



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology

VIE_SCHED




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VieVS User Workshop
11 – 13 September, 2012
Vienna







Why is a new scheduling program needed?

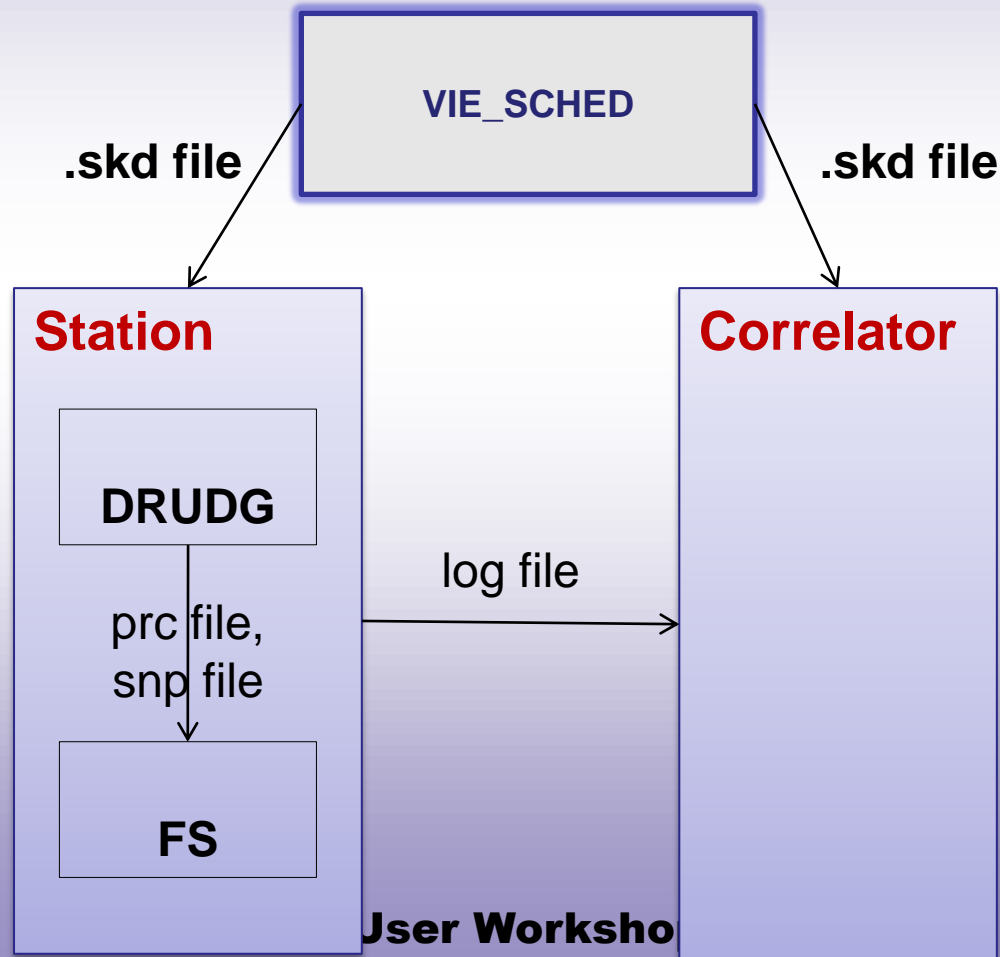
VLBI2010 Goals

-  1 mm measurement accuracy on global baselines
-  continuous measurements for time series of station positions and EOP
-  turnaround time to initial geodetic results of less than 24 hrs.

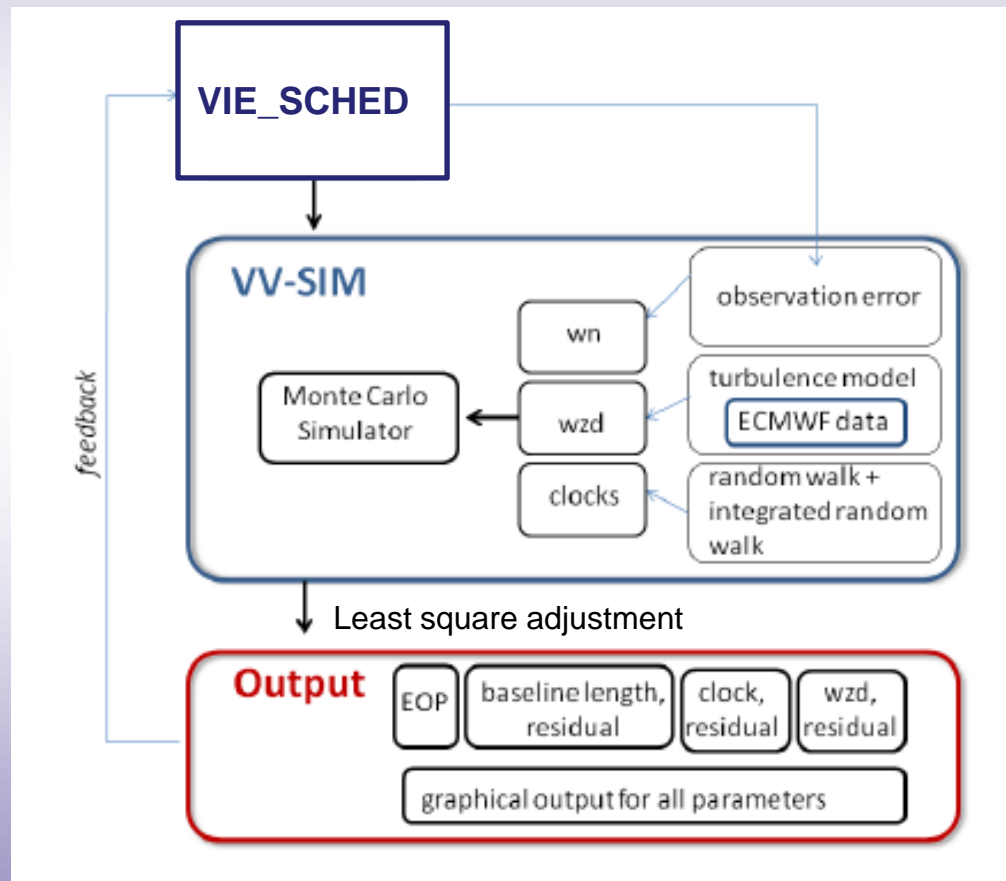
VLBI2010 Specifications

-  small fast-moving antennas
-  broadband frequency (2–14 GHz)
-  two or more antennas at a site
-  ...

