High Performance Wireless Research and Education Network

http://hpwren.ucsd.edu/ Hans-Werner Braun and Frank Vernon, PIs

National Science Foundation awards 0087344, 0426879 and 0944131

HPWREN UCSD SDSC SAN DIEGO SUPERCOMPUTER CENTER SCRIPPS INSTITUTION OF OCEANOGRAPHY UCSD it² SAN DIEGO STATE UNIVERSITY NATIONAL SCIENCE FOUNDATION

Interdisciplinary and multi-institutional collaborative cyberinfrastructure for research, education, and public safety activities.

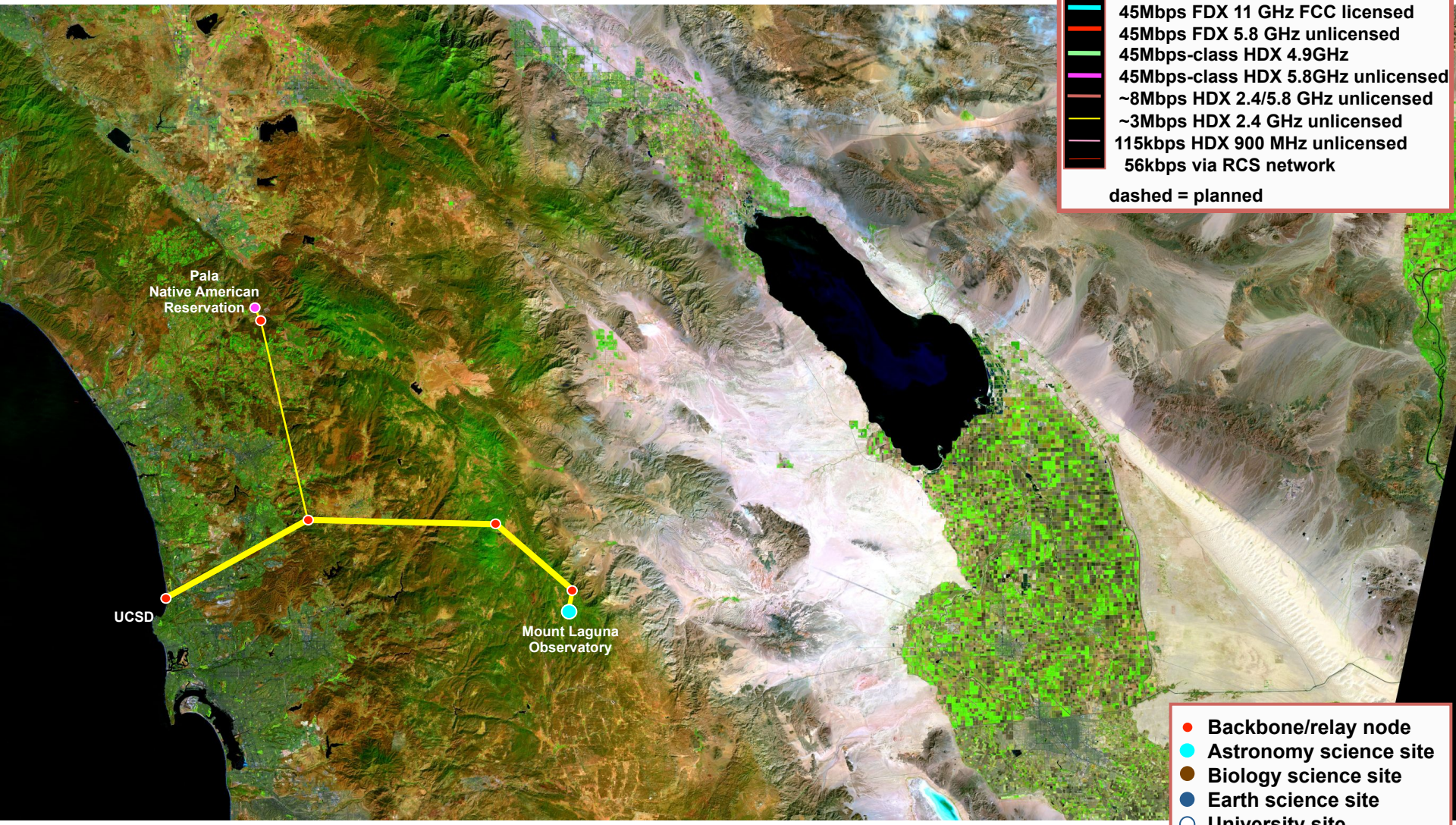
Enabled initially by an NSF funded high-speed wireless network, which spanned a vast and diverse geographic region.

Allows for real-time data transfers from many hard-to-reach San Diego and Riverside county locations.

