



The Automatic data Fill Process in the WDC Climate

**Michael Lautenschlager
Hannes Thiemann**

World Data Center Climate
(M&D/MPI-M, Hamburg)

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Home: <http://www.wdc-climate.de/>

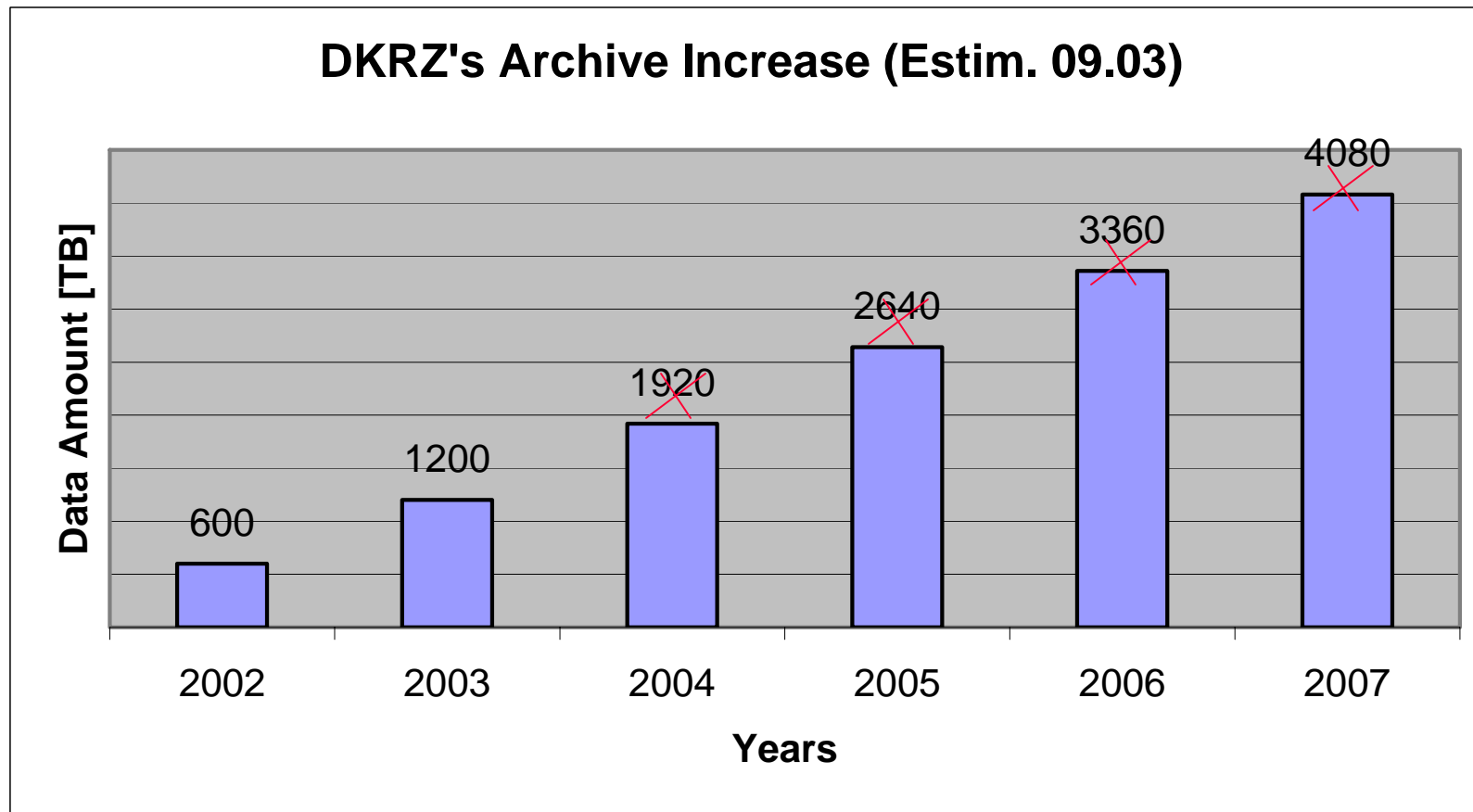


Content:

- Introduction (refer. to CASK3):
DKRZ Archive – Semantic Data Management –
Automated Fill Process
- Integrated Model and Data Infrastructure (IMDI)
- Automated Fill Process (AFP) and WDCC Development
- Summary and Outlook

