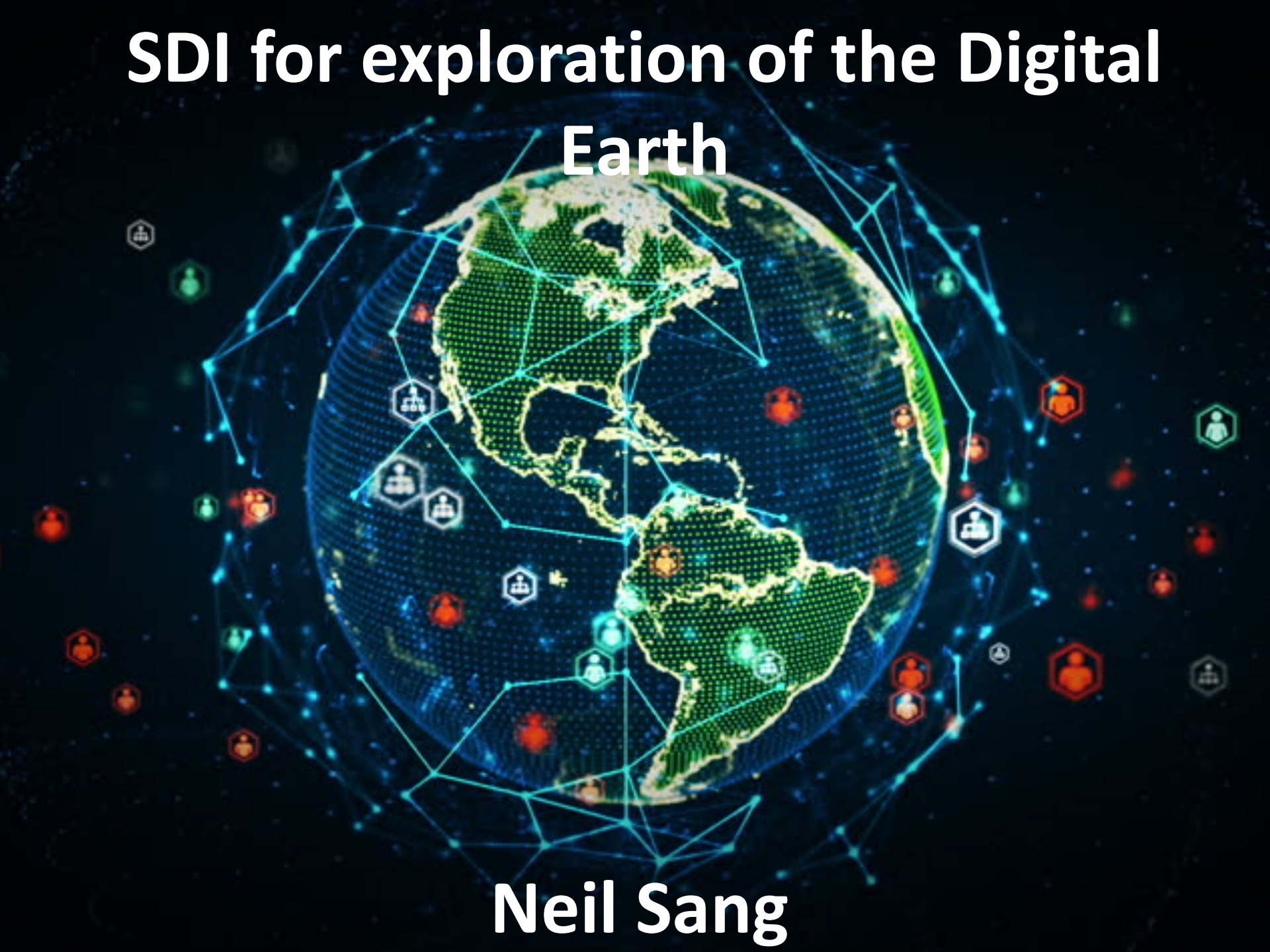
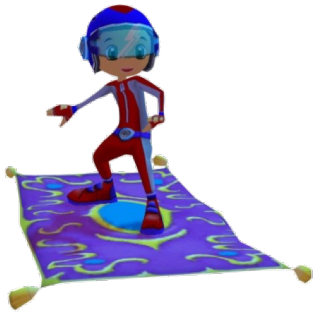
SDI for exploration of the Digital Earth



Neil Sang

The Digital Earth Challenge

“**The tools we have** most commonly used to interact with data, such as the "desktop metaphor" employed by the Macintosh and Windows operating systems, **are not really suited to this new challenge. I believe we need a "Digital Earth".**



