The SSEC Data Center

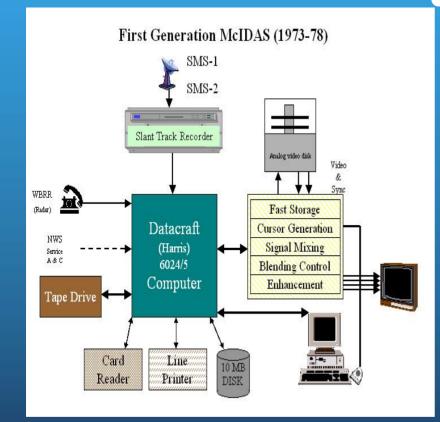
2009 MUG Meeting June 2, 2009 Jerrold Robaidek



- Data Center Mission and Funding
- History
- Staffing, Activities, Facilities, Data holdings
- Custom Products
- Monitoring
- Future

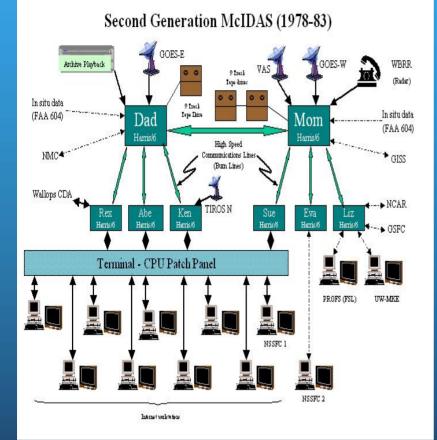
SSEC Data Center

- The SSEC Data Center mission is to create and maintain the facilities, human expertise and technology necessary to provide SSEC scientists and collaborators with the highest quality geophysical data in a timely fashion and to provide real-time data access, archive and retrieval services as necessary to support SSEC's scientific programs.
- The Data Center is treated as a project and is expected to breakeven.
- The Data Center is supported through data sales. All users pay for data, both internal to SSEC and to the outside community.



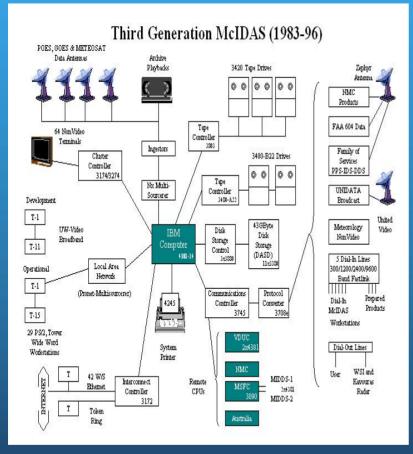
• 1973-1978

- Began as McIDAS Operations
- First Generation
 - Harris Datacraft Computer
 - 64 KB memory
 - 10 MB disk drive
 - 9 track tape drive
 - Analog disk for imagery



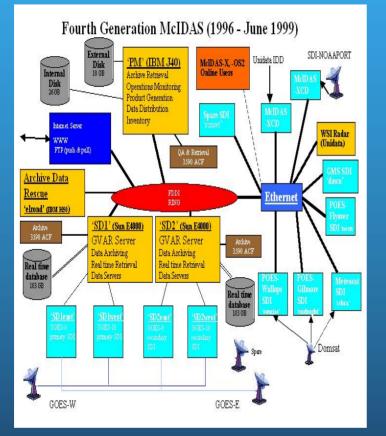
• 1978 - 1983

- Second Generation McIDAS
 - Distributed system
 - 2 Harris/6 computers (hosts)
 - Ingested satellite data
 - "Burn Boxes" moved data
 - 6 Harris/6 computers
 - Processing machines
 - Multiple users



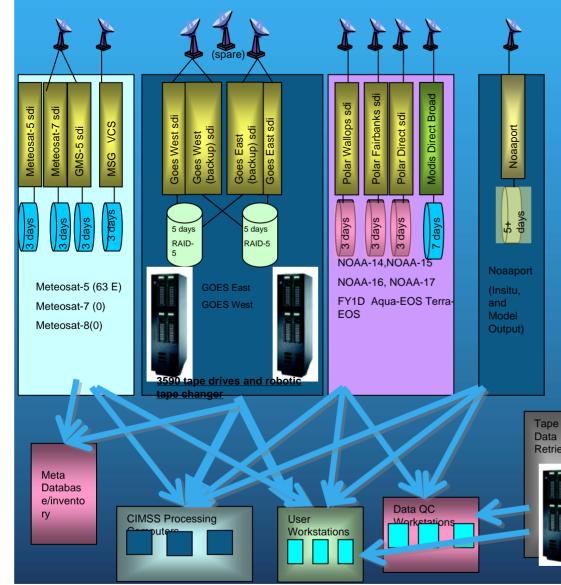
• 1983-1996

- Third Generation McIDAS
 - Centralized processing
 - IBM 4381 Mainframe
 - Begin GOES archive
 - Data archived on Sony U-matic cassettes
 - 1978-1981 Low density (3GB/tape)
 - 1981-1997 High density (6.85 GB/tape)
 - Multiple local and remote users



