



# TerraSAR-X Nutzlastbodensegment

Holger Maass, DLR Neustrelitz

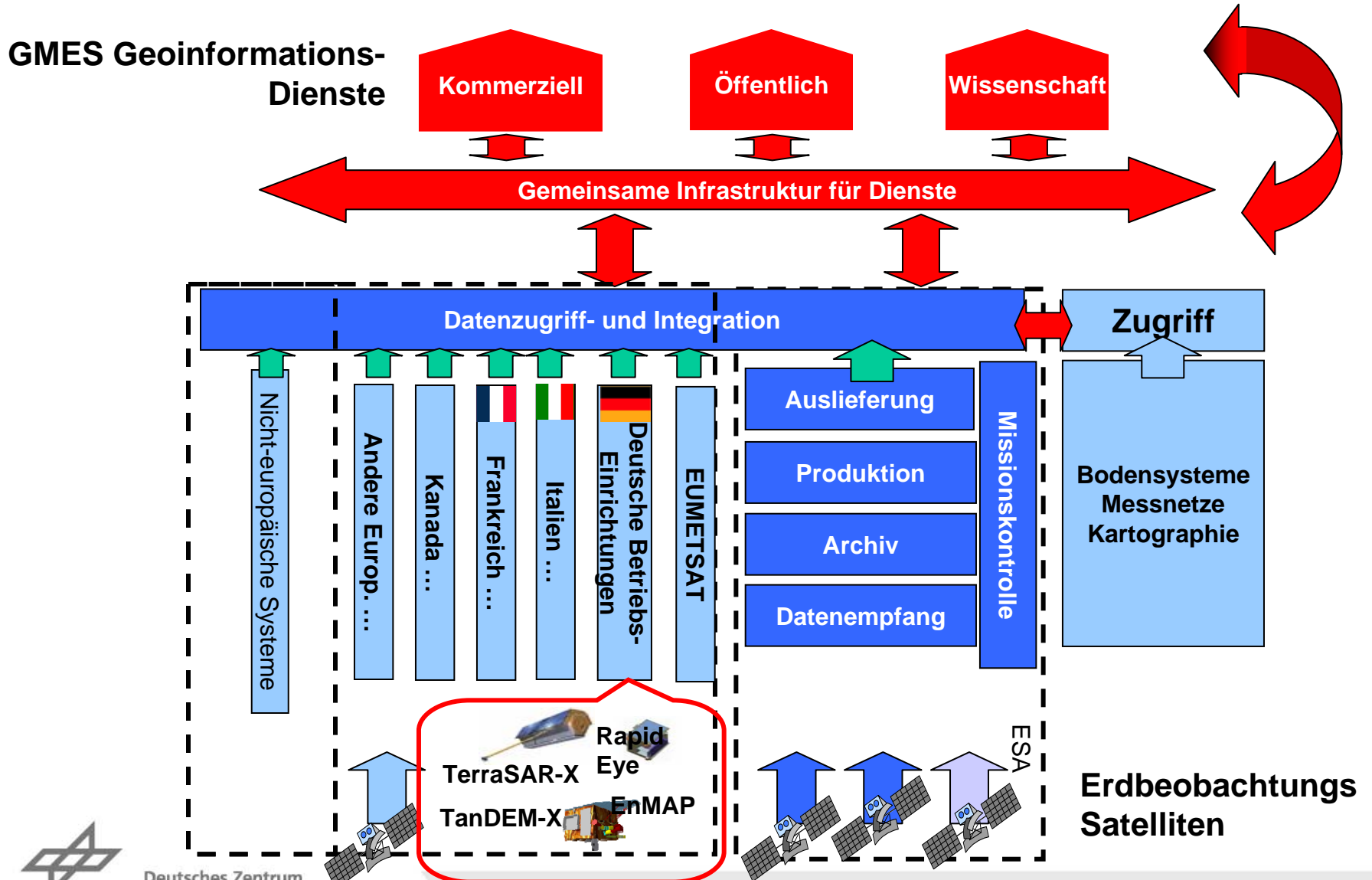
GeoForum

Warnemünde, 18./19.4.2007

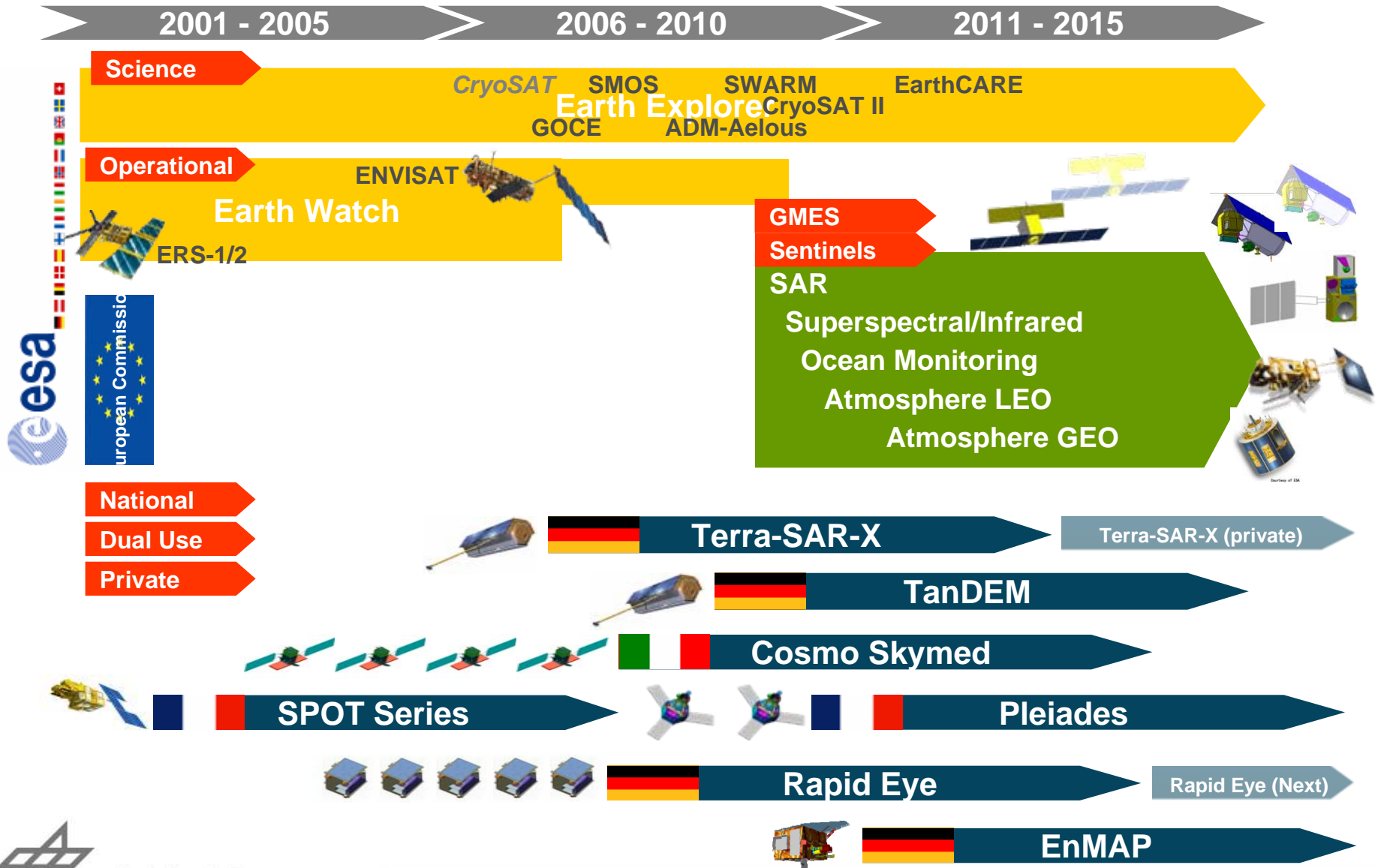


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# Bodensegment: Die GMES Infrastruktur



