

BBC digital television services –

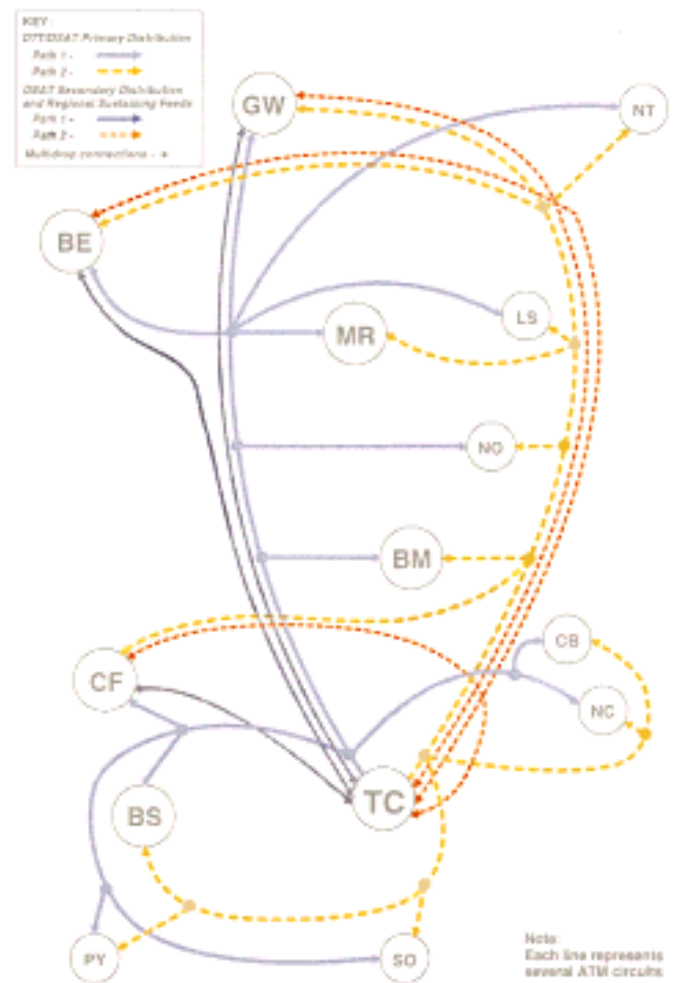
devising a technical architecture for UK-wide distribution

The BBC is both a regional and a national broadcaster. There are substantial differences in programming between England and Scotland, Wales, and Northern Ireland – the Nations – and within England there are also lesser variations between London and the ten other English regions. This regional structure has been maintained as far as possible in the digital world. Whilst the network for distributing our analogue television has been developed gradually over many years, the rapid development of new services for digital delivery by satellite, terrestrial and cable has required a fresh approach.

System Design Group at R&D has been responsible for the design of the technical architecture for the UK-wide distribution of BBC Digital Television Services. We have had to meet aggressive time scales and develop solutions to meet new and evolving requirements.

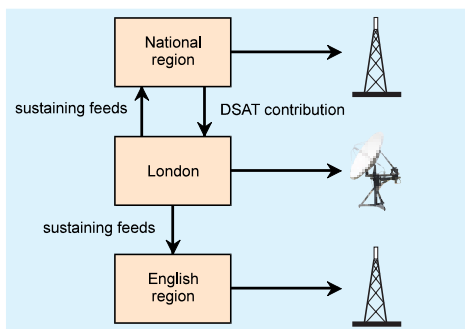
For the initial installations three key decisions were taken. First, the digital services would be distributed independently of the analogue programmes, to avoid PAL and to take account of presentational differences and the different picture aspect ratio. Secondly, compression coders for regional contributions would be installed locally, and thirdly, common coding at constant bit rate would be used for both satellite and terrestrial delivery. However, separate coding for statistical multiplexing is now being introduced on one of the satellite-delivered multiplexes to accommodate an extra service – a good example of evolving requirements.

The distribution architecture is based on ATM point to multi-point and point to point connections, carrying MPEG-2 single and multi-programme transport streams. The main signal flows between London, the Nations and the English regions are shown opposite.



