Agenda Item: 11

Source: Philips

Title: Comments on mandatory and optional features

Document for: Discussion

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Summary

An important item under discussion by 3GPP RAN TSG WG1 members is the question of whether particular features of capabilities should be mandatory or optional.

This document recommends that WG1 examines each feature in question separately and submits some proposals for consideration by RAN TSG.

Discussion

The discussion is intended to cover general principles and includes some examples from GSM which may not be specifically relevant in W-CDMA.

Mandatory

There are several reasons why particular parts of a mobile radio specification might be made mandatory. Some of these are:
- The feature is essential for operation of the system (e.g. provision of a RACH channel to support initial access).
- The feature is essential for support of a particular service (e.g. ARQ for assured packet delivery).
- The feature is essential to support a particular transport channel (e.g. pilot symbols on the BCH).
- The cost/benefit (e.g. to system capacity) is such that it can be agreed to make the feature mandatory, at least for a particular purpose (e.g. turbo coding for high quality, high bit rate data).
- Other mechanisms for a particular purpose might be viable, but only one is defined in the specification.
- A common feature is adopted to allow roaming and interoperability (e.g. GSM full rate speech codec)
- A regulatory or licensing requirement must be satisfied (e.g. operation in a particular frequency band)
- Compatibility with other systems is required

Optional

Now let us consider potentially optional features, or where more than one mechanism might be available for a particular purpose. Such features could be optional in base stations (provided they can be used independently in adjacent cells). In the case of mobile terminals, it is important that those using a given feature can use it in the presence of terminals not using it. Otherwise, in order to be useful, it would need to be mandatory in all terminals. A good example is frequency hopping in GSM (i.e. if frequency hopping is used, all terminals in the cell need to hop). So we can classify optional features (on the basis of mutual coexistence) as follows:
- Potentially optional in both base station and mobile (e.g. receiver antenna diversity)
- Potentially optional in base station and mandatory in mobiles (e.g. frequency hopping)
- Mandatory in base station and potentially optional in mobiles (e.g. support for packet data services)

The use of features which are initiated by the mobile should be optional (e.g. transmission of user data packets via the RACH).

Of course, it is possible to make potentially optional features mandatory in a specification, if benefits of doing so are judged to be sufficiently great, compared with the additional cost/complexity. However, in private systems the trade-offs may be different, more flexibility is probably desirable than in public systems.

Conformance Testing

In general it is possible to test to see if a particular feature is present in a transmitted signal (e.g. pilot bits on the BCH). It is also possible to check that a receiver behaves correctly when it receives a particular signal under given channel conditions (e.g. specified BER after channel decoder). However, it is not easy to confirm that a particular algorithm has been used in a receiver. A special case might be a bit-exact speech codec specification, where meeting the conformance test is very good (but not infallible!) indication that the correct algorithm has been implemented.

Therefore if particular features were to be made mandatory (e.g. in the receiver of mobile terminal), it is likely to be difficult to confirm their presence except by using some performance criterion. Thus in the case of a base station with open loop Tx diversity, the corresponding receiver processing could be specified for the UE, and the desired Eb/No would then be achieved. However, it seems more practical that the UE should be required simply to achieve a given performance when receiving a Tx diversity transmission. This approach allows more room for innovation.

In some cases the equipment may need to recognise signalling, even if the relevant feature is not supported.

Conclusions

To summarise the discussion above we make the following points:
- A feature should be mandatory if it is needed for the system to operate.
- A feature can be made mandatory if the benefits in terms of performance outweigh the complexity and cost.
- An otherwise mandatory feature might not need to be implemented if it is not needed for the applications supported on a particular terminal.
- A feature can be optional if terminals using it can co-exist with those that do not use the feature.
- Some features may be made mandatory for some classes of terminals (e.g. with high bit rate capability).

Therefore it is proposed that where features considered for W-CDMA could be optional or mandatory, the conditions under which they are made mandatory should be specified in detail (e.g. for which transport channels, terminal classes etc).

Furthermore, since the decision on whether particular features is mandatory is probably outside the scope of RAN TSG WG1, any statements on this issue in the draft specifications should be considered as proposals, at least until the situation is

formally clarified. A detailed set of proposals for mandatory and optional features could be prepared for consideration by RAN TSG, possibly in conjunction with other TSG's.