

WorldCom Metered Application Services Prototype Project Definition

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National Accounts

Note: This version has some comments added from Scott Yeager in the text of the write up and some drawings made to discuss and explain the concepts. The notes taken by Microsoft from the last meeting are also included at the end of this document with the new drawing of the phase 1 network to be deployed.

This last meeting pointed out that ultimately cost is the issue with respect to deploying applications. WorldCom has determined that the cost of providing national IP video or IP multimedia content is driven up significantly by the cost of the local loop which varies per location in a city and per city as well as the cost of the national backbone.

The national backbone load is reduced when the servers are deployed in cities or buildings but the local loop must be shopped based on the tariff in that part of the city where the customer building is located so the lowest cost local loop is deployed.

Protocol conversion from IP to run on the local loop transport per city that is chosen based on the tariff cost . The concept of aggregation of numerous sites onto the national backbone is another cost that is significant for delivering service on a national basis.

Background

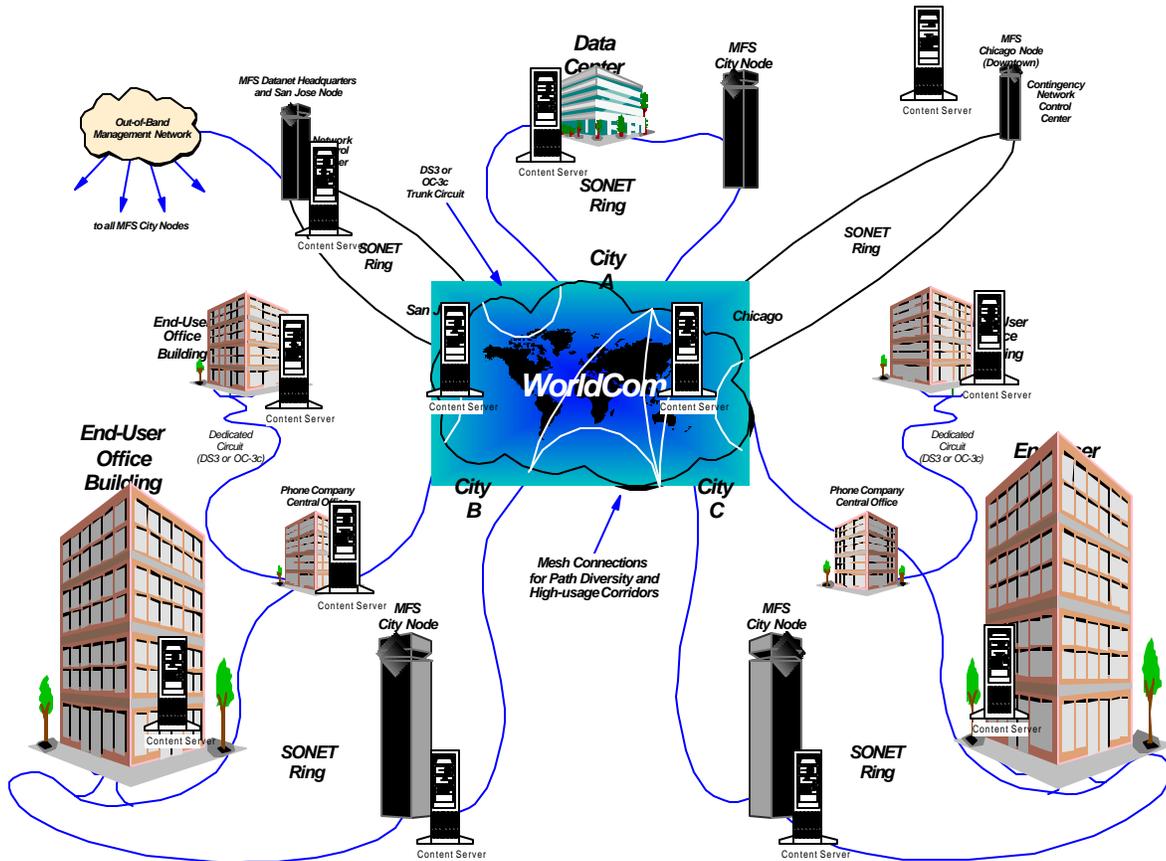
WorldCom has the goal of becoming the premier telecommunications services provider in the world generating exceptional growth and profit margins. They have acquired numerous companies and merged their infrastructure together to create the first company in the world that can provide end to end fiber based telecommunications services of all types.

The need for higher speed data communications services to deploy network centric applications makes the fiber infrastructure owned by WorldCom more important than ever as the desktop can finally deliver multithreaded, multitasking application to the enterprise user economically if the proper network is in place.

The only architecture that is economically viable for delivering multimedia content to the desktop requires a commitment to *distributed servers per application* for both real-time and on demand video or multimedia content. This means that higher speed connectivity is more important in a metropolitan area than the wide area since the load is kept local versus streaming the content across the wide area network and creating a costly load on the wide area network.

Metered Application Layer Services require Distributed Servers

Customer Requires Voice and Data End to End Services that Include Mobile Computing and Remote Access



WorldCom has the only fiber infrastructure into buildings that is designed to serve multiple tenants with multiple services. It includes the ability to provide higher speed services to non-WorldCom buildings using the unbundled local loops available to WorldCom as a result of deregulation. This coupled with the aggressive construction projects of WorldCom to build into the Central Offices of the LEC in most major cities in North America and eventually all over the world means that WorldCom has the largest footprint in the world for deploying services that utilize high speed connectivity in the metropolitan area and the wide area where necessary with the objective of keeping the network load as close as possible to the end user.

Metered Application Services Drivers

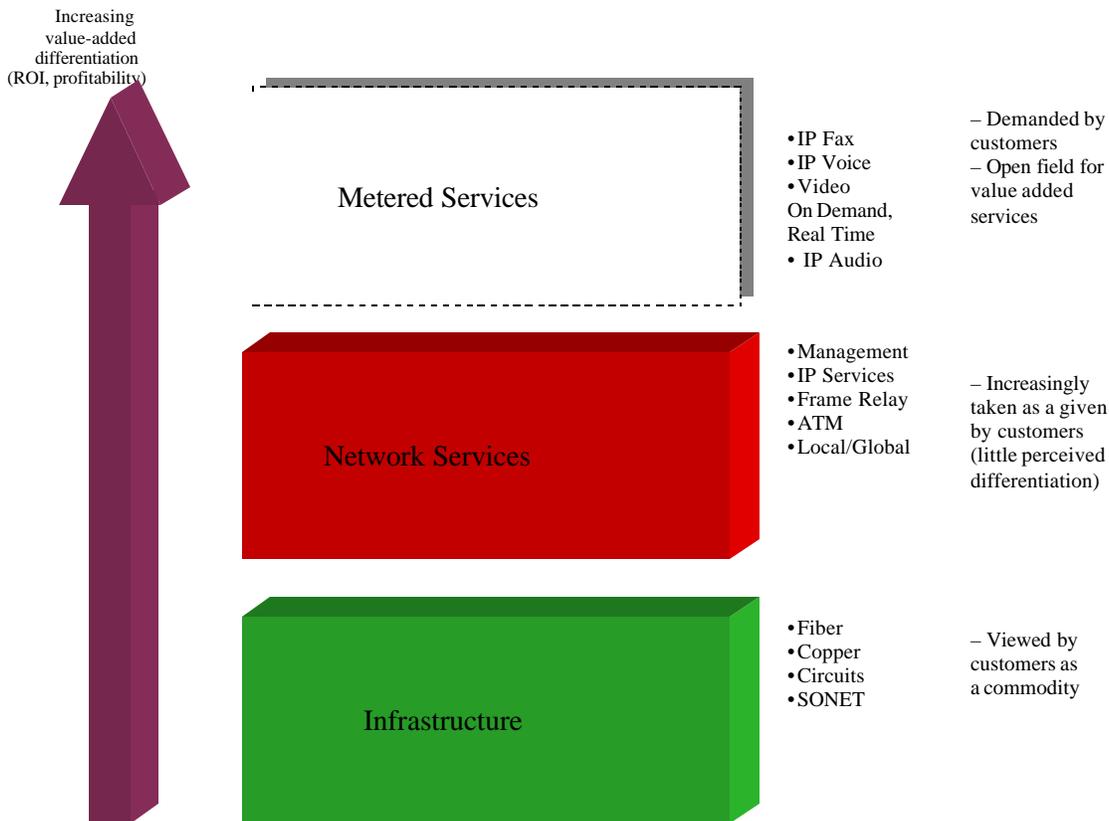
- Enterprise IT is trying to Provide Next Generation Functionality to the Desktop by Delivering Corporate Applications and Information in a WEB or "Internet" feeling approach. Building your own VPN is Very

