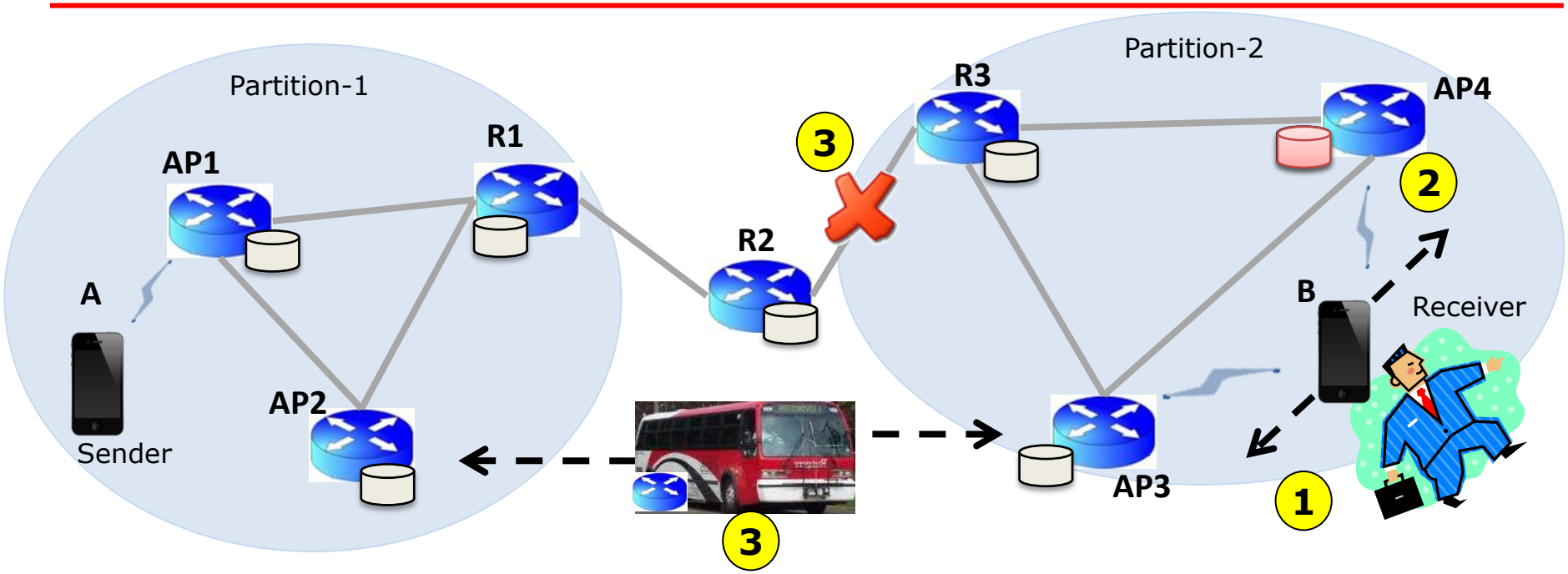
Demonstration of Routing and Name Resolution in MobilityFirst FIA

