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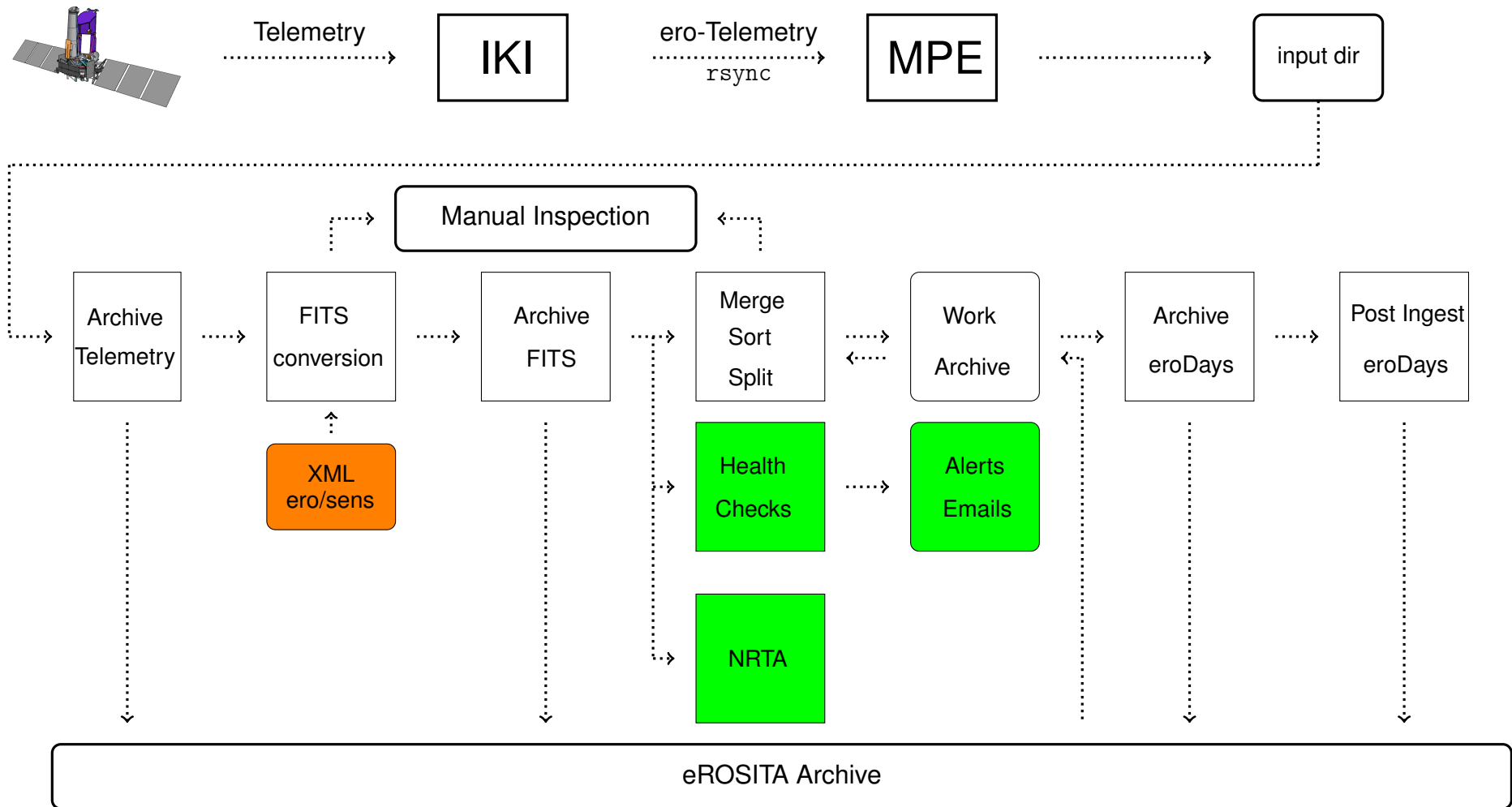
# *eROSITA Pre-Processor*

