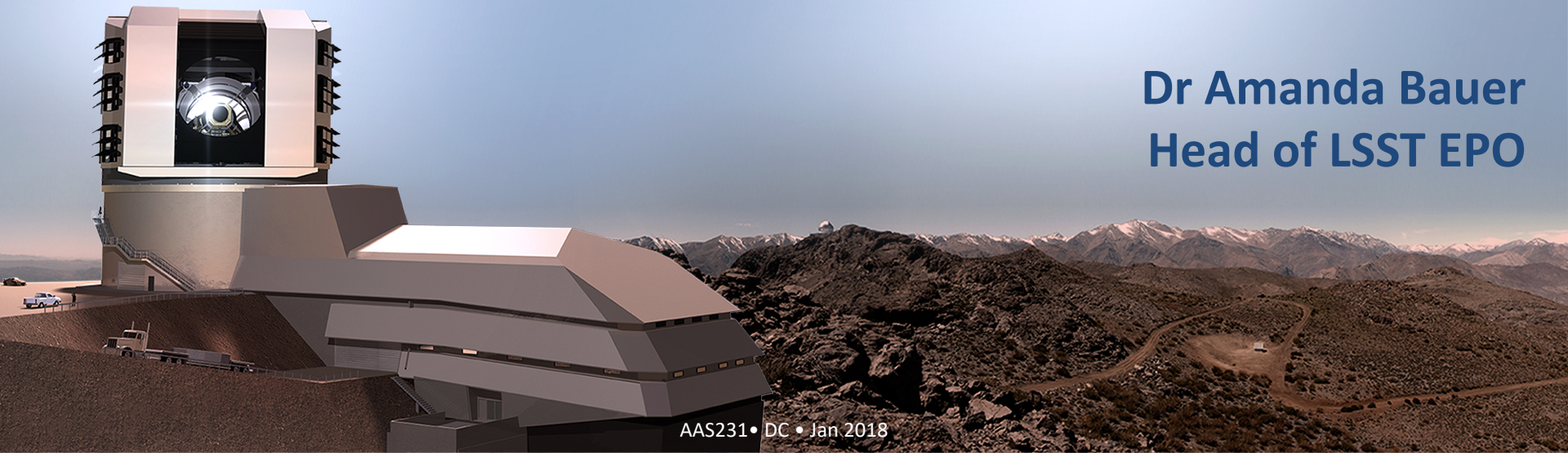
LSST Education and Public Outreach (EPO) and the Data2Dome Initiative

Dr Amanda Bauer
Head of LSST EPO



Education and Public Outreach (EPO)

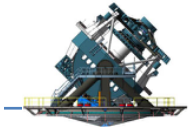
LSST EPO will enable public access to a subset of LSST data so anyone can explore the universe and be part of the discovery process.

EPO will facilitate a pathway from entry-level exploration of astronomical imagery to more sophisticated interaction with LSST data using tools similar to what professional astronomers use.

Education and Public Outreach (EPO)

To deliver data to the public, LSST EPO is creating an online Portal to host an interactive Skyviewer, provide access to LSST data for educators and the public through online Jupyter notebooks, **deliver original multimedia for informal science centers and planetariums**, and feature citizen science projects that use LSST data.

Poster 444.06 Friday “LSST: Education and Public Outreach” Bauer
Poster 444.02 Friday “Formal Education with LSST” Ardis Herrold



