



# Data and Information Management for EO Data Centers

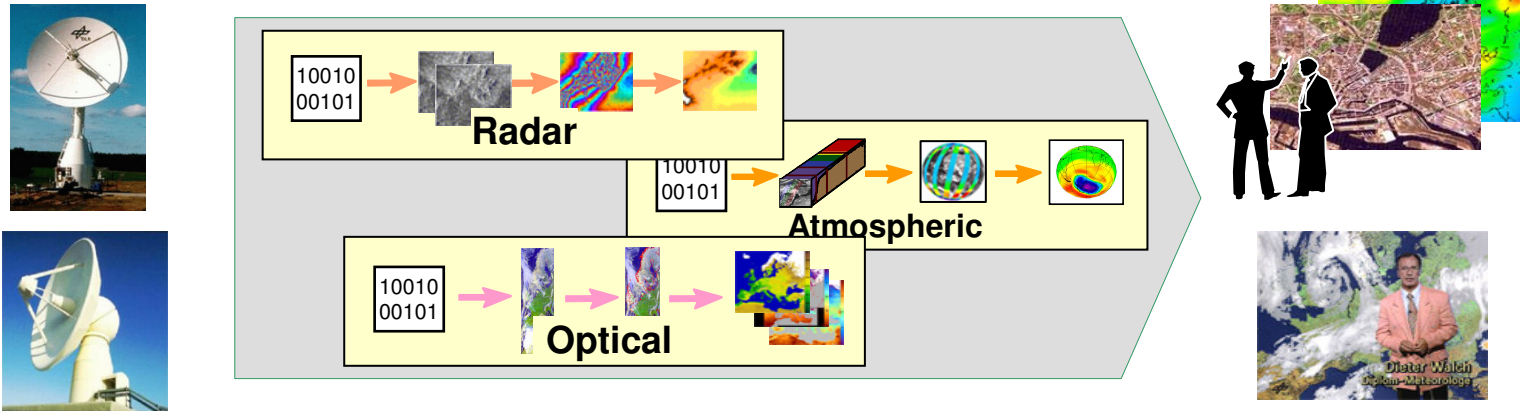
Eberhard Mikusch

German Aerospace Center - German Remote Sensing Data Center



Deutsches Zentrum  
für Luft- und Raumfahrt e.V.  
in der Helmholtz-Gemeinschaft

# Earth Observation System Environment at DLR/DFD

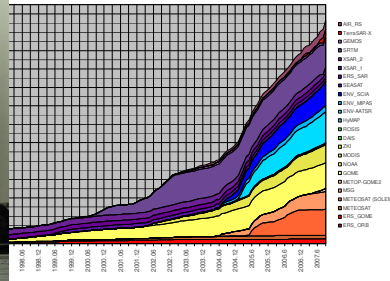


Multi-Mission Production Chains



Robot Archives

Archive C-AF Oberpfaffenhofen, Data Volume [TByte]



## Distributed Sites

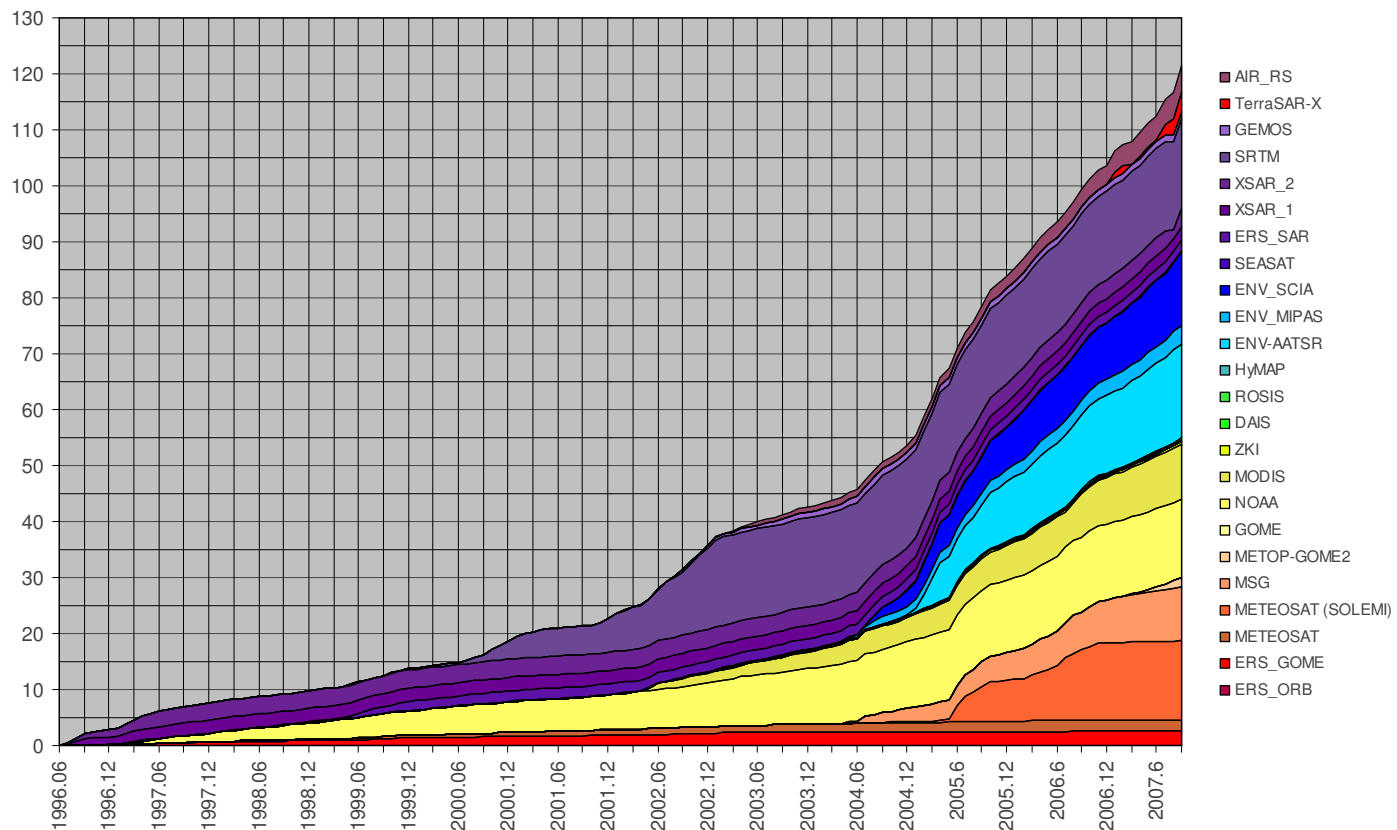


Oberpfaffenhofen

Neustrelitz

# DFD Archive Volume Statistics - Oberpfaffenhofen

Archive C-AF Oberpfaffenhofen, Data Volume [TByte]

