



ITU-T Kaleidoscope Conference Innovations in NGN

Future Challenges of IrSimple Protocol: Efficient Flow Control Scheme and Long Distance Capability

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Geneva, 12-13 May 2008

Outline

- NGN and WPAN
- WPAN technologies
- Overview of IrSimple protocol
- Future Challenges of IrSimple Protocol
- Conclusion and Future works

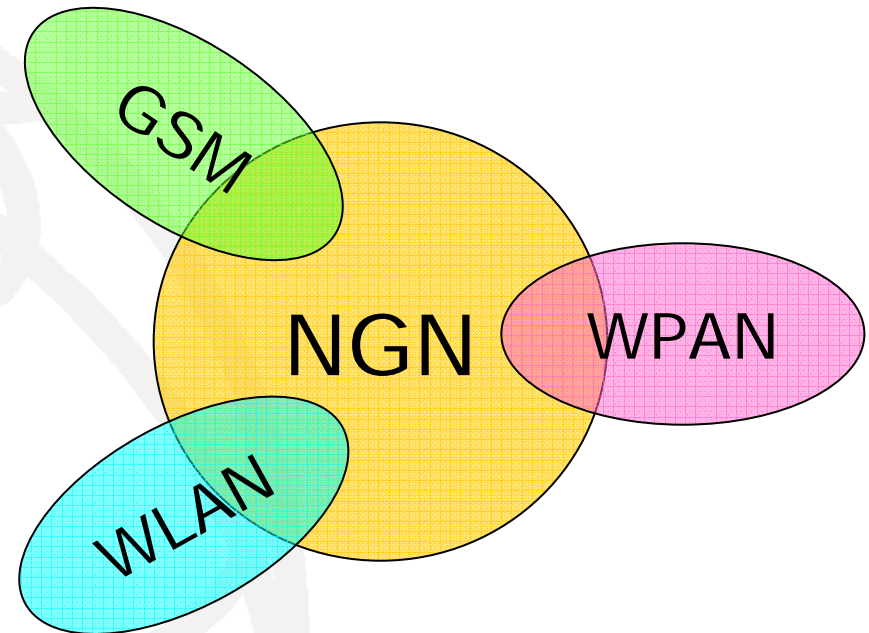
NGN and WPAN

■ **NGN**

- An IP based network
- Supports wide range of services over the same network
- Focuses on seamlessly integrating the existing wireless technologies

■ **WPAN**

- Bluetooth
- Zigbee
- IrDA



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Comparison between different WPAN technologies

	IrDA	Bluetooth	Zigbee
ISM band	Infrared	RF (2.4 GHz)	RF (2.4 GHz)
Range	1m (for UFIR and GigaIr, the distance is 20cm)	Up to 10m	Up to 70m
Connection Type, Direction	Point-to-Point, Narrow Angle (50 degrees)	Multipoint, Omni-directional	Multipoint, Omni-directional
Maximum Data Rate	100 Mbps (1Gbps will be available soon)	1Mbps	250Kbps
Security	Line of sight requirement ensures the security	Authentication, encryption, spread spectrum	Authentication, encryption, spread spectrum
Approximate Cost	\$1	\$3	\$1

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IrSimple protocol: the missing link?

- IrDA has adopted 2 new protocols

IrSimple : For instant and quick (but small sized) data transfer (i.e. transferring photo, mp3, presentation slide)

IrBurst : For large data block transfer (i.e. transferring movie file or streaming)

How IrSimple protocol works?

- IrSimple eliminates the channel listening and device discovery procedures, required in the existing IrDA protocols
- Establishes the connection immediately to provide simple and fast data transfer.