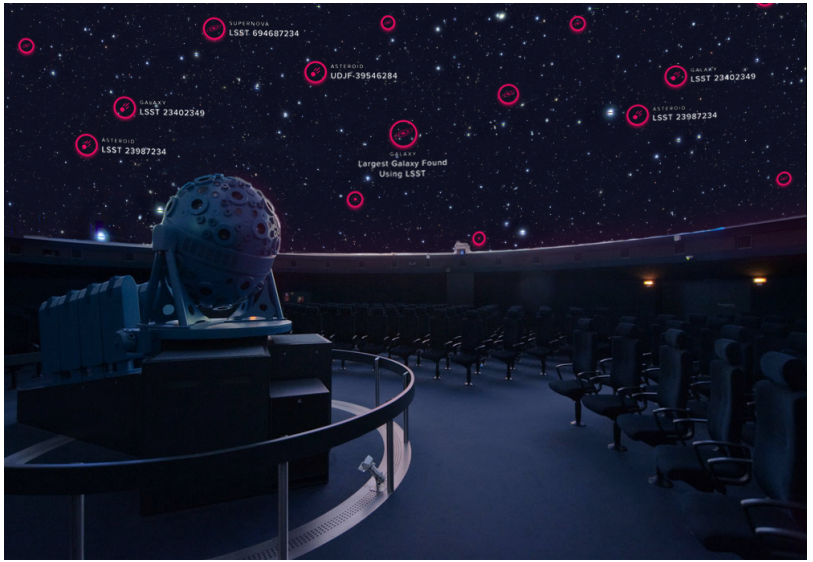
The importance of planetariums

Each year, 144 million people visit planetariums worldwide - 27 million in the US alone

(Source: Loch Ness Productions)

User needs assessments

User needs assessments



LSST EPO Deliverables:

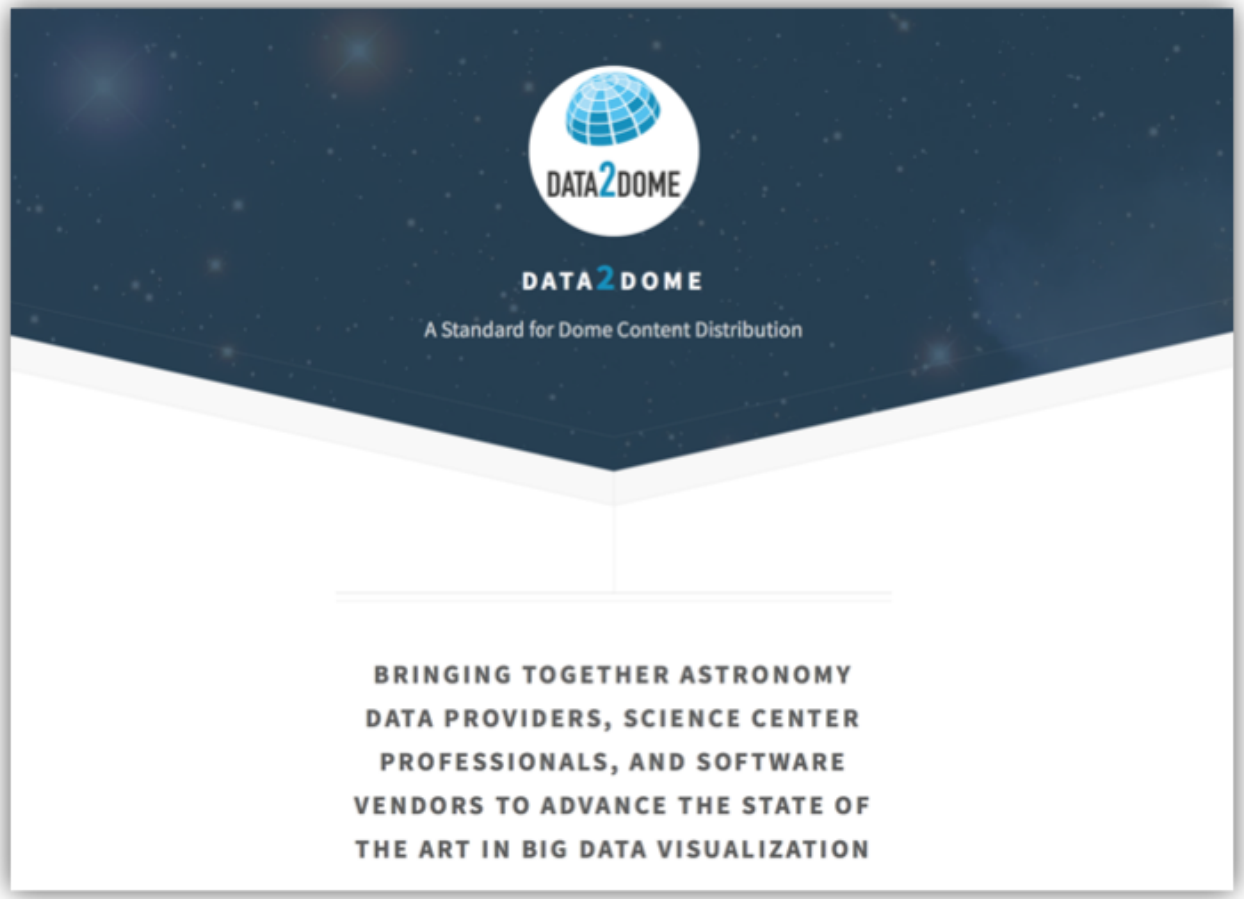
- Library of digital multimedia assets
- Fulldome sky view with LSST Alert stream overlay
- Media specific for Chilean audiences
- 3D multimedia