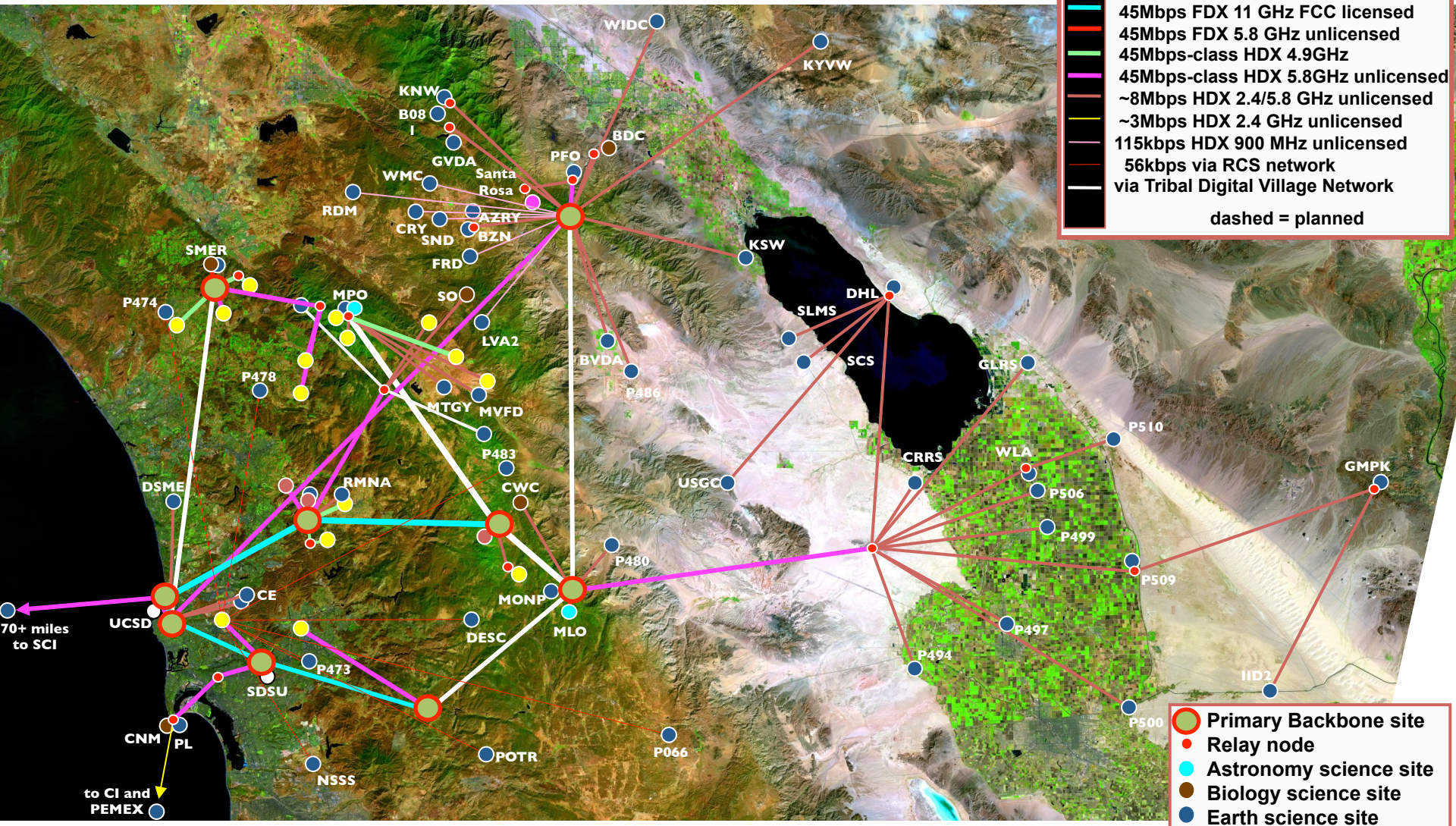
Traffic examples include high-volume bulk data (e.g., astronomy) as well as the aggregation of continuous traffic generated by many sensors throughout the region (e.g., seismic, weather, cameras).

In short: HPWREN is a system allowing UCSD researchers to deploy sensors and access sensor data throughout a widening coverage area

