TerraSAR-X, TanDEM-X, EnMAP

Gunter Schreier, DLR; Jürgen Janoth, Infoterra

GSCB Workshop, 18th – 19th June 2009
ESA/ESRIN Frascati
- Launched June 15th 2007
- PPP with Astrium/InfoTerra
- Ground segment by DLR (incl. GSC-DA/ HMA customisation
- Commercial distribution & Direct Access Terminals by Infoterra
- Science distribution by DLR
- GSC-DA contract thru Infoterra

Max. 1 h imaging / 560 Images per day
256 Gbit EOL Solid State Mass Memory
300 Mbit/s TDES-encrypted SAR Data
donlink in X-Band
Simultaneous Data Acquisition and Downlink
Electronic Beam Steering 20°-55° Elevation
+/- 0.7 ° Azimuth
Polarisation: Single, Dual, Quad
TerraSAR-X can be operated in different imaging modes

ScanSAR mode
- 100 km swath
- 18.5 m resolution

StripMap mode
- 30 km swath
- 3 m resolution

SpotLight mode and High Resolution SpotLight mode
- 5/10 km x 10 km
- 1 m resolution

Dual receive antenna mode
- Along-track Interferometry
- Ground Moving Target Detection
VHPrecision geolocation: Automatic Change Detection
TerraSAR-X data takes to date

~37000 products (L0)

2 years in orbit
• Launch scheduled Oct 21st, 2009
• Innovative close constellation flight
• Global high resolution Digital Elevation Model (DEM)
• Mission ops, payload data ground segment, processing & global DEM generation by DLR
• GSC-DA/HMA compatible thru DLR DIMS based catalog/archive
• Commercialisation thru Astrium/Infoterra
• Science thru DLR
EnMAP

Environmental Mapping and Analysis Program

- Launch: 2013
- Spatial Res.: 30m at 30km swath
- Spectral: > 200 ch. @ 420–2450 nm
- Repetition: 5 days at +/- 30° off-nadir

- DLR science satellite with operational perspectives
- Principle investigator: GeoResearch Center (GFZ)
- Ground segment, processing & distribution by DLR
- Further distribution licences (tbc)
- GSC-DA/ HMA compatible thru DLR DIMS based catalog & archive
Ground Segment & GMES Interoperability
Data and Information Management System
Backbone Components

Scientific & Commercial Users

User Information Services
EOWEB®

Product Library

Order Management

Inventory

Archive

Online/Offline Delivery

Product & Order Interface

Operator Interface

DIMS

Related Systems

ESA

infoterra

EUMETSAT

MMFI

TSXX

UMARF

Production Control

Atmospheric
Optical
Radar

Processing Systems

Operators

Ground Segment Coordination Body

Rainfall Monitoring Facility

EUMARSAT

TerraSAR-X Comm. Service Segment

Unified Meteorological Archive and Retrieval Facility
### National Remote Sensing Data Library

**National missions and (commercial) partner missions:**

All metadata and most data hosted in DIMS operated catalog and archive.

### Partner Facilities

### ESA Facilities

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<table>
<thead>
<tr>
<th>Project/Mission</th>
<th>Product Types</th>
<th>Number of Products</th>
<th>Data Volume [Gigabytes]</th>
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DIMS – general interfaces

- ESA HMA catalogue, order, programming
- CEOS CIP catalogue
- Infoterra TSXX product upload, ordering
- EUMETSAT UMARF product upload, ordering

User Services
Dissemination

DLR Multi-Mission Facility

Ingestion
Processing

3rd party mission data: IRS, airborne RS, Meteosat, MSG, MERIS VA, ...
3rd party project data: SWACI, EURAD, ...
3rd party processors: MODIS, AVHRR, ...

online delivery, media delivery
NRT dissemination, broadcast (EUMETCast, WMO/GTS)
DLR missions operations: TerraSAR-X, TanDEM-X, ...

