BETA 80 INTERNATIONAL

REQUEST FOR INFORMATION FOR COMPUTER AIDED-DISPATCH AND MOBILE SYSTEMS

COUNTY OF SAN MATEO
OFFICE OF PUBLIC SAFETY COMMUNICATIONS
RFI NO. 011316CAD

BETA 80 INTERNATIONAL

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1.1. COVER LETTER

February 15, 2016

Office of Public Safety Communications
400 County Center – PSC100
Redwood City, CA 94063

RE: RFI for County of San Mateo

Dear Ms. Young,

Beta 80 International is excited to present County of San Mateo Public Safety Communications with information for a complete Computer Aided Dispatch solution and it would be a pleasure for us to provide an on-site demonstrations of our complete CAD solution, iO™, to the County of San Mateo in the near future. Our mission is to deliver public safety related solutions designed and developed during a long history of success that extends over 3 decades.

Our Parent company, Beta 80 Group, is a CAD Vendor with 25 years of experience in Public Safety, covering 27 million citizen and manages 17 million calls each year in more than 62 Fire/Paramedic Centers installed in different countries. The parent company is based in Milan, Italy and it has offices in Italy, Switzerland, Brazil and Washington, D.C. which serves as the headquarters for the company's North America subsidiary: Beta 80 International, LLC.

Beta 80 International is confident that our CAD solution meets the overall requirements within the RFI and we believe that our last innovative solutions in Public Safety will greatly benefit your agency and the citizen of San Mateo County. Curtis Darnell, Regional Product Manager, and Carlo Paradiso, Key Account Manager, will serve as our initial points of contact and prepared to discuss your project and our iO™ solution in more detail. Below is their contact information:

Curtis Darnell	**Carlo Paradiso**
Regional Product Manager	Key Account Manager
Sacramento, CA, United States	Milan, MI Italy
Mobile +1.510.378.4695	Mobile +39 333.36.61.948
curtis.darnell@beta80group.com	carlo.paradiso@beta80group.com

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Thank you for this opportunity and we look forward to providing you a demonstration of iO™.

Sincerely,

Gregory L. Rohde
General Manager

BETA 80 INTERNATIONAL

1.2. COMPANY OVERVIEW

BETA 80 GROUP

BETA 80 GROUP

Year founded: 1986
Staff: 400
Revenues 2014: $40M

OFFICES

ITALY: Milan, Varese, Mantua, Rome, Benevento
SWITZERLAND: Lugano
BRAZIL: Sao Paulo
USA: Washington D.C.

PUBLIC SAFETY

25 YEARS of experience
62 PSAP`s installed in different countries.
27 MILLION Citizens covered
17 MILLION Calls each year

Milan is the fourth European city in terms of economic growth rate. Its PSAP is based on iO™ system and manages 1.152.493 emergency calls every day.

MEMBER OF:

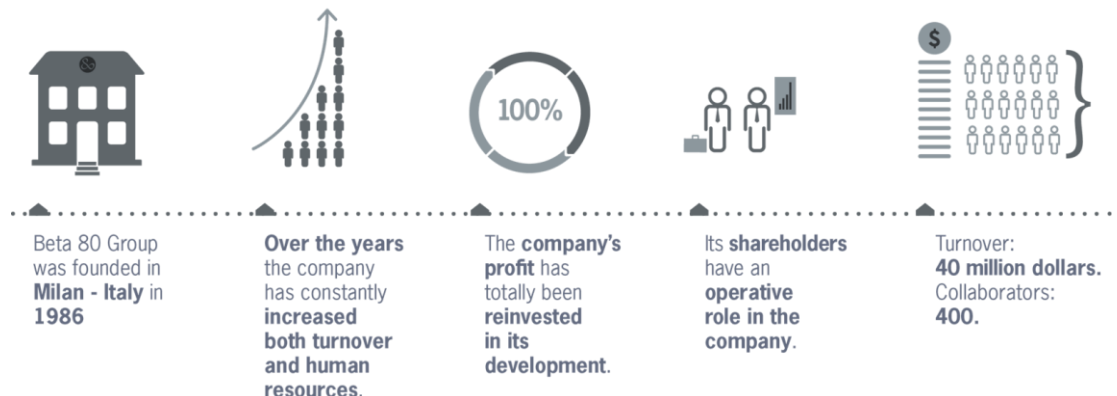**NENA** – National Emergency Number Association
EENA – European Emergency Number Association

Beta 80 Group is an Italian ICT company, established in 1986. It has devoted 30 years to growing and improving a full suite of ICT solutions dedicated to different business areas. As a company with 400 employees and revenues of $ 40 Million (with 100% of its profit being invested in R&D), it is placed among Top #100 companies in the Italian ICT market. Beta 80 Group provides high tech solutions that are based on **in-house developed software platforms** and **best of breed products and services**. Beta 80 Group`s main business areas are:

- Control Room Solutions and Public Safety (iO™ CAD software platform)
- Supply Chain & Warehouse Management
- ICT Services Solutions (ICT Consulting, Business Intelligence, Custom Software, ICT Management)

Beta 80 Group was founded in **Milan - Italy** in 1986

Over the years the company has constantly **increased both turnover and human resources**.

The **company's profit** has totally been **reinvested in its development**.

Its **shareholders** have an **operative role in the company**.

Turnover: **40 million dollars.** Collaborators: **400.**

BETA 80 GROUP IN PUBLIC SAFETY

Beta 80 Group is a CAD Vendor with **25 years** of experience in Public Safety and iO™ is one of the broadest solution on the market for Computer Aided Dispatch. iO™ is highly scalable and manages populations from 100,000 to 13.5 million people, resulting an average of 400,000 people per PSAP. The group has been working in the design and start-up of information systems supporting the activity of emergency operational stations since the early stage of Public Safety in Europe. Its core CAD product, emma, is being adapted for international markets and is called "iO". Any reference to iO™ history and structuring is mainly a reflection of emma in an adaptive platform.

Beta 80 Group has an unprecedented track record of success for its PSAP customers. Today iO™ covers **27 million citizens** and manages **17 million calls each year** in more than **62 Fire/EMS Centers installed in different countries**.

Beta 80 Group has become a leader in Public Safety Communications in Europe. After many years of successful operations, it is expanding into new international markets. Today, the Group has 4 branches in **Italy** plus 3 abroad, **Switzerland**, **USA** and **Brazil**, as well as representatives and business development activities in different countries around the world (currently Dominica, Mexico, Norway, Ireland, South Africa, China and Malaysia).

BETA 80 INTERNATIONAL

As a subsidiary of Beta 80 Group, Beta 80 International LLC, is headquartered in Washington D.C. and oversees all business operations in the U.S. Beta 80 International team has deep expertise and experience in Public Safety Communications. Members of our team have collected invaluable experience within 911 Communications Centers operations, as our General Manager, Gregory L. Rohde, and our Regional Product Manager, Curtis Darnell.

Gregory L. Rohde, General Manager

Our General Manager, Mr. Rohde is a technology executive and recognized expert in telecommunications, wireless, and public safety communications policy at the international level.

He serves and has served on several corporate and non-profit boards and holds senior executive positions in some of the industry's exciting start up wireless and spectrum companies. Rohde founded (2001) and also serves as the President of e-Copernicus – a telecommunications consulting firm providing broadband and telecommunications financing and business development services.

Mr. Rohde served as the Executive Director of the E9-1-1 Institute – a not-for-profit organization that supports the Congressional E9-1-1 Caucus in promoting E9-1-1 and emergency communications development and public policy education.

Mr. Rohde is the former Assistant Secretary of Commerce for Communications and Information and the Administrator of the *National Telecommunications and Information Administration* (NTIA), the telecommunications and information service policy agency of the United States government and manager of the federal radio magnetic spectrum. As the head of NTIA, he served as the principal advisor on telecommunications and information policies, domestic and international, to the President of the United States and was the lead voice of the Administration on matters before the Federal Communications Commission (FCC) and on international telecommunications policy issues.

Mr. Rohde's public service career began in 1988 with U.S. Senator Byron L. Dorgan (D-ND) for whom he worked for more than 10 years as chief policy advisor for all areas of jurisdiction under the Senate Committee on Commerce, Science and Transportation. Mr. Rohde played a key role in major legislation such as the Telecommunications Act of 1996, the Internet Tax Freedom Act, and the Wireless Communications and Public Safety Act of 1999.

