Information Distribution in Autonomic Networking
(draft-liu-anima-grasp-distribution-05)

Bing Liu (Presenter), Sheng Jiang, Xun Xiao, Artur Hecker, Zoran Despotovic
@Anima WG, ietf101, March 2018
Reminder

• Information distribution is a function to handle different patterns of information exchange between autonomic nodes
  – Proposing GRASP as bearing protocol

• 05 version merged draft-xiao-anima-event-service
  – New co-authors
  – Comprehensive analysis on scenarios and requirements
  – Discussions of a GRASP extension to support information distribution
Basic Scenarios of Information Distribution

• One to One (1:1)
  – Request/Response (client server model)
  + Notification (agent manager model)
    • E.g. push something to the neighbors that were sleeping/offline

• One-to-Many (1:n)
  – Full distribution (n=N)
    • Some data that in principle all nodes are interested in (e.g. Policies, “Intent”)
  – Partial distribution (n<N)
    • To a subset of nodes (e.g. “shut down all the light bulbs”)
Two Communication Models

• Instant (Synchronous)
  – The sender delivers the message *directly* to the receiver(s) and **waits** for the response.

• Asynchronous
  – The sender delivers the message *directly* to the receiver(s) and **doesn’t wait** for any response.
  – The sender delivers the message *indirectly* to the receiver(s) via a certain module/struct (e.g. Event Queue).
Possible Asynchronous Scenarios in Autonomic Networking

- **Reply takes long time**
  - Node #1
  - Node #2
  - \( T \)
  - E.g. Performing database lookup
  - \( \text{REQ} \rightarrow \text{AF} \rightarrow \text{ANIMA} \)
  - \( \text{AF} \rightarrow \text{ANIMA} \)
  - \( \text{RSP} \)

- **Sharing common interests**
  - Node #1
  - Node #i
  - \( \text{Pub} \) (network intent)
  - \( \text{Sub} \) (network intent)
  - \( \text{Sub} \) (network intent)
  - \( \text{Sub} \) (network intent)

- **Established a common view among AFs**
  - Node #1
  - Node #2
  - Node #3
  - E.g. AFs as distributed schedulers
  - \( \text{DATA 1} \rightarrow \text{AF} \rightarrow \text{ANIMA} \)
  - \( \text{DATA 2} \rightarrow \text{AF} \rightarrow \text{ANIMA} \)
  - \( \text{DATA 3} \rightarrow \text{AF} \rightarrow \text{ANIMA} \)

- **Distributing synthetic/aggregated data**
  - Node #1
  - Node #k
  - \( \text{Pub} \) (event = 
    \( \text{agg} \). Data, local data)
  - \( \text{AGGT. DATA} \)
  - \( \text{Sub} \) (event = aggt. data)
  - E.g.
    - Node \( k \) subscribes to some statistics of the network from other AFs.
    - Other AFs send local data to an aggt. node (event-/topic-based mapping) and publish
Node Requirements and GRASP Extension (1/3)

• On Instant Information Distribution
  – Instant P-to-P
    • GRASP M_Synchronization can already do this, no need for extension
On Asynchronous Information Distribution (1/2)

- Active P-2-P push
  - GRASP Extension: a new M_UnsolicitedSynch for actively push
- Flooding
  - GRASP M_Flood can already do this
- Selective Flooding
  - We need a selection mechanism to let the nodes pruning unnecessary flooding neighbors
  - GRASP Extention: defining a relevant GRASP Objective

Node Requirements and GRASP Extension (2/3)
Node Requirements and GRASP Extension (3/3)

• On Asynchronous Information Distribution (2/2)
  – A Distributed Data Layer (other than simply flooding)
    • In principle, a distributed storage system
      – Should be consistent with autonomic principles (e.g. dynamically discovered/updated/corrected)
      – Produced information will be stored somewhere “in the network” (e.g. “Intent”, “Policy”, “certificates”)
      – GRASP extension: Sub/Pub messaging
    • Event Queuing
      – Some information needs to be strictly queued. E.g. “Switch-on/off” signaling for light bulbs.
      – GRASP extension: TBD
  – API access:
    • ASAs simply access the API for asynchronous communication
Extended ANI with Info. Distribution Module

Node

Autonomic Control Plane (ACP)

Normal OS / Res

GRASP / BRSKI

Neighbor Disc/Neg.
Neighbor Selection
Channel Selection
Security Keys

Routing

AF

ASA

ASA

APIs

Node

Autonomic Control Plane (ACP)

Normal OS / Res

GRASP / BRSKI

Neighbor Disc/Neg.
Neighbor Selection
Channel Selection
Security Keys

Routing

AF

ASA

ASA

APIs

Info. Distribution (with Storage)
Event Queues
Comments?
Consider adoption?

Thank you!

IETF101, London