### Hashtags: #earth, #coolit

Contact: [[email protected]](http://www.cloudflare.com/email-protection)

### Tags: Hardware, Platform

**Challenge Description**

This challenge is about bringing together hardware builders, coders, engineers, social scientists, teachers, and community members. Create a sensor kit to measure temperature and relative humidity in several locations in real time. Or, create a real-time micronet of sensor kits and use their data to understand local environmental conditions. This data could even be used to educate the community about the urban heat island effect, weather, and climate.

There are many potential ways to participate in this challenge:

1) **Hardware:**Prototype and build a low-cost, open source temperature sensor kit to measure temperature and relative humidity.

2) **Software and Data Visualization:** Build a way to network the kits into a micronet. Create tools like interactive websites to use the data from the kits and micronets once deployed.

3) **Courseware:** Work with teachers to create modules to educate people about climate, microclimate and the urban heat island effects that would use a temperature micronet and touch on science, reading, social studies and geography.

4) **Impact:** Create concepts for community actions that can be taken to proactively address information gathered, such as warning community residents about extreme heat events. Develop apps that enable a community to create natural community cooling stations.

**Background**

The heat island effect is described as a significant temperature difference between urban areas and surrounding rural areas. According to the U.S. Environmental Protection Agency, “the annual mean air temperature of a city with 1 million people or more can be 1.8 to 5.4°F (1 to 3°C) warmer than its surroundings. On a clear, calm night, however, the temperature difference can be as much as 22°F (12°C).” ( [EPA Heat Island Effect Basic Information page](http://www.cloudflare.com/email-protection#bed6cacace849191c9c9c990dbcedf90d9d1c891d6dbdfcad7cdd2dfd0da91dfdcd1cbca91d7d0dadbc690d6cad3)). Increased urban temperatures lead to increased energy consumption and costs for air conditioning, summertime peak energy demand, and air pollution, as well as increased heat-related illness and mortality.

Temperature and relative humidity sensors are coming down in cost and the ability to network them has been piloted. The opportunity is for you to think of new and actionable ways in which these data can help communities prepare for changes like the heat island effect.

**Solution Ideas**

Here are some ways for you to frame this solution:

*Hardware: Sensor kit (sensors)*

Potential target time resolution on temperature and relative humidity data with approximately one reading every ten minutes; target accuracy with temperature--+/- 1 degree centigrade; relative humidity--+/- 2-5%; communicate with the micronet; strive to be low cost with deployment of many sensors in a single community envisioned; sensors could potentially leverage presence of existing platforms in communities (smartphones, etc.); use data standards so the data are interoperable; post technical drawings and pictures of the hardware in public locations so they can be shared; and bring your own component hardware. *Make sure to bring what you think you’ll need!*

*Software: Micronet and Data Visualization*

Build open source databases, user interfaces, software back ends, and micronets that use standards for data read/write (potentially with the Sensor Observation Service). For the micronet, consider a user interface and backend that could be used to manage the network of climate kits and data collected. For websites, consider data displays from network of sensors with interactive display functionality to allow people to zoom in to specific times, places, and time durations. Potentially create a map, perhaps layered with an API that allows users to see a spatial distribution and make comparisons. Be creative in how you present the data! Use cool graphics if you can.

*Courseware: Climate and urban heat island course module*

Solutions for courseware could include a writeup of the curriculum plan/course. Courseware could cover questions like:

How can the data be used to illustrate temporal and spatial variability in temperature and climate? How do you build data from the daily and local to the climatological, regional, and global? Are certain places always warmer or cooler than others? How do the data you gather fit in historical context and future climate projections? What is the urban heat island effect? What are the causes of it? How is it exacerbated by changes in climate? What is the effect of sunlight on buildings and pavements? How do they store heat? How do you distinguish between weather events like heat waves and climate trends? What are the public health outcomes of the urban heat island effect? How can you make where you live cooler? What actions can be taken to make your community more climate resilient? How can the data you gather through your micronet be used for community and student education and climate-related action?

*Impact: City Alert apps*

Create apps that use synthesized micronet data and make the data interpretable and actionable. Consider creating creative community alert systems that can help people understand when local conditions are too hot. For example, AirNow mashes air quality data together, and provides air quality indices that provide easily understandable gradations of air quality. Maybe have green/yellow/red indicators for the urban heat island? Determine what best fits for your community. Think about where hot spots are in in your community and how to transform these areas into green spots that can cool the surrounding areas.

**Sample Resources**

* <http://www.epa.gov/heatisland/about/index.htm>
* <http://yosemite.epa.gov/gw/heatisland.nsf/webpages/HIRI_Initiatives.html>
* <http://www.airnow.gov>
* <http://www.epa.gov/greenapps/>
* <http://www.opengeospatial.org/standards/sensorml#schemas>
* <http://schemas.opengis.net/sensorML/1.0.1/base.xsd>
* <http://www.opengeospatial.org/standards/sensorml>
* <http://www.opengeospatial.org/standards/sos>