



Washington State Reference Network

A Regional
Real-Time GPS
Network Cooperative

Space Enterprise Council
Media Forum
January 25th, U.S. Chamber of
Commerce, Washington D.C.,

Gavin M. Schrock, PLS, Seattle Public Utilities

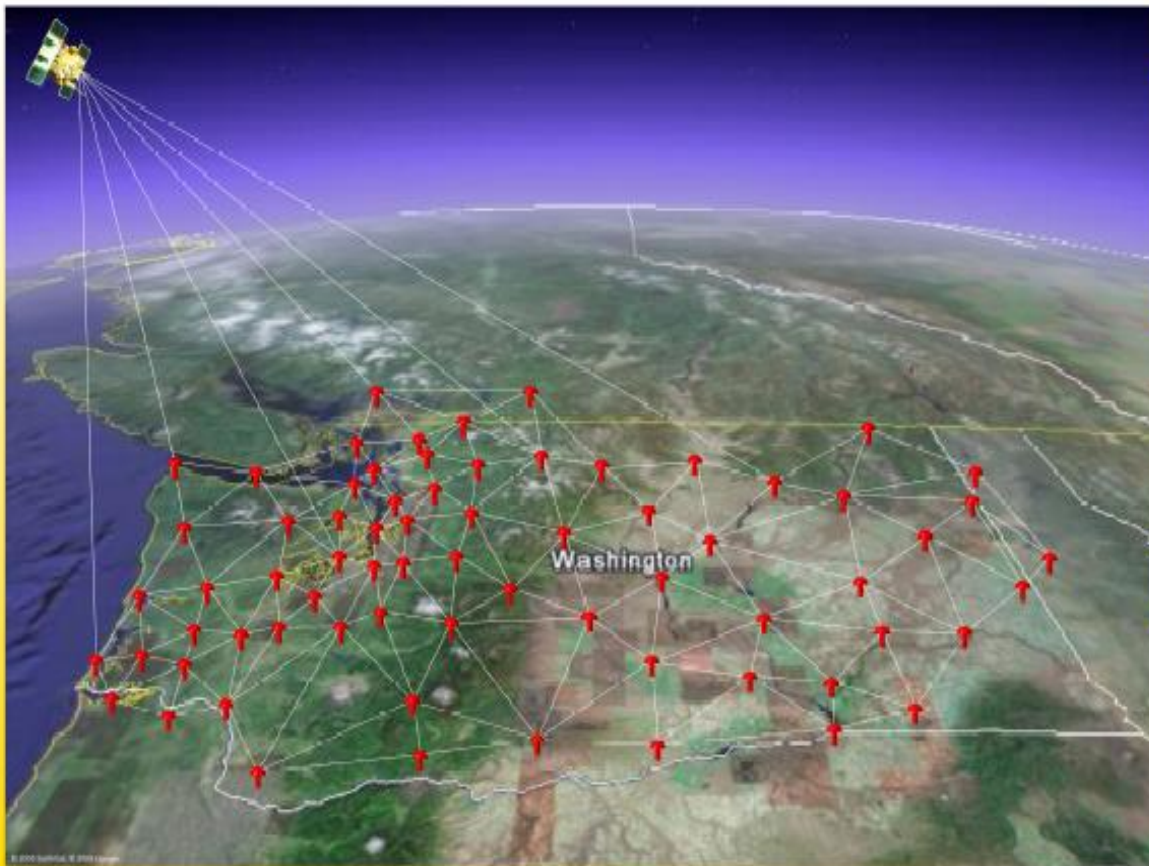
wsrn.org

Washington State Reference Network

A Regional Cooperative of Real-Time GPS Networks.

The *Washington State Reference Network* is a cooperative of real-time GPS networks offering survey data and real-time GPS correction services for Washington state. GPS data files from a network of *continuously operating reference stations (CORS)* are available for download to all with real-time services available through partnerships, memberships and subscriptions.

Visit www.wsrn.org for more information...



Technology.

"Real-time GPS networks offering survey data and real-time GPS correction services."



Cooperation.

"Services available through partnerships, memberships and subscriptions."



Precision.

"Users achieve high accuracy location on the order of centimeters in seconds."



