Building an Infrastructure
For the International Math Olympiad

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IMO Infrastructure | Agenda

- The IMO
- Requirements
- Architecture
- Technology
- Building
- Issues encountered
- Lessons learned
IMO | Facts

• Yearly event
• Different country every year
  – 600+ Intl. high school students
  – 100+ members of Jury
• 7 days long
  – 2 days of actual contest
  – 5 days of preparation / translation / correction
Network Requirements

• 5 Locations
  – 2 Amsterdam hotels
    • Contestants / 2nd Jury location
  – 1 Amsterdam sports complex
    • Contest location
  – 1 Eindhoven Hotel
    • 1st Jury location
    • (150 mi. from Amsterdam)
  – 1 Amsterdam Data center
    • At masters of system administration dept.
Network Requirements

• Controlled Internet Access
  — The Jury location needed to be offline for some time

• Access to the logistics system
  — Located in the data center

• Scanned work available at Jury location

• Q&A session before contest
Network Requirements

• “enough” Bandwidth
  – Definition: Better than last year

• Backup scenario(s)
  – When connectivity fails

• Separate networks
  – Security

• Flexibility
  – Changing topology
• Use VLANS to separate traffic
• Use a VPN setup
• Use NAT to access internet
  – One internet gateway (and one firewall)
• Use Common Sense
  – Complexity
  – Modularity
  – Open, UNIX
Network Technology

• A FreeBSD server at every location
  – OpenVPN
  – DHCP
  – DNS (slave server)
  – Router (central site)

• Cisco Wired switches
  – VLAN separation

• Simple Wireless AP’s
Central site | Technology

• Open VPN
  – 4 copies of daemon on separate ports
    • OVPN: single treaded running on Qcore
  – Self signed certificate / pki

• NAT
  – Large number of sessions (think Skype)
    • use in-kernel NAT instead of Userland
  – Multiple IP#s
    • prevent running out of source ports
Remote site | Technology

• Same setup
  – OpenVPN / Certificates
  – DNS Slave
  – DHCP on VLANS

• Anti Lockout Rule
  – Default route
  – Specific route
Site | Setup
Sites | Building

• 6 people, 4 days
  – Improvise, Improvise, Improvise
  – Document every step
  – Disseminate documentation

• Schedule
  – Reasonable deadlines!
    • Engineers estimate * pi
Sites | Backup

• 3G Modems
  – No dongles
• (warm) standby machine
  – Replacement for every site
  – All configs in one directory
• Central site: Multiple internet feeds
• Logistics system
  – Reachable over internet
  – Laptop backup
Setup | Issues

• Local situation
  – Internet Feed
  – Cabling / patches

• Changing / dynamic requirements

• Routing issues

• Switch configs

• [Logistics]
Setup | Lessons learned

• Site Surveys
  – Expect the unexpected

• Document
  – Wiki

• DNS forever

• Label **everything**

• Tools (like wireshark)

• Handtools
Setup | Lessons learned

• Do not underestimate the Engineer
  – Some really creative solutions

• Flexible by design
  – All VLANS available on all switches
  – No complicated procedures: be pragmatic

• TEST, Test, test

• Allow enough time to build

• Be able to cope with politics
Setup | Lessons learned

• Communication!
  – E-mail, GSM, SMS

• Preparation

• Rely on other parts of the organization

• A good and motivated team
  – Is fun to work with
  – Can do more than you think
  – Is a TEAM
Questions | Lessons learned

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