



Workshop on
“Drought identification and alert Northern
Tunisia”

Conceptualization of a wireless network of drought assessment

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Outline

Project Context

- **Definition of WSN**
- **Application domains of WSN**
- **Integration of WSN in GIS**

Application

Project Context

The main idea of this project is to implement an intelligent system to help low incomes farmers to face drought impacts.

This system aims:

- to connect wireless sensors measuring environmental data linked to drought indicators (temperature and humidity of soil and air, pluviometry, etc...).
- to install a spatio-temporal database communicating with a Web mapping application for a monitoring in real time.

Project Context

- This new technique allows to study the temporal evolution of the environment parameters from which we can extract the drought phenomenon indicators.
- Spatio-temporal conceptual models seek to answer the users who need to manage soil water content for irrigating, fertilizing or other activities for pursuing crop yield augmentation.
- The study will be applied in Siliana watershed Northern Tunisia.

Wireless Sensors Network

Definition

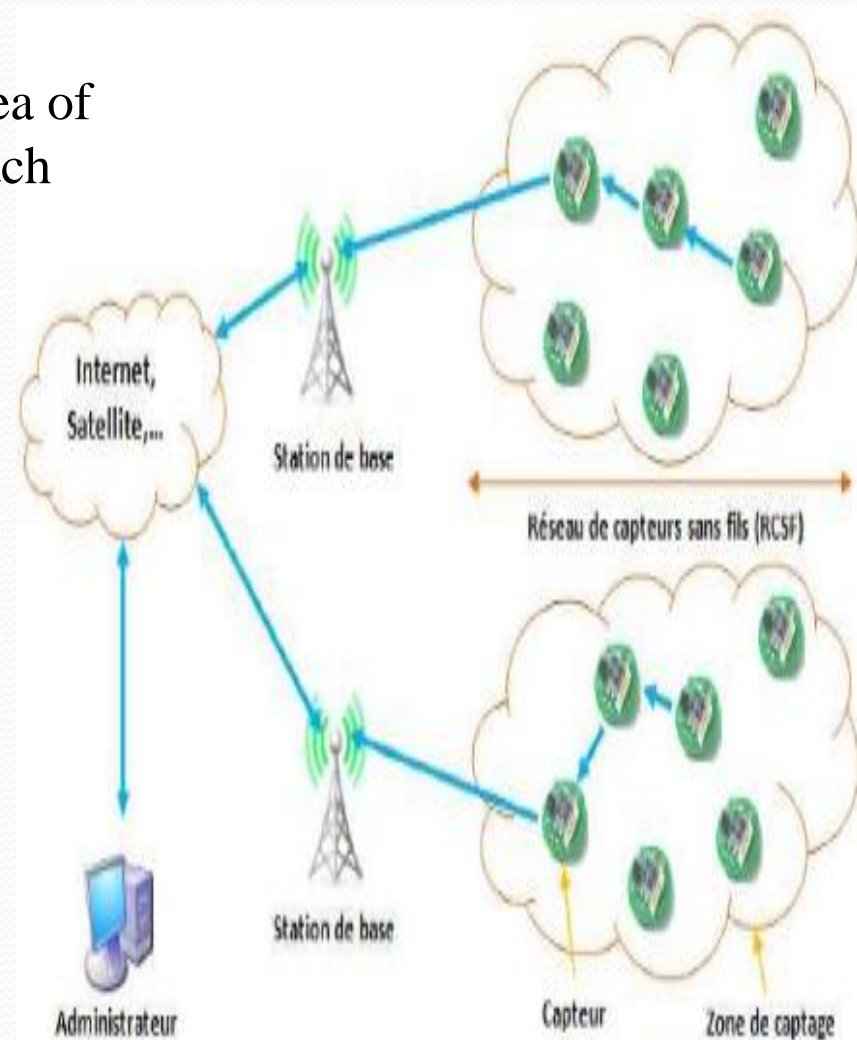
- Group nodes sensors put in the area of interest and communicating with each other via a wireless connection.

