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Caltech Submillimeter Observatory

New User Interface Program

What is UIP?

- CSO's Observation/Telescope Control Interface
 - Observing Frontend for Heterodyne Receivers
 - Telescope Control Frontend for Bolometers
- Monolithic, Text-based UI
 - VMS (DEC Command Line)-like Interface
- Built and Run on DEC Alpha/VAX + VMS
- Written in Pascal, Fortran, and C

Why New UIP?

- Migrate to PC + Free OS
 - Replace Aging Hardware
 - Vendor-neutral, Save on OS Licensing Cost
- Provide More Features
 - Better Scripting Capabilities
- Fix Bugs, Remove Undesirables
- Provide Same Look and Feel
- Modernize Codebase

Features

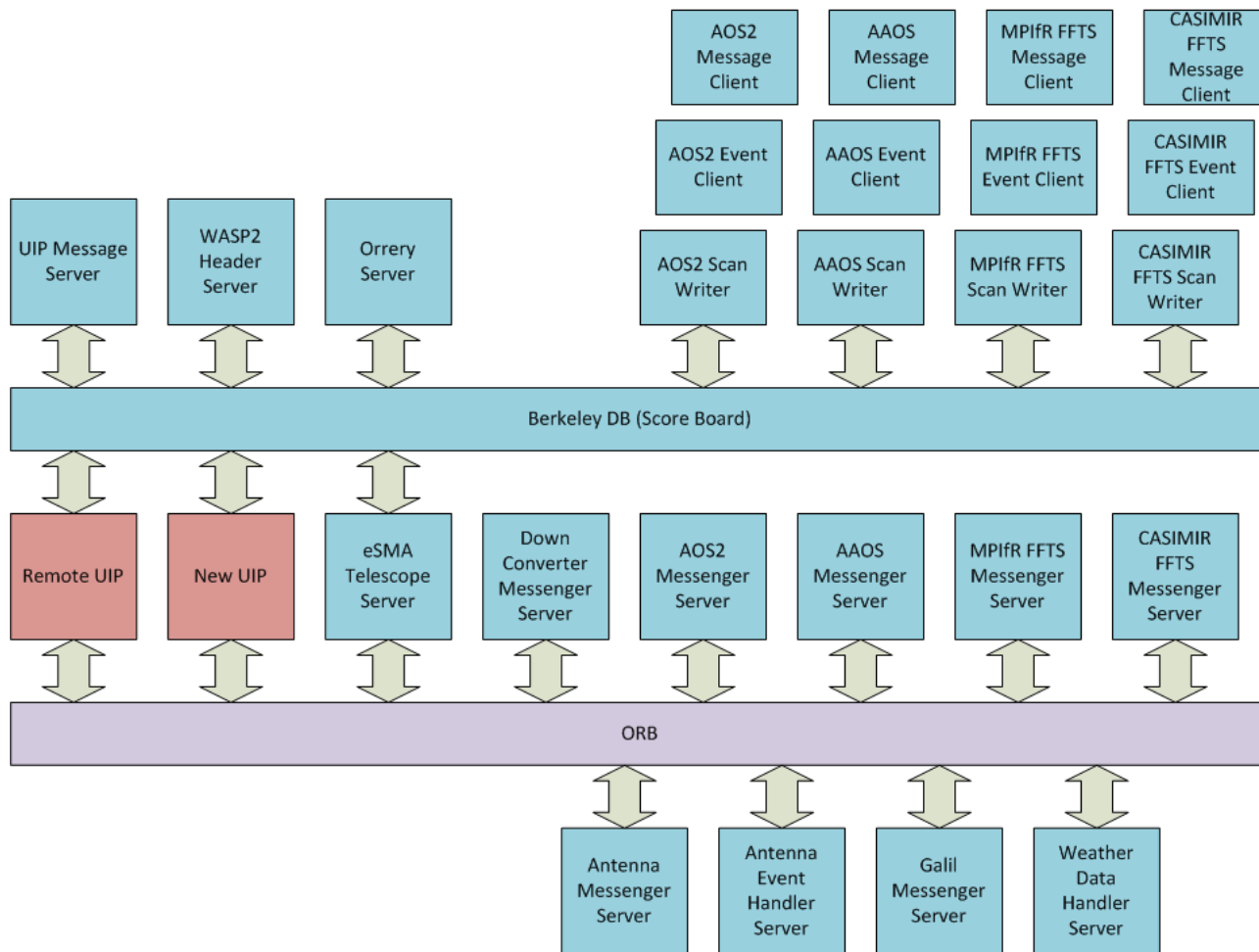
- Built and Run on PC + GNU Linux
 - Commodity Hardware
 - Modern Development Tools and Libraries
 - More Observer-friendly
- Written in C++
- GILDAS SIC as Command-line Interpreter (IRAM)
 - Look and Feel Similar to Legacy UIP
 - Better Scripting Capabilities, Python Bindings
- Version Controlled by Subversion
- Documented by Doxygen

