



ATIS STANDARD

ATIS-0500039

**Analysis of Predetermined Cell Sector Routing Outcomes  
Compared to Caller's Device Location**

**TECHNICAL REPORT**



As a leading technology and solutions development organization, the Alliance for Telecommunications Industry Solutions (ATIS) brings together the top global ICT companies to advance the industry's most pressing business priorities. ATIS' nearly 200 member companies are currently working to address the All-IP transition, 5G, network functions virtualization, big data analytics, cloud services, device solutions, emergency services, M2M, cyber security, network evolution, quality of service, billing support, operations, and much more. These priorities follow a fast-track development lifecycle — from design and innovation through standards, specifications, requirements, business use cases, software toolkits, open source solutions, and interoperability testing.

ATIS is accredited by the American National Standards Institute (ANSI). The organization is the North American Organizational Partner for the 3rd Generation Partnership Project (3GPP), a founding Partner of the oneM2M global initiative, a member of the International Telecommunication Union (ITU), as well as a member of the Inter-American Telecommunication Commission (CITEL). For more information, visit [www.atis.org](http://www.atis.org).

---

### **Notice of Disclaimer & Limitation of Liability**

The information provided in this document is directed solely to professionals who have the appropriate degree of experience to understand and interpret its contents in accordance with generally accepted engineering or other professional standards and applicable regulations. No recommendation as to products or vendors is made or should be implied.

NO REPRESENTATION OR WARRANTY IS MADE THAT THE INFORMATION IS TECHNICALLY ACCURATE OR SUFFICIENT OR CONFORMS TO ANY STATUTE, GOVERNMENTAL RULE OR REGULATION, AND FURTHER, NO REPRESENTATION OR WARRANTY IS MADE OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. ATIS SHALL NOT BE LIABLE, BEYOND THE AMOUNT OF ANY SUM RECEIVED IN PAYMENT BY ATIS FOR THIS DOCUMENT, AND IN NO EVENT SHALL ATIS BE LIABLE FOR LOST PROFITS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES. ATIS EXPRESSLY ADVISES THAT ANY AND ALL USE OF OR RELIANCE UPON THE INFORMATION PROVIDED IN THIS DOCUMENT IS AT THE RISK OF THE USER.

<p>NOTE - The user's attention is called to the possibility that compliance with this standard may require use of an invention covered by patent rights. By publication of this standard, no position is taken with respect to whether use of an invention covered by patent rights will be required, and if any such use is required no position is taken regarding the validity of this claim or any patent rights in connection therewith. Please refer to [<a href="http://www.atis.org/legal/patentinfo.asp">http://www.atis.org/legal/patentinfo.asp</a>] to determine if any statement has been filed by a patent holder indicating a willingness to grant a license either without compensation or on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain a license.</p>
--

---

ATIS-0500039, *Analysis of Predetermined Cell Sector Routing Outcomes Compared to Caller's Device Location*

*Published by*

**Alliance for Telecommunications Industry Solutions**

**1200 G Street, NW, Suite 500**

**Washington, DC 20005**

Copyright © 2019 by Alliance for Telecommunications Industry Solutions

All rights reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher. For information contact ATIS at 202.628.6380. ATIS is online at < <http://www.atis.org> >.

ATIS Technical Report on

# **Analysis of Predetermined Cell Sector Routing Outcomes Compared to Caller's Device Location**

**Alliance for Telecommunications Industry Solutions**

Approved July 2, 2019

## **Abstract**

This Technical Report summarizes the research and findings associated with ESIF Issue 99. It explores specific characteristics of sub-optimally routed wireless emergency calls, such as where they occurred as well as the distribution of their distances from the boundaries of the Public Safety Answering Points (PSAPs) to which they routed. This report also includes recommendations derived from these findings for cell sector based routing and Location Based Routing (LBR) implementations.

## Foreword

---

The Alliance for Telecommunications Industry Solutions (ATIS) serves the public through improved understanding between carriers, customers, and manufacturers. The Emergency Services Interconnection Forum (ESIF) provides a forum to facilitate the identification and resolution of technical and/or operational issues related to the interconnection of wireline, wireless, cable, satellites, Internet, and emergency services networks.

The mandatory requirements are designated by the word *shall* and recommendations by the word *should*. Where both a mandatory requirement and a recommendation are specified for the same criterion, the recommendation represents a goal currently identifiable as having distinct compatibility or performance advantages. The word *may* denotes an optional capability that could augment the standard. The standard is fully functional without the incorporation of this optional capability.

