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European Organization for Astronomical Research in the Southern Hemisphere

Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral

Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

La Silla Paranal Observatory Science Operations Department

Paranal Science Operations Operations Plan

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1 Background about this document revision

This document describes a revised Science Operations plan for Paranal (named thereafter SciOps 2.0).

The content of this updated plan is based on a re-organization of the Science Operations (SciOps) staff tasks in order to:

- Strengthen the coordination of science operations activities within, and between, the department groups, by increasing the time allocated to “high-level” activities (typically activities related to IOTs and Operations Groups),
- Improve the efficiency of the core science operations support to service mode (SM) and visitor mode (VM) observations, and the quality of the astronomical data delivered to the community of Paranal users.

In a nutshell, the operational changes are articulated along two main lines:

- Adoption of a “classical shift” scheduling-scheme for some (3 out of 5) nighttime support astronomers, whose duty time is from 3pm to 2-4am (instead of sunset to sunrise).
- Replacement of a daytime astronomer by an Operations Specialist, or “OS”. The function of Operations Specialist is a new job profile and OS are recruited among the pool of senior TIOs.

These two modifications allow recovering some operations time (e.g. by decreasing the number of overlap nights thanks to the classical shift), which can then be re-injected into “high-level” astronomers tasks such as dedicated time for Instrument Scientists or Operations Groups activities. This recovered pool of functional time is also used to account for the duties spent on instrument/operations support “outside the observatory” (e.g. Vitacura).

Finally, the new job profile of Operations Specialist permits to widen the scope of action of qualified operations staff members, who can now support both day- and night- time core operational tasks.

The details of the implementation, timeline and milestones of this revised operations plan are described in a separate document (VLT-PLA-ESO-xxxxx-yyyy, in preparation).

2 Introduction

2.1 Purpose and Scope

This document defines the Science Operations (SciOps) plan in terms of functional activities and staffing for Paranal Observatory.

Because the operations procedures are continuously adjusted to better respond to the constraints imposed by the operations of new instruments and modes, this document is kept at a fairly general, conceptual level. All details of the current operations procedures are available on the SciOps internal webpage.

The present document updates and replaces the Paranal Science Operations Plan v.1.99 [1].

2.2 Important related documents

- 1 VLT-PLA-ESO-10300-3530. Paranal Sciences Operations Plan (v.1.99)
- 2 Instrument Operations Team Charter
- 3 Science Faculty, ESO Astronomer Charter
- 4 Instrument Scientist Charter

2.3 Stylistics convention

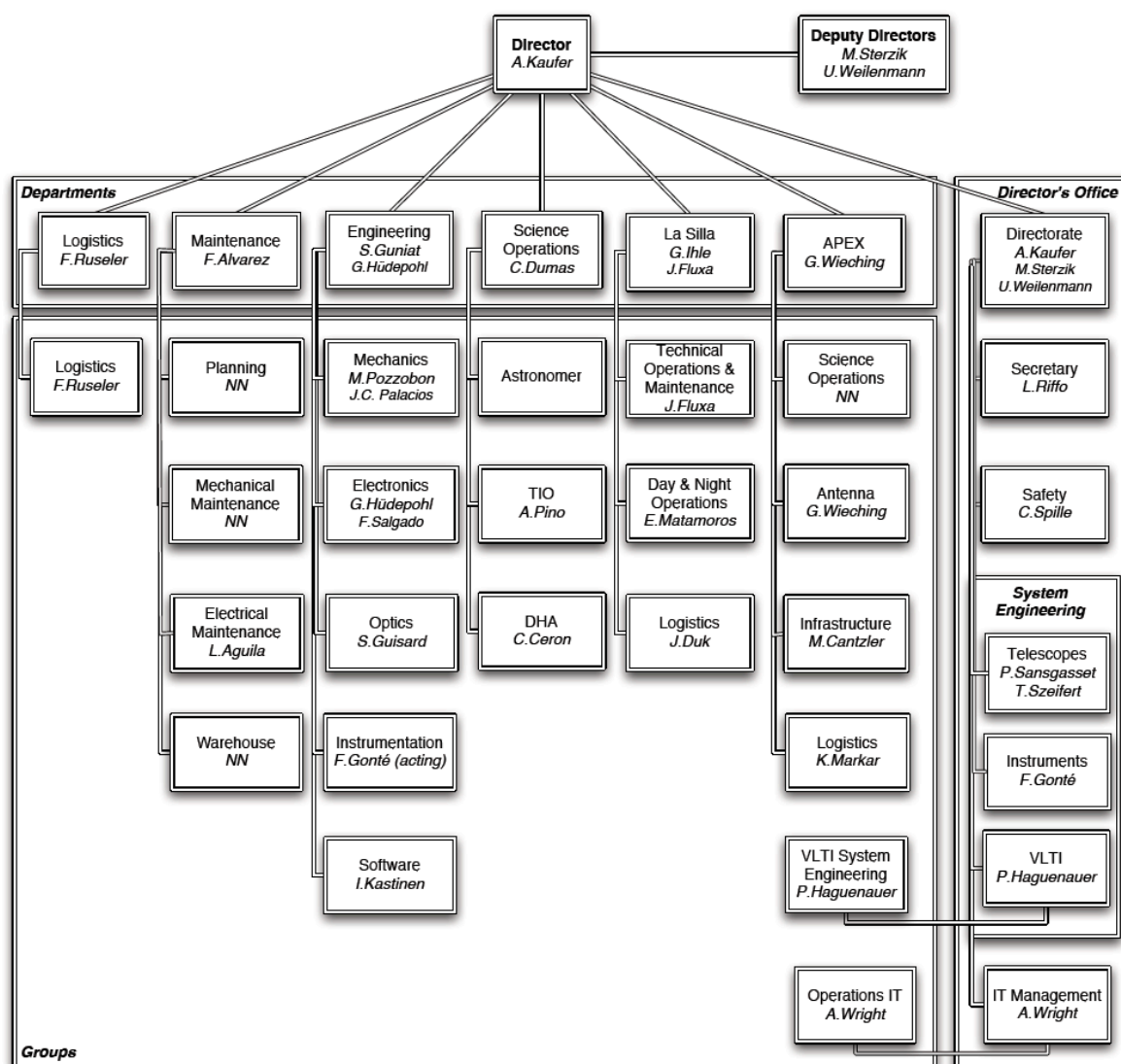
In this document, the masculine pronouns are used where referring to a job or a function.

