Louisiana Wireless Information Network (LWIN)

Statewide Interoperability Executive Subcommittee (SIEC)

Existing Network

- Zone/Hub sites physically connect via Smartrings

- RF/Console sites T1s connected to LWIN WAN at AT&T Central offices

- T1s cross-connected using 'Flex' connectors to either channels on DS3 or to Smartrings

- DS3 channels direct connected RF/Console T1s to specific channels on the Smartrings or were used for Zone-to-Zone interconnections

- Some DS3s are/were maxed out – New sites require stand-alone P2P T1s
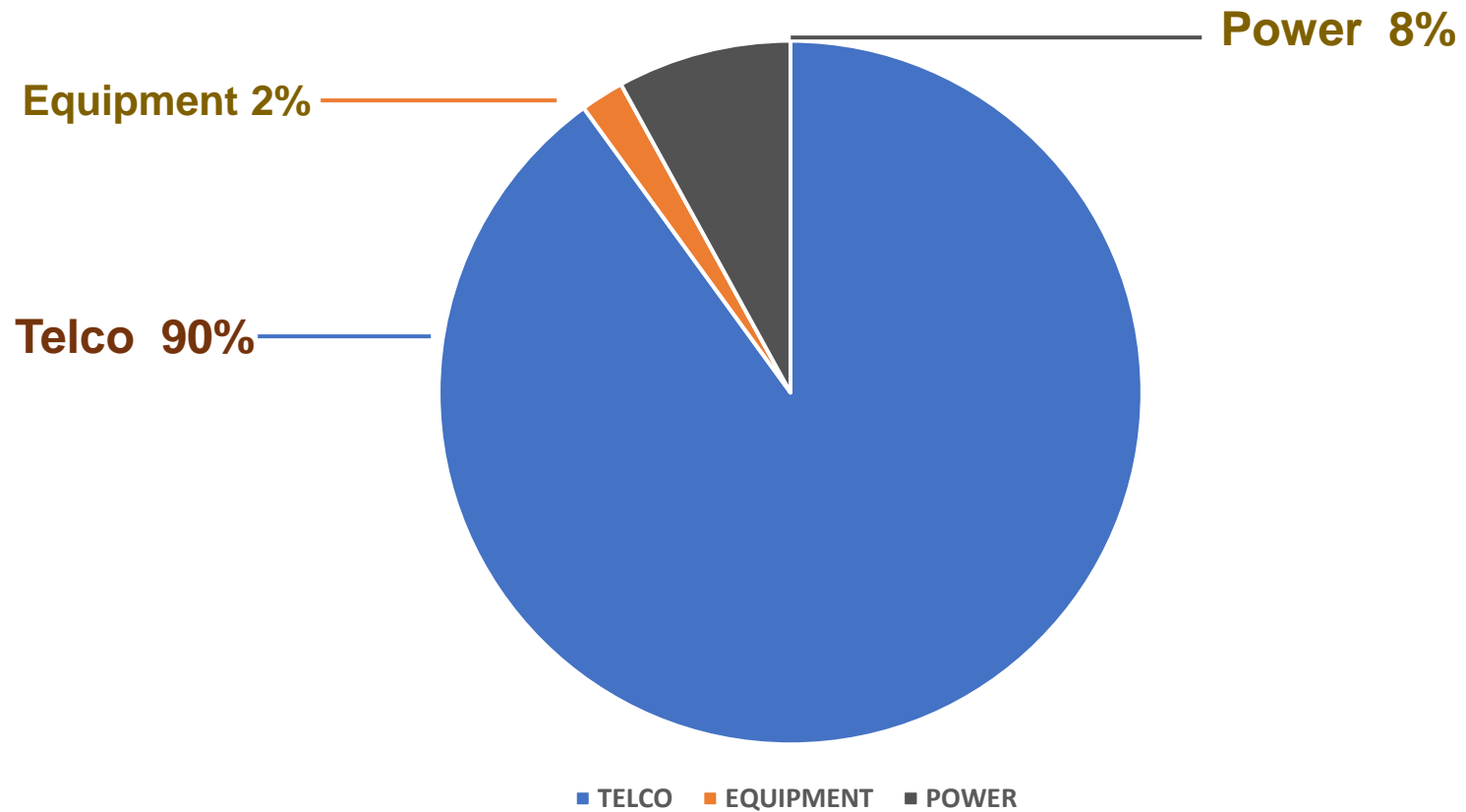
Existing Network - Challenges