“Imagine, for example, a young child going to a Digital Earth exhibit at a local museum. After donning a **head-mounted display**, she sees Earth as it appears from space. Using a data glove, she zooms in, using higher and higher levels of resolution... Having found an area of the planet she is interested in **exploring**, she takes the equivalent of a ‘magic carpet ride’ through a 3-D visualization of the terrain”

Al Gore (1999)

Spatial Data Infrastructures in the 2010s

'A compendium of various technical and organisational components, schemas, data standards, metadata standards, data hubs, open access funding models and so forth … The more interesting question is how an SDI may become more than the sum of these parts? ' **(Me, 2011)**

Product

Process

COMMISSION REGULATION (EC) No 1205/2008

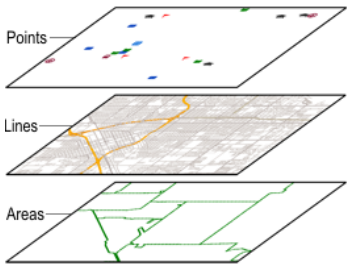
of 3 December 2008

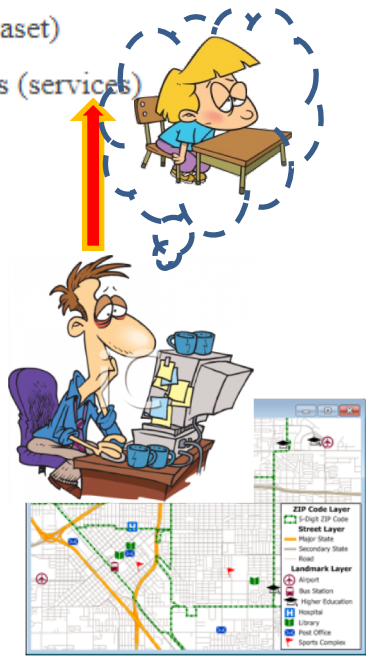
1. RESOURCE TYPE

1.1. Spatial data set series (series)

1.2. Spatial data set (dataset)

1.3. Spatial data services (services)





PRAGUE INSPIRE HACKATON 2018

OPEN STREET MAP

The Free Wiki World Map.

SCENIC OR NOT

Rate Great Britain's pretty places

Not Scenic 1 2 3 4 5 6 7 8 9 10

Home

FAQ

Leaderboard

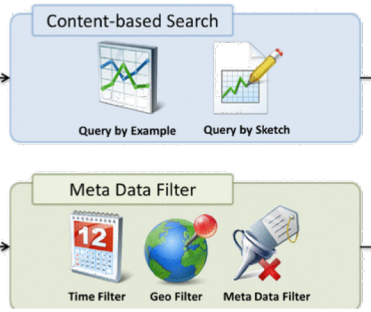
{JSON}

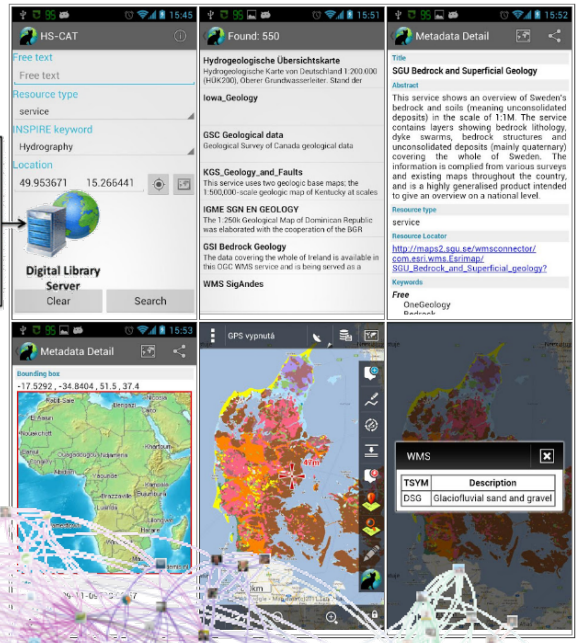
JavaScript Object Notation

RDF

Harmonisation with end user processes? .. Masser *et al.*(2008)

