

Date _____

Addendum Number 2

From: Jeffrey Hardinger
Bell Atlantic
1310 N. Courthouse Rd, 8th Floor
Arlington, Virginia 22201

To: Judy L. Lilly, Director
Communications Network Services, 0506
Virginia Tech
Blacksburg, Virginia 24061

A proposal to amend contract number CC-0696-Bell-Atl is requested. Attached are service descriptions and pricing information for the following line item(s).

<u>Type of Change</u>	<u>Service Requested</u>	<u>Purpose of Change</u>
Add	See attachment (Frame Relay ATM Network Interworking (FRANI) services and Frame Relay ATM Service Interworking (FRASI) services)	

Bell Atlantic is pleased to submit this proposal to amend the contract referenced above at the price and terms indicated in the attached document. Should the University wish to accept this proposal, please have your duly authorized representative sign in the space provided below and return this copy to the Bell Atlantic Representative at the address listed above. All other terms and conditions of the contract shall remain in full force in effect except as modified herein.

Bell Atlantic _____ Date _____

To: Minnis E. Ridenour, Executive Vice President
Office of the Executive Vice President
Virginia Tech
Blacksburg, Virginia 24061

From: Judy Lilly, Director
Communications Network Services
Virginia Tech
Blacksburg, VA 24061

Attached are documents to amend the contract referenced above. This request has been reviewed and approved by the Office of the General Counsel. Please sign and return to me at the address above.

Office of the Executive Vice-President _____ Date _____
Virginia Tech Communications Network Services _____ Date _____

cc: Purchasing

Addenda to the Broadband Network Services Agreement between Virginia Tech and Bell Atlantic

This addenda is being entered into pursuant to section 5.14 of the Broadband Network Services Agreement between Virginia Tech and Bell Atlantic dated June 12, 1996. The services contained in this addenda are in addition to and support the existing services contained in the Broadband Network Services Agreement.

Appendix A

Definition of NET.WORK.VIRGINIA Backbone

The NET.WORK.VIRGINIA Backbone is a network service provided by an interLATA carrier(s) designated by Virginia Tech to provide interLATA transport for network services provided under the Broadband Network Services Agreement between Virginia Tech and Bell Atlantic, dated June 12, 1996. The NET.WORK.VIRGINIA Backbone includes commercial Internet gateway and other gateway services provided by entities designated by Virginia Tech.

Frame Relay to ATM Network Interworking (FRANI) and Frame Relay to ATM Service Interworking (FRASI)

Contractor will provide Frame Relay ATM Network Interworking (FRANI) services and Frame Relay ATM Service Interworking (FRASI) services, in compliance with recognized industry standards, including Frame Relay Forum Standards (e.g.: FRF .5, .6 and 8) to Ordering Parties who wish to interwork the Contractor's Frame Relay Services with Contractor's ATM services. This service is intended to enable Contractor's Frame Relay end users to connect, send and receive information transparently across the NET.WORK.VIRGINIA Backbone. Three interworking and transport functions are required for FRANI. One, Frame Relay frames are segmented into ATM cells. Two, the ATM cells are transported across the NET.WORK.VIRGINIA Backbone to the destination ATM/Frame Relay node. And three, the Frame Relay frame is reassembled from the segmented cells.

The interworking function will be performed in the Contractor's Network from Contractor's FRANI equipped offices (a list of FRANI equipped offices will be updated and maintained by the Contractor and Virginia Tech and made available upon request: a partial list is included below). The end to end interworked Frame Relay service will consist of a Frame Relay Access Circuit with the appropriate interworked Permanent Virtual Circuit (PVC) and Committed Information Rate (CIR), procured from Contractor, a corresponding NET.WORK.VIRGINIA Backbone facility with a corresponding PVC,

and a second Frame Relay to ATM Internetworked Access Circuit with an interworked PVC to complete the connection. Frame Relay services which are to be adapted into ATM service which also require interLATA connectivity will be interconnected to the NET.WORK.VIRGINIA Backbone at the then current corresponding connection fees for the corresponding network speeds (see Ordering Party FRANI and FRASI intraLATA and interLATA Network Charges).

FRANI services will be provisioned across the NET.WORK.VIRGINIA Backbone via a single PVC. This PVC will be non-real time VBR (QoS). The sustained cell rate, (SCR), peak cell rate, (PCR), and Maximum Burst Size, (MBS) will be configured pursuant to recognized industry standards and specifications mutually agreed upon by Virginia Tech and Contractor.

In the case of Ordering Parties wishing to access the NET.WORK.VIRGINIA Backbone Internet gateway service, the Contractor will provide Frame Relay ATM Service Interworking (FRASI) services, in compliance with recognized industry standards, to ordering entities. Corresponding PVCs required to support NET.WORK.VIRGINIA Backbone Internet services via FRASI will be provided by Contractor and by the NET.WORK.VIRGINIA Backbone provider to provide quality of service (QoS) comparable to other Internet access services available from NET.WORK.VIRGINIA.