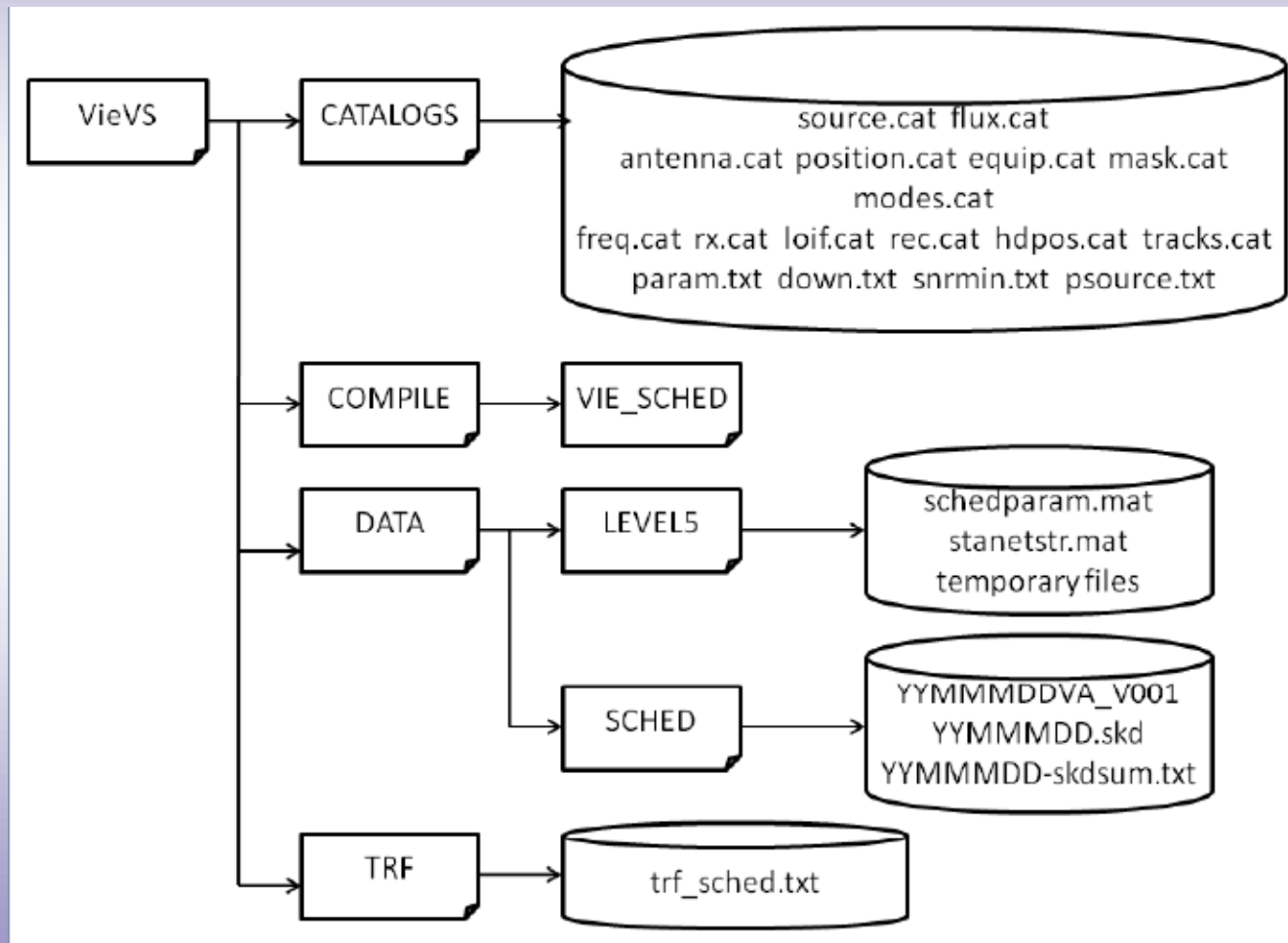
Purpose of a scheduling program --- real VLBI experiment



Purpose of a scheduling program --- **simulation research**



The structure of VIE_SCHED within VieVS



Input files (VieVS/CATALOGS)



Catalog system files

Type	File Name	Contents	Used for
Sources:			
	source.cat	source positions	simu + real
	flux.cat	source fluxes	simu + real
Stations:			
	antenna.cat	antenna information	simu + real
	position.cat	station x,y,z locations	simu + real
	equip.cat	equipment IDs	simu + real
	mask.cat	horizon and coordinate masks	simu + real
Observing modes:			
	modes.cat	observing modes	simu + real
	freq.cat	frequency sequences	real
	rx.cat	receiver setups	real
	loif.cat	station LO and IF setups	real
	rec.cat	recording modes	real
	hdpos.cat	head offsets	real
	tracks.cat	standard recorded tracks	real

Input files (VieVS/CATALOGS)

Catalog system files

--- source.cat

```
*
* IAU-Name Common      hh mm ss.ssss      sdd  mm ss.sssss      epoch  0.0 source
0019+058 $              00 22 32.441209      +06 08 04.26908 2000.0  0.0 ICRF2 def
0025+197 $              00 28 29.818496       20 00 26.74416 2000.0  0.0 2010a glob
0035-252 $              00 38 14.735511      -24 59 02.23510 2000.0  0.0 2010a glob
0048-097 $              00 50 41.317388      -09 29 05.21027 2000.0  0.0 ICRF2 def
0059+581 $              01 02 45.762382      +58 24 11.13660 2000.0  0.0 ICRF2 def
```

Input files (VieVS/CATALOGS)

Catalog system files

--- flux.cat

```

*
* Source Band Type 0.0 Flux Baseline Flux Baseline
* Name          B      (Jy) limit  (Jy) limit
*
* Source Band Type Flux MajAx Ratio PA Off1 Off2
* Name          M      (Jy) (mas)      (mas) (mas)
*
* 0019+058 X B 0.0 0.42 1000.0 0.41 2000.0 0.41 3000.0 0.41 4000.0 0.41 5000.0 0.41
* 0019+058 X B 0.0 0.42 1000.0 0.41 2000.0 0.41 3000.0 0.41 4000.0 0.41 5000.0 0.41
0019+058 X B 0.0 0.40 1000.0 0.39 2000.0 0.39 3000.0 0.39 4000.0 0.39 5000.0 0.39

```


Input files (VieVS/CATALOGS)

Catalog system files

--- antenna.cat

```

*
*ID Name      Axis  Offset Rate1 C1  Lim1  Lim1  Rate2 C2  Lim2  Lim2  Diam  PO EQ MS
*
*
A AIRA        AZEL  0.00000 180.0  0   20.0  700.0 180.0  0   5.0   88.0  10.0  Ai Ai
G ALGOPARK    ALGO  0.00000  24.4  45  41.0  454.0  9.4  45  8.8   86.8  47.0  Ap 03 --
G ALGOPARK    AZEL  0.00000  24.4  0   41.0  453.0  9.4  0   8.8   86.8  47.0  Ap 106 --
G ALGOPARK    AZEL  0.00000  24.4  0   41.0  453.0  5.0  0   8.8   86.8  47.0  Ap 106 --
G ALGOPARK    AZEL  0.00000  20.0  10  41.0  453.0  5.0  30  8.8   86.8  47.0  Ap 106 --

```

Input files (VieVS/CATALOGS)

Catalog system files

--- position.cat

```

*
*ID Name           X (m)           Y (m)           Z (m)           Occ.Code       Lon    Lat    Source
*
*
Ch CHLBOLTN        4008310.06658   -100650.75574   4943794.77179   72156301       1.44   51.15 GLB1069
*Jb JODRELL2        3822842.66000   -153800.13000   5086287.22000   00000000       2.30   53.23 Other
Jb JODRELL2        3822846.79      -153802.28      5086285.92      00000000       2.30   53.23 JIVE
Cr CARNUSTY        3526416.37832   -171421.09865   5294098.85187   76015301       2.78   56.48 GLB1069
*Yb YEBES           4848780.32491   -261702.07078   4123035.74372   73333601       3.09   40.52 GLB1069
Ys YEBES40M        4848762.10000   -261484.50000   4123084.90000   73863601       3.09   40.52 Other

```

Input files (VieVS/CATALOGS)

