NANOG Update

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JANOG 9

January 25, 2002

Special Thanks to . . .

- Ikuo Nakagawa
- Rie Shimada
- Toshio Tachibana
- Takashi Arano
- Kuniaki Kondo
- JANOG9 sponsors !

The North American Network Operators' Group

- Three annual meetings
  - Focus: current issues in Internet operations and engineering
  - Large-scale (national/international) backbone network technologies
  - Purpose: education, ISP cooperation

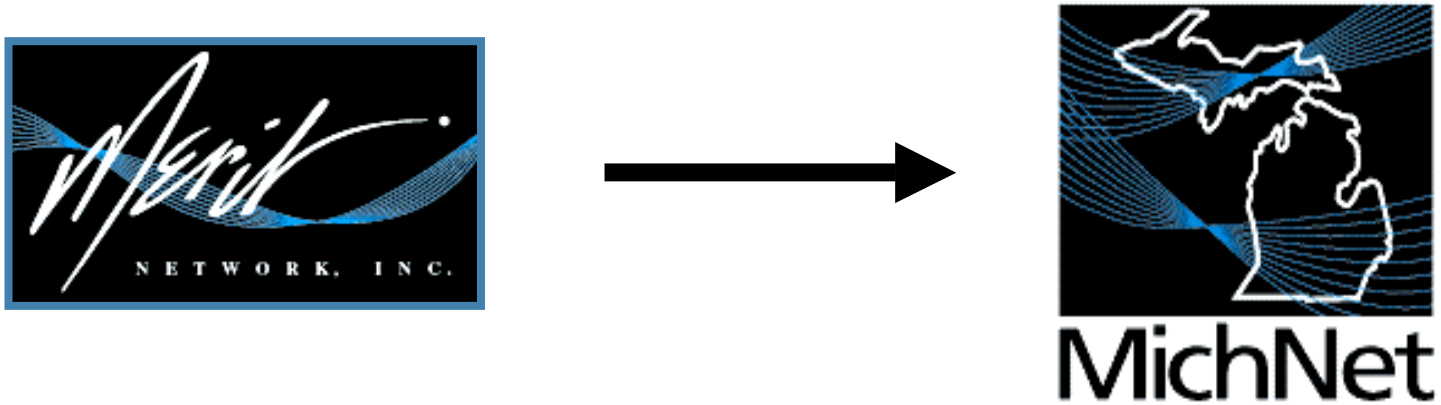
NANOG Focus

- Fairly immediate operational issues
- Technology available now or within six months
- “Anything beyond that is philosophy, wishful thinking or IETF standard-setting material.“ (Michael Dillon on the NANOG list, 1997)

- Non-profit
- Not a formal trade organization
- No formal membership
- nanog@nanog.org e-mail list
  - Lively (!) discussion of U.S. network operations
  - ~ 10,000 subscribers

Coordinated by Merit Network

- Merit is located at the University of Michigan in Ann Arbor
- Non-profit
- Founded in 1966 to link U-M, Michigan State, Wayne State University
- Now governed by all 13 of Michigan's 4-year public universities



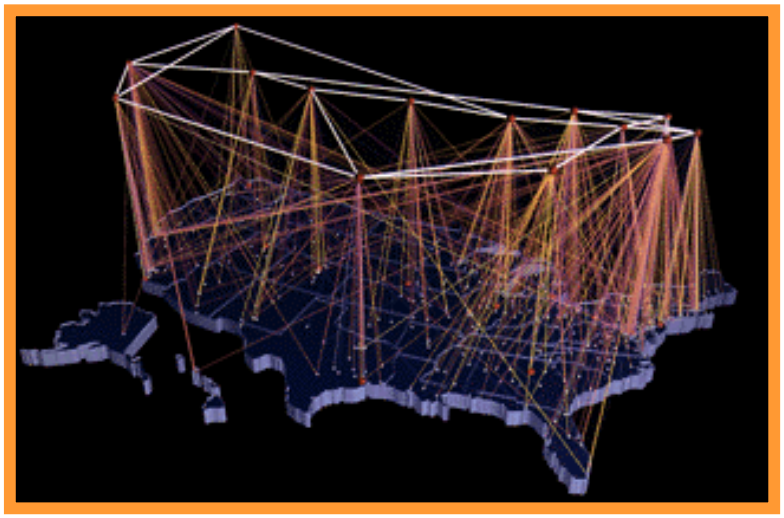
- Merit operates MichNet
- Longest-running regional in the U.S.
- Connects most of Michigan’s universities, colleges, K-12 schools to the Internet
- Connectivity for government, health care, business, industry, many other organizations

