

SCHC for ZE (Zero Energy) Devices

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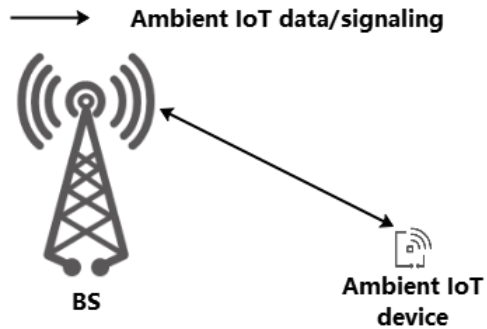
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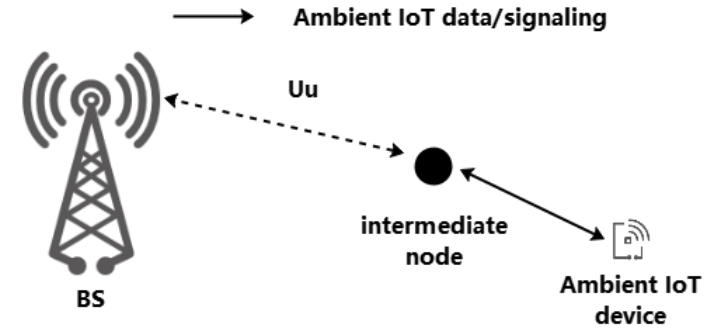
Draft: draft-ramos-schc-zero-energy-devices-01.md

- Cellular Based ZE-Devices
 - Devices and topologies
 - User plane characteristics
- Delay friendly optimized transmissions
- SCHC Context configuration
- Latency configuration for fragmentation
- Payload compression

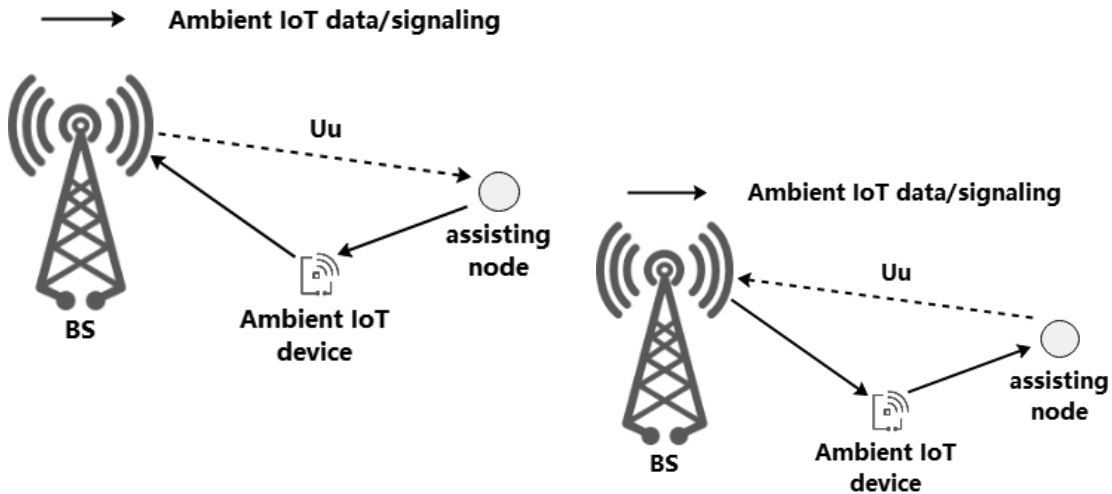
3GPP Considered Topologies



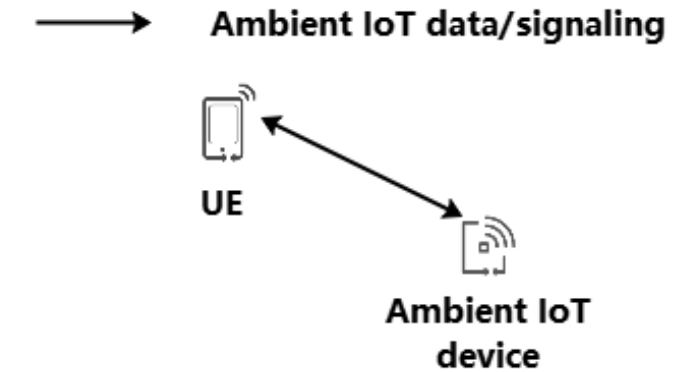
Topology 1



Topology 2



Topology 3



Topology 4

Device Types

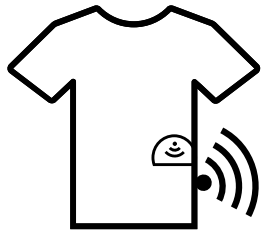
Device A

- No energy storage
- no independent signal generation/amplification, i.e. backscattering transmission.



