



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A



Computing and Software System: Glossary

020.50.00.00.00-0008 LIS

Status: **RELEASED**

PREPARED BY	ORGANIZATION	DATE
B. Mason, J. Hibbard, A. Costa, T.K. Sridharan, P. Chandra, B. Butler, E. Koch, R. Rosen	ngVLA, NRAO	2025-08-13

APPROVALS	ORGANIZATION	SIGNATURES
R. Rosen, CSS IPT Lead	ngVLA, NRAO	Signed by: <i>Rachel Rosen</i> 4602AA3F0A7C428...
E. Murphy, Project Scientist	ngVLA, NRAO	Signed by: <i>Eric Murphy</i> 82D35C8655C14D1...
R. Selina, Project Engineer	ngVLA, NRAO	Signed by: <i>R. Selina</i> 9740299D489B4DD...
P. Kotzé, System Engineer	ngVLA, NRAO	Signed by: <i>P.P.A. Kotzé</i> 9E6E22E5C0FB448...

RELEASED BY	ORGANIZATION	SIGNATURE
W. Hojnowski, Project Manager	ngVLA, NRAO	Signed by: <i>William Hojnowski</i> 722BE6EC6DE84DB...



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Change Record

Version	Date	Author	Affected Section(s)	Reason
I	2025-08-11	R. Rosen	All	Initial draft
A	2025-08-13	M. Archuleta	All	Minor edits and formatting for pdf and release.



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Table of Contents

1 Purpose of the Document 4
2 Reference Documents..... 4
3 ngVLA Glossary 5
4 Proposal Process Glossary..... 9

List of Tables

Table 1. Documents used in producing the CSS conceptual design descriptions and use cases. 4
Table 2. Relationship between the project data model, telescope data terminology, data processing terminology, and data product terminology. 11

List of Figures

Figure 1. Visual representation of the relationship between the project data model, telescope data terminology, data processing terminology, and data product terminology..... 12



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

I Purpose of the Document

The Next Generation Very Large Array (ngVLA) project uses terminology and acronyms that can have a variety of means within other projects or are new within the ngVLA project. This document provides the definition of many of the terms found in the ngVLA Computing and Software System (CSS) documents to provide clarity and avoid misunderstanding.

2 Reference Documents

Table 1. Documents used in producing the CSS conceptual design descriptions and use cases.

Ref. No.	Document Title	Rev/Doc. No.	Relates to
System Documents			
REF01	Preliminary Operations Plan	020.10.05.05.00-0001 PLA	All
REF02	L0 Science Requirements	020.10.15.05.00-0001 REQ	All
REF03	ngVLA System Requirements	020.10.15.10.00-0003 REQ	All
REF04	ngVLA System Architecture Description	020.10.20.00.00-0002 REP	All
Stakeholder Needs			
REF05	CSS Stakeholder Needs – PMN	020.50.00.00.01-0007 REQ	CSS03, CSS04
REF06	CSS Stakeholder Needs – ONL, MCL, MSS	020.50.00.00.01-0008 REQ	CSS03, CSS05
REF07	CSS Stakeholder Needs – SDA, SDP, SIT, TI	020.50.00.00.01-0009 REQ	CSS03, CSS06, CSS07, CSS08
Conceptual Narratives			
REF08	ngVLA Proposal Process Concept	020.10.05.05.00-0011 PLA	CSS03, CSS04
REF09	Observation Preparation Concept	020.10.05.05.00-0010 PLA	CSS03, CSS04
REF10	Observation Scheduling Concept	020.10.05.05.00-0012 PLA	CSS03, CSS05
REF11	ngVLA Calibration Concept	020.10.05.05.00-0015 PLA	CSS03, CSS05
REF12	ngVLA Subarraying Operational Concept	020.10.05.05.00-0014 PLA	CSS03, CSS04, CSS05
REF13	Observation Execution Concept	020.10.05.05.00-0013 PLA	CSS03, CSS05
REF14	ngVLA Data Processing & Archive Workflow Concept	020.50.55.00.00-0001 DSN	CSS03, CSS06, CSS07, CSS08
REF15	Scientific User Support and Outreach Concept	020.10.05.05.00-0009 PLA	CSS03, CSS06, CSS07
REF16	Telescope Support Concept	020.10.05.05.00-0008 PLA	CSS03, CSS05
REF17	Conceptual Narrative for Time Domain Science	020.10.05.05.00-0016 PLA	CSS03, CSS04, CSS05
REF18	Maintenance and Support Concept	020.10.05.05.00-0007 PLA	CSS03, CSS05
Technical Memos			
REF19	TTA System Design Description		CSS04



