SERVIR Wireless Sensor Network

Enabling real-time in-situ observations for environmental and disaster applications

Karthik Srinivasan

11 September 2012

SERVIR

RCMRD

ICIMOD

USAID FROM THE AMERICAN PEOPLE

NASA

In today's talk…

- Who?
- Why?
- What?
- How?
- Where?
- What next?
- Huh??

Who?

Who are we?

- SERVIR – Spanish for "*to serve*" – is a regional visualization and monitoring system
- SERVIR integrates Earth observations (e.g., space imagery), predictive models, and *in situ* data to provide timely information products to support environmental decision makers.
- SERVIR uses satellite observations, ground-based data, and predictive models to monitor and forecast environmental changes and to improve response to natural disasters.
- SERVIR enables scientists, educators, project managers, and policy implementers to respond better to a range of issues including disaster management, agricultural development, biodiversity conservation, and climate change.

Why?

Why do we need in-situ observations?

- Satellites provide excellent datasets on a global scale
- Satellite observations are great for a large number of applications, but not all
- Number of applications require local or regional scale resolution
- Challenges remain in obtaining ground truth to validate satellite observations

Why do we need in-situ observations?

- SERVIR's partners have varied needs from flash flood forecasting, wildlife tracking to frost detection
- Each application has unique needs from observational capability to sampling frequency

What?

What did we do?

- Machine-to-machine (M2M) communication technologies rely on (relatively) short range wireless links to form networks of devices
- Built on the IEEE 802.15.4 standard
- Low power, low cost requirements make them ideal devices to create in-situ monitoring networks
- SERVIR has developed a wireless sensor network (WSN) based on M2M devices

What can WSN do?

- The network is comprised of individual nodes that are part of a peer-to-peer mesh
- Capable of operating for extended periods (weeks, months) with little to no maintenance
- Network can be put to ‘sleep’
- ‘Typical’ configuration – soil moisture sensors, rain gauge, temperature sensor, accelerometer
- *Can be interfaced to any type of sensor*

