The Potential of Transportation Technology

New Uses for Technology in Transportation

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Caltrans Improves Mobility Across California

Why should we invest in technology?

- To Improve:
  - Performance
  - Cost-effectiveness
  - Quality
  - Safety
  - Environmental mitigation

So…What's the Problem?!

Mobility

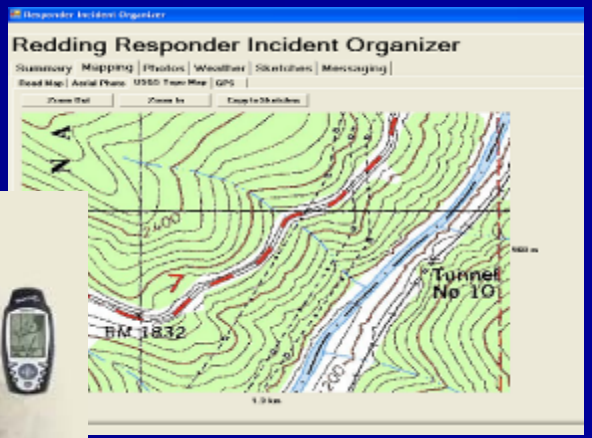
Congestion Management Research for Improved Mobility

Congestion Management
Research Approach

- **Incident Management**
- **ICM – Integrated Corridor Management**
- **Travel Demand Management**
- **Cutting Edge Technologies**

Incident Management
Responder System

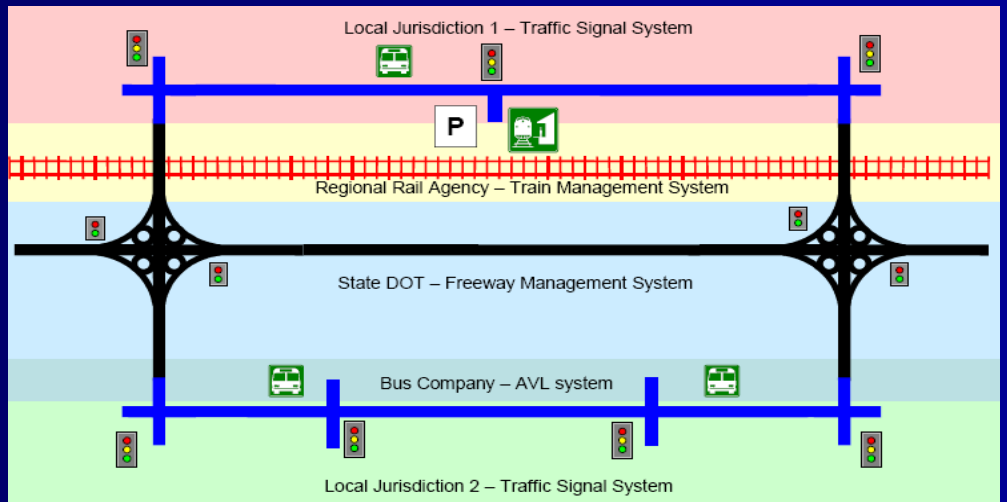
In Incident Response:
A picture is worth a thousand words



Congestion Management
Integrated Corridor Management (ICM)

- To provide the institutional guidance, operational capabilities, and ITS technology and technical methods needed for effective Integrated Corridor Management Systems.