Operators + Researchers + Vendors = NANOG Community

- NANOG brings all 3 groups together
- How? Accident of history !

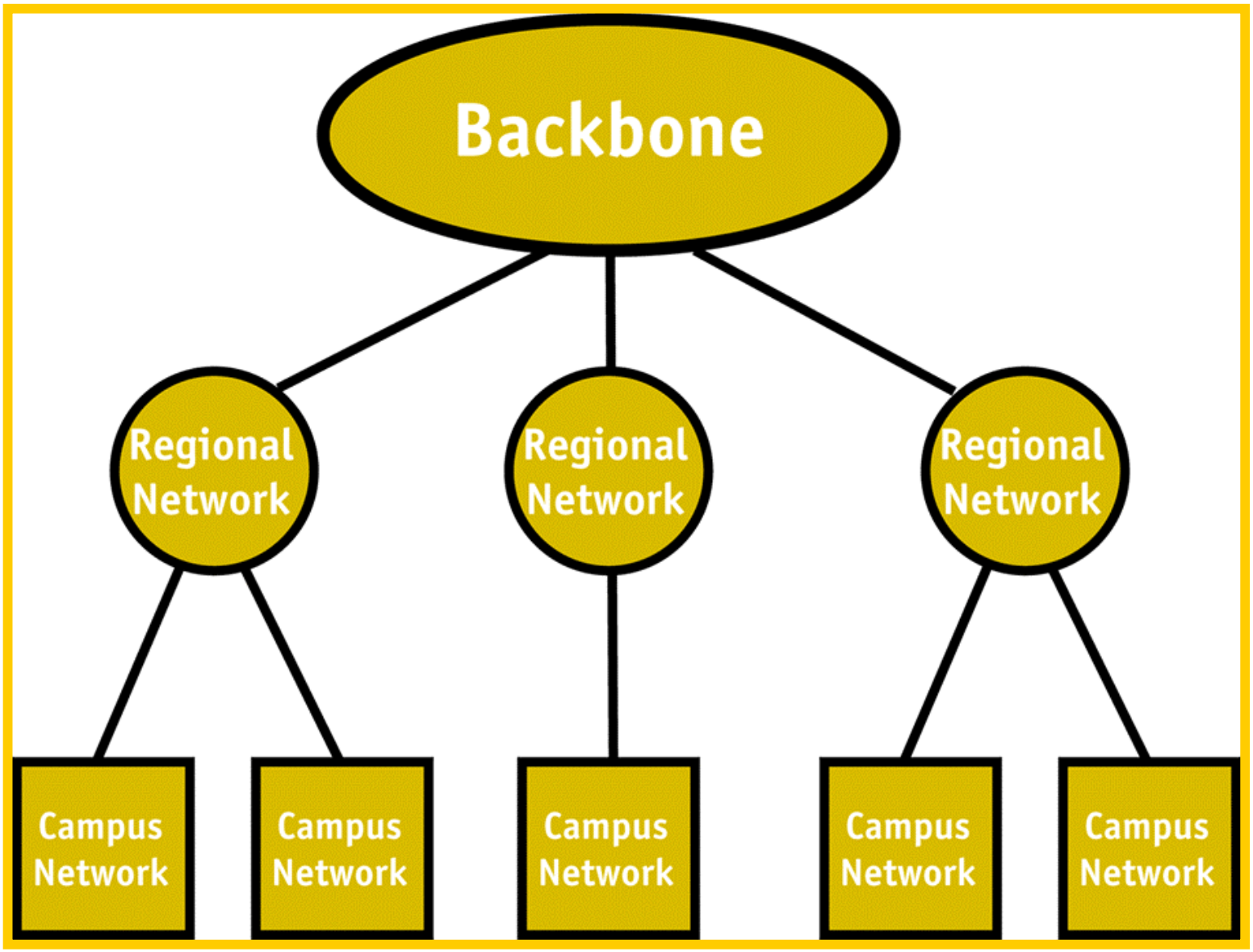
NANOG Launched During NSFNET Era

- Merit led NSFNET backbone project 1987-95
- Partnered with National Science Foundation, IBM, MCI, State of Michigan
- First national, high-speed backbone network



- Government-sponsored so no commercial traffic (R&E only)
- T1 in 1988, T3 in 1992

Three-Tiered NSFNET Architecture



NANOG Originated as Regional-Techs Meeting

- Merit staff met quarterly with 13 NSFNET regional networks
- 1994: Regional-Techs re-charters as NANOG

NSFNET Regional Nets

BARRNet	SDSC
JVNCnet	SESQUINET
Merit	SURAnet
MIDnet	Westnet
NCAR/ USAN	PSC
NCSA	NWNet
NYSERNet	

From NSFNET to the Commercial Internet