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# eROSITA Pre-Processor



eROSITA dump data received in small telemetry files, processed **immediately**

**health checks** and **NRTA** are run as new processes  $\Rightarrow$  PreProc quickly processes telemetry

# FITS Converter - TMSPLIT

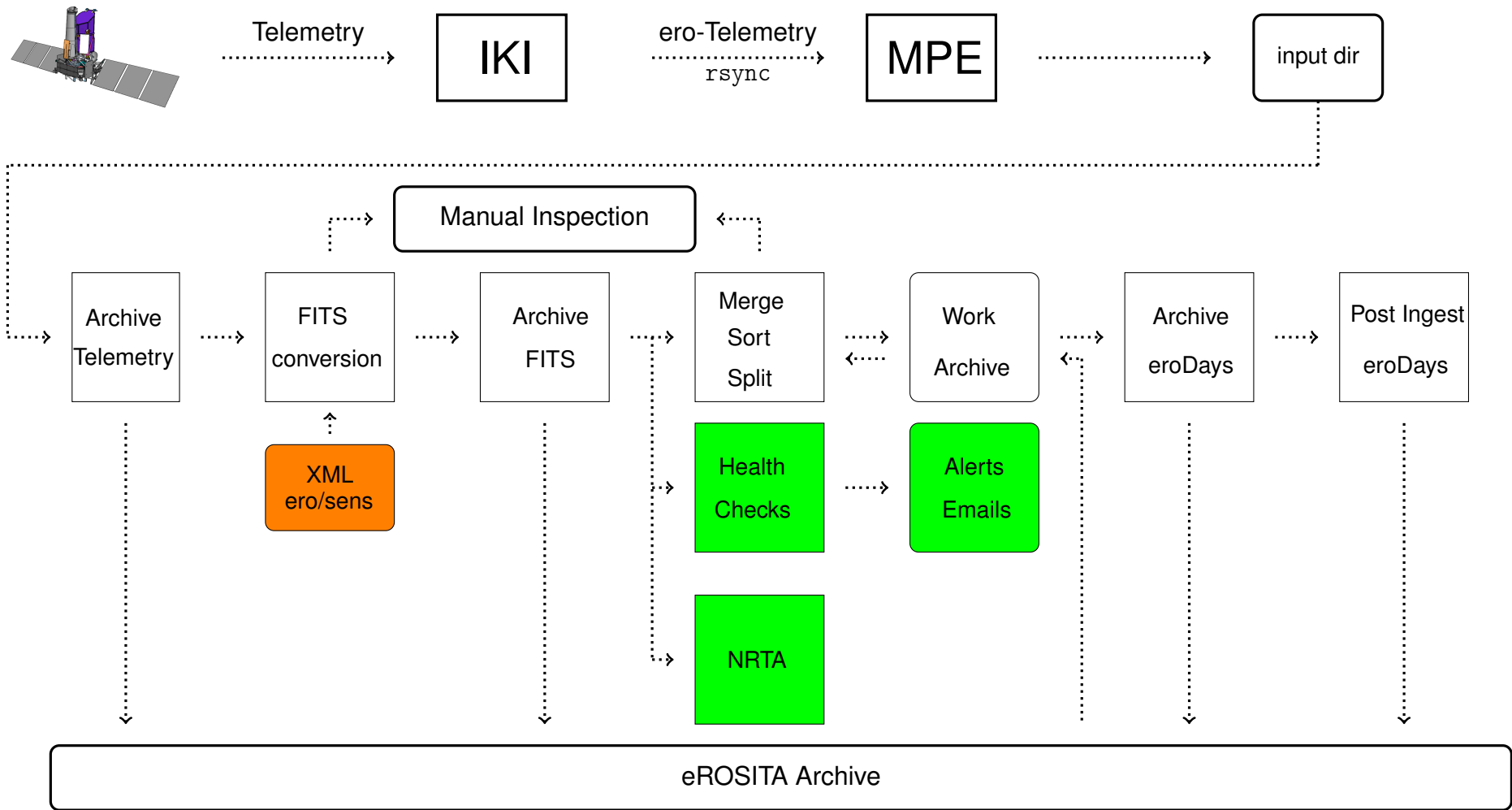
Purpose:

Convert telemetry to FITS format

XML:

- full description of telemetry content (~50000 lines)
  - allows time dependent definitions for individual data types
- flexible changes without modifying source code!

```
1 <telemetry>
2   <info>
3     <origin template="npol_template.xml" HTFile="180515.LOG" creator="HTx2XML V
3.2"/>
4     <version XMLfile="1.0" XMLlibrary="2.7.8"/>
5   </info>
6   <global>
7     <container name="SRGFrame"/>
8     <mission mission="eROSITA" instrument="eR0fm"/>
9     <time mjdref="51543.875"/>
10    <globals name="eRosita">
11      <global name="eroday" value="4"/>
12      <global name="eroMJDref" value="51543.875"/>
13    </globals>
14    <instrument>
15      <generic name="GEN" shortname="0"/>
16      <telescope tmid="0x01" name="TM1" shortname="1"/>
17      <telescope tmid="0x02" name="TM2" shortname="2"/>
18      <telescope tmid="0x03" name="TM3" shortname="3"/>
19      <telescope tmid="0x04" name="TM4" shortname="4"/>
20      <telescope tmid="0x05" name="TM5" shortname="5"/>
21      <telescope tmid="0x06" name="TM6" shortname="6"/>
22      <telescope tmid="0x07" name="TM7" shortname="7"/>
23    </instrument>
24  </global>
25
26  <container name="SRGFrame">
27    <header position="0" length="128"/>
28    <record name="eroTM1234,eroTM,eroTM2017,eroTMempty,noData"/>
29    <search stepwidth="5216" defaultrecord="eroTM" defaultfield="RCFrameID" che
ckunidentified="yes"/>
30    <padding value="NONE" />
31    <syncword value="NONE" />
32  </container>
33
34  <container name="eR0Frame">
35    <header position="0" defaultlength="48" maxlength="96"/>
36    <record name="EVNTS, HK10, HK11, HK12, HK13, HK15, HK20, HK21, HK22, HK23, HK25, HK30,
HK31, HK32, HK33, HK35, HK40, HK41, HK42, HK43, HK45, HK50, HK51, HK52, HK53, HK55, HK60, HK61
, HK62, HK63, HK65, HK70, HK71, HK72, HK73, HK75, HK80, HK81, HK82, HK83, HK84, HK85, HK86, HK8
7, HK8C, HK8D, HK8E, HK8F, HK9C, HK9D, HKA0, HKA1, HKA2, HKA3, HKA4, HKA5, HKA6, HKA7, HKAC, HK
AD, HKAE, HKAF, HKB0, HKB1, HKC0, HKC1, HKE0, HKEF, HK9E, HKD0, GYRO, SED261, SED262, BOKZ, HK
D5, HKD6, HKD7, HKx71, HKx72, HKx73, HKx74, HKx81, HKx82, REGDUMP, STRUCTDUMP, MEMDUMP, Off
setMap, NoiseMap, SplitMap, BadPixelMap, ExposureColumnMap, ExposureRowMap, ImageMap,
CCDInfo, MIPMap" />
37    <!-- <record name="EVNTS, HK9E, HKD0, GYRO, SED261, SED262, BOKZ, HKD5, HKD6, HKD7, H
Kx71, HKx72, HKx73, HKx74, HKx81, HKx82, REGDUMP, STRUCTDUMP, MEMDUMP, OffsetMap, NoiseMa
p, SplitMap, BadPixelMap, ExposureColumnMap, ExposureRowMap, ImageMap, CCDInfo, MIPMap
" /> -->
38    <search stepwidth="8" defaultrecord="EVNTS" defaultfield="RecordID" checkun
identified="yes"/>
39    <padding value="0x00" />
40    <syncword value="NONE" />
41  </container>
42
43
```



eROSITA dump data received in small telemetry files, processed **immediately**

**health checks** and **NRTA** are run as new processes  $\Rightarrow$  PreProc quickly processes telemetry

# Raw Archiver - PREPROC

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Purpose: **Build raw archive organised in eroDays**

- **input**: telemetry FITS files
- **tasks**:
  - merge data
  - sort data (2-step sorting for time, SequenceCounter)
  - split data into eroDays
  - fix missing time tags in events
  - trigger eSASS pipeline once an eroDay is complete
- **output**: raw archive will be used by eSASS pipeline

# Health Checks

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Purpose: **Identification of possible problems**

Run checks directly after reception of telemetry file and conversion into FITS  
(before archive ingestion!)

