CCN application-domains: brainstorming from GreenICN project

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CCN issues

- Literature shows that ICN architectures, and specifically CCN, have critical issues for large scale deployment
  - Routing
    - Routing table scalability: high number of prefixes and update frequency
    - Security: users should be allowed to update the routing plane to make their content reachable
  - Stateful forwarding
    - PIT can be easily flooded
  - Caching
    - Caching fake contents creates (D)DoS. Check validity before caching is thus required (security engine in the router…costly)
    - Effectiveness of universal caching is debatable. Caching seems useful only at the edge (another paper of Shenker et al. on this issue at Sigcomm main track this year)

CCN issues

- Such issues are congenital in ICN
  - Addressing contents with location independent names and using en-route resolution (to enable en-route caching) implies routing scalability issues
    - Rekhter's Law “Addressing can follow topology or topology can follow addressing. Choose one.”)
  - Stateful routing is needed for multicasting
  - Caching en-route is an asset of CCN

Devil's advocate

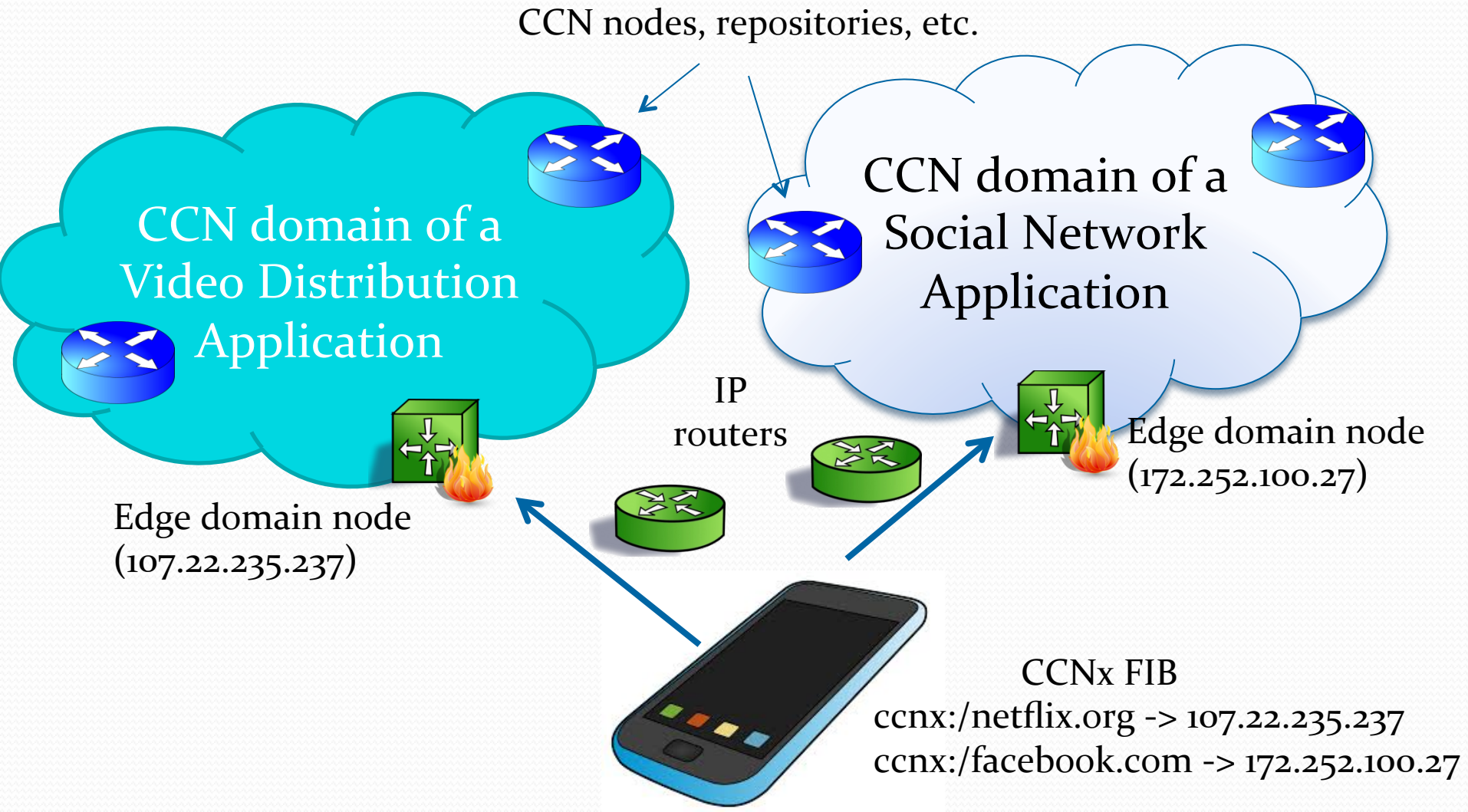
- Several papers try to alleviate such CCN issues by proposing improvements and modifications, amounting implicitly at the following question:
  - *Is it worth redesigning the Future Internet network-layer with a technology that shows Routing and Security issues from the beginning and whose main asset (Caching) has a debatable usefulness when deployed everywhere?*
    - *There are other expected pros of ICN, tough, see (*)*
  - *If CCN is not useful everywhere, why not using it only at the edge (e2e paradigm) ?*

(*) N. Blefari Melazzi, L. Chiariglione: "The potential of Information Centric Networking in two illustrative use scenarios: mobile video delivery and network management in disaster situations", invited paper, **IEEE Journal MMTC**, E-letter special issue on "Multimedia Services in Information Centric Networks", Vol. 8, N. 4, July 2013

CCN on the edge: application-domains

- CCN as a closed and trusted application domain
  - A domain is a (overlay) network of CCN nodes which serves a specific application
  - Within a domain, CCN routing only cares of its own application data and it is controlled by the provider of that application-domain
    - "Few" routing entries. No routing security issues (centralized control)
  - User to Domain via plain Internet
    - No need to persuade all ISPs to deploy this ICN (often unknown ☹) technology
    - We need "only" to motivate those who deploy applications to use ICN technology
  - The "edges" are the user and the application domain

CCN on the edge: application-domains



Why using CCN in this framework

- In our own “app-development” experience, CCN does *simplify development of applications for large scale data dissemination*
  - We used it for
    - P2P Cellular video streaming
    - Pub sub topic based service in MANET
    - Etc.
- It is for sure useful…and practical in a bounded environment

Devil's advocate: CCN vs CDN

- CCN, bounded in an application-domain, provides services similar to those of CDN (Routing-by-name, Multicasting, Caching)
- Why should Netflix, Facebook, etc. use a CCN-based application-domain rather than continue using their CDN providers?
- We are looking for answers
  - Business advances
    - Open-source software (free?)
    - ?
  - Technical advances
    - Session-less (HTTP CDNs are session-oriented)
      - Client mobility
      - Multipath routing
      - ?

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