e-control:
new concepts for remote control of VLBI-telescopes and first experiences at Wettzell

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Walter Alef (MPIfR), Helge Rottmann (MPIfR),
Ed Himwich (NASA/GSFC/NVI)

The Radio Telescope Wettzell (RTW) & Co.

RT Wettzell/Germany

The Wettzell VLBI crew (from left to right):
Ch. Plötz, E. Bauernfeind, G. Kronschnabl, R. Schatz, W. Schwarz, R. Zeitlhöfler, A. Neidhardt
(missing in picture: E. Bielmeier).

Table 2. RTW observations in 2008

program	number of 24h-sessions
IVS R1	49
IVS R4	51
IVS T2	6
IVS R&D	9
RDV/VLBA	6
EUROPE	5
CONT08	15
total	**141**
total (in hours)	**3384**

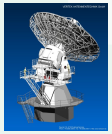
program	number of 1h-sessions
INT1(Kokee-RTW)	234
INT2/K(Tsukuba-RTW)	100
INT3/K(Tsukuba-RTW-NyAl)	41
total (in hours)	**375**

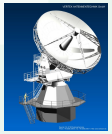
special program	number of experiments
SELENE	19
total (in hours)	**92**

TIGO Concepción/Chile

GARS O'Higgins/Antarctica

And in the future: TTW Wettzell

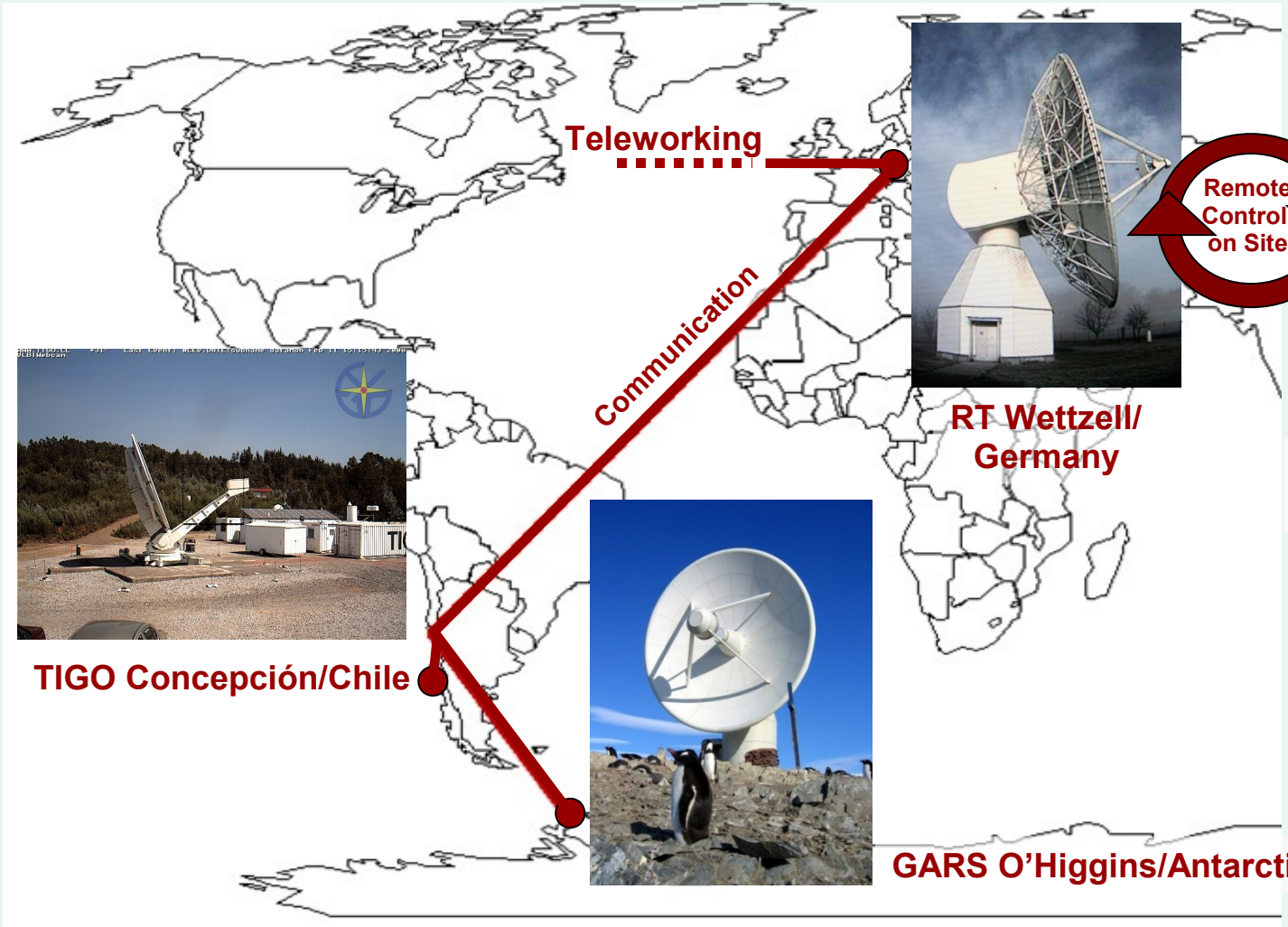




Wettzell and the idea of controlling VLBI telescopes by remote

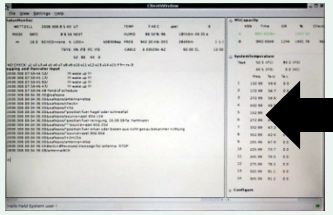
Wettzell and the idea of controlling VLBI telescopes by remote

The idea: remote attendance and control of VLBI telescopes Wettzell, O'Higgins/Antarctica and TIGO/Concepción



Wettzell and the idea of controlling VLBI telescopes by remote

Consequent design-separation of the packages



Just presentation (no logic)