# Die Flotte der GMES-Satelliten

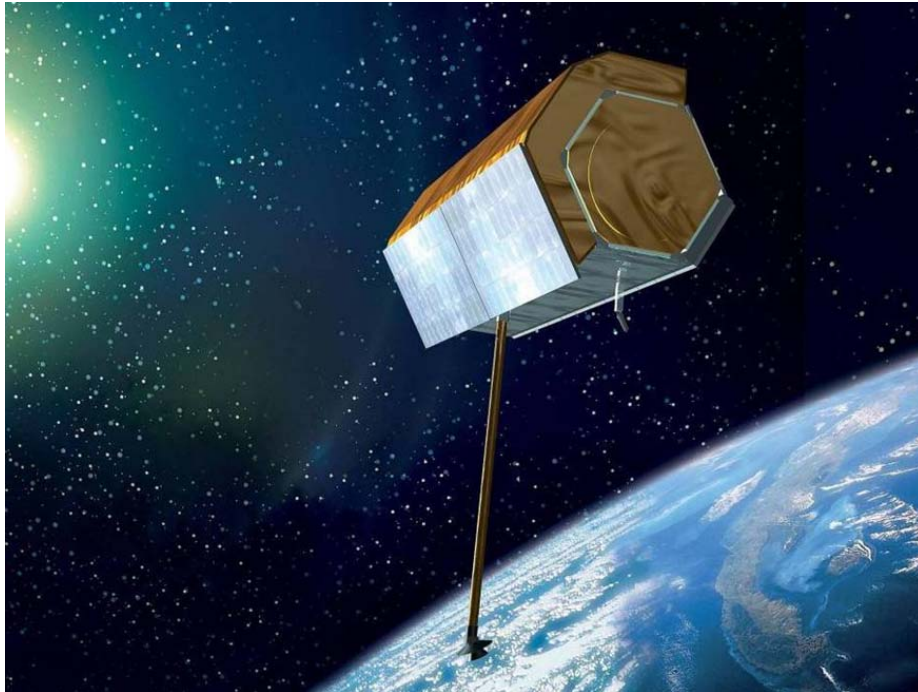


# Missionen

- **Neustrelitz:** Datenempfang für EO-Satelliten und wissenschaftliche Kleinsatelliten
  - Landsat-7 ( *ESA-Earthnet* )
  - CORONAS-F ( *IZMIRAN Moscow* )
  - *IRS-1C / IRS-1D ( Euromap )*
  - ALOS – *Commissioning Phase ( ESA-Earthnet, DLR/SSC )*
  
- **CHAMP ( GFZ Potsdam )**
- **GRACE-1, GRACE-2 ( GFZ Potsdam, JPL Pasadena )**
- **BIRD ( DLR )**
- **Aqua, Terra ( DLR )**
- **KOMPSAT-1 ( KARI, ARC Austria, DLR )**
- **ERS-2, Envisat ( DLR, National Partners )**
- **IRS-P6 ( Euromap )**
- **Orbview-2 ( Orbimage )**
- **LAPAN-TUB-Sat ( LAPAN, TUB )**
- **TerraSAR-X ( DLR, Infoterra GmbH )**
- **TanDEM-X ( DLR )**
- **EnMAP ( DLR )**
- **GMES-Sentinels**
- **IRS-P5 ( Euromap )**
- **Third Party Missions**
  - **ALOS, KOMPSAT-2, THEOS, LDCM**



# TerraSAR-X Mission



- public private partnership DLR-ASTRIUM
- high resolution X-Band-SAR instrument
- on board memory 256 Gbit
- orbit 514km; sun-synchron, repeat cycle 11 days





# TerraSAR-X: SAR Continuity in Germany

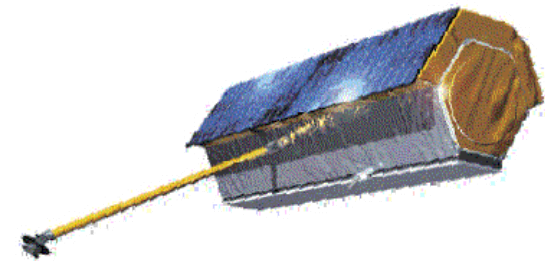


## ➤ Realization

- EADS Astrium GmbH contributes funds for implementing TerraSAR-X
- Exclusive commercial utilization rights for Infoterra GmbH
- DLR coordinates the scientific utilization of TerraSAR-X Data
- Satellite tasking will be shared equally 50/50 (scientific/commercial)

## ➤ Scientific Data Coordination

- Achim Roth , DLR ( [Achim.Roth@dlr.de](mailto:Achim.Roth@dlr.de) )



## ➤ International Ground Segment

- Licensing of Commercial Direct Access Stations by infoterra GmbH



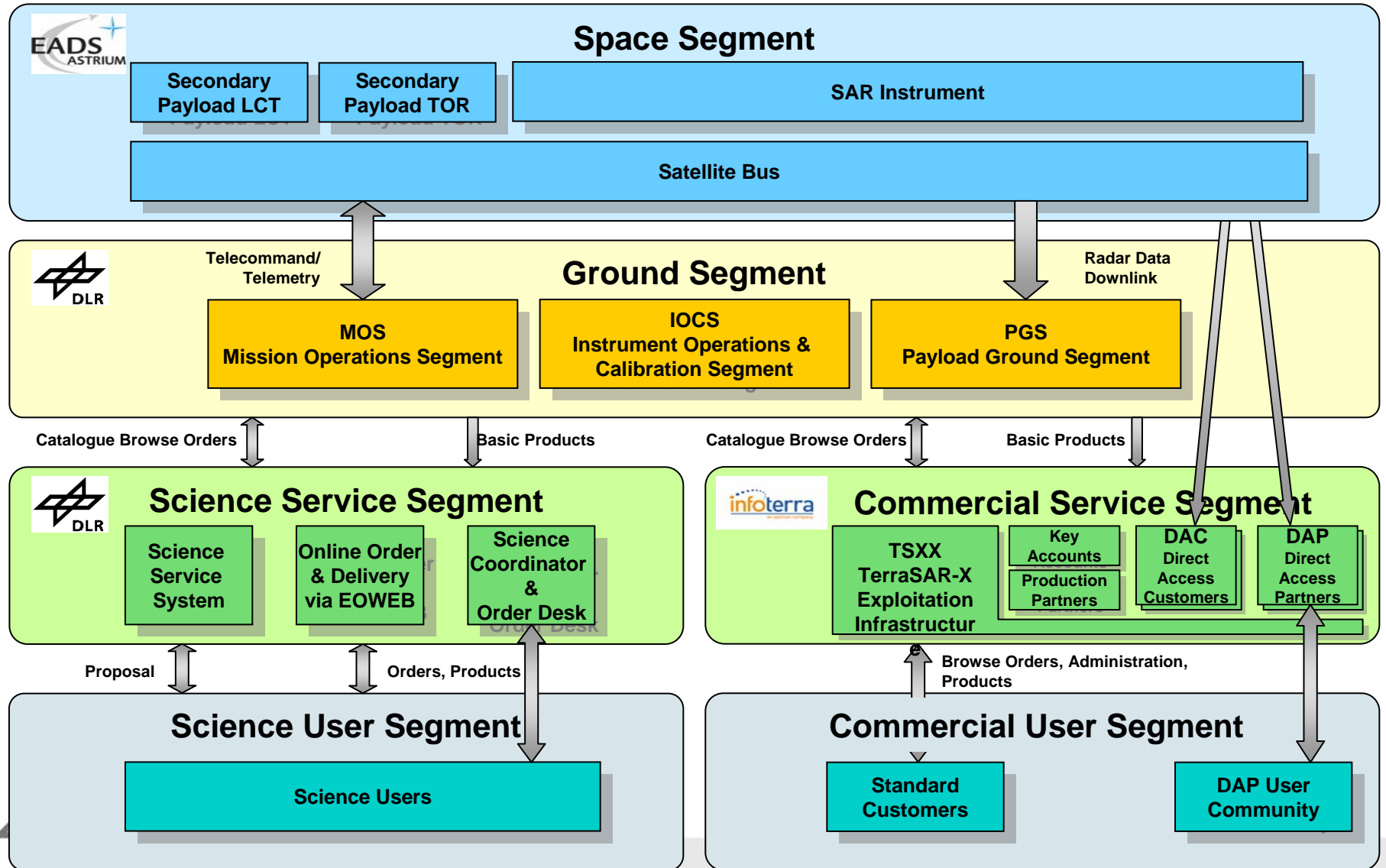
# TerraSAR-X Secondary Payloads



- **LCT:** Laser Communication Terminal
- Technology Demonstrator for inter-satellite communication link
  