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Ref. No.	Document Title	Rev/Doc. No.	Relates to
REF20	ngVLA Data Rates and Computational Loads	ngVLA Computing Memo #11	CSS08
REF21	System Considerations for ngVLA Data Processing, Transport, and Storage	ngVLA Computing Memo #12	CSS08
REF22	ngVLA Multi-subarray Scheduling Algorithm	ngVLA Computing Memo #9	CSS05
REF23	Baseline HPG Runtime Performance for Imaging	ngVLA Computing Memo #7	CSS06, CSS08
REF24	Time Averaging Limits and Baseline Dependent Averaging for the ngVLA	ngVLA Computing Memo #8	CSS06, CSS08
REF25	Telescope Time Allocation: System Description	688-TTAT-004-MGMT	CSS04
REF26	Telescope Time Allocation Tools Conceptual Architecture		CSS04
REF27	TTA Tools Gap Analysis		CSS04

3 ngVLA Glossary

Assigned Subarray: The Assigned Subarray is the reference subarray used in the first $QA_{obs}=Pass$ Calibratable Scan Execution from a Scheduling Block.

Backward Compatibility: For data processing, backwards compatibility means that all data acquired in Standard Mode Data Reduction (SMDR) will remain compatible with newer versions of the pipeline so that reprocessing of older datasets is always possible with the current production pipeline.

Calibratable Scan Block (CSB): A Calibratable Scan Block is a sequence of observing scan instructions that result in data that can be calibrated together. It is equal to or shorter than a Scheduling Block (SB). The CSB is the atomic unit of observing, meaning that, effectively, there is a potential breakpoint at the end of each CSB. The CSB boundaries can be used to interrupt the execution of an SB, for instance, triggered observations of transient sources or to break the execution for dynamic scheduling purposes. A CSB can be as little as one scan.

Calibratable Scan Execution (CSE): A Calibratable Scan Execution are the data resulting from a single Calibratable Scan Block (CSB) execution. This is the atomic unit that is evaluated by the observing QA system and given a pass or fail QA_{obs} score (QA_{obs}).

Calibration Processing Block (CPB): The Calibration Processing Block is the collection of Calibratable Scan Executions (CSEs) with $QA_{obs} = Pass$ from one or more EBs that get calibrated together. It includes all information needed to perform the applicable calibration process.



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Data Product: A Data Product, in the dictionary sense, that is produced from the Data Product Processing Block (DPPB) using metadata in the Data Product Block (DPB). These may be calibrated deconvolved images and image cubes but could include other products like catalogs and spectra.

Data Product Block (DPB): The Data Product Block (DPB) is the element of the Project Data Model (PDM) that informs the data collection and processing to make science products from one Scheduling Block.

Data Product Processing Block (DPPB): The Data Product Processing Block (DPPB) is the collection of data from all QA_{cal} = Pass Calibration Processing Block (CPBs) from a given Scheduling Block that are combined to create a set of data products. The data comprising the DPPB come from the same observing mode, and include all information needed for processing.

Executed Subarray: The Executed Subarray is the list of antennas actually used in a given Calibratable Scan Execution.

Execution Block (EB): An Execution Block (EB) comprises all the data, regardless of QA_{obs} status, resulting from a single execution of a Scheduling Block (SB), together with references to other necessary calibrations (e.g., Observatory Provided Calibration (OBCs)). Note that multiple executions of a single SB result in multiple Execution Blocks.