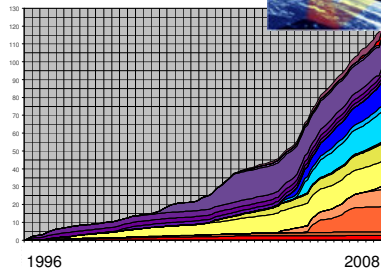


# Support for Numerous Missions and Services

National Missions  
European Missions  
International Missions



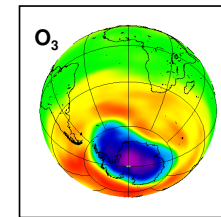
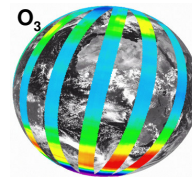
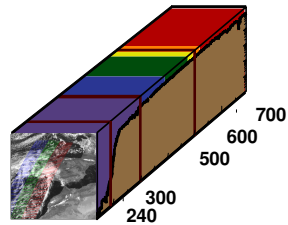
Mission examples



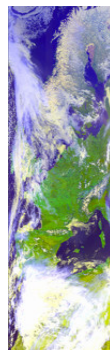
# Variety of Products and Processing

## Atmospheric Data

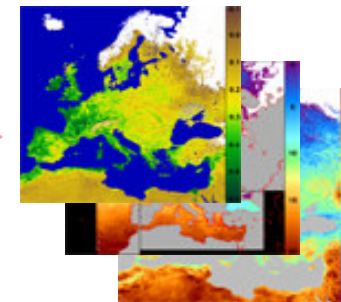
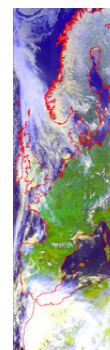
```
10110010
00010101
10111001
01000100
```



```
10110010
00010101
10111001
01000100
```

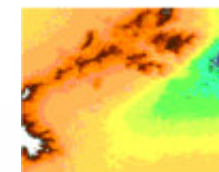
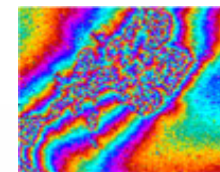
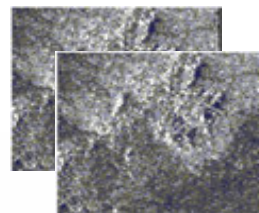


## Optical Sensor Data

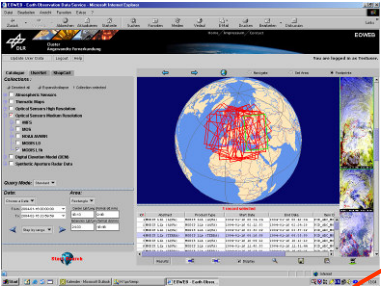


## Radar Data

```
10110010
00010101
10111001
01000100
```



# Data and Information Management System - Functionality

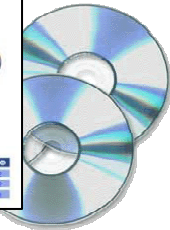


Online Access

ADMINISTRATIVE DATA	
Order ID:	200402 21103 33 33 33
Package ID:	200402 21103 33 33 33
Volume No.:	1/1
Production Date:	2004 02 28

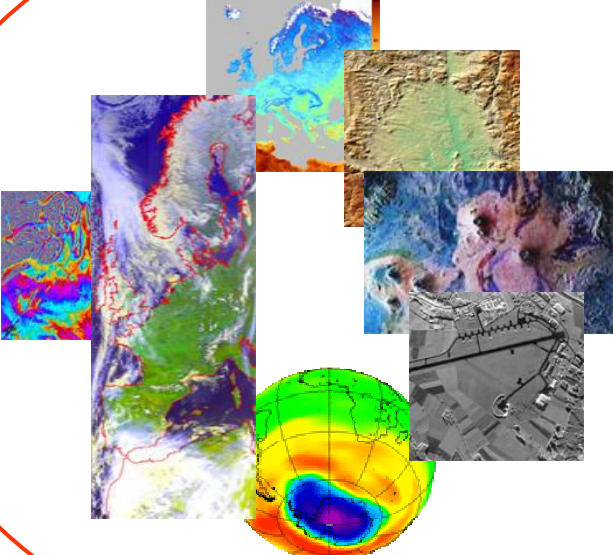
Volume Content				
This data collection has been produced as a service of DLR - DFD				
File	Product Type	Product Reference ID	Volume	Path
01	...	...	...	...
02	...	...	...	...
03	...	...	...	...
04	...	...	...	...
05	...	...	...	...
06	...	...	...	...
07	...	...	...	...
08	...	...	...	...
09	...	...	...	...
10	...	...	...	...



