



# NSF NGI Research Report to the PITAC, October 6, 1999

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# Introduction

- Broad announcements for research
  - ◆ Fund the best proposals
  - ◆ Special initiative in 98, part of program in 99
  - ◆ Consider the example of QoS in 98
- Three areas of research
  - ◆ Network growth engineering
  - ◆ Quality of Service
  - ◆ Security



# Outline

- Numbers
- Examples of research from both years
- Interagency activities
- Future agendas



# 1998 NGI Initiative

- 8 proposals funded: 5 in networking program, 3 in special projects
- \$5.6M
- 34 reviewed (33 projects, 1 joint pair)



# 1999 programs

## Proposals handled (including Wireless In.)

Program	Props	Awds	NGI Awds
Networking	95	29	6
Special Projects	50	14	5
Careers	32	9	3

- These numbers are close, but not guaranteed
- A small number of projects are collaborative
- There are also POWRE, CONACYT, Supplements, Continuing grants, REUs, joint funding with other programs



# Universities funded in 98 and 99

- Arizona State U.
- CMU
- Georgia Inst. Tech.
- MIT
- Smith College
- Stanford
- SUNY Stony Brook
- UC Berkeley
- UC Irvine
- UCLA
- UC San Diego
- UIUC
- U Kentucky
- UMD - College Park
- UMass Amherst
- UMinn - Twin Cities
- UPenn
- UT Austin
- U Virginia
- Washington U.



# NGI Research

## ■ Three areas

- ◆ Network Growth Engineering: scaling up in size and speed, measurement, network management, middleware
- ◆ Quality of Service: flow based or aggregate based, congestion control
- ◆ Security: network security and assurance, end-to-end security, other policy functions (such as pricing and cost recovery)



# Two subsections

## ■ Advanced Infrastructure

- ◆ Javad Boroumand will talk about most of real growth engineering
- ◆ Internet Technologies program: enabling the next generation internet

## ■ Advanced Research

- ◆ Falls into the three NGI areas and more





# Internet Technologies Program

- About 10 projects and \$4.5M: not NGI but relevant
- Examples
  - ◆ Measurement
    - NLANR, CAIDA, Gerla
  - ◆ Network support
    - Address validation for security(Reiher/Zhang)
  - ◆ Application support
    - QoS via Soundwire (Chafe - Music Dept, Stanford)
    - Intersection of data mining and networking
    - Wireless support of Long Term Ecology Research Ctrs.
    - Continuous Media Middleware Toolkit



# Advanced Research projects distribution

	<b>Network Growth</b>	<b>QoS</b>	<b>Security</b>
<b>1998</b>	6	1	1
<b>1999</b>	7 (6 proj)	8	2 (1 proj)



# Network Growth Engineering

- McKeown, 98: Fork Join Terabit Router
- Obraczka/Tsudik, 98: Multicast for Ad Hoc Networks
- Walrand, 98: Improved, lightweight Web transport protocol
- Bagrodia, et al. 99: Planning grant for multi-modal support for doctors
- Gao(Career), 99: VOD in Multicast Networks



# Quality of Service

- Basar, 98: Dynamic team and game theory for congestion mgmt
- Chao, 99: A Terabit IP Router with QoS
- Guerin, 99: Routing and scheduling issues in support of advance reservations
- Siu, 99: Scheduling algorithms for HS switches with QoS guarantees
- Venkatasubramanian, 98: QoS enabled middleware for global distributed computing



# Security

- Tripathi, 98: A secure and robust agent technology
- Calvert/Lam, 99: Secure multicast



# Interagency activities: workshops

## ■ Smart Environments

- ◆ NSF (funding support), DARPA, NIST
- ◆ Organized by Sollins (NSF), Fisher (NSF), Scholtz (DARPA), Mills (NIST), Stanford (NIST)
- ◆ Interdisciplinary: networking, middleware, HCI
- ◆ Highlighted
  - Great enthusiasm in community for more
  - Need for more interdisciplinary communication/collaboration
  - Different agencies different modes of operation



# Another workshop

## ■ Internet economics

- ◆ Organized by McKnight, Clark, Wroclawski
- ◆ Interdisciplinary: Bringing together technology and policy people
- ◆ Will happen in November
- ◆ Co-funded with DARPA - not easy but we can make it happen if we want to
- ◆ Previous one several years ago led to a widely acclaimed book on Internet Economics. Book planned here as well.



# Interagency communication

- Networks: Javad, Mari, Aubrey, and others
- NRT: networking program officers
  - ◆ Bridging the Gap (NASA) workshop to bring together apps and networking people
  - ◆ Possible network lecture series
  - ◆ Working on joint paper
- LSN
- JET
- Other groups ...





# Looking toward the future

- Wireless: on beyond the initiative
- Pervasive computing: smart environments, sensor nets, self organizing nets, etc.
- Management and understanding complexity: Thrust on measurement, modeling, simulation
- Next year (2001)
  - ◆ Security: workshop in 2000, problem of people, clear place for collaboration with NIST, NSA, DARPA
  - ◆ Group communication