Conversation sequence

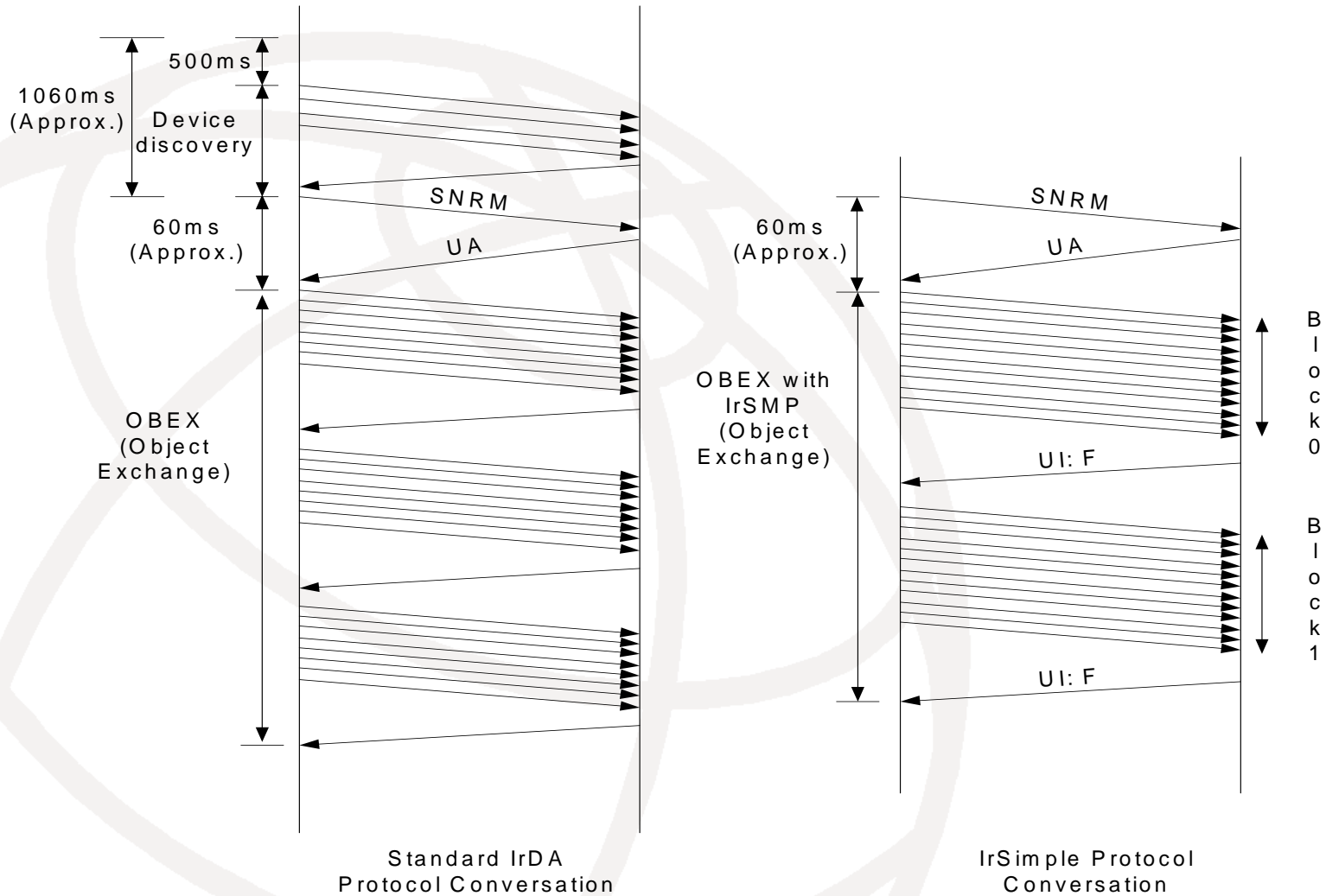


Fig. Standard IrDA and IrSimple protocol conversation

Application Scenarios (1)

