MULTITECH®

CBRS

How shared spectrum enables Private LTE/5G Networks

PCB Carolina 2023

MultiTech Overview

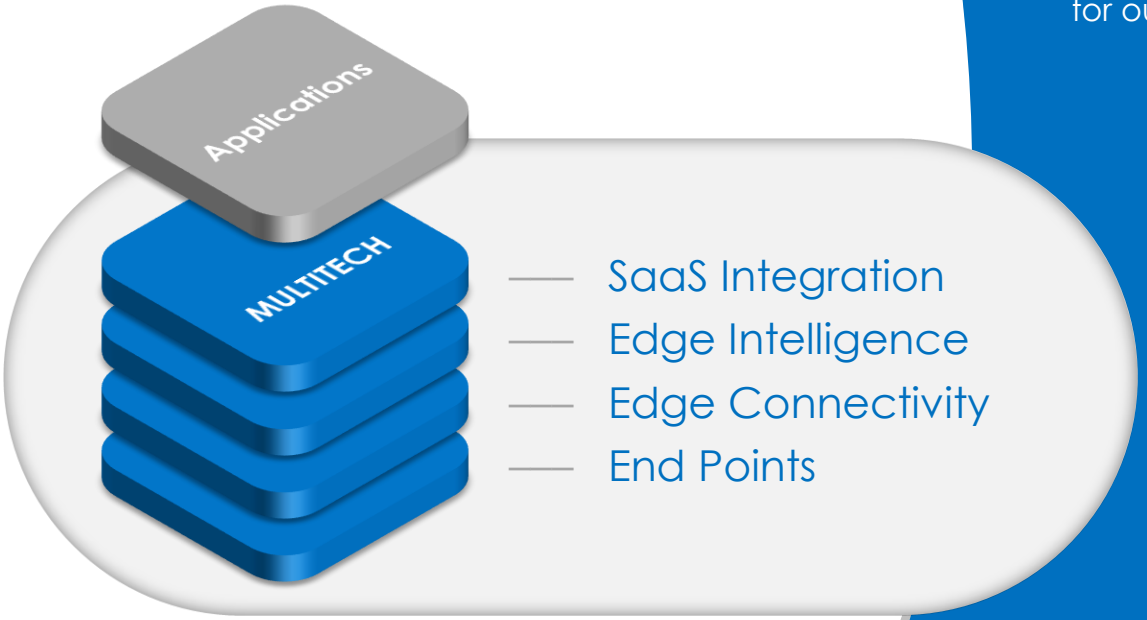
HQ	Minnesota, USA
Locations	USA (HQ), Canada (Engineering and operations), UK, DE, JP (Representative office), Global Manufacturing in US, CA and five Southeast Asian locations
Ownership	Privately Owned
Established	1970
Technology	LoRaWAN, Bluetooth, Public and Private cellular, Sensing and sensor integration, Cloud SaaS
Deployment	Over 120 million devices worldwide
Industry Associations	LoRa Alliance, 3GPP, CBRS Alliance, Entelec, Global Certification Forum (GCF), IoT M2M Council (IMC)
Quality Standards	ISO 9001, ISO 13485, UL, CSA, CE, UKCA, IPC manufacturing standards, NIST Cybersecurity Framework
Engineering	• In-house software, hardware and mechanical design and development • In-house EMC, Safety, and RF test labs

bsi. ISO 9001 Quality Management FM31060

bsi. ISO 13485 Medical Devices Quality Management FM 586973

MultiTech's Products Simplify the Journey

Our standard and customized wireless sensing and communication products use proven, standards-based technologies and open architectures to simplify the creation of connected products and connected services, reducing time, risk and effort for our customers.



Enterprise Wireless Connectivity

Open Standards Based Technology

eMBB
High data rates, high traffic volumes

- Low-Latency
- Uplink Data Rates
- Spectrum Availability

5G

5G Core Services

mMTC
Massive number of devices, low cost, low energy consumption

URLLC
Very low latency, very high reliability & availability

Benefits of Private Cellular Enterprise Networks

Remove the Wire!

- Wiring is a significant cost of a deployment
- Mobility and flexibility to fixed assets
- Connecting underserved assets

Improved Performance

- Secure predictable reliable coverage and capacity
- Enhanced Mobility & Range
- High Reliability SLAs, traffic priority (QoS)
- Extend performance and range of other RF networks

Enterprise Grade

- Simple Access to Spectrum
- Capitalized OnPrem edge to cloud compute
- Open ecosystem and standards
- Network convergence – LPWA, Wi-Fi ….

