



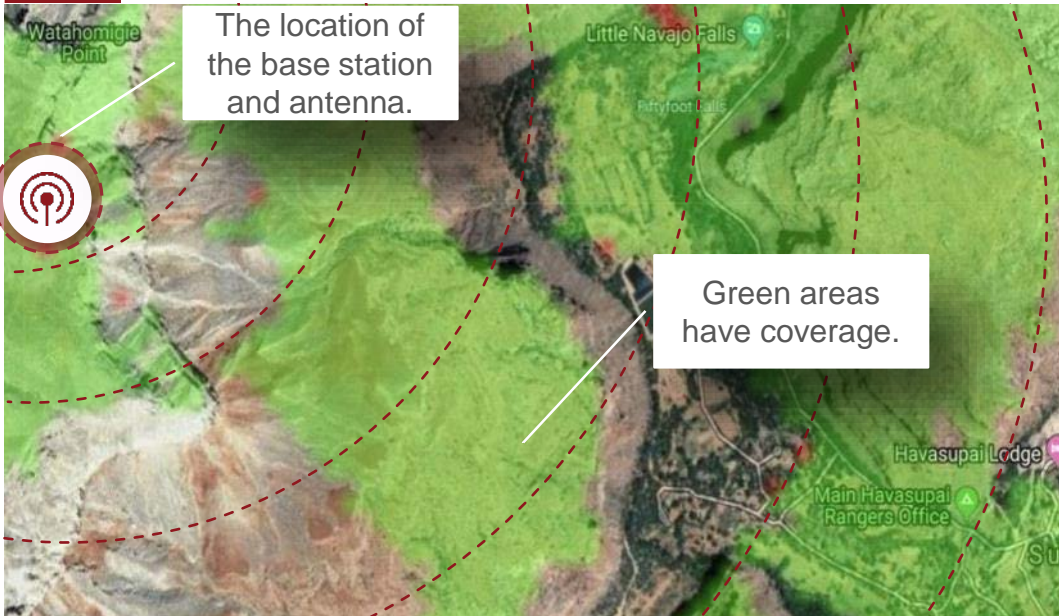
2.5 GHz Networks on Tribal Lands

MuralNet is a nonprofit whose goal is to develop and execute a strategy for bringing broadband to under-connected people on tribal lands on a grand scale.

