Terre Star

Mobile Communications. Redefined.

# WCA Cognitive Radio SIG: Technology Solutions to the Spectrum Crisis

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# TerreStar GENUS™ Smartphone


**FCC & PTCRB (industry) certification -- December 2009**

**Customizable**

- Components usable by any ODM

**User Interface**

- Windows Mobile Professional 6.5
- Touch Screen
- QWERTY Keyboard

**Terrestrial**

- Dual-band WCDMA (850 and 1900)
- Quad-band GSM/EGPRS (850,900,1800,1900)
- Wi-Fi
- Bluetooth

**Satellite**

- 2.x GHz GMR-3G
- No external antenna

**Form Factor**

- Conventional Size & Weight
  - 4.2” x 2.5” x 0.8”
  - 5.2 ounces (with battery)



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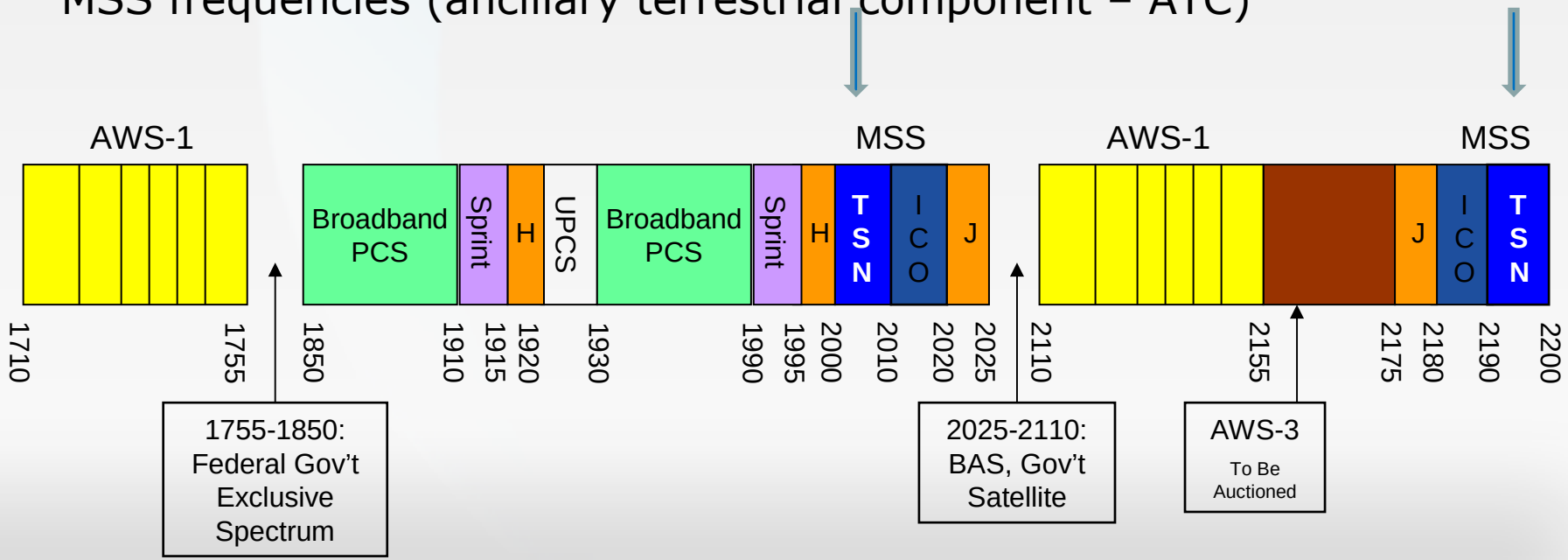
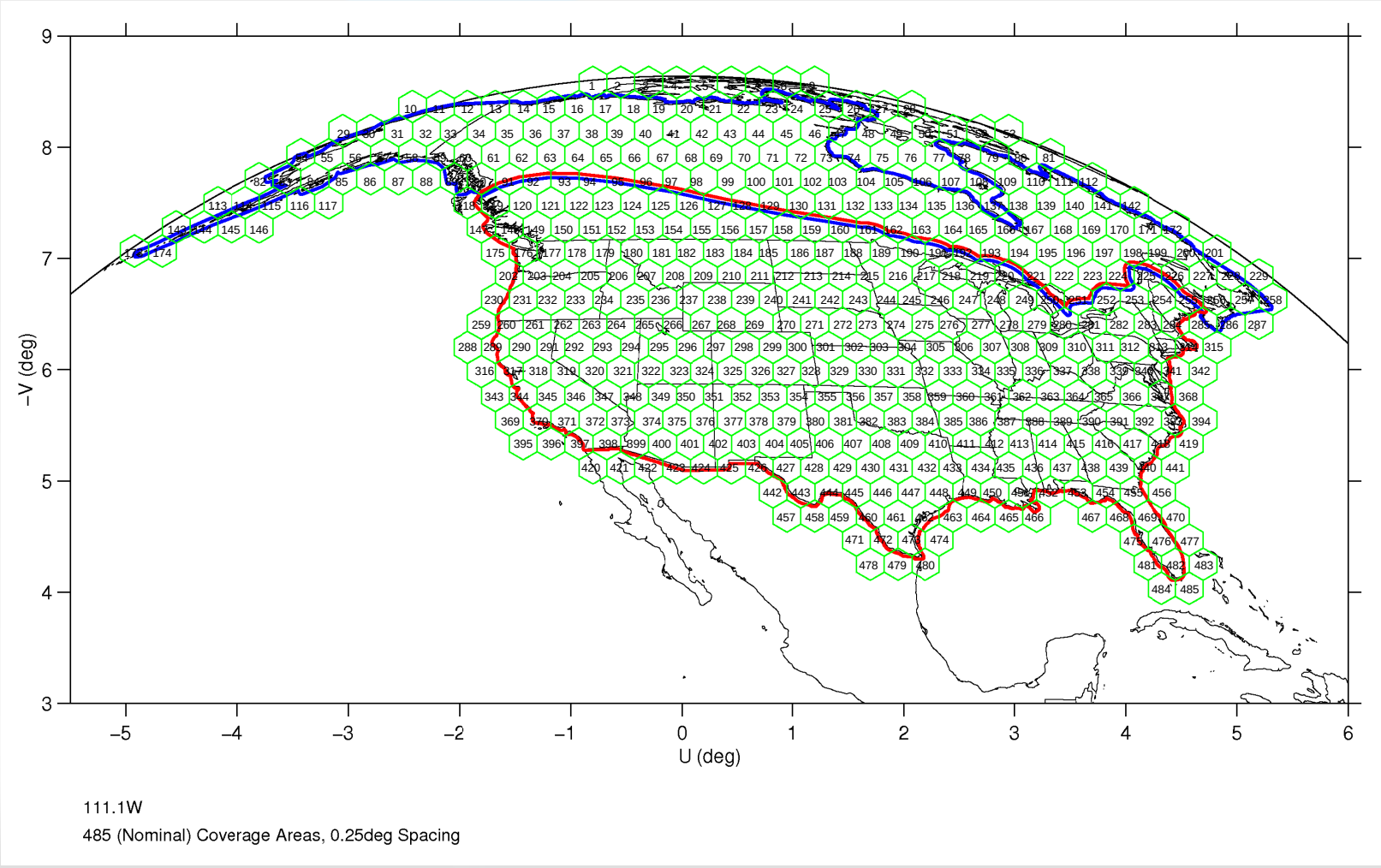
# TerreStar Spectrum

- 2 x 10 MHz of unencumbered, contiguous 2 GHz spectrum for Mobile Satellite Service (MSS)
- Well-suited for next generation mobile voice, data and content delivery
- Handsets can use regular terrestrial 3G cellular frequencies for primary communication, with satellite as a backup for resiliency
- License also allows integrated terrestrial service using the same MSS frequencies (ancillary terrestrial component – ATC)