Execution Fraction: The Execution Fraction is a metric that reflects how close a Project or a Project component is to achieving its observation goals. When the Execution Fraction becomes 1.0, the Project component can be considered complete regarding its observation stage. At the Project level, the Execution Fraction will be summed over all the project's component observations, and will be measured relative to what is needed to achieve the science goals specified in the accepted proposal.

Group Level Block (GLB): A Group Level Block is the element of the Project Data Model (PDM) that informs the data collection and processing to make science products from one or more Data Product Blocks. An example use case where Group Level Blocks are expected include core+Short Baseline Array (SBA), core+SBA+Total Power Array (TPA); they could also be used for large mosaics (tile mosaics from distinct SBs), or multi-band spectral line surveys. While Group Level Blocks exist in the hierarchy when they contain only a single Data Product Block, their purpose is to orchestrate observations and processing to make products including data multiple SBs.

Group Level Data Products (GLDP): Group Level Data Products are science products that are produced from the Group Level Processing Block (GLPB) using metadata in the Group Level Block. An example use case where GLDPs are expected include core+Short Baseline Array (SBA), core+SBA+Total Power Array (TPA); they could also be used for large mosaics (tile mosaics from distinct SBs), or multi-band spectral line surveys.

Group Level Processing Block (GLPB): A Group Level Processing Block (GLPB) is the collection of data from two or more Data Product Processing Blocks (DPPBs) that are combined to create a set of science products; these science products are called Group Level Data Products (GLDPs). These can come from multiple SBs, observing modes, subarrays, etc., and include all information needed for processing.



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

High Level Data Product (HLDP): High Level Data Products are standardized, automatically produced Data Products that are broadly intended for scientific use.

Observatory Provided Calibration (OBC): Observatory Provided Calibrations are calibration parameters that given their long-term stability are measured and maintained by the Observatory and are not measured as part of Principal Investigator Scheduling Blocks (SBs). References to OBC data required to calibrate the science data acquired by an SB must be part of the SB. OBCs are observed as part of separate special calibration SBs.

Observing Mode: A way of observing that is distinct from other modes due to differences in the hardware, observing sequence, calibration procedure, acquisition software, or data processing that are significant enough to require a separate validation before being offered for general use. Examples of Observing Modes include Interferometric Mode, Total Power Mode, Solar Mode and Pulsar Timing Mode.

Phase I Scheduling Block: A Phase I Scheduling Block is a Scheduling Block (SB) that does not (yet) contain all the information necessary to be executable. A Phase I SB contains placeholders for some observing specific observations, such as a prioritized list of candidate reference subarrays and identification of all necessary calibrations (to be observed as either Observatory Provided Calibrations (OBCs) or Scheduling Block Calibrations (SBCs)), but not necessarily the exact identity of the specific calibrators.

Phase II Scheduling Block: A Phase II Scheduling Block is a Scheduling Block (SB) that is executable and can be run by the telescope. A Phase II SB contains observing specific information, including: all needed calibrations either determined to be provided by existing, valid Observatory Provided Calibrations (OBC) or incorporated in the SB as a Scheduling Block Calibration (SBC) with a specific calibrator(s); and one selected reference subarray from the prioritized list that is consistent with the needed calibrations. The Phase II SBs are generated based on input from the mid-term scheduler, and can be updated manually or by the dynamic scheduler up to the time of execution.

Project: The Project is the collection of the metadata that specifies observations and processing that is needed to create the desired data products specified by a proposal.

Project Data Model (PDM): The Project Data Model is the data model that contains the Science Goal(s), Group Level Block(s), Scheduling Block(s), and Calibratable Scan Block(s). This information is populated by the proposal system (including time allocation) and observation preparation system.

Recipe: For data processing, the recipe is a set of processing steps.

Reference Subarray: A Reference Subarray is any one of a pre-defined set of distinct, complementary groupings of ngVLA antennas. These are intended to closely guide assignment of science goals to subarrays but not to dictate it completely. They exist primarily as a construct to facilitate scheduling, planning, and observation tracking [REF12].

