National Centre for Radio Astrophysics

Internal Technical Report

Guidelines for Internal Technical Reports

Divya Oberoi and S. Sureshkumar

div@ncra.tifr.res.in, skumar@ncra.tifr.res.in

Objective: To provide guidelines for writing Internal Technical Reports.

Document history

Revision	Date	Modification / Change
Ver.1	28 May 2012	Initial version
Ver. 2	05 June 2012	Added suggestions for sections to be included in the ITR.

Sample Internal Technical Report

Introduction: An internal technical report can be written to serve one or more of many possible objectives.

Some illustrative ones are listed below:

1. Document the design of some system or sub-system
2. Providing justification for a system or sub-system design, perhaps detailing the available options and the trade-offs made etc.
3. Describe 'SOPs' (Standard Operating Procedures)
4. Characterise the performance of some components intended for us in some system or sub-system
5. Make a technical point
6. Substantiate the presence of a problem
7. Present an investigation of some phenomenon or problem
8. Document the progress made towards solving a problem
9. Present a solution to an existing problem
10. Internal Laboratory reports

Irrespective of the details of an internal technical report, it shares some common objectives. These include:

1. To share information with the rest of the GMRT team, and interested GMRT users across the world.
2. To build a long lived and accessible repository of knowledge about various aspects of the GMRT system, including its design, performance characteristics and issues, which will over time become a valuable resource for the observatory.

This will help a large and distributed team work efficiently and provide useful and much needed reference documentation as we move forward through this important phase of GMRT Upgrade. Putting down the conclusions from the ongoing work in technical memos substantiates the progress made, leading to a sense of accomplishment. It remind us of the larger picture of how smaller pieces come together to make a whole. It also gives us a better understanding of where we stand with respect to our final goal, thus helping us chart our future course of action.

The planning and effort required to write a technical report requires some clarity of thought, and hence forces us to examine our approach and process critically, potentially improving the efficiency and the quality of our work. Sometimes the fact that a given piece of work finally needs to be documented in a report is itself helpful for planning the work. The availability of technical reports makes it easier for other GMRT team members to learn in some detail about the work being done outside their group. It also creates a natural channel to receive feedback from other members of the GMRT team, providing an opportunity to benefit from the collective experience and the wisdom of the entire team. Writing technical documentation provides useful experience for developing the skills to publishing technical work being done at GMRT more widely, for example in suitable engineering journals and memos meant for wider circulation. A comprehensive repository of technical reports will also help strengthen our position globally as a competent and professional observatory.

Guidelines: We suggest some general guidelines for writing GMRT technical reports:

1. It is usually more efficient, and easier, to write many short technical reports, each addressing a small but specific subject, than writing a single large exhaustive document covering many different aspects.
2. It is often easiest to write a technical report as soon as the work is completed. The subject is fresh in the mind, the figures and/or plots are easier to generate, and the needed ancillary information is easily available.

3. The technical reports are intended for a comparatively well informed audience. They should assume reasonable familiarity with the system on part of the reader and do not need to provide much introductory material.
4. The primary objective of the report must be clearly stated. It can be just a sentence or two.
5. A key purpose of the technical report is to communicate with the rest of the GMRT team. For this communication to be effective, the information presented should be logically organized and be largely self-contained and complete. It should usually contain the meta-data and ancillary information needed to interpret the information presented.
6. All plots/figures must be labeled, provide units where needed. The labels and values marked on the axes should be in fonts large enough that they remain legible even after the figures have been shrunk to be accommodated in the report. They must also be accompanied by appropriate brief captions conveying the key point of the plot/figure.
7. The conclusions arrived at in the report must be clearly stated at the end and their justification included in the report.
8. It is often a good idea to make the report self-contained. So please consider including the relevant information which might avoid the need to cross-reference to multiple documents. If that is not easily possible, please consider including references to, and perhaps links to relevant documents.
9. In order to provide a uniform look and feel to the GMRT Technical Reports, a simple template has been provided (.doc format).