User needs assessments

Challenges for content creators at planetariums:

- Knowing where to search for content
- Finding curated content or not having in-house data science experience
- No data format standards
- Having limited options due to software vendor, inability to share between groups
- Lacking internet connection

Data2dome.org



Data2Dome Initiative

The Data2Dome (D2D) project streamlines the flow of content from research institutions to planetariums, offering audiences a unique opportunity to access the latest data from space in near real time.

Every morning, planetarium presenters around the world can access a menu of interesting space news and fresh datasets — and download and full datasets and metadata in standard/known formats for possible inclusion in show segments during the day.

DATA2DOME

Data2Dome Data

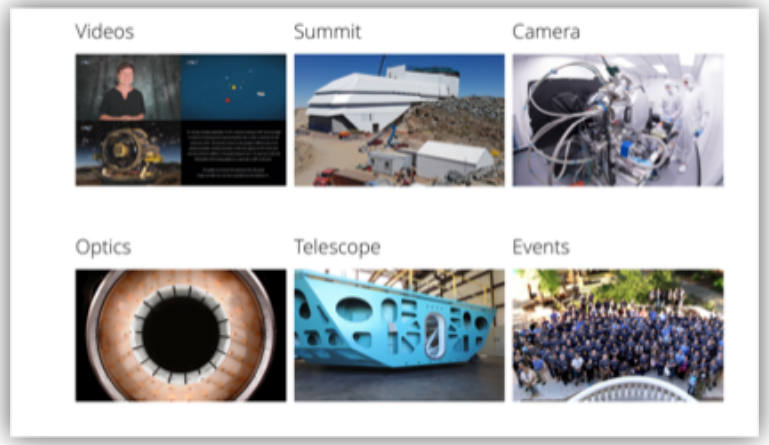
- **Descriptive metadata** as support for the presenter: concise, well-written descriptions of the content; credits; license; embargo date; links to more information etc. for the planetarium lecturer. The *Astronomy Visualization Metadata (AVM)* standard has been chosen for this.
- **Flat videos**
- **Flat images**, including planetary maps, images of sky objects, all-sky panoramas/fulldome images
- **Fulldome videos**
- **Audio**, including interview clips, sounds, music
- **3D objects**
- **Show sequences**, including presentation metadata