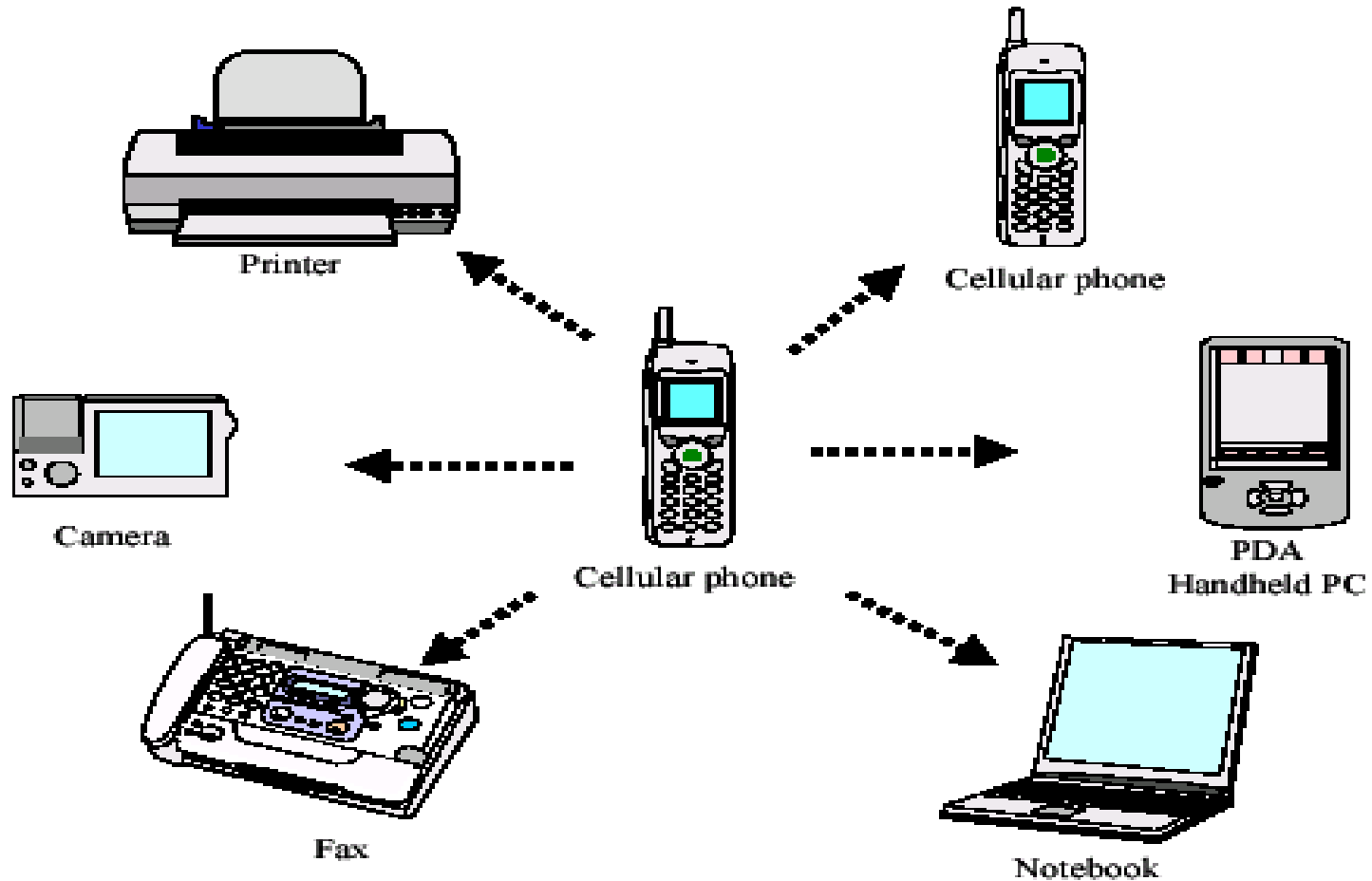
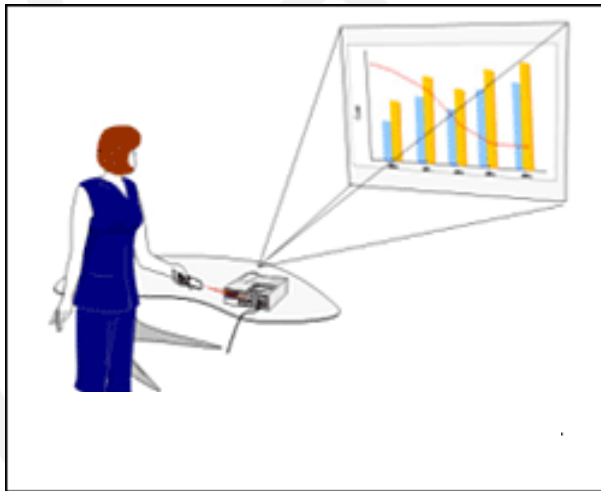
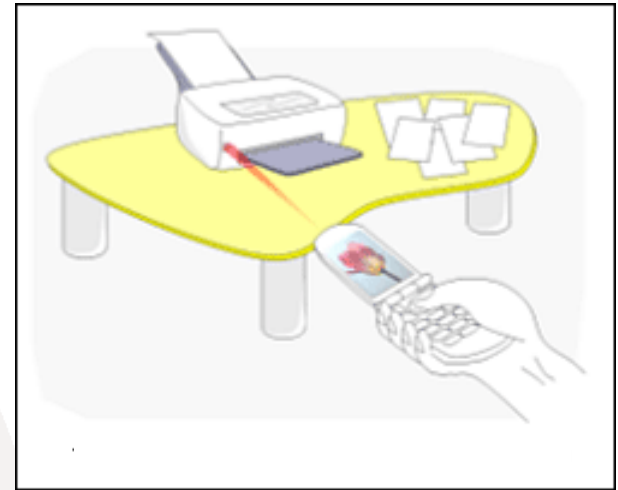
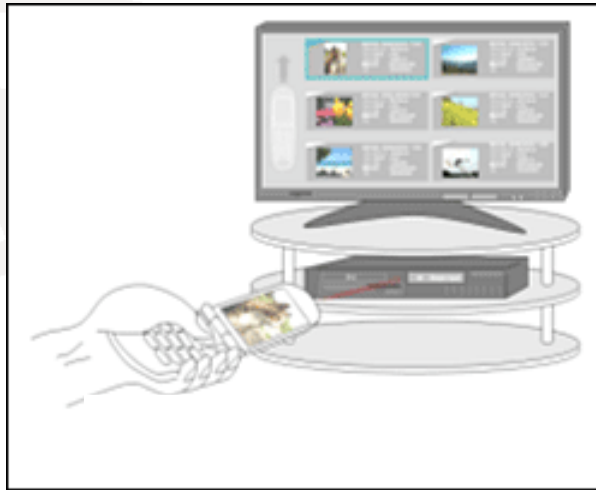


Fig. Object transfer between mobile phone and other devices or mobile phone

Application Scenarios (2)

