An Overview of Multiple Access Management Services (MAMS)

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Multi Access Management Services - MAMS

- Multi Access Management Services (MAMS) is a framework for configuring and selecting protocols for multi-access use cases.
- On individual submissions track in IETF (https://www.ietf.org/id/draft-kanugovi-intarea-mams-framework-01.txt)
  - Co-authors from operators and network vendors (Nokia, Intel, Broadcom, Huawei, AT&T, KT).
  - Currently under ISE review.
- MAMS Control Plane protocol
  - MAMS control protocol is application level protocol (JSON encoded over WebSocket).
  - User plane agnostic: selects user plane protocols (e.g. MPTCP, UDP, GRE, etc.) based on service and traffic types.
  - Discovers and selects network side proxies, e.g. off-path or on-path proxies.
  - Configures network paths independently for uplink and downlink using common IETF protocols for multi-access.
  - Adopts dynamically to network conditions using path measurements and analytics.

MAMS in other Standards/Industry forums

- 3GPP ATSSS (Study on Access Traffic Steering, Switching and splitting support in the 5G system architecture)
  - MAMS protocol architecture and flexible user plane configuration are considered in development of TR 23.793 – ”Solution 1” and Measurement control via user plane.
- Wireless Broadband Alliance (WBA)
  - Part of technology discussions in ”Unlicensed Integration with 5G Networks” workgroup and included in the outcome Whitepaper (WiP)
- Small Cell Forum (SCF)
  - Part of work item discussions on “LTE/5G & WiFi Integration Update”
- ETSI Multi Access Edge Computing (MEC)
  - MEC Ph2 multi access requirements includes MAMS use cases (MEC-0021 – UC - Optimizing QoE and resource utilization in Multi-access networks)
- WiFi Alliance (WFA)
  - MAMS Included in technical proposal on hooks for WiFi/Cellular integration for proxy discovery, link metrics and flexible selection of transport protocols

MAMS Framework

Network Connection Manager (NCM)

- Selects and configures proxies, network paths and user plane protocols based on client negotiation.

Client Connection Manager (CCM)

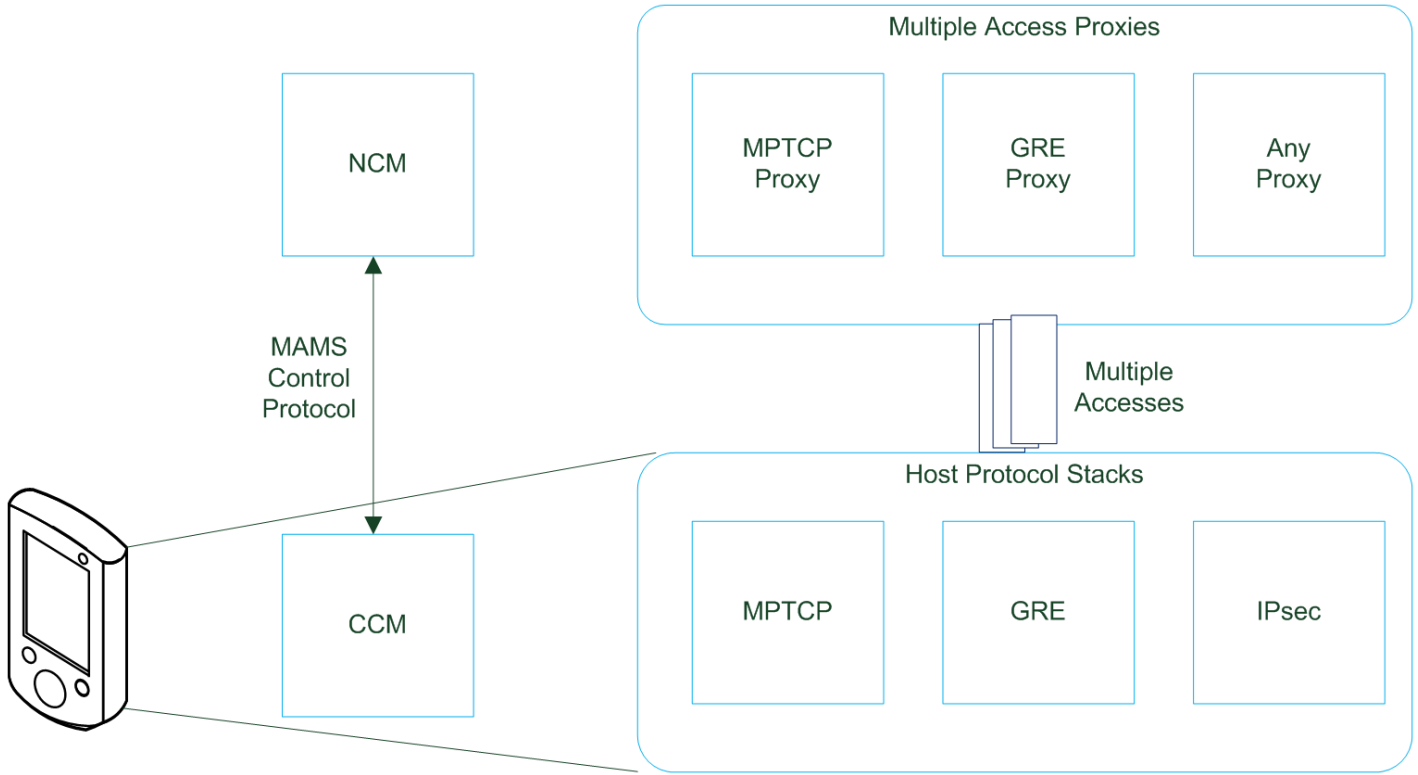
- Negotiates client's capabilities and needs with the NCM and configures network path usage.