Hardware and Tools

- Server/Workstation-class PCs (kilauea, ulu)
- openSuSE Linux
- GNU Tools (gcc, make, emacs, etc.)
- Subversion
- Doxygen, Graphviz
- In-house Tool to Generate Codes and Help Texts from Definition Files

Libraries

- TAO (Washington University)
 - CORBA as Communication Backend between UIP and Antenna, Spectrometers, and Others
- Berkeley DB (Oracle)
 - Persistent Data Storage between UIP Sessions
 - Data Sharing among UIP Instances and Others
- Boost C++ Libraries
 - Regular Expression

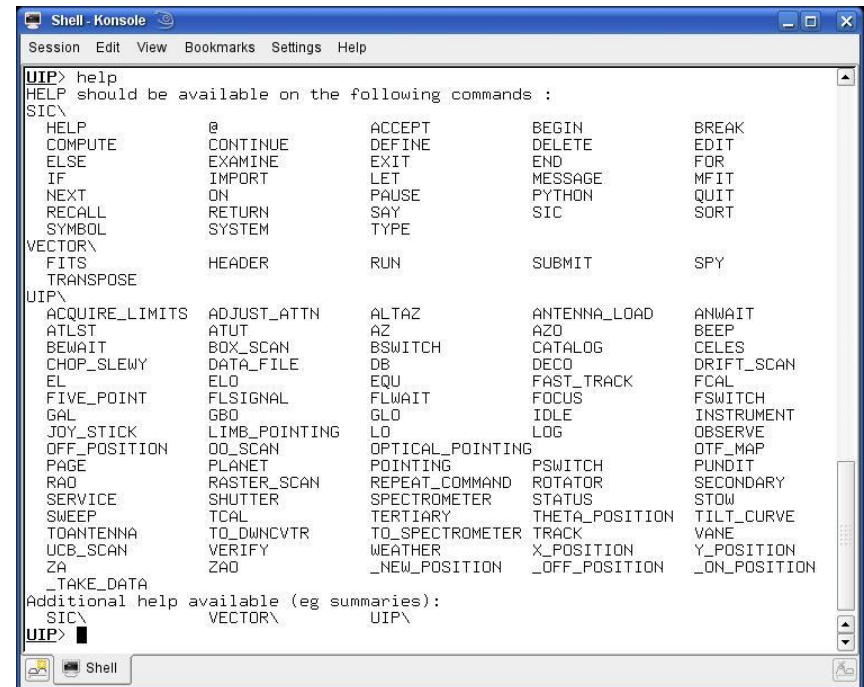


Development Tasks

- Foundation Classes, Templates, Utility Functions, Tool, and Mains in C++
- Glue for GILDAS Fortran Libraries
- Pascal to C++ Translation
- VMS System Services to POSIX System Calls
- New and Legacy Commands from Scratch
- Unit Tests, Off- and On-line Tests

Current Status and Future Plans

- In Production Use since September 2009
 - With Heterodyne Receivers and SHARC II
- A Few Rough Edges
- Support for New FFTS (→ Next Presentation)