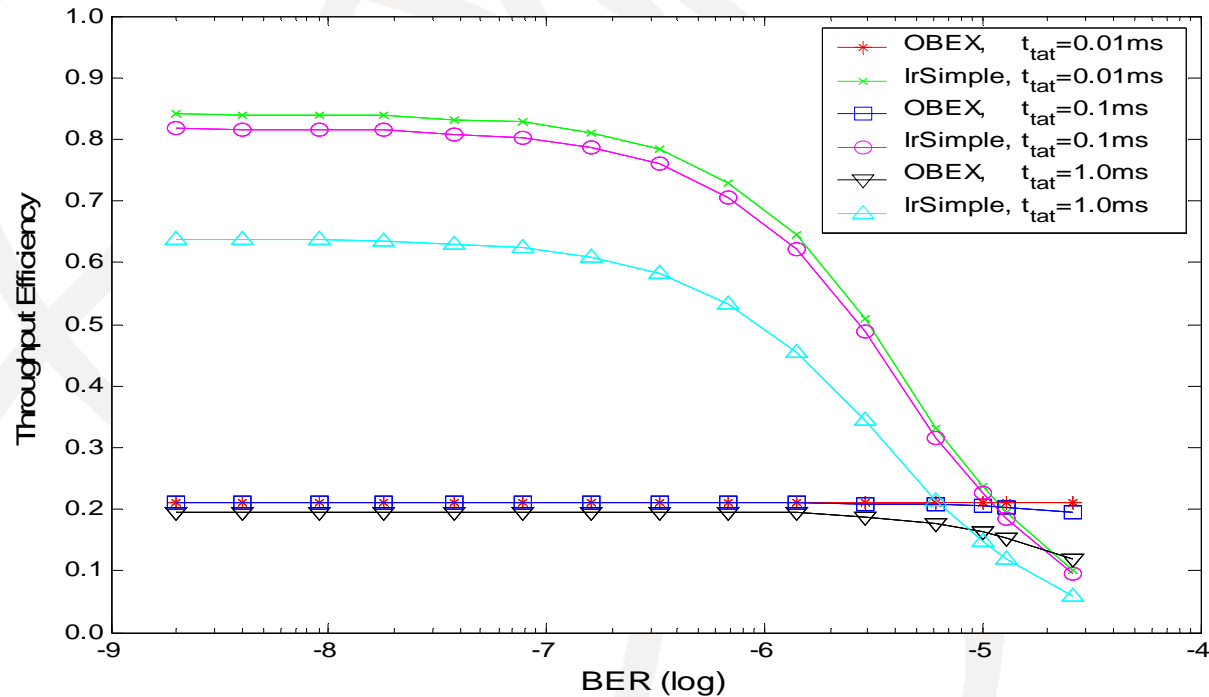


Source: NTT Docomo webpage

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Performance Comparison of IrSimple and OBEX for various bit error rates *



- IrSimple has almost 64% improvement in throughput efficiency over OBEX over 100Mb/s IrDA links with a low turnaround time of 0.01ms.

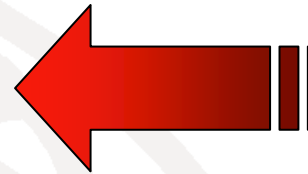
* Mohammad Shah Alam, Shamim Ara Shawkat, Gontaro Kitazumi and Mitsuji Matsumoto "IrSimple Modeling and Performance Evaluation for High Speed Infrared Communications", *IEEE Global Telecommunication Conference 2006 (GLOBECOM 2006)* Geneva, 12-13 May 2008

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User's Experience



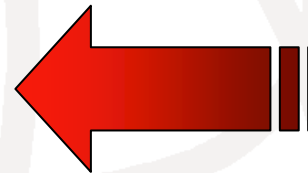
6s



Previous IrDA protocol
with 4Mbps data rate



1s



IrSimple with
4Mbps data rate



Fig. Comparison of image transfer for two million pixel (500k byte) sized photo

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Future Challenges of IrSimple Protocol

- Efficient flow control scheme
 - Lower layer (link layer) instead of higher layer (IrSMP layer)
 - Reduces redundant data retransmissions
- Long Distance Capability
 - Increase link distance beyond 1 meter guaranteed by IrDA.
 - The link distance can be increased in two ways
 - By increasing transmitted light intensity
 - By increasing receiver sensitivity

