SSEC Satellite Data Services
RabbitMQ Messaging System

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Space Science & Engineering Center
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Madison, WI

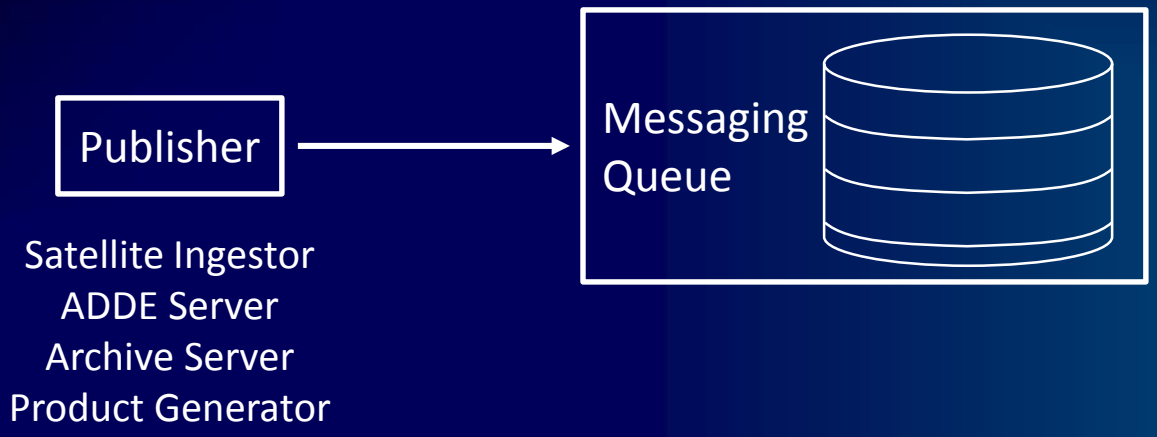

GOES-R Rebroadcast
(GRB)
Ground
Station
Antenna Electronics
Ingest System
Server
ADDE
NFS
SFTP/LDM

- What is RabbitMQ
- Benefits
- Satellite Data Services Paradigm
- Use Case

- What is RabbitMQ
  - Publisher

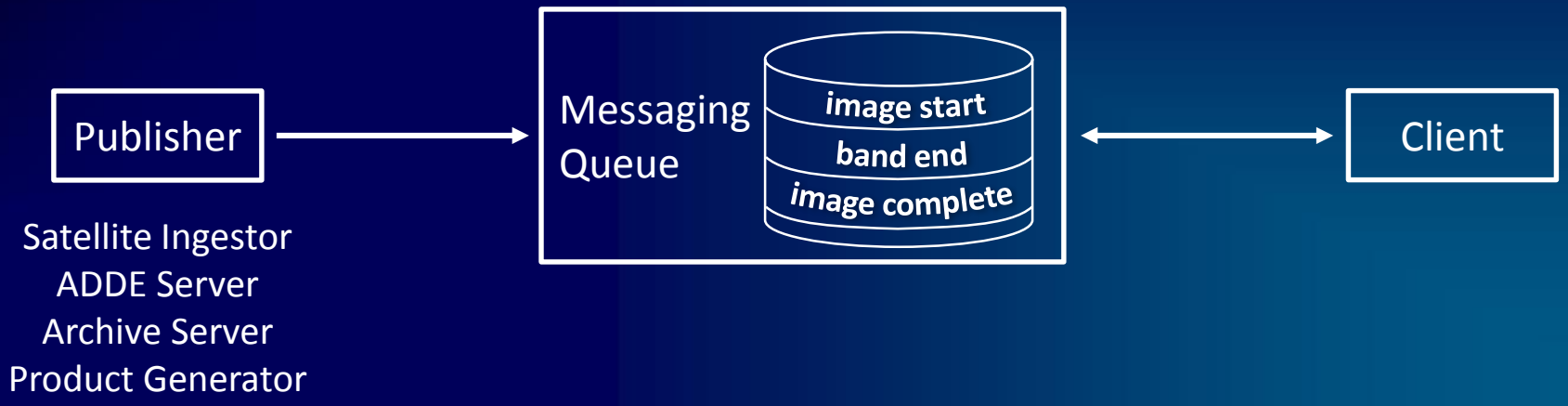
Satellite Ingestor
ADDE Server
Archive Server
Product Generator

- What is RabbitMQ
  - Publisher (currently ~200 msgs/minute)
  - Broker Message Queue

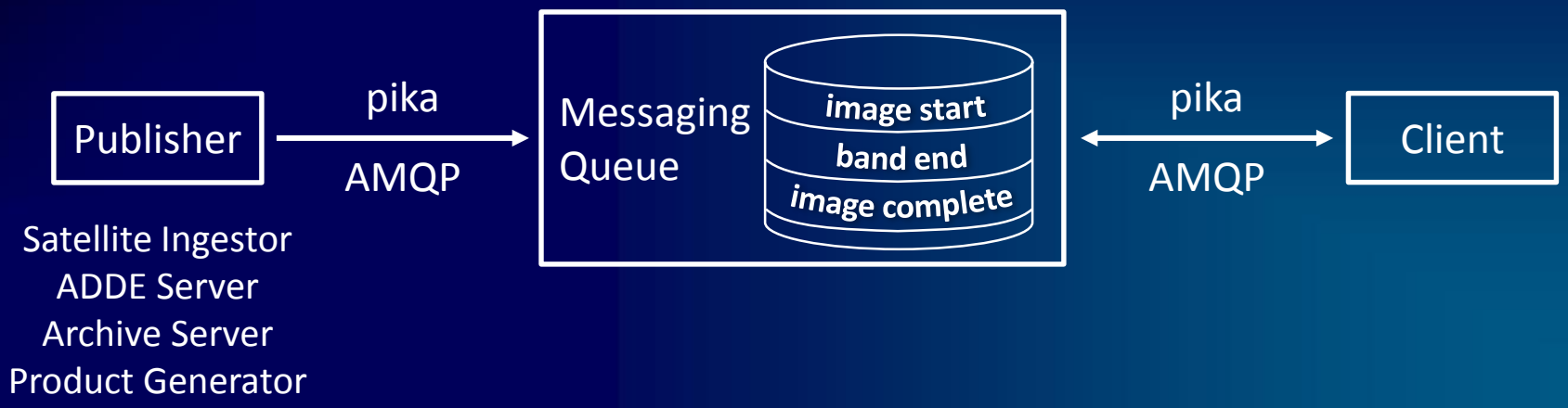


- What is RabbitMQ
  - Publisher (currently ~200 msgs/minute)
  - Message Queue – 'The Broker'
  - Client/Consumer

- What is RabbitMQ
  - Publisher (currently ~200 msgs/minute)
  - Message Queue
  - Client/Consumer
    - image start
    - band end
    - image complete

