iCeBOUND : Cloud Based Design Support System for Urban Numeric Data

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L'avenir est à créer

h e p i a

Haute école du paysage, d'ingénierie et d'architecture de Genève

iCeBOUND, a CTI project

- Arx-IT - Industrial partner
- HES-SO, hepia - Academic partner
- SIG (Services industriels de Genève)
- OCEN (Office cantonal de l'énergie)
- SGOI (Service de géomatique et de l'organisation de l'information)
- SEMO (Service de la mensuration officielle)
- CERN (Centre européen de recherche atomique)

SITG | LE TERRITOIRE GENEVOIS À LA CARTE

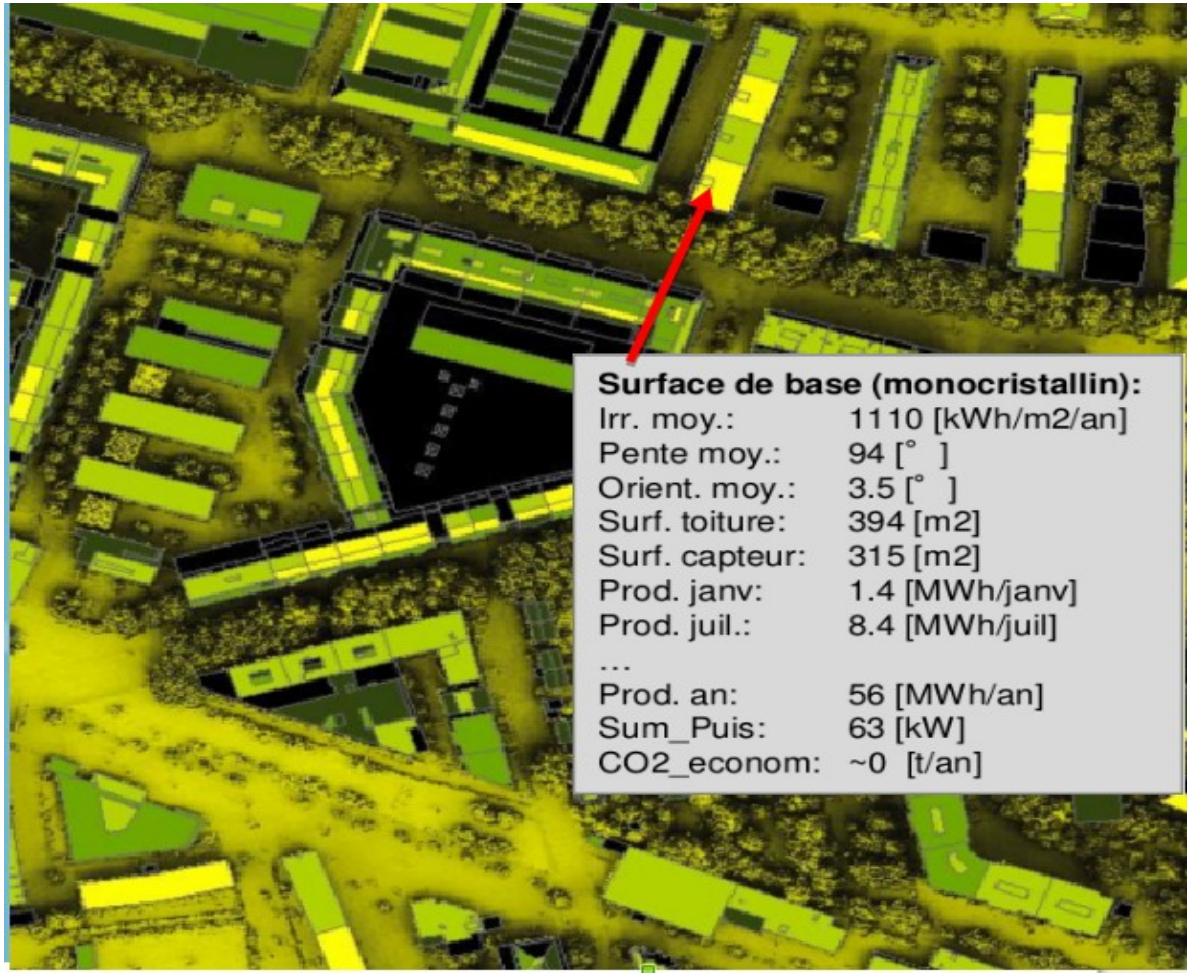
Post CTI project -

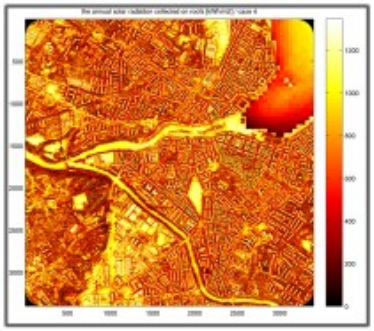
Continued interest
Lack of computing resources
Team on different project

eSCT provides a channel to continue

Framework for new support with low barrier to entry
Access to new expertise
Access to infrastructures
Bring in new partners

