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Site Data System Engineering Roles and Responsibilities
Version: 1.2

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ARM

CLIMATE RESEARCH FACILITY

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Revision History

v. 1.0 (04/18/2014) – Initial release.

v. 1.1 (06/18/2014) – Added revision history and comments in sections 5, 6, and 7 regarding rebooting of instrument computers:

Instrument computers should not be rebooted unless the system is frozen/inaccessible is inside of a regular patching maintenance cycle or other maintenance/upgrade cycle defined inside of an approved Baseline Change Request. If an instrument computer needs to be rebooted outside of the above conditions, a Data Quality Problem Report must be filed if it results in the loss of data.

v. 1.2 (07/14/2014) – Added information on backups in sections 5 and 7 and noted that Oak Ridge National Laboratory provides disks for the diskswap systems mentioned in Chapter 1.

Summary

The purpose of this document is to outline:

- Roles and responsibilities of the Atmospheric Radiation Measurement (ARM) Climate Research Facility Site Data System (SDS) Engineering Group at Argonne National Laboratory (ANL)

- Roles and responsibilities of ARM mentors and site operations staff regarding the SDS

- Operational and functional status of the SDS and the roles of staff who manage it at the time of this document

- Planning and budgeting responsibilities.

Staff who are involved are identified below:

- ANL SDS Staff

    – Cory Start (manager)
    – Matthew Scialabba
    – Brent Kolasinski
    – Richard Eagan

- Southern Great Plains SDS Staff (direction provided by ANL SDS staff manager)

    – David Swank (manager)
    – Timothy Grove
    – Trent Doyle.

This document is organized into the following chapters:

1. Data System and Network Operations
2. Data Flow Monitoring
3. Communication with Data Management Facility Operations
4. Communications with Site Operations
5. Site Support Availability and Emergency Contact Information
6. Mentor Rules and Expectations for SDS and Networking
7. Site Operator Rules and Expectations for SDS and Networking
8. Radar Engineering and Operations Group Rules and Expectations
9. Cyber Security
10. SDS Functional Roles and Representation within ARM
11. Annual Budget Planning and Input – Data System and Networking
12. Engineering and Development.

Acronyms and Abbreviations

ANL	Argonne National Laboratory
ARM	Atmospheric Radiation Measurement
BCR	Baseline Change Request
DMF	Data Management Facility
DQPR	Data Quality Problem Report
ECO	Engineering Change Order
ECR	Engineering Change Request
LANL	Los Alamos National Laboratory
SDS	Site Data System
SGP	Southern Great Plains

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Tables

1.0   Data System and Network Operations

The primary responsibility for configuring and maintaining the Atmospheric Radiation Measurement (ARM) Climate Research Facility data system and network resides with the ARM Site Data System (SDS) Engineering Group at Argonne National Laboratory (ANL). The SDS support team at the ARM Southern Great Plains (SGP) site also supports the ANL team. Together, these two groups support the following at each of the ARM measurement facilities:

Table 1.   Networking Infrastructure

Networking Infrastructure	Functionality Provided
Network Switches	Interconnects different systems on the ARM networks
Routers/Firewall	Routes traffic within the measurement facility and offsite
Virtual Private Network Tunnels	Provides secure pathways for data and other traffic to flow over the Internet
Wireless Bridging	Extends networks when Ethernet or fiber cannot be used
Fiber and Ethernet Facilities	Core physical cabling
User-Based Virtual Private Network	Provides remote access for mentors/visitors who are not on stable/static networks
User wireless	Wireless networking for visitors (only available at SGP and North Slope of Alaska duplex)

Table 2.   Data System Infrastructure

Data System Infrastructure	Functionality Provided
collector-<site>	Collects data from the instruments and sends it (and status information) to the ARM Data Management Facility (DMF)
research-<site>	Provides near real-time read-only access to data
nfs0-<site> & nfs1-<site>	Provides the high available storage for data and virtual machine storage
diskswap-<site>	Writes data to disk for shipment to the DMF. Oak Ridge National Laboratory supplies disks
ntp-<site>	Enables instruments and SDS components to maintain proper time
dns-<site>	Provides name resolution services (required for browsing the web)
pdu-<site> & ups-<site>	Provides clean power and assists with shutdown/power up of the data system
vmh0-<site> & vmh1-<site>	Provides virtualization service and hosts most of the data system and instruments
vmhvma-<site>	Works with vmhvma-<site> for virtual machine and vmh-<site> shutdowns/power ups
backuppc-<site>	Provides file-level backup services to the data system and instruments
mirror-<site>	Provides a repository for CentOS packages/updates and other packages

