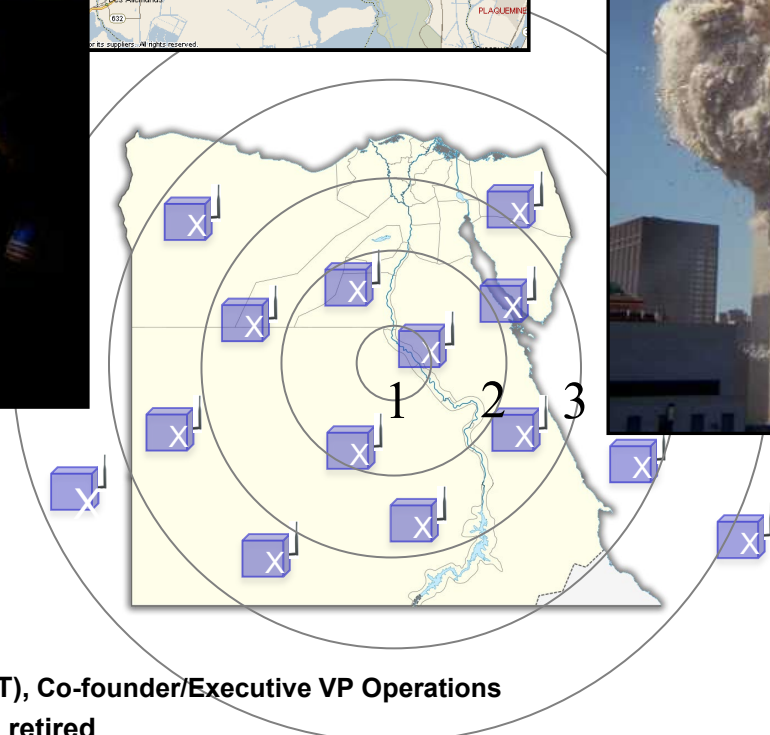


Multi-Layered Network Resources for Programmable Real-Time Networks

IEEE RTC 2022



Bernard Malone III

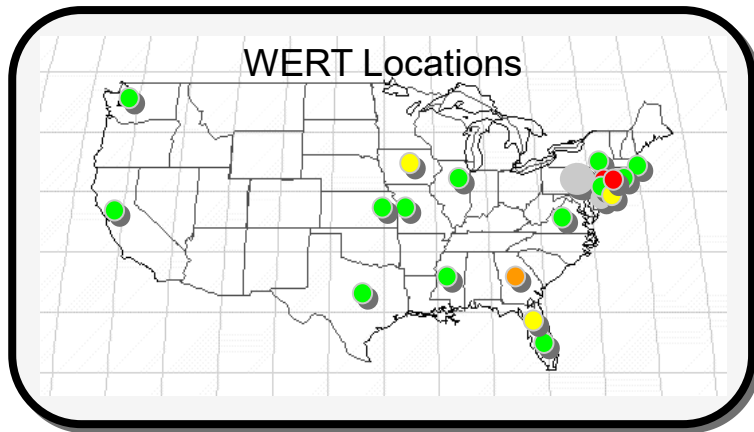
Wireless Emergency Response Team (WERT), Co-founder/Executive VP Operations
AT&T, Lucent Technologies, Alcatel-Lucent, retired

October 12, 2022

Problem: Network Service Interruptions

- Natural disasters
 - Weather-related
 - Man-made accidents
 - Terrorist activity / hackers
 - Geopolitical
-
- 9/11 Terrorist Attacks, 2001
 - Hurricane Katrina, 2005
 - Haitian Earthquake, 2010
 - Egyptian civil unrest, 2011
 - Rogers Canadian network, 2022
 - Iranian civil unrest 2022

9/11 – Access Network Unavailable



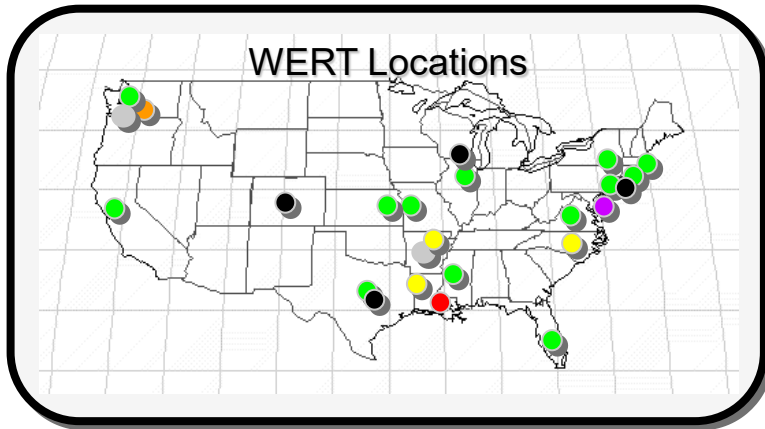
Command Center ●

- Bring Network back in case victims are alive
- Locate & Communicate with trapped survivors



