Two weeks of continuous remote attendance during CONT11

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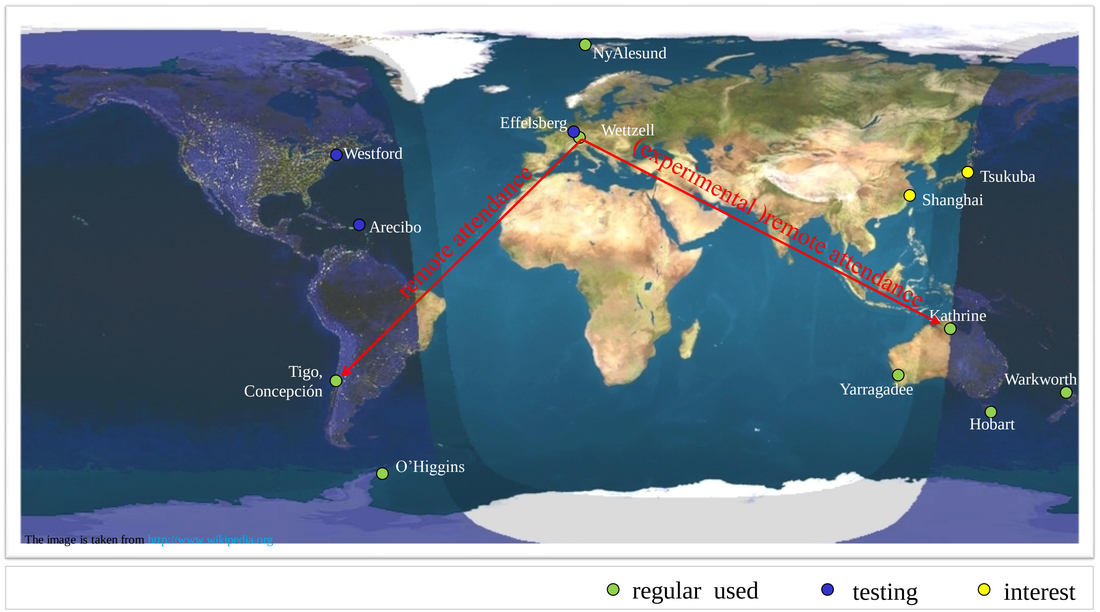
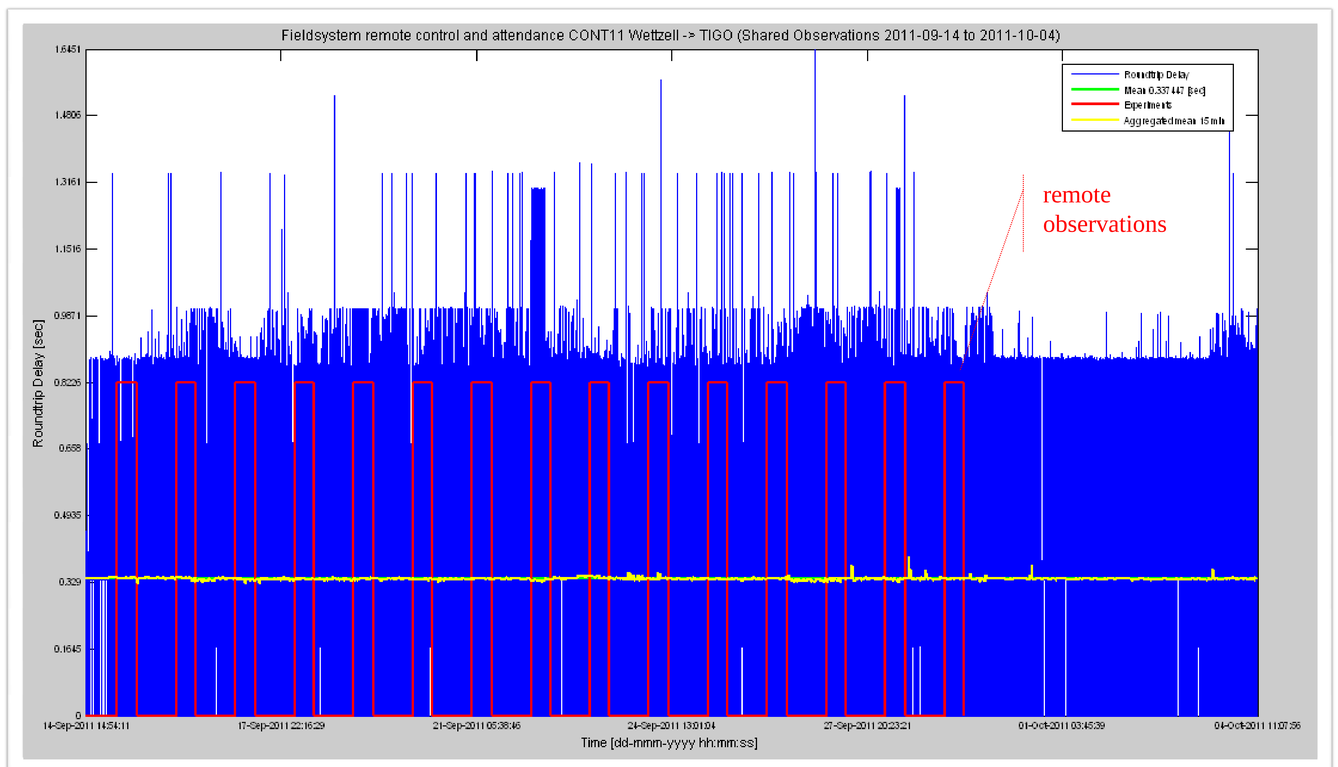
Between September 15th, 2011 and September 29th, 2011 a continuous VLBI session was operated by the network of the International VLBI Service for Geodesy and Astrometry (IVS). This CONT11 campaign is a continuation of the series of very successful continuous VLBI campaigns that were observed at irregular intervals since 1994. Within these two weeks, fourteen telescopes contributed to this experiment. Therefore, this was a perfect opportunity to demonstrate the stability of e-RemoteCtrl over long time. Furthermore, it was very useful to gather experience in remote attendance over a longer time period. The software, developed by the Observatory Wettzell, was used to attend the sessions at TIGO Concepción, Chile during the night shifts without any problems. This remote control experiment showed the usability of the new observation strategies for future experiments and developments. In parallel, a second testing connection was established to the Australian telescope Kathrine for a monitoring and integration test. Overall, the CONT11 experiment was very productive to collect experience with station remote control using e-RemoteCtrl over long distances and over a longer time period.