• 1996 - 1999

- Fourth Generation McIDAS
- McIDAS separates from Operations, now Data Center
- Moved from mainframe to distributed UNIX system
- Hired two programmers for Data Center to aid operations staff with transition
- Archive moves to computer compatible tape (3590) and adds redundancy
- Began using SSEC SDI ingestors



1999-2005

•Archiving GOES GVAR on 3590

•Began archiving Meteosat and GMS on 3590

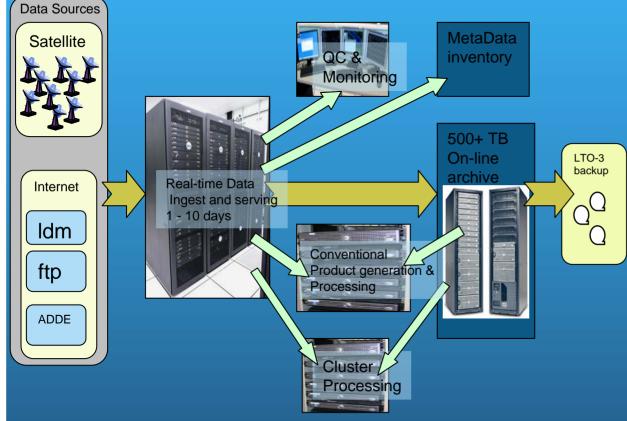
•Began archiving Grids and In situ data on 3590

•Rescued old GOES (1978-1996) from Umatic and moved to 3590

•3590 capacity was 10 GB, 20 GB compressed

•Using SSEC SDIs for most satellite data ingest

Retrieval



2005-Present
Began migrating all data from tape to large Online Raid-5 systems 500 + TB

•Tape only used for emergency backup

•LTO-3 tapes used for backup (400 GB capacity 800 GB compressed)

•Moving older SDI systems to newer SSEC SDI-104 ingestors

•Computer room staff moved to an adjoining control room

SSEC Data Center - Staff

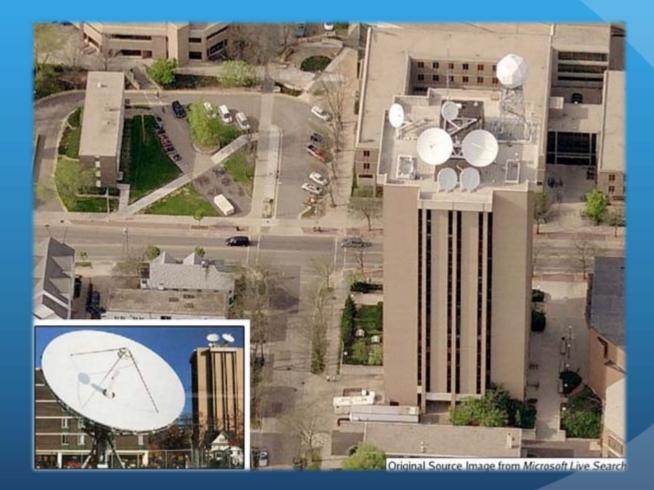
Staffed M-F, 7:30 AM - 11:00 pm Central time.

- 3 FTE ~100% time
 - Archivist & Computer Operator (1st shift)
 - Computer Operator (1st shift)
 - Computer Operator (2nd shift)
- 5 FTE ~portions of their time
 - Program Manager
 - System Programmer
 - Data Base Programmer
 - Research Specialist (PM assistant)
 - Antenna/Communication technician
- 2 Student programmers

Data Center Facilities

- Currently the Data Center has 26 racks representing about 1100 rack units of space. (Currently about 80% are filled.)
- Data Center staff monitors 60+ servers and over 650 TB of disk.
- The entire room is on two 72 KW UPSs, of which, about 80-85 KW are in use.
- Cooling provided by a mixture of campus chilled water and outside air in the winter. We are currently very close to the maximum cooling capacity of the room.