WIRELESS EMERGENCY RESPONSE TEAM

Katrina 1 – Access Network Unavailable



Command Center ●

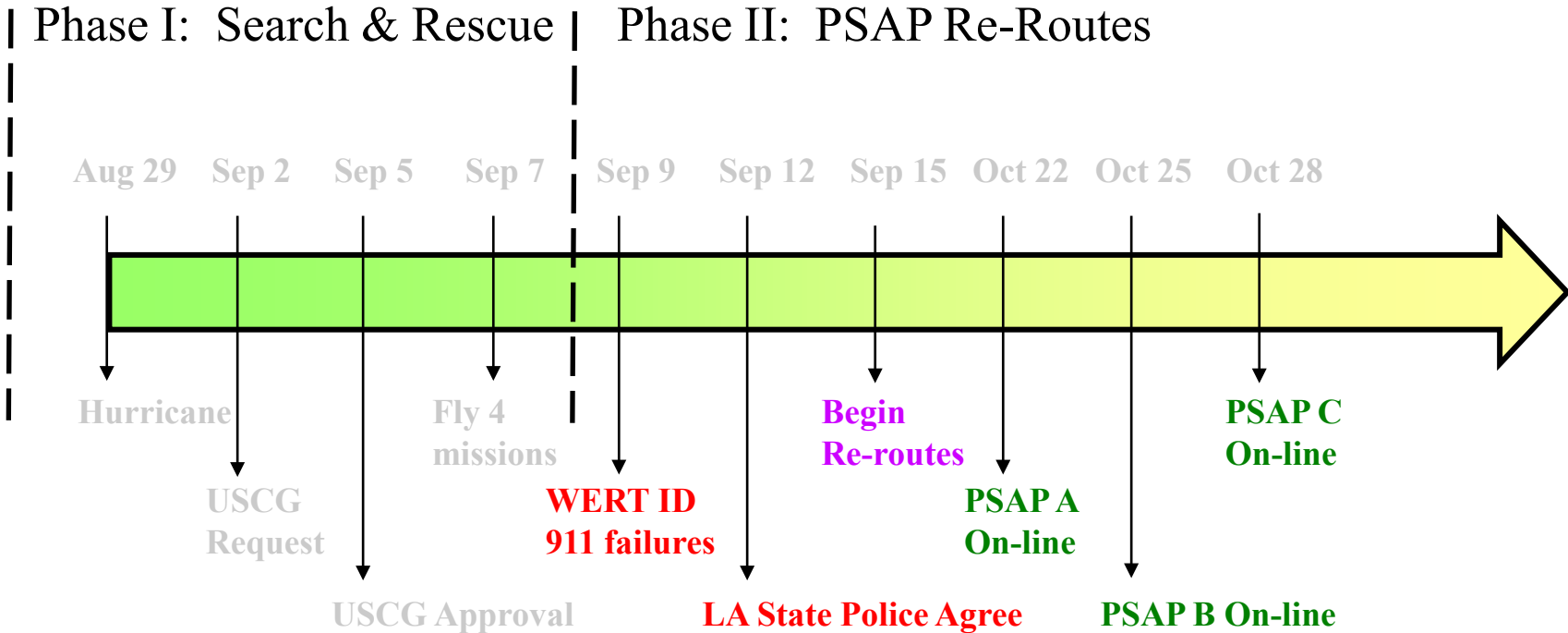
Acadia Parish	route normally	
Alabama	route normally	
Ascension Parish	225-621-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
Assumption Parish	985-369-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
Bogalusa, City of	985-732-XXXX	
Franklinton, City of	985-839-XXXX	
Jefferson Parish LA	504-349-XXXX	
Kenner, City of	504-712-XXXX	
LaFouche Parish	985-537-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
Mississippi	route normally	
Orleans Parish	504-552-XXXX	
Plaquemines Parish	504-349-XXXX	
St Bernard Parish	504-349-XXXX	
St Charles Parish	985-783-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
St John the Baptist Parish	985-652-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
St Tammany Parish	985-898-XXXX	
Tangipahoa Parish	985-747-XXXX	
Terrebonne	985-879-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
Washington Parish	985-839-XXXX	

- Bring Network back for victims trapped in attics
- Locate & Communicate with trapped survivors