Logic, arithmetic, control, administration, …

Presentation & user interface code

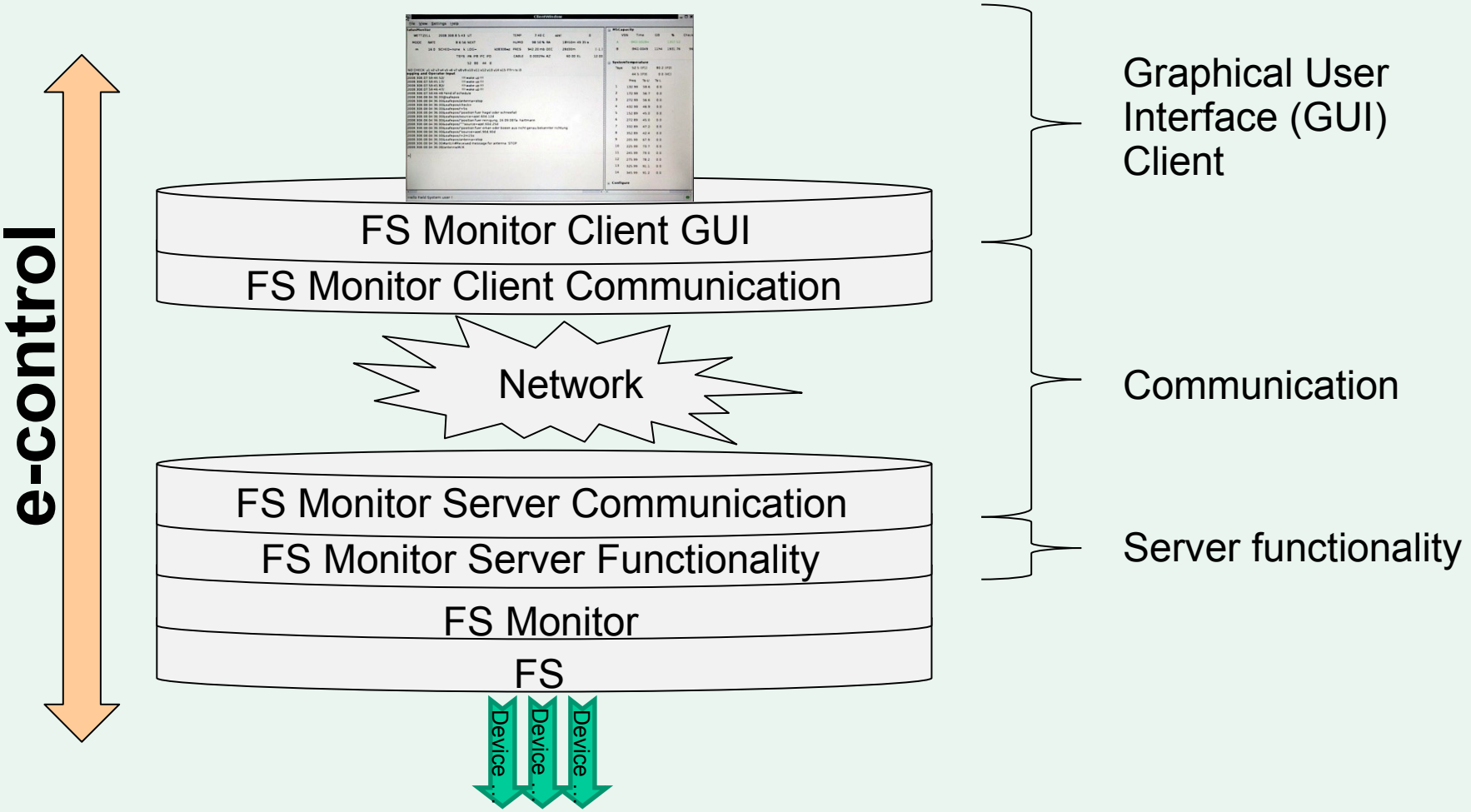
Device control code

Communication code

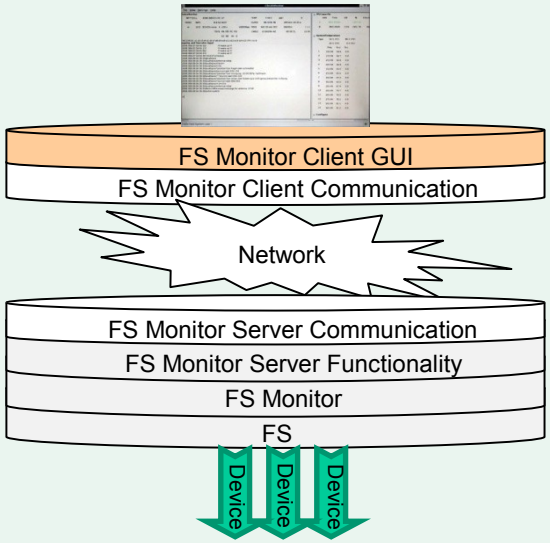
Standardized, flexible, stable connection

Wettzell and the idea of controlling VLBI telescopes by remote

The e-control stack

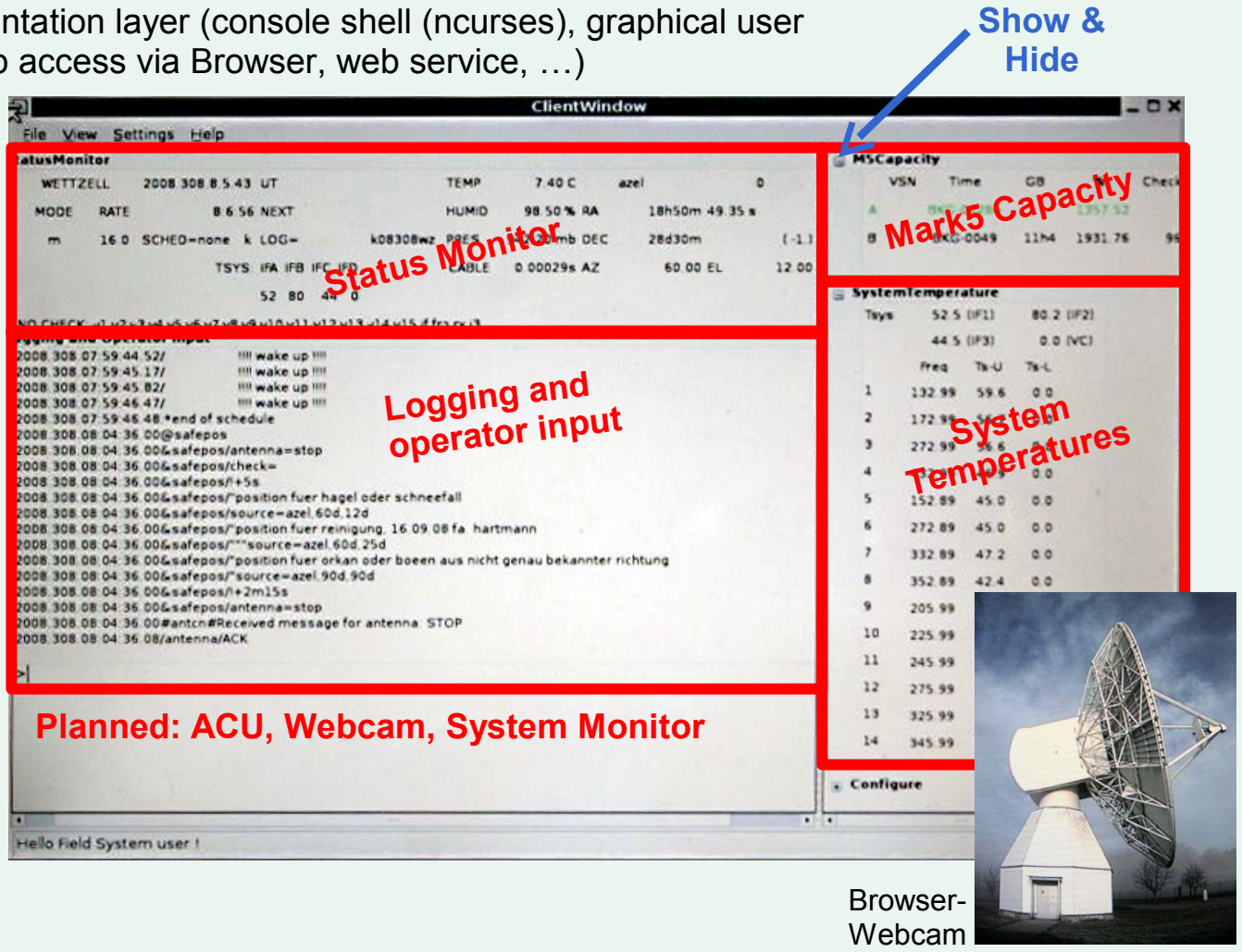


A “NASA field system” client – remote (graphical) user interface



A “NASA field system” client – graphical, (textual or browser) based

- Separation of control and presentation logic
- Interchangeability of presentation layer (console shell (ncurses), graphical user interface (wxWidgets), web access via Browser, web service, …)
- Remote controllable via client-server-architecture on idl2rpc-middle-ware
- Modularity in window units and additionally possible, separately created administration user interfaces for each device
- Basis for graphical user interface: wxWidgets (C++ based Open-Source-Framework for platform independent development of graphical user interfaces)