Curtis Darnell, Regional Product Manager

Curtis Darnell brings his lengthy public safety experience to the Beta 80 International team. He worked for 28 years at Santa Clara County Communications in California before retiring in 2010. He rose through the ranks of being a law, fire and medical dispatcher, eventually becoming the Chief of the agency and overseeing four managers, six supervisors and 73 line dispatchers. He is an active member of NENA, APCO and the NG911 Institute.

Mr. Darnell has also taught at the South Bay Regional Public Safety Training Consortium at Evergreen College in San Jose, California, for the past 12 years, instructing aspiring dispatchers in the state mandated three-week POST academy. Mr. Darnell is also a part of Gerson Lehrman Group (GLG), which manages the world's leading network of experts, the GLG Councils. Mr. Darnell has consulted with and advised a variety of clients on issues ranging from CAD vendor competition, PSAP management environments and air ambulance service delivery systems.

BETA 80 **INTERNATIONAL**

BUSINESS PARTNERSHIPS

Today, Beta 80 International is partner of Avaya (DevConnect member), ECaTs, Hunter Technologies, Tablet Command and Pick1 in the development of new solutions for Next Generation 9-1-1 (NG9-1-1). This partnership will support us in bringing innovation and disruption to the Public Safety market place in North America.

1.3 BETA 80 ADVANTAGES

IMPLEMENTATION SUCCESS

Beta 80 Group's team of developers experts and service professionals work constantly to ensure our customer's projects are successfully implemented and the iO™ solution is operating as it should. We are proud of the fact that in almost 25 years of business, we have never lost a public safety agency customer and we have never failed the implementation of a contracted project. Implementation success and customer satisfaction are our top priority. With that philosophy, we realize that the best path to follow in North America is to have iO™, "built by dispatchers, for dispatchers". That is why we have been running different Market Trials in different 911 PSAPs to best serve our customers in North America.

CUSTOMIZATION

Thanks to iO™ customization characteristics and to its modular structure, new fields, modified graphical user interface, new processes and functions can be inserted according to Customer's needs. In the cases of standard configurations or real time customizations, iO™ has the **Management and Administration Module** that allows you to fine-tune the system with respect to the specific needs of the Center.

CUSTOMER SUPPORT

In 25 years of activities for Public Safety, Beta 80 Group has never lost a customer thanks to its commitment to customer satisfaction. This relies also on solid Customer Support experience that is granted also to its North American customers. We operate through our 24/7 Help Desk that manages any requests for support and that can operate remotely to solve the majority of issues. We also use local resources based in strategic US areas to reach our customers in a few hours if of on-site support is needed.

PRICING MODEL

Beta 80 Group offers a per seat pricing model that allows PSAP and Public Safety Agencies to use the wide range of features of the platform with an all-included approach. That means that all the functionalities are already available to Call Takers, Dispatchers and Managers from the very first day of operations, without the need of future added costs. We write clear contracts for our services that thoroughly describe services, features and benefits. We know customers want to easily understand what they are getting with our all-inclusive approach instead of being surprised by hidden add-ons. The contract could be based on Perpetual License and Yearly Maintenance or on a Monthly "as a service approach", depending on the needs of any customer.

1.4. PRODUCT DIRECTION

iO™ EVOLUTIONARY ROAD MAP

Beta 80 invests more than $1.5 million dollars annually in R&D for its iO™ platform. During 2015 the development and design team worked with customers and partners with the support of global design firm to redesign major features to keep iO™ as the most innovative product on the market.

For example, some features, like a proactive command line, full list of resources and dispatches and so on, have already been added to the current version in order to be compliant with input received from dispatchers at Sacramento Regional Fire/EMS Communication Center in California where an iO™ market trial is currently being conducted.

By first quarter of 2016 we will deeply a complete new GIS platform that is better integrated with the CAD and provides the user with a completely new and more effective experience; The Tavolo™ software platform will see new releases in 3 months that will implement features required by the current customer base, such as display of resources from multiple agencies, design features and emergency plans.

We can provide, on request, a full detailed product roadmap for the next few years.

IO™ FOR LAW AGENCIES

Beta 80's depth of experience in providing CAD to its existing customers is concentrated in Fire and EMS. The existing iO™ Law services platform is being further developed where we are drawing upon individuals and call centers with long experience with U.S. law dispatching. Despite the general processing needs common to all three public safety disciplines, we recognize the particular aspects of a law CAD that are different from Fire and EMS:

- A greater volume of field generated events (car stops, person stops, safety needs viewed by officers/deputies);
- A dynamic connection to outside systems (local, state and federal) for obtaining information about misdemeanor/felony warrants, driver's licenses, vehicle registrations, probation/parole status, weapon queries, property queries, missing/protected persons, etc.; and
- Intelligent connection to RMS and premise history data bases.

Beta 80 is also interested in working directly with San Mateo County dispatchers to engage in a collaborative process with Beta 80 staff to design a law CAD that is easy to use and functions in every way that makes their work flow productive and efficient.

We will provide, "an integrated Commercial Off the Shelf (COTS) CAD/Mobile system". Our invitation to San Mateo County Public Safety is to help create an optimally customized law CAD

that can set the standard for what a law CAD should be. You know what you want. We can build it together.

1.5. BETA 80 EXPERIENCE

REFERENCE #1	
Agency Name	**AREU – Azienda Regionale Emergenza Urgenza** **Beta 80 S.p.A. as subcontractor of Telecom Italia S.p.A.** The Public agency in charge of EMS and 112 European Emergency Number services in Lombardy Region, Italy. AREU manages ten 2nd levels EMS PSAPs and three 1st level 112 PSAP (Varese, Milan and Brescia).
Est. Total Number of Uniform/Civilian Staff	Uniform / Civilian Staff: 3,644 Volunteers: 8,000
Est. Population Served	13.5 Million people (which accounts for 10 million residents and Tourists and daily commuters)
Est. Number calls of annual calls for service	1,152,493 calls per year
Est. number of fire stations and units	Number of Fire Stations: 97 Number of managed units: 580 (basic and advanced ambulances, helicopters)
Contact Name	Mr. Piero Maria Brambilla (CTO of AREU)
Contact Title	CTO Manager
Contact Phone	+39 335 54 65 655
Contact Email	p.brambilla@areu.lombardia.it
Date CAD Contract Signed / Date CAD First Went Live	Last contract signed: 2010 Date CAD First went live: 1995
How is this reference particularly relevant?	Areu's Centre is an example of managing different agencies with several and different protocols incorporated in a single emergency standard operational procedures. The Operations Centre manages the units and services increase in a metropolitan area with focus on communication and information sharing between all resources on field and the Center; using Mobile CAD, application, Radio device. Moreover, Areu offers two innovative emergency apps for its citizens, one is WhereAREU for Emergency calls and caller location (for further information check page 38-40). The app offers several functions, as for instance, the "silent call" - when the caller is in a situation of danger and is unable to talk with the dispatcher, PSAPs will have its precise positioning in real time to dispatch resources anyway. It allows you to preset a friend's phone number and has a "witness" function to let PSAPs know when the caller is not directly involved in the incident.

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REFERENCE #2	
Agency Name	**TRENTO Fire Brigades**
Est. Total Number of Uniform/Civilian Staff	Total number: 1,000
Est. Population Served	550,000 people served
Est. Number calls of annual calls for service	An average of 70,000 calls per year
Est. number of fire stations	150 Fire stations
Contact Name	Mrs. Luisa Zappini
Contact Title	Director
Contact Phone	(+39) 0461.495250
Contact Email	luisa.zappini@provincia.tn.it
Date CAD Contract Signed / Date CAD First Went Live	Last contract signed: 2010 Date CAD First went live: 2010
How is this reference particularly relevant?	Trento Fire manages several different fire stations on a mixed territory (urban-rural) coordinating with volunteer firemen as well as with professional teams. Also, it is the first Italian "*serverless*" fire PSAP with a remote disaster-proof data center, shared with other Public Safety agencies.

