

ESASky: A New Window to the Universe

María Sarmiento on behalf of ESDC team

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Issue/Revision: 1.0

Reference: ASTERICS June 2016, Heidelberg

Status: Issued

ESA UNCLASSIFIED - Releasable to the Public

Interface to all astronomy archives

ESA Sky

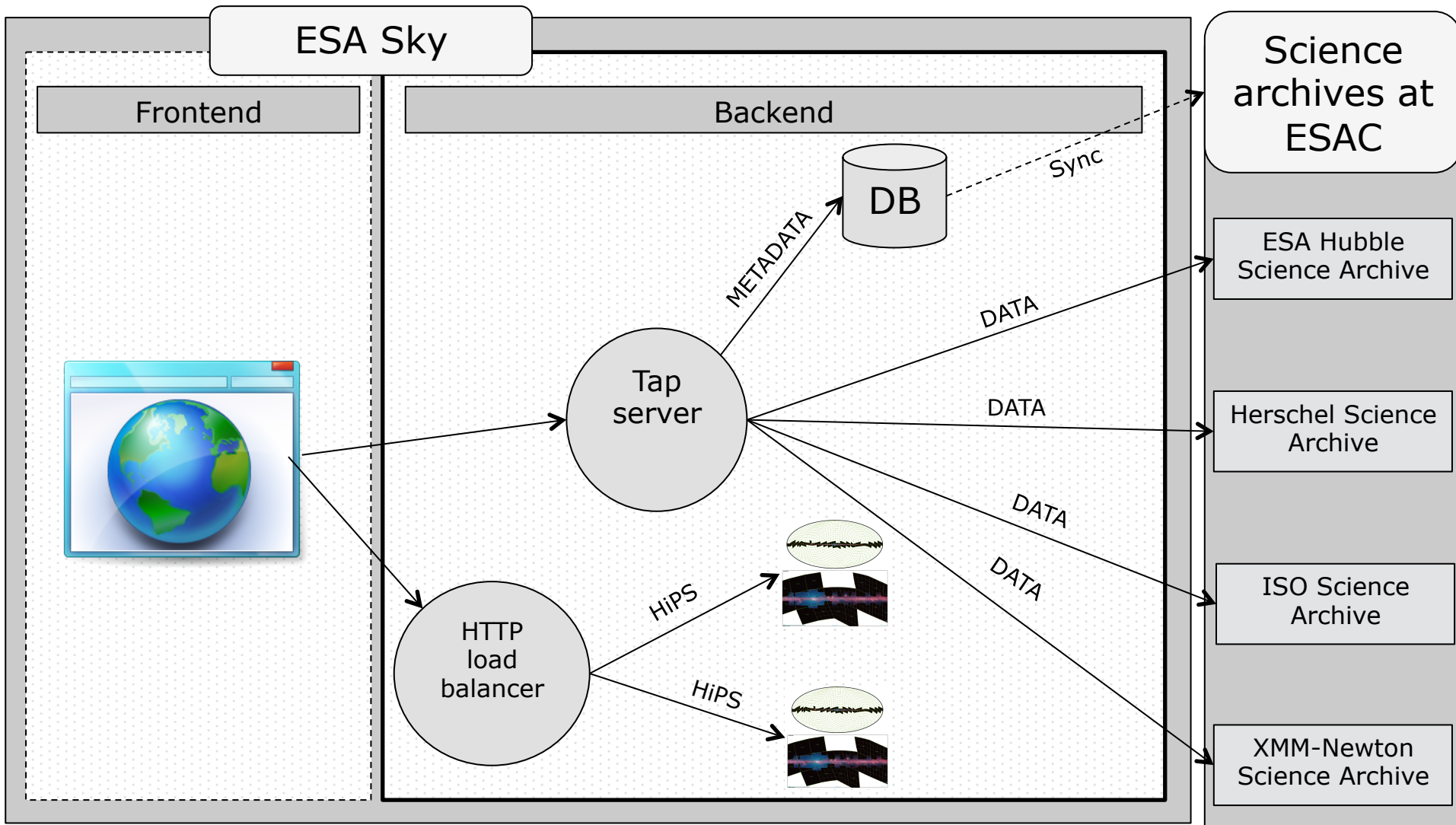


Goal: to facilitate data discovery and archival science for ALL users

- Multi-wavelength
- Project agnostic
- Exploration
- Single access point to ESA real data
- All data available online at runtime
- No user registration
- Simple and intuitive
- IVOA standards and protocols