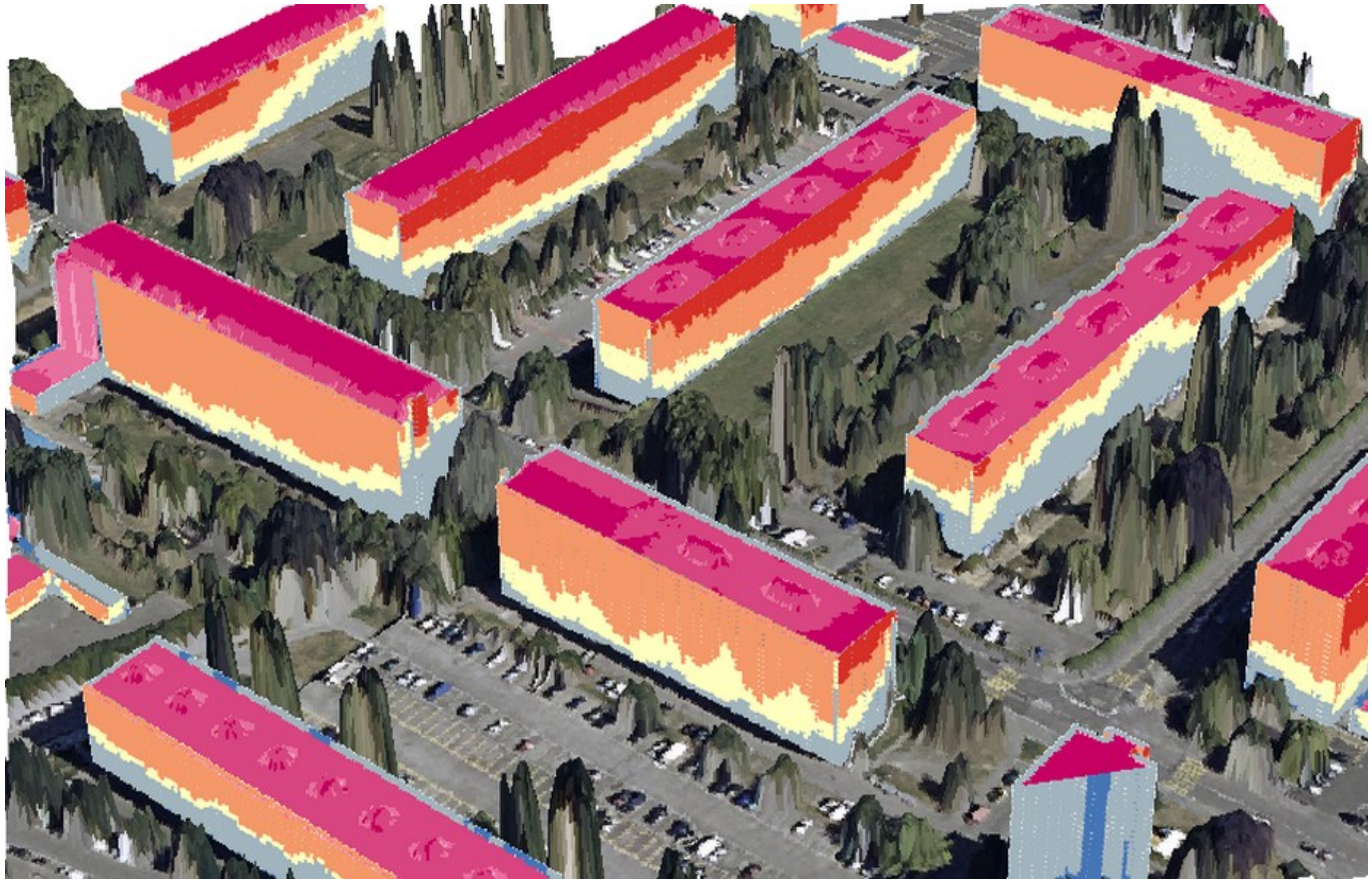
Goal and use case





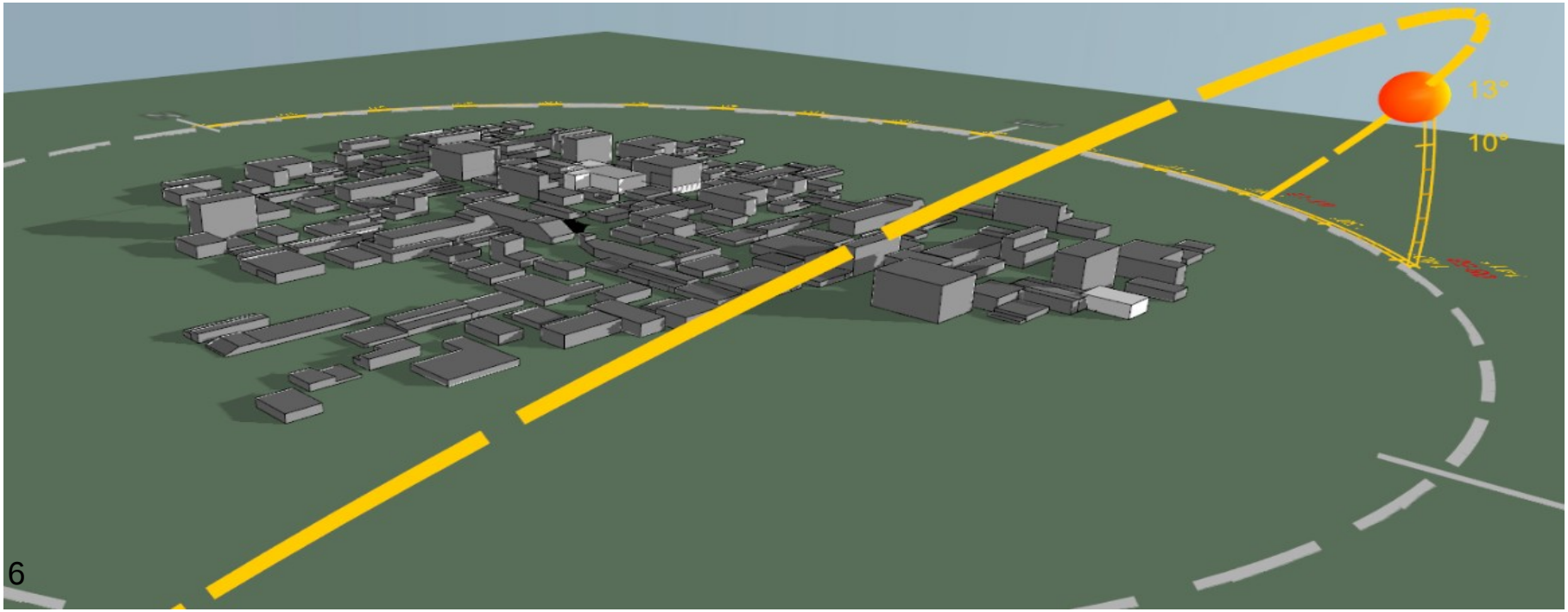
Solar radiation calculation

- Residential zone of Meyrin, 2015



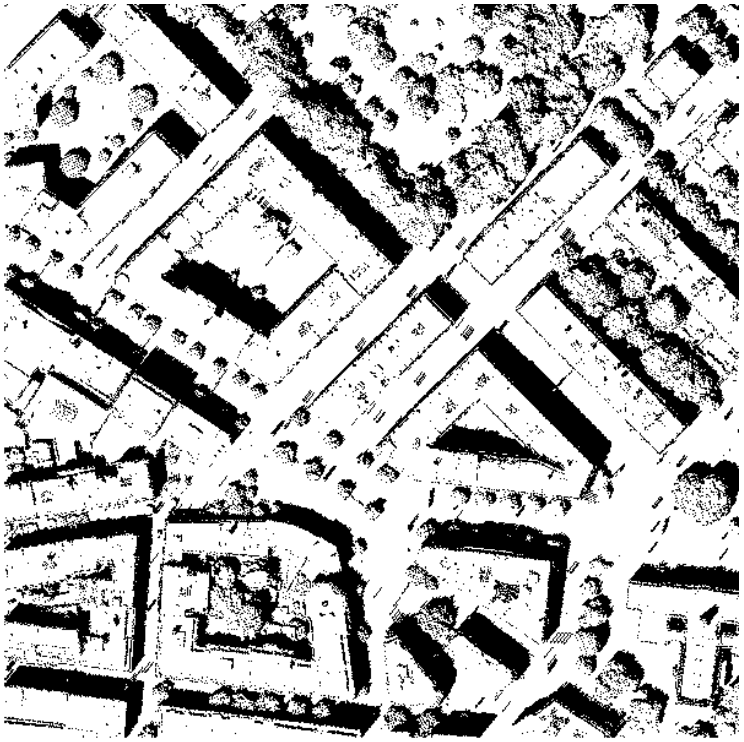
Input data