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Shell - Konsole
Session Edit View Bookmarks Settings Help

UIP> help
HELP should be available on the following commands :
SIC\
HELP      @      ACCEPT      BEGIN      BREAK
COMPUTE   CONTINUE  DEFINE     DELETE     EDIT
ELSE      EXAMINE   EXIT       END        FOR
IF        IMPORT   LET        MESSAGE   MFIT
NEXT      ON      PAUSE     PYTHON    QUIT
RECALL    RETURN   SAY        SIC       SORT
SYMBOL    SYSTEM  TYPE
VECTOR\
FITS      HEADER   RUN        SUBMIT     SPY
TRANPOSE
UIP\
ACQUIRE_LIMITS  ADJUST_ATTN  ALTAZ      ANTENNA_LOAD  ANWAIT
ATLST            ATUT         AZ         AZO           BEEP
BEWAIT          BOX_SCAN    BSWITCH    CATALOG       CELES
CHOP_SLEWY      DATA_FILE  DB         DECO          DRIFT_SCAN
EL              ELO        EQU        FAST_TRACK    FCAL
FIVE_POINT      FLSIGNAL    FLWAIT     FOCUS        FSWITCH
GAL             GBO        GLO        IDLE          INSTRUMENT
JOY_STICK       LIMB_POINTING  LO        LOG           OBSERVE
OFF_POSITION    OO_SCAN     OPTICAL_POINTING  PSWITCH
PAGE           PLANET      POINTING   REPEAT_COMMAND  ROTATOR
RAO            RASTER_SCAN SPECTROMETER  STATUS
SERVICE       SHUTTER     TERTIARY   THETA_POSITION TILT_CURVE
SWEEP          TCAL        TO_SPECTROMETER  TRACK
TOANTENNA      TO_DWNCVTR  TO_SPECTROMETER  TRACK
UCB_SCAN       VERIFY      WEATHER     X_POSITION    Y_POSITION
ZA             ZAO        _NEW_POSITION _OFF_POSITION _ON_POSITION
_TAKE_DATA
Additional help available (eg summaries):
SIC\      VECTOR\      UIP\
UIP> █
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Spectrometers and New UIP

Present CSO Spectrometers I

- MPIfR 1 GHz FFTS
 - 2 Gsps Digitizer Made by Acqiris (Agilent)
 - 1 GHz or 500 MHz Wide
 - 8192 Channels
 - 120 kHz or 60 kHz ENBW
 - ≥ 250 s Allan Variance Time (Continuum)
 - APEX SCPI Command and Data Interfaces



Present CSO Spectrometers II

- Köln 4 GHz Array AOS
 - 4 x 1.1 GHz Wide
 - 4 x 2048 Channels
 - 1 MHz Resolution
 - KOSMA AOS Library + RPC Interface
- IF Processor for AAOS
 - Built In-house
 - RPC Interface



Present CSO Spectrometers III

- 16 GHz WASP₂
 - Analog Auto-correlation Spectrometer
 - 4 x 4 (3.6) GHz Wide
 - 4 x 128 Lags
 - 33 MHz Resolution
 - Independently Operated by WASP₂ Software