NSF Visit, Oct 6, 2011

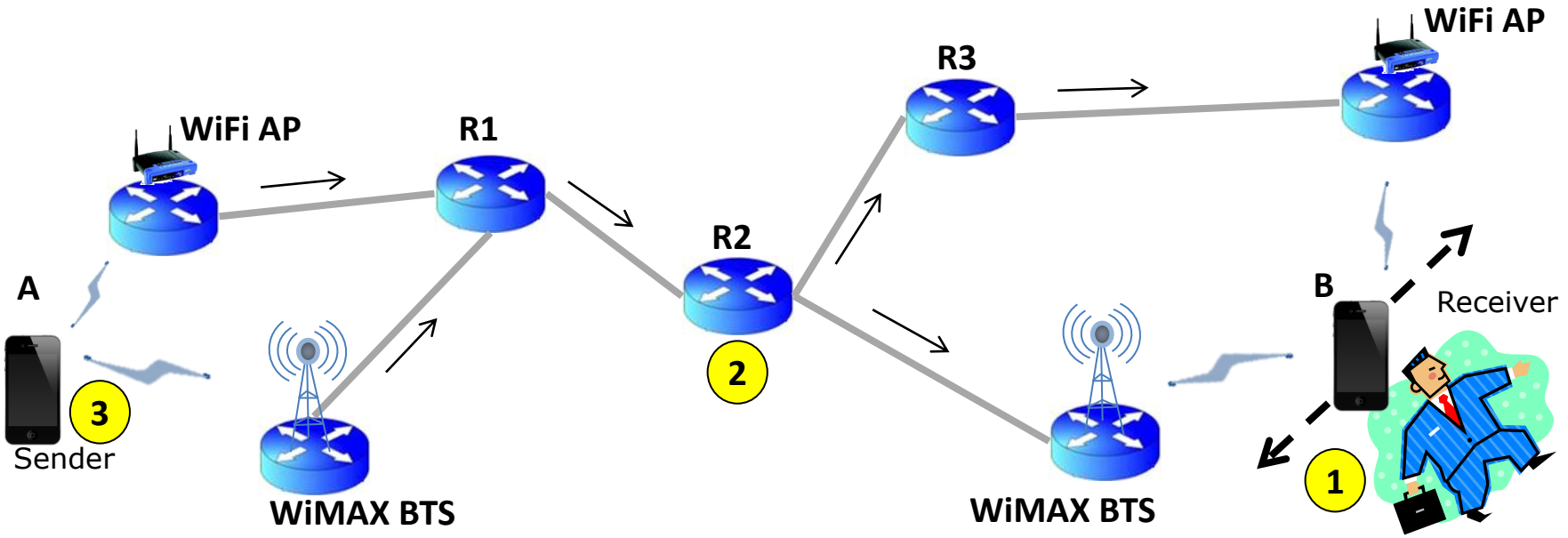
WINLAB 

Demo 1: Storage-Aware Routing



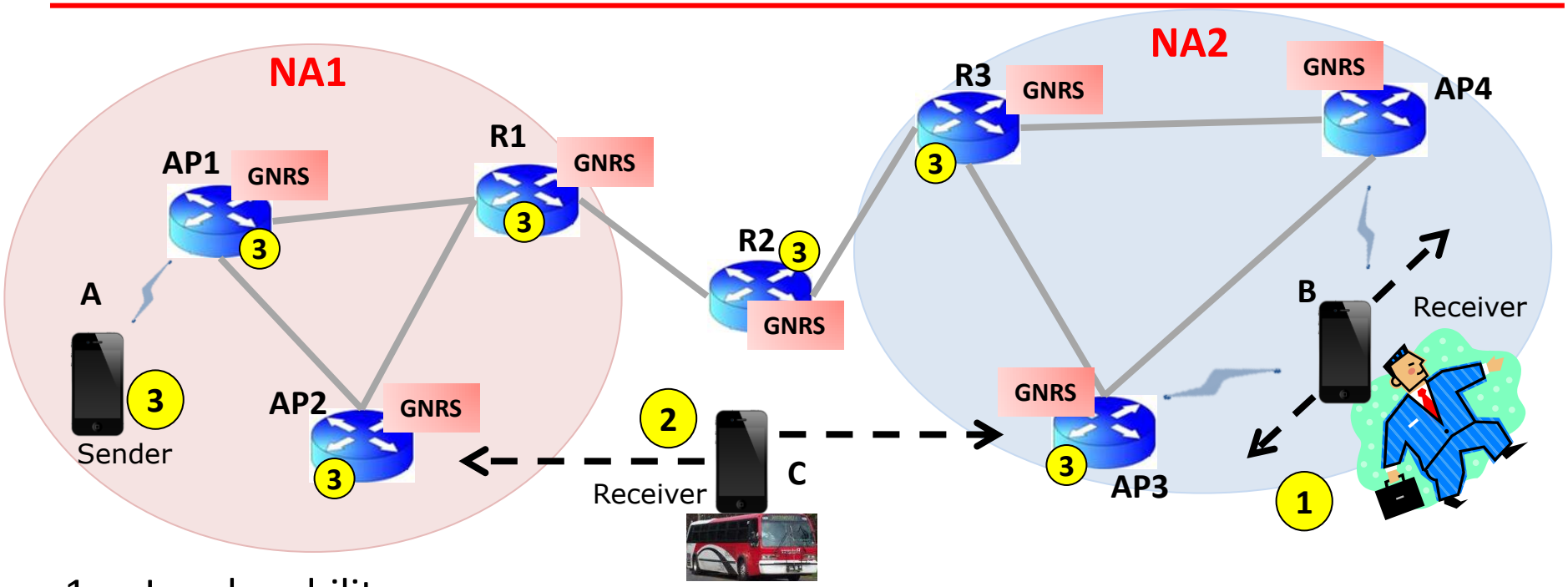
1. Destination node mobility
   - B moves between AP3 and AP4
2. Variable link quality
   - Access link B-AP4 degrades occasionally
   - Data blocks temporarily stored at AP4
3. DTN routing and mobile data ferry
   - Link R2-R3 completely fails, creating partitions
   - Bus-node bridges partitions, moving from within AP1 to AP3 range