- NSF's goal: a new NSFNET architecture by mid '90's
- NSFNET backbone to be replaced with many commercial backbones
- Linked at Network Access Points (NAPs)

Internet Commercialization (cont'd.)

- More commercial ISPs appear in early 90's
- Regional-Techs meetings grow, include broader base of vendors, operators, R & E
- Group re-charters as NANOG in 1994 to reflect broader role

Internet Commercialization (cont'd.)

- 1994 - 1995: NSFNET regionals prepare to connect to commercial backbones
- NSFNET decommissioned in 1995
- MCI and Sprint absorb NSFNET regionals

NANOG Funding

- Funded by NSF through 1997
- Now funded by registration fees, host/supporting organizations, vendor contributions

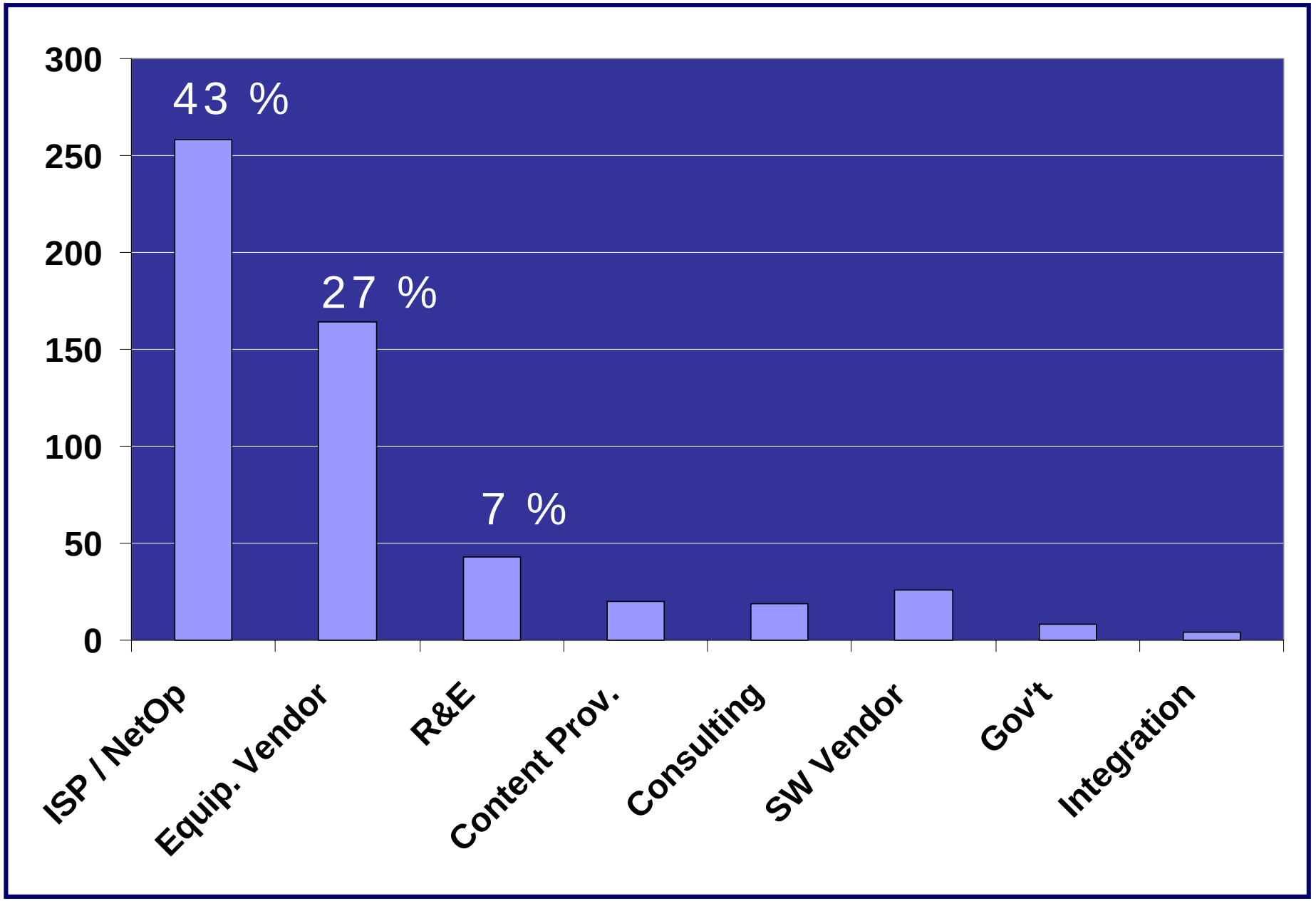
Everything You Always Wanted to Know About NANOG Meetings

