

Student Desktop TV

Safe and Secure Video Over IP

Tim Ward, NUIT

Telecommunications and Network Services

NANOG 29 Chicago



What Has Been Deployed?

NUTV Service

(<http://www.northwestern.edu/nutv>)

- 23 channels of entertainment television
 - Combination of off-air and CATV channels
- IP Multicast to all undergraduate dormitories (4350 unique locations)
- MPEG2 encoding, 29.97 FPS, ~2Mbps per stream (128Kbps mono audio)

Internet 2 Multicast Service

(<http://www.i2-multicast.northwestern.edu>)

- 2 channels CSPAN and CSPAN2
- IP Multicast to all of Internet 2
- MPEG2 encoding
 - CSPAN - 2 Mbps
 - CSPAN2 - 4 Mbps

- No client software installed on machine
- Channel guide services – what's on now and later?

Why Deploy This Type of System?

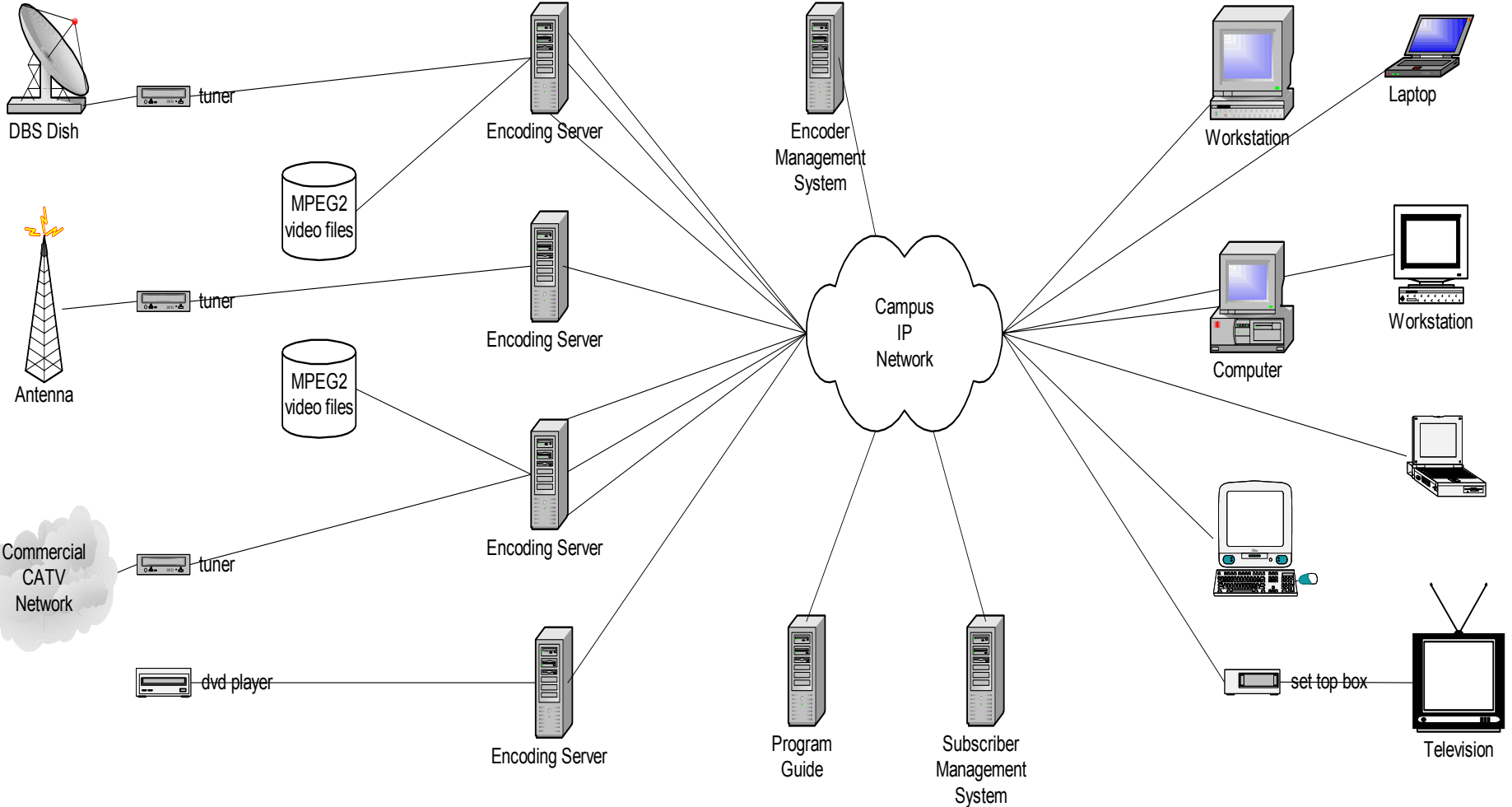
- No CATV in student dormitory rooms
 - Only in common areas/lounges
- Over 60 residence halls
 - Cost to wire with coax very high (\$2-5Million)
 - Estimated time of completion: ~4 years
- CATV major issue for the student population

