



## ***3600 MainStreet Family*** Bandwidth Managers

The 3600 MainStreet® family of bandwidth managers provides a flexible and scalable service delivery platform for the provision of a wide range of advanced business services. With its extensive range of interfaces and resource applications, the 3600 MainStreet family is designed to meet the communication requirements of corporate enterprise networks and public telephone operators throughout the world.

A suite of protection capabilities especially targeted at the needs of service providers ensures that MainStreet nodes provide high levels of availability, reliability and accessibility. Newbridge advanced voice compression capability offers users significant cost savings through reduced bandwidth requirements.

Combined with our diverse line of DTUs, MainStreet feeder multiplexers and channel banks, the 3600 MainStreet family of bandwidth managers is a central part of any complete, fully managed, end-to-end solution for your network.

# 3600 MainStreet Family

## BANDWIDTH MANAGERS

### Applications

The 3600 MainStreet family accommodates your network's evolution (growth and changes in requirements) while protecting your investment. MainStreet large multiplexers reduce spare inventory and craft training by sharing common components and providing common user interfaces.

Upgrading an existing 3600 MainStreet-based network to frame relay and/or X.25 is as simple and economical as adding a single card. This is also true for applications such as LAN internetworking, Internet access and SNA.

### 3600 MainStreet Bandwidth Manager

This versatile performer is the most successful digital overlay platform ever built, with over 70,000 nodes installed worldwide. It can be used as:

- a medium capacity private or hybrid networking hub for circuit-switched voice and data, and packet-switched LAN and frame relay applications
- an intelligent channel bank providing carrier special services
- an international gateway node providing T1, E1 and ISDN interfaces with signaling, companding, and super-rate conversion, line and circuit grooming and voice compression

### 3645 MainStreet High Capacity Bandwidth Manager

Offering superior granularity in a high capacity switch (3/0 DACS), it also supports all 3600 MainStreet applications and can be used as:

- a high capacity hub, concentrating circuit-switched voice and data, and packet-switched LAN and frame relay traffic
- an integrated solution for common carriers, replacing DCSs, M13 multiplexers, patch panels, and international conversion units to provide any combination of up to 256 T1/E1, 8 DS3, or 16 E3 interfaces in a single standards-based system

### 3600+ MainStreet Bandwidth Manager

An enhanced version of the industry-leading 3600 MainStreet, the 3600+ MainStreet product's expanded bandwidth capabilities

(up to SONET/SDH OC3/STM-1 level) allow support for a new set of interfaces and a broader range of services. Offering more capacity in the backplane, this is a multi-service delivery vehicle for use in established and emerging carrier, large corporate network and end user applications. Some typical applications include:

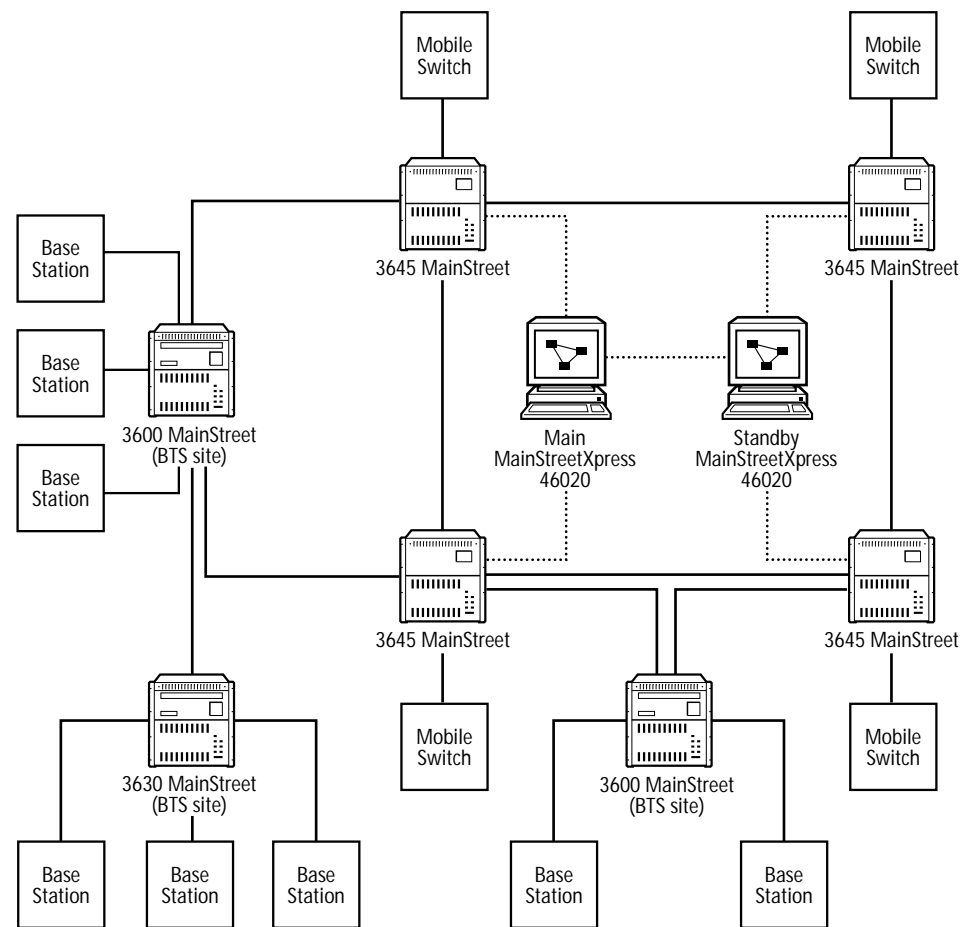
- carrier special overlay networks
- corporate or utility integrated access or transport
- carrier integrated access

### 36120 MainStreet Packet Transfer Exchange

Fully configured for frame relay service delivery, this switch delivers aggregate switching performance up to 100,000 frames per second. It can also be configured as a

multiservice switch combining frame relay and X.25 services, with all the integrated voice, data, LAN and special application features of the 3600 and 3645 MainStreet products. It can be used as:

- a scalable, high capacity networking hub for high traffic concentration of packet switched frame relay and/or X.25 traffic
- an international gateway node providing bulk frame relay and/or X.25 switching service over DS3/E3/T1/E1 interfaces with signaling, companding, and super-rate conversion
- a combination of integrated voice and data multiplexer, intelligent channel bank, and digital cross-connect switch providing integrated packet switched frame relay and X.25, and circuit switched voice and data for carrier special services



*A wireless application shows the advantage of using the 3600 MainStreet family for its ability to consolidate devices and traffic, as well as providing managed bandwidth across the network.*

### 3664 MainStreet Fractional Multiplexer

The most economical version of the family, this node can be used as:

- a medium capacity private or hybrid networking multiplexer
- an n\* 56/64 kbit/s node
- an integrated feeder node providing fractional T1, E1 and ISDN interfaces with signaling, companding, and super-rate conversion, and line and circuit grooming

### Architecture

The 3600 MainStreet family is built around a range of components that are common to all large multiplexer systems. Universal Card Slot (UCS) cards provide interface and resource features for all members of the family. Shelves contain either 8 or 16 UCS cards as well as common control circuitry and power supplies. This reduces excess inventory and simplifies craft training across the whole MainStreet line. All MainStreet components are field-upgradable to provide a designed-in migration path as networking applications evolve.

The standards-based, modular architecture of the 3600 MainStreet consists of one or two 19- or 23-inch (483 mm or 584 mm) shelves, each with 8 UCS slots, supporting up to 32 T1 or E1 interfaces and a 64 Mbit/s, full duplex, non-blocking DS0 switching matrix.

The 3664 MainStreet Fractional Access Multiplexer consists of a single 3600 MainStreet shelf supporting a full range of voice, data, and resource cards.

The 3600+ MainStreet Bandwidth Manager consists of a single shelf supporting up to 16 UCS cards or higher bandwidth UCS+ cards, as well as 3 redundant High Speed Aggregate cards.

The 3645 MainStreet High Capacity Bandwidth Manager builds on this modular architecture by connecting up to eight 3600 MainStreet peripheral shelves and High Speed Peripheral Shelves (HSPS) to one switching shelf.