3 Paranal SciOps within ESO

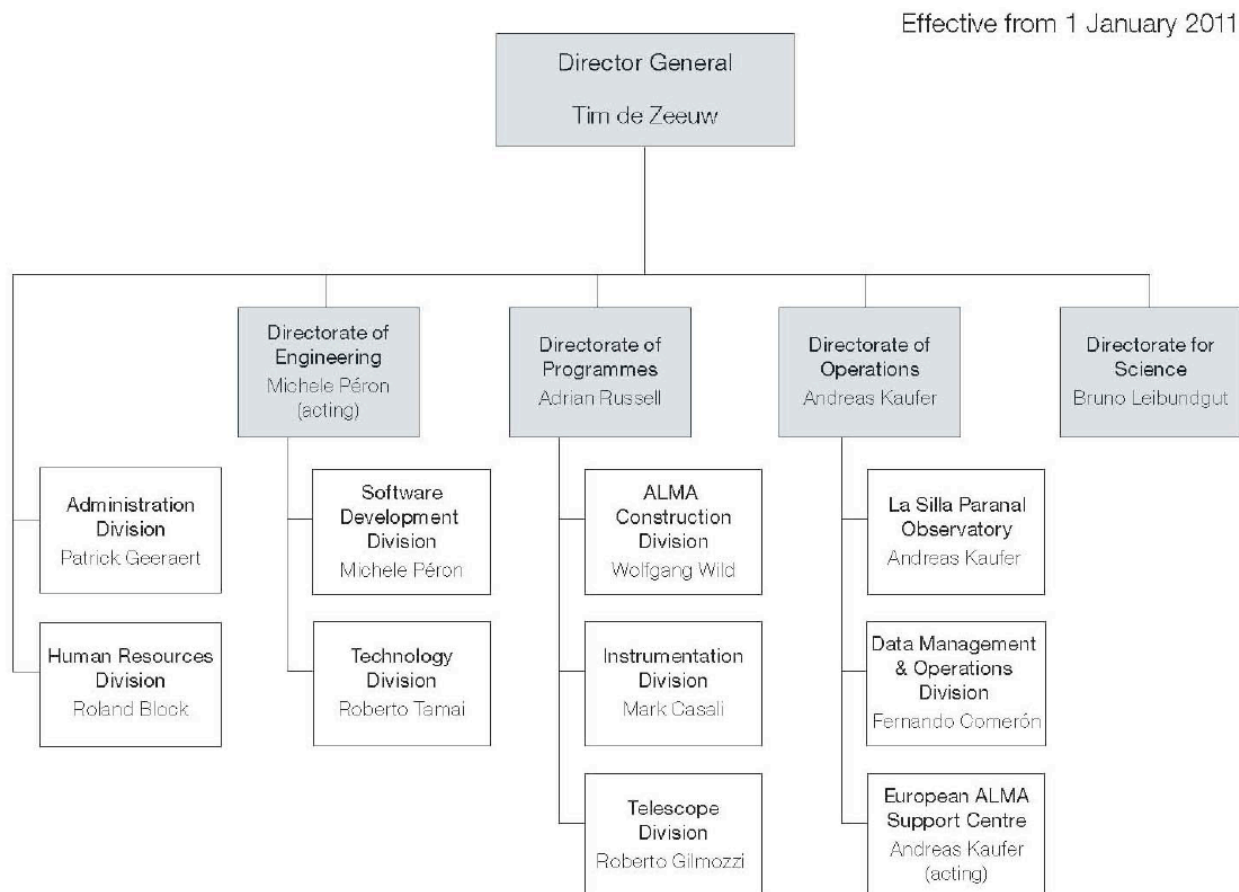
A full description of the ESO structure is far beyond the scope of this document, but it is important to stress how Paranal SciOps is deeply embedded in very tight connections to other Divisions and Departments. It is also worth noting that, in terms of size, Paranal SciOps is one of the largest departments, and is even bigger than some of ESO's Divisions.

The Paranal Science Operation Department is part of the ESO's La Silla Paranal Observatory Division. The other LPO departments are: La Silla Site (since October 2009 a site manager coordinates all activities, from logistics to engineering and operations), Paranal System Engineering (in charge of the integration, commissioning and upgrades of all systems at LPO), Paranal Engineering (in charge of the correction and improvements of all systems operated at PO, and supporting la Silla whenever needed), Maintenance (in charge of monitoring the health trend of all systems, so they can be optimally and pro-actively maintained within specifications), Paranal Logistics (in charge of coordinating all logistical aspects of PO), and APEX (run as La Silla, with a unique site manager in charge of all operational aspects).

The structure of the LPO Division is summarized in the following organizational chart:

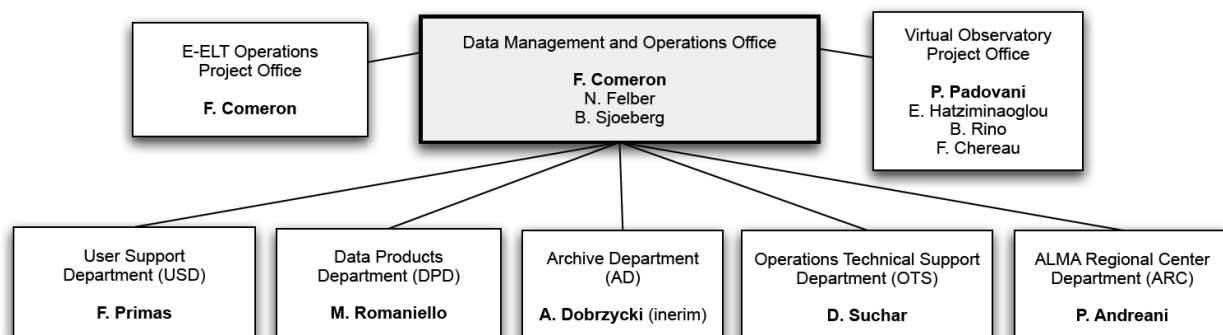


At a higher structural level, the chart representing the various ESO Directorates can be found below:



Structures in partnership with the Paranal Science Operations Dpt are also located in Garching. Those are mainly the Instrumentation Division and the departments from the Data Management and Operations Office (DMO), in particular its departments of User Support (USD) and Data Product (DPD), the latter holding two key groups working closely with Science Operations: the Data Processing/Quality Control and Science Data Product group (SDP) groups.

The chart below gives an overview of the structure of DMO:



Finally, it is worth noting that the main ESO governing bodies are: the Council (overall policies and decisions), the Finance Committee, the Scientific Technical Committee (technical decisions), the Observing Program Committee (ranking the proposals for observing time), and the User's Committee (representing the users). All committees are advisory to the Council and/or the DG.

4 Department role and activities

In a nutshell, the Science Operations Department is in charge of:

- (i) Producing astronomical data of the highest quality, and
- (ii) Maintaining, and improve whenever possible, the scientific and operational performances of the instruments.

4.1 *Production of astronomical data*

At the level of Paranal Science Operations, whose main task is to produce astronomical data, the inputs of this process are the Phase 1 science proposal and a series of executable Observation Blocks (OBs).

For Service Mode (SM) programs, the OBs are prepared at time of Phase 2 with the support of the USD astronomer. After a thorough phase of preparation and verification, these OBs, along with their ancillary documentation (README file, finding charts, scheduling instructions, ephemeris and waiver files if needed, etc), reach Paranal ready to be executed by the Paranal Science Operations staff.

In Visitor Mode (VM), Paranal SciOps provides on-site assistance to the Visiting Astronomer (VA) for the preparation and execution of their OBs.

The output is a series of astronomical data and associated calibrations files, which are made available to the program PIs and stored in the ESO archive where they can be remotely accessed.

The main steps of this operations process can be summarized as described below:

- **Preparation:** Assistance to the Visiting Astronomer (in VM), preparation of the instrument set-up (masks punch, set-up preparation), preparation of the observations, review of the SM queues, preparation of special programs (e.g. ToOs, DDTs), and preparation of the instrument sub-systems.
People involved: Day Astronomers, Day Shift Coordinator, Operations Specialists, Data Handling Operators, and support from engineering/maintenance.
- **Execution:** When the observations are actually performed. Ancillary data are acquired to calibrate the scientific data.
People involved: Support Astronomers and Telescope & Instrument Operators (TIOs), Night Shift-Coordinator.
- **Data Quality:** The science and calibration data are evaluated and their quality certified.
People involved: Support Astronomers and Telescope Instruments Operators (science data and night-time calibrations), Day Astronomers and Operations Specialists (science data and day-time calibrations), QC scientists from Data Product Department in Garching (calibrations), Data Handling for the technical certification.
- **Archiving:** The certified data are distributed to the PIs and archived.
People involved: Data Handling Operators, Archive Department in Garching.

