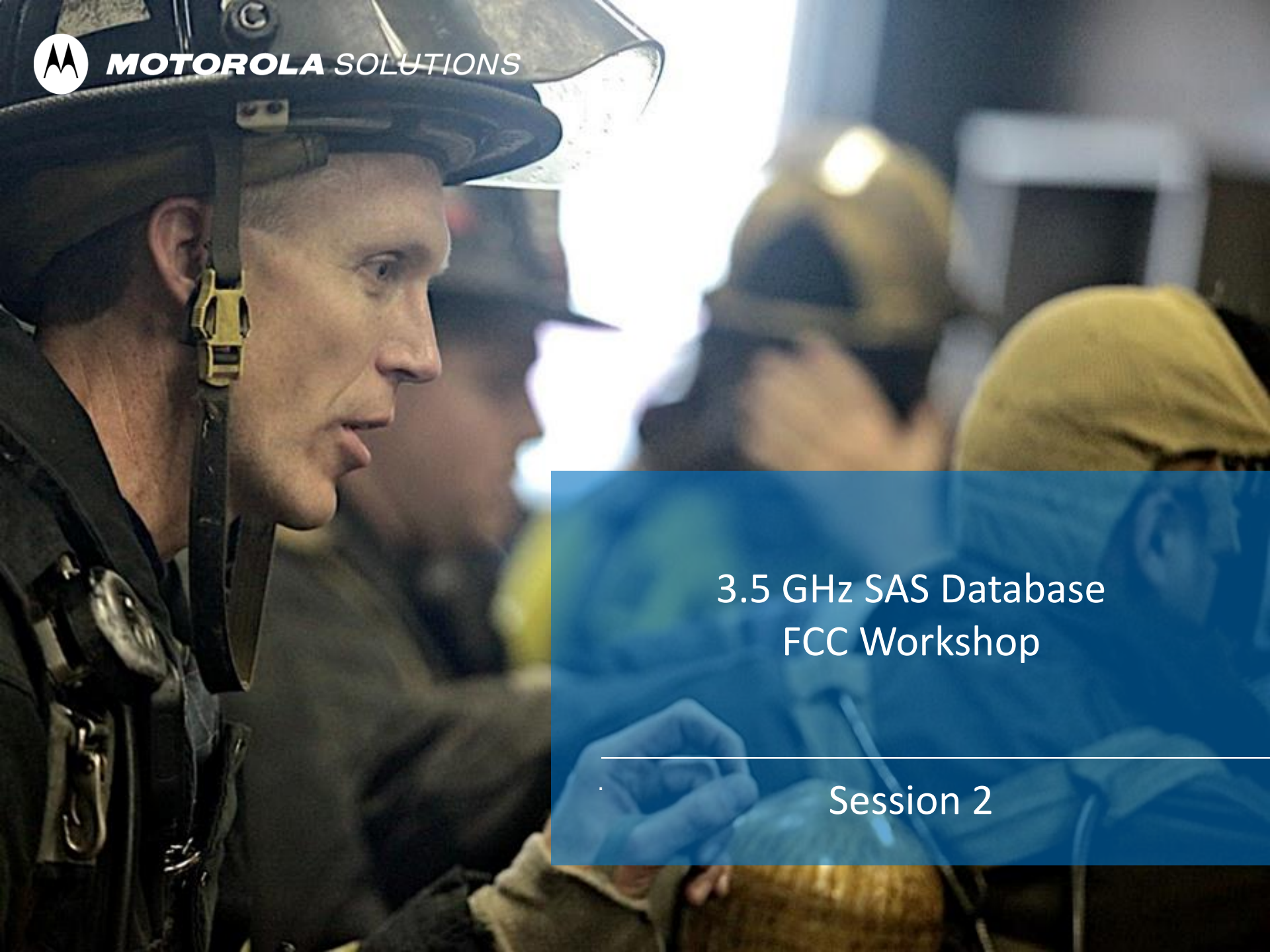



# 3.5 GHz SAS Database
# FCC Workshop

## Session 2

# Required SAS Database Capabilities…

- Some 3.5 GHz SAS Database principles…
  - Should support multiple classes of users…
    - 100-150MHz of spectrum should be able to support wide range of users…
    - Including Commercial Service Providers (e.g., LTE small cells, WiFi hotspots), General Authorized Access (e.g., consumer WiFi), and Critical Access Uses (public/life-safety, critical infrastructure)
    - Should assure at least some access to spectrum for each class of user…
    - Should support a wide range of use cases and network topologies (e.g., small cell, WiFi, WANs, backhaul, etc.)
    - Flexible/adaptable approach is preferable, to adjust to demands over time and geography
  - Must always protect higher tier users from interference caused by lower tiers…
    - Responsible for managing overall interference in the band & aiding coexistence
    - Lower priority users must reduce power to avoid interference…
    - Encourage spectrum use wherever possible (even at reduced transmit power levels)
    - Range of higher tier (incumbent, priority/critical access) users may be dynamic in nature… near real-time support required
    - Use industry standards (e.g., 3GPP, IEEE) as a baseline for interference protection requirements – encourage use of industry standard equipment and interfaces