Demo 2: Multi-homing and Multi-path



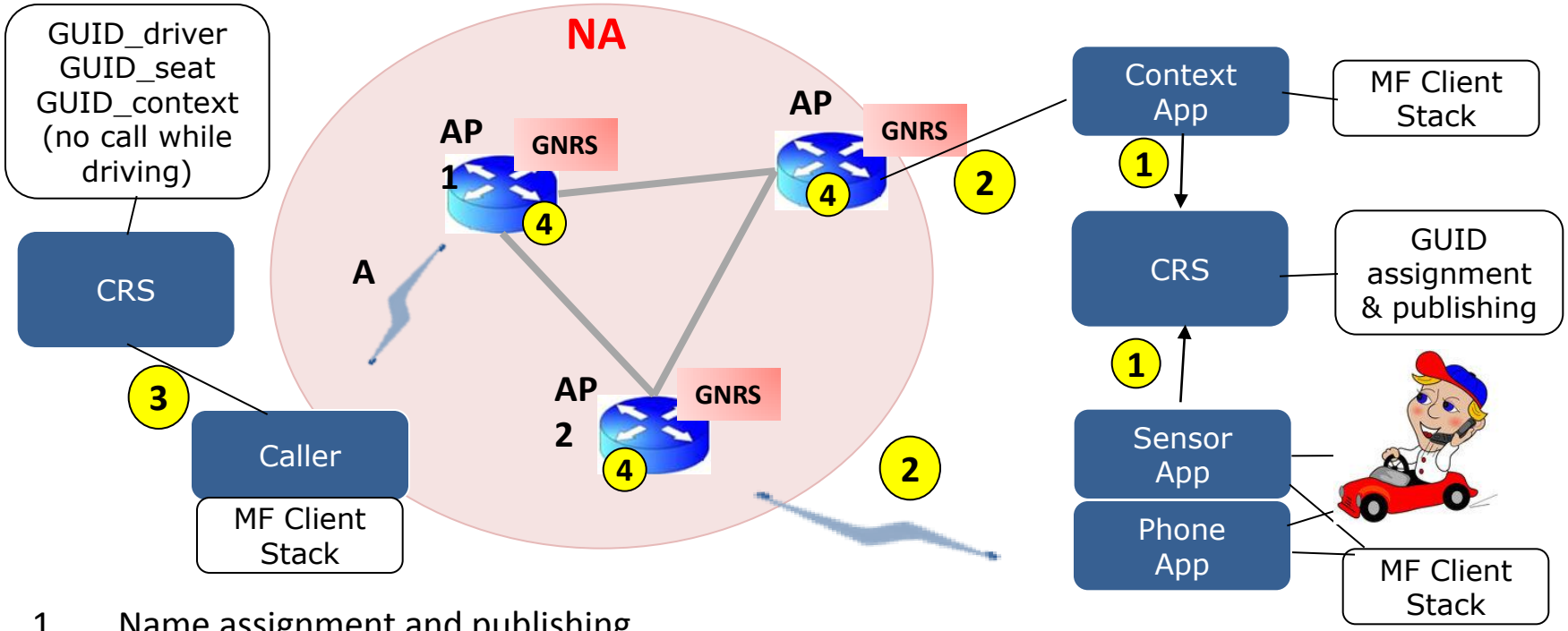
1. Multi-homed mobile with varying link quality (WiFi & WiMAX) receives on either interface, a preferred one, or both
2. Bifurcation point determines delivery path based on link/path quality
   - Intelligent striping and/or redundancy schemes
3. Multi-homed mobile stripes across two interfaces (WiFi & WiMAX)
   - Cumulate access bandwidth

