SDP GLOSSARY

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Table of Contents

1. Purpose of Document

This document provides a list of acronyms, abbreviations and terms used in the Science Data Processor Consortium Delta PDR document release. Note that there can be duplicate abbreviations, e.g. QA, and it is up to the author to clarify which is meant in that context.

2. Acronyms and Abbreviations

Acronym or Abbreviation	Expansion
AAAI	Authentication Authorisation Allocation and Identity Management
AI	Astronomer Interface
AIV	Assembly Integration and Verification
ALMA	Atacama Large Millimetre/Submillimetre Array
API	Application Programming Interface
APM	Astrometric Performance Metric
APU	Accelerated Processing Unit
AR	Acceptance Review
AR1 ..	Array Release 1
ARCH	Architecture (SDP Work Package)
AS	Australian Standard
ASKAP	Australian Square Kilometre Array Pathfinder
ATP	Acceptance Test Plan
BDA	Baseline Dependent Averaging
BDD	Block Definition Diagram
CA	Consumer App or Certification Authority

Capex	Capital Expenditure
CAS	Common Algorithm Software
CASA	Common Astronomy Software Applications (often short for the software package)
CCB	Configuration Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CERN	The European Centre for Nuclear Research
CI	Compute Island
CI	Configuration Item
CIDL	Configuration Item Data List
CIL	Configuration Item List
CISPR	International Electrotechnical Commission
CLEAN	A computational algorithm designed to perform a deconvolution on images
CMP	Configuration Management Plan
COMP	The Compute Platform (SDP work package)
COTS	Commercial Off The Shelf
CPU	Central Processing Unit
CRR	Commissioning Result Review
CS	Common Software
CSP	Central Signal Processor
CTRL	Control
DATA	The data element of the SDP (SDP work package)

DBA	Database Administrator
DDE	Direction-Dependent Effects
DDR	Detailed Design Review
DDR3	Double Data Rate 3rd generation dynamic random access memory
DDR4	Double Data Rate 4th generation dynamic random access memory
DELIV	Data Delivery (SDP work package)
DFM	Data Flow Manager
DFMDL	Data Flow Model
DFT	Discrete Fourier Transform
DI	Data Island
DIMM	Dual In-line Memory Module
DJF	Design Justification File
DLM	Data Lifecycle Management
DM	Data Manager
DO	Data Object
DP	Double Precision Floating Point
DRAM	Dynamic Random Access Memory
DRD	Document Requirements Definition
DSH	Dish
DSL	Domain Specific Language
DWDM	Dense Wavelength-Division Multiplexing
ECSS	European Cooperation for Space Standardisation

EGI	European Grid Infrastructure
EI	Engineering Interface
EIA	Environmental Impact Assessment
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EoR	Epoch of Re-ionisation
EPA	Environmental Protection Agency
EPB	Environment Protection and Biodiversity Conservation
EPEL	Extra Packages for Enterprise Linux
FA	Functional Analysis
FDR	Infiniband Fourteen Data Rate
FFT	Fast Fourier Transform
FIT	Failures-in-Test
FITS	Flexible Image Transport System: an open standard defining a digital file format for storage, transmission and processing of scientific images. Several formats have been created based on FITS.
FLOP / FLOPS	Floating Point Operations / Floating Point Operations per Second
FMEA / FMECA	Failure Modes and Effects Analysis / Failure Mode Effect Criticality Analysis
FoV	Field Of View
FPGA	Field-Programmable Gate Array
GbE	Gigabit Ethernet
GPGPU	General Purpose Graphical Processing Unit
GPU	Graphical Processing Unit

GSM	Global Sky Model
GW	Gravitational Wave
HAL	Hardware Abstraction Layer
HCA	Host Channel Adapter
HDF5	Hierarchical Data Format (version 5) designed to deal with large volumes of numerical data
HI	Neutral atomic hydrogen
HM	Health and Monitoring
HPBW	Half Power Beam Width
HPC	High Performance Computing, sometimes described in terms of national facilities
HSM	Hierarchical Storage Management
ICD	Interface Control Document
ICT	Information Communication Technology (e.g. in reference to the industry)
IdP	Identity Provider
iFFT	Inverse Fast Fourier Transforms
ILS	Integrated Logistics Support
ImageDM	Image Data Model, a data model standard defined by the IVOA
INFRA	Infrastructure (SDP work package)
I/O	Input / Output
IP	Internet Protocol
IP	Intellectual Property
IRD	Interface Requirements Document