Macro-GPS / Micro-GPS

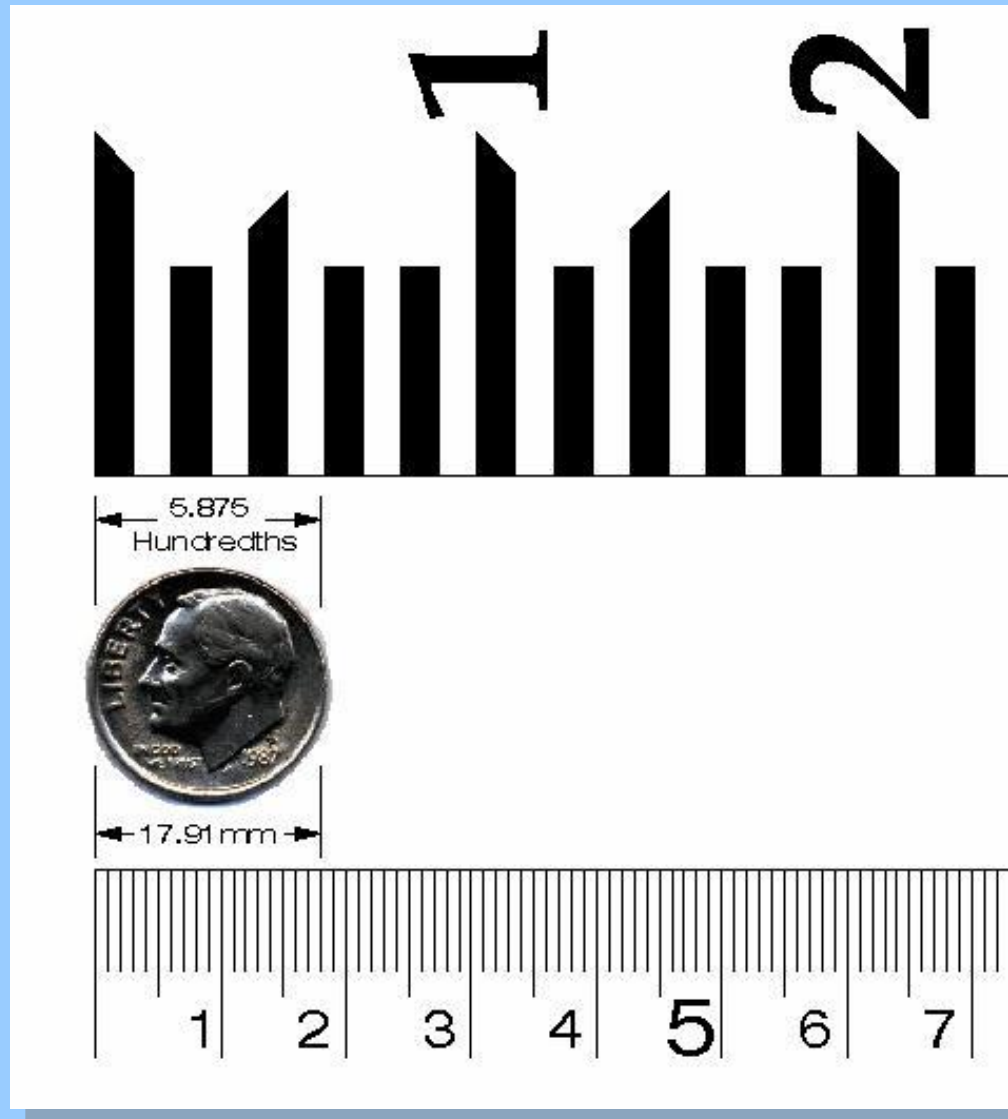
Macro

- Recreational
 - Navigational
 - Resource Mapping
- 3m -10m
 - 1m -5m

Micro

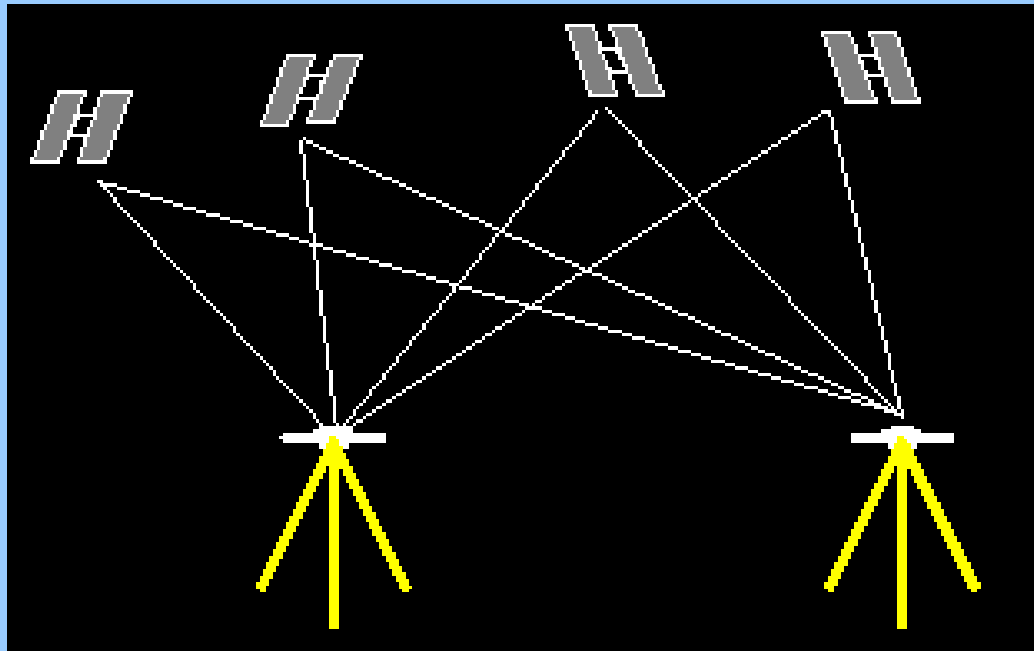
- Surveying
 - Monitoring
 - Construction
 - Science
- 1cm – 0.1m

Micro - GPS



How Do We Get Micro in Real-Time?

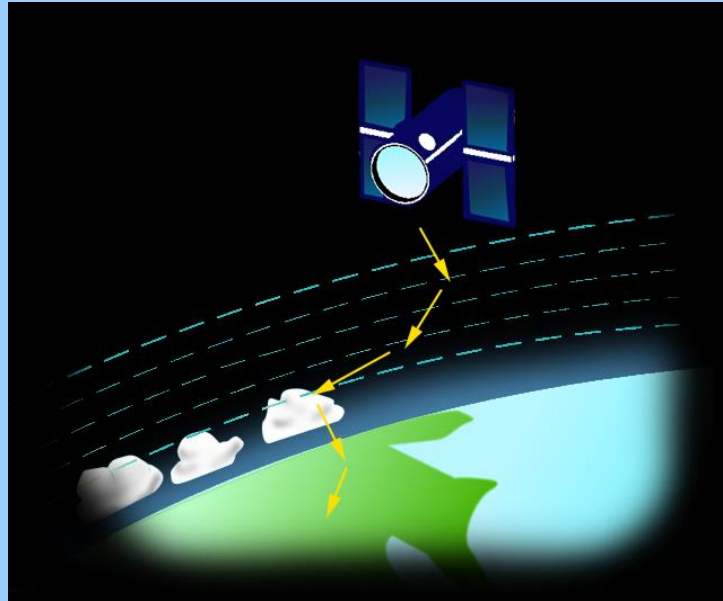
Satellites



Reference Stations

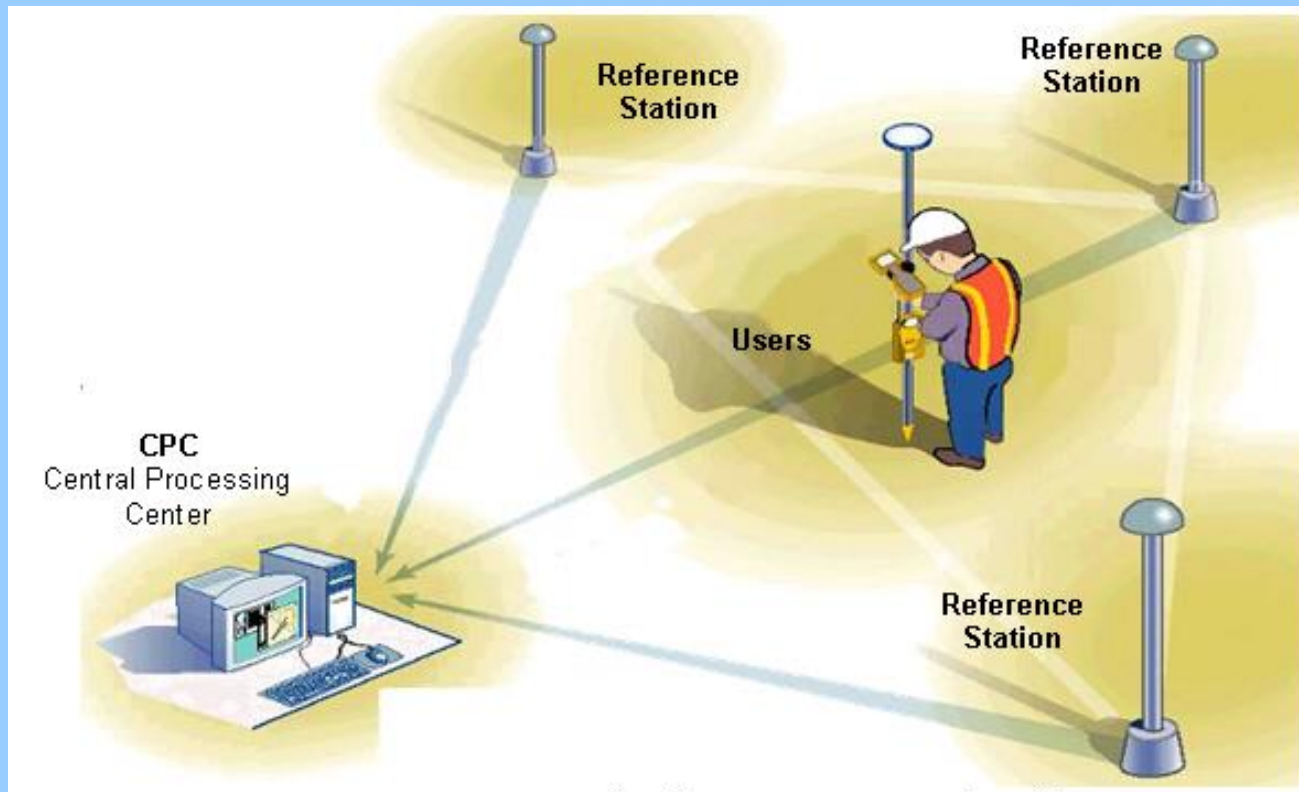
Rovers

How Do We Get Micro in Real-Time?