System Components

Live Sources (un-encoded) Recorded Sources (pre-encoded) Video Encoding & Multicasting Systems

Multicast-Enabled Campus Network

Viewers



System Features

- Live encoding of television
- Additional pre-encoded video
- Small footprint viewer software
- Viewer downloaded as part of stream
- Viewer available for multiple operating systems
- <http://www.videofurnace.com>
- Program guide for content labeling

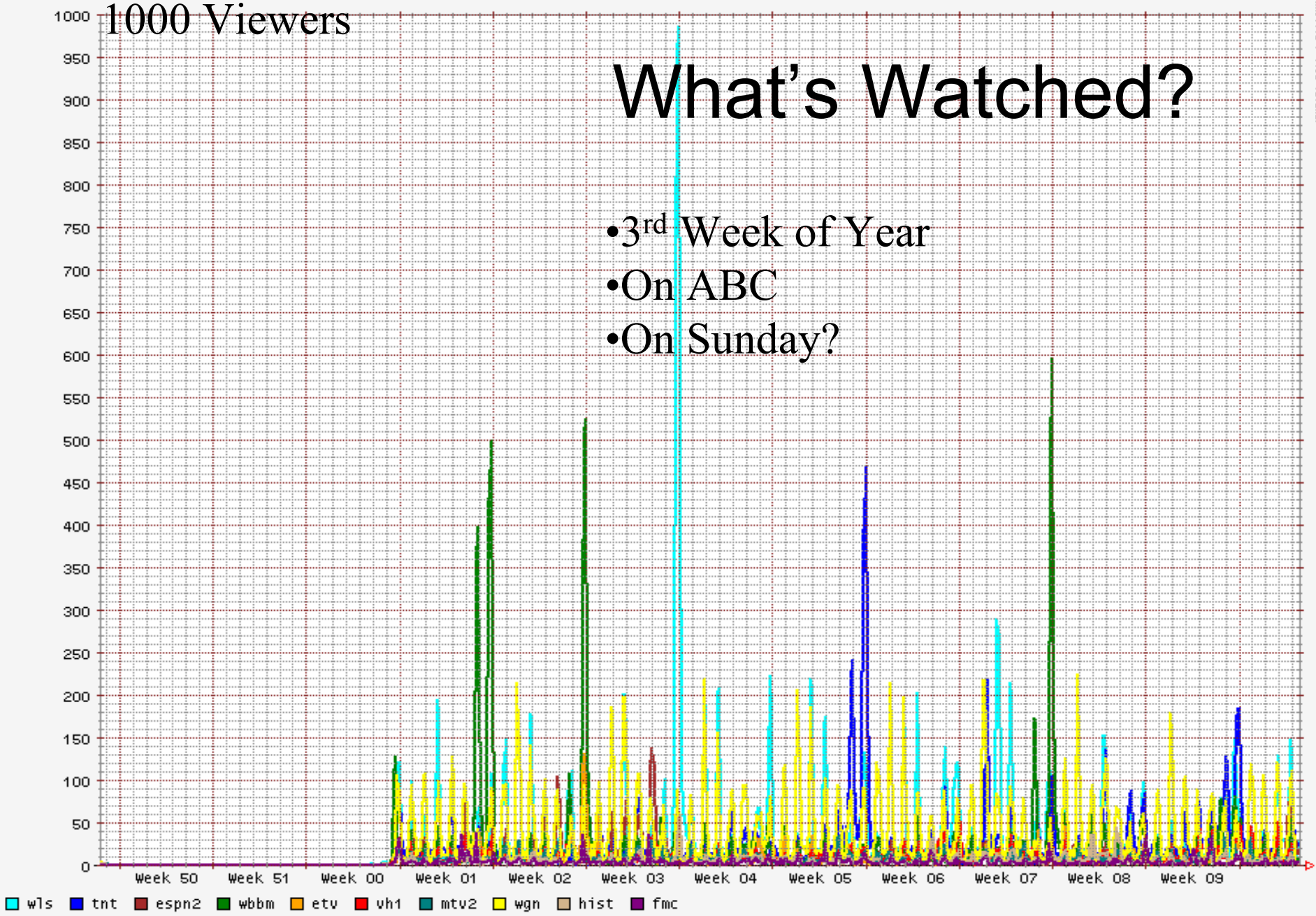