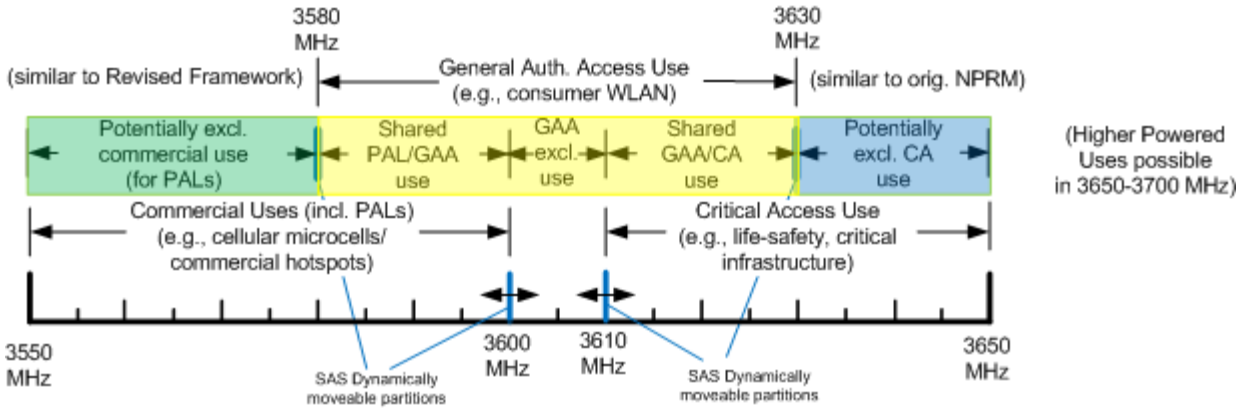
# Similarities to TVWS Databases…

| 3.5 GHz SAS Databases | Similarity in TVWS | Comments |
|---|---|---|
| **Suggest allowing multiple databases to increase system reliability and encourage innovation** | Multiple databases are certified and operational (Equipment providers also allowed to field) | Synchronization readily achievable - performed frequently among databases today |
| **Protect 1000's of users in the spectrum** | Over 10,000 users protected (10+ incumbent types) | Allow 3.5GHz base stations to act as proxies for SAS access (as in TVWS) |
| **Protect Priority Access small cells (e.g., PAL/CA users)** | Scheduled protection of wireless microphones | Update rates on the order of minutes are possible today |
| **Protect FSS receive sites** | Cable headend / BAS / TV translator receiver protection | Should take into account antenna pointing angle (azimuth and elevation) |
| **Utilize industry and FCC approved equipment classes and interference protections** | Utilized FCC and industry recommended interference protections (e.g., OET69, ATSC A/74, F-curves, TM-91) | Should allow industry standard technologies to be used (e.g., LTE, WiFi, etc.).<br>Allow PAL/CA users to self-manage interference *within* their systems.<br>Suggest use of multi-stakeholder groups to resolve interference issues. |

# Modifications to TVWS Databases…

| 3.5 GHz SAS Databases | Difference from TVWS | Comments |
|---|---|---|
| **Support priority access to spectrum and associated interference protections** | Essentially one tier of unlicensed user in TVWS | Needed for commercial and critical access uses – interference protection paradigm is similar as for incumbents though |
| **Support several different classes of secondary user equipment** | Essentially one type, with very stringent TX spectral mask | Equipment class and FCC ID can specify equipment capability (max. power level, OOBE, etc.) |
| **Allow maximum transmit power levels to be computed (if desired)** | Highly limited number of power levels supported in TVWS (e.g., 40/100mW, 4W) | Encourages much better spectrum utilization |
| **Faster database update rates required (e.g., on the order of 15 minutes)** | Daily updates required in TVWS | Needed for incumbents , and highly efficient spectrum utilization |
| **Potential to support interference environment measurements** | Not required in TVWS | Allows SAS to identify unauthorized users of spectrum and better track interference |

# A Highly Flexible Band Plan for 3.5 GHz…




- Hybrid approach assures some spectrum is available for all classes of users
  - Commercial Service Providers (e.g., PALs) / General Authorized Access (e.g., consumer) / Critical Access (e.g., public/life-safety) users
  - Critical Access users not typically commercially motivated (not well suited for PALs)
  - Supports market development of a wide range of technologies and services
- Dynamic partitions allow spectrum to be adapted for geography and usage over time
  - Can be a market-driven mechanism…
  - Allows urban areas to have more dedicated Commercial/PAL spectrum…
  - Allows regulators to change spectral mix over time using SAS system…

# In Summary…

- Opportunity for highly efficient spectrum usage…
  - 3.5GHz SAS Rollout should support a wide variety of technologies
    - Assure spectrum availability for variety of users/markets
    - Utilize industry standards wherever possible
    - Generally encourage (but not require) device frequency agility and power control
  - Allows for flexible spectrum management…
    - Provisions for adjusting spectrum usage over time and geography
    - Assures spectrum is effectively utilized
    - Readily allow new services to be rapidly added to the band…
  - Near real-time database technology exists and can support operation…
    - Can facilitate orderly co-existence in the spectrum among multiple services
    - Database update rates on the order of minutes possible…
    - Database security and privacy are key issues (protecting user information)