By reducing sources of error that affect GPS signals; like Atmospheric delays...

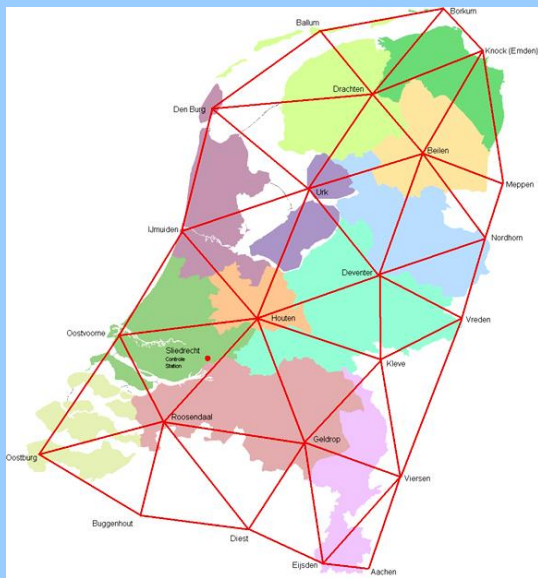
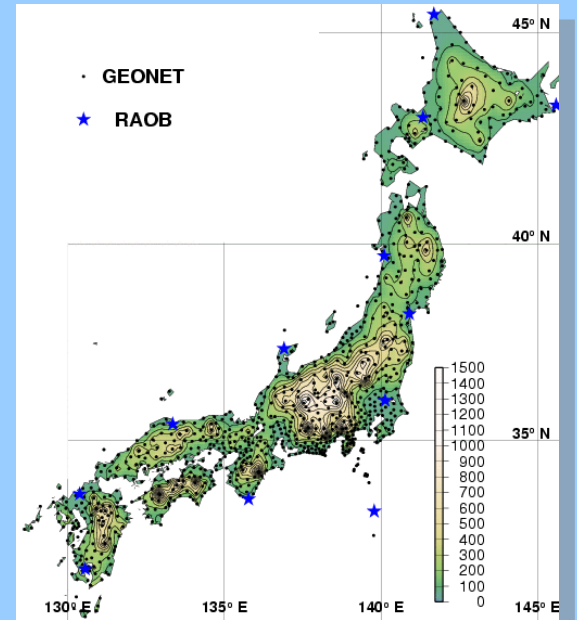
How Do We Get Micro in Real-Time?



Dual frequency receivers, like those that can be used for reference stations, can help model these delays...

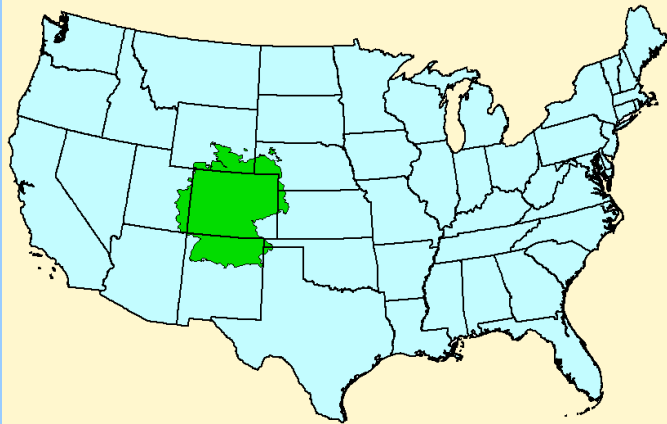
A network of these stations can model these effects, and create corrections that can be sent to field receivers...