- Sun positions
- 3D digital urban datas



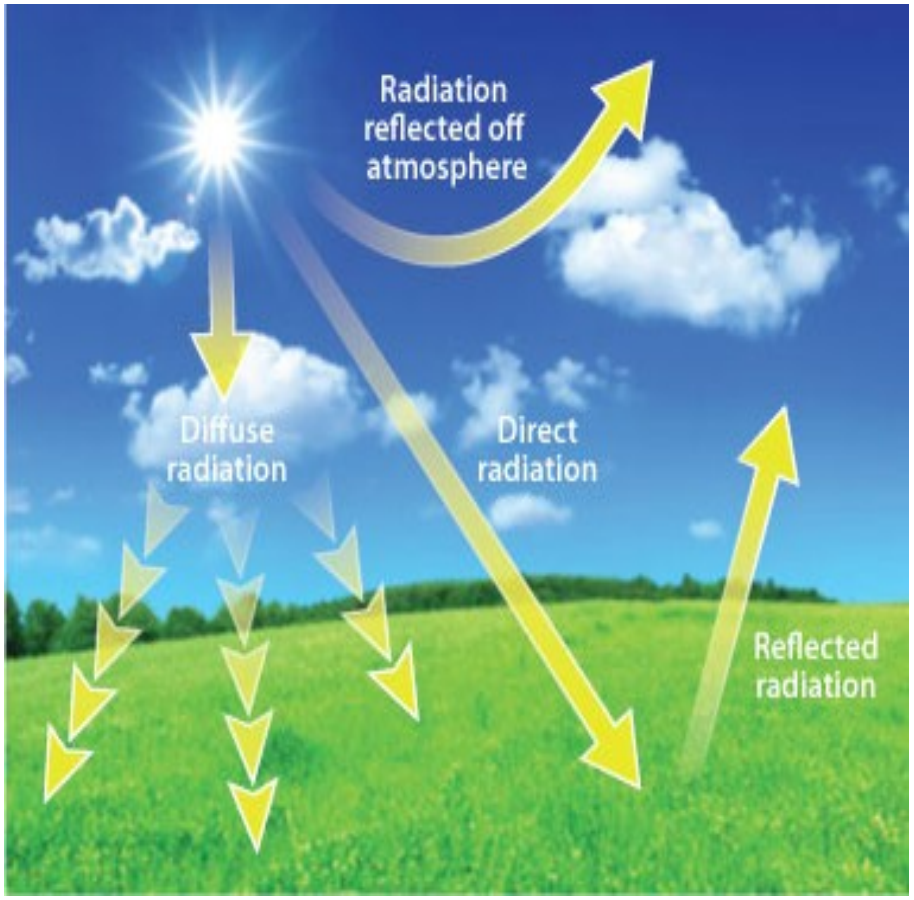
Shading calculation

- Result of a shadow process at 8am and 2pm on July



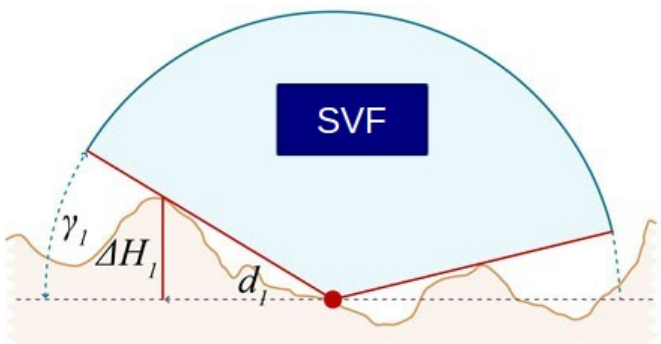
Solar radiation components

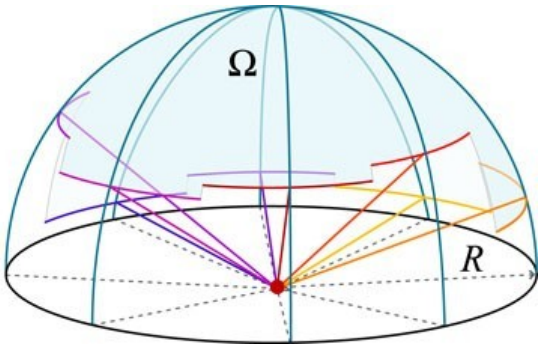
- Direct (depends on the sun visibility) radiation
- Diffuse (depends on the sky visibility ratio) radiation
- Reflected radiation

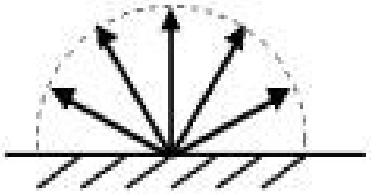


Sky view factor (SVF)

- Determines the ratio of visible sky from a point
- Input data : Sky model composed of 400 suns
- Output data : the ratio of visible sun from each point of the urban model
- Highly parallelizable





