


# EXHIBIT B

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|--|--------------------|---|--------------------|---------------------|---------------------|
| BAR CODE LABEL<br><br>  |                    | <h2 style="margin: 0;">U.S. PATENT APPLICATION</h2> |                    |                     |                     |
| SERIAL NUMBER  | FILING DATE        | CLASS   | GROUP ART UNIT     |                     |                     |
| 08/525,897   | 09/08/95           | 455   | 2611               |                     |                     |
| APPLICANT<br><br>JOSEPH M. CHRISITE, SAN BRUNO, CA.<br><br>**CONTINUING DATA*****<br>VERIFIED      THIS APPLN IS A CIP OF      08/238,605 05/05/94 ABN<br><br>_____<br><br>**FOREIGN/PCT APPLICATIONS*****<br>VERIFIED<br><br>_____<br><br>FOREIGN FILING LICENSE GRANTED 03/14/96 |                    |   |                    |                     |                     |
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| ADDRESS<br><br>HARLEY R BALL<br>SPRINT LAW DEPARTMENT<br>8140 WARD PARKWAY<br>MAILSTOP MOKCMP0506<br>KANSAS CITY MO 64114  |                    |   |                    |                     |                     |
| TITLE<br><br>BROADBAND TELECOMMUNICATIONS SYSTEM   |                    |   |                    |                     |                     |
| This is to certify that annexed hereto is a true copy from the records of the United States Patent and Trademark Office of the application which is identified above.<br><br>By authority of the<br>COMMISSIONER OF PATENTS AND TRADEMARKS   |                    |   |                    |                     |                     |
| Date   | Certifying Officer |   |                    |                     |                     |

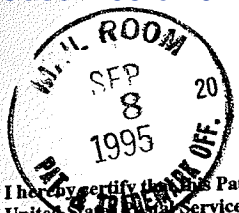
PATENT APPLICATION SERIAL NO. 08/525897

U.S. DEPARTMENT OF COMMERCE  
PATENT AND TRADEMARK OFFICE  
FEE RECORD SHEET

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CERTIFICATION UNDER 37 C.F.R. 1.10

I hereby certify that this Patent Application Transmittal and the documents referred to as enclosed therein is being deposited with the United States Postal Service on September 8, 1995, in an envelope known as "Express Mail," Mailing Label Number EF596040170US, addressed to: Box Patent Application, Assistant Commissioner of Patents, Washington, D.C. 20231.

*Michael J. Setter*  
Michael J. Setter, Reg. No. 37,936

PATENT APPLICATION TRANSMITTAL

Hon. Assistant Commissioner of Patents  
Washington, D.C. 20231

Dear Sirs:

Transmitted herewith for filing is the following patent application:

Applicants: <sup>170</sup> JOSEPH MICHAEL CHRISITE

For: "BROADBAND TELECOMMUNICATIONS SYSTEM"

Enclosed is:

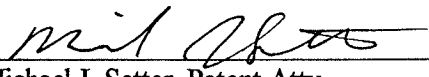
- 12 sheets of drawing
- 37 pages of specification
- 14 pages of claims
- 1 page of abstract
- 1 Declaration (unexecuted)

X The Commissioner is hereby authorized to charge the fees for the filing of this application as calculated below, and any additional fees under 37 CFR 1.16 and 1.17 which may be required during the entire pendency of the application to Sprint Communications Company L.P., Deposit Account No. 21-0765.

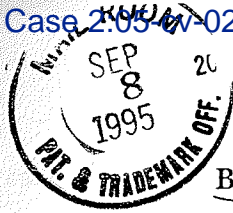
|  |                       |            |
|--|-----------------------|------------|
| Basic Filing Fee                       |                       | \$730.00   |
| Total Number of Claims, (less 20)      | <u>42</u> x \$22.00 = | \$924.00   |
| Number of Independent Claims, (less 3) | <u>6</u> x \$76.00 =  | \$456.00   |
| Total Filing Fee                       |                       | \$2,110.00 |
| Fee for Recording Assignment           |                       | \$ 0.00    |
|  |                       | \$         |
|  | Total:                | \$2,110.00 |

Respectfully submitted,

9-8-95  
Date

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A 525897

BROADBAND TELECOMMUNICATIONS SYSTEM

**Cross-Reference to Related Application**

This application is a continuation-in-part of prior application serial number 08/238,605, entitled "Method, System, and Apparatus for Telecommunications Control", filed May 5, 1994, currently pending, and incorporated by reference into this application.