Improving Flow Control Scheme

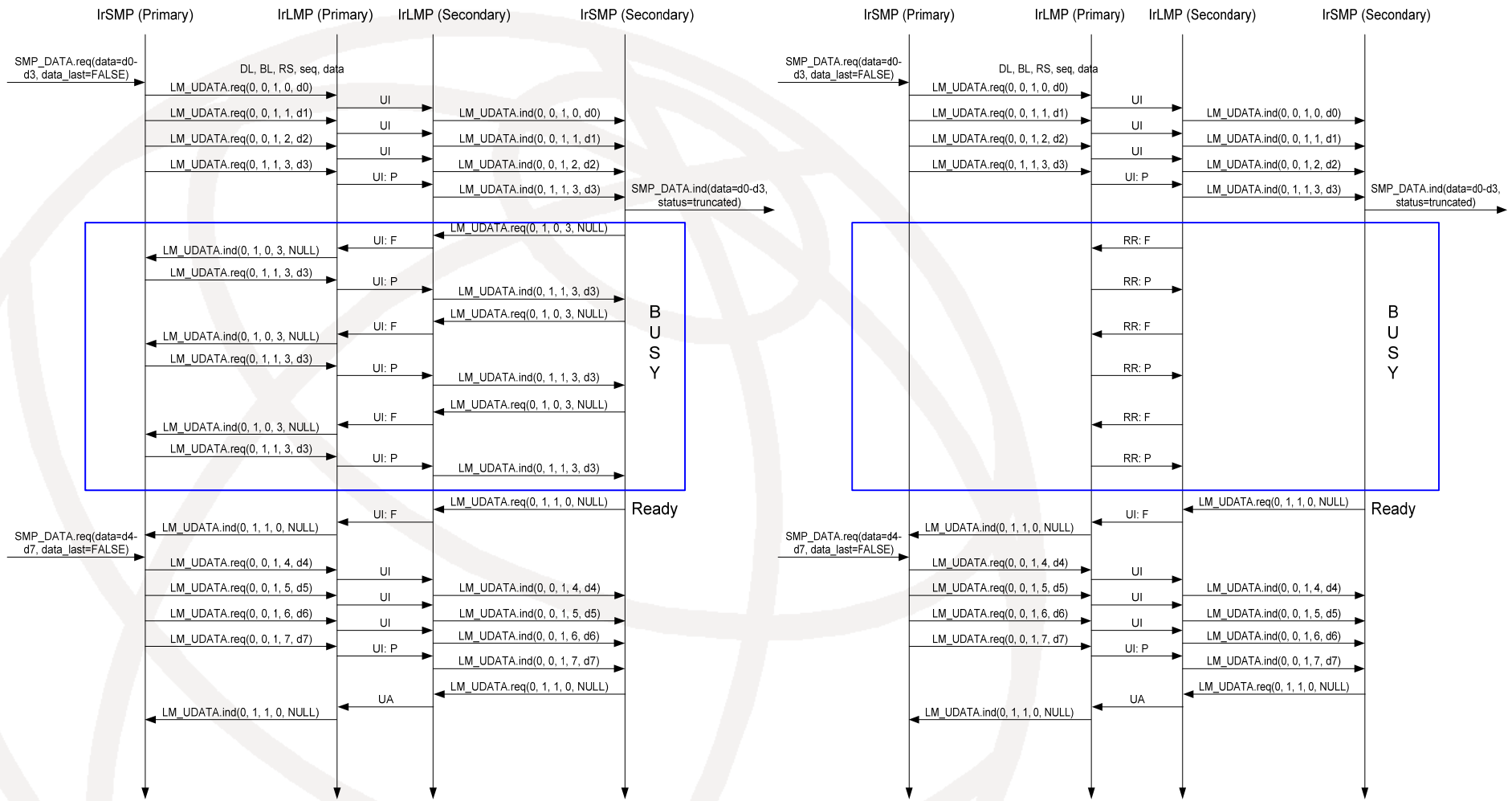
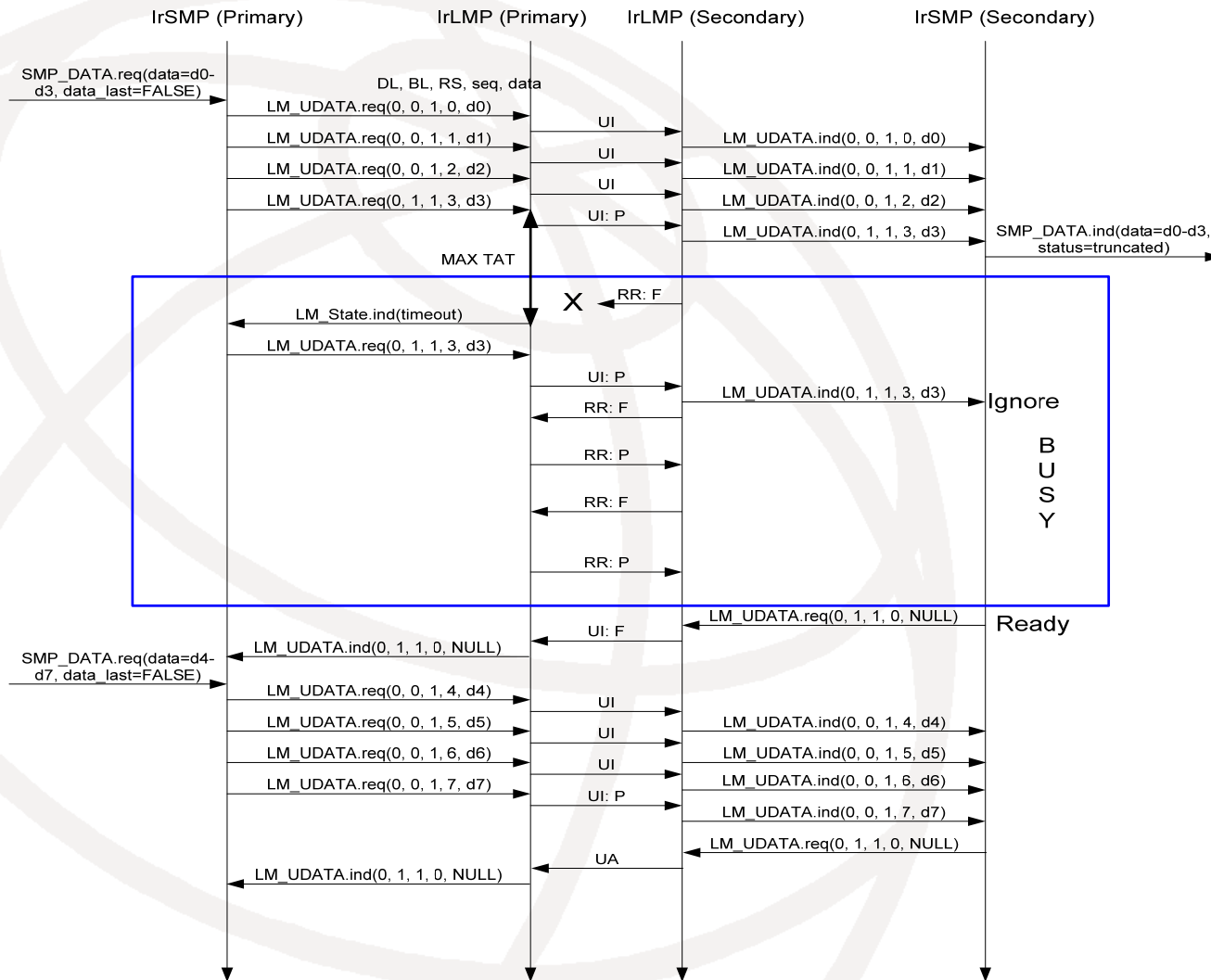