WIRELESS EMERGENCY RESPONSE TEAM

Katrina 2 – PSAPs Unavailable

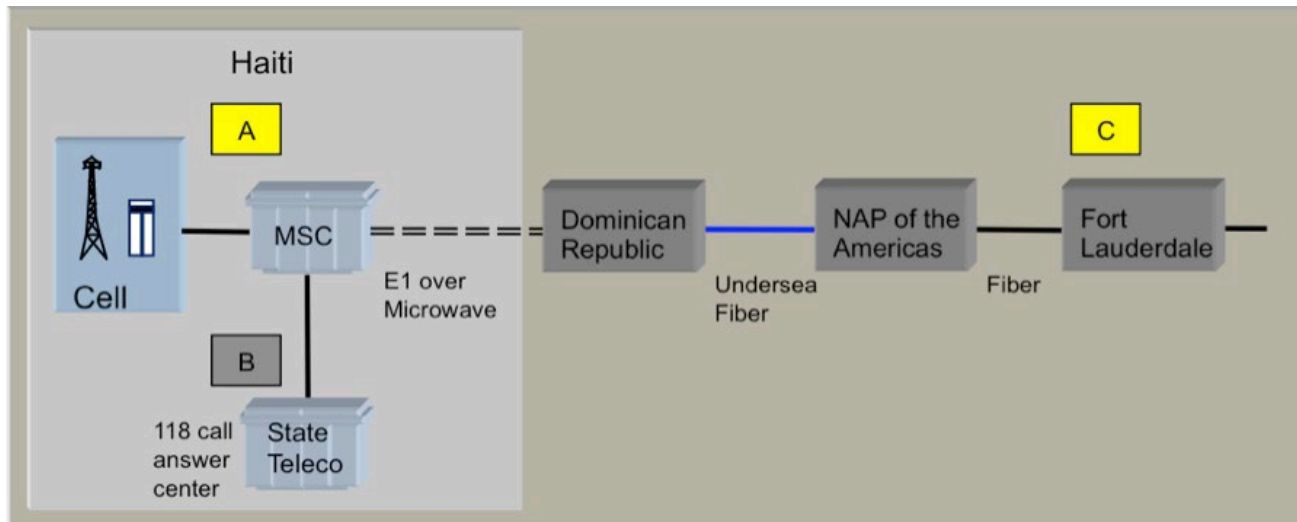


WIRELESS EMERGENCY RESPONSE TEAM

Acadia Parish	route normally	
Alabama	route normally	
Ascension Parish	225-621-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
Assumption Parish	985-369-XXXX	The PSAP is fully functional. Use this number only if unable to connect to the SR
Bogalusa, City of	985-732-XXXX	
Franklinton, City of	985-839-XXXX	
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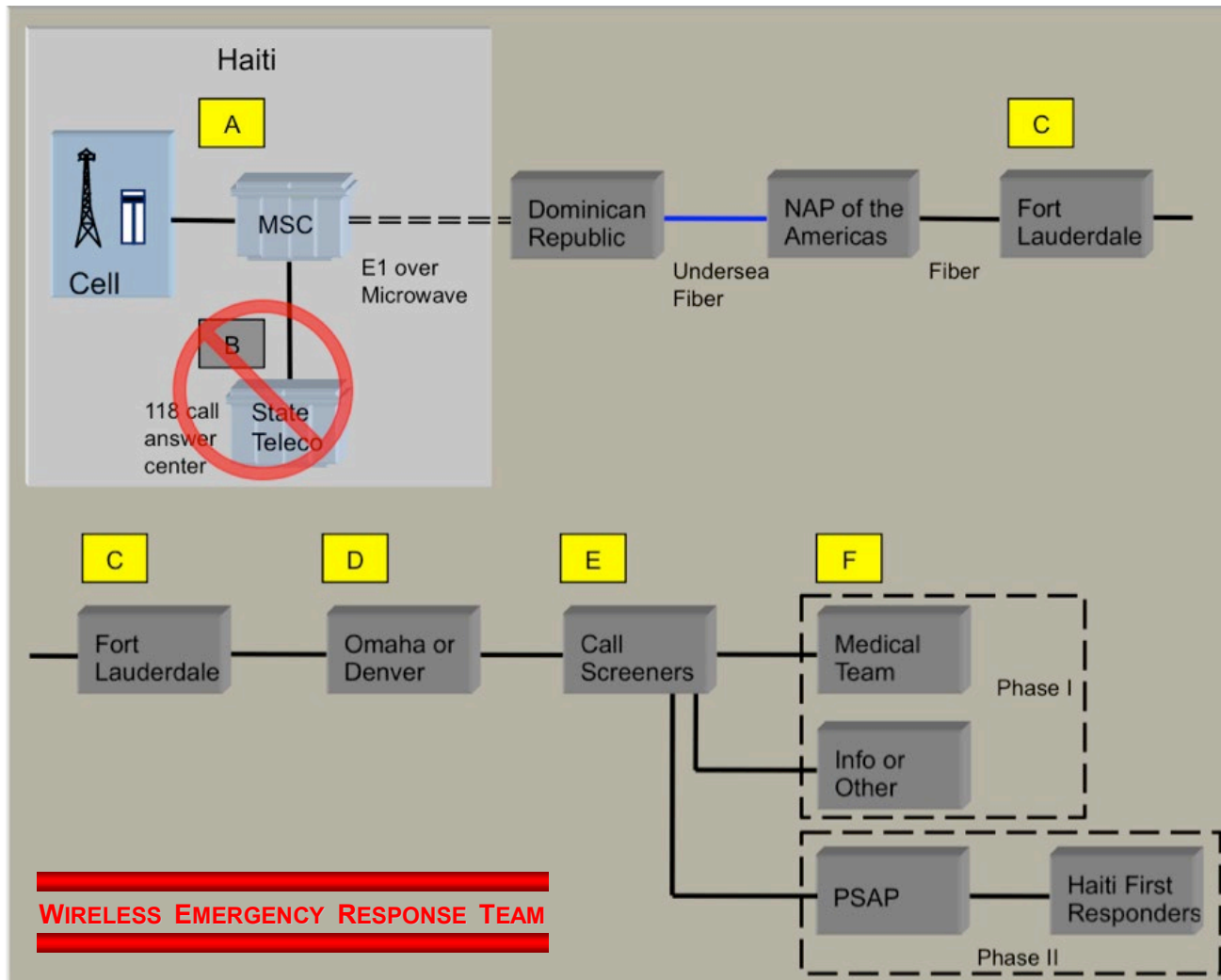
Haitian Earthquake – Services Unavailable