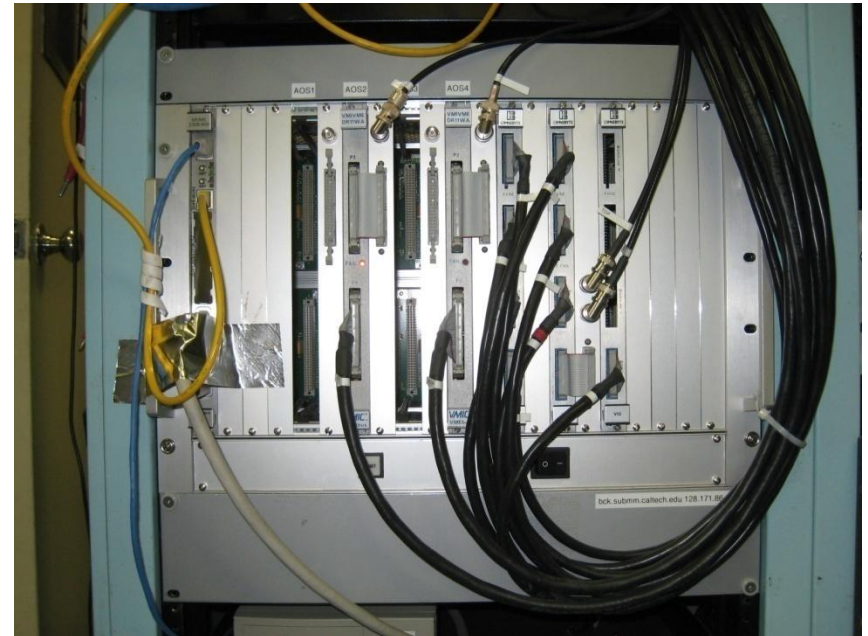
Present CSO Spectrometers IV

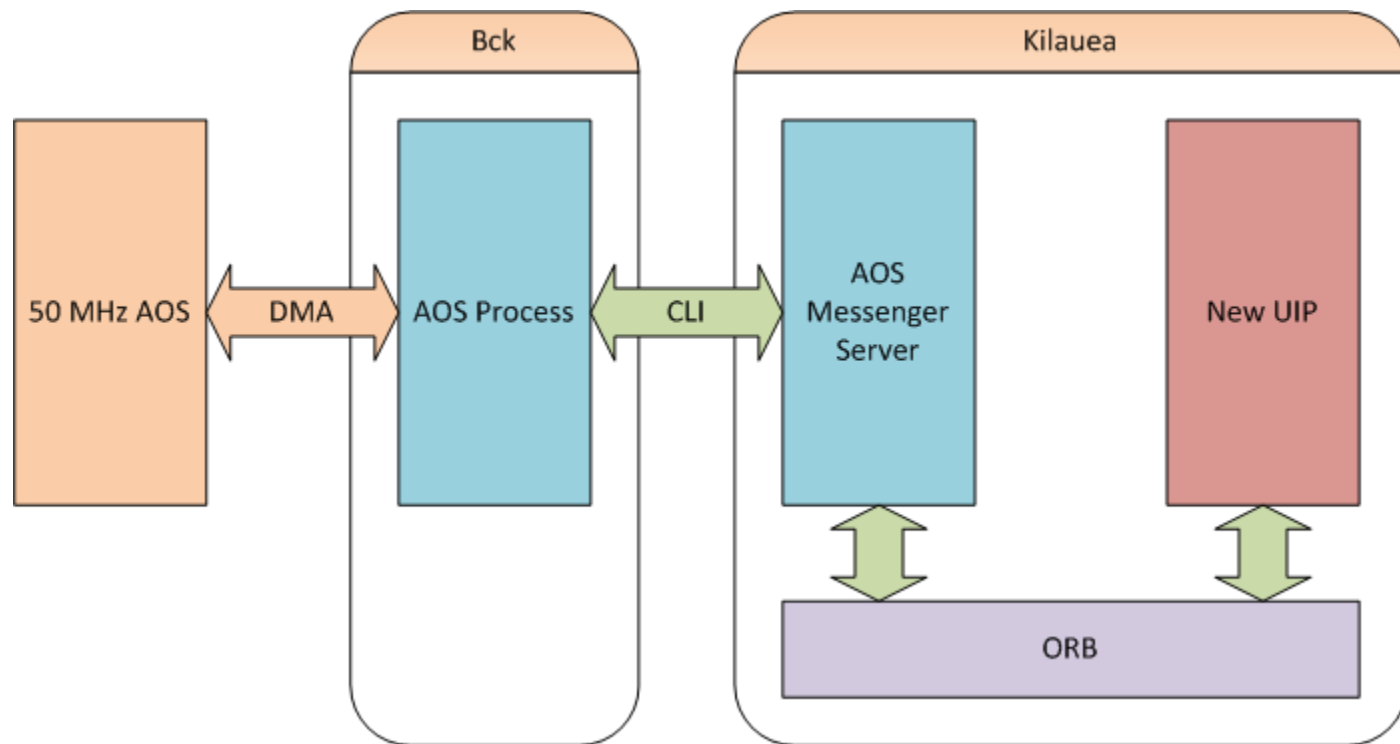
- 50 MHz AOS
 - 1024 Channels
 - 100 kHz Resolution
- 1.5 GHz AOS
 - 2048 Channels
 - 1.5 MHz Resolution



