CPTEC
Centro de Previsão de Tempo e Estudos Climáticos

MINISTÉRIO DA CIÊNCIA E TECNOLOGIA
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

The use of SMS at CPTEC's suites alongside the supercomputer's replacement

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About SMS

Reference:
http://www.ecmwf.int/publications/manuals/sms/

Acknowledgements

This presentation shows the work done by
Visualization Team, Implementation Team,
and many others from CPTEC that are developing
their suites using SMS.

ECMWF that has provided the SMS software and training course.

Motivation – Several products

CPTEC produces and provides in its webpage several products.

- Numerical weather and climate prediction
- Satellite images and satellite products
- Biomass burning detection products
- Air quality model, along others.

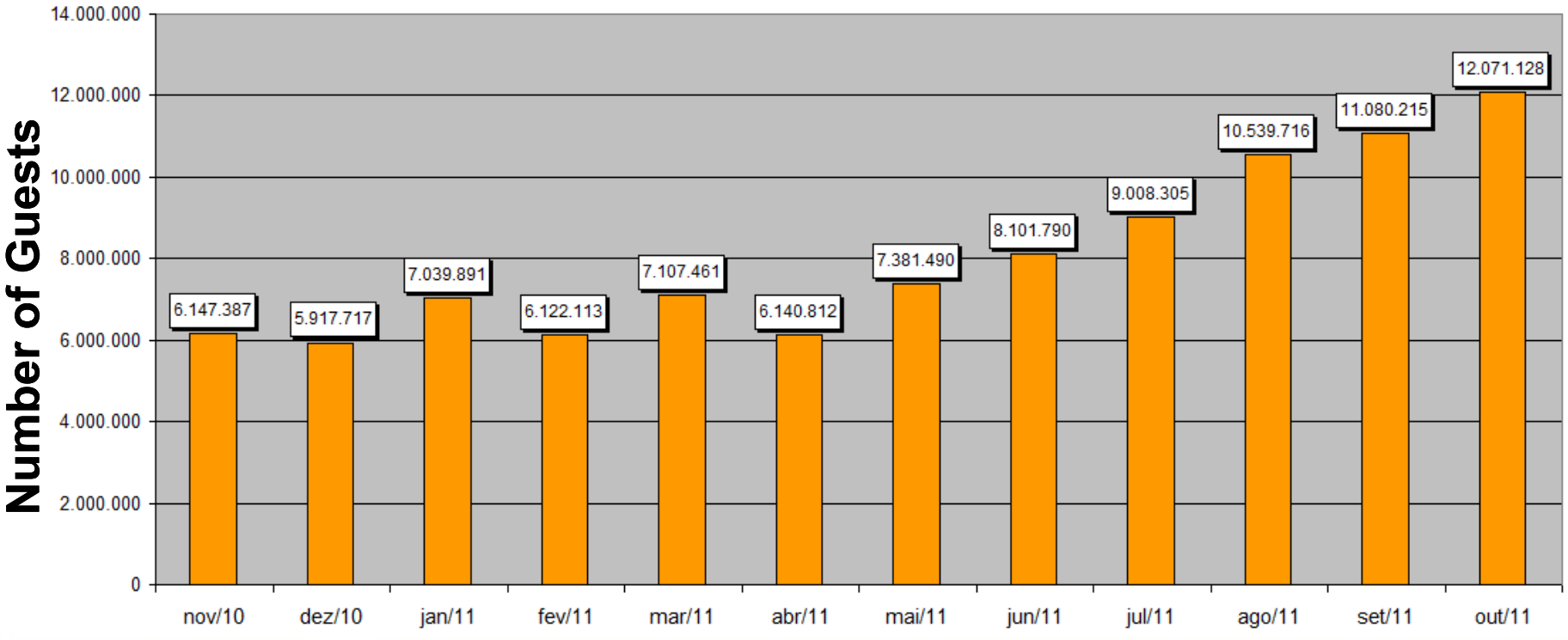
Most products are daily updated .