Delivery



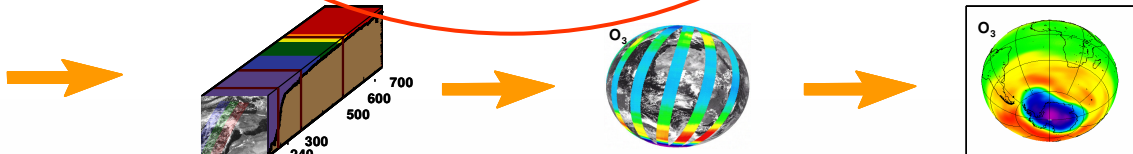
Cataloguing & Archiving



Pos	Werte	Maßstab	Produktname	Produktinhalt	Netto
01	0.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-01	Geo-Portal	1762.50
02	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-02	Geo-Portal	1762.50
03	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-03	Geo-Portal	1762.50
04	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-04	Geo-Portal	1762.50
05	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-05	Geo-Portal	1762.50
06	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-06	Geo-Portal	1762.50
07	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-07	Geo-Portal	1762.50
08	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-08	Geo-Portal	1762.50
09	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-09	Geo-Portal	1762.50
10	1.07	1:100000	DLR-Geo-Portal-2004-02-28-1011-01-01-10	Geo-Portal	1762.50