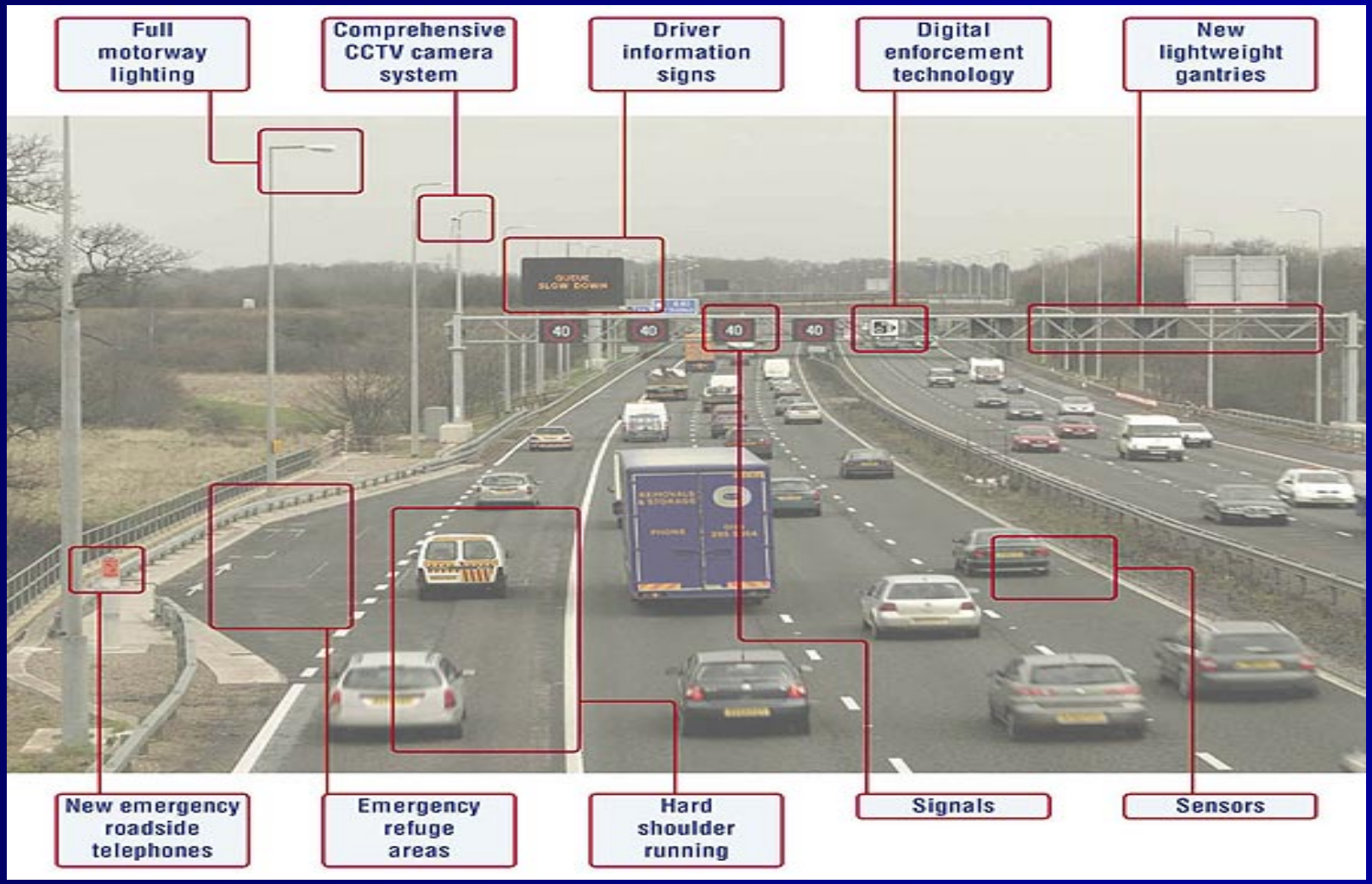
- To demonstrate effective corridor management systems and strategies through successful coordination among corridor agencies, ITS technology deployment, and proactive implementation of corridor operations.



