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Wireless Progresses!

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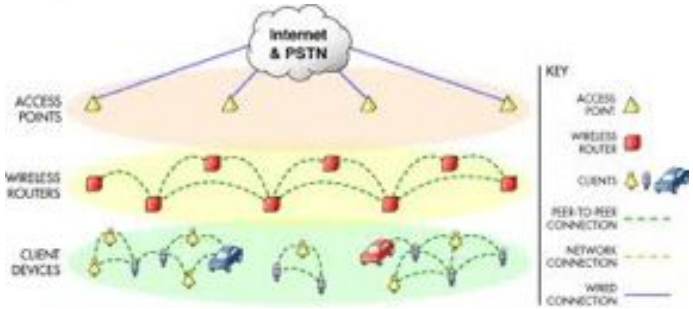
Wireless Seismic Inc.

Finding Petroleum

"Total" 3D seismic onshore – a disruptive transition!

Nov. 9, 2011

Wireless Networks



- ***Easy to use by almost everyone***
- ***Work almost everywhere***
- ***Their capacity is consistently increasing – e.g. streaming video***

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Cabled Seismic Networks

- *Difficult to transport*
- *Difficult to deploy*
- *Labor intensive*
- *HSE-challenged*
- *Difficult to maintain – a single cable break can be very disruptive*
- *Costly to repair*

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Cabled Seismic Networks

- ***Complexity has become a barrier to larger channel-count deployments***
- ***Do not function well in some (e.g. rough terrain) environments***
- ***Are not acceptable in some (e.g. urban) environments***

Conclusion (obvious) – we need a better solution

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Cable-less vs. Cabled Systems

Two primary types of cable-less systems

- ***Nodal***
- ***Wireless***

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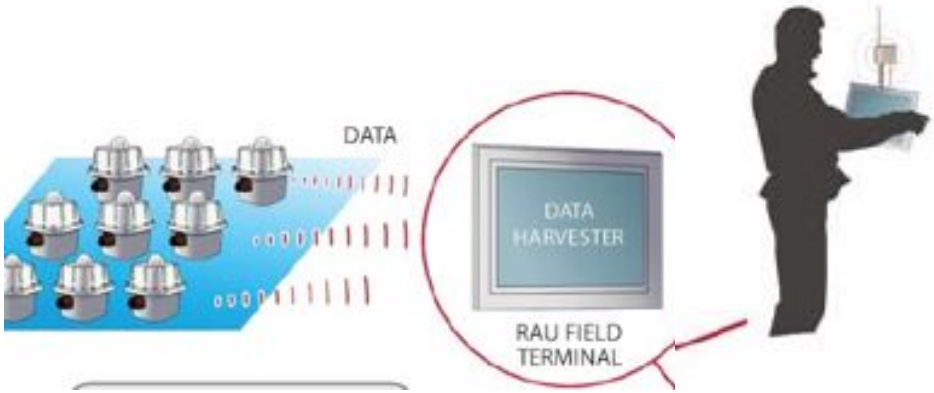
Issues with nodal systems…



1) You must physically collect the seismic data

2) Seismic data needs transcription into SEG formats

3) Limited quality control during acquisition

4) Cannot view all the seismic data while recording

Conclusion – nodes overcome the major limitation of cabled systems – but introduce several new limitations

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What about wireless?!

The challenge: Introduce wireless technology to seismic crews - but make the radio networks robust, self-sustaining and transparent to the user

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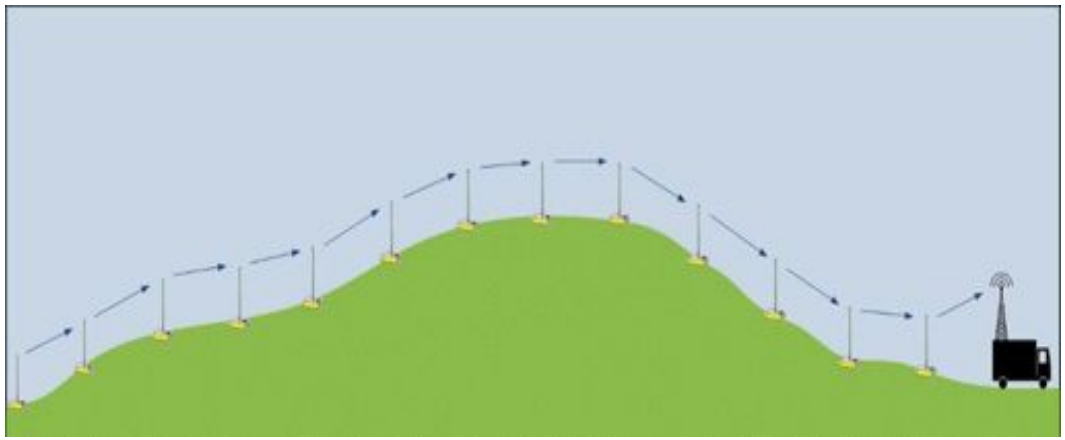
Wireless Seismic Architecture: In-lines



- *Each Wireless Remote Unit (WRU) acts as seismic acquisition station & radio relay*
- *Transmits long distances - one short hop at a time*

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Wireless Seismic Architecture: Cross Lines

- *Base Station Units (BSU's) act as collection points for the seismic data*
- *Backhaul radios transmit the collected data back to the Central*
- *Commercial 5.8 GHz mesh radio*
- *Mast is man-deployable in 10 minutes*

