

Agenda Item: 9.11
Source: IPWireless, UTStarcom, InterDigital, Sasken, Orange
Title: Proposed Work Item on 3.84 Mcps TDD Enhanced Uplink
Document for: Approval

In RAN#20, the study item “Feasibility Study on Uplink Enhancements for UTRA TDD” was approved. The aim of the study was to look into the feasibility and performance gains of uplink enhancement techniques such as Node-B scheduling, Hybrid ARQ and Adaptive Modulation and Coding for the TDD mode in order to increase the coverage and throughput and reduce the delay of the uplink. Applications that could benefit from an enhanced uplink include web browsing, video clips, multimedia messaging and other IP based applications.

RAN WG1 held prime responsibility for the study and the findings have been documented in a technical report, TR 25.804. The study has concluded that incorporation of the following uplink enhancement techniques would be beneficial:

- Node B controlled rate scheduling
- Node-B controlled physical resource scheduling
- Hybrid ARQ
- Higher order modulation (including 8-PSK at a minimum)
- Intra-frame code hopping (for 3.84Mcps TDD, 1.28Mcps TDD FFS)

The study also determined that the associated complexity is manageable and that backwards compatibility with earlier releases could be maintained.

Based on these findings, this document proposes a work item to incorporate the above enhancements for the 3.84 Mcps TDD uplink into the 3GPP specifications.

3.84 Mcps TDD Enhanced Uplink

Work Item Description

Title: 3.84 Mcps TDD Enhanced Uplink

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

- 3.84 Mcps TDD Enhanced Uplink: Physical Layer
- 3.84 Mcps TDD Enhanced Uplink: Layer 2 and 3 Protocol Aspects
- 3.84 Mcps TDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects
- 3.84 Mcps TDD Enhanced Uplink: RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

3 Justification

In RAN#20, a study item on “Feasibility Study on Uplink Enhancements for UTRA TDD” was approved. The aim of the study was to look into the feasibility and performance gains of uplink enhancement techniques to increase the coverage and throughput and reduce the delay of the uplink for packet-based services.

The study concluded that the incorporation of Node-B controlled rate- and physical resource scheduling, hybrid ARQ, and support for higher-order modulation are able to deliver a significant performance improvement over existing releases with manageable complexity and whilst maintaining backwards compatibility.

4 Objective

The technical objective of the study item is to introduce enhanced uplink functionality into the specifications in order to improve the performance of the uplink for packet-based services. The improvements should take into account backwards compatibility aspects.

- For radio interface physical layer, the feature includes:
 - Physical and Transport Channels mapping
 - Multiplexing and Channel Coding
 - Physical Layer procedures
 - Physical layer measurements
 - UE physical layer capabilities
- For radio interface higher RAN layers, the feature includes:
 - Architecture aspects
 - MAC entity (Scheduling and hybrid ARQ protocol)
 - Interlayer interactions in connected mode
 - Control plane protocols
 - User plane protocols
 - UE capabilities
- For Iur/Iub interface, the feature includes:
 - Control plane protocols
 - User plane protocols
- For radio transmission and reception, the feature includes:
 - UE radio transmission and reception
 - Base Station radio transmission and reception
 - Base Station conformance testing
 - Requirements for support of Radio Resource Management

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects :	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
25.3xx	UTRA 3.84 Mcps TDD Enhanced Uplink stage 2	R2	R1	RAN#29	RAN#30	Rapporteur: Nicholas Anderson, IPWireless
Affected existing specifications						
Spec No.	CR	Subject			Approved at plenary#	Comments

Note: this work item is the parent Work Item dealing with the stage 2 aspects; the stage 3 is defined in each of the 4 work items defined for each WG.

11 Work item rapporteurs

Nicholas Anderson (IPWireless)

12 Work item leadership

TSG-RAN WG2

13 Supporting Companies

14 Classification of the WI (if known)

X	Feature (go to 14a)
	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

3.84 Mcps TDD Enhanced Uplink: Physical Layer

3.84 Mcps TDD Enhanced Uplink: Layer 2 and 3 Protocol Aspects

3.84 Mcps TDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects

3.84 Mcps TDD Enhanced Uplink: RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

14b The WI is a Building Block: parent Feature

(one Work Item identified as a feature)

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

This WI has not finished yet. See RAN_Work_Items.

3.84 Mcps TDD Enhanced Uplink: Physical Layer

Work Item Description

Title: 3.84 Mcps TDD Enhanced Uplink: Physical Layer

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

- 3.84 Mcps TDD Enhanced Uplink
- 3.84 Mcps TDD Enhanced Uplink: Layer 2 and 3 Protocol Aspects
- 3.84 Mcps TDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects
- 3.84 Mcps TDD Enhanced Uplink: RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

3 Justification

In RAN#20, a study item on “Feasibility Study on Uplink Enhancements for UTRA TDD” was approved. The aim of the study was to look into the feasibility and performance gains of uplink enhancement techniques to increase the coverage and throughput and reduce the delay of the uplink for packet-based services.