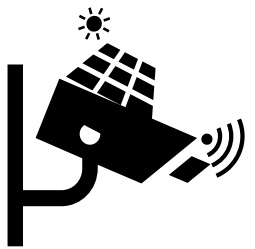
Device B

- Has energy storage,
- No independent signal generation, i.e. backscattering transmission.
- Use of stored energy can include amplification for reflected signals.



Device C

- Has energy storage,
- has independent signal generation, i.e., active RF components for transmission.



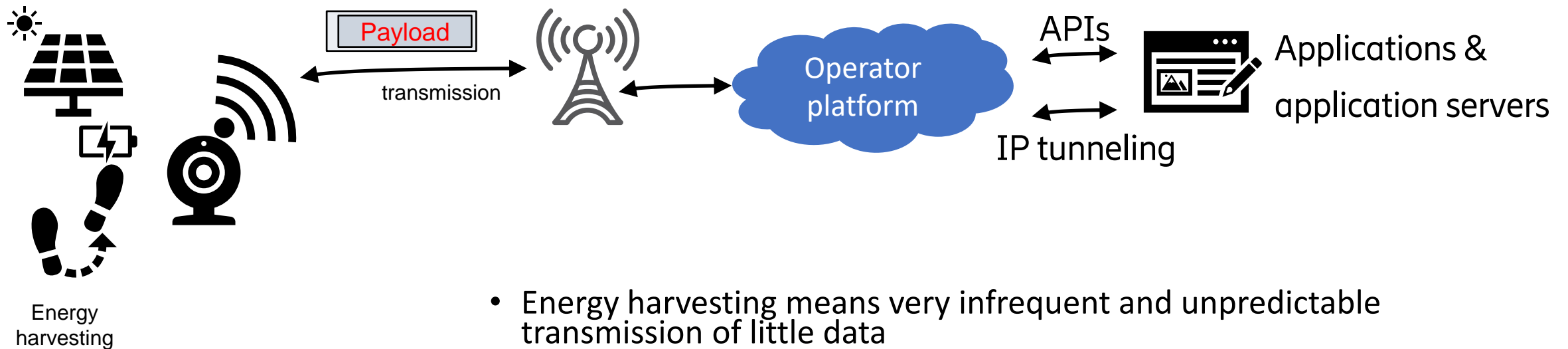
User plane characteristics

- Simplified operation to save energy
 - Longer delays for transmissions/receptions
 - Lower reliability
- Overhead reduction
 - Segmentation (fragmentation)
 - Headers and potentially payload compression
 - Reliability support
 - Padding reduction/elimination