- **TOR:** Tracking, Occultation and Ranging Instrument Package
- Provided by Geoforschungszentrum Potsdam (GFZ) / University of Texas
- Redundant dual-frequency GPS tracking receiver and a laser reflector set
- High-precision orbit determination capability for TerraSAR-X



# TerraSAR-X: Project Overview





# TerraSAR-X: Tasks of DLR



- **Management of TerraSAR-X contract with Astrium**
- **Development of the Satellite Operations System**
- **Development of the Payload Ground Segment**
- **Development of the Instrument Operations and Calibration Segment**
- **Satellite operations**
- **Data reception, processing, archiving and distribution**
- **Science coordination**
- **System engineering, calibration/validation**

# TerraSAR-X: Tasks of Astrium / Infoterra GmbH



## ➤ **Astrium:**

- **Development, assembly and launch of the TerraSAR-X**

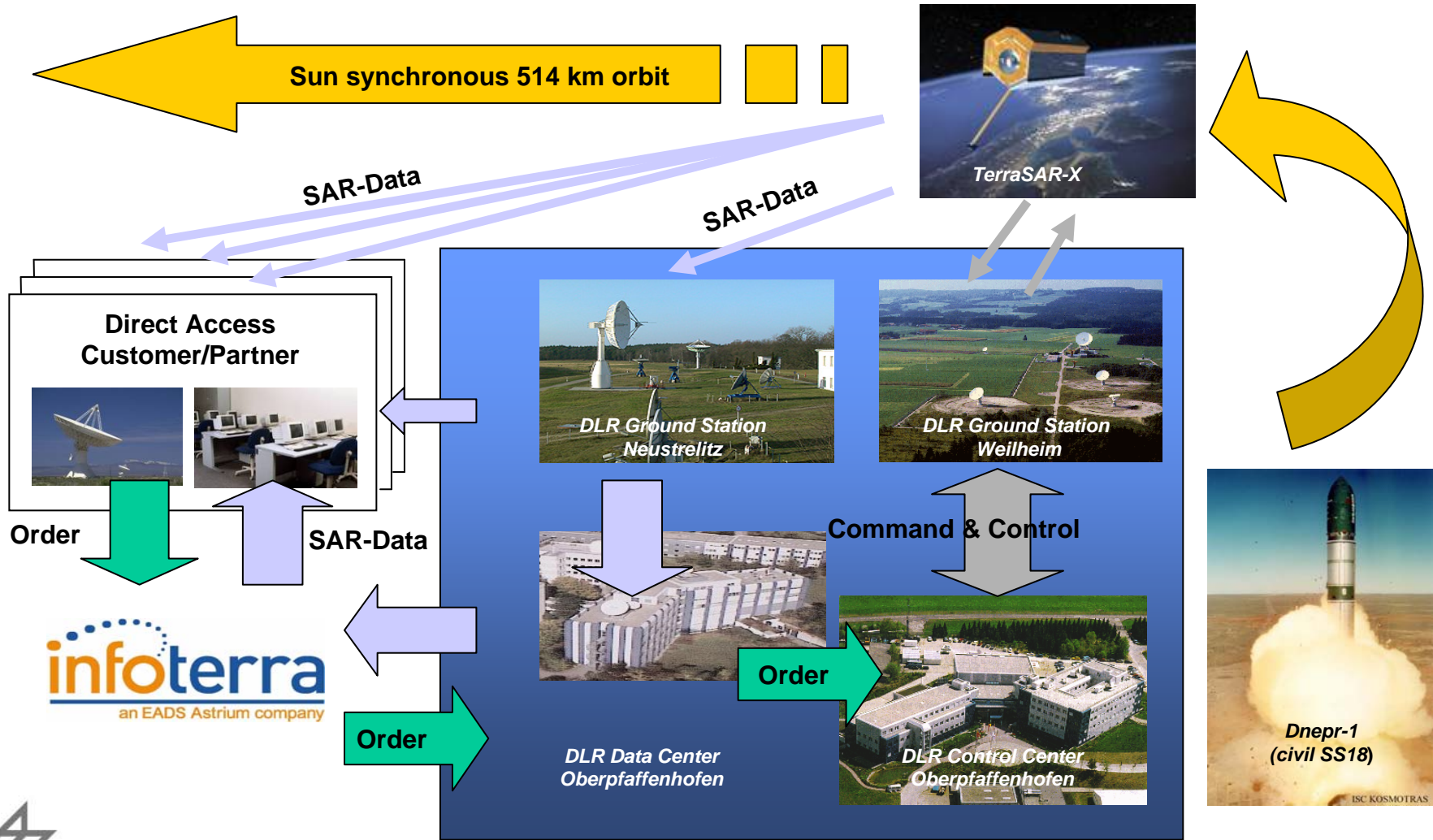
## ➤ **Infoterra GmbH:**

- **X-Band based product research & development**
- **X-Band based market development**
- **Development of a user service segment**
- **Commercial exploitation of TerraSAR-X Data**