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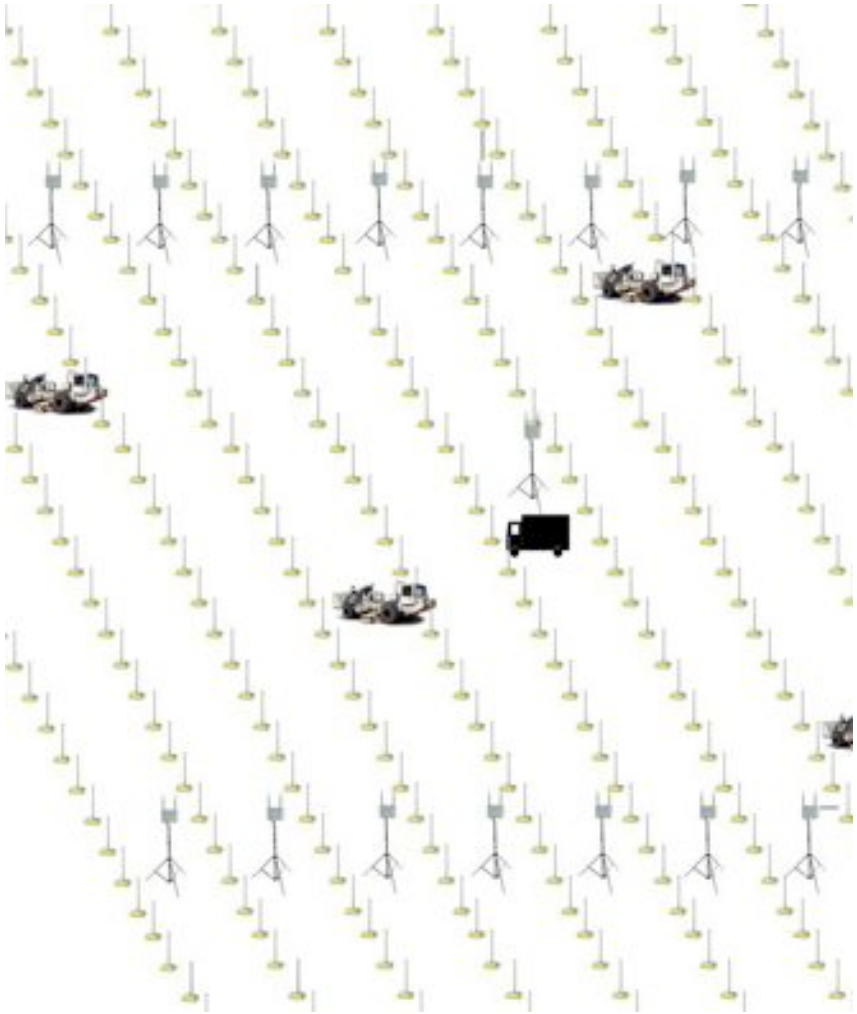
Wireless Seismic Architecture – the System

- *The RT 1000*
  - *a drop-in replacement for a cabled seismic system*
- *A complete system consists of:*
  - *Wireless Remote Units (WRU's)*
  - *Backhaul with BSU's that collect the data from the in-lines*
  - *Central recording system*
- *Data is delivered to the Central in real time:*
  - *Real time noise monitor*
  - *Continuous QC*
  - *No physical collection or transcription of seismic data*
  - *High capacity radio network*



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Wireless Seismic Systems

- *Why has real-time wireless technology not yet fully penetrated the seismic land acquisition market?*
- *Technical and operational challenges:*
  - *Prior limitations in radio technology*
  - *Power management (battery life)*
  - *Radio complexity*
- *Wireless Seismic has been focused for several years on overcoming these technical and operational challenges*

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Technical and Operational Challenges

- *Prior limitations in radio technology*
  - *Wireless Seismic has spent 5 years designing, testing and deploying radio-based seismic systems*

Conclusion – based on our experiences, current radio technology, properly engineered, has advanced to a point where a radio-based seismic system is commercially viable

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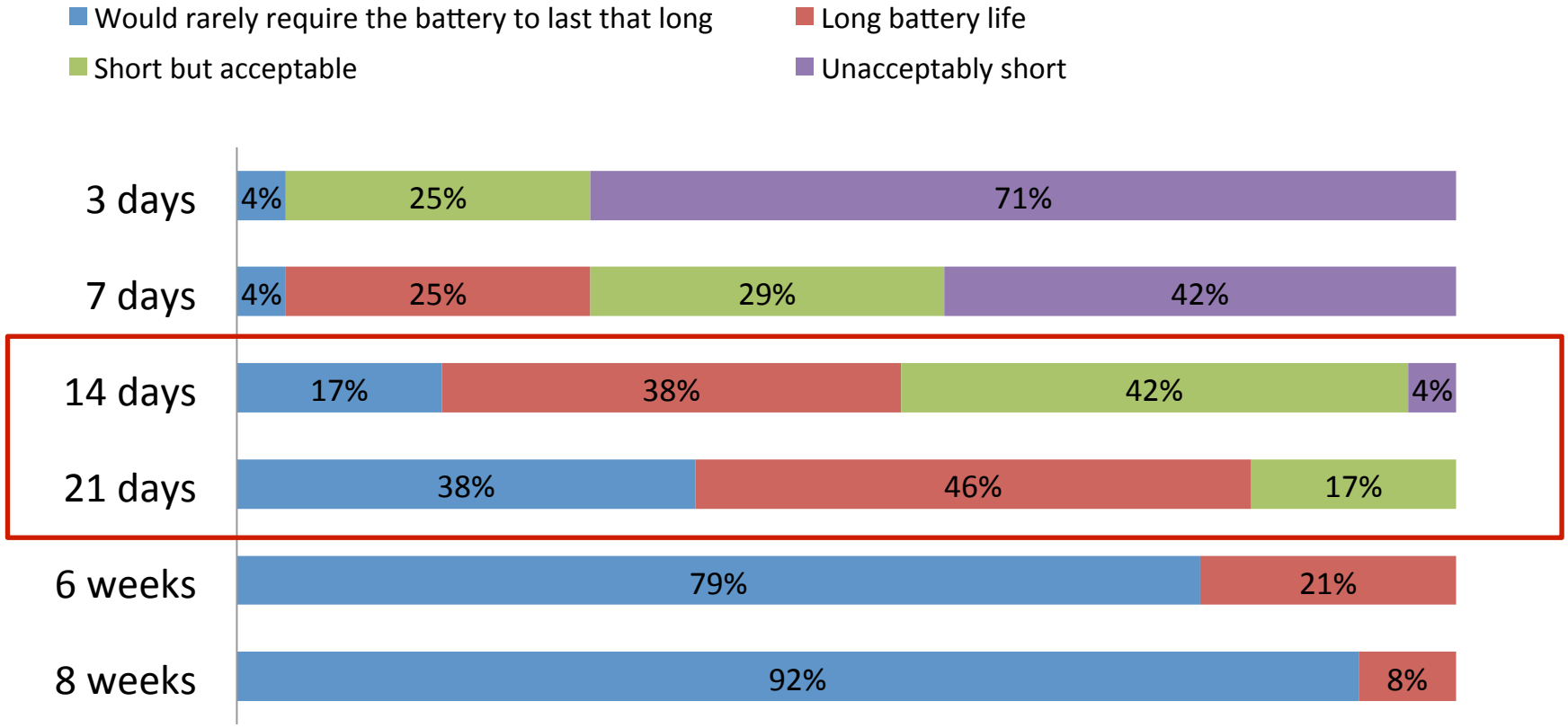
Battery Life - Survey Results