DKRZ Archive Development

Underestimated at
CAS2K3



Archive Size: Dec. 2004: 2.5 PB / Sept. 2005: 3.3 PB

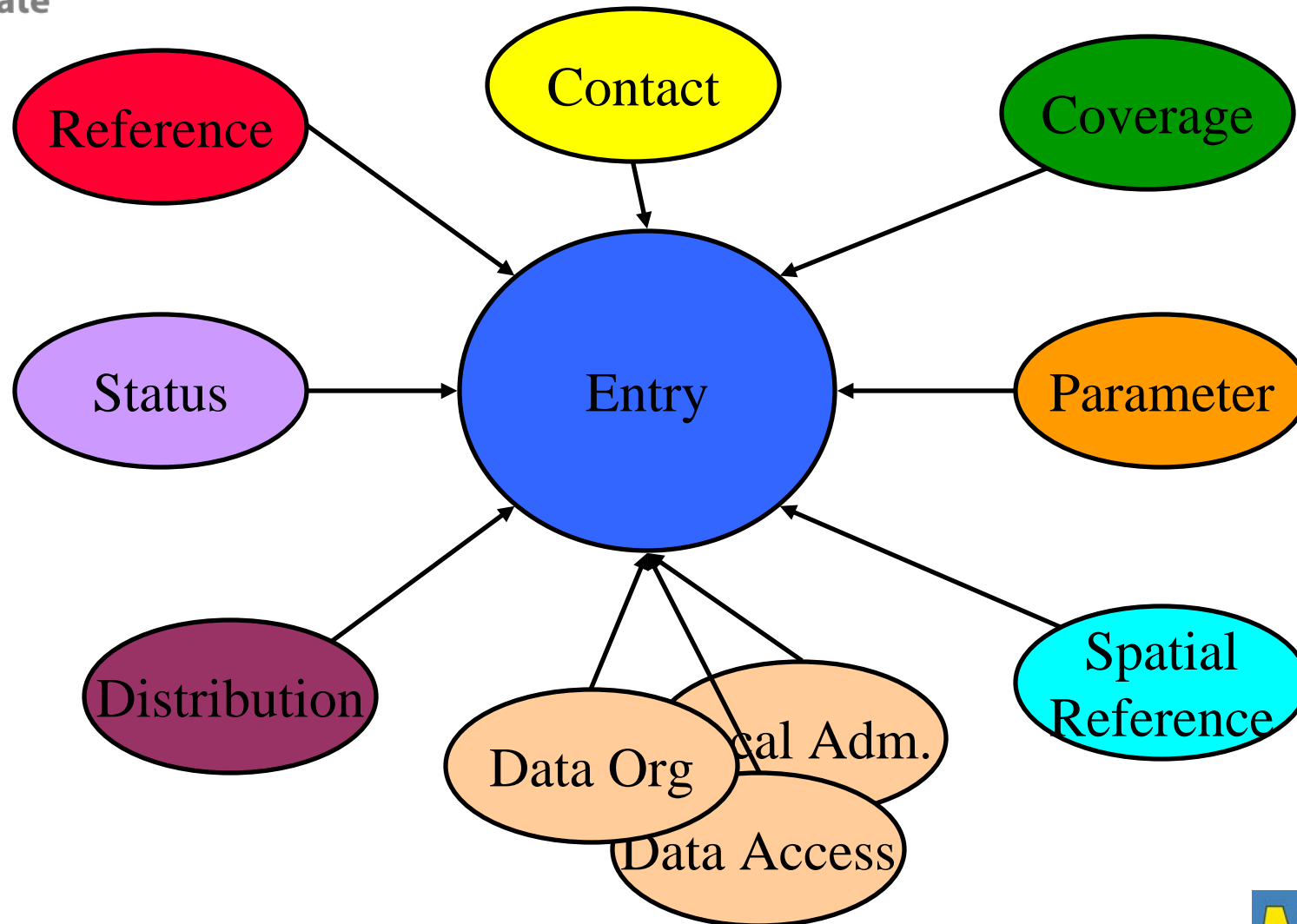
Semantic data management

Discussed at
CAS2K3

- Data consist of numbers and metadata.
- Metadata construct the semantic data context.
- Metadata form a data catalogue which makes data searchable.
- Data are produced, archived and extracted within their semantic context.
- This is realised in the DB-system of the WDC Climate with the **CERA-2 (1) data model**
(M&D / DKRZ Technical Report No. 15, 1998
<http://www.mad.zmaw.de/Services/Pingo/reports/ReportNo.15.pdf>).
- **But not all archive data at DKRZ are documented by meta data.**

