Using Arcgis for Server for organ allocation optimization in France

Esri UC 2014

Florian Bayer, Fabrice Sentenac, Ludovic Conte, Antonio Sequeira
Contents

1. Context
2. Methodology
3. Results
4. Conclusion and future work
1 - Context
L’Agence de la biomédecine

- Created by the bioethics law of August 6, 2004 from the Etablissement Français des Greffes created in 1994
- French public body
- Responsible for:
  - Operational coordination and administration of organ transplantation and tissue harvesting
  - Coordination and administration of hematopoietic stem cell grafting
  - Administration of assisted reproductive technology, human embryology and human genetics
L’Agence de la biomédecine

It is responsible for Organ allocation rules and the national waiting list

- To ensure the impartial distribution of organs to the most appropriate recipient
- To make an optimal compromise between efficacy, equity and feasibility

Some allocation rules are related to a score, with a distance interaction:

- Liver Score
- Kidney Score
Example: the Liver Score

In liver transplant, the compromise between efficacy, equity and feasibility must take into account:

- Specific recipient condition (i.e. emergency life threatening conditions)
- The quality/safety of the transplant and organ
- The distance between donor and transplant centres (cold ischemia time, transplantation team’s security)

![Urgency - Liver Score - Exceptional Allocation](image)

- The distance between donor and transplant team doesn’t matter
- Interaction between patient’s condition and the distance (gravity model)
- The distance between donor and transplant team is the most important component
The distance in allocation rules

Need to calculate the distance between transplant team and donor location for:

- Liver’s exceptional allocations
- Pediatric patients
- Deceased donors after cardiac death
- HBC and HCV donors

Problem: no specific tools to do it

- Manual search on internet
- Difficulty to have an overview of all patients locations
- Difficulty to have an overview of all available transport modalities
- Time wasting
Health care supply
Objectives

1/ Offer a geographical decision making tool for organ allocation
   - access to geocoded data (patients, hospitals) updated regularly.
   - Euclidian and drive time distance calculating.
   - Semantic request on data.

2/ Provide an access to geographical information for our partners
   - Dynamic thematic maps (organ donation rate by year)
   - Location maps (hospitals, dialysis centers, patients)

Constraints

1/ Web application
2/ Secure access by the Agence security portal
3/ Filtering view depending of user’s right
2 - Methodology
Existing tools

Webmapping: BO-Webigéo-ArcIMS (since 2007)
- Only for geographical data information access.
- Users: only internal agents.

Maps production: Arcmap
- Geographical database (40 base maps, 30,000 health structures regularly geocoded at the address, 1 DEM, roads network)
- Maps production ≈ 250/year (half by the biostatisticians)

Use of outcomes, functional and data specifications
**Ressources** : Geomatic project manager, decision support department, public market department, IT department, ESRI, Memoris

**Arcgis for server integration and installation**

- A middleware for the security access has been developed by ESRI France
- A web application based on ESRI’s Javascript API has been developed with Memoris
- The flex application was created with the flex builder and is still used by the regulation until the Javascript application is ready.
2 - Methodology

Network architecture

Internet

External users

Portal

DMZ

Tomcat 6

Middleware Orion

Arcgis for Server 10.2

Oracle 11 + SDE

Data warehouse

LAN

Internal users

Arcmap's users

Admin
Middleware

Objectives: filter the access to mapservices or to the mapservice content (whereclause) depending of the user’s profile. These profiles already exist for our Business Objects application

A/ Users see everything on the mapservice
- Mapservice: retrieval teams & DEM
- Layers: all
- Fields = team’s name only

B/ Users see one region on the mapservice
- Mapservice: retrieval teams & DEM
- Layers: Region = ‘north’
- Fields = all

C/ Users can’t see the retrieval teams mapservice
- Mapservice: DEM only
Web application

Must

- Use Javascript
- Be simple as possible for users
- Be configurable

A template and a specifications document have been written

A Javascript webapp using ESRI’s API has been developed by Memoris
2 - Methodology

Web application
3 - Results
3 - Results

Demo

Since januar 2014

- Allocation platform uses a flex application

https://www.sipg.sante.fr/
4 - Conclusion
Advantages

- Time saving for the organ platform
- Time saving for maps production
- Easy access to the data
- Homogeneous data for all Agence’s decision support system

Limits

- No backup
  - An order form can be sent to Memoris to investigate the problem
- On-call duty?
4 - Conclusion

Futur works

Testing the javascript application

Final quarter 2014

- Launching the javascript application for internal users

2015 : opening to external users ?

New thematics to add :

- dialysis
- procreation and genetics
- hematopoietic stem cell
Thank you for your attention