(But Were Afraid to Ask :)

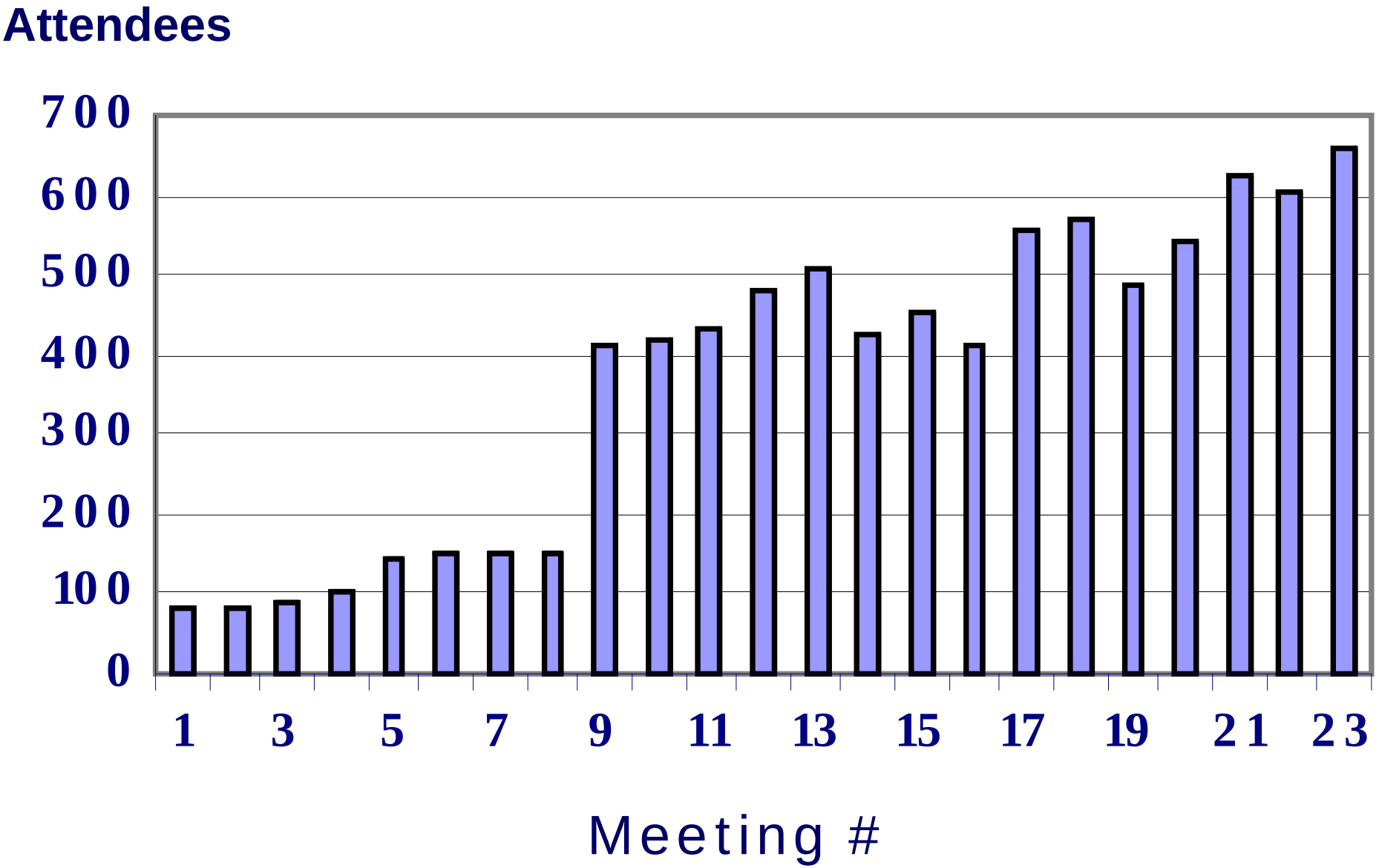
What is the Audience Like?

