Use of MARS at CMA

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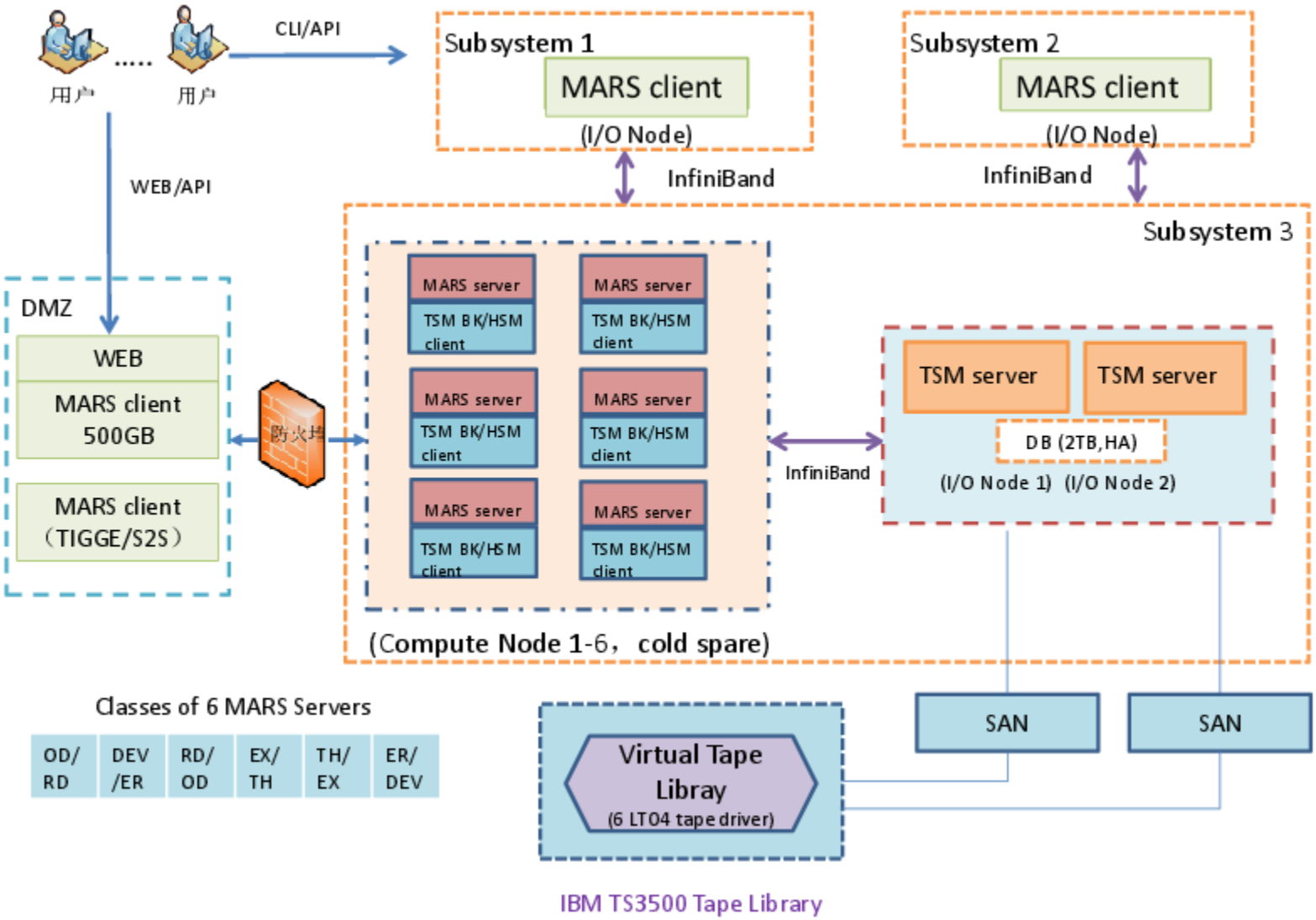
Outline

- MARS Configuration
- MARS content & statistics
- Data design & setting
- Future Plans

Architecture



MARS Installation

- Server(AIX 7) only 32bit
  - mars_server_grib_api.20070704(tailed version for TIGGE)
  - GRIB_API-1.12.3
  - EMOSlib-00392
  - TSM 6.2
- Client(AIX7/Linux)
  - mars_client_grib_api.20110523

Hardware

- Server(6)
  - IBM P460 P7, 3.55GHz, 32CPU 256GB, 320TB(GPFS)
- Client(~10)
  - IBM HPC(p460)
  - Linux/Virtual Linux server on CMA's Cloud Platform (Intel Xeon(R) CPU E7-4850 v2 10cores@ 2.30GHz 4GB/core)
- Tape
  - IBM TS3500 tape library
  - LTO4 tape drives
  - 2 IBM P740(TSM server) P7 3.55GHz 16CPU 64GB(lpar)

Online Disk

- Disk 360TB
  - 3X10TB prearc(each except OD server 3X20TB)
  - 1TB metadb, 1TB backupdb(each)
  - 20TB cache, 20TB lock, 20TB defrag, 10TB log， 10TB txn shared
  - TH server: dependent 2x10TB cache, 2x10TB locked, 10TB defrag