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REFERENCE LIST OF CONTROL ROOMS RUNNING IO™

LOMBARDIA REGION, ITALY

Beginning of service: 1994

112 – European emergency number MILAN*	22 seats, 2 administration seats eCall system installed
112 – European emergency number VARESE	18 seats, 2 administration seats eCall system installed
112 – European emergency number BRESCIA	24 seats, 2 administrator seats eCall system installed
EMS + Out-of-hours medical service + non-emergency medical transportations MILAN*	25 seats, 4 administration seats, 100 remote sites
EMS BERGAMO	20 seats, 2 administration seats, 33 remote sites
EMS COMO + Out-of-hours medical services COMO	16 seats, 2 administration seats, 32 remote sites
EMS + Out-of-hours medical services PAVIA	15 seats, 2 administration seats, 48 remote sites
Civil Protection MILAN*	12 seats, 6 administration seats

VENETO REGION, ITALY

Beginning of service: 2002

EMS VENICE	6 seats, 1 administration seats, 9 remote sites
EMS PADUA	5 seats, 1 administration seats, 9 remote sites
EMS + non-emergency medical transportation VERONA	6 seats, 1 administration seats, 7 remote sites
EMS VICENZA	6 seats, 1 administration seats, 14 remote sites

TRENTINO-ALTO ADIGE REGION, ITALY

Beginning of service: 2005

EMS + non-emergency medical transportation TRENTO	8 seats, 2 administration seats, 12 remote sites
FIRE DEPARTMENT TRENTO	5 seats, 2 administration seats

LIGURIA REGION, ITALY

Beginning of service: 2010

EMS + non-emergency medical transportation IMPERIA	6 seats, 2 administration seats
EMS SAVONA	6 seats, 2 administration seats
EMS + non-emergency medical transportation GENUA	9 seats, 2 administration seats
EMS LAVAGNA	4 seats, 2 administration seats
EMS LA SPEZIA	5 seats, 1 administration seats

TUSCANY REGION, ITALY

Beginning of service: 2009

EMS PRATO	3 seats, 1 administration seat
EMS AREZZO	6 seats, 2 administration seats
EMS SIENA	12 seats, 2 administration seats, 34 remote sites
EMS + non-emergency medical transportation GROSSETO	5 seats, 3 administration seats, 29 remote sites
EMS + non-emergency medical transportation LUCCA	3 seats, 1 administration seat

UMBRIA REGION, ITALY

Beginning of service 1999

EMS PERUGIA	8 seats, 1 administration seat, 35 remote sites

ABRUZZO REGION, ITALY

Beginning of service 1999

EMS + Out of hours medical services L'AQUILA	5 seats, 2 administration seats, 6 remote sites
EMS + Out of hours medical services PESCARA	5 seats, 2 administration seats, 3 remote sites
EMS + Out of hours medical services TERAMO	5 seats, 2 administration seats, 4 remote sites. Integration with 3rd parties : CTI (PBX Ericsson MD110 BC9), Voice recorder (Wordnet Serie 2), Analog/digital radio infrastructure (GeG), Nokia Vehicular Digipen & Stand
EMS + Out of hours medical services CHIETI	5 seats, 2 administration seats, 8 remote sites. Integration with 3rd parties : CTI (PBX Ericsson MD110 BC9), Voice recorder (Wordnet Serie 2), Analog/digital radio infrastructure (GeG), Nokia Vehicular Digipen & Stand

BASILICATA REGION, ITALY

Beginning of service 2002

EMS POTENZA	8 operator seats, 1 administration seats

SARDINIA REGION, ITALY

Beginning of service: 1999

EMS CAGLIARI	8 seats, 2 administration seats
EMS SASSARI	5 operator seats, 2 administration seats, 1 remote sites

ALBANIA

Beginning of service: 2011

EMS SHKODRA	4 operator seats, 1 administrative seat

LITHUANIA

Beginning of service: 2014

eCall system for 112 VILNIUS	seats N/A. Server-based centralized service
eCall system for 112 KLAIPEDA	seats N/A. Server-based centralized service

ISLE OF DOMINICA, CARIBBEAN

Beginning of service: 2015

9-1-1 National System	4 seats, 1 administrative seat

SACRAMENTO, CA - USA (MARKET TRIAL)

9-1-1 Sacramento Regional Fire/EMS Communications Center	IO™ CAD and The Tavolo™

FAIRFAX, VA - USA (MARKET TRIAL)

911 FAIRFAX Communication Center	The Tavolo™

CIVIL PROTECTION IN LOMBARDIA REGION, ITALY

Beginning of service: 2015

When a big emergency occurs, the civil protection manages the events in real time, through checking warnings and confirming sources/news. Based on the risk and the area of competence, iO™ civil protection supports the start of the alarming process, which involves authorities and specific organizations.

During the ongoing operations, iO™ civil protection allows to use a synoptic overview of resources, equipment, dispatcher and activities. It schedules as well the team's shifts and keeps track of a large history case checking.

Currently iO™ Civil Protection is installed in:

Area	Workplaces	Inhabitants
Province of Milano	12	3,839,000
Province of Brescia	12	1,110,000
Total Lombardia Region	**24**	**4,949,000**

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SECTION 2: iO™ CAD OVERVIEW

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2.1. iO™ COMPUTER AIDED DISPATCH

THE CAD SYSTEM

iO™ is Beta 80 International's Public Safety CAD platform (call talking, GIS and mobile) to build enterprise-wide unified communications paths and manage the transition to Next Generation 9-1-1 PSAPs. It provides first and second level PSAPs with all the features required to respond to any type of emergency call. iO™ is a complete software suite for PSAPs available on the international market and it is widely known for its ultra-high level of customization, intuitive interface, easy integration with multiple devices and vendors and effective customer support. iO™ efficiently and effectively manages a growing number of calls and types of events, designed to suit each PSAPs changing needs. iO™ also has a proven and growing track record of satisfied customers.

We have achieved this result by focusing on our 4C mantra:

- COMPLETENESS
- CUSTOMIZATION
- COST SAVING
- CUSTOMER SERVICE

iO™ VIDEO
https://youtu.be/n1DMzW6Tn1Y

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INTUITIVE FOR DISPATCHERS

iO™ provides a comprehensive, intuitive and easy to learn solution for Dispatchers and Group Coordinators. This is due to a modern, clean and attractive interface, which guides the dispatcher easily through its functionalities focused on visual information (colors, icons, buttons and drop-down menus). These features help the dispatcher to fill the incident on a quicker and more accurate way, decreasing or even eliminating the possibility of typing mistakes. If you take a glance at the screen, you know exactly what's happening – no need for long texts, codes and numbers. The events, missions and available resources are clear and real-time updated both on the CAD and on the GIS screen, and are continuously displayed so you can save time and unnecessary effort.
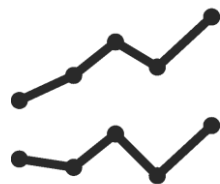
EFFICIENT FOR PSAP MANAGERS

iO™ is also proven to be the best CAD system for PSAP's managers willing to track its operations with accuracy and completeness. Due to its innovative, comprehensive and intuitive software architecture, iO™ is capable to offer an advanced technology of data collection. At the same time iO™ provides PSAP managers a deep tracking of the whole PSAP operation, managing all the data efficiently and providing structured statistics for further analysis and improvements. iO™ is far beyond NG911 standards. iO™ is the best tool to help you turning your PSAP into a high-level one.

IO's INTEGRATION

iO™ easily integrates third-party applications for system and multi-agency interoperability. It is fully integrated with our GIS system. And to make call taking easier as well, iO™ works very well together with any choice of telephony, radio or IP Based Communication technology.

- GIS: Google Maps, Google Street View, etc.
- PBX: Avaya, Siemens, Samsung, NEC, Acatel-Lucent, etc.
- Radio Systems: TETRA digital radios
- Sensor Networks
- Camera Networks
- ProQA

9-1-1 NEXT GENERATION READY

iO™ is fully compliant with NG9-1-1 architecture. Many of the features, third party apps and advanced public safety services Beta80 provides with iO™ demonstrates its embrace of the latest tools available in an increasingly complex technological environment where CADs must be able to perform in a fully digital, IP driven world.