Networks Worldwide



Networks Worldwide

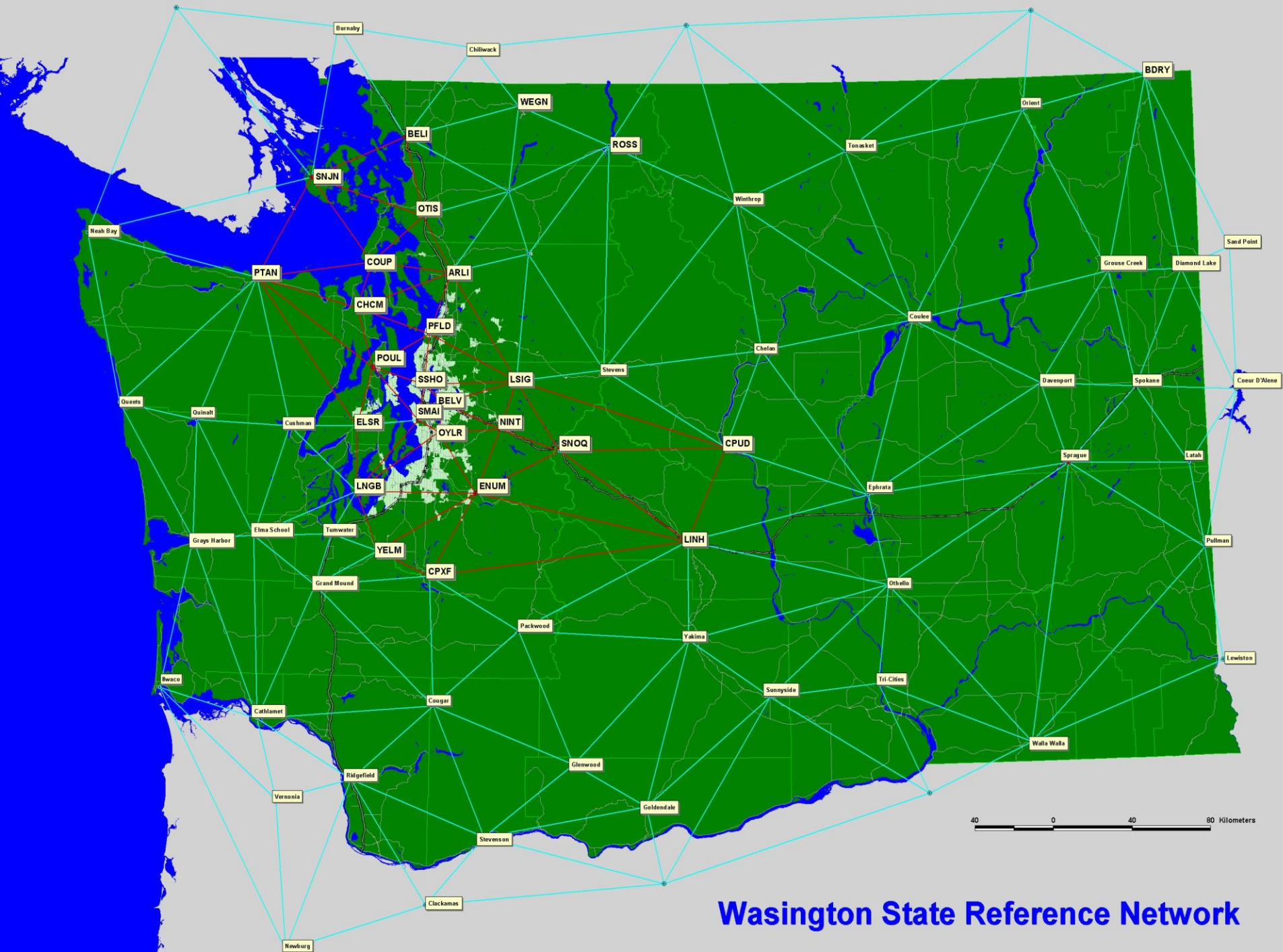
SAPOS Network Germany



Networks Worldwide



Ohio Department of Transportation

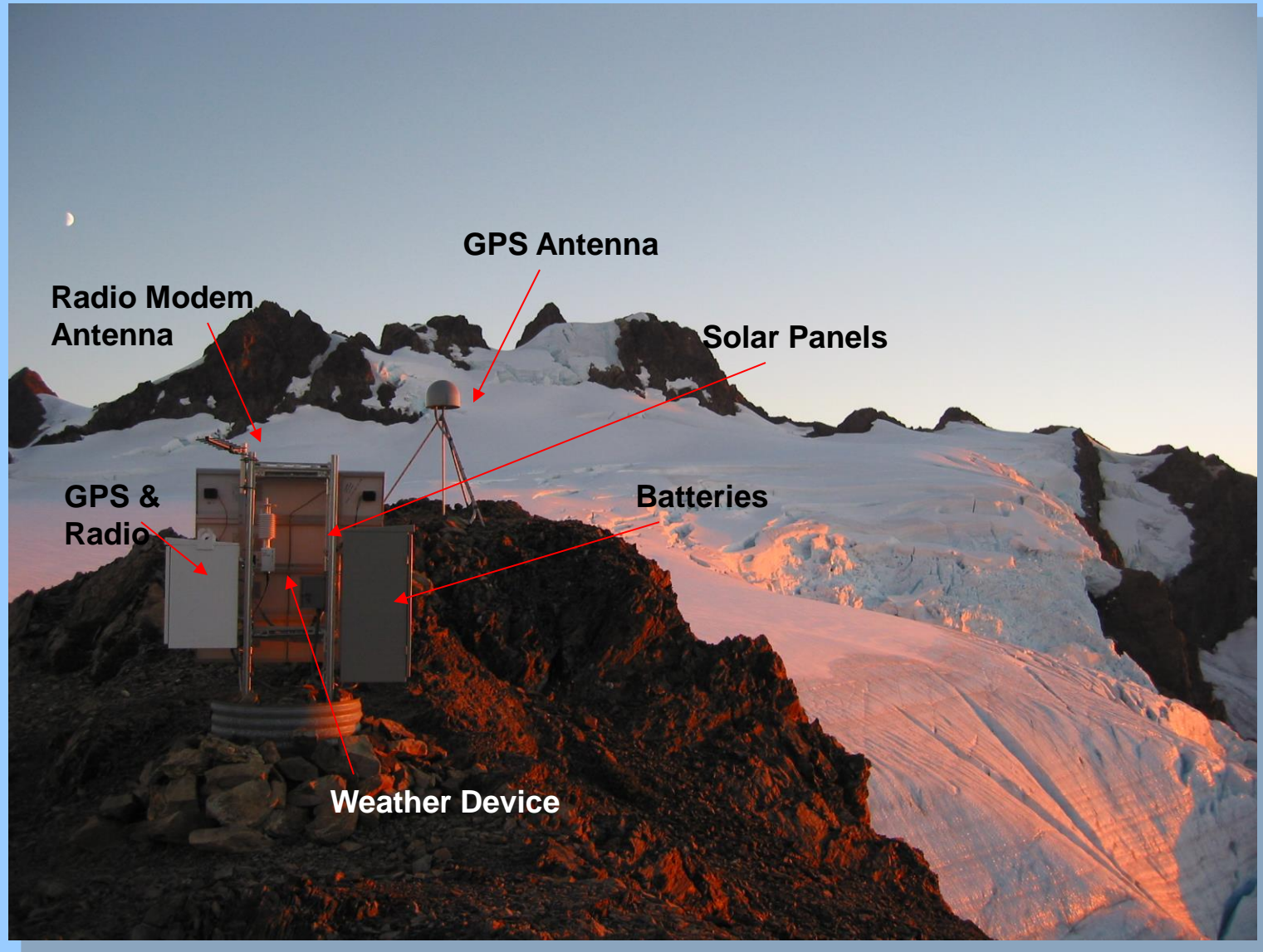


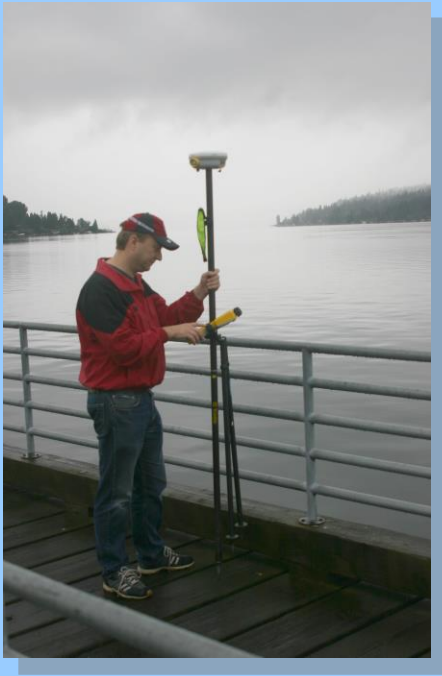
Washington State Reference Network



Reference Stations

Reference Stations



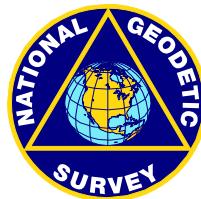


Rovers



Drivers for Network Development

- Sustainable Development
- Scientific & Academic
- Geodesy & Survey
- Resource Management
- Asset Management
- Cadastral & Commercial