The Wireless Seismic recording system runs 2 hot-swap batteries: Please rate your opinion of each of the following battery-life options, assuming that you were operating on a 12 hour shift schedule:



Conclusion - Optimum battery life is between 14 and 21 days

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Technical and Operational Challenges

- *Power Management – primary criteria*
  - *The system electronics must minimize power consumption*
    - *Meticulous engineering design has dramatically reduced power consumption*
    - *E.g. RT 1000 clock discipline is managed via radio telemetry and not via GPS on the WRU*
  - *The batteries must maximize power availability*
    - *2 x lithium-ion batteries with high power-density*
  - *Battery life must be in the range of 14 to 21 days*
    - *RT 1000 battery life (2 batteries) is typically between **15 and 25 days***
    - *Higher capacity batteries will extend life to ~40 days*
  - *-- Batteries and battery chargers need to be lightweight and portable*
    - *RT 1000 batteries have on-board charging circuitry*
    - *Result - simple and inexpensive battery chargers*

Conclusion – a wireless-based system can now be deployed that meets the market requirements for efficient and effective power management

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Technical and Operational Challenges

- *Radio Complexity - Wireless Seismic has developed a comprehensive suite of tools and technologies to minimize radio complexity*
- *The following slides provide details about these tools and technologies – the end result being a user-friendly and self-sustaining radio telemetry system.*

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Automated connection to wireless array

Tilt the WRU to power up the unit, then set it on the ground

Performs self tests, checks location, and connects to the wireless array

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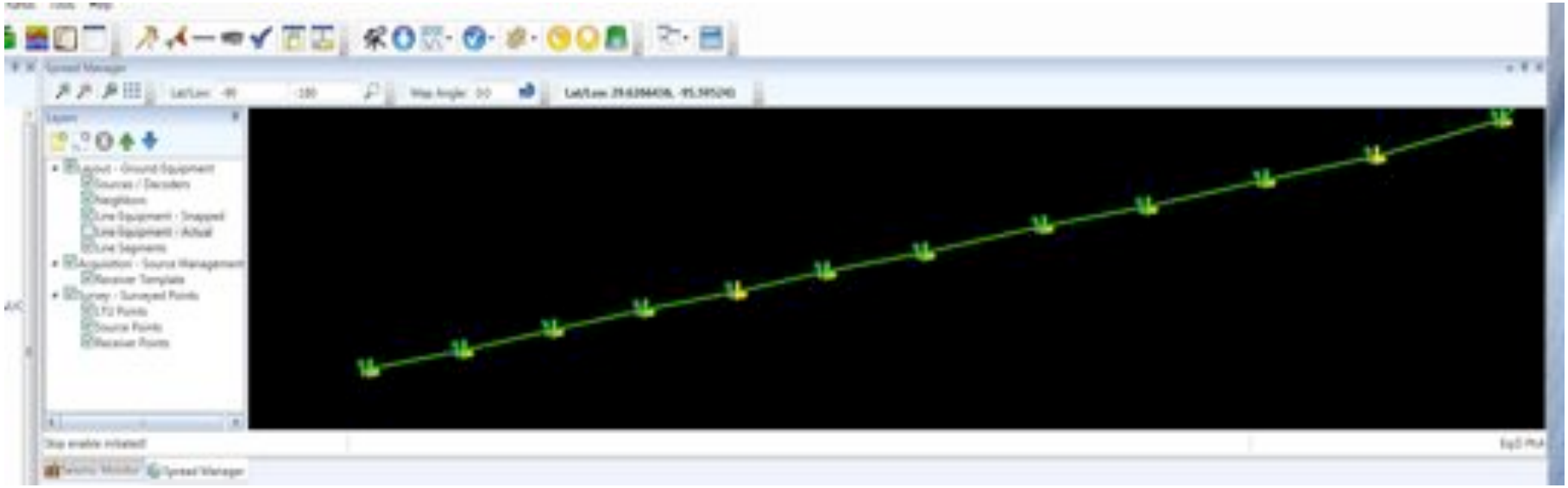
Reducing Radio Complexity

