13th TWSTFT WG Meeting

SATRE Software Releases

Delft

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2. Software Design Goals

2.1. SATRE software design goals:

- **Compatibility**
  Compatibility between all kinds of modems (single channel / multi channel)
  Compatibility within version of the same S/W lifecycle
  Only one development tree for all modems
  Core parts (calculation routines, measurement routines) unchanged !!

- **Offloading of M&C equipment**
  Data reduction where appropriate
  Reducing data rate to M&C equipment

- **Stand-alone operation**
  Automated scheduler
  Results database (minutely results)

- **Real-time operation and integrity check**
  Real-time TWSTFT calculation (serves as real time consistency / quality check)
  Exchange of core-calibration data
  Real-time identification of problems (time jumps, references etc.)
  Remote stations in unattended operation (US network)

2.2. Challenges in S/W design

Why changing software?

- **Bug fixes**
  We want to fix problems and make this available to all users
  Software errors (i.e. timestamp problem) shall be fixed

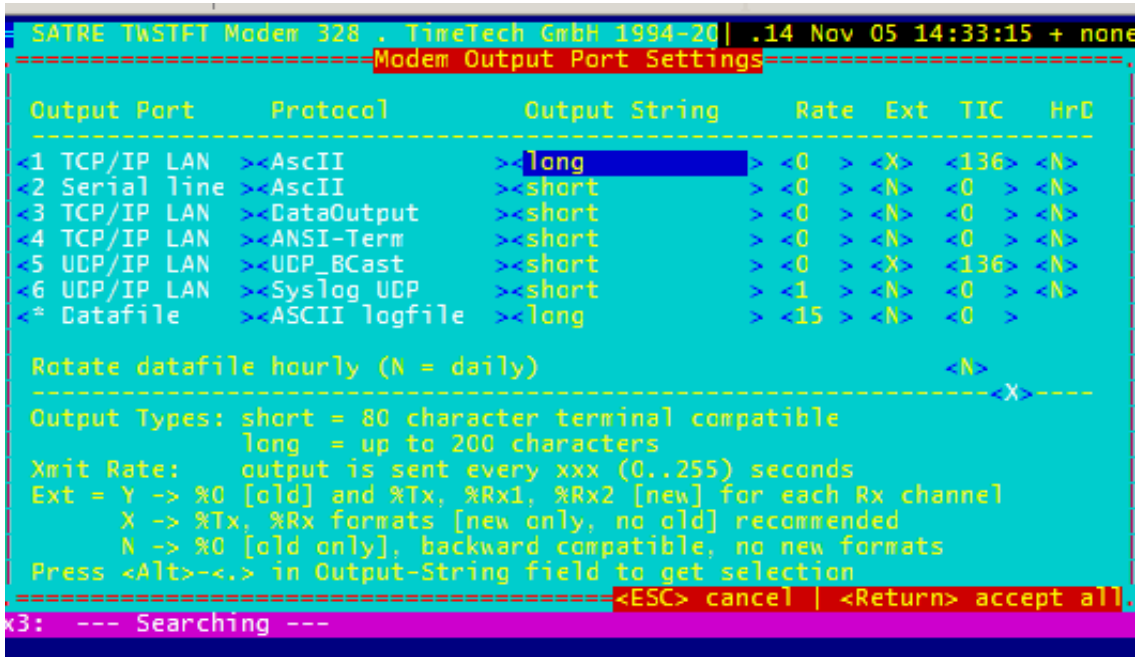
- **Integration of new hardware and functions into the modem**
  IIOTIC (RefDelay measurement)
  Single / double / triple channel modem
  Automated scheduler
  Real time TWSTFT and results database
  Doppler acquisition and tracking (inclined satellites)

- **Workaround for non-availability of hardware during modem lifecycle**
  main processor
  PCMCIA for transferring data

2.3. Problems in the past

Output formats

- configurable (**SATERM.FLD** file)
- output depends on user needs:
  - **à** every second
  - **à** raw values
    or
  - **à** mean values
  - **à** every 10 / 60 seconds