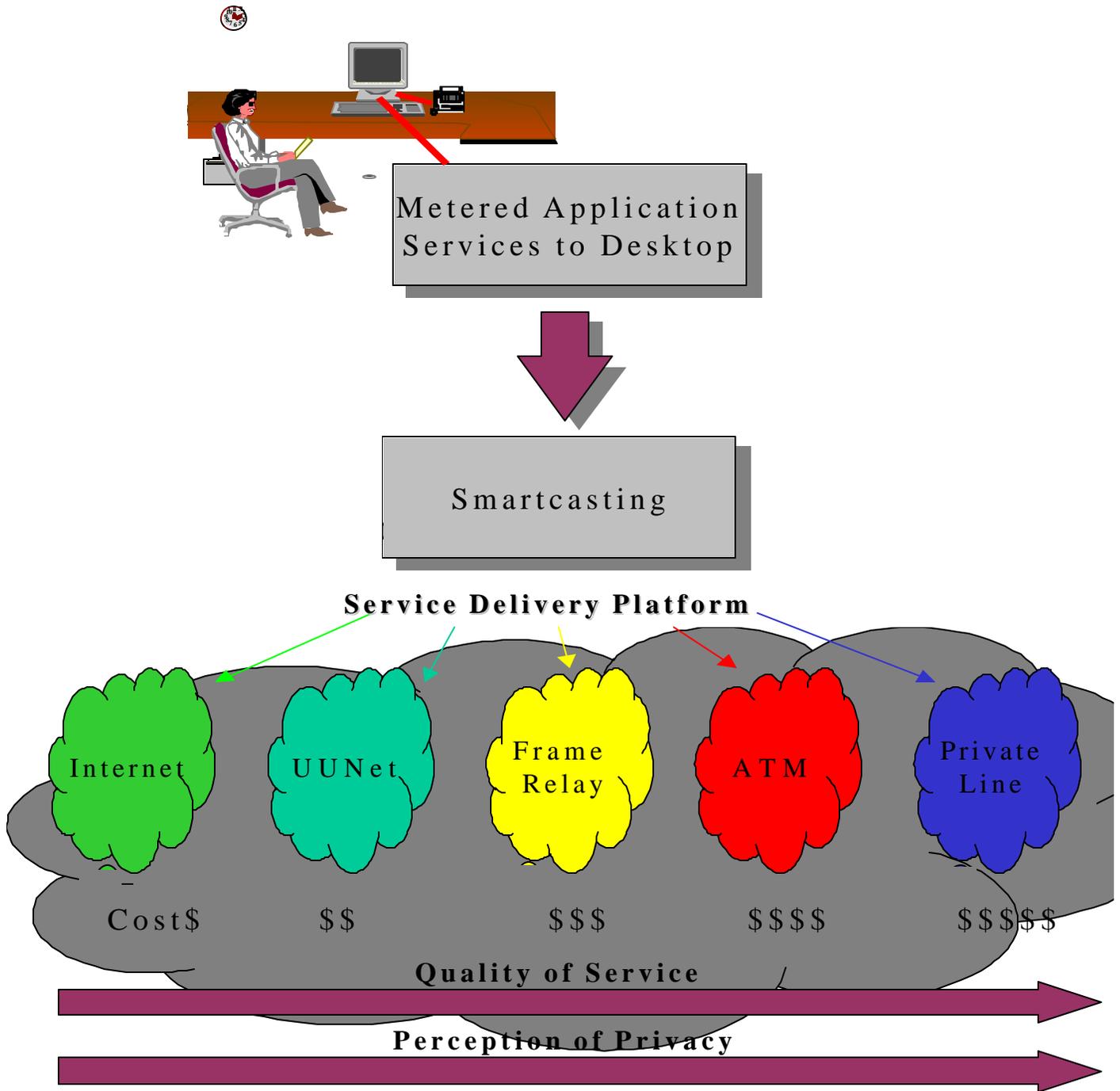
Complex and Costly with no Clear Solution that does not link to a desktop, server and protocol approach plus a specific IXC and Local Loop Solution.

- **Desktop and Server Technology finally able to support WEBish applications** Real Time Collaboration including Desktop Video, Realtime Video in for Content Broadcast, On Demand Multimedia for Training etc. with Multitmedia Email and access to Multimedia Content possible over the Network
- **Internet is Not Ready** for Robust Reliable Delivery of applications from a QoS or Security Perspective
- UUNET approach of high quality Internet will only fix the Global Backbone Problem of Bandwidth by offering a QoS over OC12 with a Security Solution. *Customer must buy into the Internet version of an IP approach for Bullet Proof Applications* that uses a Highspeed connection, a firewall and Encryption to deliver Security. Throughput suffers immensely even if you believe in these other concepts which most enterprises have difficulty embracing.
- **LAN & WAN costs are out of Control** with Existing Loads on Networks

The market is very confused about the different transport and networking protocols and technologies especially when you combine the need for handling voice, video and data simultaneously to the desktop. The opportunity exists to take a leadership position in the market and **enable all enterprises to deploy desktop multimedia applications that are real-time and on demand without having to go out and build their own private network** for each application and integrate all the technologies associated with that solution.

Metered Application Services Drivers





WorldCom can provide these services over this global infrastructure that includes the local loop, wide area, multi technology transport (Circuits, Frame Relay, ATM, global TCP/IP, Multicasting IP) and the application layer service that is routed over the network in a Smartcast way. *Smartcasting is defined as providing only the information that needs to be delivered to the desktop when it should be delivered with the appropriate quality or service that the end user is willing to pay for. The content should only be provided when they need it.* This distributed server, application layer routed, Push/Pull or “Smartcast” infrastructure is only possible to be deployed economically if you own the local loop, the distributed secure facilities for co-location, the wide area transport technologies and you deploy the applications on top of this infrastructure.

Smartcasting

Core to WorldCom's future value-proposition is the concept of Smartcasting. A Smartcasting-enabled infrastructure must have the following embedded capabilities:

- * Dynamic multi-path routing of information
- * Event-driven push/pull functionality
- * Support of multiple network protocols (TCP/IP, UDP, IP multicasting, IPX)
- * Application-level multicasting that is independent of the underlying network protocol
- * Support for multiple transport layers (frame relay, ATM)
- * Support of multiple platforms
- * Support for dynamic scalability and reconfiguration
- * Extensible, customizable, and easy to interface to other software
- * Server load balancing and fault tolerance
- * Application fault detection and diagnosis to client node level
- * Distributed architecture to support local message replication and caching
- * Distributed agent architecture to provide logical management and metering nodes.

To gain a strategic advantage, WorldCom needs to put in place an infrastructure that enables it to quickly build and deploy new value-added application services, as well as to efficiently host packaged software from third-party vendors. This is the 'intelligent network' concept in which "Smartcasting" plays a critical role. The MAS prototype should reflect this more strategic thrust so that WorldCom gets the full benefit from the effort. However, in the collaborative spirit all of the players including Microsoft, Netcentric and Modulus have give input to define the scope of the services, the scope of the project and the steps we take to turn up the first Metered Application Services.

This project will balance the big picture goals with the immediate and tactical issues associated with demonstrating the feasibility of such services and how they could be deployed, sold, installed, provisioned, managed, metered, and billed. We have chosen a Phase 1 approach that deals with what is available today and near term versus what is going to be offered later in 1998. The initial scope is limited to those features that can be deployed before the end of the year.

The ability to have the hooks in place to meter services, the Smartcasting capabilities are a component of the prototype for these applications, and we show that these capabilities are repeatable with other applications all represent components of the focus of this prototype. We have determined that it will be possible to deploy some sort of metered Smartcast solution by the end of the year. More work will be done to see if a short-term solution will be deployed or an early version of the ultimate solution with respect to the prototype. This MAS Project will become a living development tool not a finite prototype that is turned off next year as long as we are making progress and getting benefit for our efforts.

