NETALYZR
DEBUG YOUR INTERNET

CPSC 441 TUTORIAL – MAR Y, 2012

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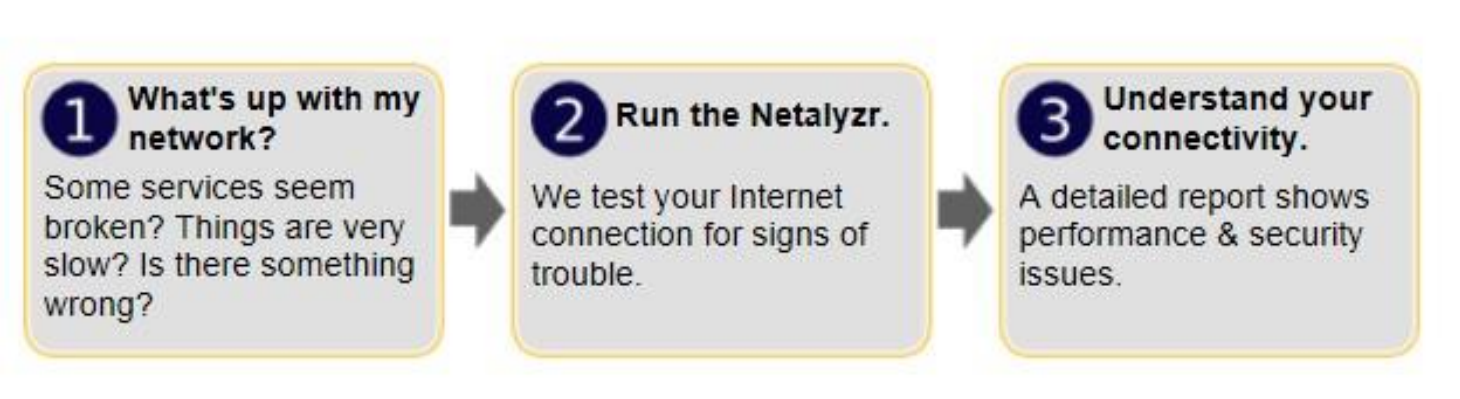
INTRODUCTION TO NETALYZR

- **Netalyzr** is developed by the Networking Group at the International Computer Science Institute, University of California, Berkeley, USA.
- It was recently published at the Internet Measurement Conference (IMC 2010).
- A free network **debugging** and **diagnostic** tool which runs in the web browser.
- Website: http://netalyzr.icsi.berkeley.edu/index.html.