Changing formats in the past were done due to

- new functions (IIOTIC measurements, cal values)
- migration from old single channel format (**%0**) to channel based format (**%Rx**)
- constant values (cal data) shall not be merged into periodic formats
- recorded output data shall be suitable for postprocessing
  - **à** config-ID, modem-ID, remote-ID etc. in the data stream

3. Update Procedures

The update consists of two steps:

- transferring the data onto the SATRE modem
  Normally a SATRE firmware update is one packed file (i.e. **UPDATE.EXE**)

- copying the files and ‘packing’ them onto the modem’s flash drive
  Normally this is a batch file (**UPDATE.BAT**) which comes out of the update file.

3.1. Transferring files

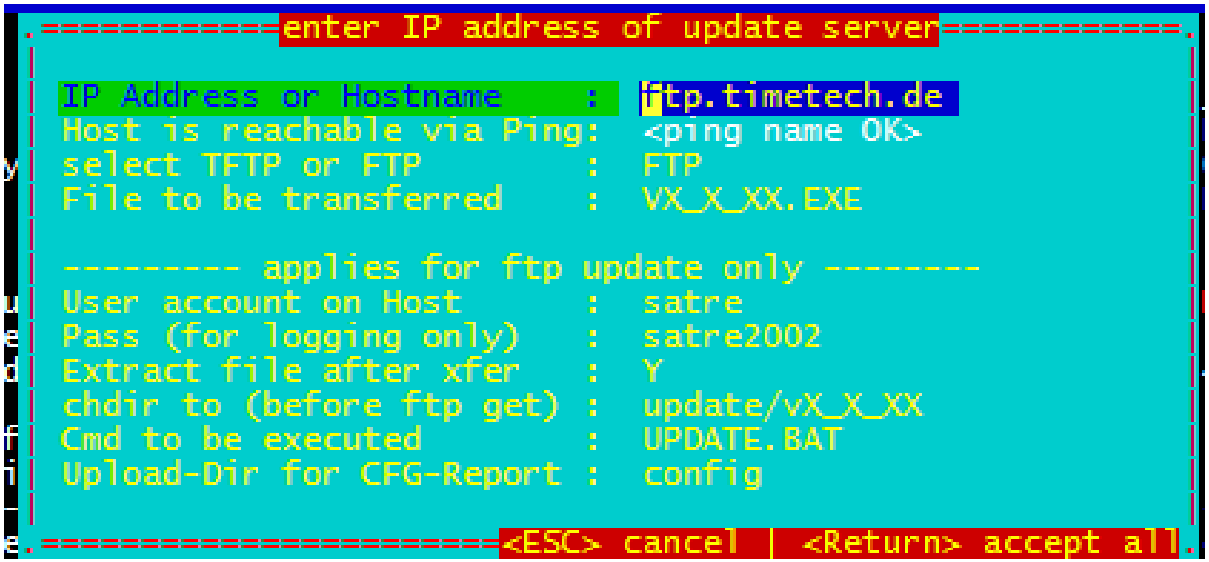
The only way to transfer data onto the SATRE is the network link.
PCMCIA adapter chipset used in earlier modems is currently unavailable.

Integration of a SATRE modem into a network is done in different ways;
firewalls affecting network transfer.

FIle transfer requires integration of the modem into the station network.
DNS (name service) is not always available; use IP addresses instead.