Geodesy and Surveying



Geodesy – Reference Framework

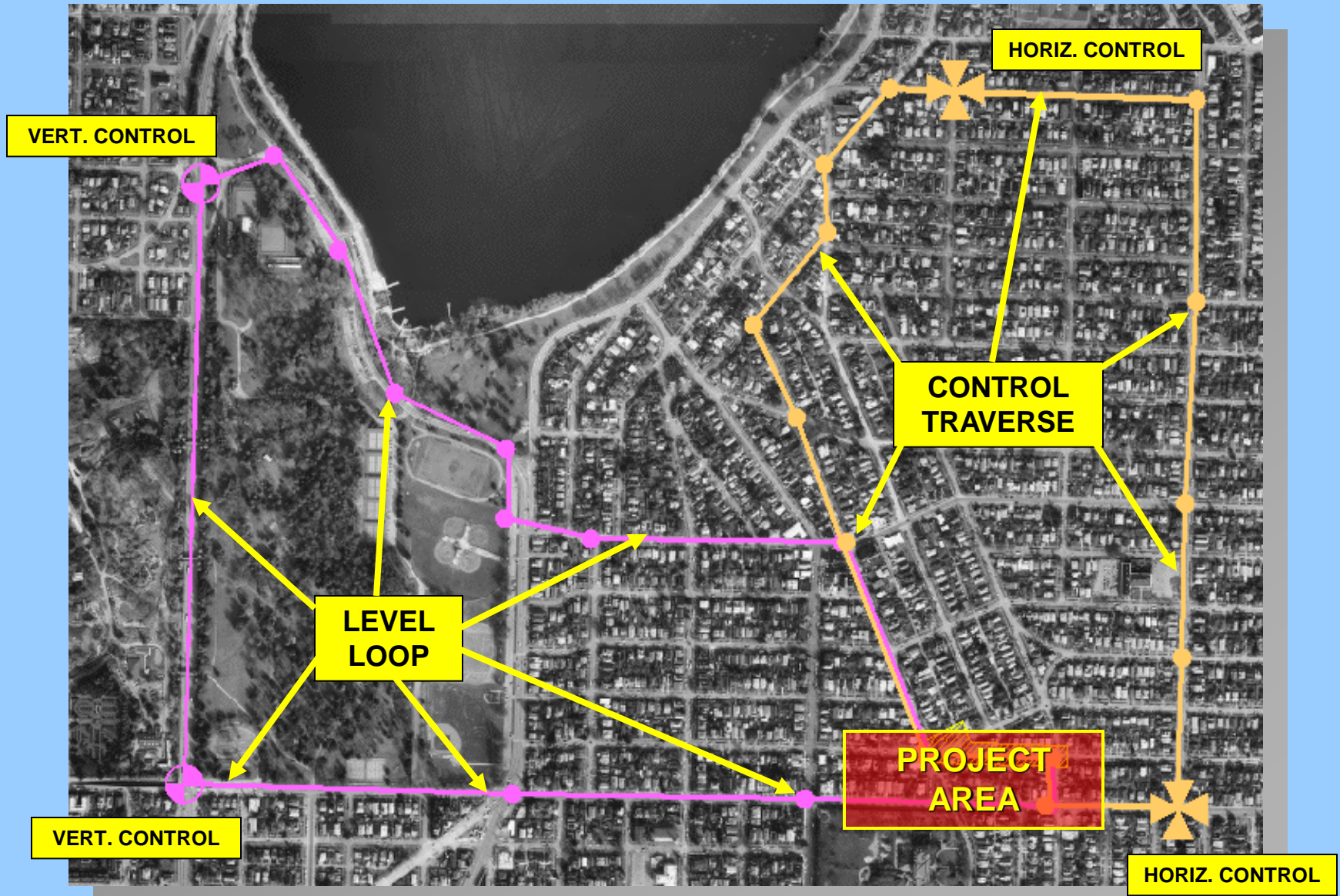


[Questions?](#) • [Comments?](#)

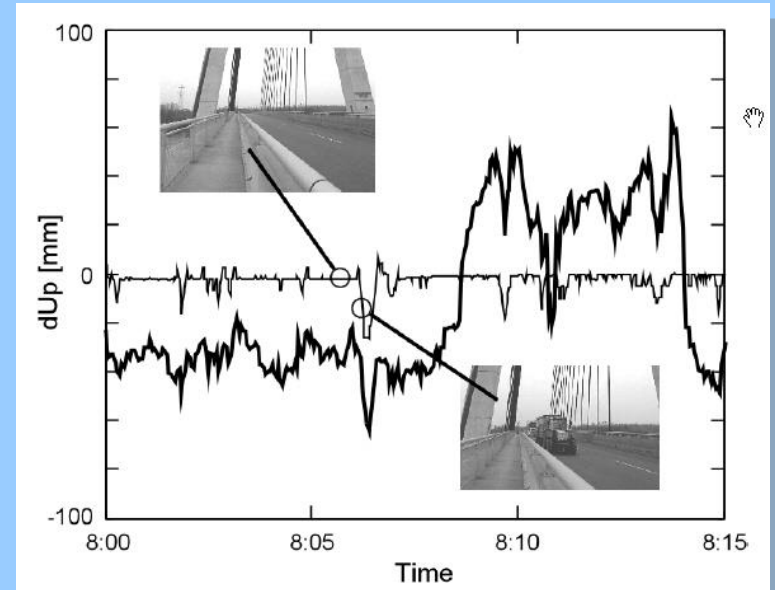
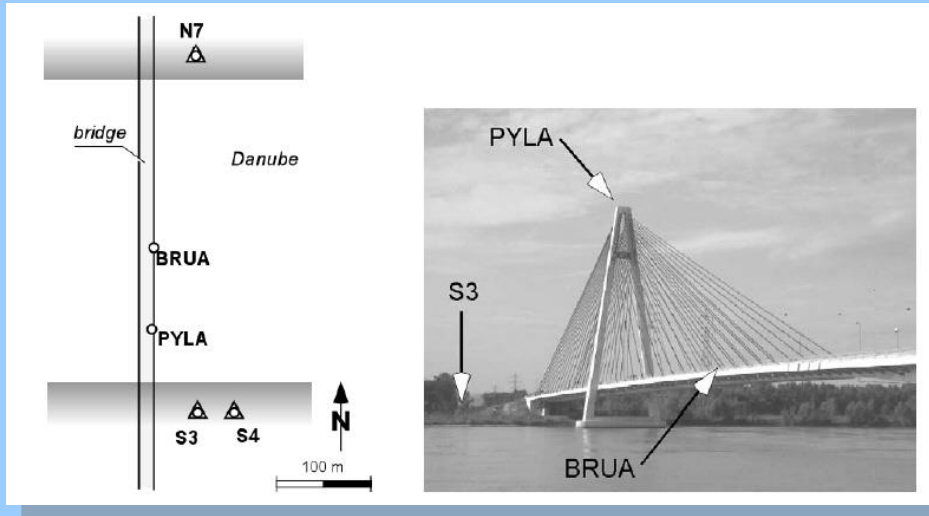
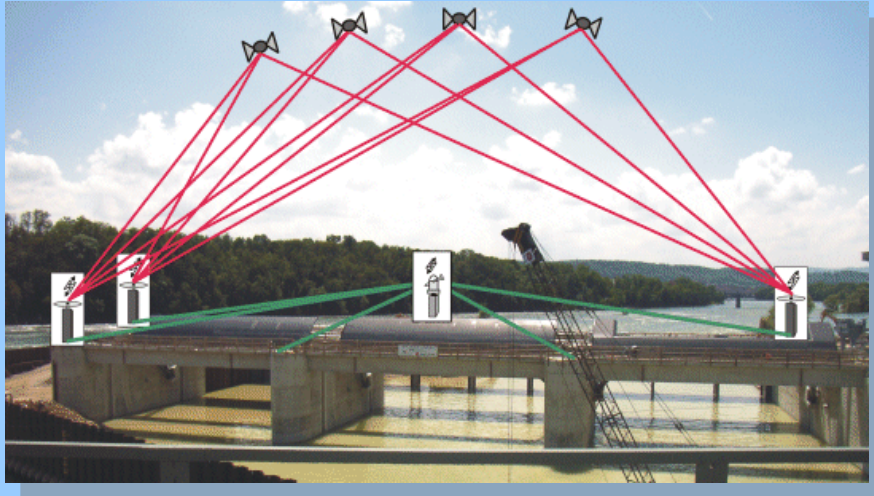
Height Modernization is a program within NOAA's National Geodetic Survey (NGS) that provides accurate height information by integrating Global Positioning System (GPS) technology with existing survey techniques. For years, GPS has been used to determine accurate positions (latitude and longitude), but now, by following Height Modernization standards, specifications and techniques, GPS can efficiently establish accurate elevations for all types of positioning and navigational needs.