www.cptec.inpe.br

CPTEC internet site

CPTEC Web Site
http://www.cptec.inpe.br

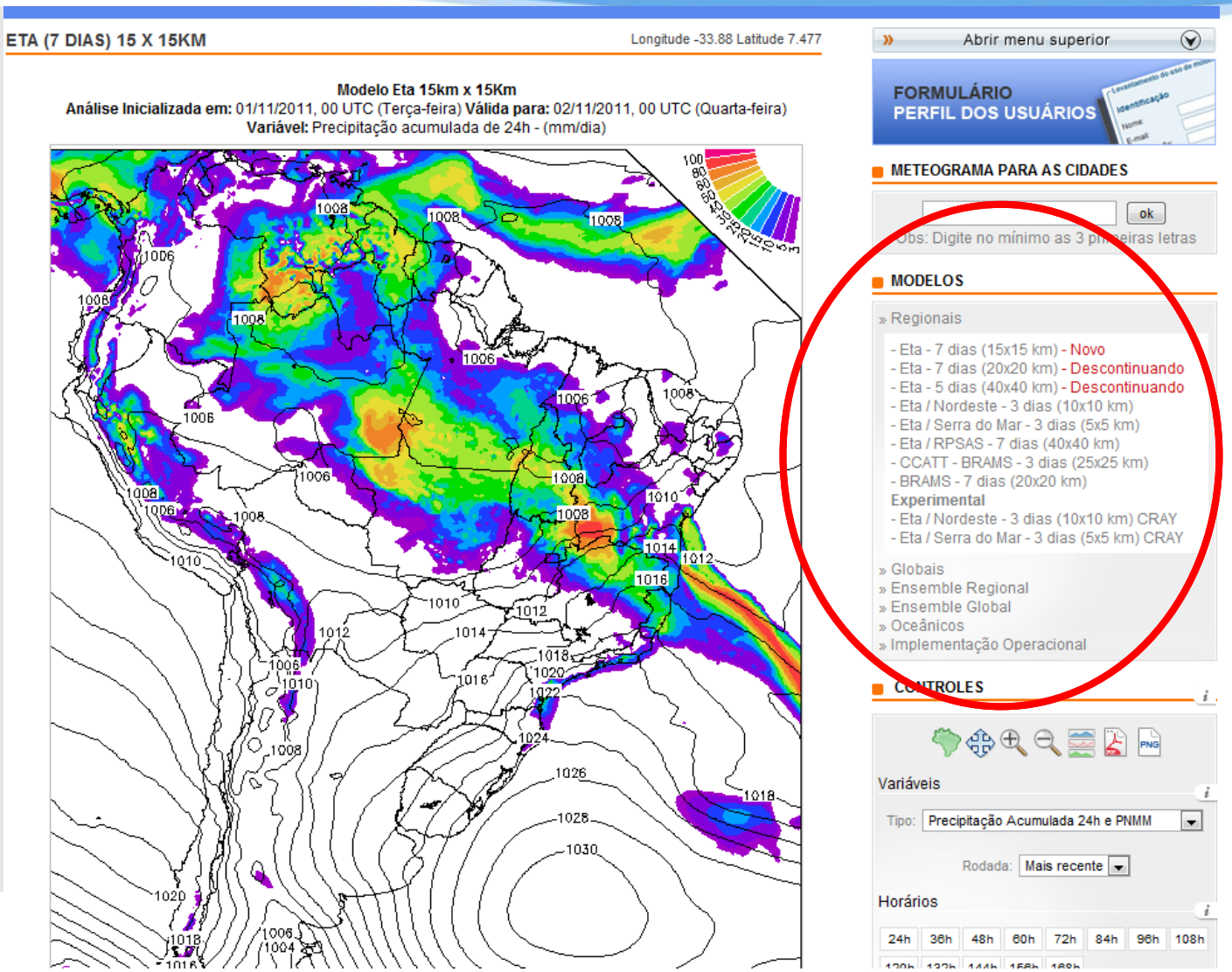
The CPTEC site has reached 12M access/month, or 400 K / day. There is a growing rate of about 23% per year.



Motivation – Many models

CPTEC runs many models:

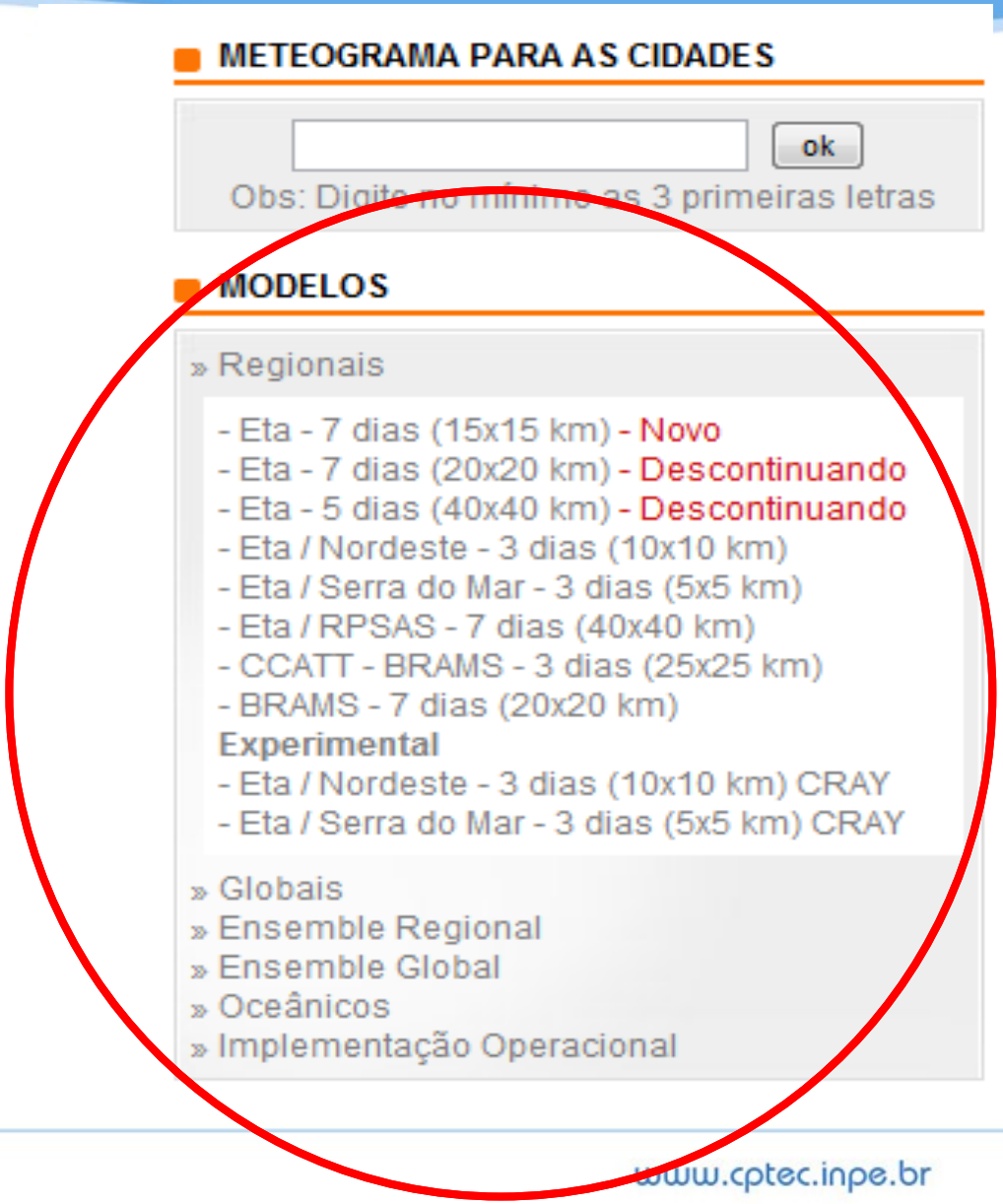
- **GCM**
- **EPS (both: regional and global)**
- **EPS for climate**
- **Regional**
- **High resolution regional models**
- **Air quality model**