Catalog system files

--- equip.cat

```

*
*Antenna   ID   DAT_Name   Heads Tape_len   X   SEFD   S SEFD   SEFD param/Equip
*          den/spd ft/min   (Jy) (Jy)
ATCA      At   ATCA       1      200    K  1500   K  1500 Mark4 MARK5A
BADARY    BD   BADARY    1x56000 17640 X   400   S   600 Mark4 MARK5B
*MOJAVE12 01   OVRO_130  1      8820  X  2750   S  3100
BR-VLBA   BR   BR-VLBA   1x56000 2x17640 X   500   S   400 S 0.1 -2.087 3.087 X 0.5 0.731 0.2
CAMBG32M CM   CAMBG32M 1x56000 17640  C   136   C   136 VLBA MARK5A
    
```

Input files (VieVS/CATALOGS)

Catalog system files

--- mask.cat

```
*
*H Name      ID Az1 E11 Az2 E12 .... Azlast Ellast  <<< line segments
*H Name      ID Az1 E11 Az2 E12 .... Azlast      <<< step functions
*C Name      ID Dec1 HA1 Dec2 HA2 .... Declast    <<< Ha/Dec coord. mask
*C Name      ID X1  Y1  X2  Y2 .... Xlast       <<< X/Y coord. mask
*
H MEDICINA ME .0      5.0   360.0  5.0
H TIGOCONO TG 0  2  21  8  106  4  123  12  131  8  150  6  194  10  215  8
- 224  5  241  4  266  8  284  8  348  2  352  4  360
```

Input files (VieVS/CATALOGS)

Catalog system files

--- modes.cat

```

*Mode name          freq.cat      chan  samp    rec.cat
*Max 16 char       Max 8 char   bw   rate    Max 16 char
*rate-chan(sess)  trk-chan-fan-bit
*                  trk-Ux+Lx-fan-bit  <---Alternate
* mode used in VIE_SCHED
VLBI2010obsmodes  GEOSX        8.0  16.0    32-16-2-1
*VLBI2010obsmodes  GEOSX       128.0 256.0   32-16-2-2
    
```

Input files (VieVS/CATALOGS)

Local control files

(1) param.txt file

Option	Description
PARA.WAVEL(1)	Wavelength of X band [meter]
PARA.WAVEL(2)	Wavelength of S band [meter]
PARA.RATE1A	Acceleration of AZ/HA axis [deg/s ²]
PARA.RATE2A	Acceleration of EL/DC axis [deg/s ²]
PARA.MARGEL1	Marge for AZ/HA axis [deg]
PARA.MARGEL2	Marge for EL/DC axis [deg]
PARA.MIN_SRCRP	The interval that the same source won't be observed twice [min]
PARA.SOURCE	Time for the antenna to settle down after slewing and before observation start time [sec]
PARA.TAPETM	Time for the tape after slewing and before observation start time [sec]
PARA.IDLE	Time allowed for idling after slewing and before observation start time [sec]
PARA.CALIBRATION	Time allowed for calibration after slewing and before observation start time [sec]

Input files (VieVS/CATALOGS)

Local control files

(1) param.txt file

PARA.MAXSLEWTIME	Maximum time to allow an antenna to slew [sec]
PARA.MAX_WAIT	Maximum time to wait for the slow antenna [min]
PARA.CORSYNCH	Time to allow the correlator to synchronize tapes [sec]
PARA.MAX_SCAN	Maximum allowable scan time [sec]
PARA.MIN_SCAN	Minimum allowable scan time [sec]
PARA.FILLINMODE	If use fill-in mode (1/0)
PARA.FILLENDT	Maximum time for the end time of fill-in scan [min]
PARA.SCREEN	If print processing information on screen (1/0)
PARA.MIN_STANUM	Minimum subnet scheduled at one time
PARA.MIN_SRC2ANG	Minimum angle between two sources observed simultaneously [deg]
PARA.SKYDT	The interval for calculation of sky coverage [min]
PARA.EXPER	Experiment code
PARA.DESCRPTION	Description of the experiment
PARA.SCANDURA	The default scan length [sec]
PARA.TRACKSMODE	The formatter mode

Input files (VieVS/CATALOGS)

Local control files

(1) param.txt file

(2) down.txt file

```
*
* down.txt - downtime information
*
* NOTE: Use this file for schedules to specify the downtime
*       that the station can't take part in observation.
*
* Name      start (YMDHMS)      end (YMDHMS)
* KOKEE     2012 08 28 18 15 00  2012 08 28 19 45 00
* WETTZELL  2012 08 28 18 15 00  2012 08 28 19 45 00
```


Input files (VieVS/CATALOGS)

Local control files

- (1) param.txt file
- (2) down.txt file
- (3) snrmin.txt file

```
*
* snrmin.txt - minimum SNR information
*
* NOTE: Use this file for schedules to specify the minimum SNR
*       of each band at stations.
*
* Name          SNR_min(X)  SNR_min(S)
*
TIGO            18          12
TIGOCONC       18          12
```

Input files (VieVS/CATALOGS)

Local control files

- (1) param.txt file
- (2) down.txt file
- (3) snrmin.txt file
- (4) psource.txt file

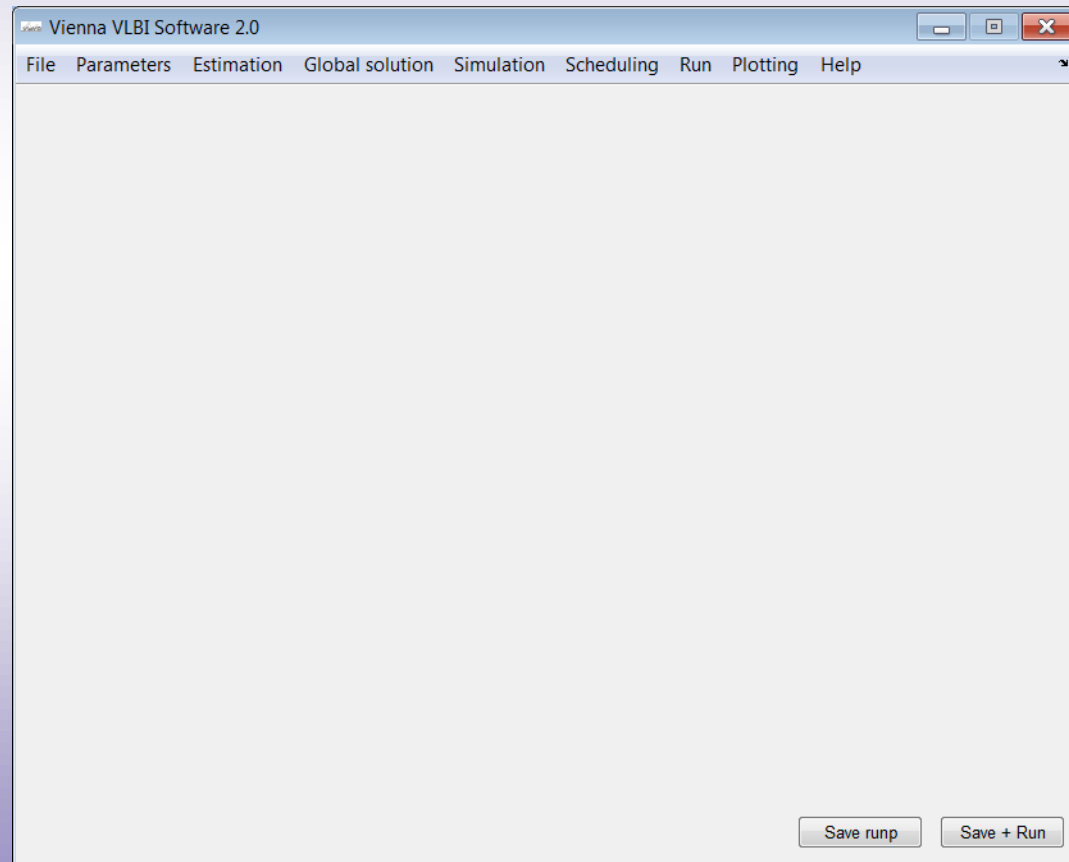
```

*
* psource.txt - particular sources needed more observations
*
* NOTE: Use this file to specify a list of sources to be observed,
*       especially for astrometry.
*
*-----
*
*           From      interval %year mo da      ICRF      flux      structure
*           (min)                                     h      elon      sigma      3.6 cm      index      Nobs
*                                     (deg)      (uas)      (Jy)
*-----
* Session RD1206 12AUG28XA
*-----
1030+074 20120829040000 20 %2012 8 29 0      2.3      92.2      0.299      2.64      1681
1023+131 20120829040000 50 %2012 8 29 0      3.7      100.0     0.546      2.64      1167
1015+057 20120828173000 180 %2012 8 29 0      4.9      134.5     0.285      2.75      1058
1013+054 20120828173000 180 %2012 8 29 0      5.5      92.2      0.443      2.75      2674
1022+194 20120828173000 180 %2012 8 29 0      10.0     78.1      0.670      2.64      3253
1055+018 20120828173000 180 %2012 8 29 0      10.4     64.0      3.218      2.81      7749
1111+149 20120828173000 180 %2012 8 29 0      12.1     122.1     0.423      2.53      1763
1049+215 20120828173000 180 %2012 8 29 0      13.1     92.2      0.980      2.95      1599
1012+232 20120828173000 180 %2012 8 29 0      14.2     84.9      0.859      2.75      2861