Fig. Existing Flow Control scheme

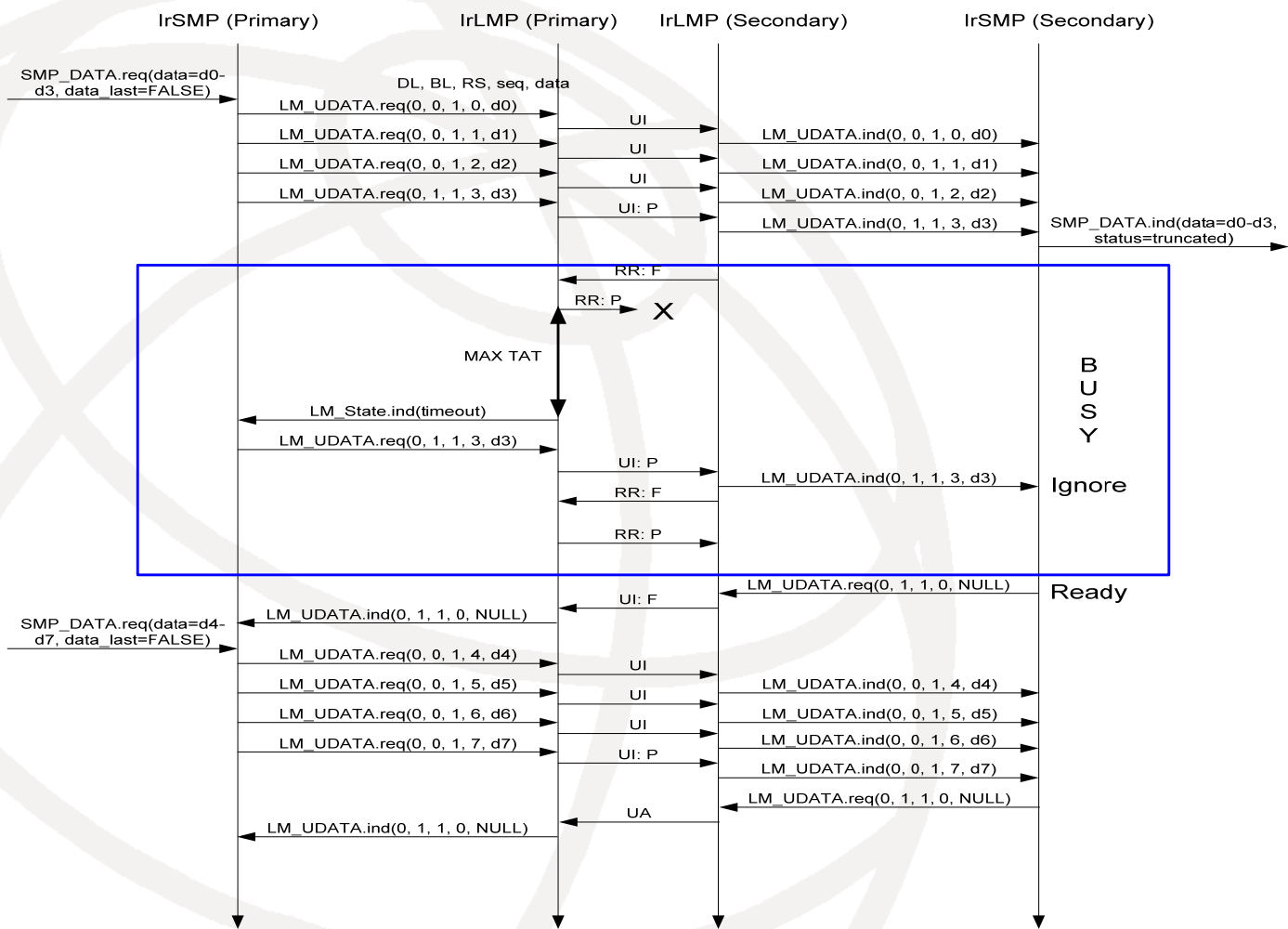
Fig. Proposed Efficient Flow Control scheme