Suggested Structure: Based on the above guidelines, we suggest the following structure for a few different types of Internal Technical Reports. These suggestions are intended to serve as a guide, the authors should feel free to modify the structure of the ITR, based on the needs of that particular document.

1. *Document the design of some system or sub-system*
    a. Title – The title of the document
    b. Objective – A very brief (few sentence) statement of design problem. It should give the reader a clear sense of what he/she can expect to find in the report.
    c. Introduction – A brief description of the context and motivation for the design being described. It should be written assuming a fair level of familiarity with the GMRT system.
    d. Target performance specifications – A summary of the performance specfications which the design is required to meet.
    e. Design description – A description of the design providing sufficient detail that a fellow GMRT team member, perhaps from a different lab, is able to understand it.
    f. Design validation – A description of and results from the work which has been done to validate the design. These might be lab measurements, and in this case should explain why the conducted test is a good test of the design, and then describe the relevant lab setup details and the measurements made. It is quite possible that this work might be substantial enough to merit an independent report. That might be a preferred option to
    g. Conclusions – A set of statements clearly stating the conclusions from the design study. These could include the strengths and weaknesses of the design studied, suitability of the design for the proposed application, list the interesting or non-obvious things which were learnt as a part of the design effort, or suggestions for useful approaches to consider for this work based on the experience gained from this effort. In a nutshell, the conclusions are the place to consolidate the final product of the design effort and also the experience and learning which was gathered during its course.
    h. Future work – If appropriate, this section should describe the next steps in the process, the directions which could be pursued based on the present work, possibilities for improvement in the design or perhaps augmentations to the presented design to improve its capability.

2. *Describe 'SOPs*
    a. Title – The title of the document
    b. Objective – A very brief (few sentence) statement describing the operating procedure and its outcome. It should give the reader a clear sense of what he/she can expect to find in the report.
    c. Introduction - A brief description of the context and need for the operating procedure being described. It should be written assuming a fair level of familiarity with the GMRT system.
    d. Target specifications – A description of the task which the SOP is expected to accomplish. This will provide the benchmark against which one can determine the usefulness of the SOP.
    e. System setup requirements – It is usually difficult to write very general SOPs. One tends to make assumptions about the state of the system, signal levels, system configuration etc. A statement of the key assumptions made, requirements about the setup or the state of the system etc. need to be included as a part of the SOP and stated clearly.
    f. SOP description – A sufficiently detailed description of the SOP so that someone who is not already familiar with it, but is familiar with the system for which the SOP is being described should be able to carry it out independently.
    g. Conclusions – Document the ability of the SOP described to meet the target specifications, its strengths and weaknesses, acceptability for the specified task etc.
    h. Future work – If relevant, describe the next step in the process, e.g. generalisation of the SOP to address a broader task, or ideas generated during this work which can lead to improvements in future, etc.

3. *Internal Laboratory reports documenting some measurements*
    a. Title – The title of the document
    b. Objective – A very brief (few sentence) statement describing the lab measurement. It should give the reader a clear sense of what he/she can expect to find in the report.
    c. Introduction - A brief description of the context and need for the measurement described. It should be written assuming a fair level of familiarity with the GMRT system.
    d. Measurement setup – Describe the lab/equipment setup used to make the measurement. Enough detail should be provided to allow an independent person to repeat the measurement.
    e. Data/Measurements – A description or presentation of the data or measurements obtained. Any comments on data quality or unusal features, limitations of the set up etc. should also be noted.
    f. Analysis – The analysis of the obtained data needed to arrive at the conclusions should be presented here. Any assumptions made should be clearly stated and justified.
    g. Sources of error – A sincere attempt to list and quantify the sources of error which would have contributed to the measurement should be provided. Inability to quantify any sources of error should also be noted.
    h. Conclusions – Based on the data obtained and the analysis done, provide the conclusions. Mention the strengths and weaknesses of the approach followed, and the regime of validity of the conclusions.
    i. Future work – If relevant, describe the next step in the process, e.g. improving the measurement setup to overcome some of its present limitations.