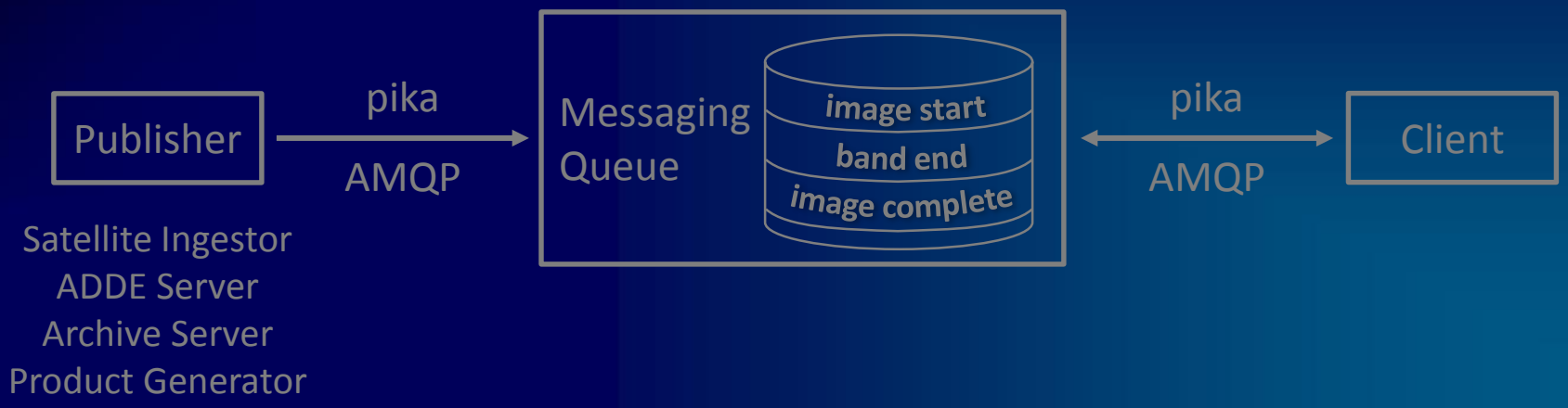


- What is RabbitMQ
  - Publisher (currently ~200 msgs/minute)
  - Message Queue
  - Client/Consumer
    - image start
    - band end
    - image complete
  - Advanced Message Queueing Protocol (AMQP)
  - Pika – python implementation of AMQP



- What is RabbitMQ
  - Publisher (currently ~200 msgs/minute)
    - Exchange / Topic
      - *satellite*
    - Topic Keys

sat_type.sat_family.sat_ID.sat_instrument.medium.server_type.format.classification.status



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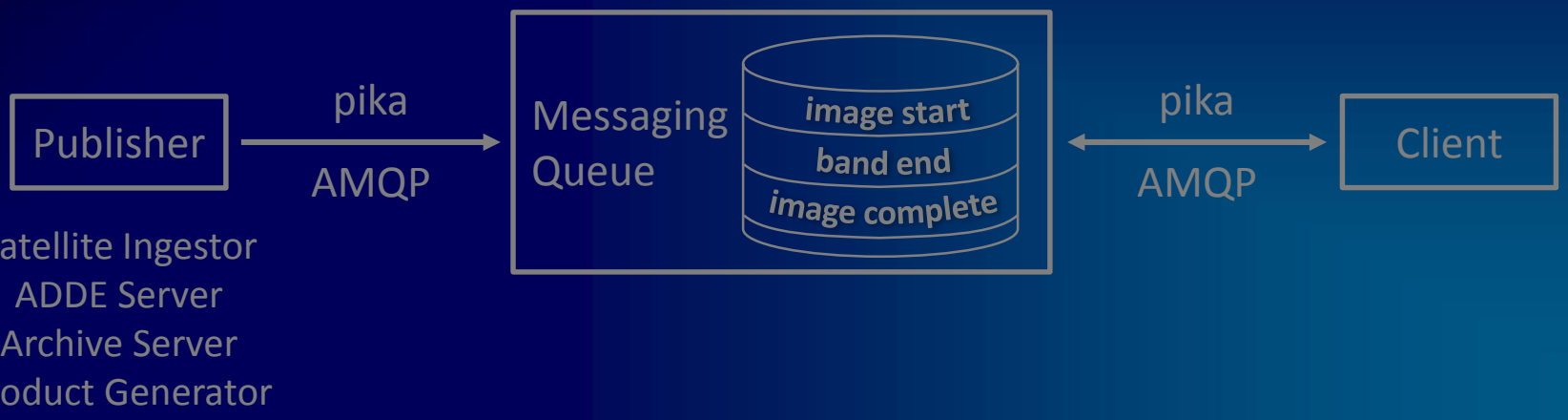
geo
leo



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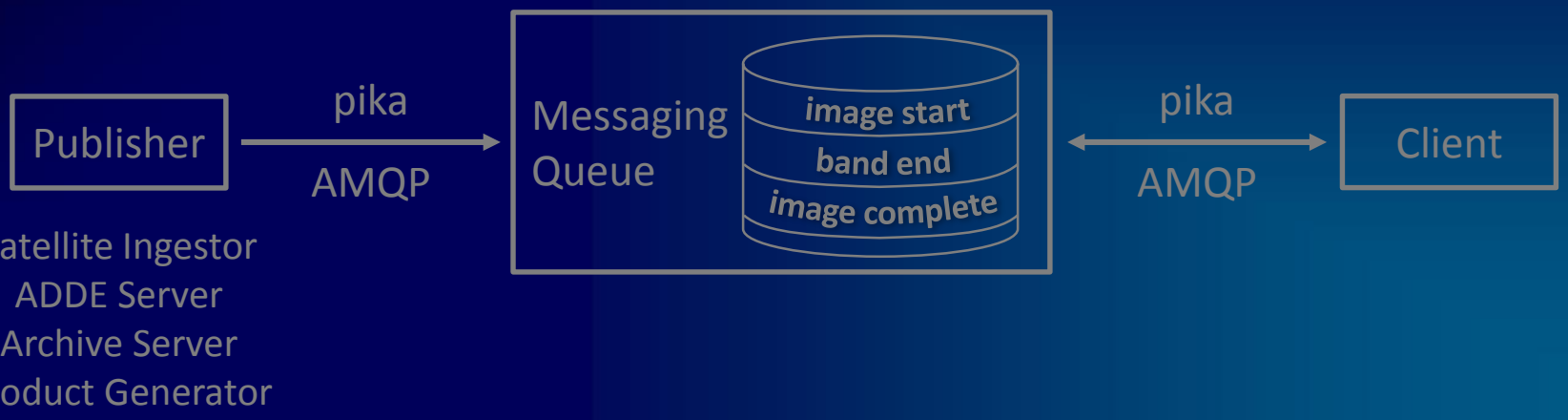
geo	goes
leo	himawari



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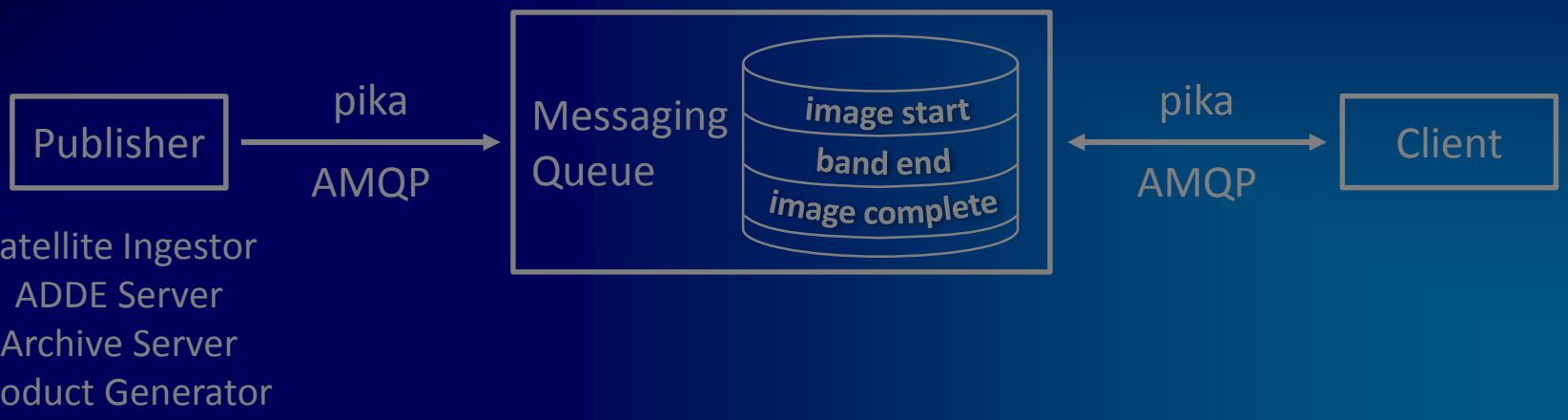
geo	goes	g16
leo	himawari	g17
		h8