- Outspoken :)
- Examples:
  - “That was the worst talk I’ve ever heard!”
  - “Are You Calling Me a Liar?”
- Email list is also rather lively

Attendee Occupations 10/01



Meeting Attendance



Attendance in October 2001

- Meeting held about one month after September 11
- Many cancellations
- Oakland, California
- 660 attendees

Countries Represented Oct. 2001

- Japan 13 attendees (unusually low!)
- UK 7
- Israel 6
- Brazil 5
- Australia 4
- France 3
- Korea 3
- Netherlands 3
- China 2
- S. Africa 2

- Hong Kong
- Belgium
- Denmark
- Germany
- Grenada
- Nigeria
- Singapore
- Sweden
- Venezuela

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Remote Attendees

Multicast

- Produced by University of Oregon, Cisco, Sprint
- H.261, MPEG-1, MPEG-2
- ~ 20 - 30 concurrent viewers
- ~ 50 - 100 unique viewers

RealMedia

- Up to 146 concurrent viewers in October

Network Connectivity

Multicast

- Native link often a struggle!
- Goal: leave behind multicast infrastructure for local area
- Often linked via Internet2 GigaPoPs

IPv6

- 6Bone connectivity via tunnel back to Merit in Michigan, to host's network, or to a GigaPoP

Network Connectivity (cont'd.)

Squid cache

- Provided by Duane Wessels, Packet Pushers
- We encourage use of Squid!
  - On average, almost twice as fast to load from cache
- ~ 1 in 6 attendees use the cache
- 43% hit rate at last meeting
- Statistics from past meetings:

  www.packet-pushers.com/NANOG/

Meeting Schedule

	Morning	Afternoon	Evening
Sun.		Tutorials	Tutorials or Host Party
Mon.	General Session	General Session	Beer ‘n Gear, BOFs
Tues.	General Session	End mid-afternoon	

Vendor Support

- Beer ‘n Gear
  - Attendees get free beer
  - Only event when vendors can show equipment
  - Limited to eight companies
  - Tabletop displays only
- Sponsor breakfasts, breaks, receptions
- Provide connectivity, equipment

