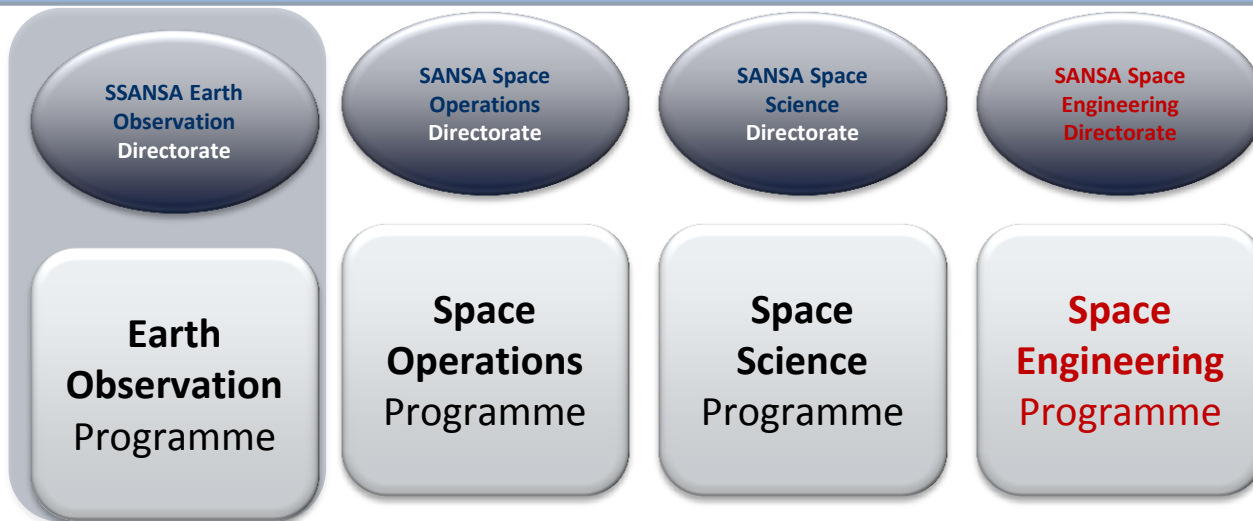


The background of the slide is a composite image of Earth and the Moon from space. The Earth's horizon is visible on the left, with a bright blue glow from the sun. The Moon is on the right, showing its craters. A blue and white swoosh is at the top.

Big Data from Earth Observation Satellites: An overview opportunities and challenges

Dr Paida Mhangara

To be the leader in ensuring that space science and technology **benefits society**, the **environment**, the **economy** and the **global community** through relevant **services**, **research and development**, and **human capital development**.



Goal 1: World-class & efficient services & societal benefits (Societal Capital)

Goal 2: Cutting-edge research, development, innovation, technology and applications (Intellectual Capital)

Goal 3: Human capital development, transformation & science advancement (Human Capital)

Goal 4: Globally competitive national space industry (Industrial Capital)

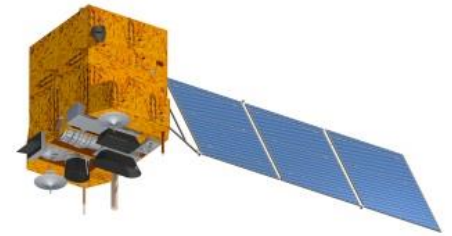
Goal 5: Make South Africa a recognised global space citizen (Global Capital)

Terabytes of Big Earth Observation Data



Our core business

- Sensor Portfolio Management reception



- Data Archiving, Processing, Dissemination




- Development of applications and geo-spatial products



Contribute to


- greater utilisation of earth observation in addressing day-to-day societal problems & needs
- better planning & decision making; performance monitoring; environmental & resource management; disaster management; national security & health

Big Data Challenges in Earth Observation

- **Reception, archiving, processing and dissemination of colossal volumes of ever increasing Earth Observation data.**
 - **Long term time series analysis**
 - **Integration of heterogeneous datasets with diverse formats and metadata.**
 - **Issues with internet bandwidth**
 - **Interoperability between different IT systems**
- 