- 15+ year old technology based on FCC LATA boundaries

- Static in nature

- Single connection per Rf/Console site; No redundancy

- No growth without significant additional expense

- T1s have become troublesome, more prone to failure due to aging equipment

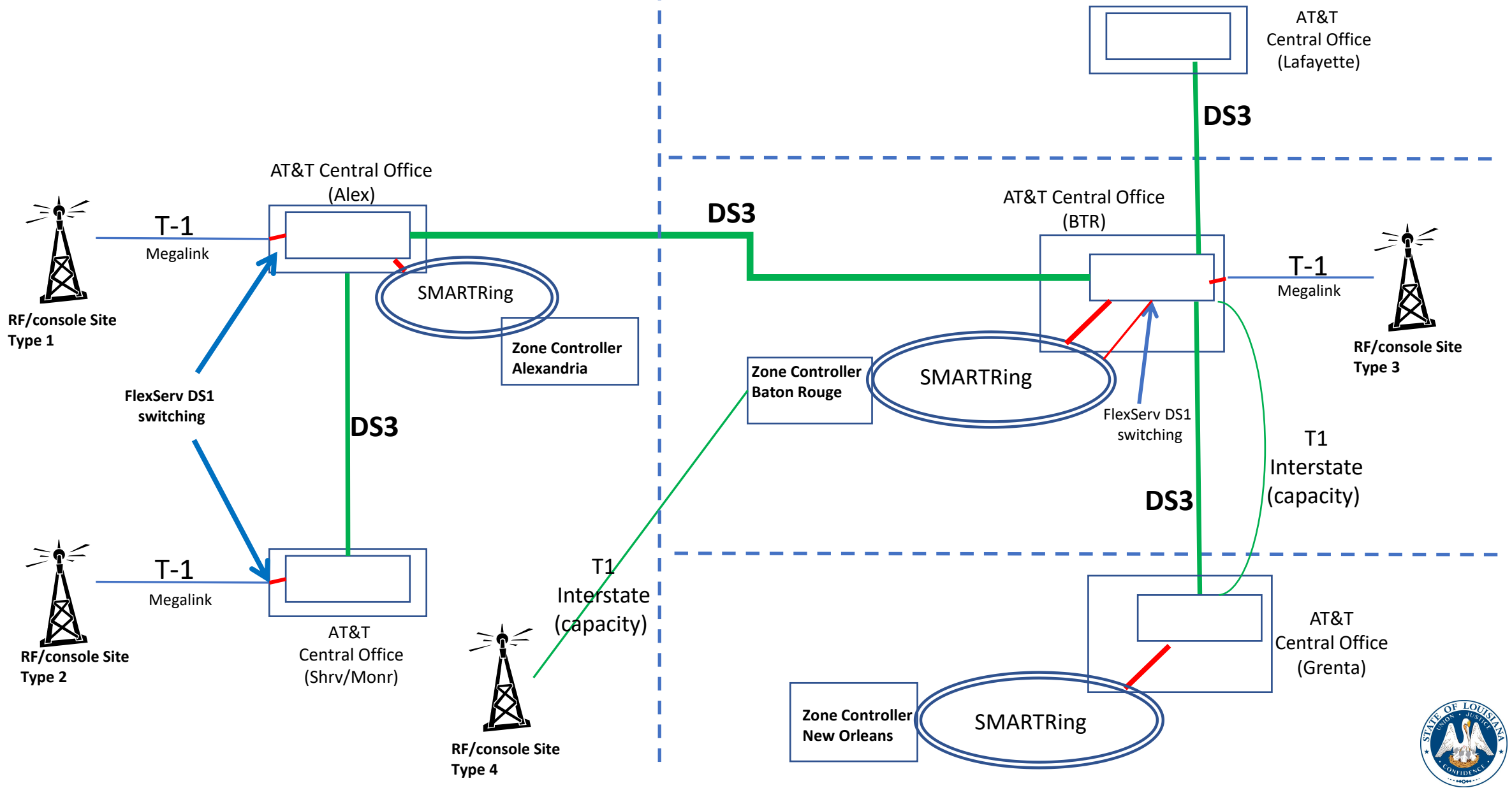- Motorola could not support T1s indefinitely & T1s will eventually be retired by AT&T **(~3 yr.)**
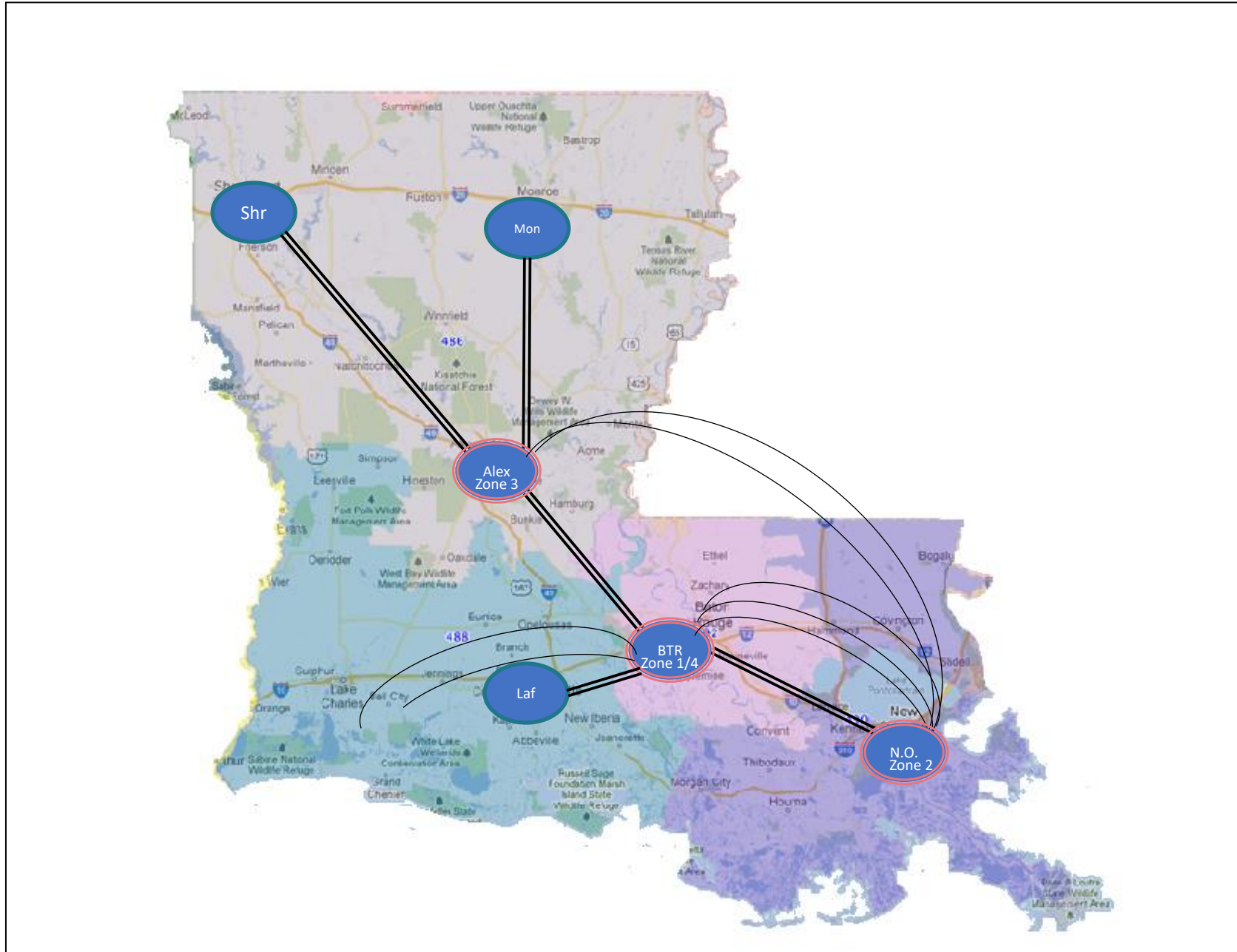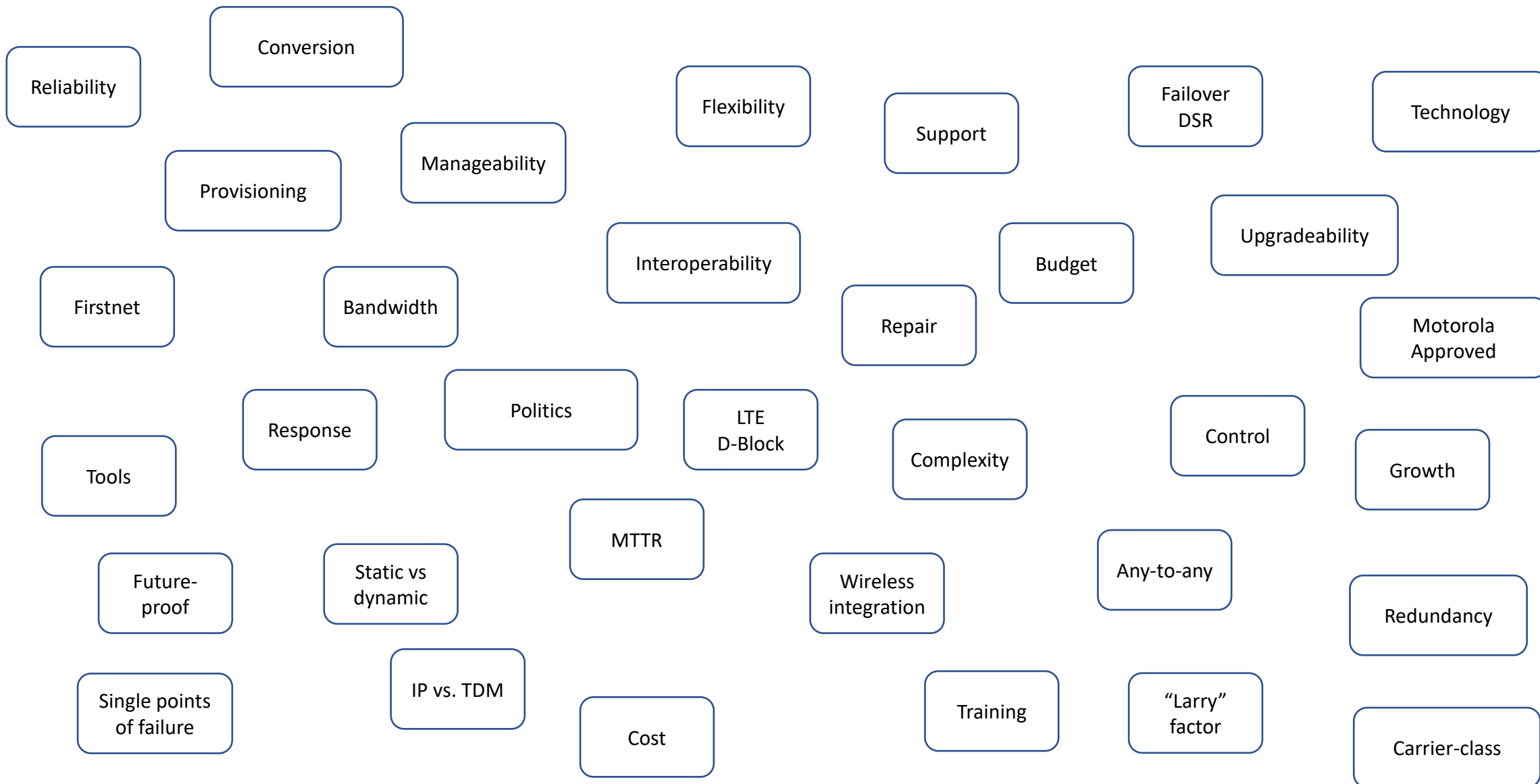
SITE OUTAGE DATA

What were the Issues?