**Background**

At present, Asynchronous Transfer Mode (ATM) technology is being developed to provide broadband switching capability. Some ATM systems have used ATM cross-connects to provide virtual connections. Cross-connect devices do not have the capacity to process signaling. Signaling refers to messages that are used by telecommunications networks to set-up and tear down calls. Thus, ATM cross-connects cannot make connections on a call by call basis. As a result, connections through cross-connect systems must be pre-provisioned. They provide a relatively rigid switching fabric. Due to this limitation, ATM cross-connect systems have been primarily used to provide dedicated connections, such as permanent virtual circuits (PVCs) and permanent virtual paths (PVPs). But, they do not to provide ATM switching on a call by call basis as required to provide switched virtual circuits (SVCs) or switched virtual paths (SVPs). Those skilled in the art are well aware of the efficiencies created by using SVPs and SVCs as opposed to PVCs and PVPs. SVCs and SVPs utilize bandwidth more efficiently.

ATM switches have also been used to provide PVCs and PVPs. Since PVCs and PVPs are not established on a call-by-call basis, the ATM switch does need to use its call processing or signaling capacity. ATM switches require both signaling capability and call processing capability to provide SVCs and SVPs. In order to achieve virtual connection switching on a call by call basis, ATM switches are being developed that can process calls in response to signaling to provide virtual connections for each call. These systems cause problems because they must be very sophisticated to support current networks. These ATM switches must process high volumes of calls and transition legacy services from existing networks. An example would be an ATM switch that can handle large numbers of POTS, 800, and VPN

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Claims

I claim:

5 1. A method of operating a telecommunications system to provide a call with a virtual connection wherein a user places the call by sending signaling for the call to the telecommunications system and by transmitting user information to the telecommunications system over a particular connection for the call, wherein the system comprises an ATM interworking multiplexer and a signaling processor linked to the ATM interworking multiplexer, the method comprising:

10 receiving the signaling for the call into the signaling processor;

processing the signaling for the call in the signaling processor to select the virtual connection;

generating new signaling in the signaling processor to identify the particular connection and the selected virtual connection;

15 transmitting the new signaling to the ATM interworking multiplexer;

receiving the user information for the call from the particular connection into the ATM interworking multiplexer;

20 converting the user information from the particular connection into ATM cells that identify the selected virtual connection in the ATM interworking multiplexer in response to the new signaling; and

transmitting the ATM cells from the ATM interworking multiplexer over the selected virtual connection.

25 2. The method of claim 1 wherein receiving the signaling for the call comprises receiving a call set-up message.

3. The method of claim 1 wherein receiving the signaling for the call comprises receiving a Signaling System #7 (SS7) initial address message (IAM).

4. The method of claim 1 wherein receiving user information for the call from the particular connection comprises receiving user information from a DS0 connection.

5. The method of claim 1 wherein receiving user information for the call comprises receiving voice information.

6. The method of claim 1 wherein selecting the virtual connection comprises selecting the virtual connection based on the dialed number.

7. The method of claim 1 wherein selecting the virtual connection comprises selecting the virtual connection based on N00 call processing.

8. The method of claim 1 wherein selecting the virtual connection comprises selecting the virtual connection based on virtual private network (VPN) call processing.

9. The method of claim 1 wherein selecting the virtual connection comprises selecting the virtual connection based on personal/terminal mobility service call processing.

10. The method of claim 1 wherein transmitting the ATM cells comprises transmitting the ATM cells on a SONET connection.

11. The method of claim 1 wherein processing the signaling for the call in the signaling processor further comprises processing the signaling to determine digital signal processing (DSP) requirements for the call, wherein generating new signaling for the call further comprises generating new signaling that identifies the DSP requirements for the call, and wherein the method further comprises implementing the DSP requirements for the call in the ATM interworking multiplexer in response to the new signaling.

12. The method of claim 11 wherein implementing the DSP requirements comprises echo control for the call.



13. The method of claim 11 wherein implementing the DSP requirements comprises encrypting the call.

5 14. The method of claim 11 wherein implementing the DSP requirements comprises adjusting a decibel level for the call.

15. The method of claim 1 wherein the particular connection and the virtual connection are bi-directional and other user information is transmitted in ATM cells over the virtual  
10 connection to the ATM interworking multiplexer for transmission to the user, the method further comprising:

receiving ATM cells for the call from the virtual connection into the ATM interworking multiplexer;

15 converting the other user information in the ATM cells from the virtual connection into a format suitable for the particular connection; and

transmitting the other user information from the ATM interworking multiplexer over the particular connection.