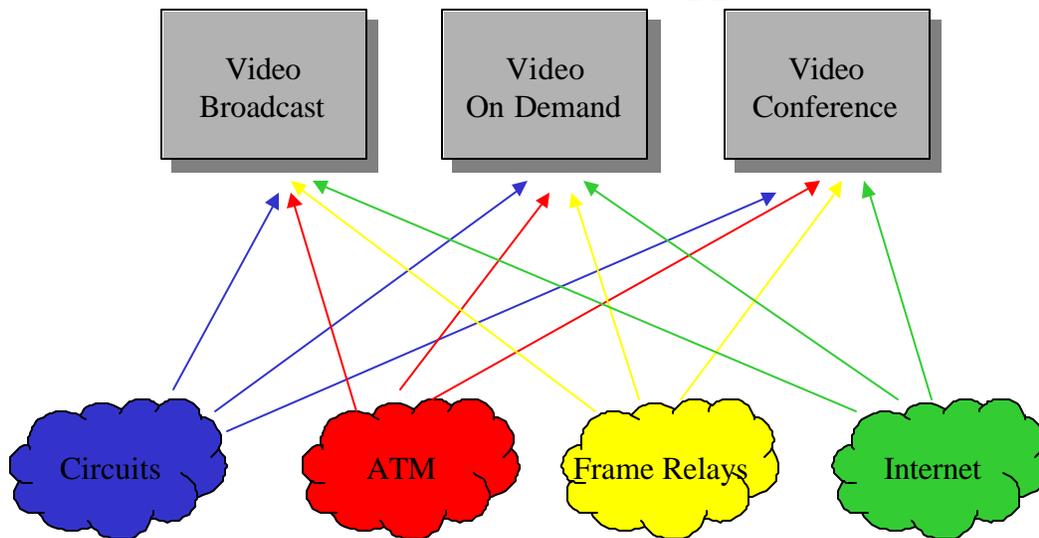
WorldCom must be able to demonstrate that we can really turn up Metered Application Services that work. The prototype must be have Applications that are SmartCast enabled. The goal is to demonstrate that it is possible to deploy applications that are intelligent about the QoS requirements for that flavor of an applications and allows the application to take into account the local loop and wide area networks that are economically available in any particular geographic region.

Part of "Smartcasting" intelligence includes the concept of being able to travel over multiple transport technologies without going to the IP layer. This *concept of not hardwiring the application to TCP/ IP* is essential to reducing the aggregation costs in a city (or building) associated with putting thousands of connections on a national backbone. It will also enable WorldCom to "tariff shop" for the lowest cost local loop in a city or a part of a city which reduces the total cost of the service. This ability to do both per geographic region is what is needed to change the costs

associated with deploying services and therefore changed the cost of having multimedia content delivered to the desktop.

This project will use a new approach to developing services and products that is tightly linked to the market feedback. We hope to change the traditional approach of hardwiring an application to a technology or protocol or local or long-distance transport.

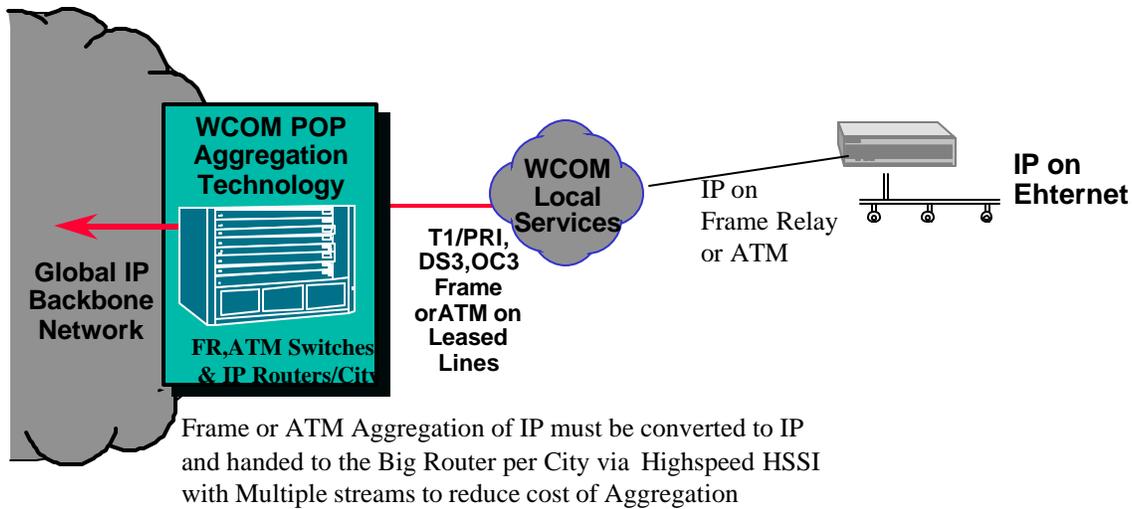
Traditional Approach to Designing and Deploying a Network for an Application



- Hard to scale
- Expensive for all
- Bandwidth lag
- Configuration nightmare

- Vendor Specific
- Increasing demand on Private Network

WorldCom has experienced numerous situations where the dedicated local loop cost per customer or per type of service has driven the cost of delivering the Multimedia IP service to price points that do not allow Content Services to be created that can be sold to the broadest market. Presently, IP Multimedia Services can only be justified by a relatively small market of financial companies that will pay for high end delivery of content.



These cost components are bundled in the monthly recurring cost of the service so IXC providers do not typically see these component costs. The LEC or CLEC local service provider sees these aggregation costs but not the IXC component of the service. The end user enterprise and the Content Provider see the total end to end cost that exceeds the value equation for the service in most instances.

WorldCom can change the economics by working on the IXC component and distributing servers and could reduce the local loop cost by tariff shopping for the lowest cost local loop, creating higher density aggregation using servers and reducing the cost of protocol conversion by eliminating the need to convert to IP in each city to get on the national backbone. The Application Layer Routing that would reside on the servers in the city could reduce the aggregation and protocol conversion costs in each city by allowing statistical multiplexing from the building to the city Node and from the City Node to the Backbone. This coupled with push/pull capabilities within the city and between cities reduces the load on the network and therefore the cost associated with delivering the services to multiple tenants per building and multiple users per enterprise in multiple buildings in any given city.

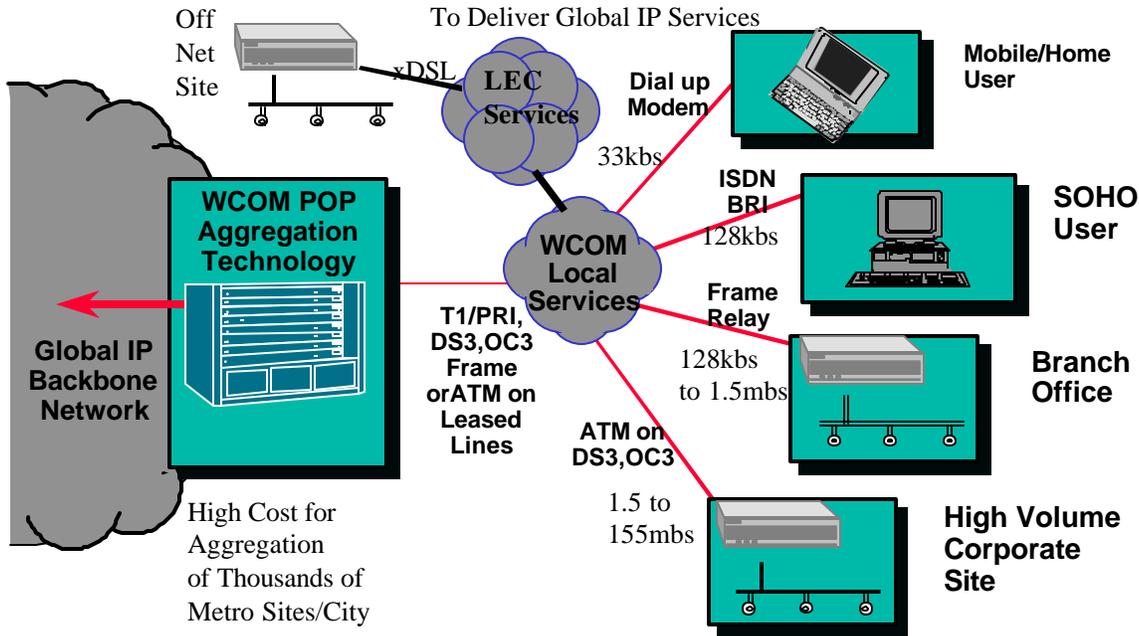
WorldCom must Tariff Shop the Local Transport