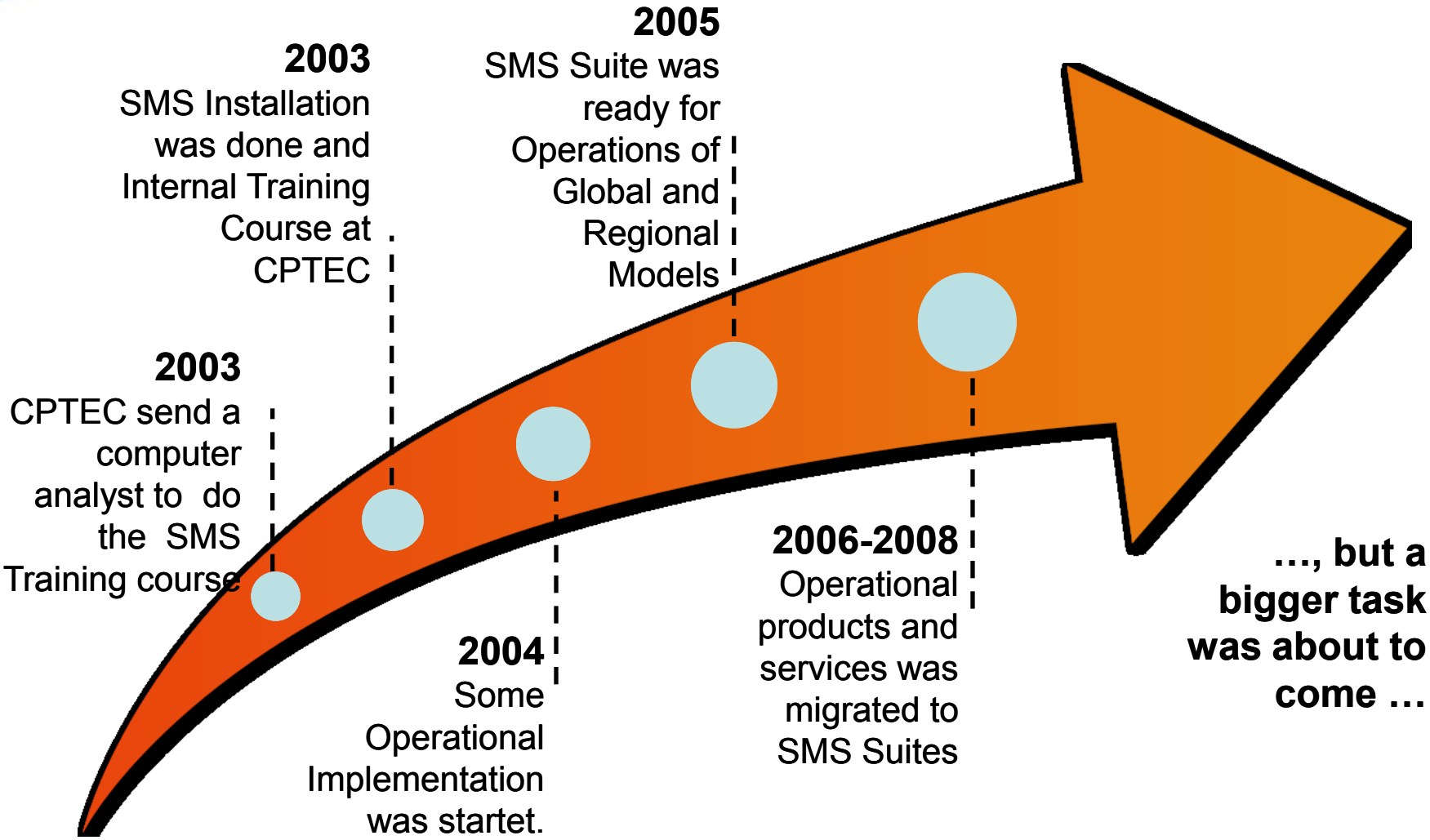
Motivation – Validation phase

To validate the migration of all these suites, CPTEC had to run and to produce validation index twice:

For the runs at old computer and for the runs at the new system.



How SMS had been used at CPTEC



Motivation – Three systems

Since its creation in 1994, CPTEC used operationally only supercomputers with few processors and few nodes up to 2010 (SX3, SX4, SX6). The model codes were highly optimized for that machines.

SX-6
Few processor
Few nodes

Migration supercomputer
Massively Parallel

New Supercomputer
> 30.000 proc.

2007

End of 2010

Motivation – Job Duplication

2007-2010 : to optimize the model code to better performance at a massive parallel system

2010-2011: to run in real time in both OLD and NEW machine to validation purposes.

The file system and connectivity in the new machine has very different design, so suites had to be changed.