- *Automated line formation*



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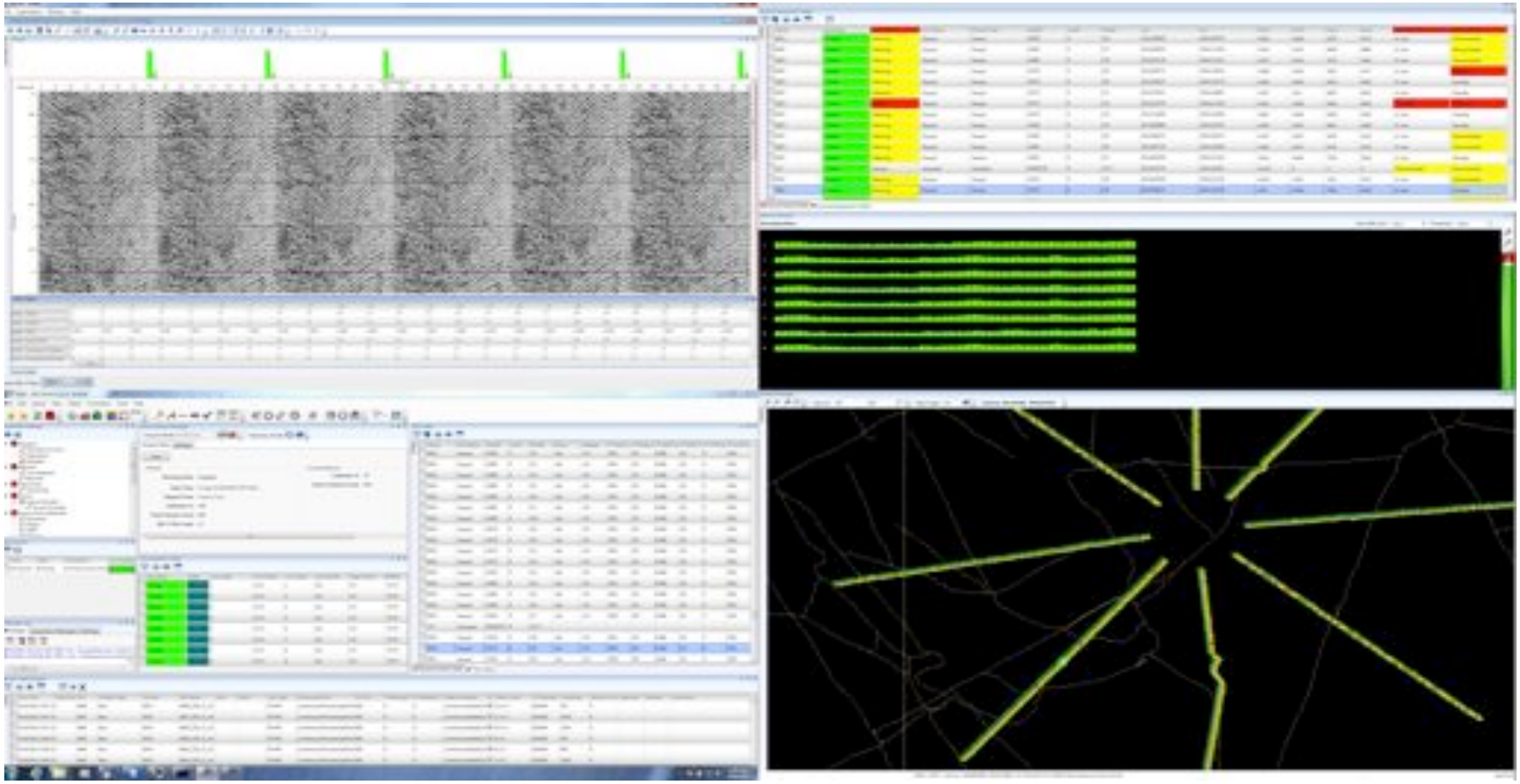
Reducing Radio Complexity

- *WRU's and BSU's automatically transmit their status back to Central*



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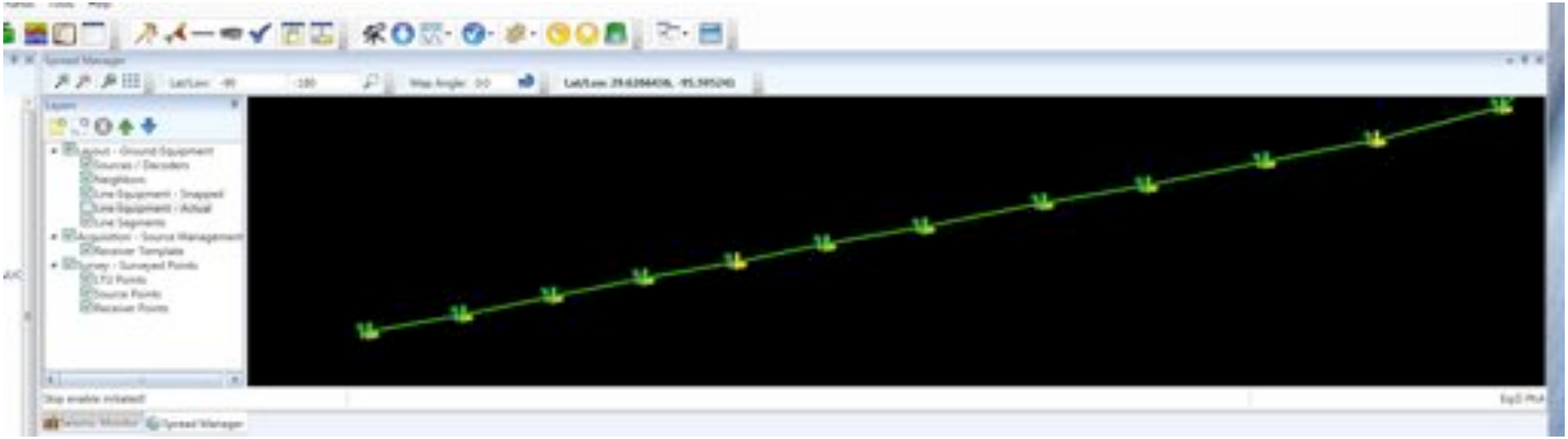
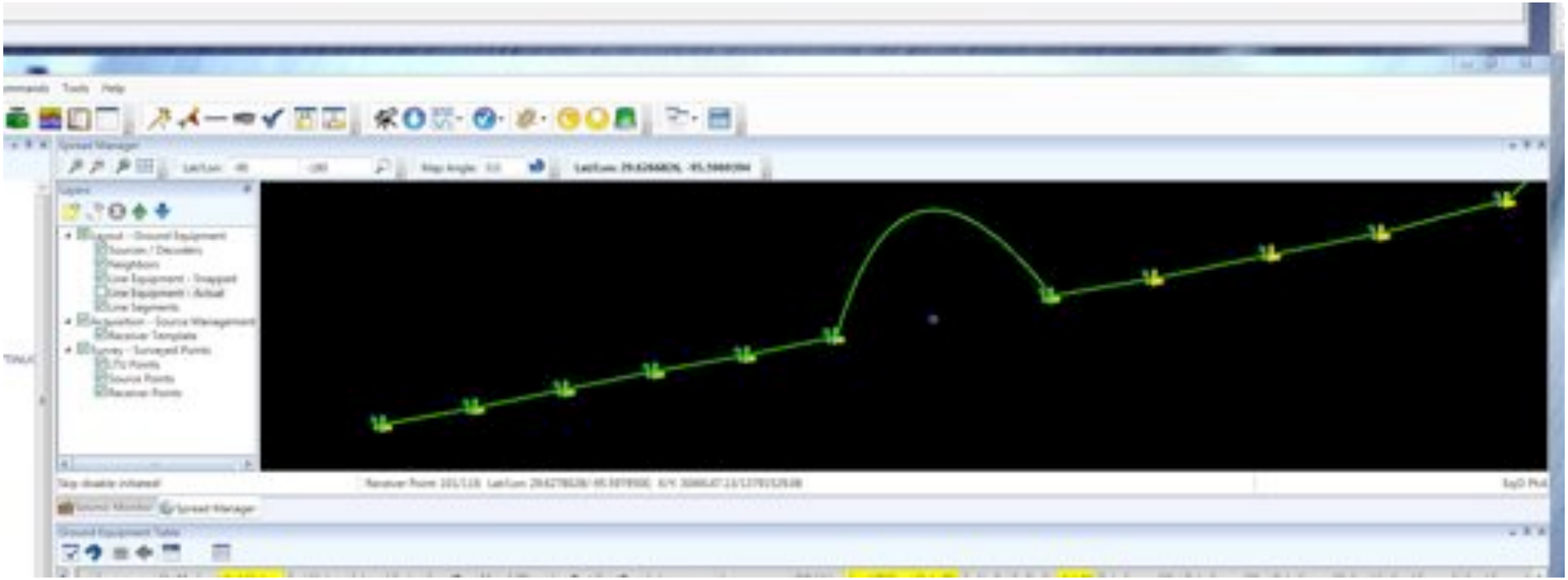
Telemetry Skip Healing



