Protocol Design

Assignment 3: Protocol Analysis

Apply Protocol Design Insights Analytically

- For diversity: look at two different protocols
  - From two rather different application domains
  - No comparison, just analyze them by themselves
- Assess their respective protocol design
  (in the sense of “grading”)
  - Using the background knowledge from the lectures (and related sources!)
  - With respect to the areas we discussed in the lectures
  - And also with respect to other “classical” criteria of your choice
    - E.g., performance
- General hint: look for concepts but not for the last bit of detail
  - Even though sometimes the details make the difference

Some Explicit Questions to ask

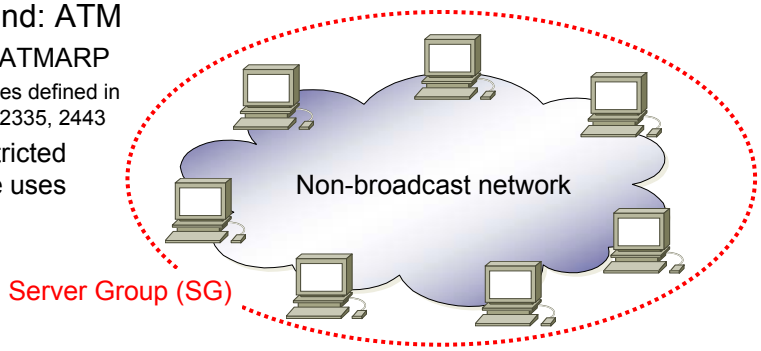
- What are the protocol's strengths and weaknesses?
- Are there any inherent showstoppers for deployment?
  - Example: "This protocol is designed for end users who are authenticated by their personal certificate…"
- Would an "applicability statement" be necessary?
  - If so, phrase one
- What are your recommendations for the next version of the respective protocol?
  - Extensions? Deletions? Modifications?

Two Protocols: Brief Introduction

- Server Cache Synchronization Protocol (SCSP)
  - RFC 2334 [40 pages]
  - Parts of OSPF, RFC 2328 [many pages, but you know OSPF already]
- Message Session Relay Protocol (MSRP)
  - draft-ietf-simple-message-sessions-14.txt [59 pages]
- Relay Extensions for MSRP
  - draft-ietf-simple-msrp-relays-07.txt [36 pages]

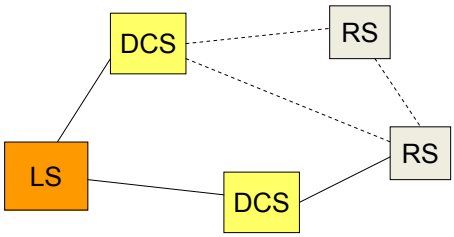
SCSP: Motivation and Background

- State synchronization protocol for a server group
  - Each server has state information cached about the clients it serves
  - Robustness requires avoiding single points of failure
  - To allow another server to take over, state changes need to be sync'ed
- Background: ATM
  - NHRP, ATMARP
    - Usages defined in RFC 2335, 2443
  - Not restricted to these uses



Terms, Phases, and Protocols

- SCSP Entities
  - Local Server (LS)
  - Directly Connected Server (DCS)
  - Remote Server (RS)



1. Hello
   - Hello protocol
2. Database synchronization
   - Cache Alignment (CA) Protocol
3. Flooding
   - Cache state update (CSU) protocol

Protocol Operation Summary

- Hello Protocol
  - After establishment of “lower layer” connectivity, LS sends HELLO messages to each DCS including its own ID
  - Observes incoming messages for its own ID to check for bidirectional connectivity
- Cache Alignment Protocol
  - Initial master-slave negotiation
    - Deterministically determine asymmetric roles of the involved peers
  - Cache summarization
    - Exchange a summary of the present state at each peer
  - Updating cache
    - Synchronize the state of the two peers by inquiring/providing missing pieces of state
  - Aligned →
- Active flooding of state changes via Cache State Update protocol

Miscellaneous

- Binary packet format
- Not an IP-based protocol
  - Uses LLC/SNAP encapsulation for link layer mapping

MSRP

MSRP: Background and Motivation

- Used in the context of SIP-based messaging in interpersonal communications
- Intended to address two major issues with SIP messaging

