VANTAGE - VSAT ATM Network Trials for Applications Groups across Europe

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Project Background

Whilst not directly connected with, or descended from, any other EU Project, VANTAGE is inevitably a legatee of what has gone before. Significantly, several of the Consortium partners have worked together in previous RACE I and RACE II projects, and thus share formative experiences with many traditional and not-yet-traditional techniques and equipments. This shared experience formed a secure base on which to build further, and is extensively reused as a foundation for VANTAGE. Indeed, without such a common background VANTAGE would not have been credible as a project.

Unlike the RACE Program, however, which was essentially concerned with research and development, the focus of A.C.T.S. is shifted emphatically towards trials and demonstrations. This change of focus caused some realignments in the traditional consortia and led, in particular, to the inclusion of more commercial telecom operators. The VANTAGE Consortium, reflects this shift and comprises a good spread of industrials, operators and universities, and one (more-than-token) SME.

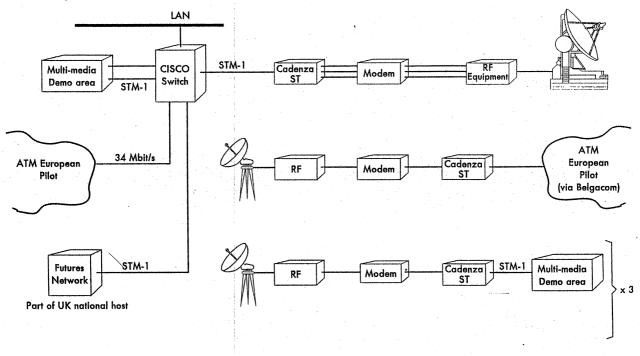
| The VANTAGE Consortium | | | | |
|------------------------|-------------------|----------|--|--|
| Industrials | Alcatel Bell | Belgium | | |
| | Alcatel Telspace | France | | |
| | | | | |
| Operators | British Telecom | U.K. | | |
| | Belgacom | Belgium | | |
| | CPRM | Portugal | | |
| | | | | |
| Universities | Salford | U.K. | | |
| | Bradford | U.K. | | |
| | | | | |
| S.M.E. | Space Engineering | Italy | | |

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Project Outline

The VANTAGE Project is unique within the A.C.T.S. Program in that it is simultaneously an infrastructure provider and trials conductor, with both internal and external users. The internal users are the Consortial partners themselves whose immediate interests relate to the performance and management of satellite network infrastructures in general. The external users (the "Application Groups" of the acronym), on the other hand, are offered a stable and reliable, managed, bandwidth-on-demand infrastructure to allow them to trial and network their own A.C.T.S. (or non A.C.T.S.) -developed applications. For these external-users VANTAGE is essentially a capacity provider offering either "last mile" access capability for those who would otherwise be unable to operate at all, or a controlled environment for the test and evaluation of applications which may ultimately need to operate in or with satellite networks.

VANTAGE offers a series of three extended Trials: from May to August 1996, from May to October (originally May to July) 1997 and from March to May 1998. All trials share the generic configuration shown below, and are based on the CADENZA concept and product family which allows any transparent satellite, with its earthstations, to become a full-function, distributed ATM switch.

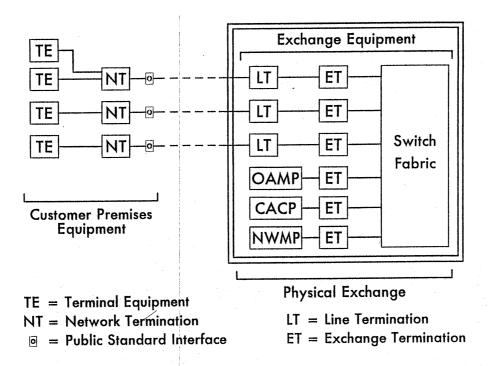


The concept was proven, with a capacity of 25 Mb/s, in a previous EU project using modified equipments from the commercially available TDMAX range; this access mode will be reused, with further TDMAX equipment modifications, in the third VANTAGE Trial. For the first and second Trials an FDMA access scheme has been adopted to allow the use of public-standard air interfaces and a range of commercially available equipments from different manufacturers. This variety of access techniques and equipments is required in order to explore the generic network management issues addressed by the internal-user trials. (For the purposes of this exploration the CADENZA switch has been "opened up" so that its components can be managed as network elements along with the modems).

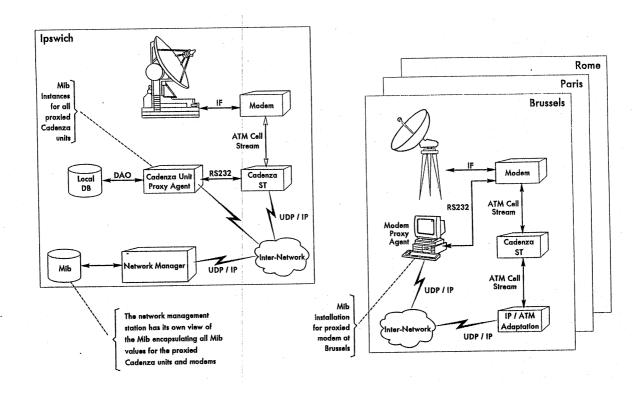
The VANTAGE system capacity and connectivity are determined by the choice of access technique and by the implementation details of the earthstation RF equipments and modems. Over the course of the three Trials the connectivity and aggregate capacity increases from a virtually non-blocking 6 Mb/s to a totally non-blocking 25 Mb/s. (By starting with a much lower capacity than is already known to be feasible it is possible to explore system performance at and near saturation *with real users*.