Previous and New system

SX6 – NEC System

- Supercomputer
- Cluster Turi – controls all tasks

CRAY System

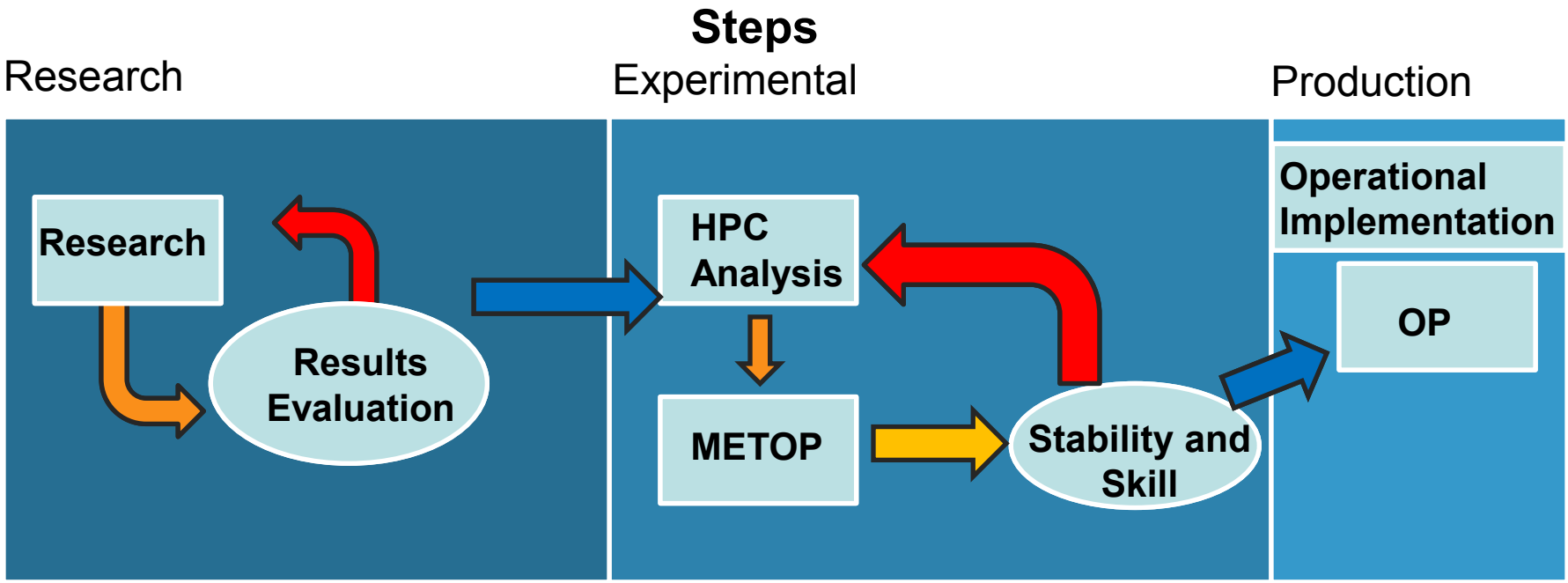
- Supercomputer
- Cluster 01 – controls models runs
- Cluster 17 – controls data flow

The Operational Implementation

The Operational Implementation team adopted SMS as its standard tool to monitor and schedule the model runs.

The Goal : To integrate research results into an operational suite to be used in the Operational Division.

But, the OI team also provide SMS to research step.



SMS – Actual Usage

The SMS is used at CPTEC, not only for model suites but also for data acquisition, data flow and data processing, and for products production for feeding CPTEC's webpage.