Power 8%

Equipment 2%

Telco 90%

TELCO   EQUIPMENT   POWER

Existing Network

Existing Network

DSP LWIN Network Factors

Conversion

Reliability

Flexibility

Support

Failover DSR

Technology

Manageability

Provisioning

Upgradeability

Interoperability

Budget

Firstnet

Bandwidth

Repair

Motorola Approved

Politics

LTE D-Block

Control

Response

Complexity

Growth

Tools

MTTR

Future-proof

Static vs dynamic

Wireless integration

Any-to-any

Redundancy

Single points of failure

IP vs. TDM

Training

"Larry" factor

Cost

Carrier-class

DSP LWIN Network Factors – Organized Functionally

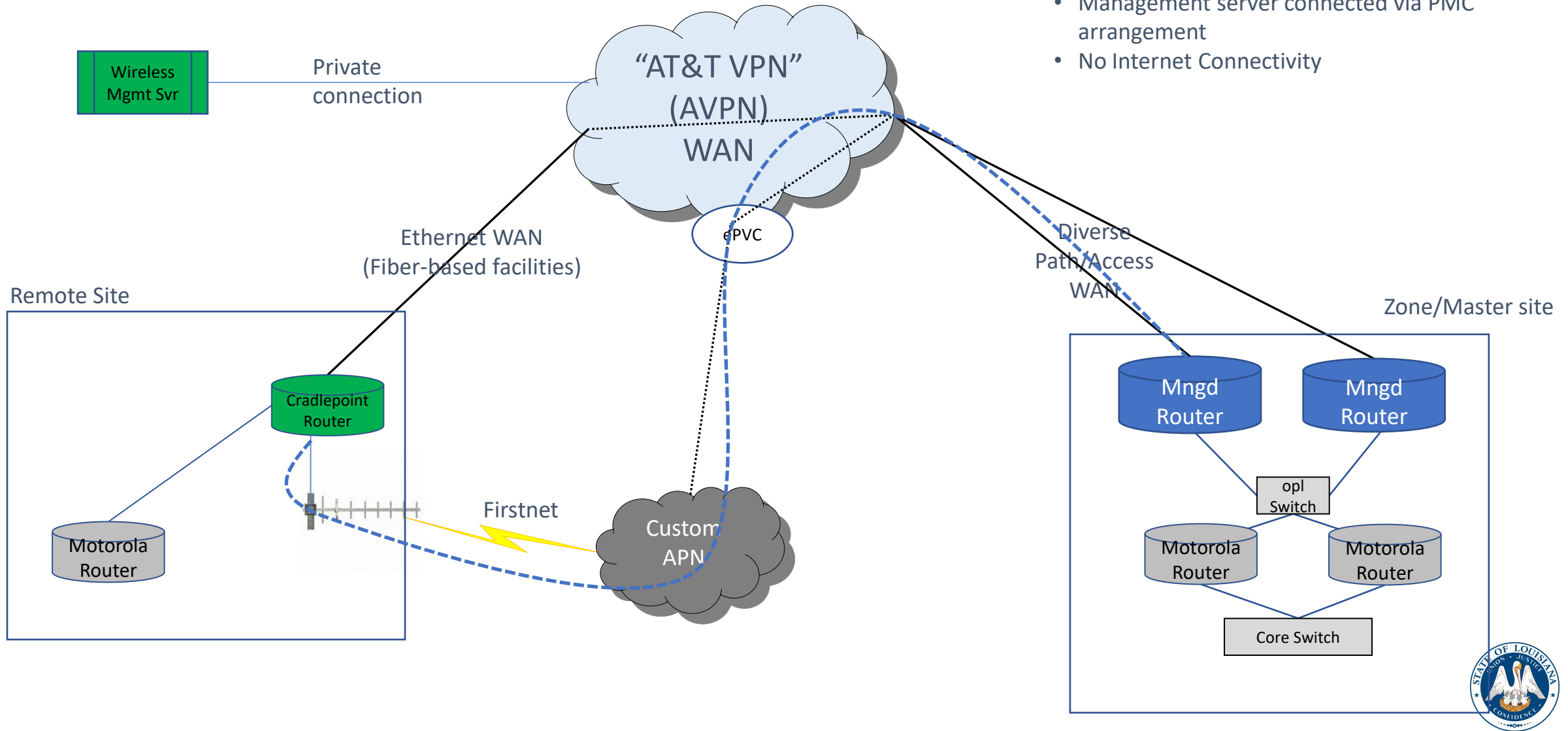| Reliability	Manageability	Cost	Flexibility	Support	Technology
Repair	Tools	Conversion	IP vs. TDM	Control	Upgradeability
Single points of failure	Complexity	Politics	Growth	Response	Wireless integration
Failover DSR	"Larry" factor	Firstnet	LTE D-Block	Training	Interoperability
Redundancy	Static vs dynamic	Budget	Bandwidth	MTTR	Future-proof
Carrier-class	Provisioning		Any-to-any	Tools	Firstnet
	Training				Motorola Approved

Network Architecture
Single Solution/Single Provider

- Meets RFP Specifications
    - Improved MTTR, Integration with FirstNet, Secure network, Centralized management, etc.
- Combines wireline and FirstNet into same network architecture
- Consistent network connectivity across entire state - No one-offs
- Upgrade network from 15+ year old technology
- Alternate connectivity at console & RF sites via Firstnet (Priority & Preemption)
- No Internet, Closed network
- Primary connection MPLS: AT&T VPN "AVPN" – Carrier-class, FCC Interstate WAN; fiber-based transport, where available, for better SLAs
- Flexibility – True any-to-any architecture

