CTIA
Building The Wireless Future
Cellular Telecommunications Industry Association

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December 4, 1998

Ms. Magalie Salas
Secretary
Federal Communications Commission
1919 M Street, N.W., 2nd Fl.
Washington, D.C. 20554

Re: Ex Parte Presentation
CC Docket No. 94-102

Dear Ms. Salas:

On November 18, 1998, Dan Grosh, Special Counsel in the Policy Division, Wireless Telecommunications Bureau, asked John Marinho, Chairman of the Telecommunications Industry Association's ("TIA") TR 45 Committee, to provide responses to ten questions regarding the operation of Automatic A/B Roaming as a possible solution for improved completion of 911 calls from a wireless handset. The Cellular Telecommunications Industry Association ("CTIA") and TIA Committee TR 45 hereby provide a joint response to the questions posed by Dan Grosh. The joint response is attached to this letter.

The following FCC staff will receive a copy of this letter and the attached joint response.

Wireless Telecommunications Bureau

Mr. John Cimko, Chief, Policy Division
Ms. Nancy Booker, Deputy Chief, Policy Division
Mr. Dan Grosh, Special Counsel, Policy Division
Mr. Ron Netro, Senior Engineer, Policy Division
Ms. Won Kim, Attorney Advisor, Policy Division

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Office of Engineering and Technology

Mr. Dale Hatfield, Chief
Mr. Bruce Franca, Deputy Chief

Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter and the attached joint response are being filed with your office. If you have any questions concerning this submission, please contact the undersigned.

Sincerely,

Lolita D. Smith

Lolita D. Smith

Automatic A/B Roaming: Industry's response to the FCC

1. How would Automatic A/B Roaming operate? Are there specific criteria for determining when to switch call to B (non-preferred) carrier? If there are no specific criteria, are there limits on the range of possible criteria a handset or carrier may apply?

   See attached 2 documents.

2. Is it possible for a call to be locked-in to the A (preferred) carrier so that the call would not be switched in any case in which the caller could not in fact communicate on the voice channel? If so, under what circumstances?

   No one has yet proposed a solution that promises to complete every 9-1-1 call from a wireless handset. There exists a small probability that any one of a number of circumstances (e.g.: signal strength or interference on the reverse control channel or voice channel; traffic congestion; base station equipment failure) can prevent effective communication on the voice channels associated with the selected control channel.

   Automatic A/B Roaming is more likely to complete 9-1-1 calls than "strongest" (or "adequate") signal. As the record in CC Docket 94-102 makes clear, the use of "strongest signal", or "adequate signal" will not preclude this phenomena from occurring because the availability of strong or adequate control channel does not indicate the availability of a voice channel, and by directing all 9-1-1 calls to a single carrier, "strongest signal" would increase the likelihood of blocking by using all available voice channels in the cell or sector. However, the use of Automatic A/B Roaming would reduce the probability of such blocking by distributing emergency calls more evenly across both carriers' networks.

3. Is it correct that Automatic A/B Roaming requires separate treatment of 9-1-1 calls, in the sense that those calls would be routed in accordance with Automatic A/B Roaming even if the handset is programmed to operate in some other mode for other calls, e.g., A only?

   Yes, using "Automatic A/B Roaming", 9-1-1 calls will be treated differently from all other calls. Regardless of how the phone is programmed (e.g., A Only, B only) the phone will attempt to complete 9-1-1 calls using the Automatic A/B Roaming functionality. Refer to the attached documents.

4. Would Automatic A/B Roaming require any differences in the way handsets handle 9-1-1 calls as compared with ordinary calls?

   Yes, as explained in question #3. To incorporate the "Automatic A/B Roaming" capabilities the software/firmware used in analog phones would need to be modified. Modifications in the field are not possible and the manufacturers believe that a minimum of six months would be required to begin manufacturing new analog phones that incorporate the "Automatic A/B Roaming" capability

5. Will Automatic A/B Roaming affect call setup times and if so by how much? How does the effect on call setup times compare with Strongest Adequate Signal?

   Compared to Strongest/Adequate signal, Automatic A/B Roaming will be far faster and more efficient in setting up and completing a 9-1-1 call. If service is available on the preferred carrier, the 9-1-1 call will be completed in <u>*much less time*</u> *than having the phone scan and rescan all control channels, calculate and compare signal strengths to make a final selection. Every time a cellular phone switches from one carrier's network to the other, it must rescan the available control channels and re-register with the carrier's switch. While the time will vary due to a number of factors, it takes an analog cellular phone 4 to 18 seconds to perform a rescan and register with the switch.*

6. Under Automatic A/B Roaming, is the call transferred to the B carrier, whether or not the call can be completed by that carrier?