5G Era Disruption

- Mission-Critical Ultra Reliable Low Latency connectivity
- Local Process and Control Automation
- Cross Vertical Integration
- Investment continuity

How to Acquire Wireless Spectrum

LICENSED

EXCLUSIVE ACCESS
WIDE AREA NETWORKS

Carrier Grade Access

Good for:
- High Availability
- Quality of Service
- Long Service commitment

Not good for:
- High Upfront Cost
- Coverage across many sites
- May not be a 3GPP band

SHARED

PRIORITY ACCESS
CAPACITY & COVERAGE

Well established standards

Good for:
- Easy to Deploy
- Low/free licensing costs
- Metro-indoor & site coverage

Not good for:
- Nationwide Coverage
- Complexity of Sharing

UNLICENSED

ANYONE CAN
USE INDOOR

Not likely to be real till 5G

Good for:
- Ease of deployment
- No License costs
- In-building coverage

Not good for:
- Mission Critical Applications
- Outdoor Macro coverage

What is CBRS?

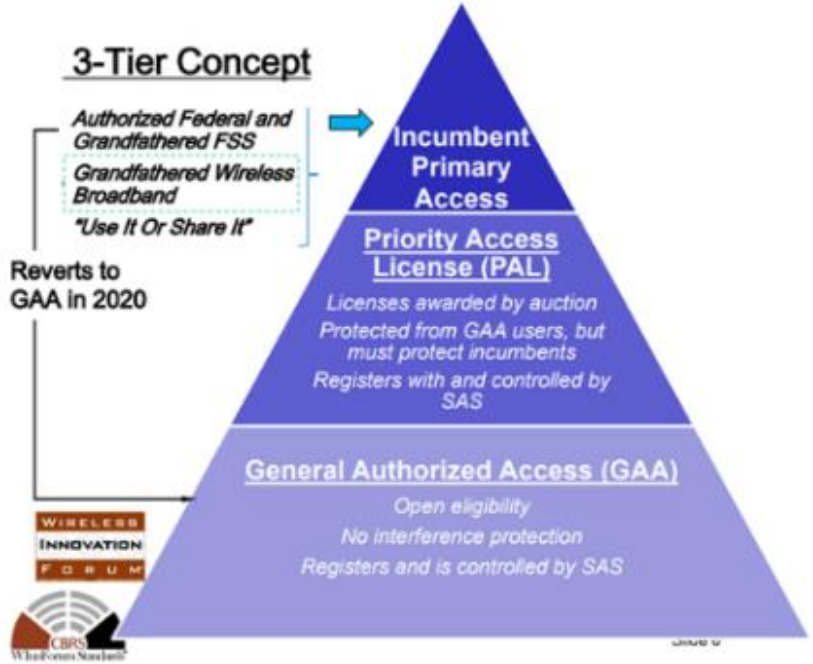
Citizen Broadband Radio System Shared Spectrum

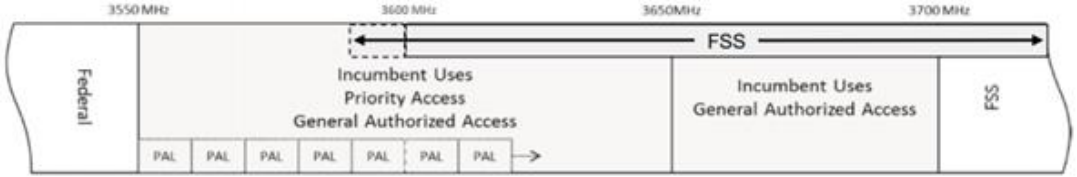
Shared 3.55-3.7 GHz Mid-Band 150MHz Mostly Fallow Spectrum!

Incumbents
- Navy RADAR and fixed satellite stations (FSS)

Priority Access Licenses (PAL)
- Up to 7 *10 MHz channels were auctioned by FCC in 2020

General Authorized Access (GAA)
- 80 – 150 MHz of open (shared) access similar to unlicensed spectrum



