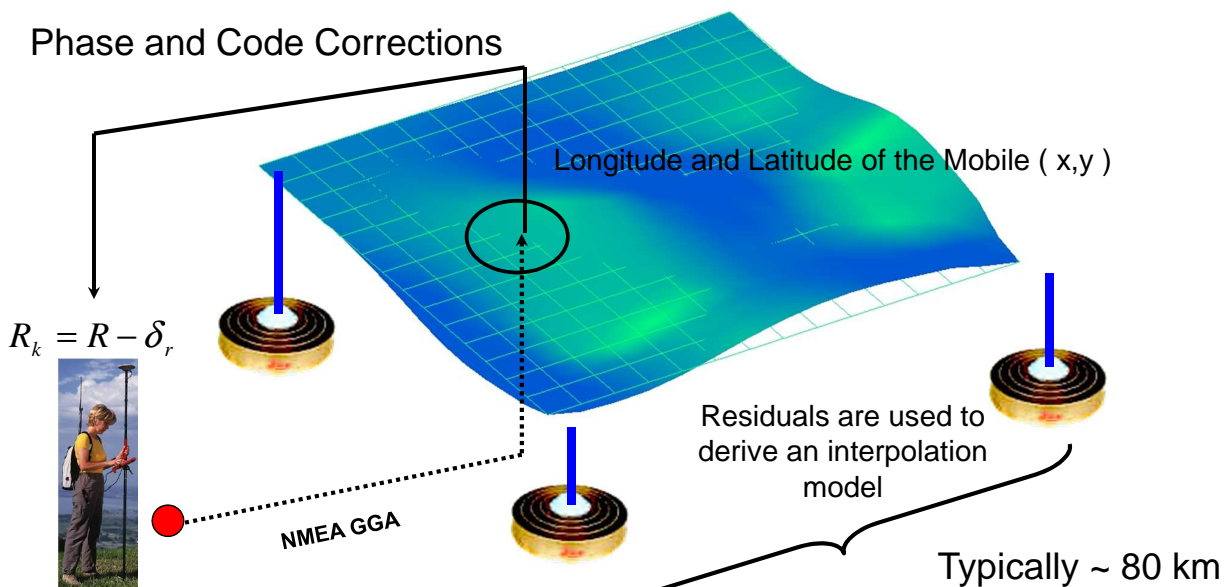


Derived Observation Corrections

$$\delta_{r0} = \alpha(N_0(\varphi - \varphi_R) + E_0(\lambda - \lambda_R)\cos(\varphi_R))$$

$$\delta_{r1} = \beta \cdot H(N_1(\varphi - \varphi_R) + E_1(\lambda - \lambda_R)\cos(\varphi_R))$$

Phase and Code Corrections



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« The GPS Network RTK of
the Surveying and Mapping
Institute of Kunming PR China
is the basis infrastructure of
our digital City »

Vice-Director WU Limin



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Questions ...

- Is there still a future for such infrastructure and what would be the conditions to make them sustainable?
- **What is the real economy? Is selling corrections the only product and how the users are prepared to pay for a service that could be still delivered by setting up their own local GNSS Base Station?**
- How to deal with the security that most countries are concerned with in term of releasing precise coordinates?
- Will we be able to cope with the new constellations signals?
- **Is Precise Point Positioning the technology that will make the GNSS Network RTK obsolete?**
- Where are the hidden costs and how much the communication infrastructure is affecting the operation expensive?
- **Multiple applications or only distribute corrections?**

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The reasons to fail ... when there is no user !

- The most important is to remind the sentence that “**how a project starts, a project ends**”.
- If a GNSS Network starts without serious investigation on user’s needs and expected services delivered in term of accuracy and availability, reliability and format, **it will fail**.
- If a GNSS Network starts without reviewing and consulting with all the potential users, it will fail.
- Workshop, training, documentation, access to the network services, website, user’s day, ... and ... publicity !
- Marketing is certainly important and no one will be surprised to assist a failure when few people were aware about the proposed services.

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Reasons to fail ...