Congestion Management
Travel Demand Management

- High Occupancy Vehicle (HOV)
- High Occupancy Toll (HOT)

Congestion Management
Active Traffic Management



Travel Demand Management

Smart Parking

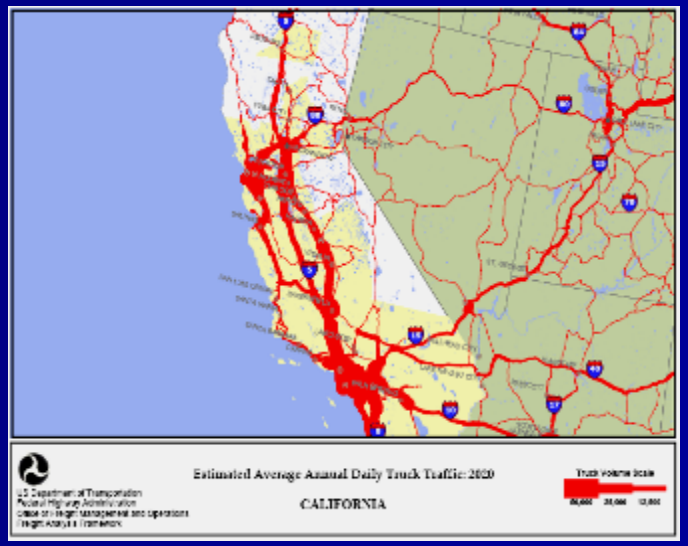
- Increases Transit Ridership
- Decreases Congestion
- More Effective Land Use
- Reduced Emissions
- Improved Air Quality
- Better Land Use Decisions
- Conserve Natural Resources

Smart Parking Sensor

Travel Demand Management

Smart Truck Parking

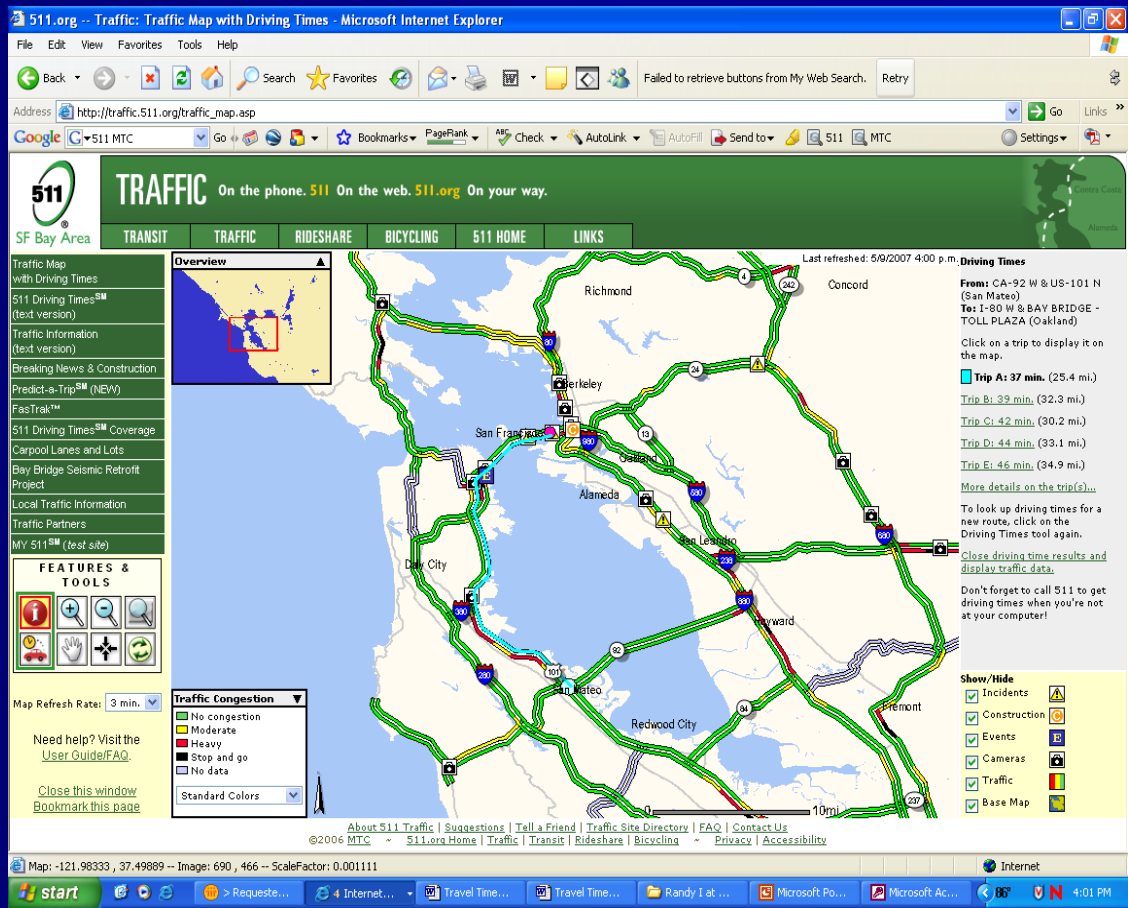
- Increase Safety
- Improve Mobility
- Better Infrastructure Preservation
- Improve Air Quality and Reduce Greenhouse Gas Emissions