N-MADP network side proxies

- User plane distribution and aggregation across configured network paths.

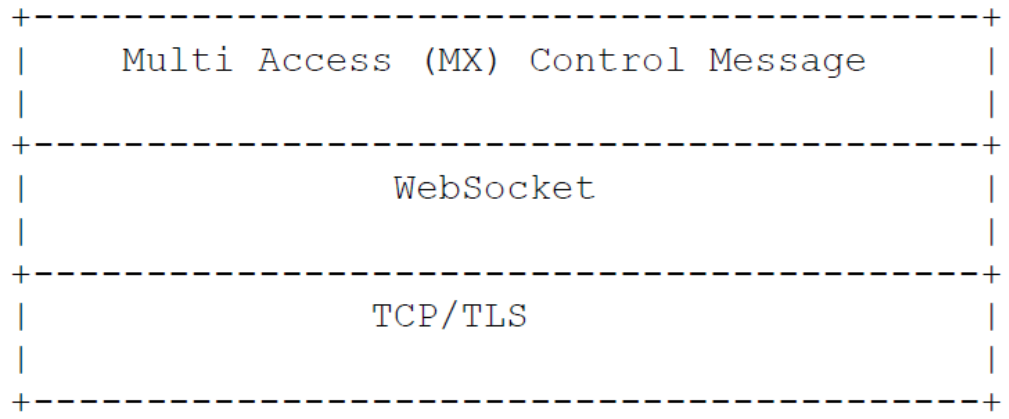
C-MADP client side user plane functions

- Supports any user plane protocols e.g. TCP, UDP, MPTCP, SCTP, GRE, …

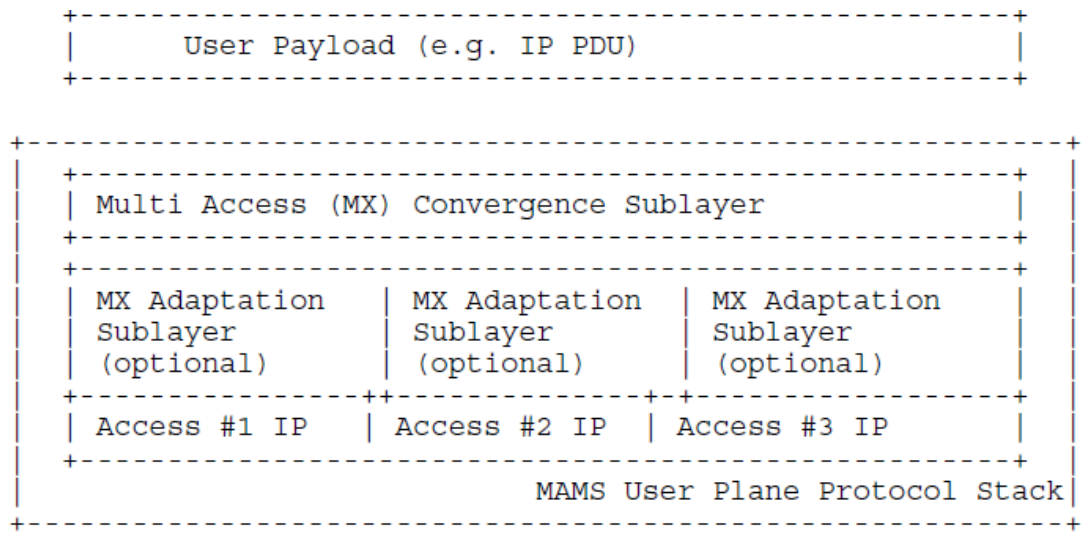


MAMS Control and User Plane Protocols

- Control Plane
  - Messages carried over WebSocket/TLS agnostic to underlying transport network
  - Configures user plane protocols per application needs and client and network capabilities
  - Supports dynamic adaptation of network paths and user plane protocol selection triggered by changing network conditions
- User Plane
  - Provides services like traffic aggregation and distribution
    - Can be use existing protocols like MPTCP, GRE Proxy
    - Or new user plane protocols (e.g. Trailer Adaptation)
  - Divided into:
  - MX Convergence Sublayer: Aggregation and Distribution
  - MX Adaptation Sublayer (optional): access and transport specific aspects of a single path (e.g. NAT, User plane security)



MAMS Control Plane Protocol



MAMS User Plane Protocol

Use cases benefitting from MAMS

- LTE/Wi-Fi integration for enterprises, public venues and stadiums.
- Introduction of local (e.g. hotspot, small cells) 5G deployments and co-operation with the rest of existing infrastructure.
- Improved use of existing fixed line assets, unified platform for managing utilization and joint traffic steering across multiple networks.

Thanks, Feedback Welcome

Back up slides

Background

- Application QoE (quality of experience) varies with choice of network paths
  - Performance varies dynamically based on network conditions, e.g. radio conditions, user population, actual network utilization
    - e.g. 1, Wi-Fi offers good capacity with small number of users which quickly degrades, low throughputs and large unpredictable delays due to uplink contention with larger user population.
    - e.g. 2, LTE capacity is limited by available licensed spectrum but offers predictable performance even with increasing number of users