Table 2. (contd)	
Data System Infrastructure	**Functionality Provided**
update-<site>	Provides the ability to scan and patch Windows software
armscan-<site>	Provides vulnerability detection via security scans on all systems
pxe-<site>	Provides Dynamic Host Configuration Protocol services along with Preboot eXecution Environment and Trivial File Transfer Protocol for building Linux systems
mon-<site>	Provides monitoring of the data system and network
logstash-<site>	Provides log aggregation and monitoring
phone-<site>	Provides telephone via Voice over Internet Protocol services to the sites
ldap-<site>	Provides ldap services to the sites
kvm-<site> & cs0-<site>	Provides access to data system components via physical console and serial console
ssh.vsn	Host at ANL for administrator access into the ARM network
tickets.vsn	ARM SDS trouble-ticket system
relay.vsn	Provides mail relay services for the sites
doc.vsn	Provides documentation on SDS infrastructure at the sites
manage.vsn	Provides central administration for the sites' virtualization infrastructure
jabber.vsn	Provides instant messaging capabilities to different groups at the sites
puppetmaster.vsn	Provides centralized configuration management for Linux systems
db.vsn	Provides database services to hosts on the virtual sensor networks
flow.vsn	Provides netflow services
mail.sgp	Provides mail services for the sites who do not use their own external services

2.0 Data Flow Monitoring

The ARM SDS team makes daily calls to track the status of instrument collections and data flow. The ARM Instrument Status Tracking tool (https://dsview.arm.gov/ddtrack/?mode=ops) is used to facilitate call and track issues. This tool also is checked periodically to identify new issues that might emerge during the day. When SDS is notified of problems, a trouble ticket is opened and tracked to resolution.

3.0 Communications with Data Management Facility Operations

The ARM SDS team communicates regularly with the DMF. The SGP staff has a weekly telephone conference call with the DMF Manager to identify and communicate problems. The ANL staff participates in the weekly ARM Engineering Group call hosted by the DMF and the Data Product Deliver

teleconference call hosted by Pacific Northwest National Laboratory every other week. These three calls should effectively communicate data flow and project status to the proper DMF and Archive staffs. Any problems identified by the DMF should be submitted as a trouble ticket to sds@arm.gov. The SDS group will track those requests to successful resolution.

4.0   Communications with Site Operations

The SDS group does not participate in site operations calls. Any problems identified, or if other support is required, by site operations staff should be reported by submitting a trouble ticket to sds@arm.gov. When the SDS group requires assistance from local site operations staff, contacts should be made using the following contact information:

- SGP – e-mail/call responsible person/people
- North Slope of Alaska – e-mail opsnsa1@arm.gov
- Eastern North Atlantic – submit Los Alamos National Laboratory (LANL) Contact Sheet
- Tropical Western Pacific – submit LANL Contact Sheet
- ARM Mobile Facility 1 – submit LANL Contact Sheet
- ARM Mobile Facility 2 – e-mail opsamf2@arm.gov
- ARM Mobile Facility 3 – e-mail opsamf3@arm.gov

All requests for assistance from site operations staff will be a result of an active Engineering Change Order (ECO)/Engineering Work Order (EWO)/Baseline Change Request (BCR) and/or SDS trouble ticket. Work that could inhibit the functionality of the site (e.g., data collections/flow, Internet connectivity, etc.) should never be done without notifying site management and/or the site operations staff.

5.0   Site Support Availability and Emergency Contact Information

The ARM SDS team maintains standard business hours in the central time zone. On Monday through Friday, an ARM SDS person should be available between 8 AM and 5 PM CT (barring vacation and sick time). The most effective way to request support from the ARM SDS team is to submit an e-mail to sds@arm.gov. This will generate a new ticket in the ARM SDS trouble-ticket system. When a ticket is submitted, the ANL SDS staff and the SGP SDS Manager will assign the ticket accordingly. All work on production systems is to be tracked/managed in an ECO, EWO, BCR, or SDS trouble ticket.

If work is planned and support from the ARM SDS team is required outside of normal business hours, an e-mail should be submitted to sds@arm.gov requesting that the work be scheduled.

If there is an emergency that requires ARM SDS support outside of normal business hours, the ANL SDS Manager can be reached at 815.603.9751. An emergency consists of issues that threaten the success of an Intensive Operational Period, physical or virtual risk to the data system and infrastructure (e.g., water leak, host/network compromise, etc.), or other extreme situation.

