

Remote Control and Monitoring of VLBI Experiments by Smartphones



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Transportable Integrated Geodetic Observatory - TIGO

Agenda

- Introduction – Motivation
- Existing remote control Software
- Jmonan Features
- General and application scheme
- Screenshots
- ToDo
- Conclusion

Motivation

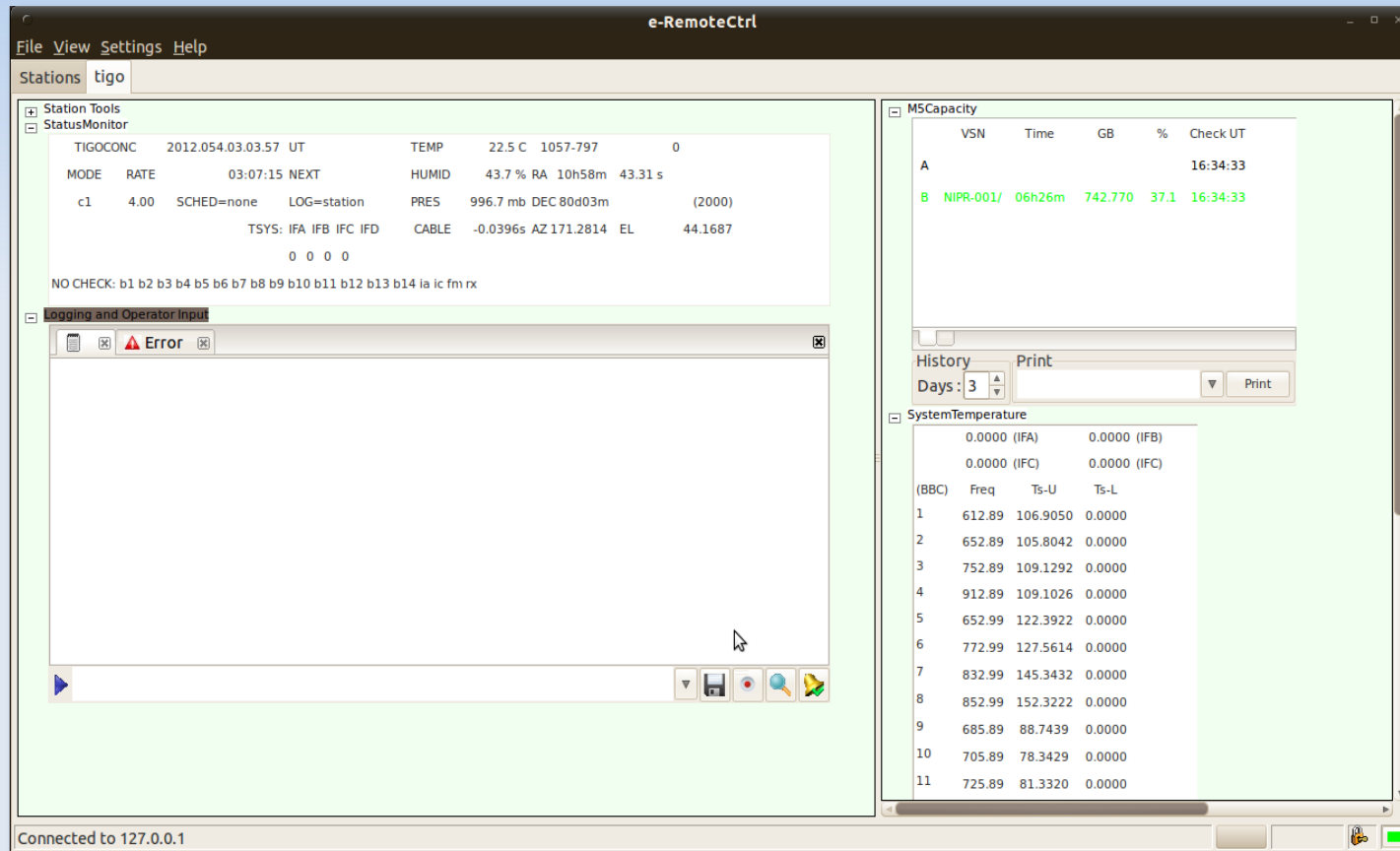
- Lack of operators in TIGO.
- Lack of use of mobile technology for VLBI.