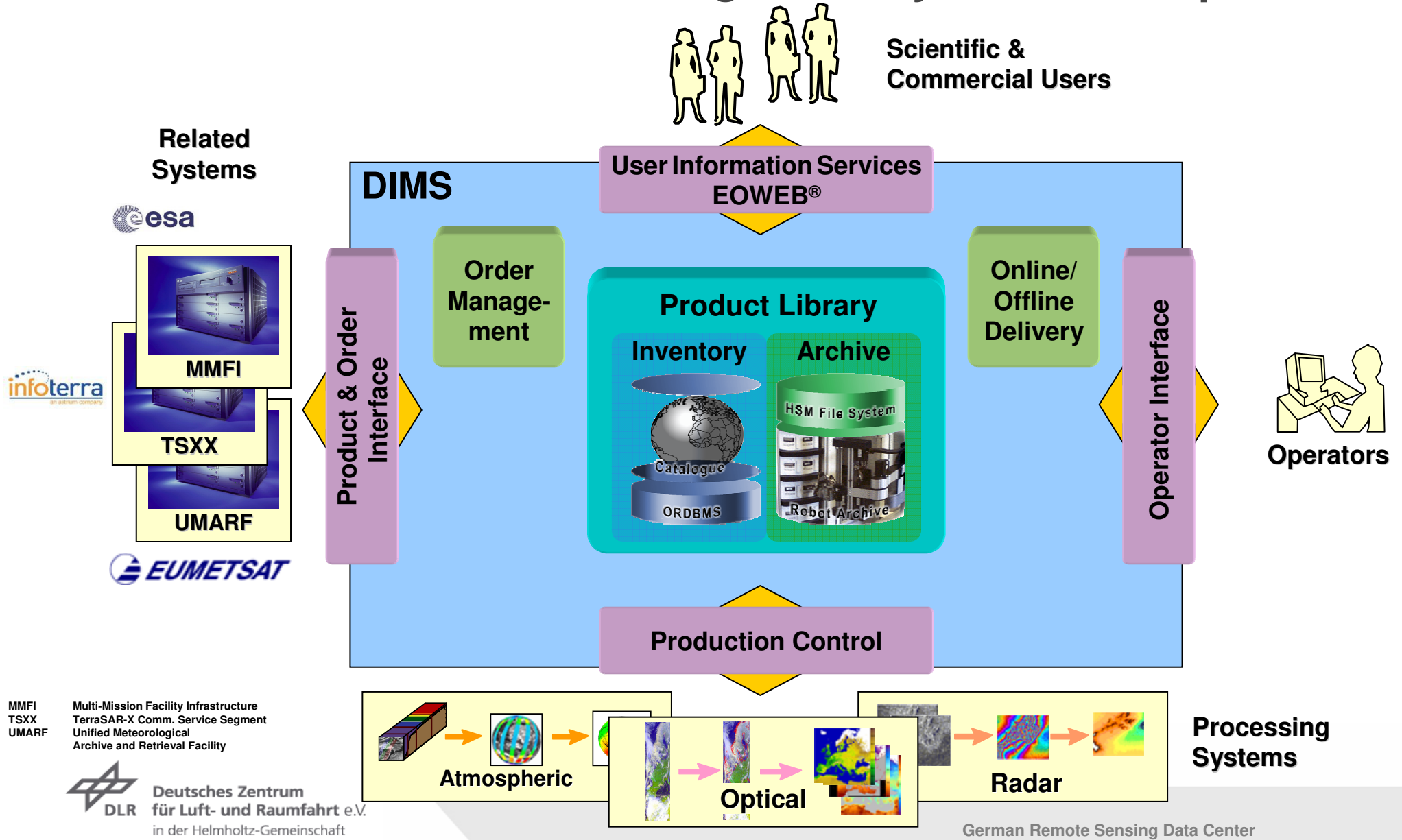
Order Management

10110010  
00010101  
10111001  
01000100

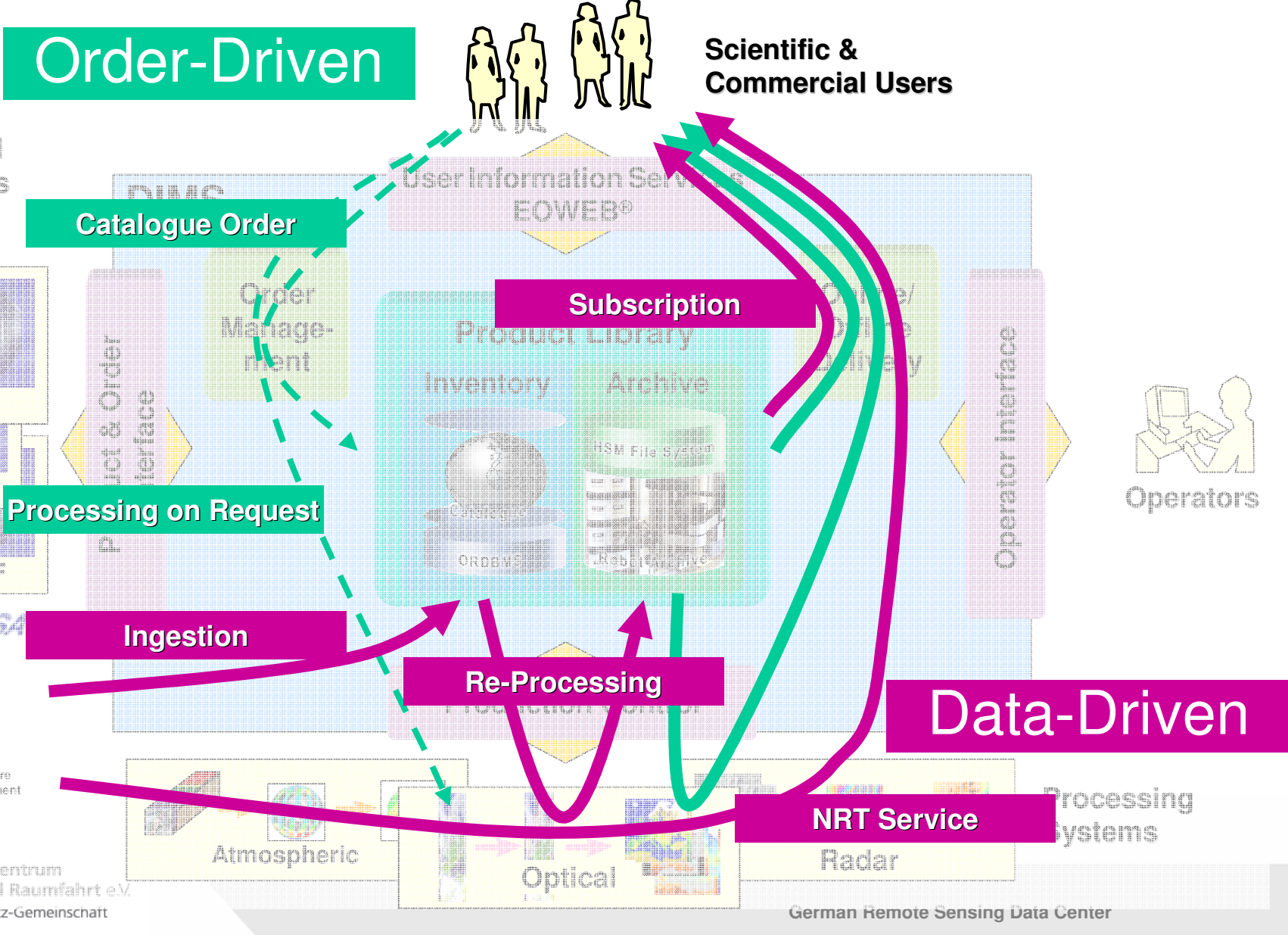


Production

# Data and Information Management System - Components



# Data and Information Management System - Scenarios

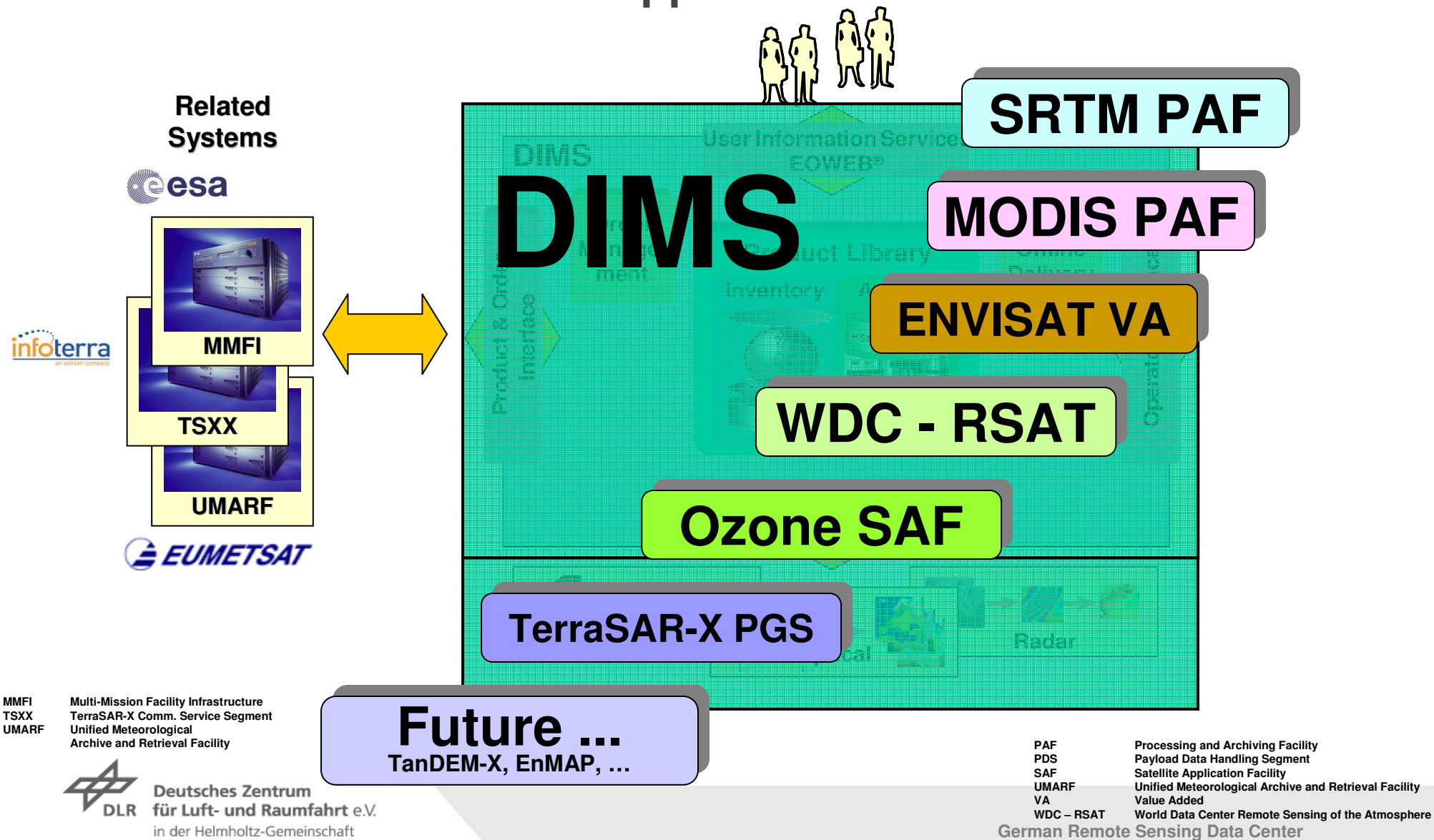


MMFI Multi-Mission Facility Infrastructure  
 TSXX TerraSAR-X Comm. Service Segment  
 UMARF Unified Meteorological Archive and Retrieval Facility

**DLR** Deutsches Zentrum für Luft- und Raumfahrt e.V. in der Helmholtz-Gemeinschaft



# DIMS Multi-Mission Support



Related Systems



MMFI

TSXX

UMARF



MMFI  
TSXX  
UMARF