2.2. IO™ MAJOR FEATURES

CAD OVERVIEW

iO™ is a Beta80 International's software platform for Public Safety and Control rooms management.
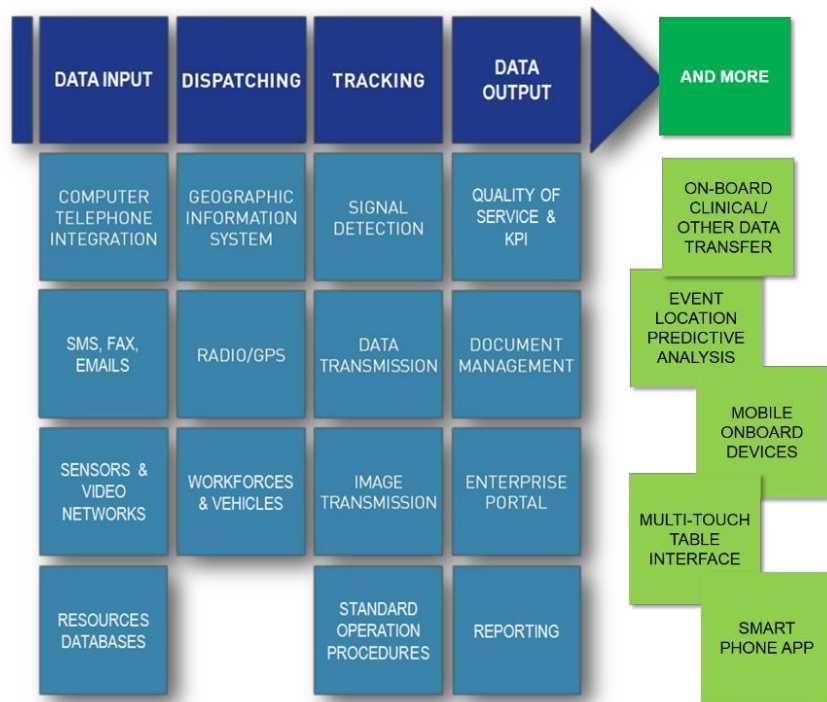
iO™ platform is a highly scalable, configurable and customizable PSAP management application, integrating the most advanced technologies available on the market.

The main elements qualifying iO™ to meet the operational needs of LAW/FIRE/EMS are:

- Integration with the most wide-spread telephone switches (PBX)
- Integration with radio and GPS systems
- Call Handling
- CAD Incident/Event Type
- Determine Dispatch Need
- Incident Classification
- Incident Information
- Advanced GIS for Incident Location
- Location Verification

- Advanced Dispatching Support
- Run Cards/Response plans
- Special Dispatch Area
- Emergency Medical Dispatch/Incident Triage
- Geo-Fencing
- Staffed and Unstaffed Units
- Vehicle/Unit Change and Additional Unit Dispositions.
- Strike Team/Task Force Designations
- Determining Response Agency & Service Area
- Secure Transactions over the Internet
- Multi-Agency and Multi-Jurisdictional Capability
- Highly Secure and Reliable Hardware Infrastructure
- Integration and Interoperability between the various agencies involved - with different tasks
- Hydrant Location and Status
- Reopen Incident
- Transfer Basic Incident Data to the Records Management System

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2.3 THE FUNCTIONALITY OF IO™ CAD SYSTEM FOR LAW, FIRE AND EMS

Beta 80 Group has extensive deep experience in providing CAD for Fire and EMS agencies, and in order to meet the needs of both Law Enforcement and multi-jurisdictional agencies Beta 80 is building a highly effective Law Enforcement CAD. As mentioned in *iO™ Product Road Map*, Beta 80 wants to create an opportunity for San Mateo County dispatchers to engage in a collaborative process with Beta 80 team to design a Law CAD that is easy to use and functions in every way that makes their work flow productive and efficient.

iO™ customization characteristics and modular structure, news field and graphical user interface, process and new functions can be inserted according to Customer's needs. In the cases of standard configurations or real time customizations, iO™ CAD has the Management and Administration module that allows you to fine-tune the system with respect to the specific needs of the Center.

EMS

The iO™ CAD has a long history with a major concentration in medical dispatching. You will find a full set of tools including event creation and management, unit dispatching and status keeping, patient care reports, Medical Priority Dispatch System (MPDS) inputs, and tools for overall system management along with views through summary displays. There are many icons in vertical and horizontal toolbars and embedded in events, event summaries, units and unit summaries.

FIRE

iO™ has also been used extensively for fire dispatch with similar applications. In addition to the structure described in medical, there is unit information relating to personnel identities and certifications, along with unit capabilities and how they qualify for specialized event creation. A familiar example of this would be what is needed for a structure response (building on fire); you may call for two engines, one truck and one Battalion Chief in your system. Like any fire CAD, iO™ recognizes the differences between various pieces of equipment and how those qualifications configure response to any variety of event types that are tabled into the CAD and follow the rule set for dispatching on events (AKA "run cards").

LAW

The iO™ CAD's current law dispatching platform is being further developed and configured for U.S. law enforcement environment. Beta 80 has already adapted its strengths in fire and medical dispatching to the U.S. dispatching environment and the Law Dispatcher is under development process. We recognize that the development of law dispatching has to incorporate most of the fundamental dispatching construction for fire and medical, but be adaptive to a greater number of field unit generated events (car stops, person stops, etc.) and be connected to various outside systems that provide vehicle wants and registration, and queries for persons with arrest warrants or wants associated with them, along with identification queries (usually a driver's license). iO™ will have windows for entering people, vehicles, guns and property. In testing out the iO™ interface, you will not presently find windows and fields associated with those queries or returns.

SECTION 3: MAJOR SYSTEM MODULES

3.1 iO™ SYSTEM CORE – CAD DASHBOARD

iO™ provides a synoptic screen available to all dispatchers, supervisors, and in its web version, to first responders. The synoptic display offers "at a glance" viewing of ongoing incidents and related dispatches.
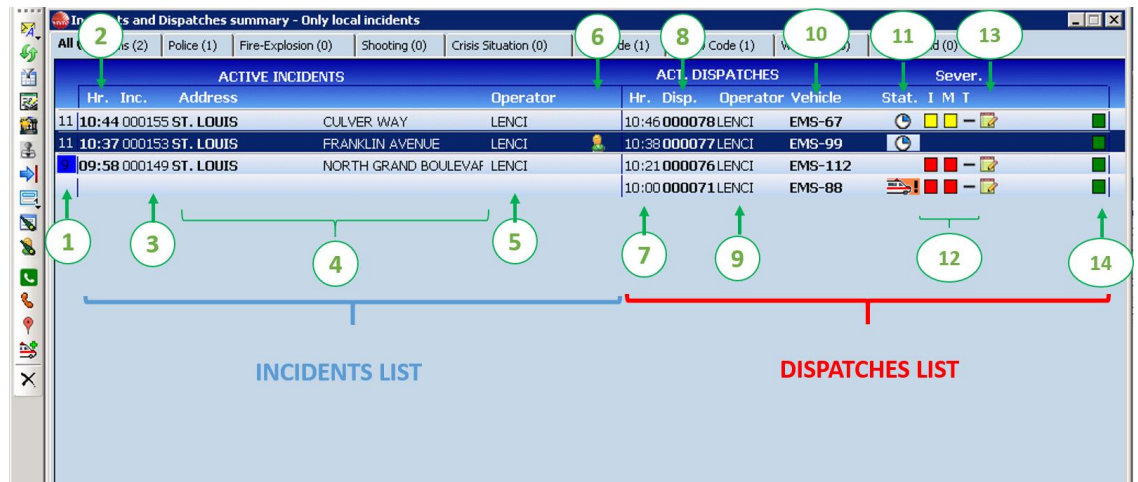
iO ™ Dashboard

As represented in the previous figure, the synoptic view is split in two panes: the incidents list on the left and the related dispatches on the right. Given an incident (e.g. incident number 000149 in the picture) more than one dispatch might be performed (dispatches 000076 and 000071 in the picture).

Using the left hand toolbar it is possible to manage the incidents (e.g. a new dispatch can be triggered, notes can be added, GIS representation can be invoked, or a phone call can be initiated).