The idea:
Use a smartphone
for monitoring and controlling
of VLBI experiments.



Existing rc-software for PC (1)

- FS Remote. (Alexander Neidhardt, Martin Ettl (FESG))



Existing rc-software for PC (2)

- Monan and Pymonan (TIGO)

VLBI STATUS MONITOR									
ANTENNA STATUS						RECEIVER STATUS			
NOT TRACKING		Azimuth		Elevation		20K Temp		25.3803	
Mode		Stand By		Stand By		70K Temp		57.2918	
SPL		Brake ON		Brake ON		Vac Press		0.0000	
Actual Pos		253.999831		2.994388		He Supply		245.3529	
Calc Pos		186.394491		28.320240		He Return		67.6370	
Actual Vel		0.000000		-0.000000		LO Status		Unlocked	
Actual Dev		0.000000		0.000000					
		No Error		No Error		WEATHER			
		No Warning		No Warning					
Prog Track		No Error		No Warning		Temp 20.0 Humi 61.5 Press 994.1			
SYSTEM TEMPS					MARK5 STATUS		SCHEDULE		
01	106.9	06	127.6	11	81.3	BANK	B	CURRENT	2012.054.15:24:00
02	105.8	07	145.3	12	79.4	VSN	NIPR-001	NEXT	15:27:17
03	109.1	08	152.3	13	92.8	REMAIN GB	749.7	LOG	station
04	109.1	09	88.7	14	98.8	REMAIN %	37.5	SKD	none
05	122.4	10	78.3			RECORDING	Off		

Smartphones programming

- Native development
 - JAVA
 - C and C++
 - Only work on the plataform
- Web development for smartphones (**JMonan**)
 - Javascript
 - PHP
 - Multiplataform. (Browser)



Features of new development Jmonan

- Client-Server architecture based on TCP/IP
- Interface optimized for smartphone screen
- Multi-platform
- Uses FieldSystem and station shared memory
- Highlights errors and warnings
- Watchdog server
- Needs only a smartphone with browser (HTML-Javascript)