```

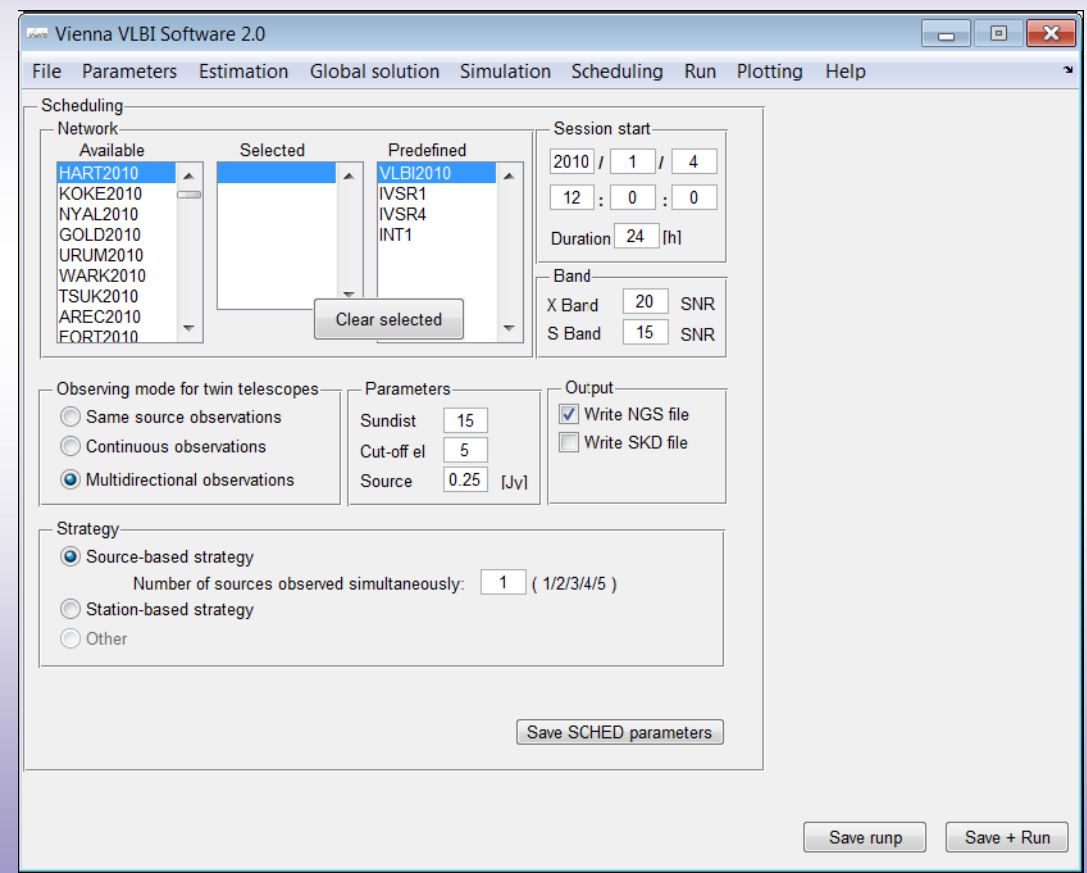
How to run VIE_SCHED

 start VieVS as usual



How to run VIE_SCHED

Scheduling GUI



The screenshot shows the 'Scheduling' window of the Vienna VLBI Software 2.0. The window title is 'Vienna VLBI Software 2.0' and it has a menu bar with 'File', 'Parameters', 'Estimation', 'Global solution', 'Simulation', 'Scheduling', 'Run', 'Plotting', and 'Help'. The 'Scheduling' section is active and contains several sub-sections:

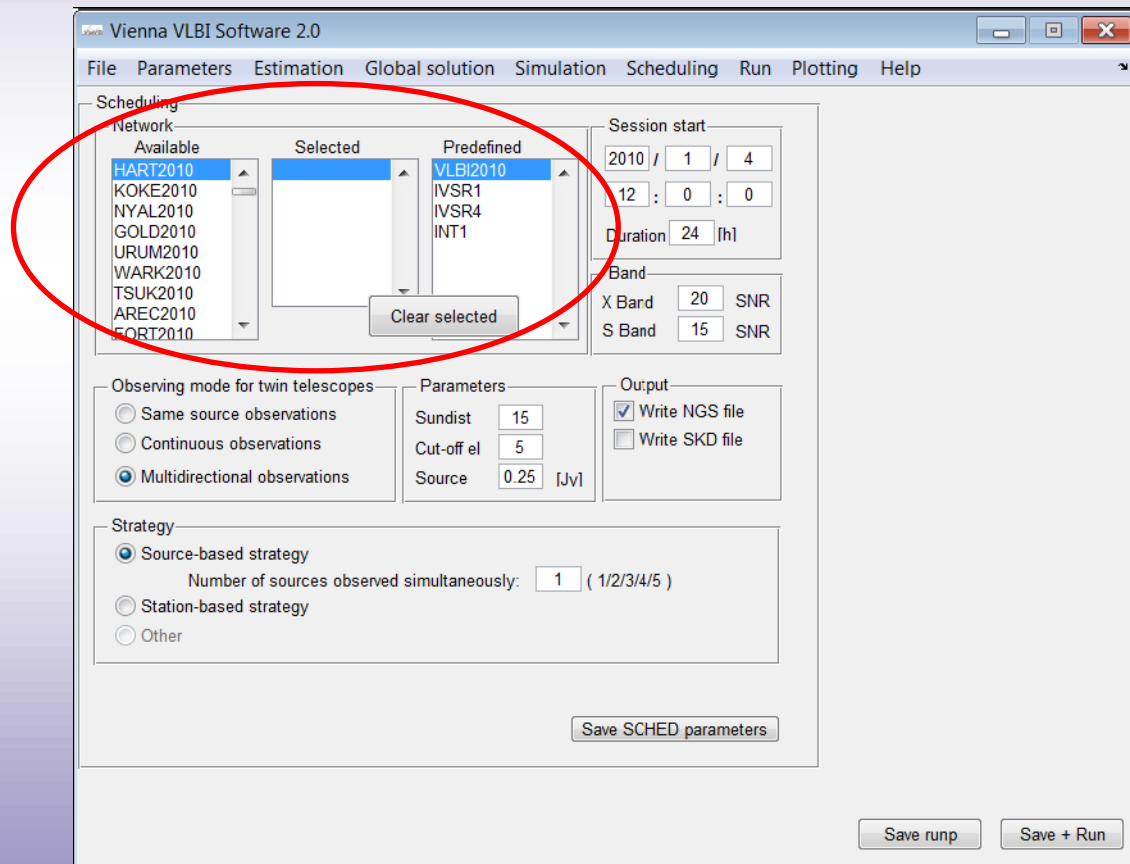
- Network:** A table with three columns: 'Available', 'Selected', and 'Predefined'.
 - Available:** HART2010, KOKE2010, NYAL2010, GOLD2010, URUM2010, WARK2010, TSUK2010, AREC2010, EORT2010.
 - Selected:** (Empty)
 - Predefined:** VLBI2010, IVSR1, IVSR4, INT1.
 - A 'Clear selected' button is located below the 'Selected' column.
- Session start:** Year: 2010, Month: 1, Day: 4. Time: 12 : 0 : 0. Duration: 24 [h].
- Band:** X Band: 20 SNR, S Band: 15 SNR.
- Observing mode for twin telescopes:** Radio buttons for 'Same source observations', 'Continuous observations', and 'Multidirectional observations' (selected).
- Parameters:** Sundist: 15, Cut-off el: 5, Source: 0.25 [Jy].
- Output:** Checkboxes for 'Write NGS file' (checked) and 'Write SKD file'.
- Strategy:** Radio buttons for 'Source-based strategy' (selected), 'Station-based strategy', and 'Other'. A sub-section for 'Source-based strategy' shows 'Number of sources observed simultaneously: 1 (1/2/3/4/5)'.

Buttons at the bottom of the window include 'Save SCHED parameters', 'Save runp', and 'Save + Run'.

How to run VIE_SCHED

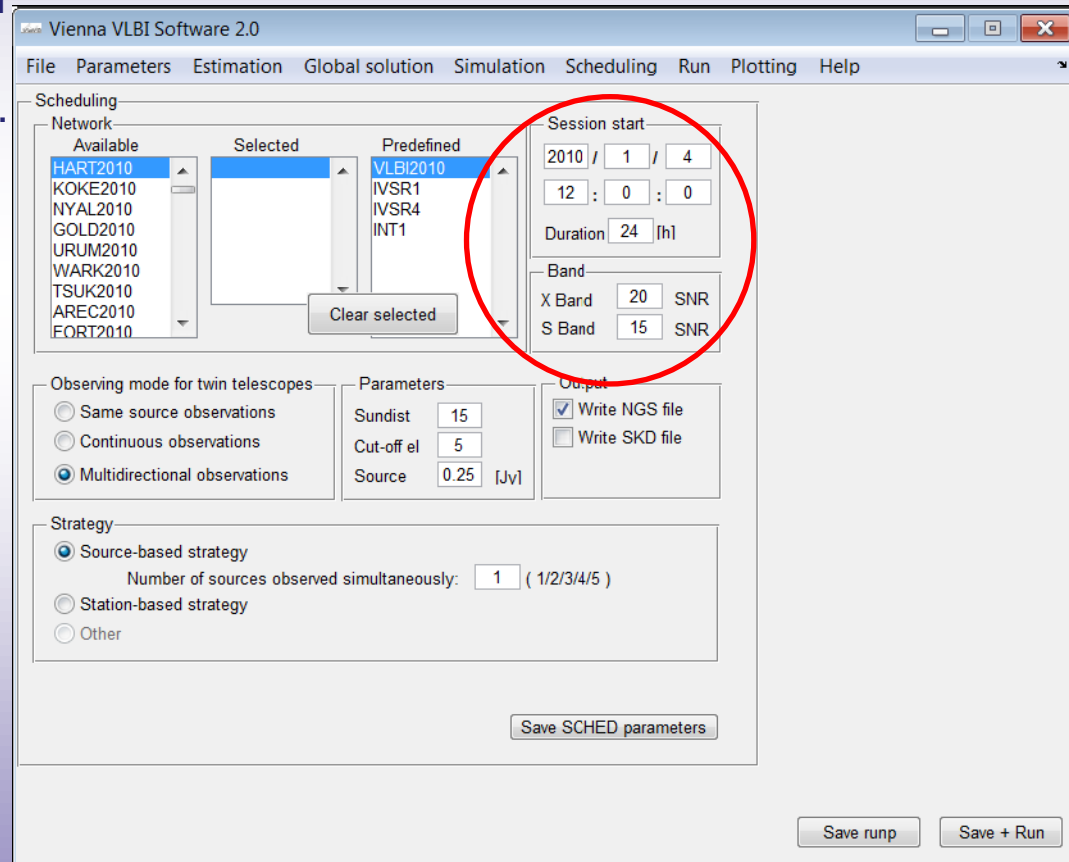


Select the stations or use a predefined network. This is usually done according to the master file.



How to run VIE_SCHED

- Change the start times of the session and its duration. The start and end times are also contained in master file.



The screenshot shows the 'Vienna VLBI Software 2.0' window with the 'Scheduling' tab selected. A red circle highlights the 'Session start' section, which contains the following fields:

- Year: 2010
- Month: 1
- Day: 4
- Time: 12 : 0 : 0
- Duration: 24 [h]

Other sections in the window include:

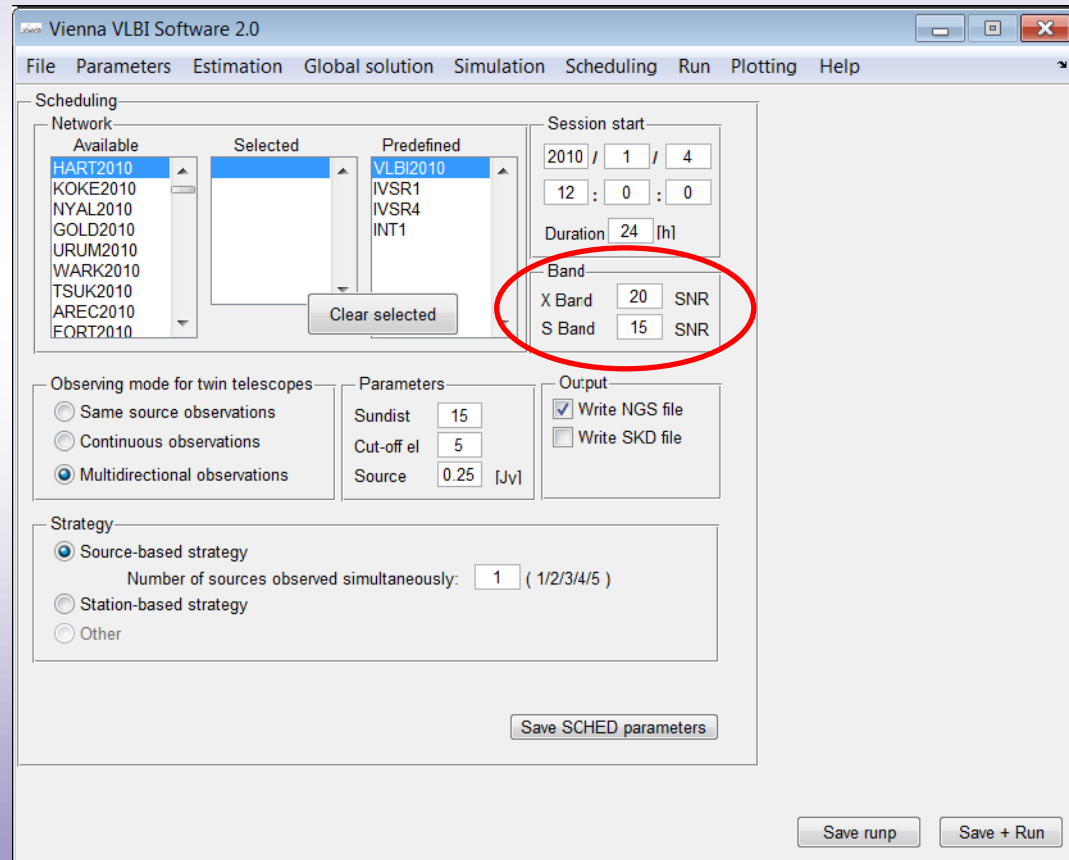
- Network:** Three lists: 'Available' (HART2010, KOKE2010, NYAL2010, GOLD2010, URUM2010, WARK2010, TSUK2010, AREC2010, EORT2010), 'Selected' (empty), and 'Predefined' (VLBI2010, IVSR1, IVSR4, INT1). A 'Clear selected' button is below.
- Observing mode for twin telescopes:** Radio buttons for 'Same source observations', 'Continuous observations', and 'Multidirectional observations' (selected).
- Parameters:** Sundist: 15, Cut-off el: 5, Source: 0.25 [Jy].
- Strategy:** Radio buttons for 'Source-based strategy' (selected), 'Station-based strategy', and 'Other'. A sub-field shows 'Number of sources observed simultaneously: 1 (1/2/3/4/5)'.
- Output:** Checkboxes for 'Write NGS file' (checked) and 'Write SKD file'.

Buttons at the bottom include 'Save SCHED parameters', 'Save runp', and 'Save + Run'.

How to run VIE_SCHED



Set the SNR targets.



Vienna VLBI Software 2.0

File Parameters Estimation Global solution Simulation Scheduling Run Plotting Help

Scheduling

Network

Available	Selected	Predefined
HART2010		VLBI2010
KOKE2010		IVSR1
NYAL2010		IVSR4
GOLD2010		INT1
URUM2010		
WARK2010		
TSUK2010		
AREC2010		
EORT2010		

Clear selected

Session start
2010 / 1 / 4
12 : 0 : 0
Duration 24 [h]

Band

X Band 20 SNR
S Band 15 SNR

Observing mode for twin telescopes

Same source observations
 Continuous observations
 Multidirectional observations

Parameters

Sundist 15
Cut-off el 5
Source 0.25 [Jy]

Output

Write NGS file
 Write SKD file


Strategy

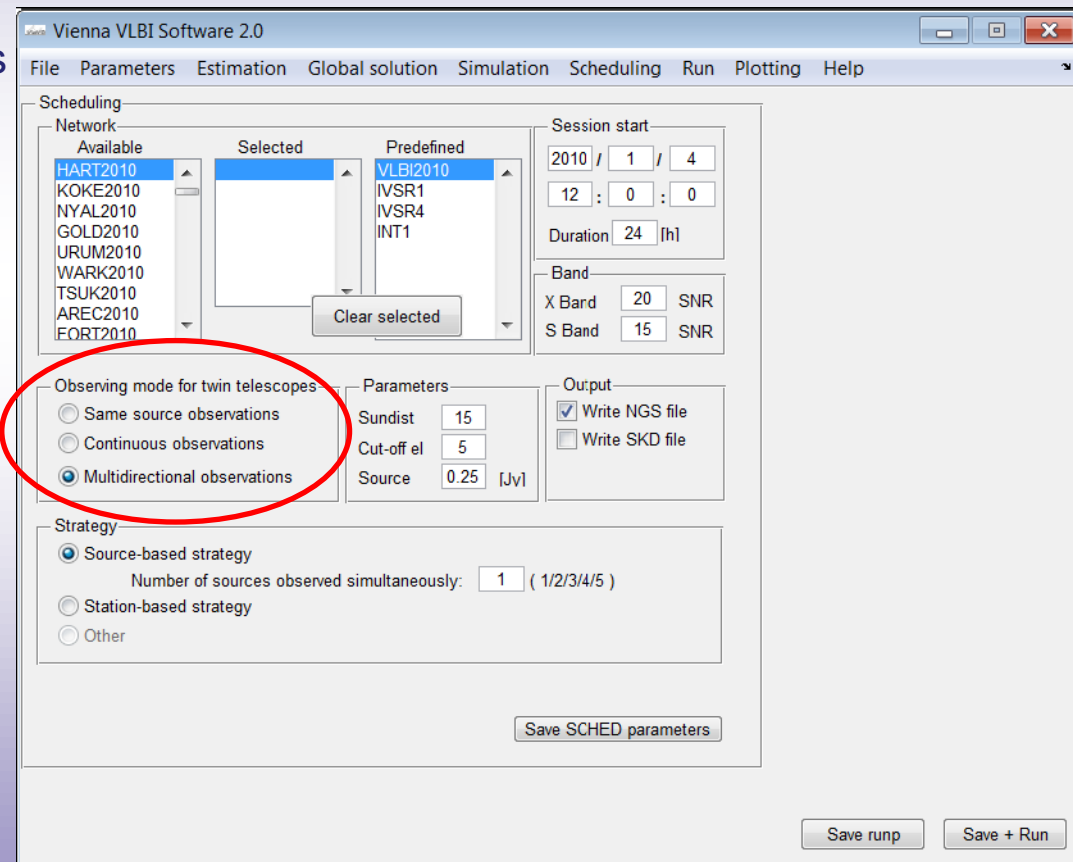
Source-based strategy
Number of sources observed simultaneously: 1 (1/2/3/4/5)
 Station-based strategy
 Other

Save SCHED parameters

Save runp Save + Run

How to run VIE_SCHED

 Specify the observing mode for twin telescopes if there are twin telescopes in the network.