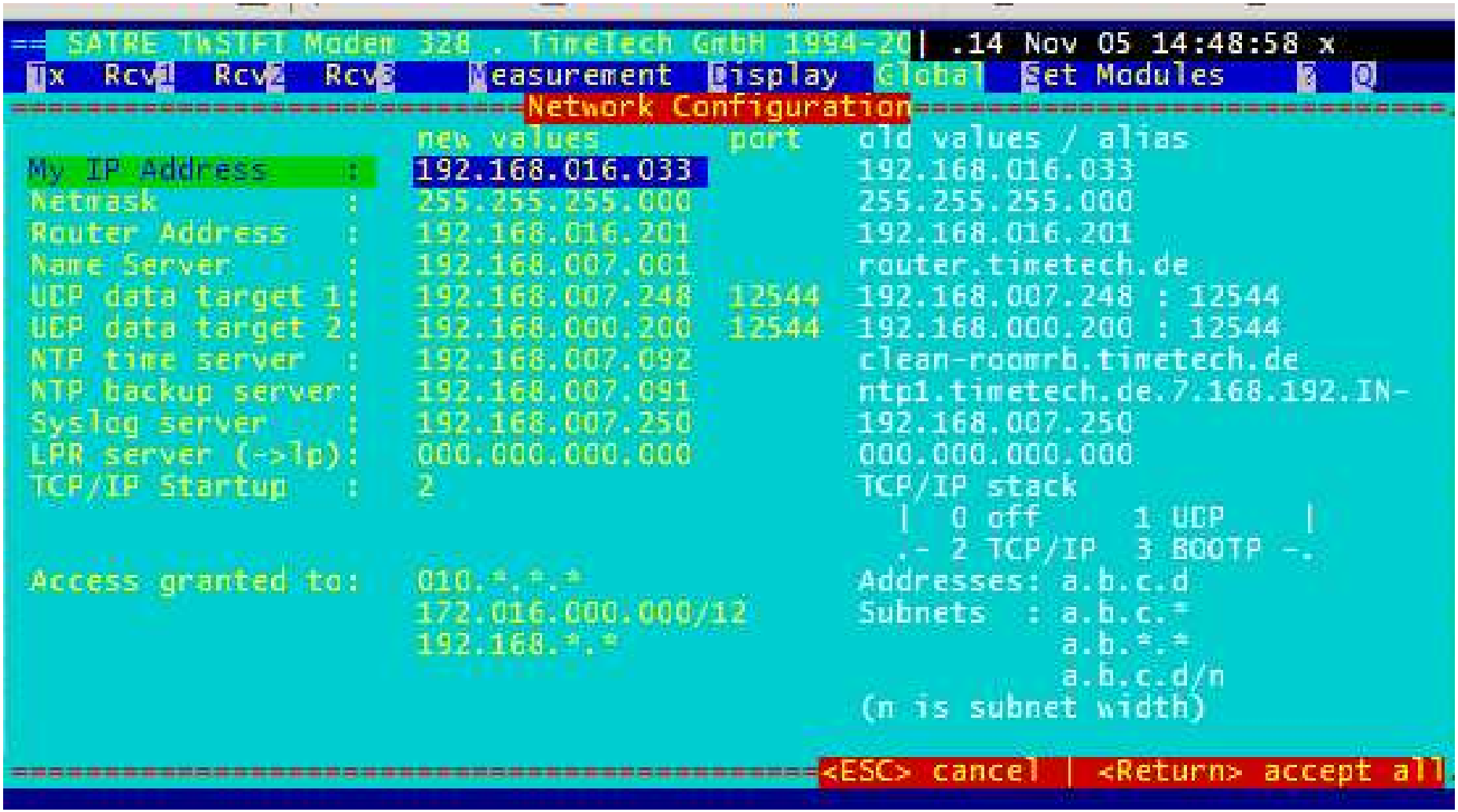
3.1.1. FTP fetch via the internet

Ready-made script available, which can be accessed by the SATRE menu. This procedure covers the file transfer in a fully automated way.



Problems:

- many modems are behind a firewall blocking ftp transfer
- many modems are in a separate network
  ´not capable of connecting to the internet



SATRE network setup. When SATRE is powered up, it first restores its last known network settings (and uses last known IP address, even if running on BOOTP).
These settings can also be used for command-line utilities.

3.1.2. FTP get via command line

If internet connectivity is not available, data can be fetched via a command line ftp client on the modem. It is available on the DOS command line. The network settings (IP address etc.) are preserved after the software quits.

The ftp client has the same commands as the windows / unix ftp client.

```
E:\NETZ\FTP  ip_address_of_server
```

Transfer the files from TimeTech's ftp server onto a location inside your station network.
Fetch the files with SATRE's ftp client.

