The Australian SKA Pathfinder

From Construction to Operations

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The Australian Square Kilometre Array Pathfinder is a 36-antenna, radio interferometer. Each antenna is equipped with phased-array feed technology backed by FPGA-based signal processing firmware. The monitoring and control software is build on top of two key technologies, EPICS (v3) and ZeroC Ice.
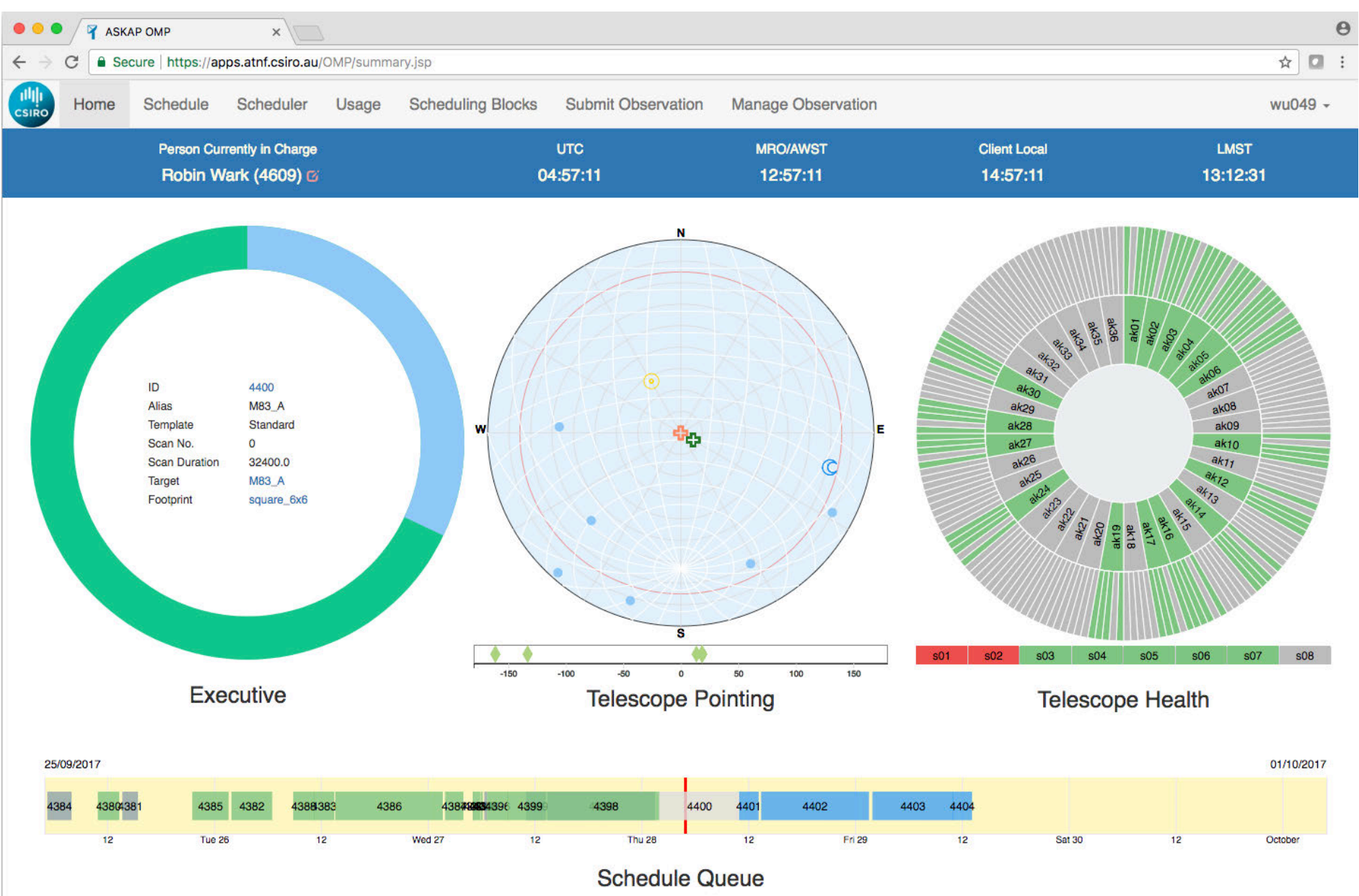

Figure 1: Observation Management Portal. Web-based observation preparation and management tool built on websocket, bootstrap, javascript and D3.js. Left to right it shows Scheduling Block (observation) state, telescope pointing and hardware health overview.