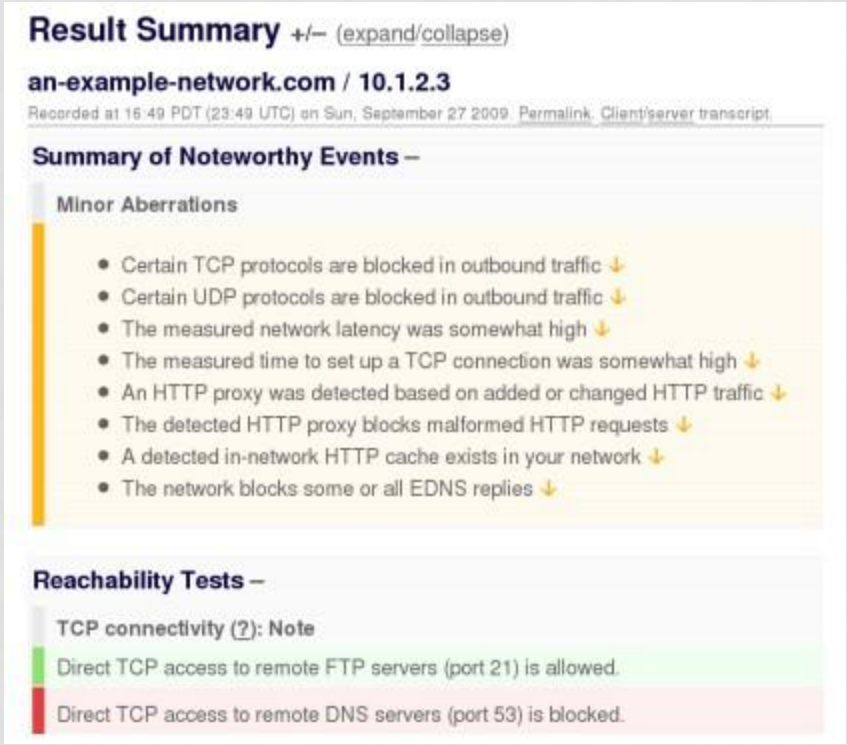
INTRODUCTION TO NETALYZR

- It is not only a debugging tool .
  - it is also the foundation of a comprehensive measurement study compiling a survey of the health of the Internet's edge.