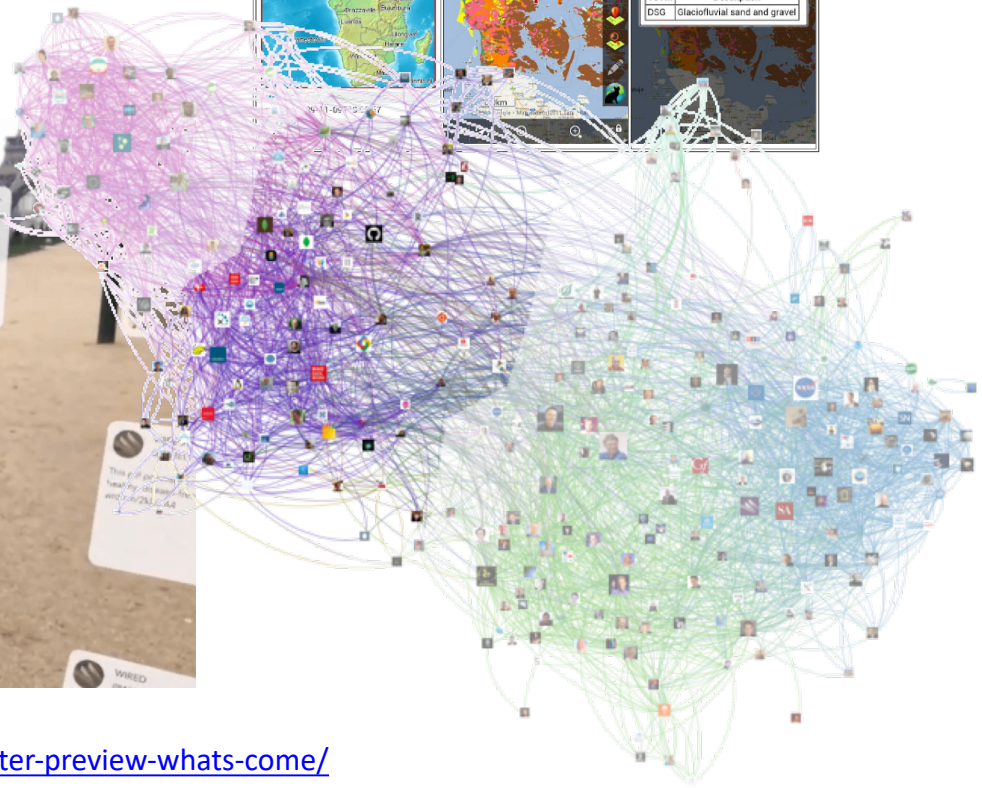
Spatial Data Infrastructures in the 2020s





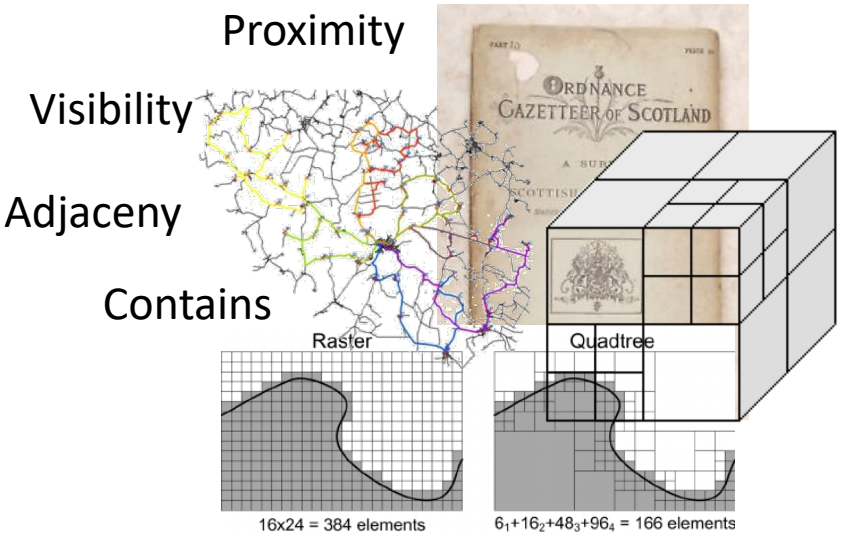
http://erra.pprd-east.eu/hs-cat

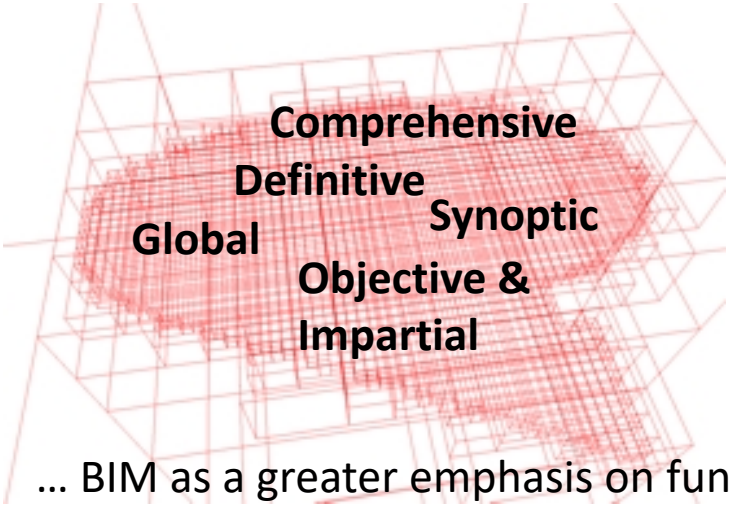
TWO WORLD VIEWS



https://thenextweb.com/apps/2017/12/08/worlds-first-ar-app-twitter-preview-whats-come/