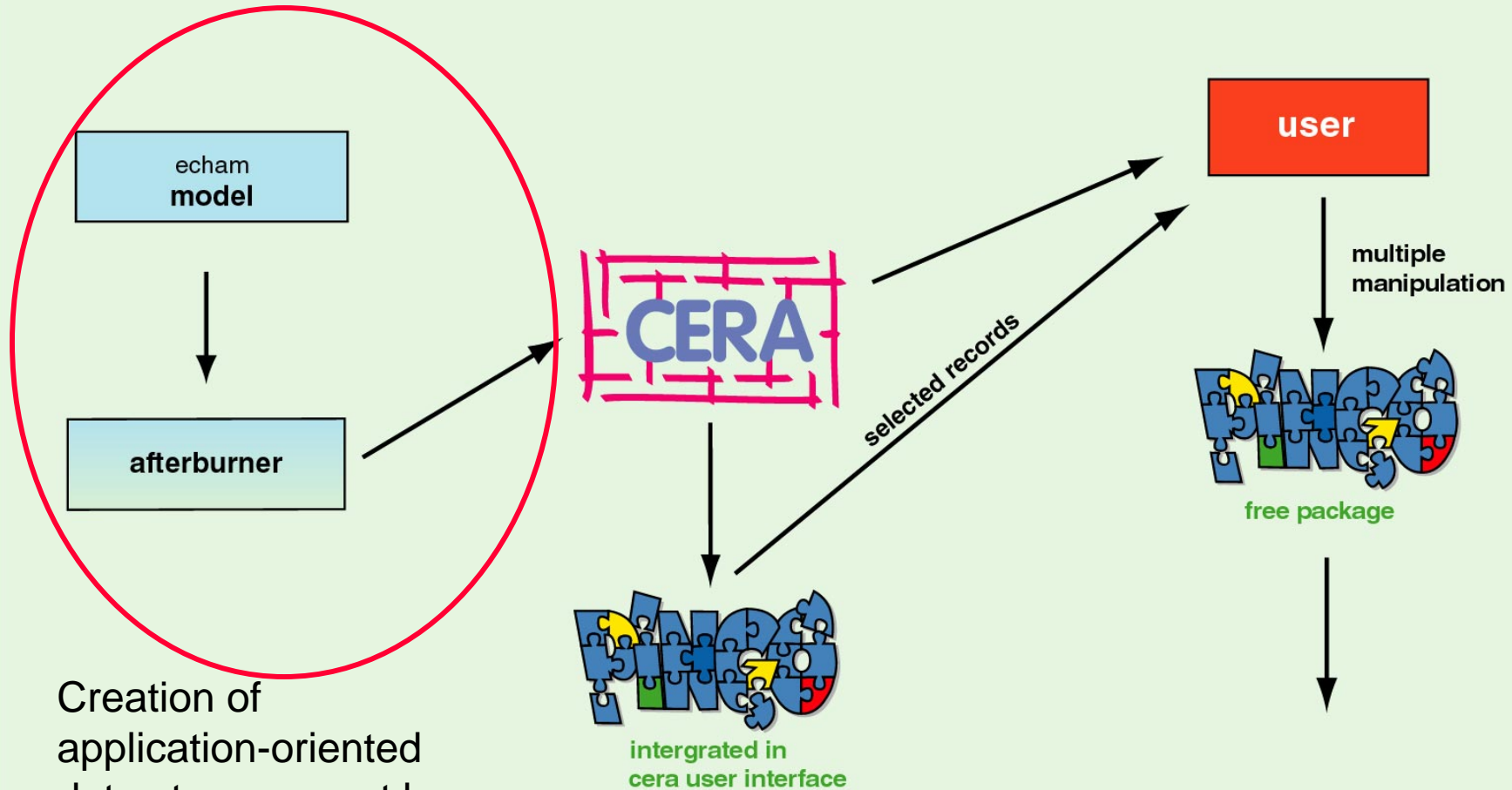
(1) Climate and Environmental data Retrieval and Archiving