objective

-Monitoring of **Area** and **environmental parameters**

Characteristics

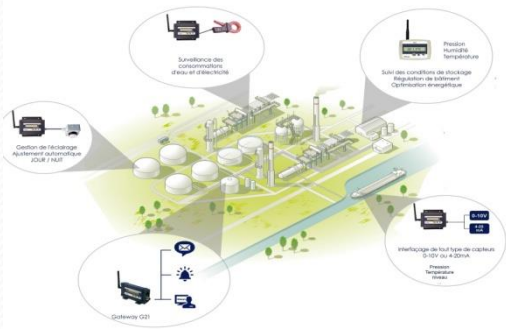
- Heterogeneity of nodes
- Scalability for deployment
- Ability to withstand harsh environmental conditions
- Ease of use



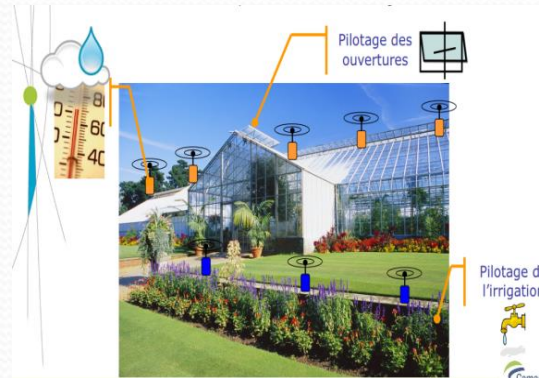
Application Domains of WSN

Project Context

Application



Industry



Ecology



Agricultural/ Environmental



Forest fire detection



Military