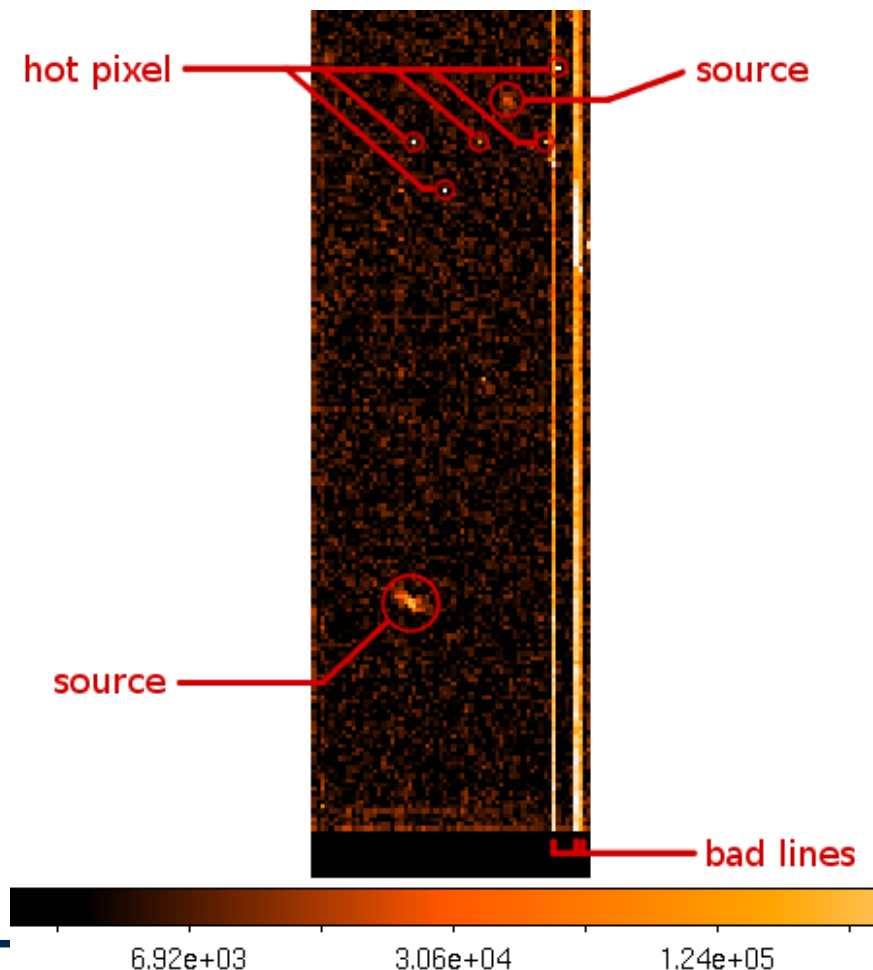
- **limit check:**
  - check all housekeeping parameters against acceptable limits (min/max)
  - limits can have two levels (“yellow”, “red”)
  - check whether a status parameter shows alarm (e.g. some valve is stuck)
  - check whether status flags are OK
  - limits can be time dependent
  - create alert file for every HK file  
(with parameter name, time range, limit, . . . for every alert)
  - merge all alerts into a single file for NRTA display
  - send Email with alerts (for selected parameters)

# Health Checks

Purpose: **Identification of possible problems**

Run checks directly after reception of telemetry file and conversion into FITS  
(before archive ingestion!)

- **pixel check:**
  - check all CCDs for **hot/cold** pixels
  - statistical analysis
  - distinguish between pixels illuminated by sources and bad pixels
  - comparison with known hot/cold pixels in CALDB
  - issue alert (send Email) for new bad pixels



