



The University of Wisconsin Space Science and Engineering Center GOES-R GRB Reception, Ingest and Distribution System

June 28, 2017



Acknowledgements

- SDS team, Dan Forrest, Rosie Spangler, Rick Kohrs, Clayton Suplinski, Nancy Troxel-Hoehn, Istvan Bocsi, Dave Jones
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- NOAA STAR
- GOES AWG
- Jim McNitt, Ed Czopkiewicz
- McIDAS Users Group (MUG)
- Quorum Communications, Inc, Allan Bundens, Rick Fogle



University of Wisconsin Satellite Data Services (SDS)

Antennas @ SSEC

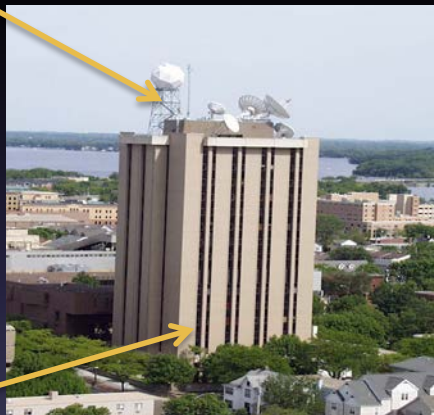
- C-Band
 - 11 meter heated (87° West – SES-2, POES Wallops Relay, MSG)
 - 6.3 meter heated (101° West – SES-1, POES Fairbanks Relay, MTSAT, Noaaport)
 - 4.5 meter (101° West – SES-1, POES Fairbanks Relay, MTSAT, Noaaport)
- L-Band
 - 7.3 meter (75° West –GOES-East Primary/GOES-16/S ready)
 - 7.3 meter (89.5° West –GOES-West Primary/GOES-16)
 - 4.6 meter (135° West –GOES-West Primary)
 - 4.5 meter (60° West –GOES-East auto tracking)
 - 3.7 meter (offline spare)
- X-Band
 - 4.4 meter (Tracking – EOS)
- X/L Band
 - 2.4 meter (Tracking – Suomi NPP, EOS, Metop A&B, NOAA-18, 19 and FY3)



SSEC SDS Incoming Data

January, 2017

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



GOES satellites	~525 GB/day
International Geo Satellites	~360 GB/day
NOAA Polar	~27 GB/day
Landsat-8	~50 GB/day
Miscellaneous Polar	~35 GB/day
MODIS polar from NASA archive	~150 GB/day
NPP (VIIRS CrIS ATMS)	~1,800 GB/day
Noaaport	~300+ GB/day

2,600+ GB/day
via Internet
(ftp, LDM, ADDE, http)

Outgoing Data

As of November 1, 2016

- On average over 875,000 ADDE transactions per day
- Over 4.1 TB data distributed per day via ADDE
- In addition over 1 TB data distributed via ftp, http, and Idm



Data Distribution

- Realtime
 - McIDAS ADDE (Abstract Data Distribution Environment)
 - ftp
 - http
 - Ldm
 - Direct access via mount
 - WMS (Web map service)
- Archive
 - ADDE
 - Direct Access
 - WMS
 - McFETCH



Geostationary Satellites received

- GOES-13 -East (75° W)
- GOES-15 -West(135° W)
- GOES-14 -Test (105° W) (not currently sending)
- GOES-16 -Test (89.5° W)
- Meteosat-10 (0° E)
- Meteosat-8 (near 41.5° E)
- COMS (128° E)

- FY-2E (86° E)
- FY-2G (105° E)
- Himawari-8 (140° E)
- Kalpana(74° E)
- INSAT-3D(83° E)



CSPP Meeting June 2017



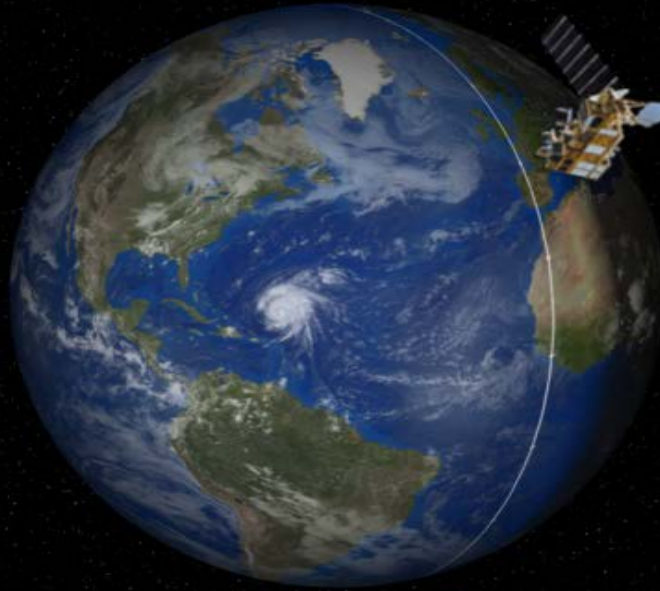
Geostationary Satellites Received at UW SSEC in 2017



	Sub-Point	Reception Method	Source	Latency	Daily Volume
GOES-13	75° West	L-Band	DB	<2 minutes	23 GB
GOES-14	105° West	L-Band	DB	<2 minutes	23 GB
GOES-15	135° West	L-Band	DB	<2 minutes	23 GB
GOES-16	89.5° West	L-Band	DB/Relay	>20 minutes via PDA <2 minutes via DB	400-500 GB
Meteosat-10	0° East	C-Band Relay	DB Relay	<15 minutes	24 GB
Meteosat-8	41.5° East	Network Relay	NOAA STAR	~30 minutes	24 GB
Himawari-8	140° East	Network Relay	NOAA STAR	~ 10 minutes	300 GB
Himawari-8	140° East	Himawari Cast Network Relay	Hawaii NWS	~ 10 minutes	62 GB
Kalpana	74° East	Network Relay	ISRO	45-120 minutes	1.4 GB
Insat-3D	83° East	Network Relay	ISRO	45-180 min	19 GB
FY2E	86° East	Network Relay	ABOM	15-30 minutes	4.7 GB
FY2G	105° East	Network Relay	ABOM	15-30 minutes	4.7 GB
COMS	128° East	Network Relay	KMA	9-24 minutes	11 GB

Polar Satellites received

- NOAA-15
- NOAA-18
- NOAA-19
- METOP-A
- METOP-B



- Aqua
- Terra
- Suomi-NPP
- Landsat-8
- FY-3B
- GCOM-W1

CSPP Meeting June 2017



Polar Satellites Received at UW SSEC in 2017

	Reception Method	Domain	ADDE Latency	Instruments	External Access
NOAA-15	C-Band relay, DDS	DB CONUS Global	DB <1 minutes after pass	AVHRR, AMSU, DCS->level-1	ADDE
				All other instruments Level-0	NA
NOAA-18	DB L-Band, C-Band relay, DDS	DB CONUS Global	DB <1 minutes after pass	AVHRR->level-1	ADDE
				All other instruments Level-0	NA
NOAA-19	DB L-Band, C-Band relay, DDS	DB CONUS Global	DB <1 minutes after pass	AVHRR->level-1	ADDE
				All other instruments Level-0	NA
Metop-A	DB L-Band, NOAA DDS	DB CONUS Global	CONUS <15 minutes after pass	AVHRR ->level-1	ADDE
				AVHRR, IASI	DB ftp (sips)
Metop-B	DB L-Band, NOAA DDS	DB CONUS Global	CONUS <15 minutes after pass	AVHRR ->level-1	ADDE
				AVHRR, IASI	DB ftp (sips)
Suomi-NPP	DB X/L Band, NASA Relay	DB CONUS Global	CONUS <15 minutes after pass	VIIRS	ADDE
				VIIRS, ATMS, CrIS	DB ftp (sips)
Aqua	DB X-Band, NASA Relay	DB CONUS Global	DB <15 minutes after pass	AIRS, MODIS -> Level-1	ADDE
				AIRS, MODIS	DB ftp (sips)
Terra	DB X-Band, NASA Relay	DB CONUS Global	DB <15 minutes after pass	MODIS -> Level-1	ADDE
				MODIS	DB ftp (sips)
Landsat-8	Network Relay (USGS)	CONUS	22-24 hours	Level-1	ADDE, WMS
Shizuku GCOM-W1	DB X-Band	CONUS	DB <1 min after pass	Level-0	SSEC ftp
FY-3B/C	DB X/L Band	CONUS	DB <1 min after pass	Level-0	SSEC ftp

Archive Data

As of Dec 2016, over 1,000 TBs online.
(closer to 1.5 PB when redundant data are included)

Grows approximately about ~150 TB/year

US Geostationary Satellites

- GOES-8 through GOES-16 (**1994-Present**) (East, West , South America and test)
- GOES-1 through GOES-7 (**1978-1996**)
- SMS-1&2 (**1978-1981**)



Archive Data

International Geostationary Satellites

- GMS/MTSAT (1998-2015)
- Meteosat/Meteosat IODC (1998-Present)
- Meteosat-1 FGGE (1978-1979)
- FY2 (2004-Present)
- Kalpana (2005-2017)
- Insat-3D (June 2014-2017)
- COMS (June 2012 – Present)
- Himawari-8 (March 2015 – Present)



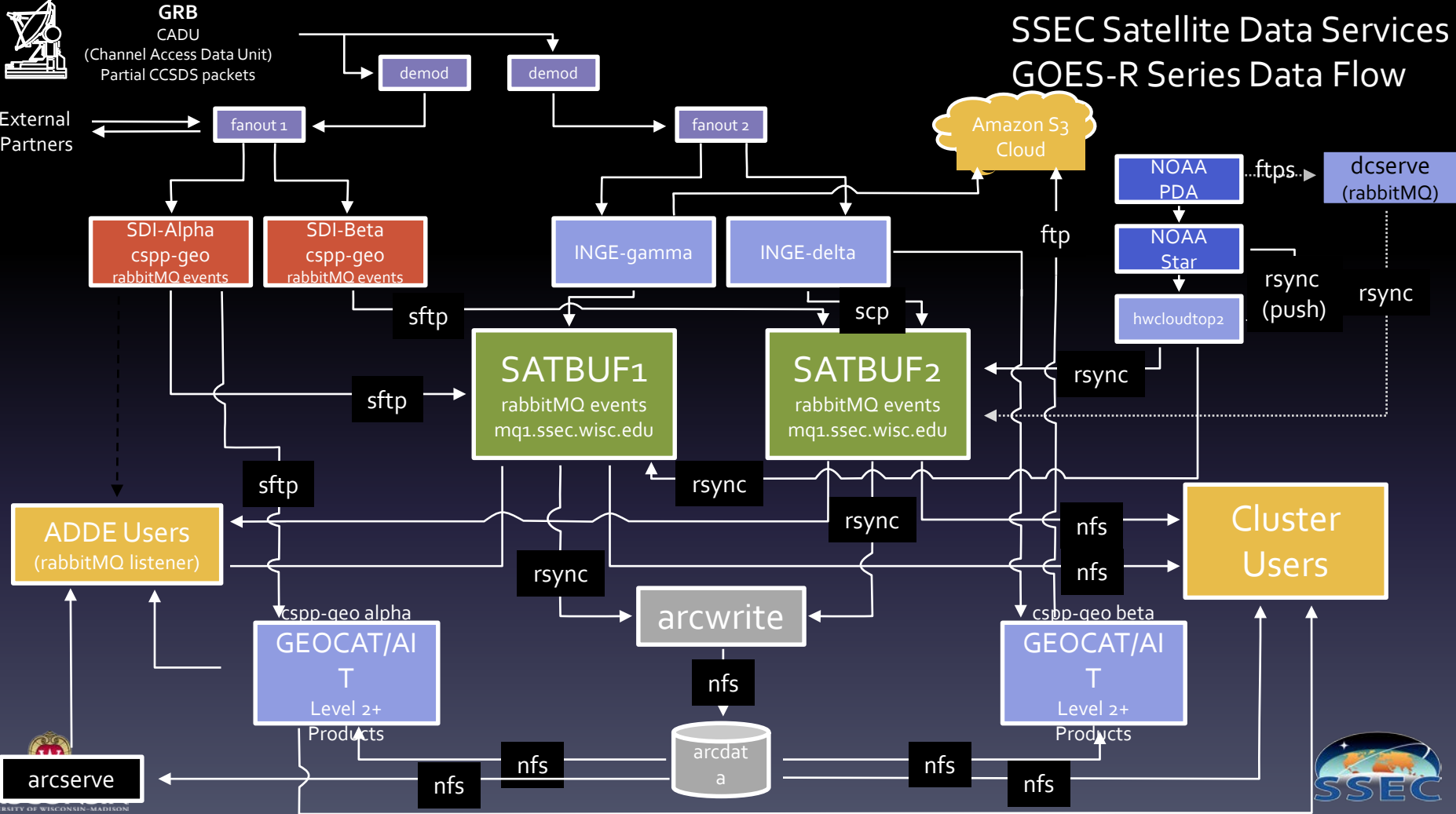
GOES-16 Receive, Ingest, and distribution system details