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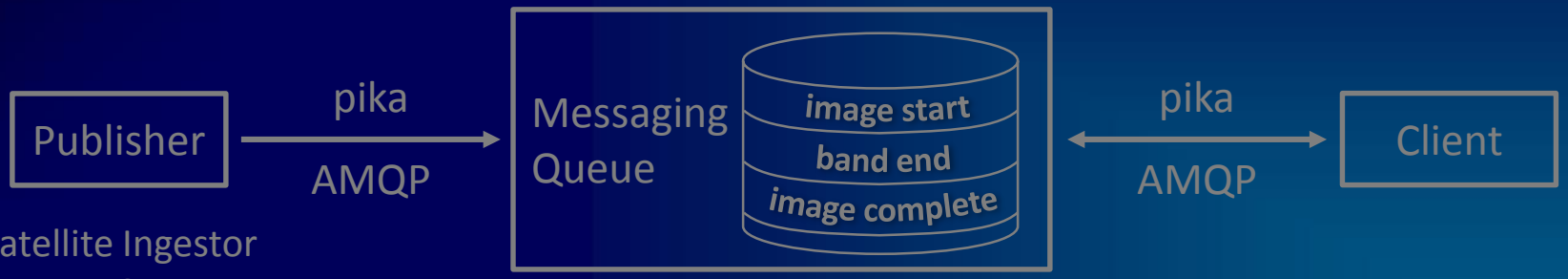
geo	goes	g16	abi
leo	himawari	g17	glm
		h8	exis
			magnetometer
			seiss
			suvi
			ahi



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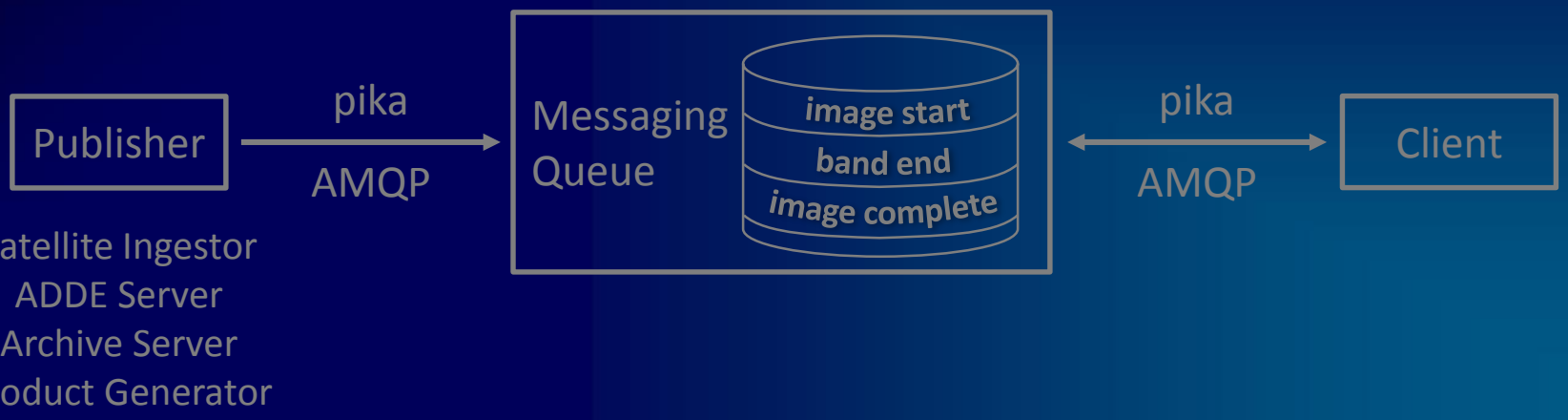
geo	goes	g16	abi	adde				
leo	himawari	g17	glm	file				
		h8	exis					
			magnetometer					
			seiss					
			suvi					
			ahi					



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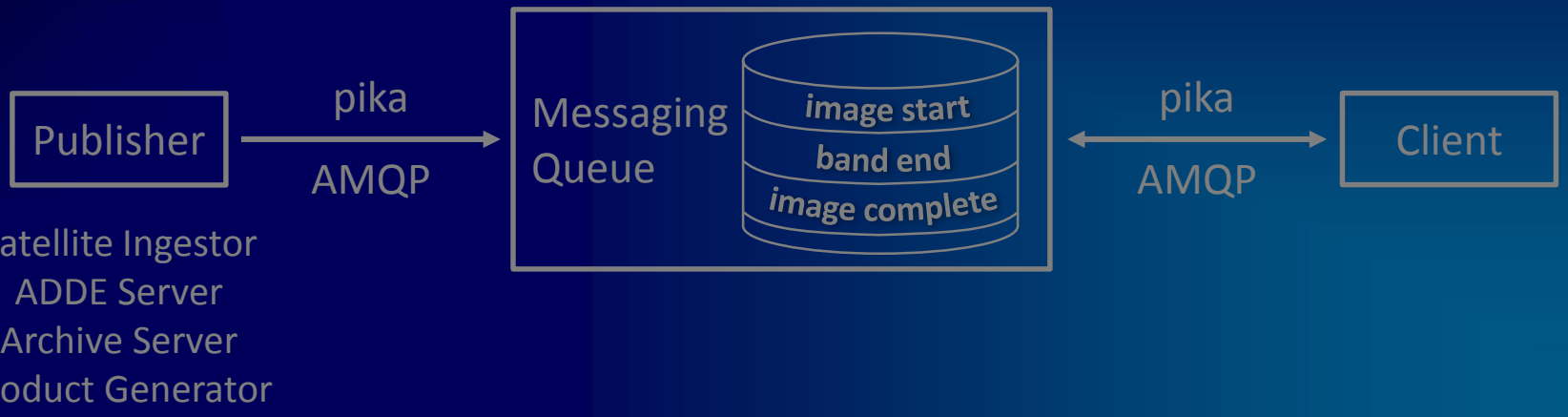
leo	himawari	g17	glm	file	adde
		h8	exis		
			magnetometer		
			seiss		
			suvi		
			ahi		



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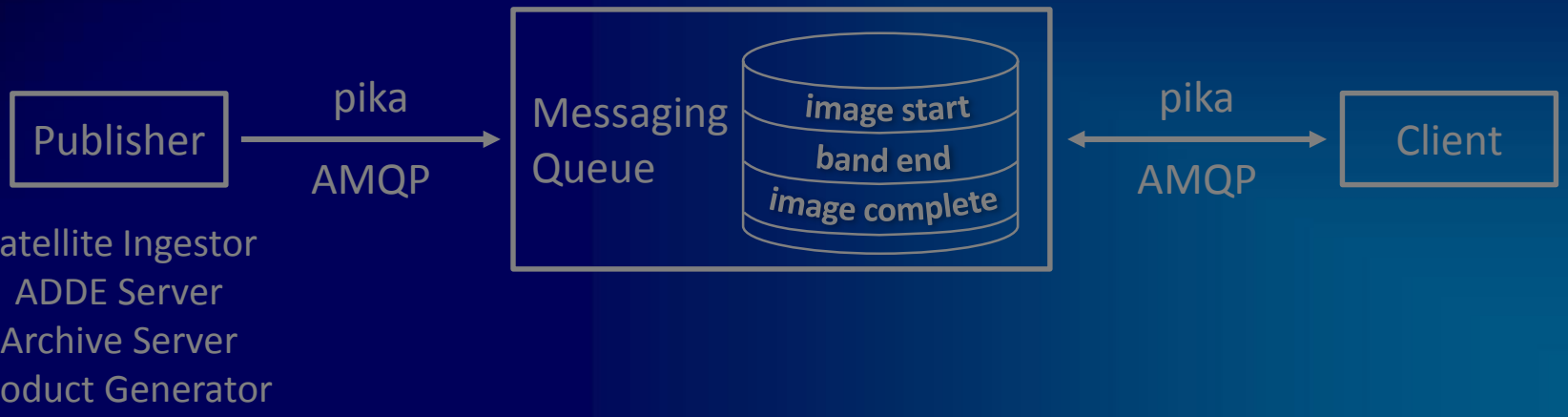
geo	goes	g16	abi	adde	sdi	ncdf
leo	himawari	g17	glm	file	adde	hsf
		h8	exis			
			magnetometer			
			seiss			
			suvi			
			ahi			