(Circuits, Local Switched Services, xDSL, Frame Relay & ATM)

& Aggregate on the the IP Backbone

via Routing & Protocol Conversion

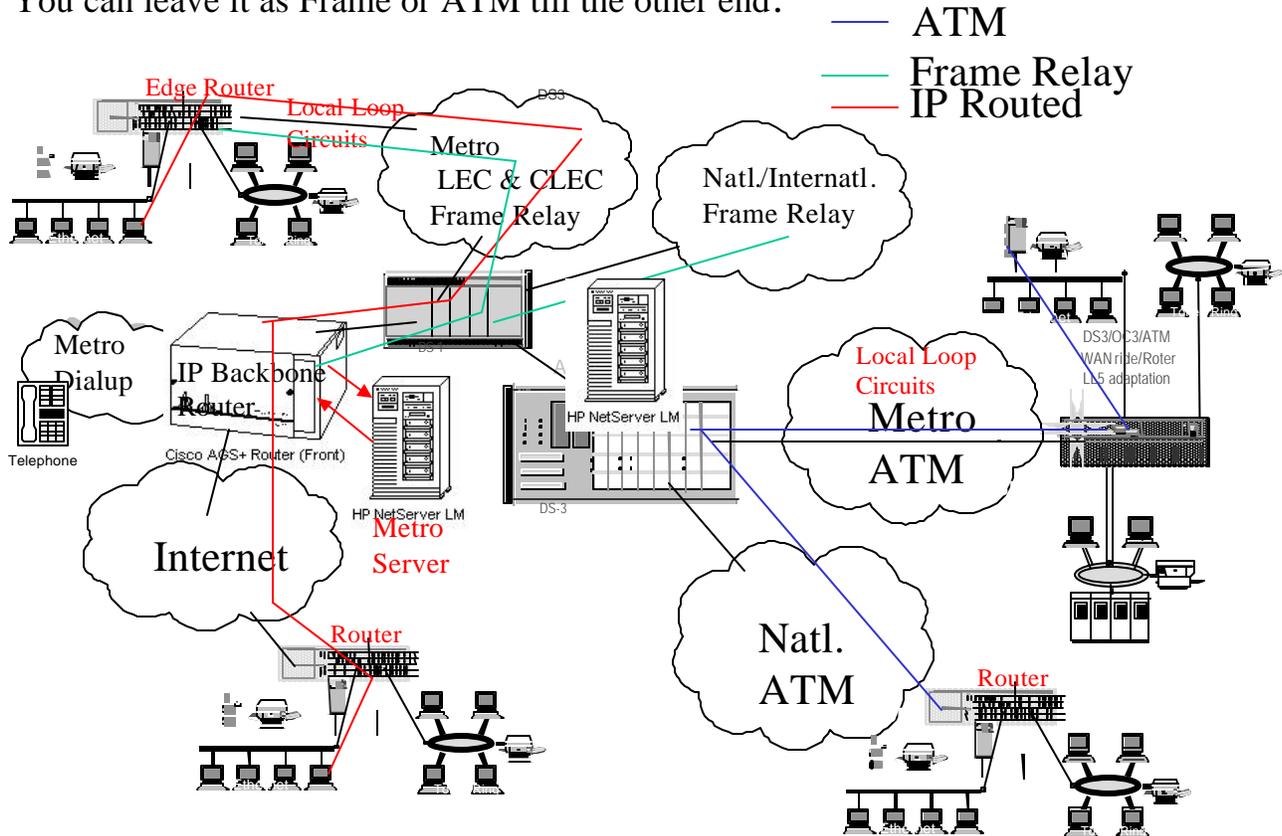
To Deliver Global IP Services



This project will change the basic economic equation associated with delivering Interactive Multimedia Content and real-time collaboration tools to the desktop by playing to the heterogeneous nature of the Telecommunications Infrastructure rather than trying to force it to be homogenous in the local loop and internationally.

The On Net, Off Net issue in the local loop drives the need to tariff shop for the lowest cost local loop at the highest speed ubiquitously so multiple local loops must be used in each city. All must be converted to IP to be put on the Global IP backbone in each city which costs a lot for the local loop edge device and the aggregation ports per city. Also, the protocol conversion per city to put IP over the Global backbone regardless of the underlying physical layer or datalink layer service provided by the LEC or WorldCom local services group.

Insert Metro Server and you must take application to IP layer in each city and then put it back on the national Backbone Otherwise You can leave it as Frame or ATM till the other end.

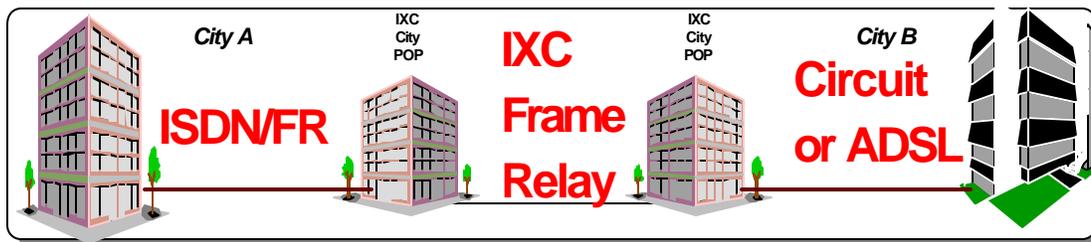


The Architecture must be worked out and the costs identified in the working prototype. Once we deploy the prototype, we will be able to identify the problems and the costs associated with deploying MAS services. The costs will include the software and hardware components from the different participants so all participants will be able to plug into the financial model their costs and their sales projections so they can get a sense of the size of the market for their products with this approach.

The projection of the volume of components is the projection for the sales of the individual products so all parties will have the ability to know how big this deal is and how many units could be sold in 1998 to 2003 by the end of this year. The team will be involved in the development of the projections which will make everyone able to influence the magnitude and aggressiveness of the plan. The intent is to build a global business plan and roll out a service that as available in a geographic region. The deal will be success based as much as possible which will minimize the risk associated with the plan since the majority of the capital is spent when you get an order which makes it easier for WorldCom to take risk.

Distributed Metered Application Servers/Tariff Shopping Local Loop

Microsoft could assist WorldCom in changing the cost associated with delivering the right quality of service and technology per application. This would require them to allow their applications to interface with the Modulus Interagent software to create an Application Layer Router on a Server which would allow the Server to have multiple NIC cards per server. This Server would “Route the Application” directly to the stack that has the underlying transport (Frame relay/ATM) and eliminate the need to go to the network layer (IP) in each city or building before the application can access the national backbone. This reduces the aggregation cost in each city and allows the local loop to be shopped so the lowest cost highest bandwidth transport is used in any city or any part of a city.

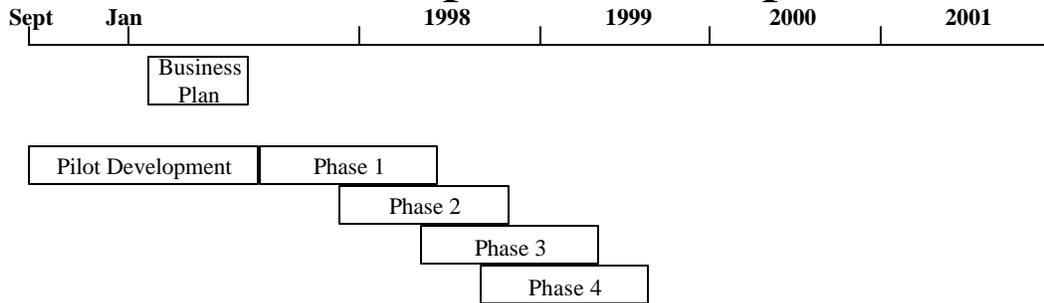


Netmeeting is a peer to peer application that is collaborative and creates load on a private network that most enterprises cannot absorb. Netshow/Vxtreme represent information channels that are a combination of “realtime” and “on demand” content delivered in different flavors of low quality to high quality video. Each Channel represents a different type of revenue stream. There are other applications and approaches that we could deploy but Microsoft represents a huge embedded base so it would be a good one to develop around.