ESASky version 1.0 - Hardware architecture



Demo

<https://youtu.be/eAfHq7s5MBQ>

➤ Data contents of the public release:

- 13 years of **INTEGRAL** data, 2077 gamma-ray sources
- 16 years of **XMM-Newton** data, 8721 observations, 565962 X-ray and 6 million optical/UV sources
- 25 years of **HST** data, 588820 observations, 29 million optical sources
- 4 years of **Hipparcos** data, 2.5 million optical sources
- 2.3 year of **ISO** data, 47652 observations
- 4 years of **Herschel** data, 16039 observations
- 4 years of **Planck** data, 9 all-sky maps, 153142 radio sources

**In total more than 35.000.000 sources
and 1 million observations!!!**

HiPS: Hierarchical Progressive Survey



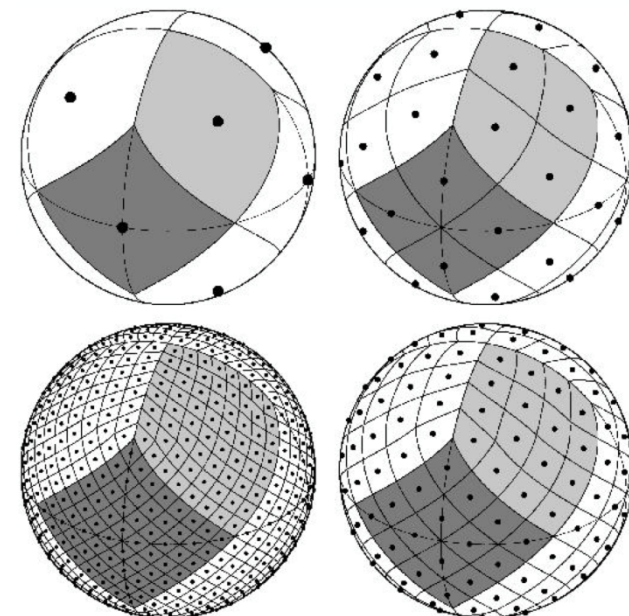
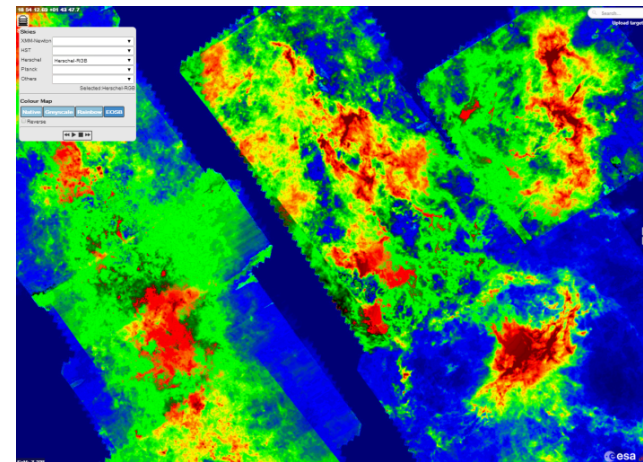
HEALPix (**H**ierarchical **E**qual **A**rea iso**L**atitude **P**ixelation)

[<http://healpix.sourceforge.net>]