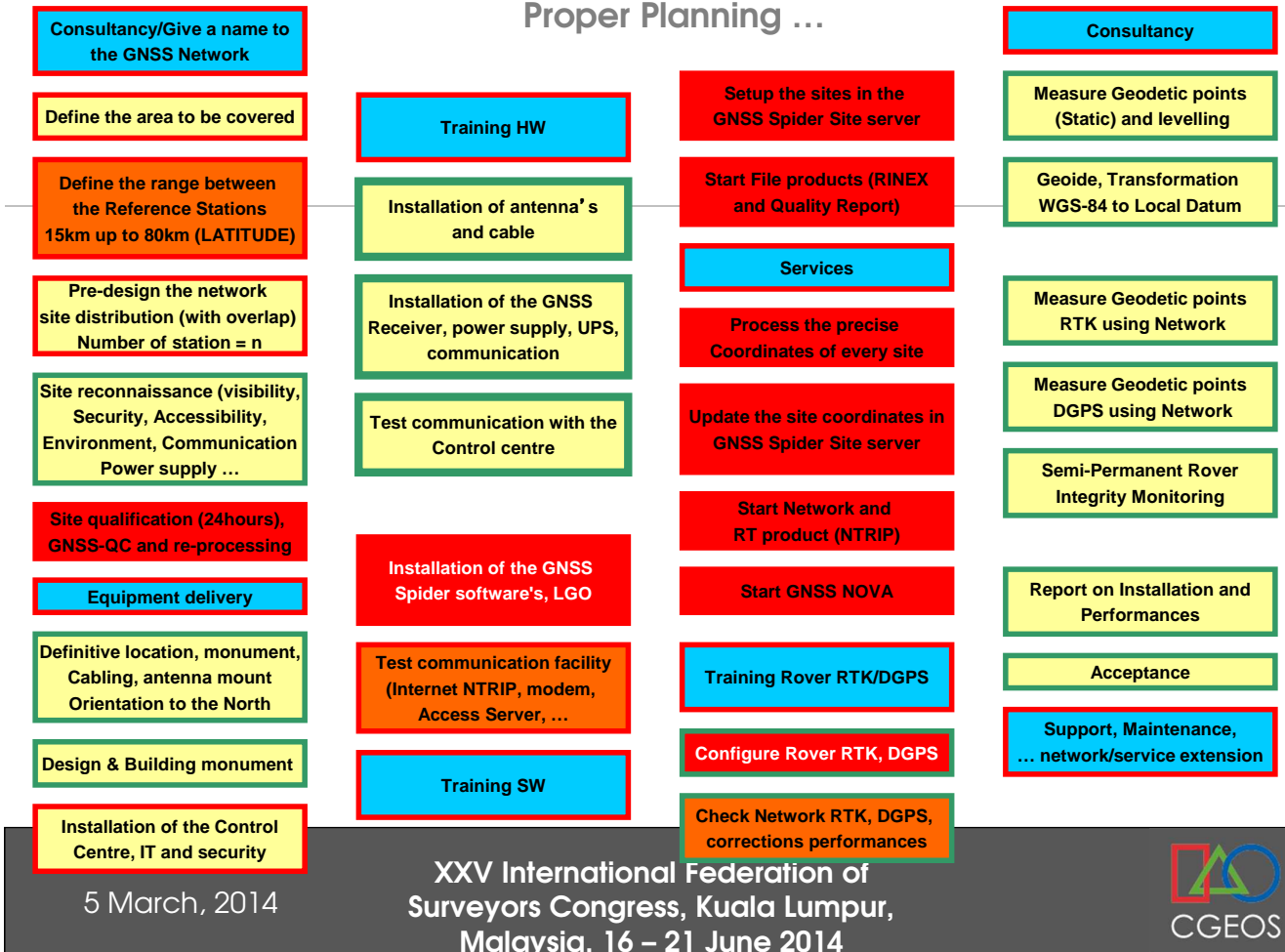
- Communications is one of the major reasons to fail as no data, no correction.
- **Improper coordinate transformation is reason to fail.**
- If the organisation in charge of delivering the associated services of a GNSS Network RTK infrastructure doesn’t have 24/7 a call centre with an expert reaction to address the user’s issues or to repair the system in case of down operations, **the project will fail**.
- **Charging too much or just for free.** Organisations that has no confidence in the deliveries or organisations who most of the time don’t want to take responsibility, will offer the service for free with the net result that if something is going wrong, after all no one is paying for the service when it works. **On the other side, charging too much will prevent people to consider the costs if they exceed what they can manage themselves by using a local GNSS Reference Station setup.**

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Proper Planning ...