Aggregated Frame Relay Committed Information Rates (CIR) for individual and combined FRANI and FRASI circuits will not exceed 50% of the subscribed line speed . For example, if an Ordering Party orders a DS-1 (1.544 Mbps) FRANI service, the total, aggregate CIR for all PVCs associated with that circuit may not exceed 768 Kbps.

No PVC supporting FRANI or FRASI service will interconnect any given pair of intraLATA or interLATA ATM switches unless there is a requested, existing or other serving arrangement mutually agreed upon by Virginia Tech and Contractor between those intraLATA or interLATA switches. The FRANI or FRASI PVCs interconnecting any pair of ATM switches or latas will be created or reconfigured as necessary according to a mutually agreed upon schedule to meet the Ordering Party's requests for new or reconfigured service. Such maintenance of FRANI or FRASI PVCs will occur at intervals mutually agreeable to Virginia Tech and Contractor such that they will meet the delivery date requirements for service requests as specified in Appendix A, Ordering section, Installation Interval, Frame to ATM UNI section of the Broadband Network Services Agreement between Virginia Tech and Bell Atlantic, dated June 12, 1996.

In the event that the quality of service on the FRANI or FRASI access links and/or the resulting PVCs to be provisioned across the NET.WORK.VIRGINIA Backbone falls below the Ordering Parties' performance expectations, the Contractor and Virginia Tech

will re-negotiate certain engineering and pricing elements to increase the available bandwidth to meet the Ordering Parties' expectations.

Access Carrier Extension Engineering Requirements:

Pursuant to the provisions of the "Carrier Access" section of Appendix A of the Broadband Network Services Agreement, the Contractor will provide connectivity to previously agreed to interLATA carrier points of presence. For new points of presence, the Contractor will provide Access Carrier Extensions to interLATA carrier points of presence mutually agreed to by Contractor and Virginia Tech.

For FRANI and FRASI services Contractor will provide additional Access Carrier Extension services on a per switch basis at a provisioning ratio that is mutually agreed upon by Contractor and Virginia Tech and in accordance with generally accepted industry standards and operational guidelines. These additional Access Carrier Extension services associated with the FRANI and FRASI offering and provided by the Contractor will be provisioned between the Contractor's cell relay platform and the then current interLATA carrier's switch. The capacity allocated to Access Carrier Extension services to support FRANI and FRASI services will be provided in addition to the capacity allocated for Access Carrier Extension services provided to support ATM UNI access to NET.WORK.VIRGINIA services

The additional Access Carrier Extension Services provided by the Contractor for the FRANI and FRASI service will be engineered to provide an acceptable and mutually agreed upon level of service by Virginia Tech, the Ordering Party, and the Contractor. In the event the quality of service on the FRANI or FRASI access links and or the resulting PVCs to be provisioned across the NET.WORK.VIRGINIA Backbone falls below the Ordering Parties' performance expectations, the Contractor and Virginia Tech will re-negotiate certain engineering and pricing elements to increase the available bandwidth to meet the Ordering Parties expectations.

Ordering Party FRANI and FRASI IntraLATA and InterLATA Network Charges:

As mentioned above, for Ordering Parties to utilize FRANI, the service will be provisioned with the following components: Frame relay subscriber circuit with interworking services provided by Contractor, PVC connections provided by Contractor and by the NET.WORK.VIRGINIA Backbone provider, CIR settings provided by the Contractor, and NET.WORK.VIRGINIA Backbone access ports.

For only those Frame Relay ATM Network Interworking (FRANI) services which require ATM Adaptation and interconnection to the NET.WORK.VIRGINIA Backbone, the Ordering Party is required to purchase a minimum of one (1) DS-1 port per respective LATA from the NET.WORK.VIRGINIA Backbone provider; Ordering Parties will not be required to purchase NET.WORK.VIRGINIA Backbone ports within LATAs where they have no FRANI services which require ATM Adaptation and interconnection to the NET.WORK.VIRGINIA Backbone. A total of up to twenty four (24) 56K Frame Relay UNIs can be terminated within that LATA, to access the aforementioned DS-1 interLATA port. If the number grows beyond twenty four (24) per LATA, an additional DS-1 port must be purchased from the NET.WORK.VIRGINIA Backbone provider for each group of twenty four (24) 56K circuits. Each DS1 Frame Relay UNI, which requires ATM adaptation and interconnection to the NET.WORK.VIRGINIA Backbone, requires a DS1 NET.WORK.VIRGINIA Backbone port. For FRANI services operating at DS-1 and higher capacities, the Ordering Party is required to purchase a NET.WORK.VIRGINIA Backbone port equal to the capacity of the corresponding Frame Relay access service.

Example: Should an Ordering Party wish to subscribe to FRANI at the DS1 level of service, the Ordering Party would require one (1) DS-1 Frame Relay to ATM Network Interworking (FRANI) circuit with adaptation and interconnection to the ATM Network for InterLATA access. At a minimum the following items are procured from Contractor: DS-1 Frame Relay to ATM Network Interworking (FRANI) UNI; an interworked PVC; and an appropriate CIR at the corresponding rate. Also a corresponding NET.WORK.VIRGINIA Backbone port at DS-1 level of service must be procured from the NET.WORK.VIRGINIA Backbone provider. The charges for these components added together represent the total access fee to access the network. Assuming the Ordering Party requires one (1) DS-1 to enter and desires to exit the network at the same level of service, a second DS-1 FRANI UNI, with identical and corresponding components and charges, are required to complete the network connection.