Both incidents and dispatches are displayed with all relevant details:

1. Numeric code which represents incident qualification (e.g. wildfire); it is a customizable value and the colour with which it is displayed is customizable, as well
2. Timestamp indicating when the incident has been created
3. Incident unique ID
4. Incident localization
5. Unique ID of the Call Taker who has created the incident
6. A person description form (e.g. patient, victim, suspect) has been attached to the incident
7. Timestamp indicating when the dispatch has been created
8. Dispatch Event unique ID

9. Unique ID of the Dispatcher who has been in charge of the dispatch creation
10. Dispatched vehicle unique ID
11. Status of the dispatch (accepted, in route, on the target, …) as communicated by the first responder via the web interface described in the "Response" paragraph, section A
12. Severity codes which are here represented as coloured icons but could be numeric values as required in the specifications document. The first code represent the outcome of the triage (caller interview), the second is the feedback received from the first responders who could change the severity level, the third one is the final severity code determined by the ER where the patient is admitted (and thus it is used only in EMS related incidents)
13. Icon representing the presence of notes attached to the incident
14. Icon representing whether the first responder has taken over the dispatch

The synoptic view can be filtered according to both the incident's qualification (i.e. EMS vs FIRE), severity code and area. The visualization is performed by clicking on the proper TAB (the TABs are completely customizable).

3.2 iO™ CALL TAKING AND EVENT CREATION

The Call Handling process is managed through our Call Taking Module that is the first software module of the software Architecture. The flow process implemented by this module is the following: the emergency call received in the Emergency Coordination Centre 9-1-1 or PSAP, is managed by means of a specific module aimed at qualifying the occurrence and locating the caller. More precisely, this module is targeted to answer the call, to geographically pinpoint the caller position and to create the new incident. The workflow of this module goes through the following steps:

- The emergency calls arrive to the emergency coordination center 9-1-1 or PSAP
- The incoming calls are distributed to Call Takers
- The ANI/ALI is captured and an Incident record is automatically opened in iO™
- GIS platform included in iO™ allows to display the incident on a geo-referenced map
- Incident qualification is determined via a customer specific list; Call Takers can then choose the most appropriate classification and the CAD immediately assign the first due recommended units and the call is sent to the dispatcher's queue
- Triage interview filter is provided use a Priority Dispatch ProQA or could be customized in according with customer needs

After these quick steps the Call Taker enables the Dispatcher to receive their information.

CALL TAKING MODULE WORKFLOW
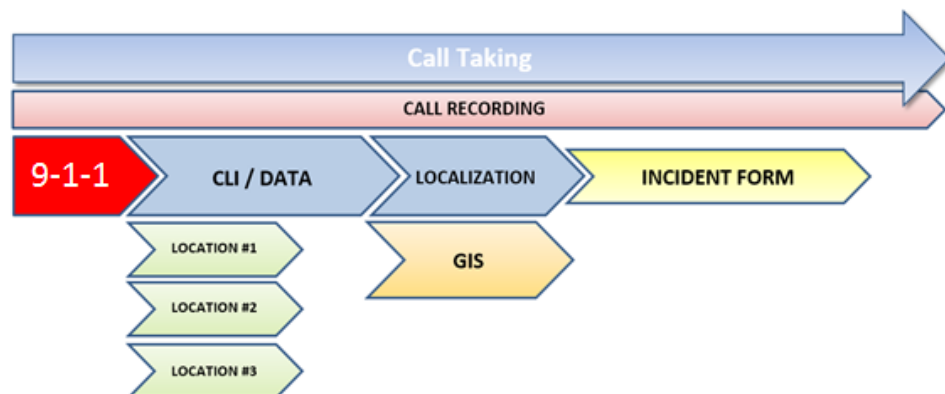
Call Taking module is followed by the Dispatch module which gives PSAP Dispatchers suitable instruments to scrutinize the ongoing emergency situation and to keep track of all active incidents and dispatches:

- Triage interview filter is provided use a Priority Dispatch ProQA or could be customized in according with customer needs
- The Dispatching module shows the summary of the incident as displayed in a dedicated form called Incident Summary. Incidents synoptic view be shared between Call Takers, Dispatchers and all other relevant Centre stakeholders
- The Dispatching module keeps track of current resource activity and management

Incoming calls pick-up is performed via *iO™* Call Taking interface by simply clicking the toolbar button represented in the following picture; this button triggers the creation of a new incident form and starts off the ANI and ALI queries.

iO ™ call pick up button

iO ™ integration with the PSAP PBX envisages also the following functionalities:

- Click to Call
- Call Hang up
- Call Transfer
- Call Hold and Resume

All these functionalities are made available by choosing the proper *iO ™* toolbar button or contextualized icon within *iO ™* windows; as an example, *iO ™* call taking incident window is shown in the following picture and, bordered in red, the "click to call" button (which in this case allows to immediately call back the caller upon abrupt interruption of the communication).

3.3 iO™ DISPATCHING

The dispatch module will be devoted to the tracking all the units dispatched. The module is devoted to the specific process related to the FIRE/EMS and will be focused on:

- The Triage going deeply in each algorithm adopted. It will be addressed both the usability aspects and the idea underneath the questions/answers process
- The activation of the missions, the possible dispatch in relation with the results of the triage
- How to follow the dispatch and to close it with related missions

DISPATCHING MODULE WORKFLOW
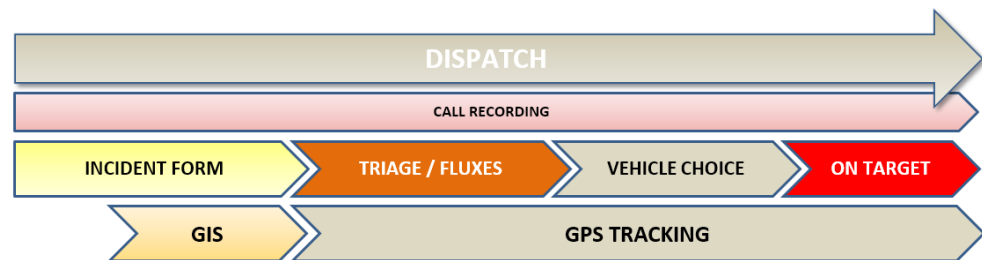
The Call Taker and the Dispatcher can see the same information and can make changes to the unit assignment or other types the information. Every change creates a notification to each other through the CAD logging of every operation in the form.

For each incident, the system allows to create an "incident virtual room" where the Call Taker and Dispatcher can work together with the same information. iO™ has an alarm application that allows notifying some changes.

In order to manage calls and units, Call Takers and Dispatchers are supported with and preconfigured and customizable response plan. This response plan can help:

- The communication between the Call Taker and Dispatcher
- Decision support
- Changes during the incident management
- Define the incident severity and priority

iO™ has many information to fill in during the Call entry phase but the mandatory information to generate a call for service (CFS) record and run cards to the dispatch are:

- ANI/ALI manual to automatically fill in
- Classification and Severity information
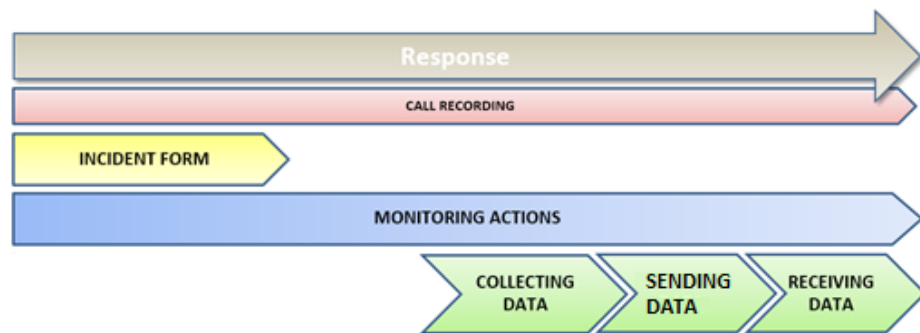
DISPATCH UNIT ALGORITM

Beta 80 can incorporate any dispatch algorithms originally created by PSAP and roll them into the iO™. In doing so, they would apply all rule sets currently being used and apply a new configuration interface to define and set the dispatch algorithms in order to examine the consistency and challenges of applying all the necessary variables. Between Beta 80 programmers, PSAP command staff, PSAP dispatchers and invited stakeholders representing community public safety needs, a process of examining the present system, retaining sensible algorithms, addressing identified challenges, and testing an evolved, new algorithm matrix can be accomplished in a collaborative and timely fashion.