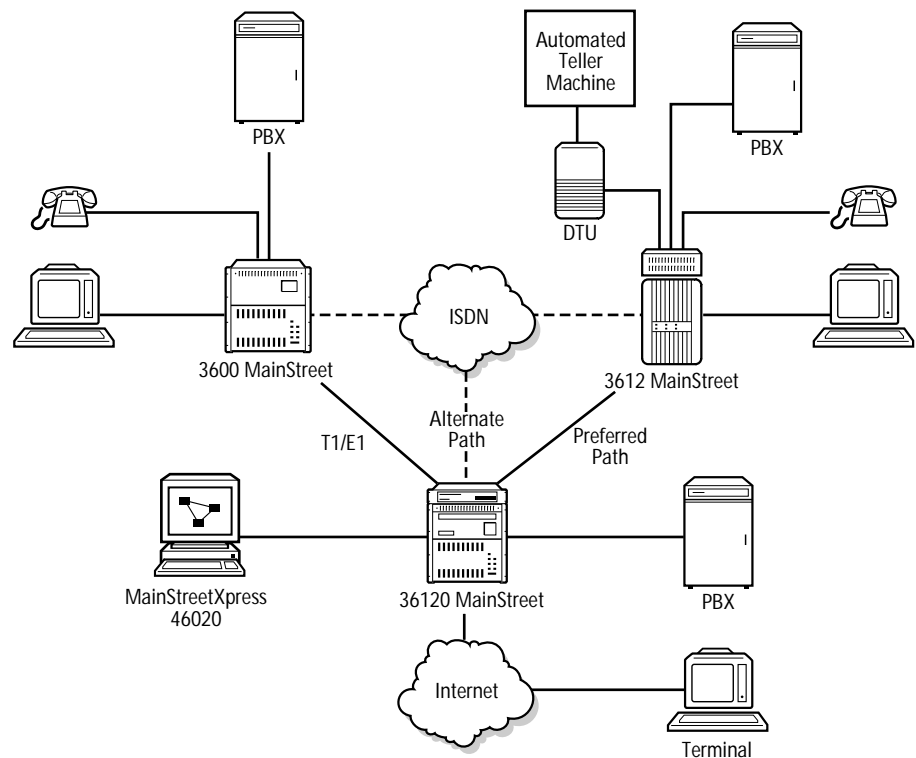
The switching shelf is the hub of the 3645 MainStreet; it provides central alarm monitoring, system wide control, and a non-blocking DS0 switching matrix for all peripheral shelves, as well as HSPSs for both one-way (unidirectional and broadcast) and two-way connections. DS3 and Dual E3 cards provide copper trunk access and single E3 cards provide copper or fiber trunk access.

The 36120 MainStreet Packet Transfer Exchange™ is built on the proven, standards-based, modular architecture of the 3600 MainStreet Bandwidth Manager. PTE cards are interconnected by both the 100 Mbit/s packet switched FASTbus™ and by the 64 Mbit/s circuit switched shelf

backplane bus. Any of the packet-switched cards (FRS, FRE, PTE) can also be utilized in any 3600 MainStreet family product to provide packet switching capability.

The Control Card (3600/64/120/+ MainStreet systems) or Switching Cards (3645 MainStreet systems) are optimized to manage DS0, primary rate and data cross-connections that identify frame streams — the shared bandwidth on which Permanent Virtual Circuits (PVCs) are configured.

PTE cards are optimized to switch a PVC segment on one frame stream with a PVC segment on another. The FASTbus provides high speed, fault tolerant, shelf-to-shelf packet switching.



#### Corporate Service Network (Financial)

In this example, a financial institution aggregates its voice and data traffic from its branch offices (3612 MainStreet Narrowband Multiplexer) and regional centers (3600 MainStreet Bandwidth Manager) using the 36120 MainStreet Packet Transfer Exchange as a central frame relay switch which also handles circuit switched traffic between the regional offices and headquarters. The MainStreetXpress 46020 Network Manager provides centrally located network management. The dial-up ISDN feature ensures backup in case of line failure for critical network reliability. By combining network consolidation products with frame relay technology, the company has created a distributed system, improved overall reliability and lowered its telecommunications costs.