Operational Experiences

- Running since Fall of 2002
- Test phase problem
 - RP for multicast tree not distributed correctly
- Two deployment problems
 - IGMP snooping and CGMP fast leave
 - Switch table flush occurs prior to router flush, causing a flood condition on all switch ports
 - IP multicast TTL Threshold
 - Command causes all multicast packets to be route processed

1000 Viewers

What's Watched?

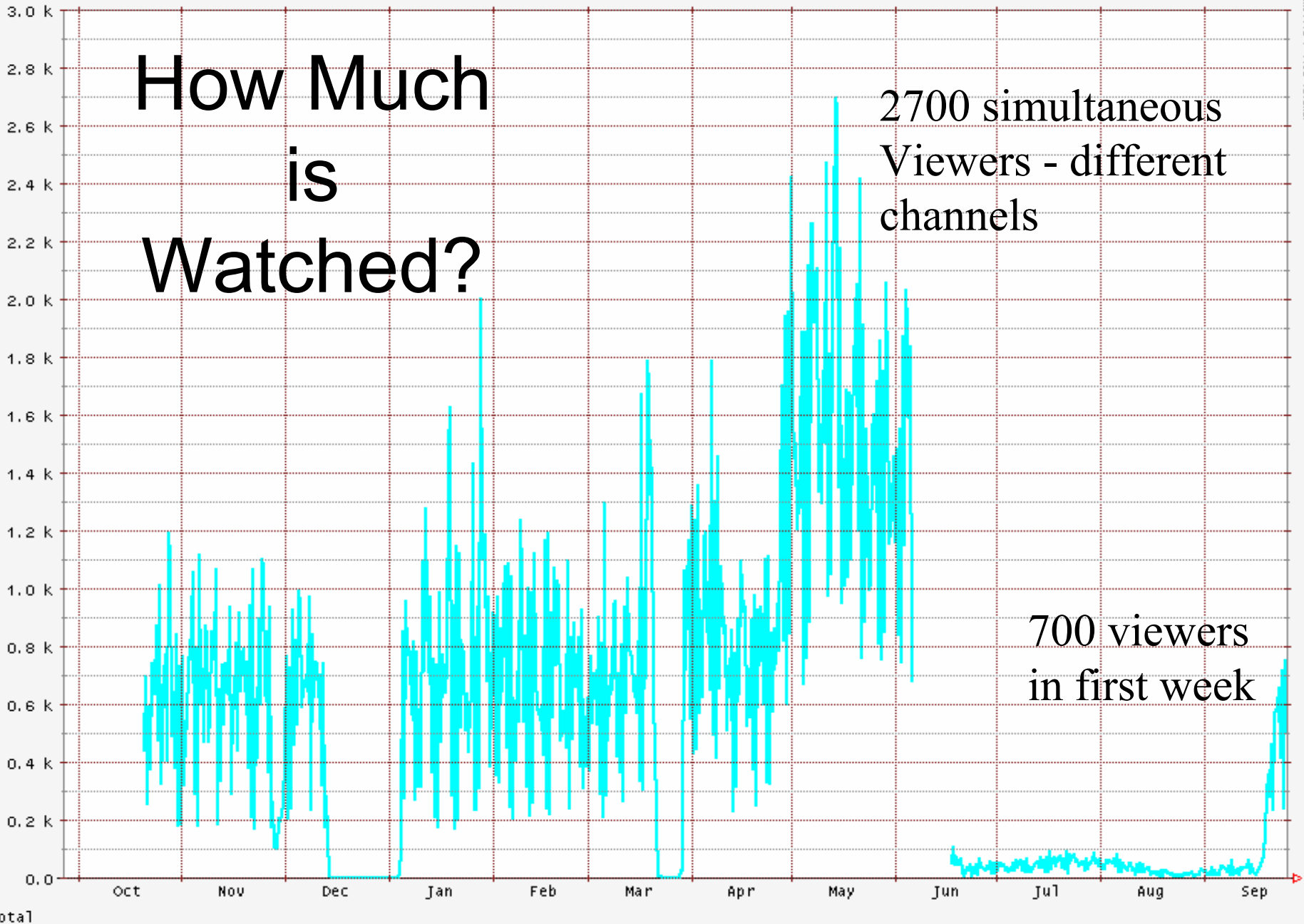
- 3rd Week of Year
- On ABC
- On Sunday?