**GRB
CADU**
(Channel Access Data Unit)
Partial CCSDS packets

External
Partners





GRB
CADU
(Channel Access Data Unit)
Partial CCSDS packets

External
Partners

demod

demod

fanout 1

fanout 2

Reception

SSE
GOES R Series Data Flow

Amazon S3
Cloud

NOAA
PDA

dcserve
(rabbitMQ)

NOAA
Star

hwcloudtop2

rsync
(push)

rsync

SDI-Alpha
cspp-geo
rabbitMQ events

SDI-Beta
cspp-geo
rabbitMQ events

INGE-gamma

INGE-delta

SATBUF1
rabbitMQ events
mq1.ssec.wisc.edu

SATBUF2
rabbitMQ events
mq1.ssec.wisc.edu

ADDE Users
(rabbitMQ listener)

cspp-geo alpha
GEOCAT/AI
T
Level 2+
Products

arcwrite

arcdata
a

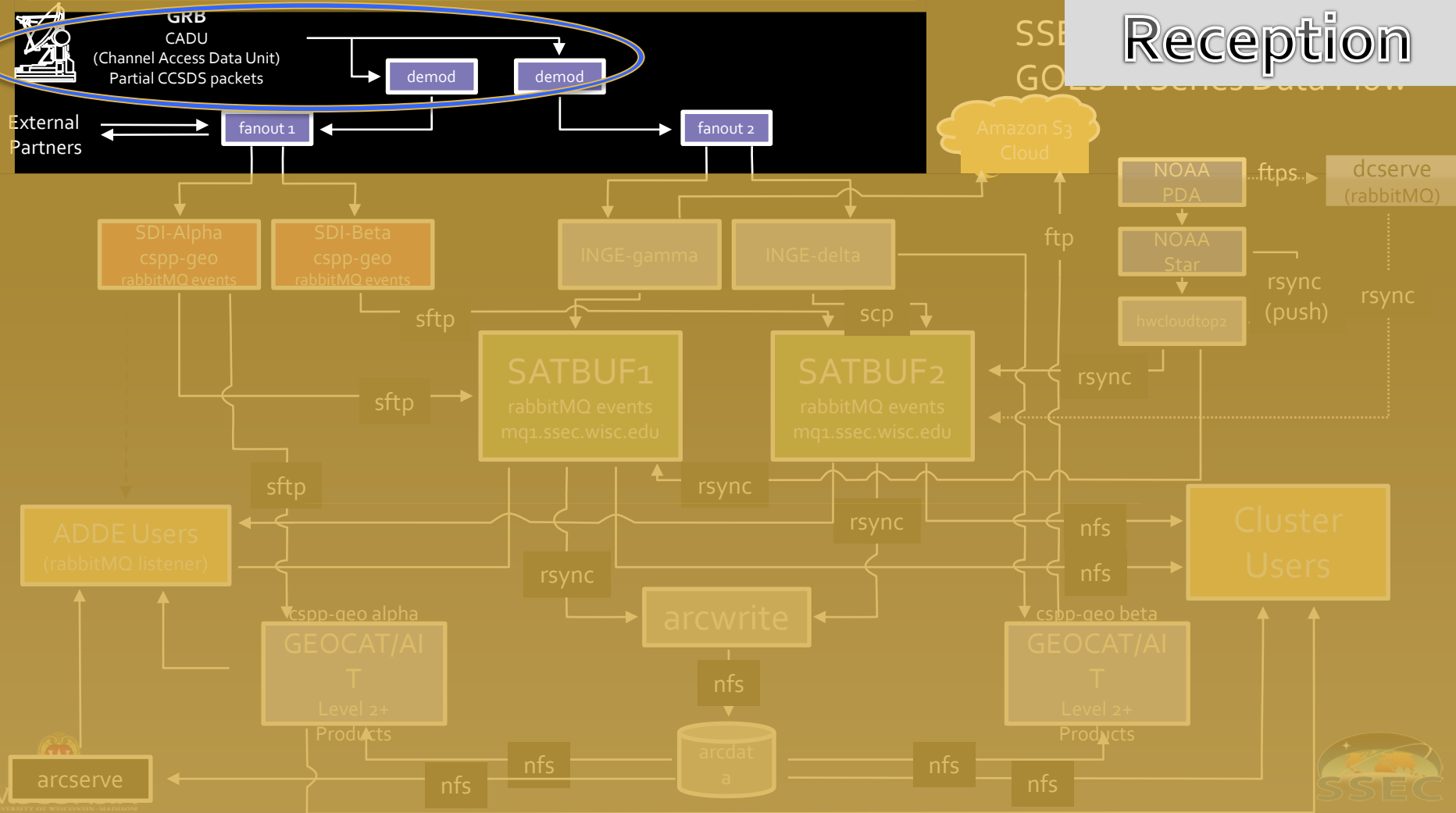
cspp-geo beta
GEOCAT/AI
T
Level 2+
Products

Cluster
Users

arcserve



Reception



Antenna Chain to Fanout





78 meters

62 meters



Antenna Specs

- 7.3 meter (Harris)
- Installed in 1974
- Originally installed for SMS-1



Feed Installation



Feed Installation



Feed Installation



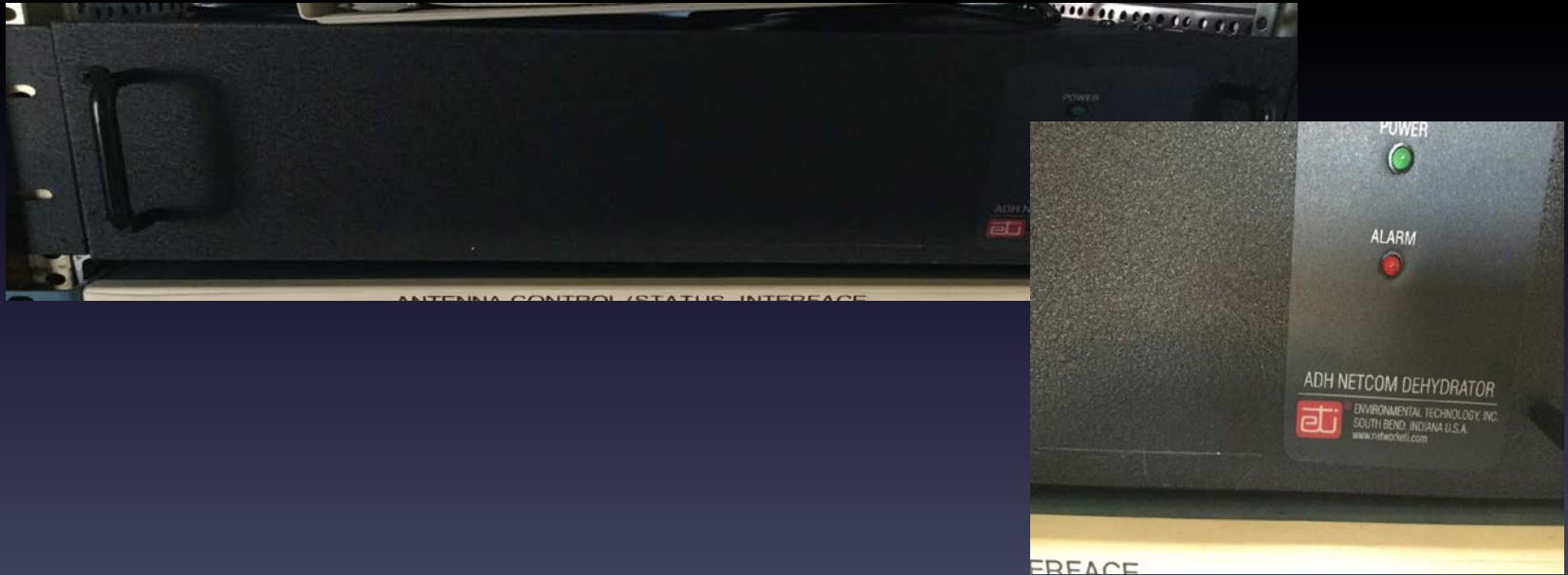
RF Splitter

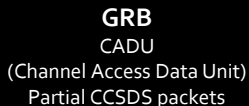


Quorum Demodulators



Rack Mounted Dehydrator





GRB
CADU





GRB

CADU

(Channel Access Data Unit)
Partial CCSDS packets

External
Partners

demod

demod

fanout 1

fanout 2

Reception

SSE

GOES

R Series Data Flow

Amazon S3
Cloud

NOAA
PDA

dcserve
(rabbitMQ)

NOAA
Star

hwcloudtop2

rsync
(push)

rsync

ftp

rsync

nfs

nfs

cspp-geo beta

GEOCAT/AI
T

Level 2+
Products

nfs

sftp

sftp

sftp

sftp

sftp

sftp

cspp-geo alpha

GEOCAT/AI
T

Level 2+
Products

nfs

SATBUF1

rabbitMQ events

mq1.ssec.wisc.edu

rsync

rsync

rsync

rsync

rsync

rsync

rsync

SATBUF2

rabbitMQ events

mq1.ssec.wisc.edu

rsync

rsync

rsync

rsync

rsync

rsync

rsync

arcwrite

nfs

arcdata

a

nfs

nfs

ADDE Users

(rabbitMQ listener)

arcserve

arcserve

arcserve

arcserve

arcserve

Cluster
Users

Cluster
Users

Cluster
Users

Cluster
Users

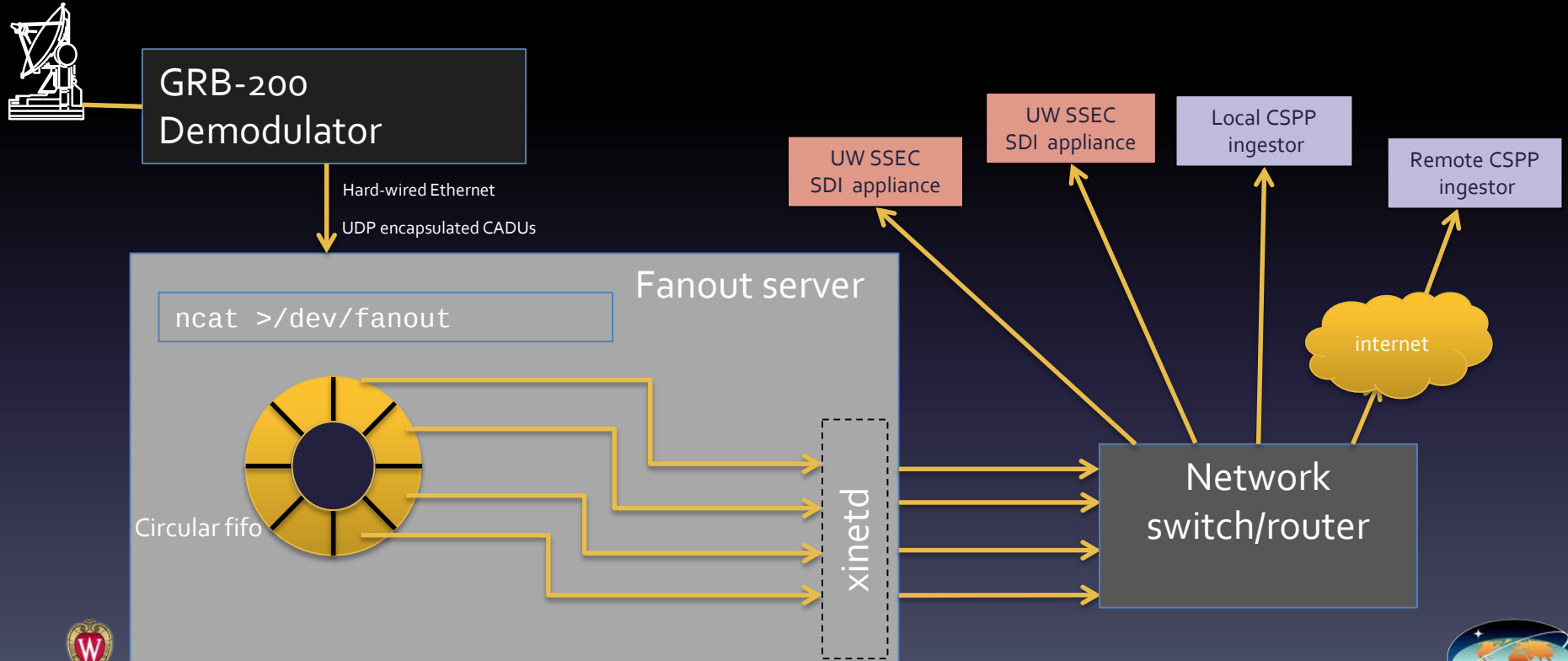
Cluster
Users

Cluster
Users

Cluster
Users



Fanout server



Fanout server hardware specs

- Dell PE R430
- single Intel Xeon 2.4GHz 6 core processor
- 8GB RAM
- 2TB disk (2 x 200GB & 1 x 1.6TB)
- \$3,600 USD