iO™ will have a "Test" and "Training" CAD environments parallel to the live CAD system where in-house personnel can add or modify algorithms using a graphical interface that in a seemingly simple user display, execute coded programming. After in-house personnel have exercised the test environment and are satisfied that they want the changed/new algorithms rolled into the live system, they would do so through a user-interface in the Administrator Module. It will be possible to manage the algorithms independently, just uploading the new one or the customization directly in the live iO™. The customer can email, call or share desktop systems via the Internet to have Beta 80 programmers review the desired changes and then update the live system remotely. This system allows most of the legwork in exploring algorithms to be done by the PSAP manager with Beta 80 doing final analysis from a programming standpoint. The Centre staff drives policy, tests the programming and loads it into live. Beta 80 makes it work by having our programmers do the deep, final analysis. The workload for algorithm creation and changes can be handled mainly by PSAP managers, but you will always need Beta 80 to ensure that the entire CAD ecosystem remains functional when new changes are made.

iO™ driving a sensible set of algorithms that incorporate the complexities of:

1. Call type and priority
2. Location

3. Recommended unit(s) closest in time given actual traffic conditions, taking into account department policies regarding dispatching from station, dispatching resources out of station and resource diversion from lower priority calls
4. Recommended unit(s) and personnel being qualified to handle call type
5. Static conditions (high-rise structure response, airport, waterways, tunnels, etc.)
6. Fluid conditions with integration with third party software or sensors (weather, time of day, season, traffic impedance, police actions, other fire calls, etc.)
7. Progressive expansion of resources dispatched identified by greater alarm, IC/BC special request

Within iO™, PSAP dispatchers can:

1. Override and/or modify resource recommendations on a call
2. Open a window displaying the full information on a unit and update or change capabilities, qualification, personnel using checkboxes, pull-down menus or command line entries
3. Perform a "preview" of unit(s) recommendation on a call without actually executing the dispatch

Beta 80 has incorporated Pro-QA into iO™ for many years. Algorithms for medical calls, although simpler than fire calls, need to take into account:

1. Call type (unconscious, bleeding, fall, stroke, etc.)
2. Severity. In MPDS, expressed as (lowest to highest):
   a. Alpha
   b. Bravo
   c. Charlie
   d. Delta
   e. Echo
3. Unit(s) recommendation
   a. ALS
   b. BLS
   c. Paramedic transport unit only; no fire unit
4. Code of response
   a. Alpha and Bravo; Code 2
   b. Charlie, Delta, Echo; Code 3
5. Diversion policies; e.g. unit responding on Alpha or Bravo show "available" for new "Echo" call
6. Special circumstances
   a. PD scene- unsafe

b. Bariatric patient requiring extra manpower

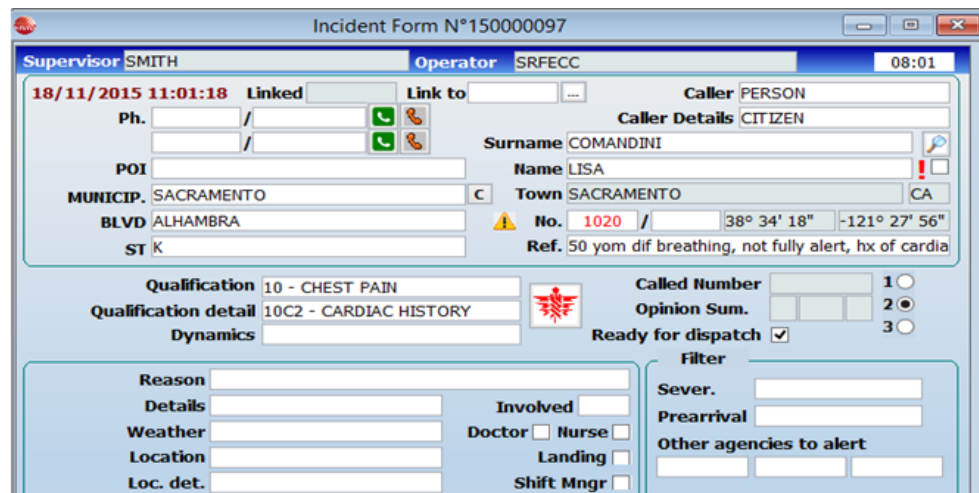c. Rescue; vehicle, confined space, etc.

The dispatch unit algorithm are included in the Response plans. The Response plans in the iO™ are the "Boxes" where it is possible, through the simple interface in the Administrator Module to manage the algorithms independently.

The response plan starts with five inputs:

- Incident Type. (Law, Fire, Medical and Local Government (DPW, Animal Control, etc.)
- Sub Incident Type (Structure fire, vehicle collision rollover; people trapped, stroke, chest pain, childbirth imminent, overdose, etc.)
- Location
- Units Type
- Units Location

In accordance with the classification of incident and following LAW, FIRE, Medical, Priority Dispatch or the Centre's protocol is possible to enrich the response plan with single or multiple inputs/conditions to cover the larger number of cases.

The incident type, incident location, active dispatch mode and the person involved are the input for iO-CAD's response plans. Regarding the condition (inputs), the response plan support the dispatcher defining the algorithms and suggest to show the unit type/attribute, number of units to be assigned and mileage restrictions in to the dispatch form where all this information are available for the dispatcher.

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This is our current iO™ call processing and creation of an incident. Some fields are required, other fields are useful but optional.

This form/display represents the activity of all units logged on and indicates if they are available or unavailable.

This snapshot is of the unit's activity in a particular call. As you can tell with all three, it uses Microsoft window architecture with fillable fields, indicating required and non-required fields. Icons provide shortcuts and show dispatcher commands with a help box when you roll over the icon.

During our market trial period, in Sacramento Regional Fire/EMS Communications Center (SRFECC), we have had Sacramento fire dispatchers trouble shoot the iO workstation and suggest changes useful to the dispatchers to be able to use the platform better.in a US market. Beta 80 reviews the input and is making modifications to have the call handling, unit dispatch, unit summary and unit composition be recorded, sent back to Beta 80, and their software design team makes the changes and rolls them into the LIVE system.

Beta 80 International does not anticipate that any algorithm that is presently coded into San Mateo's current system won't be able to work in the iO™ environment. The only two general factors that can't be coded as an algorithm is a dispatcher making a situational decision in the absence of an algorithm driven action, or any algorithm that is part CAD, part paper or dispatcher knowledge that is the equivalent of having a part of the formula state, "and magic happens here!" All algorithm processes can be quantified, categorized, understood as single components, and understood in a variety of relational action formulas.

3.4 iO™ MULTI-LOCATION INCIDENT

Dispatch statuses are represented on iO™ synoptic frame and are kept updated with the real phase of the rescue. They appear under the shape of customizable icons that can be specialized upon the emergency type (LAW, FIRE, EMS, EOC and Local Government) and/or the units (e.g. air, water, land); as an example, a subset of them, related to FIRE/EMS rescue units:

1. Dispatch Created And Unit Selected
2. Unit enroute
3. Unit diverted to different event
4. Unit on – scene
5. Unit headed to the hospital
6. Unit arriving at hospital
7. Unit returning to station (available or unavailable)
8. Unit ready for new dispatch

For each unit it is possible to add location, which is a combination of the main location event and the status of the unit. Every incident has the main location and the units can be moved to a different location following the status and the incident changes.

This Multi-Location Incident is supported by the iO™-GIS that track the units.

For instance, a unit with an on-scene status (point 4 in the upper list) can be changed to another on-scene status in a different location by simply adding new location address or geo-referred point in the dedicated Dispatch Unit tracking's form. This operation can be used in Planning or Unplanned mode.

In the same way, iO™ has the ability to manage units transporting patients to multiple hospitals or facility destinations. This information can be captured at multiple points during the incident within the Call for Service (CFS) event.