Demo 3: Use of GNRS in Internet Routing



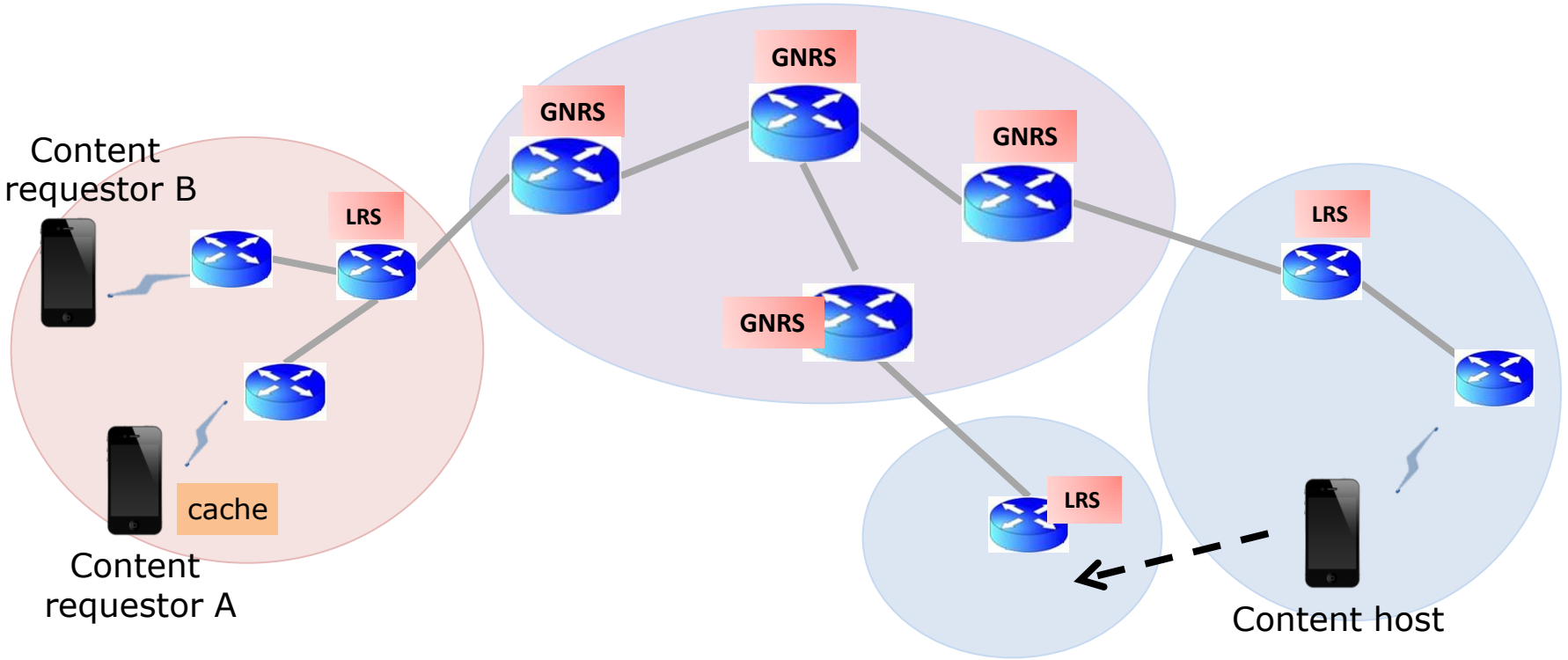
1. Local mobility
   - Receiver B moves between AP3 and AP4, no change to GNRS mapping
2. Inter-network mobility
   - Receiver C moves between AP2 (NA1) and AP3 (NA2)
   - GNRS update from ($GUID_C$, NA1) → ($GUID_C$, NA2)
3. Early or late binding
   - Based on Service ID specified in MF header
   - Error reporting, and recovery following re-query to GNRS