Scan (see also Scheduling Block and Execution Block): A scan is a contiguous period of data acquisition on a given subarray on a single target, with a single set of intents. It is considered to be a part of a Calibratable Scan Block (CSB).



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Scan Subarray: A subset of a subarray that has antennas that point in the same direction, can be correlated together, can be processed together, and are stored in a single Science Data Model (SDM).

Scheduling Block (SB): A Scheduling Block is the set of instructions needed for acquiring a contiguous sequence of Calibratable Scan Blocks (CSBs) that are intended to be observed together, including all required online calibrations (e.g. reference pointing). The Scheduler should work at the SB level but must be aware of CSBs. An SB can be executed multiple times; each execution of the SB results in a new Execution Block.

Scheduling Block Calibrations (SBC): Scheduling Block Calibrations are calibrations included in the Scheduling Block. These are calibration data specific to individual observations and are obtained as part of the scheduling block to track parameters that change within an observation or are too specific and not generally applicable for the observatory to devote time to maintain under Observatory Provided Calibration (OBC).

Science Data Model (SDM): The Science Data Model (SDM) is the format of the complete scientific data of an observation. The science data model is the storage of observatory raw data in that it is capable of capturing the metadata of an interferometric or total-power dataset completely without any compromise including all data relevant for calibration and observatory administration.

Science Goal: The Science Goal is the element of the Project Data Model (PDM) that describes the set of quantitative properties desired of the data products, as specified in a proposal. These can include: desired angular resolution (or range); center frequency, desired spectral resolution and spectral grasp (including spectral region of interest); whether continuum images or spectral line cubes are of primary scientific interest (either, both, or none are possible); largest angular scale; quality of the synthesized beam (i.e., Gaussianity of the PSF); sensitivity within a specific time window; and baseline-hours awarded in a specified range of spatial frequencies. The desired angular resolution and largest angular scale will determine the range of spatial frequencies that the project requires, and the (likely distinct) range of spatial frequencies within which awarded baseline hours are tracked.

Simultaneous Subarrays: Simultaneous Subarrays are two or more subarrays which are constrained to acquire data in one or more receiver bands on a science target(s) at the same times within some tolerance (scan start and stop times within +/-5% of scan duration, for example). These subarrays will be scheduled as a unit. Example use cases include multi-band transient observations, and some multi-band or multi-array solar system object observations.

Standard Mode Data Reduction (SMDR): Standard Mode Data Reduction is the observing modes that can be automatically processed with no or minimal manual intervention [REF14]. For SMDR projects, Scheduling Blocks (SBs) will be automatically generated with minimal need of customization, the processing products will have well defined Quality Assessment scores, and the resulting products (including High Level Data Products (HLDPs)) are well defined.

Subarray: A subarray is a group of system resources that: are scheduled as a set and have the same hardware resources (such as antennas, correlator, and computing). The antennas do not necessarily point in the same direction. Subarrays can operate concurrently (i.e. independently and at the same time), or they can be coordinated (see simultaneous and synchronous subarray definitions).



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Synchronous Subarrays: Synchronous Subarrays are two or more subarrays which are constrained to acquire data on a science target(s) at the same time, with scan and integration time boundaries aligned. Example use cases are multi-frequency (or multi-array) solar or very rapid transient observations.

Telescope Time Allocation (TTA): Telescope Time Allocation (TTA) Tools project encompasses the definition, design, development, and deployment of a new suite of tools for the proposal and time allocation process for NRAO operated telescopes (VLA, VLBA, HSA, GMVA). This tool will also be used to support the proposed next generation VLA. Documentation can be found [here] (<https://openconfluence.nrao.edu/display/SRDP/TTA+Tools+Documentation>).

4 Proposal Process Glossary

Allocation Request: The part of a Proposal that specifies the details of the requested observatory resources. An Allocation Request consists of one or more Request Specifications.

Request Specification: Specifies the resources that are being requested in the Allocation Request. There are different types of Request Specification. For example, Observation Specification is the common type of Request Specification where the Facility involves a telescope. But the Request Specification could be a Data Processing Specification, where the Facility is a computing cluster.

