

TECHNICAL PAPERS

CABLE '82

**CABLE '82 NCTA CABLE L
VERS! CABLE '82 NCTA
BLE DELIVERS! CABLE '8
'82 NCTA CABLE DELIV
S! CABLE '82 NCTA CAB
ABLE DELIVERS! CABLI
CABLE DELIVERS!**

Petitioner ARRIS Group, Inc.'s

EXHIBIT

NCTA 31st ANNUAL CONVENTION & EXPOSITION □ MAY 3-5, 1982 □ LAS VEGAS

1008

1982 CONVENTION TECHNICAL PROGRAM SUBCOMMITTEE

Wendell H. Bailey, Chairman
National Cable Television Association

Norman P. Weinhouse
Hughes Communications

Scott Tipton
Home Box Office

Tom Polis
Communications Engineering Management Services

Joseph Van Loan
Viacom Cablevision

Charles Eissler
Oak Communications, Inc.

Alex Best
Scientific-Atlanta, Inc.

NCTA SCIENCE & TECHNOLOGY DEPARTMENT

Wendell H. Bailey
Vice President

Katherine S. Rutkowski, Assistant Director
Technical Program Coordinator

Barbara J. Avent
Administrative Assistant

Additional copies are available from NCTA,
Science & Technology Dept.
1724 Massachusetts Ave., NW, Washington, D.C. 20036
(202) 775-3637

Copyright © 1982, The National Cable Television Association,
1724 Massachusetts Ave., NW, Washington, D.C. 20036

ISBN 0-940272-05-9

MetroNet: An Overview of a CATV Regional Data Network

R. P. McNamara
Sytek, Incorporated

P.E. Morse
Jerrold Division, General Instruments

Abstract

MetroNet is a low cost, high performance data communications network which is based on a synergistic combination of broadband analog, digital and packet switching communication technologies. MetroNet is seen as a means of providing a cost effective, data communications link to the small business and residential consumer market over currently deployed cable systems.

A description of the marketing and network communication requirements for MetroNet, along with general architectural considerations - both hardware and software, are discussed.

1. Introduction

The evolution of new services offered by cable operators is being driven by the demands of users and franchise authorities for additional value added services and the need of MSOs to generate new revenue streams. An area of active investigation by many MSOs is the provisioning of a two way data communication link over the cable network. This data link is the backbone over which many of the contemplated services will be provided.

Two market segments would appear to have significant need (in terms of traffic volume) for a data communications backbone; the business market and the residential consumer market. The business market contains users having a substantial data communication need and who would welcome the capacity, topology and cost saving potential of a CATV network as an

alternative to the Public Switched Telephone Network (PSN). This market is being driven by the attempts of many companies to improve white collar worker productivity by deploying "Office of the Future" enhancements. The second market segment is that of the residential consumer. Unlike the business market, the residential consumer market does not yet exist and will have to be developed.

The telecommunication services which are being developed for the home consumer environment are usually consolidated under the umbrella of Videotex Services. It would appear safe to assume that the cost of providing network access and transport will have a strong bearing on the ultimate penetration of Videotex services in the residential market. This paper will describe a network which directly addresses the needs of the residential marketplace and will focus on describing a general architectural overview of MetroNet, a CATV regional data network.

It is projected that the consumer market will provide combinations of audio, textual and graphical information to the home subscriber. To many experts, the emergence of this market during the decade of the 80's is a certainty. The only question which remains is whether the market will evolve as an extension of plain old telephone service (POTS) or whether it will be provided by an alternate local distribution system, the cable. [1] It is our contention that the nature of the service (data), the traffic characteristics of the service (bursty transmission and long holding times), the type of plant the service is provided on (circuit switched, analog) and the recent movement of local telephone companies to cost based pricing (designated Universal Measured Service) will make the provision of Videotex services over the currently deployed Public Switched Network (PSN) a costly and unattractive offering. As a cost effective alternative, Videotex Service could be provided by local CATV franchises.

MetroNet is a low cost, high performance, data communication network and is a synergistic combination of broadband analog, digital and packet switching technologies. Utilizing standard cable TV facilities, MetroNet will provide a transparent, high performance, communication system incorporating distributed network intelligence. For the residential consumer market, MetroNet will be compatible with all existing (subsplit and midsplit) cable systems. Unlike other proposed CATV data networks, MetroNet makes no assumption as to where in the network control and service nodes are located. As such, MetroNet is completely generalized as to service node deployment. The MetroNet system architecture will provide the interconnection of a wide range of subscriber and service nodes, configuration flexibility, and the ability for a low cost phased introduction of service.

One of the underlying design goals of MetroNet is that it must provide today's Videotex services inexpensively yet still have the flexibility required for future network growth and applications. The generality of the system enables it to effectively service a wide range of user applications - from control and security monitoring systems to packetized LPC voice and data.

This paper will provide an overview of the MetroNet System. Among the areas discussed will be:

- ◆ Residential Market Requirements
- ◆ Network Requirements
- ◆ MetroNet's Network Architecture

2. Residential Market Requirements

This section begins by addressing the home telecommunication market and extrapolating the consumer network requirements by examining the range and types of service which will be deployed. The

intention here was not to study all possible future services in great detail, but rather to forecast general trends in the development of this market and to estimate their impact on the telecommunications network that will transport these services. These projections were used to create a network traffic model in an effort to evaluate the network performance.