Pre-Earthquake Network

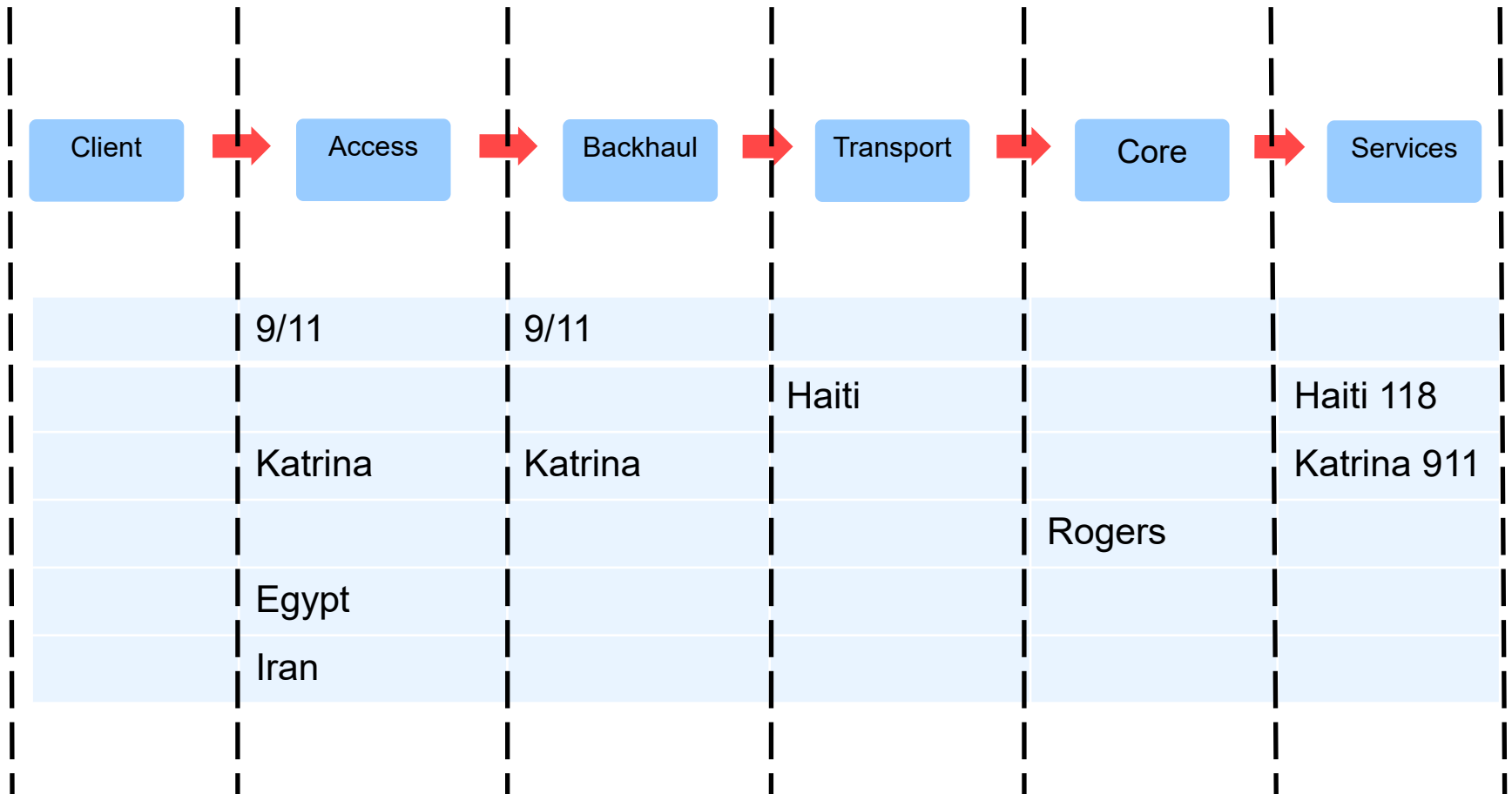


Haitian Earthquake – Services Unavailable

Temporary Remote Emergency Call Service (TRECS)



