www.mobilaps.com
e: hkassab@mobilaps.com

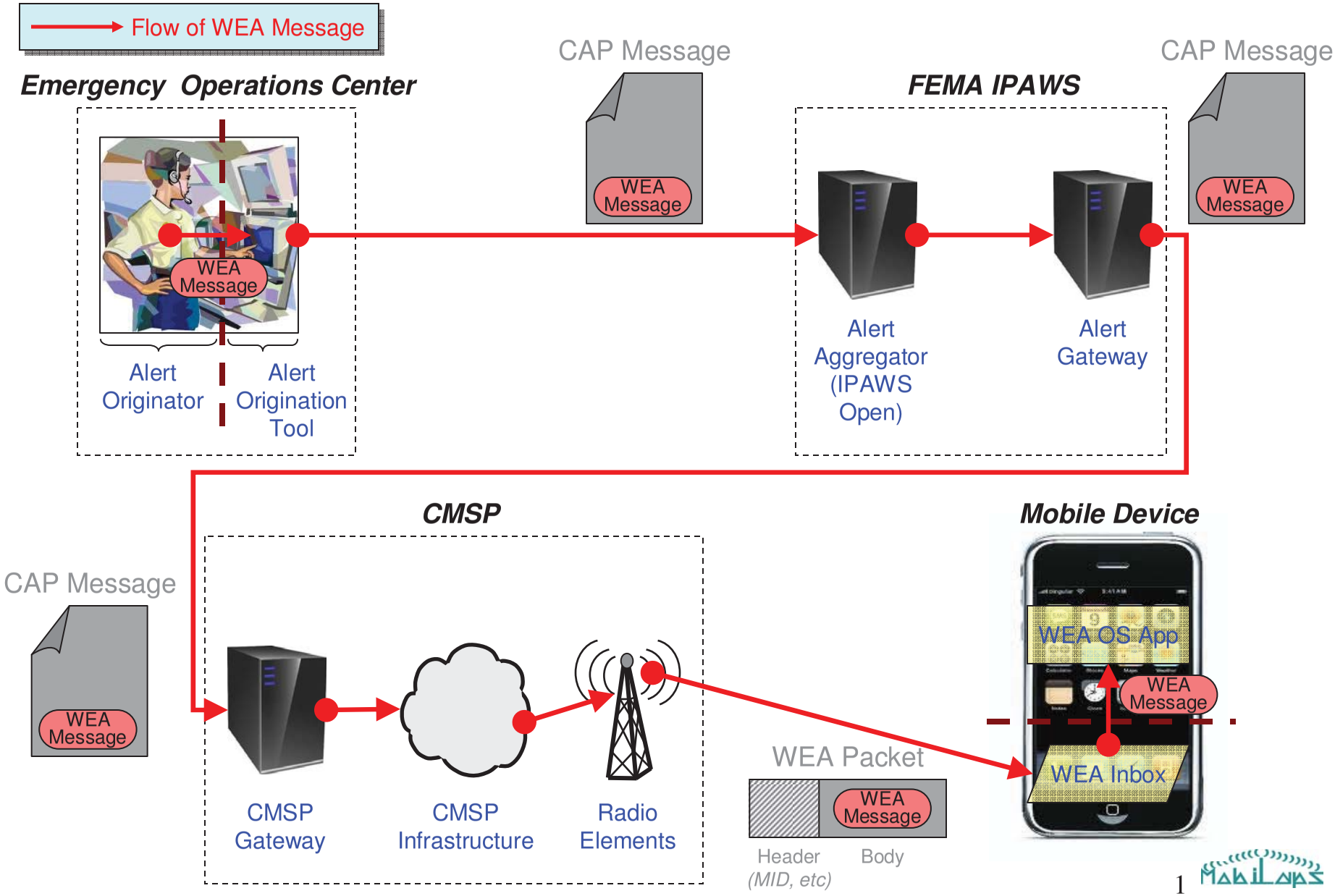
Comparison of Various Options for Increasing Message Lengths in Basic-WEA

Prepared for:

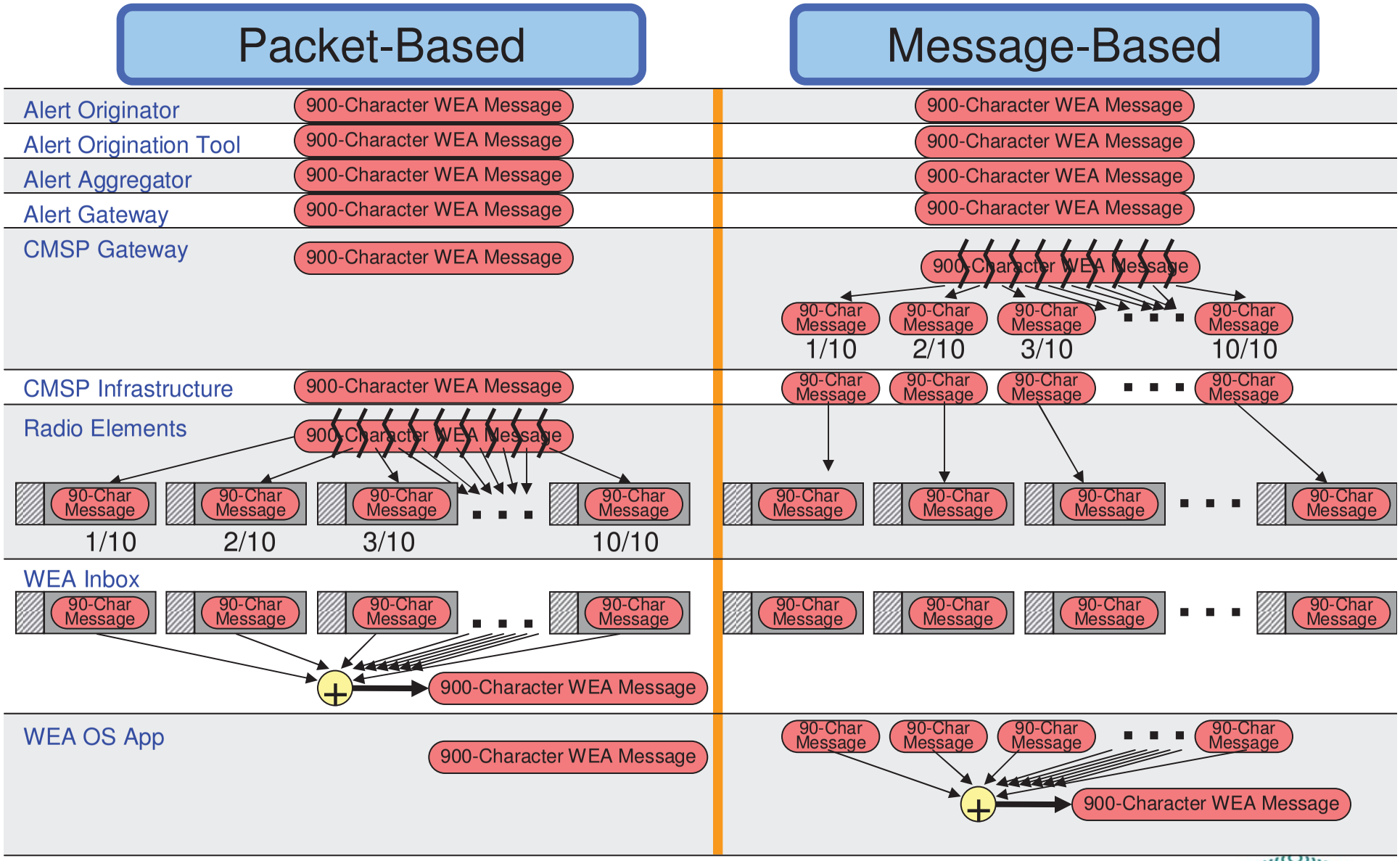
CSRIC Working Group 2
The Geographic Targeting, Message Content & Character Limitation Sub-Group

