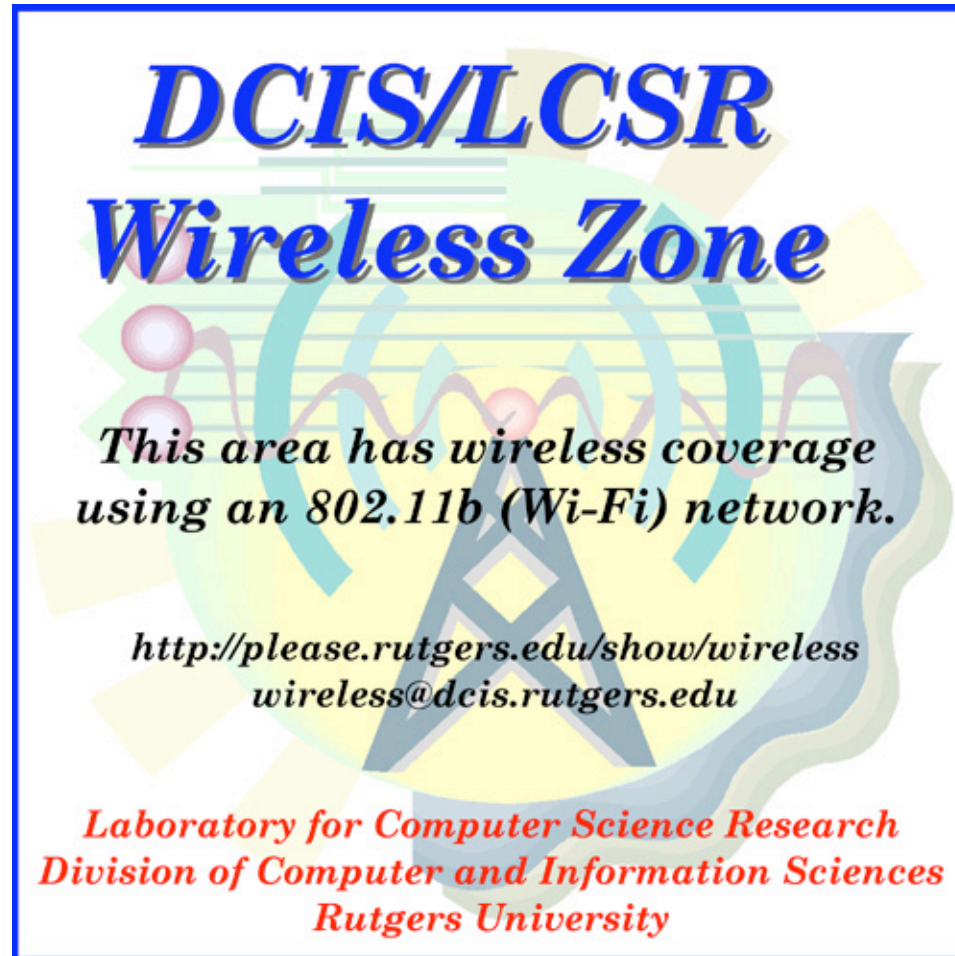


# LAWN

## Local Area Wireless Network

A sign for a wireless zone. It features a blue border and a background with a stylized 'A' logo and a signal wave. The text is as follows:

***DCIS/LCSR***  
***Wireless Zone***

*This area has wireless coverage  
using an 802.11b (Wi-Fi) network.*

*<http://please.rutgers.edu/show/wireless>  
[wireless@dcis.rutgers.edu](mailto:wireless@dcis.rutgers.edu)*