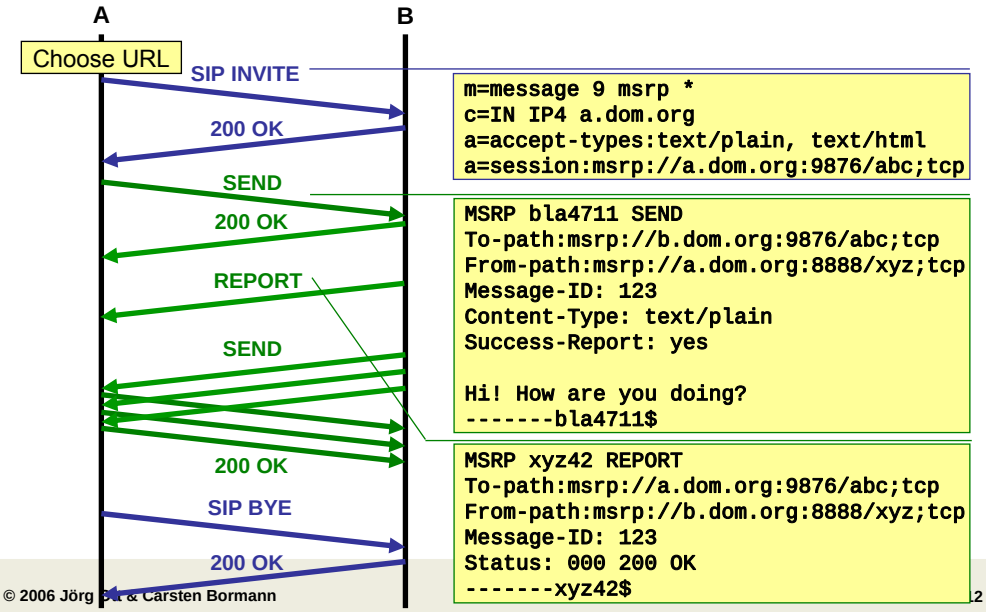
1. MESSAGE: Message frequency
   - Only one outstanding message: one MESSAGE per RTT
     - But: messages are stand-alone; no dialog context to check against
2. MESSAGE: Large messages
   - UDP is an acceptable transport for SIP: no congestion control
   - Endpoints can't see beyond next hop
   - Artificial limit on message size (1300 bytes) not really acceptable

- Alternative: Content indirection: store message contents in an accessible locations and convey only pointers (URLs) in message

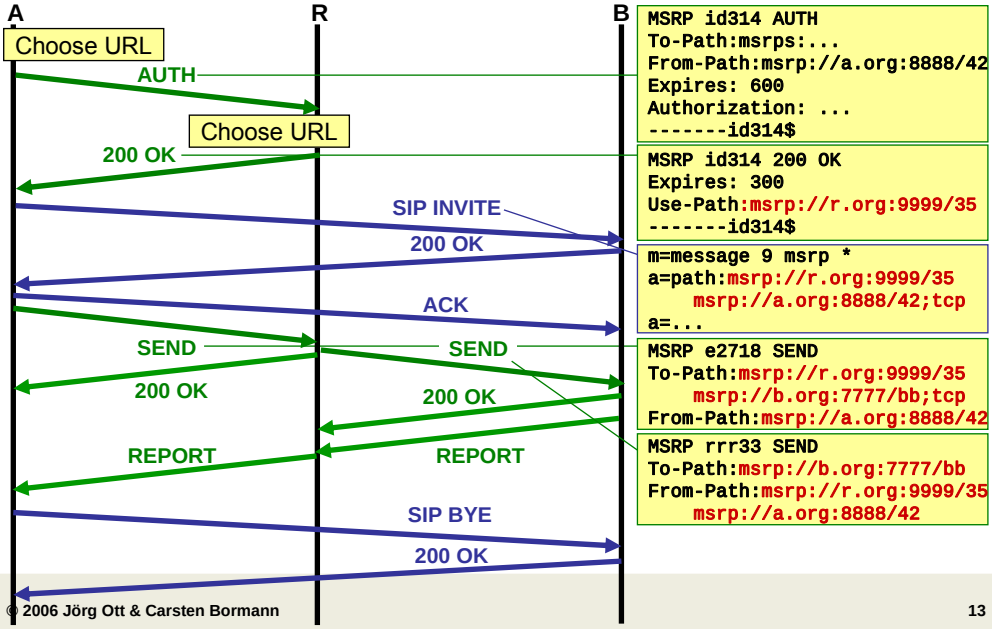
Message Session Relay Protocol (MSRP)

- Protocol for Messaging Sessions
  - Uses TCP or another reliable and congestion controlled transport
  - Message encoding similar to SIP and HTTP
- Just another media protocol
  - Messaging sessions require explicit setup and teardown
    - E.g., SIP dialogs (INVITE, BYE)
  - SDP to describe sessions (m=message)
  - Uses SDP Offer/Answer to convey parameters
    - Exchange dynamic transport addresses for communications (MSRP URLs)
    - Negotiate supported message formats
  - SEND method to convey messages
    - May request confirmation from the remote side (on success and/or failure)
    - Support for chunking of large messages (2 KB chunks)
  - REPORT method to provide confirmations
- Two modes of operation
  - Direct communication between peers (simple case)
  - Communication via relays (NATs, firewalls, policy)

Direction Communication between Peers



Communication via a Relay



How much?

- Just to give a ballpark figure
- 10 pages (12 points, 1.5 lines spacing)
- May include figures
- May be 7 or 8 pages, may be 12 or 14
- May not be 2 pages or 40