Typically, place uploaded files on the modem into E:\TEMP.
This is the same location, where the automated procedure puts the files.
Unpack the update file (by calling **`UPDATE.EXE`**)
Then the update script (**`UPDATE.BAT`**) can be called manually.

Caveats:

- transfer files binary (BIN) **à** SATRE's client defaults to ASC mode!
- ftp client is case sensitive on the unix end, but not on the DOS end …

3.1.3. Transfer via TFTP

TFTP (trivial file transfer) is a very simplistic protocol. It has no authentication mechanism (no user / password), so this is a possible security problem.

à normally TFTP ports are blocked via firewalls

à TFTP usually available only within the closed subnet

SATRE has a TFTP server, which is available, when the software is running.
This can be used for uploading files.

Caveats:

- put SATRE into idle mode when uploading files
- upload speed is typically 5 to 10 kBytes/second.
  A typical SATRE firmware image has ~ 1 MByte!
- Due to security reasons, every tftp upload to the modem must be confirmed!

3.1.4. Last resort – TFTP command line utilities

When SATRE main software can not be started, the network can be manually configured in the **`E:\NETZ`** directory.

The following tools are available there (usage like their unix counterparts)

- **`PING`**
  as known in other operating systems

- **`BOOTP`**
  tries to obtain a network confiruration from a BOOTP/DHCP server

- **`FTP`** (see above)

- **`TFTP`** (see above)

- **`TFTP SERVE`**
  starts a tftp server

- **`INET STAT / INET DEBUG / INET CONFIG`**
  shows settings (IP addresses, errors etc.) from the loaded TCP/IP kernel

3.2. Copying / packing into flash memory

The SATRE file system consists of three parts

- firmware section (C-drive)
  this drive holds the packed firmware

- configuration section / user data section (D-drive)
  this drive holds all parts, which can be changed by the user

- working area (E-drive)
  this is a volatile RAM drive, which gets set-up on system boot and gets filled with the firmware extracted from C: Any changes on the E-drive will be lost after the next reboot

Packing onto the flash drive is NOT performed by any update routine described above, because:

- if an update fails, one can cycle power on the modem and has exactly the LAST version

- one can ‘try’ an updated version without loosing the original one

Packing is performed in the directory **`E:\SATRE>`** with the command **`PACK`**

3.3. Releasing the firmware files

TimeTech has set up a new ftp server

ftp://satre.twstft.de

user: **web1f4**

pass: **satre2002**

The ‘old’ server ftp.timetech.de will be maintained, but discontinued soon.

We put there

- firmware releases – including bug fixes
- version history, known issues etc.
- documentation and application notes