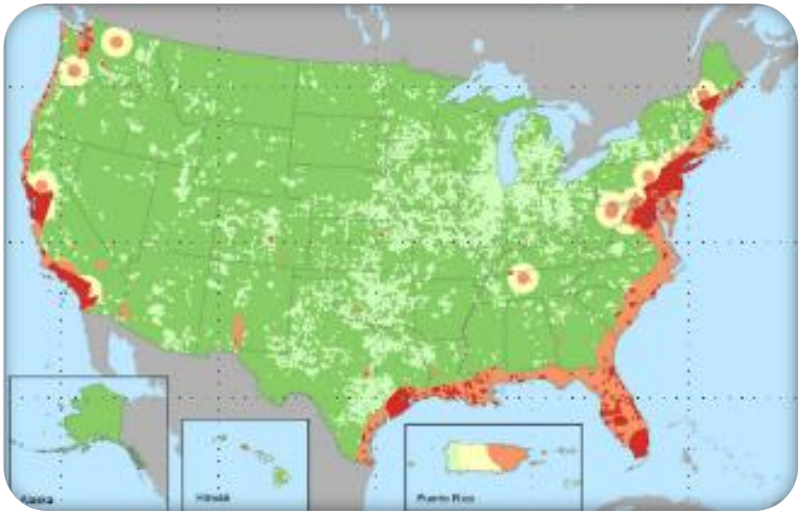


Protected Zones & FSS Earth Stations

Grandfathered Licenses Expired in 2020

- SAS with ESC (Environmental Sensing Capability) required for coastal operation 3550-3700 MHz
- Fixed Satellite Service (FSS) are protected, may impact GAA

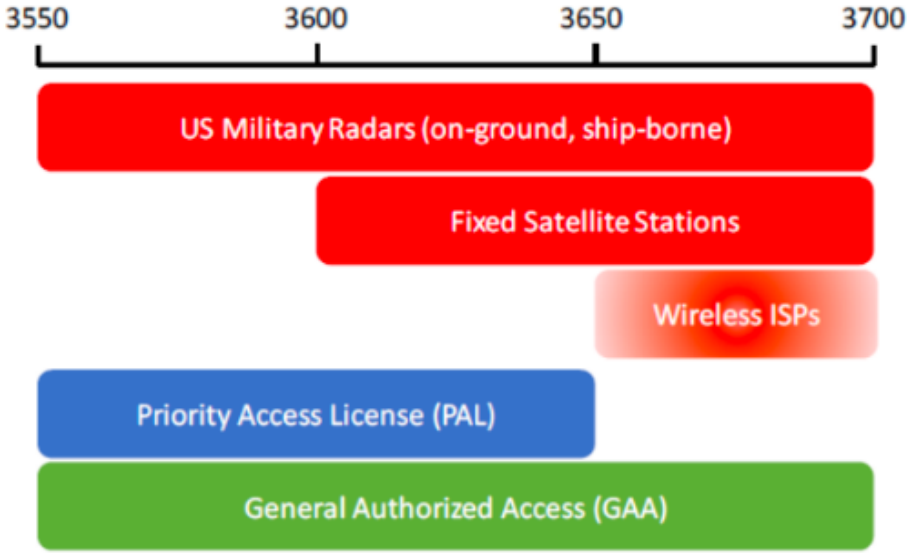
Federal & FSS Protected Zones



Grandfathered Licenses

PAL Auction Raised $4.6B – Aug 2020

FCC Auction 105 sold 20,625 licenses to 228 bidders



Seven PAL Blocks in 3,233 Counties (22,631)

- 10-Year License with Auto-Renewal
- Each PAL License is 10 MHz Channel
  - Located within 3,550 – 3,650 MHz
- Max 40 MHz per County per Licensee
  - PALs may be contiguous - or not
- Only 13 counties did not sell a PAL
- 2,545 counties sold all 7 PALs
- 688 counties sold less than 7 PALs
- Areas where a PAL is not Operating, Remain GAA
- 50%+ Build-out within 10 years
  - Could be achieved through sub-licensing

End-to-End Cellular CBRS Networks

Key Building Blocks

Devices

CAT A

- Indoor/Outdoor <6m
- EIRP < 30dBM/10MHz

CAT B

- Outdoor mounted
- Professional Install
- EIRP < 47dBm/10MHz

CBSD (RAN)