How Much is Watched?

2700 simultaneous
Viewers - different
channels

700 viewers
in first week



Keeping it Secure

- Access Control
 - Unicast – network allowed to get client?
 - Multicast – is the stream available on the network?
- Client to Server - License Transaction
 - Can I get a client?
 - Encrypted transaction
- Encrypted Streams
 - Can I watch this stream?
 - Key exchange for stream being watched
 - 128-bit key with a 64-bit block cipher

Keeping it Legal

- Content licenses
 - Local cable provider treats us as a multi-dwelling unit
 - Limited right to re-transmit from the content owners themselves
- MPEG2 licenses
 - Well provision for student TV
 - Over provision for Internet 2-based distribution
- What's missing from the player?

Links

- <http://www.northwestern.edu/nutv>
 - Campus Multicast of 23 channels
- <http://www.i2-multicast.northwestern.edu>
 - Internet 2 Multicast of CSPAN and CSPAN2
- tpw@northwestern.edu

marmot(/u/tward)

File Edit View Window Help

Quick Connect Profiles


Mutt 1.4i: ~/Mailbox (threads) [2415/2415] [N=33,*=0.post=0.new=10]

2347 N
2348 N
2349
2350
2351 T
2352 r
2353
2354 T
2355 +
2356 r C
2357
2358 C
2359 +
2360
2361 T
2362 +
2363 +
2364 +
2365 +
2366
2367 C
2368
2369
g:Quit d
New mail
Connected to

NUTV - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://www.tss.northwestern.edu/nutv/helpguide/index.html



What's happening at NUTV?

September 26, 2003

All NUTV channels are operating normally.

Upcoming NUTV Scheduled Maintenance

Watch NUTV now!

Feedback

NUTV home

NU TV VIDEO FURNACE

Receiving Northwestern University Channel 1

PLAN-IT PURPLE

NUCH

Here's what's happening @ NU:

Tuesday Night Fellowship
Coon Auditorium
9:00 PM - 10:15 PM, September 30, 2003

WildKatz klezmer ensemble's first rehearsal/info session
629 Foster (basement)
7:30 PM - 8:30 PM, October 1, 2003

about upcoming events,
northwestern.edu.


NU TV VIDEO FURNACE

Now Showing Channel Program Guide Sep 26, 2003 11:20 AM

NUCH1	Northwestern University Ch...	06:00 AM	Washington Journal
ARTS	A & E Network	09:00 AM	U.S. House of Representatives
CNN	Cable News Network	01:00 PM	U.S. House of Representatives
COMEDY	Comedy Central	06:00 PM	Close Up
		07:00 PM	Prime Time Public Affairs
CSPAN2	Cable Satellite Public Affairs...	10:00 PM	Prime Time Public Affairs
DISN	Disney Channel		
DSC	The Discovery Channel	01:00 AM	Public Affairs
ESPN	ESPN	02:00 AM	Public Affairs
ESPN2	ESPN2	05:00 AM	Public Affairs
ETV	E! Entertainment Television	06:00 AM	Washington Journal
MTV	MTV - Music Television	09:00 AM	Washington Journal
TBS	Turner Broadcasting System	12:00 PM	Public Affairs
TNT	Turner Network TV	05:45 PM	President Bush's Weekly Radio Addr...
TOON	Cartoon Network	06:00 PM	America & the Courts
USA	USA Network	07:00 PM	American Perspectives
VH1	VH1 - Video Hits One		
WBBM	CBS Affiliate		
WFLD	Fox Affiliate		
WGN	WB Affiliate		
WLS	ABC Affiliate		
WMAQ	NBC Affiliate		
WPWR	UPN Affiliate		


Sat Sep 27, 2003 05:00 AM

Description:
U.S. House of Representatives
Fri 09/26 09:00 AM - 01:00 PM No Rating



NU TV VIDEO FURNACE

Receiving ESPN



NL Ohka (9-12) vs. Harang (4-2)