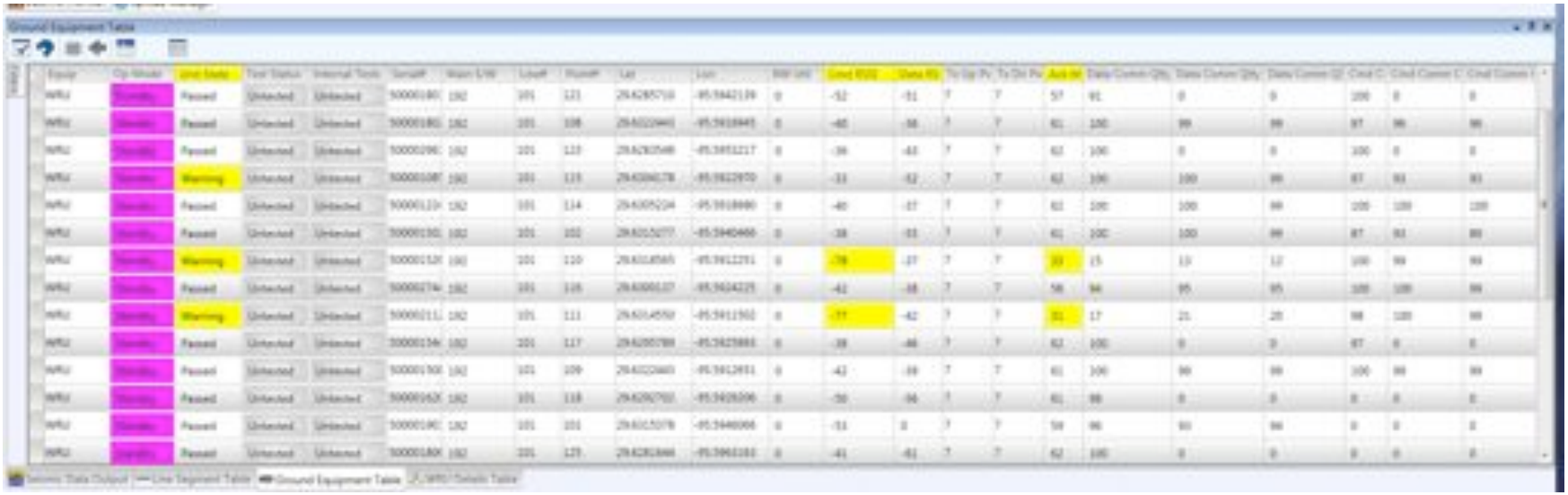


Automated Power Levelling

Automated Transmission Retries

Reducing Radio Complexity

- *Comprehensive suite of tools to view and analyze radio links and performance*



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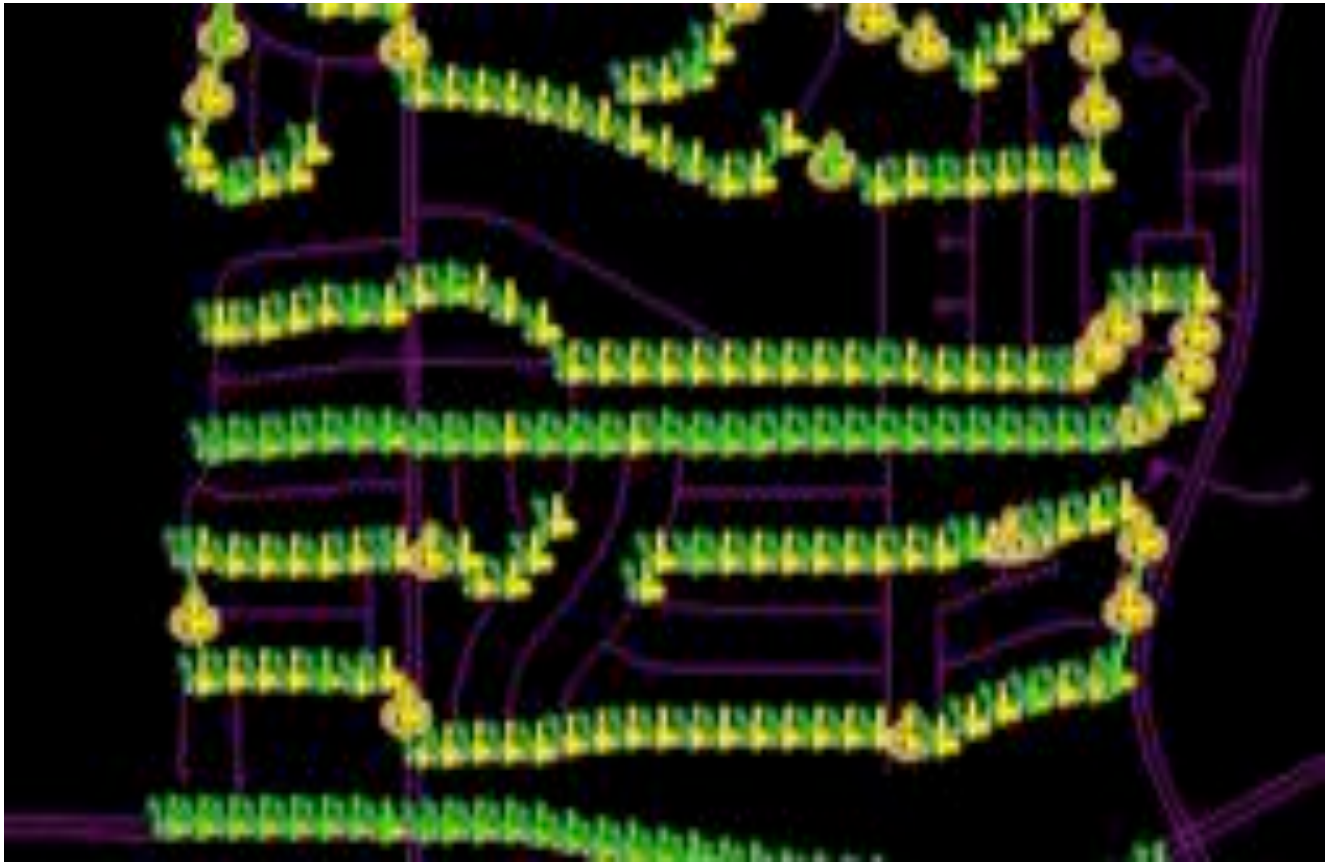
Urban Seismic – Using repeaters

- Repeaters are just WRU's that are inserted between 2 surveyed WRU's
  - act as a radio relay to improve radio communications in challenging areas
  - allow lines to be "snaked" as needed



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Reducing Radio Complexity

- *Automated data flow control*
  - *Suspends WRU data transmission in the affected area until the bottleneck is overcome*