Telecommunications Network Model

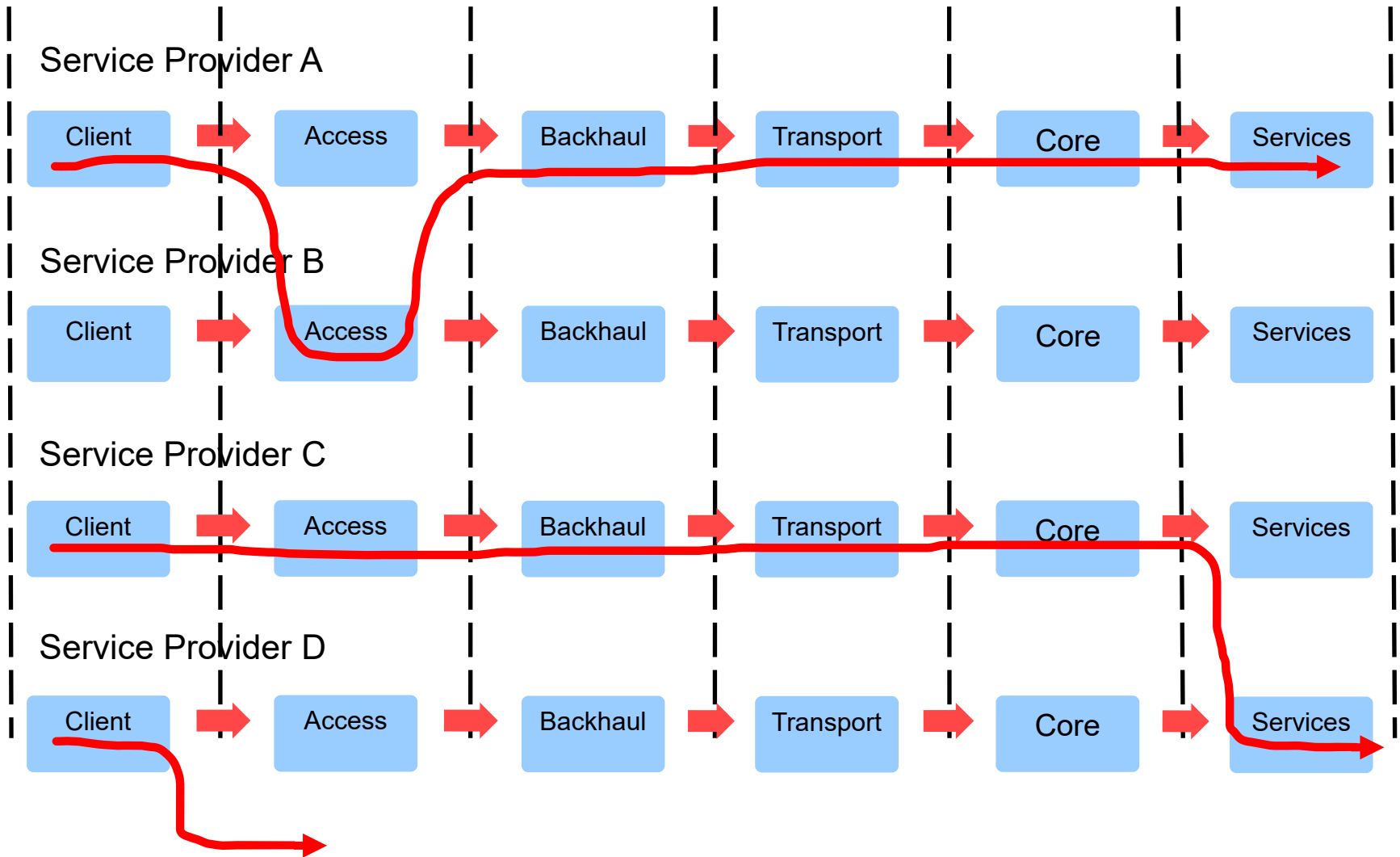


Network Function Alternatives

Identify parallel layers of network functions

1. Reroute to parallel resources
2. New Developments
 - Failover spectrum/circuits; access, backhaul, trunks, network services
 - Failover end-user services
 - Failover emergency services