The relationships and partnering arrangements that will be built into the business model and business plan will be the key to making the project successful once the products are rolled out to the field. The basic assumption is that everyone must make money from this endeavor and we are mixing different kinds of traditional revenue streams when we create the partnering relationships in the deal. Telephony revenues for private networks are typically flat rate per month per bandwidth. Only long-distance is usage sensitive but the metric is so much per minute and the bandwidth utilized is a constant per call. We are enabling high burst applications to occur over the network as needed. As much data can go out in a second that would go out in an hour at dial up speeds so time is not necessarily the thing to measure. The service provider must take into account continuous and peak load on the network in relation to throughput and latency. These issues do not exist in the long-distance arena.

This project will utilize the prototype to develop the costs and revenue model to develop the business plan as opposed to the more traditional approach of developing a plan first to get approval for the prototype. This is necessary to rapidly develop these capabilities and get market input directly from the enterprise customers before the product is fully developed. In this way the costs should be more accurate and the revenue projections should reflect prices the market is willing to pay versus some theoretical numbers.

MAS Business Development Concept



Change the Approach by Jointly Developing the Technical and Market Driven Solution with Vendors to develop a Business Plan that makes sense to the Customer and WCOM and the MAS partners by developing and deploying solution before all the cost and revenue issues are determined.

Use the Prototype to get the Customers to Inform the MAS Team of their Value Equation

Capital

Personnel

Outsource Services

Revenue*

*Based on XXX Assumptions

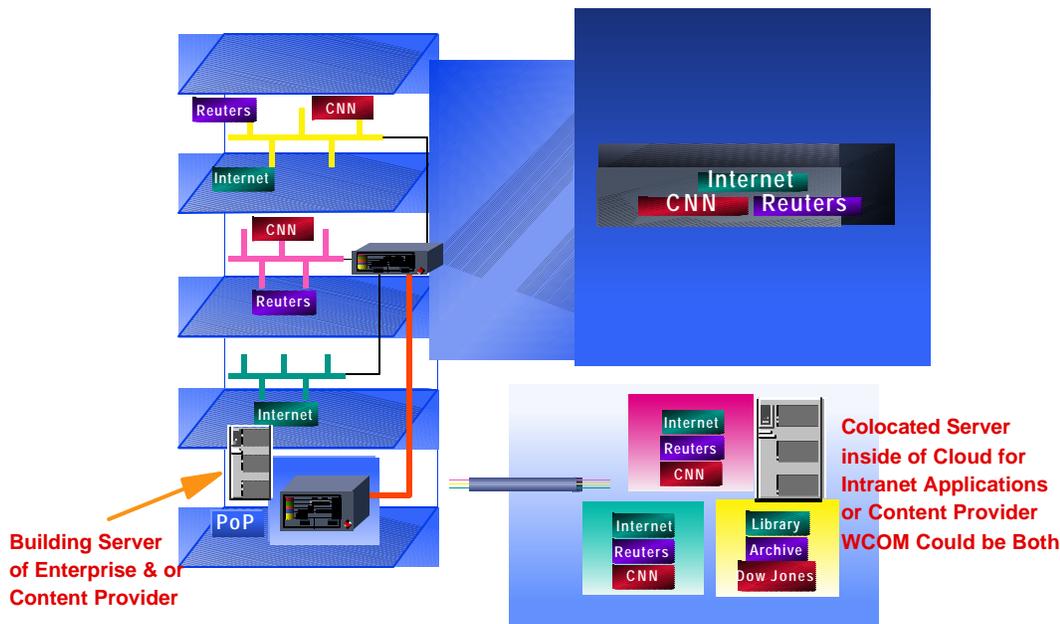
This type of application layer solution requires WorldCom to partner with hardware and software solutions providers to develop and deploy these kinds of solutions on a global basis. The goal is to leverage the Worldcom infrastructure and deliver solutions to users that are economical and functional that make money for Worldcom but take into account the value equation of the end user and empower them to buy and pay for what they feel is worth paying for per application per user.

Project Mission

The intent of this project is proof of concept that Metered Application Layer Services are services that are possible to be deployed and metered by a global service provider. They assume the service provider would be utilizing a distributed server approach to keep the content and application as close to the user as possible. Our experience indicates that this distributed approach is the “secret” to delivering a fast response time to the screen so the users experience is functionally acceptable for multimedia applications at the desktop at a reasonable cost.

The immediate mission of this project is to demonstrate rather widely that geographically distributed applications could be layered on a low, medium and high performance networks. Specifically, MS NetMeeting is capable of transporting audio and video traffic via these different transport technologies with the next component being the delivery of training materials via NetShow in a low, medium and high quality manner. Each service would be delivered via the different transport technologies with each transport approach having a different quality of service and would therefore have a different rate per service.

There are strong indications that the enterprise customers would be interested in purchasing a service that delivered the application functionality in lieu of building these applications on their own corporate backbones because of the challenges associated with creating the load associated with multimedia applications on a corporate network.



The other objective would be to prove the capabilities of the software and network transport required to provide video and multimedia content to the enterprise desktop. The market is skeptical of the real world viability of such services since they have been promised for so long by the communications and computer industry but have never proved to be viable at a reasonable cost.

Participant Objectives/Contributions

Each participant in the deployment of this prototype has a business objective that must be considered to make the investment in time, resources, and products or services able to be justified to their respective management. These objectives should be listed to make certain that all participants achieve their business goals by participating in this project.

All participants will bring marketing and PR resources to bear for major announcements and marketing programs. We will involve them once the prototype is implemented and we jointly agree to the story we want to emphasize to the public.

WorldCom

WorldCom is interested in growing revenues and increasing margins but must compete in a market where the customer has a need for more than just switched long distance and private line services. The goal is to create the next generation of services that would enable enterprise customers to migrate to real-time collaboration at the

desktop and implement workflow process solutions that make their enterprise more productive by utilizing the tools that are now available at the desktop at a reasonable cost.

WorldCom would offer these applications services at different costs depending on the transport technology, the quality of service, the security issues or frequency of use and meter the application in relation to the delivery technology so there would be need for application layer routing to specific transport solutions per application each with their own metering approach.

This allows the customer to place their own value on the specific application and the cost associated with delivering the application via a specific transport technology with perceived or real quality of service and security capabilities.

The concept of delivering each application in a closed user group or virtual private network way to each user so each user only gets the information they requested when they requested it at the price they place value on that content is called "Smartcasting" and is an integral component of the value equation in delivering application layer services.

These services would eliminate the need for the enterprise to continue the never-ending path of replacing technology and upgrading the WAN to facilitate doing business in a distributed manner. WorldCom would grow revenues and increase margins by capturing more market share when enabling the new applications and by eroding the revenues of other carriers for existing network requirements. Ultimately, WorldCom becomes a strategic player with the enterprise not just a commodity long distance vendor.

Enterprise customers wish to build higher speed global backbones for more internal networking and collaboration requirements. The cost of building DS3 backbones to carry all the applications envisioned is too high to be justified in most business case analysis. Therefore, many new applications that could be deployed to the desktop are held back because of network bottlenecks. WorldCom wishes to penetrate the small medium and large enterprise customer base and sell all telecommunications services to as many of these customers as possible. Solving the business problems of these customers is the key to winning over the largest market segment and selling all the services available from WorldCom.

The ability to deploy multithreaded multitasking applications to the desktop is finally possible at a reasonable cost. This eliminates the desktop from being the bottleneck it has been in the past for delivering low cost multitasking solutions to the desktop with the introduction of Windows 95 and Windows NT running on Intel chips in PC's.

WorldCom would be the ultimate user of all participants' technologies in the prototype since they would be creating services using all these technologies. WorldCom would be contributing physical space, power and security in the cities chosen for the prototype, personnel to implement the project, different transport backbones (IP, Frame Relay, ATM, Circuits) between the cities including local loops, xDSL technology, network management capabilities and project management expertise.

The project would involve different groups within WorldCom each contributing manpower and expertise to accomplish the scope of the project.

Gridnet will be the Project Manager for the deployment of the Prototype and provide the application layer expertise to implement the Netshow/Netmeeting applications on distributed servers, the data base functionality, the metering application and the network/systems management functionality. The rules that would be defined for application layer routing in conjunction with the metering of each application over the different transport technologies will be a major issue that Gridnet will deal with in implementation. Gridnet has already implemented the suite of Microsoft Internet Server Solutions that would be the backbone of this prototype. They will provide the space and people needed to operate the project from Atlanta.