Travel Demand Management
Traveler Information

Provides up-to-the minute information on:

- Traffic Conditions
- Incidents
- Driving Times
- Transit schedule, route and fare
- Carpool/ Vanpool
- Bicycling



Travel Demand Management

Travel Times on Changeable Message Sign

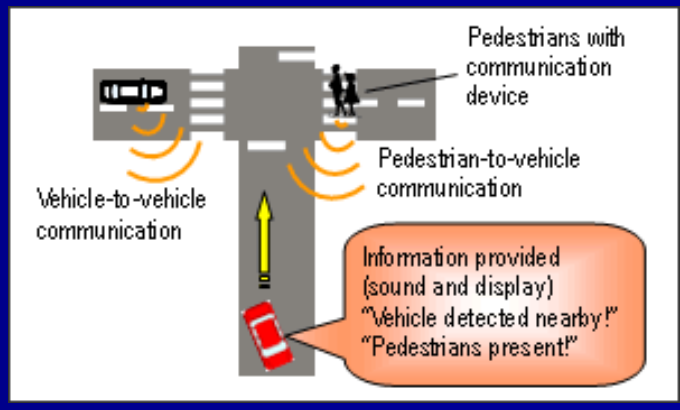
- May 2005 – Caltrans started to display travel times on two CMS in Bay Area
- Currently we have 100 CMS displaying travel times throughout the State
- Travel times are updated every minute

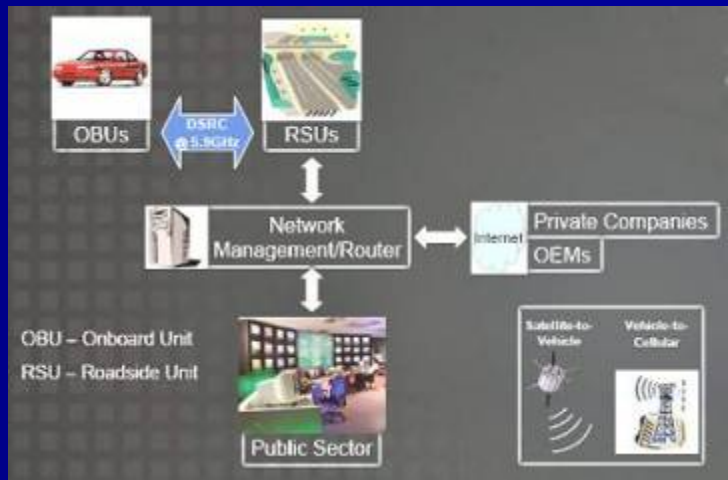
US 101 Commuter Travel Time Information System

Congestion Management
Cutting Edge Technologies

Vehicle Infrastructure Integration (VII)

- In Vehicle Signage
- Optimized Traffic Signal Control
- Traveler Information
- Ramp Metering
- Electronic Toll Collection
- Intersection Collision Avoidance





