RTT TECHNOLOGY TOPIC
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Multi media modelling

In last month's Hot Topic we suggested that some useful cost savings and performance gains (a better more consistent user experience) would come out of W-CDMA deployment over the next 3 to 5 years. The rationale for implementing W-CDMA should not be based on data rates or link budgets but on the power and performance benefits realisable from a flexible physical layer and MAC layer capable of handling multimedia without destroying the fundamental properties (and value) of the content being exchanged.

However we can only define these benefits if we can define the shape and properties of the traffic moving into and out of the network. We suggest that there are presently some misconceptions as to how multimedia will evolve and the related impact of this evolution on radio access and network design (and by implication, radio access and network cost and margin).

Let's consider three possible models:

MODEL NUMBER ONE- THE DOWNLINK BIASED ASYMMETRIC MODEL

Figure 1: The Downlink Biased (Asymmetric) Model

This is the 'model of the moment'. The assumption is that users download video clips and audio clips and video/audio clips (not the same thing of course) from a media store resident in the operator's network or accessed via the operator's network.

The emphasis on downloading is partly due to the additional power available on the downlink ie the base station has more mains powered transmit energy available than the battery powered handset. In turn this has led vendors to introduce or talk about introducing downlink enhancements, for example 1xEV for CDMA2000 and HSDPA for W-CDMA, that offer higher downlink data rates.

The problem with these enhancements is that downlink bandwidth is ultimately constrained by handset battery power and capacity. A 384 kbit decoder will typically be running at 600 to 700 MOPS (million operations per second). A 1920 kbit decoder will be running at about 3500 MOPS and a 10 Mbit decoder will be running at over

17000 MOPS.

The downlink model also depends on having a lightweight low cost high resolution low power budget high colour depth display in the phone.

MODEL NUMBER TWO – THE UPLINK BIASED ASYMMETRIC MODEL

Figure 2: The Uplink Biased (Asymmetric) Model

In this model the dominant flow of traffic is **into** the network and consists of people taking pictures and sending them somewhere. The model has gained in popularity as digital camera performance has improved but is partly dependent on the availability of low cost devices that are, effectively, digital cameras with a phone attached rather than a phone with a digital camera.

Figure 3: Samsung Swivel Screen Phone

The Samsung product illustrated in Figure 3 is one example based on a display that swivels (into camcorder mode) with a camera in the hinge of the device. The practical challenge for these devices, apart from making sure the hinge doesn't break, is to get them slim and light enough to be pocket friendly.

	Depth Comparisons	Weight	Battery
Alphacell	25 mm	110 g	900 mA/hr
Panasonic GD87	23 mm	103 g	720 mA/hr
Panasonic P504i	16.8 mm	99 g	

Figure 4: Panasonic Flip Phone Form Factor

Figure 4 shows some form factor comparisons between the latest Panasonic phone, earlier Panasonic phones and other phones. These phones need to be super light (sub 100 gm or less) and super slim (sub 17 mm). Next up are phones with two displays (already available) and two cameras (available soon in Japan).

Note that it's handset hardware (and to an extent handset software) that determines uplink and downlink loading. Before you can start any kind of sensible radio or network planning you need to have a good idea of the mix of handsets in the network and a good idea of how they are going to be used.

Which brings us to model number three.

MODEL NUMBER THREE – THE BALANCED UPLINK/DOWNLINK SYMMETRIC MODEL

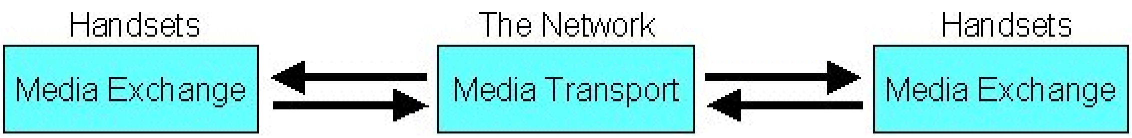

Figure 5: The Balanced Uplink/Downlink (Symmetric) Model

This model is our personal favourite as it most closely emulates traditional user behaviour. In this model, people talk and send video simultaneously to each other in real time- voice with added video.

The challenge here is not so much handset hardware (as the components are similar to those needed for models 1 and 2). The issue is how to provide sufficient control over end to end delay (first order effect) and delay variability (second order effect) given that the latency requirements are at least as tight and arguably tighter than full duplex voice.

If this model becomes, as we suspect, the dominant usage model over the next 3 to 5 years then it will make existing efforts to provide downlink enhancements rather pointless. What's needed is a balanced uplink/downlink, effectively what we have always had in existing voice dominant wireless networks.

It also highlights the need for close control of network end to end latency and effectively rules out IP based flexible routing. In practice it will mean a more pervasive persistent deployment of ATM than presently some vendors expect.

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