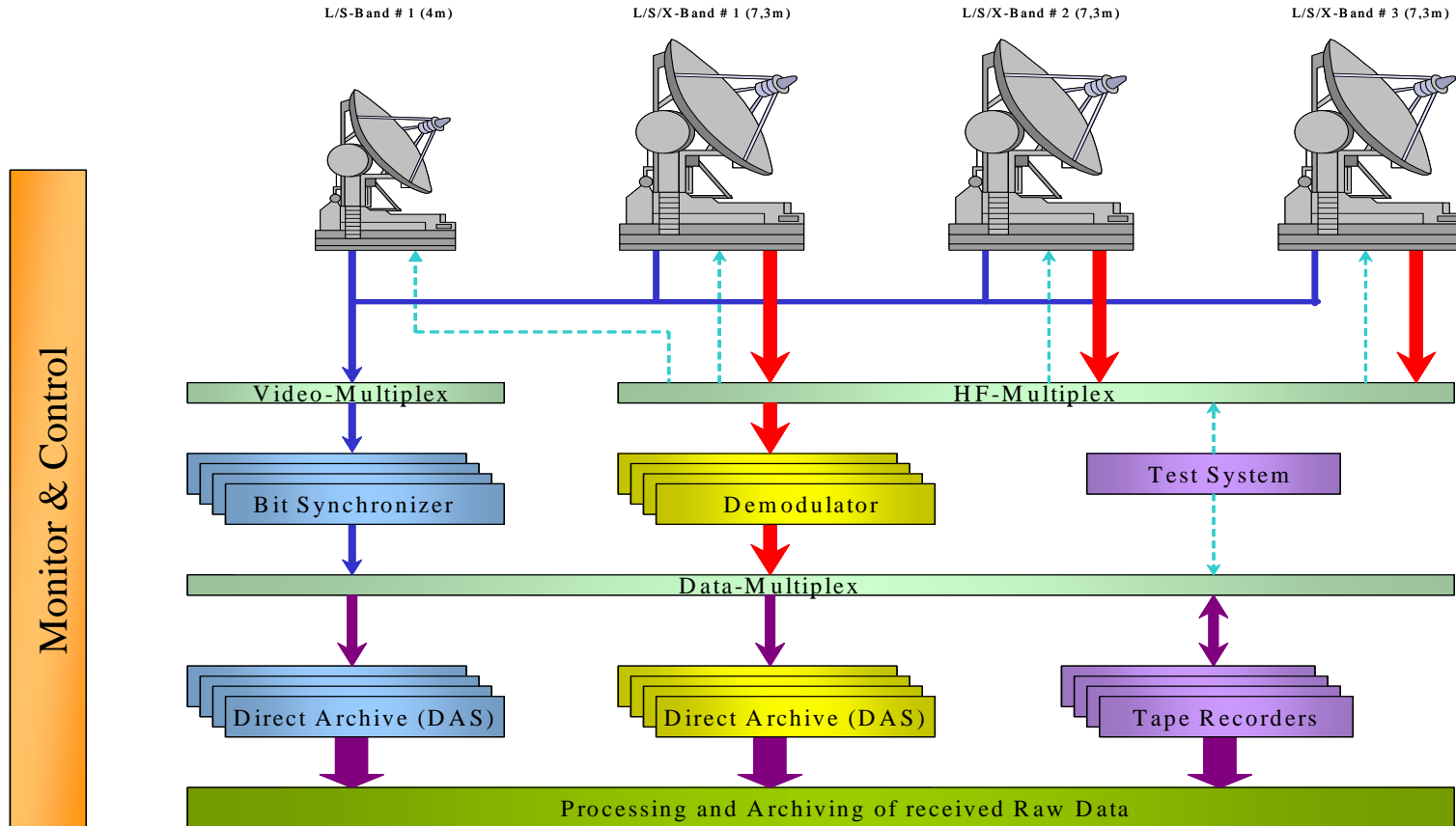
# Mission Ground Segment



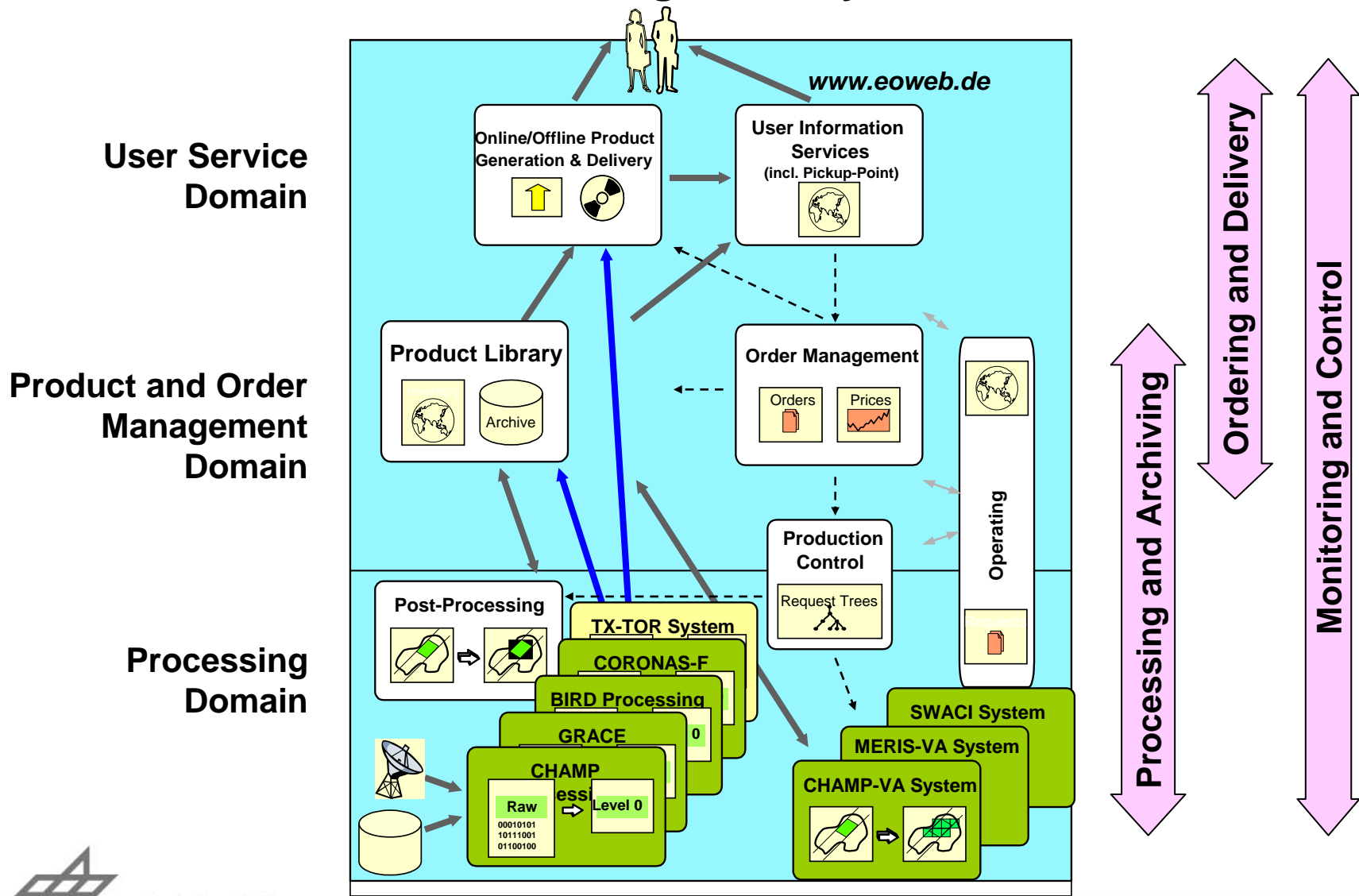
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# Neustrelitz – Groundstation Reception Network