Visualization

SMS server at Product Cluster

Products for the Web Page and Coorporative Users

Climate

SMS for Climate data and Climate Ensemble products

Monthly climate analysis meeting

Weather Forecast

SMS server at a Cluster

Weather data visualization analysis

New servers running SMS

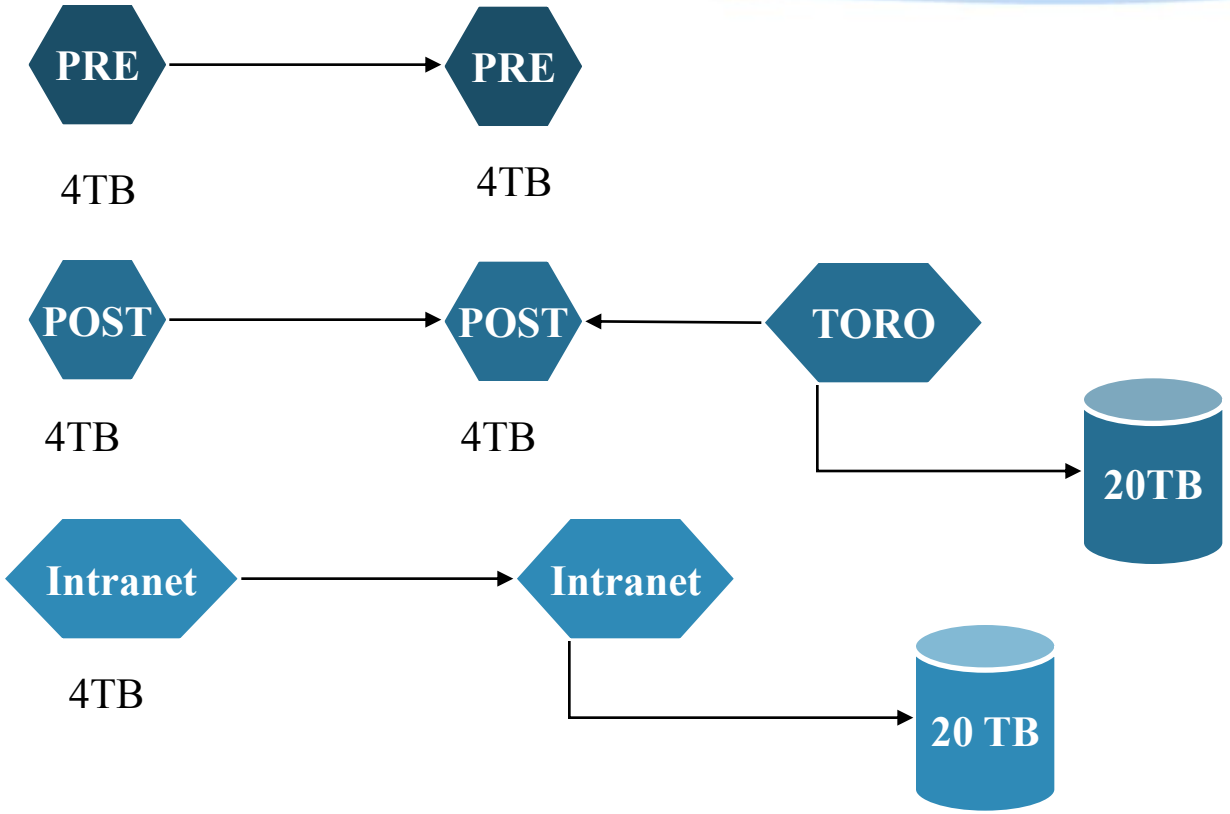
SMS servers

Products

Climate

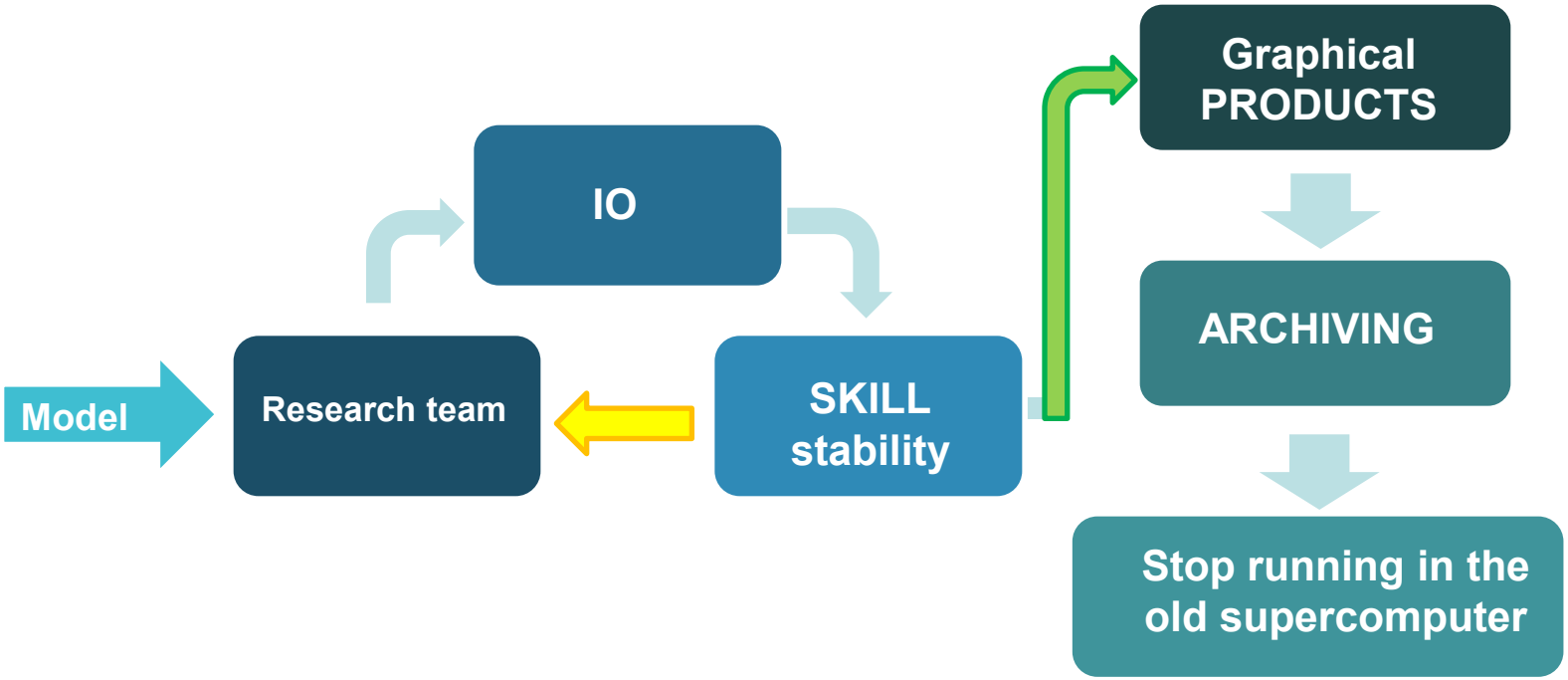
Meteorological

applications



All the process are been supervised 24x7 by the computer operations team