The study concluded that the incorporation of Node-B controlled rate- and physical resource scheduling, hybrid ARQ, and support for higher-order modulation are able to deliver a significant performance improvement over existing releases with manageable complexity and whilst maintaining backwards compatibility.

4 Objective

The technical objective of the study item is to introduce enhanced uplink functionality into the specifications in order to improve the performance of the uplink for packet-based services. The improvements should take into account backwards compatibility aspects.

- For physical layer, the building block includes:
 - Physical and Transport Channels mapping
 - Multiplexing and Channel Coding
 - Spreading and modulation
 - Physical Layer procedures
 - Physical layer measurements
 - UE physical layer capabilities

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects :	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
		R1				
Affected existing specifications						
Spec No.	CR	Subject			Approved at plenary#	Comments
25.201		Physical layer – general description			RAN#31	
25.221		Physical channels and mapping of transport channels onto physical channels (TDD)			RAN#31	
25.222		Multiplexing and channel coding (TDD)			RAN#31	
25.223		Spreading and modulation (TDD)			RAN#31	
25.224		Physical layer procedures (TDD)			RAN#31	
25.225		Physical layer; Measurements (TDD)			RAN#31	

Note: this work item is the Physical Layer part of the stage 3 of the 3.84 Mcps TDD Enhanced Uplink work item.

11 Work item rapporteurs

Nicholas Anderson (IPWireless)

12 Work item leadership

TSG-RAN WG1

13 Supporting Companies

IPWireless Inc., UTStarcom, InterDigital, Sasken, Orange

14 Classification of the WI (if known)

	Feature (go to 14a)
X	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

14b The WI is a Building Block: parent Feature

(one Work Item identified as a feature)

TDD Enhanced Uplink

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

This WI has not finished yet. See RAN_Work_Items.

3.84 Mcps TDD Enhanced Uplink: Layer 2 and 3 Protocol Aspects

Work Item Description

Title: 3.84 Mcps TDD Enhanced Uplink: Layer 2 and 3 Protocol Aspects

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

- 3.84 Mcps TDD Enhanced Uplink
- 3.84 Mcps TDD Enhanced Uplink: Physical Layer
- 3.84 Mcps TDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects
- 3.84 Mcps TDD Enhanced Uplink: RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

3 Justification

In RAN#20, a study item on “Feasibility Study on Uplink Enhancements for UTRA TDD” was approved. The aim of the study was to look into the feasibility and performance gains of uplink enhancement techniques to increase the coverage and throughput and reduce the delay of the uplink for packet-based services.

The study concluded that the incorporation of Node-B controlled rate- and physical resource scheduling, hybrid ARQ, and support for higher-order modulation are able to deliver a significant performance improvement over existing releases with manageable complexity and whilst maintaining backwards compatibility.

4 Objective

The technical objective of the study item is to introduce enhanced uplink functionality into the specifications in order to improve the performance of the uplink for packet-based services. The improvements should take into account backwards compatibility aspects.

- For radio interface higher RAN layers, the building block includes:
 - Architecture aspects
 - MAC entity
 - Control plane protocols
 - User plane protocols
 - UE capabilities

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects :	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
		R2				
Affected existing specifications						
Spec No.	CR	Subject			Approved at plenary#	Comments
25.301		Radio Interface Protocol Architecture			RAN#31	
25.302		Services provided by the physical layer			RAN#31	
25.306		UE Radio Access capabilities definition			RAN#31	
25.321		Medium Access Control (MAC) protocol specification			RAN#31	
25.331		Radio Resource Control (RRC) protocol specification			RAN#31	

Note: this work item is the Layer 2 and 3 Protocol Aspects part of the stage 3 of the TDD Enhanced Uplink work item.

11 Work item rapporteurs

Derek Richards (IPWireless)

12 Work item leadership

TSG-RAN WG2

13 Supporting Companies

IPWireless Inc., UTStarcom, InterDigital, Sasken, Orange

14 Classification of the WI (if known)

	Feature (go to 14a)
X	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

14b The WI is a Building Block: parent Feature

(one Work Item identified as a feature)

TDD Enhanced Uplink

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

This WI has not finished yet. See RAN_Work_Items.

3.84 Mcps TDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects

Work Item Description

Title: 3.84 Mcps TDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

- 3.84 Mcps TDD Enhanced Uplink
- 3.84 Mcps TDD Enhanced Uplink: Physical Layer
- 3.84 Mcps TDD Enhanced Uplink: Layer 2 and 3 Protocol Aspects
- 3.84 Mcps TDD Enhanced Uplink: RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

3 Justification

In RAN#20, a study item on “Feasibility Study on Uplink Enhancements for UTRA TDD” was approved. The aim of the study was to look into the feasibility and performance gains of uplink enhancement techniques to increase the coverage and throughput and reduce the delay of the uplink for packet-based services.

The study concluded that the incorporation of Node-B controlled rate- and physical resource scheduling, hybrid ARQ, and support for higher-order modulation techniques are able to deliver a significant performance improvement over existing releases with manageable complexity and whilst maintaining backwards compatibility.