ISO	International Standards Organisation
IVOA	International Virtual Observatory Alliance
IXR	Intrinsic Cross-polarisation Ratio
LAN	Local Area Network
LFAA	Low Frequency Aperture Array
LHC	Large Hadron Collider (CERN)
LINFA	Local Infrastructure (SDP work package)
LMC	Local Monitoring & Control (SDP work package)
LML	Lifecycle Modeling Language
LoC	Lines of Code
LoC	Latency-optimised Cores
LOFAR	Low-Frequency Array (radio telescope)
LRU	Line Replaceable Unit
LSA	Logistics Support Analyst
LSM	Local Sky Model
MeerKAT	64-dish Karoo Array Telescope
MIL-STD	Military Standard
MLC	Multi-Level Cell
MOTS	Modified-Off-The-Shelf software
MPI	Message Passing Interface
MPLS	Multi-Protocol Label Switching
MS	Measurement Set

MTBF	Mean Time Between Failure
MTU	Maximum Transmission Unit
MTR	Metrics
MTTR	Mean Time to Repair
MWA	Murchison Widefield Array
NEMA	National Environment Management Act (South Africa, Act 1998)
NIC	Network Interface Controller
NOHSC	National Standard for Occupational Noise
NREN	National Research and Education Network
NVRAM	Non-volatile Random Access Memory
NZS	New Zealand Standard
ObsCoreDM	Observation Data Model Core Components, a data model standard defined by the IVOA
OHS	Occupational Health and Safety
Opex	Operational Expenditure
OPM	Polarimetric Performance Metric
ORR	Operational Readiness Review
OS	Operating System
OST	Observatory Support Tools
OTS	Off-The-Shelf
PA	Producer App
PAF	Phased Array Feeds
PB	Petabyte

PCI	Peripheral Component Interconnect
PCIe	Peripheral Component Interconnect Express
PCM	Phase-Change Memory
PDG	Physical Deployment Graph
PDR	Preliminary Design Review
PHS&T	Package, Handling, Storage and Transport
PI	Principal Investigator
PIP	Pipelines (SDP work package)
PIP.INP	The SDP work package responsible for input conditioning which is a sub-element of the Pipeline work package
PPM	Photometric Performance Metric
PROT	Prototyping (SDP work package)
PS	Persistent Storage
PSF	Point Spread Function
PSRFITS	A standard FITS-based format for pulsar data files
PSS	Pulsar Search
PST	Pulsar Timing
QA	Quality Assurance. Note that sometimes Quality Assessment can be abbreviated to QA, but the default interpretation is Quality Assurance.
QoS	Quality of Service
QPI	QuickPath Interconnect
QR	Qualification Review
QTP	Qualification Test Plan

R_{max}	Sustained Performance
R_{peak}	Peak Performance
RA	Requirements Analysis
RB	Requirements Baseline
RBD	Reliability Block Diagrams
RC	Regional Centre
RDMA	Remote Direct Memory Access
REQ	Requirement
REST	Representational State Transfer: and abstraction of the WWW architecture with a particular style and set of constraints. Web services are sometimes described as 'RESTful.'
RFI	Radio Frequency Interference
RMR-NIC / RNIC	RDMA Network Interface Card
ROM	Rough Order of Magnitude (used in estimation)
RPM	Radiometric Performance metric
SaDT	Signal and Data Transport
SANS	South African National Standard
SD	Sequence Diagram
SDD	Software Design Document
SDN	Software-Defined Network(ing)
SDP	Science Data Processor
SDP	Software Development Plan
SDR	System Design Review