# 485 (Nominal) Coverage Areas — U.S. and Canada

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485 (Nominal) Coverage Areas, 0.25deg Spacing



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# TerreStar Delivered in 2009

- Launched the world's largest, most powerful commercial communications satellite - TerreStar-1 and successfully deployed its 18 meter reflector, the largest commercial satellite antenna ever unfurled.
- Completed the first end-to-end phone call over TerreStar-1 between two TerreStar GENUS™ smartphones and satisfied last regulatory milestones.
- Introduced the world's first quad-band GSM and tri-band WCDMA/HSPA smartphone with integrated all-IP satellite-terrestrial voice and data capabilities – TerreStar Genus™.
- Signed agreements with Qualcomm and Infineon to add S Band satellite capability to next generation mobile chipsets enabling integrated satellite functionality in mass-market devices costing about the same as cellular-only devices.
- Brought on-line redundant gateway earth stations in the United States and Canada.
- Announced the successful completion of in-orbit testing of TerreStar-1.
- Activated an all-IP, 4G core network.
- Executed a distribution agreement with AT&T whereby AT&T will offer the TerreStar GENUS solution to its government and commercial customers.
- Received FCC and industry certification for the TerreStar GENUS™ smartphone.

# TerreStar Capabilities

TerreStar's services will allow military, defense, first and emergency responders, law enforcement and government users to have:

- Resiliency - when radio/cell towers are down, satellite service will operate immediately
- Cost-effective
- Satellite and cellular communications on a single Smartphone

improving their ability to serve their nations in times of crisis, and maintain communication in remote parts of the US and Canada.

# Integrated Network Architecture




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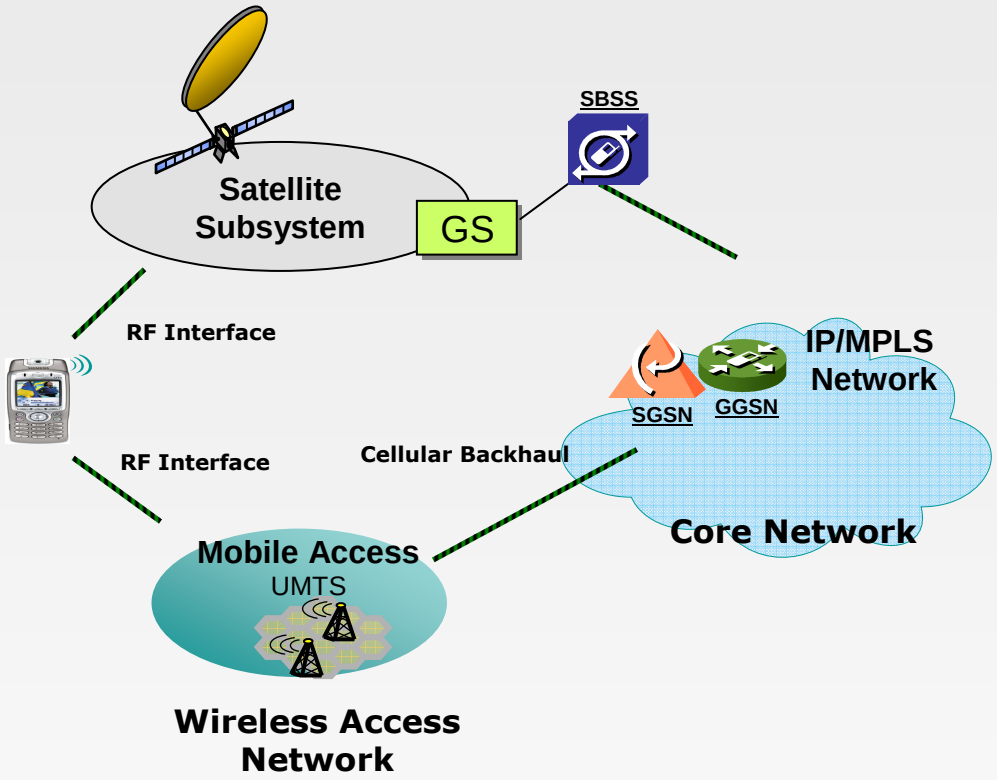
# Value of Satellite and ATC Co-existence