HPWREN topology, December 2000

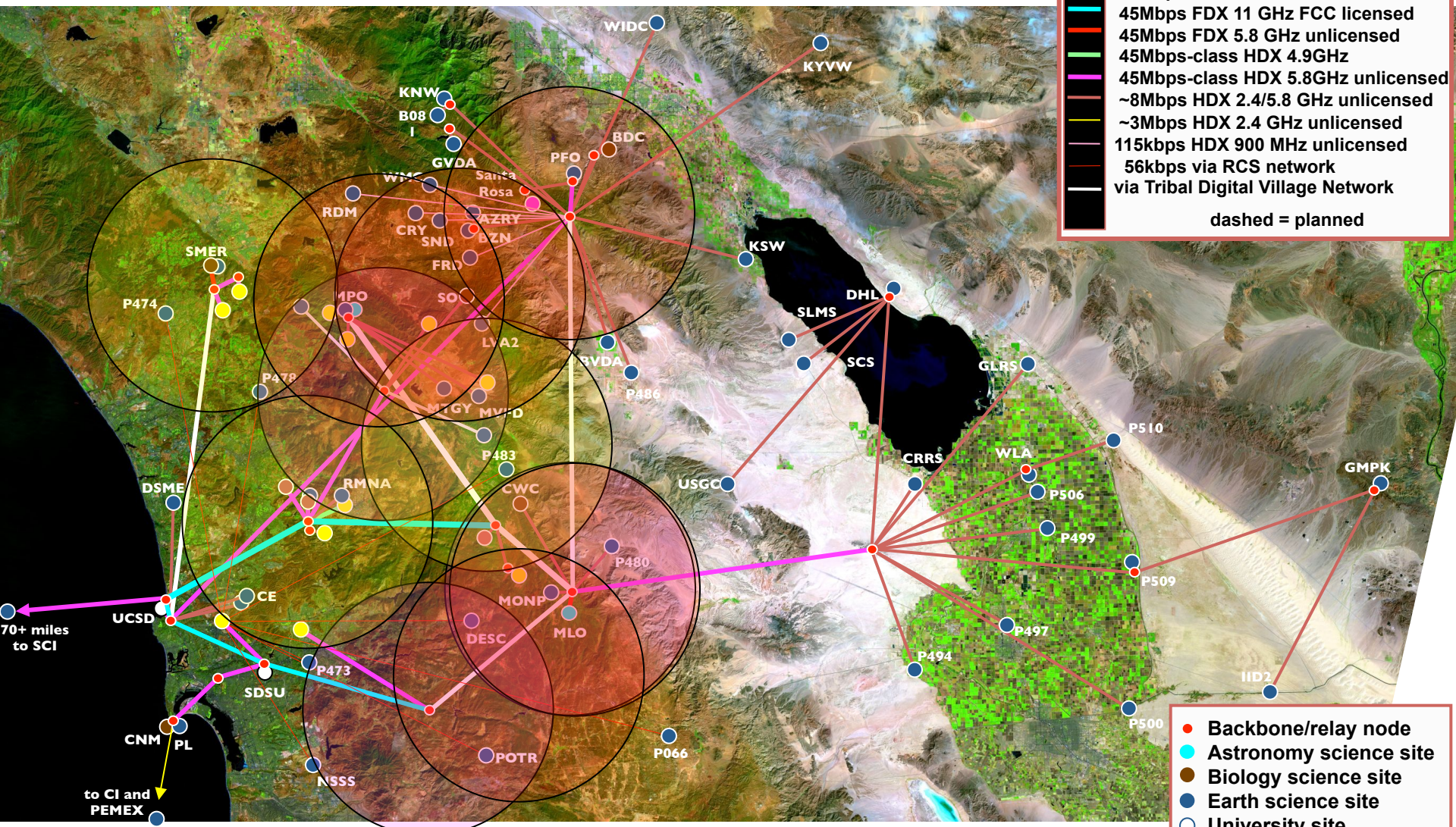


HPWREN topology – February 2012



Various real-time network cameras for environmental observations (one of 3 view sets)

360 degree environment observing cameras



Red circles: HPWREN or SDG&E supplied cameras

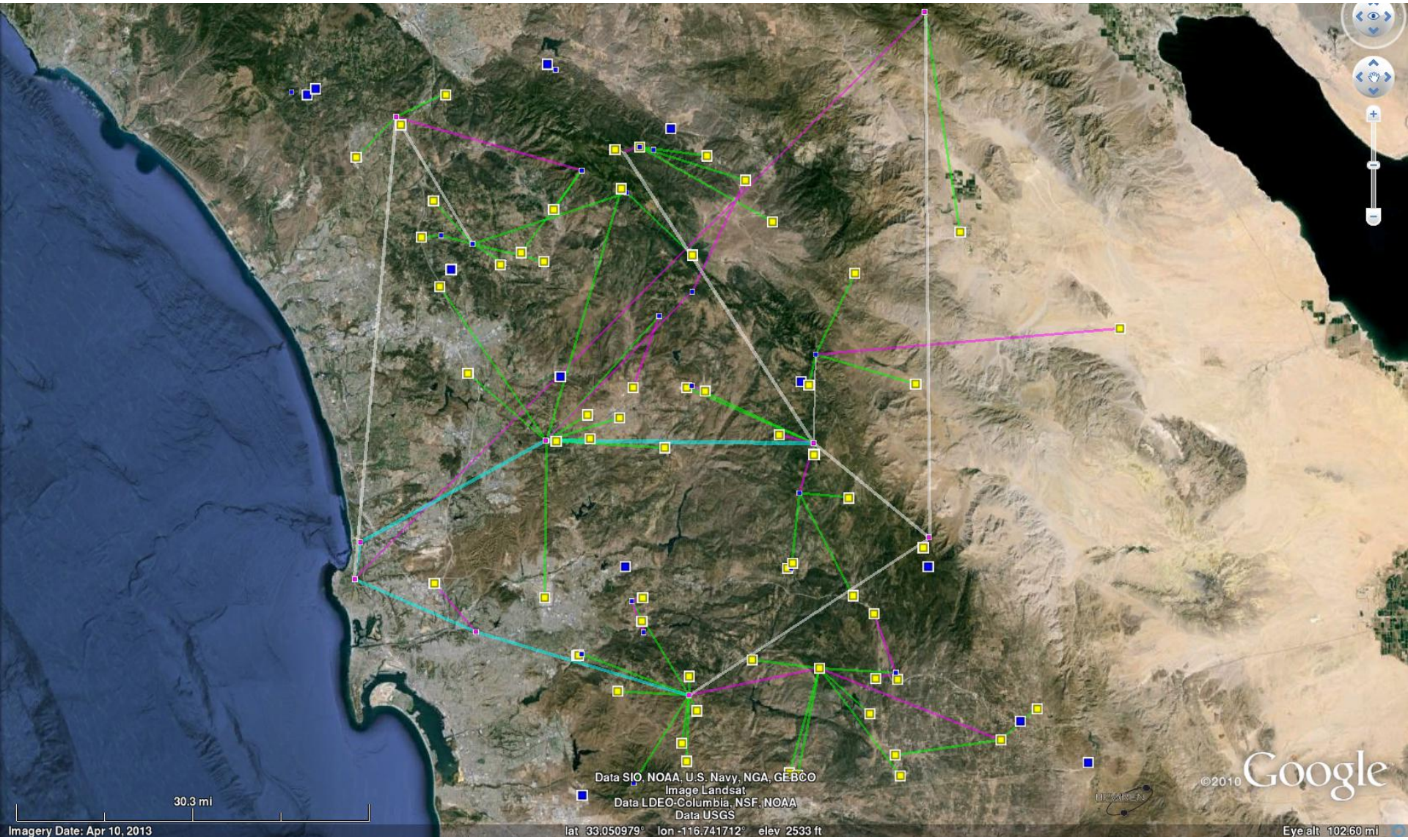
Yellow circles: SD County supplied cameras

approximately 50 miles:

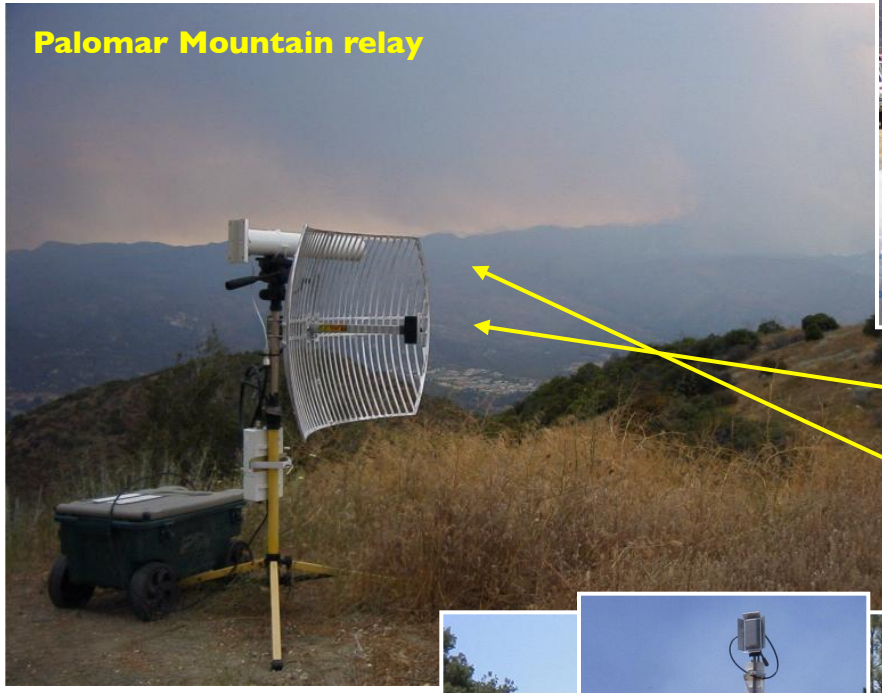
Note: locations are approximate

ANR High Performance Wireless Research and Education Network HPWREN

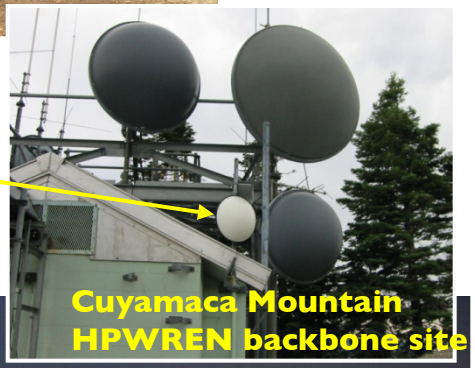
Fire stations – ASAPnet extension

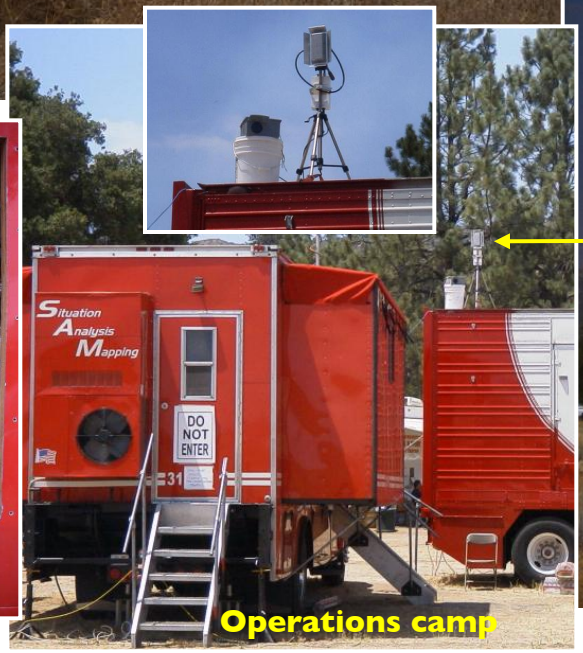


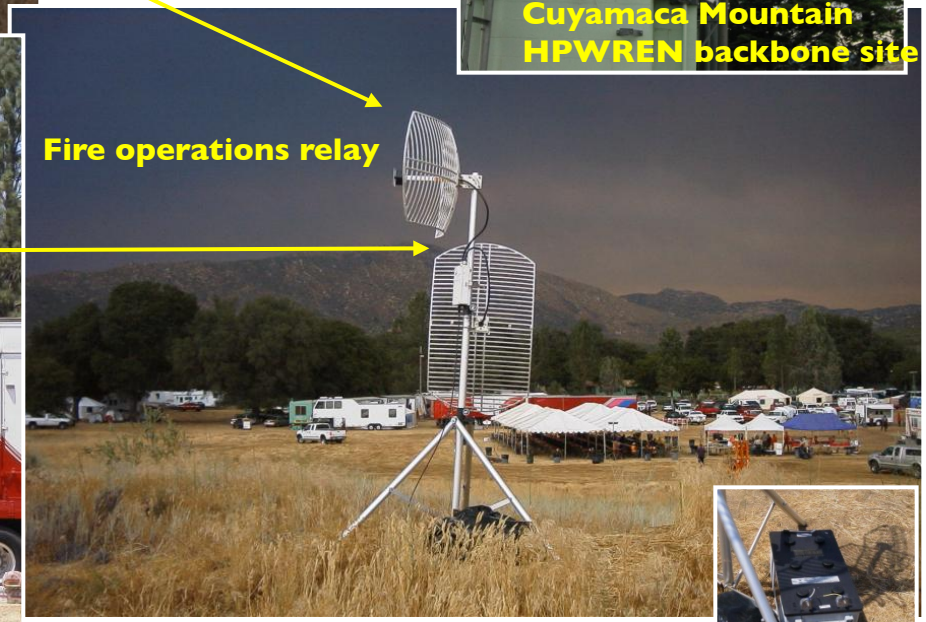
Coyote Fire HPWREN connection



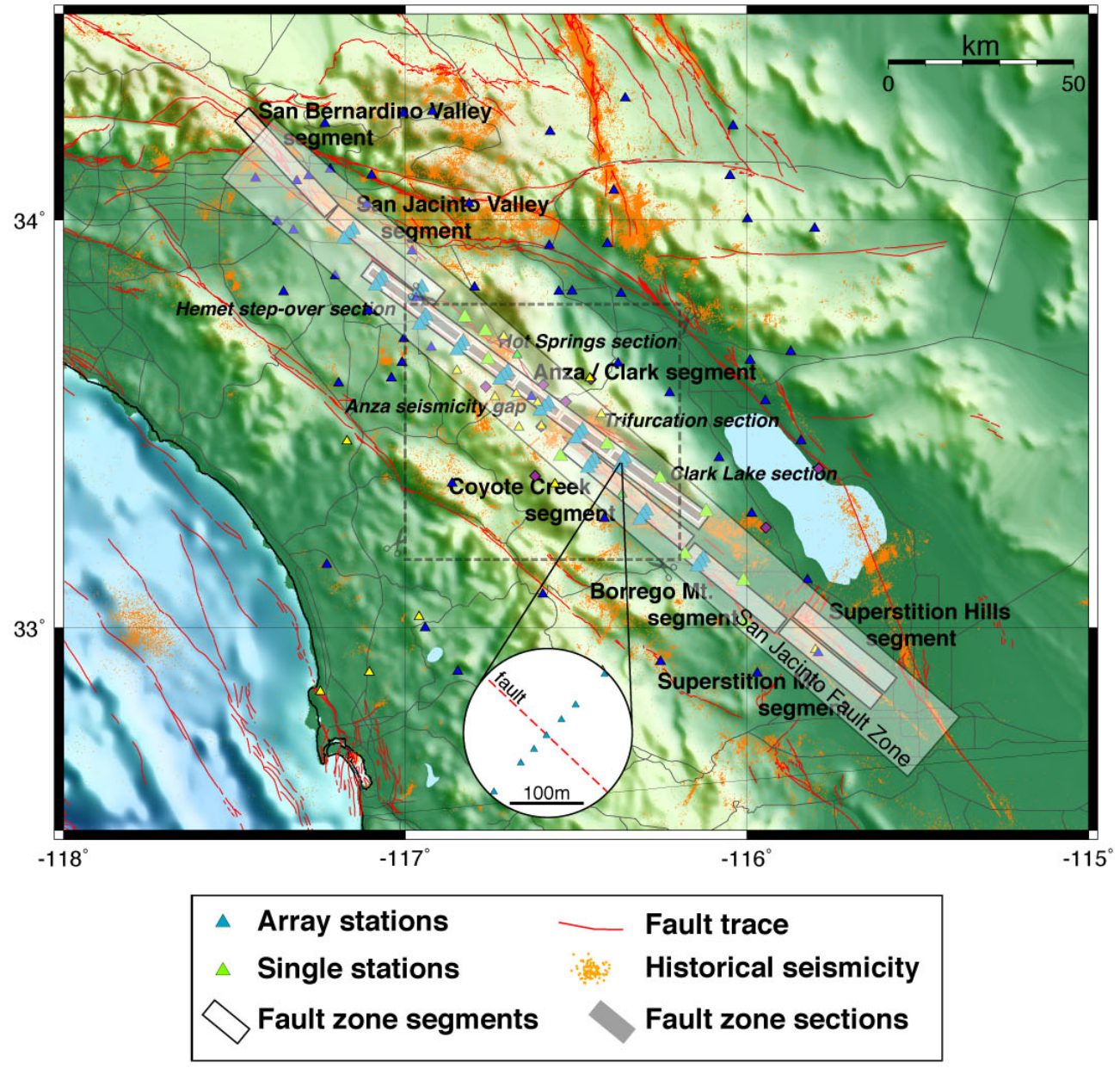
July 2003







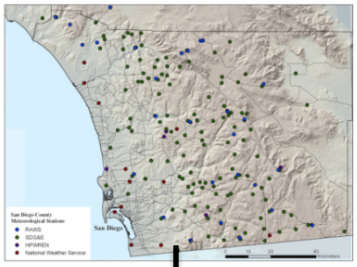
Geophysics

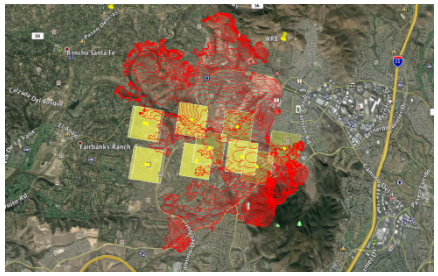

km
0
50
San Bernardino Valley segment
San Jacinto Valley segment
Hemet step-over section
Hot Springs section
Anza / Clark segment
Anza seismicity gap
Trifurcation section
Clark Lake section
Coyote Creek segment
Borrego Mt. segment
Superstition Hills segment
Superstition Mt. segment
San Jacinto Fault Zone
fault
100m
34°
33°
-118°
-117°
-116°
-115°
Array stations
Single stations
Fault zone segments
Fault trace
Historical seismicity
Fault zone sections

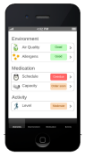
Real-time weather sensors
(many of them able to produce 1/sec data)