SE	System Engineering (SDP work package)
SEP	Software Engineering Plan
SIA	Simple Image Access,a protocol associated with the IVOA
SIB	Standards Information Base
SKA	Square Kilometre Array
SKA1_Low	A phased array of simple dipole antennas to cover the frequency range 50 to 350 MHz
SKA1_Mid	An array of several thousand dish antennas to cover the frequency range 350 MHz to 14 GHz
SKA1_Survey	An array of dishes with capability of covering a huge field of view
SKAO	SKA Office
SMF	Single-Mode Optical Fibre
SoC	System on a Chip
SODA	Server-side Operations for Data Access, a protocol associated with the IVOA
SP	Single Precision Floating Point
SPEAD	Streaming Protocol for Exchanging Astronomical Data
SpectralDM	Spectral Data Model, a data model standard defined by the IVOA.
SPM	Spectrometric Performance Metric
SRelD	Software Release Document
SRR	System Requirements Review
SS	Science Support
SSA	Simple Spectral Access, a protocol associated with the IVOA
SSS	Software System Specification

SUITP	Software [Unit/Integration] Test Plan
SUM	Software User Manual
SVerP	Software Verification Plan
SValP	Software Validation Plan
SWE	Software Engineering
SWRR	Software Requirements Review
SysML	Systems Modelling Language
TAP	Table Access Protocol, a protocol associated with the IVOA
TB	Terabyte
TBC	To Be Confirmed
TBD	To Be Decided / Determined / Defined
TCD	Telescope Configuration Data
TCP	Transmission Control Protocol
TDD	Test Driven Development
TM	Telescope Manager
TM	Telescope Model
ToO	Target of Opportunity
TS	Technical Specification
ToR	Top of Rack
UDP	User Datagram Protocol
UML	Unified Modeling Language
VDIF	VLBI Data Interchange Format

VLBI	Very Long Baseline Interferometry
VM	Virtual Machine
VO	Virtual Observatory
VOTable	An XML standard for the interchange of data represented as a set of tables
X.509	A standard for certification systems
WA	Western Australia
WAN	Wide Area Network
WBS	Work Breakdown Structure
YOT	Year On Telescope

3. Terms

Term	Definition
Accelerator	A specialised type of computer processor that allows high bandwidth and/or parallel processing. Typically refers to a GPU.
Architecture	Architecture and software architecture are synonymously used for the combination of system and domain specific application architecture.
Archive (Preservation)	Conceptual entity which is a data repository. In the SDP this is not a permanent record of all data.
Automatic code generation	Generation of source code with a tool from a model.
Base (numerical)	See note below under Gigabyte.
Baseline	This has three broad meanings within the SDP and these must be determined by context (planning term, SKA phase, interferometry term).
Baseline Design	Initial design parameters for the first instance of the SDP which determine broadly the conditions for the expression of capabilities. These are captured in the document: SKA-TEL-SKO-DD-001 System Baseline Design.
Baseline-Dependent Averaging	Allows differing integration periods for different baseline lengths.
Calibration	Calibration has several context-dependent meanings for the SDP, and this should be elaborated in the specific document to which it applies.
Capability	A grouping of sub-system elements that map directly to a particular science mission or engineering task.
Centi-SDP	A scaled-down system to roughly 1% of the full SDP system for SKA1 (in terms of FLOPS).
Code coverage	Percentage of the software that has been executed (covered) by the test suite.

Commensal observation	Running more than one set of data reductions on the same set of data, eg. running the same input data through the spectral line pipeline and continuum pipeline at the same time. This contrasts with sub-arraying.
Common Algorithmic Software	The collection of domain-specific algorithmic software that is shared between pipelines.
Component	A stateless building block of a data reduction pipeline that is controlled by the Data Manager.
Computational efficiency	The percentage of the theoretically available processing power (see peak performance) that can be achieved for useful processing (see sustained performance). Depends on hardware, application and implementation.
Compute Island	The basic replicable unit in the Compute Platform. A Compute Island is a self-contained, independent collection of compute nodes.
Compute Nodes	Each Compute Island is made of multiple Compute Nodes. Each Compute Node is a collection of 1 or more physical hardware items that together make up a system that provides double buffered storage, high ingest speed and deterministic performance during all operating modes, including simultaneous ingest and batch processing.
Compute Platform	The collection of hardware systems in the Science Data Processor and the software and services required to efficiently use these systems.
Conditioning	Manipulating the data to make it useable by subsequent steps in a pipeline.
Configuration Item	A Configuration Item (CI) is a significant component of the project selected to be put under configuration control.
Construction Phase	The phase of SKA development following the Pre-construction (design) Phase and ending with fully integrated and accepted telescope systems.
Consumer App	A representation of an application or component that consumes data as part of a pipeline.
Continuum Imaging	The production of a continuum image.
Continuum Pipeline	A pipeline to produce a continuum data product.