OnGo

Lte

5G

FCC Database

SAS Introduced by FCC to manage spectrum grants

- Access
- Interference
- Power & Frequencies

SAS

ESC Network

Core 5GC – 4GEPC

Incumbent (tier 1) Spectrum use must be detected by ESC in coastal zones

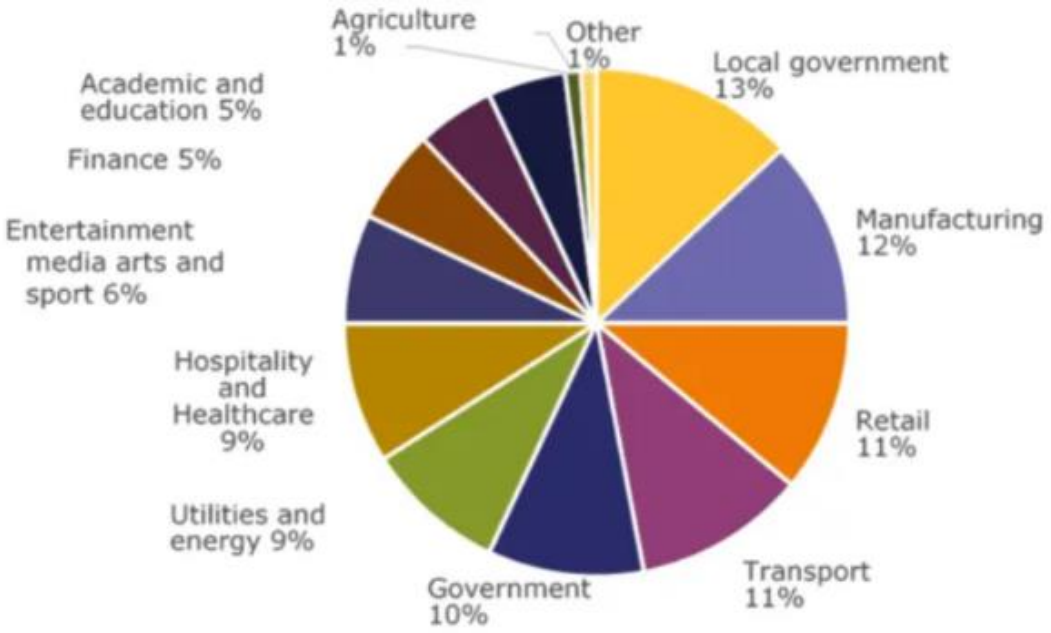
- CBSD channel reassigned < 5 mins

IoT Platform Apps

Market Drivers for LTE based Private Networks

Top Industries:

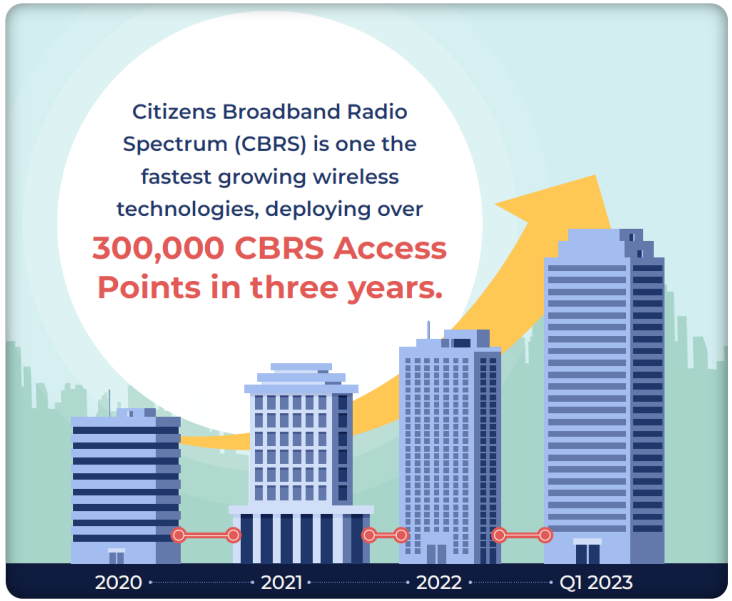
1. Industrial 32% Manufacturing, Transportation, Utilities & Energy
2. Government 23%
3. Hospitality 15% Entertainment & Healthcare
4. Retail / office 12-19%



Source: Small Cell Forum (SCF) Report 'market drivers and use cases for LTE-based private networks'

CBRS on a Fast Growth Track

- CBRS deployments grew 121% from April 2021 to January 2023
- 85% of active CBSDs grants were GAA-only
- 78.1% of counties nationwide had at least one active CBSD



Sources: CBRS Alliance & US Dept. of Commerce (NTIA)

Enterprise Cellular Go To Market

Module & Devices

Telit
MULTITECH
QUALCOMM
SEQUANS

Base Stations & Small Cells RAN + Core Vendors

ERICSSON
QUCELL
CISCO
Airspan
druid
NOKIA
redline communications
affirmed
BaiCells
ATTOCORE
RUCKUS an ARRIS company
JMA WIRELESS
HUAWEI
Telrad
Quortus
Alelleran
SERCOM
Radisys
SAMSUNG
MOTOROLA SOLUTIONS
Cambium Networks
ATHONET
ip access
CORNING
ceragon

