

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

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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.

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.

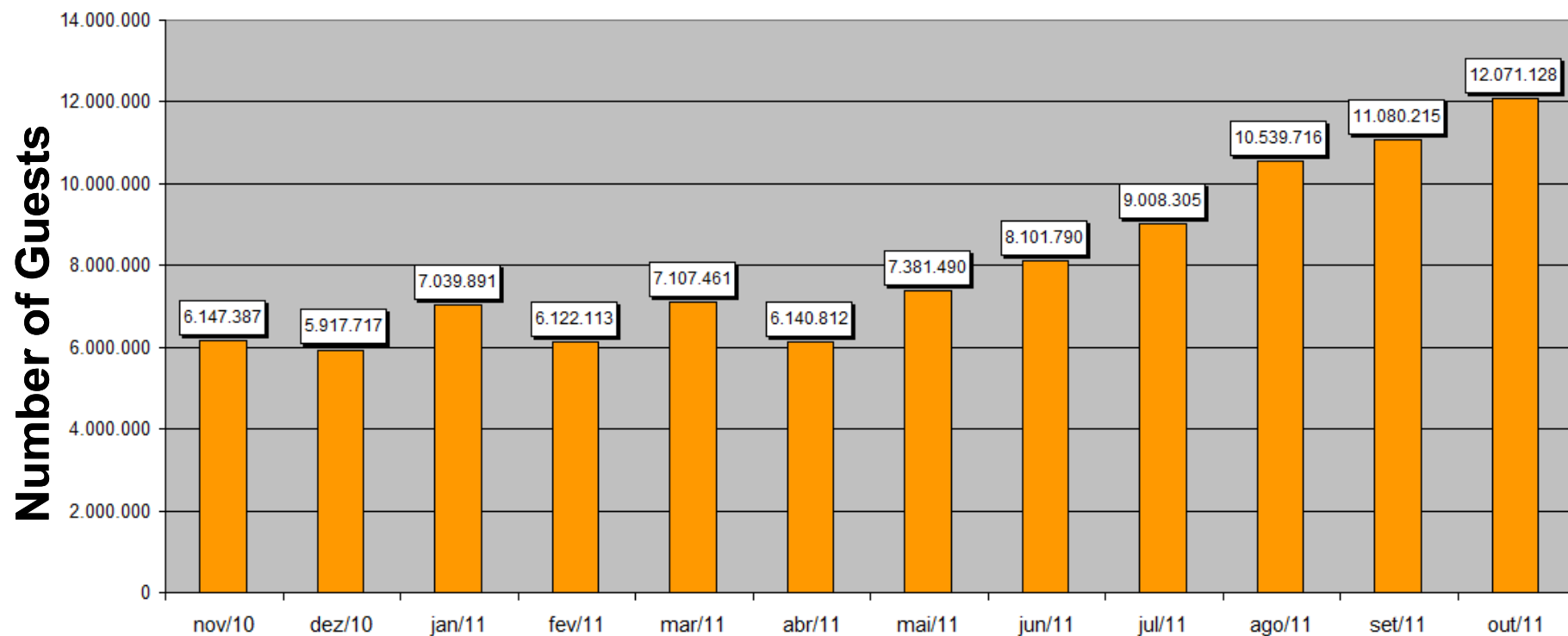
Most products are daily updated.

The screenshot displays the CPTEC website interface. A red circle highlights the 'Previsão Numérica' (Numerical) menu item in the top navigation bar. Below this, a map of Brazil shows temperature forecasts for Thursday, 02/11/2011, with a color scale from 1°C to 36°C. A sidebar on the left lists various services like 'Previsão de Tempo', 'Imagens de Satélites', and 'Agricultura'. The main content area includes a weather forecast for São Paulo, SP, and a video player featuring a meteorologist. The right sidebar contains news, services, and a seasonal calendar.

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.