   According to the FCC R&O CC 94-102, effective 1 April 1998, all 9-1-1 calls are processed by wireless carriers. Under Automatic A/B roaming, if there is no service with the preferred carrier (A) then the handset is forced to the non-preferred carrier (B). If service is available (e.g. a signal is present) then yes, connection to a PSAP will be made. If no signal is present on the non-preferred carrier (B) then the call can not be completed. Using a proposed variation of Automatic A/B roaming, the phone could at this point re-initiate the search sequence with or without manual intervention (optional variations of the basic functionality). If there is no service available from either the A or B cellular carrier to complete the 9-1-1 call (as is true in Rock Creek Park in Washington, DC), then none of the proposed alternatives will work (nor would "strongest signal")!

7. Do TIA or CTIA have recommended rule language that would implement Automatic A/B Roaming?

   CTIA believes that the FCC should describe a requirement by rule, and leave the development of technical standards, if any are needed, to TIA and the open industry standards process. Automatic A/B Roaming, as described in the attached document, requires mobile stations that are subject to the cellular system compatibility specifications set forth in Section 22.933 of the Commission's rules to automatically override the preferred carrier programming and seek the non-preferred carrier in the event that the preferred carrier is unable to process a 9-1-1 call attempt. Whether this requirement should be applied to mobile stations with digital modes is addressed below.

8. Can Automatic A/B Roaming be applied to dual and multi-mode handsets with digital modes?

   There are significant difficulties in applying Automatic A/B Roaming to incompatible digital air interfaces. Even within compatible digital air interfaces, Automatic A/B Roaming can not be applied to GSM, CDMA, or TDMA digital air interfaces because of the way these digital technologies

function. The question concerning the feasibility of including Automatic A/B Roaming to the analog portion of dual and multi-mode handsets has only recently been raised, and at present, handset manufacturers are still investigating whether Automatic A/B Roaming can be applied to the analog portion of dual/multimode phones, and in particular, whether including Automatic A/B Roaming in such phones will add complexity and require redesign of such handsets.

9. Does Automatic A/B Roaming include, or is it compatible with, a manual backup mode such as that proposed by Bell Atlantic Mobile that would allow the user to switch the call to a different carrier than that selected by Automatic A/B Roaming?

   The manual backup mode proposed by Bell Atlantic Mobile is called "Selective Retry", and it is not included in Automatic A/B Roaming which automates this process without requiring intervention by the caller. While "selective retry" is not incompatible with Automatic A/B Roaming, it would not appear to have any benefit given the handset's ability to automatically override the preferred carrier programming and seek the non-preferred carrier in the event that the preferred carrier is unable to process a 9-1-1 call attempt.

10. In general, in what ways is Automatic A/B Roaming superior in completing 9-1-1 calls to current practice and rules, A/B, and Strongest/Adequate Signal? In what ways is it inferior?

    We are not aware of any area where Automatic A/B Roaming is inferior to the Strongest/Adequate Signal proposal. Automatic A/B Roaming enhances emergency call completion, and is compatible with existing network registration, call set-up and processing of analog cellular calls, and works within the existing technical standards.

    Automatic A/B Roaming functionality is invoked <u>only as necessary</u> to complete a 9-1-1 call when the preferred carrier is unable to process the 9-1-1 call (i.e., for a very small minority of 9-1-1 call attempts). On the other hand, based on the Dallas and Atlanta field data placed in the record of CC Docket 94-102 by the Ad Hoc Alliance, strongest signal and adequate signal approaches result in 9-1-1 calls being processed by the non-preferred carrier approximately <u>50% of the time</u>. Further analysis of the Dallas and Atlanta field data would indicate a random distribution of forward control signal strength, so that that when the preferred carrier is below the proposed adequate signal threshold, in most instances, so is the non-preferred carrier. This calls into further question the claims advanced by the Ad Hoc Alliance. The Dallas and Atlanta field data also shows that Automatic A/B roaming would have allowed for call completion, except in a few instances where <u>neither</u> carrier would have been able to provide a satisfactory connection, <u>i.e.</u>, the Rock Creek Park type of situation, where neither carrier provides coverage.