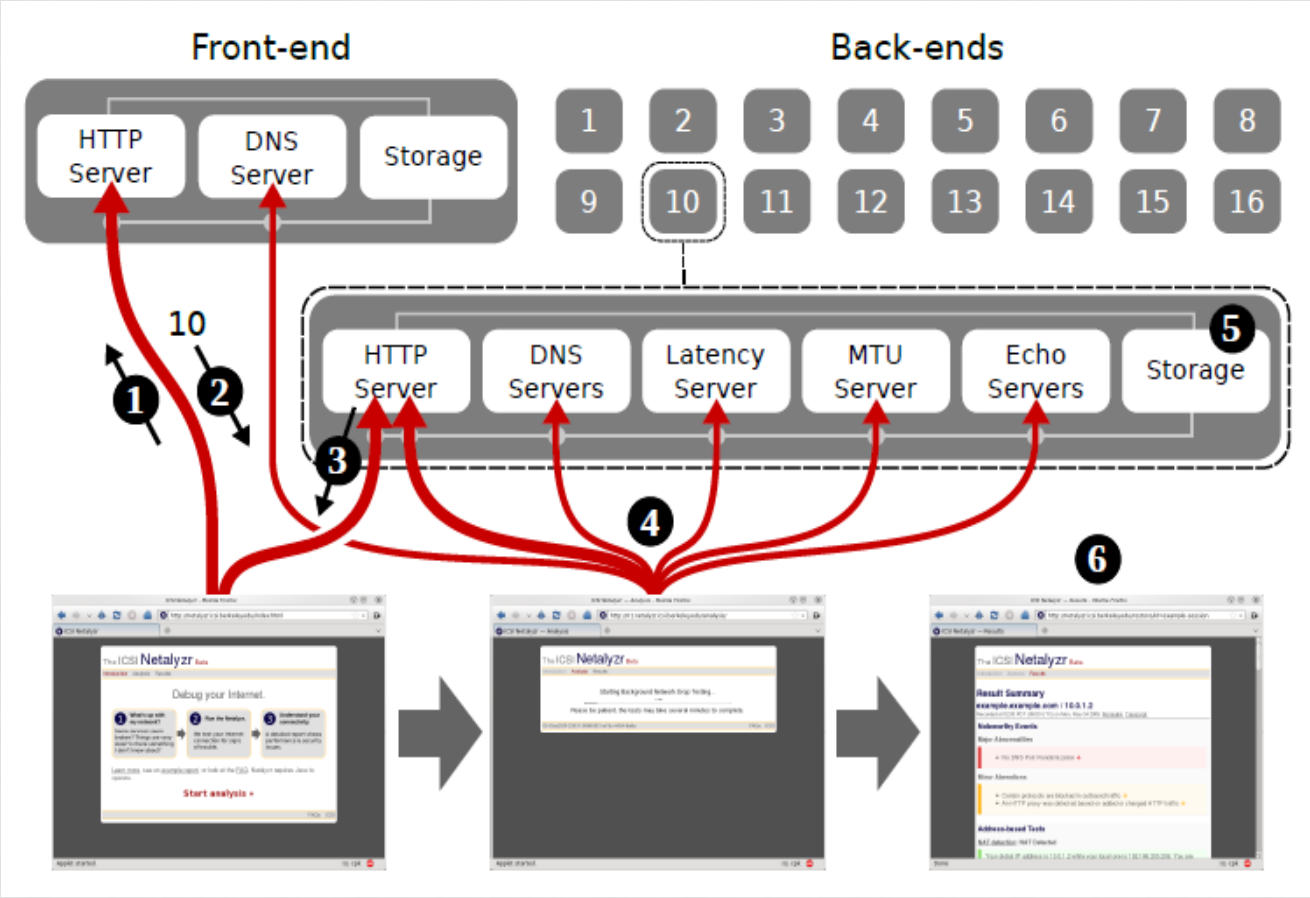
SYSTEM DESIGN

- **Application Flow**
  - Users initiate a test session by visiting the Netalyzr website and clicking Start Analysis on the webpage
  - Applet conducts a large set of measurement probes
  - The applet redirects to a summary page that shows the results of the tests in detail and with explanations



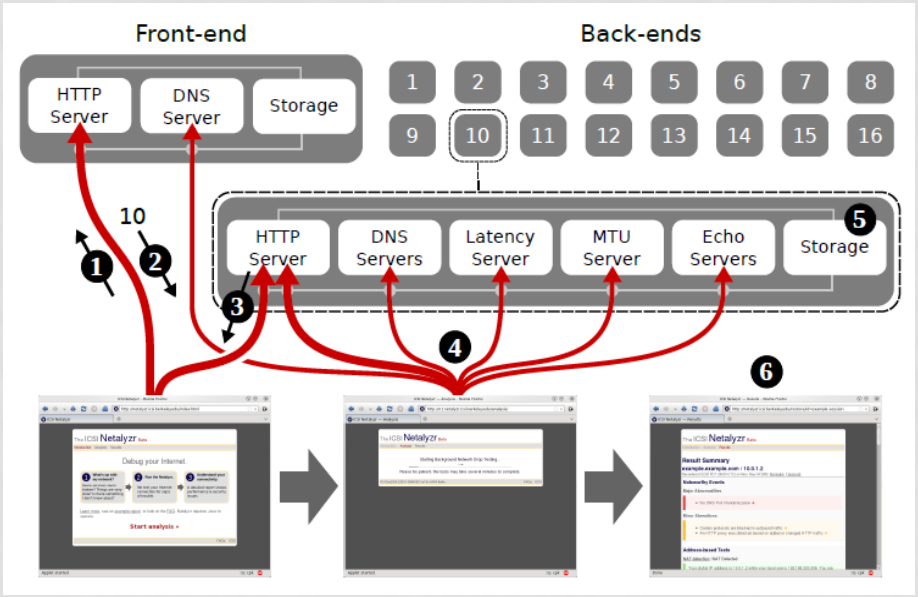
SYSTEM DESIGN

- Netalyzr's conceptual architecture



SYSTEM DESIGN

- **1.** The user visits the Netalyzr
- **2.** When starting the test, the **frontend** redirects the session to a randomly selected **back-end** node.
- **3.** The browser downloads and executes the **applet**
- **4.** The applet **conducts test** connections to various Netalyzr servers on the back-end, as well as DNS requests which are eventually received by the main Netalyzr DNS server on the front-end.



- **5.** Store the test results and raw network traffic for later analysis.
- **6.** Netalyzr presents a summary of the test results to the user

SYSTEM DESIGN

- **Front- end Back-end hosts: involves three distinct locations:**
  - User's machine running the test applet
  - Front-end machine responsible for dispatching users and providing DNS service
  - Back-end machines: Each hosts a copy of the applet and a full set of servers.
- **Front-end Web server:**
  - Provide the main website(e.g. documentation);
  - Include an applet that insures the user has Java installed and then directs the user to a back-end server
  - limits visitors to a fixed number of measurements per minute per back-end server

SYSTEM DESIGN

- **Back-end Servers:** servers host actual measurement applets
  - DNS Servers, Echo Servers
  - Bandwidth Measurement Servers
  - Path MTU Measurement Server
  - Storage, Session Management

- **Measurement Applet**
  - Implement **38** types of tests
  - Conduct the test cases sequentially
  - Also employ Multithreading : ensure
    test sessions cannot stall the entire process;
    Speed up parallelizable tasks
  - Test Completes →transmit test results to back-end server

MEASUREMENTS CONDUCTED

Types of measurements Netalyzr conducts:

- Network Layer Information
- Service Reachability: using echo server
- DNS measurements: DNS Servers
- HTTP proxying and Caching
  - HTTP Proxy Detection
  - Caching policies, Content Transcoding, and File-type Blocking.