Number of levels depend on pixel angular resolution

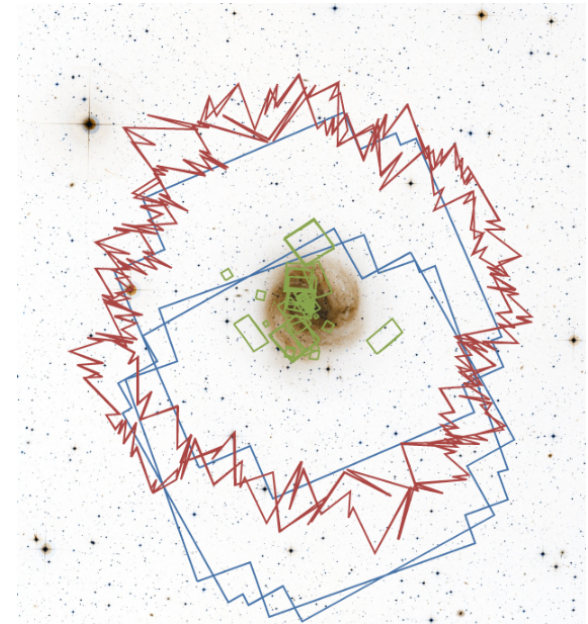
Mission/ Instrument	Angular resolution	#max hips levels
Planck/LFI & HFI	low	1
Herschel/SPIRE	medium	5
HST/ACS	high	11

[<http://ivoa.net/documents/Notes/HiPS/index.html>]



ESASky v1.0 – Backend Data Generation. Footprints

- A footprint is the representation of the sensitivity coverage of a specific satellite instrument for a single observation
- Footprints Space-Time Coordinate Metadata Linear String Implementation (STC-S) plotted on top of HiPS
- Footprint Finder (ST-ECF)
- Example:
 - HST: Provided by project
 - Herschel: Footprint Finder (ST-ECF)
 - XMM: Instrumental + pointing