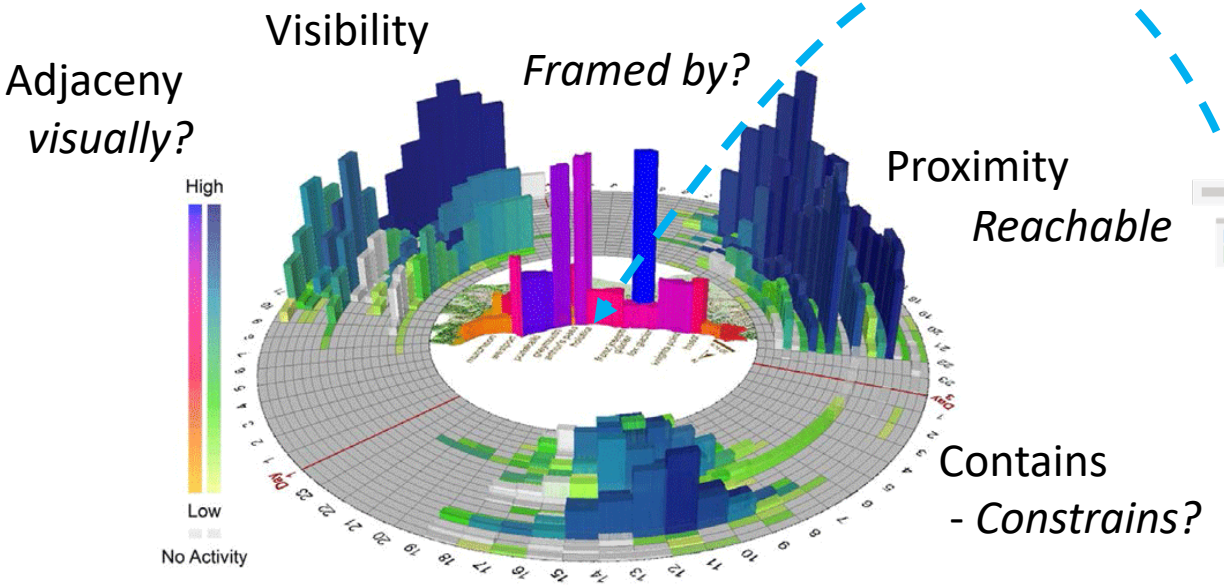
Query concepts in traditional GIS

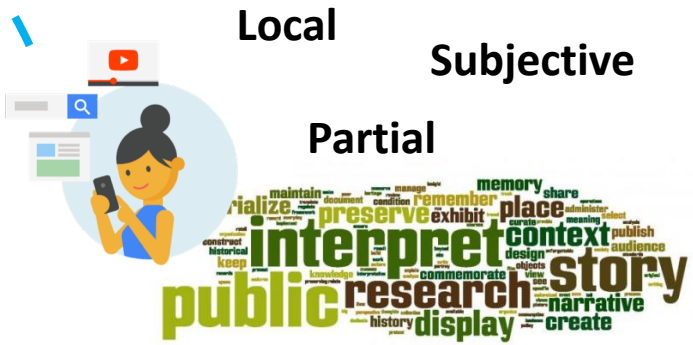




… BIM as a greater emphasis on function but is basically the same paradigm..

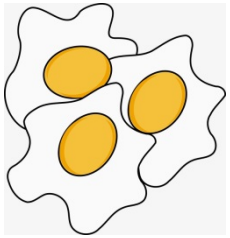
Query in an immersive paradigm





https://www.gislounge.com/multi-view-gis/

'toplogical complements..'