MEASUREMENTS CONDUCTED

- Network Layer Information
  - **Addressing**
  - IP fragmentation: sending UDP payloads to test servers, check for the ability to send and receive fragmented UDP datagrams
  - Path MTU:

    applet → server: send large UDP datagram, resulting in fragmentation

    server →applet: applet conducts a binary search beginning with a request for 1500 bytes, infer from server's response
  - **Latency, Bandwidth, and Buffering**
  - IPv6 adoption

MEASUREMENTS CONDUCTED

Addressing

- Obtain the client's local IP address via the Java API , then use a set of raw TCP connections and UDP flows to echo server to learn the client's public address. ➔ presence of NAT (Network address translation)

- If across multiple flows they observe more than one public address
  - If more than one→ a client changed networks while the test was in progress
  - b. or NAT does not attempt to associate local systems with a single consistent public address, NAT simply assigns new flows out of a new public address.

MEASUREMENTS CONDUCTED

Latency, Bandwidth, and Buffering

- These measurements are done using UDP
  - Wish to stress the network
- For 10 Seconds
  - Send large UDP packets to Netalyzr server
  - Ramp up the sending rate with exponential doubling: for each packet received, send two more
  - Measure the bandwidth and additional latency for each packet during the last 5 seconds of this process
  - Wait an additional 5 seconds for buffers to drain
- Then repeat for downlink direction

DEMO

- Demo of NetAlyzr on the **U of C network**
- Report: http://netalyzr.icsi.berkeley.edu/restore/id=ae81b058-5188-12b30318-c751-4cbb-a199

Vs

- Demo of NetAlyzr from my **home network**
- Report: http://n1.netalyzr.icsi.berkeley.edu/restore/id=43ca253f-15389-b318888e-2a3a-4fcc-99f0/rd


The ICSI Netalyzr

Start Analysis Results

Result Summary + – (help)

136.159.18.37

Recorded at 13:06 PST (21:06 UTC), Feb 29 2012. Permalink. Referrer. Client/server transcript.

Address-based Tests + –

- NAT detection (?): NAT Detected ±
- Local Network Interfaces (?): OK ±
- DNS-based host information (?): OK ±
- NAT support for Universal Plug and Play (UPnP) (?): Not found ±

Reachability Tests + –

- TCP connectivity (?): OK ±
- UDP connectivity (?): OK ±
- Traceroute (?): OK ±
- Path MTU (?): OK ±

Network Access Link Properties + –

- Network latency measurements (?): Latency: 73ms Loss: 0.0% ±
- TCP connection setup latency (?): 75ms ±
- Network background health measurement (?): no transient outages ±
- Network bandwidth (?): Upload >20 Mbit/sec, Download >20 Mbit/sec ±
- Network buffer measurements (?): Uplink is good, Downlink is good ±


The ICSI Netalyzr

Start Analysis Results

Result Summary + – (help)

S01067444012f8b4a.cg.shawcable.net / 70.72.184.185

Recorded at 01:02 EST (06:02 UTC), Mar 07 2012. Permalink. Client/server transcript.

Summary of Noteworthy Events + –

Major Abnormalities –

- Your DNS resolver returns IP addresses for names that do not exist ↓

Minor Aberrations –

- Not all DNS types were correctly processed ↓

Address-based Tests + –

- NAT detection (?): NAT Detected ±
- Local Network Interfaces (?): OK ±
- DNS-based host information (?): OK ±
- NAT support for Universal Plug and Play (UPnP) (?): Yes ±

Reachability Tests + –

- TCP connectivity (?): OK ±
- UDP connectivity (?): OK ±
- Traceroute (?): OK ±
- Path MTU (?): OK ±

REFERENCE

- http://www.icir.org/christian/publications/2010-imc-netalyzr.pdf
- http://netalyzr.icsi.berkeley.edu/index.html