4.2 *Schedule of activities*

4.2.1 *Long-term*

ESO operations activities are paced by the 6-month period of the observing programs, which define the frequency of all processes aiming at maintaining and developing our tools and procedures, from the smallest (e.g. new calibration templates), to the largest (e.g. commissioning of new instruments). Any operational change requires clear definition, review, and approval, before being considered for implementation. Implementation itself consists in phases of commissioning (technical integration and testing) and “Paranalization” (align operations to VLT standards), before being finally accepted for operations.

In terms of instrument projects, Science Operations can:

- (i) be involved with other partners (typically LPO Engineering, Garching instrumentation) in some common activities, such as the commissioning of a new instrument, or upgrade of an existing one,
- (ii) fully lead a project when it is self-contained within the department activities. The definition of such project is done through the submission of “Change Requests” (for cost > 5000Euro and/or 1 week of work), or “Minor Change Requests” (below the previously defined limits). When a change request concerns the modification of an instrument, or one of its modes, its implementation is synchronized with the release of the Call for Proposal (CfP). The CfP defines precisely what instruments and modes will be offered at the start of the upcoming observing period.

One should refer to the Instrument Operations team (IOT) Charter document [2], which describes precisely the role of all participants of the IOT and level of authority during instrument interventions and projects.

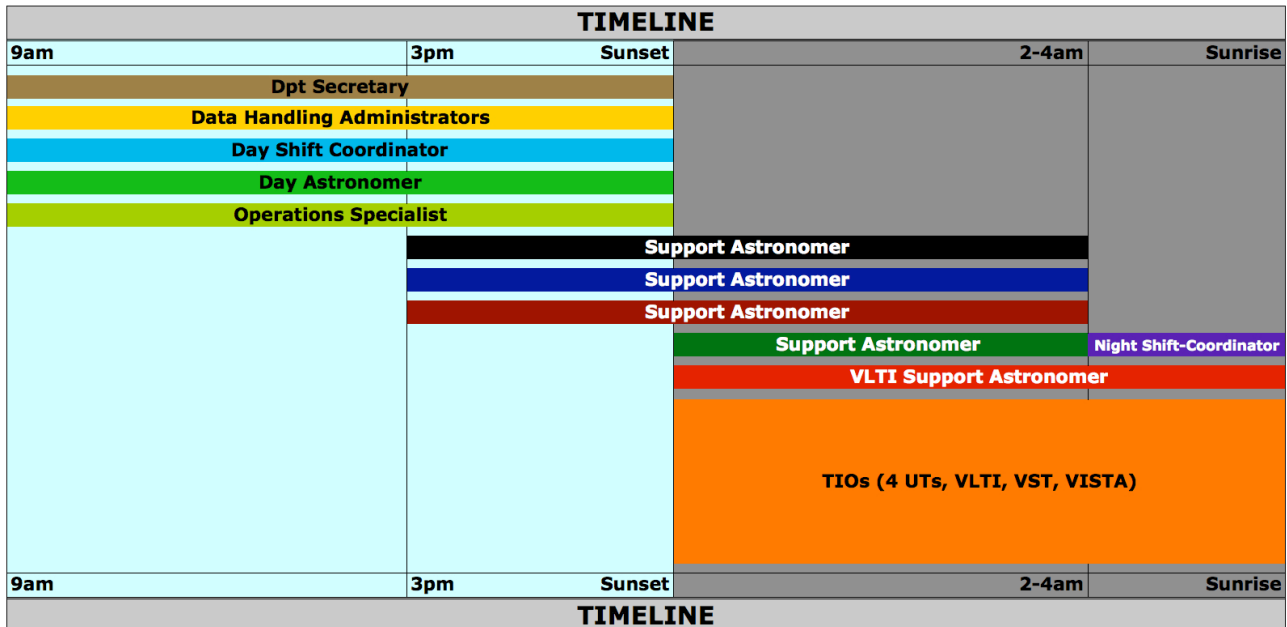
4.2.2 *Short-term*

The instruments, and all related sub-systems involved in the operations, require constant maintenance (both preventive and corrective) and improvement. Science Operations play a major role in these activities (e.g. performance characterization, calibration plan, long/short-term health trends) to ensure that the performances of all systems remain within, or exceed, the pre-defined optimal specifications.

SciOps is the main user of the observatory systems and thus plays a critical role in detecting anomalies, which are reported using a ticketing system of Problem Reports (see Communications and Interfaces). Typically, when an anomaly is detected (e.g. performance deviates from acceptable limits, or more dramatically, the instrument stops operating properly), a Problem Report is created describing the details of the system behavior. The problem is then assigned to a Group within the Paranal Departments (System Engineering, Engineering, SciOps, Maintenance) until its nominal performances are re-established. After System-Engineering and/or Engineering and SciOps have certified that the optimal system functionalities have been restored, the system can resume operations.

5 Science Operations Staff Categories

Each Science Operation staff is recruited to execute a specific type of operational activities (in addition to science duties for the astronomer category of staff). The figure below illustrates the various day- and night- time activities, and timeline coverage for each job category:



5.1 Astronomers

Astronomers (PhD in astronomy, astrophysics or equivalent) are responsible for the Day and Night Operations. They are supported in their tasks by the Operations Specialists (day-time and night-time). As part of this core responsibility, the astronomer will be either:

- Day Astronomer, working from 9am to sunset
- UT Astronomer, working either:
 - from 3pm[†] to ~3am (On-call from ~3am to sunrise),
 - from sunset to sunrise (act as night shift coordinator after ~2-4am).
- VLT astronomer, working from sunset to sunrise.
- Shift Coordinator: Whenever the astronomer has acquired a sufficient level of knowledge and expertise in the operational work, he can also endorse the activity of Day- or Night-Shift Coordinator (according to the operations needs).
 - Day Shift Coordinator (working from 9am to sunset)
 - Night Shift Coordinator (working from sunset to sunrise), but in charge of one UT

[†] The exact starting time of the UT astronomer in the afternoon is somewhat flexible and must be adjusted with the time the UT support ended the night before, this in order for the duty time, including the time reserved for night-lunch (which can take place before or after sunset as required by operations), not to exceed 12h. For instance, if the night activities required support to be provided later than 3am, the starting time in the following afternoon (or previous afternoon if such activities were pre-established) should be moved forward accordingly, but no later than sunset.

operations as “UT Astronomer” from sunset to ~3am.

Operations Staff Astronomers are hired on different types of contract:

- Faculty astronomers (up to 105 nights/year of duty at Paranal): They spend a significant fraction of their time on personal research (corresponding to 33% of the time outside the observatory). They are expected to maintain and develop an important scientific activity (cf ESO Astronomers' Charter [3]). Their performances are evaluated both on the operational and scientific achievements.
- Operations astronomers (up to 135 nights/year of duty at Paranal): Their performance is only evaluated wrt to their operational achievements. The remaining of their working time (corresponding to 20% of the time outside the observatory) can be devoted to personal research or operational investigation. Their involvement in the technical and operational aspects of the department is deeper and broader than that of the Faculty astronomers.
- Fellows (80 nights/year of duty at Paranal): These junior astronomers are fully involved in supporting the core operation processes. Although they are not expected to take up additional responsibilities, they are encouraged to become actively involved in activities related to Instrument Operations Teams (e.g. Instrument Fellow) or Operations Groups.