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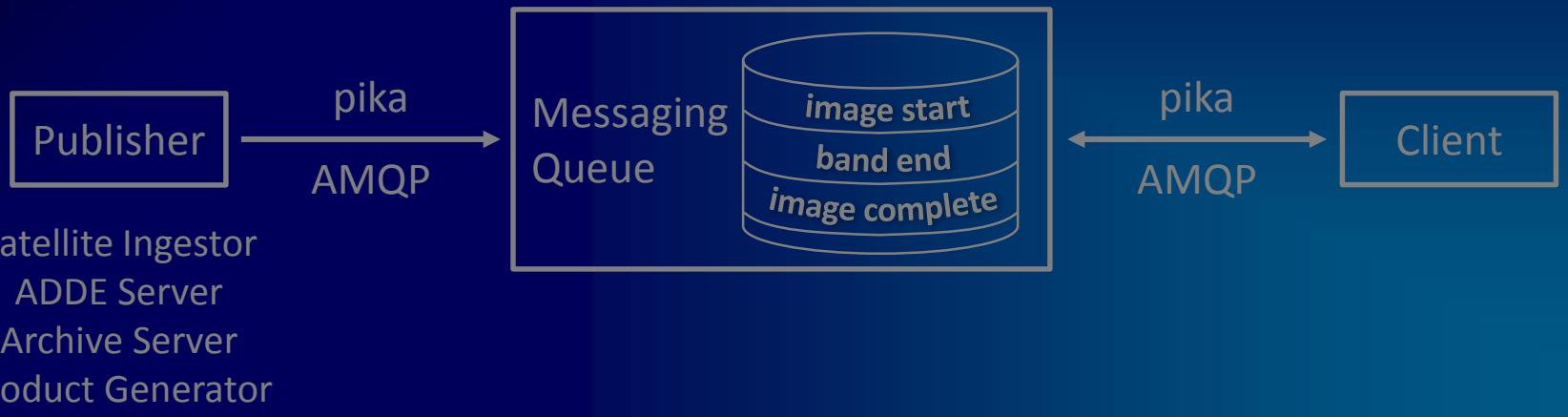
geo	goes	g16	abi	adde	sdi	ncdf	band
leo	himawari	g17	glm	file	adde	hsf	image
		h8	exis				product
			magnetometer				granule
			seiss				
			suvi				
			ahi				



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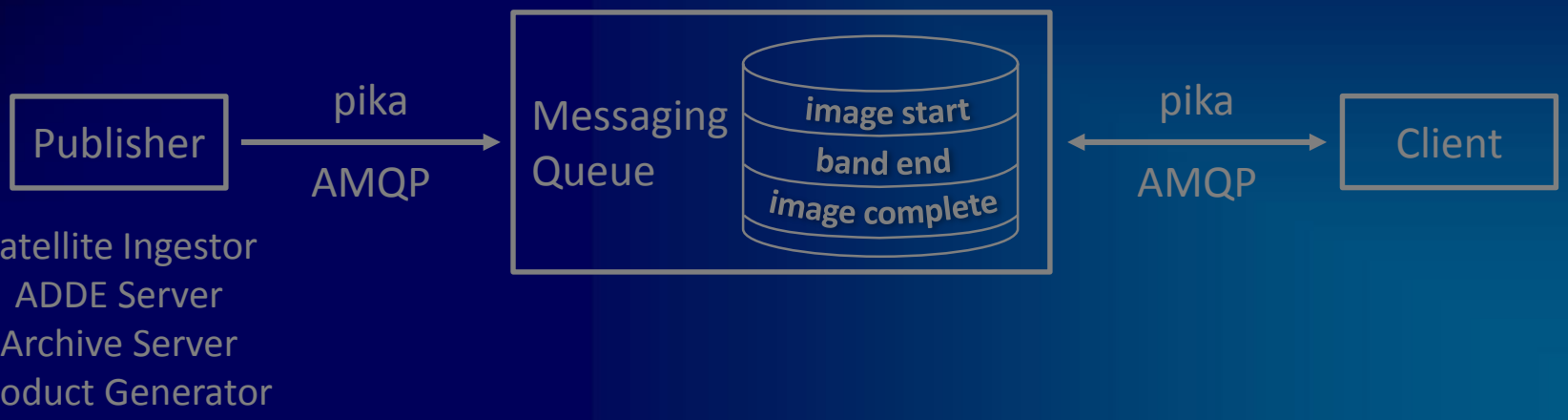
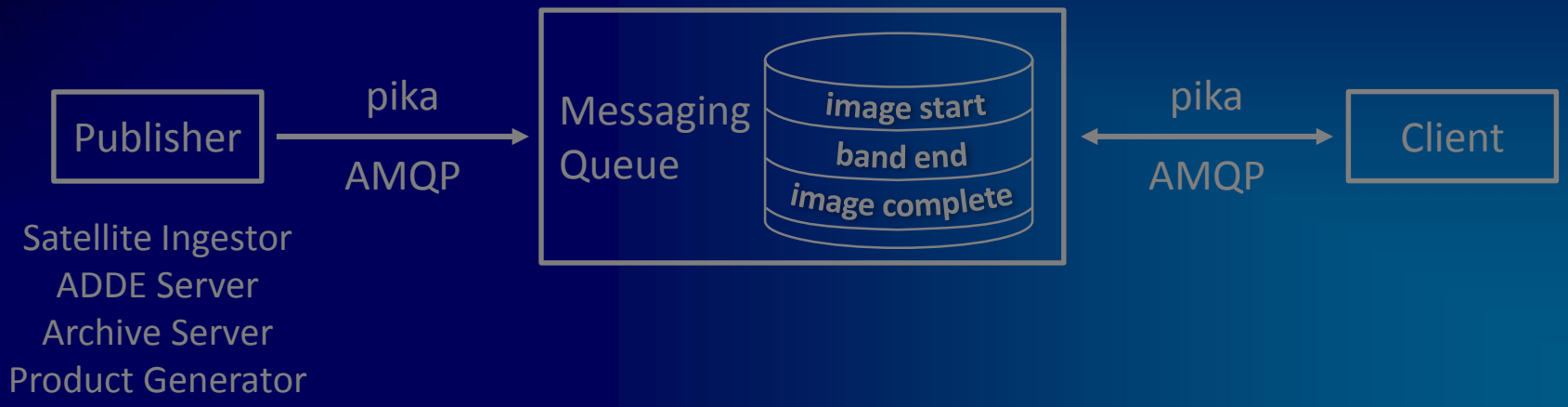
geo	goes	g16	abi	adde	sdi	ncdf	band	start
leo	himawari	g17	glm	file	adde	hsf	image	end
		h8	exis				product	complete
			magnetometer				granule	
			seiss					
			suvi					
			ahi					



- What is RabbitMQ
  - Publisher
    - Exchange / Topic
      - *satellite*
    - Topic Keys
    - Body/Payload

satellite_family:	GOES	satellite_location:	GOES-East	coverage:	Mesoscale-1
satellite_ID:	G16	start_time:	2018-04-30 19:52:29.2	mode:	3
instrument:	ABI	end_time:	2018-04-30 19:52:35.0	signal_type:	grb
medium:	adde	create_time:	2018-04-30 19:52:39.3	data_type:	RadM1
server_type:	sdi	server_ip:	satbuf1.ssec.wisc.edu	title:	ABI L1b Radiances
message_type:	band	adde_dataset:	EASTA/M1		
status:	end	band:	3		