Shp

GRID

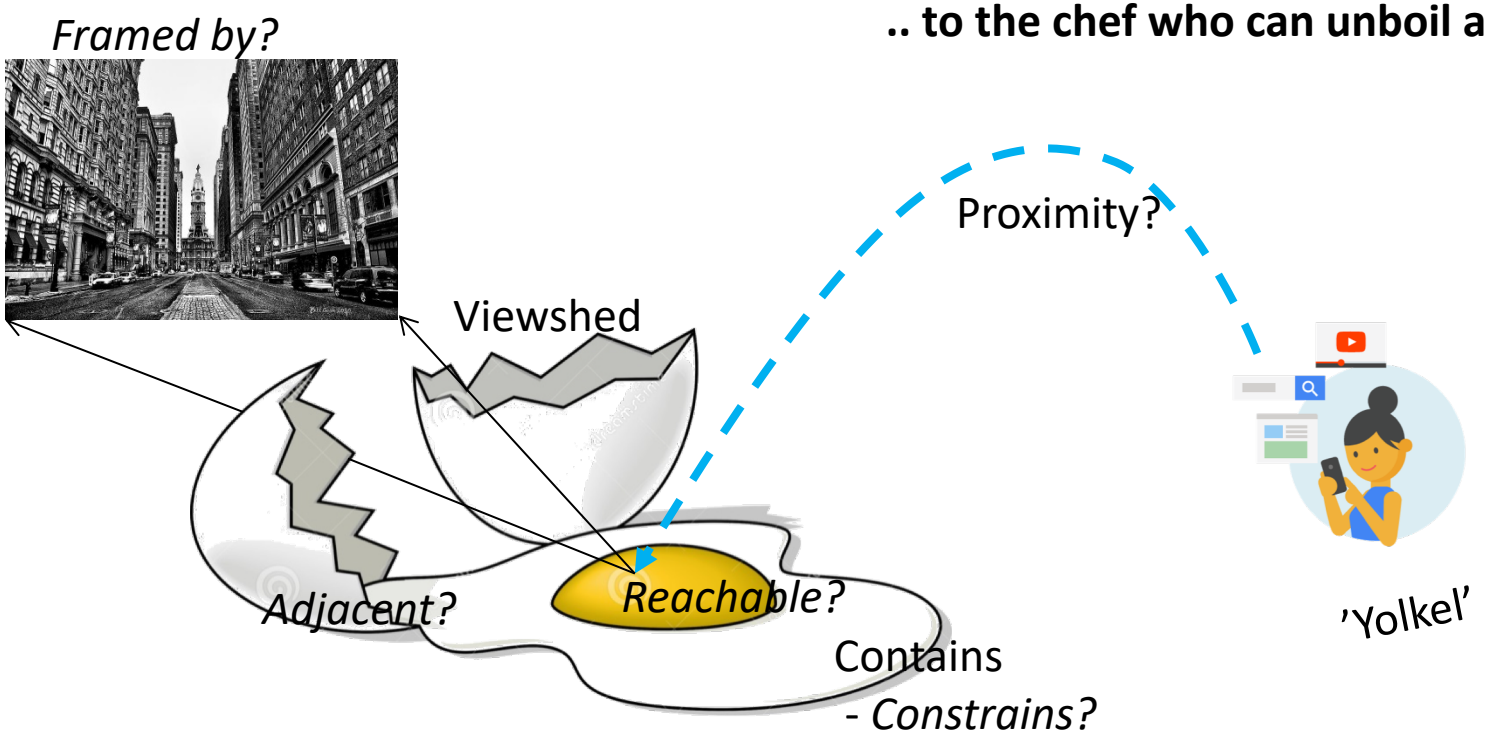
Delaunay TIN

SDI

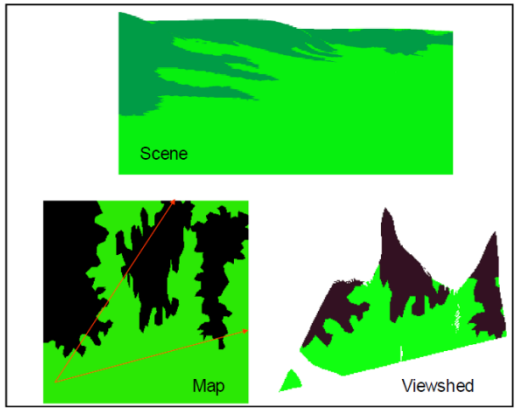
Immersive World

(Egg Yolk model : after Roy & Stell 2001.. Gotts& Cohn 1997)

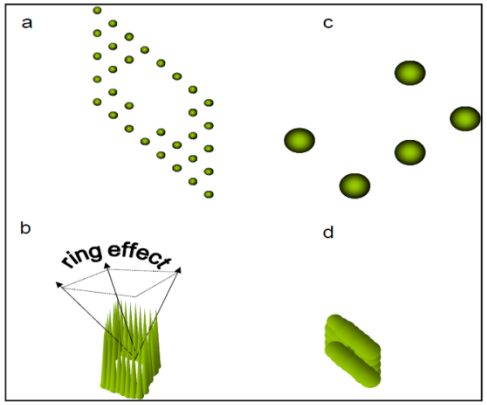
.. to the chef who can unboil an egg!



