- will add to ANR/HPWREN staff mailing list
- Weekly reports (will email reminders)
  - \*ONLY\* in clear text
  - No HTML or other funky formatting
- I mostly telecommute
  - use email or skype (hwbraun)
- produce ideas and communicate them
  - do not think I know everything
- take initiative (no micromanagement here!)



- mid-1980s: Univ. of Michigan technical rep for USAN and SDSCnet
- 1986-1991: NSFNET (Univ. of Michigan)
- at SDSC (General Atomics) starting 1991:
  - CASA gigabit testbed
  - Network analysis projects
  - NSF's NREN Engineering Group
  - Web caching
  - National Laboratory for Applied Network Research (NLANR)
- 1996-1997: Teledesic
- at SDSC (UCSD Research Scientist) since 1997:
  - NLANR (until ~2005)
  - since 2000: HPWREN



High Performance Wireless Research and Education Network http://hpwren.ucsd.edu/ National Science Foundation awards 0087344. 0426879 and 0944131



Interdisciplinary and multi-institutional collaborative

cyberinfrastructure environment for research education, and public safety activities.

Enabled by a National Science Foundation funded high-speed wireless network, which stretches across a vast and diverse geographic region.

Allows for real-time data transfers with many hard-to-reach locations.

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



#### **HPWREN topology, December 2000**



http://anr.ucsd.edu

155Mbps FDX 6 GHz FCC licensed 155Mbps FDX 11 GHz FCC licensed

#### **HPWREN** topology, April 2011



Applied Network Research

http://anr.ucsd.edu

155Mbps FDX 6 GHz FCC licensed

# 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**







### Geophysics







#### **Collaborative agency connections**



# Applied Network Research



#### Mt. Laguna 360 degree view cameras



# Applied Network Research

#### Various real-time network cameras for environmental observations



### Applied Network Research



#### **Mount Laguna sensor instrumentation**



### Applied Network Research



#### HPWREN met sensor data web site example



Applied Network Research

#### SDG&E and HPWREN met sensor data visualization, Santa Ana focus



### Applied Network Research

#### **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/

# Applied Network Research



- Real-time data visualization environment
  - Marc Pelessone: HTML5/Canvas
  - Mehran Ghamaty: Android smartphone
  - Derek Tran: Android tablet