e-RemoteCtrl observations during CONT11

A continuous VLBI session was operated by the International VLBI Service for Geodesy and Astrometry (IVS) in September 2011. This campaign was held for a period of two weeks with continuous measurements, where fourteen telescopes contributed in operation. The main goal of this campaign was to gather precise data for supporting high resolution earth rotation studies, investigations on reference frame stability and investigations on daily to sub-daily site motions. Therefore, this was a perfect chance to demonstrate and test shared observation strategies, using “e-RemoteCtrl”. This software uses remotely accessible, autonomous process cells as server extension to the NASA Field System, based on Remote Procedure Calls (RPC). With this technology several remote control and attendance tests were successfully shown with telescopes at Germany, Chile, Antarctica and also at foreign sites as Hobart and Kathrine. During CONT11 Wettzell run the TIGO telescope remotely attended the whole two weeks during night-shifts. For security reasons, the whole communication was tunneled using Secure Shell (SSH) with automatic connection control. It (re-)establishes broken SSH tunnel without user interaction.





The results

During the shared observation the roundtrip delays (time for sending a request and receiving the response) of commands were captured for more than two weeks. The results of these survey are illustrated in the left figure (blue graph). For a better interpretation an aggregated mean calculation for 15 minutes intervals over the round-trip delays is used (yellow graph). Therefore, higher network loads can be seen, influencing the remote control. The mean roundtrip delay to Chile and back is about 0.33 seconds. This means that each command takes a third second from sending to the response.