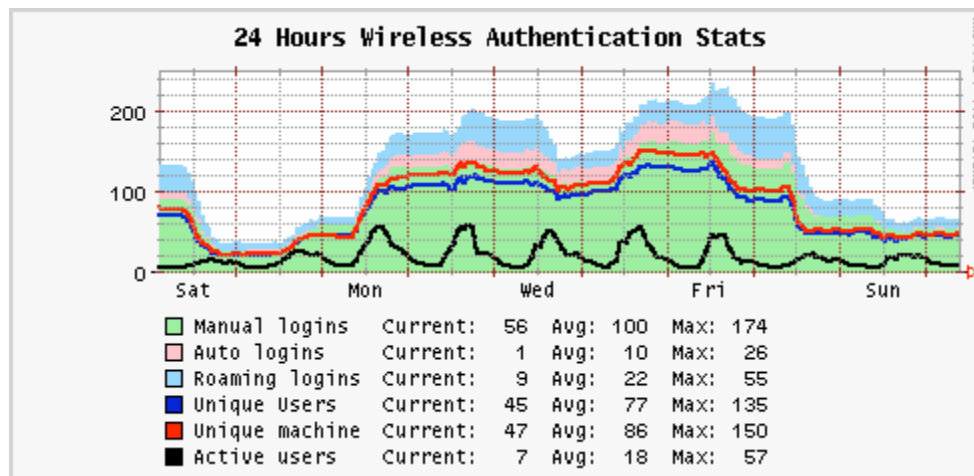
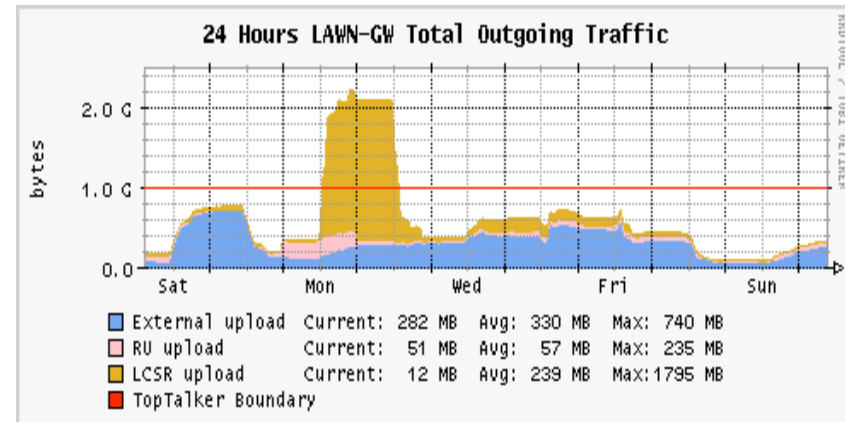
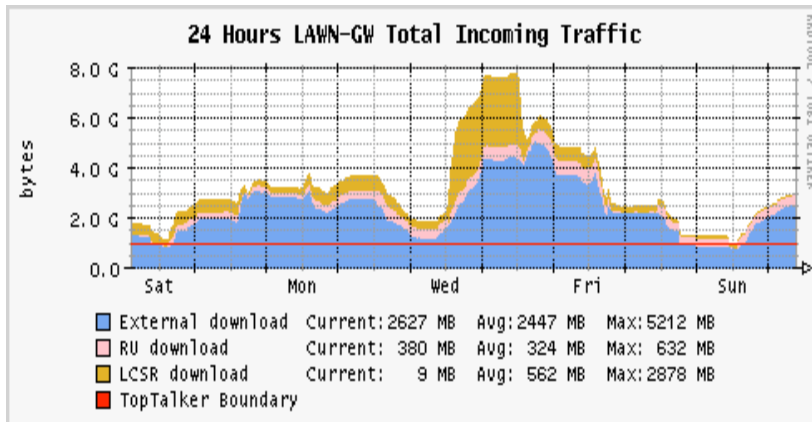
*Laboratory for Computer Science Research  
Division of Computer and Information Sciences  
Rutgers University*

# LAWN Environment

<http://please.rutgers.edu/show/wireless/>

- Wireless coverage **plus** managed DHCP
- In operation for four years
  - deployed in April of 2001
- 90,000 sq ft coverage
  - Covers all floors in Hill and CoRE
  - 40 access points,
  - 1,150 unique users in 2004
    - 1,450 different MAC addresses
    - 28,150 sessions

# Usage of LAWN



# LAWN

## Design Goals

- Designed for a university environment
  - Federated control
    - Authenticate against trusted servers
  - Environment must coexist with wireless research
    - 5 cooperating overlapping 802.11b networks
  - Easy access for visitors and collaborators
    - Workshops, conferences, etc.
  - SNR of 60 or better
  - Handles wired and wireless identically
    - Wired provides better bandwidth
    - Wired eliminates RF interference

# LAWN

## Design Decisions

- Usage
  - Allow encryption but **don't** require it
  - Monitor on a per user per destination basis
    - Based on user ID, not IP or MAC address
    - Record end-to-end traffic patterns
      - within wireless, to DCS, to RU, to Internet
  - Usage above 1GB a day dealt with in person
    - 1-2 a month, no repeat offenders
  - 1 MB throttle considered but not adopted
    - Fewer than 10 users on an AP at any given time

