

Proposal of frame mix profiles for NGFI

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Proposal of frame mix profiles for NGFI							
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Background

- Annex E in current IEEE1914.1 draft is not in a complete state because it only specifies a simple RMIX profile
 - Ratio for higher layer split 0%
 - Ratio for low layer split 90% {256:1,384:1, 512:1, 1024:1}
 - Internet MIX(background traffic): 10% {64:7, 570:4, 1518:1}
- In [1], it is proposed to use EMIX in Y.1564 to specify the mix profile via a sequence of the designator (e.g., {aeaaeageaaea} referring to the table

a	b	с	d	e	f	g	h	u
64	128	256	512	1024	1280	1518	MTU	User defined

- It is desirable to provide commendations for the frame mix profiles (designation patterns) to cover NGFI-I (Fronthaul) and NGFI-II (midhaul)
- [1]. Frame Mix options (1914.1), Stuart Whitehead, Anritsu



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IEEE 1914.3 Time Domain Traffic

CPRI frame structure

- Each basic frame (BF) contains fixed number of bits
- Control word at each basic frame (BF)
- 1 control word and 15 data words in a BF
- # of bits/word depending on CPRI line rates

How it fits into a packet:

			Packet size	256 15		18	
				# of BFs per	Latency	# of BFs per	Latency
option	т	BF data rate	add line codi	Packet	Estimate(us)	Packet	Estimate(us)
1	8	128	160	12	3.1	75	19.5
2	16	256	320	6	1.6	37	9.6
3	32	512	640	3	0.8	18	4.7
4	40	640	800	2	0.5	15	3.9
5	64	1024	1280	1	0.3	9	2.3
6	80	1280	1600	1	0.3	7	1.8
7	128	2048	2560	0	0.0	4	1.0
7A	128	2048	2112	0	0.0	5	1.3
8	160	2560	2640	0	0.0	4	1.0
9	192	3072	3168	0	0.0	3	0.8
10	384	6144	6336	0	0.0	1	0.3





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NGFI-I EMIX for IEEE 1914.3 Time Domain Traffic

Structure Agnostic mode

- A RoE packet carries N * CPRI Basic Frames of fixed size.
- There is not further splitting or looking into CPRI frame
- ➔ Constant packet size
 - Reasonable to assume N is selected as a tradeoff between overhead and latency
 - \circ Examples
 - Low line rate: N=18 for line rate opt 3, 0.8us latency due to packetization
 - High line rate: N=4 for line rate opt 7, 1us latency

Proposed packet size

_	Low line rate option:	EMIX=c	(256)
_	High line rate option:	EMIX=q	(1518)

Structure Awareness mode

- Data segmented according to separate A&C containers
 - \circ \rightarrow possibly result in mixed packet sizes due to A&C container difference
- Control word is also separated into a different packet
 - \circ Control word/data word ratio: 1:15
 - $\circ \quad \textbf{\rightarrow} \textbf{Small} \text{ packet size needs be added for control word}$

Proposed packet size

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- Low line rate option:
- High line rate option:

EMIX=abc (64, 128, 256)

EMIX=adg (64, 512, 1518)

IEEE 1914.3 Frequency Domain Traffic

IEEE 1914.3 specification for frequency domain data

- Frequency domain data is sent on per symbol basis
- Packet length calculation:

sampleWidth x 12 x 2 x (# of used PRBs)/8

- A symbol of data is not segment-able, so well likely leading to jumbo packets
 - Example: 100 PRB, 16bit sample width, Length = 16x12x2x100/8=4800

PRB distribution profile

- Figure from real-life RAN statistics
- Showing almost flat distribution cross PRBs
- Natural assumption of a uniform distributed PRB profile





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NGFI-I EMIX for IEEE 1914.3 Frequency Domain Traffic

Packet size calculation at various PRB sizes:

sample width(bits)	16
bytes/RE	4
# of RE/PRB	12

			Proposed EMIX size	Proposed EMIX
PRB size	# of radio elements(RE)	Payload size(bytes)	(w/margin for header)	designator
20	240	960	1024	е
40	480	1920	2000	u1
60	720	2880	3000	u2
80	960	3840	4000	u3
100	1200	4800	5000	h

Assumption: uniformly distributed PRB profile

Proposed EMIX:

EMIX=ehu1u2u3 with

е	h	u1	u2	u3
1024	5000	2000	3000	4000





Midhaul (NGFI-II) packet statistics

Figure from Real Network

- Packet size does not include Ethernet, IP, or GTP headers, etc.
- Packet size reflects current transport layer MTU (Max Transfer Unit) settings.
- Packet size at the PDCP layer (i.e. DPCP output to RLC) for midhaul
- Simulate eMBB traffic

Observation

- Peak around 1014 byte pack size
- Average 960 bytes





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Midhaul EMIX design

Using packet distribution from the real network:

Quantized distribution

Packet size	distribution
64	0.29%
128	3.83%
256	26.38%
512	60.09%
1024	6.39%
1280	3.01%
1518	0.00%

EMIX design

а	0
b	1
С	4
d	9
e	1
f	0
g	0

EMIX sequence:

bddcddcdedcddcd

a	b	c	d	e	f	g	h	u
64	128	256	512	1024	1280	1518	MTU	User defined