Migration of the model suites



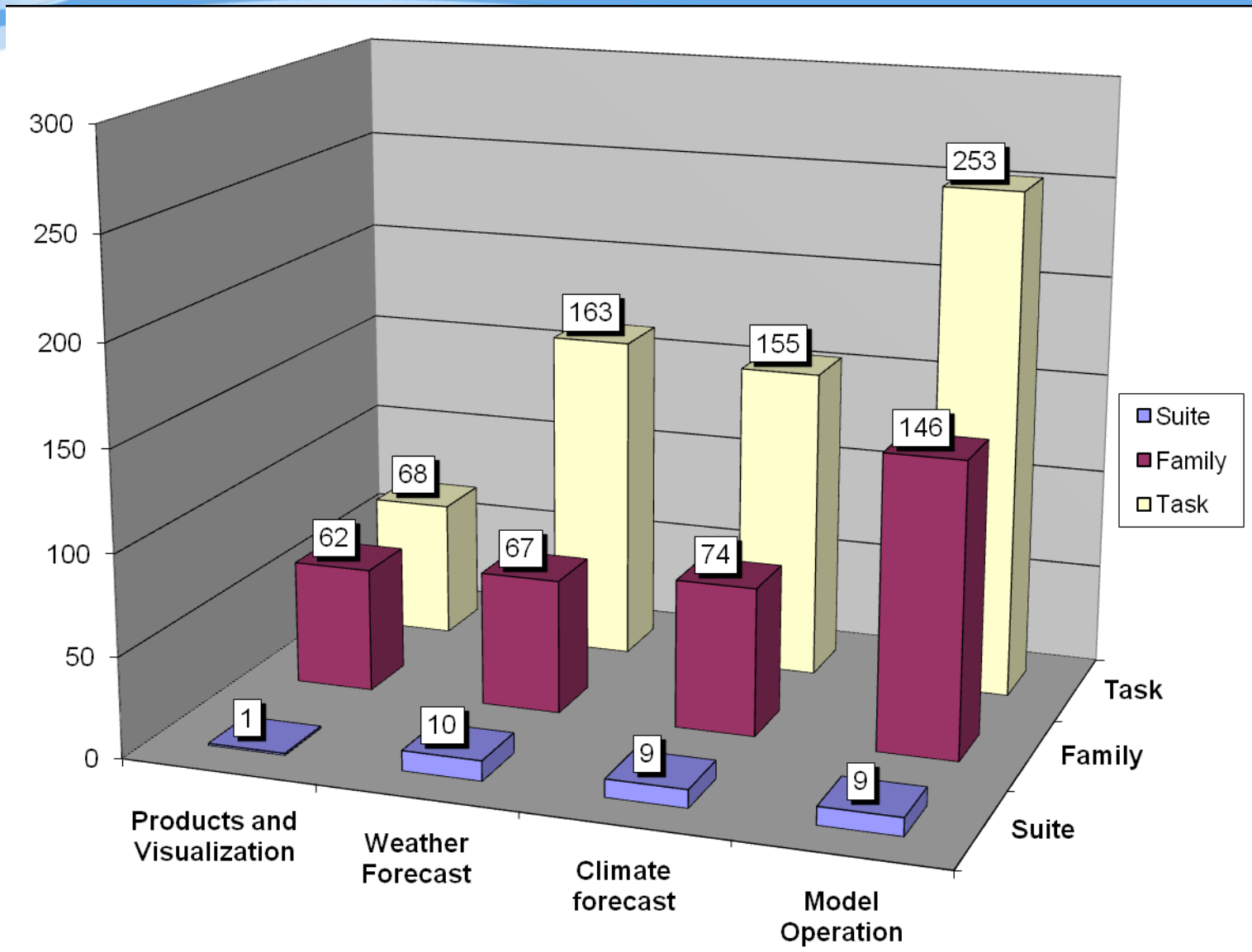
Migration of the model suites

Model	KIND
Ensemble-T126	EPS Global
T213	Global
T299	Global
WWATCH	Ocean Wave
Eta15	Regional
Eta_Serra_Mar	Regional
Eta_Nordeste	Regional
Eta_Oens	Regional
BRAMS20	Regional
CCATT	Air quality
GPSAS	Global
Umid_Solo	Surface
RPSAS	Regional
Clima – pers	EPS Climate
Clima – prev	EPS Climate
Avaliação – METOP	Skill Products
Geração ODS	Pre-process
Eta Clima pers	EPS Climate Regional
Acoplado	Coupled GCM