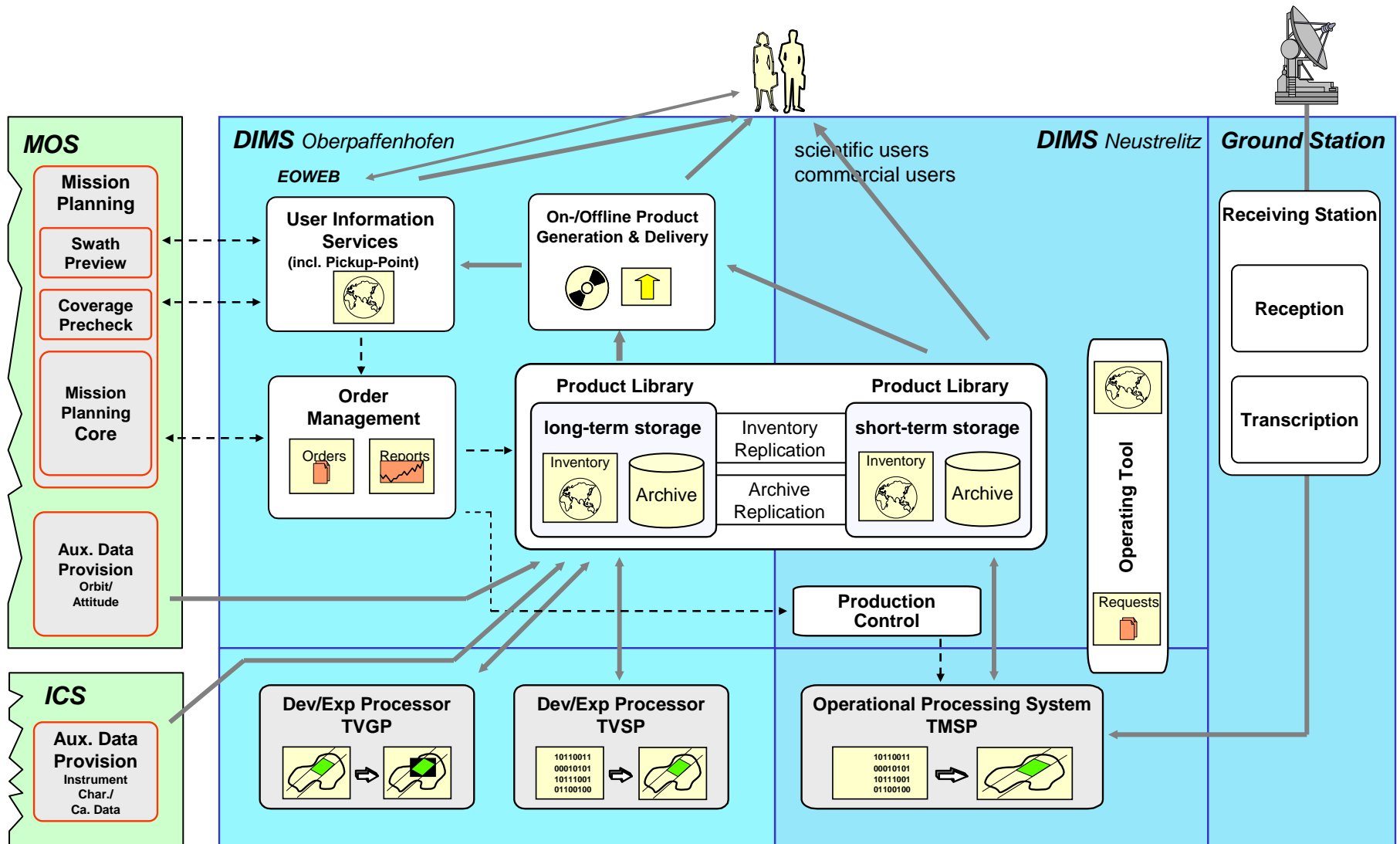
## Ground Station Neustrelitz NSG



# Daten- und Informations Management System DIMS - Überblick

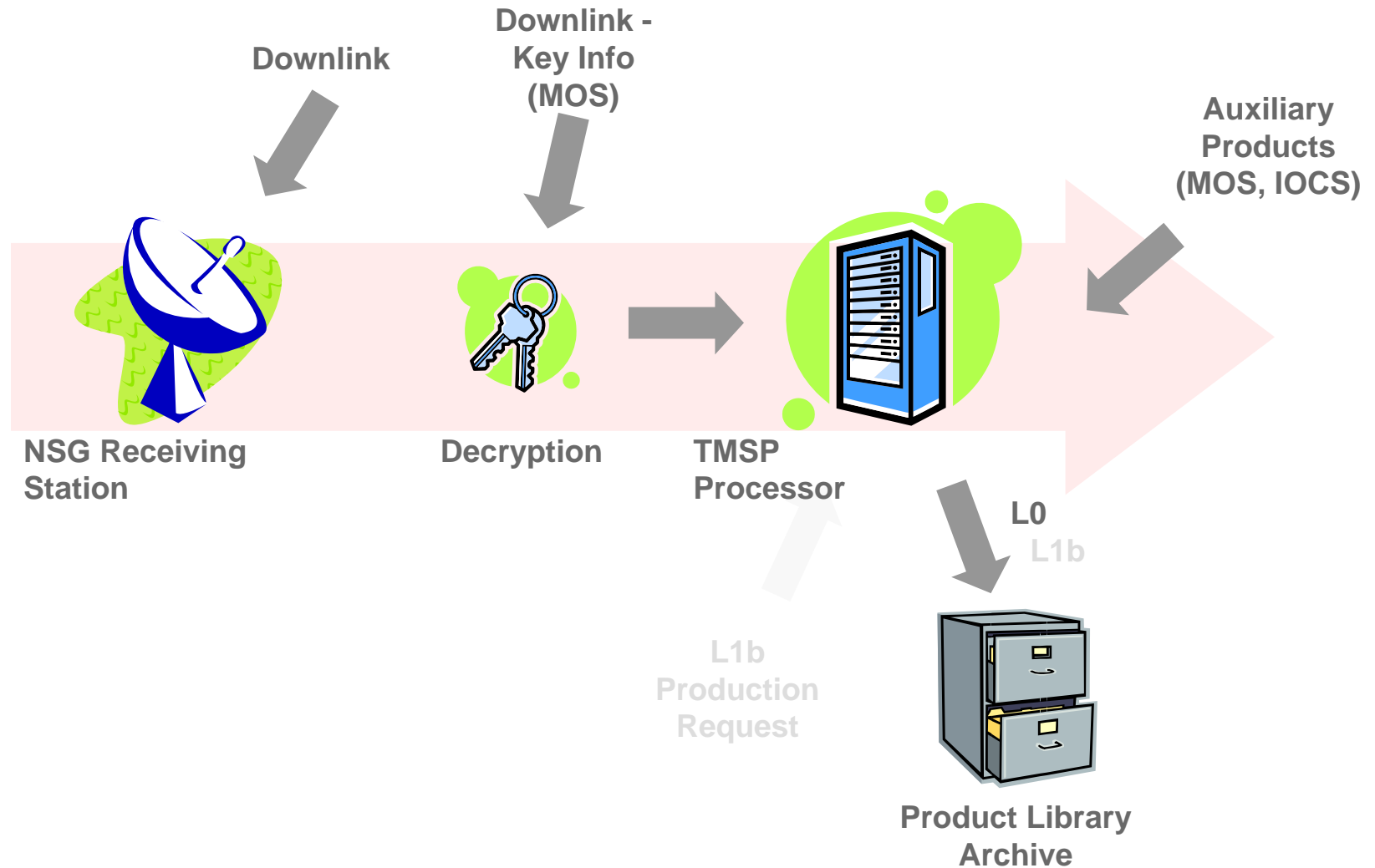


# TerraSAR-X - Overview Payload Ground Segment (PGS)

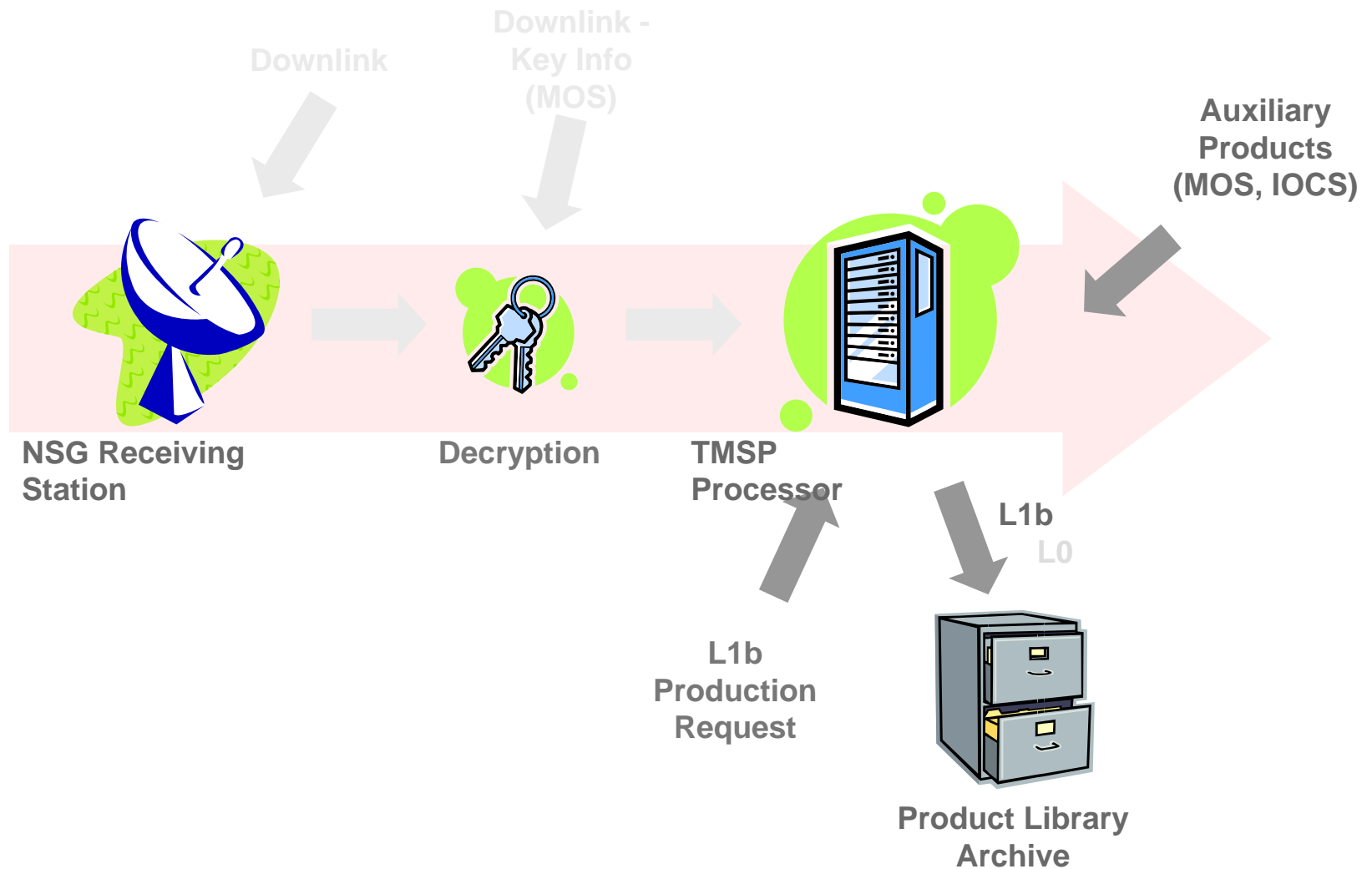




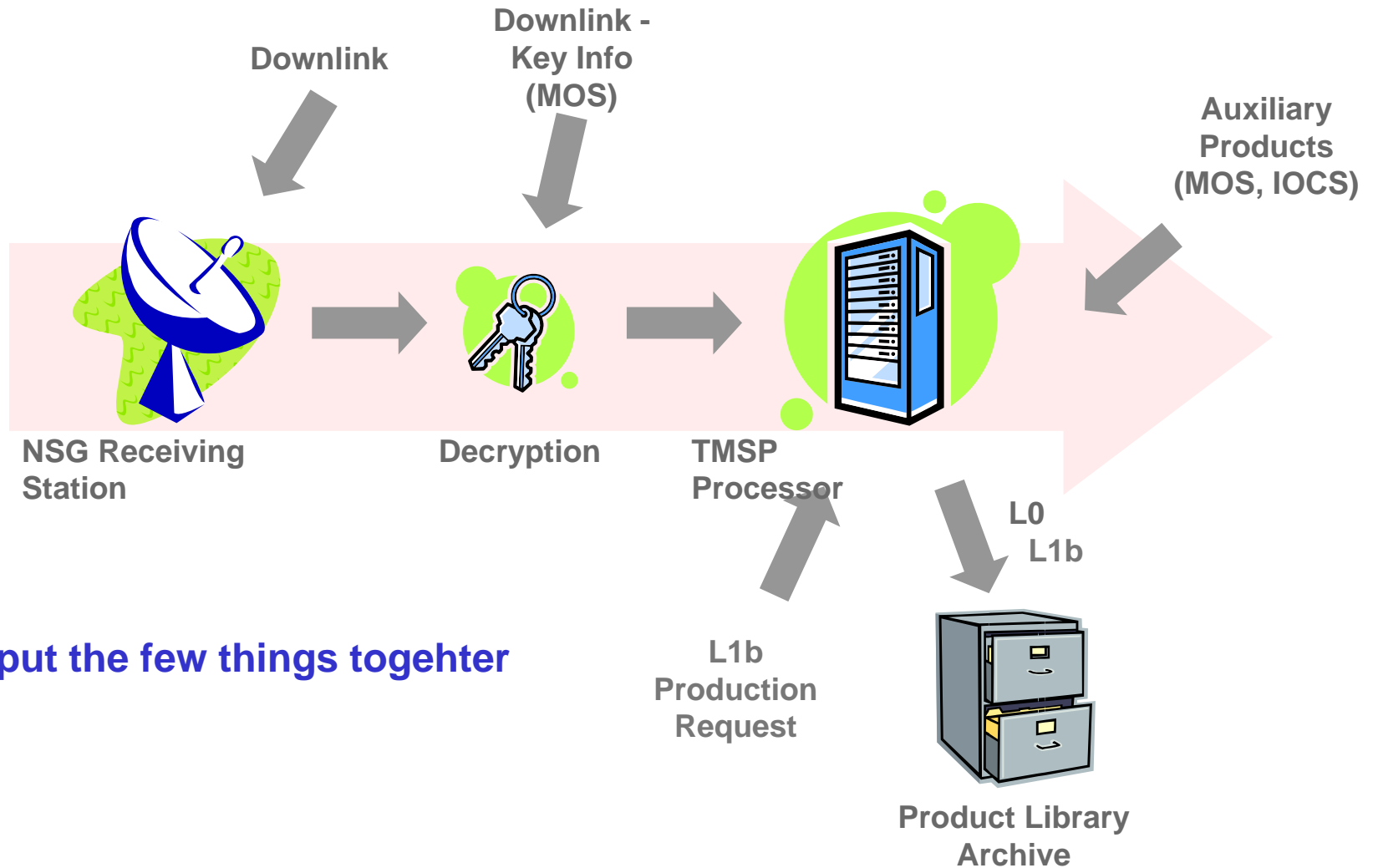
# PGS SAR Data Workflow – Data Driven L0 Generation and Archiving