Interfacing Legacy AOS

- Backend Computer
 - Controls Legacy AOS Directly
- AOS Process
 - Reads out CCD Frame by Frame (Every 23 ms)
 - Text-based UI
 - Graphical Quick Look





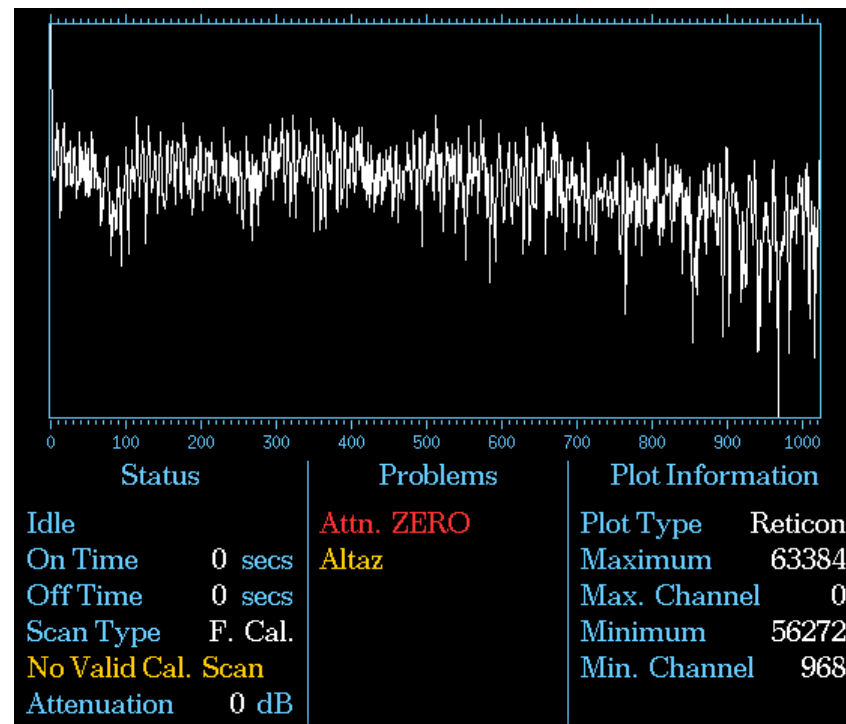
File Edit View Terminal Tabs Help

bck[1]\$ aos2

AOS main menu:

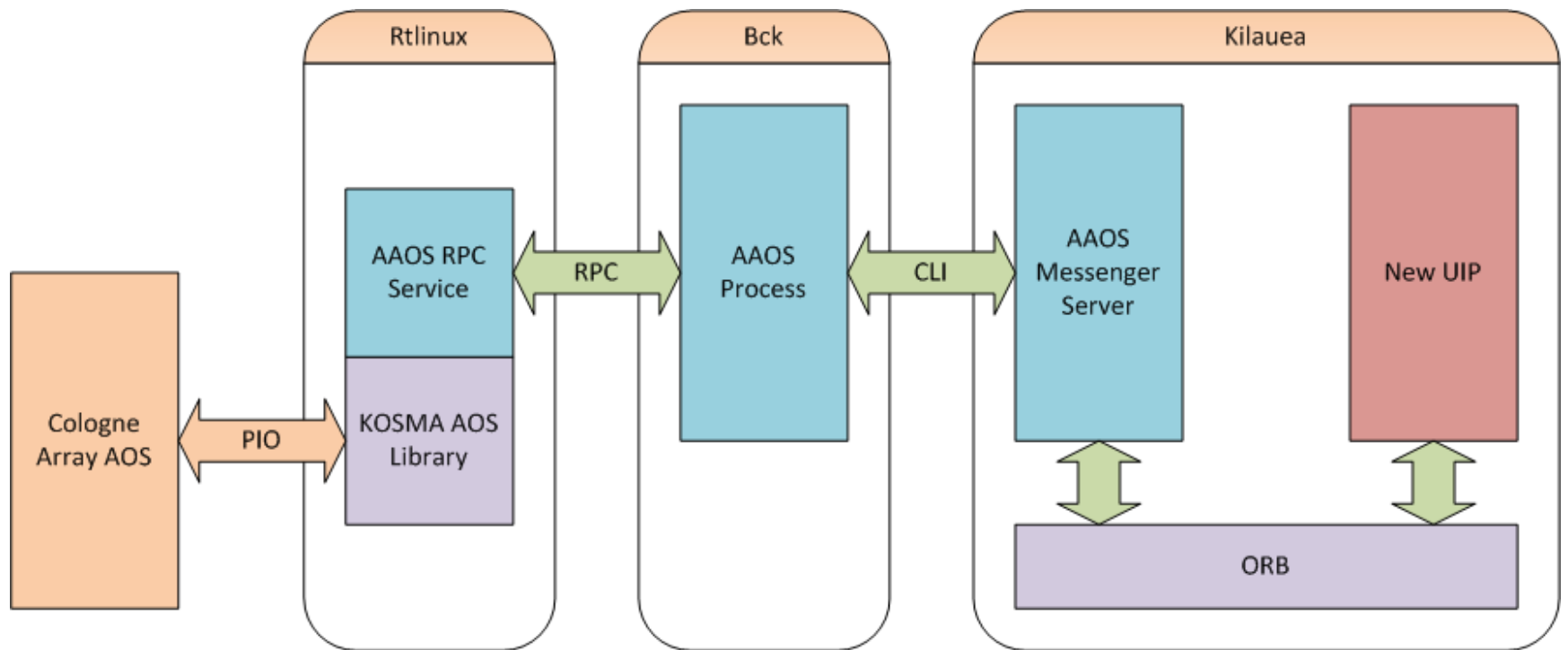
1	Print this message	20	Set integration parameters
2	Attenuator commands	21	Set scan type
3	Print AOS status	22	Query T. CAL status
4	Start AOS	23	Window operations
5	Stop AOS	24	Select ON accum., clear ON only
6	Set Reticon readout rate	25	Select DARK accumulator
7	Obscure commands	26	Allan variance related commands
8	Display related commands	27	Hilo setup
9	Select ON accumulator		
10	Select ON accum. - clear	29	Frequency switching stuff
11	Select OFF accumulator		
12	Select OFF accum. - clear		
13	Take data - transmit		
14	Take data		
15	Auto-adjust attenuator		
16	Make this scan the CAL		
17	Invalidate CAL scan		
18	Set event flag if idle		
19	Query integration variables	100	Send status
-1	Exit program	0	Send I'm alive!