Vienna VLBI Software 2.0

File Parameters Estimation Global solution Simulation Scheduling Run Plotting Help

Scheduling

Network

Available	Selected	Predefined
HART2010		VLBI2010
KOKE2010		IVSR1
NYAL2010		IVSR4
GOLD2010		INT1
URUM2010		
WARK2010		
TSUK2010		
AREC2010		
EORT2010		

Clear selected

Session start
2010 / 1 / 4
12 : 0 : 0
Duration 24 [h]

Band
X Band 20 SNR
S Band 15 SNR

Observing mode for twin telescopes

- Same source observations
- Continuous observations
- Multidirectional observations

Parameters
Sundist 15
Cut-off el 5
Source 0.25 [Jy]

Output
 Write NGS file
 Write SKD file

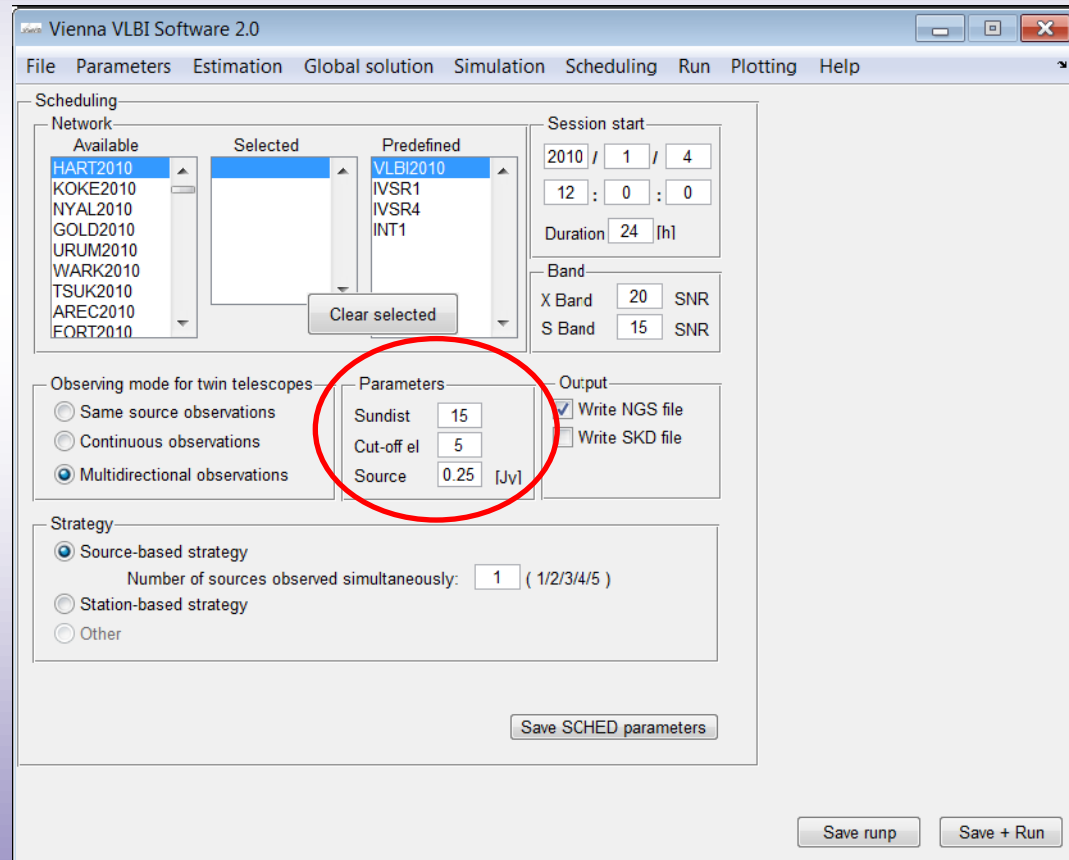
Strategy
 Source-based strategy
Number of sources observed simultaneously: 1 (1/2/3/4/5)
 Station-based strategy
 Other

Save SCHED parameters

Save runp Save + Run

How to run VIE_SCHED

 Give the parameters for scheduling.



Vienna VLBI Software 2.0

File Parameters Estimation Global solution Simulation Scheduling Run Plotting Help

Scheduling

Network

Available	Selected	Predefined
HART2010		VLBI2010
KOKE2010		IVSR1
NYAL2010		IVSR4
GOLD2010		INT1
URUM2010		
WARK2010		
TSUK2010		
AREC2010		
EORT2010		

Clear selected

Session start

2010 / 1 / 4

12 : 0 : 0

Duration 24 [h]

Band

X Band 20 SNR

S Band 15 SNR

Observing mode for twin telescopes

Same source observations

Continuous observations

Multidirectional observations

Parameters

Sundist 15

Cut-off el 5

Source 0.25 [Jy]

Output

Write NGS file

Write SKD file

Strategy

Source-based strategy

Number of sources observed simultaneously: 1 (1/2/3/4/5)