  - *Data held in local memory*
- *Backhaul reliability layer*
  - *automated recovery of data lost over the back haul network*
  - *data recovered directly from BSU's*
- *Automated queuing and acknowledgements of commands*
  - *Guarantees commands get to all WRU's*
- *Automated data recollection*
  - *"mops up" any remaining missing data after all of the other automated systems have run their course*

Conclusion

- The RT 1000 system delivers robust, reliable and (most importantly) self-sustaining RF networks

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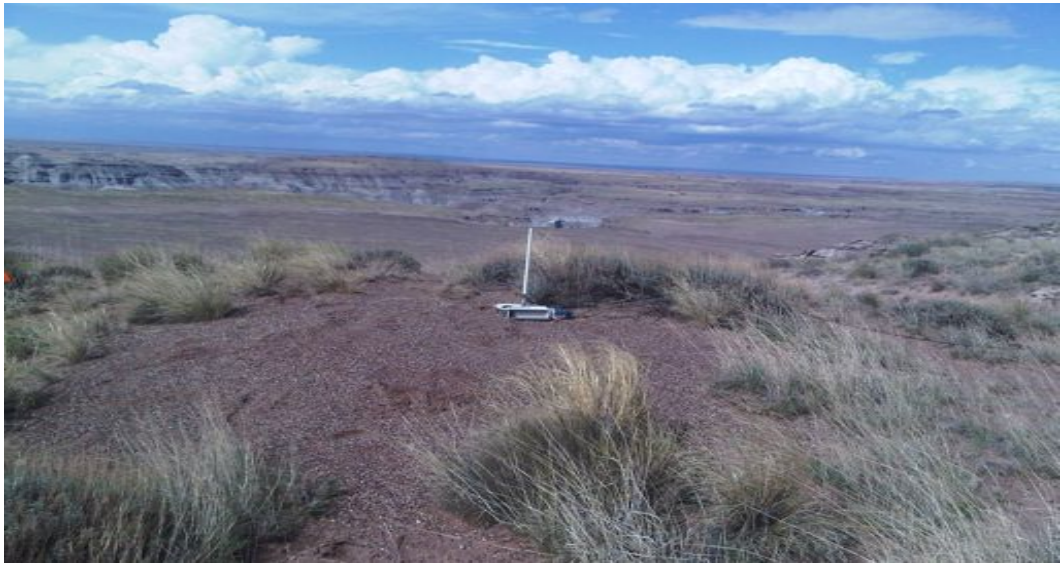
2011 - RT 1000 deployments in varied terrain