Data Center Antennas



Data Center Antennas

• C-Band

- 11 meter (87° West POES Wallops Relay, MSG)
- 7.3 meter (101° West POES Fairbanks Relay, MTSAT, Noaaport)

• L-Band

- 7.3 meter (75° West -GOES-East Primary)
- 4.6 meter (135° West -GOES-West Primary)
- 4.5 meter (60° West -GOES-SA auto tracking)
- 4.5 meter (105° West -GOES-test/spare)
- 3.7 meter (offline spare)
- X-Band
 - 4.4 meter (Tracking EOS)

Rooftop Antenna Challenges







SSEC Data Center - Incoming Data Spring 2009

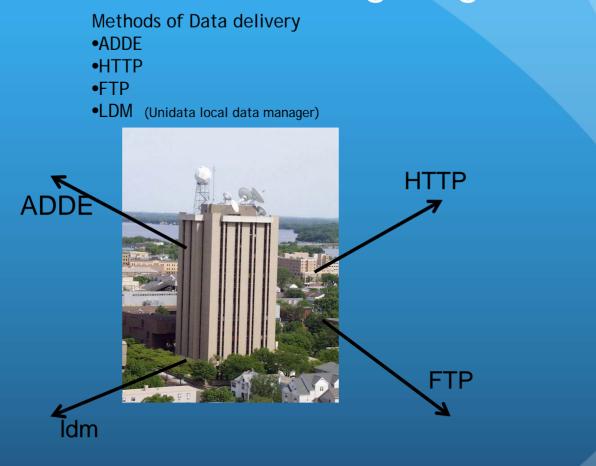
150+ GB/day via Satellite (C-band, L-band, X-band)



•Online Archive grows ~150+ GB/day

85+ GB/day via Internet (ftp, LDM, ADDE, http)

SSEC Data Center - Outgoing Data



May 2009 ADDE Data Usage Statistics

Real-Time ADDE average daily data access	408 GB
Archive ADDE average daily data access	76 GB
Average # of daily transactions	450,000+
Average MB sent /minute	336
Average #/transactions per second	5.3
Latest month total data sent	14.3 TB

SSEC Data Center - Activities

- Currently ingesting, serving and archiving 9 geostationary satellites
 - GOES-10, GOES-11, GOES-12, GOES-test, MET-7, MET-9, MTSAT, Kalpana, FY-2C, FY-2D
- Currently ingesting and serving 8 polar orbiting satellites
 - NOAA-15, NOAA-16, NOAA-17, NOAA-18, NOAA-19, AQUA-MODIS, AQUA-AIRS, TERRA-MODIS, METOP
- We are the primary feed for the Unidata Satellite Data broadcast over the IDD to University Community (150+ U.S. Universities)
- Generate customized weather data products for users
- Process and provide NWS AWIPS system with EOS products

SSEC Data Center - Activities

- Assist Satellite Operations Control Center and other agencies in satellite checkout and troubleshooting of related problems
- Support to field experiments
 - Special archiving
 - Extended staffing, either on-call or on-site
- Provide large dataset backups for users
 - Read, write, and copy tapes
 - Provide specialized archives of user data
- Provide Help Desk support to users of the SSEC SDI, and assist in the generation of SDI user documentation
- Assist McIDAS User Services team with McIDAS testing for system upgrades
- Provide archive data to in-house and external users

SSEC Data Center - Real-Time Data

• Real-Time satellite data online:

•	GOES-Test/O	3 days
•	GOES-12 (EAST)	6 days
•	GOES-11 (WEST)	6 days
•	GOES-10 (South Am.)	3 days
•	MET-7(Indoex)	7 day
•	MET-9 (OE)	2 days
•	MTSAT-1R	5 days
•	Kalpana	30 days
•	FY-2C	3 days
•	FY-2D	3 days
•	NOAA POES (relay)	3 days
•	Metop	7 days
•	TERRA (MODIS)	7 days
•	aqua (modis)	7 days
•	AQUA (AIRS)	7 days

SSEC Data Center - Conventional Data

- Real-Time conventional data online:
 - Point
 - Grids
 - Text
 - Radar

9.0 days + current5.0 days + current9.0 days + currentmost recent 8 hours

SSEC Data Center - Archive

Satellites	Data Archive Format	Status	Period of Record
GOES-1 – GOES-7	RAW MODE A, AA, AAA	On-line, but needs indexing	Jan 1979 – Jan 1996
GOES-8 – GOES-13	RAW GVAR	On-line	Jun 1995 – present
GMS-5	AREA	On-line	Nov 1998 – May 2003
MTSAT	AREA and HRIT	On-line	Jul 2005 – present
MET-7 at 0°E	PDUS	On-line	Mar 1999 – May 2006
MET-5/7 (Indoex 63/57°E)	PDUS and OpenMTP	On-line	Mar 1999 – present
MET-8/9	HRIT	On-line	Mar 2004 – present
Kalpana	HDF	On-line	Dec 2004 – present
FY-2C/D	AREA	On-line	Jun 2005 – present