Hisham Kassab, Ph.D.
e-mail: hkassab@mobilaps.com
Tel: (301) 608-8222

High-Level Architecture of Current WEA System



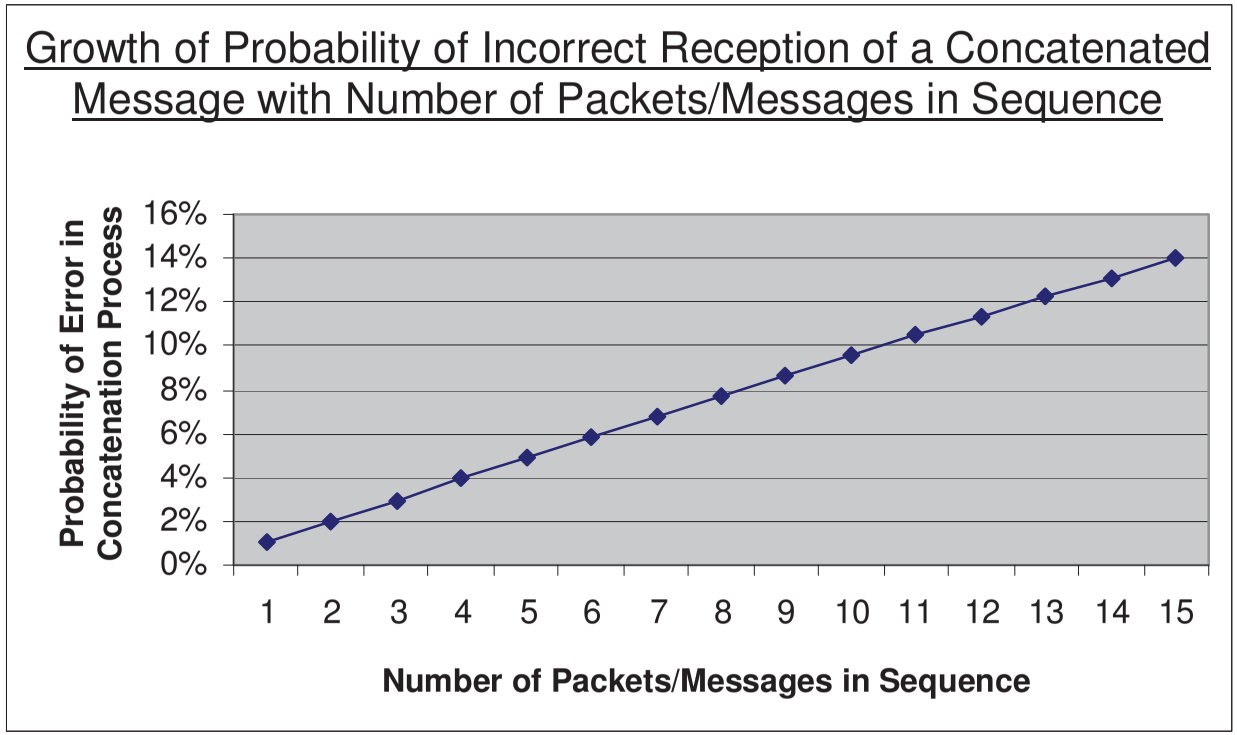
Concatenation – *Packet-Based vs Message-Based*



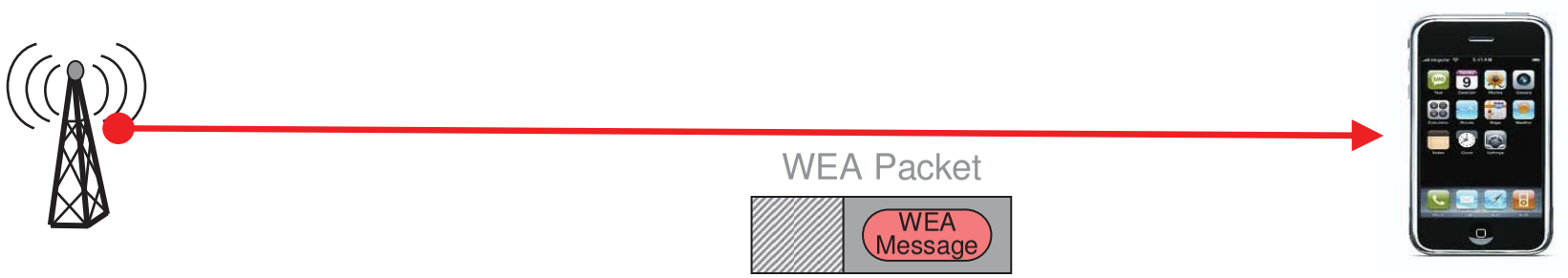
Concatenation – *Issue of dropped packets/messages*

If one of the building-block packets or messages is dropped or lost, then the entire longer message is dropped/lost

Assumption: Probability of error in a single packet: 1%



Fewer bits per character - *Introduction*



Example: Hello World!