Correlator product	Output of the CSP correlator. Mainly a matrix comprised of cross-multiplied antenna or station products, commonly referred to as visibilities.
Data Delivery Platform / Delivery Platform	A software stack whose purpose is to transfer Data Products to the OST user or to a Regional Centre. It enables the user to query and request data, and allows for the transfer of the requested data.
Data Driven	This means that a Data Object with a managed data life cycle can trigger an action when changing state.
Data Flow Manager	The LMC function responsible for the construction and management of the logical graph to the static physical graph.
Data Flow Model	Logical description of the required distribution of all data in order to implement a specific pipeline processing.
Data Island	A Data Island is a logical construct. It is part of the Data Layer and hosts a Data Manager. The Data Flow Manager dynamically forms a Data Island by allocating a collection of Compute Nodes or entire Compute Islands with a shared name space for the purpose of executing processing components.
Data Layer	A software stack that manages the data flow from the reception of raw data through to the delivery of science data products.
Data Life Cycle Manager	A subsystem of the Data Layer that automates and manages the migration of Data Objects through the various life cycle states.
Data Manager	A subsystem of the Data Layer that is responsible for the management of Data Objects inside Data Islands.
Data Models	Schematics showing relationships between Data Objects.
Data Object	A datum (an instance of class DataObject) with associated life cycle state information. A Data Object can be serialised and stored.
Data Product	A collection of data objects ready for preservation (archiving) and subsequent use. Typically a data product will include metadata and have successfully completed QA. Prior to the Index Science Product function in the SDP, a collection of data objects is called a Data Product. Subsequently it is called a Science Data Product.

Double Buffering / Multiple Buffering	The use of two or more buffers in alternating roles. For example, while buffer A is used to store data, buffer B is used to access data for processing.
Drift scan	A technique which involves a continuously changing pointing centre and step-wise changing phase centres, with the whole field then jointly deconvolved.
Drop	An indivisible construct which acts as a container for data and its associated components to move through a data flow system.
ECSS-E-ST-40C	This document from ECSS defines the principles and requirements applicable to space software engineering.
ECSS-M-ST-40C	This document from ECSS defines the configuration management and information/documentation requirements for space projects. The document is structured into two main parts, the first part presenting the processes and the second one providing the detailed requirements.
Eventually Consistent Replication	A model used in distributed computing to achieve high data availability.
Faceted algorithm / Faceting	An algorithm that is able to synthesise data from non-coplanar telescope baselines (such as may result from the Earth's curvature or rotation).
Filterbank	An array of FIR (Finite Impulse Response) filters feeding into a FFT that splits a broadband signal into narrowband channels.
Gigabyte / Gb	In the SDP base 10 is used. 1 Gigabyte is 1,000,000,000 bytes
Gibibyte / Gi	1 Gibibyte is 2^30 bytes = 1,073,741,824 bytes https://en.wikipedia.org/wiki/Binary_prefix
Global Sky Model	The overall source catalogue for observations.
Graph (Logical / Physical)	Graphs are an artefact of the SDP's data-driven processing model and contain data flow and processing for data analysis as data moves through the pipeline. The Physical Graph is a description of which processing steps are required to be carried out and where. A Logical Graph Template defines which specific data products and which specific actions on those data products are part of a generic processing pipeline, but it contains no observation specific or hardware specific information