Forecasting service demands for the residential marketplace is not a straightforward undertaking. Indeed, many studies conducted during the last decade have

predicted rapid development of this market. [2] Generally, these forecasts came as a result of anticipation of the results of the integration of new computer technology and advances in both telephone and cable television communication service. It was expected that this integration would make possible and, indeed, substantially lower the cost of a wide variety of services that previously were not handled electronically.

However, in many cases changes have been slower than expected. Except for a broader variety of television programming, increased use of video games, and some custom calling features, the home telecommunications market is not appreciably different from that of ten years ago.

Many reasons could be offered for this belated development. Primary among these is the requirement that many actors in the marketplace have to undertake activities simultaneously. Generally, there is not one driving force but many. The offering of a service such as electronic funds transfer necessitates significant resource allocation on the part of banks, communication companies, information processing firms, and residents. Market signals have to be very clear before this investment will be forthcoming. Individuals or firms that may lose market share should conditions change, e.g. sellers of paper, may delay through legislative or judicial means. Finally, regulatory uncertainty has also resulted in reluctance on the part of market participants to make the required investments.

Many of the forces which would tend to expand the home telecommunications market still exist today, but counterforces are also present. Thus, one of the fundamental design criteria for MetroNet was that the network architecture had to be modular and allow for either rapid or slow development of the consumer marketplace.

The potential range of these new services encompass such diverse areas as energy management, home security, bank and shop at home, video games, electronic directories and personal data storage, to name a few. While the projected market for these services is expected to be significant, the most difficult issue at this time is identifying those services which form the base or "critical mass" for the development of this marketplace. Unlike the Business Marketplace, which is being driven by a need for greater productivity in the office market, the residential consumer is motivated by a different set of needs. Most consumers acceptance of a new service (or set of services) will be

based on the savings or perceived savings that the service offers to the subscriber. Table I summarizes the key services, their traffic characteristics, and their market penetration by 1990. The peak traffic was developed from a model of each prospective service. It should be emphasized that these services were used as an indication of the core or critical mass of services and formed a baseline for the network traffic model.

SERVICE	Peak Traffic Bits/Sec/ Residence	Penetration (Total) Households
1) Home Banking	2.6	30%
2) Home Shoppings	11.35	25%
-Comparison Shoppings	7.1	50%
-Reservations	.12	20%
3) Electronic Mail	2.66	2%
4) Electronic Newspaper	15.5	20%
- News		
- Public Notices	.16	30%
- Classified	1.6	30%
- Financial	1.75	10%
5) Information Services		
- References	15.5	30%
- Traffic Conditions	6.5	20%
- Software Packages	.77	10%
6) Security Services	.3	5%
7) Energy Management	.14	10%
8) Education Program	37.	5%
9) Medical Monitorings	.3	1%
10) Entertainment Services		
- Video Games	1.68	30%
- Gamings	.20	15%

3. Network Requirements

MetroNet will act as the integrated data communications backbone for all value added services to the home. This role places some rather unique requirements on the network implementation. MetroNet must support a wide range of applications, many of which have not been identified (in Table I above) or developed. In the

design of MetroNet, it was realized that the network should provide a wide range of performance, customized to the needs of each application. Wideband, low delay applications should coexist with narrowband, delay tolerant applications without requiring the latter to pay the cost of the former. Furthermore, as more data traffic, users and applications are migrated to an integrated, regional data communications network, an increasing number of them will require privacy and security features to safeguard their data from other users. These features should

be modularly included so that users not requiring these services do not pay for them and, further, that the full interconnectivity of the network is not compromised. Stated another way, a secure user should be able to optionally invoke the security and privacy services of the network.

A summary of the network design assumptions and requirements is shown in Table II. These assumptions and requirements were used to define the MetroNet system architecture and discuss such issues as Network topology, bandwidth, connectivity and control.

The choice of a network architecture was most strongly affected by the following network requirements:

- ◆ The network would have to support bursty, data type traffic.
- ◆ Network bandwidth is assumed to be a scarce and valuable resource.
- ◆ The network will be deployed in a hostile environment.

The first two requirements could be met by a network similar in design to SYTEK's System 20 LocalNet product line, that is, a distributed intelligence, packet switched network. However, the third requirement mandated that some form of centralized network administrative control be provided to prevent fraud (both of the network and of other users).

In the development of the MetroNet architecture, it became apparent that consideration must be given as to how the services depicted in Table I are provided. Specific issues considered with respect to service provisioning, included: who provides the service, the location of the service node, the size of the service node - among others.

A comparison was made between centralized vs decentralized service node deployment. A centralized service node was characterized as being located at (or trunked to) the cable system headend. In this scenario, all services are provided by the MSO. A decentralized network architecture would allow service nodes to be physically located anywhere in the network. Services may or may not be provided by the MSO - that is, many service nodes would be provided by outside vendors or entrepreneurs. The non-MSO service nodes would still generate a revenue stream for

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.