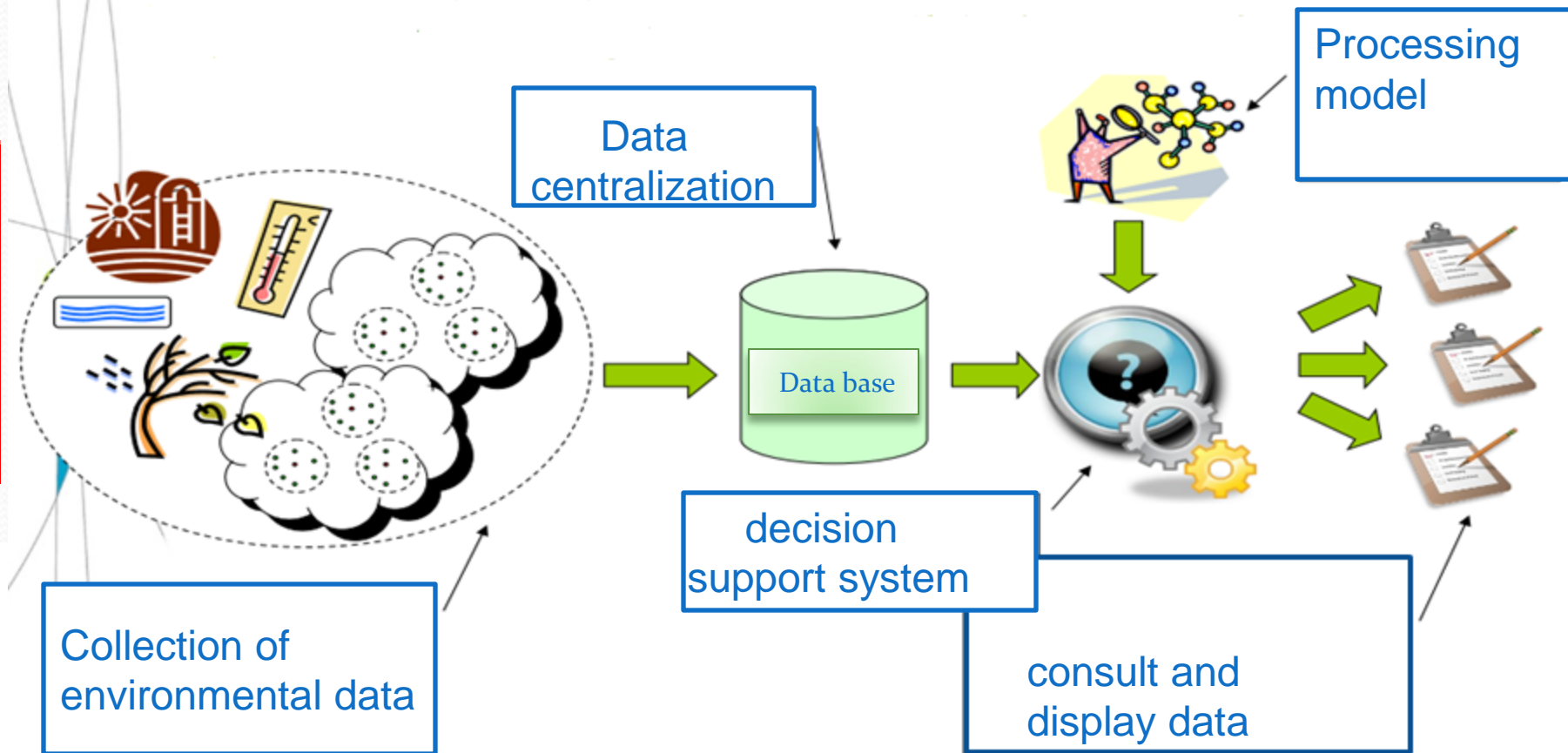


Health

Integration of WSN in GIS to create an automatic decision system for the natural observed phenomena

Project Context

Application



the adopted procedure

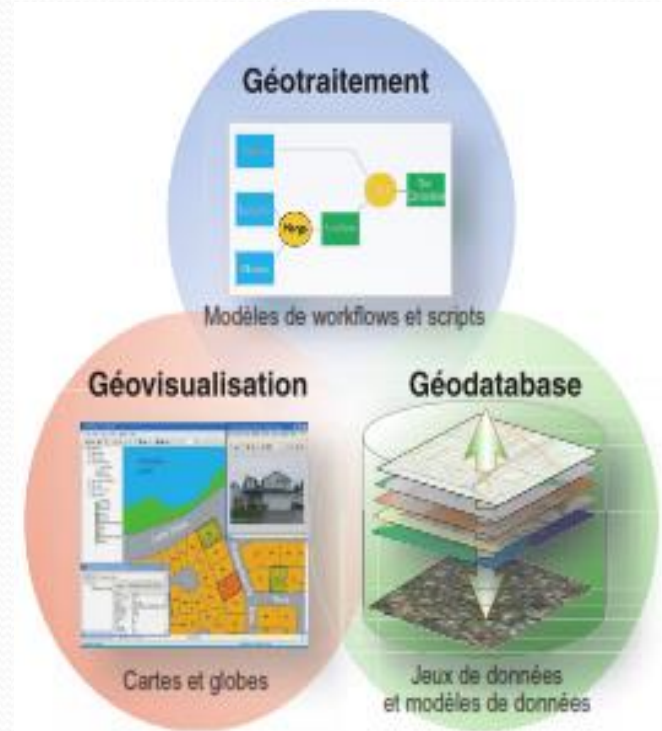
- Implement the conceptual spatio-temporal model
- WSN location

- Implementation of spatio-temporal queries, for example:

-Detect Data of sensor situated in position A (x, y) observed during the last 5 minutes