5.2 Telescope Instrument Operators (TIO)

Telescope and Instrument Operators are recruited with an engineering, high-level technician degree, or equivalent, with a demonstrated professional experience, or ability, to work with high-technology systems. The TIOs operate the telescopes (UTs, ATs, VST, VISTA), their instruments, and ancillary systems (LGSF, domes, cooling, but also DIMM, ASM, etc) to maximize their efficiency, while maintaining the safety of people and equipment. Experienced TIOs are generally expected to act additionally as Weather Officer, or Safety Coordinator, depending on scheduling requirements.

5.3 Operations Specialists (OS)

Operations Specialists are recruited among senior TIOs and share their functional duties between nighttime TIO activities (50%) and daytime operations support (50%).

The daytime duties take place between 9am and sunset, similarly to daytime astronomers, and consist to support all daytime operations activities (execution of daytime calibrations, calibration completeness and quality check, mask-manufacturing, instrument troubleshooting, etc), except for those tasks that require astrophysical expertise (e.g. support of visiting astronomer, consolidation of science data quality (QC0)).

5.4 Data Handling Operators

The Data Handling Operators are hired as database experts, or with related, equivalent expertise. They are responsible for the consistency and archival of the data produced on the telescopes, as well as for monitoring, maintaining and troubleshooting the Data Transfer and Data Flow Systems, the Operation Database, and the Support Tools (Remedy, Maximo) and their underlying databases.

5.5 Science Operations Secretary

The Department Secretary is hired as bilingual executive assistant. S/he provides administrative and managerial assistance to the Head of Science Operations, as well as to all the other SciOps staff.

The SciOps secretary is given some related assignments for general support to other, broader aspects of the Observatory operations, such as for instance the introduction of observatory rules to new staff members, etc.

5.6 Head of Science Operation Department

The Head of SciOps (HoSciOps) is a Faculty astronomer whose main responsibilities consist to participate to the definition (as part of the Management team) of the Observatory Policies and their implementation within the Science Operations Department, to prepare and implement the department budget, to lead the recruitment of the SciOps personnel, and to define and implement the goals and objectives for each member of the personnel and evaluate their related performances.

5.7 Deputy Head of Science Operation Department

The department Deputy support the HoSciOps in his managerial tasks and replaces him during periods of unavailability (science and home leaves).

5.8 SciOps management team (Musketeers)

The main members of the SciOps management team are the Instrument Operations Team Coordinator, the Operations Group Coordinator and the VLTI Group Coordinator (additional members can be added by the HoSciOps, if operations required it). The members of this team inform and advise the Head of Science Operations on the aspects of general operations, VLTI operations and Instrument Operations. They support the HoSciOps in the implementation of the operations procedures throughout the department.

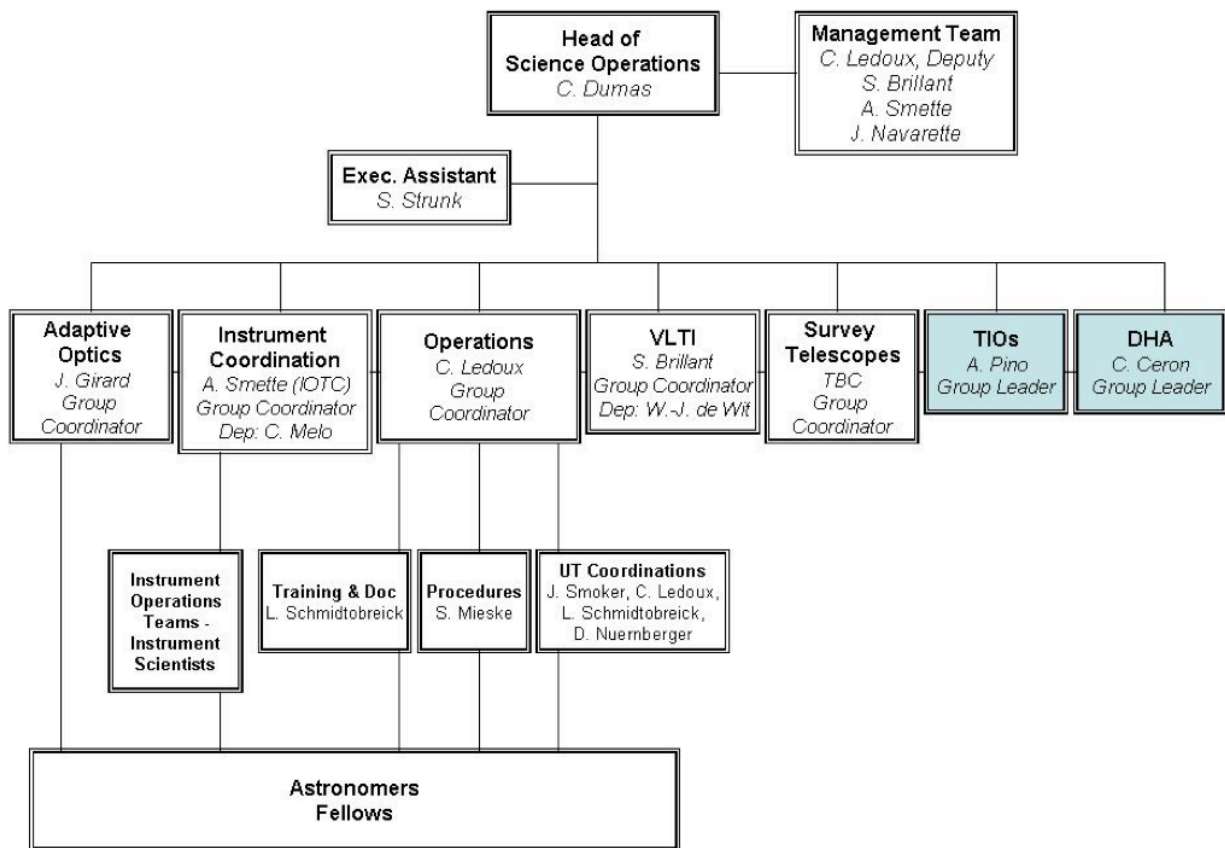
5.9 Additional contributors

Although graduate students from the ESO-Santiago offices work exclusively towards the obtention of their PhD thesis, they can nevertheless become involved in short, well-targeted operations or instruments projects. These projects should have a complete execution time of <8-20 days, so to be fully achieved within one or two standard operations shifts. Students involved in observatory projects are thus scheduled at Paranal on a voluntary basis (no more than 30n/yr) under the supervision of a senior astronomer.

6 Department's Administrative and Managerial Structure

6.1 Structure and lines of report

The Department structure is represented by the following organizational chart:



Head of the SciOps: S/he reports directly to the La Silla Paranal Observatory Director. The Head of SciOps is managing the general operation budgets for all operation staff and related expenses (Job732), including training.

Dep. Head of SciOps: S/he reports to the Head of SciOps.

SciOps management team (Musketeers): It is composed of the coordinators of the Operations, VLTi and Instrument Operations Teams. These assignments are done on a renewable 1-year basis. The team meets regularly (every two weeks) to discuss operational matter and take preventive and corrective actions whenever needed.