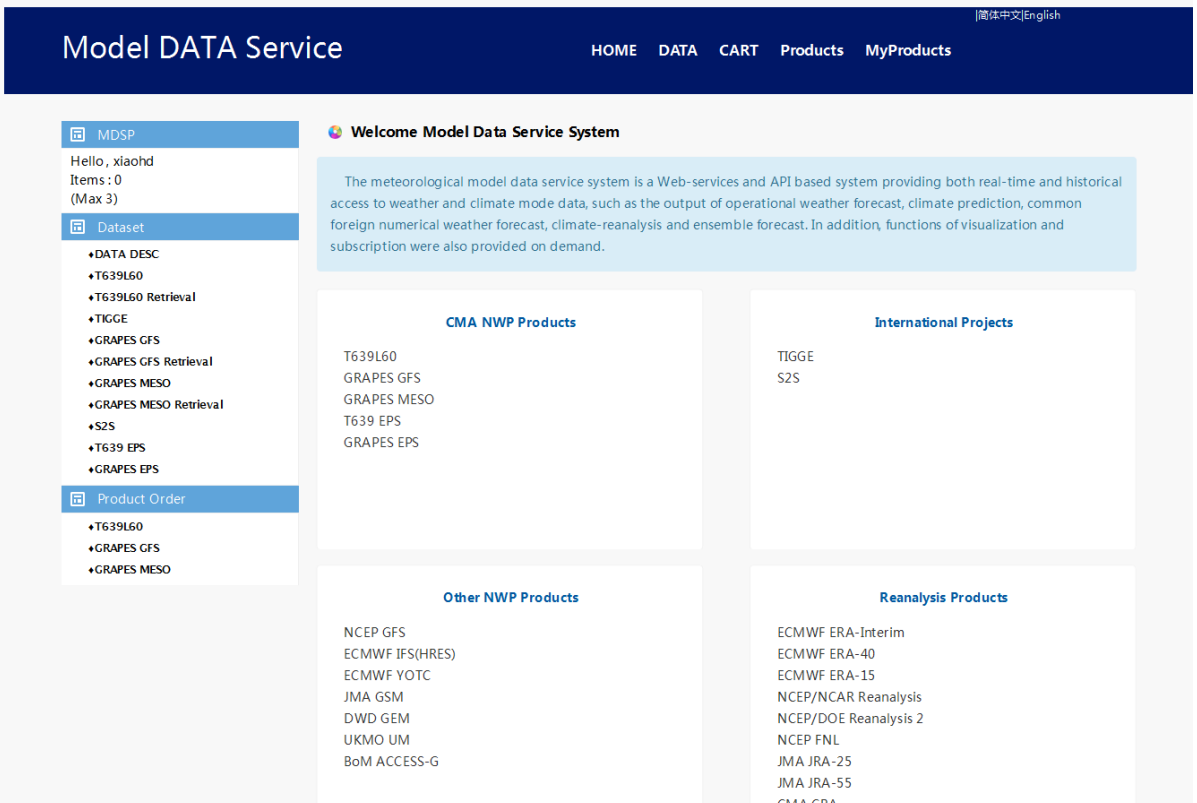
Archived data

Class	Model	Date range	Amount(TB)		Daily increased amount(GB)
			Disk	tape	
OD	T639L60	2008.11-	61.3	21.2	23.5
	GRAPES_GFS	2014.10-			1.9
	GRAPES_MESO	2014.12- 2014.7- 2014.9			16.9
TH	TIGGE	2014.7-	14.1	315.6	~500
	S2S	2014.1-	24.3		

Model	Top	Level Type	levels	Params	Fields	File Size(MB)	Files/Cycle
T639L60	10Pa	PL/SFC	36	54	445	232.3	55
GRAPES_GFS	10hPa	PL/SFC	17	16	112	23.5	41
GRAPES_MESO	10hPa	PL/SFC	17	50	551	74.8	21
TIGGE	hPa	PT/PV/PL/SL	9	39			
S2S	hPa	PL/SFC/PT	10	45			

Access method

- Command line based MARS Client
  - JOB-batch/interactive on HPC
  - Dedicated server
- Web portal
  - TIGGE/S2S/T639L60/GRAPES Web portal



Data design

- Fixed GRIB_API bugs: unable to represent variables of 1.5 hPa
- local definition
  - local.38.def
  - local.38.0.def
  - local.38.1.def
  - mars_labeling.38.def
  - ls_labeling.38.def
  - grib2LocalSectionNumber.38.table
  - GRIB_DEFINITION_PATH

Local definition(1)

- Add “model” keyword to distinguish different model output data in the same class
  - codetable[2] marsModel "mars/babj/model.table" : dump,lowercase,string_type;
- Explicit define “domain” keyword
  - codetable[2] marsDomain "mars/babj/domain.table" : dump,lowercase ;
- Operation products setting(production_0.def)
  - Association between “type”, “typeOfProcessedData”
  - Association between “stream” and “typeOfProcessedData”