Monitoring

Accessing Demodulator

nc fanout1 50030

```
Downloads — robo@mcfetch1:/var/www/cgi-bin — ssh — 255x52
robo@mcfetch1:/var/www/cgi-bin
</G8380>
<G8380>
  <serialno val="158618"/>
  <dev val="2.18"/>
  <temp val="38"/>
  <fan val="0K"/>
  <f>
    <clock val="1K"/>
    <LUCP>
      <RSSI val="36.4"/>
      <Mten val="8"/>
    </LUCP>
    </RUCP>
    <RUCP>
      <RSSI val="36.4"/>
      <Mten val="8"/>
    </RUCP>
  </f>
  <G8400>
    <LUCP>
      <PUSMC val="1K"/>
      <S80 val="17.8"/>
      <AOL val="8.99"/>
      <H80 val="0950K"/>
      <Socet:an val="N08"/>
      <P115 val="208"/>
      <R80C val="8"/>
    </LUCP>
    <RUCP>
      <PUSMC val="1K"/>
      <S80 val="17.5"/>
      <AOL val="8.81"/>
      <H80 val="0950K"/>
      <Socet:an val="N08"/>
      <P115 val="208"/>
      <R80C val="8"/>
    </RUCP>
  </G8400>
  <G8400>
    <Power val="0K"/>
    <Current val="308"/>
    <Charge val="80"/>
    <Conn val="0K"/>
    <Serialno val="158724"/>
    <dev val="3.81"/>
    <Voltage val="22.5"/>
    <clock val="1K"/>
    <temp val="38"/>
    <fan val="28"/>
    <Press val="1P"/>
    <Charge val="13"/>
  </G8400>
</G8380>
```



Monitoring

CheckMK 1.2.8p12

Secure https://dcmn.ssec.wisc.edu/dcmn/check_mk/index.py?start_url=%2Fdcmon%2Fcheck_mk%2Fview.py%3Fview_name%3Dallhosts

90 rows robe (admin) 15:34

Views: Overview, Host & Service Problems, Main Overview, Network Topology, Hosts, All hosts, All hosts (Mini), All hosts (Grid), Favorite hosts, Host search, Host Groups, Host Groups (Grid), Host Groups (Summary), Services, All services, Favorite services, LLMI Check, Recently changed services, Serv. by host groups, Service search, Version Status, Service Groups, Service Groups (Grid), Service Groups (Summary), Services by group, Business Intelligence, All Aggregations, Hostname Aggregations, Problem Aggregations, Single-Host Aggregations, Single-Host Problems, Problems, Alert Statistics, Host problems, Pending Services, Service problems, State services

state	Host	Icons	OK	Wn	Un	Cr	Pd	state	Host	Icons	OK	Wn	Un	Cr	Pd	state	Host	Icons	OK	Wn	Un	Cr	Pd
UP	acpu1.ssec.wisc.edu		29	0	0	0	0	UP	acpu2.ssec.wisc.edu		29	0	0	0	0	UP	arcserve1.ssec.wisc.edu		48	0	0	0	0
UP	arcserve2.ssec.wisc.edu		83	0	0	0	0	UP	arcwrite1.ssec.wisc.edu		80	0	0	0	0	UP	arcwrite2.ssec.wisc.edu		78	0	0	0	0
UP	bass.ssec.wisc.edu		20	0	0	0	0	UP	boit.ssec.wisc.edu		81	0	0	0	0	UP	castor.ssec.wisc.edu		21	0	0	0	0
UP	compgen1.ssec.wisc.edu		30	0	0	0	0	UP	compgen2.ssec.wisc.edu		30	0	0	0	0	UP	cispelpha.ssec.wisc.edu		32	0	0	0	0
UP	csppbeta.ssec.wisc.edu		32	0	0	0	0	UP	dtips.aomi.noaa.gov		38	0	0	0	0	UP	dtips.ece.uprm.edu		34	0	0	0	0
UP	dserv1.ssec.wisc.edu		53	0	0	0	0	UP	dcarchive.ssec.wisc.edu		32	0	0	2	0	UP	dcarchive.ssec.wisc.edu		38	0	0	0	0
UP	dcprod-sv.ssec.wisc.edu		20	0	0	0	0	UP	dcqc.ssec.wisc.edu		34	0	2	0	0	UP	dserv1.ssec.wisc.edu		43	0	0	0	0
UP	dserv2.ssec.wisc.edu		44	0	0	0	0	UP	dserv3.ssec.wisc.edu		50	0	0	0	0	UP	dserv4.ssec.wisc.edu		46	0	0	0	0
UP	dserv5.ssec.wisc.edu		48	0	0	0	0	UP	dserv6.ssec.wisc.edu		43	0	0	0	0	UP	east1.ssec.wisc.edu		1	0	0	0	0
UP	east1.ssec.wisc.edu		30	0	0	0	0	UP	east2.ssec.wisc.edu		21	0	0	0	0	UP	east3.ssec.wisc.edu		25	0	0	0	0
UP	evergreen.ssec.wisc.edu		34	0	0	0	0	UP	fanout1.ssec.wisc.edu		33	0	0	0	0	UP	fanout2.ssec.wisc.edu		32	0	0	0	0
UP	gmsbok.ssec.wisc.edu		89	0	0	0	0	UP	geor04.ssec.wisc.edu		70	1	0	0	0	UP	geor05.ssec.wisc.edu		82	0	0	0	0
UP	geor06.ssec.wisc.edu		46	0	0	0	0	UP	geor07.ssec.wisc.edu		41	1	0	0	0	UP	geor08.ssec.wisc.edu		56	0	0	0	0
UP	geor09.ssec.wisc.edu		45	0	0	0	0	UP	geor10.ssec.wisc.edu		38	0	0	0	0	UP	grdelta.ssec.wisc.edu		32	0	0	0	0
UP	grgamma.ssec.wisc.edu		33	0	0	0	0	UP	grsm.ssec.wisc.edu		34	0	0	0	0	UP	hwcloudtop1.ssec.wisc.edu		36	0	0	0	0
UP	hwcloudtop2.ssec.wisc.edu		33	0	0	0	0	UP	lfiguard.ssec.wisc.edu		36	1	0	0	0	UP	lightning.ssec.wisc.edu		36	1	0	0	0
UP	mcfetch1.ssec.wisc.edu		31	0	0	0	0	UP	mcfetch2.ssec.wisc.edu		35	0	0	0	0	UP	mcfetchproxy.ssec.wisc.edu		30	0	0	0	0
UP	np1.ssec.wisc.edu		36	0	0	0	0	UP	np2.ssec.wisc.edu		36	0	0	0	0	UP	npserve1.ssec.wisc.edu		44	0	0	0	0
UP	npserve2.ssec.wisc.edu		44	0	0	0	0	UP	pollux.ssec.wisc.edu		33	0	0	0	0	UP	prodgen1.ssec.wisc.edu		32	0	0	0	0
UP	prodgen2.ssec.wisc.edu		32	0	0	0	0	UP	prodgen3.ssec.wisc.edu		36	0	0	0	0	UP	qweb.ssec.wisc.edu		100	0	0	0	0
UP	sabuf1.ssec.wisc.edu		36	0	0	0	0	UP	sabuf2.ssec.wisc.edu		32	0	0	0	0	UP	sdalpha.ssec.wisc.edu		33	0	0	0	0
UP	sdbeta.ssec.wisc.edu		21	0	0	0	0	UP	sddelta.ssec.wisc.edu		23	0	0	0	0	UP	sdepsilon.ssec.wisc.edu		23	0	0	0	0

© Matthias Kettner

CheckMK

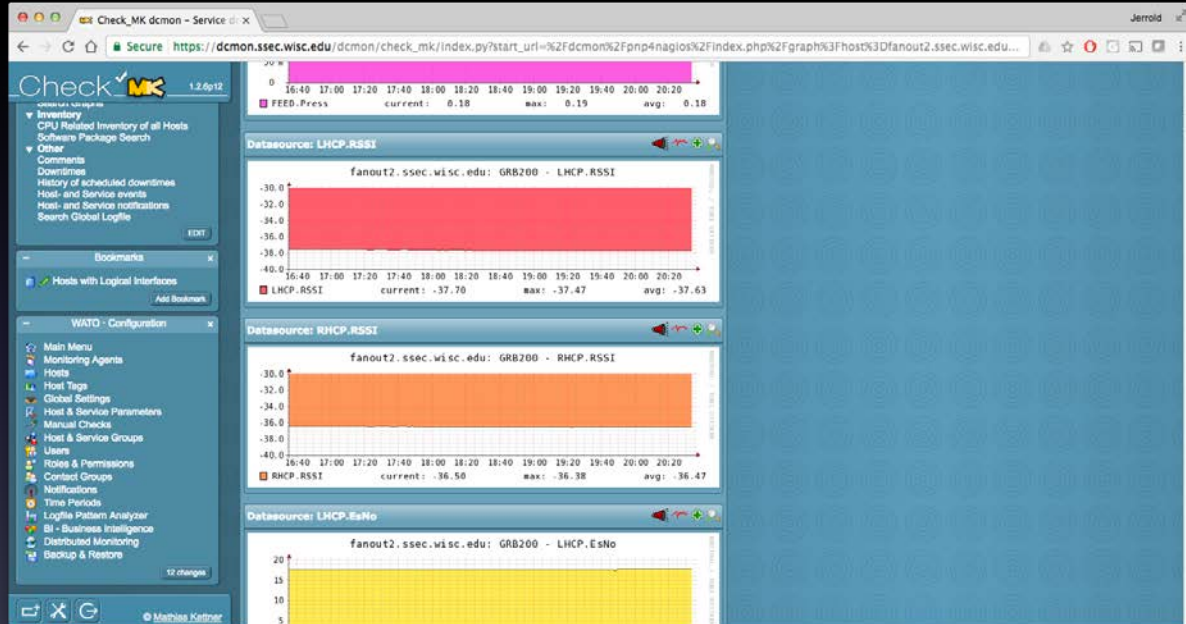


Monitoring

The screenshot displays the CheckMK web interface. The browser address bar shows the URL: `https://dcmn.ssec.wisc.edu/dcmn/check_mk/index.py?start_url=%2Fdcmn%2Fcheck_mk%2Fview.py%3Fview_name%3Dservice%26service%3DCRB200...`. The interface includes a left sidebar with navigation links such as Overview, Hosts, Host Groups, Services, and Service Groups. The main content area shows details for the service 'fanout2.ssec.wisc.edu, GRB200'. The service state is 'OK'. The output of the check plugin is displayed, showing various metrics like FEED Temp, FEED Press, and LHCPRSSI. The service performance data is also shown, including the service check command, service normal/retry check interval, current check attempt, service notification number, service check type, the age of the current service state, the last time the service was OK, the time since the last check of the service, the time of the next scheduled service check, the time of the next service notification, and the time of the last service notification.