- Ability to maximize use of available spectrum
- Ability to utilize spectrum and capacity where needed
- Ability to interoperate satellite and ATC networks
- Present standards 3GPP apply to both satellite and ATC




**Only the Integrated Solution Maximizes Value**



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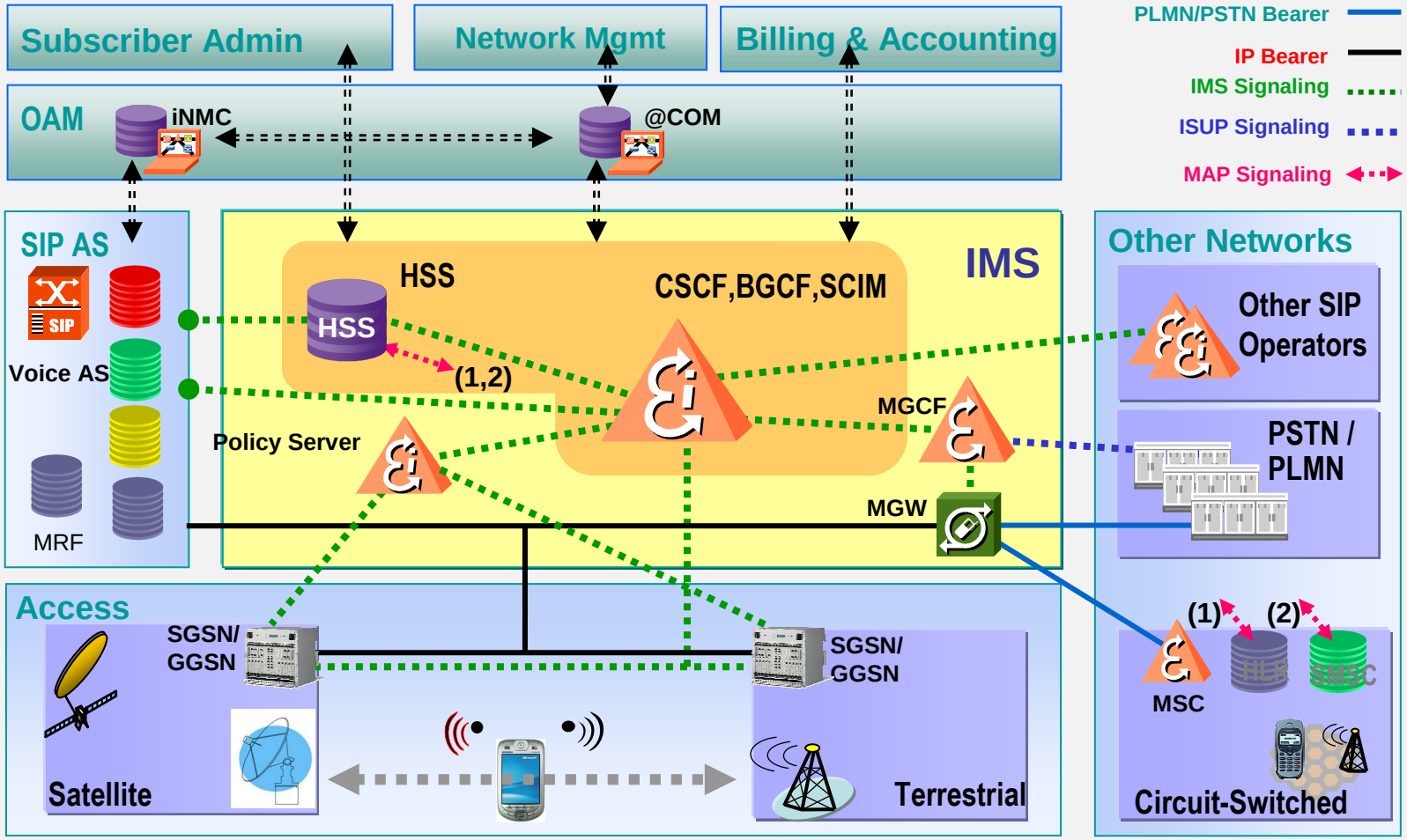
# Enabling Service for Users