Local definition(2)

- Change “expver” keyword to express horizontal resolution and domain
  - T639L60: H30G
  - GRAPES_GFS: H55G
  - GRAPES_MESO: H15R
- Change Cloud Base Level to Surface Level(4.5.table)
  - LocalDir/tables/4/4.5.table
- Add local definition for parameters
  - LocalDir/localConcepts/babj/name.def
  - paramId.def/shortName.def/units.def

Parameter definition

Example

- paramID.def
  - #Surface Vapor Flux
  - '3801224' = {
  - discipline = 0 ;
  - parameterCategory = 1 ;
  - parameterNumber = 224 ;
  - typeOfFirstFixedSurface = 1;
  - }
- Name.def
  - #Surface Vapor Flux
  - 'Surface Vapor Flux'= {
  - discipline = 0 ;
  - parameterCategory = 1 ;
  - parameterNumber = 224 ;
  - typeOfFirstFixedSurface = 1;
  - }
- shortName.def
  - #Surface Vapor Flux
  - 'qfx' = {
  - discipline = 0 ;
  - parameterCategory = 1 ;
  - parameterNumber = 224 ;
  - typeOfFirstFixedSurface = 1;
  - }
- Units.def
  - #Surface Vapor Flux
  - 'W m**-2' = {
  - discipline = 0 ;
  - parameterCategory = 1 ;
  - parameterNumber = 224 ;
  - typeOfFirstFixedSurface = 1;
  - }

MARS setting

- mars.def(client)
  - parameter
    - Surface Vapor Flux; qfx;3801224
  - model
    - GRAPES ; GRP
    - GRAPES_MESO ; GRPM
    - T639L60 ; T639
- buildRules(server)
  - cluster $model$
  - PSimpleNode<PString>(model)
  - node PSimpleNode<PString>(expver)

Example(1)

- Tools
  - addLocSec：add local definition to GRIB2 data
  - grib2request2/splitgrib2:add “expect” to creat request
- Original analysis
  - grib2request -1 –f gmf.639.2016022812120.grb2
  - GRIB,
  - DATE = 20160228,
  - TIME = 1200,
  - STEP = 120,
  - LEVTYPE = PL/SFC/2,
  - LEVELIST = 0.1/0.2/0.5/1/1.5/2/3/4/5/7/10/20/30/50/70/100/150/200/250/300/350/400/450/500/550/600/650/700/750/800/850/900/925/950/975/1000/0,
  - PARAM = 156/130/131/132/135/138/155/133/157/165/166/167/260074/134/3063/260009/0/3015/3016/146/147/176/177/3099/3066/228002/172/3017/3014/260121
  - grib2request2 - INFO - 20160229.003601 - Decoded 445 GRIB messages
  - grib2request2 - INFO - 20160229.003601 - Request time: wall: 2 sec cpu: 1 sec
  - grib2request2 - INFO - 20160229.003601 - Memory used: 9.37 Mbyte(s)

Example(2)

- Add local definition
  - export GRIB_DEFINITION_PATH=LocalDir/local/definitions:$GRIB_API/share/grib_api/definitions
  - addLocSec –l 38 –n 1 –c ‘OD’ –m ‘T639’ –e ‘H30G’ –d ‘G’ –p ‘.grb2’ gmf.639.2016022812120.grb2
    - setLocalDefinition=38
    - localDefinitionNumber=1
    - class=OD
    - model=T639
    - expver=H30G
    - domain=G
    - postfix=.grb2
    - INFO: input grib file: gmf.639.2016022812120.grb2
    - output grib file: gmf.639.2016022812120_new.grb2

Example(3)

- grib2request2 -1 –f gmf.639.2016022812120_new.grb2
- GRIB,
- ORIGIN = BABJ,
- DATE = 20160228,
- TIME = 1200,
- CLASS = OD,
- EXPVER = H30G,
- MODEL = T639,
- DOMAIN = G,
- STEP = 120,
- LEVTYPE = PL/SFC,
- LEVELIST = 0.1/0.2/0.5/1/1.5/2/3/4/5/7/10/20/30/50/70/100/150/200/250/300/350/400/450/500/550/600/650/700/750/800/850/900/925/950/975/1000,
- PARAM = 156/130/131/132/135/138/155/133/157/165/166/167/500010/260074/134/500036/139/170/183/236/140/171/184/237/3063/260009/228228/186/187/188/164/3015/3016/146/147/176/177/3099/198/182/205/3066/228002/172/3017/3802225/3802226/3800224/3802224/3018/500234/3801225/3014/260121,
- TYPE = FC,
- STREAM = OPER,
- EXPECT = 445
- grib2request2 - INFO - 20160229.005952 - Decoded 445 GRIB messages
- grib2request2 - INFO - 20160229.005952 - Request time: wall: 2 sec cpu: 1 sec

Future

- Statistics
- Performance tuning
- Deploy distributed MARS
- More model output data
- WebAPI
- High availability?
- Retrieve data from offline tape?