3.4. When SATRE should be updated

At one side

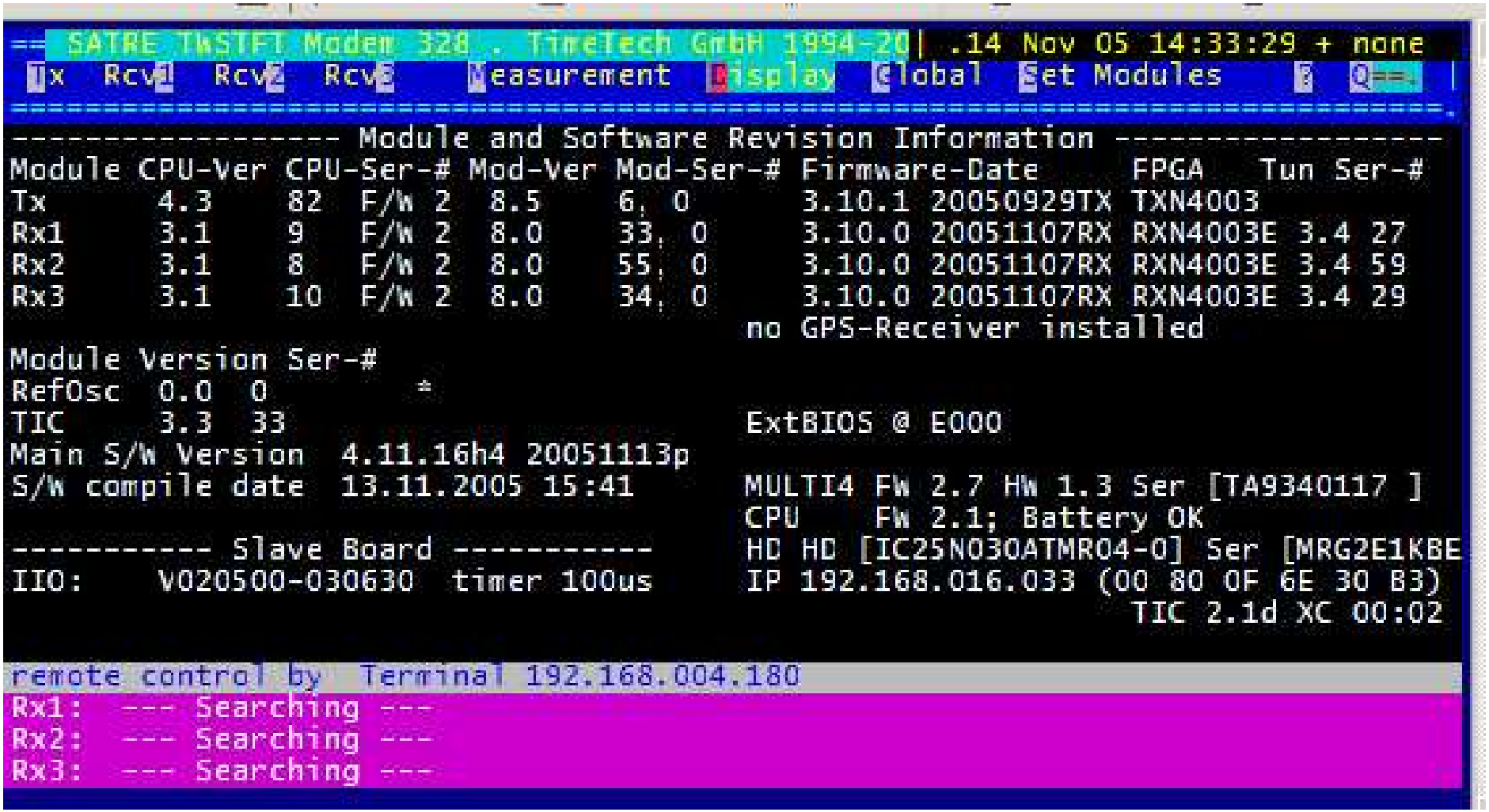
- keep the software in the field ‘constant’ (i.e. untouched)

But:

- make new functions available to others
- quick fix problems

Recommendation:

- major updates not more frequent than once per year
- defining of ‘release versions’, which will be kept in exactly this configuration on the server, so that the whole network can use this version. This version undergoes detailed testing and will include as much as possible feedback from the last period
- avoiding branches to ease maintainability of the software



SATRE version screen (Display | ∗) showing hardware and software configuration.

4. Version History

Latest development areas (V4.8 to V.11) are

- automated schedules
  capable of bi-hourly schedules
  schedule and macro files uploadable by user commands

- IIOTIC (RefDelay) measurement

- Exchange of Cal-data (RefDelay, SysDelay etc.) via RF
  to enable better real-time TWSTFT [ongoing]

- better characterisation
  (thermal sensitivity, amplitude sensitivity) [ongoing]

- unified output format
  to ease processing of single / multichannel modems

- data reduction (minutely measurements)

5. Ongoing Development

The following functions are under development:

- capability to acquire and track satellites in inclined orbits
  including TLE based prediction

- Rx outliers (delay spikes)
  isolated spikes in tracking high chiprates in low noise conditions
  (not relevant for 2.5 MChip links, but visible in high C/No 20 MChip links)

- new main processor
  fully backward compatibility within the SATRE-4 software
  continued removal of obsolete components
  firmware on CF card – writable on every Windows based computer
  à easy firmware exchange / S/W configuration control

- basic commanding / monitoring of remote unmanned stations
  schedule upload, (limited) data retrieval