SoLA DPS - AVPN Ethernet
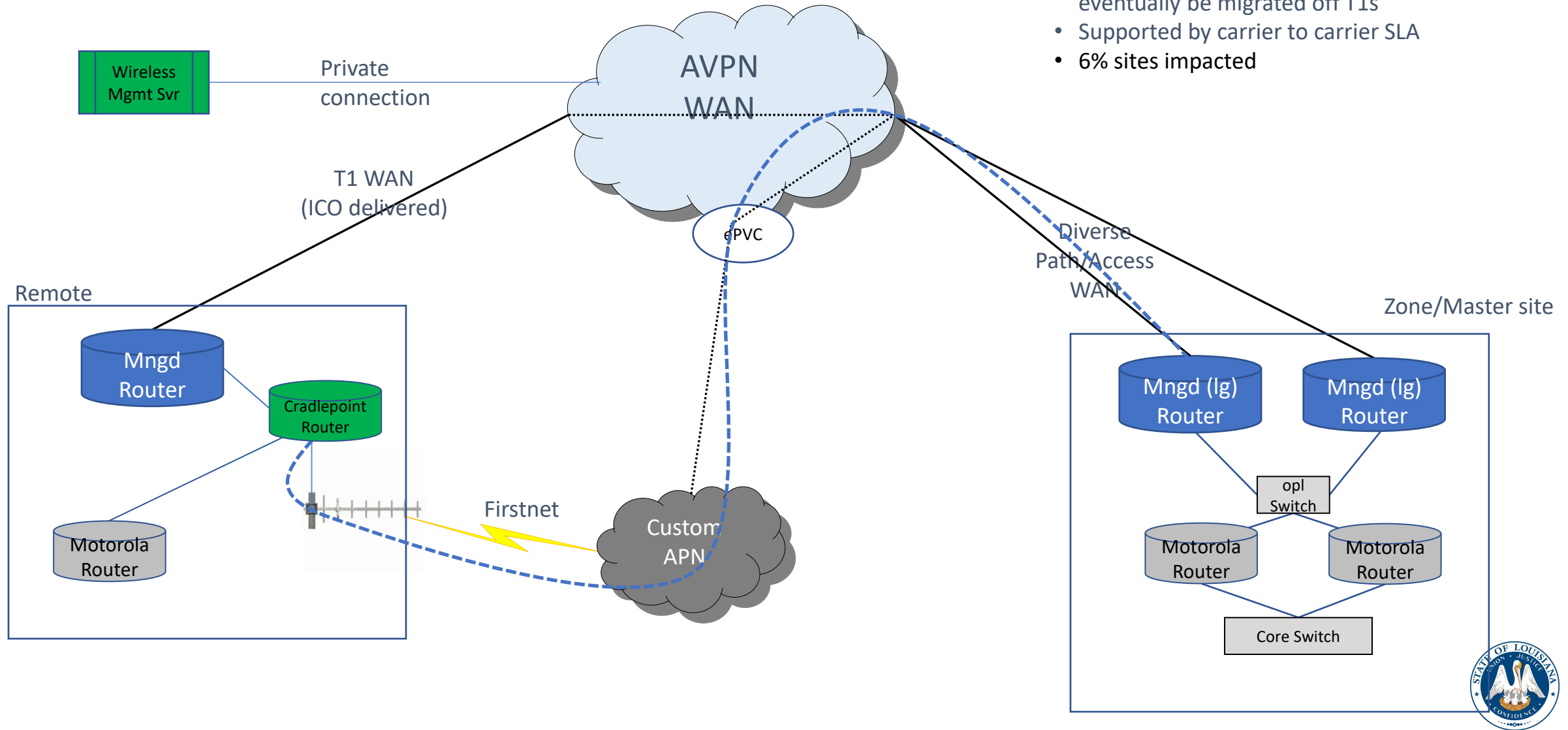# Direct Connected to Wireless Router

- Ethernet AVPN at In-footprint and most ICO sites
- Wireless router handles all remote connectivity functions
- Zone Routers term host end of **GRE tunnels**
- Management server connected via PMC arrangement
- No Internet Connectivity

Wireless Mgmt Svr

Private connection

"AT&T VPN" (AVPN) WAN

ePVC

Ethernet WAN (Fiber-based facilities)

Diverse Path/Access WAN

Remote Site

Zone/Master site

Cradlepoint Router

Firstnet

Custom APN

Motorola Router

Mngd Router

Mngd Router

opl Switch

Motorola Router

Motorola Router

Core Switch

SoLA DPS - AVPN T1
Traditional Router pass-through

- ICO Sites, where T1 transport is only option
- T1 router configured as pass-through
- ICOs peer with AT&T at carrier level into the AVPN cloud
- As arrangements are made, sites will eventually be migrated off T1s
- Supported by carrier to carrier SLA
- 6% sites impacted

Wireless Mgmt Svr

Private connection

AVPN WAN

ePVC

T1 WAN (ICO delivered)

Diverse Path/Access WAN

Remote

Mngd Router

Cradlepoint Router

Motorola Router

Firstnet

Custom APN

Zone/Master site

Mngd (lg) Router

Mngd (lg) Router

opl Switch

Motorola Router

Motorola Router

Core Switch

SoLA DPS FirstNet
Wireless Back-up Connectivity

1. Fail-over mechanism dependent on Firstnet connectivity.

2. Firstnet overlaid with Custom APN (encrypted, private wireless IP space) for highest level of security.

3. No connectivity to Internet.

4. Wireless virtual port direct connects to AVPN. Alternate routes appear in AVPN as secondary physical connections

5. Fail-over (will detect for physical and logical link failures)

6. Wireless device management

7. Ticketing & Break/fix – Automated ticketing, Managed via dedicated, purpose-built portal

SoLA DPS FirstNet
Wireless Back-up Connectivity (cont)

- Zone/Hub AVPN: fiber-based diverse route, diverse access; Requires redundant Routers that are networked for local fail-over scenarios

- Primary wireline connection @ Remotes
  - A. Ethernet Sites: AVPN direct connects to wireless router.
  - B. T1 Sites: Mngd AVPN router passively passes IP address to Ethernet port of Wireless router.

- External antennas (when required) – Additional one-time costs for wireless site assessment, equipment, and installation. Coordinated and approved with end-user agency.

Only AT&T offers the ability to direct connect FirstNet and a wireline WAN connection at the carrier level. All other providers would have to integrate Internet-based elements into their solution.

Deployment Planning

- Final-Firm site list based on true demark locations

- Phased Deployment Approach

- Deployment Criteria
  - Reduce redundant network (cost savings)
  - Highest Impact/Effort
  - Address sites with complex migration criteria
  - Fiber build-out
  - All sites individually evaluated and worked into master deployment plan

    You WILL have input on when your site is migrated

Site Evaluation Criteria

Each site will be individually evaluated for migration needs:

- Site assessment may be required

- Demark Location – Modify existing or establish new

- Fiber build-out

- ICO locations

- Wireless back-up signal – Drives if external antenna is required

- Proximity and direction of closest AT&T Mobility tower(s)

Phased Deployment

Phase 1 –   Juniper/AT&T Hardware Install
                   - Network Prep

Phase 2 –   Interzone Link Upgrade

                   1. Zone 1 <-> Zone 4

                   2. Zone 2 <-> Zone 3

                   3. Zone 3 <-> Zone 4

                   4. Zone 1 <-> Zone 2

                   - Decom DS3 Interlinks

Phase 3 –   RF & Console Site Migration – Requires router upgrade at all
                   sites.