Site alias	fanout2.ssec.wisc.edu
Hostname	fanout2.ssec.wisc.edu
Service description	GRB200
Service icons	
Service state	OK
Servicegroups the service is member of	
Service service level	
Service contact groups	check-mk-notify, all
Service contacts	check-mk-notify, datacenter, dsuqr, graemem, beavers, nickb, tommyj
Output of check plugin	OK - FEED Temp=32, FEED Hum=16, FEED Press=0.1803, GRB200.Temp is 31.6, LHCPRSSI is 37.7, RHCPRSSI is 36.5, LHCPEaNo is 17.86, RHCPPEaNo is 17.0333, LHCPLFPS is 266.817, RHCPPLFPS is 266.817
Long output of check plugin (multiline)	GRB200.Temp=31.25;40.0;50.; FEED Temp=32; FEED Hum=16; FEED Press=0.180333; LHCPRSSI=37.7;40;35;45;30; RHCPRSSI=36.5;40;35;45;30; LHCPEaNo=17.86;13;19;3;20; RHCPPEaNo=17.0333;13;19;3;20; LHCPLFPS=266.817;265.363;262.366; RHCPPLFPS=266.817;265.363;262.366;
Service performance data	
Service Perf-O-Meter	
Service check command	check_mk-local
Service normal/retry check interval	60s/60s
Current check attempt	1/1
Service notification number	0
Service check type	PASSIVE
The age of the current service state	43 min
The last time the service was OK	105 sec
The time since the last check of the service	105 sec
The time of the next scheduled service check	41 min in the past!
The time of the next service notification	-
The time of the last service notification	-

Monitoring



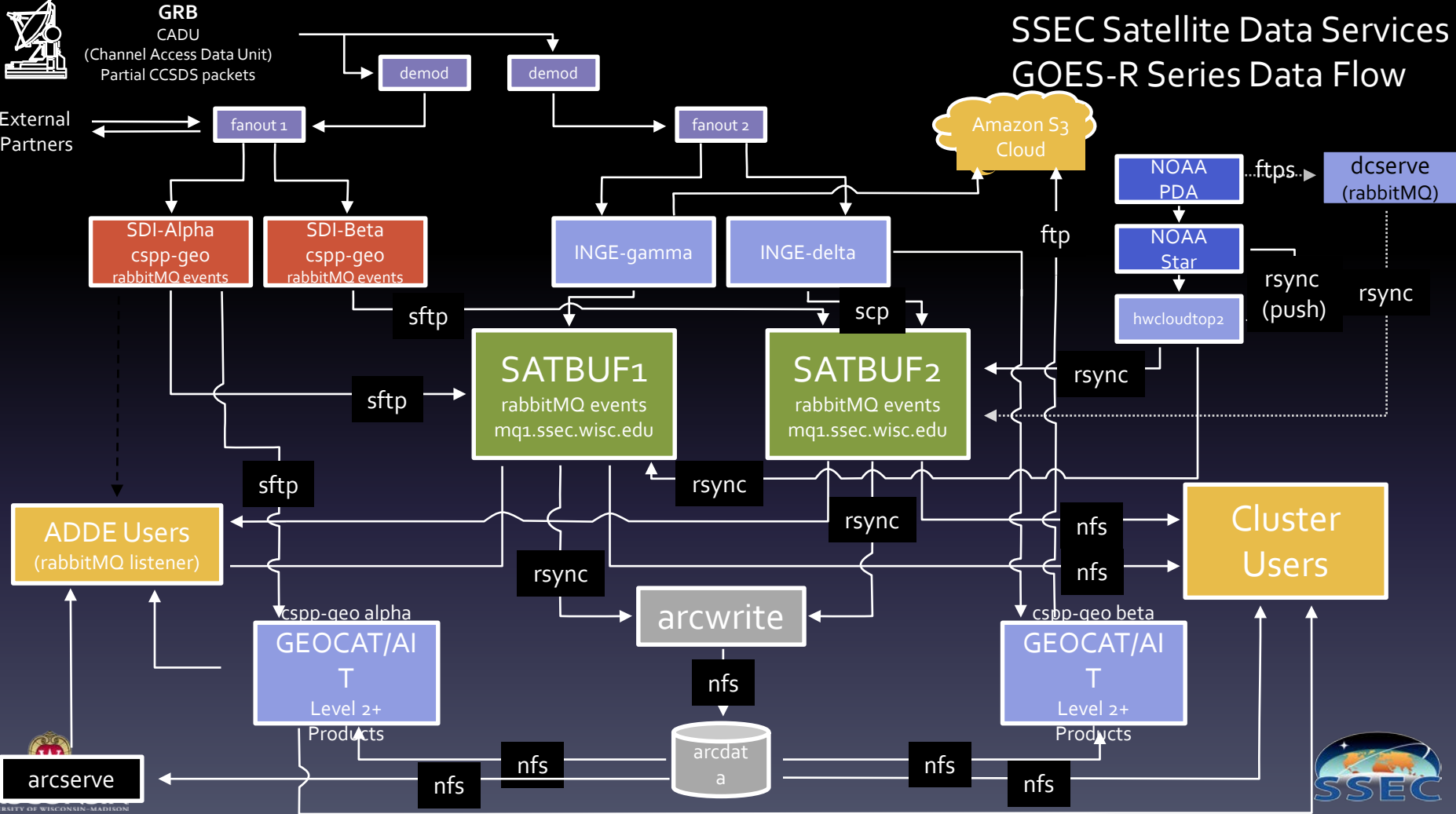
CheckMK





**GRB
CADU**
(Channel Access Data Unit)
Partial CCSDS packets

External
Partners





GRB
CADU

(Channel Access Data Unit)
Partial CCSDS packets

External
Partners

Ingest

SSE
GOES-R Science Data Flow

Amazon S3
Cloud

NOAA
PDA

NOAA
Star

hwcloudtop2

dcserve
(rabbitMQ)

rsync
(push)

rsync

SATBUF1

rabbitMQ events
mq1.ssec.wisc.edu

SATBUF2

rabbitMQ events
mq1.ssec.wisc.edu

ADDE Users
(rabbitMQ listener)

Cluster
Users

arcwrite

arcdata
a

cspp-geo beta

GEOCAT/AI
T

Level 2+
Products

cspp-geo alpha

GEOCAT/AI
T

Level 2+
Products

arcserve

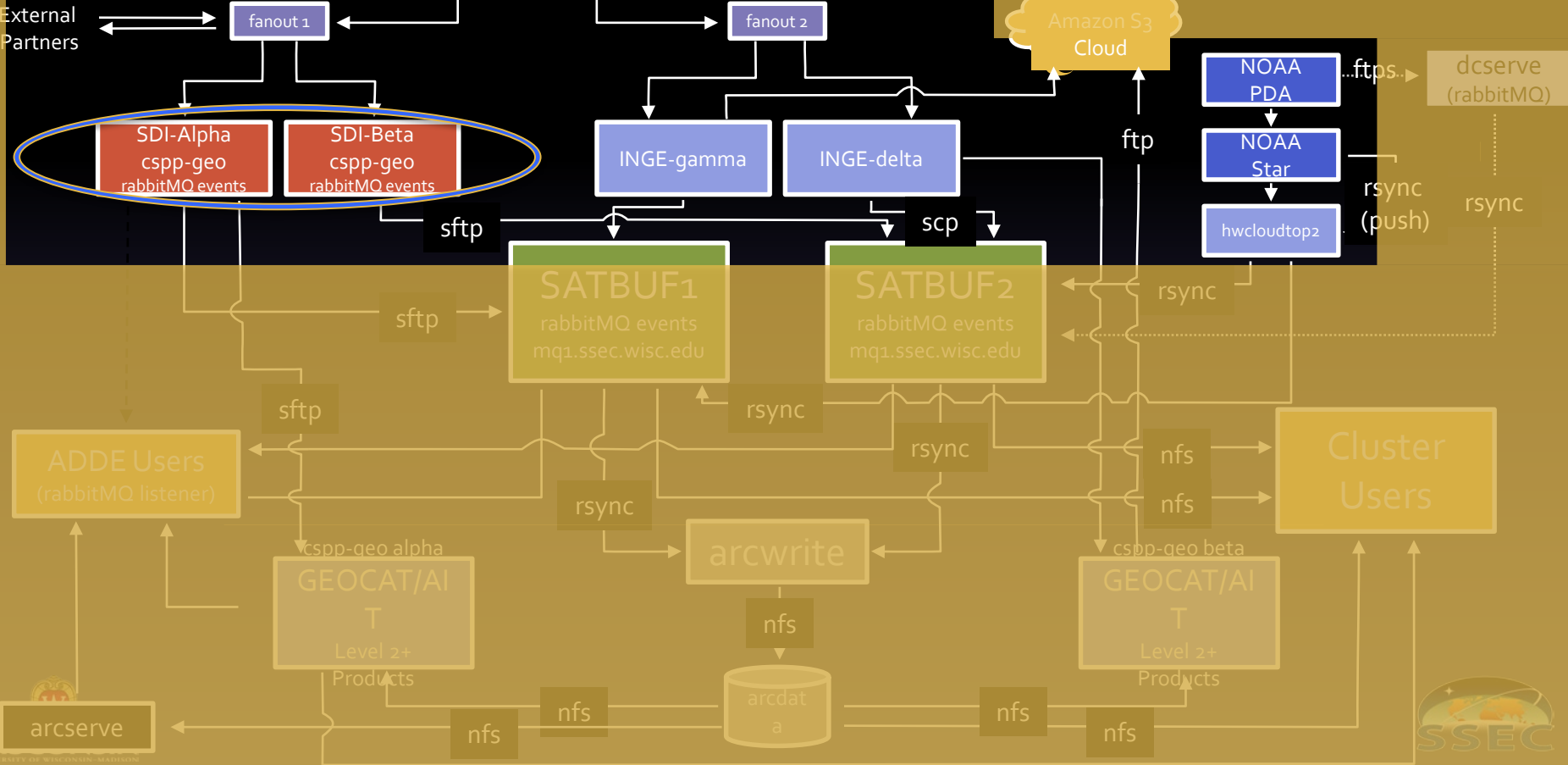




GRB
CADU

(Channel Access Data Unit)
Partial CCSDS packets

External
Partners



SDI-GRB Appliance



- Preconfigured to ingest GRB
- Runs CSPP-GEO GRB
- Holds ~7 days of data from all instruments
 - ABI (compressed) *
 - GLM *
 - EXIS
 - MAG
 - SEISS
 - SUVI

*Works with ADDE servers



SDI-GRB Appliance



- Dell R540
- single Intel Xeon 2.5GHz 12 core processor
- 64GB Ram
- 7.2TB disk (2 x 500GB & 6 x 1TB)

SDI-GRB Appliance



- Data can be accessed with
 - McIDAS-X
 - McIDAS-V
 - Unidata IDV
 - SFTP
 - NFS mount

SDI-GRB Appliance



2 options available

- \$25,000 (sftp, nfs)
- \$30,000 (sftp, nfs, ADDE)

Includes 1 year of support

<http://www.ssec.wisc.edu/mcidas/software/sdi/sdi.html>



Data Ingest Performance

Coverage	Typical Minimum latency	Typical Maximum Latency
MESO	1 second	5 seconds
CONUS	2 seconds	9 seconds
Full Disk	4 seconds	45 seconds

Latency defined as:

(time completed netcdf written to disk – report file creation time)