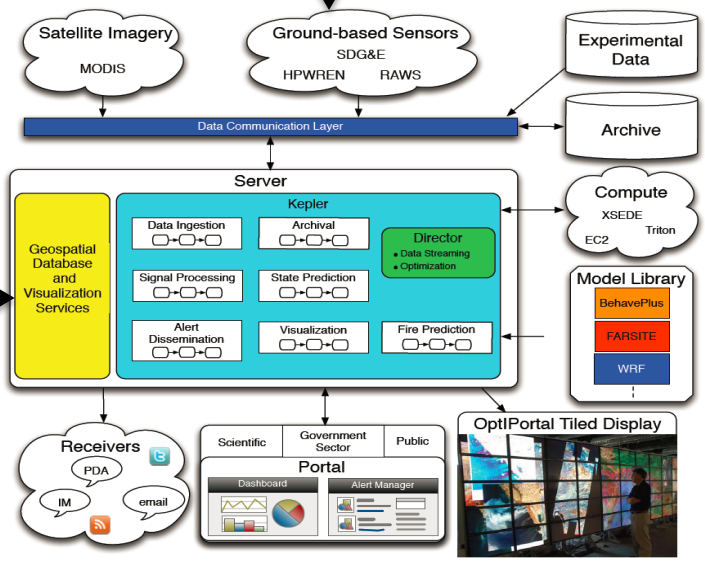
Toro Peak WXT520
SMER North Station WXT520
Red Mountain WXT520
Sky Oaks WXT520
Pala WXT520
Boucher Hill WXT520
Puerta La Cruz WXT520
Warner Springs WXT520
Mesa Grande WXT520
Black Mountain WXT520
Volcan Mountain WXT520
West Ramona WXT510
West Ramona WX200
Mount Woodson WXT520
San Clemente Island WXT520
UCSD San Diego Supercomputer Center Davis
Mount Laguna WXT520
Lyons Peak WXT520
Lyons Peak CS
NPS Cabrillo National Monument - Zone 3 WXT520
NPS Cabrillo National Monument - NOAA

WIFIRE: A Scalable Data-Driven Monitoring, Dynamic Prediction and Resilience Cyberinfrastructure for Wildfires









Development of: cyberinfrastructure for analysis of large dimensional heterogeneous real-time sensed data for fire resilience *before*, *during* and *after* a wildfire …

Supporting real-time assessment, simulation, prediction, and visualization of wildfire behavior

IDI Efforts

- HPWREN is in transition, with past and future leadership working together to expand research support, collaboration and system sustainability
- Overall goal is to enable UCSD researchers to more easily use HPWREN to deploy sensors and access sensor data throughout a widening coverage area
- Efforts to do this, aligning with IDI campus goals include
  - Evaluating current operational models
  - Integrating best IT infrastructure practices
  - Consolidating and documenting data workflows and lifecycle
  - Curating data for publication, access and preservation
  - Embracing economies of scale offered by latest IT technologies
  - Improving system services and maintenance response time

Specific activities

- Widening coverage area of HPWREN with sector antennas
- Expanding operational documentation of HPWREN
- Increasing system monitoring activities across SDSC, SIO and Calit2, incorporating automation tools for monitoring and maintenance response tracking
- Adding web site redundancies and load sharing for camera real-time and archival data at Calit2
- Reviewing integration of HPWREN servers into SIO's IT management model, including virtualization efforts
- Reviewing network backbone and SDSC gateway configuration to improve performance, reliability and redundancy
- Considering an additional gateway to CENIC networks

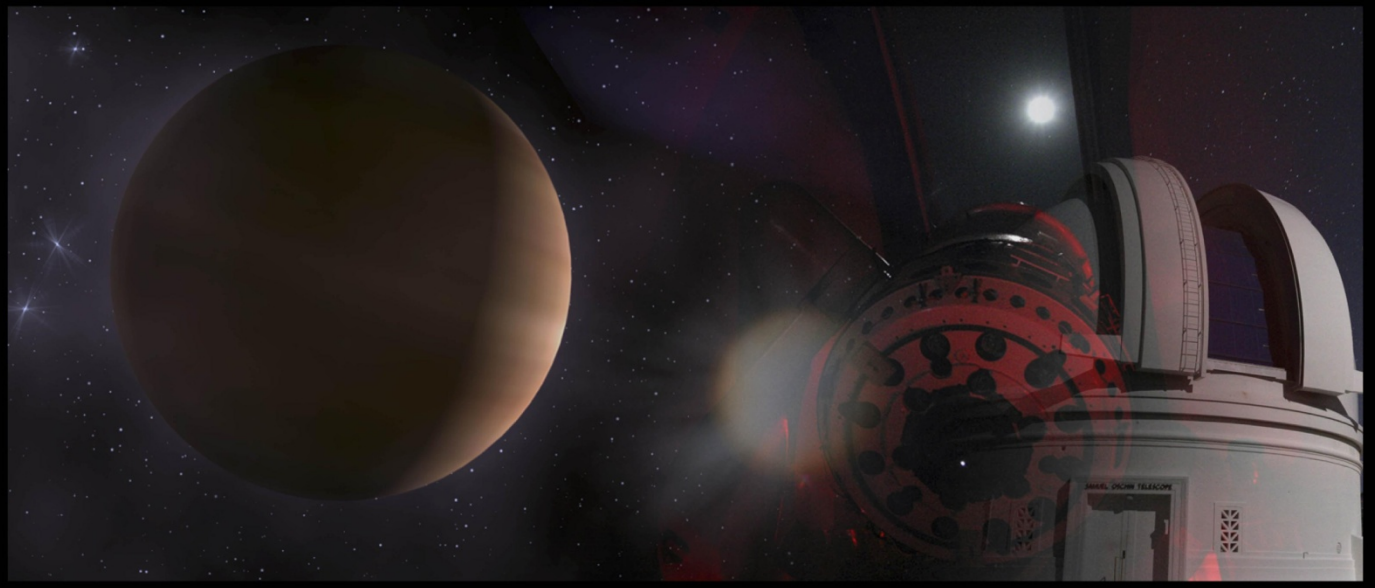
Anticipated Outcomes

- Expand HPWREN network infrastructure to allow UCSD researchers to deploy and access Internet capable sensors in a wider coverage area … we want to support
  - New researchers and research activities
  - New PIs and their funding efforts
  - New sensor deployments
- Make HPWREN data more accessible to researchers
- Preserve HPWREN data, a critical UCSD intellectual property
- Expand training and outreach across UCSD to leverage new discoveries and build collaborations
- Provide public safety information to the community as part of UCSD's service-oriented mission
- Engage with Pacific Research Platform to broaden the reach of UCSD investigators