Observation Specification: A type of Request Specification. It has a Scan List and Facility-specific information (e.g., sub-array, receiver) describing a request for observation.

Allocation Disposition: The disposition of a given Allocation Request to use observatory resources. An Allocation Disposition consists of one or more Request Specification Dispositions together with internal comments.

Request Specification Disposition: Like Request Specification but includes scheduling priorities, approved time, proprietary period, and disposition constraints. There is not a 1-to-1 mapping between Request Specification Dispositions and Request Specifications even though an Allocation Disposition is associated with one Allocation Request.

Observation Specification Disposition: A type of Request Specification Disposition. It is like an Observation Specification but includes scheduling priorities, approved time, proprietary period, and disposition constraints.

Proposal Process: How a proposal is processed at submission in the TTA Tools. Upstream of a proposal process is "Proposal Creation"; downstream is "Project Creation". One example of a proposal process is the Proposal Panel Science Review Process, which consists of a Science Review, Feasibility Review, Scheduling Review, Allocation Process, Approval Process, and Closeout Process.



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Science Review Process: A phase in the Proposal Process that outputs a Scientific Merit Metric, comments for the PI, and comments for internal use. An example is a Science Review Panel or the Distributed Peer Review Process.

Feasibility Review: A phase in the Proposal Process that outputs Technical and Data management comments for the PI and comments for internal use. Feasibility Reviews come in two flavors: a Technical Review and a Data Management Review.

Schedule Forecast: A statistical projection of the observing schedule, given the available time on a facility, to inform the determination of scheduling priorities.

Scheduling Review: A phase in the Proposal Process that outputs Preliminary Scheduling Priorities per Request Specification Disposition and forecasts a schedule. In EVLA-era systems, this is facilitated by the Proposal Handling Tool.

Allocation Process: A phase in a Proposal Process that outputs Recommended Scheduling Priorities per Request Specification Dispositions and recommends the forecasted schedule. An example of this phase is the Telescope Time Allocation Committee.

Approval Process: A phase in the Proposal Process that outputs the Approved Scheduling Priorities per Request Specification Dispositions and approves the forecasted schedule. An example of this phase is the Directors Review.

Closeout Process: A phase in the Proposal Process that outputs the data needed for metrics and notifies PIs of the outcome of the Proposal Process. It is at this point that the Proposal becomes immutable. An example output of this phase is a Disposition Letter.

Project Creation: The step in TTA Tools that stages Proposals to handoff to Facility specific software, like ngOBS (ngVLA), the OPT (EVLA), or the DSS (GBT).

Project: A project is a facility specific structure that stores data from Allocation Dispositions that contain a positive disposition (e.g., Scheduling Priority A, B, C, or D) for that facility, along with the relevant proposal metadata. A project is created for each proposal per facility when at least one Allocation Disposition for that facility has a positive disposition.

Proposal Creation: The step in TTA Tools where a Proposal is created by a user. For Science PIs, this consists of providing Science oriented information.

Proposal: A request to use observatory resources that includes a scientific and technical justification. Here, observatory resources are typically telescope time but may also include other types of resources (e.g., correlator or computing cluster time). The information contained within a Proposal is sufficient for evaluating the request and for scheduling, executing, and processing any approved requests.

Schedule Forecast: A statistical projection of the observing schedule, given the available time on a facility, to inform the determination of scheduling priorities.



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

Solicitation: An announcement from the observatory to the community to submit a request to use observatory resources. Each Solicitation is composed of Capabilities and a Proposal Process. A Solicitation has attributes (e.g., call period).

Solicitation Configuration: The step in TTA Tools where a Solicitation is configured – a Proposal Process is specified, the Facilities capabilities are specified, and validation criteria are set.

Table 2. Relationship between the project data model, telescope data terminology, data processing terminology, and data product terminology.