A “NASA field system” client – all-in-one control for several sites

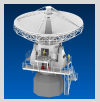
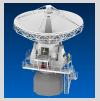
Planned overview and all-in-one control for several sites

ClientWindow

File View Settings Help

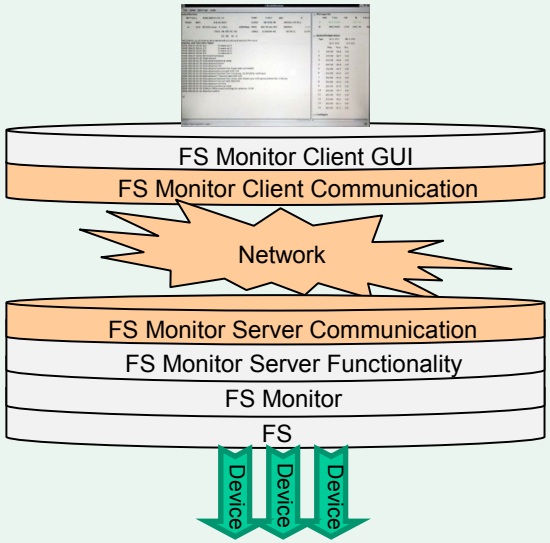
Overview | RTW | TTW1 | TTW2 | TIGO | O‘Higgins

Overview

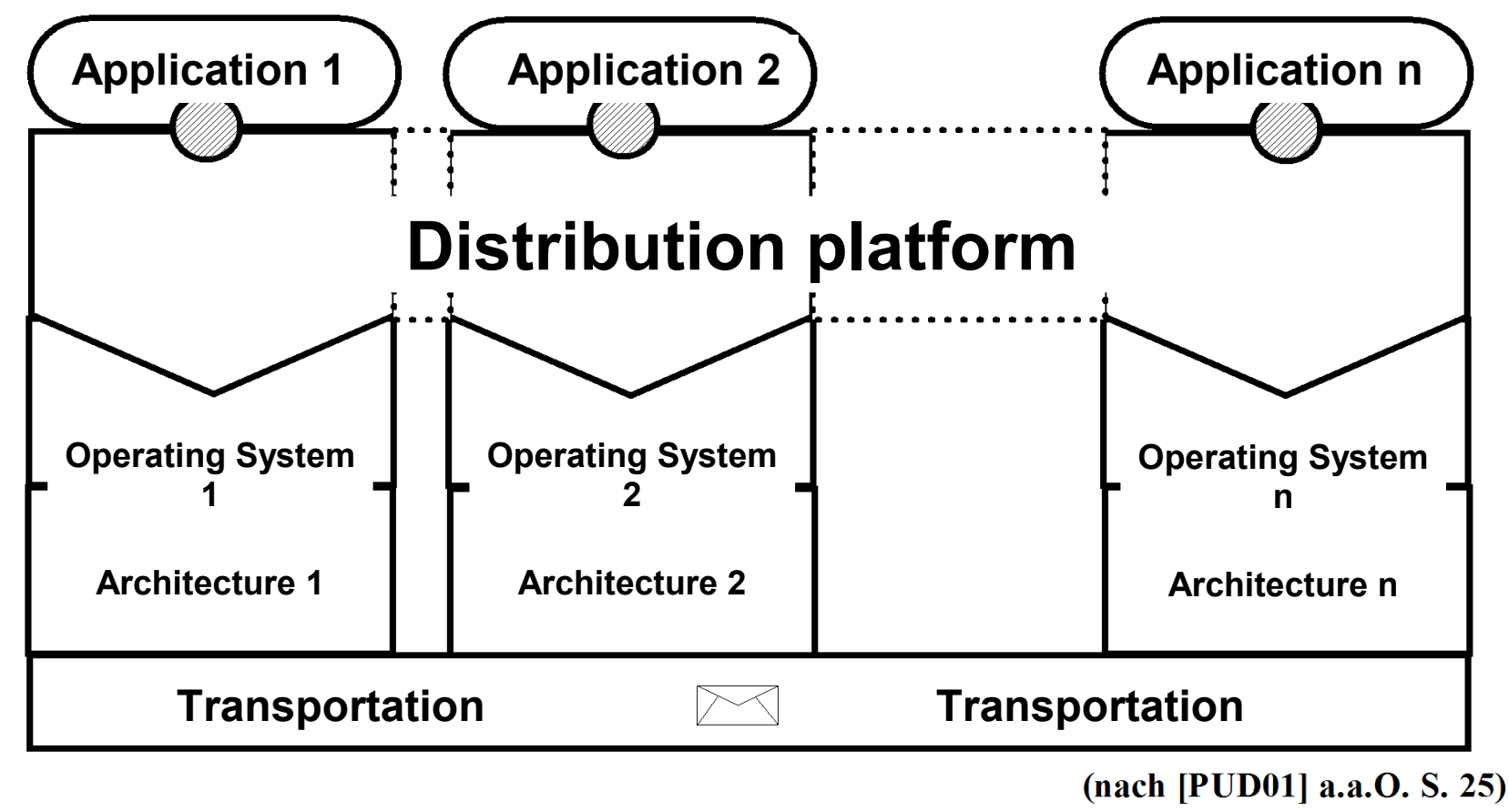
Site	Cam	State	Schedule Source	Time Next	Last error
RTW					
TTW1					
TTW2					
TIGO					
O‘Hig					

Hello Field System user !