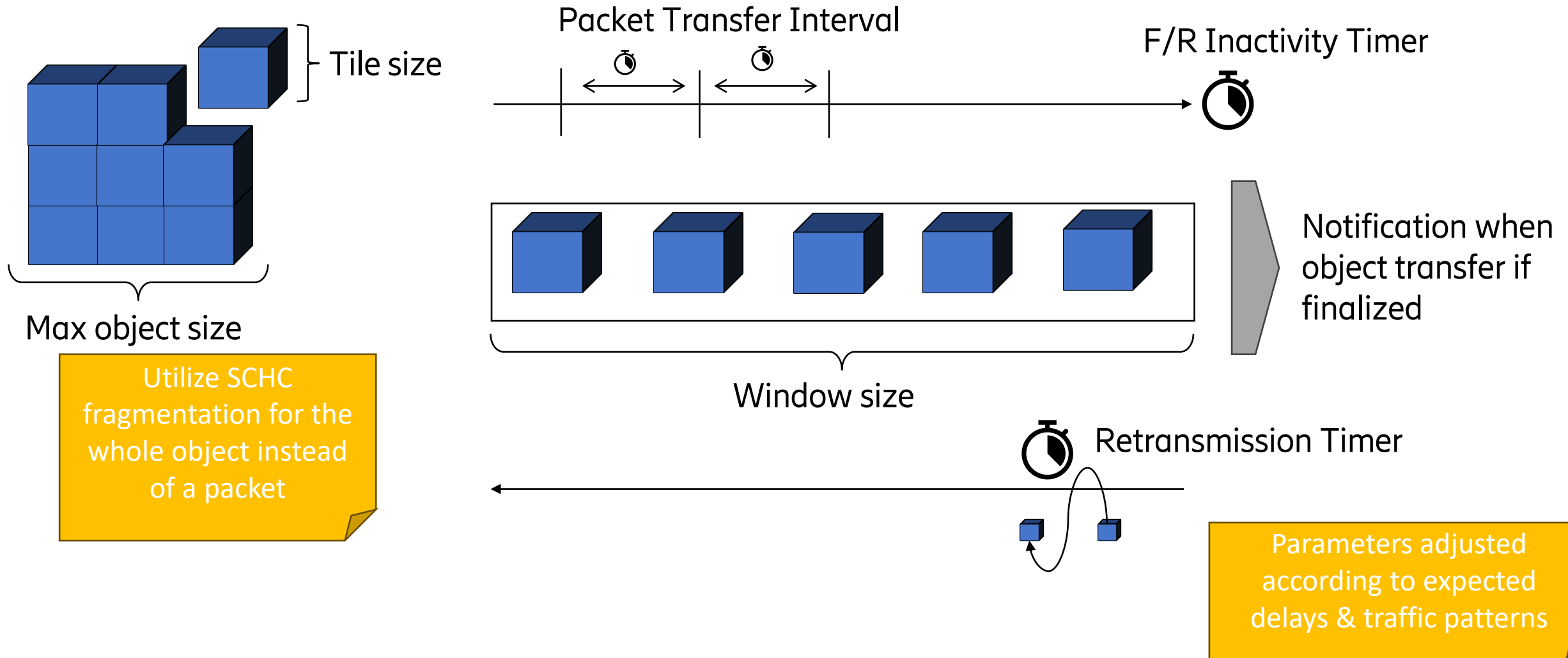
SCHC

Zero Energy UEs would transmit quite infrequently, unpredictable and low payload

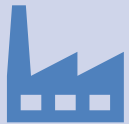


- Energy harvesting means very infrequent and unpredictable transmission of little data
- The transmission should maximize likelihood of decoding and higher layer protocols should support delay tolerant and low overhead capabilities

Use of SCHC as a transfer protocol to enable delay tolerance



Context configuration



Out-of-band configuration

Predetermined profiles factory set

Issue: Notify profile to the network entities



In-band configured by radio control protocol or higher layer protocols

Configuration according to traffic and site characteristics

Issue: Size of context and efficiency of format

In band configuration of context

- Delay expectancy
 - No_delay
 - Hours (short ?)
 - Days (medium ?)
 - Weeks (Long ?)
 - Month (extra long?)
- Timers
 - Packet transfer interval
 - Inactivity timer
 - Re-transmission timer
- Max_Packet_Size
 - Small
 - Medium
 - Large
- SCHC window size
- MAX_ACK_REQUEST
 - Addressing changes in delays

Latency configuration for fragmentation

- **Latency mapping hours.**

- The devices that maps to this kind of profile would have a source of energy that can recharge the device at least once per hour.
- Retransmission timers can be set to a maximum of 6 hours
- Inactivity timers: 3 to 4 hours.

- **Latency mapping a day.**

- The devices may require a full day to recharge for sending a packet.
- Retransmission timer may take 4 or 7 days
- Inactivity timer of 2 or 3 days.

- **Latency mapping a week.**

- In this case very infrequently packets are sent and therefore it is not expected that a lot of data would be transmitted at once.
- Retransmission timer and inactivity timer would be quite close to the transmission time.
 - Could be 2 weeks for inactivity timer and 3 weeks for retransmission timer.

- **Latency mapping a month.**

- Similarly to the previous case, the values should also map close to transmission expectation.
- 2 months for inactivity timer and 3 months for retransmission timer.

Payload compression

- Reuse of same SCHC compression engine to compress also payload with a field separator configured/or data-model/protocol used specified

JSON for SENML

```
[  
  {"bn":"2001:db8:1234:5678::1/",  
   "n": "temperature", "u": "Cel",  
   "v": 25.2}, {"n": "humidity",  
   "u": "%RH", "v": 30}  
]
```

FID	FL	FP	DI	TV	MO	CDA		Sent [bits]
application/senml+json.bn.1	22	1	up	2001:...	equal	not-sent		0
application/senml+json.n.1	11	1	up	temp...	equal	not-sent		0
application/senml+json.u.1	3	1	up	Cel	equal	not-sent		0
...		
application/senml+json.n.2	8	1	up	hum...	equal	not-sent		0

Should we discuss WG
adoption?