# 3600 MainStreet Family

## BANDWIDTH MANAGERS

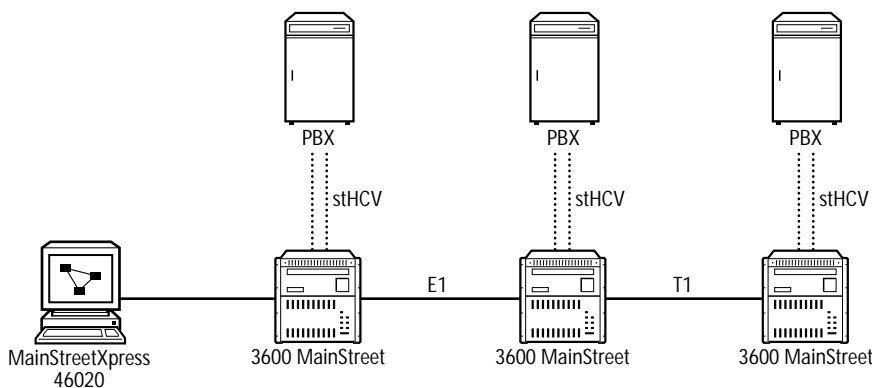
### Network Management

The MainStreetXpress 46020 Network Manager allows operators to control transmission network equipment using point-and-click path and parameter configuration. Operators can remotely configure nodes, monitor real-time operations, set up and manage path routes, perform diagnostics, and isolate and manage network problems. The center-weighted approach to network management reduces internode control overhead on the network by storing system parameters in a non-volatile configuration database.

When used in a network managed by a MainStreetXpress 46020 Network Manager, the 3600 MainStreet family of bandwidth managers allows advanced partitioning capabilities to the time slot level so as to manage congestion, maintain cross-customer security and provision virtual private network services.

### Flexible Switching

DS0 cross-connect switching is done by the common control circuitry, optimized to provide low transit delays. DSP card-based subrate multiplexing and switching applications supported include: DDS DSOA/DSOB, I.460 X.50, HCM (High Capacity Multiplexing) and  $n * 8$  kbit/s channels. For HCM, the switching resolution is 800 bit/s. Packet switching cards can be installed to support high speed switching of multiple frame relay or X.25 channels.



*An international corporate voice network managed by the MainStreetXpress 46020 Network Manager. The 3600 MainStreet product offers T1/E1 conversion and stHCV voice compression, a compression technology that eliminates decompression and recompression at each forwarding node in the network, thus improving final voice quality.*

The 36120 MainStreet provides up to 512 Mbit/s switching capacity, over any combination of up to 256 T1/E1, 8 DS3, or 16 E3 interfaces, carrying up to 3,698 frame streams and a total of 126,976 PVCs. This permits hybrid packet and circuit switched services on the same primary rate link.

The 3600+ MainStreet Bandwidth Manager builds on the architecture of the successful 3600 MainStreet product by providing wideband/broadband, SONET/SDH switching functionality (VC/VT) in addition to increased narrowband switching capability. The 3600+ MainStreet architecture allows for the development of higher bandwidth cards, such as unchannelized T3/E3, and octal T1/E1 to support increasing bandwidth needs and efficiency requirements.

### 36120 MainStreet Congestion and Link Management

The 36120 MainStreet supports:

- threshold alarm levels for mild, severe, and absolute congestion of frame streams, PVCs, frame switches, and the FASTbus interface
- Forward and Backward Explicit Congestion Notification (FECN and BECN) bits
- the Discard Eligibility (DE) bit
- the user, network, and bi-directional modes of the LMI, ANSI T1.167 Annex D, and CCITT Q.933 Annex A link management protocols



*An enhanced version of the 3600 MainStreet Bandwidth Manager, the 3600+ MainStreet Bandwidth Manager features greater capacity in the backplane to support wideband/broadband SONET/SDH functionality.*

Class of service parameters are fully configurable on a per PVC basis, including Committed Information Rate (CIR), Committed Burst Size (Bc), and Excess Burst Size (Be).