Gridding	The process by which visibilities, which may be measured at any real position in the *uv*-plane, are aggregated or interpolated to discrete grid positions so that the (inverse) FFT may be computed.
Hadoop	Apache Hadoop is an open-source software framework for storage and large-scale processing of datasets on clusters of commodity hardware.
High Performance Computing	Generally, computing at the forefront of contemporary available processing capacity.
Image cube	3D images with spatial coordinates as the two first axes and the frequency (velocity channels) as third axis.
Infiniband	A type of high-throughput network link typically used in high-performance computing systems and supercomputers.
Ingest Processing	The processing required to ingest data into the SDP.
Integration testing	Testing in which software components, hardware components, or both are combined and tested to evaluate the interaction between them.
Intel	A company that produces CPUs and accelerators, including the Xeon and Xeon Phi families.
Interconnect System	The complex interconnects between the various components of the SDP. This relates to the Hardware Abstraction Layer.
Kanban	A quality improvement methodology.
Linux Containers	An instance of an OS Container. Provides an operating system-level isolation method for running multiple isolated Linux systems that has its own process and network space.
Local Sky Model	A subset catalogue for the observation being processed of the overall source catalogue (sometimes referred to as the 'Global Sky Model').
Local Telescope Model	A local copy of the telescope model used by the SDP to save reloading the global model.
Logical model	Implementation-independent model of software items used to analyse and document software requirements.

Logical Science Product	An entity that a user requests from the query interface. It is made up of one or more Physical Science Products.
Lossless compression	Any data reduction technique that allows the original input data to be perfectly reconstructed.
Lossy compression	Any inexact data reduction technique; i.e. that approximates the original input data in a way that is not reversible.
Major cycle	The Major Cycle is (the part of) an iterative image deconvolution technique where data and models are converted between the visibility domain and image domains for the purpose of improving the sky model.
Minor cycle	The Minor Cycle is that part of the Major Cycle which updates the sky model in the image domain.
Low-latency interconnect	A network infrastructure optimised for low-latency communication, rather than high throughput. Example: Infiniband.
Memristor	"memory resistor" – a novel type of electrical circuit component.
Metadata	A set of data that describes and gives information about other data, usually following a standard for astronomical data.
Middleware	Middleware is computer software that provides services to software applications permitting communication access via an Application Programming Interface (API)
Milli-SDP	A vastly scaled-down system to roughly 0.1% of the full hardware of the SDP system for SKA1 (in terms of FLOPS).
Mirror Science Archive	A repository which is maintained with identical data to the Science Archive.
Mosaicking (Mosaicing)	A technique of extending the field of view by taking 'snapshots' of fields with adjacent pointing centres and combining data to create an image. In SDP this means multiple phase and pointing centres (which coincide) but joint deconvolution of bright sources from the entire mosaicked field.

Near real time computing	Processing with a deadline. Although in our application there is no hard deadline as in the classic definition of real-time processing, the first stage of the SDP needs to keep up with the CSP data stream. To distinguish from classic real-time processing, we call this near real-time processing.
Non-precious data	Data which, if lost, does not need to be retrieved.
Nvidia	A company that produces GPUs and mobile CPUs, including the Tegra and Tesla families.
Observation	In terms of LMC, this involves executing a particular SDP capability for a defined period of time.
Observatory Support Tools	This is a collection of capabilities (software tools, applications, hardware) used by observatory staff principally for quality assessment of science data.
OS Containers	See Linux Containers.
Peak Performance	Maximum theoretically available compute power for a particular system.
Physical Deployment Graph	Output of the translation by the Data Flow Manager of the Data Flow Model to a mapping of the pipeline onto the available hardware. The physical graph is implemented by the Data Manager processes.
Physical Science Product	Forms part of a Logical Science Product. They are the artefacts delivered to OST users and Regional Centres,and ultimately used by astronomers.
Platform	e.g. Delivery Platform, Processor Platform. Generally this refers to hardware.
Pre-construction Phase	The phase of SKA design activities running from late 2013 into 2017.
Preservation System	Previously known as the Long Term Archive, (Science) Data Archive, or Archive, this is where data is stored. Its output are the Science Data Products.
Producer App	A representation of an application or component that produces data as part of a pipeline.