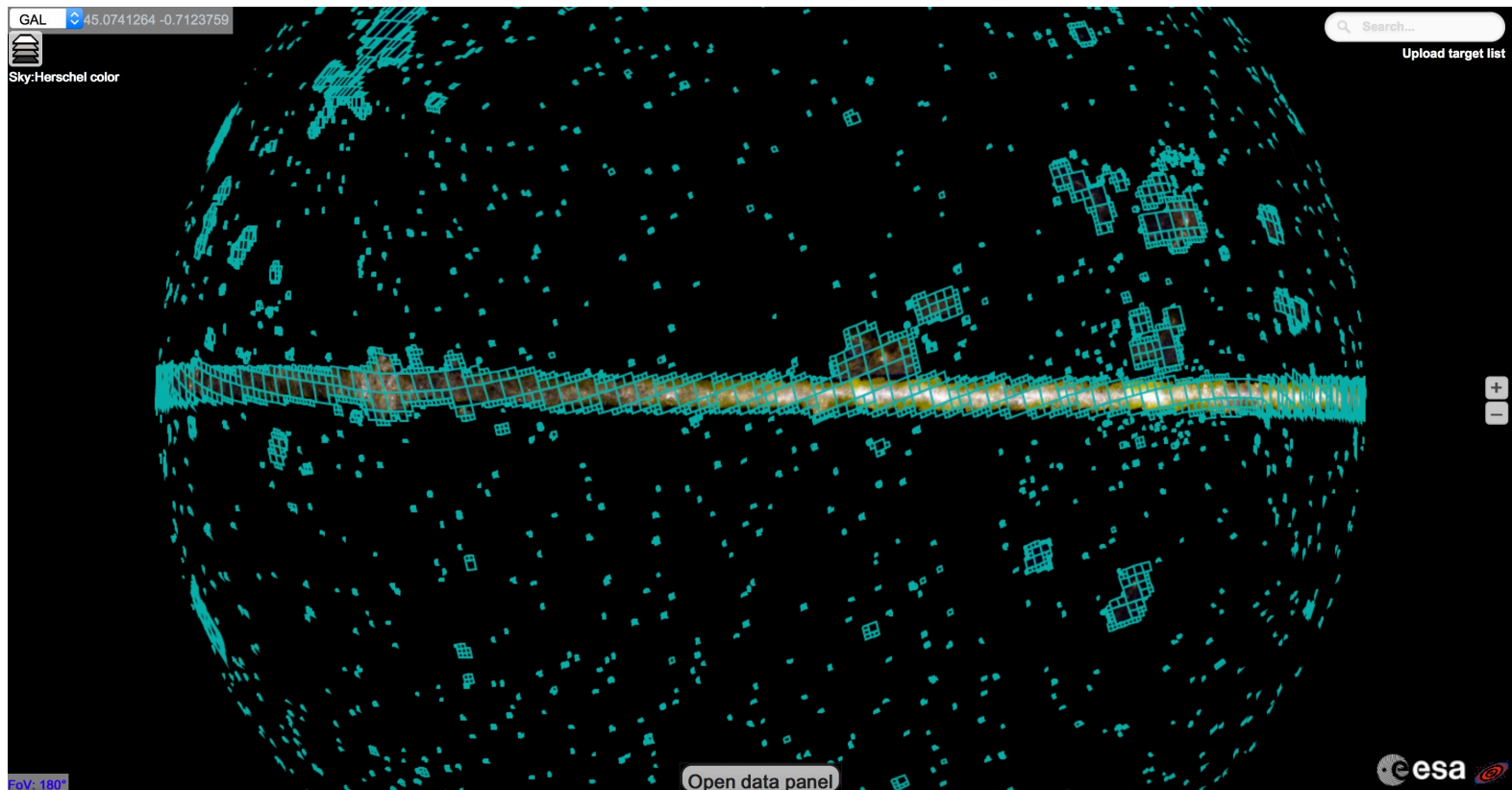


ESASky v1.0 – Backend Data Generation. Moc



MOC (Multi-Order Coverage) plotted on top of HiPS

IVOA standard [<http://ivoa.net/documents/MOC/index.html>]



ESASky v1.0 – Backend Data Generation. Footprints in numbers



Observation type	#footprints (#observation)	#polygons per observation	#total polygons	#total points
XMM-Newton	8.375	From 2 up to 13	20.041	192.831
XMM-OM(UV)	9.211	2	18.422	38.462
XMM-OM(UVB)	3.379	2	6.758	76.925
HST	345.519	From 2 up to 10	777.376	2.361.085
ISO	6.898	From 2 up to 9	17.104	50.198
Herschel	23.172	2	46.344	1.076.667

ESASky v1.0 – Backend Data Generation. Moc in numbers.



Observation type	Total #polygons in MOC	Total #points in MOC (x4)	#footprints	#polygons per observation	Total #polygons	Total #points
XMM-Newton	12.848	51.392	8.375	From 2 up to 13	20.041	192.831
XMM-OM(UV)	7.128	28.512	9.211	2	18.422	38.462
XMM-OM(UVB)	3.702	14.808	3.379	2	6.758	76.925
HST	34.795	139.180	345.519	From 2 up to 10	777.376	2.361.085
ISO	9.103	36.412	6.898	From 2 up to 9	17.104	50.198
Herschel	17.099	68.396	23.172	2	46.344	1.076.667

ESASky v1.0 - Backend Data Access



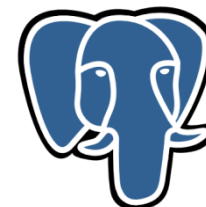
Apache HTTP Server

- Serves HiPS requests



Java Servlet container (Tomcat)

- Serves TAP & Target Resolver requests
- Data and metadata download request



PostgreSQL

Database

- PostgreSQL DB (FDW and MV)
- Spherical data types library (PgSphere)+q3c +PostGIS for ephemerides
- Footprints -> Spherical data types



q3c

Usage of IVOA Protocols & Standards

- TAP requests
- ADQL translation to SQL + PgSphere
- Storage of STC-S footprint information