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« *GPS, GLONASS and BDS are just the tools to interact from real to digital ...* »

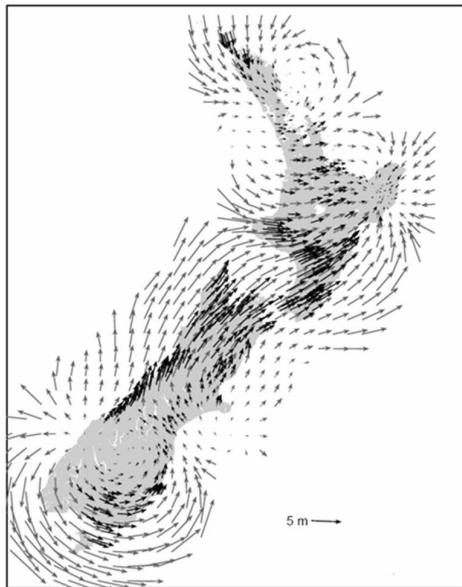


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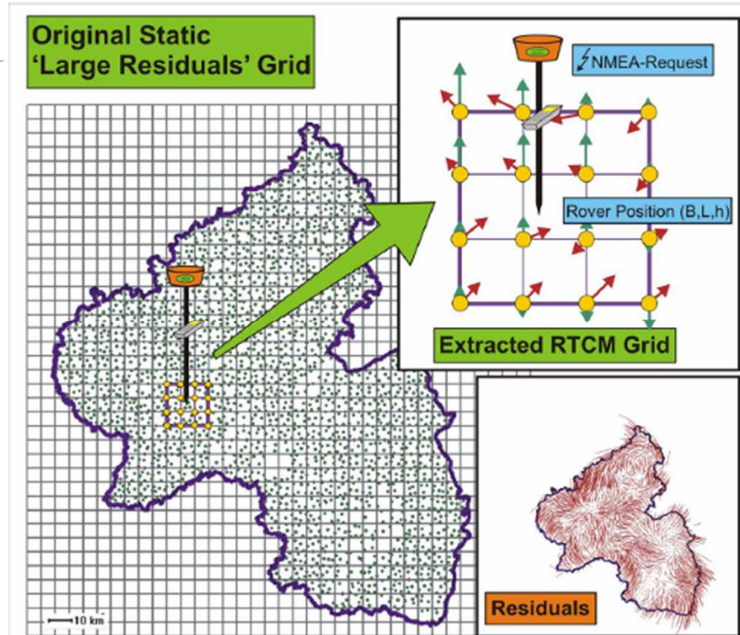
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Transformation from WGS-84 to Local Datum



This shows the differences between NZGD1949 and NZGD2000 after applying the 7 parameter similarity transformation



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Reasons to succeed ...