# Visualization

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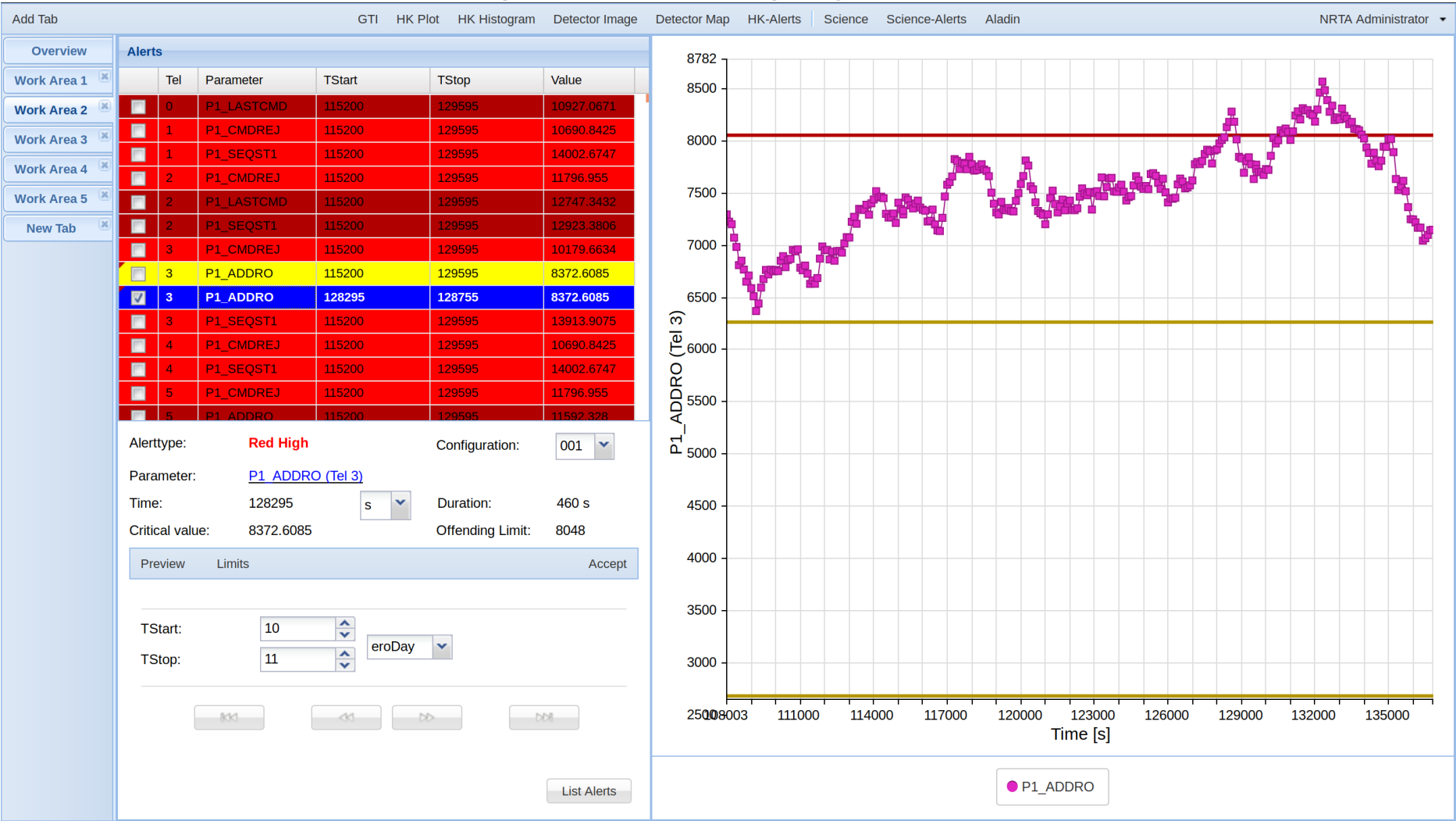
Visualize data in **web-browser** using client-server architecture:

⇒ data is safe on server, no need to install software, just a web browser.

- analyze **housekeeping data** (all data of the whole archive available)
  - show one or more HK parameter over time (any time range)
  - show corresponding limits
  - show / manage alerts
  - create histograms
  - show GTI (data completeness) info
- analyze **detector data**
  - browse/generate/stack detector images & maps (with JS9 similar to DS9)
  - show bad pixels
- analyze **NRTA science data**
  - browse NRTA science results
  - show / manage scientific alerts
  - user management (respect data rights!)



Example: housekeeping data alerts



# Summary

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- telemetry dump files are received at MPE by `rsync`
  - PreProc continuously watches the reception directory for new files
  - a new telemetry file is immediately archived
  - and then converted to FITS files (XML file depending on type)
  - the resulting FITS files are also [archived](#), staged for [archiving](#), [NRTA](#), and [health checks](#)
  - health checks produce alerts for every telemetry file (—→ Email)
  - NRTA, health checks, and archiving run as separate processes
  - PreProc uses a “work archive” to avoid too many file versions in eROSITA archive
  - once an eroDay is complete or telemetry dump is finished, work archive is flushed to archive
  - every time an eroDay is ingested, a post-ingest pipeline is run
  - post ingest checks limits, badpixels, calculates event rates, and creates/collects info for NRTA WWW frontend per eroDay
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