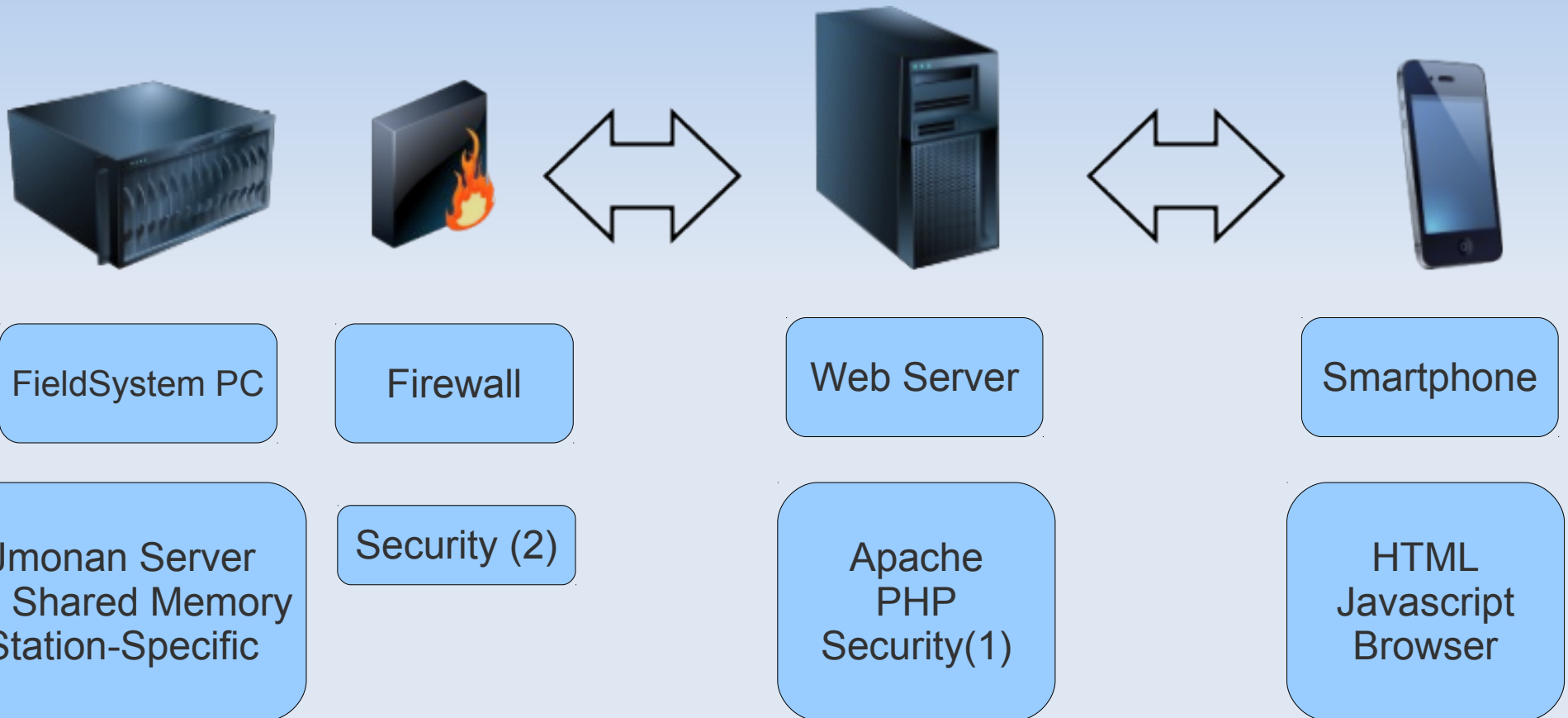


Features of Jmonan

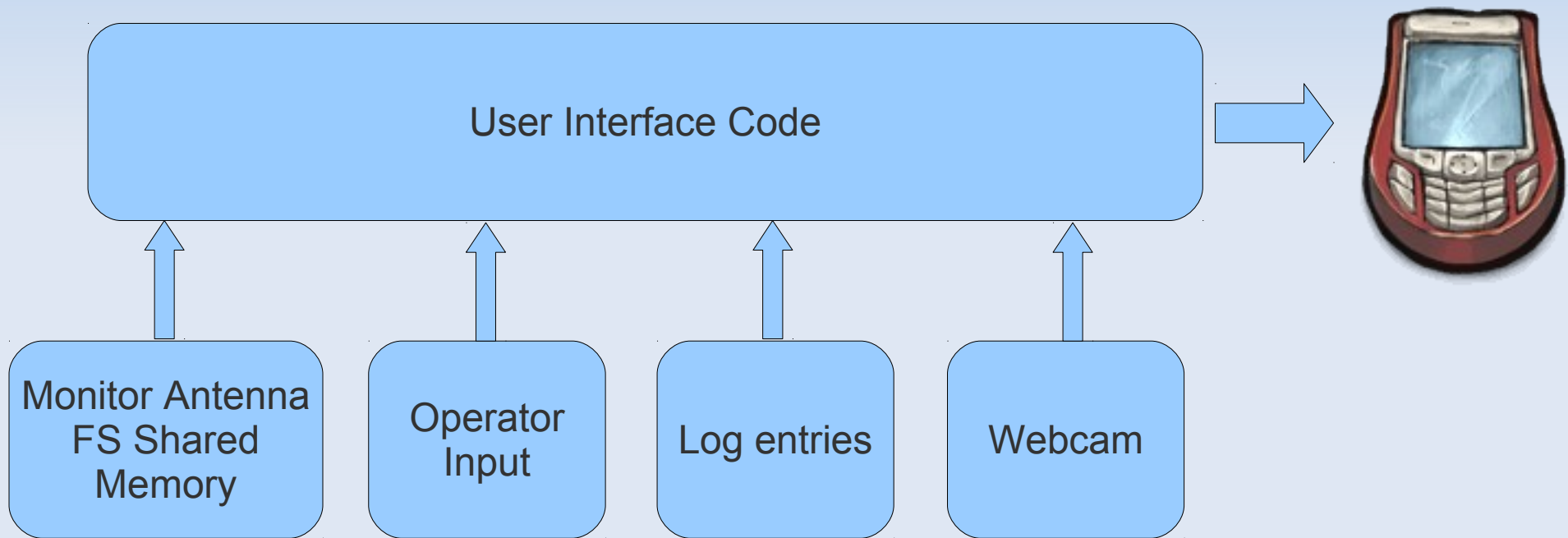
- Visualized actual status of:
 - Radio telescope (mode, position, velocity, brakes)
 - Receiver (cryo params, box temperature, voltages)
 - Schedule (session, source)
 - Recorder (recording on/off, scan name, capacity)
- Input of commands to the FS (remote control!)
- Displays the log entries
- HTTP Security (login)
- Webcam Interface (visual control)