The communication – with a remote procedure call middleware and ssh



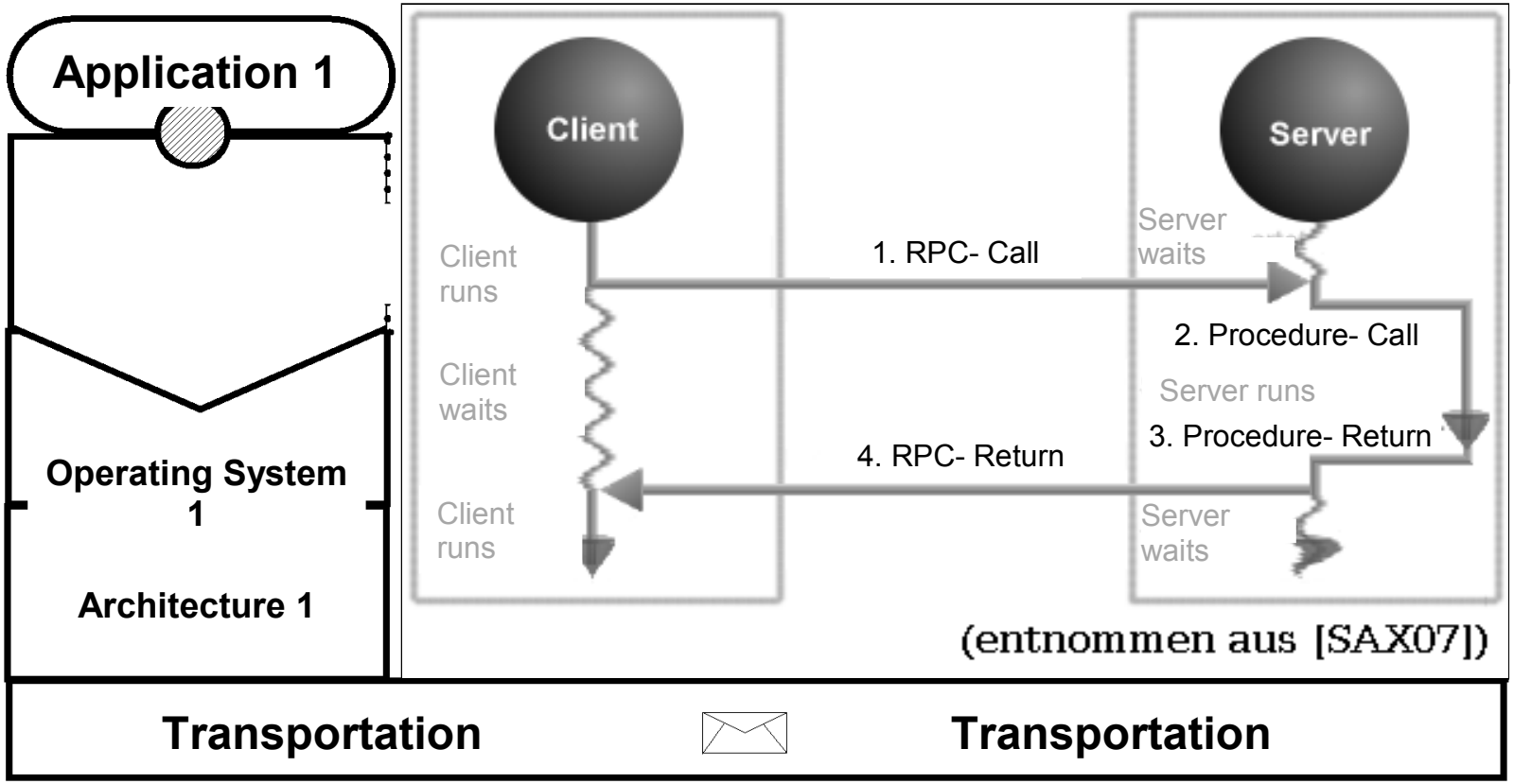
The communication – with a remote procedure call middleware



(nach [PUD01] a.a.O. S. 25)

[SAX07]: Saxonia Systems: Remote Procedure Call, http://www.linuxfibel.de/rpc.htm, Download 23.04.2007
[PUD01]: Puder, Arno; Römer, Kay: Middleware für vereteilte Systeme, 1.Auflage, dpunkt.verlag GmbH Heidelberg 2001

The communication – with a remote procedure call middleware



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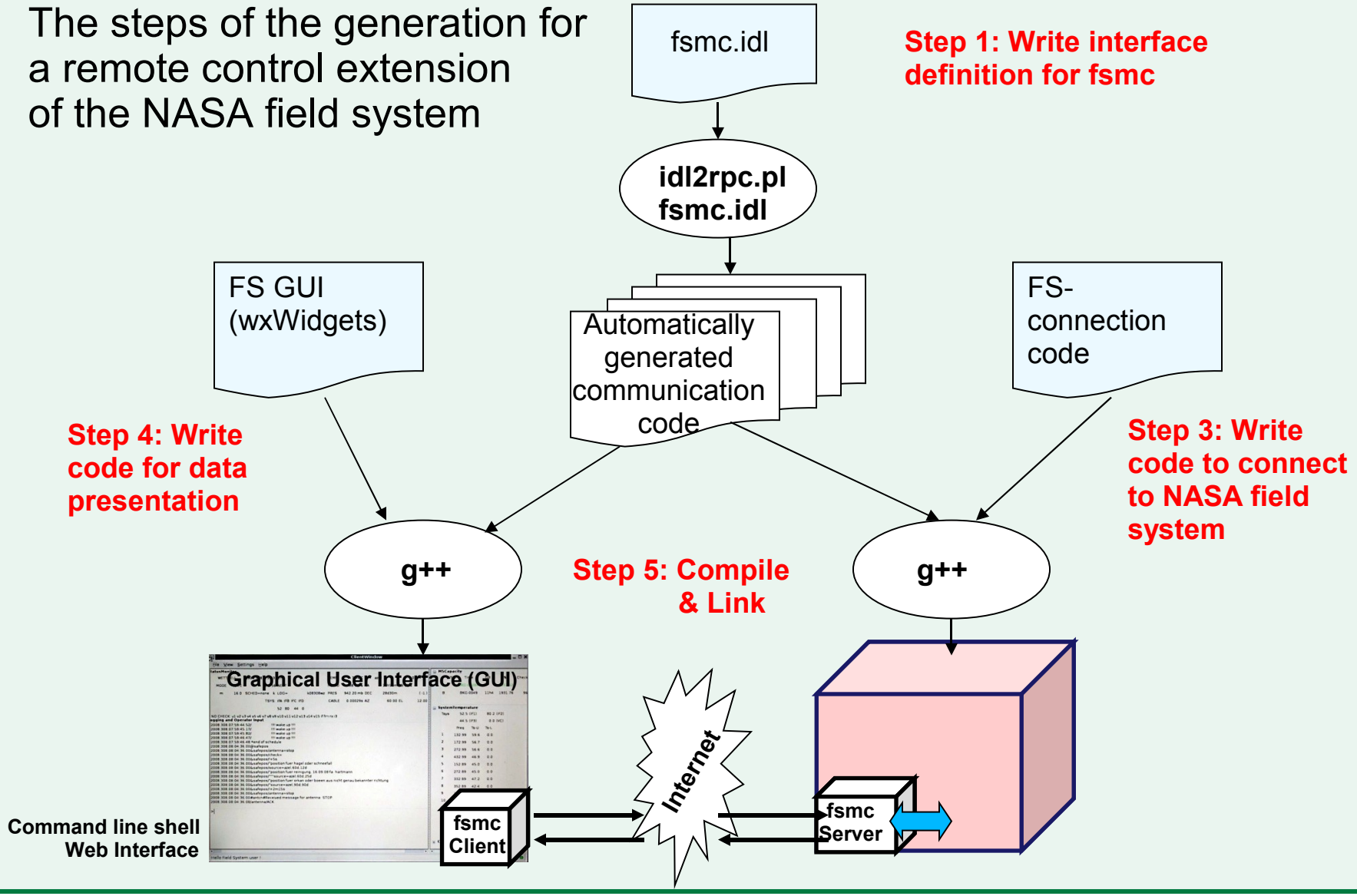
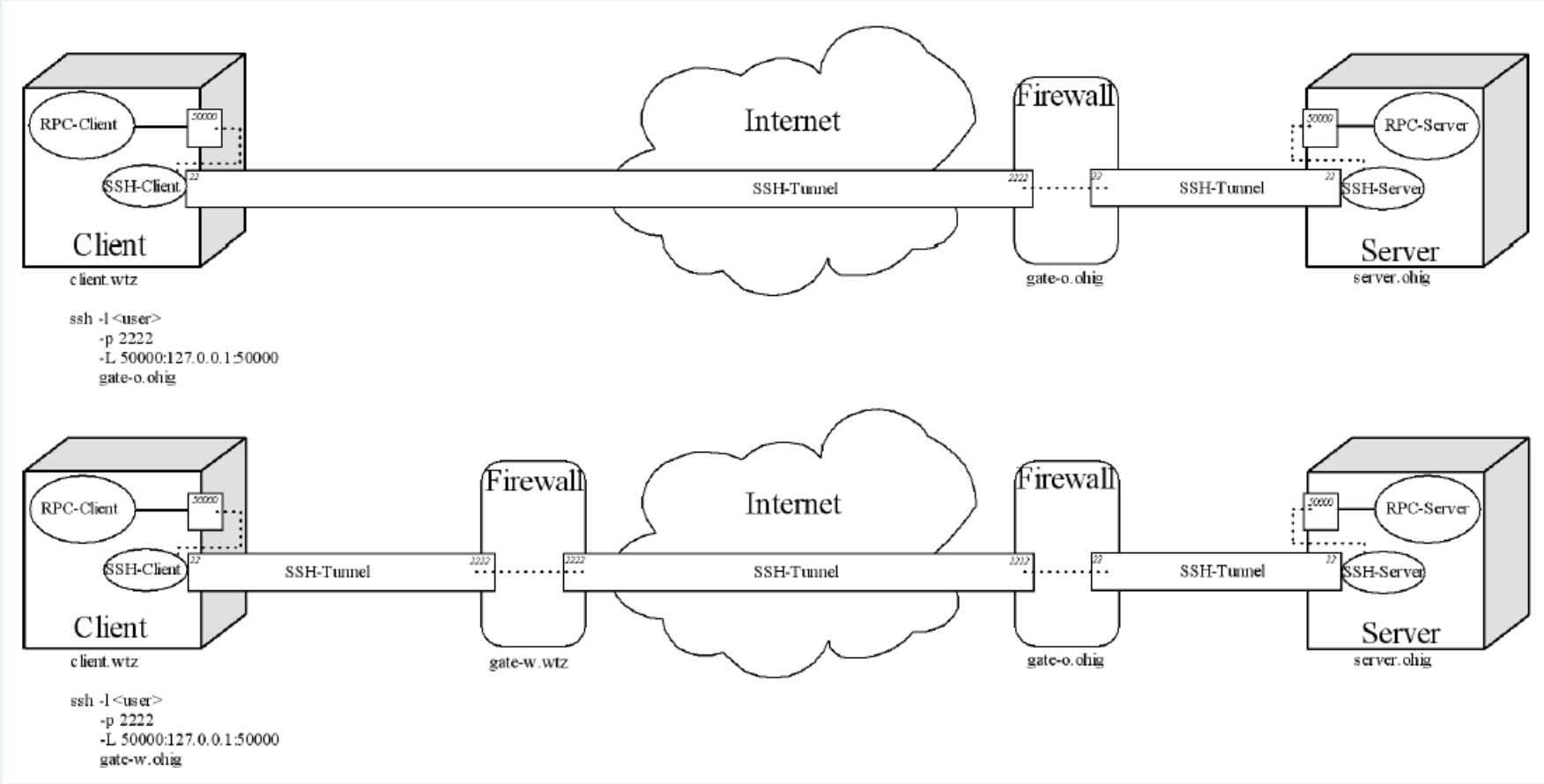
The communication – using a middleware generator