Using Big Data in Earth Observation

SANSA aims to:

- **Promote data access for socio-economic benefit.**
 - **Efficiently use big EO data for scientific analysis.**
 - **Safeguard imagery for long term re-processing, time series analysis, verification or validation.**
 - **Share big data on collaborative and inter-operable platforms.**
- 

Opportunities for Big Data in Earth Observation

➤ Virtualisation and Cloud Computing


- Virtualised sharing of network, storage and computing resources
- Virtualisation offers greater flexibility for management of systems
- Greater independence for user
- Performance overhead (and expense VMware)
- External Cloud hosted on an independent internal network for greater security but also autonomy

➤ Grid-based High Performance Computing (HPC)

- Advanced data processing infrastructure
- Computational efficient algorithms
- Intensive data processing using heterogeneous computing resources
- Suitable to deal with the high dimensionality of satellite remote sensing data

➤ Data Mining

Emerging Trends: EO Big Data

- **Automatic Data Acquisition**
 - **Spatial processing in cloud environments**
 - **Semantic mining of information**
 - **Intensive visualization**
 - **Discovery and aggregation (cubes)**
 - **Security of data access**
 - **Interoperability standards**
 - **Peak loads enabled web services**
 - **New manipulation and transfer techniques**
 - **New Data and algorithm descriptions**
- 



Data:

Reception

Archive

Processing

Distribution

Application

Direct reception sensors

Data received by SANSA Space Operations demodulators
Ingested, archived and catalogued by SANSA Earth
Observation ground segments



- Landsat 7 (currently down for repair)
- SPOT 4 and SPOT 5
- Preparing for SPOT 6 and 7
- MODIS (Aqua and Terra)
- NOAA AVHRR