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16. A method of operating a telecommunications system to provide a call with a narrowband connection wherein a user places the call by sending signaling for the call to the telecommunications system and the telecommunications system facilitates the call by transporting user information in ATM cells over a virtual connection, and wherein the system comprises an ATM interworking multiplexer and a signaling processor linked to the ATM interworking multiplexer, the method comprising:

receiving the signaling for the call into the signaling processor;

processing the signaling for the call in the signaling processor to select the narrowband connection;

generating new signaling in the signaling processor to identify the virtual connection and the selected narrowband connection;

transmitting the new signaling to the ATM interworking multiplexer;

receiving the ATM cells for the call from the virtual connection into the ATM interworking multiplexer;

converting the ATM cells from the virtual connection into user information in narrowband format in the ATM interworking multiplexer in response to the new signaling; and

transmitting the user information from the ATM interworking multiplexer over the selected narrowband connection.

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17. A method of operating a telecommunications system to provide a call with a virtual connection wherein a user places the call by sending signaling for the call to the telecommunications system and by transmitting user information to the telecommunications system over an access connection for the call, wherein the system comprises a plurality of access connections, a plurality of ATM interworking multiplexers connected to the access connections, a signaling processing system linked to the ATM interworking multiplexers, and an ATM cross-connect system connected to the ATM interworking multiplexers and configured to provide a plurality of virtual connections between the ATM interworking multiplexers, the method comprising:

10 providing the user with a first access connection to a first ATM interworking multiplexer;

receiving the signaling for the call into the signaling processing system;

15 processing the signaling for the call in the signaling processing system to select a virtual connection from the first ATM interworking multiplexer through the ATM cross-connect system to a second ATM interworking multiplexer and a second access connection to the second ATM interworking multiplexer;

20 generating, in the signaling processing system, a first new signal for the call that identifies the first access connection and the selected virtual connection, and a second new signal for the call that identifies the selected virtual connection and the second access connection;

transmitting the first new signal to the first ATM interworking multiplexer and the second new signal to the second ATM interworking multiplexer;

25 receiving the user information for the call from the first access connection into the first ATM interworking multiplexer;

converting the user information from the first access connection into ATM cells that identify the selected virtual connection in the first ATM interworking multiplexer in response to the first new signal;

30 transmitting the ATM cells from the first ATM interworking multiplexer through the ATM cross-connect system over the selected virtual connection to the second ATM interworking multiplexer;

converting the ATM cells that identify the selected virtual connection to user information for the second access connection in the second ATM interworking multiplexer in response to the second new signal;

5 transmitting the user information from the second ATM interworking multiplexer over the second access connection.

18. The method of claim 17 wherein receiving the signaling for the call comprises receiving a call set-up message.

10 19. The method of claim 17 wherein receiving the signaling for the call comprises receiving a Signaling System #7 (SS7) initial address message (IAM).

20. The method of claim 17 wherein receiving user information for the call from the first access connection comprises receiving user information from a DS0 connection.

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21. The method of claim 17 wherein receiving user information for the call comprises receiving voice information.

20 22. The method of claim 17 wherein selecting the virtual connection comprises selecting the virtual connection based on the dialed number.

23. The method of claim 17 wherein selecting the virtual connection comprises selecting the virtual connection based on N00 call processing.

25 24. The method of claim 17 wherein selecting the virtual connection comprises selecting the virtual connection based on virtual private network (VPN) call processing.

25. The method of claim 17 wherein selecting the virtual connection comprises selecting the virtual connection based on personal/terminal mobility service call processing.

26. A method of operating a telecommunications system to provide a call with a virtual connection wherein a user places the call by sending signaling for the call to the telecommunications system and by transmitting user information to the telecommunications system over an access connection for the call, wherein the system comprises a plurality of access connections, a plurality of ATM interworking multiplexers connected to the access connections, a plurality of signaling processors linked to each other and the ATM interworking multiplexers, and an ATM cross-connect system connected to the ATM interworking multiplexers and configured to provide a plurality of virtual connections between the ATM interworking multiplexers, the method comprising:

10 providing the user with a first access connection to a first ATM interworking multiplexer;

receiving a first signal for the call into a first signaling processor;

15 processing the first signal in the first signaling processor to select a virtual connection for the call from the first ATM interworking multiplexer through the ATM cross-connect system to a second ATM interworking multiplexer and to select a point for the call connected to the second ATM interworking multiplexer;

generating a second signal in the first signaling processor that identifies the selected virtual connection and the point;