CERA-2 Data Model Blocks





Automated Fill Process (AFP)

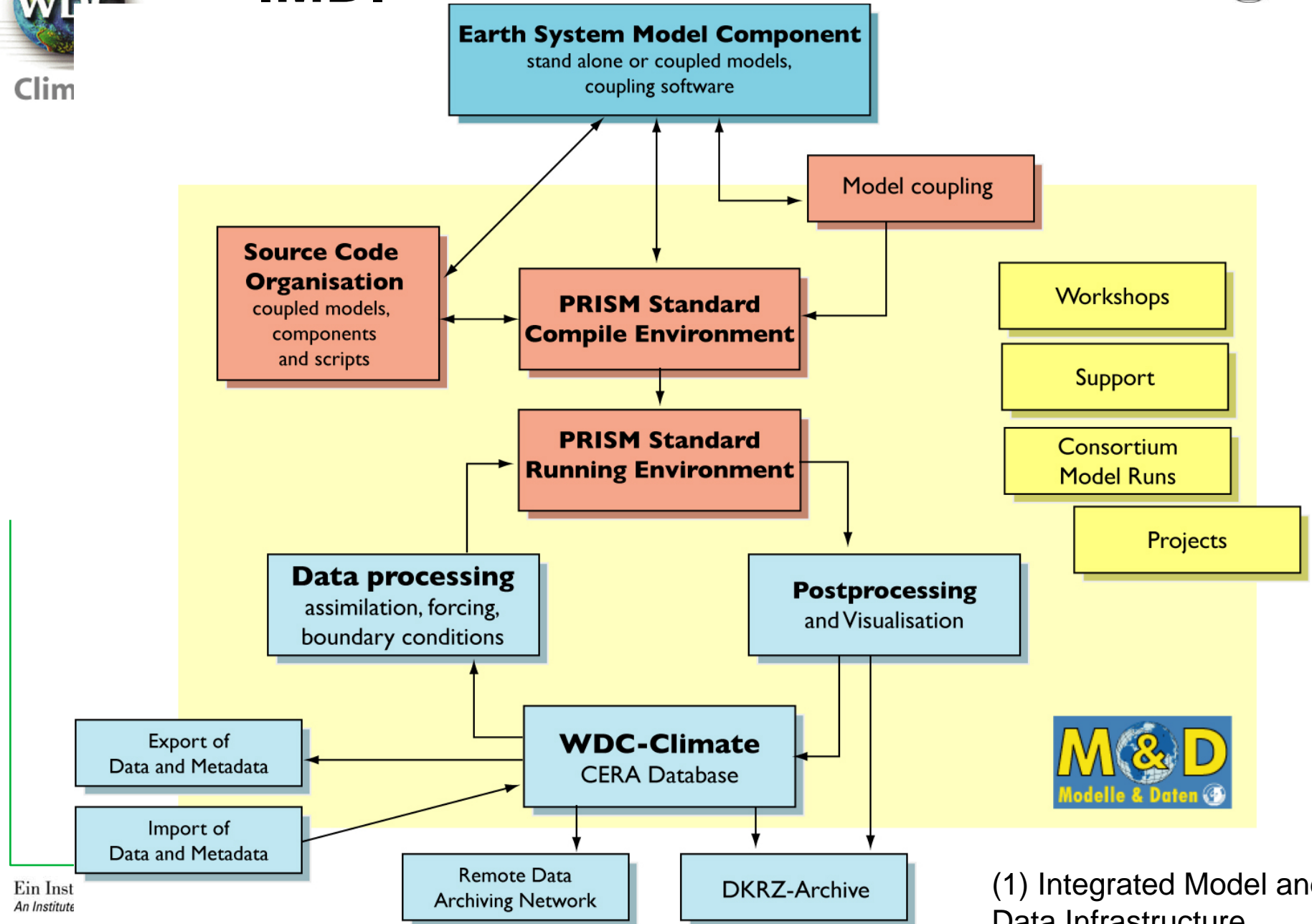


Creation of application-oriented data storage must be automatic because of large archive rates !!!