                   - Broke into 3A through 3E sub-phases

                   - Decom DS3 & Smartring after usage drops to zero

Existing Network

P2P T1s:
    Shreveport - 18
    Monroe - 17
    Alexandria - 17
    Lafayette - 29
    Baton Rouge - 40
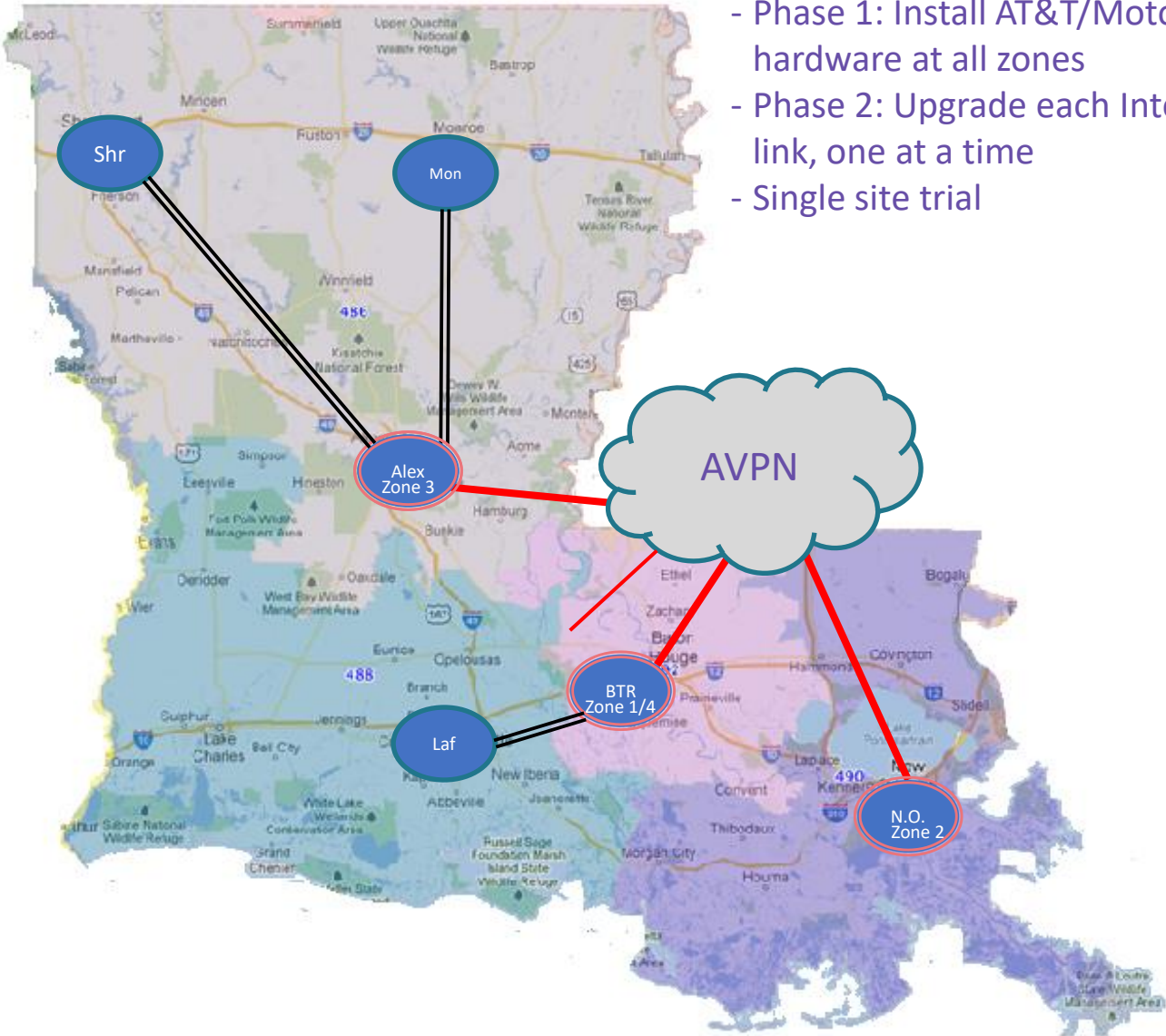   New Orleans - 16
Zone mapping:
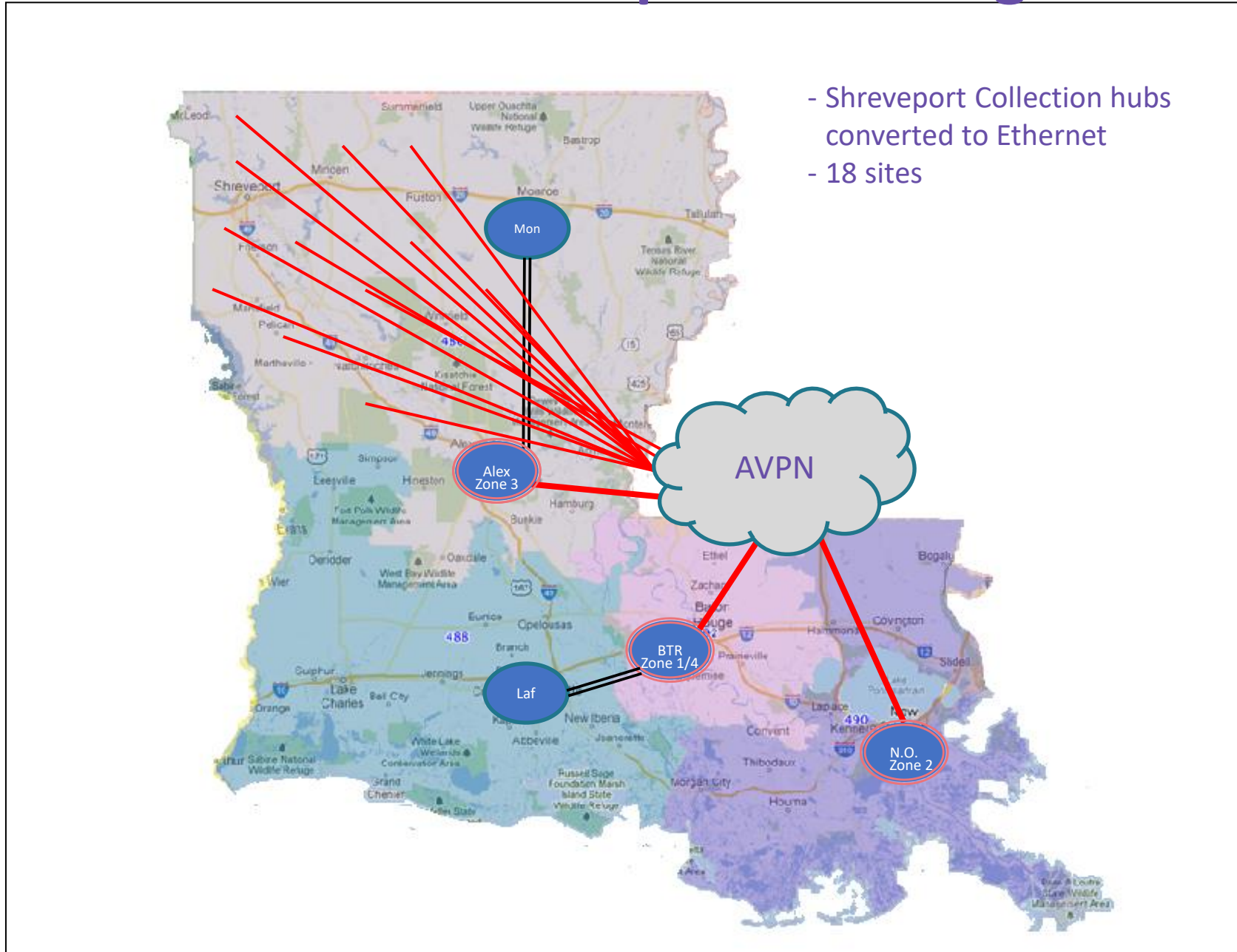   2 Alex to BTR
    4 N.O. to Alex
    3 N.O. to BTR
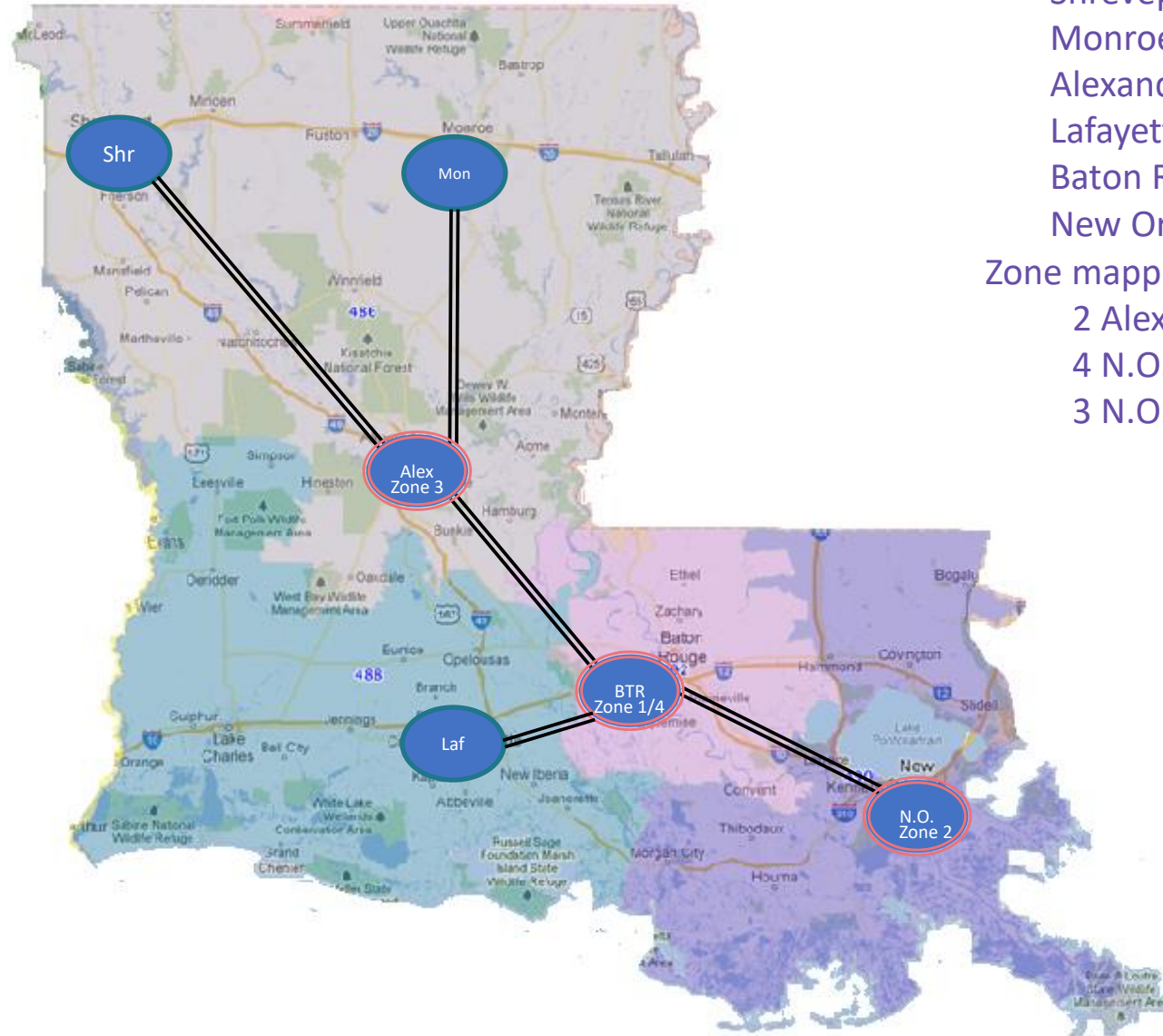
Phase 1 & 2 – InterZone Upgrade