TerreStar IMS Architecture integration with Mobile Core & other CXRs



# Next Generation Chipsets

| | GSM/HSPA/LTE/GMR-3G | CDMA/HRPD(EVDO)HSPA+/LTE/sHRPD |
|---|---|---|
| Chipset | **Infineon**<br>• Software Defined Radio<br>– Programmable protocols<br>– Support for all major frequency bands<br>• High volume / Low cost chips<br>• Lower power consumption | **Qualcomm**<br>• Qualcomm Chipset<br>– sHRPD Satellite Protocol in future chips<br>• Significant downstream channels<br>• High volume / Low cost chips<br>• Universal – 3GPP, 3GPP2, CDMA |
| Satellite Base Stations | **Hughes Network Systems**<br>• Native support for GMR3-G Satellite Protocol | **Alcatel-Lucent**<br>• Leverage Commercial Base Stations<br>– Higher Volumes |

# Addressable Wireless Market Segments

**A number of wireless market segments would benefit from the addition of TerreStar service capabilities**

## Government & Public Safety

- First Responders, Public Safety Personnel & Essential Mission Critical Personnel
- Continuous coverage when terrestrial networks are unavailable

## Industry/Enterprise

- Need for communication and vertical applications for business continuity and in remote areas
- All enterprise markets, including finance & insurance, transportation & logistics, extractive industries, oil & gas, agriculture, forestry, etc.

## Outdoor Adventurers

- Adventurous travelers to parks and nature areas, leisure boaters, ATV/4x4/snowmobilers, mountain bikers...
- For use in emergencies and occasional communications

## Rural Population

- Consumers and small business users living/working in areas where terrestrial coverage is poor
- For use for basic communication

## Safety Conscious

- Risk averse business and consumers willing to pay a premium for safety and peace of mind
- For use primarily in emergency situations

# Significant Progress on Roam-In

**TerreStar has made significant progress towards launching the Roam-In business**

## Execution of Roam-In Plan

| Perfected Spectrum & Secured License | Technological Ecosystem | Roaming-Agreements | Third Party Distribution Agreements |
|---|---|---|---|
| • Successfully launched satellite into orbit on July, 1 2009<br>• First successful call over satellite using TerreStar smart phones completed on July 19, 2009<br>• All FCC and IC milestones achieved<br>• January 2010 - FCC granted license to TerreStar integrate terrestrial use of its 20 Mhz S Band spectrum into its next-generation mobile wireless network. | • Integrated satellite / ground-based design<br>• Handsets achieved FCC and industry certification in December 2009<br>• Third-party handset certification process underway<br>• R&D agreements in place with Infineon and Qualcomm for chip development<br>• Nokia base stations available, with next gen LTE versions expected to be available in 2011 | • AT&T roaming agreement executed<br>• In discussions with other carriers | • AT&T distribution agreement executed<br>• Significant progress in negotiating distribution agreements with third-parties<br>• Creates a distribution channel for TerreStar handsets and satellite services<br>• Currently integrating logistics, provisioning, billing and customer care operations with initial MNO. |

**Roam-In Revenues Expected To Begin in 2010**



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# ATC Opportunities

**Several Integrated Satellite / ATC opportunity classes identified**

- 4G upgrade for existing carriers
- 4G capacity expansion for existing carriers
- Market / geographic expansion
- Industry vertical applications (Smart Grid, transportation, government…)

- **Project activity underway in all classes**
- **Commercial availability of 2.0 GHz LTE equipment expected in 2011**
- **4G demands even more spectrum for implementation**
- **TS-2 (ground spare) 85% complete and on schedule at Space Systems Loral (SSL) to permit commencement of commercial ATC operations in late 2010**