Public Interface	User interfaces taking data from the SDP for use by non-experts (see 'Astronomer interface').
Quality of Service	Quality of service (QoS) is the overall performance of a computer network, particularly the performance seen by the users of the network.
Regional Centre	An approved off-site facility to which requested Science Products will be delivered..
RESTful web services	Web services that adhere to the architecture of REST (see Acronyms and Abbreviations).
Scheduler	The program that arranges the processing of jobs in the appropriate sequence.
Science Archive / Science Data Archive	See Preservation System.
Science Catalogue	The query-able metadata descriptions of indexed Science Data Products.
Science Data Processor	The collection of software, hardware, and processes which takes data from the Central Signal Processor and Telescope Manager, processes it, and delivers it ultimately to the Regional Centres or directly to the SKA users.
Science Data Product	Prior to the Index Science Product function in the SDP, a collection of data objects is called a Data Product. Subsequently it is called a Science Data Product or Science Product. See also Logical Science Product and Physical Science Product.
Scrum	A variant of Agile project management methodology, it is an iterative and incremental software development framework for managing product development.
Self Calibration (Self cal)	The process of estimating the telescope errors. The "self" refers to the fact that we use the source itself (and the associated data) to solve for the telescope based errors.
Singleton Function	Functions that exist independently of capabilities. These are managed by the Master Controller.

Stateless	Stateless means that there is no record of previous interactions and each interaction request has to be handled based entirely on information that comes with it.
Stress test	Test that evaluates a system or software component at or beyond its required capabilities.
Sub-array	This term implies that the collecting area is sub-divided and each part is scheduled independently. The definition includes the sub-division of any resource in the system (correlator, NIP, beamformers, SDP, etc.). An astronomy sub-array requires end-to-end capability, full TM support, etc. (a full system "slice").
Sub-arraying	Separate streams of data being channelled through separate pipelines simultaneously.
Sub-band	A subdivision of a frequency band.
Sustained performance	Actual achieved, useful computational performance for a particular application on a particular system. Depends on hardware, application and implementation (among others).
Telescope Configuration Data	The data that accompanies observation data to describe the observatory set up at the time of observing.
Telescope Model	A dynamic computational model of the Telescope used to answer all queries about the state of the Telescope. This includes configuration information, numerical models, empirical parameters, and conventions
Test case	Set of test inputs, execution conditions and expected results developed for a particular objective such as to exercise a particular program path or to verify compliance with a specified requirement.
Tier n site	Relating to data storage. The Tier 0 site is at the location where the data has been generated (South Africa or Australia). A Tier 1 site is the first storage site receiving data directly from a Tier 0 site. Tier 1 and Regional Centre are sometimes used synonymously.
Tiered Data Delivery / Data Transport Service	The method, software and processes by which bulk data is transported to OST Users or to Regional Centres. Also referred to as ‘Bulk Data Transport’.

Time smearing	Degradation of an image due to the duration of an observation which is affected by the Earth's rotation.
***uv* buffer**	See visibility buffer.
***uv*-coverage**	Plot of the *uv*-plane as sampled by a measurement device.
***uv* data point**	A measurement originating from a single pair of antennas in a single frequency channel that gives a single datum to be placed in the *uv*-plane.
***uv*-plane**	A 2D grid of values that is equal to the 2D Fourier-transform of the angular distribution (brightness distribution) of observed sources in the sky.
Virtual Machine	Is an emulation of a computer system, based on the computer architecture and specifics of a real or hypothetical computer.
Virtual Observatory	A collection of interoperating data archives and software tools that comply to IVOA standards which govern its data models, access protocols, data formats and service registries.
Voxel	A voxel represents a value on a regular grid in three-dimensional space.
Visibilities	The raw *uv* data obtained from the correlator of an interferometry-based radio telescope, representing a set of measurements in the *uv*-plane.
Visibility buffer	Accumulates visibility data after the ingest pipeline for use in subsequent pipelines that require buffered access to the full observation set.
w-projection	An algorithm that is able to synthesise data from non-coplanar telescope baselines (such as may result from the Earth's curvature or rotation).
w-snapshots	An algorithm based on a combination of w projection and snapshot imaging, for controlling the size of the "W" convolution kernel, which overcomes some of the deficiencies of wide-field radio interferometric telescopes.