# PGS SAR Data Workflow – Request Driven L1b Generation



# PGS SAR Data Workflow Integration



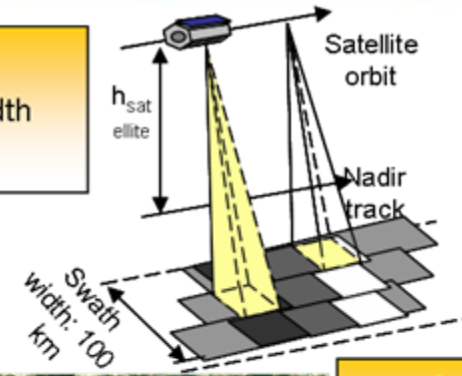
Just put the few things together



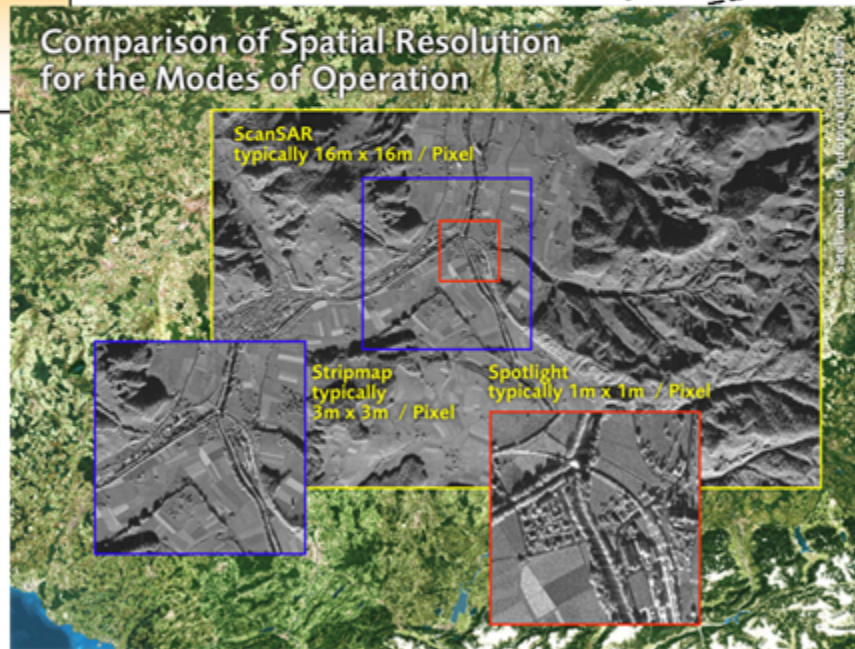
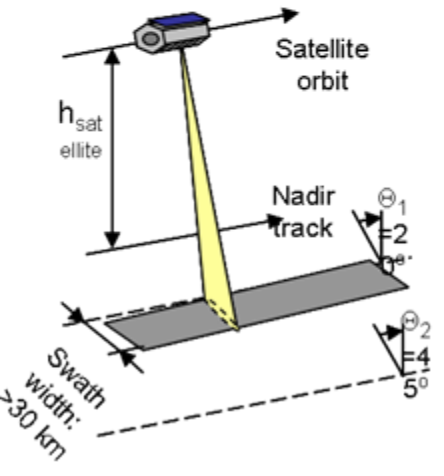
# TerraSAR-X Imaging Modes



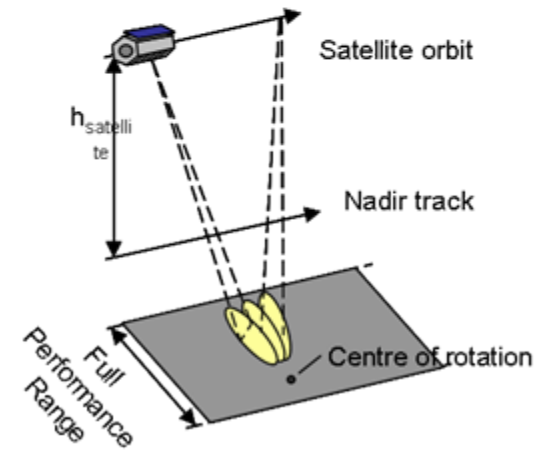
- **ScanSAR Mode**
  - 100 km swath width
  - 16 m resolution