- NOAA AVHRR
- CBERS (awaiting launch of CBERS 3)
- Landsat 8
- SumbandilaSat

Big Data

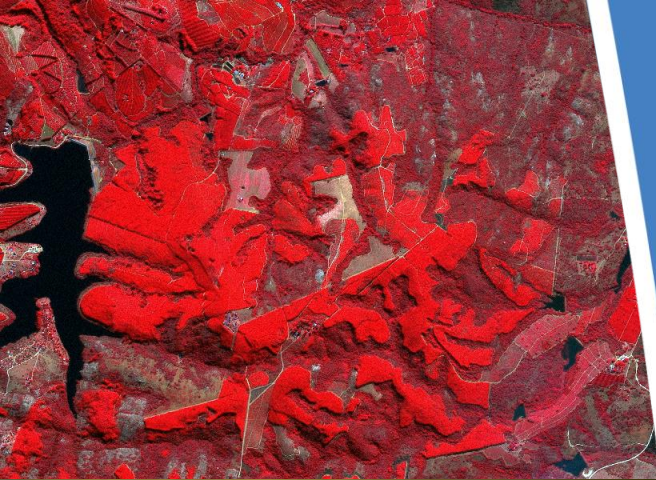
Reception

Archive

Processing

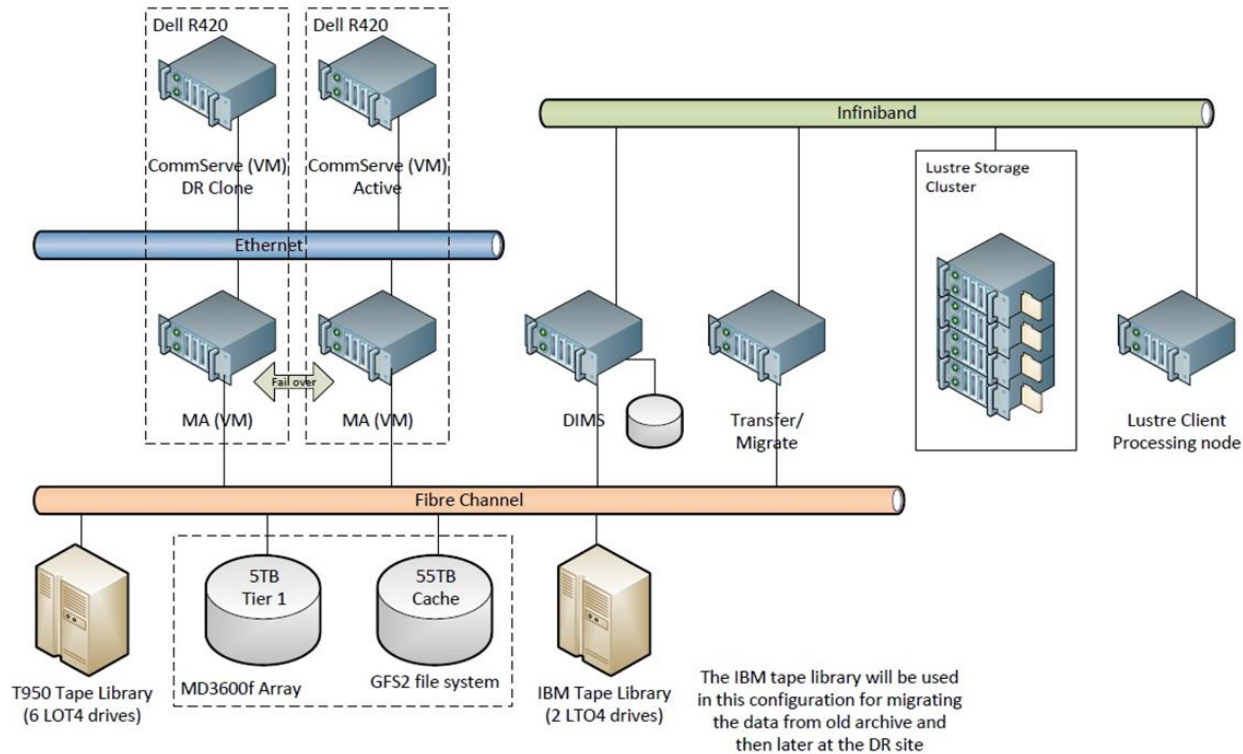
Distribution

Application



ARCHIVE OVERVIEW

Archive Hardware Architecture



SAEOS Hardware



14 dual/quad core
processing servers

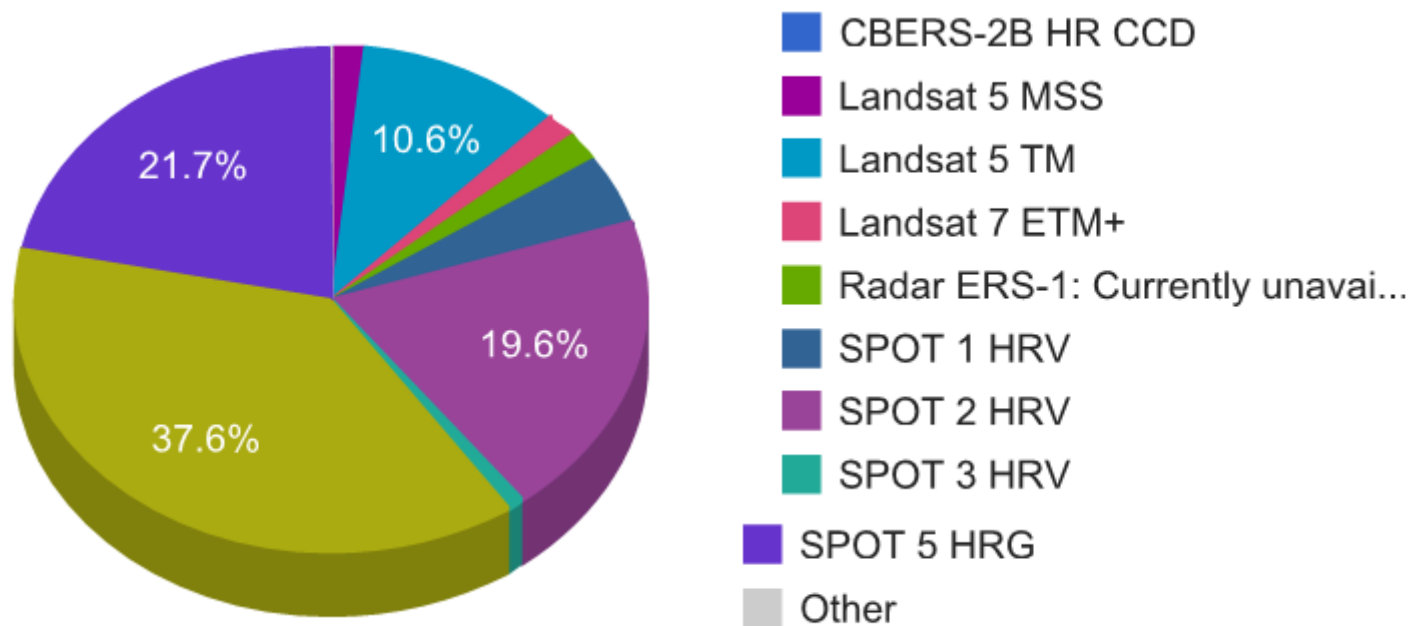


80 TB online storage



760 TB LTO4
Tape Library

Current archived Data on Our Catalogue



- including Landsat 2,3 and 4
SumbandilaSat
SAC-C multi-spectral
ERS-1 radar



Details of EO Data Archive

Sensor	Spatial resolution	Coverage	Date of Acquisition
Landsat: MSS,TM, ETM, LDCM (Landsat 8)	15m-60m	Southern Africa	1972 - 2011
SPOT 2, 4,5, 6	1.5m-20m	Southern Africa	Since 1994
CBERS 2B	20m	SADC except, Mauritius, DRC, Madagascar and Seychelles	2008-2009
SAC-C	175m	SADC except, Mauritius, DRC, Madagascar and Seychelles	2008-2009
MISR	275m, 1.1km	Africa	2003 - now
MODIS, AQUA & TERRA	250m,500m, 1km	Africa	2000
NOAA AVHRR	1.1km	Africa	1984
ERS-1	30m	Africa	1994 to 2009
MERIS	300m	Africa	2002



Data:
Reception
Archive
Processing
Distribution
Application

Processing Levels

- Automated processing: Landsat and SPOT
 - Pre-processing by ground segment: Raw to Level 1
 - Ground control point collection: Level 1 to Level 2
 - Orthorectification: Level 2 to Level 3Aa
 - Radiance to top of atmosphere reflectance : Level 3 Ab
 - True colour processing for Blue Band of SPOT imagery
 - Pan-sharpening for imagery with panchromatic bands

- Manual/semi-automated processing or all Levels for remaining sensors
 - SumbandilaSat and CBERS orthorectification