 - Backup and/or national 911 center
 - Client mesh node store & forward
 - Satellites 911, store and forward
 - iPhone store and forward 911 to next phone

Telecommunications Network Model



Emergency Mode Network Operation

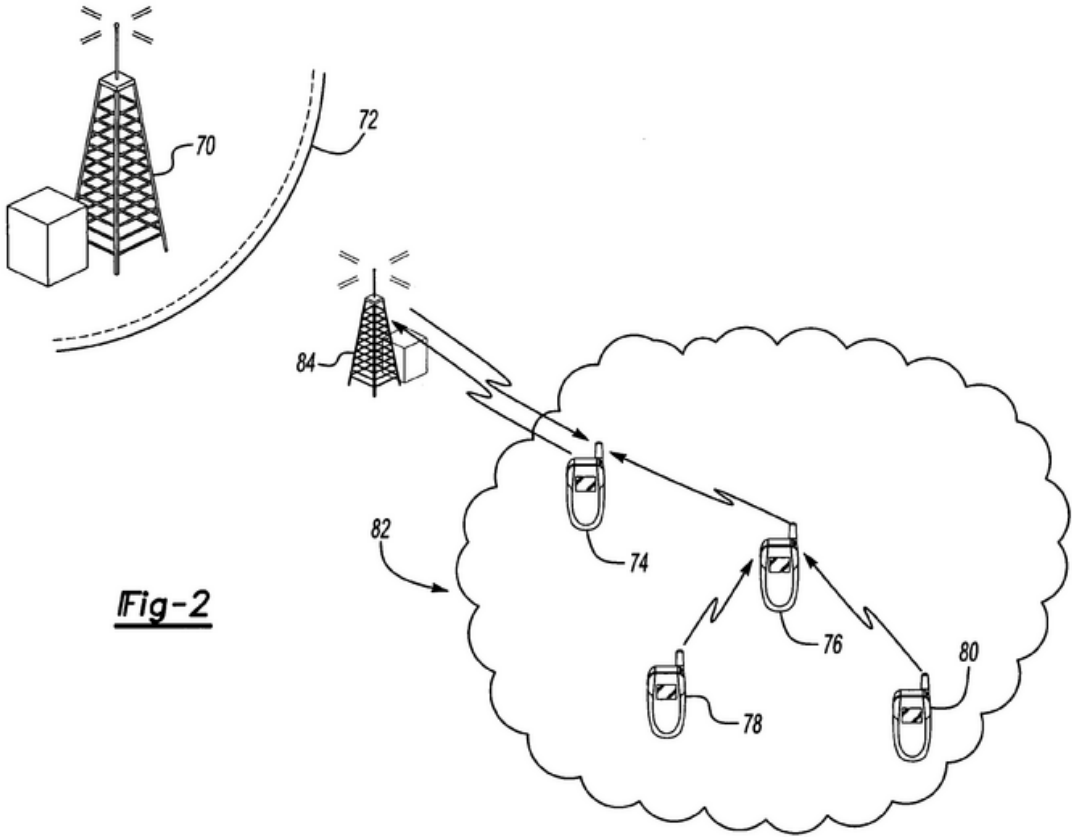
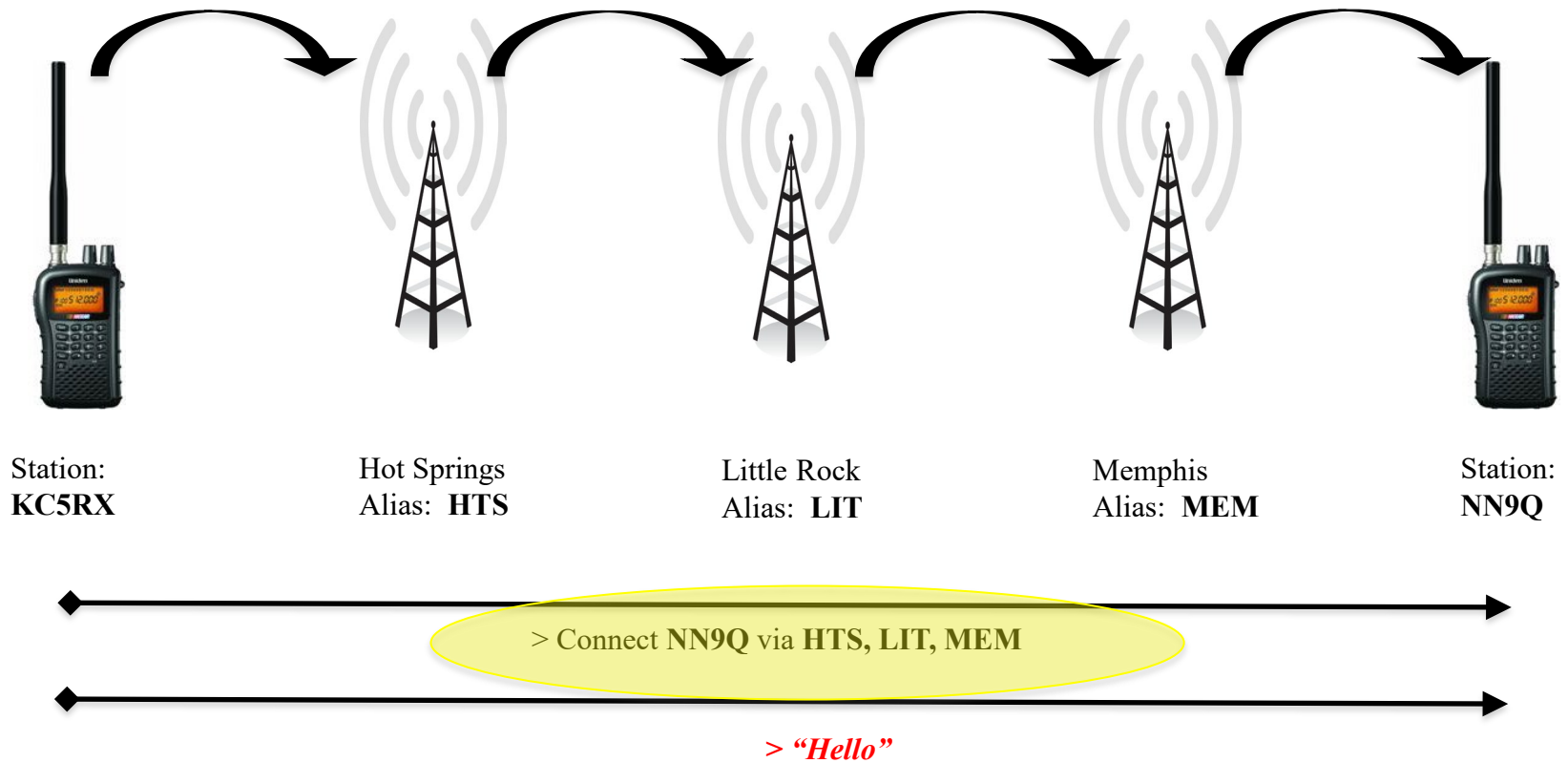
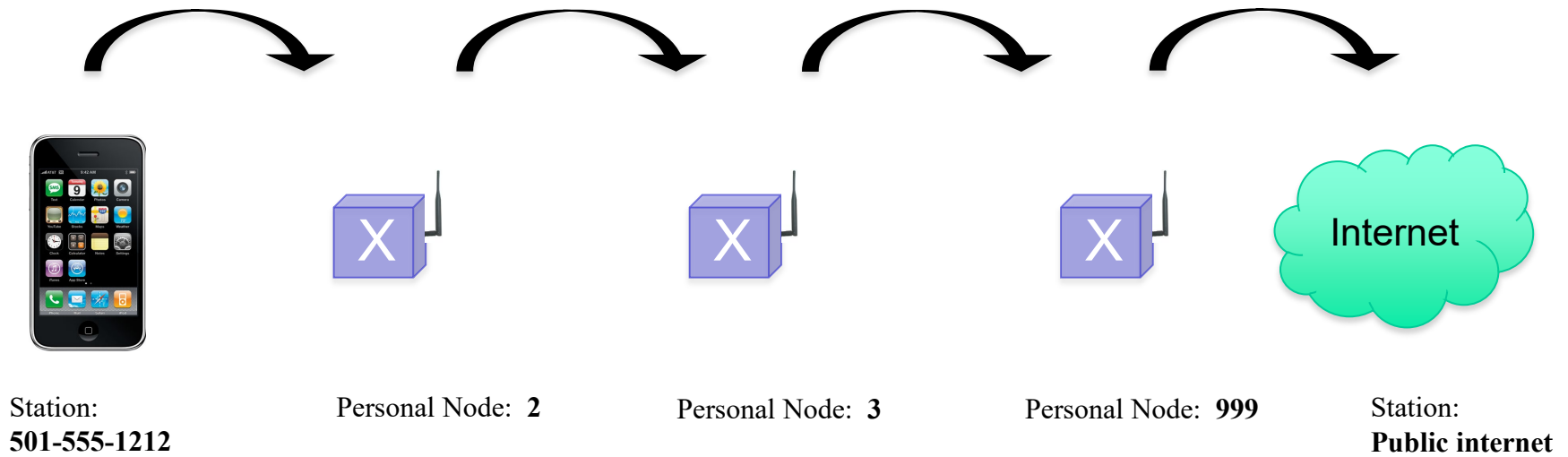