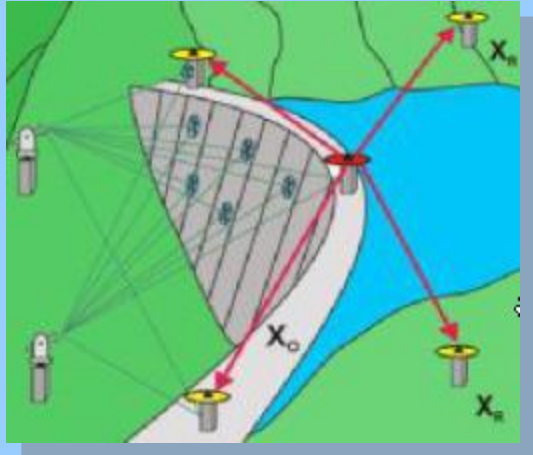
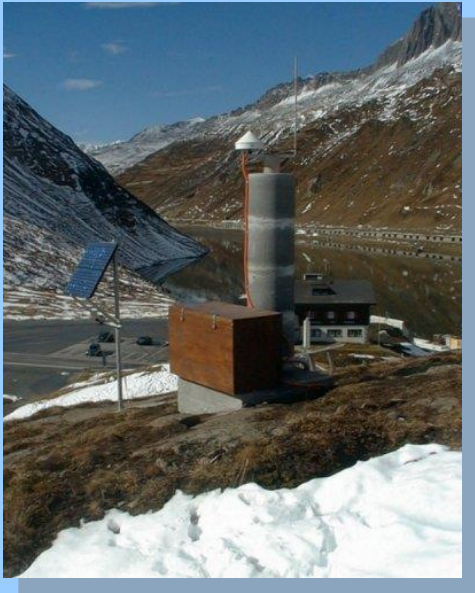
Conventional Survey Example