SSEC Data Center - Archive

Conventional Data archive holdings

Data	Data Archive Format	Status	Period of Record
Point data	McIDAS MD	On-line	Mar 1976 – present
Model GRIDs	McIDAS GRID	On-line	Sep 1996 – Aug 2004
Model GRIDs	GRIB	On-line	Jul 2003 – present
Weather Text	Daily Binary File	On-line	Sep 1996 – present

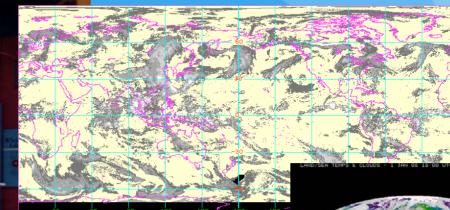
Geostationary Satellite Inventory

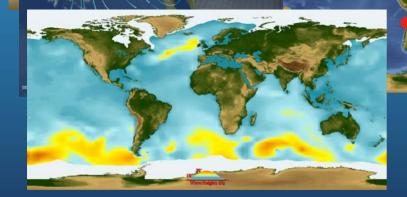
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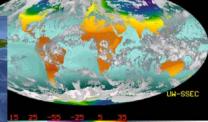
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17:10	17:10:17	Imager	CONUS	RSO	1-4,6 (1 2 3 4 6)
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18:30	18:30:16	Imager	OTHER	RSO	1-4,6 (12346)
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18:40	18:40:17	Imager	CONUS	RSO	1-4,6 (1 2 3 4 6)
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			An estimated 1 line	has errors	
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Special Products







SURFACE SYNOPTIC OBS CLOUD TOP

Monitoring Tools

- Big Brother
- GEO Clock
- Grib Monitor
- Antenna Signal Strength
- Individual Product QC
- Power, temperature

Big Brother for Server Monitoring

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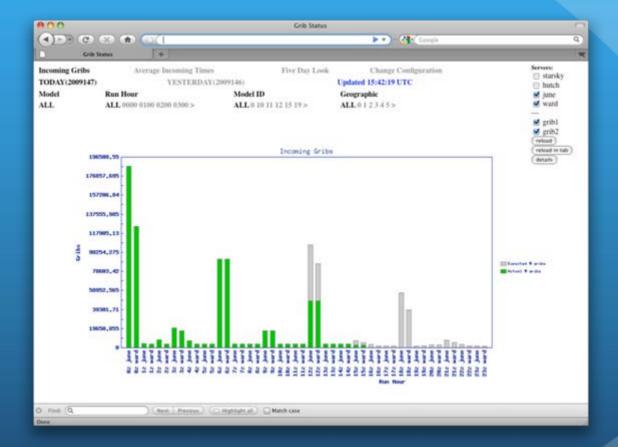


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Grib Ingest Monitoring



Antenna Signal Monitor

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2: MSG (Spare)	14.6 (1993)	-21	02661.600	081.2500	May 27 15:28	3
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2: POES Gilmore	12.2 (601000	GT-20	02661.600	060,9000	May 27 15:12	Threshold values: Eb/N0 NOAAPORT Signal Strength
3: MTSAT (Spare)	12,4 (http://	GT-20	02661.600	060,9000	May 27 15:27	Gecen: >= 9 Green: >= 75 Yellow: >= 7.5 Yellow: >= 40
NOAAPORT	Signal Strength	Viterbi Rate	Symbol Rate	Signal Frequency	Last Updated	Ref. (7.5 Ref. < 40
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dvb2	80	7	6.349000	1194.099976		

UPS Power and Room Temperature

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Graphs for same 649-1	+			
Summary		1	Time Ranges;	
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SSEC Data Center - Near Term Goals

- Complete satellite archive indexing for older GOES data
- Complete servers for ADDE access to archived GRID and GRIB data
- Triple cooling capacity of the Data Center
- Increase the power capacity of the Data Center an additional 72 KW

to smalle

 Continue to migrate from older storage t faster systems

SSEC Data Center - Future

- Expand use of clusters for inter-satellite data comparisons, climate studies, PEATE/DMS etc.
- Expand data use in new technologies, GIS, McIDAS-V
- Build new technologies for seamless data distribution, and leverage existing technologies, ADDE, LDM, http, etc

THANKS!