SAN DIEGO STATE UNIVERSITY
SKY ARROW

Research and New Discoveries

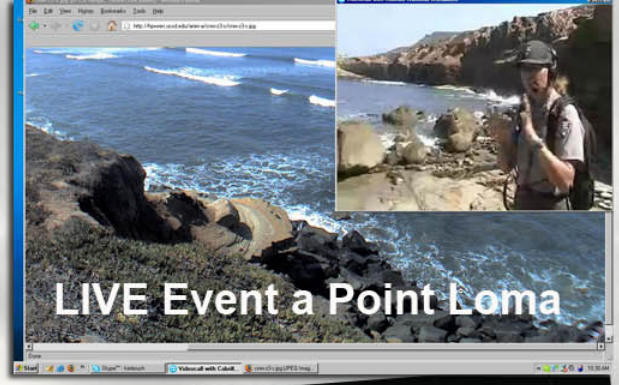
Palomar Observatory's automated and remotely operated telescopes, together with the availability of high speed wireless data connection via HPWREN (High Performance Wireless Research and Education Network) facilitate advanced astronomy science. It allows for long term studies and projects, high volumes of data that can be transferred and stored elsewhere, and enabling researchers to respond rapidly to real-time events from anywhere in the world. This is setting the stage for New Discoveries and a greater understanding of our Universe.



http://www.astro.caltech.edu/palomar/
http://hpwren.ucsd.edu/

Biology/Ecology sciences


Michael


LIVE Event a Point Loma


NPS Workshop


TDVnet site


LIVE at the Science Center


Pala Learning Center

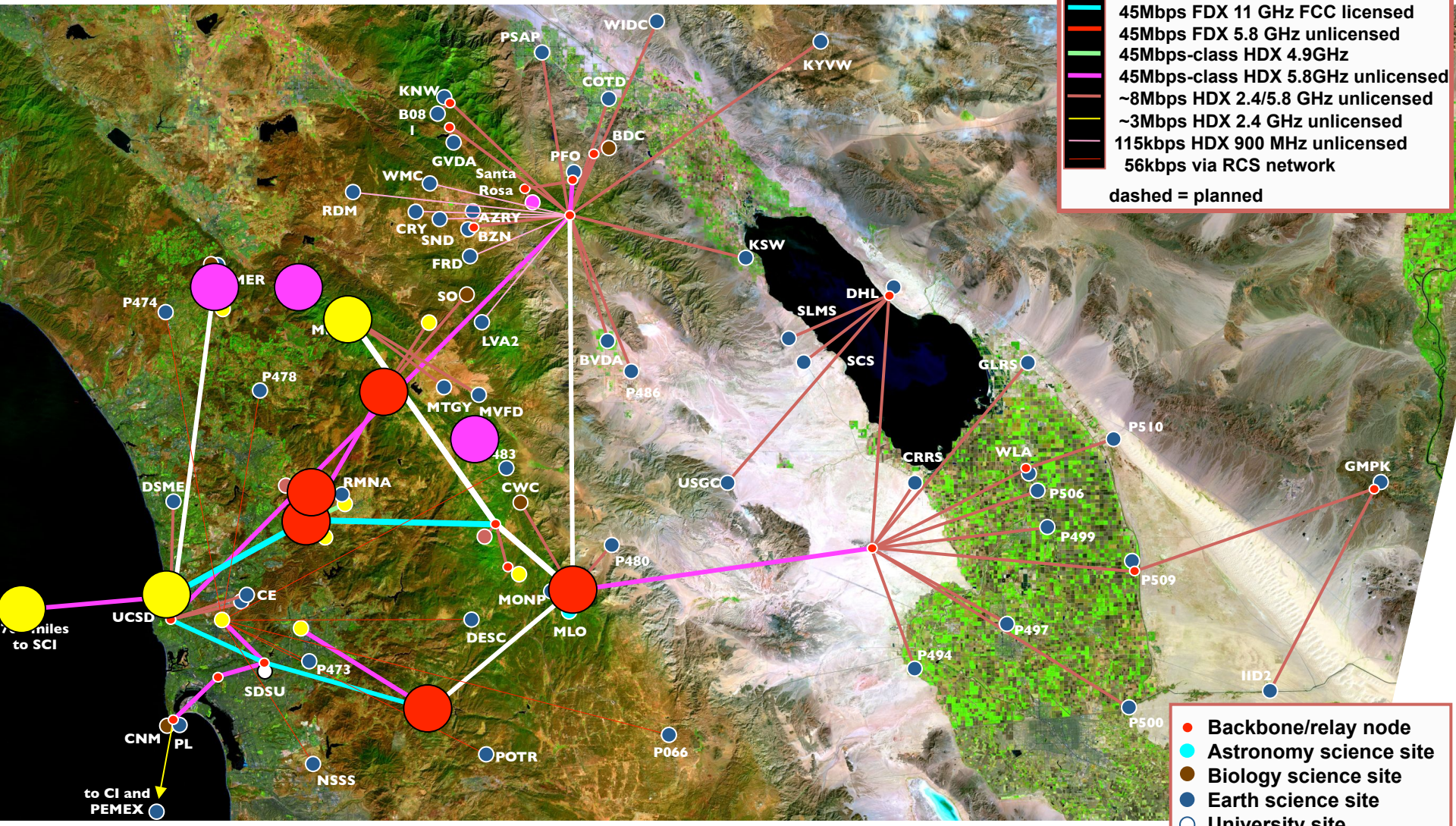

View off Palomar Mountain

Outreach


LIVE at Pala

Collaborative agency connections

HPWREN topology, real-time met sensors



Red circles: 1/sec wind data

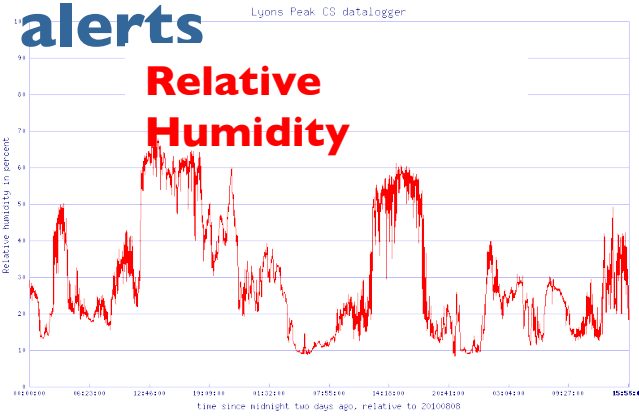
Purple circles: 1/second wind data (SD County supplied sensor)