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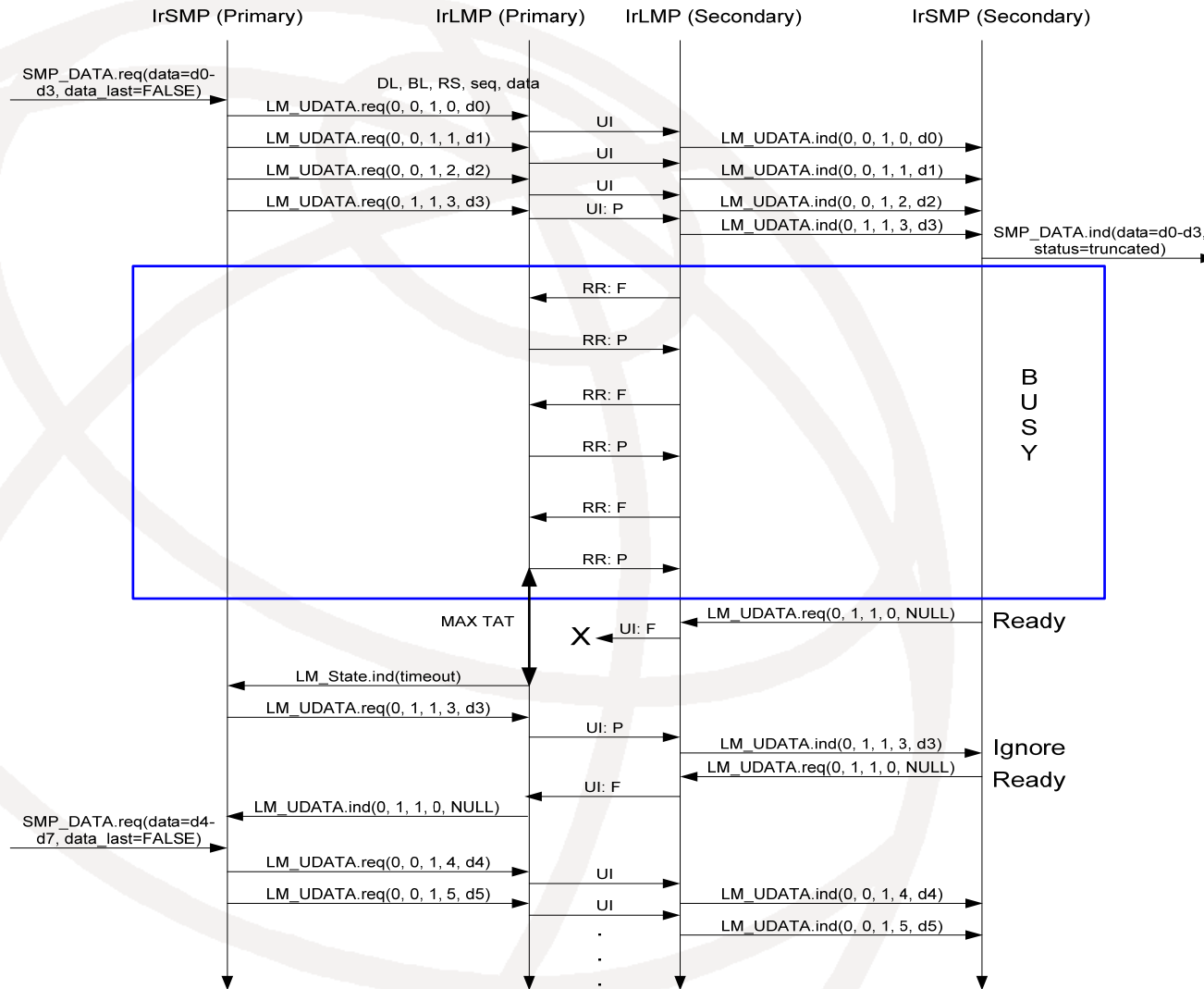
When Receive Ready (RR) frame from secondary station is lost



When Receive Ready (RR) frame from primary station is lost



When Data (UI) frame is lost



Long distance capability: Increasing Transmitted Light Intensity

Minimum luminance in the vicinity of 1cm ²	mW/cm ²	0.009	0.009	0.009	0.009	0.009	0.009	0.009
The maximum attainment distance	cm	20	30	40	50	100	200	300
Gain area	cm ²	400	900	1600	2500	10000	40000	90000
Required minimum luminance	mW/Sr	3.6	8.1	14.4	22.5	90	360	810
The maximum allowable luminance	mW/cm ²	500	500	500	500	500	500	500
Minimum Distance that can be received	cm	0.08	0.13	0.17	0.21	0.42	0.85	1.27

Long distance capability: Increasing Receiver Sensitivity

Minimum quantities of light for each cm ²	mW/cm ²	0.009	0.009	0.009	0.009	0.009	0.009	0.009
Standard maximum distance	cm	20	20	20	20	20	20	20
Gain area	cm ²	400	400	400	400	400	400	400
Minimum luminance	mW/Sr	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Distance	cm	20	30	40	50	100	200	300
Gain area	cm ²	400	900	1600	2500	10000	40000	90000
Reception magnification		1	2.25	4	6.25	25	100	225
Reception radius	mm	1	1	1	1	1	1	1
Radius of antenna	mm	1	1.5	2	2.5	5	10	15

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Conclusion and Future Works

- An improvement in the existing flow control
 - At IrLAP layer
 - To reduce redundant traffic in the system.
 - Can recover all possible error cases
- Existing IrDA physical layer
 - Can support at least 3 meters distance
 - Increasing transmitter intensity
 - Increases the minimum distance between devices
 - Increasing receiver sensitivity
 - Radius of the required concentrator/lens/antenna is practical
- Future works
 - To modify the error recovery scheme
 - More applications of IrSimple protocol
 - To complement the drawbacks of other WPAN technologies