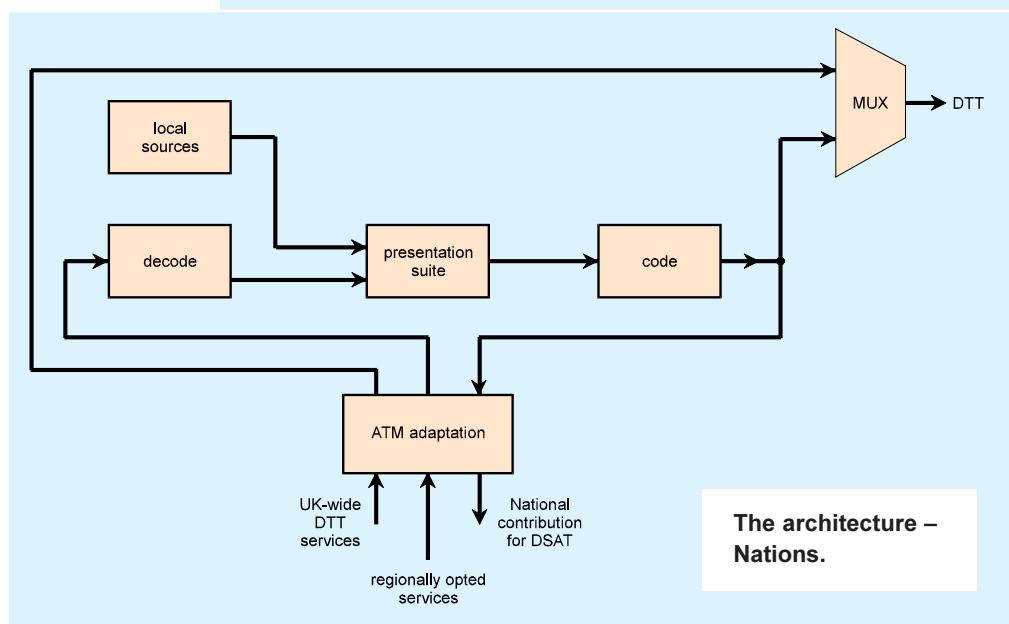
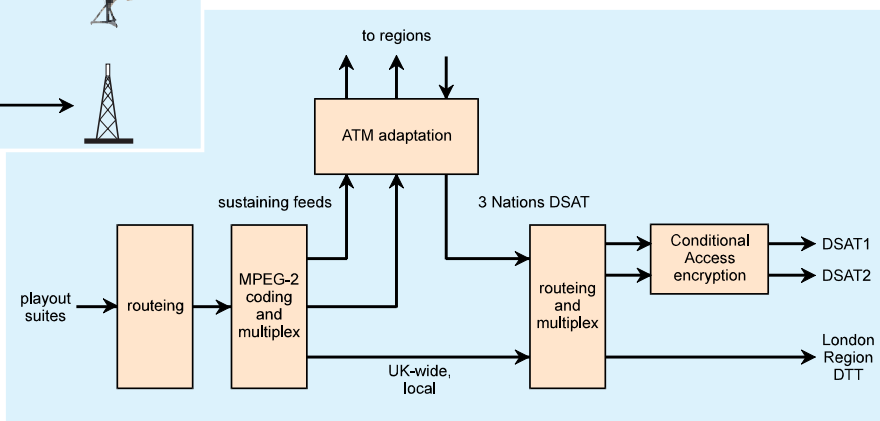
Digital TV distribution circuits implemented over new ATM infrastructure.

The UK-wide and London-based services are coded in London for emission using a video bit rate of just over 5 Mb/s. Regional services are created locally, using sustaining feeds from London as a basis. The sustaining feeds are coded at main profile at main level (MP@ML) at a coding rate of 8.7 Mb/s, which gives a margin for the subsequent decode/recode operation representing an acceptable compromise between quality and bit rate. The National centres at Glasgow, Cardiff and Belfast also have individual connections from London over which “clean” programme material – without regional branding or interstitial material – can be transferred to a local server for delayed transmission.



The architecture – regional connections.

The architecture – London.



The architecture – Nations.

For DSAT, the regional services are returned to London, where they are combined with the London material to form the two DSAT transponder feeds. This combination is essentially an add-drop transport-stream multiplex – there is no other processing of the regional contributions except for the conditional access encryption applied to all the DSAT services to ensure correct geographical access to services in accordance with programme-rights restrictions.

For DTT, two further sustaining feeds are provided, the UK-wide DTT services multiplex and a complete English DTT multiplex. The latter includes specially commissioned news programmes containing items from all regions. Services in these feeds are coded at the final emission rates, to avoid further decode/recode operations and to minimise bit rate. The UK-wide services are those with no regional variants (for example BBC NEWS 24) and these are combined in the national regional studio centres with the national regional services to form the national DTT outputs. The English DTT multiplex is currently passed straight through at English regional studios – the equipment to add English regional programmes to DTT will be phased in later this year. The sustaining feed of the complete English DTT multiplex will be retained, and this will allow a service to be maintained – albeit without local programme inserts – in the case of a failure in the regional equipment.