# LAWN

## Why use Federated Control

- Authenticators may need to be different
  - A grants access only to A's student/staff
  - B grants access only to B's student/staff
  - C grants access to both A's and B's student/staff
- A variety of clients are handled
  - WINxxx, XP, OS9, OSX , Linux
  - PDAs (e.g., IPAQ, WinCE)
  - Sony Robotic Dogs, NSF GPS research

# LAWN

## Distributed Authentication

- All authentication transactions are secure
  - Identify yourself and your authentication server
  - Provide password
- User is authenticated against the selected authentication server
- Works well for collaborators and vendors
  - they use their own VPN
  - they access their own resources

# LAWN Equipment Costs

- 80% of our equipment costs are access points
  - 802.11b or 802.11b/g with POE(802.3AF)
  - 802.11a for dedicated access
  - \$200 each
- A single gateway/firewall supports a building-cluster
  - Handles bandwidth from all APs (400MHz PII)
  - Reuse retired equipment, \$1000 for rack mounted
- Several gateways share one authenticator
  - Only used during authentication – lightly loaded
  - Reuse retired equipment, \$1000 for rack mounted



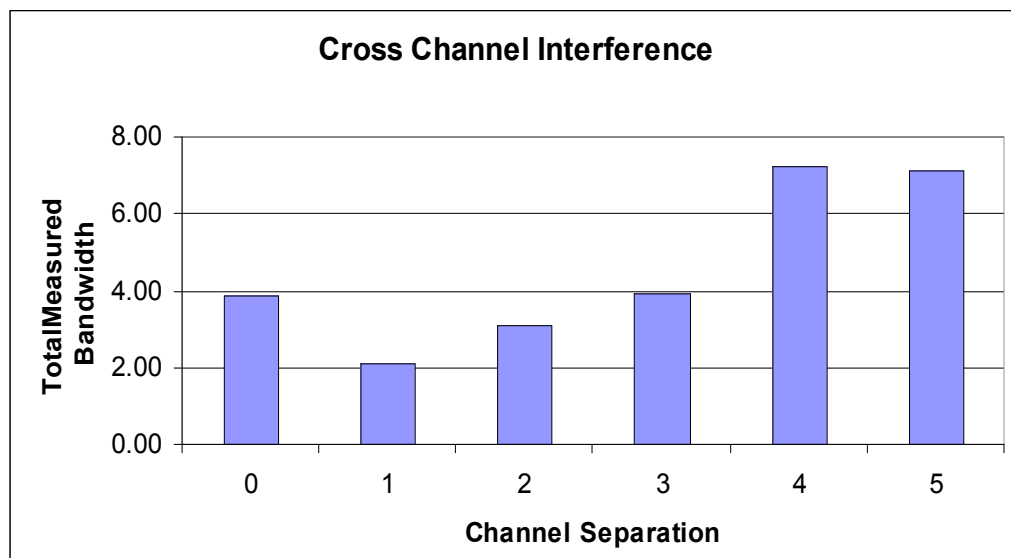
# LAWN Operation Costs

- Cost effective operations
  - Faulty access points
    - 2% of an FTE      1 hour per week
  - Unannounced research networks
    - 1% of an FTE      30 minutes per week
  - Software maintenance and upgrades
    - < 1% of an FTE      ~ 1 hour per month
- Installations
  - Multistory buildings vs. single story

# LAWN

## Cross Channel Interference

- 1,6,11 deployment (separation of 5)
- 1,4,8,11 deployment (separation of 3, 4, 3)



# Lawn Summary

<http://please.rutgers.edu/show/wireless/>

- Based on trusted distributed authenticators
- Visitors and collaborators are first class citizens
- Security is user's responsibility
- 15% of LAWN users logged in at any given time
- Equipment cost is dominated by access points
- Operational cost is dominated by access points

# Wireless at RU - 2010 and beyond

- Are publicly available wired-machines in RU's future?
- Should print stations be collocated with wireless environments?
- Should wireless environments support PDAs and cells phones?

# Wireless at RU - 2010 and beyond

- How should RUs prioritize wireless environments?
  - Public buildings, student residences, classrooms, academic and staff offices, outdoor spaces ?
- What wireless services should be provided?
  - Wired services repurposed for wireless devices?
  - Inherently wireless (i.e., location dependent) services?
    - Where is the nearest print station?
    - How do I get to x from where am I now?