Table 1: Key specifications/technologies of ASKAP

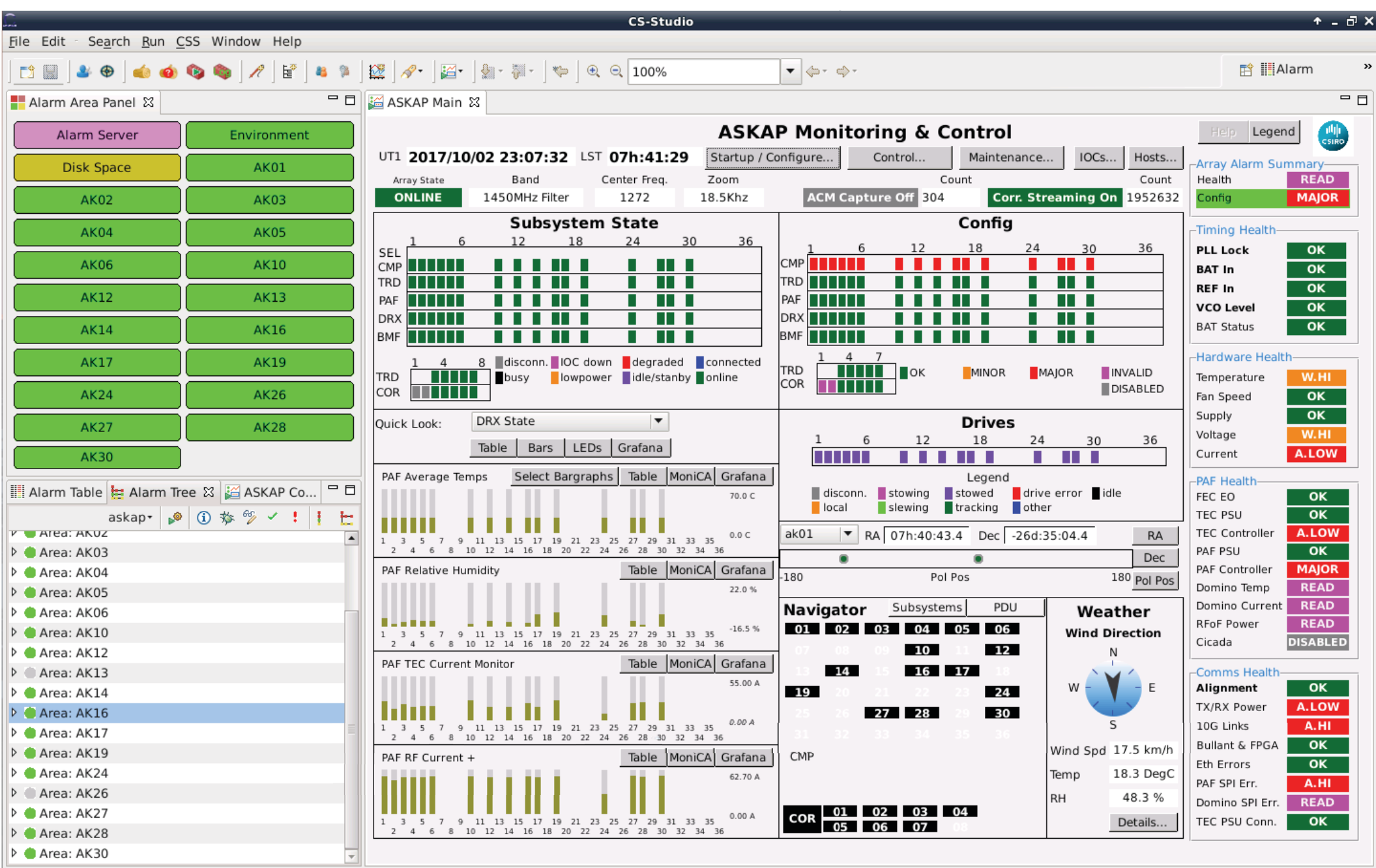|	
Frequency range	0.7–1.8 GHz
Bandwidth	300 MHz
Field of view	30 square degrees
Detector technology	Phased-array feeds
Number of beams	36
Number of dishes	36
Dish diameter	12 m
Drives system	three-axis antenna
Output Data rate	3 GB/s
Power	Hybrid diesel/PV station

Figure 2: Control System Studio (cs-studio) main operator display including BEAST alarm displays on the left hand side. Investigation of web-based displays based on EPICS v4, websocket and React.js components is progressing.