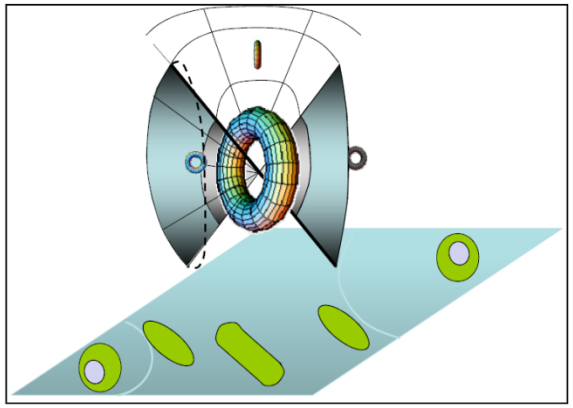
Types of Visual Complement



Viewshed and Scene

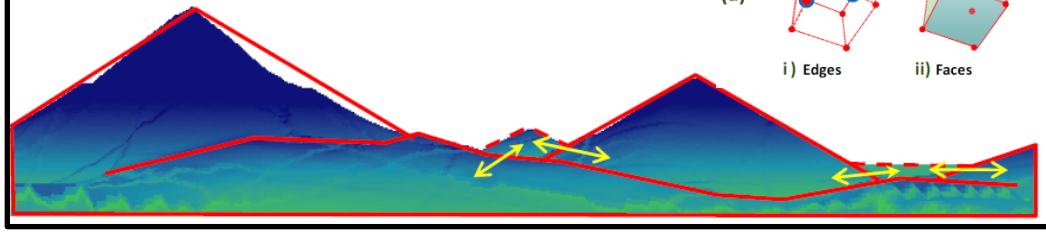


Patterns

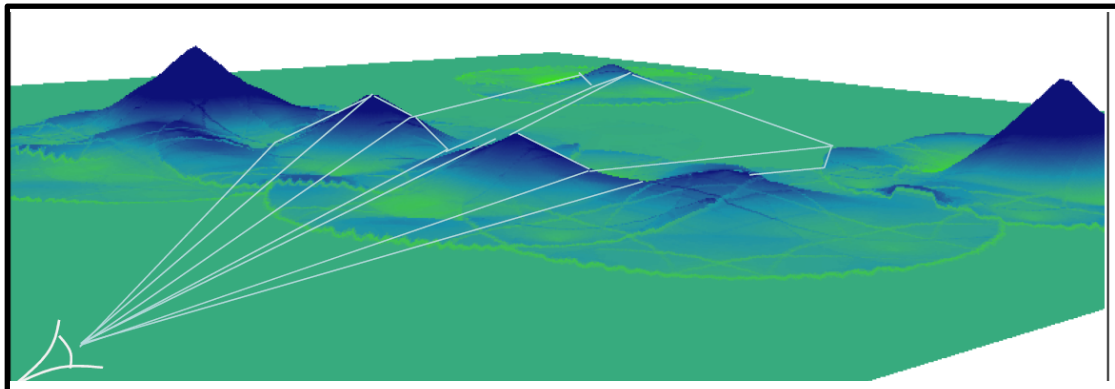


Visual 'Euler' Topology

Horizons : visual edges, t junctions, cusps, adjacencies and graphs