Previous Local Hosts

- Terremark (2/02)
- Cisco
- CenterGate
- Riverstone
- AOL
- iHighway (2 meetings)
- Exodus
- Nortel
- Univ. of Oregon
- Quest
- NetRail
- Genuity
- IBM Global Services
- PacBell
- CIX
- UCSD
- Pittsburgh Supercomputing Center
- NCAR
- Merit (4, beginning in ‘94)

Presentations

- Many talks generated by Call for Presentations
- Other talks solicited by Program Committee
- Role of Program Committee differs from JANOG:
  - Members not responsible for particular topic area
  - Main task: review proposals and slides

Presentations

- Submission/review process has gotten more formal over time
  - Advance slides often required
- Agenda is fluid to stay timely

Sample February Topics

"DNS Damage - Measurements at a Root Server"

- Evi Nemeth, CAIDA
- Measurements on F root server at PAIX, Palo Alto, California
- Malformed A queries were 14% of the load
  - These ask for IP address of an IP address, rather than for a hostname

DNS Damage (cont'd.)

- 20% of queries asked for non-existent TLDs (Includes lots of internal Microsoft names)
  - (Includes 14% A queries above)
- Private address space sneaks out as source addresses and query targets
- Denial of service attacks often use the DNS as reflectors
- Conclusion: Performance of the root servers amazing given the bogus query load

More February Topics

New Developments in Peering for Tier-2 and Content Providers

- Jeb Linton, EarthLink
- Two major changes in peering industry:
  - Seven Tier-1 providers plan to use common colocation space for "Next-Generation" peering at OC-48 and higher speeds.
  - What's the impact?

Peering (cont'd.)

- Prices for transit services have gone down.
- In general, traditional peering methods, such as legacy NAPs and private line peering, are no longer less expensive than transit.
- So, peering providers need to lower prices.

Panel: NAP IXP Updates

- Mike Hughes, LINX, moderator
- Includes NYIIX/LAIIX/6IIX update by Akio Sugeno

More February Topics

Analysis of IS-IS Routing Protocol Behavior

- Cengiz Alaettinoglu & Steve Casner, Packet Design
- Analysis of IS-IS packet traces collected on several major ISP backbones
- Where convergence problems lie & how to fix them
- Recipe for achieving sub-second IGP convergence

February Topics

Problematic inter-domain routing issues

- Olaf Maennel and Anja Feldmann, Saarland University, Saarbruecken, Germany
- New public domain tool, “character,” for BGP analysis
- Also use MRT tools
- Sample finding: even with flap dampening, nearly half of all updates are still flapping prefixes
- www.net.uni-sb.de/~olafm/

Even More February Topics

Use of Native Multicast on GIANT, New European Network

- Agnes Pouele, DANTE & Jan Novak, Cisco
- GIANT = 10 Gbit/s pan-European network
- Will carry native multicast traffic for 28 countries in Europe by February 2002

February Topics

Global Crossing's operational experience with MPLS

- Dave Siegel, Global Crossing
- Solved issues with integrating purchased networks (1999)
- Use of MPLS for IPv6 and VPNs

All these abstracts are on the web:

www.nanog.org/mtg-0202/

Slides will be available during/after the meeting

Future Presentations

Intelligent route control technology

- Products that tweak BGP to select optimal path
- RouteScience, netVmg, Sockeye, Opnix, Proficient are among companies developing specialized boxes
- Specific focus: provide optimized egress routes to multihomed enterprises
- Vendors not yet ready to discuss in February

Future Presentations (cont'd.)

Status of four-byte AS number implementations

- When are we going to run out of AS numbers?
- Registry plans for dealing with the problem
- Operational experience with vendor implementations
- Hopefully next meeting (May/June)

More Future Presentations

Native multicast peering at exchange points

- Panel discussion of deployment problems, pros and cons
- Hopefully next meeting

NANOG 24 / ARIN X

First back-to-back meetings, fall 2002

- Goal: provide additional operator input to ARIN
- Both organizations will offer Sunday tutorials
- NANOG will meet Sunday - Tuesday as usual
- ARIN Wednesday - Friday
- ARIN IP analysts available at help desk throughout

Questions and Comments

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www.nanog.org