- **Stripmap Mode**
  - 30 km swath width
  - 3 m resolution



- **Spotlight Mode**
  - 5 km x 10 km scene
  - 1 m resolution



- **Dual Receive Antenna Mode**
  - **Along-Track Interferometry, Moving Target Identification**



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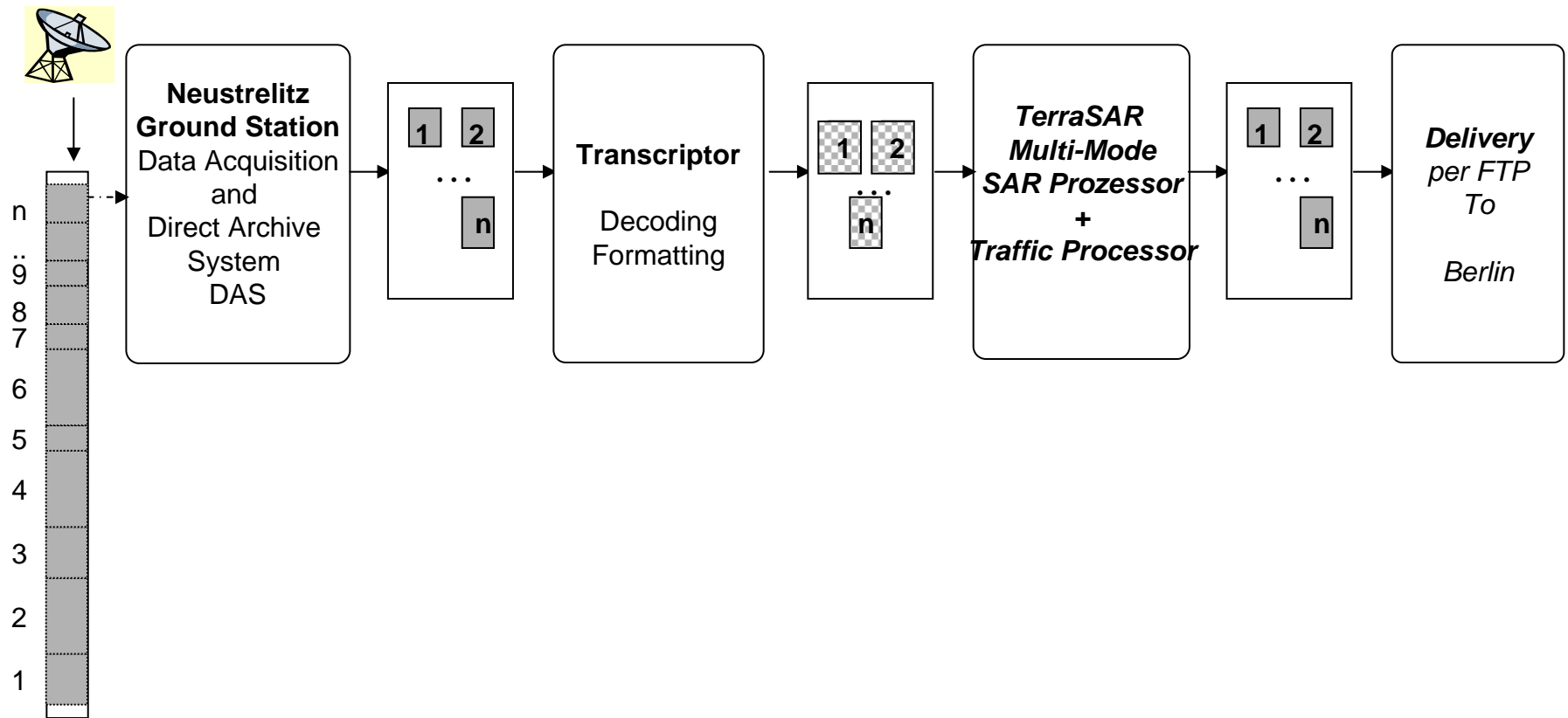
# TerraSAR-X modes

	Spotlight Mode I	Spotlight Mode II	Experimental Spotlight	Stripmap Mode	ScanSAR Mode
Ground Resolution					
- Across Track	2m*	2m*	1m*	3m	16m
- Along Track	1m	1m	1m	3m	16m
Product Coverage					
- Along x Across	5 x 10 km	10 x 10 km	5 x 10 km	<1500 x 30 km	< 1500 X 30 km
Access Range ( full Performance)	20° - 55° 2 x 463 km	20° - 55° 2 x 463 km	20° - 55° 2 x 463 km	20° - 45° 2 x 287 km	20° - 45° 2 x 287 km
Access Range ( data collection)	15° - 60° 2 x 622 km	15° - 60° 2 x 622 km	15° - 60° 2 x 622 km	15° - 60° 2 x 622 km	20° - 60° 2 x 577 km