    Because the strongest signal and adequate signal approaches will divert 9-1-1 calls that could otherwise be completed successfully by the preferred system,

they will cause congestion and blockage, both at the air interface and on the trunks linking the wireless carrier to the PSAP.

It must be noted that 9-1-1 call completion by the non-preferred carrier can result in unintended consequences regardless of what mechanism was used to force the 9-1-1 call onto the non-preferred carrier's network. The caller's records are not accessible to the non-preferred carrier and callback might not be possible by the non-preferred carrier if the phone's MIN is not the phone's MDN (Mobile Directory Number) as will be the case if number portability is required for wireless phones. Call setup time is increased as well. In addition, the ability to locate 9-1-1 callers will be placed at risk when the non-preferred carrier completes a 9-1-1 call. For example if Carrier A implements a network based Phase 2 9-1-1 location solution, and Carrier B implements a GPS Handset solution (with GPS/phones units provided to its customers), a customer from Carrier A, whose 9-1-1 call is being completed by the non-preferred Carrier B, cannot be located because there is no GPS unit built into the Carrier A customer's phone.

As TIA determined, the Strongest Signal works against 9-1-1 call completion by forcing handsets to reregister on the non-preferred system. Automatic A/B Roaming minimizes the number of times that the non-preferred carrier will be called upon to complete 9-1-1 calls thereby minimizing the possibility of unintended consequences and maximizing the network capacity available to complete 9-1-1 calls.

Finally, the Automatic A/B Roaming proposal has been developed by, and can be implemented through an open industry process, while the Strongest Signal/Adequate Signal proposal involves proprietary patented technology. Automatic A/B Roaming can be implemented within the existing industry standard with no need for an unprecedented change to the cellular system compatibility specifications requested by the Ad Hoc Alliance.

Attachments

1. Description of Automatic A/B Roaming

2. TIA correspondence on call origination (from the Chair of TIA TR45.1 Analog Subcommittee)

AUTOMATIC A/B ROAMING FOR 9-1-1 CALLS: AUTOMATING "A OVER B" OR "B OVER A" SYSTEM SELECTION for 9-1-1 Calls[1]

November, 1998

Background

There has been a lot of controversy recently over approaches for improving the completion rate of 9-1-1 calls from wireless phones. The Ad Hoc Alliance for Public Access to 9-1-1 has been urging the FCC to adopt rules that would mandate the use of a "strongest signal" concept wherein a cellular analog phone would seek out the strongest forward control channel from either the A or B carrier before completing the 9-1-1 call.

In September of 1998, the FCC issued a Notice for Additional Comments for a revised "adequate signal" proposal from the Ad Hoc Alliance that sets a –80dBm threshold for 9-1-1 calls at which point the handset would switch from the preferred carrier to the non-preferred carrier. An alternative to "strongest/adequate signal" is to manually program analog cellular phones to allow the phone to access the non-preferred carrier if the preferred carrier's network is not available. The industry term for this is System Selection wherein the phone can be programmed to allow an A side carrier serviced phone to access the B side cellular carrier if the A side cellular carrier's network is not available (or vice versa if it is a B carrier serviced phone). Coverage "holes" will always exist in one form or another in the wireless network due to the very nature of radio communications. Thus a wireless telephone user who is located in such a hole may find that there is no signal or insufficient signal to establish and maintain adequate communications over the wireless system accessed by the handset. In the case of no signal from the preferred system, manually programming a purely analog handset to use A over B or B over A will allow the 9-1-1 call to be completed by the non-preferred carrier if this carrier has coverage at that location. However, it must be noted that any approach to completing 9-1-1 calls that overrides System Selection might not be desirable to the customer in some instances. For example border problems along the Canadian and Mexican borders could cause the 9-1-1 call made in the U.S. to be answered across the border. Similar problems could exist where the A and B cellular market areas are not contiguous, and near large bodies of water or in mountainous terrain.

In September of 1998, TIA responded to a June 1998 CTIA Standards Requirements Document for improving call completion of 9-1-1 calls. In the September 1998 response, TIA indicated that System Selection could be automated in a manner that we now refer to as "Automatic A/B Roaming" whereby the handset functionality automatically overrides any "local" A/B programming of the handset (e.g., subscriber programmed for preferred carrier only) and seeks a non-preferred carrier in the event that the preferred carrier is

[1] System Selection allows you to select the cellular system that your phone will access - also referred to as System Mode or Network Selection

unable to process the 9-1-1 call attempt. TIA indicated that such an approach can be implemented within existing standards and is compatible with present network registration, control, and call setup procedures and functions.