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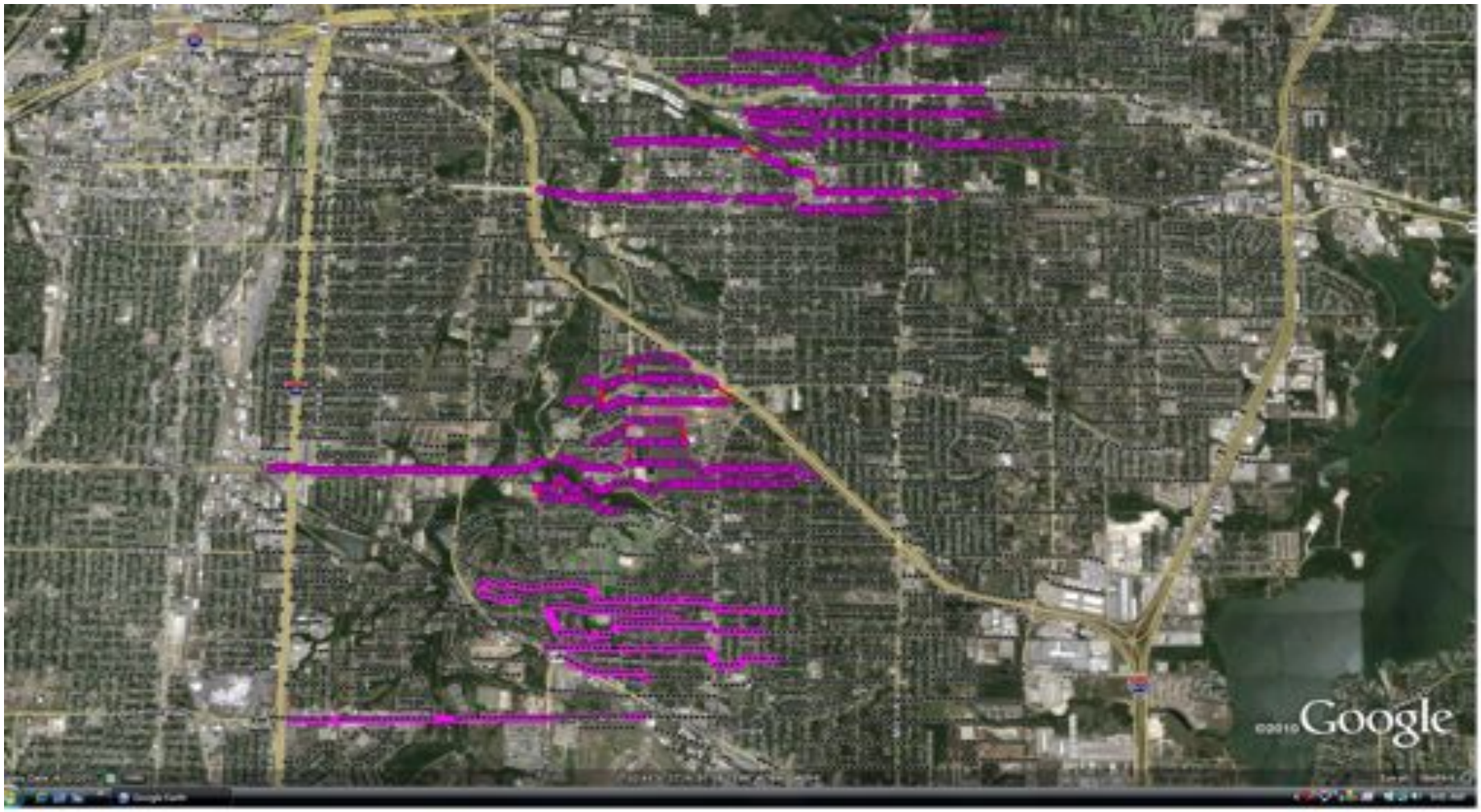
Urban Seismic deployment



Discontinuous infill and overlay patches
Total spread distance >7 miles

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Road crossings and traffic were not a problem…