Table 2: Main monitoring and control software stack

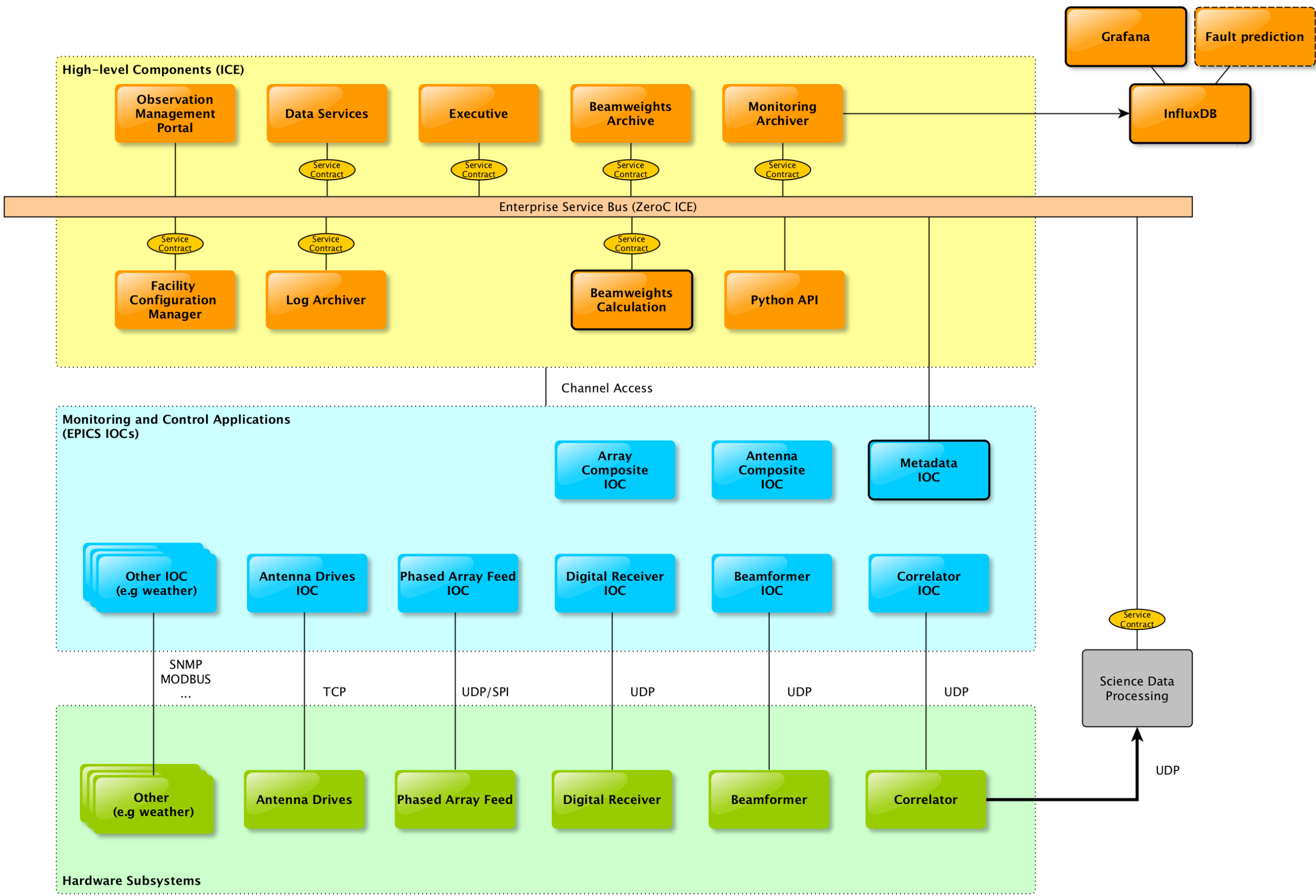| |
|---|
| EPICS v3 |
| asyn |
| ZeroC Ice |
| HDF5 |
| open-monica |
| cs-studio |
| BEAST |
| InfluxDB |
| grafana |
| Debian |
| Python |
| Java |
| C++ |
| Subversion/git |
| jenkins |

Figure 3: Logical view of ASKAP M&C architecture. Components highlighted by a black frame are updated or new architectural elements since the previous status update. Colored components form the Telescope Operating System (TOS) and are hosted on site. Science data ingest and processing is done at Pawsey Supercomputing facility in Perth.

Figure 4: Grafana time series display of weather information. This is now replacing the data browser in cs-studio.