Structural Deformation Monitoring



Dams and Reservoirs



Structural Deformation Monitoring

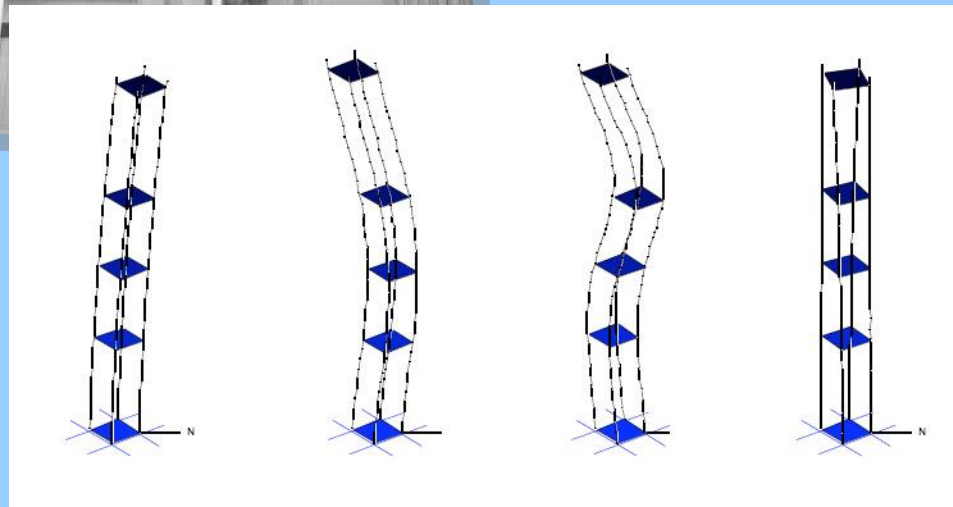


Plate Tectonic Studies

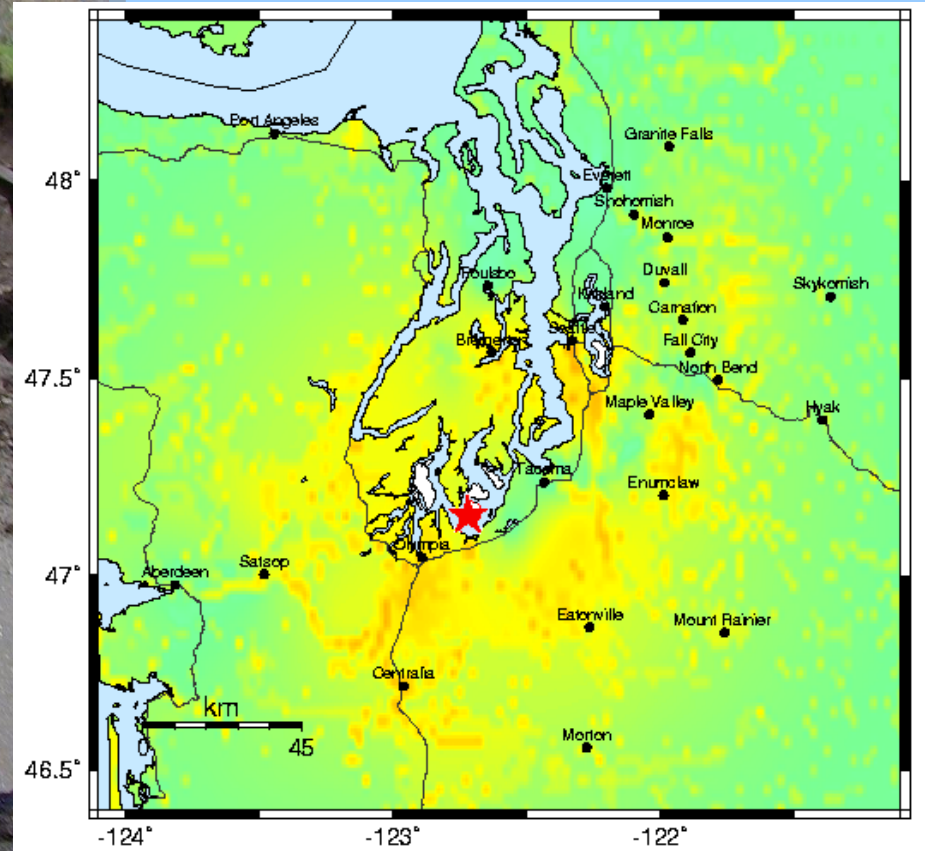


Plate Tectonic Studies

Plate Boundary Observatory

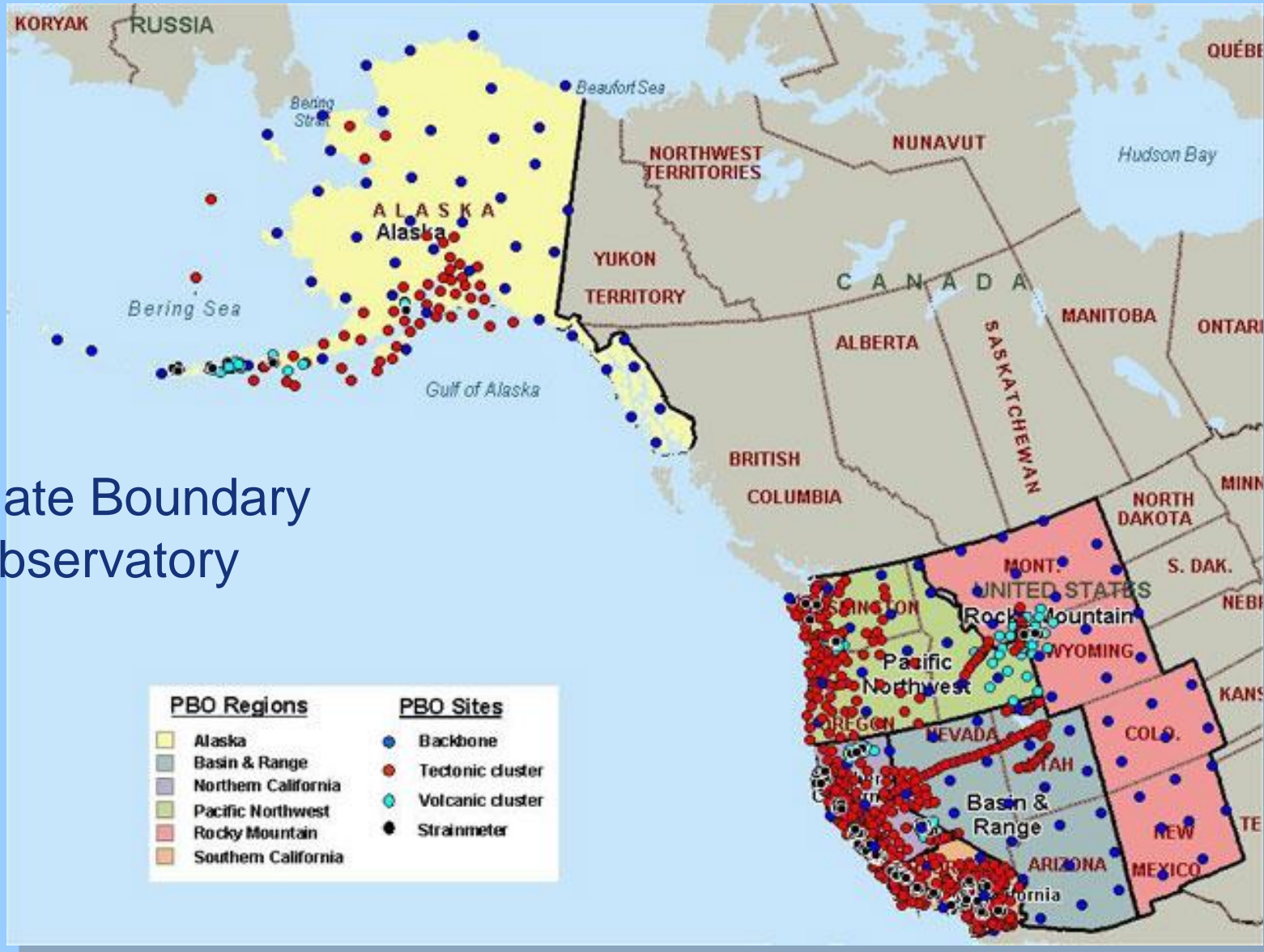
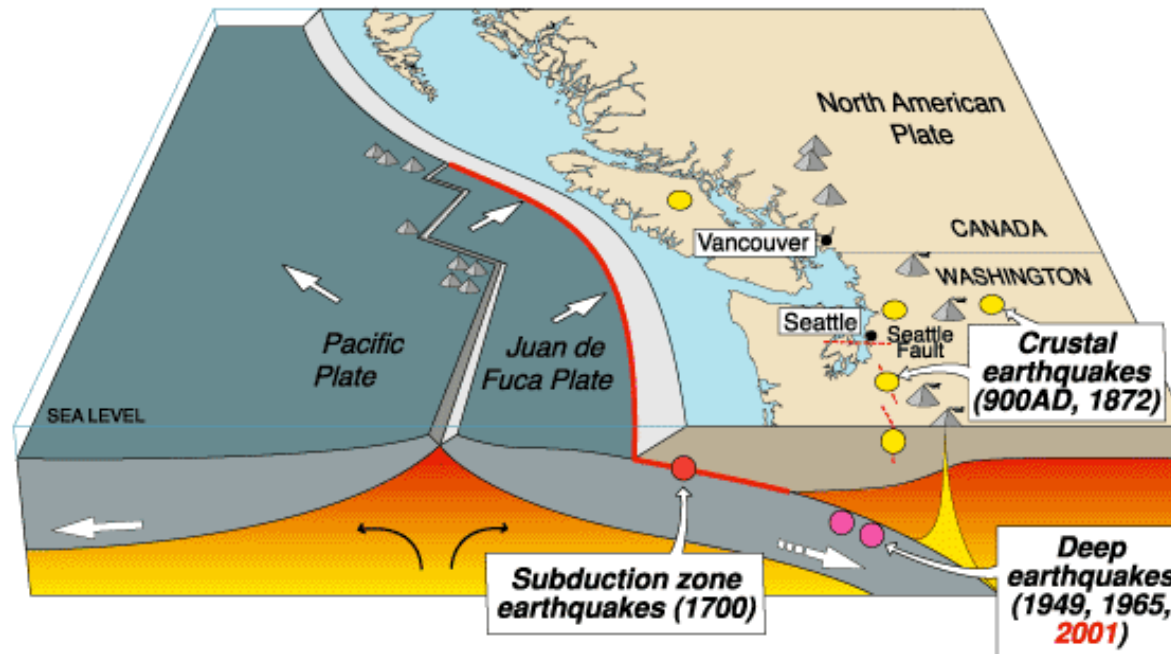