Curt Gray's group will provide the physical space and manpower to manage the hardware and software under the guidance of Gridnet in San Jose, Tulsa and D.C. They will also arrange for the local loop and wide area backbone

connectivity to allow the prototype to function as a stand alone closed user group implementation independent of other WorldCom networks. Once the prototype is operational the design centers in San Jose and D.C. will be the main "show and tell" sites that all participants will be able to utilize for press coverage as well as bringing potential customers in to see the metered applications working. Expansion to other sites is planned once the prototype is deployed and all detail associated with deployment of new sites are quantified.

The National Accounts Technical Services Group under Scott Yeager will be involved as needed by Gridnet or Curt Gray's group to help implement the prototype. The main function of the Network Communications Consultants (NCC's) will be to function as the users of Netshow and Netmeeting. They will help us determine the viability of the service from the view of a user that needs to impart knowledge to other members in the enterprise via network from the desktop without getting on airplanes or driving across town or getting on elevators to go to different floors. They can determine the relative benefit of the different transport approaches per application and help us determine the rate structure based on the increased quality of service and security of each application per each transport solution.

Once the prototype is functional, the customer base managed by the National Accounts Organization who's presales support comes from the NCC's will be asked to view the applications and give input on the relative value of the different services. The initial target group will be the major financial institutions out of N.Y. that are very interested in deploying real-time collaboration tools and multicast video applications for the distribution of multimedia content to the desktop.

The concept of "Smartcasting" originated with feedback from these large sophisticated users and some multimedia content providers who sell IP services into these enterprise customers. They will not allow multiple channels of content to be delivered to the desktop from the intranet or via the internet until an intelligent approach to "push/pull" issues is deployed per user per content stream and each content stream may have different quality of service and security requirements.

Microsoft

Microsoft has been extremely successful on the desktop but would like to penetrate the carrier market from the perspective of having services deployed by a communications services provider using NT and the Backoffice Suite with the Internet Suite of applications, as opposed to the traditional host mainframe or UNIX platforms that would typically be deployed by the carrier IS departments.

Microsoft would provide the suite of software they deem appropriate including Explorer 4.0, Netmeeting, Netshow, NT, SQL and any Internet oriented software deemed necessary for the project. They will also commit to work with Compaq, Netcentric and Modulus Technologies (if required) to integrate the browser, Netshow/ Netmeeting client and server software for the application layer routing, "Smartcasting" and the metering functionality required to develop such services. They will also contribute personnel that will be dedicated to this project to make it happen in the designated time frame.

Apogee

Apogee would like to demonstrate to the market that they have a global carrier using their software to provide the metering/tariffing/billing function for delivering the applications layer services of the future.

Apogee will provide their metering software in conjunction with Compaq servers to allow the prototype to include the metering function per application and transport protocol. This will facilitate the ability to meter differently for the same application delivered over each transport or perceived quality of service and security approach. They were

already focused on the approach for metering and billing all the way to the desktop per application for the enterprise to distribute costs and push the cost back to the end user so this fits that paradigm nicely.

The metering capability utilized in the prototype will enable WorldCom to capture realistic cost information to develop the rate structure for the services that is dependent on all costs. This would include the cost of deploying metering software and the database associated with tracking utilization of each type of service and transaction. Netcentric will also commit to looking at the Interagent approach to determine how to meter the application layer routing functionality that is independent of transport, client browser, computing platform and integrating this to work with the Micorsoft Netshow and Netmeeting software as the first two metered applications.

Compaq

Compaq would like to penetrate deeper into the carrier market by demonstrating the viability of multiprocessor services using the WINTEL platform versus UNIX in conjunction with NT and SQL Databases to deliver carrier strength functionality for the telephony applications of the future.

Compaq will deliver their servers for the cities designated and assist in configuration and installation as needed.

Modulus Technologies

Modulus is interested in having their InterAgent software utilized in as many applications as possible so that the industry has an open way of enabling applications to communicate independent of network transport, network protocol, or computing platform.

Modulus already has a number of partnerships with other software companies and would be interested in pursuing alliances with Microsoft, Netcentric, and Compaq.

Modulus would deliver the InterAgent technology to Microsoft, Netcentric, and Compaq to plug into their client and server software. The InterAgent software would provide a middleware layer to facilitate the application-layer routing and the 'smartcasting' functionality across the multiple transport solutions provided by WorldCom. The InterAgent software will also provide a 'glue' layer so that interfaces and drivers to the various software components required by the project can be plugged into the system. Load balancing and fault tolerance functionality would also be available through the InterAgent software.

Modulus will work with Microsoft, Apogee and Compaq to confirm that InterAgent provides the best approach to this functionality and will provide whatever details are needed by all the participatants to incorporate the InterAgent software into the overall solution.

Below is the most recent email sent to Microsoft asking them to answer questions if they choose to not interface with Modulus going forward.

From: Yeager, Scott
To: Ron Wollum; Bill Anderson; Jay Beavers; Richard Weeks; Tim Dwayne Southard; 'Griebing, John-Internet'; Kent Dallas
Subject: Summary of Discussion
Date: Friday, January 09, 1998 2:22PM

Thanks for the candid discussion yesterday. We discussed several issues together and I reiterated numerous concepts that have been discussed in the document I have written and in other meetings. Please reread the document to try to understand all the functionality that I need for this project before you come back to me next week.

I have several requests for you to prepare before the next discussion.

Please prepare a written discussion with illustrations concerning the Winsock II approach. Use the Modulus write up and modify it or create your own version but discuss how Winsock II would be the interface between the Netshow, Netmeeting, and Explorer and Intereagent Router from Modulus. Your comments that you did not see Modulus and being able to handle streaming applications such as voice or video confuses me since the way that we discovered Modulus Intereagent was from a financial trading customer using Modulus to deliver multimedia streaming content to the desktop over IP. It was in full production for that intranet back in 1993. One of the perceived benefits of the Interagent approach is this flexibility to handle bursty messaging and streaming via the same communications bus.

Please also discuss how we would use Winsock II to go out over the backbone native ATM for high speed video application using Netshow and Netmeeting and the IE Explorer. I need this independent of interfacing with Intereagent since we have envisioned an higher speed higher, Quality video to the desktop product offering for the enterprise or Content providers all along.

We have to be able to select more than IP protocol to accomplish a High Quality video service offering and we know this will involve native ATM to the desktop. If this is not done via Interagent then the choice needs to exist to go out native ATM and that is the functionality promised in Winsock II to my understanding. So, it seems that you must committ to recompiling Netshow, Netmeeting and IE Explorer to Winsock II to allow me to go out native ATM. So why not just make another option to use Interagent?

We have chosen Interagent Router from Modulus to allow us to create the Smartcasting functionality. This architecture has been agreed upon by everyone and has always included the concept of Intereagent interfacing with the Metering/Billing and Management Applications. During the discussion you implied that you may have a solution that displaces the need for the Interagent Router Software. If you choose to take this approach please be prepared to explain how your software will provide the following functionality.

1. Dynamic multi-path routing of information- This is needed to allow us to create Multicast functionality on top of traditional IP backbone not set for IP multicasting and could allow cusotmer to deliver multicast streams inside of IPX LANS that do not have IP deployed yet. This would be very imortant for delivering multiple streams of content to multiple enterprises regardless of the underlying network infrastructure. This is also how different message will be sent to the metering/ billing applications and the network management applications. This included the concept of messaging to the customer desktop network management system as well as the WorldCom management systems.

* 2. Event-driven push/pull functionality - This is how the content providers will customize thier products to deliver their chosen content

or an intranet could offer just in time info. to the enterprise users.

* 3.Support of multiple network protocols (TCP/IP, UDP, IP multicasting, IPX, QoS/RSVP, ATM and Frame Relay)- This is needed to take advantage of the multiple local loops that will be available and tariff shop the local as well as route traffic multiple backbones between cities. This also has implications in the connectivity from the desktop LAN to the WorldCom demarc in the building. That one reason we need to interface at the client level since LAN component cannot be ingorned in defining the QoS for any given content stream from a content source.