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Backhaul masts on streets…

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…and in back gardens…

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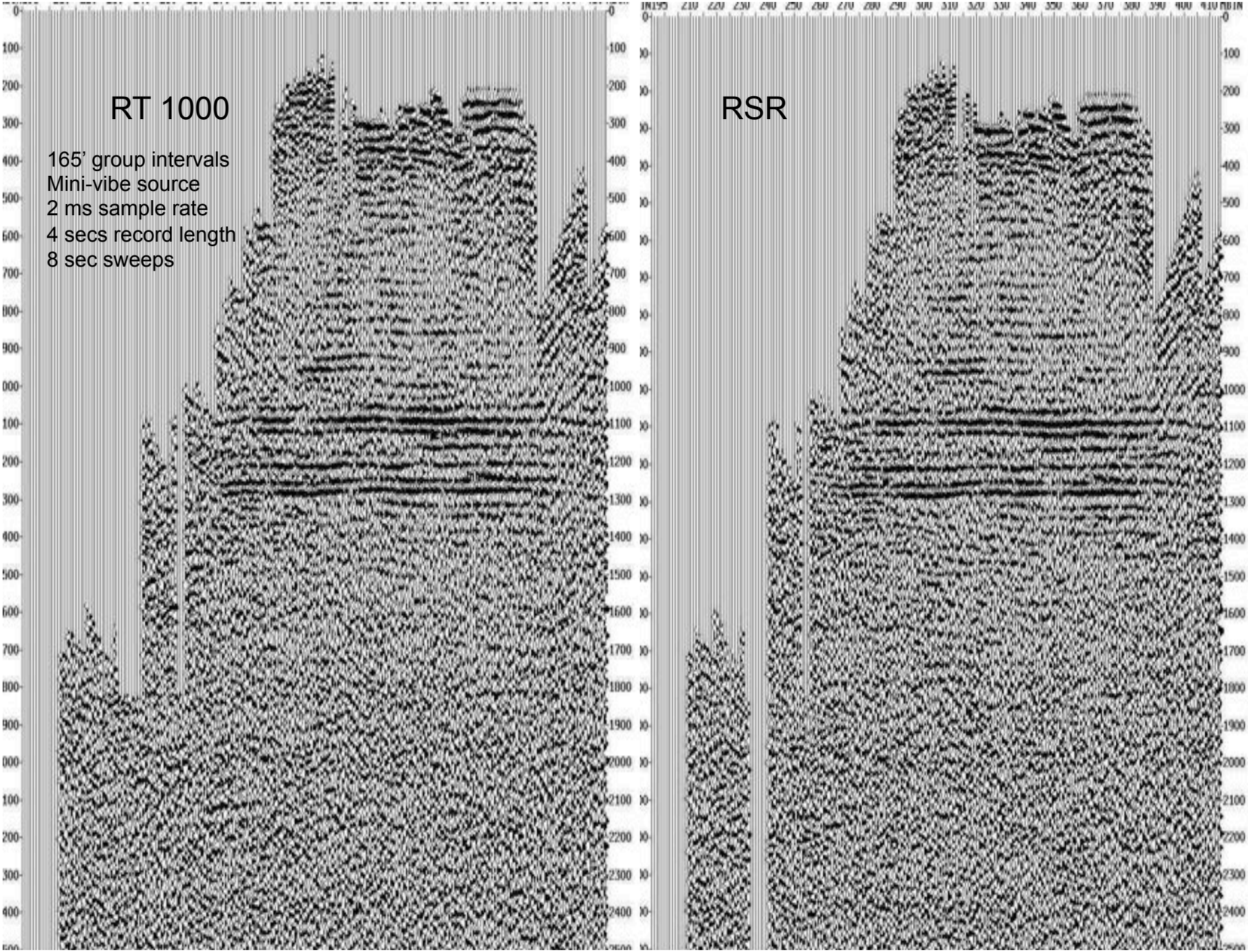
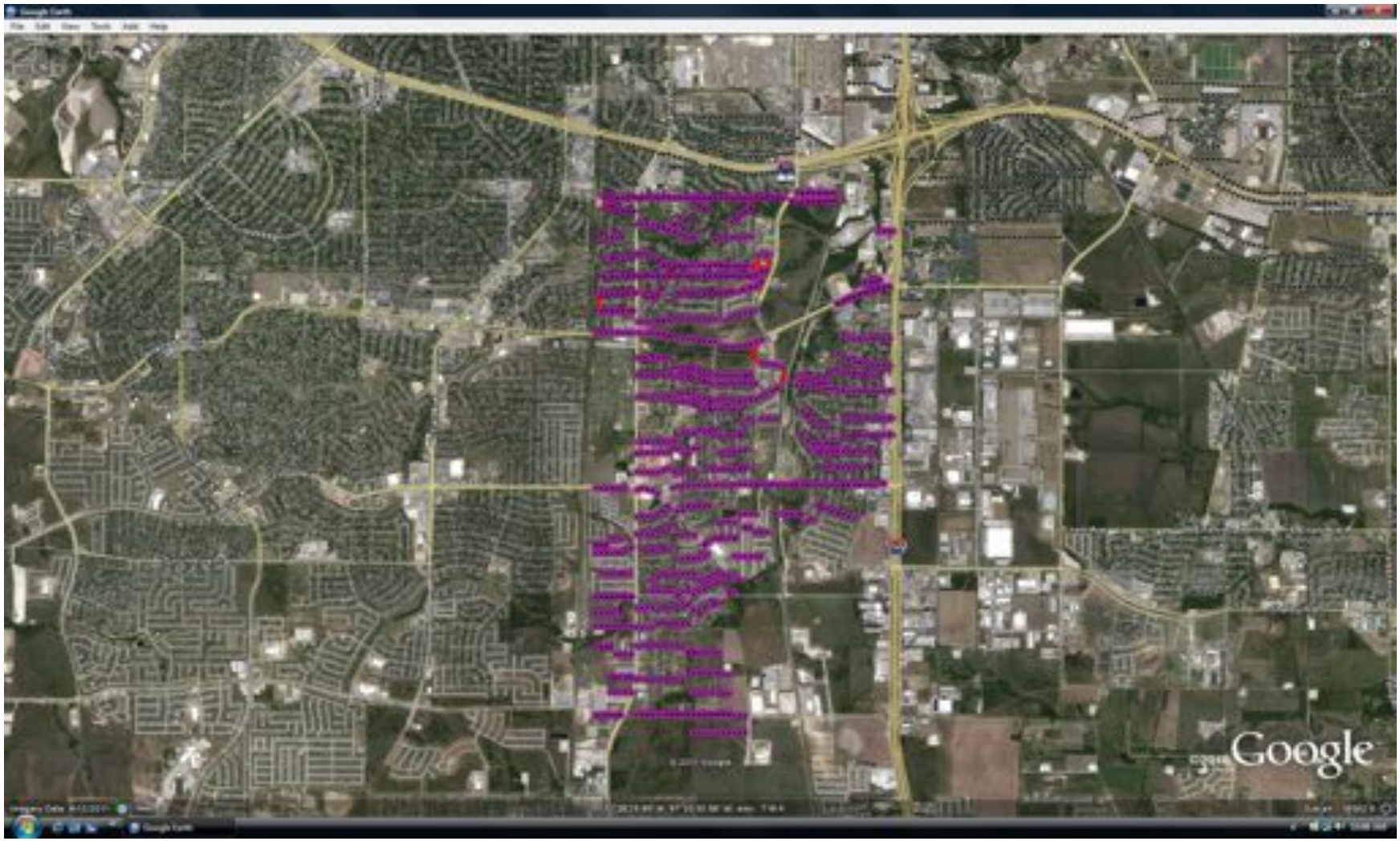

RT 1000
165’ group intervals
Mini-vibe source
2 ms sample rate
4 secs record length
8 sec sweeps
RSR

Standalone Urban Deployment



Successful standalone acquisition using Vibrator source and >1,000 total channels on the ground

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Summary

- *The limitations of cabled systems are well understood – and are further exacerbated by ever-increasing channel-count deployments*
- *Nodal systems overcome many of the limitations of cabled systems – but introduce other limitations that cabled systems don't have*
- *Radio-based systems offer the best potential for a cable-free world – but several important challenges have to be overcome*
- *One key challenge - the radio networks - must not substitute RF limitations for the limitations of cables*
- *Wireless Seismic has introduced a real-time wireless system with RF networks that have been developed to be efficient, reliable, robust and self-sustaining*
- *The RT 1000 system has been deployed in a variety of environments – and has demonstrated that a real-time wireless system is now commercially competitive*
- *The RT 1000 is available for delivery now*
- *The major focus of Wireless Seismic moving forward, is to scale up the RT 1000 technology and deliver large channel-count systems in the near future*

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More information

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