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

ETA (7 DIAS) 15 X 15KM Longitude -33.88 Latitude 7.477

Modelo Eta 15km x 15km
 Análise Inicializada em: 01/11/2011, 00 UTC (Terça-feira) Válida para: 02/11/2011, 00 UTC (Quarta-feira)
 Variável: Precipitação acumulada de 24h - (mm/dia)

» Abrir menu superior

FORMULÁRIO PERFIL DOS USUÁRIOS

» **METEOGRAMA PARA AS CIDADES**

» **MODELOS**

» Regionais

- Eta - 7 dias (15x15 km) - **Novo**
- Eta - 7 dias (20x20 km) - **Descontinuando**
- Eta - 5 dias (40x40 km) - **Descontinuando**
- Eta / Nordeste - 3 dias (10x10 km)
- Eta / Serra do Mar - 3 dias (5x5 km)
- Eta / RPSAS - 7 dias (40x40 km)
- CCATT - BRAMS - 3 dias (25x25 km)
- BRAMS - 7 dias (20x20 km)

Experimental

- Eta / Nordeste - 3 dias (10x10 km) CRAY
- Eta / Serra do Mar - 3 dias (5x5 km) CRAY

» Globais

- » Ensemble Regional
- » Ensemble Global
- » Oceânicos
- » Implementação Operacional

» **CONTROLES**

Variáveis

Tipo: Precipitação Acumulada 24h e PNMM

Rodada: Mais recente

Horários

| | | | | | | | |
|------|------|------|------|------|-----|-----|------|
| 24h | 36h | 48h | 60h | 72h | 84h | 96h | 108h |
| 120h | 126h | 144h | 156h | 168h | | | |

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.

METEOGRAMA PARA AS CIDADES

Obs: Digite no mínimo as 3 primeiras letras

MODELOS

» Regionais

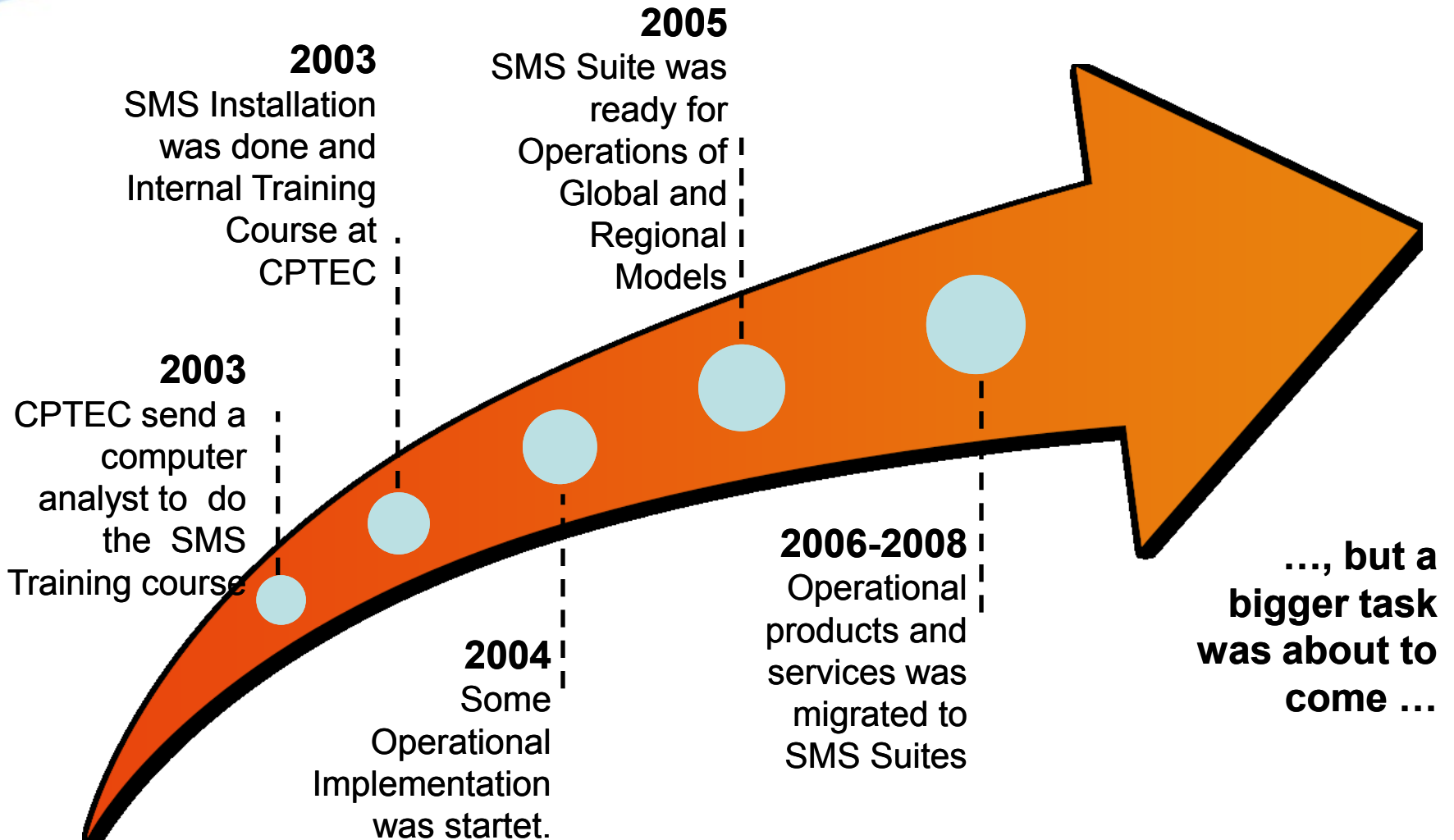
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- Eta - 7 dias (20x20 km) - Descontinuando
- Eta - 5 dias (40x40 km) - Descontinuando
- Eta / Nordeste - 3 dias (10x10 km)
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Experimental