Demo 4: Sensor and Context use case



1. Name assignment and publishing
   - Mapping from human readable (tags) to GUIDs, for both sensors and context
2. Connect to MF network
   - GNRS is updated as sensor and context apps open MF sockets
3. Caller gets GUIDs
   - Driver's GUID: non restricted GUID_driver, restricted GUID_context (no call while driving)
   - Seat's GUID: anyone on the car? Who is driving the car?
4. MF routers route the call to right location (context or phone directly)

Demo 5: Content Retrieval and Caching



1. Content host publishes content to GNRS.
2. A requests content with c_GUID, and receives the content from the content host.
3. A caches content and update GNRS.
4. B requests GUID lookup and gets back the network address of both A and the content host. B will go to A for content as it is closer.
5. Meanwhile, content host moves, but there is no impact on the content retrieval for B.

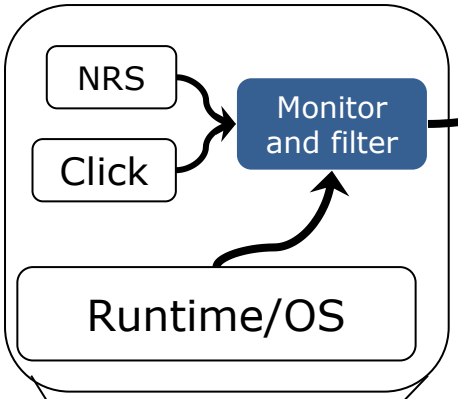
Testbed Details

- Orbit grid + WiMAX
  - Wireless topologies, incl. partitions or networks, using host-based filtering and/or separate channels
- MF Click router with GNRS server
  - Storage aware routing (GSTAR, R3?)
  - GNRS servers with static list of participating nodes
- Android phone, Linux laptop clients
- OML framework for network statistics and event gathering
  - MF Router instrumented

Visualization

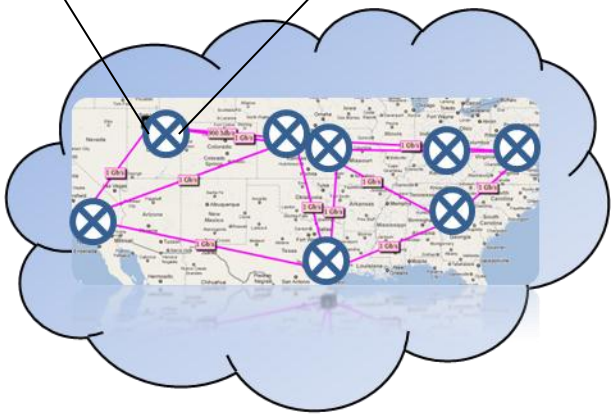
Data collection framework with API, monitors, filters and data warehouse
E.g., Orbit Measurement Library (OML)

MF Network element
e.g. Router



HTTP, XML, JSON

Browser: AJAX/JS/Flash



What's on?