Project Data Model	Telescope Data	Data Processing	Data Products
Project			
Science Goals			
Group Level Block		Group Level Processing Block	Group Level Data Product
Data Product Block		Data Product Processing Block	Data Product e.g., HLDP
Scheduling Block	Execution Block	Calibration Processing Block	Calibration products
Calibratable Scan Block	Calibratable Scan Execution		



Title: Computing and Software System: Glossary	Owner: Rosen	Date: 2025-08-13
NRAO Doc. #: 020.50.00.00.00-0008 LIS		Version: A

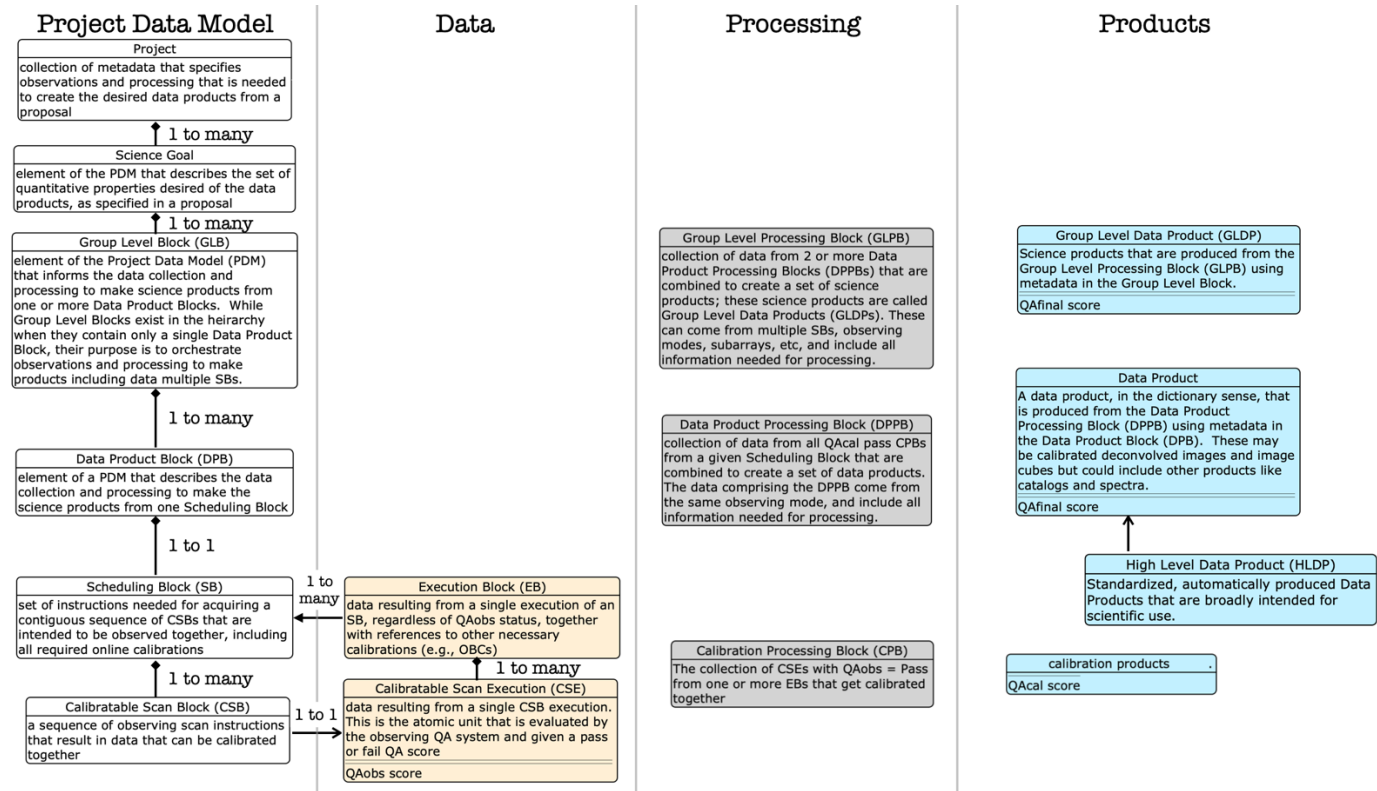


Figure 1. Visual representation of the relationship between the project data model, telescope data terminology, data processing terminology, and data product terminology.