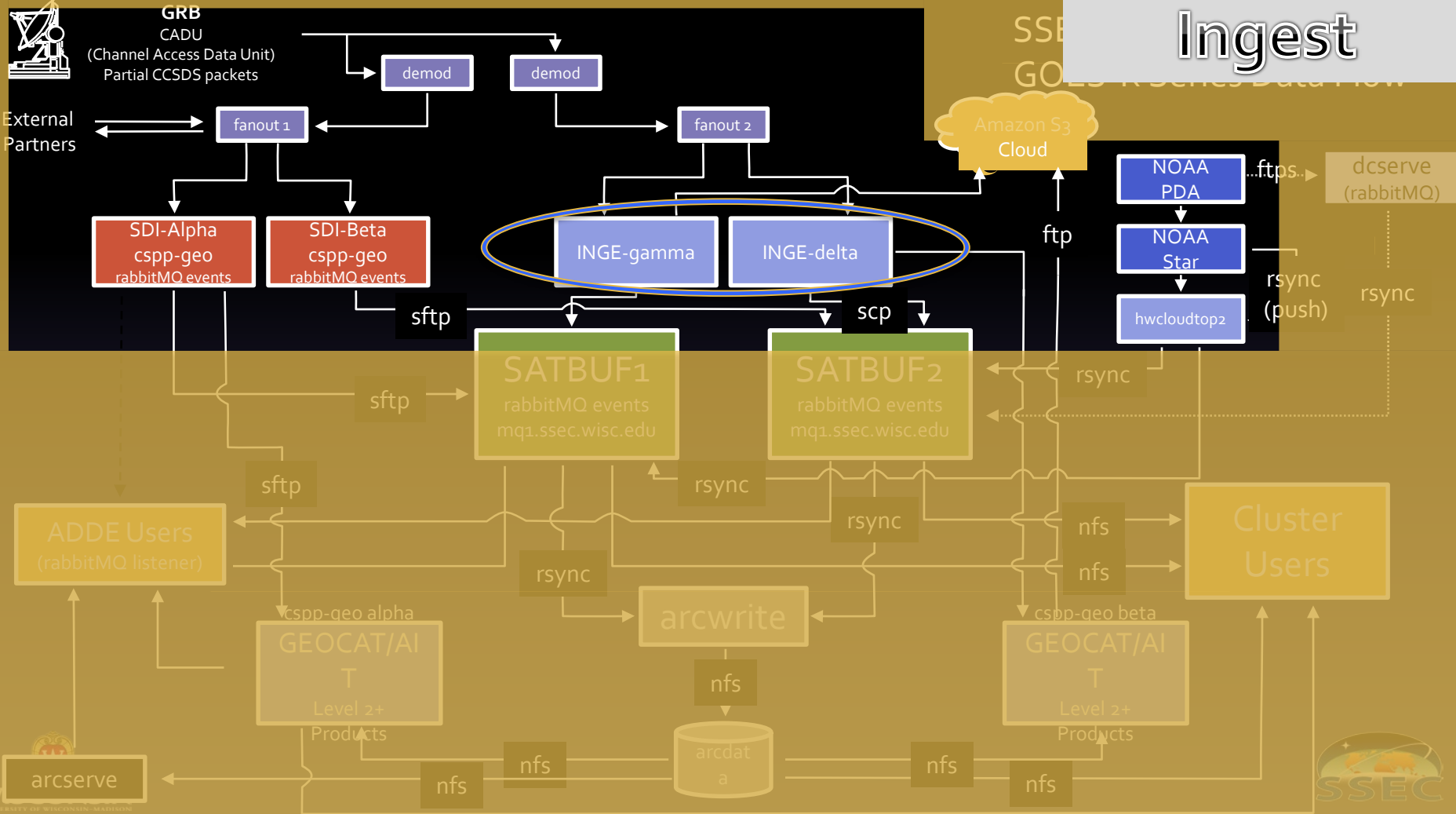


Ingest

GRB
CADU

(Channel Access Data Unit)
Partial CCSDS packets

External
Partners



CSPP Ingestors

- Running latest CSPP GEO ingest software
- Also running custom SDS ingest software
- Pushing data to other servers

CSPP Ingestors

- Specs
 - Dell R430
 - single Intel Xeon 2.4GHz 14c processor
 - 64GB Ram (4 x 16GB)
 - 8.4TB disk (2 x 600GB & 6 x 1.2TB)

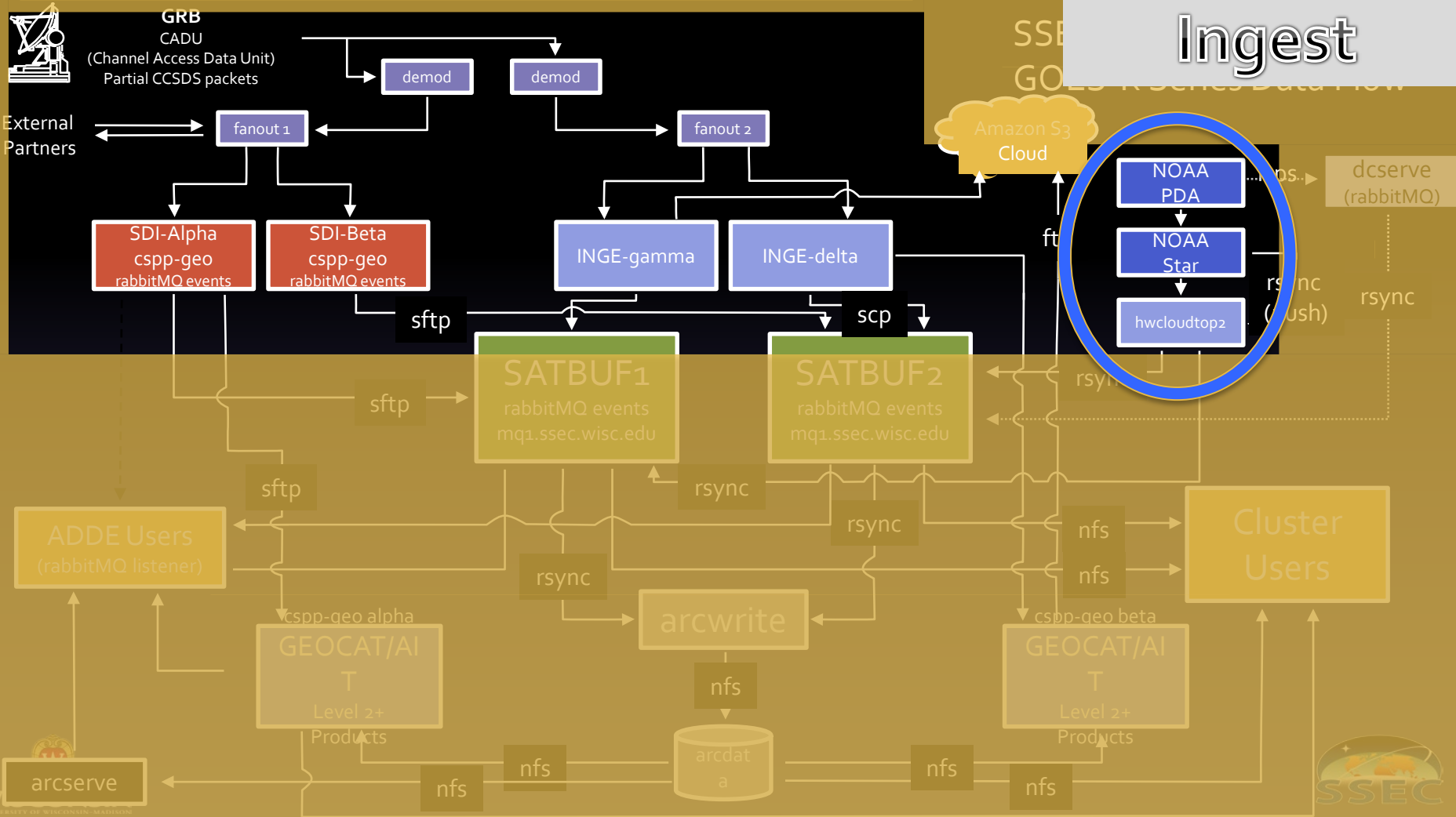




GRB
CADU

(Channel Access Data Unit)
Partial CCSDS packets

External
Partners



Ingest

SSE

GOES

RCS Data Flow

Amazon S3
Cloud

NOAA
PDA

NOAA
Star

hwcloudtop2

dcserve
(rabbitMQ)

rsync
(push)

rsync

Cluster
Users

arcwrite

arcdata

nfs

nfs

nfs

nfs

arcserve

cspg-geo alpha

GEOCAT/AI
T
Level 2+ Products

cspg-geo beta

GEOCAT/AI
T
Level 2+ Products



Data Ingest via NOAA STAR

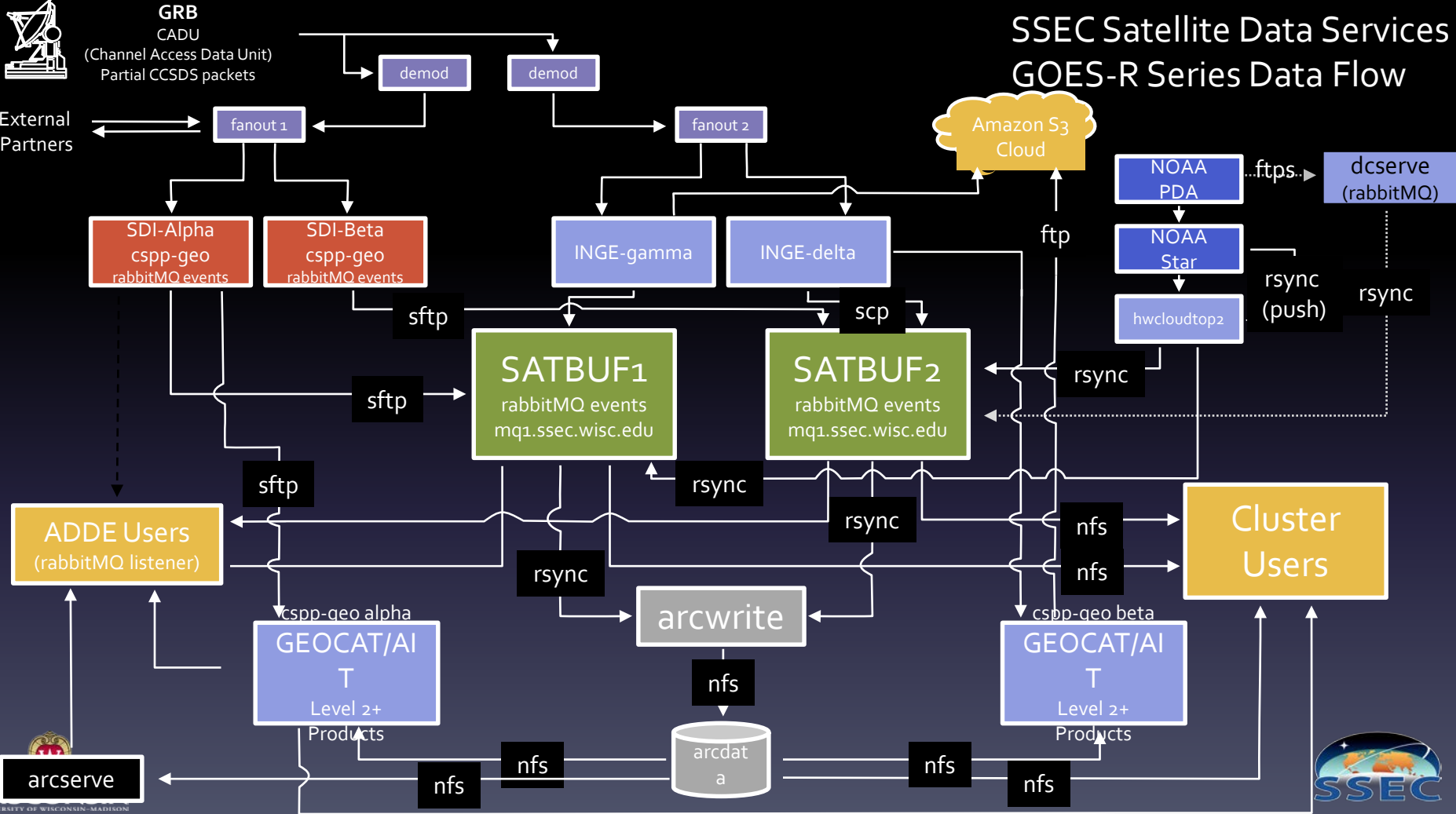
- Rsync from NOAA STAR (data from PDA)
- Pushed to local lustre filesystems
- Delayed 20 minutes
- Used if/when GRB antenna feed goes away