AFP projected at CAS2K3 and integrated into IMDI in 2004

jörg wegner 11/24/2000





(1) Integrated Model and Data Infrastructure



Pros and Cons of IMDI

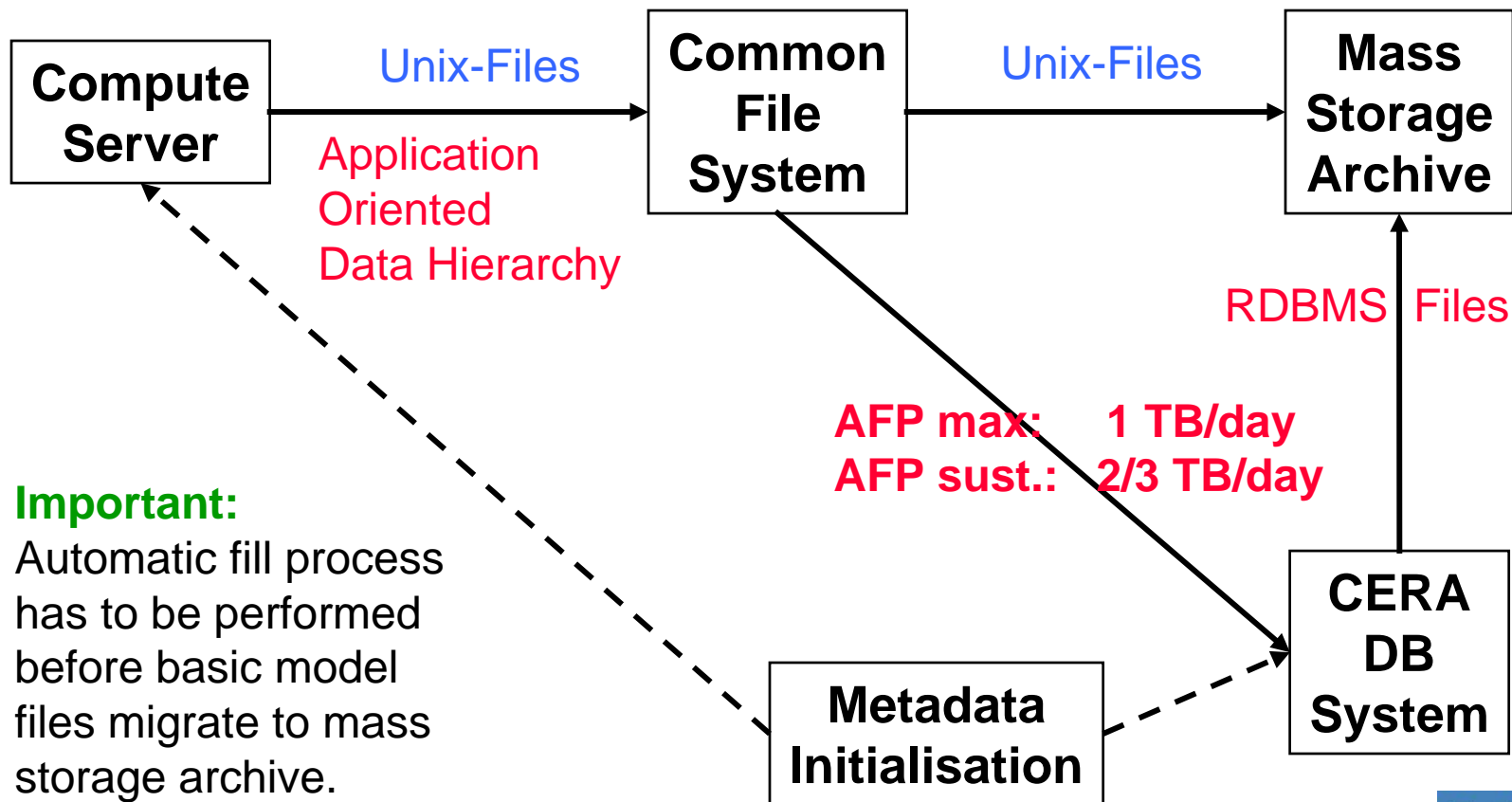


- Climate** ◆ In addition to the **PRISM modeling environment** data management is included by **primary data processing** and the **Automated Fill Process** (AFP)
- ◆ Models in IMDI are executable on the **PRISM platforms** (CRAY, IBM, NEC, SGI, Fujitsu)
 - ◆ IMDI therefore supports:
 - **Huge modelling experiments** (IPCC AR4 calculations)
 - **Model development** in a coupled environment
 - ◆ **Restrictions:** Models have to fit the PRISM defined standard interfaces for information exchange and for I/O-operations
 - ◆ **M&D focuses** with respect to IMDI on the integration of ECHAM5/MPI-OM, CLM and REMO and on project support for e.g. COSMOS, GEMS and ENSEMBLES.
 - ◆ **Maintenance of the PRISM SW** and model integration is performed in the PRISM Support Initiative (PSI) (<http://prism.enes.org/>)