3.5 iO™ NEXT GENERATION 9-1-1 AND TELEPHONY INTEGRATION

The voice platform represents the front-end towards external users constituted in three layers:

- PBX
- CTI supplying the Remote Call Control interface towards the iO™ platform
- Call logger

iO™ is interfaced to the Telephone system through a CTI integration. The Telephone system handles the incoming calls queuing displayed on iO™. It enables the personnel to easily perform all the relevant actions that may occur during the Call Taking and Call Dispatching phases (i.e. pick-up calls, hold & resume calls, "ad hoc" conference, call transfer, Call Park, phone-book/calls directory consultation and click-to-call, etc.).

Whenever a Call Taker picks up an incoming 9-1-1 call, iO™ automatically creates the CFS record which is displayed on the Call Taker's screen and filled with all the relevant fields generated by ANI/ALI.

ANI/ALI data can be automatically mapped to corresponding address and phone data fields based on the iO™-GIS system in the CFS event entry form.

Every phone call undergoes a recording process performed by a call logger. In this way all the calls related to a specific incident are logged and archived as documental attachments to the incident record. The interworking between the iO™ and the call logger relies on specific APIs. At the end of the call, the iO™ allows the Call Taker/Dispatcher to play the conversation back to catch some detail that a bad line or a particularly panicked caller have made hard to understand.

NG 9-1-1 current capability: iO™ supports the display, storage, retrieval, and forwarding to mobile data devices. It also included text messages, images, telematics information, and streaming video and audio where the mobile CAD software support these function. These functions are embedded in iO™ mobile solution or it could be through API integration with a third party vendor.

3.5.1 OVER THE TOP MOBILE NG911 SERVICES USING ILOC8 BY AVAYA

The Avaya iLoc8 Application, installed in the 911 PSAP, enables dispatchers to engage with a cellular device when additional information or enhanced location data is required.

A dispatcher simply clicks to send an SMS text message with a special link and instructs the caller to click on the link. A browser to browser session is then established, and information such as location data, and the default language set in the device is then shared. On Android devices, battery levels can also be obtained so the dispatcher knows if they need to hurry up or if they have plenty of time with the caller. In the future other data like biometrics data from wearable devices may also be available to be queried.

Because multimedia and Location is delivered over the Internet, it is independent of the telephone carrier providing the actual voice connection. This also means that the best possible location data is provided directly by the phone, and not via the carrier which can be challenging at best.

The multimedia capabilities of iLoc8 also allows a dispatcher to receive pictures from the caller of the event in progress, allows the dispatcher to push pictures or video to the caller such as instructions on how to do CPR, and on capable phones WebRTC can be used for live 2 way video as well.

At the dispatcher side, the location data is integrated into the iO™ to provide a consistent experience.

3.5.2 WHEREAREU APP - NG9-1-1

The app WhereAREU, is the iO™'s App for emergencies. It allows placing an emergency call, along with the transmission of the correct position of the caller (latitude, longitude, altitude, date, time and address) to facilitate intervention.

Mobile callers' identification and localization process can leverage on iO™ Emergency App which can be downloaded by citizens from relevant on line Markets. iO™ Emergency App supports Android, iOS and Windows operating systems.

The App is directly connected to the PSAP through iO™. The main difference between WhereAREU and the others Apps on the market, is the fact that it's directly tied to the software systems of the PSAP, allowing the reception of the caller's location by the call taker, even when the caller is not able to precisely tell where he or she is located.

Thanks to the new function called **"Silent Call"**, when the caller is in a situation of danger and is unable to talk with the dispatcher, PSAPs will have its precise positioning in real time to dispatch resources anyway. It allows you to preset a friend's phone number and has a "witness function" to let PSAPs know when the caller is not directly involved in the incident.

The app provides end users with a support/FAQs page aimed at introducing them to its correct use and best practices: the FAQs page presents an extract of the most frequently asked questions useful to present the context of the PSAPs.

The images below show how WhereAreU works in 112 European PSAPs.
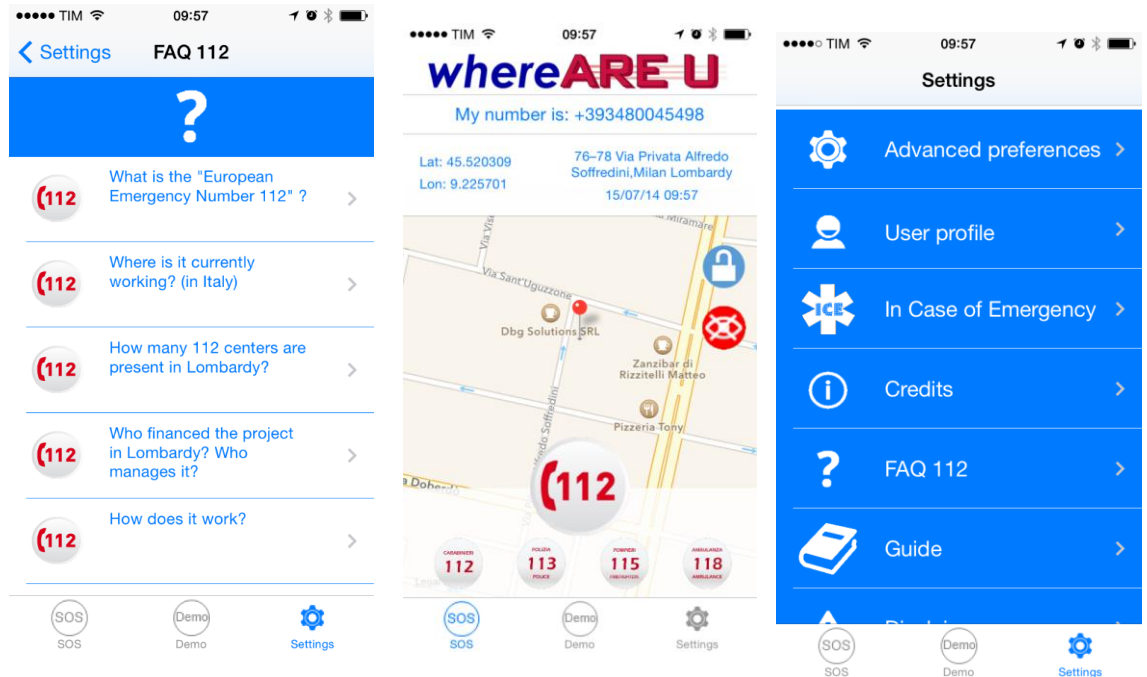

HOW DOES WHEREAREU WORK?

The App works like this:

1. End user downloads the App on his smartphone;
2. End user registration process includes the following steps / conditions: insertion of personal data, terms of use acceptance, confirmation of personal registration via SMS with name and mobile phone number;
3. The App gets the caller position provided by the smartphone and shows it on the screen. When an emergency call is placed, the position is sent on the smartphone's data channel or, when data network is not available, by an SMS. This backup mechanism guarantees the transmission of the location information whenever an emergency call is placed. Even when it was a "Silent Call" the citizen will be identified in a very short time, and first responders can intervene as early as possible;

4. The PSAP dispatcher will locate the caller according to the information sent by the phone. The Call Taker will ask the caller the reason for the call. Being located by the PSAP is very important for a rapid and precise response of the Emergency Services;

5. If the caller is only a witness to the event, he/she can click on the "witness" icon and turn it green: doing this, allows the PSAP agent to understand that the caller is not directly involved in the emergency and he will address his questions more appropriately, especially if the caller location is different than the incident location.