Multi-Mission Facility Infrastructure  
TerraSAR-X Comm. Service Segment  
Unified Meteorological  
Archive and Retrieval Facility



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SRTM PAF

MODIS PAF

ENVISAT VA

WDC - RSAT

Ozone SAF

TerraSAR-X PGS

Future ...  
TanDEM-X, EnMAP, ...

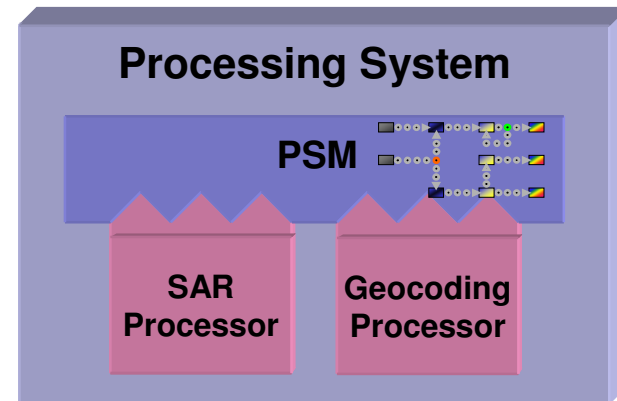
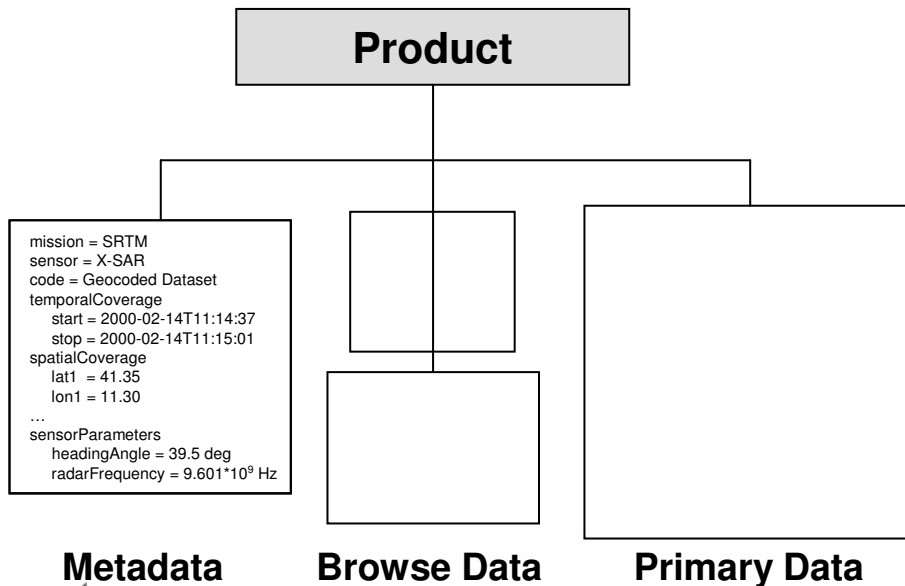
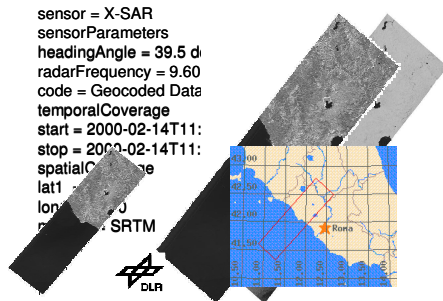
PAF Processing and Archiving Facility  
PDS Payload Data Handling Segment  
SAF Satellite Application Facility  
UMARF Unified Meteorological Archive and Retrieval Facility  
VA Value Added  
WDC - RSAT World Data Center Remote Sensing of the Atmosphere