**GRB
CADU**
(Channel Access Data Unit)
Partial CCSDS packets

External
Partners



Level-2 Processing

- CSPP GEO
- Data pulled from SDI via SFTP
- Creates L2 products

Level-2 Processing

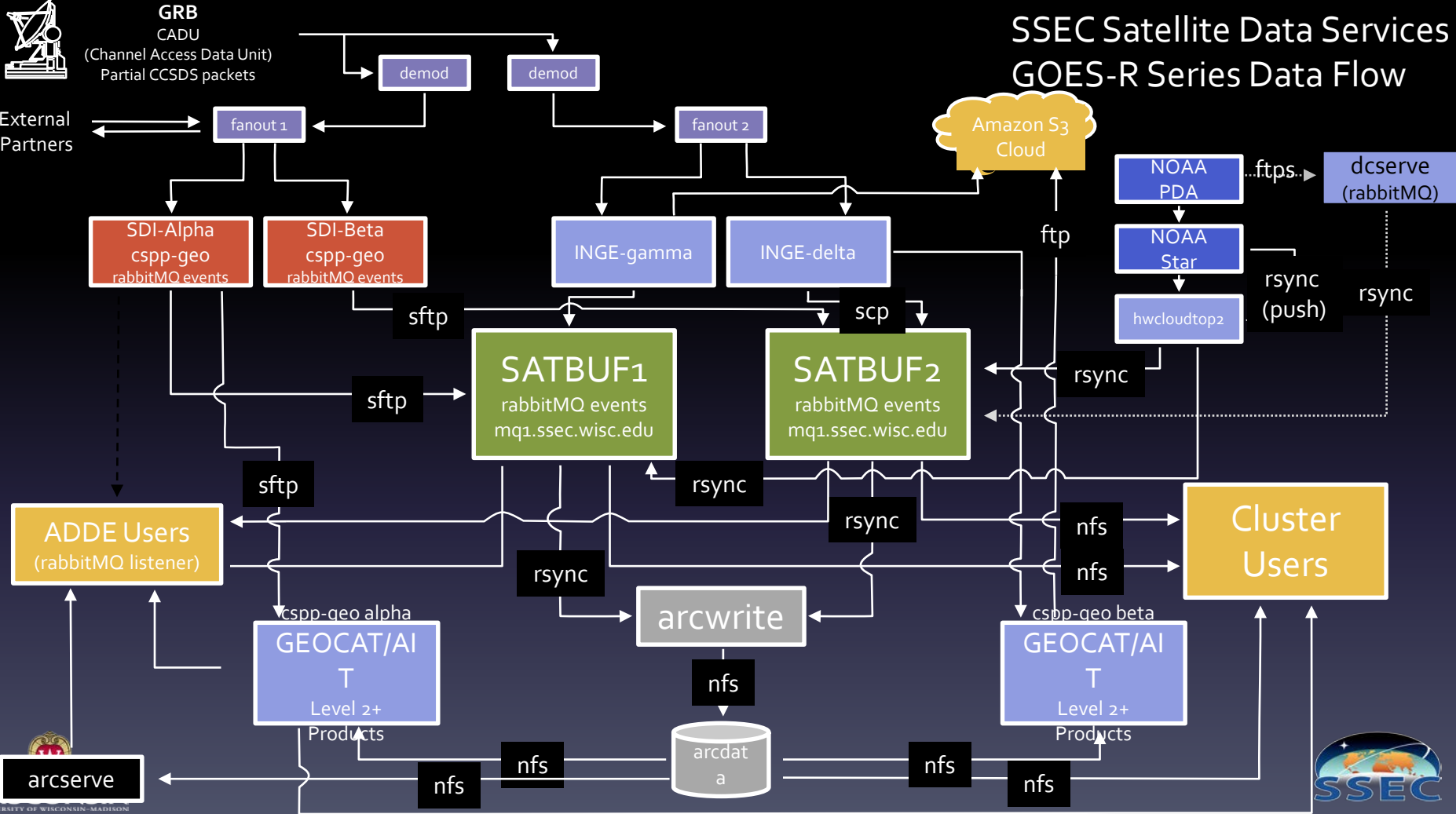
- Server Specs
 - Dell PE R730
 - 2 x Intel Xeon 3.0 GHz 12 core processors
 - 256 GB Ram (8 x 32GB)
 - 33.86TB Disk (2 x 960GB & 4 x 8TB)
 - \$13,340 USD





**GRB
CADU**
(Channel Access Data Unit)
Partial CCSDS packets

External
Partners





GRB
CADU
(Channel Access Data Unit)
Partial CCSDS packets

Distribution

External
Partners

fanout 1

demod

demod

fanout 2

SDI-Alpha
cspp-geo
rabbitMQ events

SDI-Beta
cspp-geo
rabbitMQ events

INGE-gamma

INGE-delta

Amazon S3
Cloud

NOAA
PDA

dcserve
(rabbitMQ)

NOAA
Star

hwcloudtop2

SATBUF1
rabbitMQ events
mq1.ssec.wisc.edu

SATBUF2
rabbitMQ events
mq1.ssec.wisc.edu

ADDE Users
(rabbitMQ listener)

Cluster
Users

cspp-geo alpha
GEOCAT/AI
T
Level 2+
Products

arcwrite

cspp-geo beta
GEOCAT/AI
T
Level 2+
Products

arcserve

arcdata
a





GRB
CADU
(Channel Access Data Unit)
Partial CCSDS packets

Distribution

External
Partners

fanout 1

demod

demod

fanout 2

Amazon S3
Cloud

SDI-Alpha
cspp-geo
rabbitMQ events

SDI-Beta
cspp-geo
rabbitMQ events

INGE-gamma

INGE-delta

NOAA
PDA

dcserve
(rabbitMQ)

NOAA
Star

hwcloudtop2

sftp

SATBUF1
rabbitMQ events
mq1.ssec.wisc.edu

SATBUF2
rabbitMQ events
mq1.ssec.wisc.edu

scp

ftp

rsync

rsync
(push)

rsync

sftp

rsync

rsync

rsync

nfs

nfs

Cluster
Users

ADDE Users
(rabbitMQ listener)

rsync

arcwrite

nfs

cspp-geo beta

GEOCAT/AI
T
Level 2+
Products

nfs

nfs

arcdata
a

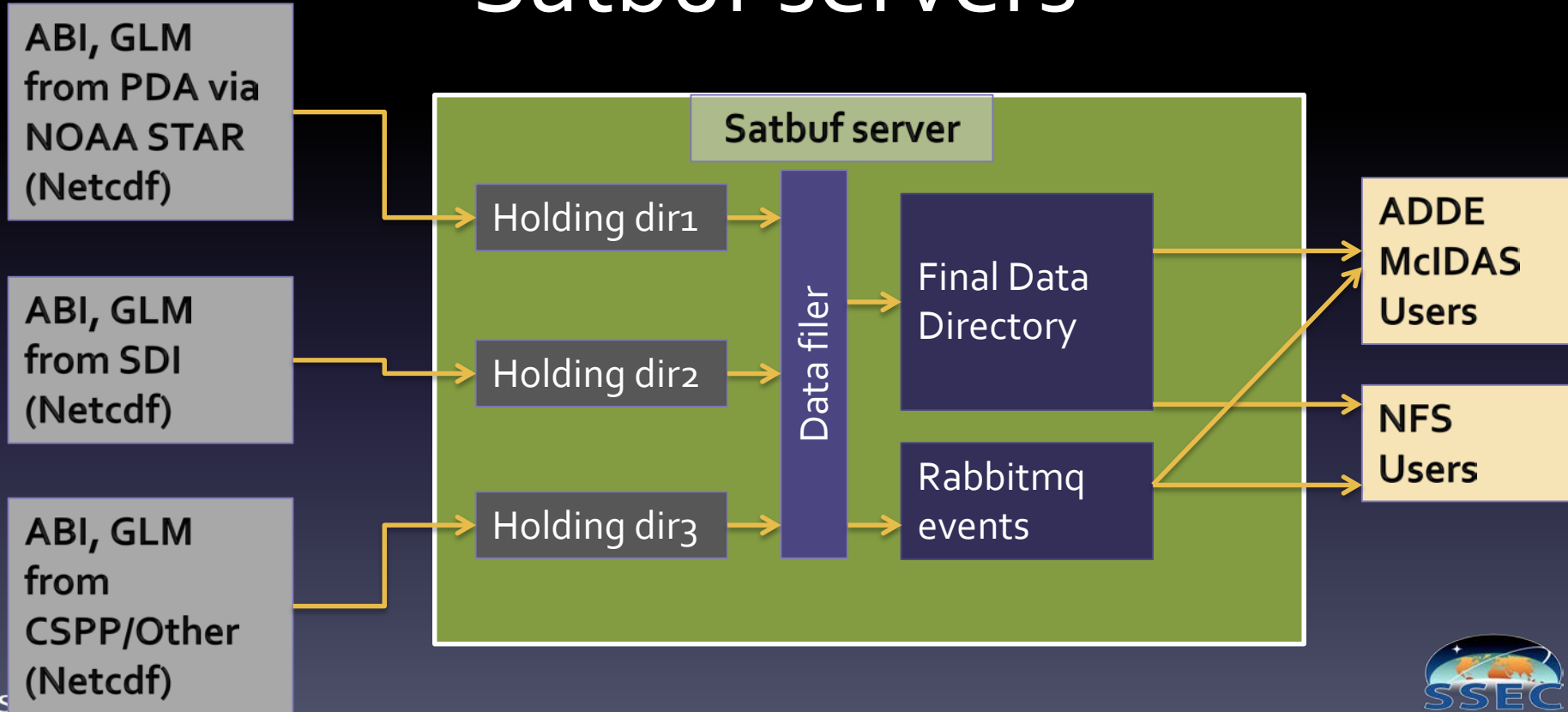
nfs

nfs

arcserve



Satbuf servers



Satbuf servers

- Server Specs
 - Dell PE R530
 - single Intel Xeon 2.3GHz 10 core processor
 - 128GB RAM (8 x 16GB)
 - 49TB disk (2 x 500GB & 6x 8TB)
 - 10 Gbps network
 - ~\$11,000 USD