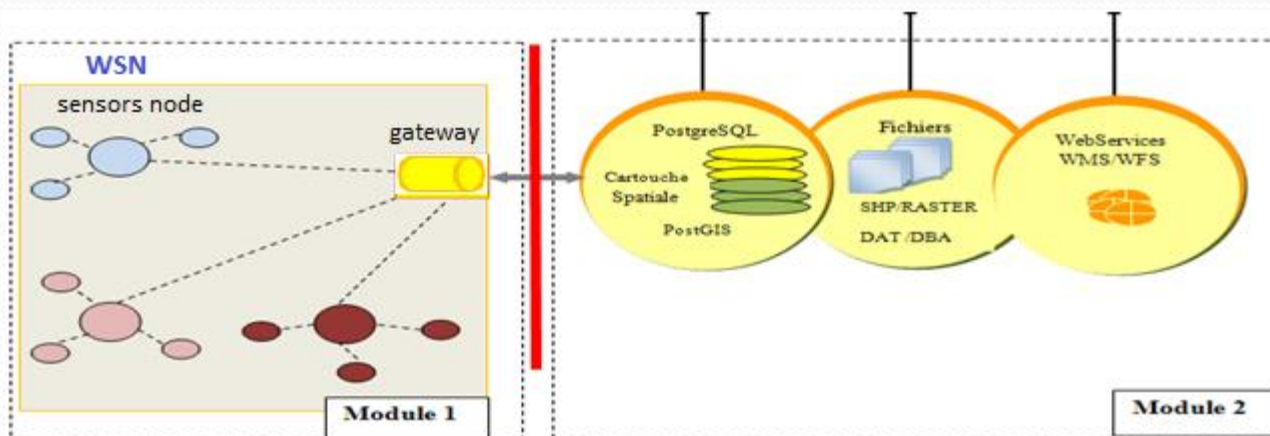
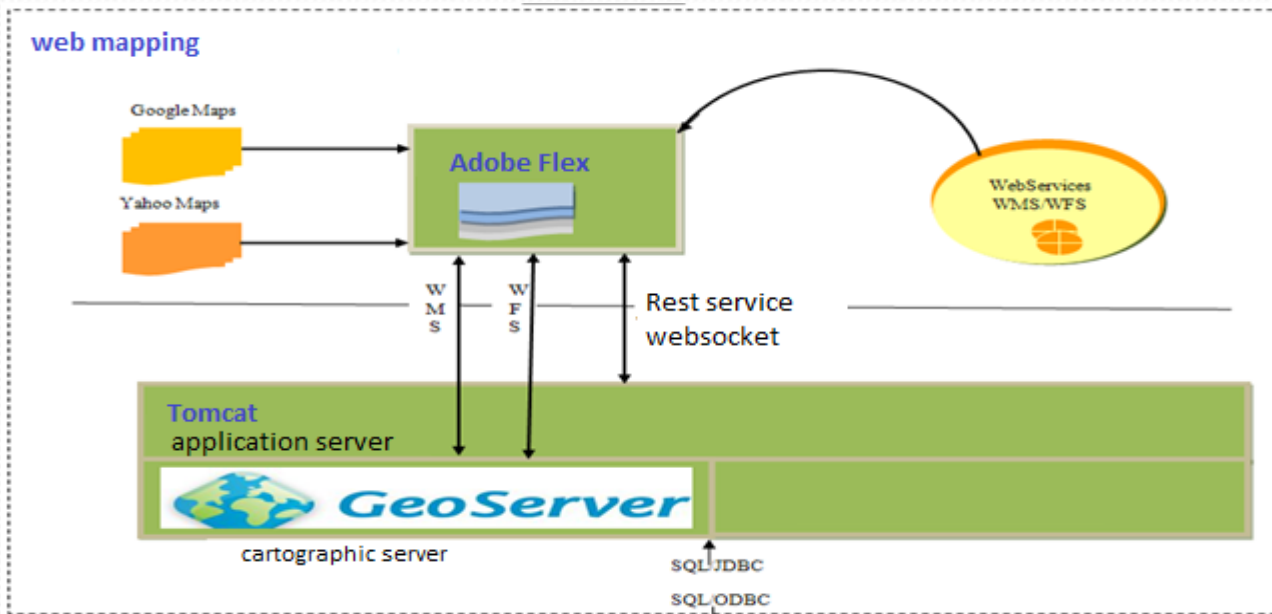
-Detect Data of sensor situated in 2 positions: B (x1, y1) and C (x2, y2) observed between two times T1 and T2