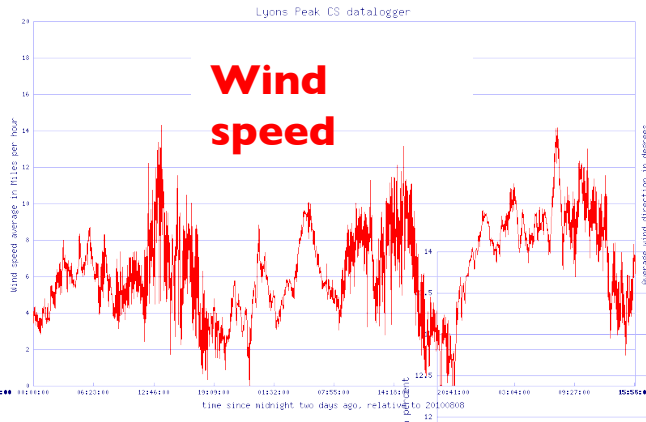
Yellow circles: 1/minute wind data

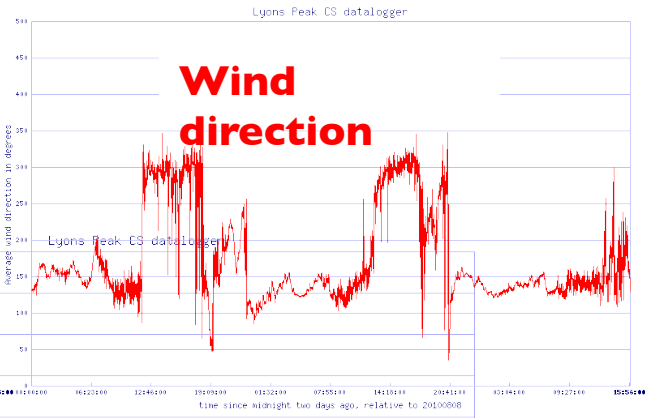
approximately 50 miles:

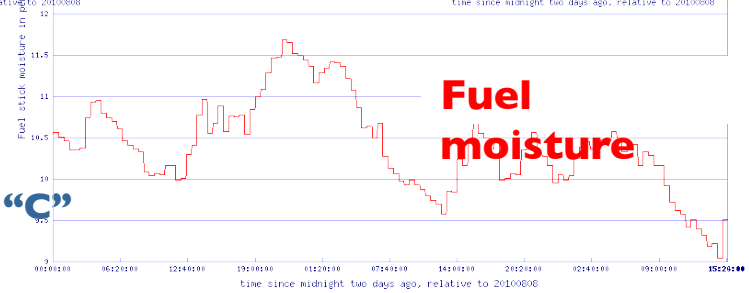
Note: locations are approximate

Real-time data based alerts









Trigger real-time computer-generated alerts, if:

condition "A" AND condition "B" AND condition "C"
OR condition "D"

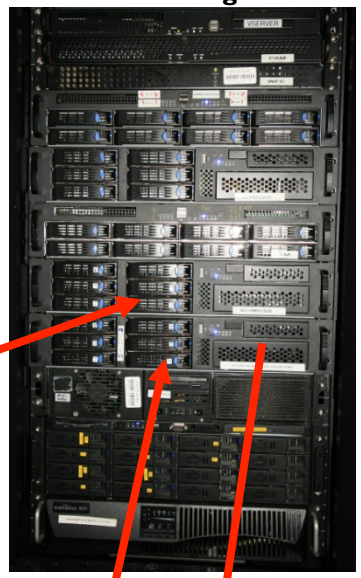
exists, in which case several San Diego emergency officers are being paged or emailed during such alert conditions, based on HPWREN data parameterization by a CDF Division Chief. This system has been in operation since 2004.

Date: Wed, 4 Aug 2010 09:31:05 -0700
Subject: URGENT weather sensor alert

LP: RH=26.1 WD=135.2 WS=1.9 FM=6.8 AT=80.7 at 20100804.093100
More details at http://hpwren.ucsd.edu/Sensors/

Incident-based sensor alert concept

Centralized analysis and automated alert generation



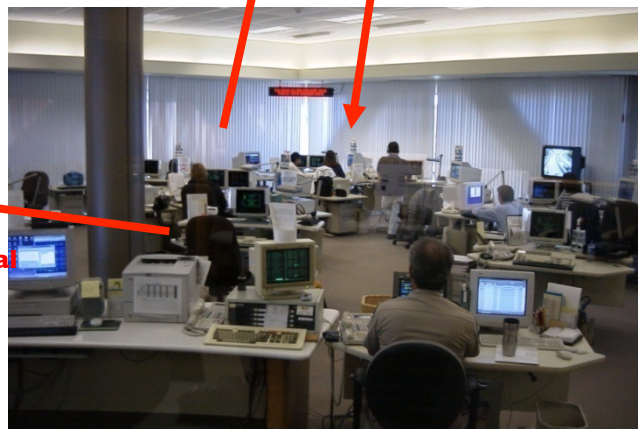
Event-deployed networked sensors

Raw sensor data

Wildland fire incident

Configuration of alert parameters

Computer-generated alerts



Notification to active firefighters about critical environmental changes

Command center