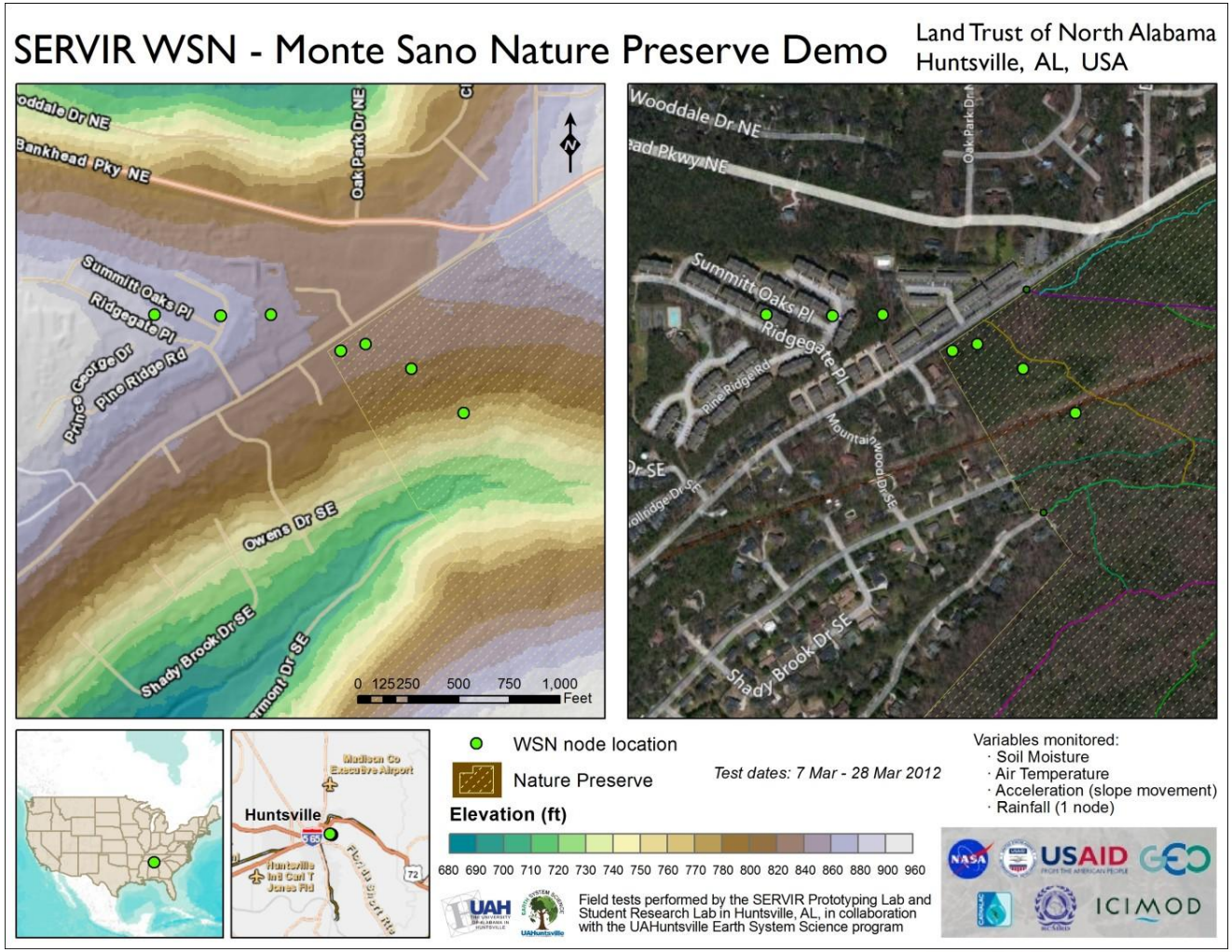
What is a peer-to-peer network?

- Individual nodes can have different configurations
- Every node in the network performs the same network functions
- Nodes talk to their nearest neighbors
- No router in the network
  - No single point of failure
- Every node can be battery operated

HOW?

Where?