Data Archive Rates and AFP

100 TB/month
(2005 average)



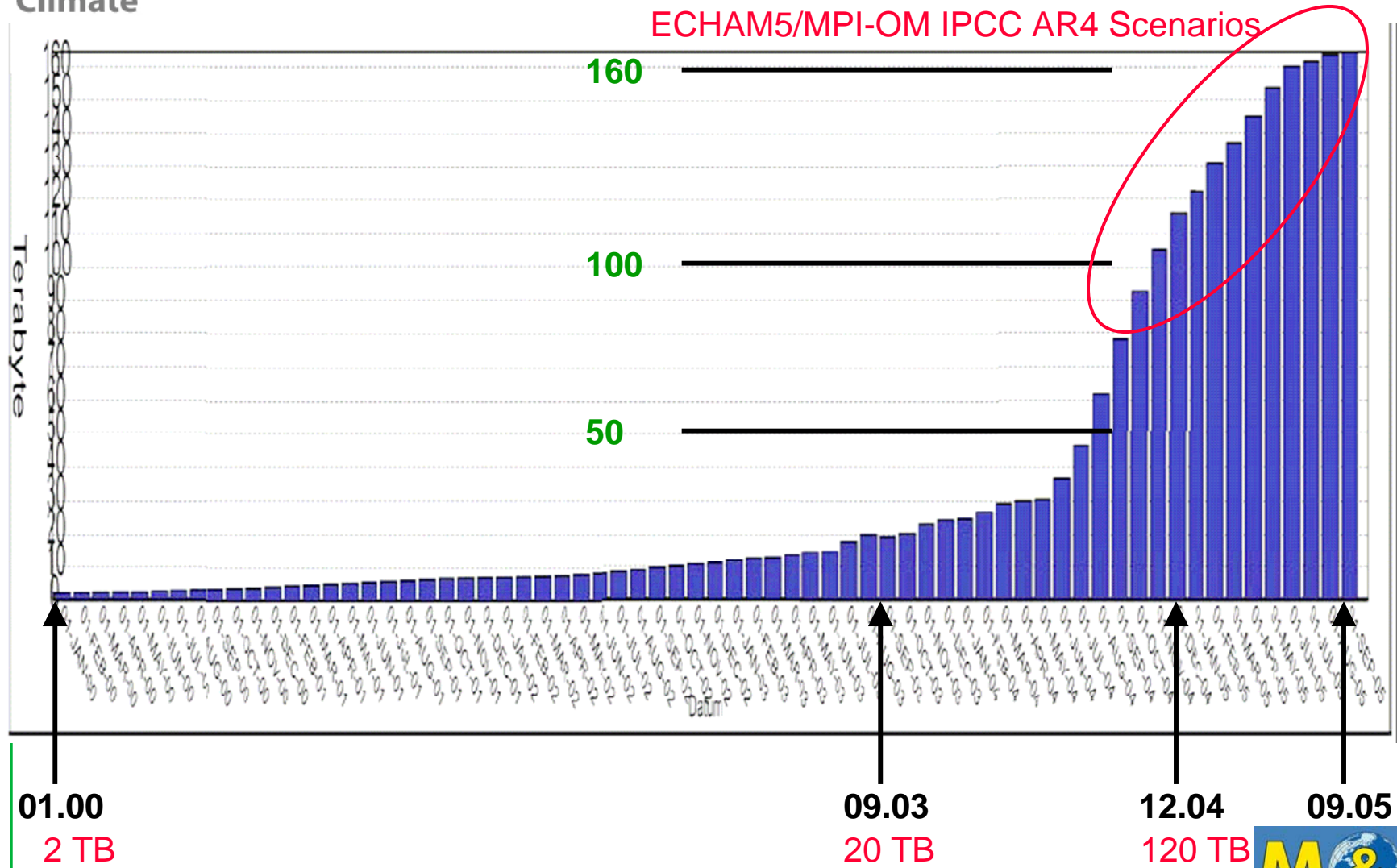
Important:

Automatic fill process has to be performed before basic model files migrate to mass storage archive.