6.0   Mentor Rules and Expectations for Site Data System and Networking

Mentors are expected to be responsible for ensuring that instruments for which they are responsible function properly. This responsibility extends to software that controls the instruments.

The SDS is responsible for systems on which software run, the network infrastructure to which the instruments connect, and the Internet connection that provides for data flow and remote access. The SDS also provides file-level backups for all SDS and instrument computers. If a mentor is not sure if a system is being backed up, they should send e-mail to sds@arm.gov requesting verification. While system validations and verifications are done regularly, it can be easy to miss one given the number that enter and leave a measurement facility over time.

In accordance with their responsibilities:

- Mentors should not make system-level changes (e.g., changes to network settings, user permissions, etc.) without coordinating with or receiving direction from the SDS.

- The SDS should not make system/software changes (e.g., rebooting, editing software settings, etc.) without coordinating with or receiving direction from the mentor, unless the system is inoperable, and the mentor-approved recovery procedure involves a software/system restart.

- Mentors are to include the SDS when planning for and purchasing new instrument systems to ensure proper integration into the ARM infrastructure. The ARM standard instrument computer specification is to be followed. Documentation and justification are to be provided if a system that does not meet the ARM standard instrument computer specification is needed.

- Neither mentors nor SDS should make any changes that could interfere with data creation/flow without submitting an approved BCR to account for the possible loss of data.

- Instrument computers should not be rebooted unless the system is inoperable or inaccessible or is in a regular patching maintenance cycle or other maintenance/upgrade cycle defined by an approved BCR. If an instrument computer needs to be rebooted outside of the above conditions, a Data Quality Problem Report (DQPR) must be filed if rebooting results in a loss of data.

- Mentors and SDS should maintain clear communications with each other and function within the roles as described above to maximize data availability.

- For any support beyond that being tracked within the BCR/EWO/ECO systems, mentors should submit a ticket to sds@arm.gov for prompt resolution.

7.0   Site Operator Rules and Expectations for Site Data System and Networking

Site operators are expected to be responsible for supporting instrument mentors by performing maintenance tasks as directed by the instrument mentors and the SDS group. Some of these tasks are daily tasks necessary for proper functioning of the instrument/system. Other more-complex tasks are requested to address specific issues.

The SDS is responsible for the systems on which software run, the network infrastructure to which the instruments connect, and the Internet connection that provides for data flow and remote access. For some measurement facilities, the SDS provides operational services (e.g., telephony, e-mail, etc.).

In accordance with their responsibilities:

- Site operators should not make changes to systems or the SDS that are not outlined as a daily support task in the instrument or SDS manual.

- Site operators should not make system-level changes (e.g., changes to network settings, user permissions, etc.) without coordinating with or receiving direction from the SDS.

- Site operators should not make system/software changes (e.g., rebooting, editing software settings, etc.) without coordinating with or receiving direction from the mentor, unless the system is inoperable, and the mentor has approved a recovery procedure that involves a software/system restart.

- Site operators should not make any changes that could interfere with data creation/flow unless coordinating with SDS and/or instrument mentors in response to an approved BCR that accounts for the possible loss of data.

- Instrument computers should not be rebooted unless the system is inoperable, or is within a regular patching maintenance cycle or other maintenance/upgrade cycle defined in an approved BCR. If an instrument computer needs to be rebooted in a situation beyond the conditions described above, a DQPR must be filed if data is lost.

- Site operators and the SDS should maintain clear communications with each other and function within the roles as described above to maximize data availability.

- For any support beyond that being tracked within the BCR/EWO/ECO systems, site operators should submit a ticket to sds@arm.gov for prompt resolution.

8.0   Radar Engineering and Operations Group Rules and Expectations

Radar mentors are expected to be responsible for ensuring that instruments for which they are responsible function properly. This responsibility extends to the software that controls the instruments.

The SDS is responsible for the systems on which the software run, the network infrastructure to which the instruments connect, and the Internet connection that provides for data flow and remote access. The SDS also provides file-level backups for all SDS and instrument computers. If a mentor is not sure if a system is being backed up, they should send e-mail to sds@arm.gov requesting verification. While validations and verifications are done regularly, it can be easy to miss one given the number that enter and leave a measurement facility over time.