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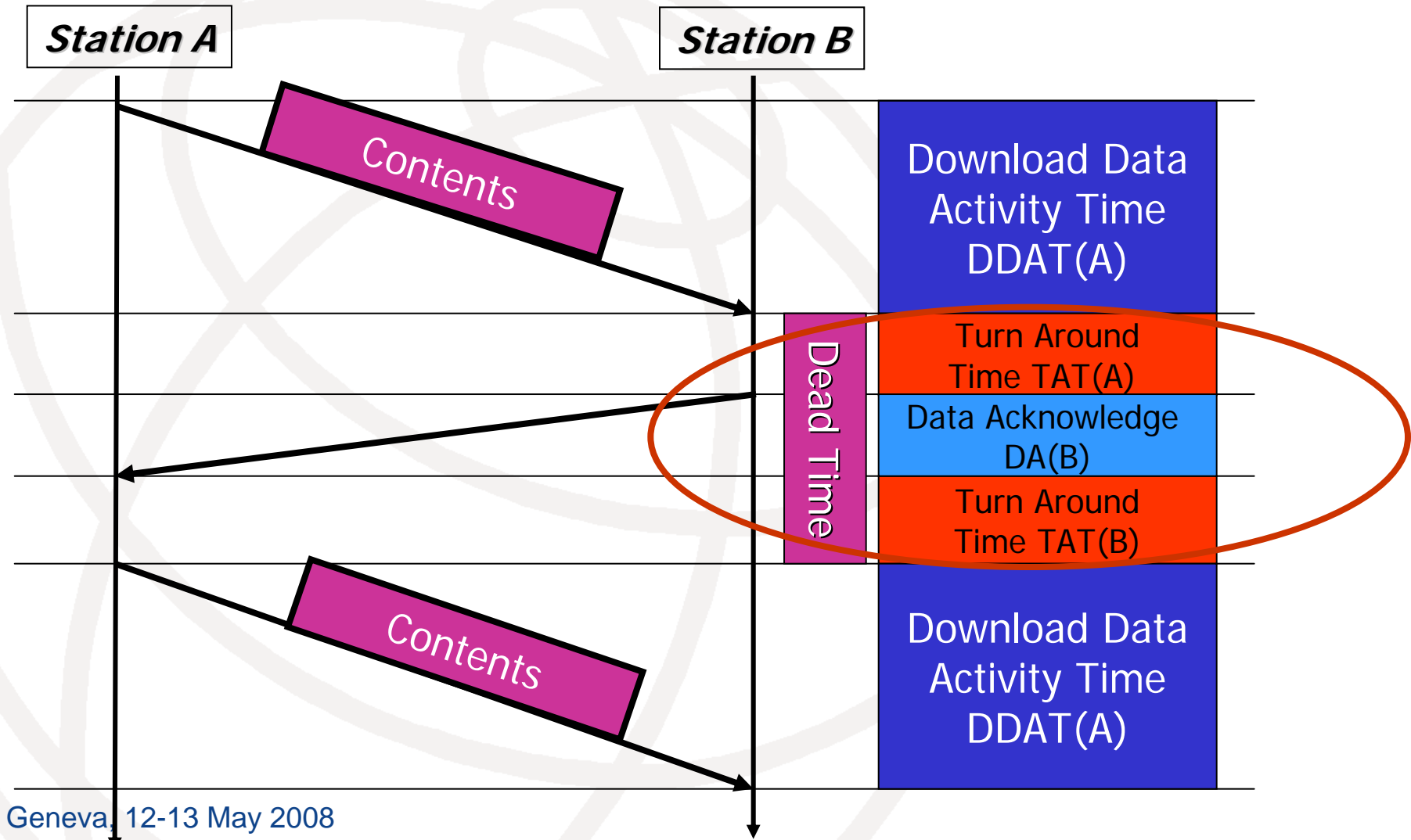
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Acknowledgement

*Special thanks go to Telecommunications
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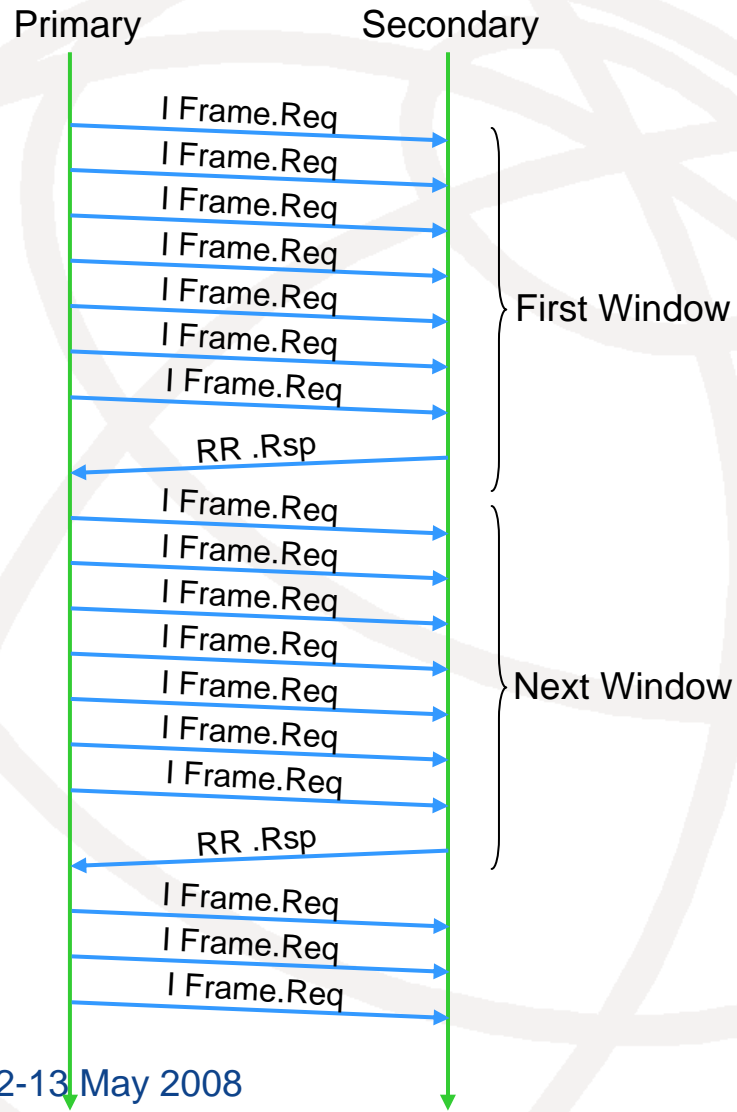
Thank You.

IrDA links conversation scheme



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Current IrDA Data Transfer Sequence



IrSimple Enhanced Burst Data Transfer Sequence