- indexation of real-time data
- Data consulting via a web mapping application



Basic System Architecture

Module 3



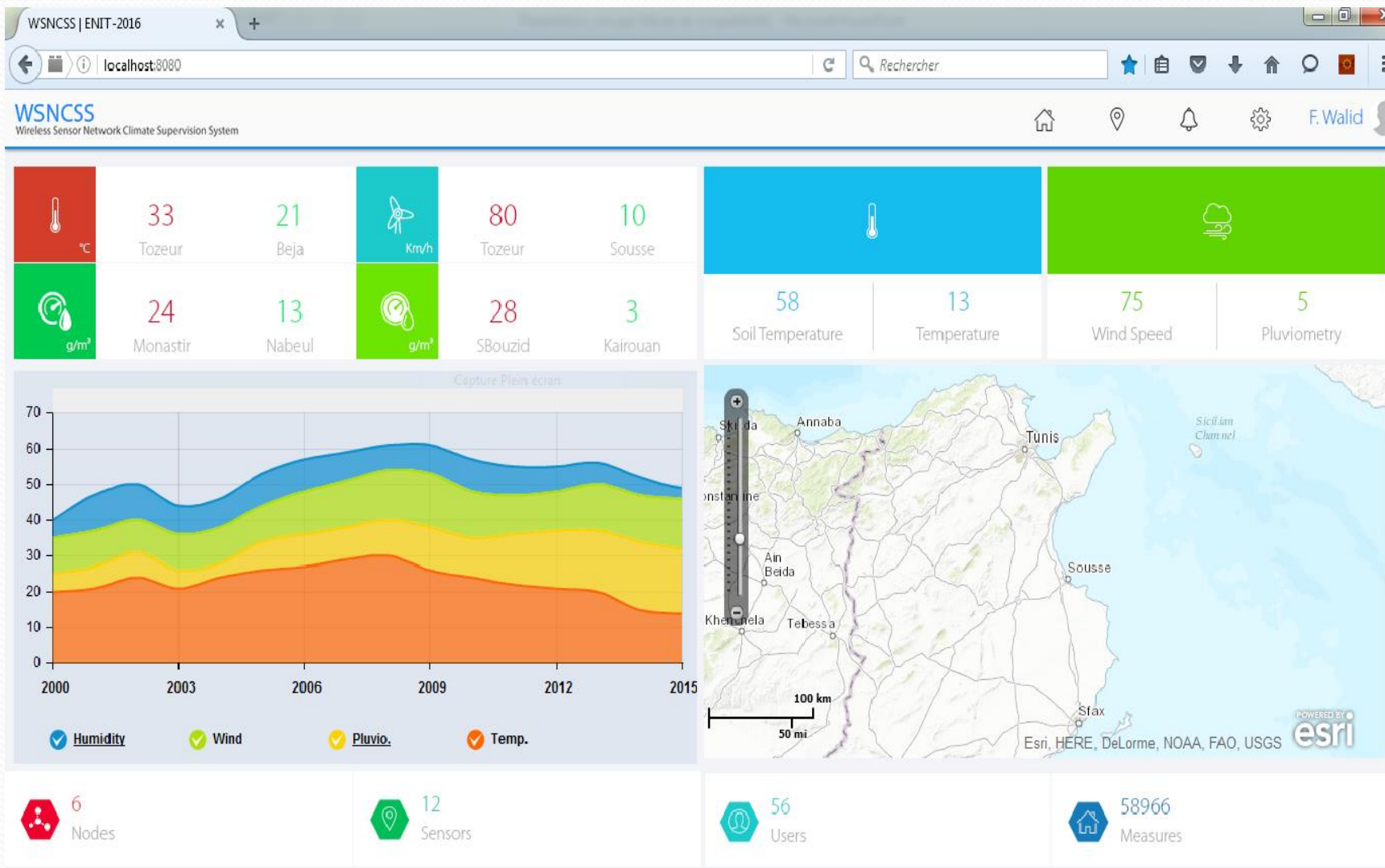
Contexte du projet

Application

dashboard

Contexte du projet

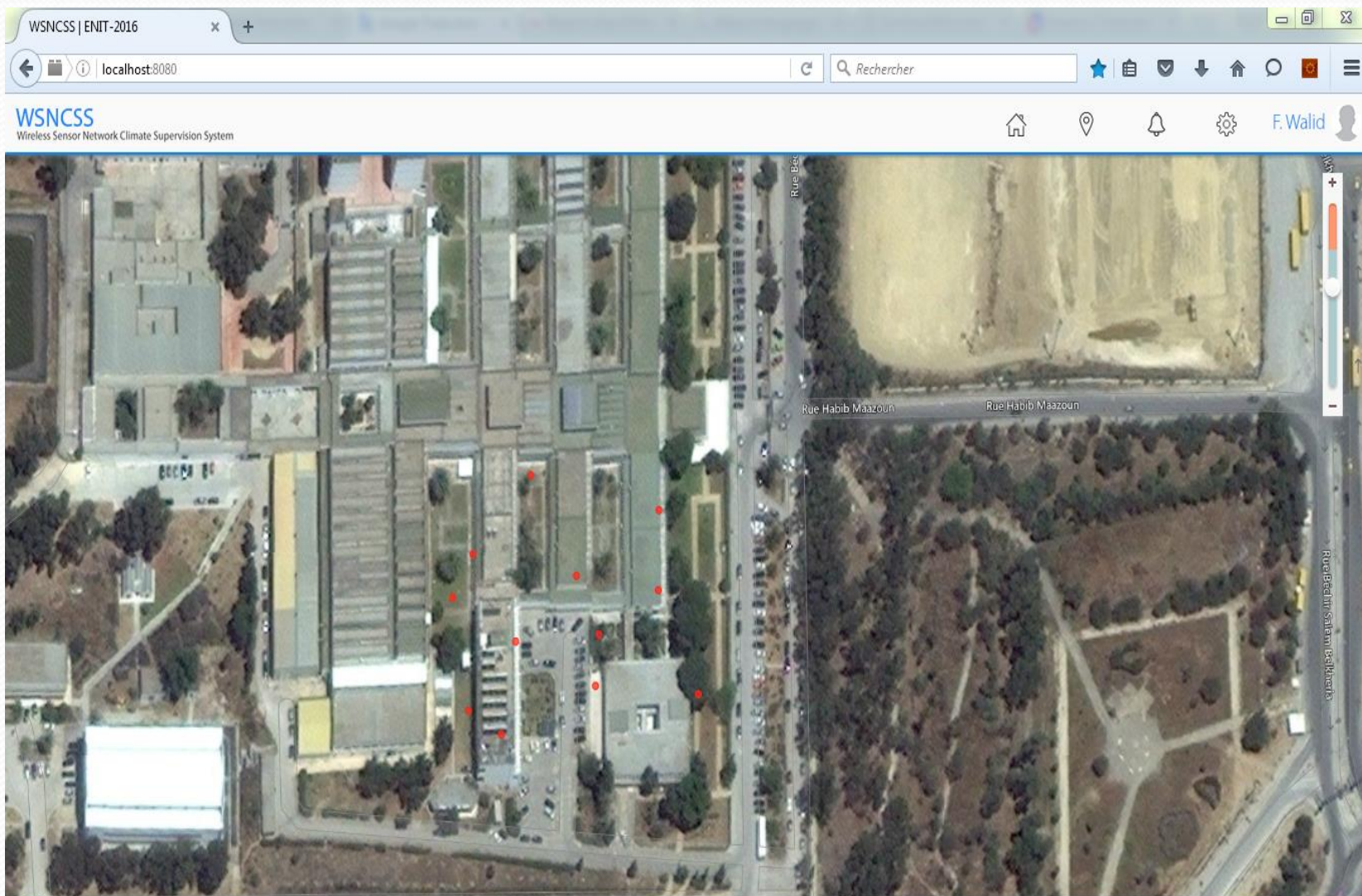
Application



Interface sensor nodes position

Contexte du projet

Application



Interface consulting real time information sent by the sensor

Contexte du projet

Application

The screenshot displays the WSNCSS (Wireless Sensor Network Climate Supervision System) web interface. The browser address bar shows 'localhost:8080'. The interface features a navigation bar with a home icon, a location pin, a notification bell, a settings gear, and the user name 'F. Walid'. The main content area is split into two sections: an aerial satellite map on the left and a data panel on the right. The map shows a campus area with several red dots indicating sensor locations. The data panel lists the following real-time measurements:

Icon	Measurement	Unit	Value	Timestamp
H	humidité	g/m ³	5.4	10/04/2016 10:38
S	ensoleillement	W/m ²	49.0	10/04/2016 10:35
U	pluviometrie	L/m ²	1.6	10/04/2016 10:38
T	temperature	°C	19.5	10/04/2016 10:38
WS	vitesse du vent	km/h	13.7	10/04/2016 10:37

At the bottom right of the data panel, there is a link that says 'Affiche Rapport complet'.

Interface consulting historic of sensor data

Contexte du projet

Application

The screenshot shows a web browser window with the URL localhost:8080. The page title is "WSNCSS | ENIT-2016". The main content area displays information for node "noeud223M2" (Type Noeud: ATMDM2, Nbre Capteurs: 5). A sidebar on the left lists sensors with their status (green or red dots). The main table shows the history of measurements for the selected sensor "libelum30 humidité". The table has columns for "Valeur", "Echelle", "Precision", and "Instant". The data shows several measurements with values ranging from 5.2070977659252495 to 9.278546506225505, all with an echelle of 22 and precision of 33, recorded on 26/2/2016 at 17:05.

Nom de Noeud : noeud223M2 Type Noeud : ATMDM2 Nbre Capteurs : 5

Liste Capteurs Détails Capteur

Type Mesure Status Type : libelum30 Taux Erreur : 22 Type Mesure : humidité

libelum22pluviometrie ● DataGrid Graphique

libelum29temperature ●

libelum2Mtesse du vent ●

libelum23ensoleillement ●

libelum30 humidité ●

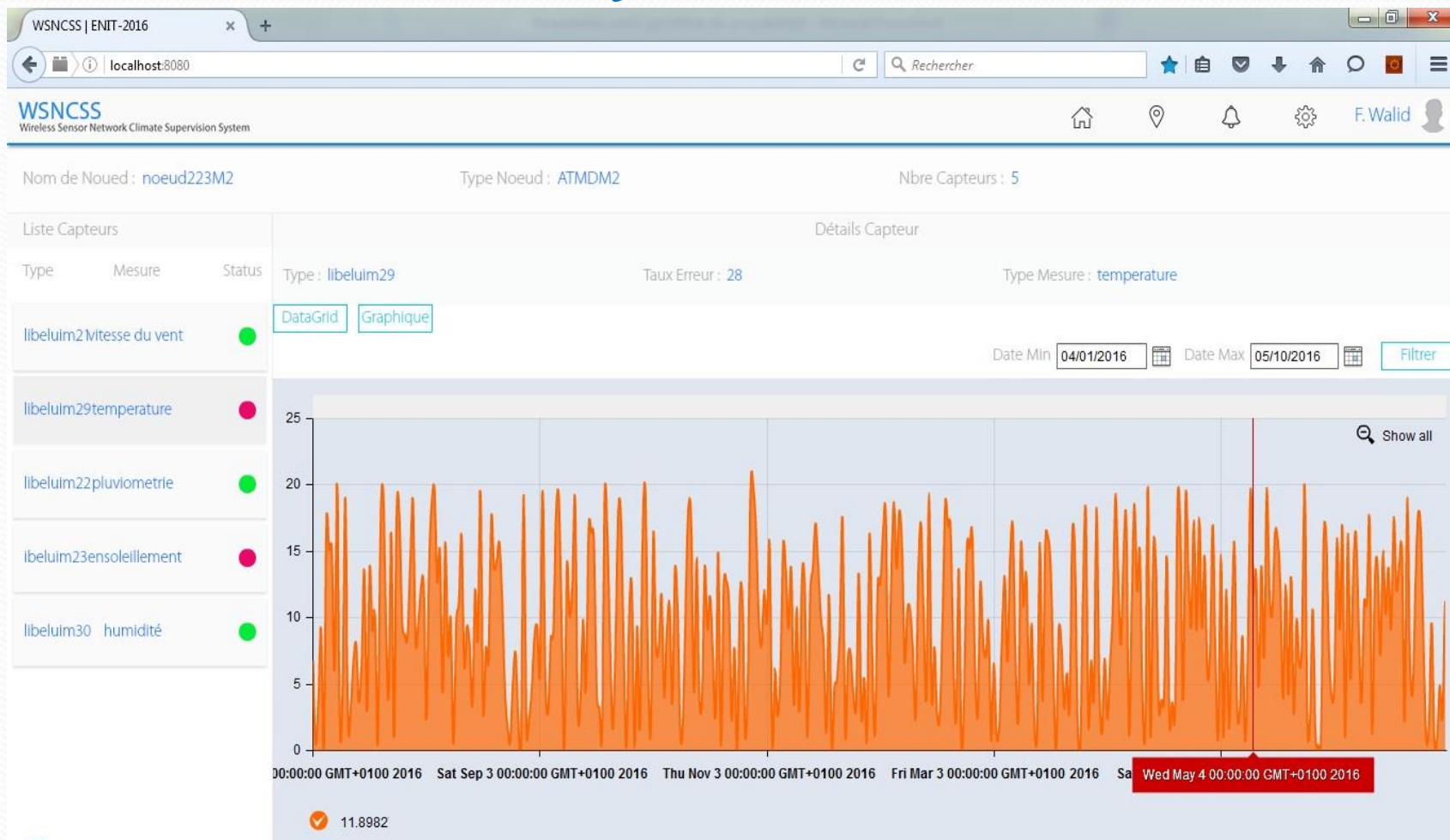
Date Min 10/04/2015 Date Max 05/10/2016 Filtrer