- Phase 1: Install AT&T/Motorola hardware at all zones
- Phase 2: Upgrade each InterZone link, one at a time
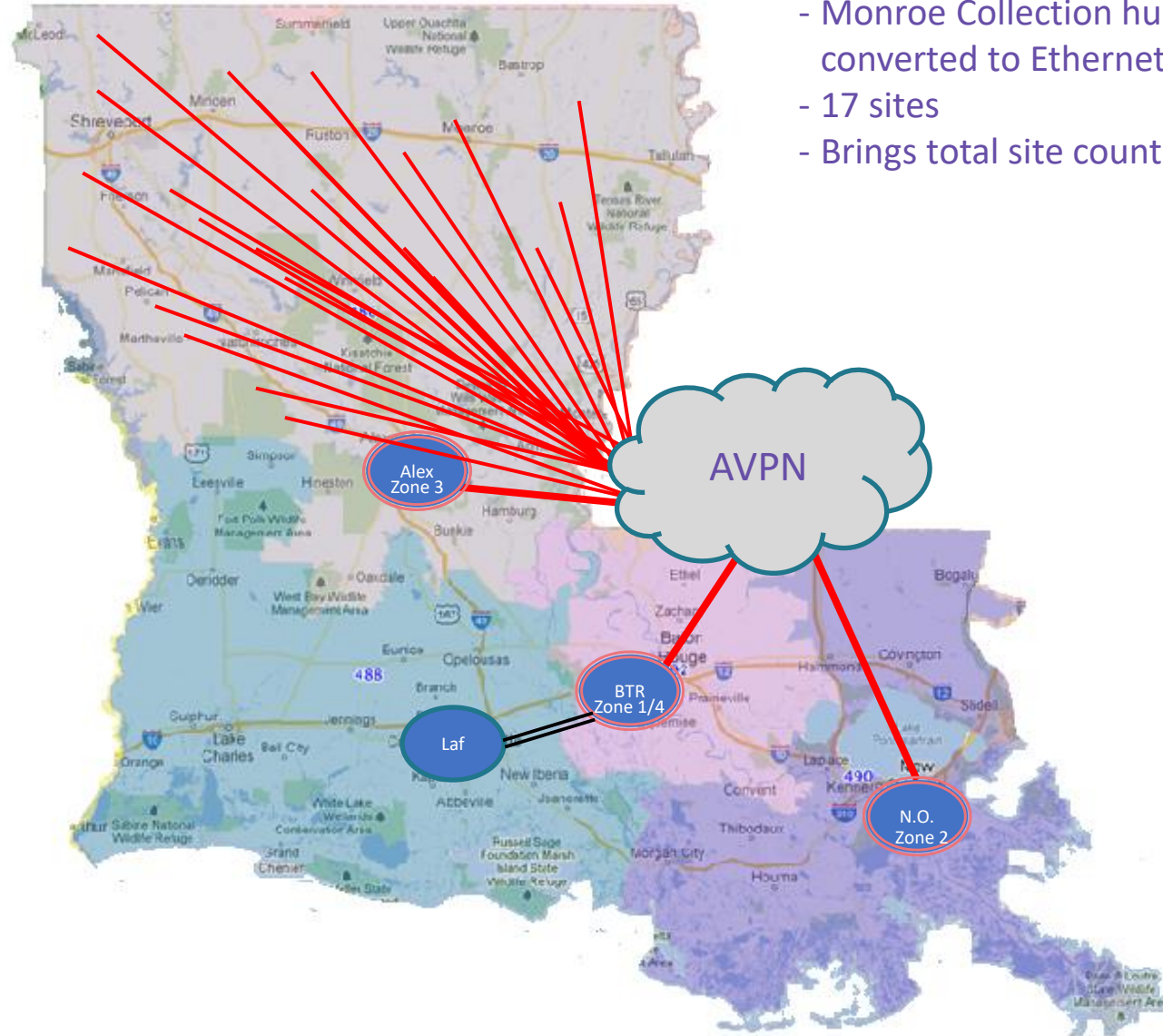- Single site trial