Automatic A/B Roaming capability appears to be the best alternative for enhancing call completion for 9-1-1 calls. Of the alternatives considered by TIA, this approach minimizes potential unintended consequences while meeting the basic objectives of the FCC in a timely manner. This concept is also acceptable to carriers, manufacturers, and the public safety community.

The attached document provides an overview of a call flow (including network registration, control, call setup procedures and functions) that might occur using "Automatic A/B Roaming" for a 911 call. In essence, using "Automatic A/B Roaming", if an A side customer's 9-1-1 call can not be completed by the A side carrier, the phone will switch to the B side and scan the B side to complete the 9-1-1 call.

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November 23, 1998

Ed:

Per your request, here is some background information on what's contained in the air interface regarding the selection of System A or B during call origination. The reference is EIA/TIA-553 (September 1989).

In section 2.3.10 PREFERRED-SYSTEM SELECTION indicates that "A means must be provided within the mobile station to identify the preferred system as either System A or System B". There is no indication of when this can or cannot be changed.

Throughout the call processing section (2.6), the sometimes-confusing term of "serving-system status" is used. If the preferred system is System A, the serving system status is *enabled.* If the preferred system is System B, the serving-system status is *disabled.*

The failure in any of the tasks in the origination process end at the Serving System Determination Task (2.3.1.12) which states:

> "If the serving-system status does not correspond to the preferred system, the mobile station may enter the Retrieve System Parameters Task (see 2.6.1.1); otherwise, it must enter the Paging Channel Selection Task (see 2.6.1.2)".

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In other words, the mobile should return to scanning the control or paging channels of the system (A or B) on which the access was just attempted, unless the preferred system selection has been changed.

The access can be broken down into a couple of major phases: Determining parameters of the system that control the access attempt, transmitting the access to the base station, and waiting for an order from the base station.

Regarding the selection of the control channels from which to receive the parameters for accessing the system, the air interface specification is loosely worded. In section 2.6.1.1.2 UPDATE OVERHEAD INFORMATION the document states "If the mobile station cannot complete this task on the strongest dedicated control channel, it *may* (my emphasis) tune to the second strongest dedicated control channel and attempt to complete this task within a 3-second interval." Thus, no signal level thresholds for access are specified, the ability to receive the overhead information is the indicator that the mobile can attempt to be served by the system.

If the mobile cannot successfully receive the overhead information on the current "serving system" (A or B), it *may* try the other.

When attempting to transmit the access to the system for a call origination (section 2.6.3), the mobile sets a timer to "a maximum of 12 seconds" to complete the access, i.e. successfully transmit the origination request to the base station. Then the mobile scans the control channels and chooses "up to two channels with the strongest signals".

If the mobile fails to access the strongest channel, the air interface specification indicates in section 2.6.3.13 ALTERNATE ACCESS CHANNEL TASK that the mobile " *may* tune to the second strongest channel. Otherwise, if it fails on the second channel, the mobile "must enter the Serving-system Determination Task (2.6.3.12)."

Upon successfully transmitting the origination request to the base station, the mobile station sets a timer to 5 seconds to receive either an initial voice channel designation message, a directed retry message, an intercept order or a reorder message.

The initial channel designation message tells the mobile station to tune to the voice channel where the call will continue in the conversation state. Any failure on the voice channel (fade timer expires) sends the mobile back to the Serving-system Determination Task (2.6.3.12) to scan the preferred system control channels.

The directed retry message allows the system to indicate to the mobile a list of up to 6 other access channels to try. Either one additional access attempt from the list is allowed (using the Last Try flag, LT_s) or it can continue to try the channels until the 12-second access timer expires. If this fails, the mobile goes to Serving System Determination Task (2.6.3.12).

The other two messages, reorder and intercept send the mobile to the Serving-system Determination Task (2.6.3.12).

This is the extent to which EIA/TIA-553 specifies the relevant actions of the mobile station during an origination. If you have any questions, please contact me at your earliest convenience.

Regards,

John Kay

Chair, TIA TR-45.1

CC: John Marinho, Chair, TIA TR-45
Tim Jeffries, CTIA

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