Visual Framing



Visual Hull

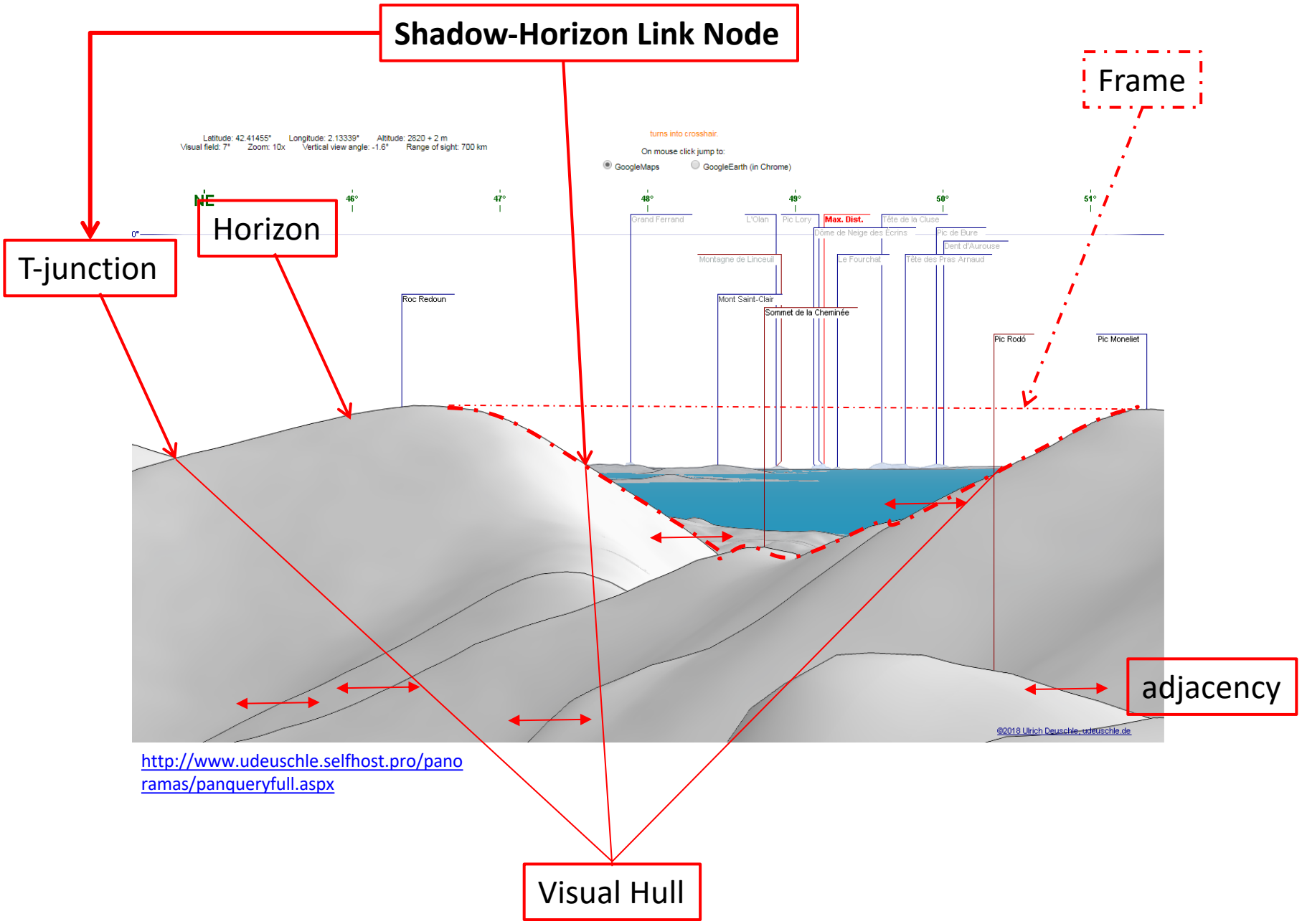
Visual Scale

Minimum Bounding Rectangle?

© Marc Bret (Beyond Horizons team)

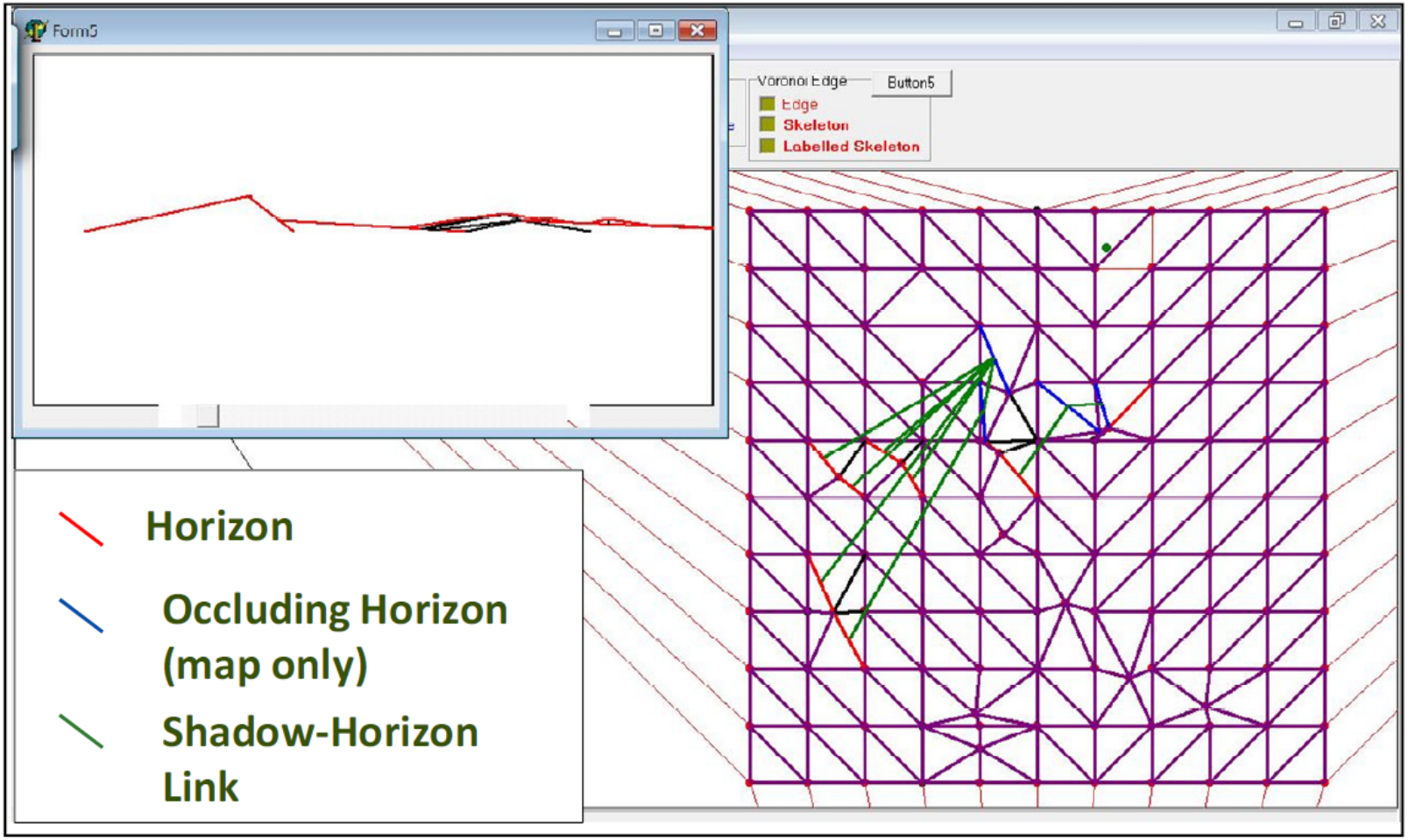
https://beyondhorizons.eu/2016/08/03/pic-de-finestrelles-pic-gaspard-ecrins-443-km/

