DISCOS [1] is a control system developed by the Italian National Institute for Astrophysics (INAF) and currently in use at three radio telescope facilities of Medicina, Noto and the Sardinia Radio Telescope (SRT) [2]. DISCOS development is based on the adoption of the ALMA Common Software (ACS) [3] framework. During the last two years, besides assisting the astronomical commissioning of the newly-built SRT and enabling its early science program, the control system has undergone some major upgrades. The long-awaited transition to a recent ACS version was performed, migrating the whole code base to 64 bit operative system and compilers, addressing the obsolescence problem that was causing a major technical debt to the project. This opportunity allowed us to perform some refactoring, in order to implement improved logging and resource management. During this transition the code management platform was migrated to a git-based versioning system and the continuous integration platform was modified to accommodate these changes. Further upgrades included the system completion at Noto and the expansion to handle new digital backends.

NEW FEATURES

- External Backends can now be easily integrated into the control system, enabling custom observations via a simple TCP/IP-based protocol. A reference implementation is also provided.
- Roach2-based spectrometer were installed at SRT and Medicina sites for high-temporal-resolution spectroscopic observations.
- Dewar positioner is in charge of compensating the field rotation when dealing with multi-pixel receivers equipped with a de-rotation system.
- Frequency Tracking keeps a requested frequency in the center of the backend band. Both frontend and backend local oscillators could be tuned during this operation.
- Github organization containing repositories of the whole code base, support tools, and documentation. https://github.com/discos
- User manuals and developer documentation ported to Restructured Text format and continuously integrated with the code base. Available online at https://discos.readthedocs.io

MAJOR UPGRADES

- Code base entirely migrated to a git-based distributed version control system, reducing the size of the repository from 3GB to 130MB and keeping all history, also migrating all issues and tags.
- Upgrade of the Operative System from 32 to 64 bit. Being mostly C++ code this required a great effort.
- Migration of the whole code base to ACS version 2016
- Automated provisioning of development and production environments based on Ansible recipes and Vagrant/Ansiblebox based virtualization.


Above: the team at work, installing DISCOS at Noto. Bottom left: the Italian radioastronomy sites. Table below basic features of the three antennas. Right (top to bottom): schematics of the major project upgrades recently completed. The DISCOS project documentation can be found using the above QR code.

<table>
<thead>
<tr>
<th></th>
<th>SRT</th>
<th>Medicina</th>
<th>Noto</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main mirror</strong></td>
<td>64 m</td>
<td>32 m</td>
<td>32 m</td>
</tr>
<tr>
<td><strong>Antenna Control Unit</strong></td>
<td>Beckhoff PLC Ethernet Vendor protocol</td>
<td>VxWorks-based PC Ethernet Vendor protocol</td>
<td>VxWorks-based PC Ethernet Vendor protocol</td>
</tr>
<tr>
<td><strong>Active surface</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Current back-ends</strong></td>
<td>Total Power XARCONS Roach boards DFB</td>
<td>Total Power XARCONS (Roach boards)</td>
<td>Total Power</td>
</tr>
</tbody>
</table>

S 5GHz continuum map of the supernova remnant IC1313/6E44, obtained with the Noto 32-m dish.