Phase 3A – Shreveport Hub Migration

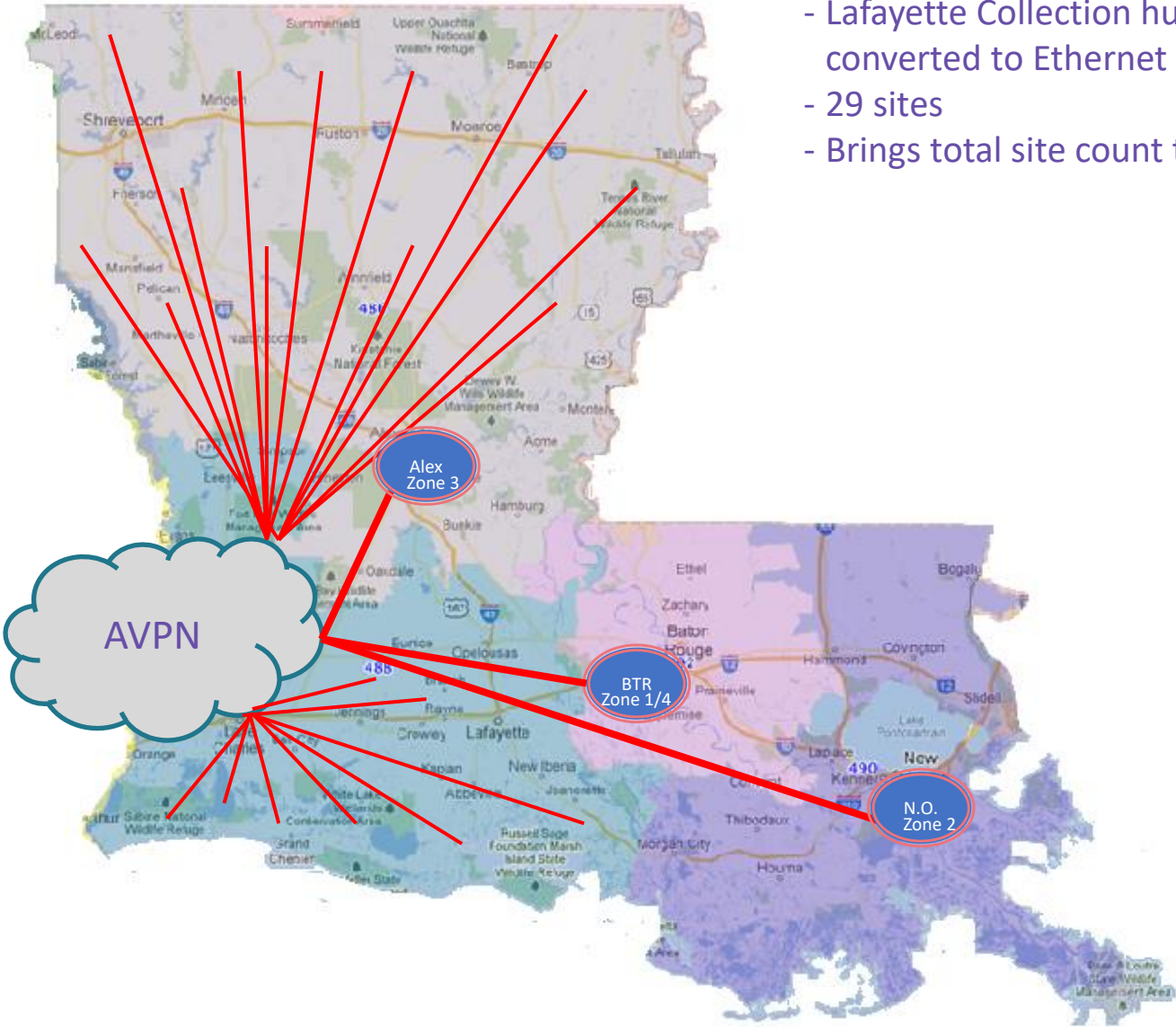- Shreveport Collection hubs converted to Ethernet
- 18 sites

Phase 3B – Monroe Hub Migration

- Monroe Collection hub converted to Ethernet
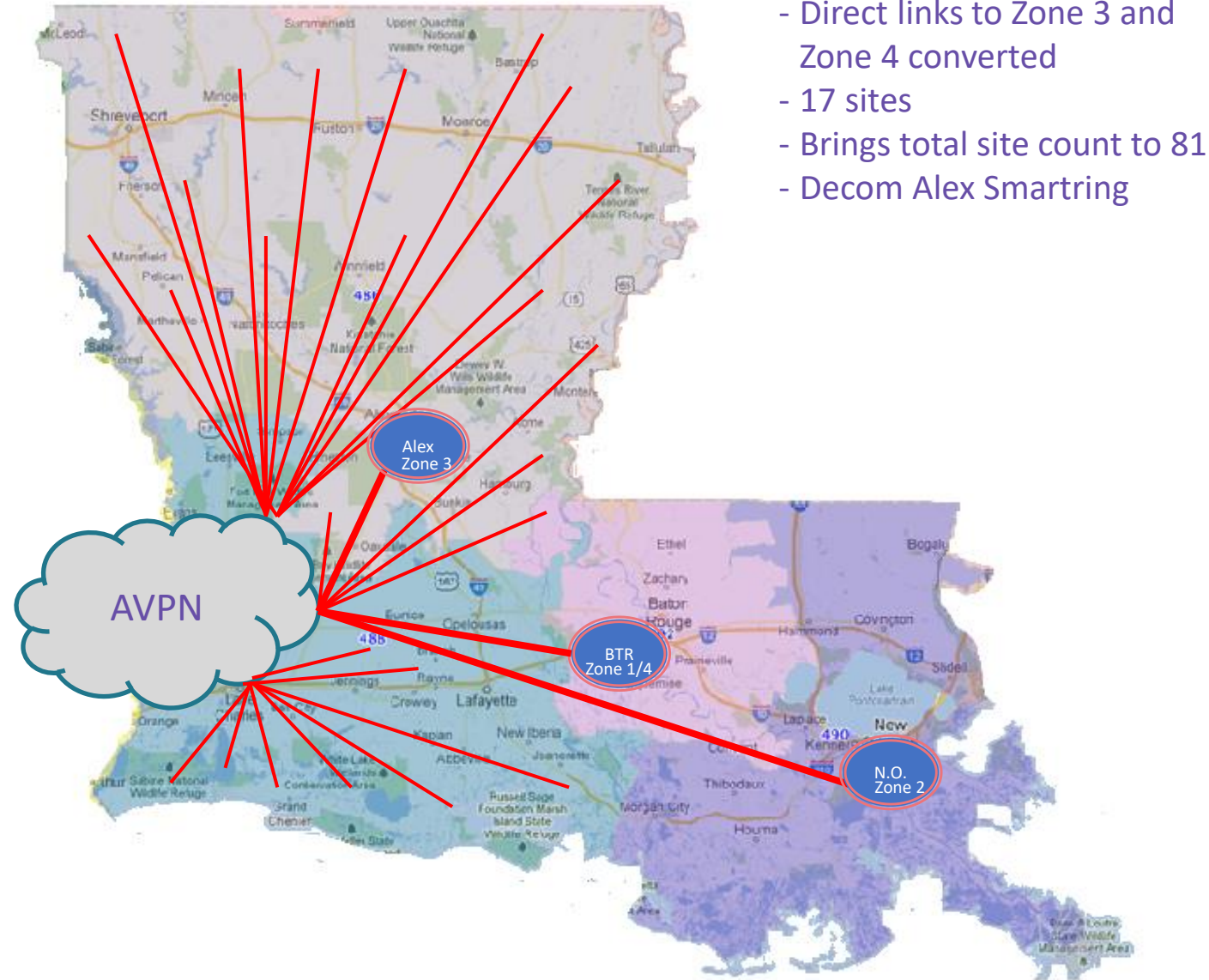- 17 sites
- Brings total site count to 34