AOS>



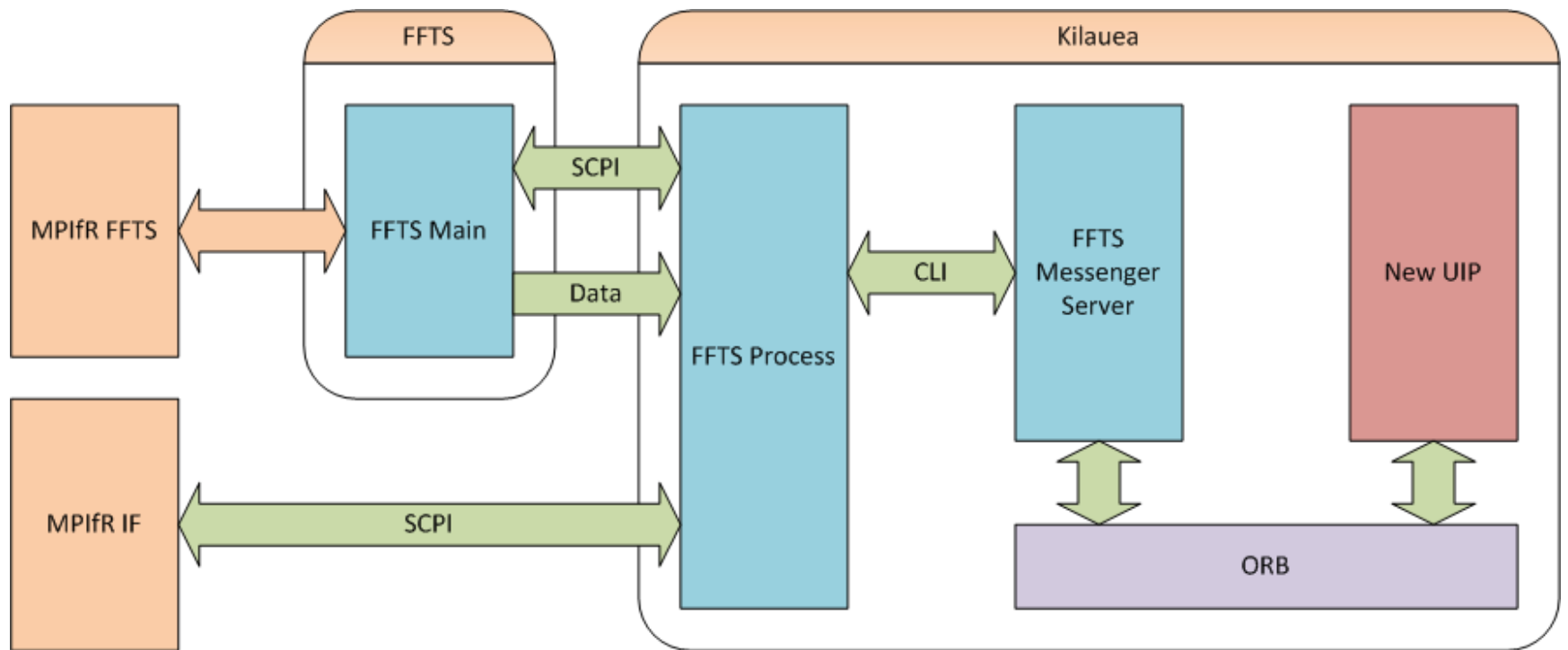
Interfacing Köln Array AOS

- AOS Library (KOSMA)
 - Controls AAOS's DSP through PI/O
- RPC Service for AOS Library
 - Enables to Call AOS Library Remotely
- AOS Process for Array AOS
 - Same Text-based UI as Other AOS Processes
 - Same Graphical Quick Look as Others
 - Data Typically Transferred Every 500 ms



Interfacing MPIfR FFTS

- IF and FFTS Computers
 - APEX SCPI Command Interface (UDP)
 - APEX Backend Data Stream Interface (TCP)
- FFTS process
 - Same Text-based UI as AOS Processes
 - Same Graphical Quick Look as Others
 - Data Typically Transferred Every 500 ms



Future CSO Spectrometer

- CASIMIR 8 GHz FFTS
 - Made by Omnisys Instruments
 - 4 x 2.2 GHz Wide
 - 4 x 8192 Channels
 - 270 kHz Resolution
 - ≥ 350 s Allan Variance Time (Continuum)
 - CASIMIR/KOSMA FFTS Library + RPC Interface



Interfacing CASIMIR FFTS

- FFTS Library (CASIMIR/KOSMA)
 - KOSMA Control (\approx KOSMA AOS Library Interface)
- RPC Service for FFTS Library
 - Same Interface as RPC Service for AOS Library
- FFTS Process for CASIMIR FFTS
 - Same Text-based UI as Others
 - Same Graphical Quick Look as Others
 - Data Typically Transferred Every 500 ms

