Agenda

- S2 Toolbox Project Overview
- SNAP Common platform
- Sentinel 2 specific features
- First release status
- Demonstration
Project Overview
Project Overview

- An open-source, flexible and re-usable scientific multi-mission Toolbox
- Based on the strong software heritage of BEAM & NEST
- with specific Sentinel 2 exploitation tools
Project Overview

Prime Contractor
Project Manager
Technical Manager
Java Expert
Image Processing & OTB Expert
Obs & RT Scientist
Software Engineering Team

Software Development Team
BEAM Expert
Coastal Appl. Scientist
Software Engineering Team
L2/L3 Product Expert
Product Engineering Team
Biophysical Scientist
Agri & Forest. Appli. Scientist

The power of innovation
Cardinal requirements

- Open Source (GPLv3 licence)
- Multi mission: all current BEAM supported products, and lots of new ones
- Extensible, modular
- Portable
- Easy to use
- Built on BEAM and NEST heritage
SNAP Common Platform

- Based on SNAP common platform for S1, S2, S3 toolboxes
  - Interoperability with other toolboxes

- Interface to 3rd Party software
  - Python/C++
  - Standalone tools adapter

- Smart installer
  - Auto configuration

- Task Queue

- Performance optimizations

- Cloud Exploitation Platform
Sentinel 2 TBX specific functionalities

- Sentinel 2 data readers: L1B, L1C, L2A
- Multi-mission: new land-products readers
  - Spot 1-7, RapidEye, UK-DMC, Deimos, Ingenio/SEOSAT, EnMAP
- Sentinel 2 scientific processors
  - Sen2Cor: Atmospheric correction for S2-MSI L1C
  - Reflectance to radiance converter
  - Level 3 processor: temporal synthesis
  - L2B processor: biophysical products
  - Water processors (to be defined)
  - Crop mapping processor
Sentinel 2 TBX specific functionnalities
SNAP

SentiNel Application Platform
SNAP Common Platform

- Coordinated Development for S1/S2/S3 toolboxes
  - Common release plan
  - Common base platform, common set of modules
  - Interoperability between 3 toolboxes

- Based on heritage of BEAM and NEST
  - All functionalities of both software united in a single platform

- Additionnal common tools developed jointly
SNAP Common Platform

- Source code: Github
- Issue tracker: Jira
- Downloads: earth.esa.int/web/sentinel-tbx/home

- Java 1.8 / Maven / IntelliJ IDEA
- Soon based on NetBeans platform API (docking, module management...)
- Jenkins for continuous integration
Standalone Tools Adapter

- Easy integration of external tools as processing modules:
  - Orfeo Toolbox
  - GDAL
  - < Put your own image processing tools here >
Cloud Exploitation Platform

- Exploit cloud processing platforms
  - Run the Sentinel 2 Toolbox modules on remote platform
  - Create processing chains
  - Use remote data repositories

- Facilitate the use of these processing platforms from the toolbox
  - Provide user interfaces
  - Query remote data catalogue
  - Queue processing requests
  - Query status
  - Retrieve the results and open them in the toolbox
Sentinel 2 Toolbox specificities
Products are aggregation of granules (L1B) or tiles (L1C)

Transparent to the end user: single mosaic in Sentinel 2 Toolbox

Optimized multi-resolution viewing/processing

JPEG2000 decoding through OpenJPEG library

(Courtesy of ESA)
Sentinel 2 data

VIS

NIR

SWIR

400 nm
600 nm
800 nm
1000 nm
1200 nm
1400 nm
1600 nm
1800 nm
2000 nm
2200 nm
2400 nm

60 m
20 m
10 m
400 nm
600 nm
800 nm
1000 nm
1200 nm
1400 nm
1600 nm
1800 nm
2000 nm
2200 nm
2400 nm

B1

B5

B6

B7

B8a

B9

B10

B11

B12

Aerosols

Water-vapour

Cirrus

Vegetation Red-edge

Snow / ice / cloud discrimination
Sentinel 2 data

- Manifest [XML]
- Browse Image
- GRANULES
  - GRANULE 1
  - DATASTRIP 1
- DATASTRIPS
- AUXILIARY DATA (optional)
- Processing parameters, IERS bulletin,...

- Metadata
- Image data
- Auxiliary data
- Quality Indicators data
- QC check reports

GML - JPEG2000

XML/GML

(Courtesy of ESA)
Level 2A processor

- Bottom of atmosphere reflectance in cartographic projection

- Additional data
  - Scene Classification Map
  - Water Vapour Map
  - Aerosols Optical Thickness Map

- Algorithm
  - Cloud/Cloud shadow detection
  - Cirrus correction
  - Slope effect correction
  - BRDF effect correction
Level 2A processor

- Seamless Integration in the toolbox
- Graphical User Interface provided
- Level 2A product reader

L1C  Classification  L2A
Level 3 processor

→ Multi-temporal Cloud Free composites generation

L1C product at date \( t_n \)  
L1C product at date \( t_o \)  
L1C product at date \( t_p \)  
L1C product at date \( t_q \)...

L3 Algorithm
Spatio-temporal synthesis

L3 product (L1C synthesis)
Biophysical products (L2B)

- Automatic generation of L2B product from L1C/L2A
  - LAI: Leaf Area index
  - FAPAR: fraction of photosynthetically active radiation absorbed by the green elements of the canopy
  - CCC, the Canopy Chlorophyll Content used as a proxy of the nitrogen status of the plant
  - CWC, the Canopy Water Content used also as a proxy for the water status of the plant

- Algorithm by INRA
New land-oriented products readers

- SPOT 1-7 readers
- RapidEye L1B/L3A
- UK-DMC
- Ingenio/SeoSAT
- Deimos
- EnMAP
Release Status
Release status

- Public release planned for September 29
- Stable and tested
- Distributed publicly on ESA website

https://earth.esa.int/web/sentinel-tbx/home

- S1/S2/S3 Toolboxes: 3 independent installers
- Next release will be a single installer with 3 toolbox modules to install separately
Release status

→ Common SNAP features
  → BEAM and NEST features merged together
  → Rebranding of the application
    → Common code base, common look and feel
→ Additionnal readers in Sentinel 2 Toolbox:
  → Sentinel 2 L1C
  → Spot 1-5 L1/L3
  → RapidEye L1/L3
  → Spot 4 – Take Five
Release status: next releases

- Release 2 (Mar 2015)
  - Smart Installer, Standalone Tools Adapter, Orfeo Toolbox integration, Processing Previews
  - Sen2Cor L2A & L3 scientific processor

- Release 3 (Jun 2015)
  - New data readers, New scientific processors

- Release 4 (Sep 2015)
  - Undo/Redo, Task manager, OpenDAP, new readers
Release status : next releases

Release 5 (Jan 2016)
  - Segmentation, Classification
  - New scientific processors (L2B)

Release 6 (Apr 2016)
  - In Situ data, GUI scripting
  - New readers