### Protection Switching

All voice, data, aggregate and subrate aggregates can be preconfigured with a RAPID (Reserved Alternate Path with Immediate Diversion) alternate path to provide fast rerouting of critical information channels. All primary rate interfaces can be configured for card redundancy. DS3 and E3 cards also provide access (link) redundancy. The FASTbus is based on a dual, counter-rotating ring topology that automatically bypasses PTE card or cable failures to maintain system operation.

The 3600+ MainStreet network protection is provided by UPSR (Unidirectional Path Switched Ring) and 1+1 link redundancy for SONET/SDH applications and RAPID for network-wide protection of 64 kbit/s services.

### Voice Interfaces

Analog voice channel access is provided through E&M, LGS cards (Loop and Ground Start Subscriber), LGE cards (Loop and Ground Start Exchange), and E&M, LGS, LGE, and MRD (Manual Ring Down) Channel Units. Both internal and external ringing generators are supported for LGS and MRD interfaces. Digital voice access is provided through T1, E1 or V.35/X.21 PRI aggregate cards. Optional resource cards and modules provide a wide range of voice compression capabilities, including ADPCM, 8 and 16 kbit/s HCV, LD-CELP and A-CELP. Newbridge patented stHCV functionality allows transport of compressed voice through tandem switches without any compression/decompression degradation.

### Data Interfaces

Data devices can be connected directly through V.24/RS232, V.32, V.35, X.21/V.11, RS422 (RS530A, V.36/RS449, X.21, or V.35), OCU-DP, 4WT0 or 64 kbit/s codirectional interfaces. Remote data devices can be connected through the 2B+D format, V.24/RS232, V.35, and X.21/V.11 interfaces of the 26XX or 27XX MainStreet DTUs (Data Termination Units).