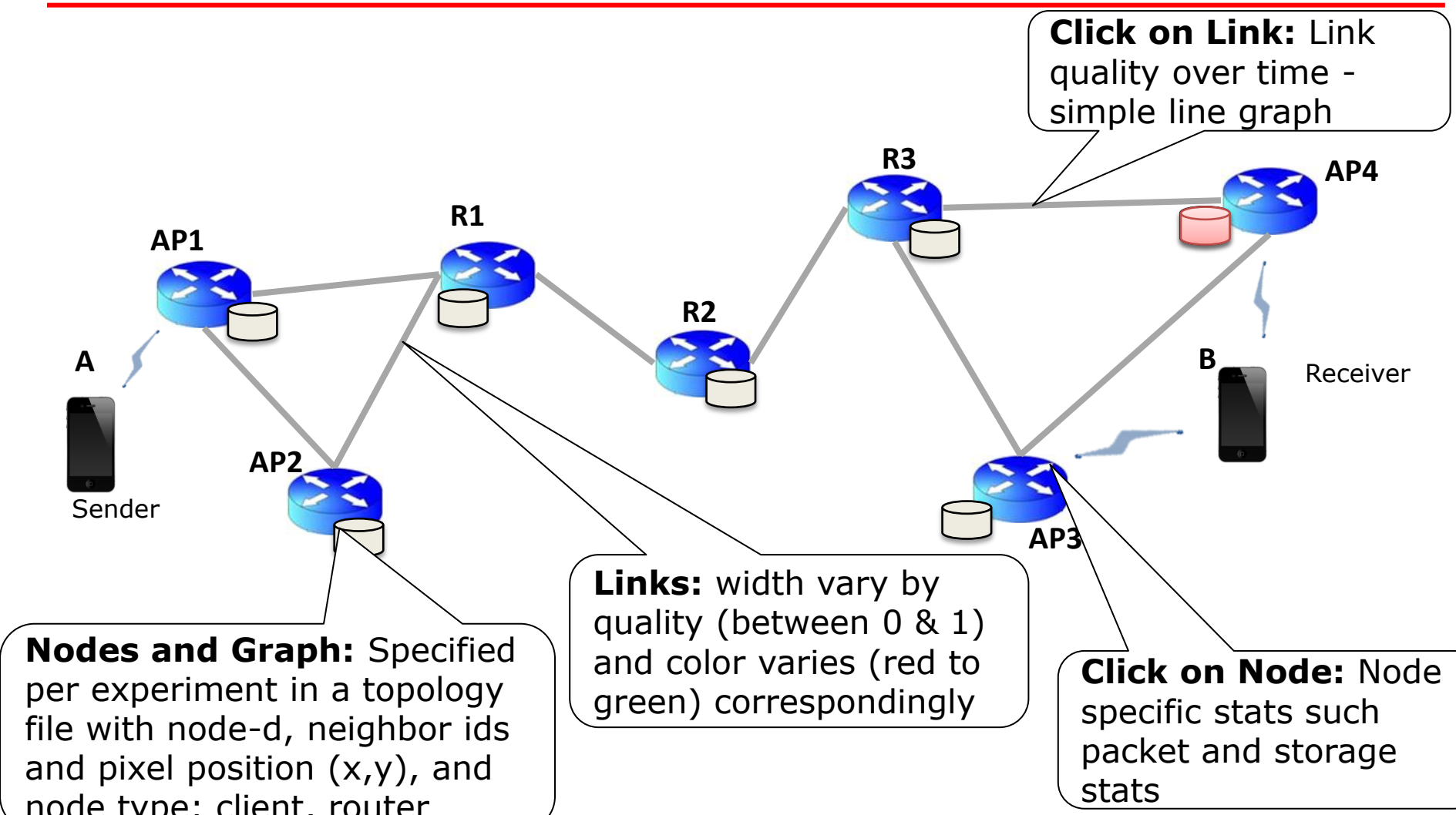
1. Network statistics
2. Packet and flow tracing
3. Routing events
4. Application events

Network map credits: ProtoGENI's Flack tool. http://protogeni.net/trac/protogeni

Visualization Screen 1 : Choose experiment

- Simple dropdown for choosing particular experiment

Visualization Screen 2 - Main Topology Screen



Inputs and Backend PHP

- List of experiments and corresponding topology file for each
- Topology File Format – per demo
  - #<node-id> <node-type><node-x> <node-y> <neighbor count> <neighbor1-id> <neighbor2-id> ….
  - Ids are integers, x and y are pixel positions, node-type=router | client
  - For each node-type a different image
- node_stats.php
  - Input: node-id
- link_stats.php
  - Input: node-id1, node-id2, number of entries (optional, default 1)
  - Number of entries gives history of link quality for plotting simple line graph

TODO

Routing

- Complete integration of DTN extension within GSTAR
- Simple protocol to inform access router of GUID of attached client
- Extend LSA announcements to advertise gateway designation
- Integration of R3 impl. with Click prototype? (maybe by Nov demo)

Multi-homing

- Enabling simultaneous use of interfaces on Android device
- Striping across multiple interfaces (client) or paths (MF router)

GNRS

- Integrate Click router with GNRS daemon to process requests from router
- Overlay routing between GNRS servers

Visualization

- Web interface design and integration with OML repository