Station-based strategy

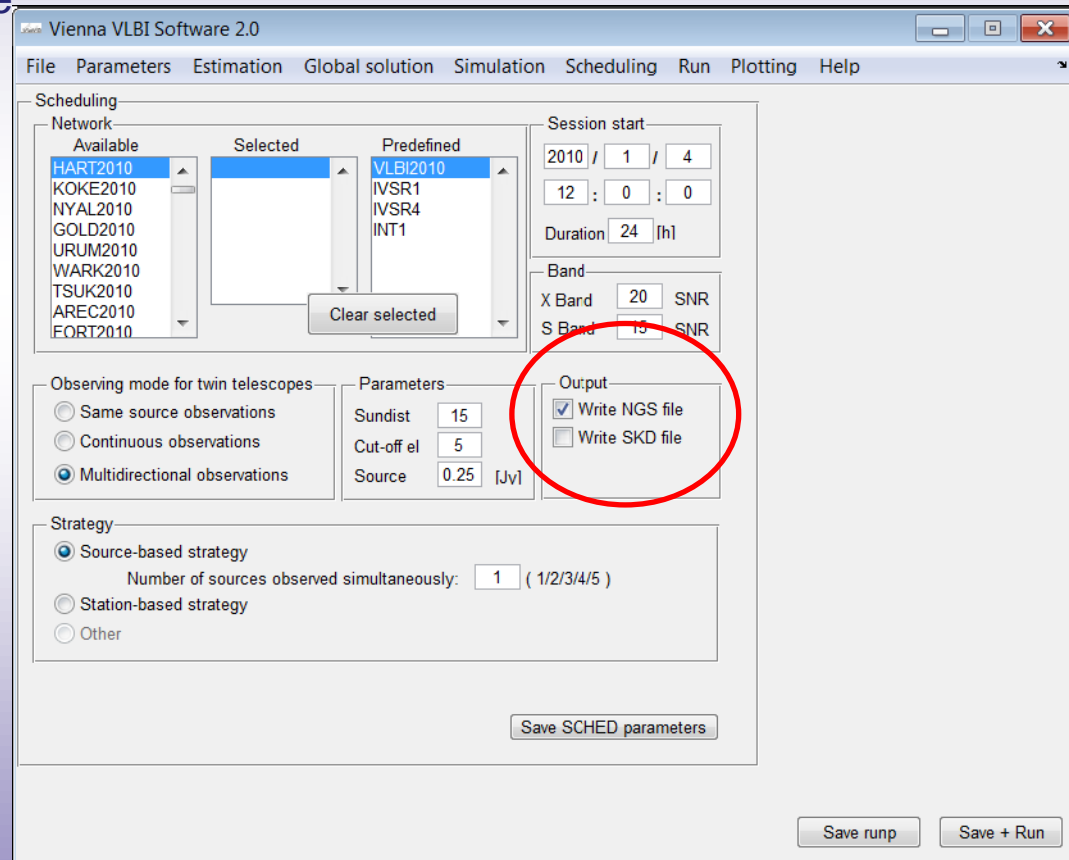
Other

Save SCHED parameters

Save runp Save + Run

How to run VIE_SCHED

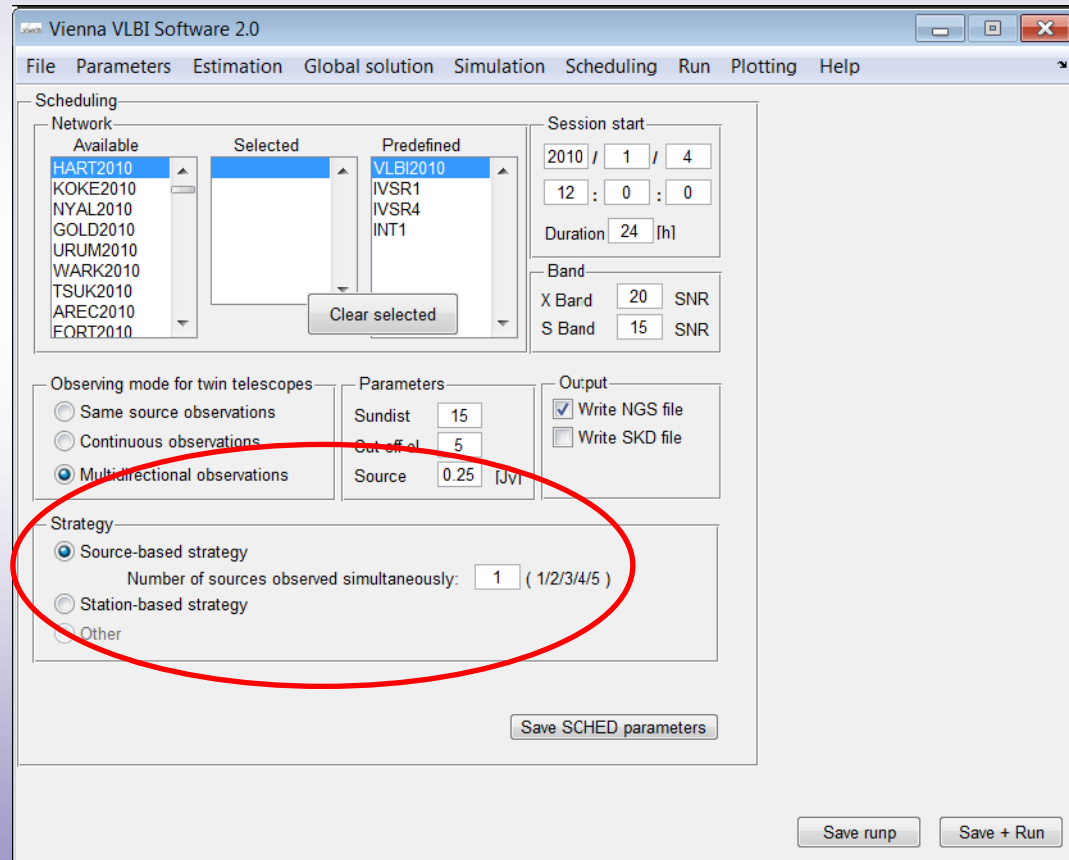
- Specify the type of output file (NGS file or SKD file).



How to run VIE_SCHED



Specify the strategy used for scheduling.



Vienna VLBI Software 2.0

File Parameters Estimation Global solution Simulation Scheduling Run Plotting Help

Scheduling

Network

Available	Selected	Predefined
HART2010		VLBI2010
KOKE2010		IVSR1
NYAL2010		IVSR4
GOLD2010		INT1
URUM2010		
WARK2010		
TSUK2010		
AREC2010		
EORT2010		

Clear selected

Session start
2010 / 1 / 4
12 : 0 : 0
Duration 24 [h]

Band
X Band 20 SNR
S Band 15 SNR

Observing mode for twin telescopes
 Same source observations
 Continuous observations
 Multidirectional observations

Parameters
 Sundist 15
 Cut-off 5
 Source 0.25 [Jy]

Output
 Write NGS file
 Write SKD file

Strategy
 Source-based strategy
 Number of sources observed simultaneously: 1 (1/2/3/4/5)
 Station-based strategy
 Other

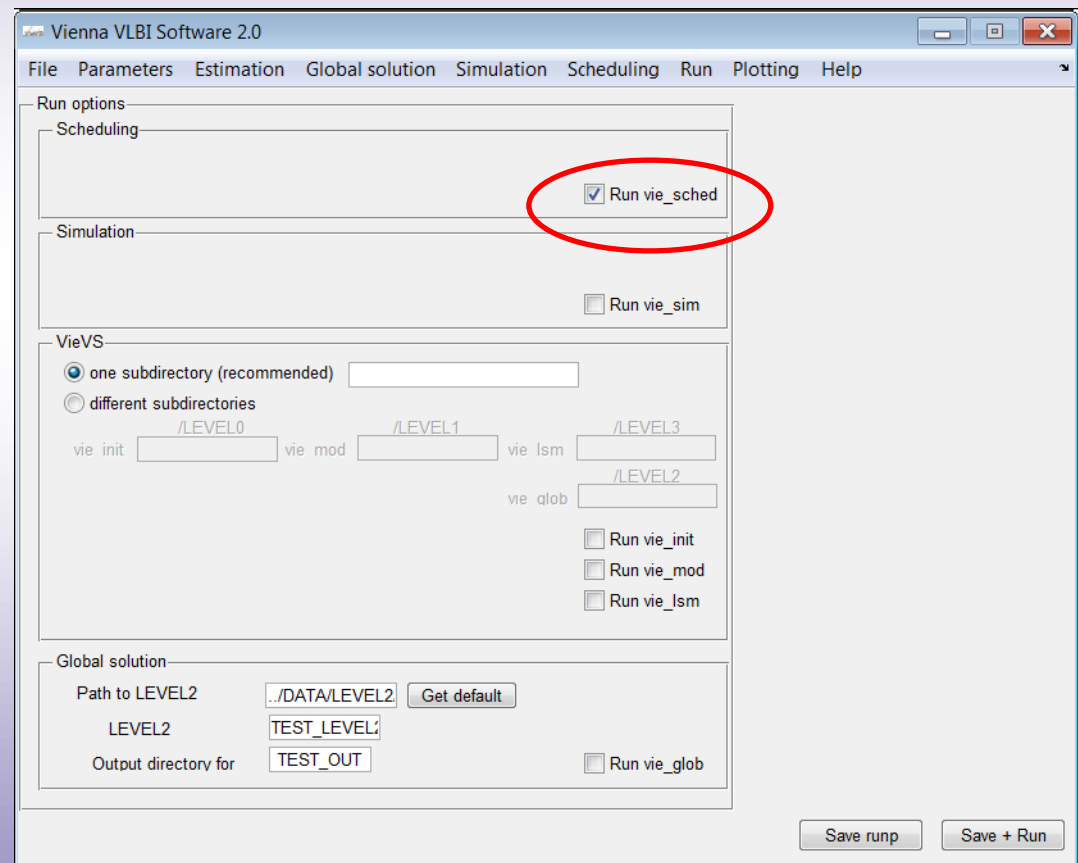
Save SCHED parameters

Save runp Save + Run

How to run VIE_SCHED



Run Options for VIE_SCHED



Output files (VieVS/DATA/SCHEDED/)

skdsum.txt

NGS file

.skd file

Output files (VieVS/TRF/)

trf_sched.txt

Thanks for your attention!

problems? questions?
mail to jing.sun@tuwien.ac.at

Jing Sun would like to thank the FWF for funding project SCHED2010 (P21049-N14).