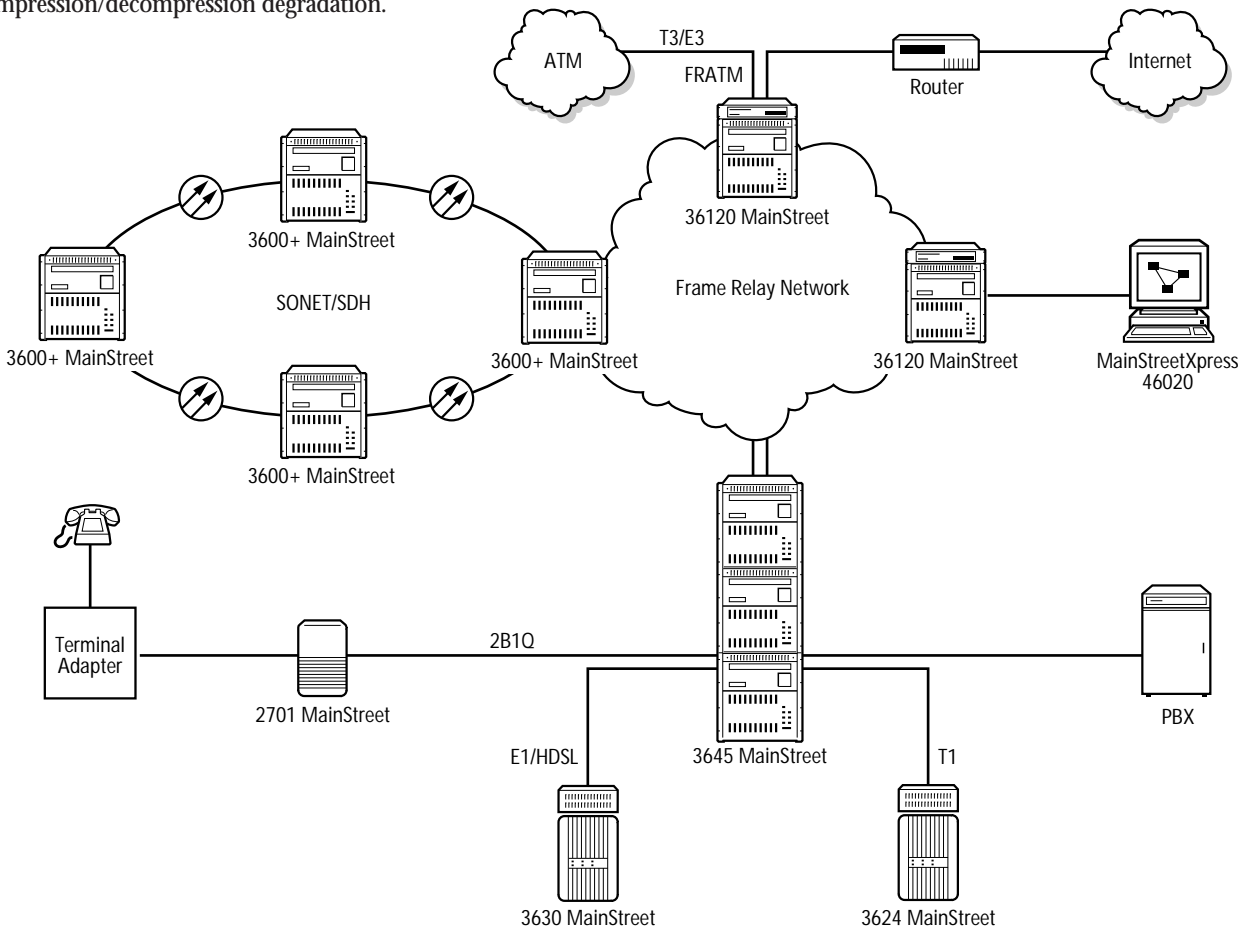
### Aggregate Interfaces

Aggregate access can be through channelized, fractional or full T1 or E1 interfaces, T3 or E3 (3645 MainStreet only),

STM-1 and OC3 (3600+ MainStreet only), n\* 64 kbit/s, V.35 or X.21 PRI, or 56 kbit/s, V.35 or X.21 PRI aggregates.

### Resource Cards

Resource cards available for the 3600 MainStreet family include Digital Signal Processing (DSP), Data Communications Processor (DCP), Call Processor Card (CPC), as well as the Frame Relay Switch (FRS), Frame Relay Engine (FRE) and Packet Engine (PE) for frame relay and X.25 applications.



### Multiservice Network

The Newbridge MainStreet family offers a wide array of voice and data capabilities (circuit and packet) that allow the elegant introduction of multiple services on a single network. In this example, a local exchange carrier uses the 3645 MainStreet as a subscriber traffic concentrator interconnected to a 36120 MainStreet frame relay network, as well as a metropolitan area services network based on a 3600+ MainStreet self-healing fiber ring. ATM backbone services are accessed through the 36120 MainStreet FRATM. The MainStreetXpress 46020 Network Manager controls traffic across all flavors of the network.

# 3600 MainStreet Family

## BANDWIDTH MANAGERS

### Technical Summary

#### Voice Interfaces

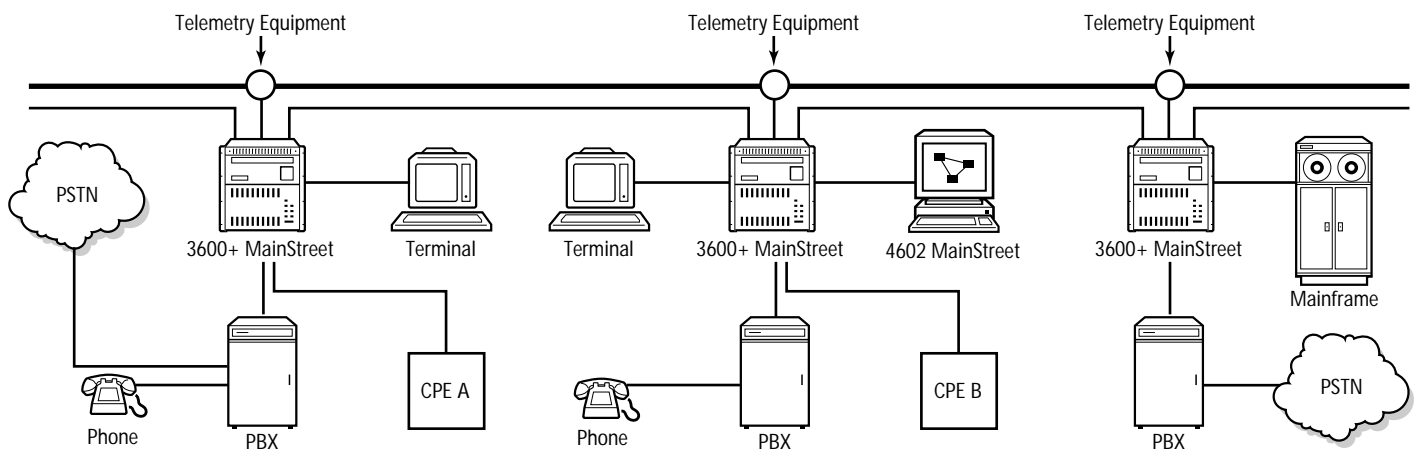
	3600	3645	3664	36120	3600+
E&M (Type I,II,III,V)	●	●	●	●	●
LS/GS Subscriber (LGS)	●	●	●	●	●
LS/GS Exchange (LGE)	●	●	●	●	●
T1 D4 and ESF formats	●	●	●	●	●
E1 CAS and CCS, R2D (E&M)	●	●	●	●	●
E&M, LGS, LGE, and MRD Channel Units	●	●	●	●	●