ESASky v1.0 - Frontend

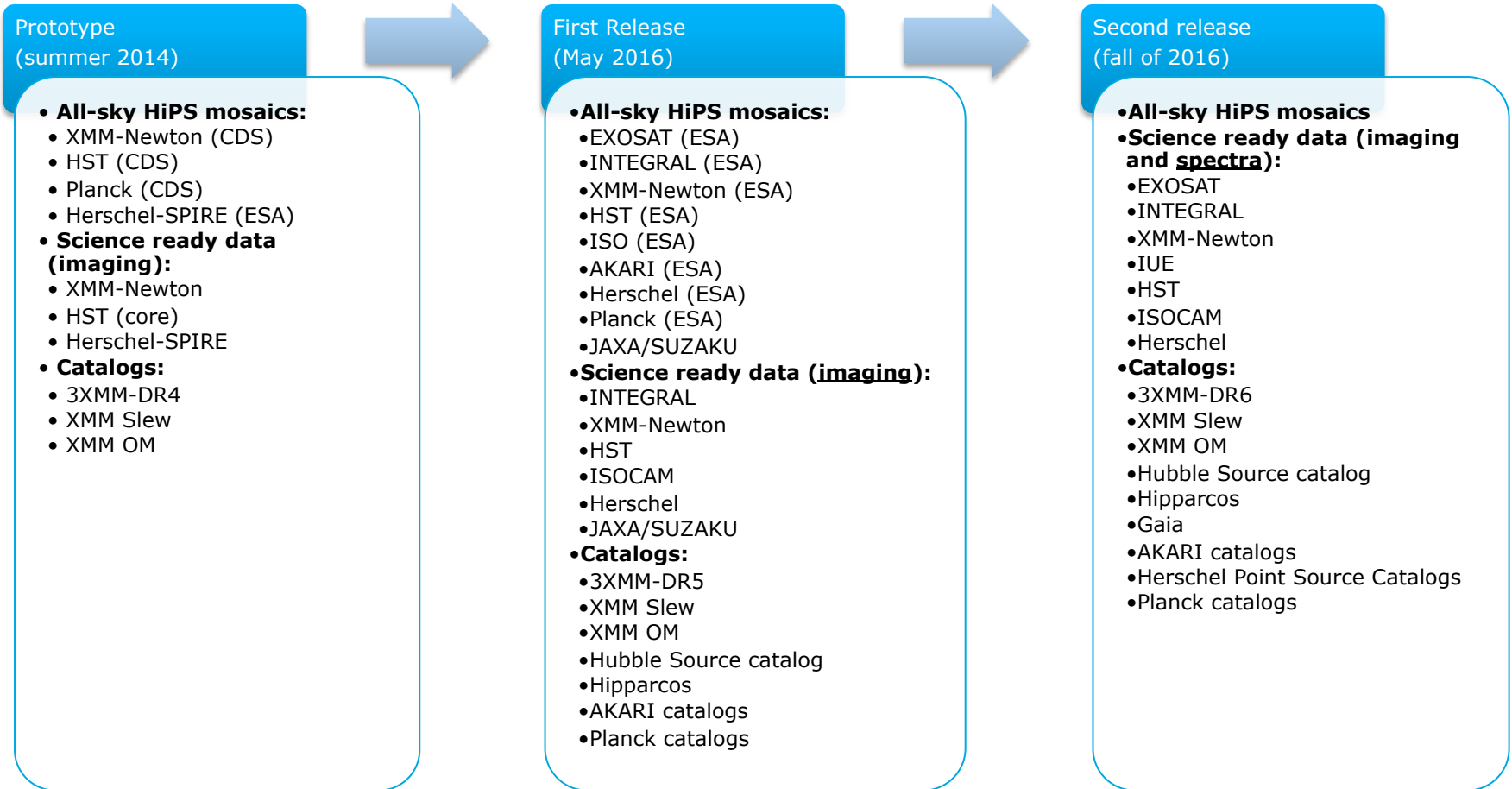
- Running on a Web Browser (HTML5/CSS3)
- Google Web Toolkit
 - Aladin Lite wrapper (JSNI)
 - Data Visualization (Highcharts)
- Usage of IVOA Protocols
 - TAP accessing archive metadata
 - ADQL describing complex FoVs
- Astronomical services access
 - Target coordinates resolver
 - Angular size resolver