The steps of the generation for a remote control extension of the NASA field system

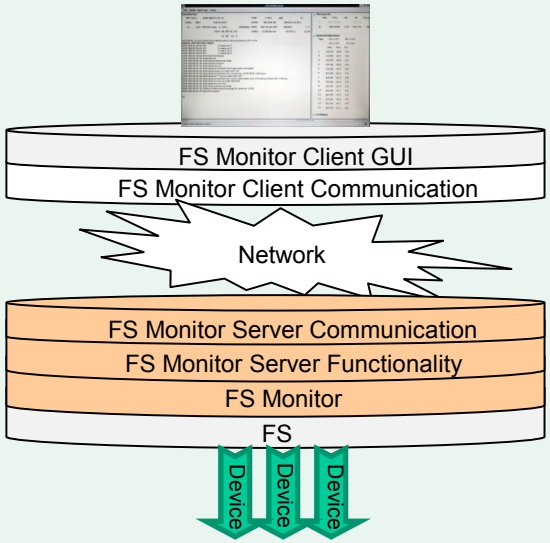


The communication – security with ssh - tunneling



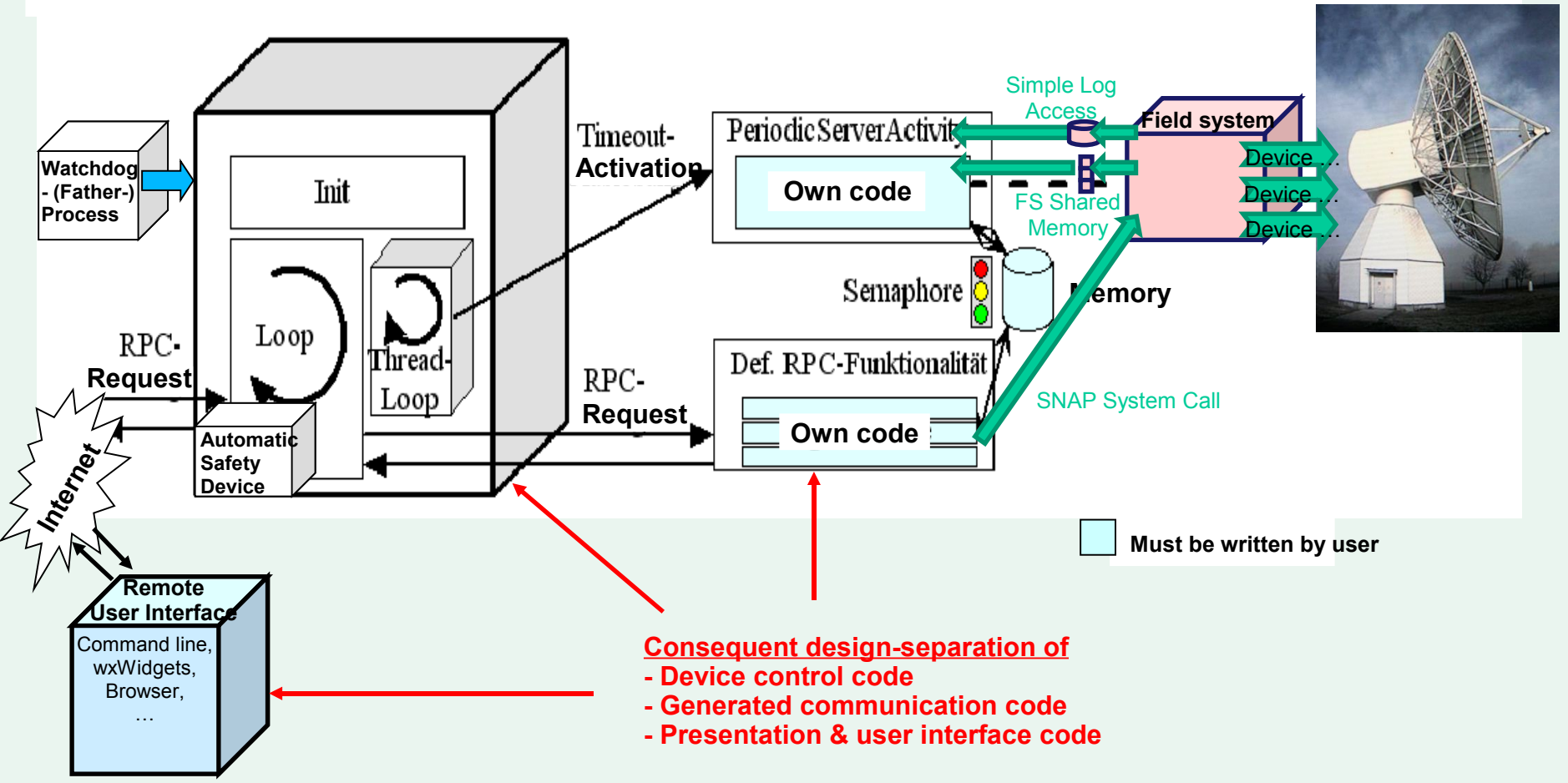
But additional efforts are necessary to control the ssh-connection and prevent blackouts (currently in planning)