German Remote Sensing Data Center

# Essential Tasks of a Data Center

## Product Management

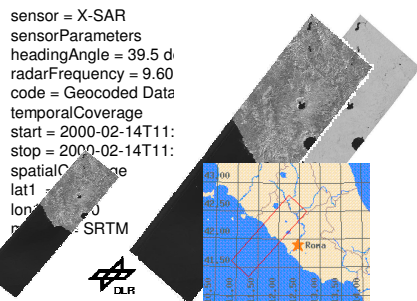
## Processing Management



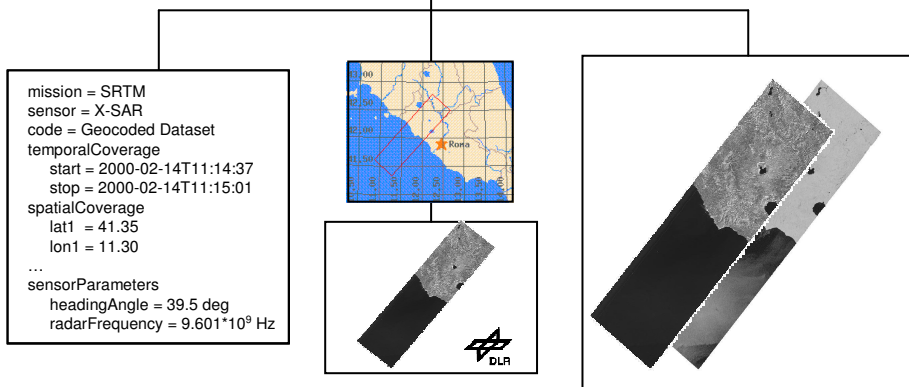
# Essential Tasks of a Data Center

## Product Management

## Processing Management



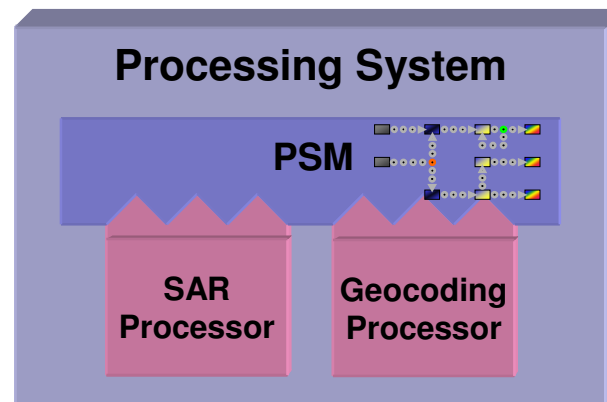
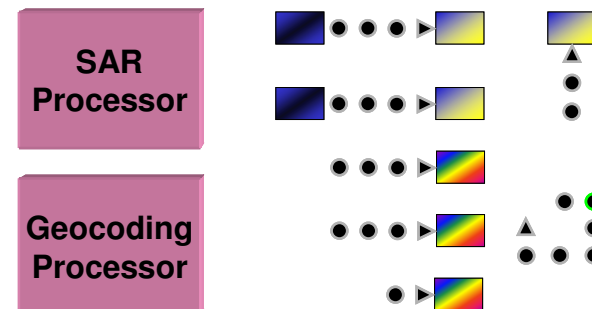
**Product**



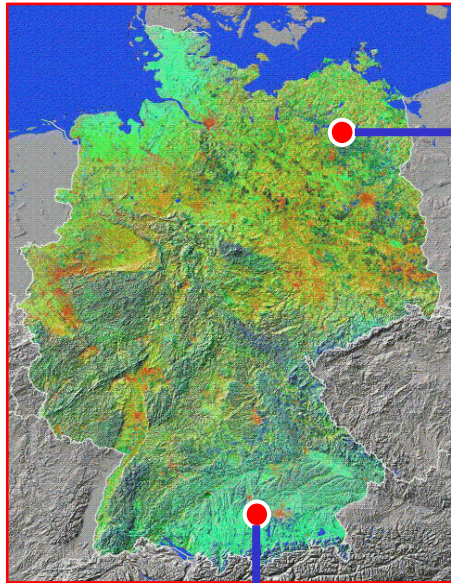
**Metadata**

**Browse Data**

**Primary Data**



# DLR/DFD Distributed Robot Archives



**Neustrelitz**

- ▶ Fully automated, extendable robot libraries
- ▶ Petabyte capacity (currently 2.2PB)
- ▶ High network bandwidth (600MBit/s)
- ▶ Long-term data preservation
- ▶ Long-time operational experience