Highcharts JS

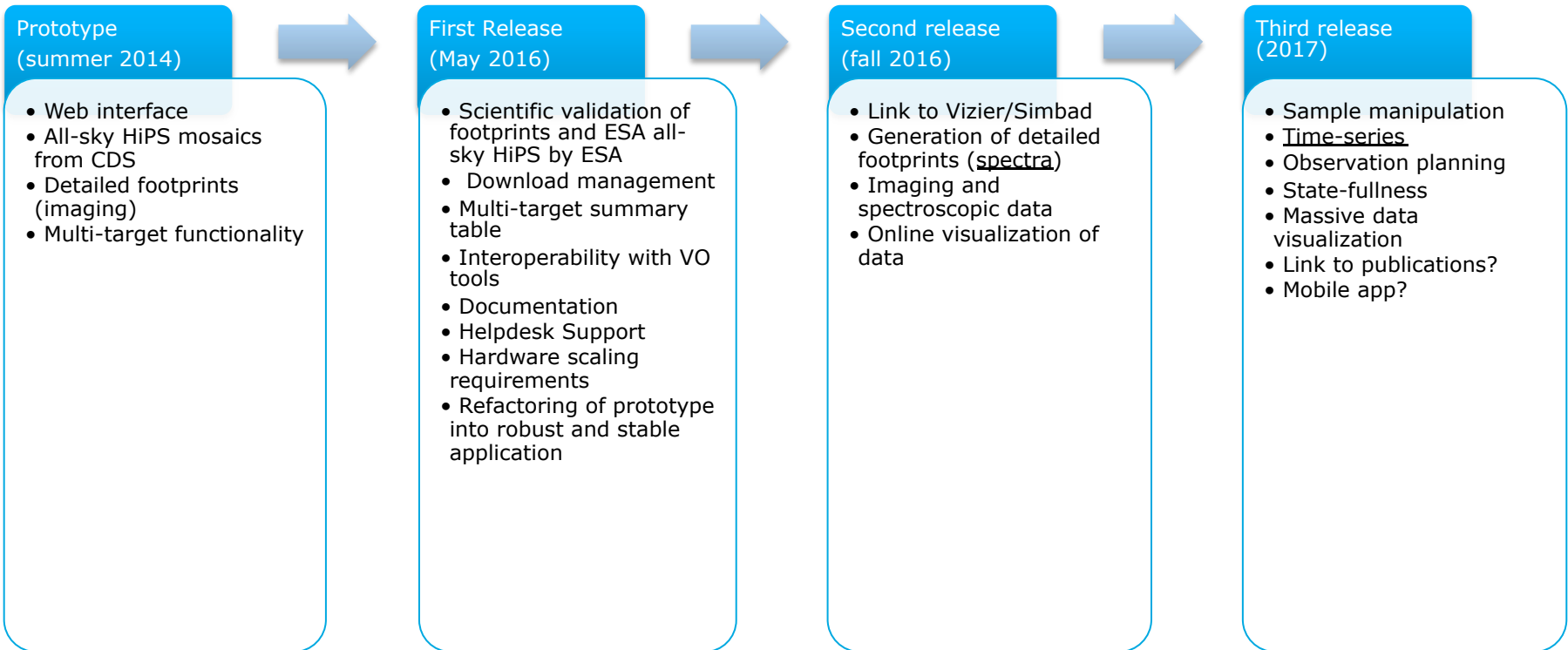


ESASky data contents roadmap



Aim: continuous integration, testing and releasing

ESASky feature roadmap



Aim: continuous integration, testing and releasing

Try the ESASky yourself !



The screenshot shows the ESASky web interface. At the top, there's a browser window with the URL `archives.esac.esa.int/esasky-beta/`. The main area is a 3D visualization of the sky with observation footprints in cyan and yellow points. A large white text overlay reads `http://sky.esa.int`. The interface includes a search bar with 'm 83', an 'Upload target list' button, and a 'Data Panel' at the bottom with tabs for 'XMM-Newton', 'XMM-OM(UV)', 'HST', 'ISO', and 'Herschel'. A table below the tabs shows columns for 'ObservationId', 'Instrument', 'RA (J2000)', and 'DEC (J2000)'. A message at the bottom says 'Showing global sky coverage for the mission. Zoom in to get the actual footprints of the individual observations.' There are also zoom controls (+, -) and a 'Close data panel' button.

Questions?



Your feedback is really appreciated!

<https://support.cosmos.esa.int/esdc/>

Or directly to:

Maria.Henar.Sarmiento@esa.int

Thank you!

Team

Fabrizio Giordano (Software Engineer and Key Person), Jesús Salgado (Technical astro lead), Bruno Merín (Product Owner), Deborah Baines, Belén López Martí (HiPS generation), María H. Sarmiento (Software Engineer), Elena Racero (HiPS and footprints), Raúl Gutiérrez (Software Engineer), Pilar de Teodoro (DB administrator), Sara Nieto (Software Engineer)

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