Global interest in Data2Dome

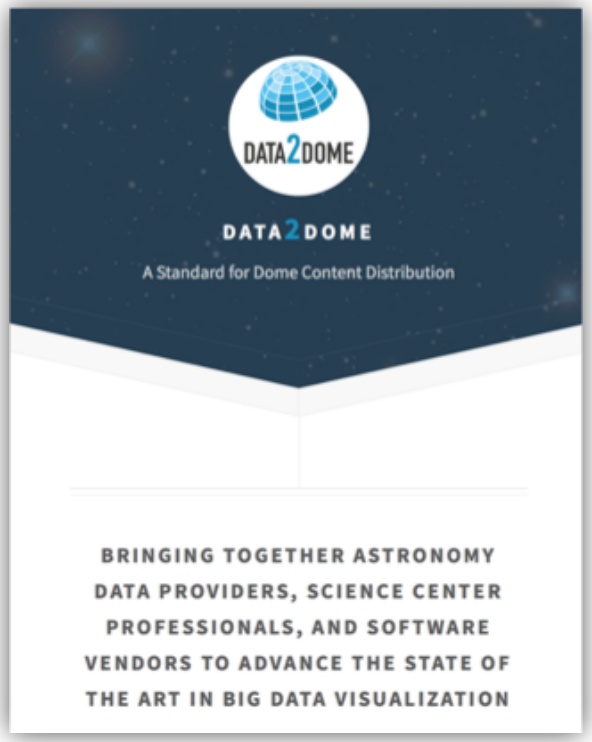
Data2Dome

Lars Lindberg Christensen (European Southern Observatory)
Mathias Andre (European Southern Observatory)
Max R. Rößner (European Southern Observatory)
Kevin Scott (Evans & Sutherland)
Mark Subbarao (Adler Planetarium)
Ben Emmons (LSST)
Valentina Schettini (European Southern Observatory)
Jürgen Rienow (Berlin Planetarium)
Björn Voss (Münster Planetarium)
Robert Hurt (Infrared Processing and Analysis Center)
Ka Chun Yu (Denver Museum of Nature & Science)
Marta Entradas (London School of Economics and Political Science, DINÂMIA'CET/ISCTE-IUL)
The IPS Science and Data Visualization Task Force

gallery.lsst.com



Data2dome.org



Stay in contact with LSST EPO through ***community.lsst.org***
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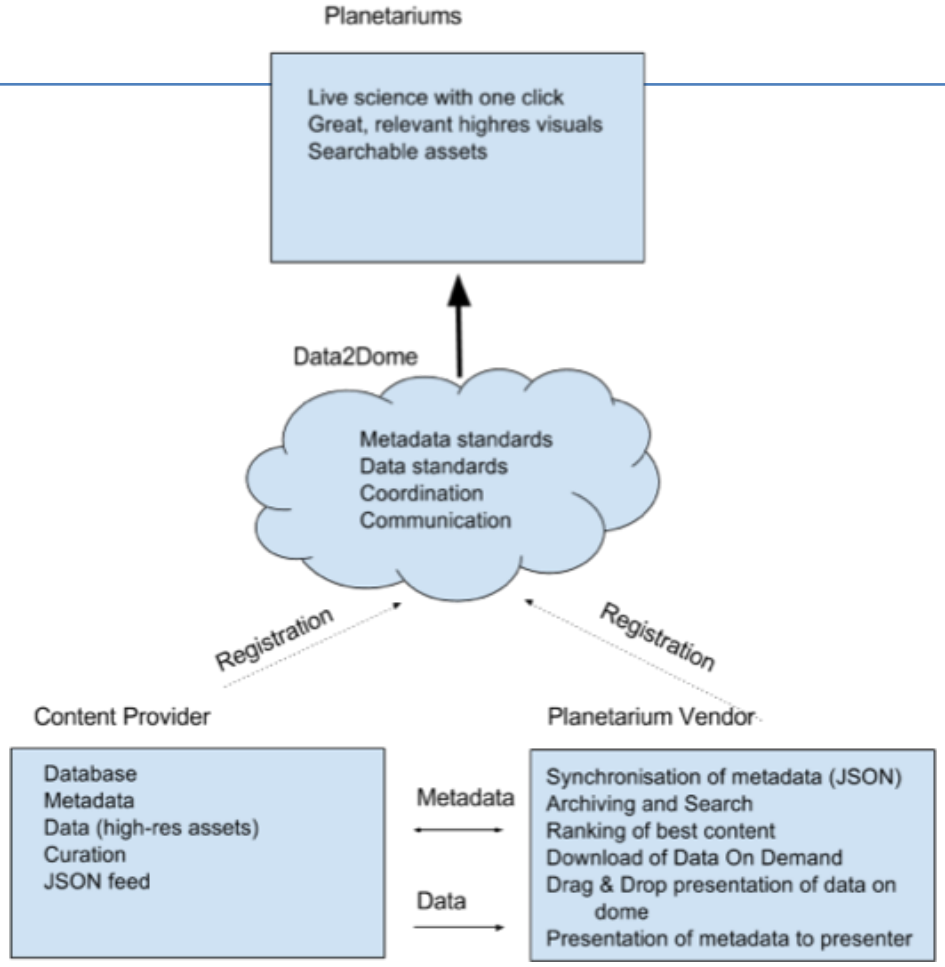
Implementation