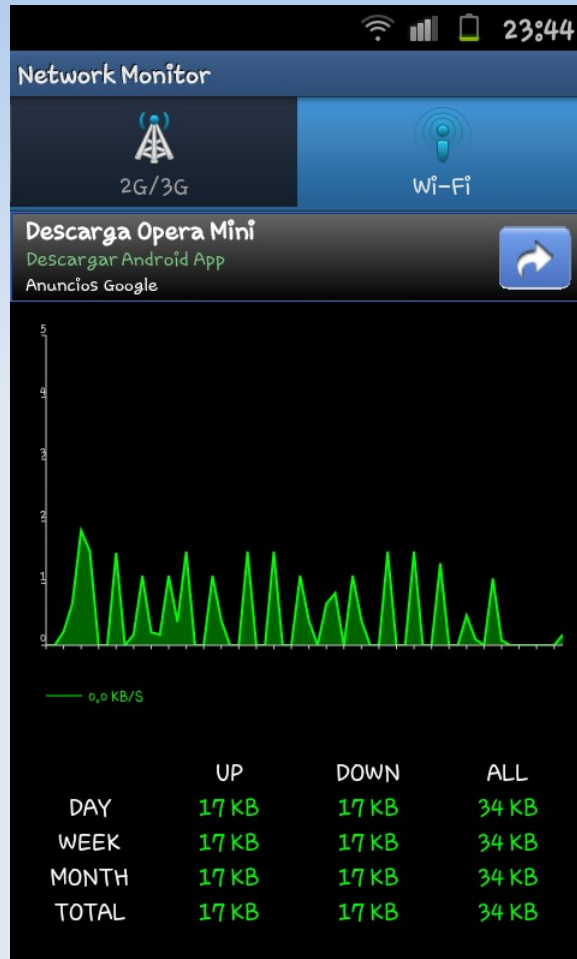
General Scheme



Application Scheme



Network optimized



- 3 seconds update (customizable)
- Not load the entire page and values.
- Average 2KB each update.



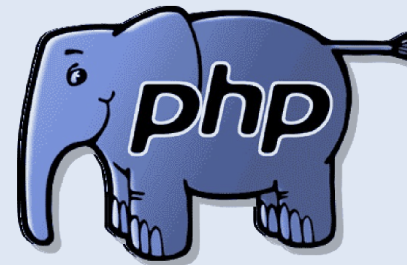
Server Side

- Running on the FieldSystem PC
- Design separation on three services
 - Monan (Monitoring Antenna)
 - Oprin (Operator Input)
 - Log (Log Entries)
- Written in C
- Watchdog



WebServer Side

- Apache Webserver
- HTML
- Javascript
 - Ajax
 - JQuery framework
- PHP



Screenshot Antenna Status

The screenshot displays a software interface for antenna status. At the top, there are buttons for 'Oprin&Log', 'Webcam', and 'Stop'. Below these are three tabs: 'Antenna Stat...', 'Receiver Stat...', and 'Mk5 Status'. The 'Antenna Stat...' tab is active, showing a table with columns 'Azimuth' and 'Elevation'. A red banner at the top of the table indicates 'NOT TRACKING'. Below the table is a 'Schedule' section with a table showing 'Current', 'Next', 'Log', and 'Skd' parameters. Red arrows point from the 'Antenna Stat...' table and the 'Schedule' table to external labels on the right.