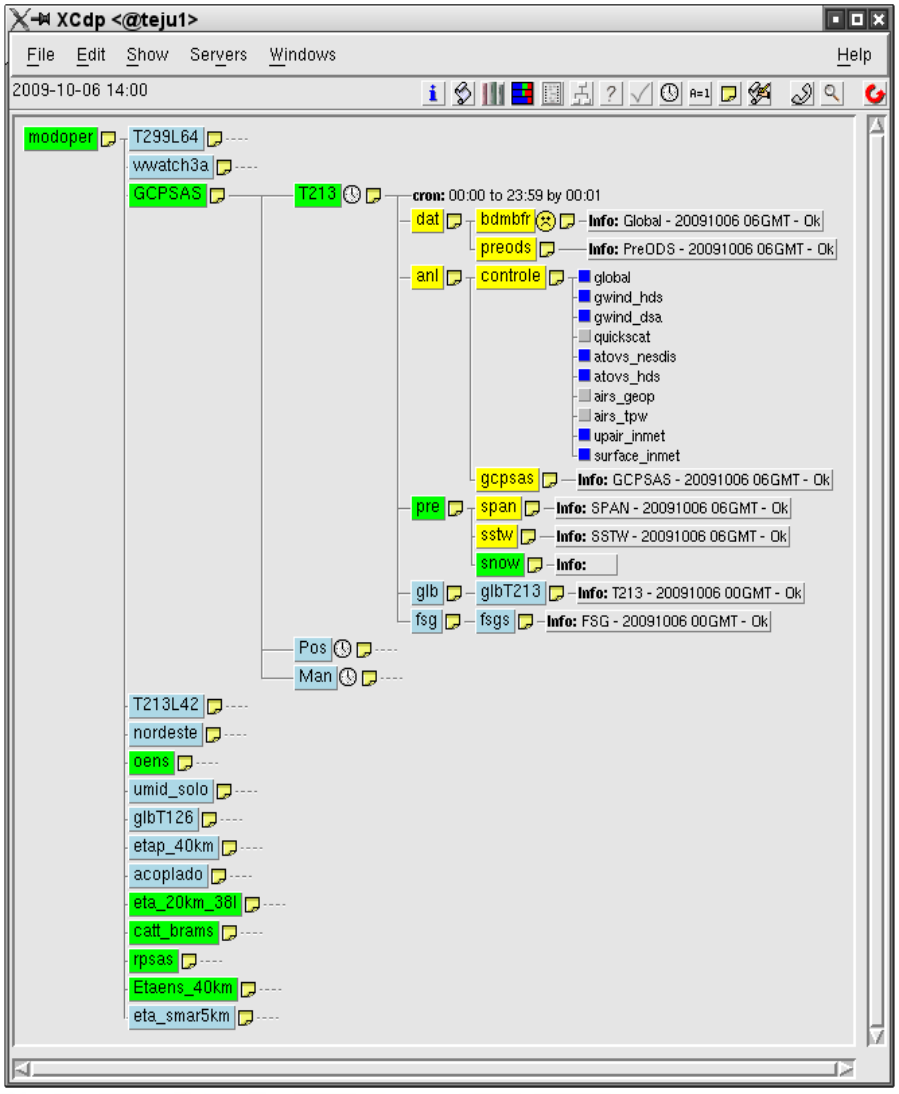
CPTEC Model Suites

SX- NEC | old		CRAY | new		
	Hours		**Hours**	**Number of Processors**
Regional Models Eta 20 km	**3:35** ---------	**Regional Models** Eta 15Km Brams 20 km	**1:12** **1:52**	**192** **168**
Global Models T213 T299	 **1:44** **2:55**	**Global Models** T213 T299	 **0:50** **1:53**	 **144** **384**
EPS Global T126 Regional	 **2:06** **NA**	**EPS** Global T126 Regional	 **2:00** **NA**	 **96**
Ocean Wave Model Wwatch	 **2:30**	**Ocean Wave Model** Wwatch	 **0:20**	 **48**
Tracer Model CATT-Brams	 **6:30**	**Tracer Model** BRAMS-CCATT-gases BRAMS-CCATT-prev	 **0:30** **0:25**	 **624** **624**
Climate EPS Model Global / Regional / Coupled	NA	**Climate EPS Model** Global / Regional / Coupled	NA	

CPTEC SMS numbers



SMS – operational model suites



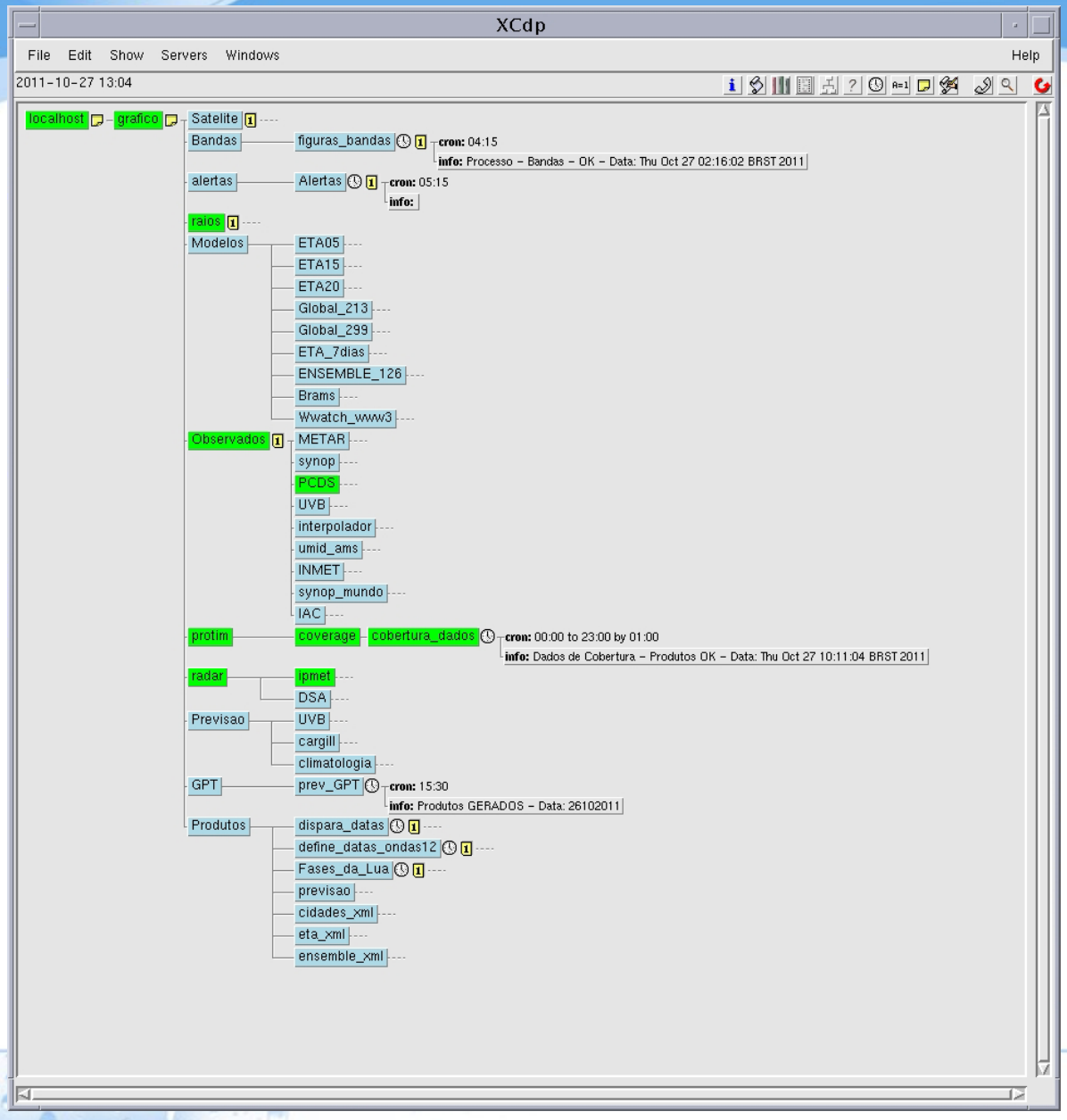
Global Models

- **T299L64** - Global (~44 km)
- **GCPSAS** - Global with CPTEC analyses (~63 km)
- **T213L42** - Global (~63 km)
- **oens** - Global ensemble with 15 members (~100km)
- **umid_solo** - Soil moisture estimation (27km)
- **glbT126** - Global (~100km)
- **acoplado** - Global Coupling Ocean-Atmospheric (~100 km)
- **wwatch3a** - Waves watch (~100 km)