Executive assistant: S/he reports to the Head of SciOps.

Astronomers (staff and postdoctoral fellows): From the managerial point of view, all the astronomers report directly to the Head of SciOps. Still, astronomers are expected to become involved in operations group an/or instrument operations teams, and are supervised in these tasks by the coordinators of the corresponding groups (e.g. Instrument Scientists are supervised by the IOT

coordinator).

Data Handling Operations: All La Silla-Paranal DHAs report to the DHA group leader. The La Silla Data Handling Operations are coordinated with the La Silla Site Manager.

Operations Specialists and TIOs: They report to the TIO group leader. Two TIO night-shift coordinators assist the TIO group leader in his managerial tasks.

6.2 TIO and DHA Group Leaders

The Leaders of these groups assist and report to the Head of SciOps. They contribute to the definition of the SciOps policies and to their implementation within their respective group. They define and review the staff Goals and Objectives, participate to the selection of their group personnel, lead their group staff, and organize the operations and training schedule within their group. The group leaders are formally appointed by the Observatory management.

The DHA group leader manages the DHA expenses budget (Job735).

6.3 Operations Groups

Operations groups are purely operational structure with no direct managerial responsibilities. These groups permit to better coordinate the operational tasks and improve the efficiency of the science operations department. Members of the operations group can be Paranal staff astronomers and fellows.

The coordinators of the operations groups directly report to the Head of Sciences Operations. They assist the Head of SciOps by defining the future goals and objectives for the staff members and by providing an evaluation of the staff performance in relation to the activities carried out within their group.

Each of the operations group below is led by a Group Coordinator, who is appointed internally for a renewable period of 1 year, and whose role is to coordinate the activities of the group, coach its members and empower them so they can achieve their goals within the group:

- **General Operations (GenOps):** This group defines up-to-date procedures and tools for the VLT/VLTI operations. It also maintains the SciOps documentation, webpages and the training plan of his staff members. Because of the important number of tasks supervised by this group coordinator, the activities of “training and documentation”, and “procedures”, are coordinated by two group members acting as the group coordinator assistants. More details available on the [GenOps webpage](#). The group structure is also made of 4 UT coordinators (one per UT) whose role is to coordinate operational matter at a given UT (standardization of operations procedure, calibrations, training, etc) while developing team spirit among the Dpt members supporting the operations on that UT (see operations page for more details).
- **Instrument Operations Teams (IOT):** (See Instrument Operations Team Charter [2] for a detailed description of the IOT activities). In a nutshell, each Instrument Operations Team is led by an Instrument Scientist (see below). The IOT defines and implements common calibrations procedures and tools to secure the production of science graded data product as well as the stability of the performance of the different VLT-(I) instruments. More details available on the [IOT webpage](#).
- **Adaptive Optics (AO):** This group supports the IOTs of AO instruments in maintaining

optimal performances and calibrations of their AO systems. This includes all AO systems on the mountain, whether they are dedicated to standalone instruments (e.g. CRİRES, SINFONI, NACO), or for systems such as the VLTI. This group also provides the operational interface with the engineering AO group in Garching. More details are available on the [Group AO webpage](#).

- Survey Telescopes (ST): The goal of this group is to support the commissioning of the two Survey Telescopes (VST and VISTA), and integrate them within the operations of the Paranal Observatory. The group supports the HoSciOps in defining and implementing the operations and calibration plans of the two survey telescopes.
- Very Large Telescope Interferometer (VLTI): This group coordinates all operational activities of the VLTI instruments and systems, including commissioning of the new instruments, and operations-readiness of the second generation of VLTI instruments.

The participation in the activity of these operations groups is opened to all SciOps astronomers, and Operations Specialists.

6.4 Instrument Scientists

(See Instrument Scientist Charter [4] for a detailed description of the IS activities).

The Instrument Scientist (IS) coordinates the activities of his IOT. The IS is appointed to this task for a renewable period of 1 year. The IS himself is an astronomer, and the IOT members are composed of personnel from Paranal (instrumentation engineer responsible, software engineer, instrument fellow, any astronomers or TIOs/Operations Specialists willing to participate) and Garching (Garching IS, QC scientist, USD astronomer, pipeline developer, ETC specialist).

A detailed description of the IS responsibilities is described in the IS charter [4] and is available on the SciOps IOT webpage. In a nutshell, the main responsibilities of the IS can be described as follow:

- Long term: Definition, implementation and characterization of observing modes (including upgrades). Definition, implementation and maintenance of the instrument calibration plan.
- Medium term: Characterization, monitoring, improvement of the instrument performances. Maintaining up-to-date all documentation (manuals and web-based) related to the scientific and operational use of the instrument.
- Short-term: Tracking and reporting problems impairing optimal operational performance of the instrument, write quarterly instrument reports and report on the use of technical time.

7 Operations plan: Job functions and staffing plan

7.1 Systems to operate

- 4 UTs used 100% of the time, including ~20% in VLTI mode,

- 4 ATs operated ~80% of the time for VLTI, so that VLTI is used ~100% of the time,
- 2 survey telescopes: VST and VISTA.
- 16 instruments (3 per UT, 2 for VLTI, 2 for surveys) and 3 facilities (LGS, AOF, PRIMA)
- Astrometeorology station: DIMM, ASM, MASCOT.

7.2 Functions within the Department

The following operational functions are defined within the department. Each activity is carried out in turnos, whose duration and frequency is defined within the quarterly operations schedules established by the various groups (Astronomers, DHAs, TIOs). These schedules are produced taking into account the operations requirements, the telescope allocation schedule, the contractual constraints (type of shift, number of nights...), the training requirements and personal constraints (vacation, private commitments, conferences...).

The following descriptions are kept short and at the conceptual level. Detailed descriptions and procedures are available on the SciOps web pages.

7.2.1 Shift Coordinators

7.2.1.a Day Shift Coordinators

Responsibilities: The daytime SC coordinates all daytime activities involving the operations of the telescopes and instruments, interfacing with the other departments of engineering and maintenance. His main responsibilities are:

- External coordination: Coordination with Parlogs, Engineering, and Maintenance, such as coordinate hand-over of the telescopes and systems from and to Engineering, coordinate engineering activities (planned or emergency) that have an impact on SciOps activities, etc.
- Internal coordination: makes sure that every day/night time activity is covered, prioritize operations activities, etc.
- Astronomical coordination: SC is responsible for reviewing and evaluating the possible execution of Target of Opportunity triggers, assisting night support astronomers with definition of queues and priorities whenever needed, etc. SC also has delegation of authority for real-time adjustments to the telescope schedule (e.g. shift a visitor run from 1st half of night to middle of night...). The SC has the authority to embargo data in case of suspected target conflicts.
- Managerial responsibilities: SC can authorize emergency changes of schedule for all SciOps members (e.g. to send someone off Paranal in case emergency, or bring someone up the mountain to secure optimal operational coverage).
- Training and coaching: as an experienced astronomer, the SC coaches more junior astronomers to the best practices of operations.
- Meetings: The day shift coordinator:
 - Participates to a 9:00 morning meeting led by engineering to discuss PPRS priorities in preparation for the upcoming observing night.
 - Chairs an afternoon meeting around 16:00-17:00 (depending on season) to close the loop on the action items issued at the morning meeting, discuss the readiness and

configuration of the telescopes, instruments and sub-systems for the night of observing, and any other operations matter.