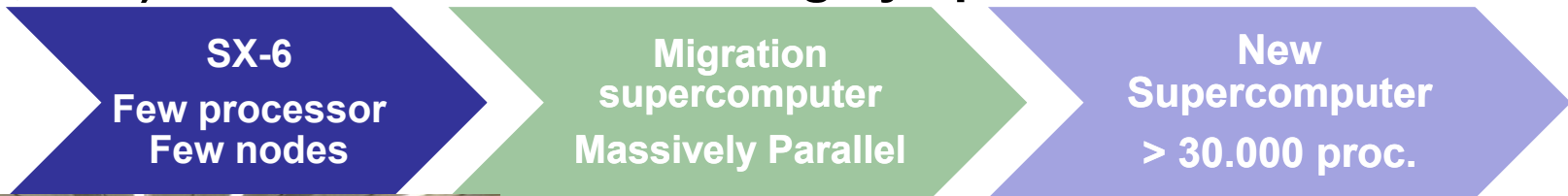
- Eta / Nordeste - 3 dias (10x10 km) CRAY
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» Globais

- » Ensemble Regional
- » Ensemble Global
- » Oceânicos
- » Implementação Operacional



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.



2007



End of 2010



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.

**SX6 – NEC
System**

**CRAY
System**

Supercomputer

**Cluster Turi –
controls all tasks**

Supercomputer

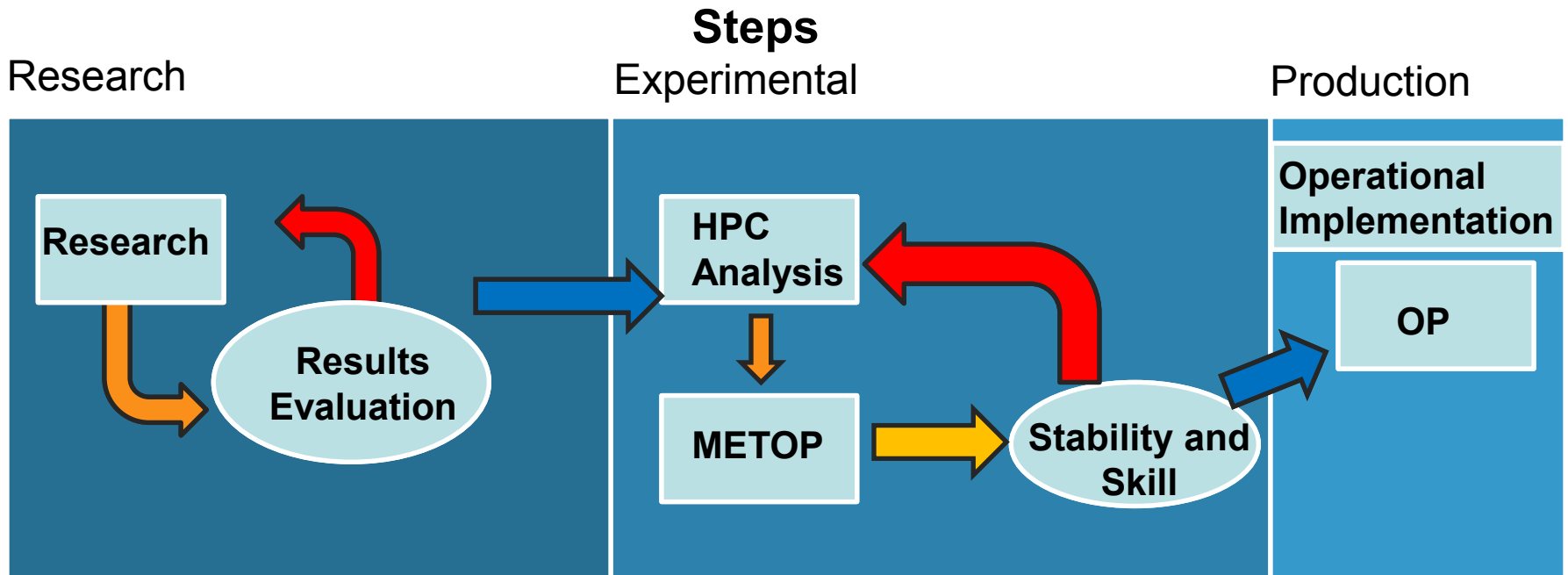
**Cluster 01 –
controls
models runs**

**Cluster 17 –
controls
data flow**

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.