70TByte of data

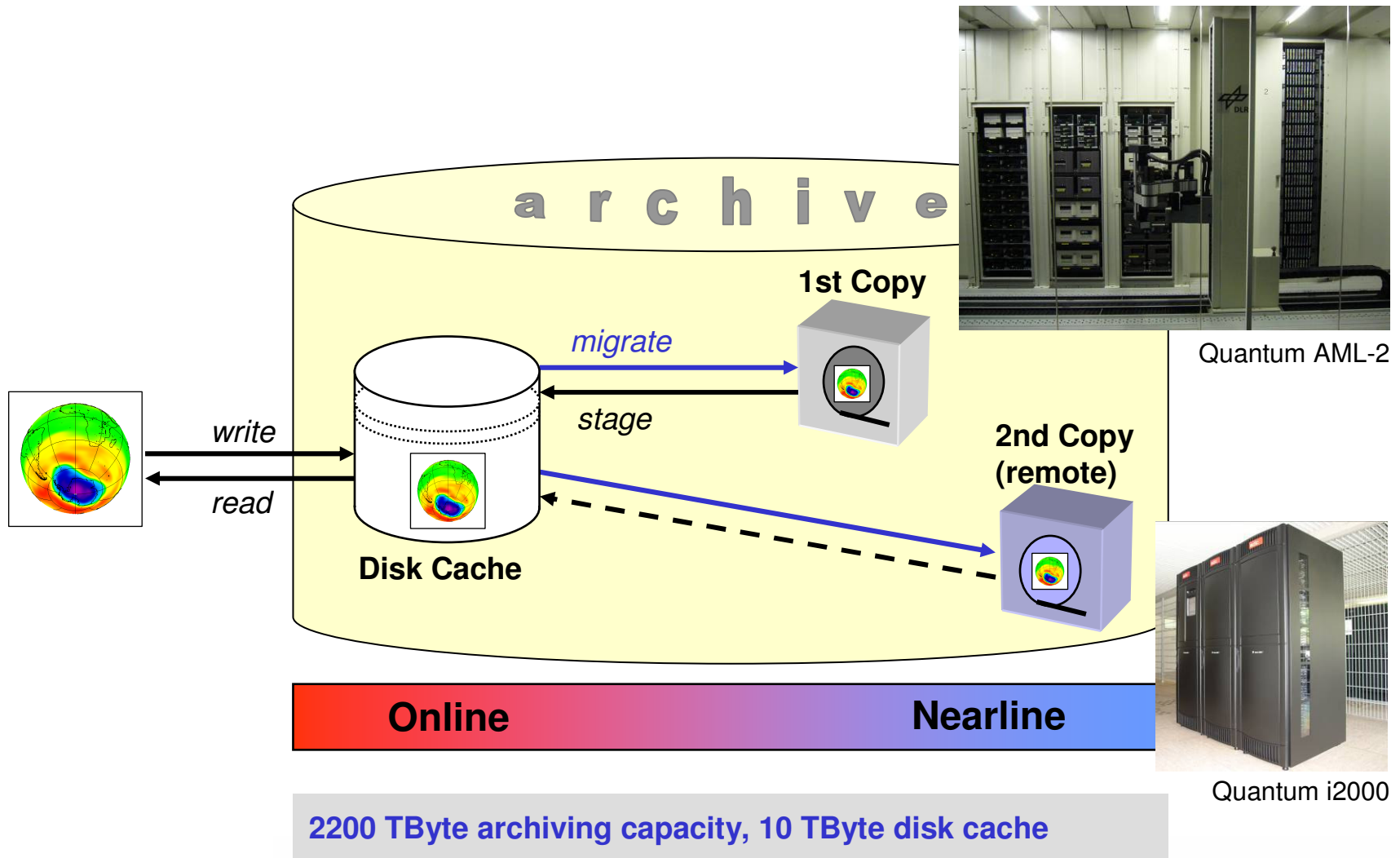


**Oberpfaffenhofen**



130TByte of data

# Hierarchical Storage Management



# EOWEB® User Information Service - Interactive User Interface

- User registration
  - Product catalogue and browse
  - Product ordering
- for archived data and satellite acquisitions

**Product Order Options**

Selected Product(s):

Id	Abstract	Item Descriptor Identifier	Product Type	Start Date
3	TSX-1 SAR L0 Stripmap future scenes - single	PID_ARC_TSX-1_SAR_L0_Stripmap_future_scenes1	singleScene-single-Stripmap	2006-04-30 16:51:11

Order Options:

Order Service: DLR-DFD

Order Option: Product Type:singleScene-single-Stripmap; SubType:ACQ\_L1b\_1

**Acquisition Options**

Polarization Channels: HH

Acquisition Priority: 1

Bandwidth [MHz]: 150

Extension of acquisition time window: 0 / + 0 cycle(s) (1 cycle = 11 days)

**Processing Options**

Processing Level: L1B

Permanent Archiving: Yes

Orbit Precision: PREDICTED

Resolution: Spatially Enhanced (SE)

Product Type: Single Look Slant Range Complex (SSC)

Projection: Auto

Processing Priority: 1

**Delivery Options**

Delivery Method: ftp

Product Medium: File

Product Format: DTED

**EOWEB - Earth Observation Data Service - Microsoft Internet Explorer**

Adresse: http://eoweb.dlr.de:8080/servlets/template/welcome/entryPage.vm

Cluster Angewandte Fernerkundung

You are logged in as anonymous user.

**Catalogue** | UserSet | ShopCart

**Collections:**

- Deselect all
- Expand/collapse
- 1 Collection selected
  - MODIS L0
  - MODIS L1b
  - Digital Elevation Model (DEM)
    - Shuttle Radar Topography Mission (SRTM)
      - DEM Product
        - Multilook Ground Range Detected (MGD)
        - Single look Slant range Complex (SSC)
        - Geocoded Terrain Corrected (GTC)
      - Mission Coverage (No Ordering)
    - Synthetic Aperture Radar Data

**Query Mode:** Standard

**Date:** From: 2000-02-11 00:00:00 To: 2003-02-22 23:59:59

**Area:** Rectangle Center (Lat/Lon): 48.33 11.86 Extension (Lat/Lon): 2.26 5.77

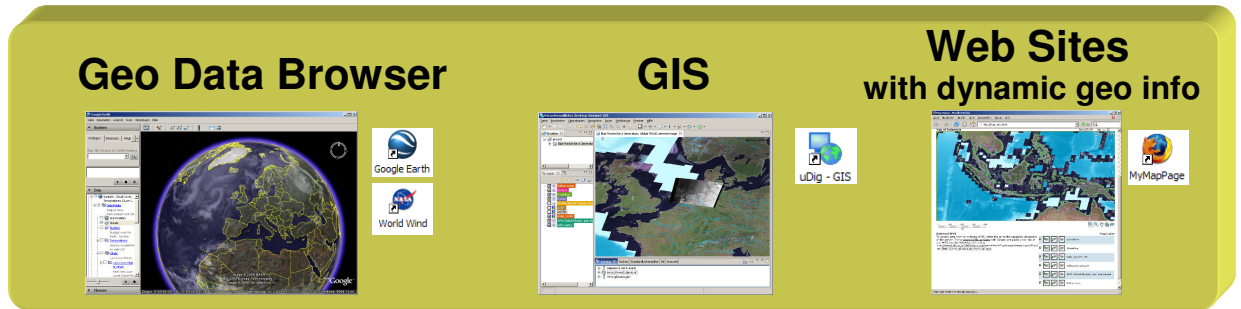
1 record selected

Id	Abstract	Product Type	Start Date	End Date	Item
1	E0120000N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
2	E0121500N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
3	E0123000N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
4	E0124500N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
5	E0130000N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
6	E0131500N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
7	E0132000N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
8	E0134500N491500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
9	E0130000N490000_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
10	E0121500N490000_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
11	E0123000N490000_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
12	E0124500N490000_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
13	E0130000N490000_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
14	E0131500N490000_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
15	E0134500N490000_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D
16	E0120000N484500_SRTM_1	DEM	2000-02-11 00:00:00	2000-02-23 23:59:00	PID_ARC_D