Plate Tectonic Studies

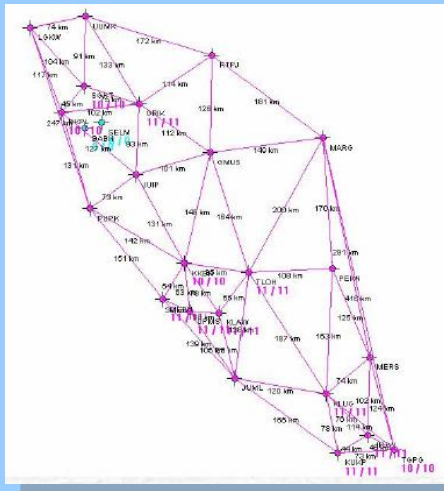
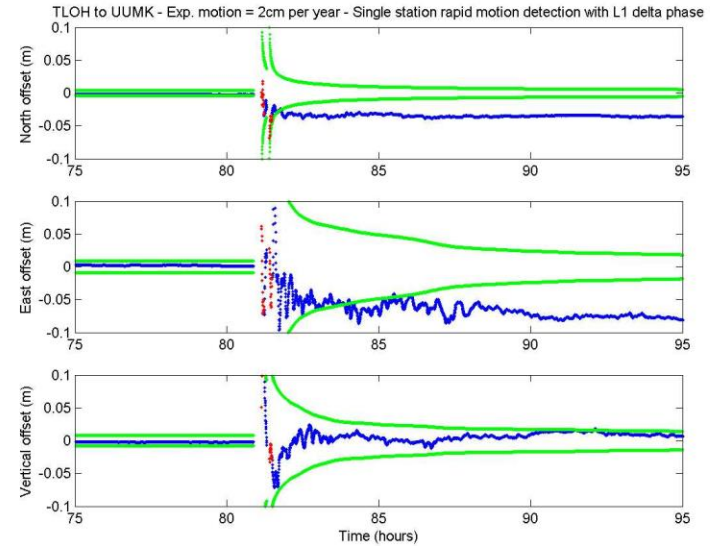


Cascadia earthquake sources



Source	Affected area	Max. Size	Recurrence
● Subduction Zone	W.WA, OR, CA	M 9	500-600 yr
● Deep Juan de Fuca plate	W.WA, OR,	M 7+	30-50 yr
● Crustal faults	WA, OR, CA	M 7+	Hundreds of yr?

Plate Tectonic Studies



JUPEM – Real-Time Network
Department of Surveying and Mapping, Malaysia

Port Operations



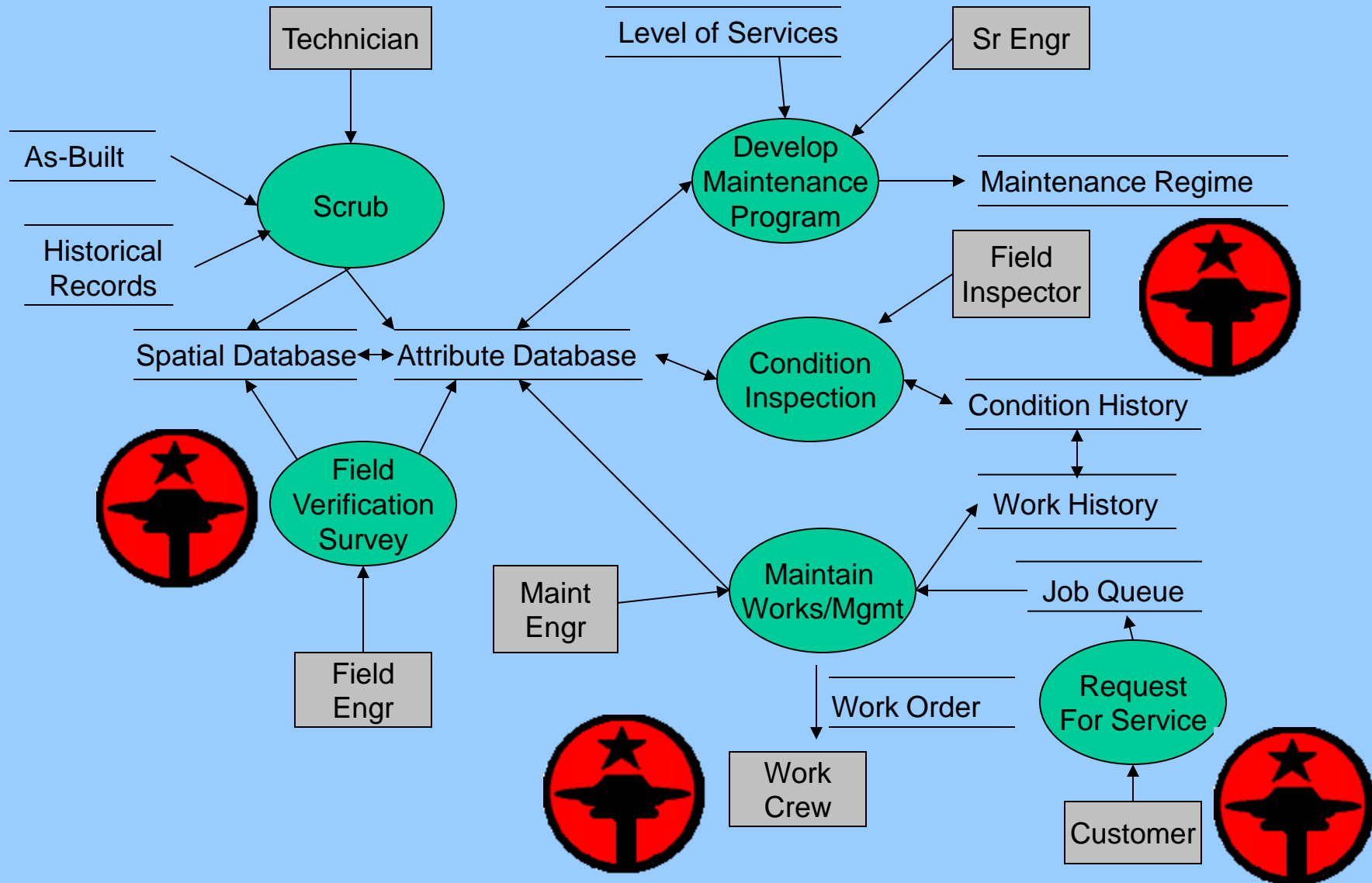
Precision Tide / Current / Flood



Control Monumentation



Resource and Asset Management



Roadblocks to Innovation



“The less we spend, the less we get budgeted next time”



“We get to charge our client more with conventional methods”

L2C – Double Boost!

Improved Technology

&

Show of Support

A Call for a Nationwide Real-Time Initiative



- **Support Real-Time GPS Initiatives Across the Nation**
- **Support Public Safety and Commerce**
- **Grants and Matching Funds for Public Networks**
- **Incentives for Commercial Networks**
- **Address Duplicity of Effort**
- **Vendor Solution Independent**

**Thank
You**

www.wsrn.org