FRANI and FRASI, at a minimum, are available from the Contractor's central offices listed below. This list will be updated and maintained separately by both the Contractor and Virginia Tech. During the term of this Agreement, Contractor will not discontinue or restrict access to FRANI or FRASI services as described herein from any serving office which is currently identified on the aforementioned list or which is subsequently added to the list unless mutually agreed to in writing by Contractor and Ordering Parties.

<u>Central Office-Telco</u>	<u>Services</u>	<u>56K</u>	<u>DS1</u>
Arlington CO, Arlington-Bell Atlantic		56K	DS1
Butte St. CO, Norfolk-Bell Atlantic		56K	DS1
Luck Ave. CO, Roanoke-Bell Atlantic		56K	DS1
Grace St. CO, Richmond-Bell Atlantic		56K	DS1

Tazewell CO, Bluefield-GTE	56K	DS1
Great Bridge CO, Chesapeake-GTE	56K	DS1
Warsaw CO, Richmond-GTE	56K	DS1
Harrisonburg CO, Harrisonburg-GTE	56K	DS1
Manassas CO, Manassas-GTE	56K	DS1

FRANI and FRASI services will be made available upon the successful conclusion of the FRANI and FRASI pilot and acceptance testing to be conducted by Virginia Tech. These tests will be mutually agreed to by the Contractor and Virginia Tech and will commence within thirty (30) days written notice by Virginia Tech to Contractor of intention to begin testing or at a time mutually agreed to by Contractor and Virginia Tech.

As applicable to the Ordering Party, Frame Relay services may also be purchased under this Appendix A without the purchase of the interworking capability. Should an Ordering Party wish to connect to the NET.WORK.VIRGINIA Backbone for interLATA access, corresponding and compatible connections are required and must be purchased from the NET.WORK.VIRGINIA Backbone provider.

Appendix B
Pricing for Modification #4

<u>Frame Relay Circuits</u>	<u>Monthly</u>	<u>NRC</u>
56K Frame Relay	\$ 150.00	\$ 800.00
DS1 Frame Relay	\$ 380.00	\$ 1,000.00
4 Mbps	\$ 2,300.00	\$ 2,000.00
6 Mbps	\$ 2,600.00	\$ 2,000.00
22.5 Mbps	\$ 3,000.00	\$ 2,000.00
45 Mbps	\$ 3,800.00	\$ 2,000.00

Frame Relay to ATM Network Interworking (FRANI)
and Frame Relay to ATM Service Interworking (FRASI) Circuits

	<u>Monthly</u>	<u>NRC</u>
56K Frame Relay	\$ 195.00	\$ 800.00
DS1 Frame Relay	\$ 528.00	\$ 1,000.00
4 Mbps	\$ TBD	\$ TBD
6 Mbps	\$ TBD	\$ TBD
22.5 Mbps	\$ TBD	\$ TBD
45 Mbps	\$ TBD	\$ TBD

All Frame Relay Services include one (1) non interworked Permanent Virtual Circuit (PVC) at no additional cost.

<u>Additional Frame Relay Services</u>	<u>Monthly</u>	<u>NRC</u>
Additional PVCs	\$ 1.25 ea.	N/A
Group Addresses	N/A	\$50
Committed Information Rate (per PVC)		
-56K	\$5.00	N/A
(either 8K, 16K, 28K,)		
-DS-1		
56K	\$2.00	N/A
128K	\$4.00	N/A
192K	\$7.00	N/A
256K	\$9.00	N/A
384K	\$12.00	N/A
512K	\$25.00	N/A
768K	\$38.00	N/A

Committed Information Rate for 4, 6, 22.5 and 45 Mbps (CIR in increments of 2 Mbps per PVC not to exceed 50% of the subscribed line speed)

-2 Mbps	\$50.00	N/A
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Administrative Change Charge
for Frame Relay

N/A	\$50
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Administrative Change Charge may apply for changes to group addresses, PVC reconfigurations, and CIR reconfigurations.

Example: Should an Ordering Party order a DS1 Frame Relay connection with two PVCs and a CIR of 384K, without ATM adaptation, the monthly and non-recurring charges are as follows:

- The DS1 Frame Relay monthly cost would be \$380.00, plus \$12.00 for the CIR level, plus \$1.25 for the additional PVC. The total non-recurring cost would be \$1,000.00.

Example: Should an Ordering Party order a DS1 Frame Relay connection with two PVCs and a CIR of 512K, with ATM adaptation, with service interworking to the NET.WORK.VIRGINIA Backbone Internet gateway the monthly charges are as follows:

The DS1 Frame Relay monthly cost would be \$528.00, plus \$25.00 for the 512K CIR level, plus \$1.25 for the additional PVC. The total non-recurring cost would be \$1,000.00.