Fig-2

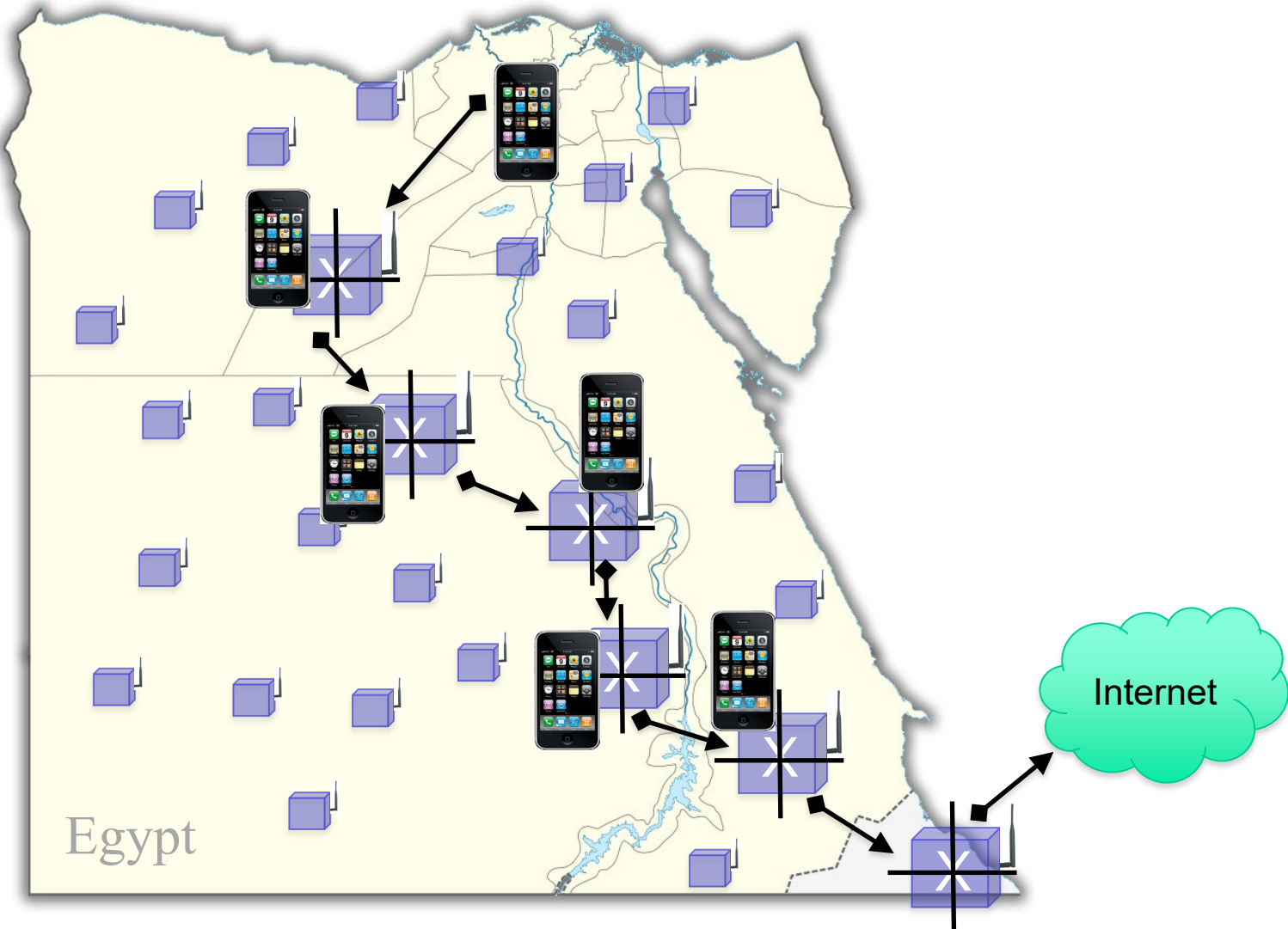
Simple Store & Forward



Store & Forward to Services



Personal Router Mesh



Start the Discussions

- Programmable Real-time Networks
- Identifying parallel layers of network functionality resources
- Concept architecture for reconfigurations
- Prototypes
- Resource owner agreements
- New inventions & developments
- Talent pool needs and development

wert-help.org

WERT - WIRELESS EMERGENCY
RESPONSE TEAM

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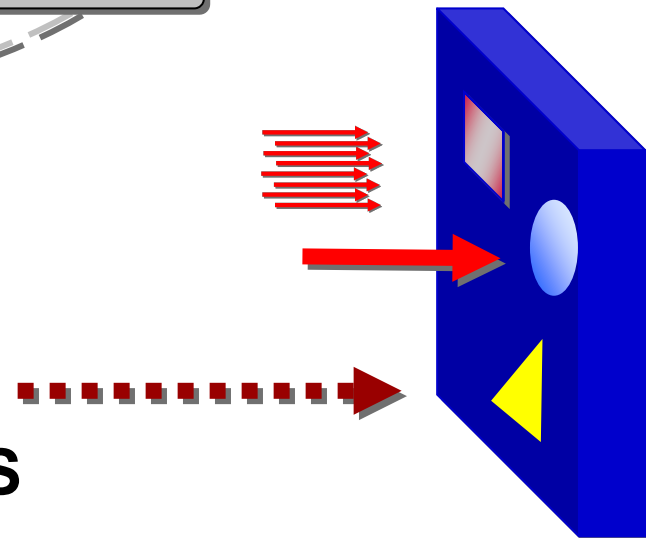
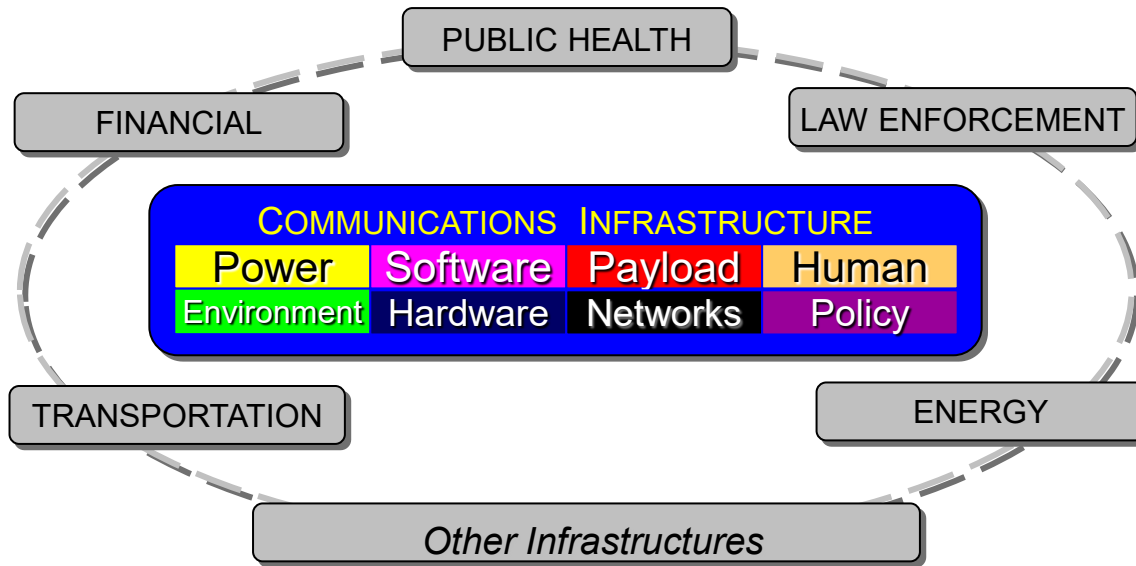
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THE WIRELESS EMERGENCY RESPONSE TEAM (WERT)

... using wireless technology to save lives.