Phase 3C – Lafayette Hub Migration

- Lafayette Collection hub converted to Ethernet
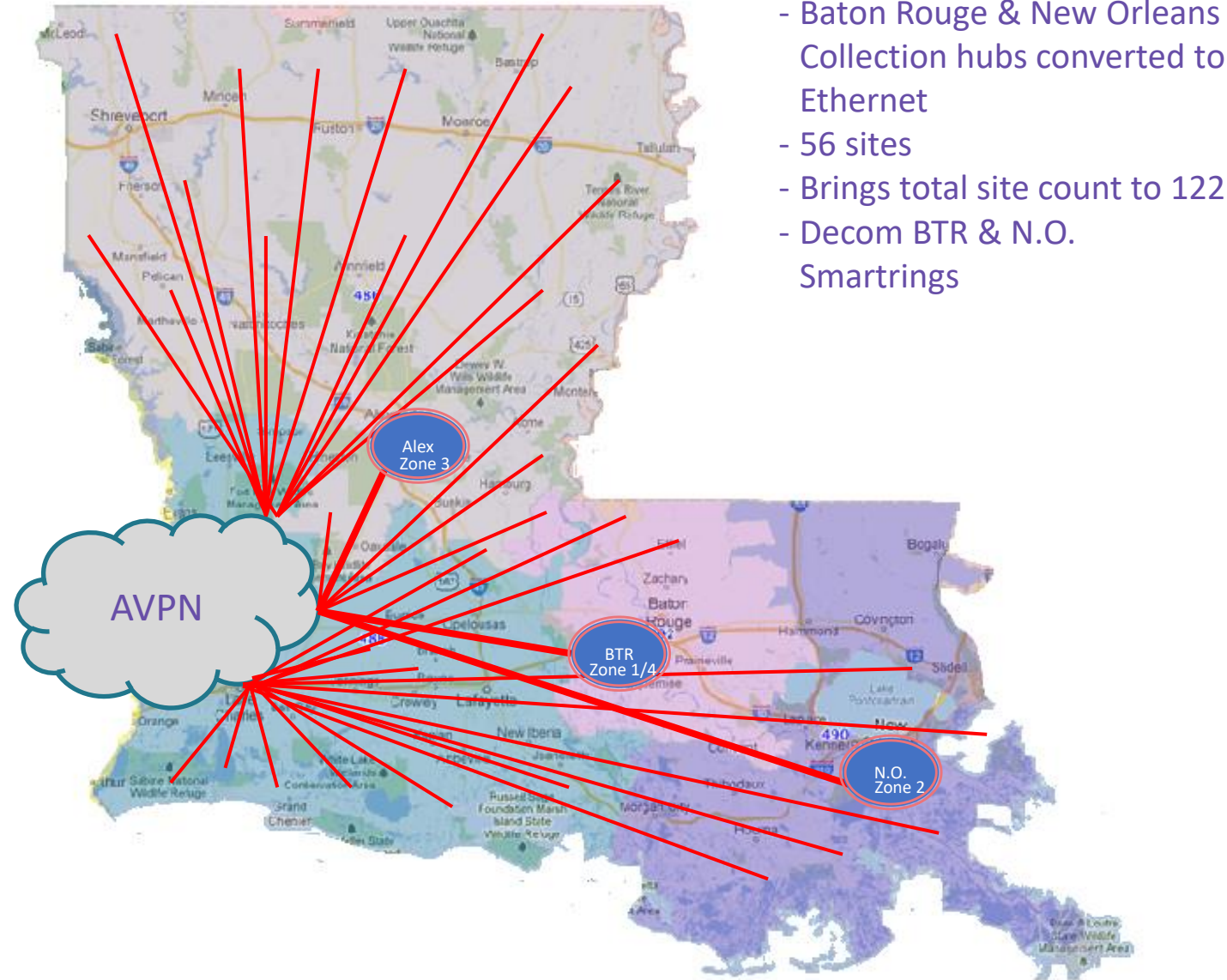- 29 sites
- Brings total site count to 58

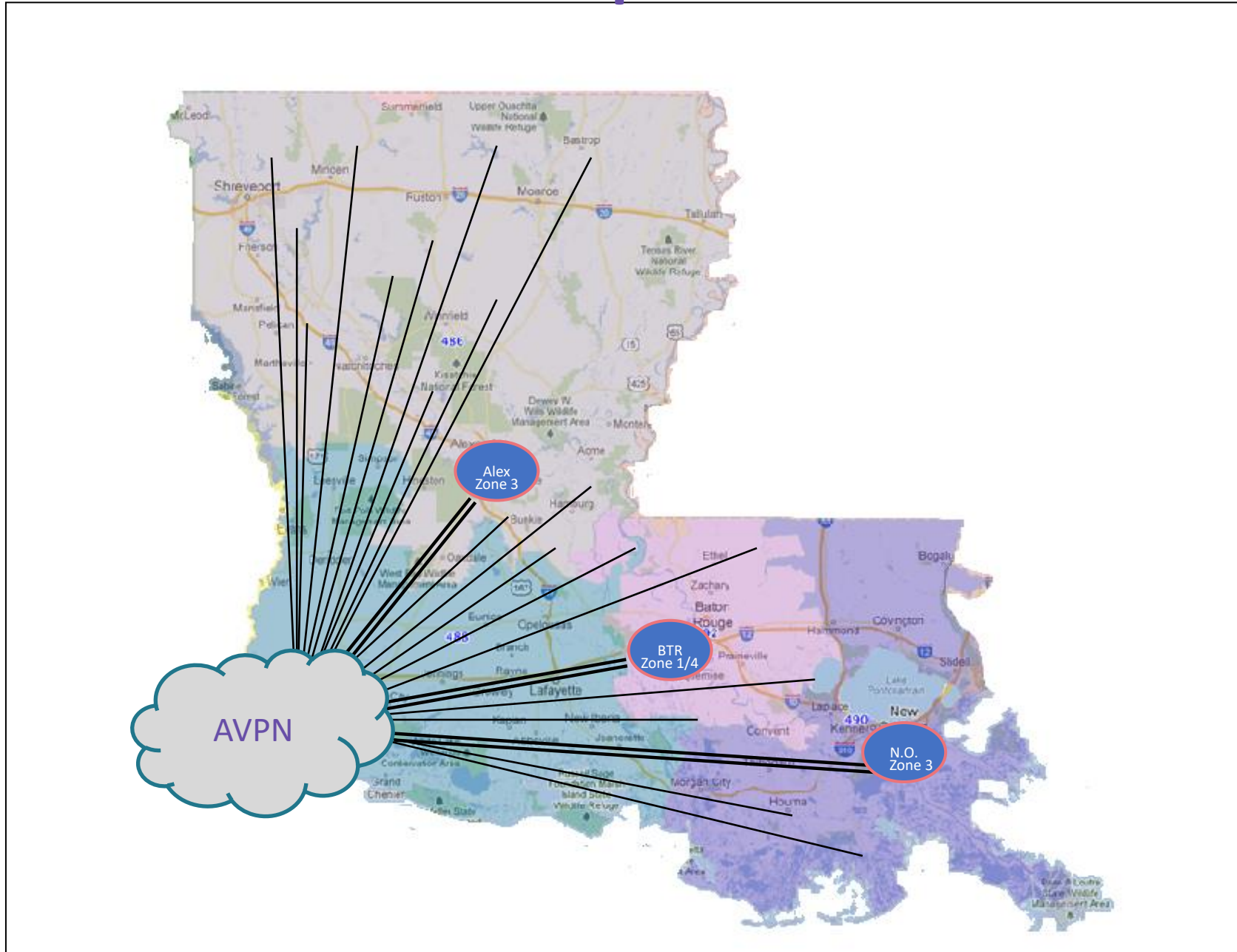# Phase 3D – Zone 3 & 4 Direct Link Migration

- Direct links to Zone 3 and Zone 4 converted
- 17 sites
- Brings total site count to 81
- Decom Alex Smartring

Phase 3E – Zone 1 & 2 Direct Link Migration

- Baton Rouge & New Orleans Collection hubs converted to Ethernet
- 56 sites
- Brings total site count to 122
- Decom BTR & N.O. Smartrings

Completion

Motorola Equipment Change out

All sites (RF, Console, and Master Sites) will need new routers:

- Site routers (RF and Console) will be covered by Motorola

- State covering cost of Master Sites

- Local agencies for console sites will be responsible for labor to change out site routers.

Motorola Equipment Change out

Two step process for change out at each site:

- Rack and stack, Power on, Connect Ethernet circuit, Test

- Once circuit/equipment verified, schedule/perform cutover from T1 to Ethernet

This may/may not occur in the same week depending on scheduling of resources.

Local agency will have input on when cutover/downtime occurs

Motorola Equipment Change out

For sites in Region 1 that have Microwave redundancy, Motorola will provide replacements for both site routers.

Microwave is T1 at site:

> No further work will be done.

Microwave is Ethernet:

> Motorola will provide quote to local agency for additional configuration.

Upgrade Costs:

One-Time   NEXT BUDGET CYCLE

WHO	WHAT	LOCAL SHARE	STATE SHARE
Motorola	Equipment	0	$4,805,000
Motorola	Equipment Installation	$35,000	
AT&T	Ethernet Installation	0	$2,207,519

Monthly

WHO	WHAT	LOCAL SHARE	STATE SHARE
AT&T	Ethernet Circuit	$902.63	$178,428.63
FirstNet	LTE Backup Link	$44.39	