From base-station to mobile device: each character represented by 7 bits in current WEA implementation

H	e	l	l	o	<space>	W	o	r	l	d	!
1001000	1100101	1101100	1101100	1101111	0100000	1010111	1101111	1110010	1101100	1100100	0100001

More accurately: maximum is 630 bits

Fewer bits per character – *Wastefulness of 7 bits*

				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	@	Δ	SP	0	¡	P	¿	p
0	0	0	1	1	£	_	!	1	A	Q	a	q
0	0	1	0	2	$	Φ	"	2	B	R	b	r
0	0	1	1	3	¥	Γ	#	3	C	S	c	s
0	1	0	0	4	è	Λ	¤	4	D	T	d	t
0	1	0	1	5	é	Ω	%	5	E	U	e	u
0	1	1	0	6	ù	Π	&	6	F	V	f	v
0	1	1	1	7	ì	Ψ	'	7	G	W	g	w
1	0	0	0	8	ò	Σ	(	8	H	X	h	x
1	0	0	1	9	Ç	Θ	)	9	I	Y	i	y
1	0	1	0	10	LF	Ξ	*	:	J	Z	j	z
1	0	1	1	11	Ø	1)	+	;	K	Ä	k	ä
1	1	0	0	12	ø	Æ	,	<	L	Ö	l	ö
1	1	0	1	13	CR	æ	-	=	M	Ñ	m	ñ
1	1	1	0	14	Å	ß	.	>	N	Ü	n	ü
1	1	1	1	15	å	É	/	?	O	§	o	à

128 characters require 7 bits ($log_2 182=7$) – however not all 128 characters used in WEA messages

Fewer bits per character – *Downsizing character set*

@	~~¡~~	SP	0	¡	P	¿	p
£	_	!	1	A	Q	a	q
$	~~¥~~	"	2	B	R	b	r
~~È~~	~~É~~	#	3	C	S	c	s
~~è~~	~~é~~	~~ù~~	4	D	T	d	t
~~ì~~	~~ò~~	%	5	E	U	e	u
~~Ç~~	~~Ø~~	&	6	F	V	f	v
~~ø~~	~~Å~~	'	7	G	W	g	w
~~Å~~	~~å~~	(	8	H	X	h	x
~~Δ~~	~~Φ~~	)	9	I	Y	i	y
LF	~~Γ~~	*	:	J	Z	j	z
~~Λ~~	1)	+	;	K	~~Ä~~	k	~~ä~~
~~Ω~~	~~Æ~~	,	<	L	~~Ö~~	l	~~ö~~
CR	~~Π~~	-	=	M	Ñ	m	ñ
~~Ψ~~	~~ß~~	.	>	N	~~Ü~~	n	~~ü~~
~~Σ~~	~~Θ~~	/	?	O	~~§~~	o	~~à~~

Character set needs *at most 94* characters for WEA

94 characters require *6.55 bits* per character

With 6.55 bits per character, *maximum length is 96*

Even larger maximum lengths achievable by (a) dropping more characters (e.g., small letters) and (b) exploiting statistical characteristics of WEA msgs

FURTHER RESEARCH NEEDED

Fewer bits per character – *Current vs Proposed*

	Current	Proposed
Alert Originator	Hello World!	Hello World!
Alert Origination Tool	Hello World!	Map characters to bits using enhanced bit representation 1000010000100001011001011001110011010101000100111001000100101100001110111 00 7bits 6bits 6bits 6bits 6bits 6bits 7bits 6bits 6bits 6bits 6bits 7bits Reparse bits according to native WEA 7-bit representation 1000010000100001011001011001110011010101000100111001000100101100001110111 00 B ò , Y f T ' _ Π Å p
Alert Aggregator	Hello World!	Bò,YfT'_ΠÅp
Alert Gateway	Hello World!	Bò,YfT'_ΠÅp
CMSP Gateway	Hello World!	Bò,YfT'_ΠÅp
CMSP Infrastructure	Hello World!	Bò,YfT'_ΠÅp
Radio Elements	Hello World!	Bò,YfT'_ΠÅp
WEA Inbox	Hello World!	Bò,YfT'_ΠÅp
WEA OS App	Hello World!	Bò,YfT'_ΠÅp Convert characters to bits using native WEA 7-bit mapping 1000010000100001011001011001110011010101000100111001000100101100001110111 0000 Parse bits according to enhanced bit mapping 1000010000100001011001011001110011010101000100111001000100101100001110111 00 H e l l o W o r l d !