2017 The Havasupai Network and 2.5 GHz Spectrum

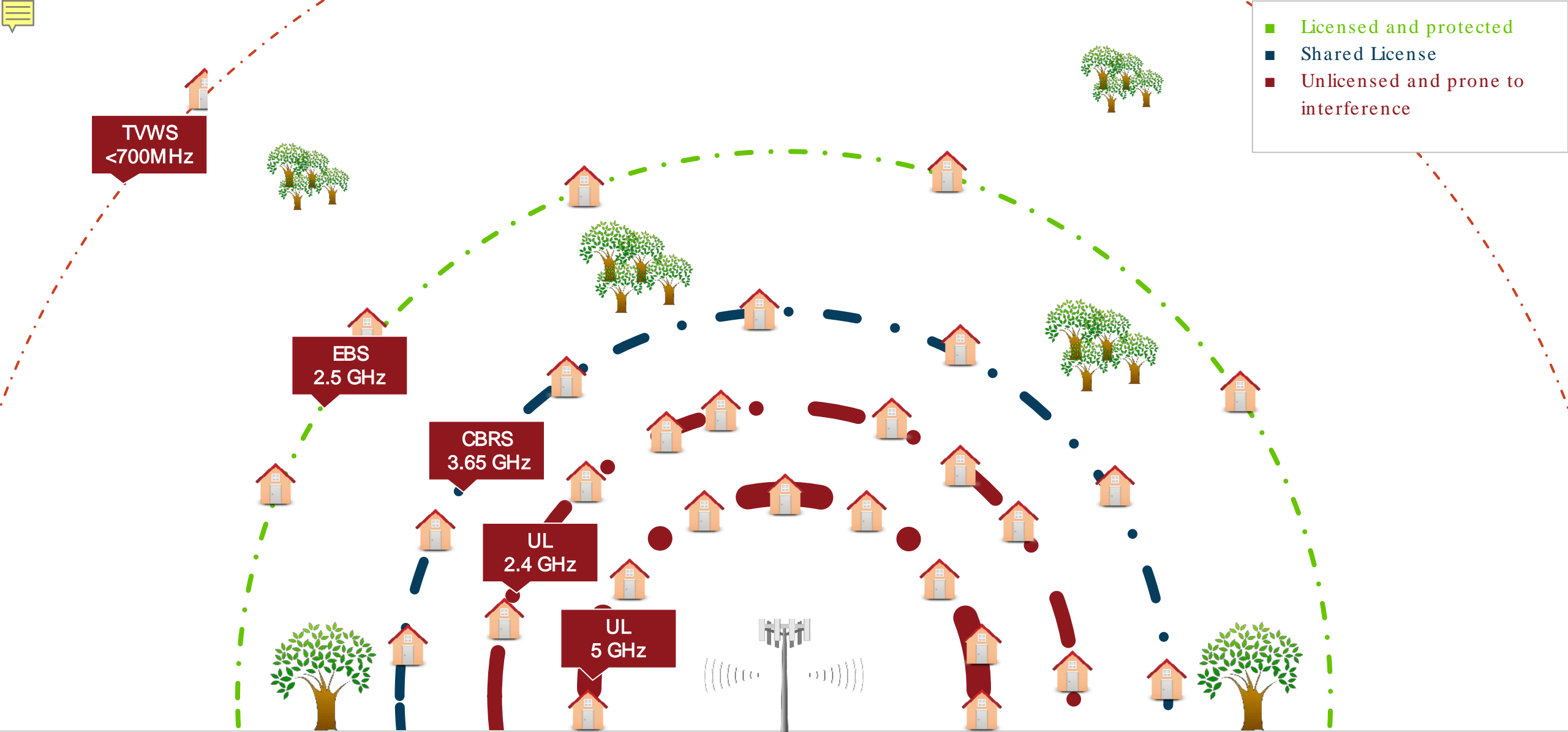


LTE Equipment and Installation	Legal Costs for Permanent License
 <p>≈\$10k to \$15k</p>	<p>≈\$25k</p>
 <p>Half a day</p>	<p>A year and a half</p>



Network Performance
 Pilot: 7 teacher homes, broadband in the center of village
 Now: 31 homes, 8/1 speeds
 Expansion: broadband to 100% of village, 75% of campgrounds





- Licensed and protected
- Shared License
- Unlicensed and prone to interference

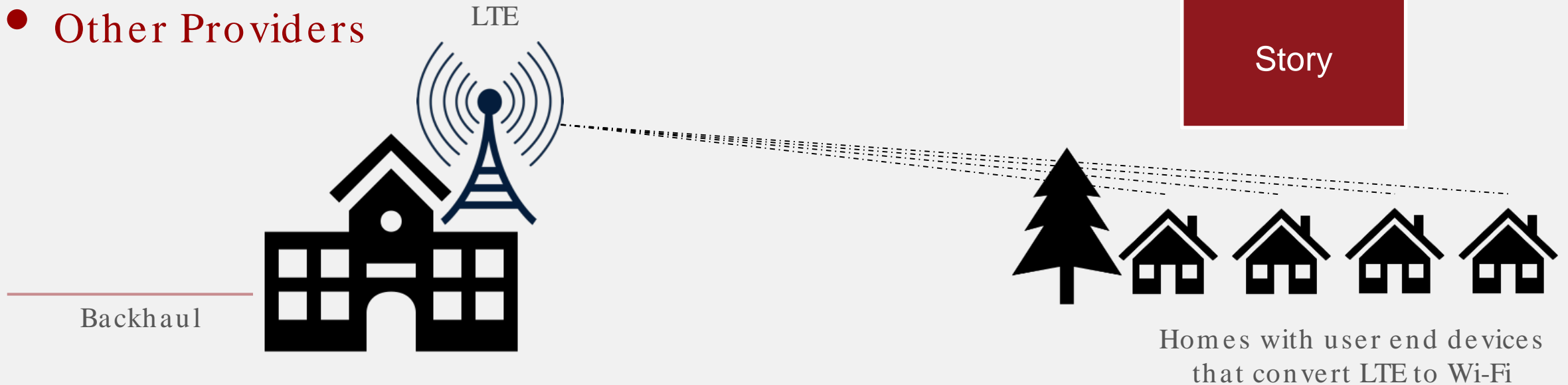
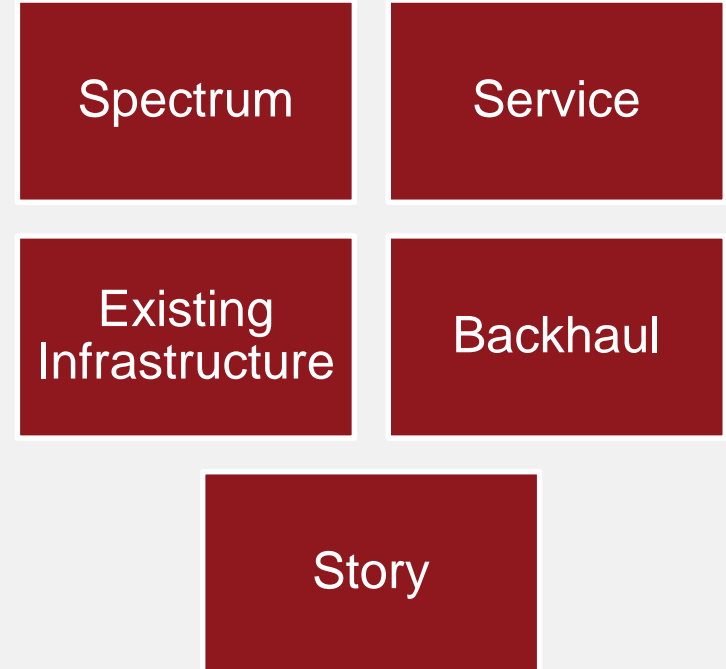
Spectrum vs. Range (Permitted power per FCC service rules assumed per band) This figure is intended only to suggest relative ranges and coverage areas among various single-carrier frequencies at a common received signal level (RSL) and noise floor throughout the coverage area, which may be above or below the lowest RSL at which a particular technology can operate, assuming sufficient SINR.