*4. Support of multiple platforms

* 5.Support for dynamic scalability and reconfiguration- over time there will be thousands of servers deployed worldwide and the cloud will constantly move closer to the user including distributed servers within buildings for multiple services shared over the same local loop to the building.

* 5.Extensible, customizable, and easy to interface to other software- We are using MSIS, SQL, Avesta, hTemplate and Apogee and Unicenter as component to deliver the overall solution today . There will be additional software components that will be added in the future. All these components will be obtaining messages pertinent to their function from the Internagent Router Software since mulitple messages must be sent to mulitple applicaitons concerning any one event. This WorldCom message bus concept is intergral to the MAS project.

*6. Server load balancing and fault tolerance

* 7.Application fault detection and diagnosis to client node level

* 8.Distributed architecture to support local message replication and caching

9. The abilitiy to use the WorldCom message bus for streaming applicitons such as Video or Voice.

This should help you to prepare for our call and discussion next week. I am looking forward to our discussion.

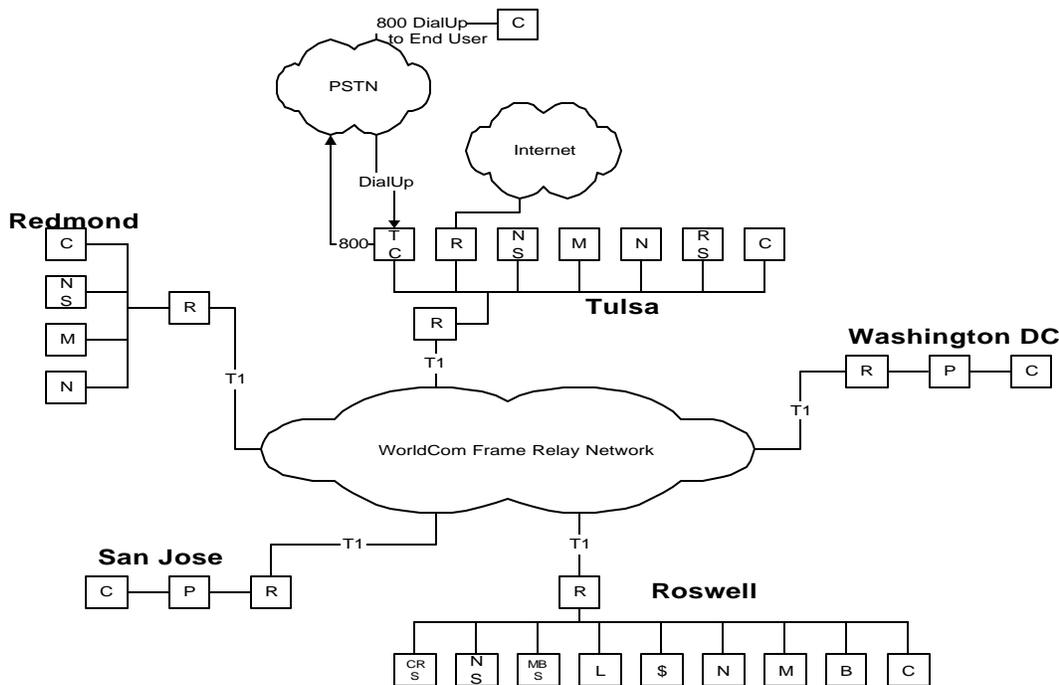
Avesta Technologies

Avesta has one immediate roll to be the front end to the Modulus MSMQ application developed for Microsoft to demonstrate Smartcasting in a financial environment. They have the potential to be a source for developers for the MAS project and could be involved in the integration with Unicenter for the network management component as well.

Other players may become involved such as Template Software which represents a solution for the order entry, provisioning, customer services issues in the future.

Strawman Design/Geographic Layout

The initial Phase 1 project will only use TCP/IP over Frame Relay and T1 local loops to get the prototype up and running and allow the application to work over the wide area.



Legend

C = Client Machines	M = Modulus InterAgent Routing	P = Microsoft Proxy Server	\$ = Microsoft Commerce Server
R = Router	N = NetCentric Metering Server	L = Microsoft Locator Server	B = GridNet Billing Server
NS = NetShow	RS = Radius Server	MB S = Microsoft MemberhsioServer	CR S = Microsoft Content Replication Server

Geographic Locations initial phase:

San Jose WorldCom Lab, WorldCom Tulsa Lab, Atlanta Gridnet main Site, D.C. WorldCom Lab, Microsoft Campus Redmond, Wash.

Local Loop Options per City:

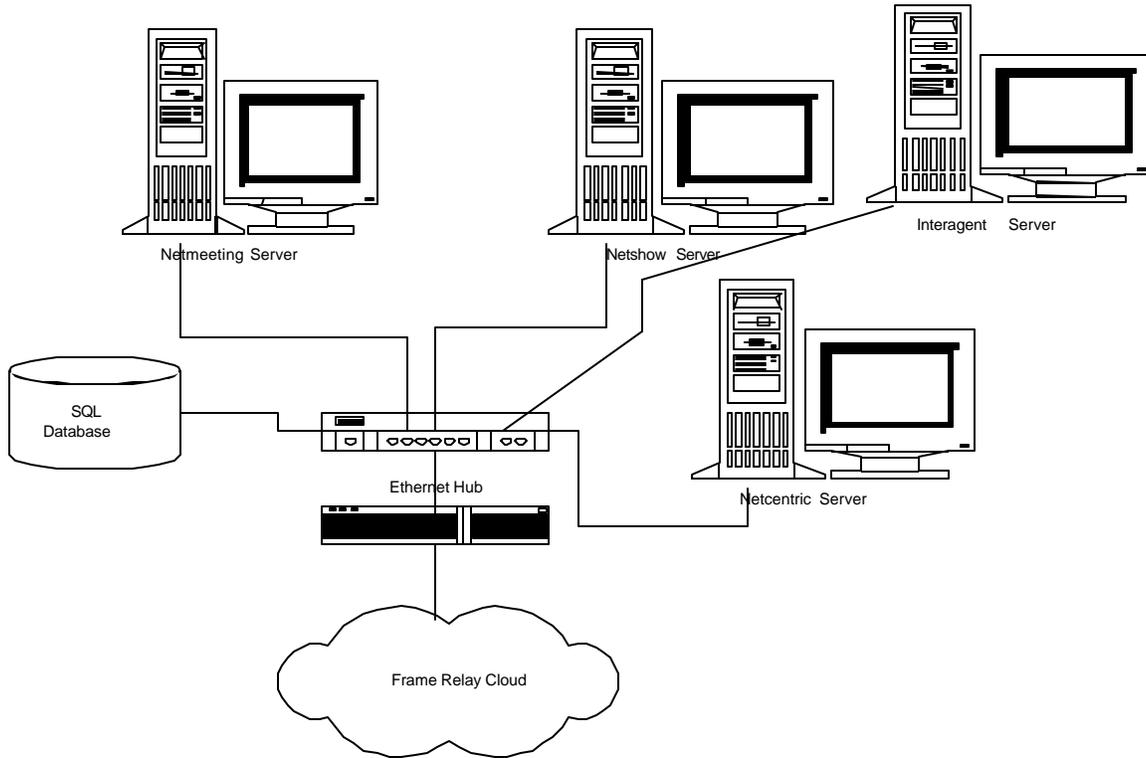
San Jose and D.C. sites use WorldCom fiber on net T1 or T3, Tulsa and Gridnet Site in Atlanta attempt to use xDSL technology in local loop at minimum of T1 speeds, Build Fiber to Microsoft later order T1 initially.

Backbone Options between cities:

Frame Relay for Phase 1, ATM from WorldCom, Routed IP via the Gridnet Network
Options: Dedicated Circuits and via an Internet Service Provider (UUNET)?

Hardware Requirments:

Define for Microsoft Server Software including SQL database software
Netcentric Server Software includes linkage to the SQL database servers



Space Requirments:

Per Server, total per location.

Manpower/Technical Expertise:

Per Location, per application (Netmeeting, Netshow Application Software & Netcentric Metering Software including Database requirements).

xDSL Technology to Tulsa & Gridnet:

WorldCom will need to deploy xDSL technology if possible to the two off net sites in Tulsa and Atlanta.