\*) at 30 degr. Incidence Angle



# TerraSAR-X: Traffic Project

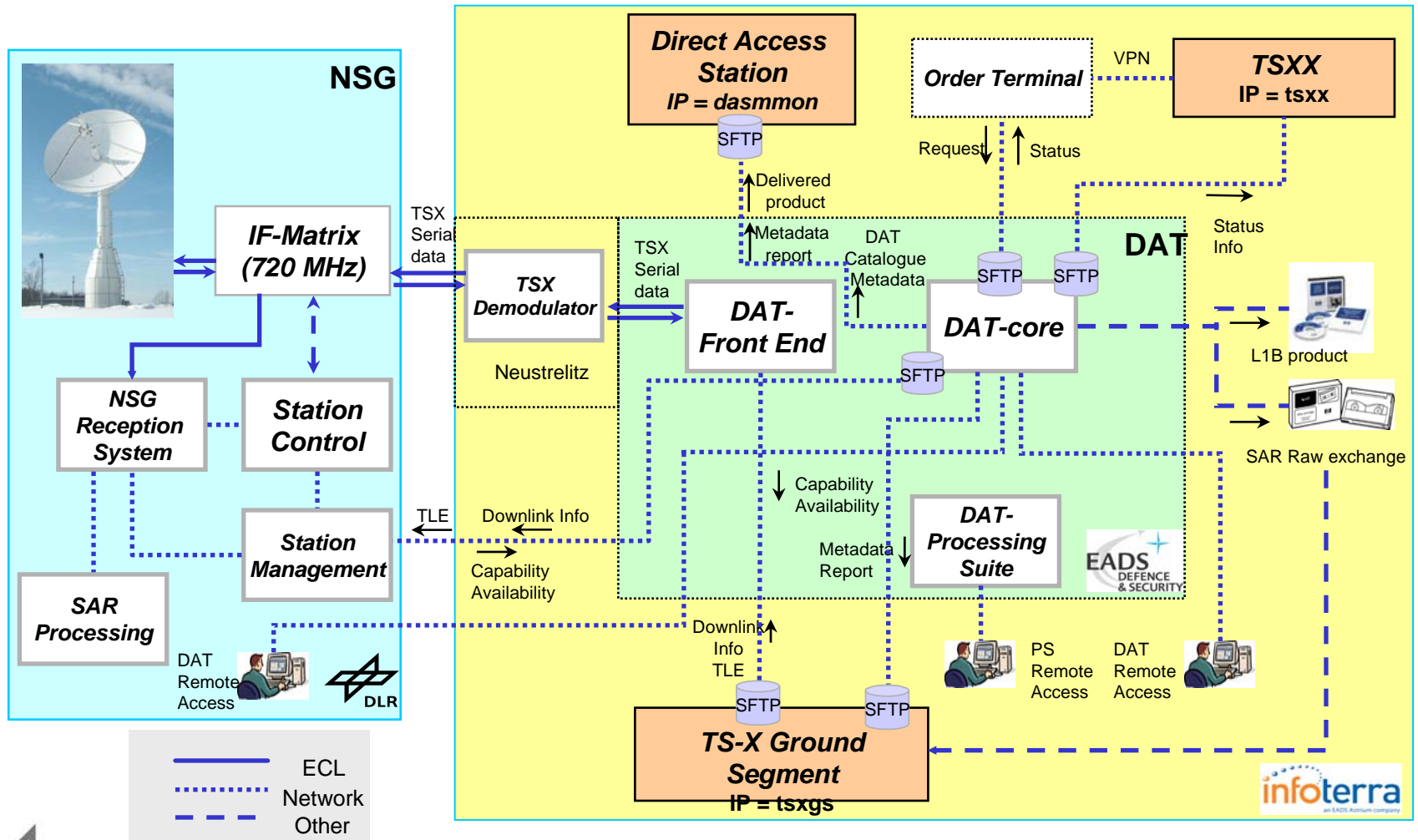




# TerraSAR-X Demonstrationsprojekt – Verkehrsbeobachtung



# TerraSAR-X - Direct Access Reference Station

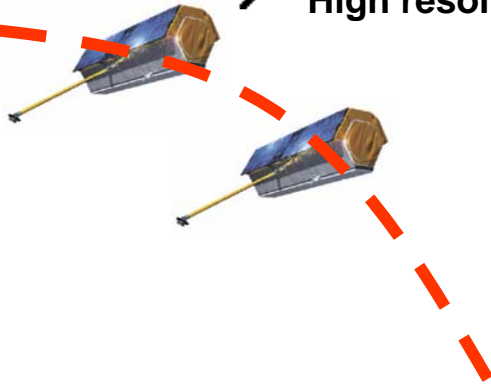


# Future German Missions

➤ Phase A study completed for two pre-selected proposals in 2005

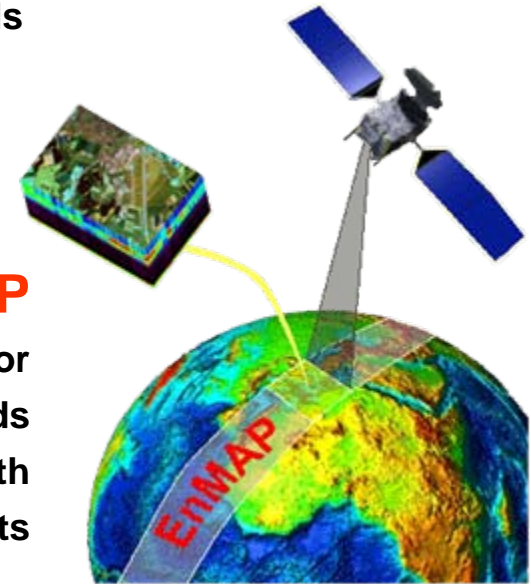
## TanDEM-X

- X-band satellite to fly in interferometric tandem configuration with TerraSAR-X
- High resolution (1m) for global Digital Elevation Models



## EnMAP

- Satellite with hyperspectral sensor
  - 420–2450nm; >200 bands
  - 30m resolution, 30km swath
- Wide range of geo-/bio-application products



Launch TanDEM-X: 2009

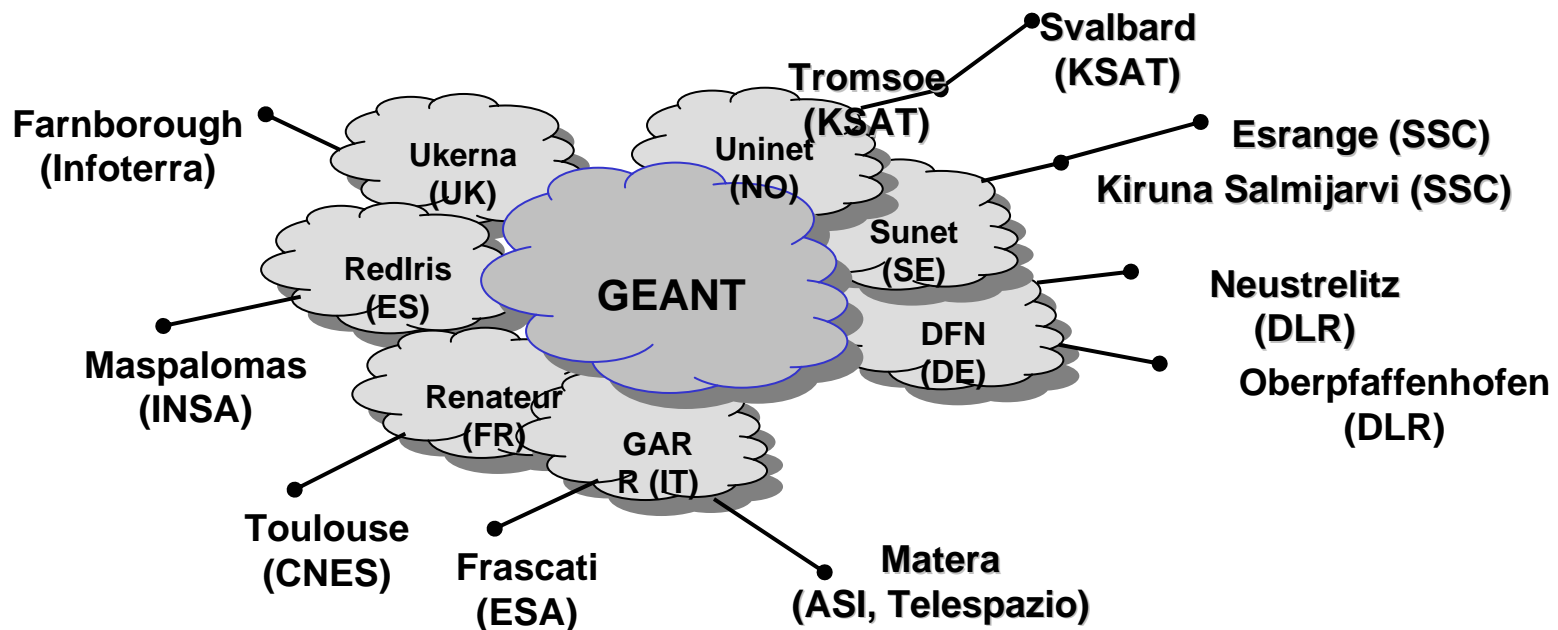
Launch EnMAP: 2011



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# HiSEEN - High Speed ESA Earth Observation Network

- 34 Mbps Network
- Based on the GEANT/NREN (Academic) Backbone
- De-facto high end-to-end throughput availability
- Cost effective solution





# DLR Neustrelitz - Realtime Space Application Center

## International

- Fester Knoten im internationalen Netzwerk der Empfangseinrichtungen
  - Wissenschaftliche und kommerzielle Kooperationen

## Europäisch / GMES

- GMES Betriebs und Anwendungszentrum
  - Echtzeitdienste
- Brückenfunktion zum Baltikum und zu den EU-Beitrittsländern

## National

- Nationale Satellitendaten Service Einrichtung
  - Empfang, Verarbeitung und Auslieferung von Satellitendaten
  - Test- und Simulation
  - Referenzstation
  - Ausbildungs- und Trainingsobjekt



# Links

- <http://www.gmes.info>
- [http://ec.europa.eu/comm/space/gmes/index\\_en.htm](http://ec.europa.eu/comm/space/gmes/index_en.htm)
- <http://www.esa.int/esaLP/LPgmes.html>
- <http://smeprojects.esa.int/AboutSMEunit.asp>
- <http://www.europa-mv.de/>
- <http://www.dlr.de/rd/fachprog/eo/gmes>
- <http://www.caf.dlr.de>
- <http://www.zki.caf.dlr.de>
- <http://www.wdc.dlr.de>
- <http://www.dlr.de/rd/rp6/>
- <http://www.terrasar.de/>





# Referenzen

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- G. Schreier, DLR-DFD, Parlamentarischer Abend, Berlin, Juni 2006
- M. Bock, DLR-DFD, GMES-Initiative, Bozen, 1.2.2007
- B. Schättler, TX-GSRR, Oberpfaffenhofen, Dezember 2006



**Vielen Dank für die Aufmerksamkeit !**



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