Based on graphic from Thompson, L. and Vande Stadt, W. "Vantage Point Solutions: 5G is Not the Answer For Rural Broadband" Broadband Communities Magazine, March/April 2017

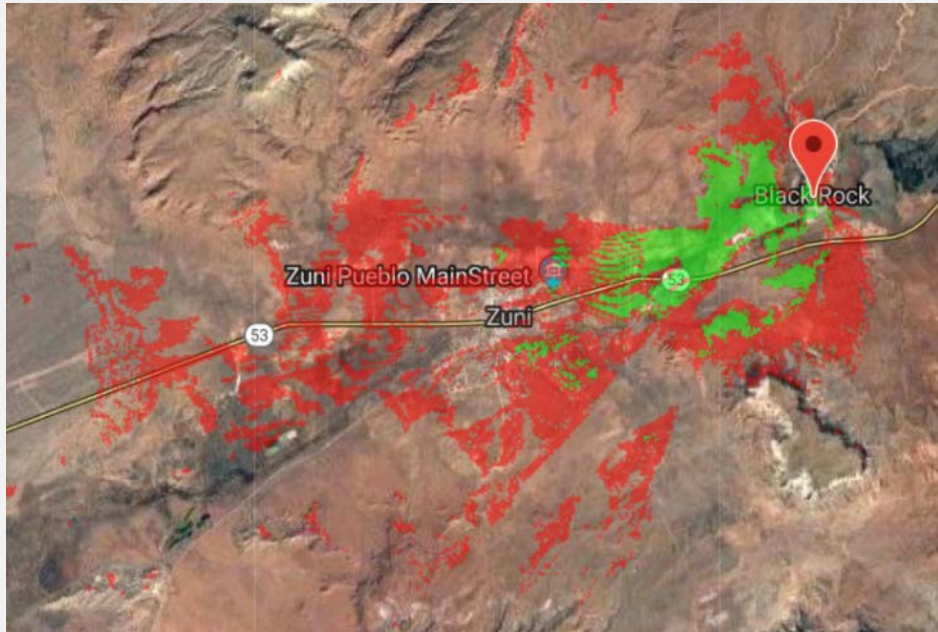
What to do with 2.5 GHz Spectrum ?

Partnerships between

- Tribal Government
- Emergency Services
- Power Companies
- Economic Development Institutions
- Educational Institutions
- Local Internet Service Providers
- Other Providers



Extending Intranet/Internet for Tribal College, 20 MHz, \$11k



Labor Tower climbers, half a day Network engineer, 1.5 days Project manager, 2 days Facilities manager, 2 days IT personnel, 0.5 days	\$600 Volunteer Volunteer In-house In-house
Permits	none since existing tower used
Equipment	\$10k
First Month of Operations	10 hours to distribute home units 2 hours to test network 4 hours to maintain network
Coverage	26 out of 40 target homes have high speed internet

Future Tribal Government Network: 40 MHz, 75-120 Connected Buildings with 10/1 to 25/3 Mbps Speeds



Labor Tower climbers, full day Remote network engineer, 0.25 days Project/facilities manager, 2 days IT personnel, 0.25 days	\$1200 Volunteer In-house In-house
Permits	none since using existing tower at the center of town
Equipment	\$25k
Backhaul	Existing provided by the Tribal government
Operations per month	4 hours to maintain network
Coverage	83% of population



Networks are Expandable



Backhaul



Arrays can use just two channel sets

What can you do with spectrum?

- ✓ Build and maintain your own network
- ✓ Lease spectrum access
- ✓ Trade spectrum access for service, backhaul, infrastructure, etc.
- ✓ Use it as collateral since spectrum licenses are a bankable asset
- ✓ Sell it after buildout requirements are met (not advised)



Contact us for help with the application process and network planning at info@muralnet.org