20 transmitting the second signal to <sup>a</sup>the second signaling processor;

processing the second signal in the second signaling processor to select a second access connection for the call from the second ATM interworking multiplexer to the point;

generating a third signal in the first signaling processor that identifies the first access connection and the selected virtual connection;

25 transmitting the third signal to the first ATM interworking multiplexer;

generating a fourth signal in the second signaling processor that identifies the selected virtual connection and the second access connection;

transmitting the fourth signal to the second ATM interworking multiplexer;

receiving the user information for the call from the first access connection into the first ATM interworking multiplexer;

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converting the user information from the first access connection into ATM cells that identify the selected virtual connection in the first ATM interworking multiplexer in response to the third signal;

5 transmitting the ATM cells from the first ATM interworking multiplexer through the ATM cross-connect system over the selected virtual connection to the second ATM interworking multiplexer;

converting the ATM cells that identify the selected virtual connection into user information suitable for the second access connection in the second ATM interworking multiplexer in response to the fourth signal; and

10 transmitting the user information from the second ATM interworking multiplexer over the second access connection to the point.

27. The method of claim 26 wherein receiving the first signal for the call comprises receiving a call set-up message.

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28. The method of claim 26 wherein receiving the first signal for the call comprises receiving an Signaling System #7 (SS7) initial address message (IAM).

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29. The method of claim 26 wherein receiving user information for the call from the first access connection comprises receiving user information from a DS0 connection.

30. The method of claim 26 wherein receiving user information for the call comprises receiving voice information.

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31. The method of claim 26 wherein selecting the virtual connection comprises selecting the virtual connection based on the dialed number.

32. The method of claim 26 wherein selecting the virtual connection comprises selecting the virtual connection based on N00 call processing.

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33. The method of claim 26 wherein selecting the virtual connection comprises selecting the virtual connection based on virtual private network (VPN) call processing.

34. The method of claim 26 wherein selecting the virtual connection comprises selecting the virtual connection based on personal/terminal mobility service call processing.

35. A telecommunications system to provide a call received over a particular connection with a virtual connection in response to signaling for the call, the system comprising:

a signaling processor operable to receive and process the signaling for the call to select the virtual connection for the call, and to generate and transmit new signaling that identifies the particular connection and the selected virtual connection;

an ATM interworking multiplexer operable to receive user information from the particular connection, convert the user information into ATM cells that identify the selected virtual connection in response to the new signaling, and to transmit the ATM cells from the ATM interworking multiplexer over the selected virtual connection; and

a link between the signaling processor and the ATM interworking multiplexer operable to transfer the new signaling from the signaling processor to the ATM interworking multiplexer.

36. The system of claim 35 further comprising an ATM cross-connect system connected to the ATM interworking multiplexer and configured to provide a plurality of virtual connections to the ATM interworking multiplexer.

37. An ATM interworking multiplexer for providing calls with virtual connections in response to signaling for each of the calls, the multiplexer comprising:

an access interface operable to receive user information for each call from a particular connection for that call;

5 a control interface operable to receive signaling for each call that identifies the particular connection and a virtual connection for that call;

an ATM adaption processor coupled to the access interface and the control interface and operable to convert user information from the particular connection for each call into ATM cells that identify the virtual connection for that call, the conversion occurring in  
10 response to the signaling for that call;

an ATM interface coupled to the ATM adaption processor and operable to transmit the ATM cells for each call over the virtual connection for that call.

38. The multiplexer of claim 37 wherein the access interface includes a DS0 interface.

39. The multiplexer of claim 37 wherein the access interface includes a DS1 interface.

40. The multiplexer of claim 37 wherein the access interface includes a DS3 interface.

41. The multiplexer of claim 37 wherein the access interface includes an OC-3 interface.

42. The multiplexer of claim 37 wherein the access interface includes an OC-12 interface.

43. The multiplexer of claim 37 wherein the access interface includes an E1 interface.

44. The multiplexer of claim 37 wherein the access interface includes an E3 interface.

45. The multiplexer of claim 37 wherein the signaling for each call identifies a particular DS0 connection for that call.