	Azimuth	Elevation
NOT TRACKING		
Mode	Stand By	Stand By
SPL	Brake ON	Brake ON
Actual Pos	253.999831	2.995934
Calc Pos	249.364579	63.948983
Actual Vel	0	0
Actual Dev	0	0
	No Error	No Error
	No Warning	No Warning
Prog Track	No Error	No Warning

Schedule	
Current	2011.299.19:12:39
Next	19:14:20
Log	station
Skd	none

Antenna Status Parameters

Schedule Status Parameters



Screenshot Receiver Status

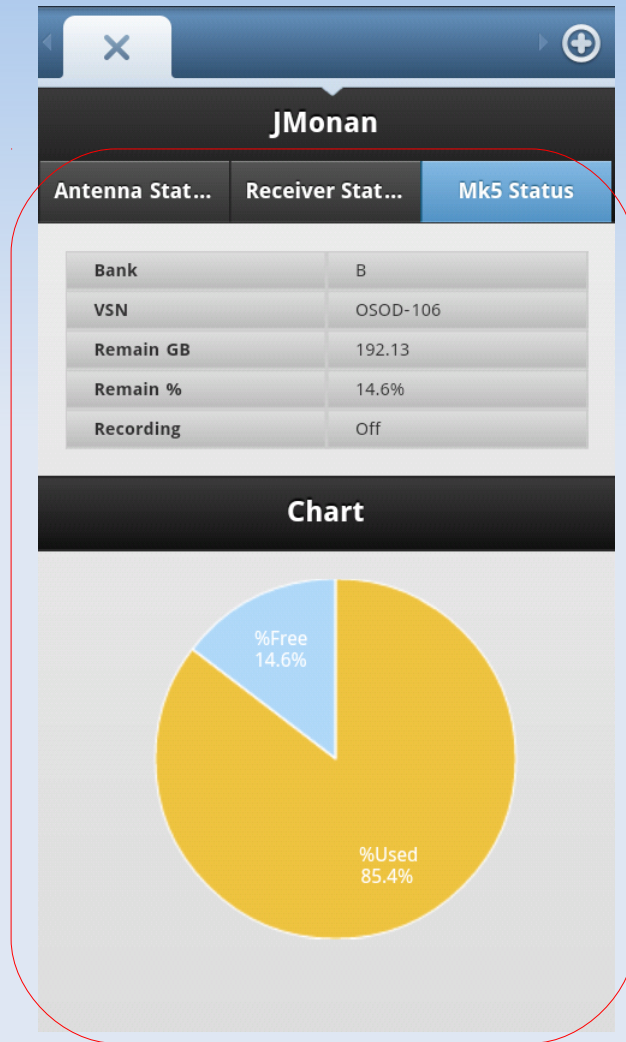
The screenshot shows the JMonan interface with three tabs: Antenna Stat..., Receiver Stat... (selected), and Mk5 Status. The Receiver Stat... tab displays a table of parameters. A red box highlights this table, with an arrow pointing to a blue box labeled 'Receiver Status Parameters'. Below this, another red box highlights a table titled 'Temp Sys', with an arrow pointing to a blue box labeled 'System Tempertures'.

Receiver Status Parameters	
20K Temp	43.1441
70K Temp	76.0252
Vaccum Press	0
He Supply	295.3675
He Return	118.5678
LO Status	Locked

System Tempertures			
01	111	08	158.8
02	108.2	09	97.6
03	113.2	10	83.7
04	113.6	11	77.4
05	125.2	12	84.5
06	133.3	13	107.4
07	151.7	14	507.3