 - MISR High Resolution processing to 275m for all bands and other value-added products (including albedo, LAI, FAPAR and atmospherically corrected reflectance)











Data:




Reception
Archive
Processing
Distribution
Application

SANSA Online catalogue Version 2:

<http://catalogue.sansa.org.za>


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Welcome to the SANSA Earth Observation Online Catalogue


 **Search**
 **Visualise**
 **Order**


**Earth
Observation
Data**

The development of this catalogue was funded by the [South African Department of Science and Technology](#).


**Welcome:** This site provides the SANSA (South African National Space Agency) earth observation data catalogue for the sensors listed below. SANSA (and in their former capacity as a part of the CSIR) has been acquiring satellite earth observation data since the early 1980's when reception of Landsat-2 MSS data commenced.

**A note on browser compatibility:** This web site works with Mozilla Firefox 3 or better, recent versions of Google Chrome, Opera, Safari and Internet Explorer 8. Users of older versions of Internet Explorer should upgrade to version 8 to get the best experience.


**Legacy Catalogue:** The old catalogue (that this catalogue aims to replace) is still [online here](#).

**Getting Started:** Watch our [short video](#) which provides a quick-start guide to using the catalogue.

Need a Free and Open Source GIS to view imagery and to carry out your GIS work with? Try our SANSA branded special edition of Quantum GIS. Click [here](#) to download.



This catalogue was funded by the [Department of Science and Technology](#).



You are logged in as
Wistebaar(twistebaar)

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Thank you