A “NASA field system” extension server– remote accessible, autonomous process cells

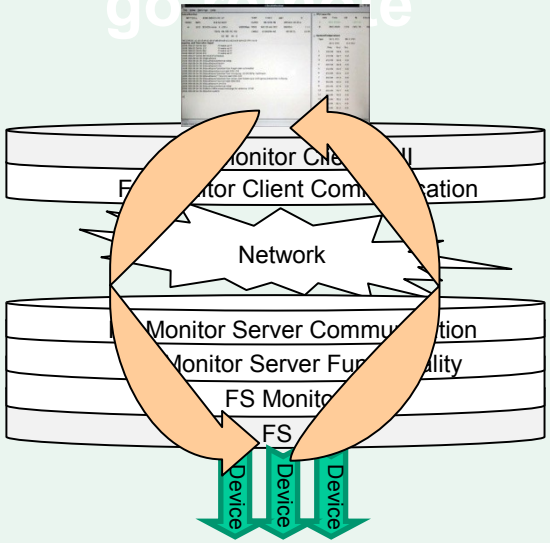


A "NASA field system" extension server-autonomous process cells

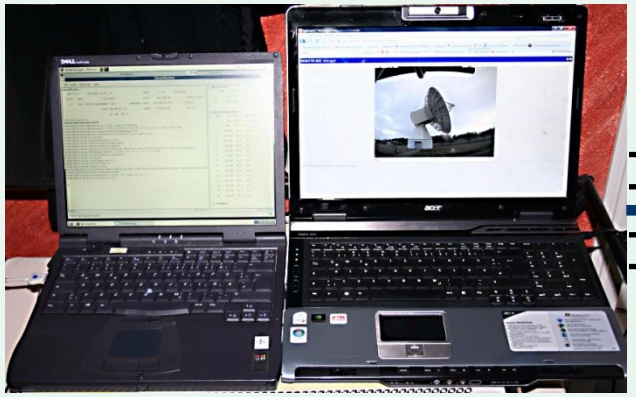
Autonomous process cell offers a remote monitoring of the NASA field system (at the moment in a first iteration for a feasibility study)

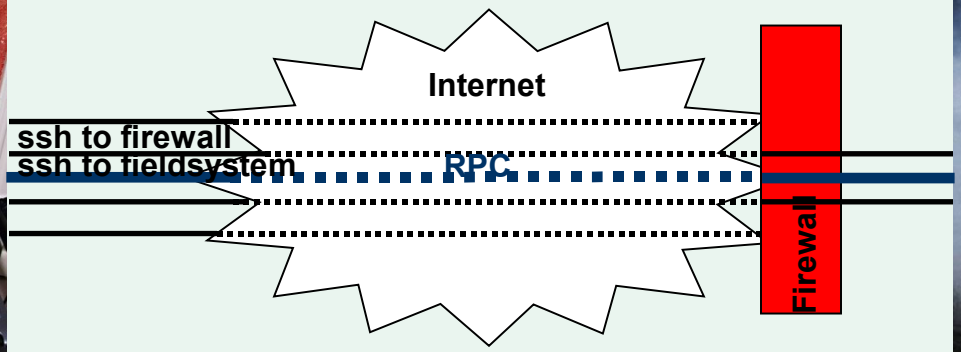


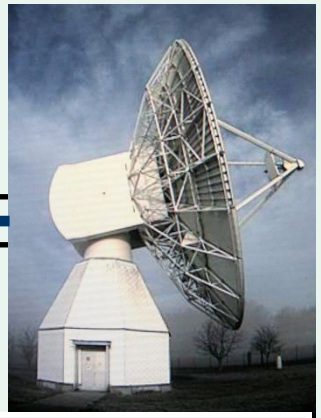
First e-control tests – Wettzell (Germany), O'Higgins (Antarctica) and TIGO (Chile)