Network Management

It is in the nature of an ATM switch that its OAM, CAC, and Network Management processes correspond to value-added services attached to the switching fabric like any other user or application. The geographical distribution of the switch does not affect this correspondence, but does make it more relevant.

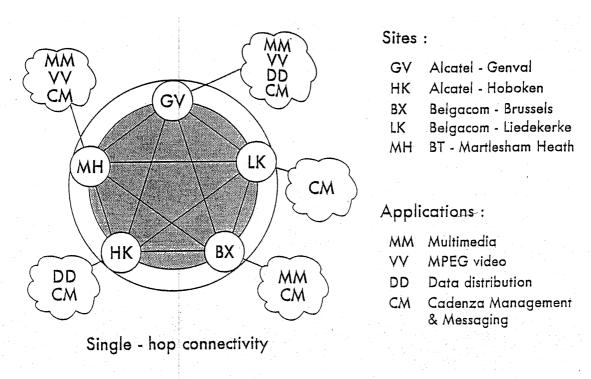


The remote configuration and control of the distributed switch components, as network elements, in the geographically dispersed earthstations can be signalled in-band, indistinguishably from conventional user data. The VANTAGE Project includes the development of OAM and CAC processes together with a formal, SNMP-based Network Management System capable of exploiting all the CADENZA switch features. These include: virtual path and virtual channel allocation (and dynamic reallocation), translation table establishment and maintenance, earthstation modem and transmitter controls (frequency and bandwidth), and traffic and performance monitoring and recording. The VANTAGE implementation of these processes is illustrated below.



User Applications

For Trial 1 the user applications were provided from within the Consortium, and included commercial multi-media and file transfer packages, MPEG video delivery, and a proprietary data dissemination (image-on-demand) system. The performance of these applications was evaluated in a variety of single and combined configurations between various sites, and simultaneously between five sites as shown below.



The external user projects already committed for Trials 2 and 3 are shown below together with their key characteristics. They include several multimedia, tele-education and telemedicine applications plus a "stock exchange-in-the sky" experiment, and a fly-in disaster relief information system. Both Trials will also include additional internal user applications, and the configuration and satellite capacity sharing will be centrally managed and monitored.

| VANTAGE External Users | | | | |
|------------------------|-----------------|-------------|-------|--|
| Project | Application | Capacity | Trial | |
| GRAVITAS | Disaster Relief | 2 + 2 Mb/s | 2, 3 | |
| IMMP | Tele-education | 2 + 2 Mb/s | 2, 3 | |
| YANNIS | Tele-education | 2 + 8 Mb/s | 2 | |
| DECLARE | Tele-medecine | 2 + 2 Mb/s | 2 | |
| TELEPATHOLOGY | Tele-medecine | 2 + 2 Mb/s | 2 | |
| DIVINE | Multimedia | 2 + 2 Mb/s | 2 | |
| THESEUS | Stock exchange | 2 + 8 Mb/s | 3 | |

Project Achievements

The VANTAGE Project has passed its halfway point within budget and on schedule, with the first Trial successfully mounted and completed within the first year. The infrastructure has been widely demonstrated with "conventional" applications, and has successfully countered the traditional perception of satellites as unreliable, error-prone, and prohibitively distant. Indeed, some of the commercial multi-media packages tested were found to offer unacceptably low reliability and quality when operated on the bench without a satellite, and to exhibit internal processing delays already comparable with those of a geostationary satellite hop. The second Trial has already started, and has had to be extended by three months in order to service the demand of a burgeoning user population -the originally planned three projects having been increased to six. Others are under negotiation for the third Trial. In addition to the clear humanitarian value of many of the applications being trialled, the others will allow sustained, quantitative evaluation of various tele-education products and statistically significant comparisons between terrestrial and satellite-based access systems.

Conclusions

For any Project conducted within, and supported by, an EU Framework Program the *required* conclusion is that it achieves its own objectives, contributes to those of the Program as a whole, and yields other, possibly less tangible, benefits beyond.

Having successfully completed its first Trial, and started its second, on time and within budget, the VANTAGE Project is clearly achieving its own objectives. The need to extend the second Trial to accommodate additional users from both within and beyond the A.C.T.S. community puts it well on course for achieving the wider Program objectives.

So far as the intangible benefits are concerned, VANTAGE has already shown that European industry has achieved, and is able to deploy, a world-leading capability in ATM transmission and switching over satellite - a capability which is demonstrably needed by, and able to satisfy, a wide range of real users.

VANTAGE has also demonstrated the effectiveness of the EU Framework Programs which, with their precompetitive, partial-funding philosophy, and their freedom from micro-management, provide both a high-synergy stimulus for European industry to pursue its own technical and commercial objectives, and a high profile platform on which to display its achievements.

Acknowledgements

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