Valeur	Echelle	Precision	Instant
5.2070977659252495	22	33	26/2/2016 17:05
8.052321320737033	22	33	26/2/2016 17:05
9.493321263422573	22	33	26/2/2016 17:05
5.009601491913951	22	33	26/2/2016 17:05
9.151004015696875	22	33	26/2/2016 17:05
6.114955433217659	22	33	26/2/2016 17:05
9.278546506225505	22	33	26/2/2016 17:05

Interface consulting historic of sensor data (Graphic mode)

Contexte du projet

Application



configuration Interface of WSN

Consulter Configuration Utilisateur Contact

NOUVEAU RESEAU

ID Reseau: 5
Nom Reseau: ENIT_Réseau
Emplacement Reseau: Tunis
Ajouter **Annuler** **Nouveau noeud**

PARAMÈTRES DE NOUVEAU NOEUD

Reseau: ENIT_RESEAU
Nom noeud: N555
ID noeud: 14
Longitude: 10.147000
Altitude: 36.830360
Energie: 98
Date de création: 2012-06-11
Valider **Annuler** **Nouveau capteur**

PARAMÈTRES DE NOUVEAU CAPTEUR

Nom Noeud: N555
Type mesure: TEMP_INTER **Ajouter nouveau type**
ID capteur: CAPT5
Etat: Active Inactive
Périodicité: 22
Capacité de Mémoire: 60
Date de création: 2012-06-06
Valider **Annuler**

Seuil: 39
Occurence: 2
Valeur: 36
Autonomie: 10
Taux d'erreur: 0.002
Date de mesure: 2012-06-07 11:03:45

AJOUTER UN NOUVEAU TYPE:

Element de mesure: température
Type de mesure: TEMP_INTER
Unite: C
Valider **Annuler**

Conclusion

- In this project we implemented an intelligent system using wireless sensors network to help low incomes farmers to face drought impacts.
- a spatio-temporal database communicating with a Web mapping application for monitoring, in real time, environmental data linked to drought indicators
- This tools help, for example, to answer the users who need to manage soil water content for irrigating, fertilizing or other activities for pursuing crop yield augmentation.
- This system will be installed in Siliana watershed Northern Tunisia



THANK YOU FOR YOUR
ATTENTION