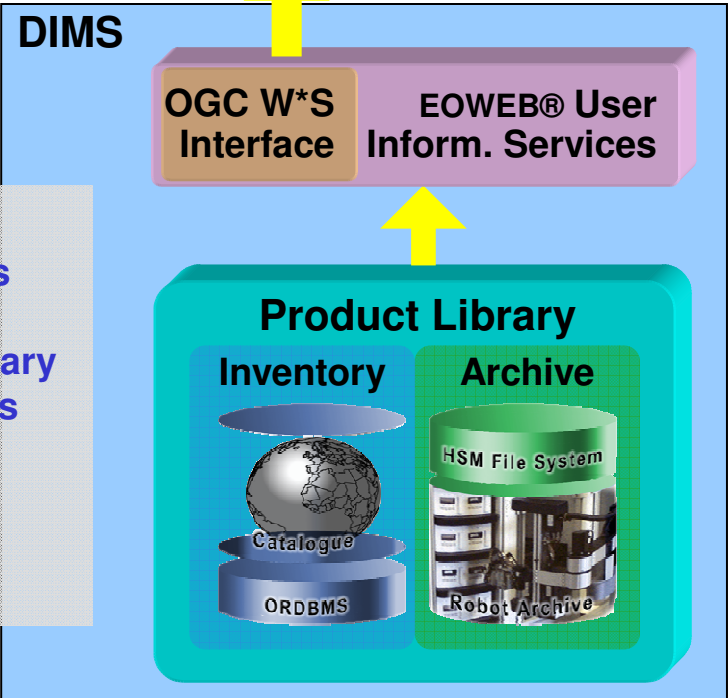
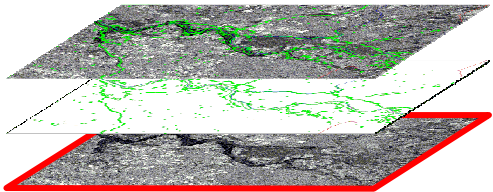
Latitude 47.25 Longitude 15.38

Example: Catalogue Order, SRTM

# Geo Data Access – Improving EOWEB® Data Access



Visualisation  
Evaluation



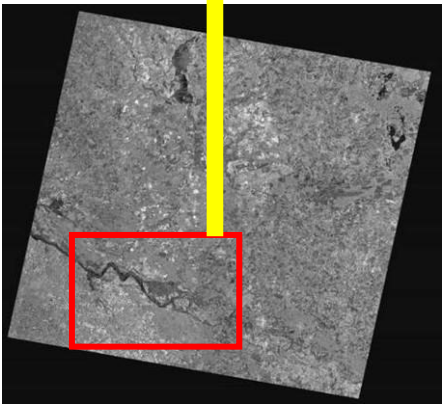
Online Access  
Post-Processing

Standardized access via OGC web mapping interfaces

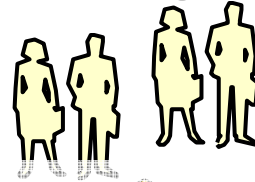
Bridge between Product Library and Geo Information Systems

Post-Processing Functions: e.g. extraction, projections, format conversions

Long-Term Archiving



# Data and Information Management System - Operations Summary



Scientific & Commercial Users

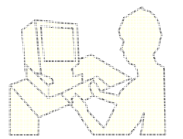
Related Systems

DIMS

User Information Services  
EOWEB®

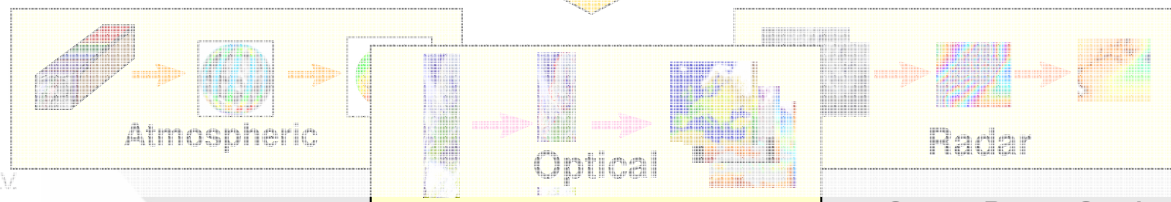
## DLR-DFD DIMS operation characteristics

- 50 processing systems
- 60.000 product transfers per month
- 100 product types
- 1,300,000 products
- 8 Mio. files
- 220 TByte of data



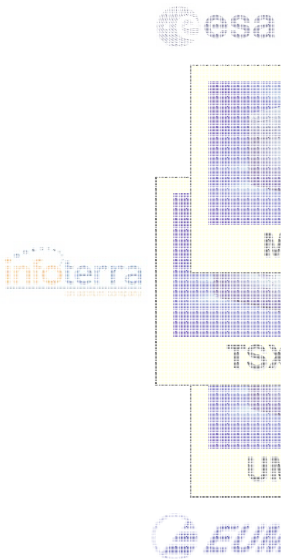
Operators

Production Control



Processing Systems

German Remote Sensing Data Center



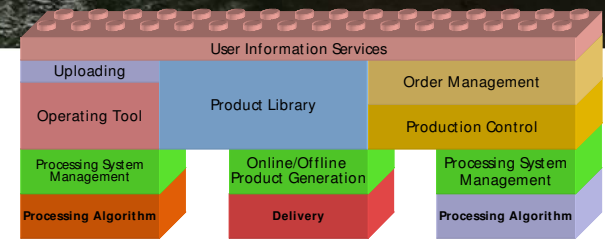
MMFI Multi-Mission Facility Infrastructure  
TSXX TerraSAR-X Comm. Service Segment  
UMARF Unified Meteorological Archive and Retrieval Facility



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# Conclusion



- DLR-DFD has developed a Data and Information Management System - DIMS to provide
  - building blocks for data centers / ground segments
  - sustainable access to archived data and satellite acquisitions
  - a scalable multi-mission facility configurable for new missions/sensors
  - comprehensive functionality for digital product management: archiving, cataloguing, processing, ordering and delivery
  
- DIMS components are in operational use
  - at DLR-DFD distributed ground segment sites (since 2000)
  - at ESA distributed multi-mission facility infrastructure (7 sites)
  - at Infoterra TerraSAR-X commercial user service segment