46. The multiplexer of claim 37 wherein the ATM interface includes an OC-3 interface.

47. The multiplexer of claim 37 wherein the ATM interface includes an OC-12 interface.

5 48. The multiplexer of claim 37 wherein the particular connection and the virtual connection for each call are bi-directional and wherein:

the ATM interface is further operable to receive ATM cells containing user information from the virtual connection for each call;

10 the ATM adaption processor is further operable to convert the ATM cells from the virtual connection into user information suitable for the particular connection for each call; and

the access interface is operable to transmit the user information from the virtual connection for each call over the particular connection for that call.

15 49. An ATM interworking multiplexer for providing calls on virtual connections with particular connections in response to signaling for each of the calls, the multiplexer comprising:

an ATM interface operable to receive ATM cells for each call over the virtual connection for that call;

20 a control interface operable to receive signaling for each call that identifies the virtual connection and a particular connection for that call;

an ATM adaption processor coupled to the ATM interface and the control interface and operable to convert the ATM cells for each call into user information suitable for the particular connection for that call, the conversion occurring in response to the signaling for  
25 that call; and

an access interface coupled to the ATM adaption processor and operable to transmit user information for each call over the particular connection for that call.

50. An ATM interworking multiplexer for providing calls with virtual connections in response to signaling for each of the calls, the multiplexer comprising:

an access interface operable to receive user information for each call from a particular connection for that call;

5 a control interface operable to receive signaling for each call that identifies the particular connection, a virtual connection, and digital signal processing requirements for that call;

10 a digital signal processor coupled to the access interface and the control interface operable to apply digital signal processing to the user information for each call in response to the signaling for that call;

an ATM adaption processor coupled to the digital signal processor and the control interface and operable to convert user information from the particular connection for each call into ATM cells that identify the virtual connection for that call, the conversion occurring in response to the signaling for that call; and

15 an ATM interface coupled to the ATM adaption processor and operable to transmit the ATM cells for each call over the virtual connection for that call.

51. The multiplexer of claim 50 wherein the digital signal processor is operable to apply echo control.

20 52. The multiplexer of claim 50 wherein the digital signal processor is operable to apply encryption.

25 53. The multiplexer of claim 50 wherein the digital signal processor is operable to apply digital voice compression.

54. The multiplexer of claim 50 wherein the digital signal processor is operable to adjust the decibel level for calls.

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55. A telecommunications system for transporting user information for a call over a virtual connection selected for the call in response to a first signal for the call, the system comprising:

a plurality of access connections operable to receive and transmit user information;

a plurality of ATM interworking multiplexers connected to the access connections

5 and operable and to transmit and receive user information over the access connections and to transmit and receive ATM cells over a plurality of virtual connections;

an ATM cross-connect system connected to the ATM interworking multiplexers and configured to provide the plurality of virtual connections between the ATM interworking multiplexers;

10 a signaling processing means for receiving and processing the first signal for the call to identify a first access connection used for the call, to identify a first ATM interworking multiplexer connected to the first access connection, to select a virtual connection for the call from the first ATM interworking multiplexer to a second ATM interworking multiplexer, and to select a second access connection connected to the second ATM interworking  
15 multiplexer;

a signaling generation means coupled to the signaling processing means for generating a second signal for transmission to the first ATM interworking multiplexer that identifies the first access connection and the virtual connection, and for generating a third signal for transmission to the second ATM interworking multiplexer that identifies the virtual  
20 connection and the second access connection;

a signaling transfer means for transferring the second signal to the first ATM interworking multiplexer and for transferring the third signal to the second ATM interworking multiplexer;

25 a first adaption means in the first ATM interworking multiplexer for receiving the second signal, and in response, converting user information from the first access connection into ATM cells that identify the virtual connection and converting ATM cells from the virtual connection into user information suitable for the first access connection;

a second adaption means in the second ATM interworking multiplexer for receiving the third signal, and in response, converting the ATM cells from the virtual connection into

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user information suitable for the second access connection and converting user information from the second access connection into ATM cells that identify the virtual connection.

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56. The system of claim ~~55~~ wherein the first signal is a Signaling System #7 (SS7) initial address message (IAM).

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57. The system of claim ~~55~~ wherein the first access connection is a DS0 connection.

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58. The system of claim ~~55~~ wherein the user information is voice information.

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59. The system of claim ~~55~~ wherein the virtual connection is selected based on the dialed number.

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60. The system of claim ~~55~~ wherein the virtual connection is selected based on N00 call processing.

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61. The system of claim ~~55~~ wherein the virtual connection is selected based on virtual private network (VPN) call processing.

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62. The system of claim ~~55~~ wherein the virtual connection is selected based on personal/terminal mobility service call processing.

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