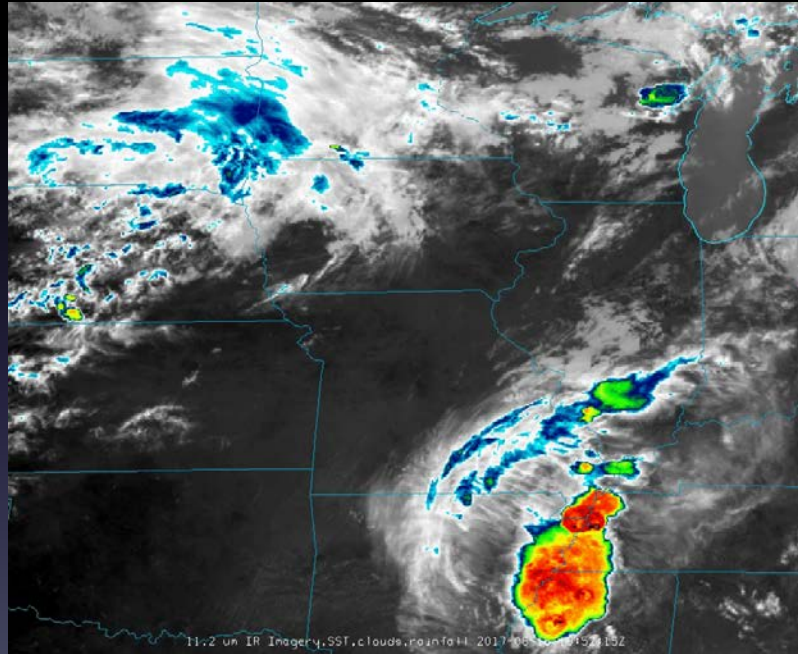


Visualization

- McIDAS-X
- McIDAS-V
- Unidata IDV
- RealEarth



Visualization

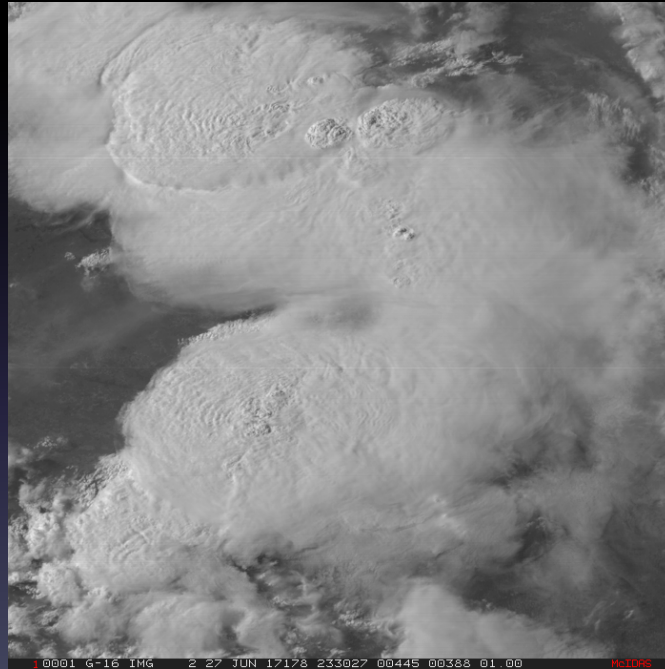


11.2 um (ABI band 14) IR Temperatures

~20:00Z 06/16 to ~08:17Z 06/17 displayed in McIDAS-V



Visualization



GOES-16 ABI in McIDAS-X

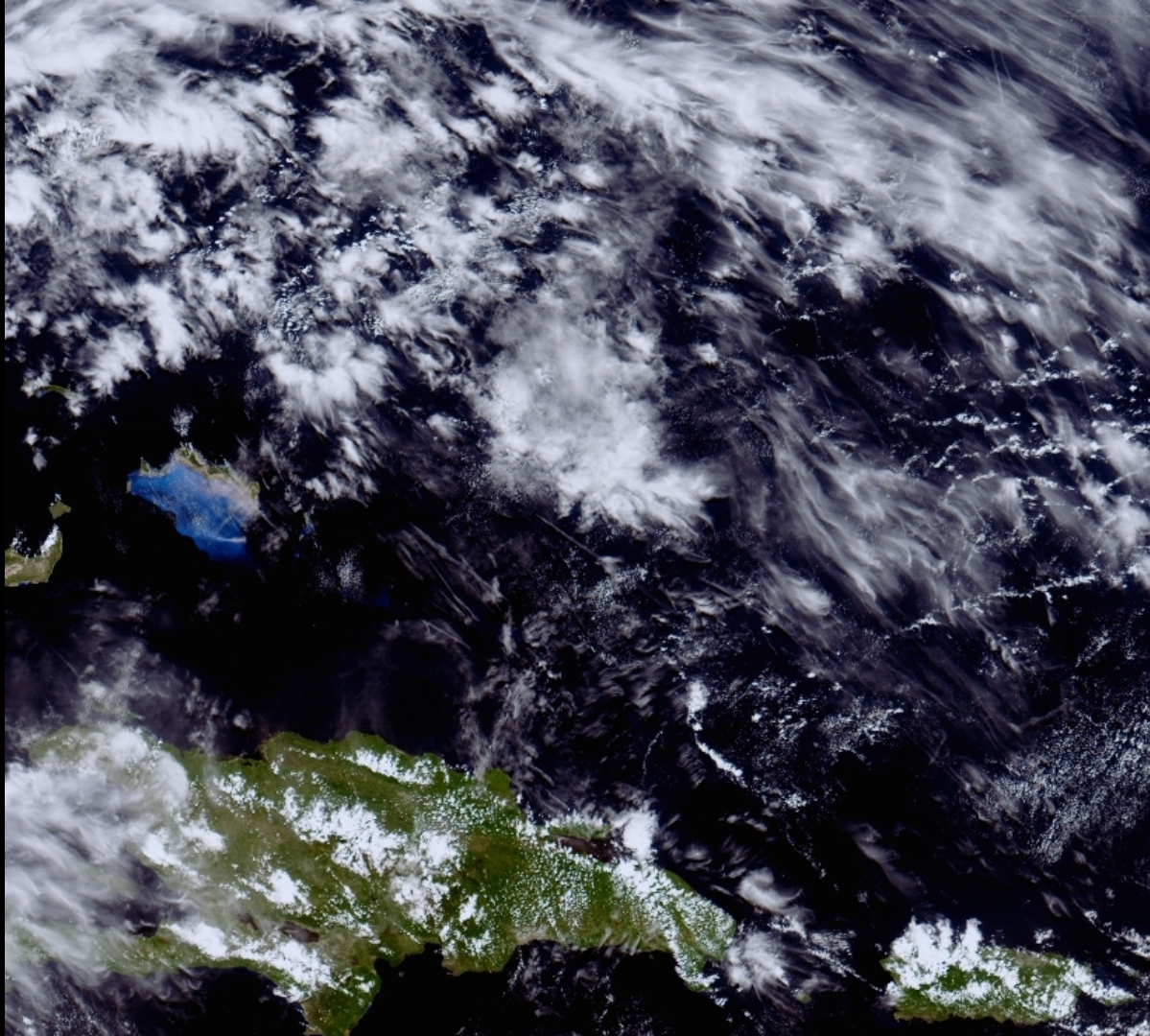


GOES-16 RGB displayed
In McIDAS-X



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON





WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON





GRB
CADU
(Channel Access Data Unit)
Partial CCSDS packets

External
Partners

fanout 1

demod

demod

fanout 2

Distribution

SDI-Alpha
cspp-geo
rabbitMQ events

SDI-Beta
cspp-geo
rabbitMQ events

INGE-gamma

INGE-delta

Amazon S3
Cloud

ftp

NOAA
PDA

dcserve
(rabbitMQ)

NOAA
Star

hwcloudtop2

rsync
(push)

rsync

sftp

SATBUF1

rabbitMQ events
mq1.ssec.wisc.edu

scp

SATBUF2

rabbitMQ events
mq1.ssec.wisc.edu

sftp

sftp

rsync

rsync

rsync

nfs

nfs

ADDE Users
(rabbitMQ listener)

Cluster
Users

cspp-geo alpha
GEOCAT/AI
T
Level 2+
Products

arcwrite

nfs

arcdata
a

cspp-geo beta
GEOCAT/AI
T
Level 2+
Products

nfs

nfs

nfs

nfs

arcserve



Uplink to Amazon Cloud

- Tested ABI feeds only
- Plans to test GLM
- Very low latency





GRB
CADU
(Channel Access Data Unit)
Partial CCSDS packets

Distribution

External
Partners

fanout 1

demod

demod

fanout 2

SDI-Alpha
cspp-geo
rabbitMQ events

SDI-Beta
cspp-geo
rabbitMQ events

INGE-gamma

INGE-delta

Amazon S3
Cloud

NOAA
PDA

dcserve
(rabbitMQ)

NOAA
Star

hwcloudtop2

SATBUF1
rabbitMQ events
mq1.ssec.wisc.edu

SATBUF2
rabbitMQ events
mq1.ssec.wisc.edu

ADDE Users
(rabbitMQ listener)

Cluster
Users

cspp-geo alpha
GEOCAT/AI
T
Level 2+
Products

arcwrite

cspp-geo beta
GEOCAT/AI
T
Level 2+
Products

arcserve

arcdata
a



Event Driven Requests

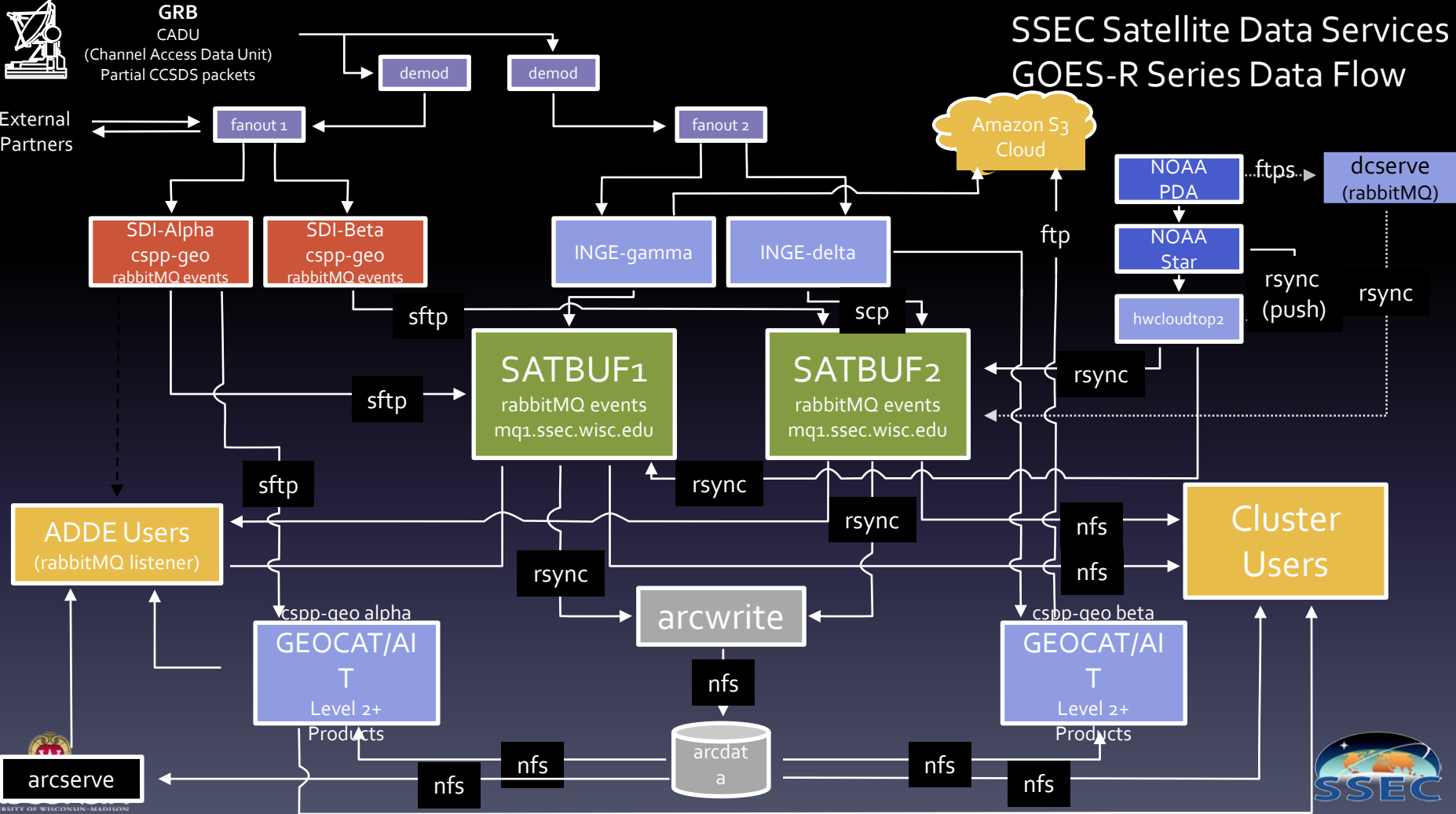
- Use rabbit MQ to notify users of new products
- Reduces “polling”
- Provides better fall over support





**GRB
CADU**
(Channel Access Data Unit)
Partial CCSDS packets

External
Partners





GRB
CADU
(Channel Access Data Unit)
Partial CCSDS packets

Archive

External
Partners

fanout 1

demod

demod

fanout 2

Amazon S3
Cloud

SDI-Alpha
cspp-geo
rabbitMQ events

SDI-Beta
cspp-geo
rabbitMQ events

INGE-gamma

INGE-delta

NOAA
PDA

dcserve
(rabbitMQ)