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 Cooperative Users

Climate

SMS for Climate data and Climate Ensemble products

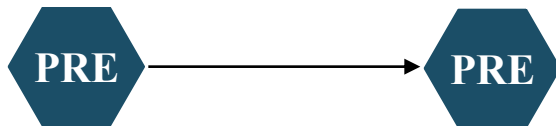
Monthly climate analysis meeting

Weather Forecast

SMS server at a Cluster

Weather data visualization analysis

SMS servers



4TB

4TB

Products

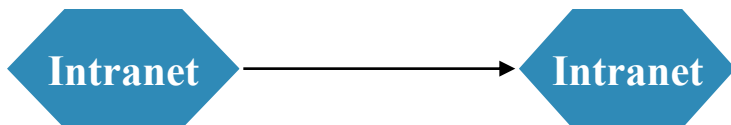
Climate

**Meteorological
applications**



4TB

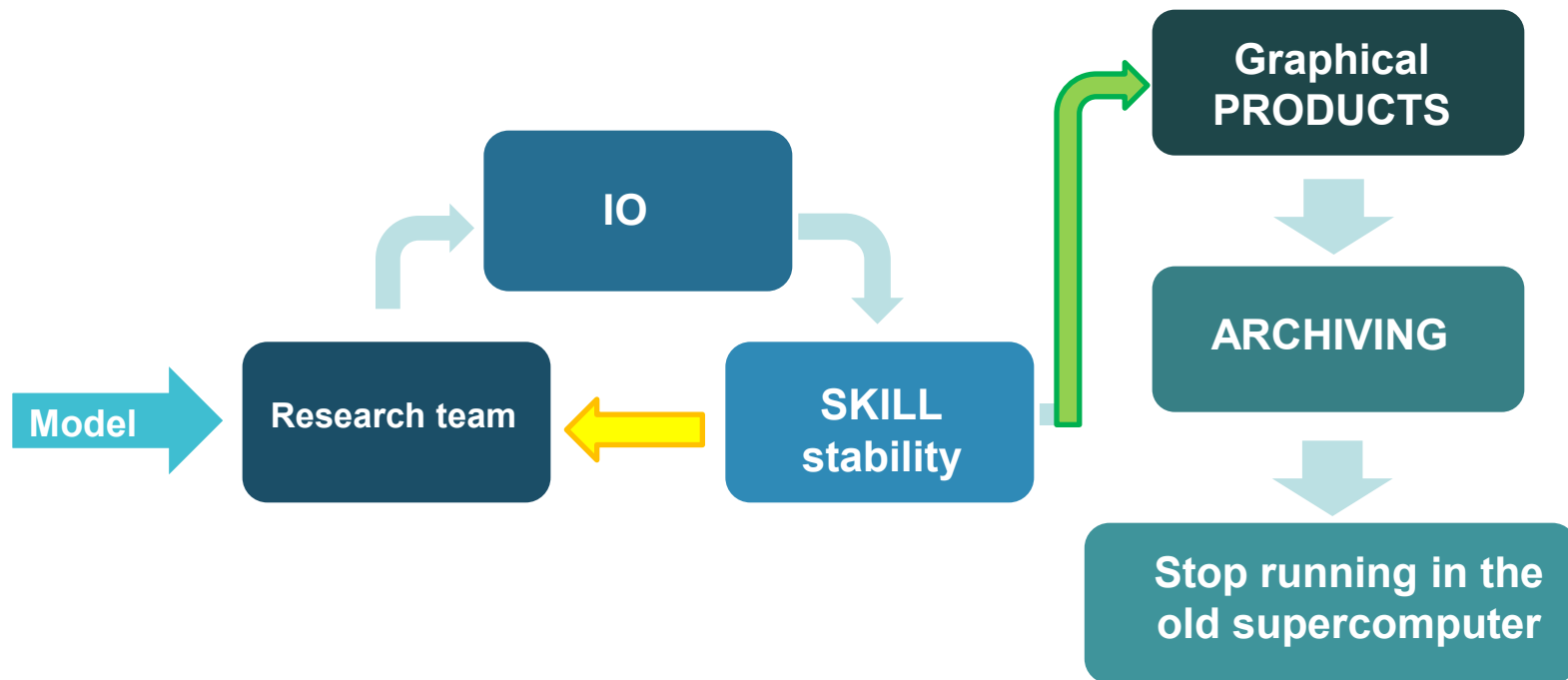
4TB



4TB

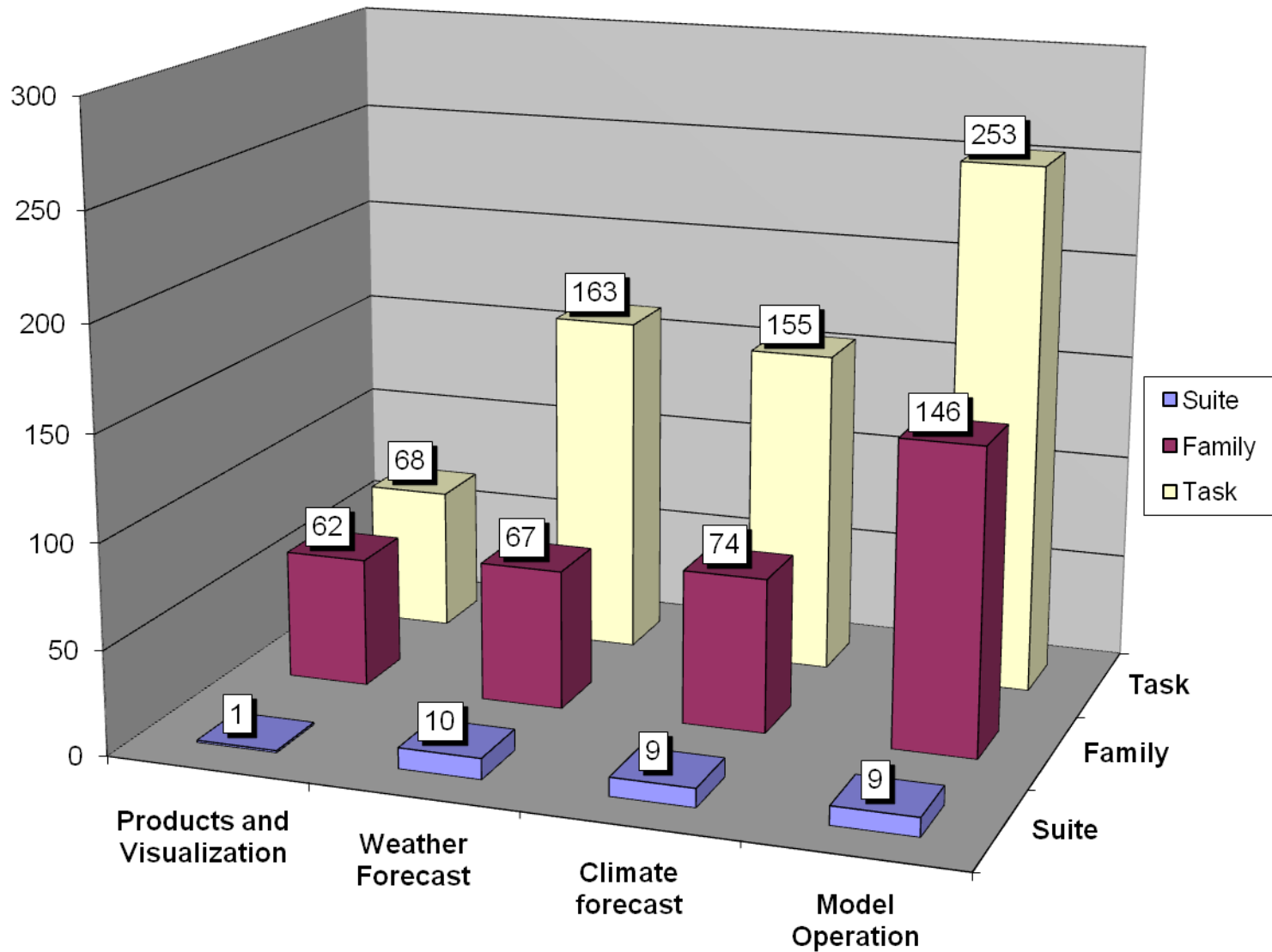


**All the process are been supervised 24x7
by the computer operations team**



| 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 |

| 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 | |