Meeting Notes:
Sept 8th 1997

First Product (Phase I)

- Focused on 56kps, throttled by 56kps limitation of local loop.
- Flat rate for NetMeeting, NetShow backbone.
NetMeeting – can be a MAS application, but current issue when it's a client to client connection, there's no way to determine if someone has manipulated the client connection to avoid metering. Will/should future NetMeeting application have enhanced security and protocol support to help identify "qualified" users.
- Get the customer hooked to using multimedia content.
- Choose content that is not mission critical so consequence of interruptions is not serious. Possible Harvard University training scenario, Bloomberg, MSNBC, CNN (see Michele Davis).
- Build the pilot first which in turn drives the creation of the business plan. Use the pilot to help identify value of service and intricacies. Incremental costs are incurred as market and revenue base expands.
- Work on the mindset of the mainstream "IP" with Metered Application Services. The encoding/decoding of IP drives up cost. Project undertone to remove the dependencies on IP and need for encoding/decoding hardware at distribution points.
- Project is Enterprise focused, i.e. from the content provider to the Enterprise.
- Operability should be transparent whether the server is located at the customer location or NetOp location and not limited to a NetOp architectural definition within any given city.

Second Product (Phase II)

- Focused on 56, 128 and 512kps.
- Metered usage of channels, i.e. usage sensitive.
- On demand focus utilizes slow and mid bandwidth speeds (on demand training).
- Real-time focus utilizes higher speed (real time training, corporate meetings).
- Allow customer to switch between flat rate and premium network.
- Allow WorldCom to "prove" their innocence of network issues in a passive way by enabling monitoring of servers and services through to the desktop – the customer.

Ownership – Follow Up

- Modulus, NetCentric and Microsoft Consulting Services (MCS) (Jay Beaver) to analyze NetShow SDK.
- Modulus to follow up with Microsoft (Chris Vandenberg) on server approach to application development.
- WorldCom – GridNet, (Robert Gourley) to build network infrastructure to 5 sites. Coordinate with Microsoft (Michael Sandoval) for connection to Microsoft campus.
- WorldCom – GridNet, (Tim Southard) to install and configure server hardware and software from Roswell to ship from this central location to other sites.
- WorldCom (Scott Yeager) to follow up with Compaq on hardware.
- Microsoft (Richard Weeks) to provide PowerPoint presentations from meetings in Redmond.
- Microsoft (Richard Weeks) to provide Microsoft software to GridNet in Roswell.
- Microsoft (Richard Weeks) to provide meeting write up.
- Microsoft (Richard Weeks) to provide initial software implementation design, usage guide.
- NDA follow up contacts:
 - Microsoft (Ron Wollum)
 - NetCentric (Nelson Hsu)
 - Modulus (Rex Shelby)
- ATM future feature implementation between GridNet (Robert Gourley) and Microsoft (Dan Perry).

Timelines

11/1/97

- GridNet (Robert Gourley) - Router network complete.
- WorldCom (Scott Yeager) - Servers to be acquired in Roswell.
- Microsoft (Richard Weeks) - Software implementation specs complete.

12/1/97

- Modulus and Microsoft software in alpha test phase.
- IE 4.0 client (distribution) configuration in test phase.

General Presentation Information

WorldCom (Scott Yeager)

Definitions

A network is defined in terms of an Enterprise, e.g. from the server to the desktop. This is unlike an ISP who stops at the point of presence in a city. WorldCom goes to the building. See slides for details

Daniel Adam

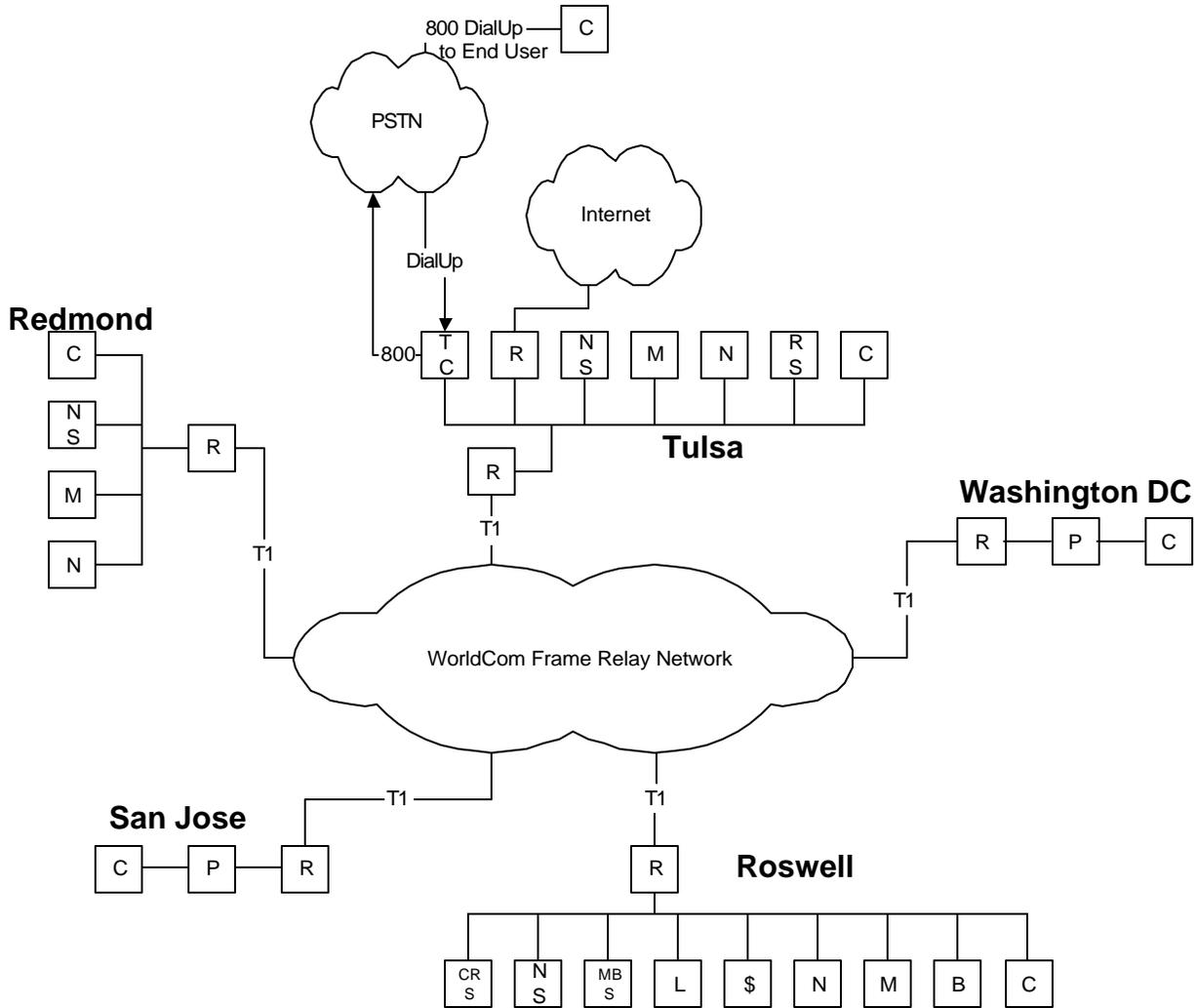
NetShow

- Upcoming version and beta of NetShow includes the VXTreme codecs, released by year end.
- Once the next revision of NetShow is a retail product, the support for VXTreme will end and will then be handled on a customer by customer basis.
- NetShow 4.0 will support RealAudio, Microsoft's .ASF 1.0 file format. The key for NetShow 4.0 will be the updated .ASF file format, which includes better architecture, water marking, security better management tools, etc.
-

Bernard Aboba

Microsoft NT .50

- Memphis – beta 2 available now. There is RSVP functionality in beta 2.
- Primary upgrades in NT 5.0 are focused on the network features.
- NT 5.0 will allow Multicast to forward over any interface.
- NT 5.0 will support IGMP v.2 protocol.
- NT 5.0 will provide full support for ATM as a host.
- NT 5.0 will provide additional security support: IPSEC, Kerberos 5, IT version SSL, SmartCard APIs, VPN(PPTP using L2TP), Directory Service will support certificates and public key technology.
- The Microsoft Management Console (MMC) will replace the control panel.
- NT 5.0 will support TAPI version 3.0 (IP fax support, etc.)
- NT 5.0 will support Radius Authentication and accounting



Legend

- | | | | |
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