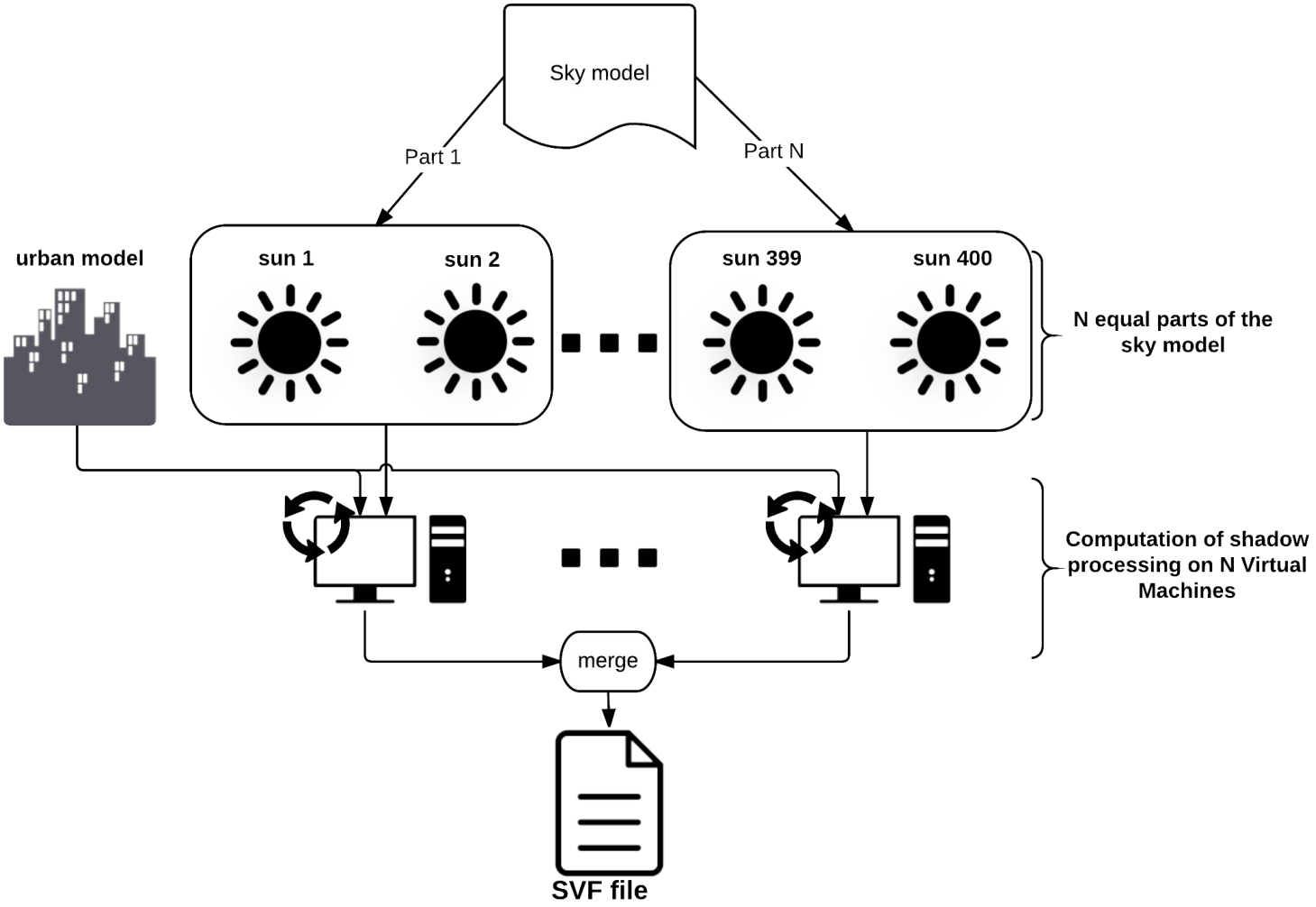


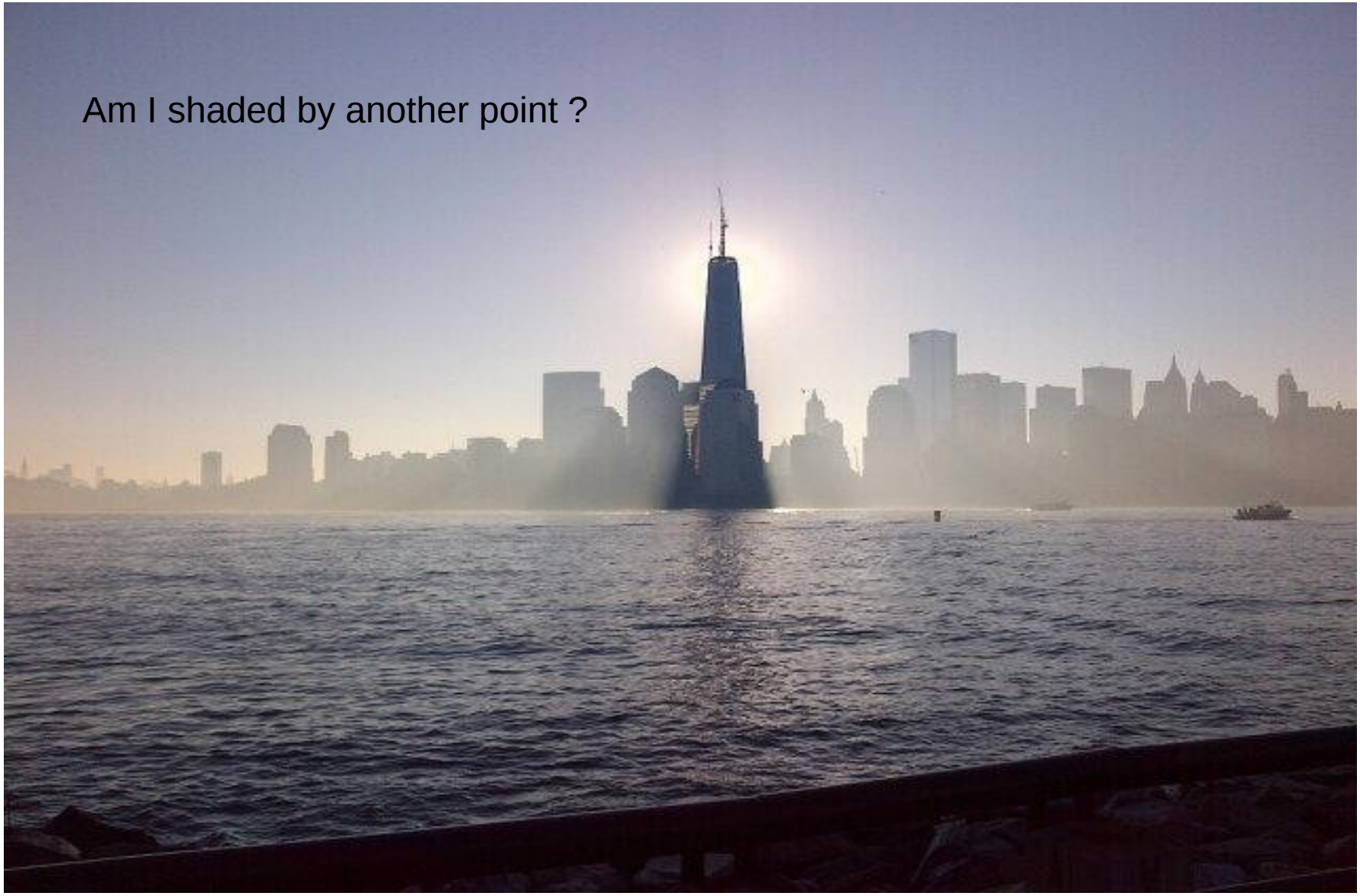
SVF parallelization : challenges

- Reducing the time taken from an execution on a real urban area (3.4 * 3.4 [km]) compared with the original software
- Optimization in term of execution cost
- Integrating the distributed computation system into the current decision support system

http://www.andescyclechallenge.com/wp-content/uploads/2014/10/Challenge_accepted.png

SVF sun parallelization : principle





http://gamedayrcom.c.presscdn.com/wp-content/uploads/2013/05/1-world-trade-center.jpeg

http://orig12.deviantart.net/42ae/f/2011/018/b/3/empire_state_building_shadow_by_jadeddreams1-d37htfj.jpg

iCeBound: eSCT extension

- eSCT project support extension of iCeBOUND to:
  - Cluster Framework : HTCondor
    - With home made python orchestration library
  - MR Framework : Hadoop
  - Two targeted providers : AWS & SWITCHengines
  - Multicloud library : Apache libcloud

https://janikvonrotz.ch/wp-content/uploads/2014/03/Amazon-AWS-Logo.png
https://engines.switch.ch/horizon/auth/login/?next=/horizon/project/instances/
https://libcloud.apache.org/images/media/libcloud-logo-with-text-medium.png
https://research.cs.wisc.edu/htcondor/images/white_bird_logo.png

SVF parallelization : conclusions

- eSCT allows us to continue the research on iCeBOUND
- Decreasing the computation time from 2 days to 2 hours with condor
- MapReduce version is ready to be tested

Questions ?

http://www.chambre-21.notaires.fr/data/photo/16.jpg