Regional Models

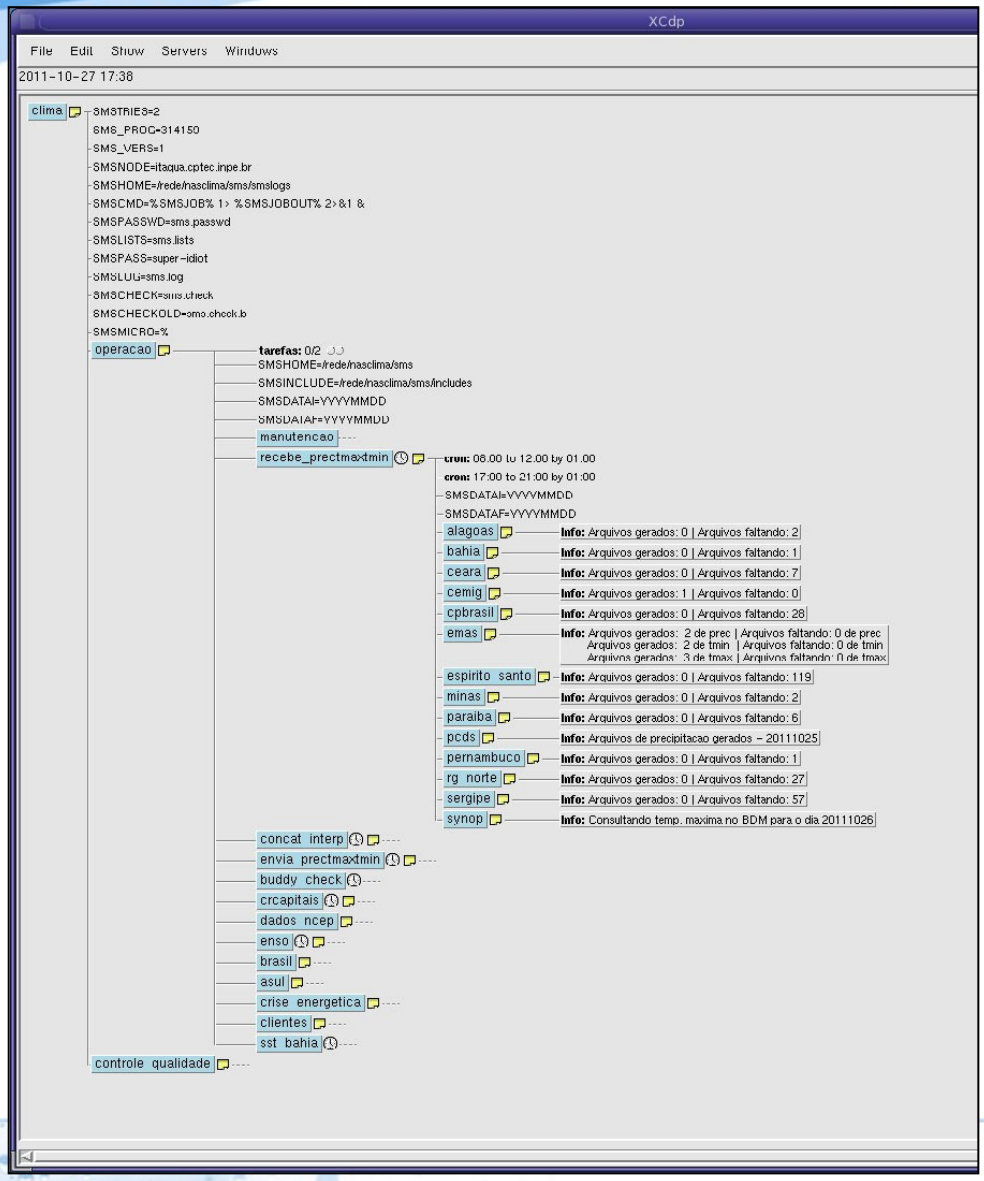
- **etap_40km** - Regional ETA over South American (40 km)
- **Etaens_40km** - Regional ETA ensemble over South American with 5 members (40 km)
- **eta_20km_38l** - Regional ETA over South American (20 km)
- **catt_brams** - Regional BRAMS over South American (30 km)
- **rpsas** - Regional ETA over South America with CPTEC analyses (40 km)
- **nordeste** - Regional ETA over northeast of Brazil (10 km)
- **eta_smar5km** - Regional ETA over southeast Brazil(5 km)
- **Wwatch** (35 km)

SMS – Products and Visualization



The SMS controls the production schedule of several products and images used inside and outside CPTEC, of its models and data image outputs.

SMS for Climate Operation



All the climate EPS and climate products are on SMS control. The migration to SMS is done and is been use.

Advantages taken by using SMS

Speed up of the migration processes - especially among Operational Implementation and Supercomputing Monitoring team.

Speed up of the identification of source of crashes and bugs

The suites were rewrite in order to incorporate advanced functionalities and standards.

SMS helped to create suite documentation, stability and reliability. It is much easier now to put a new model or product in operational mode then before, and the risk of interruption is very small.

Conclusion

- The use of the SMS at CPTEC is very useful, helping us to keep our webpage updated;
- The supercomputer replacement was a very demanding task that CPTEC only was able to do because had adopted the use of SMS and we was using it widely;
- SMS give ways to incorporate documentation that are very helpful not only in operation but also during the migration phase.

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Thank you !

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