Simple VII Block Diagram

Driver

End User

Vehicle Data

Driver Display

Subscriber Applications

On Board Equipment

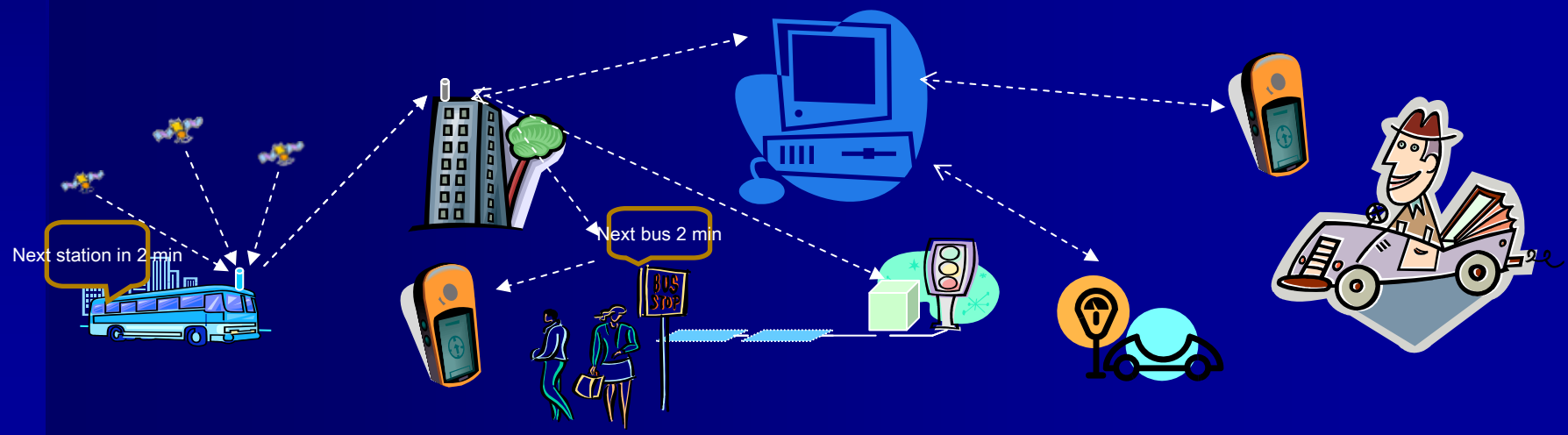
Backhaul Network

5.9 GHz DSRC

Road Side Equipment

SAFE TRIP-21
The Connected Traveler Project

- Use consumer handheld devices to collect and provide timely, accurate, reliable traveler information
- Accelerate testing and implementation of Vehicle Infrastructure Integration (VII) applications
- Transit/modal integration
- Demonstrated at ITS World Congress in 2008



A True Partnership

Total Project Budget: $12.4 million

- Caltrans - Infrastructure owner/operator + $4.2M
- USDOT/RITA - Federal Government + $2.9M
- Nokia - H/W Data Collection/Processing + $2.5M
- Navteq - High accuracy vectored maps + $2.0M
- UC Berkeley – Research, Data Integration + $0.8M
- Nissan – Vehicle expertise - $30K

Mobile Millennium: mobility tracking using cellular phones

UC Berkeley – CCIT – Nokia – Navteq

Safety

- Balsi Beam
- Cooperative Intersection Collision Avoidance Systems

Balsi Beam - Positive Protection Campaign

- Workers are our most valuable resource
  - $33 Million in workers compensations
  - 173 CT Fatalities
  - 103 injured on foot in work zones (10 year)
- Safety is no Accident

Cooperative Intersection Collision Avoidance Systems (CICAS)

The Project consists of these technologies:

- Vehicle-based – sensors, processors, and driver interfaces within the vehicle
- Infrastructure-based – roadside sensors and processors to detect vehicles and hazards, messaging signs, and interfaces to communicate various warnings to drivers
- Communications systems—Dedicated Short-Range Communications (DSRC) to communicate warnings and data between the infrastructure and vehicles