#### Data Interfaces

V.24 / V.28 / RS232-C	●	●	●	●	●
RS422 (4 full duplex interfaces independently configurable as RS 530A, V.36 / RS449, X.21 or V.35)	●	●	●	●	●
V.35	●	●	●	●	●
X.21 / V.11	●	●	●	●	●
OCU-DP AND 4WTO Channel Units	●	●	●	●	●
64K codirectional (G.703 with AIS detection)	●	●	●	●	●
2B1Q Line Card (interfaced with 2700 DTUs)	●	●	●	●	●
DNIC Line Card (interfaced with 2600 DTUs)	●	●	●	●	●

#### Aggregate Interfaces

44.736 Mbit/s DS3		●			
34 Mbit/s E3		●			
1.544 Mbit/s T1 (D4, ESF, 64 kbit/s chan.)	●	●	●	●	●
2.048 Mbit/s E1 (CAS, CCS, 64 kbit/s chan.)	●	●	●	●	●
56 kbit/s or n*64 kbit/s V.35 PRI	●	●	●	●	●
56 kbit/s or n*64 kbit/s X.21 PRI	●	●	●	●	●
ISDN PRI	●	●	●	●	●
T1/E1 HDSL	●	●	●	●	●
Fractional T1 Module	●	●	●	●	●
ISDN S/T BRI Card	●	●	●	●	●
ISDN U BRI Card	●	●	●	●	●
Optical Extension E1	●	●	●	●	●
Optical Extension E3	●	●	●	●	●
TTC-2M Card	●	●	●	●	●
OC3 Card					●
STM-1 Card					●



This application shows a network that might be constructed by a national utility taking advantage of its existing right-of-ways. The 3600+ MainStreet product provides access to a fiber-based transmission infrastructure using SONET/SDH, while providing fine enough granularity to handle  $n * 8$  kbit/s voice channels using stHCV voice compression.

## Resource (Application) Cards

	3600	3645	3664	36120	3600+
Data Communication Processor (DCP) Card	●	●	●	●	●
General Facilities Card	●	●	●	●	●
Test Card (metallic test access for carrier card)	●	●	●	●	●

## DSP Applications

	3600	3645	3664	36120	3600+
Voice Compression	●	●	●	●	●
• ADPCM (ITU G.721)					
• 8 and 16 kbit/s HCV compression					
• 8 kbit/s A-CELP (ITU G.729)					
• 16 kbit/s LD-CELP (ITU G.728)					
G3 fax support (V.17) over compressed voice (14.4 kbit/s max.)	●	●	●	●	●
Modem (V.32bis) tones support over compressed (CELP) voice (14.4 kbit/s)	●	●	●	●	●
Subrate multiplexing and switching of compressed voice and data	●	●	●	●	●
Echo cancellation (26ms, G.165)	●	●	●	●	●
Voice conference bridging	●	●	●	●	●
Mu / A-law companding conversion	●	●	●	●	●
Multidrop PCM data bridging	●	●	●	●	●
I.460 (n*8 kbit/s transparent) Multiplexing	●	●	●	●	●
High Capacity Multiplexing (HCM)	●	●	●	●	●
DDS and X.50 rate adaptation	●	●	●	●	●