- Deployment configurations determine certain network path choices for applications
  - e.g. Enterprise apps available only via Wi-Fi IP gateway, Cellular operator hosted Cloud only available via cellular IP gateway, IPsec/VPNs
- Different traffic types require different user plane treatment
  - e.g. MPTCP based aggregation of link capacity for TCP based video flows, Encapsulating Trailer/Header (e.g. GRE) based reordering support for UDP traffic over multiple links
- Selecting best combination of network paths and user plane treatment is essential for consistent and high QoE
  - Dynamically adapt to changing network conditions
  - e.g. Improve enterprise conferencing service (e.g. Skype) by choosing Wi-Fi access in uncongested conditions, Switch only uplink to LTE access as Wi-Fi radio link condition degrades or congestion increases

Limitations of current IETF multi-access approaches

- MPTCP
  - MPTCP Proxy Discovery and Selection missing
  - Identification and configuration of application flows for MPTCP usage (not all flows need MPTCP)
  - Improve performance using out of band path probing and radio link measurements to control
  - Trigger/Defer creation and Proactive deletion of subflows
  - MPTCP scheduler / load balancer configuration (e.g. using enhanced Socket APIs work in IETF)
- Multiple Provisioning Domain Architecture (RFC 7556)
  - PvDs are used to enable separation and configuration consistency for multiple concurrent connections but only at time of IP stack configuration.
  - PvD information is conveyed by DHCPv6, RAs or IKEv2 and assumes IPv6.
  - For interface selection assumes separate host policies that MAMS can provide.

Limitations of current IETF multi-access approaches (cont.)

- IKEv2 Mobility and Multihoming Protocol, MOBIKE (4555)
  - Allows the IP addresses associated with IKEv2 and tunnel mode IPsec Security Associations to change.
  - Is currently limited to tunnel mode, but3GPP needs also transport mode.
  - Load balancing between multiple interfaces is beyond the scope of MOBIKE specification.
  - Does not work over address pairs that provide only unidirectional connectivity.