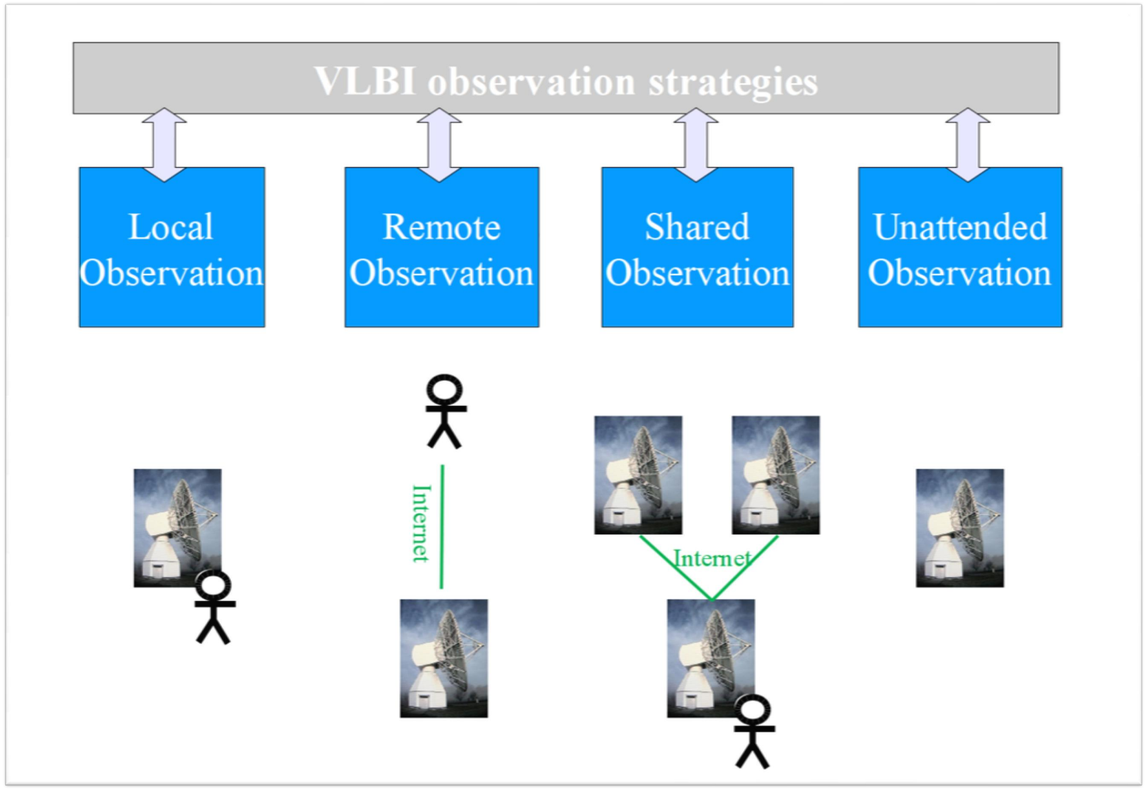
With this two week lasting, regular observation test very important conclusions could be made: (1) The used SSH-stabilization without a human interaction worked quite well, without large connection losses. (2) The test usage gathered further information to improve the usability of the graphical user interface. (3) Additional system monitoring data are necessary to get a better overview of the system status from remote. (4) Authentication and authorization mechanisms as well as user role management becomes more and more important with a growing number of participating stations.

A possible „e-RemoteCtrl network“

At the Geodetic Observatory Wettzell several possible observation strategies were detected. Local, remote and unattended observations has been proven to be reliable in past tests. The successful CONT11 experiment has shown, how a network of telescopes as TIGO (Chile), Wettzell (Germany) and Kathrine (Australia) can be operated remotely. Therefore routinely sharing of the control between operators on different sites is the next challenge.

Since all three Australian geodetic VLBI telescopes (AuScope network) it is possible to cooperate in a global network of telescopes using remote techniques. Together with the already tested control of TIGO it is even possible to shift the control around the world following the daylight zone. Then the control during a local night shift can be done by another station in the daylight zone. This may reduce the burdens of operator night shifts, while keeping the number of observations.

In sum the shared observation test showed new possibilities and was very successful. Therefore these new strategies can offer technical realizations for vision as the Global Geodetic Observing System (GGOS) or new Square Kilometer Arrays (SKA), where a set of telescopes must be flexibly controlled by few operators. Next development steps are organized in the Novel EXplorations Pushing Robust e-VLBI Services (NEXPReS).



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