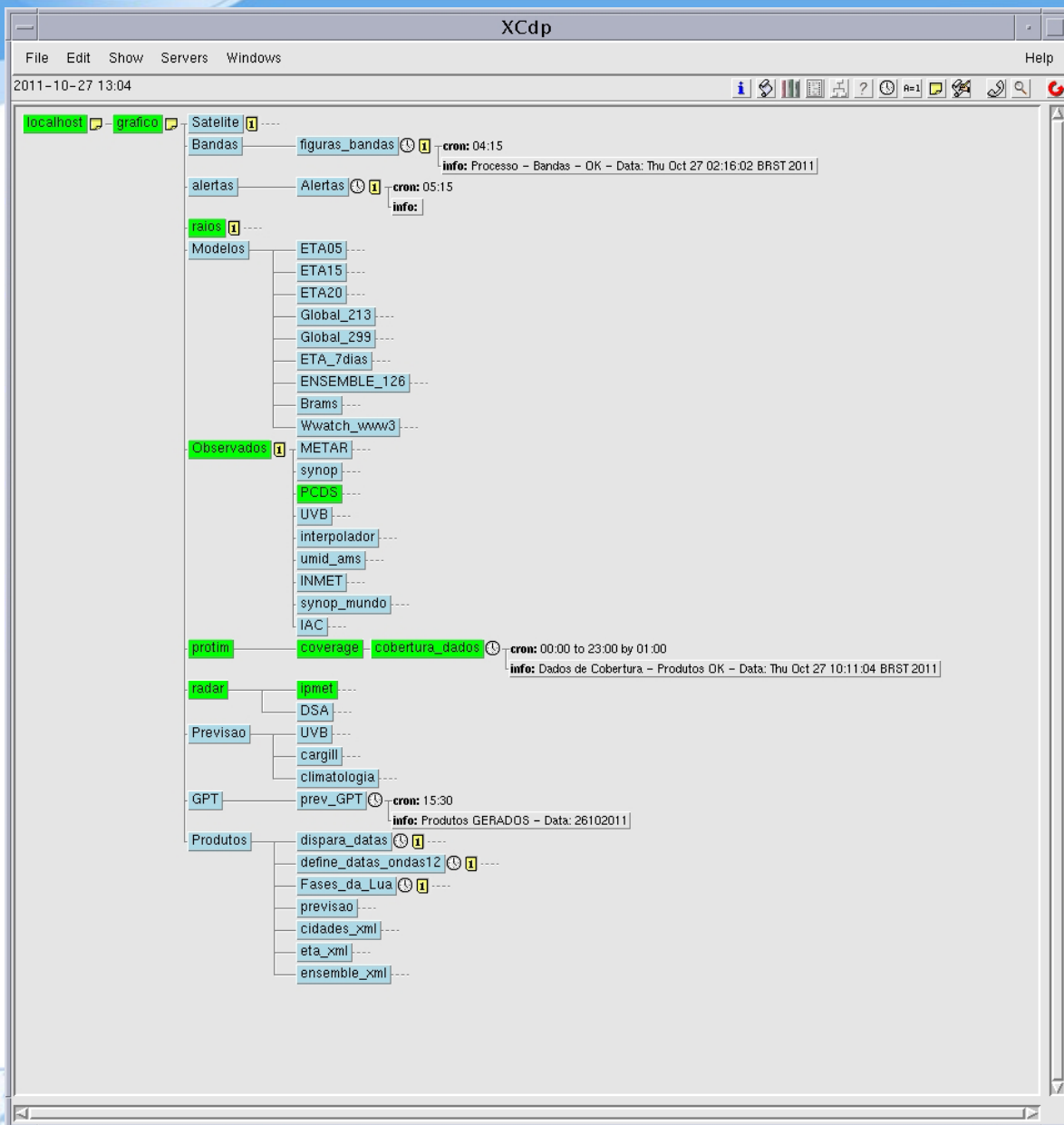


Global Models

- **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)



The screenshot shows the XCdp application window with a menu bar (File, Edit, Show, Servers, Windows, Help) and a toolbar. The main area displays a tree structure of products and services:

- localhost
 - grafico
 - Satelite
 - Bandas
 - figuras_bandas (cron: 04:15)
 - info: Processo - Bandas - OK - Data: Thu Oct 27 02:16:02 BRST 2011
 - alertas
 - Alertas (cron: 05:15)
 - info:
 - ratos
 - Modelos
 - ETA05
 - ETA15
 - ETA20
 - Global_213
 - Global_299
 - ETA_7dias
 - ENSEMBLE_126
 - Brams
 - Wwatch_www3
 - Observados
 - METAR
 - synop
 - PCDS
 - UVB
 - interpolador
 - umid_ams
 - INMET
 - synop_mundo
 - IAC
 - protim
 - coverage
 - cobertura_dados (cron: 00:00 to 23:00 by 01:00)
 - info: Dados de Cobertura - Produtos OK - Data: Thu Oct 27 10:11:04 BRST 2011
 - radar
 - ipmet
 - DSA
 - Previsao
 - UVB
 - cargill
 - climatologia
 - GPT
 - prev_GPT (cron: 15:30)
 - info: Produtos GERADOS - Data: 26102011
 - Produtos
 - dispara_datas
 - define_datas_ondas12
 - Fases_da_Lua
 - previsao
 - idades_xml
 - eta_xml
 - ensemble_xml

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

```

XCdp
File Edit Show Servers Windows
2011-10-27 17:38
clima |
  SMSTRIES=2
  SMS_PROG=314150
  SMS_VERS=1
  SMSNODE=itaqua.cptec.inpe.br
  SMSHOME=/rede/inasclima/sms/smlogs
  SMSCMD=%SMSJOB% 1> %SMSJOBOUT% 2> &1 &
  SMSpasswd=sms.passwd
  SMSLISTS=sms.lists
  SMSPASS=super-idiot
  SMSLUU=sms.log
  SMSCHECK=sms.utcheck
  SMSCHECKOLD=smo.check.b
  SMSMICRO=%
operacao |
  tarefas: 0/2
  SMSHOME=/rede/inasclima/sms
  SMSINCLUDE=/rede/inasclima/sms/includes
  SMSDATAI=YYYYMMDD
  SMSDATAF=YYYYMMDD
  manutencao | ...
  recebe_prectmaxdmin |
    cron: 06:00 lu 12:00 by 01:00
    cron: 17:00 to 21:00 by 01:00
    SMSDATAI=YYYYMMDD
    SMSDATAF=YYYYMMDD
    alagoas | Info: Arquivos gerados: 0 | Arquivos faltando: 2
    bahia | Info: Arquivos gerados: 0 | Arquivos faltando: 1
    ceara | Info: Arquivos gerados: 0 | Arquivos faltando: 7
    cemig | Info: Arquivos gerados: 1 | Arquivos faltando: 0
    cpbrasil | Info: Arquivos gerados: 0 | Arquivos faltando: 28
    emas | Info: Arquivos gerados: 2 de prec | Arquivos faltando: 0 de prec
      Arquivos gerados: 2 de tmin | Arquivos faltando: 0 de tmin
      Arquivos gerados: 3 de tmax | Arquivos faltando: 0 de tmax
    espirito santo | Info: Arquivos gerados: 0 | Arquivos faltando: 119
    minas | Info: Arquivos gerados: 0 | Arquivos faltando: 2
    paraiba | Info: Arquivos gerados: 0 | Arquivos faltando: 6
    pcds | Info: Arquivos de precipitacao gerados - 20111025
    pernambuco | Info: Arquivos gerados: 0 | Arquivos faltando: 1
    rg norte | Info: Arquivos gerados: 0 | Arquivos faltando: 27
    sergipe | Info: Arquivos gerados: 0 | Arquivos faltando: 57
    synop | Info: Consultando temp. maxima no BDM para o dia 20111026
    concat_interp | ...
    envia_prectmaxdmin | ...
    buddy_check | ...
    crcapitals | ...
    dados_ncep | ...
    enso | ...
    brasil | ...
    azul | ...
    crise_energetica | ...
    clientes | ...
    sst_bahia | ...
    controle_qualidade | ...
  
```

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

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.

- **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.**



Thank you !