REFLECTIONS ON 20TH ANNIVERSARY OF 9-11

8 Ingredients of Communications Infrastructure



THREATS vs. VULNERABILITIES

Vulnerability Assessment

	Component / Service	Function	Redundancy Configuration Installed	Redundancy Type Installed	Hot spare standby Installed	Cold spare Available	Config Backed Up	Time to Restore	BUSINESS Outage Impact	GUEST Outage Impact	SPOF	Recommendation	
Telecom Services	1	Internet 10Gig AT&T	Internet	ACT-STBY	system	--	--	msecs	All	All		OK	
	2	Internet 100Meg Verizon	Internet backup	SIMP	--	--	--	hours	All	All		Review	
	3	Internet 250Meg AT&T	Internet VoIP	SIMP	--	--	--	hours					
	4	VoIP Telephone Service AT&T	Telephone service	SIMP	--	--	--	hours				Review	
	5	DirecTV Service AT&T Antennas	TV service suites	ACT-ACT	unit	--	--	msecs				OK	
	6	DirecTV Service AT&T Chasis	TV service suites	SIMP	--	N	N	days					
	7	CABLETV Service Spectrum	TV truck docks	SIMP	--	--	--	hours					
	8	Internet 200Meg Spectrum Broadcast patch bay	TV truck docks	SIMP	--	--	--	hours					
	9	Internet 200Meg Spectrum Vickery warehouse	Security	SIMP	--	--	--	hours					
Building IT Network	9	ASR1001-HX Internet router (2)	Internet router	ACT-ACT	chasis	--	--	msecs				OK	
	10	Firepower 2110 Firewall Staff/Trust (2)	Firewall	ACT-STBY	chasis	--	--	msecs				OK	
	11	Firepower 2140 Firewall Guest (2)	Firewall	ACT-STBY	chasis	--	--	msecs				OK	
	12	CORE Switch NEXUS 7706 MDF Room (2)	Core switching	ACT-ACT	system	--	--	msecs				OK	
	13	ACCESS Switch C9300 IDF Rooms	Access switching	SIMP	--	N	Y	hours				OK	
	14	WiFi Controller Cisco 9800 (2)	WiFi service	ACT-STBY	chasis	--	--	msecs				OK	
	15	WiFi Access Points (620) 9120AXI, 9120AXE, 1561I	WiFi service	SIMP	--	N	Y	hours				OK	
	16	ISE Identity Services Engine Authentication (2)	Authentication	ACT-ACT	system	--	--	msecs				OK	
	17	CUCM Call Manager	Telephone service	ACT-STBY	--	--	--	hours					
	18	UCCX Contact Center Express	Telephone service	ACT-STBY	--	--	--	hours					
	19	Unity Voice Mail	Voice mail	ACT-STBY	--	--	--	hours					
	20	CER Emergency Responder	Telephone service	ACT-STBY	--	--	--	hours					
	21	Analog Voice Gateway VG320	Analog POTS lines	SIMP	--	N	N	days					
	22	Telephone Desksets IP Phones (300)	Telephone service	SIMP	--	N	Y	hours				OK	
	23	HyperFlex Converged Compute vmware	Virtual Machine	ACT-ACT	system	--	--	msecs				OK	
	24	Domain Controller - on HyperFlex	--	--	--	--	--	--					
	25	UCS Servers compute & storage	Virtual Machine	POOLED	unit	--	--	msecs				OK	
	26	HyperFlex Fabric Switch (2)	Virtual Machine	ACT-ACT	chasis	--	--	msecs				OK	
	27	DNA automation appliance	Automation	--	--	--	--	days				OK	
	28	GPS Network Timing Antennas	Broadcast clocks	ACT-ACT	unit	--	--	msecs				OK	
	29	GPS Network Timing Chasis ZONU	Broadcast clocks	SIMP	--	N	N	days					
	30	NAS Storage Drive I: F: P:	file storage	POOLED	unit	--	--	msecs				OK	
	31	UPS Battery Systems	emergency power	SIMP	--	N	N	days				Take Action	
	32	Cooling Systems MDF	cooling systems	ACT-ACT	system	--	--	msecs				OK	
	33	Public Safety DAS system	emergency comm	--	--	--	--						
	34	Cellular DAS	cellular service	ACT-ACT	chasis	--	--	msecs				OK	
	Building Systems	35	Security Camera System	Security	--	--	--		TBD				
		36	Door Access Control System	Security	--	--	--		TBD				
		37	Lighting System	Building	--	--	--		TBD				
38		Motorola 2-way Radio Repeater system	Communications	POOLED	unit	--	--	msecs					
Applications	39	Microsoft Office Applications (email, etc)	Staff office apps		CLOUD	--	--	msecs					
	40	OneDrive File Storage	file storage		CLOUD	--	--	msecs					
	41	Sharepoint File Storage	file storage		CLOUD	--	--	msecs					
	42	Accounting Sage	Accounting		CLOUD	--	--	msecs					
	43	Payroll Proliant	Payroll		CLOUD	--	--	msecs					
44	TimeKeeper NovaTime	TimeKeeper		CLOUD	--	--	msecs						

NETWORK OUTAGE IMPACT