Service Providers

boingo
Geoverse
syniverse
verizon
airtower NETWORKS
CROWN CASTLE
AMERICAN TOWER
mobilitie
DENSE AIR
Connectivity
WISPA
exteNet

System Integrators

Tech Mahindra
HCI
Pierson WIRELESS
CROSSOVER
Infosys
USA
RF CONNECT
future TECHNOLOGIES
Insight
ANS Advanced Network Services

CBRS SAS Vendors

amdoc
Google
COMMSCOPE
SONY
federated wireless

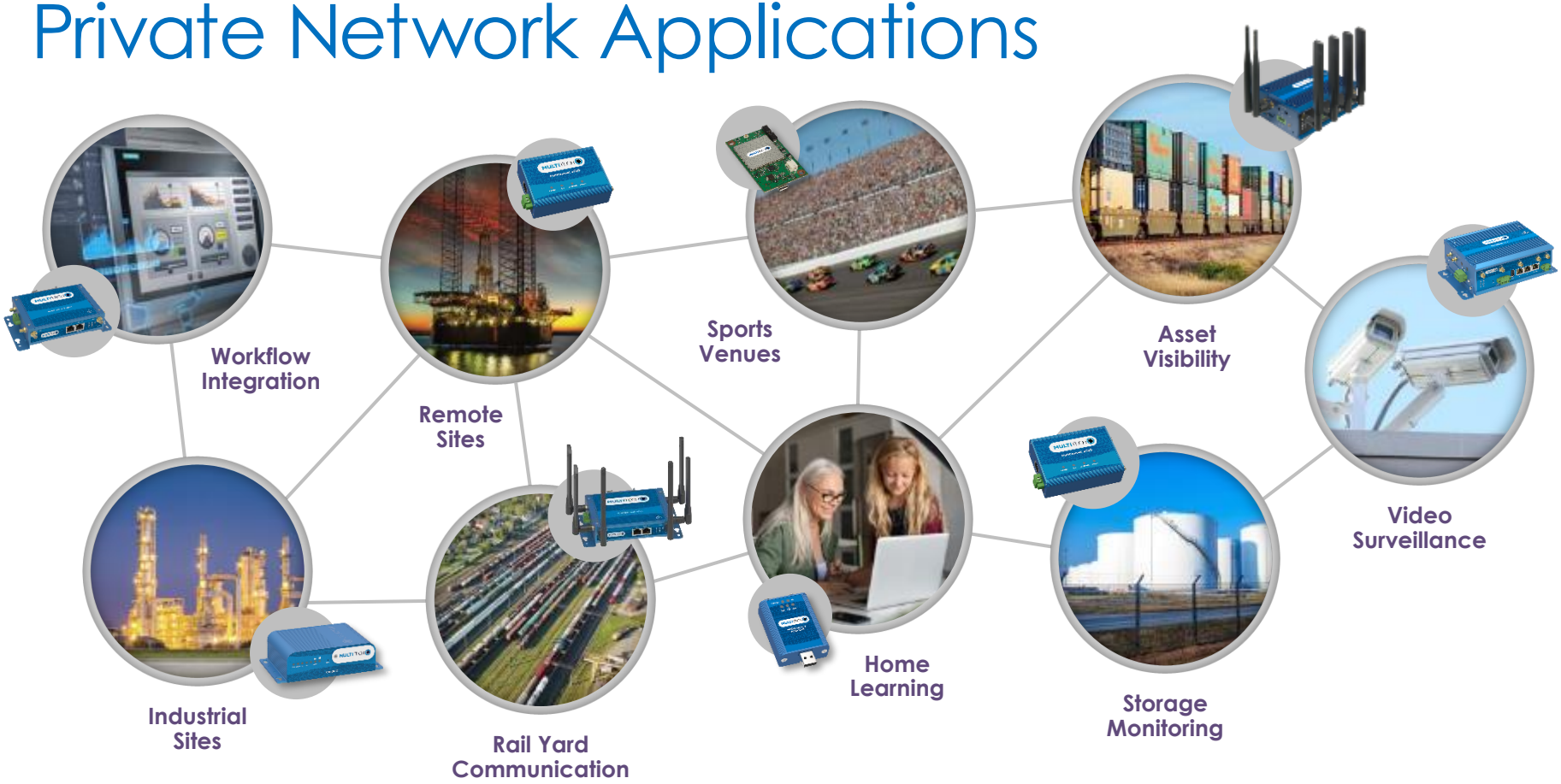
Distributors & VARs

SYNNEX CORPORATION
INGRAM MICRO
scansource
Digi-Key
AVNET
GraybaR

Data Management

aws
Azure
IBM

Private Network Applications



Autonomous Forklift Vehicles

Warehouse Logistics

SETUP:

- FCC Band 48-CBRS 3.55-3.7 GHz 4G-LTE Cat 12

WHY:

- Expedited Supply chain Complexity
- Worker Shortages & Improved Safety
- Standardizing Workflows

REQUIREMENTS:

- Full Mobility with deterministic performance
- Coverage without white spots
- Highly scalable across locations
- Predictable Low-latency

Climate & Access Control

Commercial Real Estate

SETUP:

- FCC Band 48-CBRS 3.55-3.7 GHz 4G-LTE Cat 12

WHY:

- Secure & safer smart properties
- No costly cable runs
- Instant anywhere control & visibility
- Unauthorized access notifications

REQUIREMENTS:

- Deterministic latency under 50ms
- 50 MB data performance
- Prioritized traffic profiles for different asset classes

Robotic Equipment

Smart Manufacturing

SETUP:

- 5G SA network using n48 – FCC CBRS 3.55-3.7 GHz

WHY:

- Manufacturing Agility
- Remote management and control

REQUIREMENTS:

- 1GB+ data performance
- Deterministic latency under 50ms
- Privacy of data remaining OnPrem
- Cost effective coverage
  - 10:1 improvement over Wi-Fi APs
- Spectral efficiency & mgmt
- Prioritized traffic profiles for different asset classes

CBRS Recap

CBSD:
Citizens Broadband Radio Service Devices

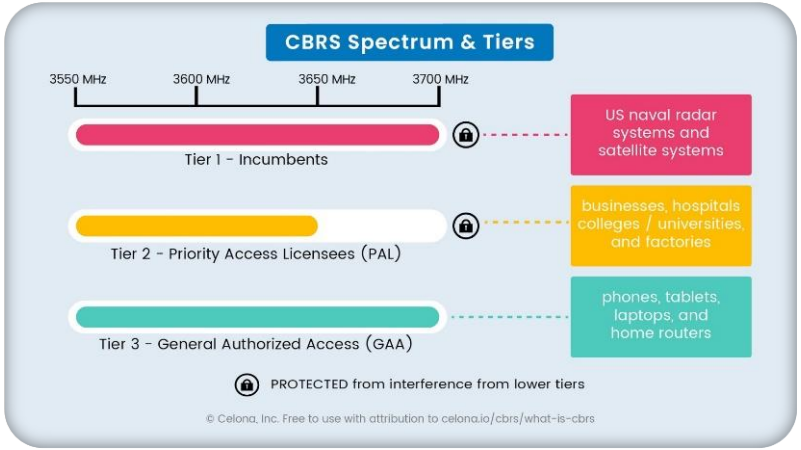
- Base station / CBSD (eNodeB)
- Interfaces with SAS

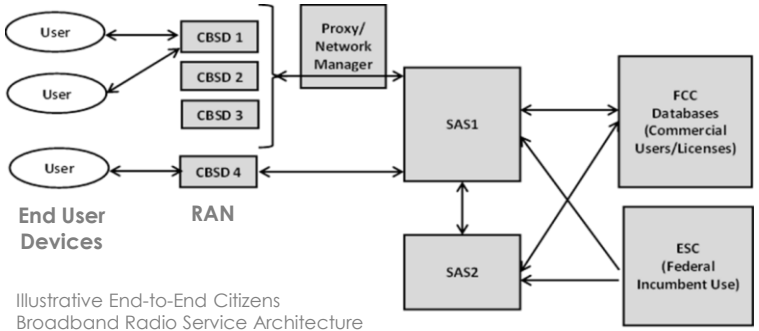
SAS: Spectrum Access System Database

- Allocates allowed spectrum and maximum transmission power to CBSDs
- Provides interference protection: PAL/GAA to Incumbents, PAL to PAL, GAA to PAL

ESC: Environmental Sensing Capability

- Detects signals from Tier 1 Incumbents and informs SAS
- SAS re-allocates CBSDs as needed





Illustrative End-to-End Citizens Broadband Radio Service Architecture

MULTITECH®

Unlocking the potential of
the Internet of Things

Thank You

for additional information
please contact:

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