Implementation

1. The **D2D project** determines the standard of the metadata, the format for the exchange of the metadata (JSON) and data and approves the Content Providers. D2D also communicates any changes to the standards and new Content Providers with all stakeholders.
2. The **Content Provider** maintains a database of metadata and data. The Content Providers must guarantee that data and metadata are free to use by the planetariums. This content will need to be curated so that the best (most relevant and most interesting) data are provided. The metadata are made available in a JSON file.
3. The **Planetarium Vendor** will (through a Vendor Cloud solution) synchronise the JSON file as often as necessary, provide an interface that allows the presenter to search and filter the metadata instantaneously, and then download the presenter's chosen asset on demand in any size needed (the JSON file has deep links for different format/sizes). The metadata are archived and ranked so that the best content is most visible at any given time. The data assets are automatically displayed at the default location of the dome. The planetarium presenter is also offered a text summarising the content on a console screen.

Data2Dome Example Use Cases

A new press release

- An Earth-like exoplanet system is announced by NASA and ESO.
- Within hours a human curator finds the press release interesting and features it.
- The D2D JSON file is automatically updated within minutes to contain the new press release metadata.
- Soon after (to be determined by the vendor) the news will appear in the the D2D presenter menu under News.
- The release has the necessary metadata to characterise the content, and points to data/high-res assets (at least an image).
- A lecturer thinks this is relevant news, flies to the host star in the planetarium system, downloads assets and presents them to the audience.

Tonight is a lunar eclipse!

- The event appears in the presenter menu.
- As it is ranked highly the presenter bring this event up in today's Sky at Night shows. The associated assets (images, flat videos and fulldome videos) are downloaded, automatically distributed to all render nodes of the planetarium system and available for instant presentation. The lecturer is supplied with background information concerning the event, such as the times of key milestones.

Data2Dome Example Use Cases

It's 20 July

- The D2D menu highlights the anniversary of the Apollo 11 Moon landing.
- The planetarium operator brings up this event in today's Sky at Night shows. The associated assets (images, all-sky images, flat videos and fulldome videos), are downloaded, automatically distributed to all render nodes of the planetarium system and available for instant presentation.The lecturer is supplied with background information concerning the Apollo 11 Moon landing.

The Chelyabinsk meteorite

- An important event like the Chelyabinsk meteorite takes place.
- It happens too fast for a press release to appear, but a blog contains a link to a high-res video of the Chelyabinsk event.
- The D2D blog JSON file is automatically updated within minutes to contain the new press release metadata.
- Soon after (to be determined by the vendor) the news will appear in the the D2D presenter menu under News.
- Owing to its importance and topicality the asset soars in the ranking.
- It is quickly discovered by presenters worldwide.
- The asset is displayed on domes worldwide hours after the event.

Data2Dome Example Use Cases

HST images

- The presenter needs an image of the interesting Bubble Nebula.
- He/she searches the metadata in the Vendor Cloud, and finds a Hubble image.
- The 79 MB 8k-pixel image data are marked for download and are displayed on the dome after some seconds.

Hubble videos (flat and fulldome)

- The presenter needs a video of the super-Earth 55 Cancri e.
- He/she searches the metadata in the Vendor Cloud, and finds a Hubble flat UHD video.
- The 100 MB Ultra HD H.265 frames data package is marked for download and is displayed on the dome after a few minutes.