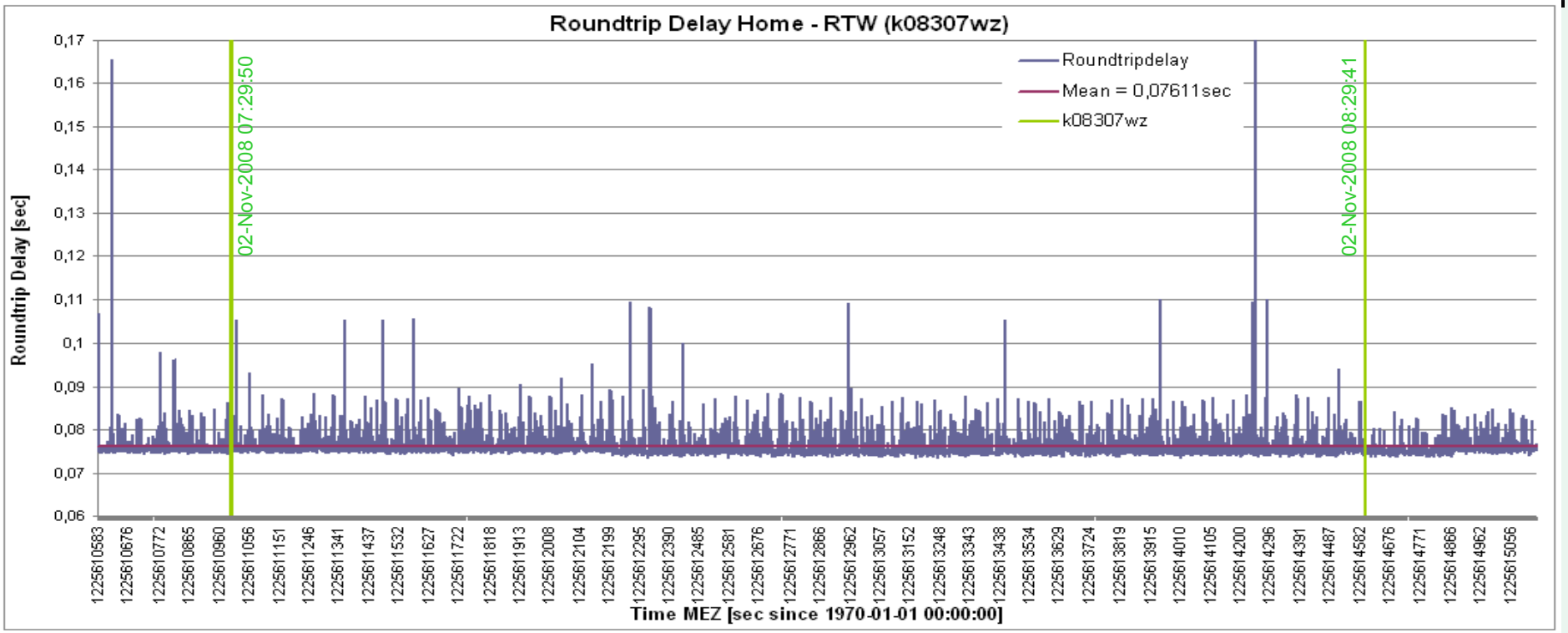


First e-control tests– Radio telescope Wettzell (RTW)/Germany

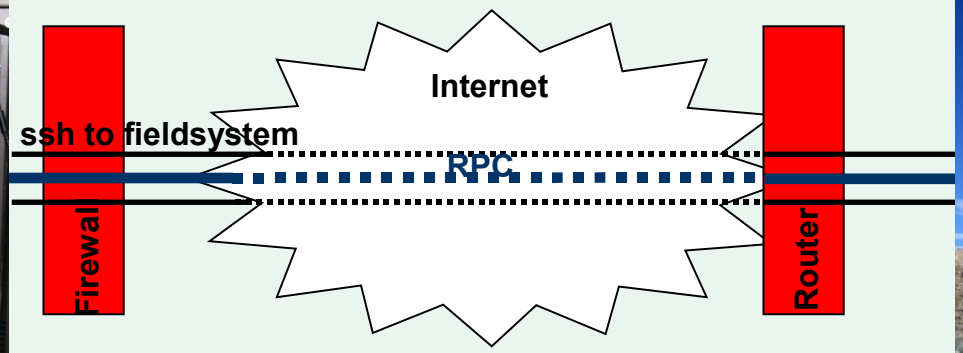


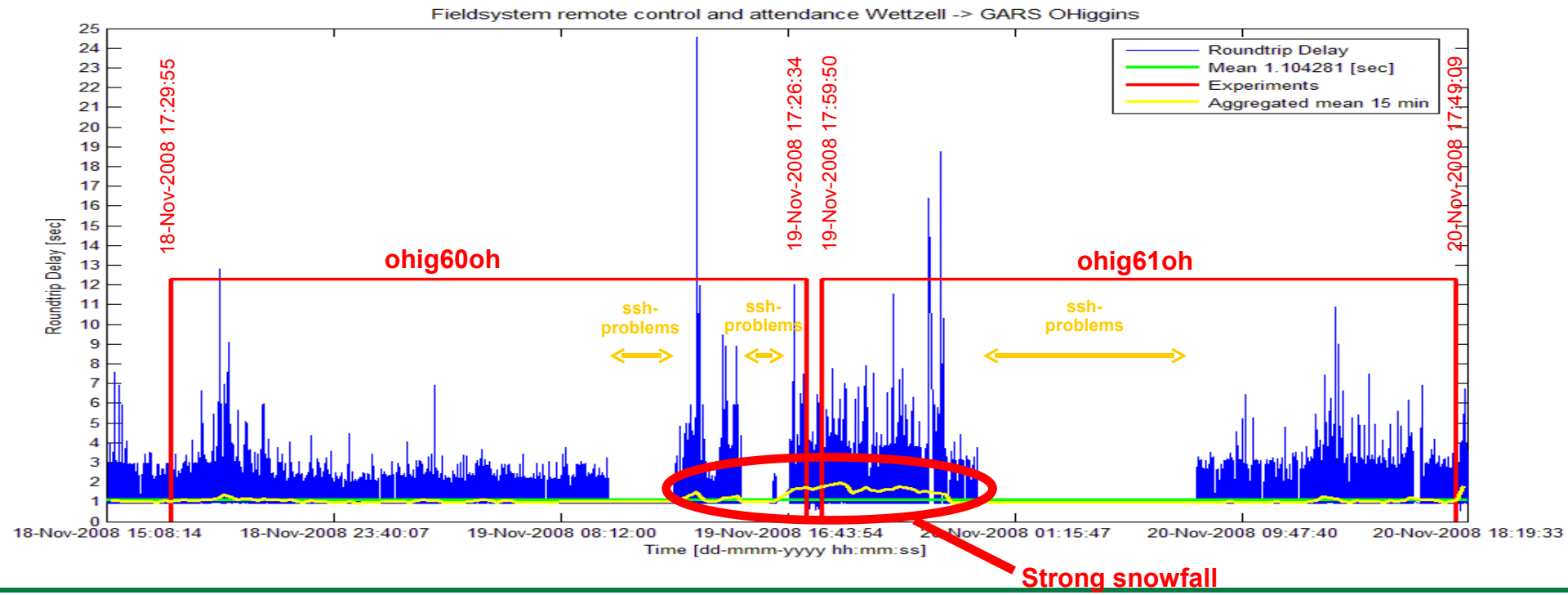




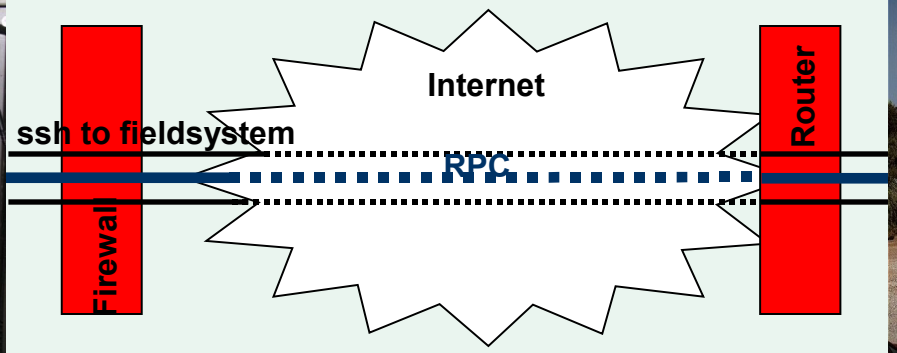


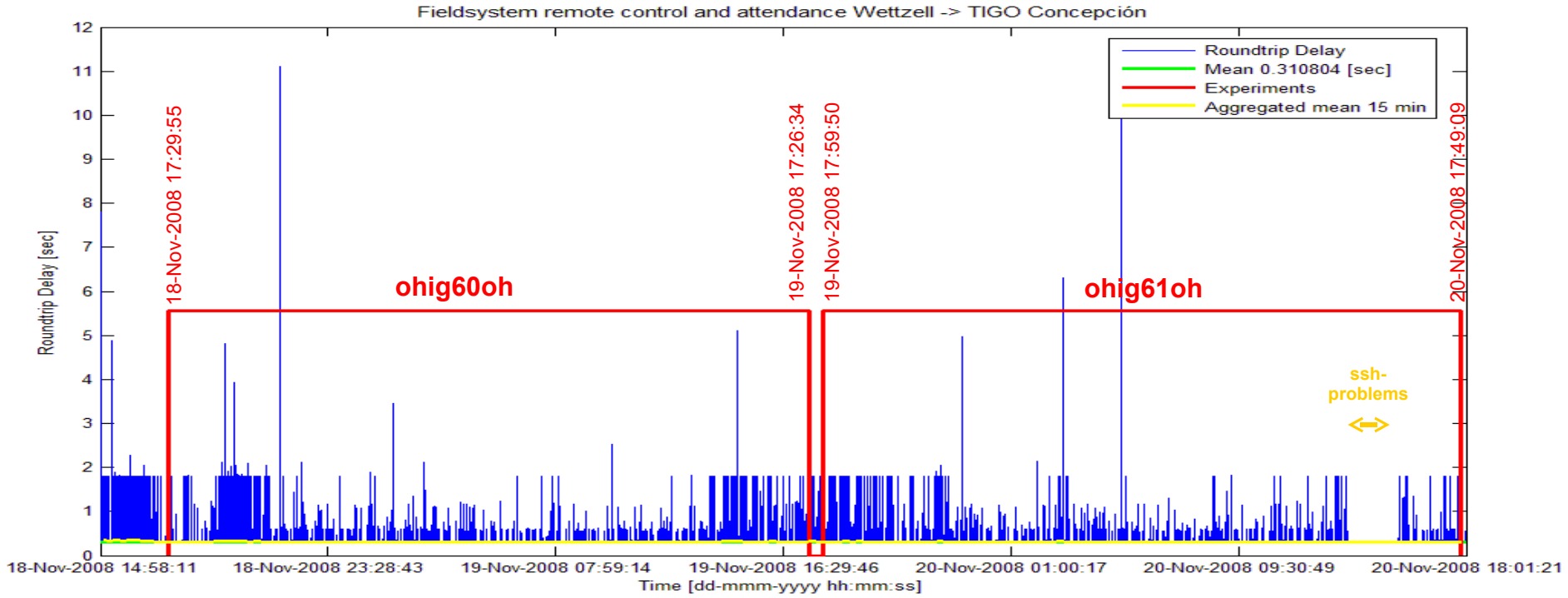
First e-control tests– GARS O'Higgins/Antarctica