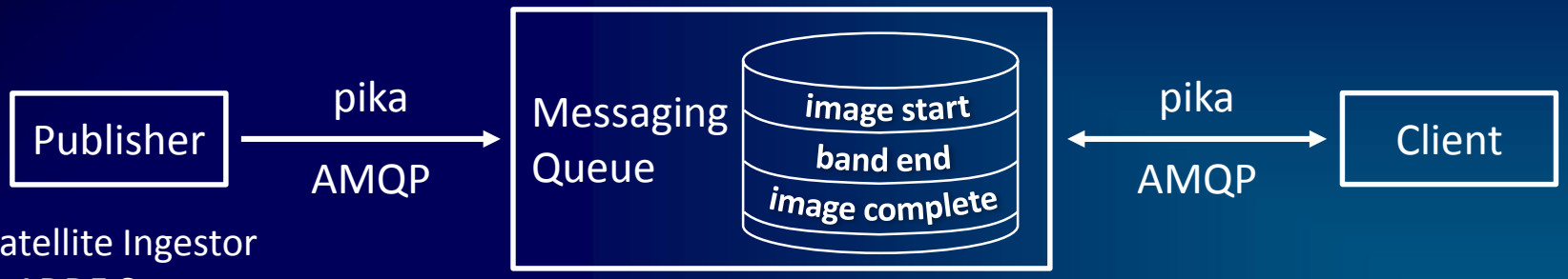
path: /data/goes/grb/goes16/2018/2018_04_30_120/abi/L1b/RadM1/
OR_ABI-L1b-RadM1-M3C03_G16_s20181201952292_e20181201952350_c20181201952393.nc



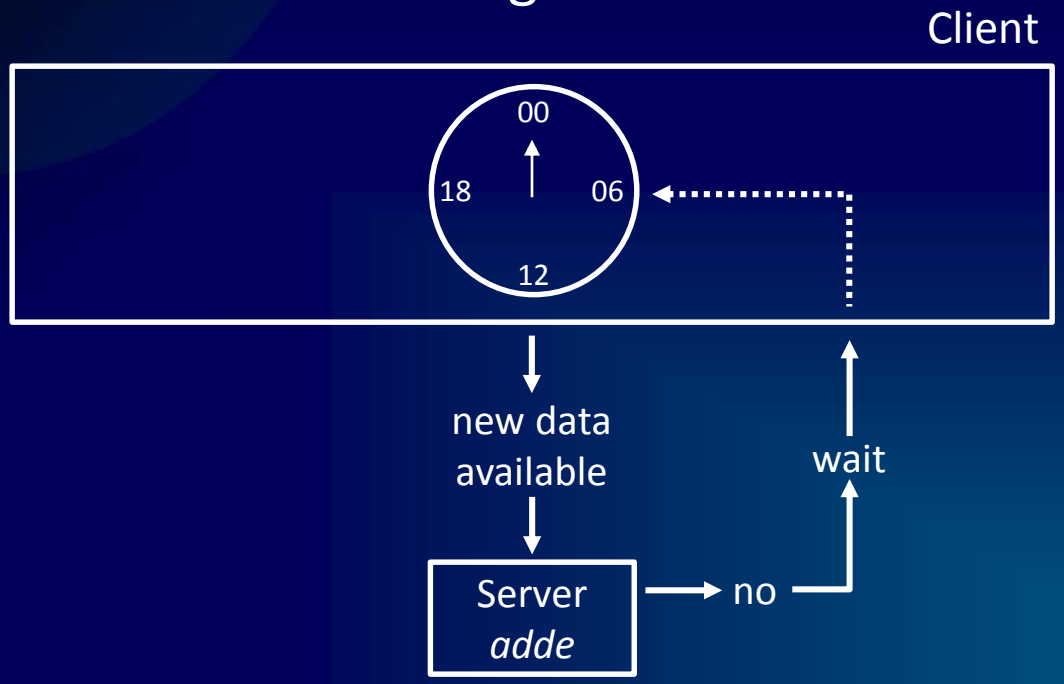
- What is RabbitMQ
  - Client
    - Exchange / Topic
    - Subscribe to Keys
    - amqpfind *http://www.ssec.wisc.edu/datacenter/amqpfind/*

sat_type.sat_family.sat_ID.sat_instrument.medium.server_type.format.classification.status

geo.goes.g16.abi.adde.sdi.ncdf.band.end



- RabbitMQ Benefits
  - Avoid multiple data request
    - cron
  - Immediate Access to data
    - adde
    - https
  - No need for e-mail messages



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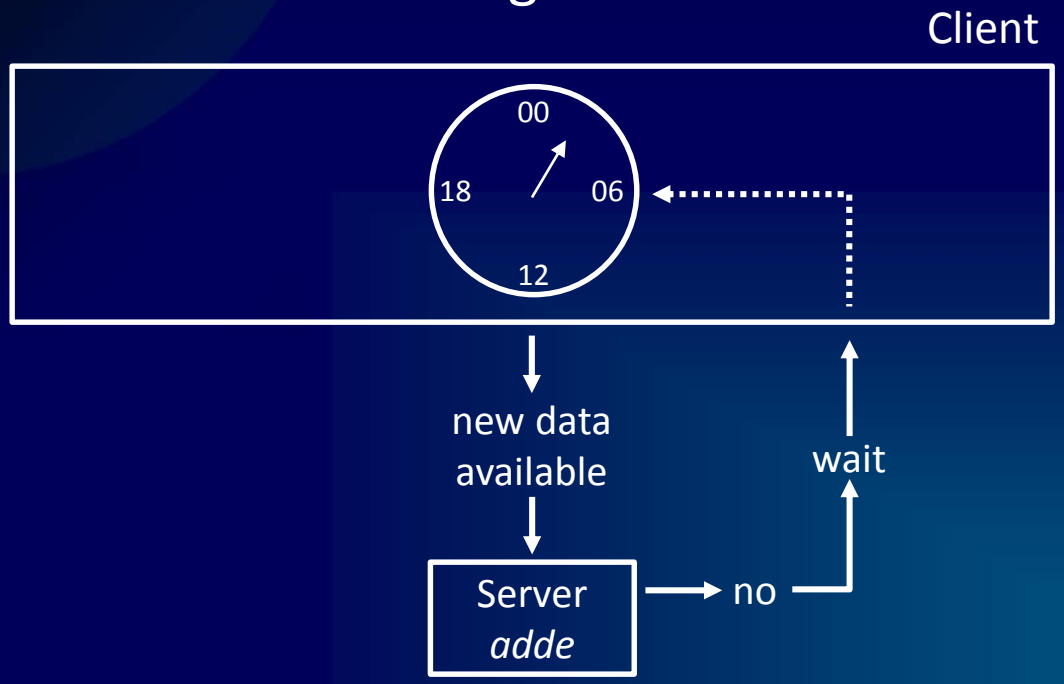