Working schedule: The working day starts at 09:00. The day of work ends once all telescopes are in operations. The nighttime shift coordinator takes over the responsibility of overseeing the operations at nighttime.

Training: The day SC is an astronomer with extensive experience of the Observatory. As a rough guideline, it is expected that the SC will have spent ~200 nights on the mountain before taking up this responsibility, but SC assignment is also based on the overall development of the individuals within the Dpt. Detailed Duties of the SC duties are available on the internal department webpage.

7.2.1.b Night Shift Coordinators

Responsibilities: The night shift coordinator is a UT astronomer (i.e. not assigned to VLTI night support) who also acts as shift-coordinator for nighttime activities.

The Night-Shift coordinator must formally authorize a UT astronomer to leave the control room between 2-4am, after having verified that both the TIO and the UT support astronomer have discussed together the rest of the night strategy, prepared queues, and any special circumstances such as time critical observations, use of special mode, need for special calibrations, etc.

When some, or all of the other, UT astronomers have left the control room, he is responsible for providing support of astrophysical nature to the TIOs (clarification of target identification, observing strategy, data quality rough assessment if needed) during the last hours of the night (in visitor mode, such inputs of astrophysical nature are provided by the visiting astronomer).

The night shift coordinator should also provide expertise and support towards real-time decision (RRM, TOO, instrument switch, engineer call due to technical problem, etc). In case of doubt, and if the urgency of the situation requires it, the night-shift coordinator can decide to call the UT support astronomer (who remains “on-call” after he has left the control room) to get clarification on a particular aspect of a program.

In case of emergency circumstances (e.g high-risk earthquake) occurring during the last part of the night, the Night-Shift Coordinator can request all UT astronomers to return to the control room to help with the handling of the situation.

Working schedule: The working hours are from sunset to sunrise.

Training: As for the daytime shift-coordinator, the nighttime shift-coordinator is an astronomer with extensive experience at the Observatory.

7.2.2 Day Astronomer

Responsibilities:

1/ Core process:

a/ Certification of the past night: the DA is responsible for the completeness and quality certification of the data acquired during the previous night. This includes also the calibration frames acquired in the morning.

b/ Preparation of the following night: DA is also responsible for delivering the system to the night astronomers at the beginning of the night. This includes making sure the required instrument set-up have been performed (mask manufacturing and insertion, special filters installed...) and verified; making sure the observation queues have been updated, the special observations (e.g. ToOs) are ready. As most DAs are also certified for night operations, they use their knowledge of the night

procedures to make sure everything is ready.

The day preparation also includes support for Visiting Astronomers, but the UT astronomer, when present in the afternoon, is ultimately responsible for providing VA support in a SciOps2 scheme.

2/ Ancillary processes: a significant responsibility of the DA is to monitor the instruments through the various QC systems, and investigate possible deviations. The DA is the front-line in case of instrument problems: they use their knowledge, the knowledge database (PPRS, documentation....) and that of their colleagues to solve most issues arising with the instruments. The rest of the time is used on activities such as IOT and/or Operations group projects.

Working Schedule: from 09:00 until handover to the nighttime operations team.

Training is described in the department training plan. In summary, an astronomer will be certified for day operations after passing successfully 2 shifts of training with an expert. A certification checklist summarizes the main points and concepts to be acquired.

7.2.3 *Night Astronomers*

7.2.3.a *UT Astronomers*

Responsibilities:

In the afternoon, the UT support astronomer:

- Helps with the activities in preparation of the upcoming observing night (see daytime astronomer for all details),
- Provides guidance to the VA, when it applies, in preparing and optimizing observing strategy,
- Verify and certify any pending OB classification from the previous night and corresponding consolidation of the night-report
- Work on any high-level operations or instrument duties as part of an operations groups or IOT.

After sunset, together with the TIOs, the NA performs the night observations, maximizing the scientific output of the telescope. In Service Mode, the NA is in charge of the definition of the observation sequence, and of certifying the quality of the data produced. In Visitor Mode, the NA is responsible for making sure the visitor makes the best possible use of his allocated time. In all modes, the NA is responsible for the night reporting (i.e. Night Report, Problem Reports, PSO tickets, USD tickets), but this responsibility is delegated after 2-4am, when he leaves control of the OBs execution to the TIO, under the supervision of the Nighttime Shift Coordinator.

During the first part of the night, until 2-4am, the TIO performs the actual observations while the NA focus on the definition of the observation queues, and helps the TIOs with the data quality control assessment. In preparation for the second part of the night, the NA prepares two observing queues, one assuming the current meteo conditions will continue, the other one in case of changes (for the best or worst). These queues, and the particularities of some programs if needed, must be discussed with the TIO before leaving the control room.

The night support astronomer must have the approval of the night-shift coordinator to leave the control room between 2-4am. The exact time of departure depends on the operations circumstances. For instance, the shift-coordinator might require the night support astronomer to remain until 4am because some training is ongoing at the UT (either astronomer or TIO), or because of complexity of the observations to be carried out. Also the TIO must have taken his night-lunch before the night

support astronomer leaves the control room. In case technical activities require the presence of the night support astronomer (e.g. commissioning, technical time requested by the night-astronomer), the early departure of the control room is waived and the night-support astronomer must remain present at the console until SM/VM observations are resumed.

It is important to note that the UT astronomer remains “On-call” after he has left the control room and can be called by the Night-shift coordinator.

In case the UT astronomer had to provide on-call support, or return to the control room for emergency circumstances, the starting time of the UT astronomer on the next day can be move forward accordingly (after 3pm, but no later than sunset). In general, the afternoon starting time of the UT astronomer must remain flexible (although no later than sunset) to take into account the cases when the UT astronomer must remain in the control room after 4am for operational reasons.

Special VLTi: Depending on the operational complexity of the instruments and systems, their operations might require the presence of an astronomer for the entire length of the night. This is currently the case for operating the VLTi instruments (with UTs or ATs).

Working schedule: The UT support astronomer must be present in the control room no later than 3pm in the afternoon.

Training: As described in the department training plan, an astronomer will be certified for night operations on a telescope after passing successfully 2 shifts (or more, according to training plan) of training with an expert. A certification checklist summarizes the main points and concepts to be acquired.

7.2.3.b *VLTi Astronomers*

Responsibilities:

The responsibilities of the VLTi Astronomer are similar to that of the UT astronomer, the only differences being the working hours (sunset-sunrise) and the fact that several telescopes (ATs or UTs) are used in VLTi mode.

Working schedule: The VLTi support astronomer must be present in the control room just before sunset.

Training: Similar to UT astronomers.

7.2.4 *Night-time Telescope Instrument Operators (TIOs)*

Responsibilities: For a given night, each TIO is assigned a given telescope. The TIO operates that telescope and its instrumentation, so to maximize their efficiency, while maintaining the safety of people and equipment. In normal operations, the TIO fully performs the observations selected in the execution sequence (SM), or by the visitor (VM), and at the end of the night (02:00-04:00 onward), performs the full operations of the whole system (except for VLTi since a Night-support astronomer remains at the console in this case). The certification level determines the telescopes and instruments that a TIO can operate.

After the Night support astronomer left the control room, between 2-4 am, the TIOs continue executing SM OBs (according to the observatory’s priorities) that have been prepared in two separate queues (for two sets of meteo conditions) by the UT support astronomer and discussed together. The TIOs is then delegated the task to provide a grade to the executed OBs based on a zero-order quality assessment (image quality and/or rough estimation of SNR wrt goals set by the PI and ambient conditions). The TIO applies the calibration plan for the corresponding instrument and mode. In VM, the TIO simply executes the OBs selected by the VA.