Infrastructure

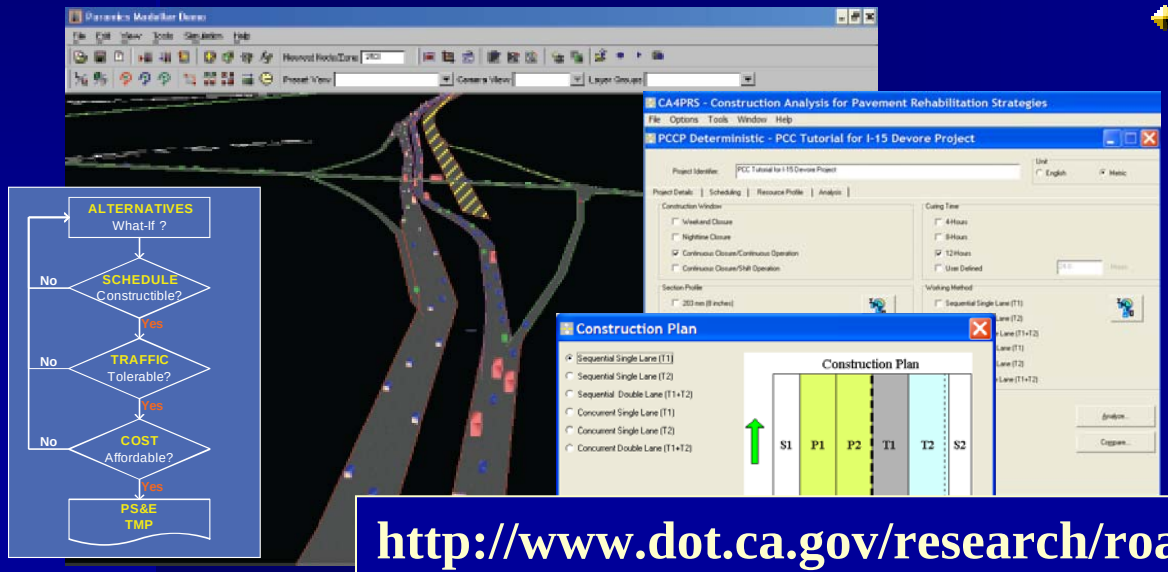
- **C**onstruction **A**nalysis for **P**avement **R**ehabilitation **S**trategies (CA4PRS)
- Quieter Pavement

CA4PRS

Construction Analysis for Pavement Rehabilitation Strategies

Received 2007 Global Road Achievement Award from IRF, 2007

- Optimize construction scheduling and traffic management planning for highway rehabilitation projects
- Evaluate various "what-if" scenarios for the combinations of design, construction, and traffic operations



- Balancing competing objectives
  - ✓ Better Performance
  - ✓ Faster Delivery
  - ✓ Cost Savings
  - ✓ Work-Zone Mobility and Safety

http://www.dot.ca.gov/research/roadway/ca4prs/

Quieter Pavements

- Reduce Tire-Pavement Noise without compromising other pavement performance and durability
- Improve mixture properties and construction quality
- Develop innovative surface treatment materials/methods
- Develop implementation policy for when, where, and how to use quieter pavements
- International Collaboration with the Danish Road Institute

http://www.dot.ca.gov/hq/esc/Translab/ope/QuieterPavements.html

National Transportation Leadership

Caltrans leverages limited state research funding by successfully competing for federal grants:

- Integrated Corridor Management ($0.5M)
- Smart Truck Parking ($5.4M)
- SafeTrip-21: Connected Traveler ($2.9M)
- SafeTrip-21: Smart Parking ($1.0M)
- Cooperative Intersection Collision Avoidance Systems ($3.4M)
- National Cooperative Highway Research Program ($3.5M)
- University Transportation Centers ($4.5M)

It Starts With Research!

We need TECHNOLOGY CHAMPIONS!