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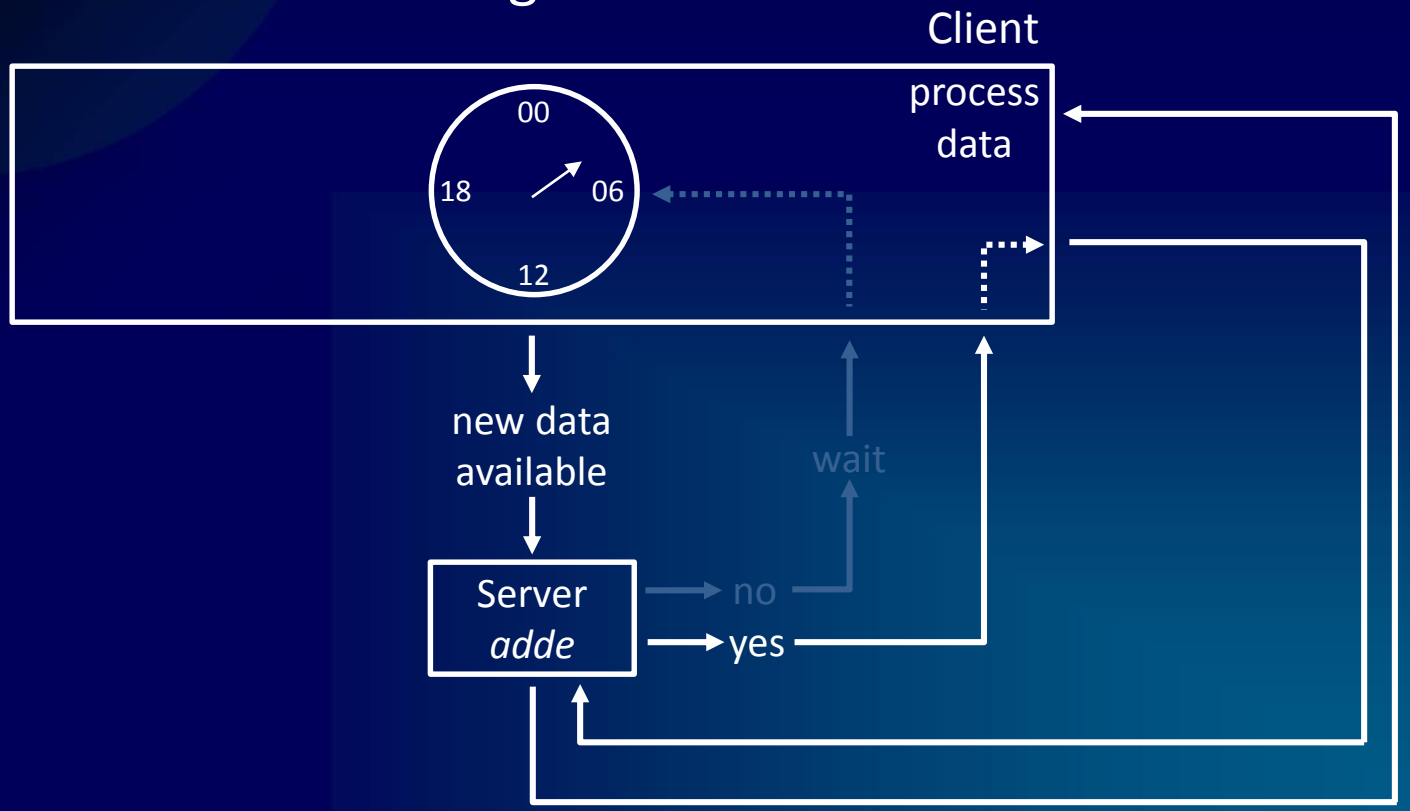

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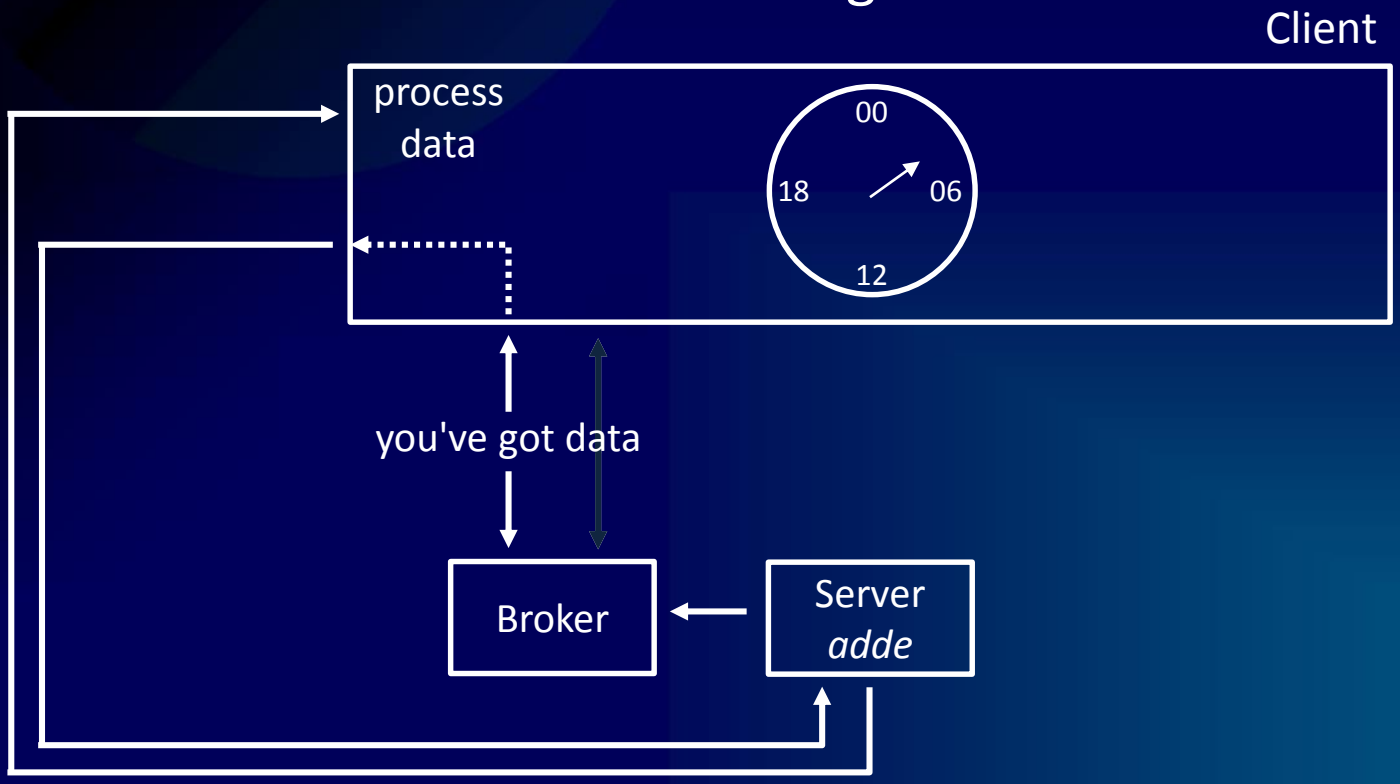
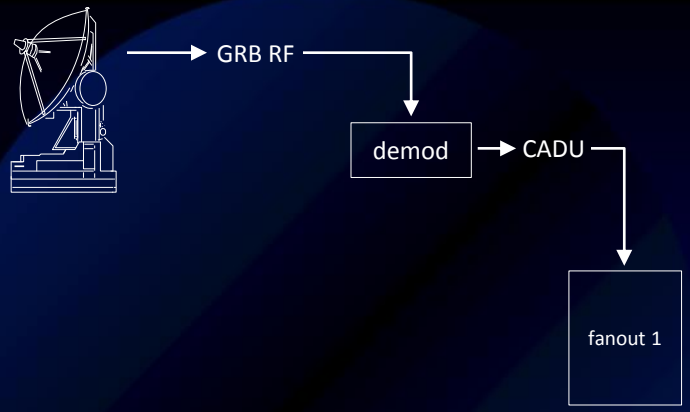
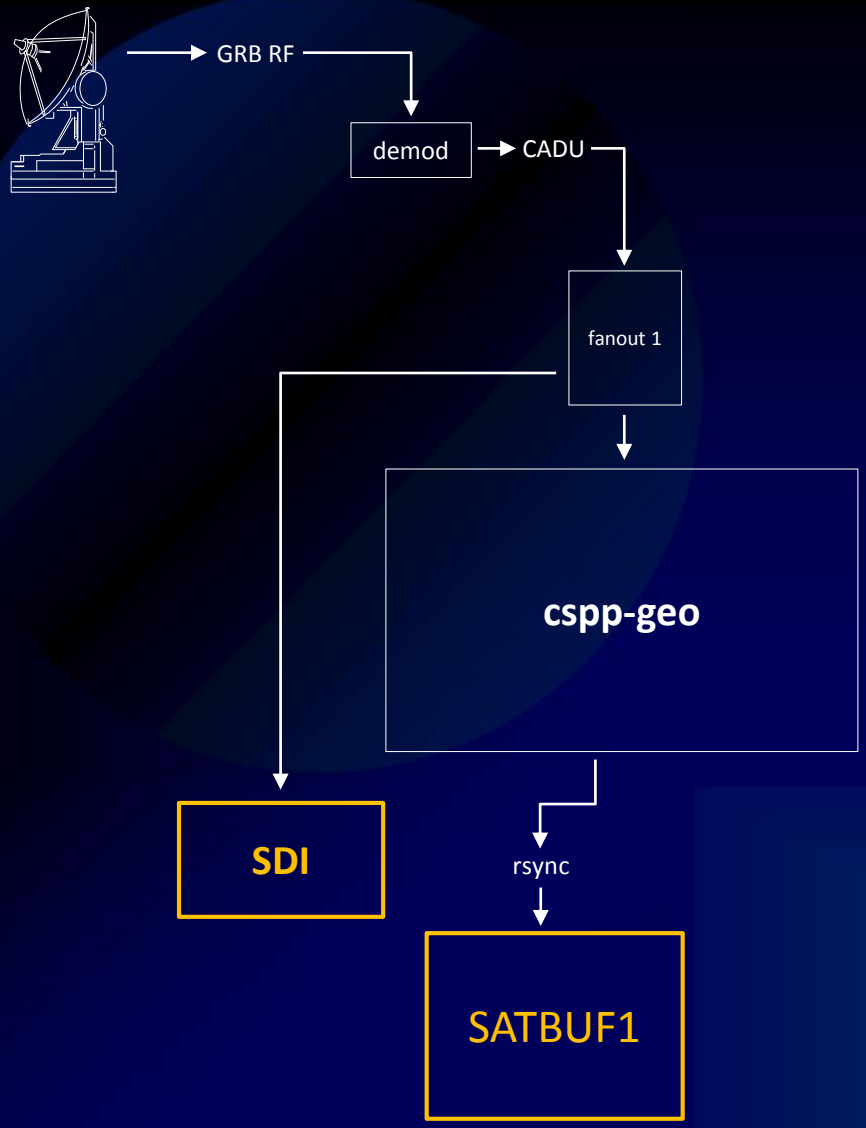