Development of WDCC DB Content

Climote





WDCC Statistics



WDCC Access as **Data Downloads per month**

Jan. – Aug. 2005

Volume: 1.9 – 8.2 TB / month

Number: 4000 – 184,000 per month

Jan. – Dec. 2004

Volume: 0.2 – 2.2 TB / month

Number: 1500 – 78,000 per month

Current database size is **171.4382** Terabyte

Number of experiments: 560

Number of datasets: 65266

Number of blob within cera at 07-SEP-05: **4,487,162,740**





WDCC DB Storage



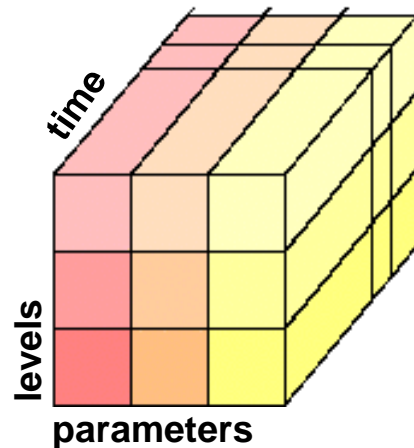
how we get the grid data:
Files from climate model



postprocessing step 1:
homogenizing time and
calculation of diagnostics

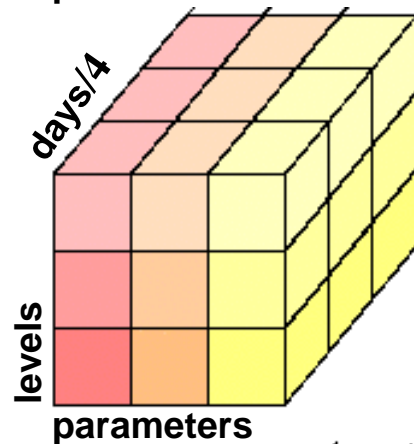


postprocessing step 2:
isolation of levels &
parameters and creation
of BLOB table input

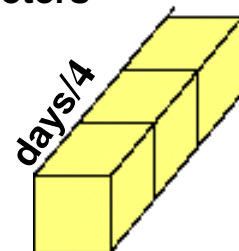


Storage of global coverages per file or BLOB :

all levels, all parameters
arbitrary time intervals



all levels, all parameters
1 moment (6 by 6 hours)



1 level, 1 parameter
1 moment
(= 1 BLOB = 1 global field)



WDCC Data Access Granularity

- **Finest granularity** for RDBMS data access (SQL) is on BLOB level
- **Sub-BLOB data access** requires data processing outside the RDBMS
- BLOB sizes within WDCC
 - **Fine granularity**: global field of 1 variable at 1 vertical level for 1 moment
20 – 100 KB / BLOB depending on model resolution
 - **Coarse granularity**: global fields of one or more variables at all vertical levels for 1 moment
around 25 MB / BLOB for climate model output
 - Model output **file sizes**: global fields of of all variables at all vertical levels for many moments (referenced by pointers in CERA-2 meta data)
500 MB – 1 GB / File for climate model output



Climate

Summary and Outlook

Max-Planck-Institut für Meteorologie
Max Planck Institute for Meteorology



- ◆ **AFP** was implemented in IMDI and **successfully applied to the ECHAM5/MPI-OM** climate scenario experiments for the IPCC AR4.
- ◆ AFP covers data fill rates **up to 1 TB/day** into the WDCC DB system.
- ◆ **User data access** moves from Unix file access to **DB downloads** at least for remote users (170 TB by Web-browser interface).
- ◆ Future tasks: **How to limit the archive growth rate?** Answer will probably result in a **modified data storage policy at DKRZ** (data classification related to different service levels)





The Winter **TopTen Program** identifies the world's largest and most heavily used databases.

Email reached in September, 13th:

..... Congratulations on achieving Grand Prize award winner status (1) in Database Size, Other, All and TopTen Winner status Database Size, Other, Linux;Workload, Other, Linux in Winter Corp.'s 2005 TopTen Program!

(1) Grand prizes are awarded for first place winners in the All Environments categories only.

WDCC's **CERA DB** has been identified as the **largest Linux DB**.