In case of doubts wrt acquisition, target identification, OB execution priority or data quality, the TIO can then request the advise/support from the nighttime shift coordinator. If additional expertise is needed, the night-team can request phone-support from the UT support astronomer who remains on-call after leaving the control room. In case of persisting doubts wrt an OB grading, the relevant information should be included into a PSO ticket so the daytime team can finalize the grading.

At the end of the night, the TIOs are responsible to put the instrument in calibration mode, execute the telescope and dome closing procedures, launch the calibration sequence for the instruments and send the night-report.

Schedule: From sunset to the complete shutdown of the telescope at the end of the observations, which must happen no later than 20min before the official time of sunrise.

Training: It is defined in the TIO group training plan, which considers first UT training, then certification on the various UT instruments and VLTI systems.

7.2.4.a Additional TIO Function: Weather Officer

Responsibilities: The weather officer is in charge of monitoring the weather (and logging the corresponding data in the Night-Report), and to issue the weather-related instructions (weather change warnings, dome closure, domes in safety position, re-open domes) following the corresponding guidelines. The Weather Officer is also in charge of operating the ASM (DIMM, MASCOT and other related systems).

The TIO in charge of operating the LGSF cannot be Weather Officer simultaneously.

Schedule: The weather officer is on duty while the telescopes are under SciOps responsibility (from evening to morning twilight). The WO is identified in the TIO schedule.

Training: Coaching and certification by other Weather Officers. WO certification is expected for all TIOs with a few years of experience.

7.2.4.b Additional TIO Function: Safety Coordinator

Responsibilities: The SciOps Night Safety officer monitors the safety of people and equipment at night, and coordinate with the Observatory Emergency Brigade/ Safety Officer in case of emergency or accident. In particular, the SciOps Night Safety Officer coordinates and enforces the evacuation of the buildings in case of fire or earthquake, etc.

Schedule: During normal night TIO operations. The Safety Coordinator is identified in the TIO schedule.

Training: Coaching by senior TIOs certified as Safety Coordinator.

7.2.5 Operations Specialist

Responsibilities: The Operations Specialist shares his/her time (according to turnos) between the functions of TIOs (see above) and that of daytime operations support. The daytime tasks are the same than those of the daytime astronomer, exception made of all activities requiring a unique astrophysics expertise (such as consolidation of OB classification, support of VAs in preparing the observing strategy for their program).

Working Schedule: Either from 09:00 until handover to the nighttime operations team (day-shift) or from sunset to sunrise (night-shift).

Training is described in the TIO group training plan. In summary, an operations specialist will be

certified for day operations after passing successfully several shifts of training with an expert. A certification checklist summarizes the main points and concepts to be acquired.

7.2.6 Data Handling Administrator

Responsibilities: the data handling operator ensures the consistency and archival of the data produced on the telescopes, and monitors, maintains and troubleshoots the Data Flow System and its related databases.

As database administrator, DHA shall also monitor, maintain and troubleshoot the operation databases and tools (chiefly REMEDY and MAXIMO).

DHA also support and maintain the software available at the visiting astronomer machines located in the VISAs residencia offices.

The background work of the DHA includes preparation and implementation of DFS and operation databases upgrades.

Schedule: the DHA work on the standard daytime shift defined by the Observatory.

Training: coaching by experienced DHAs.

7.3 Staffing Plan

The staffing plan is a breakdown of all the people required to be present at any given time at the observatory to secure optimal operations of its various systems. It also takes into accounts the various functions endorsed by the staff (e.g. a support astronomer can also be Instrument Scientist and/or Group coordinator).

7.3.1 Requirements

The full operations of Paranal Observatory require the following staffing. Note that all systems can be operated either in Service Mode or in Visitor Mode, with no impact on the staffing plan.

7.3.1.a Daily staffing requirements:

The numbers below correspond to the daily science operations staffing at the observatory:

- 7 TIOs: 4 for the UTs, 2 for the Survey Telescopes, and one for the VLTI (sunset-sunrise).
- 4 Support astronomers for the UTs (3 of them from 3pm to 2-4am, 1 of them from sunset to sunrise, acting night-shift coordinator from 2-4am to sunrise)
- 1 night-astronomer for the VLTI (sunset-sunrise)
- 1 Day Astronomer for all the systems (9am-sunset)
- 1 Operations Specialist (9am-sunset)
- 1 Day Shift Coordinator (9am-sunset)
- 2 DHA in Paranal to control Data-Flow at both sites (LaSilla and Paranal).

7.3.1.b Astronomer staffing resources

The breakdown of our current budgeted astronomer staffing is listed below:

- 1 Head of SciOps.
- 25 staff astronomers (plus 1 additional position corresponding to the rotation of one staff astronomer being reassigned to the Office for Science at any given time).
- 12 postdoctoral fellows.

7.3.1.c TIO and OS staffing resources

A total of 16 TIO and 6 OS are needed to support the 7 systems to operate (VLTI, 4 UTs, 2 Survey Telescopes). The OS share equally their time between TIO support (50%) and daytime support (50%).

As a result, taking into account that 0.25 FTE are dedicated for TIO group management and another 0.25 FTE for site testing, a total of 18.5 FTE provide the core TIO support, and the remaining 3 FTE correspond to the OS daytime operations support (including a margin of ~0.4 FTE for TIO and OS activities).

7.3.1.d Other staffing resources

- 5 DHA members to support the two sites (Paranal and La Silla).
- 1 Executive Assistant.

8 Interfaces and Communication

The department of Paranal Science Operations needs to constantly communicate with the other Observatory departments. Moreover, because of the shift system, there is no continuity in the staff presence on the mountain, and the people on-duty must have all the necessary information on-site, without relying on colleagues who are off-duty, to carry out their tasks. Consequently, a complex, but complete, set of communication tools has been set up. It is critical that these communication channels be always respected, as any deviation *will* result in loss of information, and therefore in duplication of efforts, loss of efficiency, and increased frustration.

This section lists the main channels of internal and external communication.

8.1 Reports

8.1.1 End of Night Report

Purpose: internal and external (to all groups related to operations)

Frequency: daily, for each telescope, at the end of the observations.

Using the Remedy-based NightReport tool in Remedy, a summary of the night is issued for each telescope. It includes all the observations and calibrations acquired, and all the Remedy tickets issued, as well as a number of statistics and metrics characterizing the night.

8.1.2 Handover Report

Purpose: Internal, from <function> to <function>

Frequency: at the end of each shift.

Every time someone leaves a function, either at the end of a shift (leaving the Observatory), or moving to a different function during the same shift, a handover report is written for the next person taking over this function. The format is slightly different for each function, but the main items reported are:

- Issues that happened during the completed shift
- Pending action items for the next shift

The handover reports are published and archived as PSO tickets.

8.1.3 *Quarterly Report*

Purpose: Internal reporting to direct supervisor

Frequency: While there is no fixed deadline (so that these reports can be issued while on Paranal), the full year must be covered (no gap) and one report must reach the supervisor during each 3-month period. These reports also include Science Operations reports to the Observatory Director's Office.