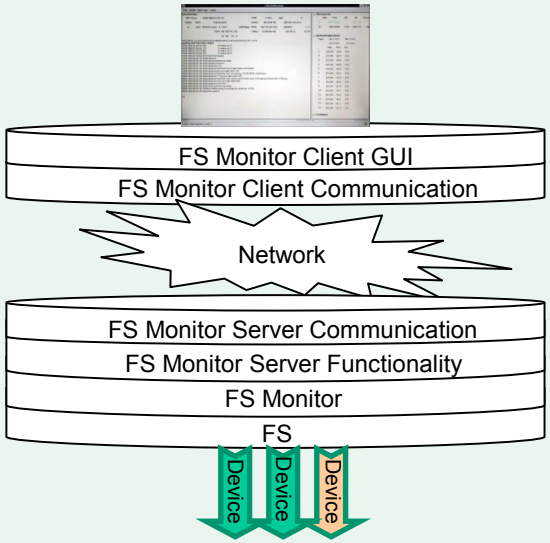


First e-control tests– TIGO Concepción/Chile



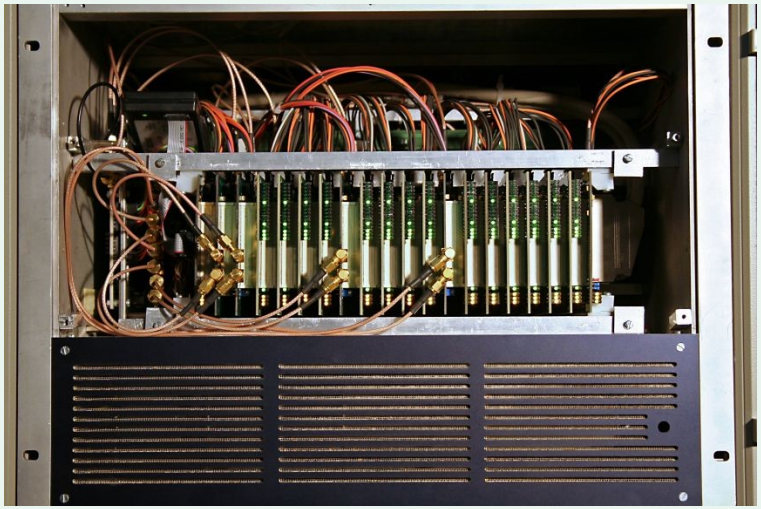


Not only useful for e-control: Adding new devices to the NASA field system



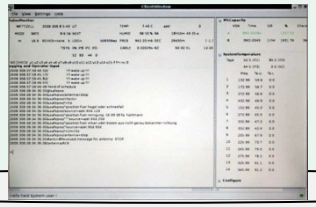
Adding new devices to the NASA field system

e.g. feasibility studies for the new DBBC (INAF)



DBBC core 1 (INAF)

Adding new devices to the NASA field system



FS Monitor Client GUI

FS Monitor Client Communication

Network

FS Monitor Server Communication

FS Monitor Server Functionality

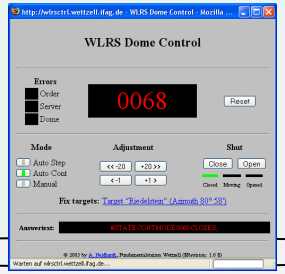
FS Monitor

FS

Device ...

Device ...

e.g. DBBC



DBBC Client GUI

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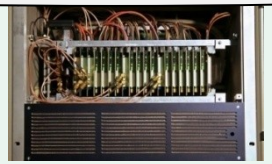
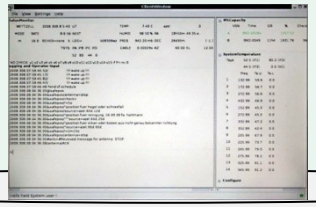


DBBC Hardware

Adding new devices to the NASA field system



FS Monitor Client GUI

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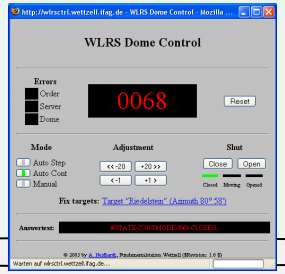
FS

DBBC Client Com.

Device ...

Device ...

e.g. DBBC



DBBC Client GUI

DBBC Client Communication

Network

DBBC Server Communication

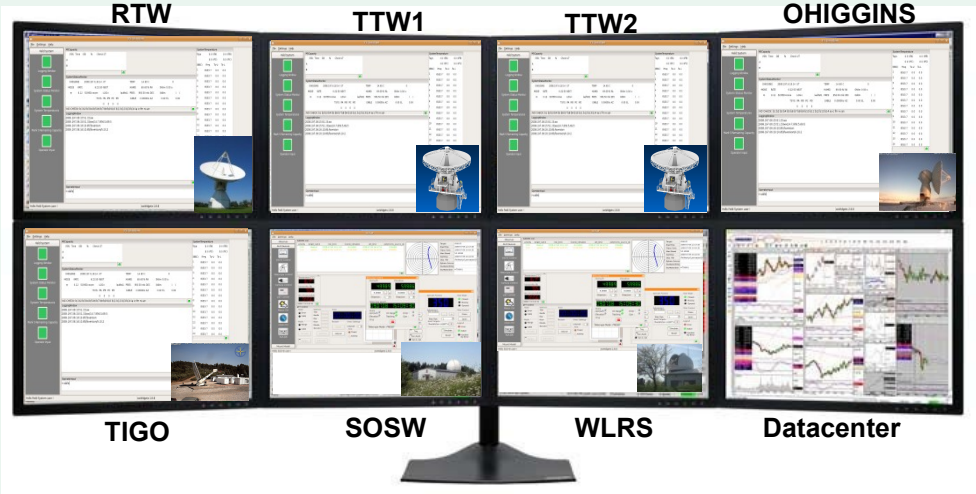
DBBC Server Functionality

DBBC Hardware

A future concept – Combined control of different systems in a geodetic observatory

Combined control of different systems in a geodetic observatory

- Optimized work flows
- Increasing the number of observations with e-control (automation and remote attendance/control)
- Time sharing of measuring equipment
- Just-on-time scheduling and updating to adapt flexible observation programs
- Additional integrated safety system(s)
- Standardization of system software for different systems
- BUT: There will be always situations where highly educated personnel is needed at the observatories



Think about the technical realizations of GGOS ?

Picture similar to: Hase, Hayo; et. al.: Twin Telescope Wettzell (TTW) - a VLBI2010 Radio Telescope Project. IVS General Meeting 2008


Thanks for your attention
Gracias por su atención
If you have further questions, send an email to:
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