Semantic Indexing of a Scene?



http://www.udeuschle.selfhost.pro/panoramas/panqueryfull.aspx

Perspectival Query / Ego-centric query

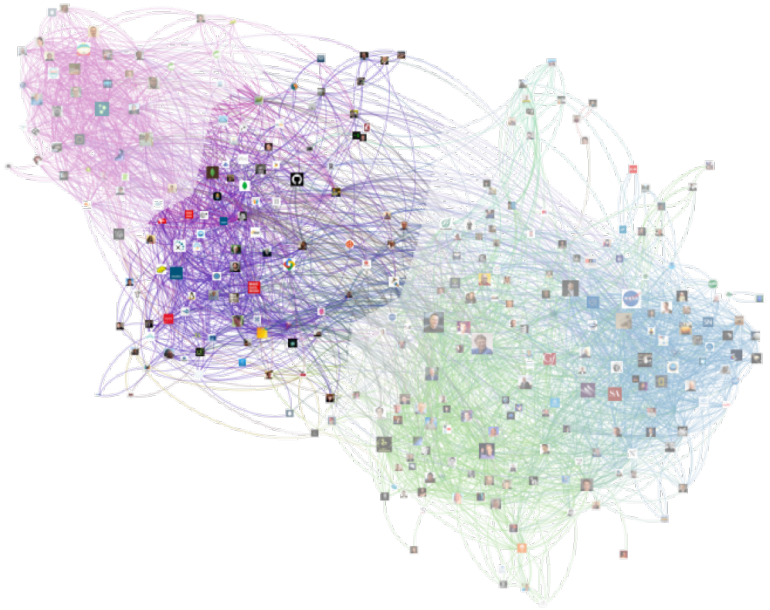


Doesnt have to be visual :

Could be sounds or other **context : platial not spatial (e.g. Goodchild 2012)**.

Graph based SDI

- Semantic
- Topological
- Features and relations are objects
- n-dimensional
- As distributable as the web itself



Please do not just buy Neo4j off the shelf and use its spatial component : SDI has a chance to lead the IT/data science sector!

How can it be done?

Guibas, Stolfi, Gold, Ledoux and others show graph structures are very useful for managing spatial data.

Sang 2011/2016 demonstrates the usility of spatially embedded pointers for non-contiguous complements.

Agoub, Kunde & Kada 2016 Suggest a UML based graph component to SDI.
https://www.dgpf.de/src/tagung/jt2016/proceedings/papers/20_DLT2016_Agoub_et_al.pdf

Immersive SDI :

Local not Global

Platial not (necessarily) spatial

Serial not (necessarily) Parallel

Objects not (only) layers / tables

Instantial not (necessarily) Synoptic

Topology not (necessarily) spatial

Relative to the observer / User (not definitive)

Think : Exploratory not Observatory

Not a monolithic structure to be adhered to but a way to let datasets grow with use

Thankyou for Listening

neil.sang@slu.se @ansergis www.ansergis.com