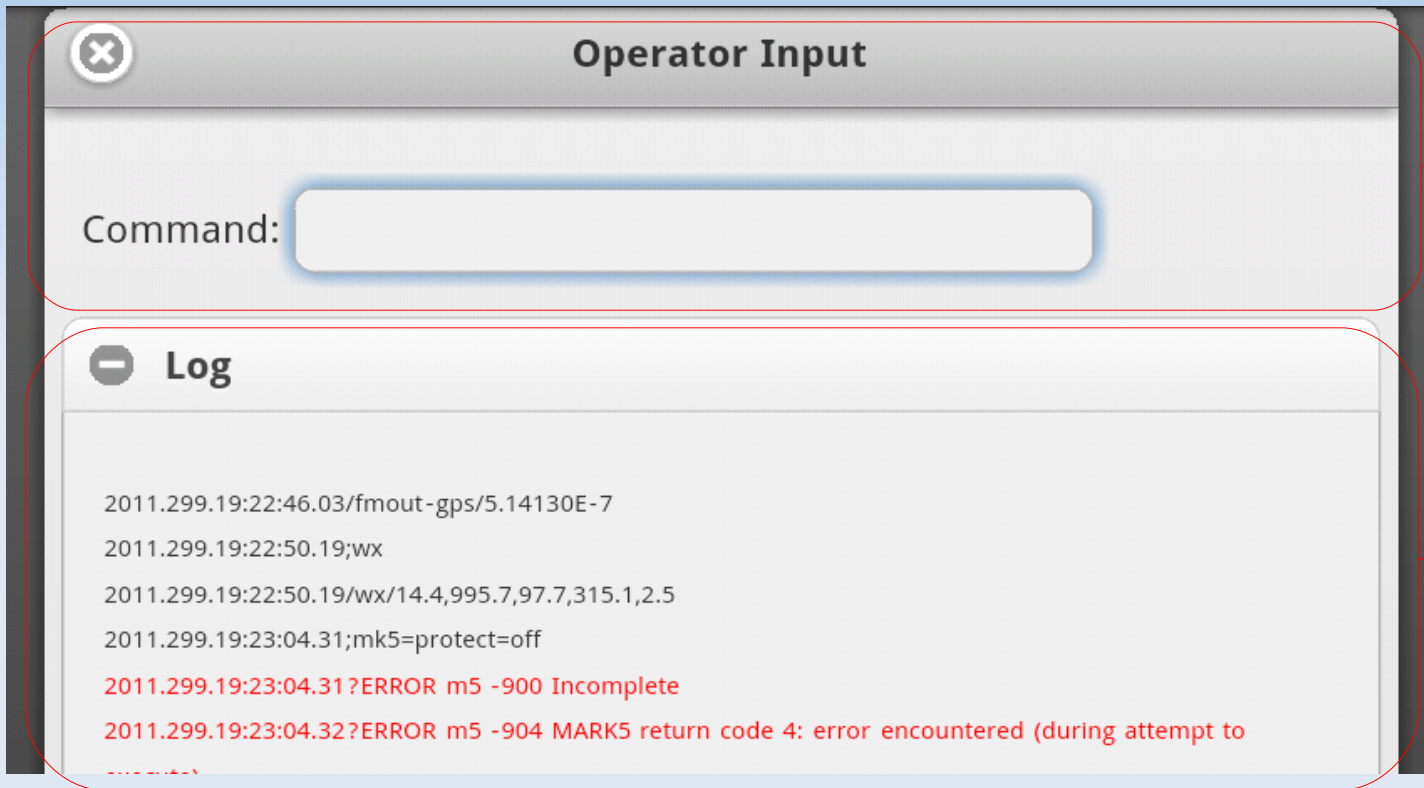
Screenshot Recording Status



Mk5 Status Parameters



Screenshot Operator Input - Log



The screenshot shows a window titled "Operator Input" with a close button (X) in the top-left corner. Below the title bar is a "Command:" label followed by a text input field. Below the command field is a "Log" section with a minus icon and the word "Log". The log contains several entries, including timestamps, coordinates, and error messages. Red arrows point from the "Command:" field to a blue box labeled "Operator Input" and from the "Log" section to a blue box labeled "Log Entries".

Operator Input

Command:

Log

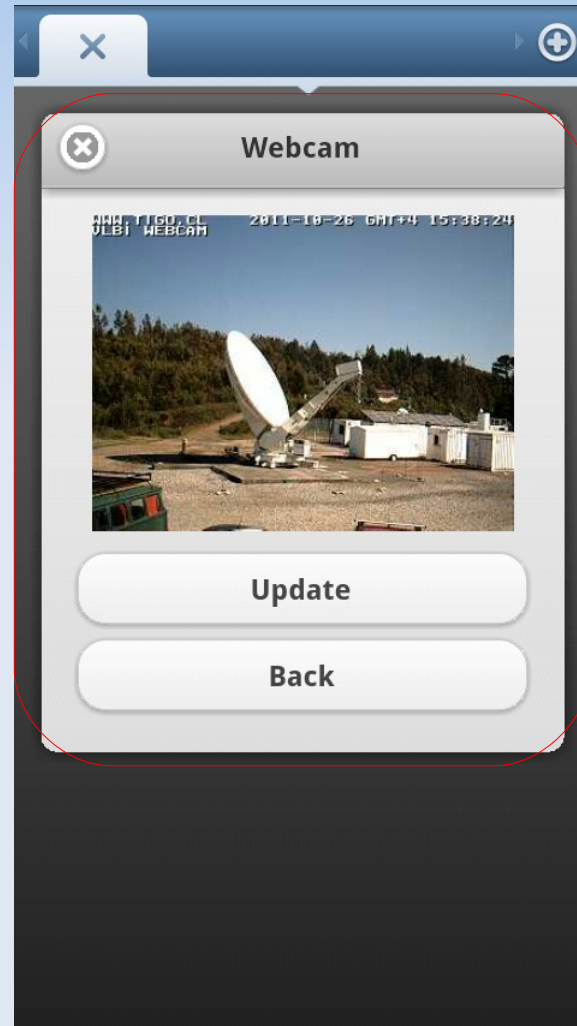
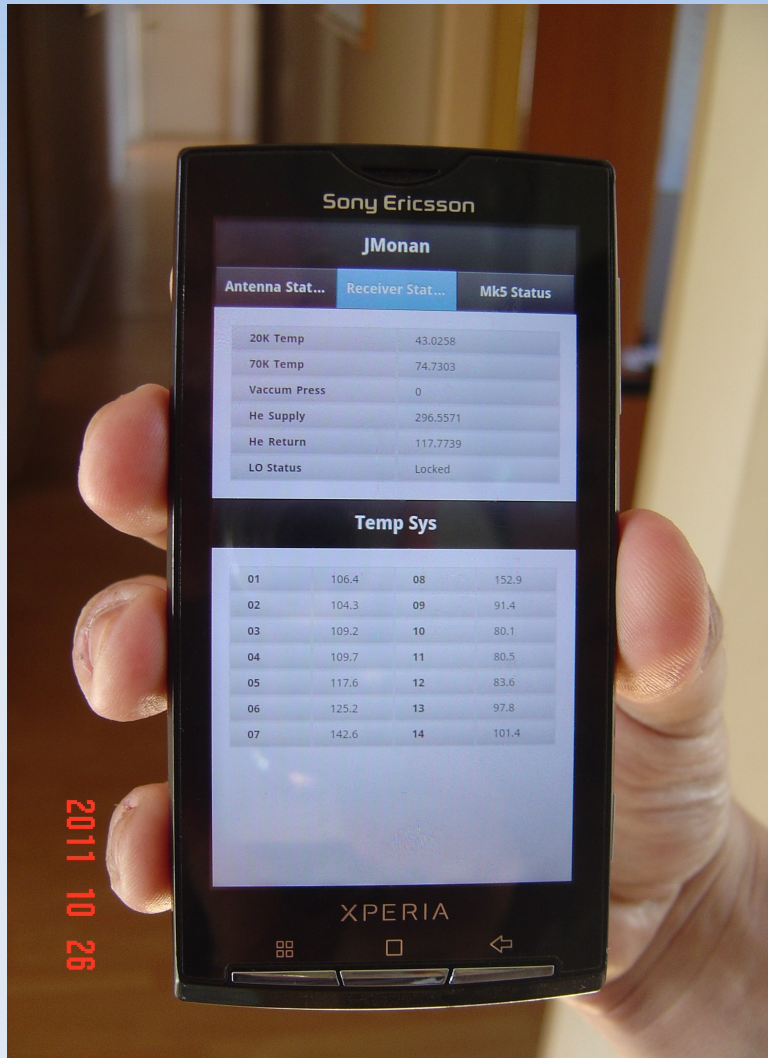
2011.299.19:22:46.03/fmout-gps/5.14130E-7
2011.299.19:22:50.19;wx
2011.299.19:22:50.19/wx/14.4,995.7,97.7,315.1,2.5
2011.299.19:23:04.31;mk5=protect=off
2011.299.19:23:04.31?ERROR m5 -900 Incomplete
2011.299.19:23:04.32?ERROR m5 -904 MARK5 return code 4: error encountered (during attempt to

Operator Input

Log Entries



Screenshot Webcam image



Webcam Interface



To Do

- Packaged versions
 - Android (Most smartphones)
 - IOs (Iphone)
 - Symbian (Nokia)
- Autocomplete (Operator input)
- Command History
- Standard for other stations



Conclusion

- Is a new software for smartphones and enables remote control and monitoring of VLBI radiotelescopes.
- Is a useful tool for understaffed VLBI stations.
- Was developed and tested successfully at TIGO during 2011.
- Software code is available under GNU public license via personal contact: cherrera@tigo.cl.



Interested?
cherrera@tigo.cl

The End