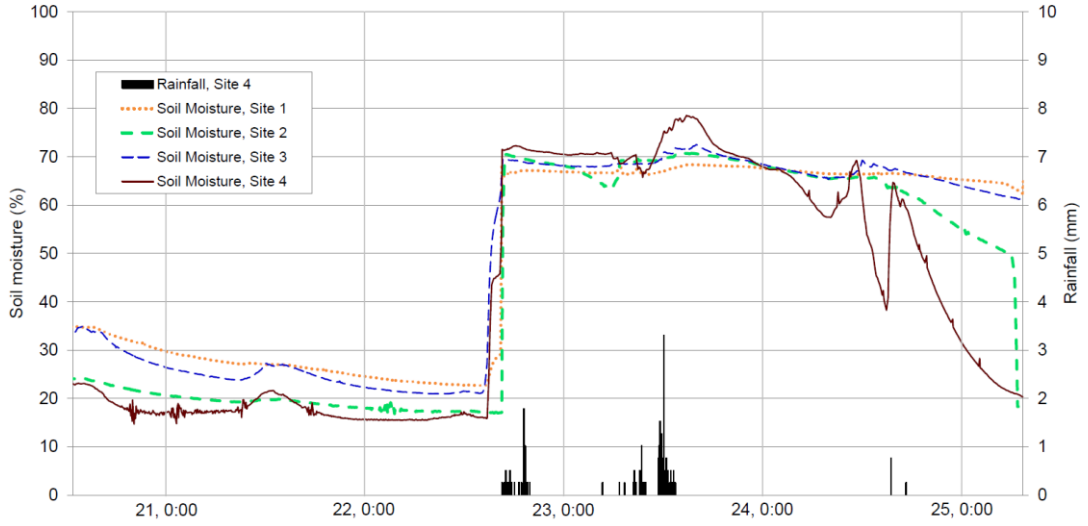
Monte Sano Field Demonstration

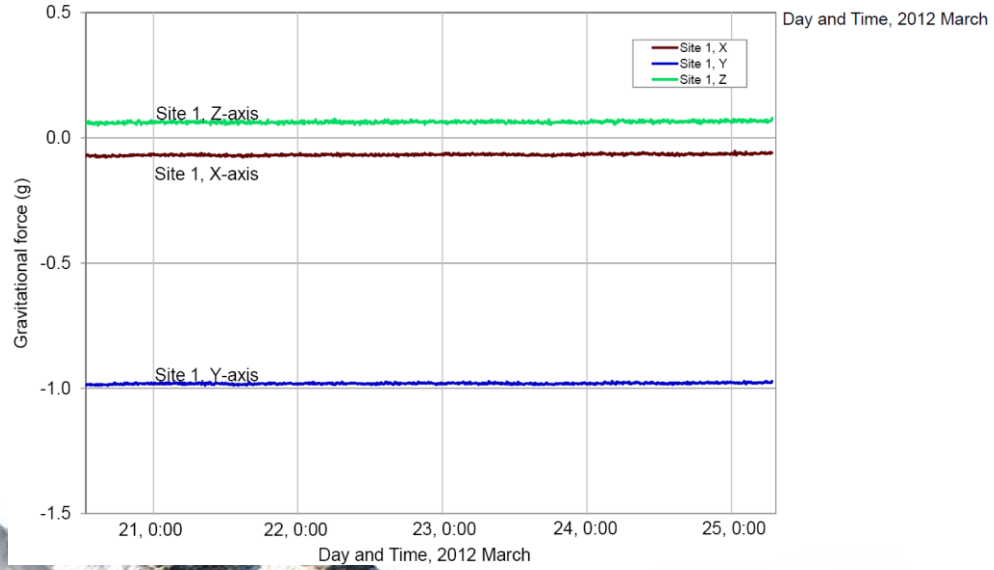


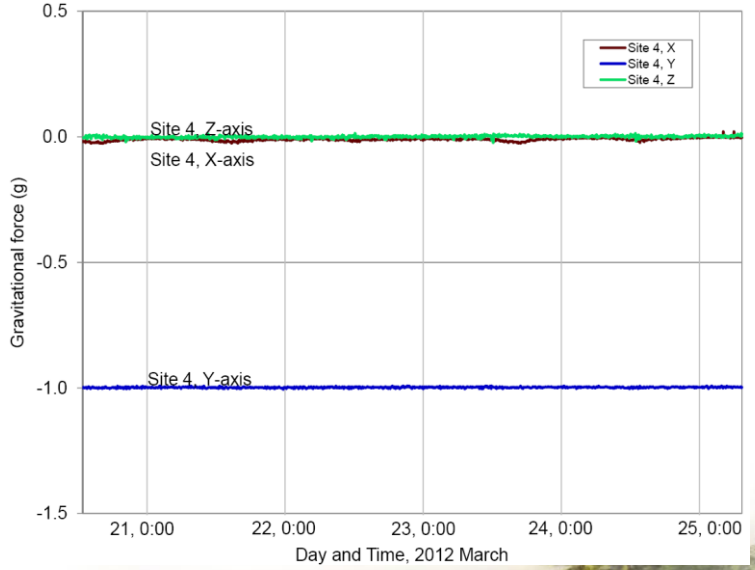
SERVIR

Monte Sano Field Demonstration

Monte Sano Field Demonstration







SERVIR

What next?

What next?

- Develop a web interface to enable real-time remote display http://servirbeta.net/mapresources/sensorprocessing/sensorgraph.aspx
- Implement a flash-flood early warning system in Bangladesh
- Partner with UAH (Dr. Nair) to implement an end-to-end landslide warning system
- Others?

And finally….
Huh???
(Questions?)