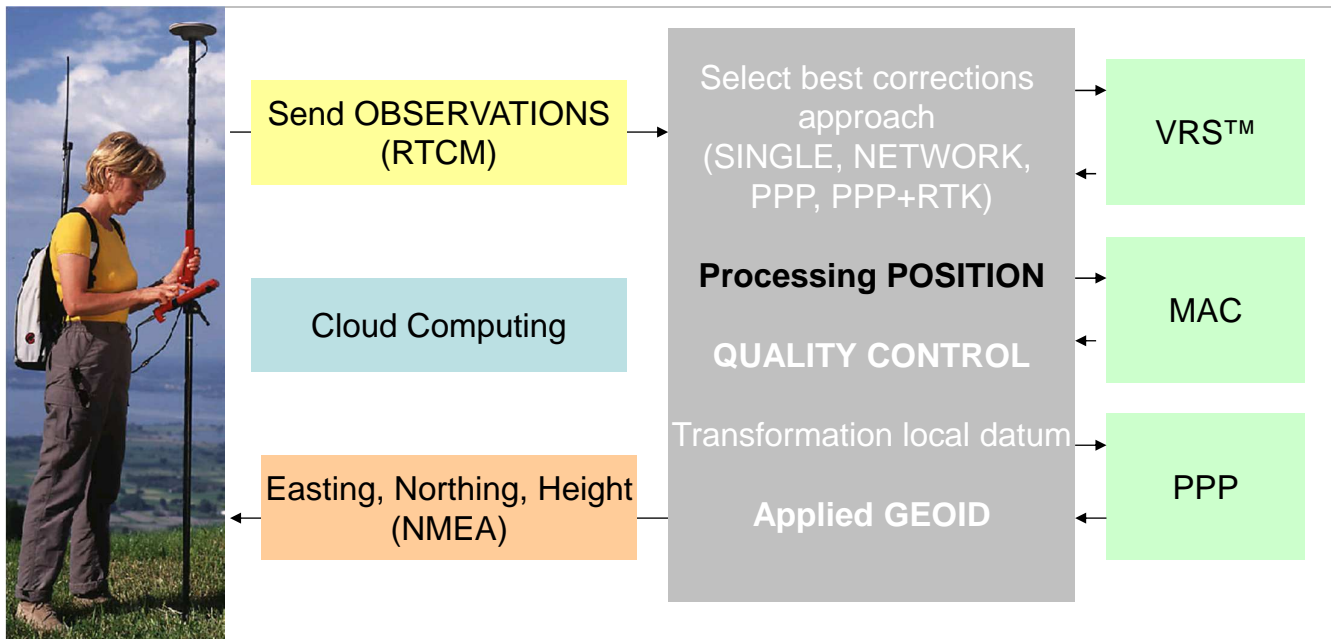
- **If there is a need !** Identify the future customer's needs !
- Carefully design and plan the deployment (hotspot strategy vs full coverage)
- Planning, planning, planning
- Consider "more" services than only "corrections"
- No concession about the coordinates (must match !)
- **24/7 ... not for surveyors ... but for farmers !**
- National Security can be an issue for precise coordinates
- **Cloud RTK© is the only way for providing effective paid services**

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CLOUD RTK© Coordinates as a Service



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Reasons to succeed ...

- Don't specify for GALILEO (Nobody knows when it will be operational and even when there will be enough satellites to fix a position) but request for COMPASS/BEIDOU BDS right now ...
- Don't be impressed by the number of channels a receiver has. **It's not a car !** GNSS Reference Receiver hardware must provide RAIM and fallback mechanism not only for communication ! Must be top grade precise type.
- **GNSS Network RTK software must provide expected performances on the Rover RTK end ... Benchmark proposals and compare.**
- VRS™, iMax, FKP, PRS, MAC ... all should lead to same end user performances (time to fix, precision and accuracy)
- **Precision without Reliability means ZERO quality !**

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Reasons to succeed ...

- **Gold rule 1 :** *single GNSS CORS must support at minimum 10 to 20 GNSS Rover client*
- **Gold rule 2 :** *when you have a community of GNSS Rover RTK, it's time to propose the services of a GNSS Network RTK*
- There is still hope ... when it fails : REDESIGN !
- Remember : the customer has always the choice ... to setup his own GNSS Base Station ...

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Positioning Infrastructure



Building Construction



Utilities Sector



GPS Monitoring



Precise Vehicle
Tracking



Emergency Services



Port Operations



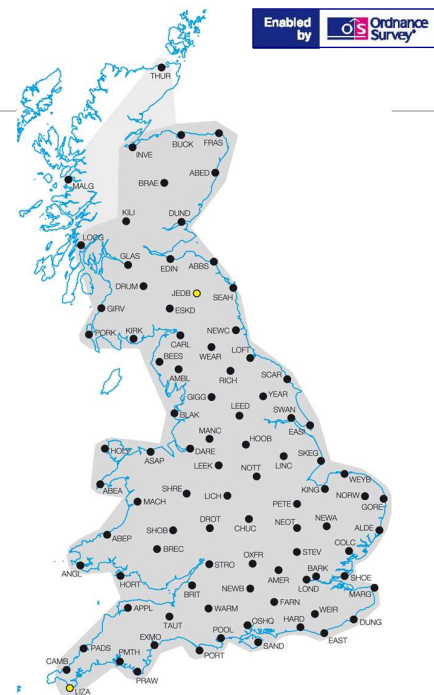
Land Surveying



Machine Control



Agriculture



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Many thanks for your consideration

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Hans Ni, President
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COMNAV

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