## Frame Relay / X.25:

	3600	3645	3664	36120	3600+
Frame Relay Switch (FRS) Card	●	●	●	●	●
Frame Relay Engine (FRE) Card	●	●	●	●	●
FRATM	▼	▼		●	▼
X.25 Packet Engine (PE) Card	●	●		●	●

## General

# of universal card slots	16	128	8	128	16
# of E1/T1 ports (Dual E1/T1 cards)	32	256	32	256	32
Shelf Sizes	19–23"	19–23" HSPS1 HSPS2	19–23"	19–23" HSPS1 HSPS2	19"

▼ – With addition of FASTbus

Model/Shelf Type	Width	Depth	Height	Power (all models)
3600/45 PU Class A 19"	483 mm (19 in.)	245 or 259 mm (9.64 or 10.2 in.)	486 mm (19.15 in.)	Maximum power consumption per shelf: 3600/45/64/120 285 W (ac), 260W (dc) 3600+ 550 W (dc)
3600/45 PU Class B 19"	483 mm (19 in.)	235 mm (9.25 in.)	486 mm (19.15 in.)	<b>Power supplies</b>
3600/45 PU 23"	584 mm (23 in.)	305 mm (12 in.)	445 mm (17.5 in.)	Single and dual input load sharing: 48 V dc, -24V dc, 120 V ac (60 Hz), and 240 V ac (50 Hz)
3645 HSPS1	483 mm (19 in.)	235 mm (9.25 in.)	486 mm (19.15 in.)	23-inch shelf and HSPS2 support dual load sharing power supply cards
3645 HSPS2*	483 mm (19 in.)	305 mm (12 in.)	578 mm (22.75 in.)	3600+ provides three load sharing power supplies (1:2 redundancy)
3600+	483 mm (19 in.)	300 mm (11.8 in.)	756 mm (29.75 in.)	<b>Operating Environment (all models)</b>
				0–40°C (32–104°F) 5–95% relative humidity, non-condensing Shelf and card variants for FCC Part 15 (Class A) and EN55 022 (Class B) EMC (Electromagnetic Conformance) specifications

\*(includes integral heat deflector)

**Corporate Headquarters**

Newbridge Networks Corporation  
600 March Road, P.O. Box 13600  
Kanata, Ontario Canada K2K 2E6  
Telephone: +1 613 591 3600  
Facsimile: +1 613 591 3680  
Internet: [www.newbridge.com](http://www.newbridge.com)

**North and South America**

Newbridge Networks Inc.  
593 Herndon Parkway  
Herndon, Virginia U.S.A. 20170-5241  
Telephone: 1 800 343 3600  
              +1 703 834 3600  
Facsimile: +1 703 471 7080

**Europe, Middle East and Africa**

Newbridge Networks Limited  
Coldra Woods, Chepstow Road  
Newport, South Wales NP6 1JB U.K.  
Telephone: +44 (0) 1633 413600  
Facsimile: +44 (0) 1633 413680

**Asia Pacific**

Newbridge Networks  
Suite 5-01/02, 5th Floor  
Menara Keck Seng  
203 Jalan Bukit Bintang  
55100 Kuala Lumpur, Malaysia  
Telephone: +60 3 241 2317  
Facsimile: +60 3 241 2418

Newbridge and logo, and MainStreet are registered trade marks and Packet Transfer Exchange and FASTbus are trade marks of Newbridge Networks Corporation.

MainStreetXpress is a trade mark used exclusively by Newbridge Networks Corporation and Siemens AG under license for their comprehensive solutions in broadband communications. No agency relationship, partnership, or joint ownership of a legal entity is to be inferred or implied by the use of the term alliance.

Information subject to change without notice.  
© 1997 Newbridge Networks Corporation.  
All rights reserved. 7094