In accordance with their responsibilities:

- Radar mentors should not make system-level changes (e.g., changes to network settings, user permissions, etc.) without coordinating with or receiving direction from the SDS

- The SDS should not make system/software changes (e.g., rebooting, editing software settings, etc.) without coordinating with or receiving direction from the mentor, unless the system is inoperable, and the mentor-approved recovery procedure involves a software/system restart

- Radar mentors are to include the SDS when planning for and purchasing new instrument systems to ensure proper integration of the systems into the ARM infrastructure. The ARM standard instrument computer specification is to be followed. Documentation and justification are to be provided if a system that does not meet the ARM standard instrument computer specification is needed

- Neither radar mentors nor the SDS should make any changes that could interfere with data creation/flow without submitting an approved BCR to account for the possible loss of data

- Instrument computers should not be rebooted unless the system is inoperable, or is within a regular patching maintenance cycle or other maintenance/upgrade cycle defined in an approved BCR. If an instrument computer needs to be rebooted in a situation beyond the conditions described above, a DQPR must be filed if data is lost

- Radar mentors and SDS should maintain clear communications with each other and function within the roles as described above to maximize data availability

- For any support beyond that being tracked within the BCR/EWO/ECO systems, mentors should submit a ticket to sds@arm.gov for prompt resolution.

Currently, there are exceptions to the rules and expectations outlined above. The SDS team has non-administrative access to all radars. Administrative access will be obtained by the SDS before the end of CY14. To provide a more reliable hardware set, where prudent, the SDS also is working to standardize the hardware of the radar system servers, including servers that reside directly on the ARM public network address space. Systems that reside on radar private networks are not within the scope of this hardware maintenance. Currently, the radars are not part of the ARM baseline set of instruments in which metrics are reported (with the exception of the Ka-band ARM zenith radars). To prepare for including the radar systems into the baseline, as many systems as possible should be standardized with hardware supported by the SDS group. This hardware will include support contracts and will allow for the highest level of support from the vendors and the SDS team.

9.0   Cyber Security

The SDS team is responsible for protecting the ARM measurement facilities from cyber threats. This requires securing the systems, networks, and remote access to the greatest extent possible without interfering with successful data collection. The requirements are outlined in the "ARM Measurement Facility Security Plan," which is maintained by the ANL SDS Manager, who also maintains the ARM Cyber Security Plan, and is the cyber security subject matter expert for the ARM Program.

10.0 Site Data System Functional Roles and Representation within ARM

The ARM SDS Manager, and sometimes other SDS team members, participates in a number of telephone conferences and meetings to effectively communicate site status, data flow issues, and project updates. These calls and meetings also allow for input on short-term and long-term planning and budgeting.

10.1 ARM Engineering Meeting

The DMF hosts weekly conference calls to assess status of projects/issues pertaining to data collection and flow, ingest and value-added product development, and any other development efforts. The ANL SDS Manager provides input on site status, SDS work, collection issues, and other software development tasks.

10.2 Data Flow Operations

The DMF Manager hosts a weekly conference call with the SGP SDS team to assess collection and data flow issues. The DMF also communicates upcoming changes to the SDS team and provides technical solutions to any issues identified in collection and site transfer software.

10.3 Engineering Review Board

The ARM Technical Director hosts the weekly Engineering Review Board conference call. The ARM SDS Manager represents the SDS team and provides other input regarding site operations to pertinent engineering change requests (ECR) as they are reviewed.

10.4 Data Product Delivery Conference Call

The Archive Manager hosts a bi-weekly conference call to assess site status, data flow, processing, and Archive availability. The purpose of this call is to track issues end-to-end from data collection all the way through archiving. The ARM SDS Manager provides input on site status and data flow.

10.5 Group of Six (Distributed Lifecycle and Architecture Group)

The ARM Data Lifecycle and Architecture Group was formed to produce the long-term vision for the ARM computing environment and overall architecture and to work with the broader ARM Data Lifecycle development team. The ARM SDS Manager provides input on networking, cyber security, data collection and flow, and a number of other topics.

11.0 Annual Budget Planning and Input

The ANL SDS Manager provides an SDS effort and contract maintenance budget request to the ARM Technical Director yearly. These requests consist of funding for effort to support the SDS infrastructure, other overhead costs to support SDS operations, hardware/software/ISP contract, and other engineering costs including hardware and software upgrades funded directly by ARM Engineering Group funds.

12.0 Engineering and Development

To properly support and plan for the future, it is important to learn new techniques and systems, test alternative methods, and develop new systems. The ARM SDS team is constantly researching and developing more efficient and cost-effective solutions to provide the highest level of support possible while being as fiscally responsible as possible with the funding entrusted to the group. As the program evolves, requirements and needs change so this is a critical task.