GSCB Workshop, ESA/ESRIN (Frascati)
18th – 19th June 2009
DLR HMA implementation for GMES Contributing Missions

GMES Service Projects (GSP) and User Segment

GMES Space Component Data Access (GSCDA)

... special interfaces for rush tasking requests

Coordinated Data Access System (CDS)

HMA-I-D Project
- HMA Catalog Service
- HMA Order Service
- HMA Sensor Programming Service
- HMA User Management

IRIS

gcm

GCM TSX

GCM IRS

DIMS NZ

DIMS OP

DLR Multi-Mission Facility

GSCB Workshop, ESA/ESRIN (Frascati)
18th - 19th June 2009
GSC-DA GCM TSX implementation V2

GMES Service Projects (GSP) and User Segment

GMES Space Component Data Access (GSCDA)

Coordinated Data Access System (CDS)

HMA Catalog Service
HMA Order Service
HMA Sensor Programming Service
HMA User Management

TSXX - Infoterra
TerraSAR-X Exploitation
(Commercial Service Segment)

Mission Manager

DLR Multi-Mission Facility

MOS
Mission Operations Segment

IOCS
Instrument Operations and Calibr. Segment

Contributing Mission TerraSAR-X

GSCB Workshop, ESA/ESRIN (Frascati)
18th - 19th June 2009
GSC-DA GCM IRS implementation V2

GMES Service Projects (GSP) and User Segment

GMES Space Component Data Access (GSCDA)

Coordinated Data Access System (CDS)

HMA Catalog Service
HMA Order Service
HMA User Management

Euromap

DLR Multi-Mission Facility

Contributing Mission IRS

IRS

Euromap

EDVEO

URF

PL

OC

OPS

NRSA

National Remote Sensing Agency

 Implemented in V1
HMA Implementation and GSC-DA GCM Schedule

**HMA-I-D**
DLR HMA Implementation
- SRR May’09
- PDR Aug’09
- AR Dec’09
- IVRR Apr’10
- ORR Jun’10

**GCM TSX**
(tentative)
GSC-DA V1
- KO Jul’09
- IVRR Oct’09
- ORR Nov’09
- GSC-DA V2

**GCM IRS**
GSC-DA V1
- KO Jun’09
- IVRR Sep’09
- ORR Oct’09
- GSC-DA V2

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Product QA at DLR PDGS

- No specific contributions on QA4EO by DLR, however: Generic product QA in:
  - DIMS production management (TSX, TDX, EnMAP, etc..)
  - O3-MSAF production (Ozone and more)
QA in Operating Tool
Internet, DLR WAN, HiSEEN at DLR, Site LANs, Stations future
German GMES EO data interfaces

Satellite Data Security Act (SatDSiG) .. where applicable

GMES/Sentinel data policy .. where applicable

*) only science data for RapidEye
Satellite Data Security Act

The permit … must be granted if the dissemination of data in the individual case does not harm the vital security interests of the Federal Republic of Germany, does not disturb the peaceful coexistence of nations and does not substantially impair the foreign relations of the Federal Republic of Germany.

Legislative Authority:
Federal Ministry of Economics (BMWi)
Executive Authority:
Federal Office of Economics and Export Control (BAFA)

License for operation (DLR only) and for distribution of data (DLR & Infoterra), of a high grade earth observation system
German Satellite Security Act

- Summarized geomatrix:
  - SAR DATA < 2.5m resolution (HS, SL)
  - Check of sensitive area list (subject to change)

  - Afghanistan, Ethiopia, Armenia, Aserbeidschan, Bahrain, Bosnia-Herzegovina, Djibouti, Eritrea, Georgia, Irak, Israel & Palestine, DR Kongo, Kosovo UNMIK, Lebanon, Moldawia, Somalia, Sudan, Tschad, Usbekistan, West Sahara

  - Release request necessary
  - Delivery delay >5 days

  - Yes
  - No Release

  - Release Permission

  - Yes
  - No Release

  - Not sensitive
  - sensitive

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Ground data flow for Sentinels: Challenges & suggestions

• Up to 6 Sentinels in orbit (plus S4&5 EUMETSAT payloads) plus more!
• Capture all data, globally!
  – thru dump stations
  – direct access stations
  – Use of EDRS (downlink directly to PACs)

• Increase European EO data backbone capacity (HiSeen 2.0), incl. access to non-European Stations, where necessary
• Enable regional NRT (near ~< 15 min) stations/services
• Seamless integration of collaborating (ESA national) and 3rd party missions
• Care for quality products, archive, access, use
Final Recommendations

• Entire GMES data flow shall allow:
  – Flexible and fast (NRT) solutions
  – Interfaces with other and global data networks
  – Cooperations with specific approaches/exceptions

• Care of sustainability of HMA (and other technical solution)
  – ... one standard only as good as long as there is no better one...
  – sufficient resources to built and maintain HMA (@ esa & @ mission operators)

• Care for data & data use
  – Long Term data preservation
  – Use-oriented and open data policy
Thank you for your attention