Satellite Data Service
GOES-16 Data Flow



Satellite Data Services
GOES-16 Data Flow



Satellite Data Services
GOES-16 Data Flow

GRB RF

demod

CADU

fanout 1

cspp-geo

SDI

publish messages

mq1 RabbitMQ server

rsync

rsync

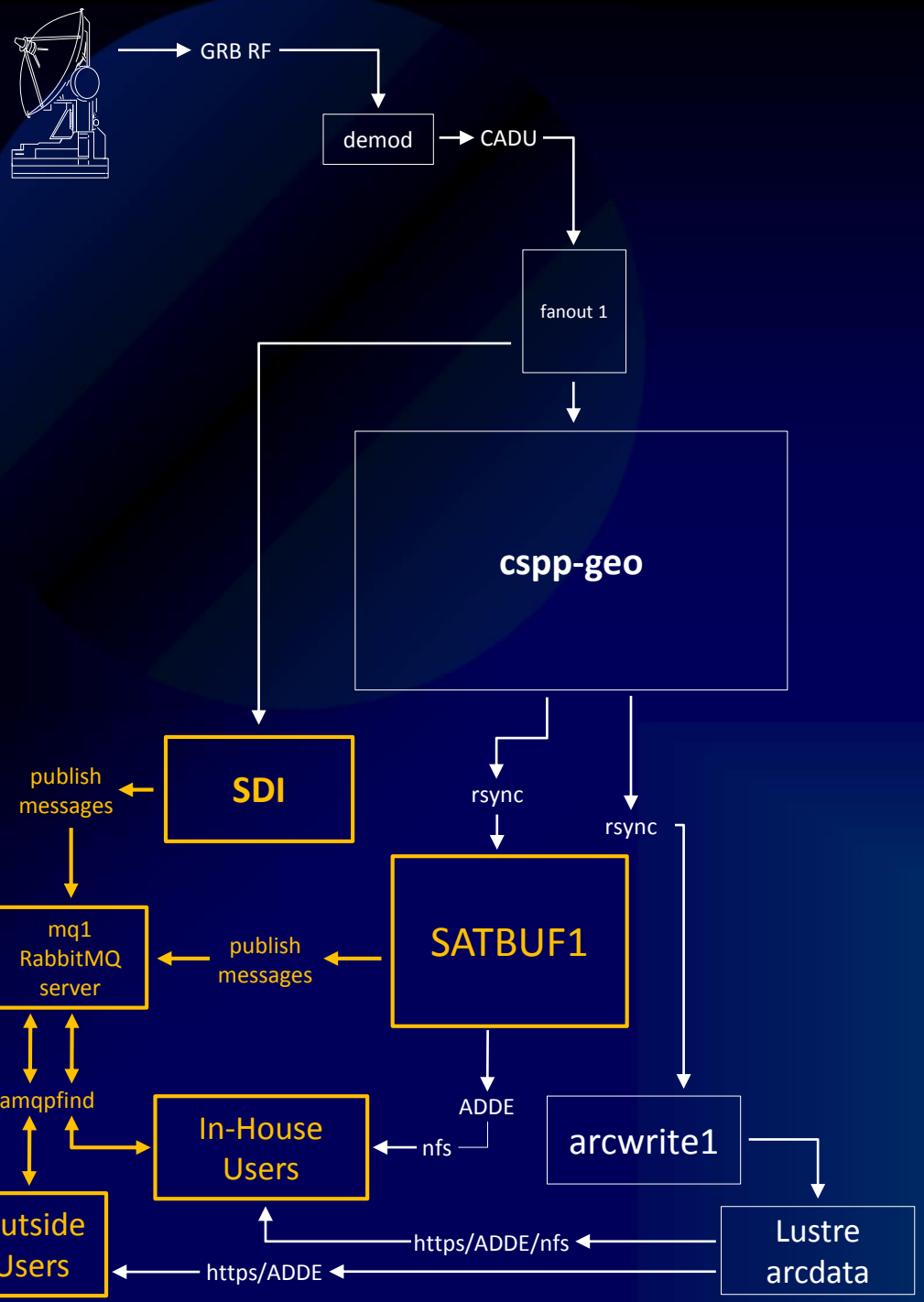
SATBUF1

publish messages

arcwrite1

Lustre arcdata

Satellite Data Services
GOES-16 Data Flow



Satellite Data Services
GOES-16 Data Flow

GRB RF

demod

demod

CADU

Amazon

CADU

fanout 1

fanout 2

rsync/nfs

rsync/nfs

GRBDELTA

cspp-geo

dbINGE

score

GRBGAMMA

cspp-geo

dbINGE

score

csppalpha
GEOCAT/AIT
Level 2+
Products

csppbeta
GEOCAT/AIT
Level 2+
Products

publish
messages

SDI
sdigrbbeta

rsync

rsync

rsync

Lustre
AWG

rsync

rsync

rsync

SDI
sdigrbbeta

publish
messages

nfs

Lustre
Users

SATBUF1

SATBUF2

mq1
RabbitMQ
server

publish
messages

publish
messages

mq2
RabbitMQ
server

amqpfind

ADDE

nfs

In-House
Users

arcwrite1

arcwrite2

ADDE

nfs

In-House
Users

amqpfind

Outside
Users

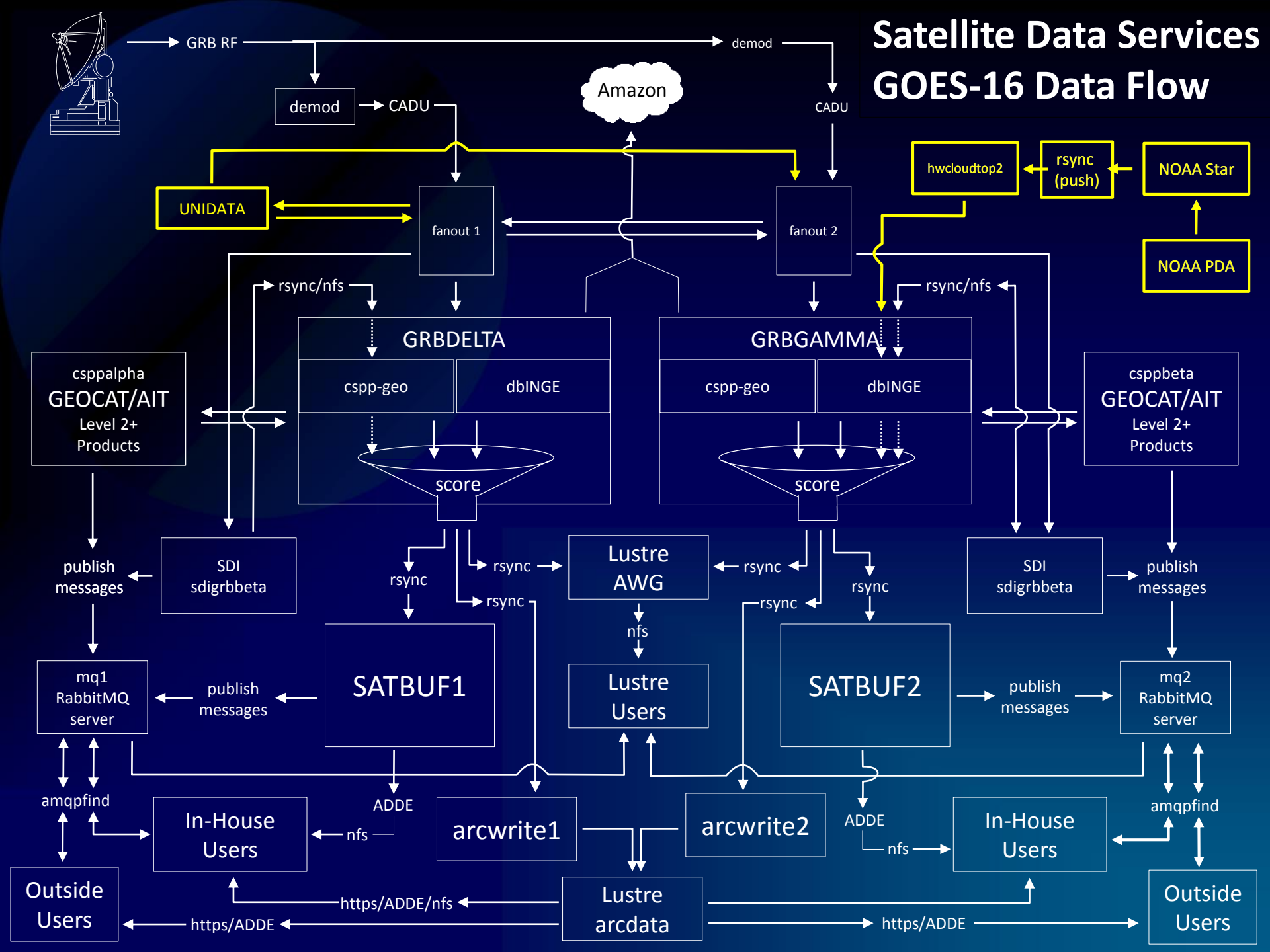
https/ADDE/nfs

https/ADDE

Lustre
arcdata

https/ADDE

Outside
Users


Satellite Data Services
GOES-16 Data Flow
GRB RF
demod
demod
CADU
Amazon
CADU
hwcloudtop2
rsync (push)
NOAA Star
NOAA PDA
UNIDATA
fanout 1
fanout 2
rsync/nfs
rsync/nfs
GRBDELTA
GRBGAMMA
csppalpha GEOCAT/AIT Level 2+ Products
cspp-geo
dbINGE
cspp-geo
dbINGE
csppbeta GEOCAT/AIT Level 2+ Products
score
score
publish messages
SDI sdigrbbeta
rsync
rsync
rsync
Lustre AWG
rsync
rsync
rsync
SDI sdigrbbeta
publish messages
nfs
mq1 RabbitMQ server
publish messages
SATBUF1
Lustre Users
SATBUF2
publish messages
mq2 RabbitMQ server
amqpfind
ADDE
ADDE
amqpfind
In-House Users
nfs
arcwrite1
arcwrite2
nfs
In-House Users
Outside Users
https/ADDE/nfs
Lustre arcdata
Outside Users
https/ADDE
https/ADDE

Satellite Data Services
GOES-16 Data Flow

GRB RF

demod

demod

CADU

Amazon

CADU

hwcloudtop2

rsync (push)

NOAA Star

NOAA PDA

UNIDATA

fanout 1

fanout 2

rsync/nfs

rsync/nfs

GRBDELTA

cspp-geo

dbINGE

score

GRBGAMMA

cspp-geo

dbINGE

score

csppalpha
GEOCAT/AIT
Level 2+
Products

csppbeta
GEOCAT/AIT
Level 2+
Products