4 Objective

The technical objective of the study item is to introduce enhanced uplink functionality into the specifications in order to improve the performance of the uplink for packet-based services. The improvements should take into account backwards compatibility aspects.

- For Iur/Iub interface, the building block includes:
 - Control plane protocols
 - User plane protocols

5 Service Aspects

None

6 MMI-Aspects

None

7 Charging Aspects

None

8 Security Aspects

None

9 Impacts

Affects :	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't know					

10 Expected Output and Time scale (to be updated at each plenary)

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
		R3				
Affected existing specifications						
Spec No.	CR	Subject			Approved at plenary#	Comments
25.401		UTRAN overall description			RAN#31	
25.420		UTRAN Iur Interface: General Aspects and Principles			RAN#31	
25.423		UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling			RAN#31	
25.427		UTRAN Iub/Iur Interface User Plane Protocol for DCH Data Streams			RAN #31	
25.430		UTRAN Iub Interface: General Aspects and Principles			RAN#31	
25.433		UTRAN Iub interface NBAP signalling			RAN#31	
25.435		UTRAN Iub Interface User Plane Protocols for Common Transport Channel Streams				

Note: this work item is the UTRAN Iub/Iur Protocol Aspects part of the stage 3 of the TDD Enhanced Uplink work item.

11 Work item rapporteurs

Jim Miller (Interdigital)

12 Work item leadership

TSG-RAN WG3

13 Supporting Companies

IPWireless Inc., UTStarcom, InterDigital, Sasken, Orange

14 Classification of the WI (if known)

	Feature (go to 14a)
X	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

14b The WI is a Building Block: parent Feature

(one Work Item identified as a feature)

TDD Enhanced Uplink

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

This WI has not finished yet. See RAN_Work_Items.

3.84 Mcps TDD Enhanced Uplink: RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

Work Item Description

Title: 3.84 Mcps TDD Enhanced Uplink: RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing

1 3GPP Work Area

X	Radio Access
	Core Network
	Services

2 Linked work items

- 3.84 Mcps TDD Enhanced Uplink
- 3.84 Mcps TDD Enhanced Uplink: Physical Layer
- 3.84 Mcps TDD Enhanced Uplink: Layer 2 and 3 Protocol Aspects
- 3.84 Mcps TDD Enhanced Uplink: UTRAN Iub/Iur Protocol Aspects

3 Justification

In RAN#20, a study item on “Feasibility Study on Uplink Enhancements for UTRA TDD” was approved. The aim of the study was to look into the feasibility and performance gains of uplink enhancement techniques to increase the coverage and throughput and reduce the delay of the uplink for packet-based services.

The study concluded that the incorporation of Node-B controlled rate- and physical resource scheduling, hybrid ARQ, and support for higher-order modulation are able to deliver a significant performance improvement over existing releases with manageable complexity and whilst maintaining backwards compatibility.

4 Objective

The technical objective of the study item is to introduce enhanced uplink functionality into the specifications in order to improve the performance of the uplink for packet-based services. The improvements should take into account backwards compatibility aspects.

- For radio transmission and reception, the building block includes:
 - UE radio transmission and reception
 - Base Station radio transmission and reception
 - Base Station conformance testing
 - Requirements for support of Radio Resource Management

5 **Service Aspects**

None

6 **MMI-Aspects**

None

7 **Charging Aspects**

None

8 **Security Aspects**

None

9 **Impacts**

Affects :	USIM	ME	AN	CN	Others
Yes		X	X		
No	X			X	X
Don't know					

10 **Expected Output and Time scale (to be updated at each plenary)**

New specifications						
Spec No.	Title	Prime rsp. WG	2ndary rsp. WG(s)	Presented for endorsement at plenary#	Approved at plenary#	Comments
		R4				
Affected existing specifications						
Spec No.	CR	Subject			Approved at plenary#	Comments
25.102		User Equipment (UE) radio transmission and reception (TDD)			RAN#32	
25.105		Base station (BS): radio transmission and reception (TDD)			RAN#32	
25.123		Requirements for support of radio resource management (TDD)			RAN#32	
25.142		Base Station (BS) conformance testing (TDD)			RAN#32	

Note: this work item is the RF Radio Transmission/ Reception, System Performance Requirements and Conformance Testing part of the stage 3 of the TDD Enhanced Uplink work item.

11 **Work item rapporteurs**

Shin Horng Wong (IPWireless)

12 Work item leadership

TSG-RAN WG4

13 Supporting Companies

IPWireless Inc., UTStarcom, InterDigital, Sasken, Orange

14 Classification of the WI (if known)

	Feature (go to 14a)
X	Building Block (go to 14b)
	Work Task (go to 14c)

14a The WI is a Feature: List of building blocks under this feature

(list of Work Items identified as building blocks)

14b The WI is a Building Block: parent Feature

(one Work Item identified as a feature)

TDD Enhanced Uplink

14c The WI is a Work Task: parent Building Block

(one Work Item identified as a building block)

This WI has not finished yet. See RAN_Work_Items.