Table 3: Monitoring and Control specifications

Total number of records	> 2.5 million
Total number of archive	> 250,000
Total number of soft IOCs	> 300
Number of Linux hosts	< 6

Figure 5: Left: Aerial view of core ASKAP antennas and central building (top-right)

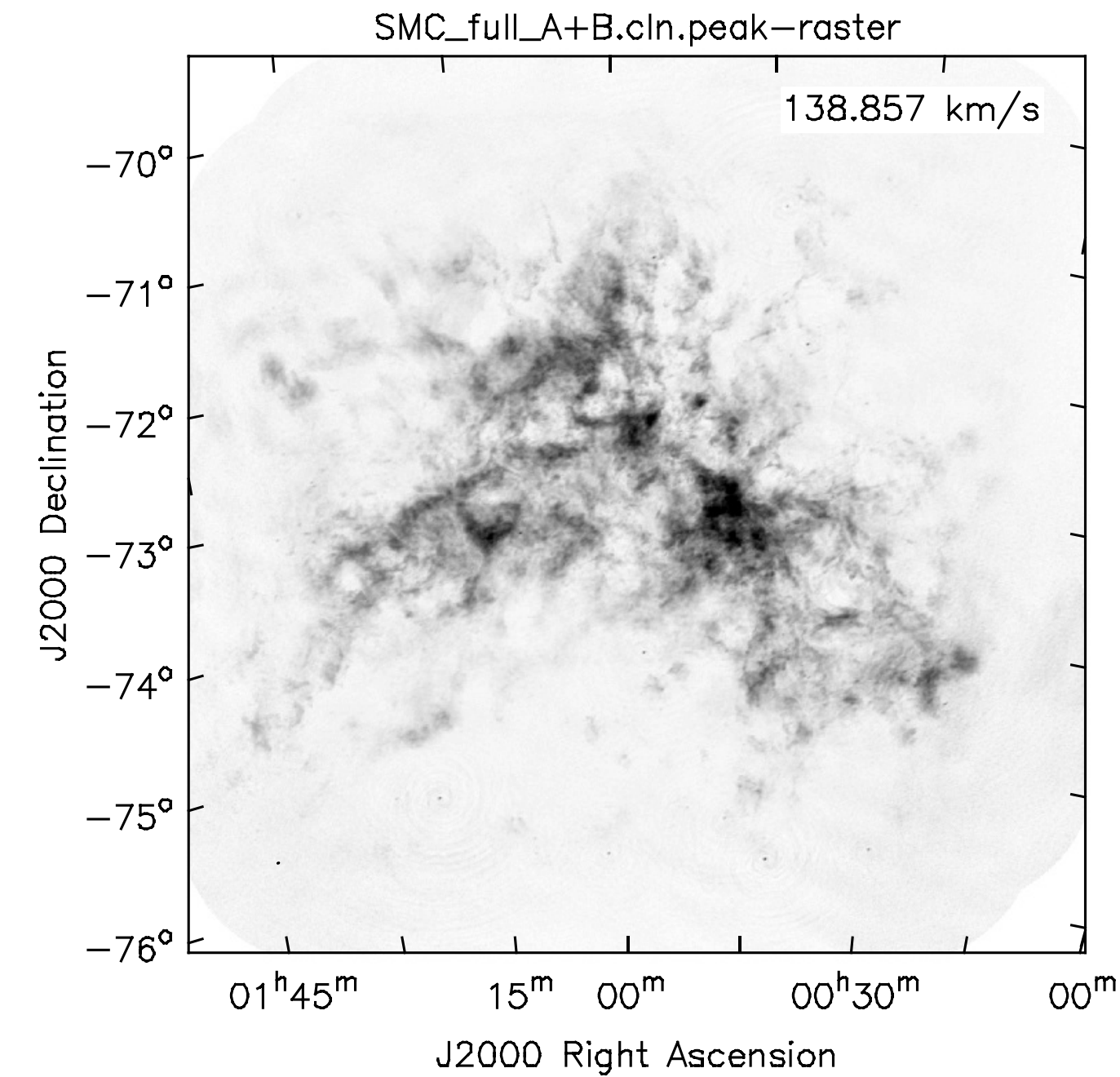**Figure 6:** Phased-array feed in antenna focus

Figure 7: The Small Magellanic Cloud (SMC) in atomic hydrogen emission from ASKAP-12. The SMC was observed in a single ASKAP field of 36 beams and using 12 antennas. This image shows the peak brightness of the SMC with an angular resolution of about 1 arcminute.
Credit: N. McClure-Griffiths (ANU), H. Denes (ANU & CASS), and the ACES and GASKAP teams

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