publish messages

SDI
sdigrbbeta

rsync

rsync

rsync

Lustre
AWG

rsync

rsync

rsync

SDI
sdigrbbeta

publish messages

nfs

mq1
RabbitMQ
server

publish messages

SATBUF1

Lustre
Users

SATBUF2

publish

mq2
RabbitMQ
server

amqpfind

In-House
Users

ADDE

nfs

arcwrite1

arcwrite2

ADDE

nfs

In-House
Users

amqpfind

Outside
Users

https/ADDE

https/ADDE/nfs

Lustre
arcdata

https/ADDE

Outside
Users

Single Server

```
./amqpfind    -H mq2.ssec.wisc.edu -u sdsuser -p sdsmq \
              -X satellite \
              -C 'geo.goes.*.*.*.*.*.*.*' \
              -j '{start_time} {coverage} {instrument} {message_type} {status}'
```

Multi-Server

```
./amqpfind    -H mq2.ssec.wisc.edu -u sdsuser -p sdsmq \
              -H mq1.ssec.wisc.edu -u sdsuser -p sdsmq \
              -X satellite \
              -w 60.0 \
              -C 'geo.goes.*.*.*.*.*.*.*' \
              -j '{start_time} {coverage} {instrument} {message_type} {status}'
```

Wrapper Script

```
$HOME/amqpfind/amqpfind -X satellite  -C 'geo.goes.*.*.*.*.*.image.complete' \
        -H mq1.ssec.wisc.edu -p sdsmq -u sdsuser \
        -j '{start_time} {server_ip} {adde_dataset}'|\
        grep --line-buffered -i CONUS| \
        xargs -P1 –n4 python $HOME/bin/mc-example.py
```

mc-example.py

```
#! /usr/bin/python
def main(cmdArgs):
    import mcidasx
    import datetime
    imageDate = cmdArgs[1]
    imageTime = cmdArgs[2]
    server = cmdArgs[3]
    addeDataset = cmdArgs[4]
    group = addeDataset.split('/')[0]

    mcenv = mcidasx.mcenv(f=['3@750x1250'], i=228, g=8)

    mccmdout = mcenv.dataloc('ADD ' + group + ' ' + server)
    dateTimeStr = imageDate + ' ' + imageTime
    dateTimeObj = datetime.datetime.strptime(dateTimeStr,'%Y-%m-%d %H:%M:%S.%f')
    dateTimeKeyword = dateTimeObj.strftime(' DAY=%Y%j TIME=%H:%M:%S ')
    mcCmd = ' USER 1234'
    mcCmdOut = mcenv.logon(mcCmd)
    mcCmd = addeDataset + dateTimeKeyword + ' BAND=13'
    mcCmdOut = mcenv.imgdisp(mcCmd)
    mcCmd = ' X current-G16-band13.gif'
    mcCmdOut = mcenv.frmsave(mcCmd)

if __name__ == '__main__':
    import sys
    main(sys.argv)
```

Thank You!

Questions?