The responsible for each operations group or instrument, e.g. Instrument Scientist, Group Leaders, and Operation Group Coordinators sends a summary of the related activities over the last quarterly period. The main points to be addressed are the following:

- Personnel matter: people who joined the group/team, who left, who got certified, etc...
- Achievements: what was completed during this month
- Projects: which new project was started, and with which time-scale
- Issues: report any problem that is developing and that might turn into a showstopper ("red flag"), or for which the assistance/support of the supervisor may be needed.
- If relevant: statistics.

The instrument/systems quarterly reports are published as PSO tickets. A generic template is available on the SciOps internal procedure webpage.

8.2 *Ticketing system*

The Remedy system is used to create and track "tickets". As a general rule, each ticket has a "subject" which briefly summarizes the issue, a description of the issue at hand, a field where follow-up can be described, a person to which it is assigned, and a status field describing in which state it is. The general workflow is the following: an issue is reported in a "new" ticket, which is assigned to someone, or a group. That person/group deals with the issue (period during which the ticket is "assigned", or "open"), and logs the activities in the ticket. Eventually, the issue is solved, and the ticket is closed.

General ticket rules: As for emails, the subject line must be carefully crafted. All the relevant information must be included in the body of the ticket, so that the problem/request can be investigated/processed. As many tickets are either created and processed using generic accounts, the name of the person submitting and editing the tickets should always be included at the bottom of each contribution.

8.2.1 *Paranal Science Operations Tickets (PSO)*

This is the main internal communication tool for PSO. Any information or request for actions within SciOps should take place using a PSO ticket.

Some tickets can be very short-lived (e.g. from Day Astro to Night Astro: “don't forget the morning std star for this program”), others will remain open for months (keeping track of a project), others, finally are purely informative (announcement of a new procedure). PSO tickets are also used to archive all the SciOps handover and bimonthly reports.

8.2.2 *Paranal Problem Reporting System (PPRS)*

It provides the main interface with Engineering and is used to:

- Report technical problems together with all the corresponding diagnostic information (logMonitor and/or Bob info, error messages of all types, etc, with related time stamps), so that engineering can investigate it and hopefully “fix” it to reach nominal operational performances.
- Request minor changes of a system that is currently working, to improve its operations and performances. The Configuration Control Board (CCB) will review such requests before stating on possible authorization of implementation.
- Keep track of configuration changes. This can be hardware (filter exchanged or AT moved) or software (new version installed).

PPRS related to the operation of the systems should be created from the managing ticket interface (Remedy- or Maximo- based) so that all relevant information is properly included in the Night-Report.

8.2.3 *USD Tickets*

The USD tickets are our main interface with the User Support Department, which gives support to the users of ESO facilities during Phase 1 and Phase 2. USD tickets can be created/consulted via the Remedy interface.

8.2.4 *DFS Tickets*

The DFS tickets are our main interface with the Data Flow System, including archiving of observations, or preparation of data packages. DFS tickets can be created and consulted via the Remedy interface.

8.2.5 *Data Archive Requests (DAR)*

The DAR tickets are used to request a data set to be saved on portable media, typically for a visiting astronomer.

8.3 *Meetings*

Several meetings are regularly taking place. We list here those occurring on a regular basis. To these, one should add various information meetings at the group, division or organization level

(“All-Hands” meetings).

8.3.1 Department meetings

Chair: Head of SciOps

Participants: All SciOps

Time: Roughly quarterly

Purpose: Announcements (staffing, procedures, general operations) and topical discussion (e.g. operations groups activities).

8.3.2 Morning coordination meetings

Chair: COE (Chief Operations Engineer)

Participants: UT managers, Instrumentation, Software, SC

Time: Daily (morning, 9:00am)

Purpose: Discussion and prioritization of problem reports generated during the previous night.

8.3.3 Afternoon coordination meetings

Chair: SC

Participants: UT managers, DA, SC, DHA.

Time: Daily (evening, ~2h before telescope handover)

Purpose: Main exchange of information between Engineering and SciOps, on ongoing problems and upcoming activities. Coordination of the main operations-related activities.

8.3.4 Engineering group leader meetings

Chair: Head of Engineering

Participants: All Engineering Group Leaders, SC, TIOs

Time: weekly, Wednesday 15h

Purpose: report on main activities taking place on Paranal by each of the groups, for information and coordination.

8.3.5 Configuration Control Board (CCB)

Chair: Member of System Engineering group

Participants: PSE members, IT, System scientists (Telescope, VLTI, Instrument). Others might be invited depending on the issues at hand.

Time: bi-weekly, Thursday 14h

Purpose: review the “Minor/Major” Change Requests, collect/complete requirements, assign priorities.

8.3.6 *Musketeers meetings*

Participants: Heads of the Sciences Operations, VLTI Coordinator, IOT coordinator, Operations coordinator.

Time: bi-weekly, Wednesday ~14h

Purpose: Follow-up on all aspects of science operations.

8.3.7 *Seven Samurais meetings*

Participants: Heads of the Operations-related Departments (OPO, DPD, USD, Paranal SciOps, Director's Office (for La Silla), IOTC, QC and Archive)

Time: weekly, Wednesday ~14h (Garching time)

Purpose: discuss cross-department operation issues.

8.4 *E-Mails and mailing lists*

8.4.1 *General E-Mail information*

As a general rule, any “official” email sent internally (within SciOps) or externally shall be systematically CC'd to one of the official SciOps addresses:

- For instrument/system email, CC to the instrument/system account (eg, vimos@eso.org)
- For telescope email, CC the corresponding telescopes (eg, antu@eso.org)
- For group related matters (either administrative or operation group), CC either the group E-Mail (e.g. genops@eso.org)
- For Email to Paranal staff: antu@eso.org.
- For managerial/personnel/personal matters: Head of SciOps

As a general rule, it is recommended to systematically use informative subject lines. Also note that some procedures give a specific format for the Subject line; strictly adhere to these, as it is likely that a piece of software is looking for that format.

Note that in most cases, the use of PSO tickets (see below) is preferred to that of the emails, as the ticketing system keeps track of the exchange and records it.

paranal@eso.org is the main E-mail address entry point for external users. This address is currently re-directed to the Head of SciOps and his Deputy, to antu@eso.org and to the Director's Office.

antu@eso.org: Is the SciOps Shift-Coordinator email. This E-Mail collects the information that is relevant for day-to-day operations. The tickets related to the telescope or its instruments are copied there for convenience. Information such as authorization for target changes, etc, are also directed to the corresponding telescope. These mailboxes are read and handled by the DA, NA, and are maintained by the SC.

8.4.2 *Instrument E-Mails*

The instruments have email addresses, such as isaac@eso.org or uves@eso.org. These are the main entry point for any question or problem related to an instrument. These mailboxes are primarily

handled by the Instrument Scientist, who can delegate this task to a SciOps member of his IOT when the IS is unavailable, or ultimately to the staff on the mountain.

8.4.3 *Operations group E-Mails*

Each of the operation group has a mailing list, to which group-related email should be sent. Write to that address instead of the personal email of the group coordinator. The way these lists are handled is the responsibility of each of the group coordinator.

8.4.4 *Managerial group E-Mails*

Each of the managerial groups has a mailing list including all the members of the group. The addresses are par-astro@eso.org, par-tios@eso.org, dha@eso.org. Use them for important communications relevant for all group members.

8.4.5 *Department E-Mail*

The par-sciops@eso.org mailing list is the union of the 3 managerial group mailing lists and includes also the Dpt secretary.