NOAA
Star

hwcloudtop2

SATBUF1
rabbitMQ events
mq1.ssec.wisc.edu

SATBUF2
rabbitMQ events
mq1.ssec.wisc.edu

ADDE Users
(rabbitMQ listener)

cspp-geo alpha
GEOCAT/AI
T
Level 2+
Products

arcwrite

arcdata
a

cspp-geo beta
GEOCAT/AI
T
Level 2+
Products

Cluster
Users

arcserve



GOES-16 Archive

- ABI level-1 netCDF
 - 135 - 140 GB/day netCDF Mode 3 compressed GZIP₁
 - 250+ GB/day netCDF Mode 4 compressed GZIP₁
 - 99 GB/day CADU Mode 3 (150 GB in Mode 4)
- Archive ABI, GLM netCDF (no level-2 products)
- Archive of GRB CADU packets (first 6 months/TBD)



Inventory

Search - SDS Inventory

SDS INVENTORY | SEARCH | CALENDAR | CONTACT | MCFETCH

DATE: 2017-06-27

START TIME: 00:00

END TIME: 23:59

SATELLITE: MET-8, GOES-13, FY-2E, GOES-15

TYPE: HRIT, Block 11, Imager, Sounder

COVERAGE: FD, HRV, UNKNOWN, NH

SCHEDULE: ROUTINE, RSO, ROUTINE-2014, FLOOD

SEARCH

COLLAPSE

LAT: 0

LON: 0

2017-06-27 | Day 178 / 365 | 2012:04 UTC | Tuesday, June 27th



Inventory

Search - SDS Inventory | https://qweb.ssec.wisc.edu/inventory_beta/#search&start_time=2017-04-13T00:00:00... | SDS INVENTORY | SEARCH | CALENDAR | CONTACT | MCFETCH

April 13, 2017 / 10:00

2,999 times | 2,999 files | 1 satellite

100% N. BEOP # | [Download](#) | GOES-16

IMAGETIME	W_ELEM	E_ELEM	N_LINE	S_LINE	SUB_LAT	SUB_LON	COVERAGE	TYPE	SCHEDULE	BANDS
2017-04-13 00:00:25	None	None	None	None	0.0	89.0	MES02	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
> Missing MES02 Band 03 for 2017103 000025 > Missing MES02 Band 05 for 2017103 000025										
2017-04-13 00:00:38	None	None	None	None	0.0	89.0	FD	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
> Missing MES02 Band 03 for 2017103 000025 > Missing MES02 Band 05 for 2017103 000025										
2017-04-13 00:00:56	None	None	None	None	0.0	89.0	MES01	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
> Missing MES02 Band 03 for 2017103 000025 > Missing MES02 Band 05 for 2017103 000025										
2017-04-13 00:01:25	None	None	None	None	0.0	89.0	MES02	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
2017-04-13 00:01:56	None	None	None	None	0.0	89.0	MES01	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
2017-04-13 00:02:18	None	None	None	None	0.0	89.0	CONUS	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
> Missing CONUS Band 16 for 2017103 000218										
2017-04-13 00:02:29	None	None	None	None	0.0	89.0	MES02	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
> Missing CONUS Band 16 for 2017103 000218										
2017-04-13 00:02:56	None	None	None	None	0.0	89.0	MES01	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
> Missing CONUS Band 16 for 2017103 000218										
2017-04-13 00:03:26	None	None	None	None	0.0	89.0	MES02	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
2017-04-13 00:03:56	None	None	None	None	0.0	89.0	MES01	ABI	MODE3	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

2017-05-27 | Day 178 / 365 | 20:15:55 UTC | Tuesday, June 27th



Inventory

Search - SDS Inventory x Jerrold

Secure https://qcweb.ssec.wisc.edu/inventory_beta/#search&start_time:2017-04-13%2000:00...

SDS INVENTORY SEARCH CALENDAR CONTACT MCFETCH

April 13, 2017 / 100

DOWNLOAD / 0000-16

BANDS	LATITUDE	LONGITUDE	API KEY
1	45	90	
2			
3			
4			
5			
6			
7			

SIZE HORIZONTAL	SIZE VERTICAL	FORMAT
640	480	GIF

CUSTOM PARAMETERS	SCRIPT FORMAT
	WGET

DOWNLOAD SCRIPT

00:03:56 none none none none U.U. 00:00 MCDU1 API MCDU1 9 10 11 12 13 14 15 16 14:16:16

2017-05-27 | Day 178 / 365 | 20:17:38 UTC | Tuesday, June 27th



Inventory

```
COES16_d20170413h000026_d20170413t234556.sh
# No Selection

#!/bin/bash

#####
#
# Title : COES16_d20170413h000026_d20170413t234556.sh
# Description : This script will download the specified GOES-16 data from
# the MCFETCH API.
# Author : SSEC Satellite Data Services
# Date : 2017-04-27 20:17 UTC
# Usage : bash COES16_d20170413h000026_d20170413t234556.sh
# Notes : Run this script from the directory in which you want the data.
# This script must be made executable in order to run.
# On Linux and mac machines:
# chmod a+x COES16_d20170413h000026_d20170413t234556.sh
#
# For obtaining a free MCFETCH API key, please refer to the following link:
# https://mcfetch.ssec.wisc.edu/#register
#
# Search URL:
# https://ssec.ssec.wisc.edu/inventory\_beta/#search&start\_line:2017-04-13%2000:00:00&end\_line:2017-04-13%2023:59:59&satellite:GOES-16
#
# DISCLAIMERS: BY USING THIS SCRIPT, YOU WILL BE MAKING DATA REQUESTS TO THE
# MCFETCH SERVER THAT MAY IMPACT THE DATA QUOTA OF YOUR ACCOUNT. IF YOU EXCEED
# THIS QUOTA, YOUR ACCOUNT MAY BECOME LIMITED IN TERMS OF DATA REQUESTS AND
# YOU MIGHT LOSE THE ABILITY TO DOWNLOAD DATA FROM THIS SERVER.
#
# THIS SOFTWARE IS PROVIDED BY THE AUTHOR "AS IS" AND ANY EXPRESS OR IMPLIED
# WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF
# MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO
# EVENT SHALL THE AUTHOR BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
# SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO,
# PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS;
# OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY,
# WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
# OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF
# ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.
#
#####

KEY=""

HTTP="http://mcfetch.ssec.wisc.edu/cgi-bin/mcfetch?key=${KEY}&satellite=GOES16&output=GT&lat=43+90&size=400+600"

COMMANDS=(
"date=20170413&time=00:00:26&band=2"
"date=20170413&time=00:00:26&band=4"
"date=20170413&time=00:00:38&band=2"
"date=20170413&time=00:00:38&band=4"
"date=20170413&time=00:00:56&band=2"
"date=20170413&time=00:00:56&band=4"
"date=20170413&time=00:01:26&band=2"
"date=20170413&time=00:01:26&band=4"
"date=20170413&time=00:01:56&band=2"
"date=20170413&time=00:01:56&band=4"
"date=20170413&time=00:02:18&band=2"
"date=20170413&time=00:02:18&band=4"
"date=20170413&time=00:02:26&band=2"
"date=20170413&time=00:02:26&band=4"
"date=20170413&time=00:02:56&band=2"
"date=20170413&time=00:02:56&band=4"
"date=20170413&time=00:03:26&band=2"
"date=20170413&time=00:03:26&band=4"
"date=20170413&time=00:03:56&band=2"
"date=20170413&time=00:03:56&band=4"
"date=20170413&time=00:04:26&band=2"

```

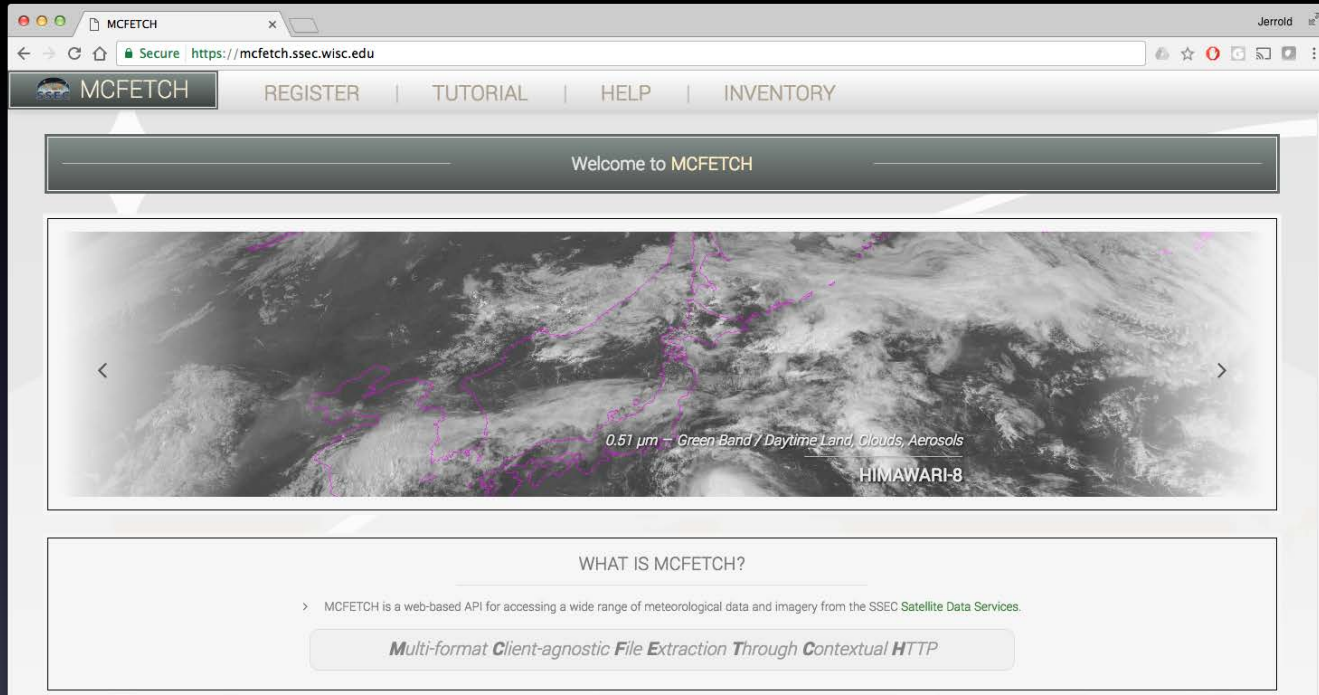


Inventory

http://qcweb.ssec.wisc.edu/inventory_beta/

<http://inventory.ssec.wisc.edu/inventory/>

McFETCH



McFETCH

Tutorial - McFETCh

Secure <https://mcfetch.ssec.wisc.edu/#tutorial>

McFETCh REGISTER TUTORIAL HELP INVENTORY

Welcome to the McFETCh Tutorial

1 2 3 4 5 6 7 8 9 10 11 12

LOCATION

- > To pick the location of the center point of your output data, you can specify the latitude and longitude.
- > Note: this is an optional parameter.
- > Even though the center point is described by two numbers, they are both under the "lat" parameter in the URL.
- > The format of the parameter is "lat=<latitude>+<longitude>".
 - Ex. <http://mcfetch.ssec.wisc.edu/cgi-bin/mcfetch?lat=12.2+68.48>
- > Note: when selecting a longitude, McFETCh uses west-positive longitudes.
- > To select a latitude and longitude for your command, fill in the following input fields or click on the map.

Enter a latitude here Enter a longitude here



<http://mcfetch.ssec.wisc.edu/cgi-bin/mcfetch?>

GO



McFETCH

- Free access to entire geostationary archive
- Limited to 1000 transactions/day
- 1 GB/day
- Data older than 180 days
- Output formats:

AREA

GEOTIF

netCDF

Flat Text

GIF

Flat Binary

JPG



McFETCH

Register for a free key at:

<https://mcfetch.ssec.wisc.edu>

End