TSG-RAN Working Group 3 meeting #2
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Agenda: **12.1**

Source: **Motorola**

Title: **Signaling Bearer for the IP Domain: A comparison of Alternatives**

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Date: **March 15-19, 1999**

Source:

Key Issue: **Iu Reference Point (IP domain control plane)**

1. Introduction

The following alternatives have been proposed for the signaling bearer for the IP domain:

Alternative 1:

Alternative 1 proposes that the protocol stack for the signaling bearer for the IP domain is based on state of the art protocol(s) being developed within IETF. Figure 1 illustrates the preferred protocol stack for this scenario. For further details of alternative 1 refer to Tdoc R3-99-135.

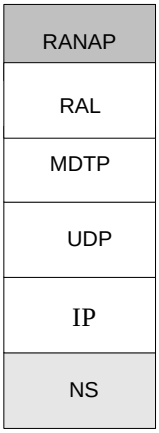

Figure 1: IP Based Control Plane Protocol Stack for the IP Domain

Alternative 2:

Alternative 2 proposes that the signaling bearer for the IP domain is based on that used in PSTN/ISDN (see Figure 2). For further details of this proposal refer to ETR 23.20 V1.5.0 Appendix 1, Section 1.2 and S3.12, Iu Signalling Transport V0.0.2

Figure 2: SS7 Based Protocol Stack Control Plane for the IP domain

2. Discussion

It is widely accepted that a signaling bearer that uses IP based protocol stack for the signaling bearer for the IP domain is better suited that one that employs a signaling system 7 based protocol stack.

The proponents of the Alternative 2 argue that having a control plane that is based on SS7 will allow the control plane to be the same for both the IP and the PSTN domain. This will facilitate the implementation of a single serving node (MSC and GSN combined) to serve both domains. Further, it is claimed that having a SS7 based control plane for both the IP domain and the PSTN/ISDN domain will facilitate a simpler RNC implementation.

The IP domain is designed to provide access to IP applications to end-users. IP is by its very nature connectionless in contrast to the PSTN/ISDN domain that is connection oriented. The signaling system 7 is designed to serve the need of connection oriented applications. Therefore the use of a control plane protocol stack that is based on SS7 (proposal 2) either will not be appropriate for the IP domain or additional standardization activities will have to be undertaken within 3GPP.

Note that SS7 does not have all the tools required to serve the needs of the IP domain. For instance, the notion of linksets[1] used in the PSTN/ISDN domain has little meaning for the IP domain. It is relevant to note that currently 3 different proposals are being considered for the IP domain user plane. Note that the notion of linksets is used in the SS7 to achieve fault tolerance and load balancing. IP uses its connectionless approach to achieve the same desired results. Note that IP is inherently fault tolerant and IP routing policies are designed to route around failures and achieve load balancing. Further, IP is superior to SS7 in adapting to congestion. Note that SS7 uses flow control techniques (withholding acknowledgements), implemented at the end points, to respond to congestion, which adversely affects performance.

MDTP provides load sharing across a multiple link set with guaranteed delivery sequence. In SS7, guaranteed delivery sequence is only achieved if all messages are exchanged over the same path.

Choosing an SS7 based control plane would restrict the evolution of the IP domain since protocols designed specifically to address the needs of the IP world could not be incorporated into the IP domain in UMTS/3GPP.

[1] Linksets refer to a group of signaling links. No more than 16 links can be assigned to a linkset. All links in a linkset must have the same adjacent nodes. The switching equipment alternates transmission across all links in a linkset to ensure equal utilization of all available links.

The use of SS7 based control plane restricts the nature of network topologies that must be employed since SS7 is based on a point-to-point paradigm. On the other hand no such restrictions are placed by the use of an IP based control plane.

An IP based control plane enables dynamic configuration of network elements and topologies. For instance, an RNC can be added in a “plug and play” fashion. This results in simplifying network configuration and management significantly. On the other hand, if an SS7 based control plane is used, adding an RNC would require significant planning, manual configuration, and coordination.

Given that IP based protocols will be used for network management and configuration the IP protocol stack has to be supported on all network elements. Since an IP based protocol stack is required for network management, the argument that additional complexity will be placed on network elements, if an IP based protocol stack is used for the signaling bearer, is incorrect.

An IP based control plane could implement Network Time Protocol (NTP), which provides synchronization of time, to national time standards, across all nodes within a subnet. This could be useful for Billing ,Diagnostics and/or Debugging, where timestamps could be used to correlate events. No such mechanisms exist for an SS7 based control plane.

It is widely accepted that the hardware costs of an SS7 based implementation is significantly more expensive than an IP based solution. For example, the price/performance of a router is significantly less than a comparable Signaling Transfer Point (STP). Furthermore, the footprint of a STP is substantially larger than rack mountable Router equipment. Therefore, the cost of deploying IP based equipment will most likely be an order of magnitude less than the cost of deploying SS7 based equipment.

It has been agreed that L1/L2 shall be independent of L3 signaling. The IP protocol suite is designed on this principle and IP protocol can be supported over any L1/L2 technology. However, the same can not be said for the SS7 protocol suite. Therefore, in order to use an SS7 based protocol stack for the signaling bearer, additional standardization work would have to be undertaken to achieve the desired independence.

There are a number of national variations of SS7, whereas there is only one version of IP, i.e. no national variations.

3. Conclusions and Proposals

From the discussion in section 2 it is quite clear that use of an IP based control plane is the logical and obvious choice for the IP domain in UMTS/3GPP. Therefore it is proposed that an IP based protocol stack is used at the Iu reference point for the IP domain signaling bearer.

Further, given that some organizations have expressed an interest in using the same control plane for both the IP domain and the PSTN/ISDN domain in UMTS/3GPP, the use of an IP based control plane must be investigated for the PSTN/ISDN domain. IP protocols are capable of encapsulating SS7 addresses while a similar capability does not exist in SS7. In this context, it is interesting to observe that some interfaces in cellular networks employ an IP based control plane for wireless telephony (IS-634).

Given the above observations, the following working assumption is proposed:

1. An IP based control plane is chosen at the Iu reference point for the IP domain.
2. The Control Plane protocol stack in Figure 1 is chosen as the Control plane at the Iu reference point for the IP domain.
3. The diagram for alternative 1 in section 1 of this contribution is added to a new subsection 5.2.2 of S3.12, ref [1].

4. References

[1] S3.12, Iu Signalling Plane, v0.0.2