Suggestions for improvement of this document are welcome. They should be sent to the Alliance for Telecommunications Industry Solutions, Emergency Services Interconnection Forum (ESIF), 1200 G Street NW, Suite 500, Washington, DC 20005.

At the time of consensus on this document, ESIF, which was responsible for its development, had the following leadership:

- R. Marshall, ESIF Chair (Comtech)
- J. Green, ESIF 1<sup>st</sup> Vice-Chair (Sprint)
- R. Muscat, ESIF 2<sup>nd</sup> Vice-Chair (Bexar Metro 911)
- K. Springer, ESIF ESM Co-Chair (AT&T)
- J. Green, ESIF ESM Co-Chair (Sprint)

The Emergency Services & Methodologies (ESM) Subcommittee was responsible for the development of this document.

**Table of Contents**

<b>1</b>	<b>SCOPE, PURPOSE, &amp; APPLICATION</b> .....	<b>1</b>
1.1	SCOPE.....	1
1.2	PURPOSE.....	1
1.3	APPLICATION.....	1
<b>2</b>	<b>REFERENCES</b> .....	<b>1</b>
<b>3</b>	<b>DEFINITIONS, ACRONYMS, &amp; ABBREVIATIONS</b> .....	<b>2</b>
3.1	DEFINITIONS.....	2
3.2	ACRONYMS & ABBREVIATIONS.....	2
<b>4</b>	<b>BACKGROUND</b> .....	<b>2</b>
<b>5</b>	<b>APPROACH</b> .....	<b>3</b>
5.1	DATASETS.....	3
<b>6</b>	<b>METHOD</b> .....	<b>3</b>
6.1	STAGE 1 – GEOGRAPHIC ANALYSIS.....	3
6.2	STAGE 2 – PROXIMITY ANALYSIS.....	4
<b>7</b>	<b>ANALYSIS</b> .....	<b>4</b>
7.1	STAGE 1 – GEOGRAPHIC ANALYSIS.....	4
7.1.1	<i>Nationwide</i> .....	5
7.1.2	<i>State of Iowa</i> .....	6
7.1.3	<i>Atlanta Area</i> .....	7
7.1.4	<i>Philadelphia Area</i> .....	8
7.1.5	<i>Seattle Area</i> .....	9
7.1.6	<i>Detroit Area</i> .....	10
7.2	STAGE 2 – PROXIMITY ANALYSIS.....	10
7.2.1	<i>CDF Analysis Graph</i> .....	11
7.2.2	<i>CDF Analysis Table</i> .....	11
<b>8</b>	<b>CONCLUSIONS / RECOMMENDATIONS</b> .....	<b>12</b>
8.1	STAGE 1 – GEOGRAPHIC ANALYSIS CONCLUSIONS.....	12
8.2	STAGE 2 – PROXIMITY ANALYSIS CONCLUSIONS.....	13
8.3	RECOMMENDATIONS.....	13
8.3.1	<i>Cell Sector Based Routing</i> .....	14
8.3.2	<i>Location Based Routing (LBR)</i> .....	15

**Table of Figures**

FIGURE 7.1 – NATIONWIDE HEATMAP OF SUB-OPTIMALLY ROUTED CALLS.....	5
FIGURE 7.2 – STATE OF IOWA HEATMAP OF SUB-OPTIMALLY ROUTED CALLS.....	6
FIGURE 7.3 – ATLANTA AREA HEATMAP OF SUB-OPTIMALLY ROUTED CALLS.....	7
FIGURE 7.4 – PHILADELPHIA AREA HEATMAP OF SUB-OPTIMALLY ROUTED CALLS.....	8
FIGURE 7.5 – SEATTLE AREA HEATMAP OF SUB-OPTIMALLY ROUTED CALLS.....	9
FIGURE 7.6 – DETROIT AREA HEATMAP OF SUB-OPTIMALLY ROUTED CALLS.....	10
FIGURE 7.7 – CDF APPLIED TO ALL CALLS IN STUDY.....	11
FIGURE 8.1 – POSITIONING CONCEPTUAL DIAGRAM.....	14

**Table of Tables**

TABLE 7.1 – CDF PERCENTAGES AT SPECIFIC DISTANCES.....	12
--	----