You can presently find on the App Store or Google Market the European Version (112) as seen in the picture. The U.S. version has already been developed and will be released shortly.
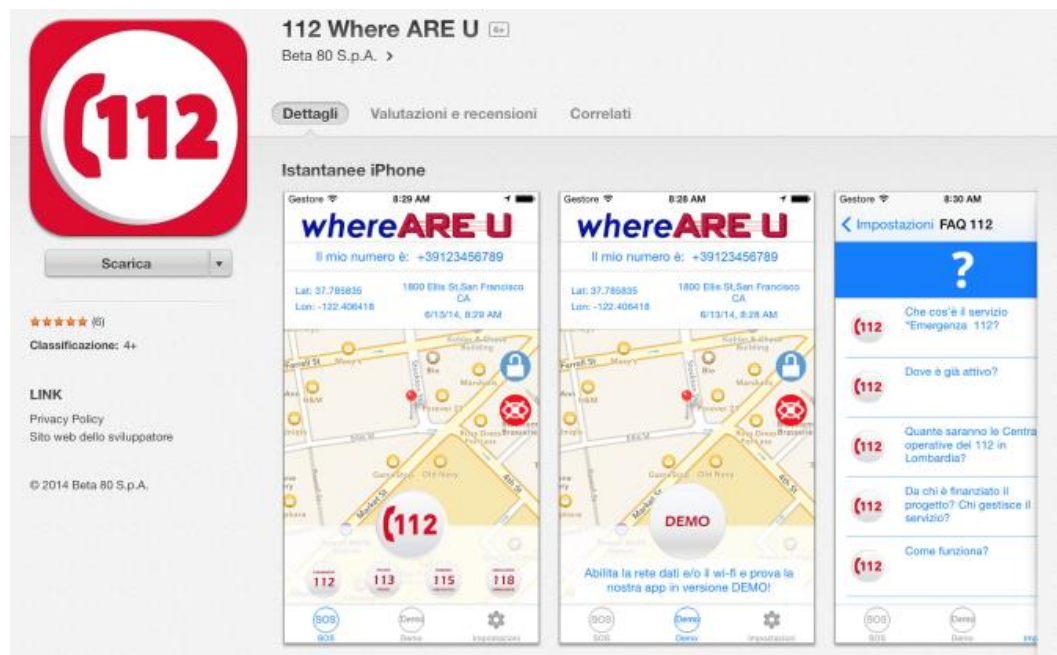
WHY *WHERE*AREU IS IMPORTANT?

Normally PSAPs receives the position of the caller, whether the app is used or not. However, WhereAREU sends a precise positioning, with the exact coordinates recorded by the smartphone and the caller's address if available. This is always crucial information to give to the dispatcher, to perform the best possible service.

Moreover, people who call emergency numbers, all too often fail to explain where they are: with the app WhereAREU you will no longer need to explain it, because the app will do it for you.

*WHERE*AREU TODAY

The app is already available for a huge number of phones. In Italy, we have already more than 100,000 people registered. We are working to make it compatible with older phone models, and be able to function even without an internet connection. For now, if there were not enough field, the coordinates are sent to the control unit via SMS.

This project is strongly supported by the Lombardy Region and the city governments, it is already operational in the provinces of Lecco, Monza Brianza, Como, Varese, Bergamo and Milan, Sondrio. It aims to achieve coverage of the entire region within a short time, before expanding in the rest of Italy.

*WHERE*AREU WON THE SMART COMMUNITIES AWARD

The WhereAREU App was one of the 12 winners at the Smart Communities Award – Smart Communities and Social Innovation as an engine for Regional Development. The ceremony was held in Milan on October 22nd during the SMAU International 2015, the most important Italian event dedicated to Information & Communication Technologies designed to help main national and international suppliers of ICT to meet entrepreneurs, corporate and public administration decision makers and ICT dispatchers.

3.6 iO™ TRIAGE MODULES

iO™ triage module allows the use of Priority Dispatch's triaging system, ProQA. A complete worldwide "industry standard" solution aimed at managing the key questioning to be performed by Police, EMS and Fire dispatchers, ProQA fully integrates with the iO™ module.

The Priority Dispatch System (PDS) for Police, Fire and Medical, has been broadly adopted in the world and is currently used in over 3000 cities with over 70,000 trained dispatchers using over 30,000 seats licenses, taking over 65 million calls a year. PDS is being used in more than 40 countries, in over 18 different languages.

Other than having its own, Beta 80 developed, PDS iO™ is integrated with Priority Dispatch EMS ProQA and it's about to be certified for EMS ProQA Paramount.

Basing on our experience, the CAD interface to an external call taking/protocol system should perform the following tasks:

- Launch the Tiered Dispatch tool directly from the CAD screen
- Populate the Tiered Dispatch tool screen with a minimum set of data specific to the incident: starting time, incident ID, ANI/ALI
- Make the severity and determinant code available to CAD as soon as they have been generated in order for the CAD system to generate the proper run card for dispatchers
- Real time import of the Q&A session related information within the CFS record and make it available to dispatchers (and to field personnel depending on the mobile CAD software capabilities). This set of information will then be logged within the CFS record and be part of incident's historical data
- Manage changes in case status (e.g. determinant change) in order for concerned dispatchers and responders to be properly alerted in a timely manner
- In case the Call Taker and dispatcher are the same person, the integration between the PDS and CAD is designed to make it easy to toggle between both systems

3.7 iO™ WEB MODULE

Through iO™ Web module, the first responder has full visibility on and can manage the following:

- Incidents occurring or occurred (and not archived yet) within his/her jurisdiction area; as depicted in the previous picture, are displayed along with all relevant details:
  1. Colour code identifying an EMS, Fire, Police dispatch
  2. Incident unique ID
  3. Incident creation timestamp
  4. Incident locality/address
  5. Call Taker
  6. Dispatch creation timestamp
  7. Dispatch unique ID
  8. Dispatcher
  9. Involved vehicle code
  10. Dispatch statuses
  11. Severity code assigned during the call taking phase and subsequent severity codes directly assigned by first responders and admitting hospital
  12. Colour code representing the remote site occurred take-over
- Archived incidents and dispatches
- Emergency vehicles under his/her jurisdiction/district are displayed along with the following information: status (free, engaged), availability (e.g. H24, H12), plate, radio code and channel, free text notes filed
- Geo-localization of both incidents and vehicles can be performed via direct web access to the PSAP GIS application although iO™ Web can be customized to embed a basic map producing per-area filtered incidents and vehicles static positions

A summary of iO™ Web Feature based on profile's user:

- Scheduled EMS transports management
- Personnel Scheduling System
- District's area facilities and services availabilities: e.g. hospital bed count, open pharmacies, after hours medical service
- Per-district registries: frail patients, GPs and practices, first responders, Plants & Factories (HAZMAT), phone book
- Crew management
- Printing capabilities

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3.8 iO™ UNIT ASSIGNMENT AND TRACKING

iO™ GIS module, in conjunction with an Automatic Vehicle Location (AVL) system, provides a powerful tool for tracking the positions that represent real-time location and route taken by resources localized by on board GPS devices.

iO™ can integrate real time tracking tools to identify the location and the distance travelled by units via GPS. The sampling methodology is fully configurable and customizable rendering iO™ opens to external AVL technologies.

The Dispatcher begins to define, through the response plan, the unit engagement. The system lists all available units ordered by their distance from the incident. Upon configuration, a higher priority can be given to a particular vehicle type basing on the severity code associated with the incident; in this case this priority parameter overwrites the incident proximity of the unit. For example, it could be possible to associate a higher priority (no matter the distance) to an advanced medical vechicle whenever an EMS/FIRE priority 1 incident takes place.

iO™ shows the available list using an configurable algorithm base on response plan and enable criteria such as:

- Units/staff capabilities
- Weather
- Traffic
- Severity
- Unit Status
- Operational Knowledge

All units displayed are only those actually free and ready for a new dispatch; if an emergency resource has been marked as "unavailable" (e.g. because it is under repair), it will be not be added to the available units until its status turns again into "free".

In every moment, the Dispatcher has the current and the last updated available units list display on his screen. Tracking the performance of rescue missions, monitoring the activity of the crew and the intervention timing, both via AVL and with the support of image/data transmission systems, is enabled with the help of GIS.

MAJOR AND SPECIAL ASSIGNMENTS

iO™ Dispatch Module doesn't have any limitation in terms of number of units that can be assigned and or recommended at a time.

A response plan supports Dispatchers in identifying units or specific units. At the same time, the units can be added or removed depending on special criteria such as: staffing capabilities, unit capabilities, secondary capabilities, personnel capabilities, resource groups, routing-based recommendations, target hazards, premises based response plans, response plans based on time of day or day of week, and other factors.

Finally, in case of Fire and EMS Centers, iO™ allows the adjustable dispatch levels to be changed according to dispatch policy plans in special circumstances.

3.9 iO™ MOVE-UP

The strategic relocation of a resource to fill in temporary gaps in coverage is done by the iO™ Forecasting Module. The recommendations are given automatically by the iO™ system based on Forecasted Coverage and strategic relocation of resources can be done automatically or manually.

iO™ Forecasting Module:

- Resources cover the territory in strategic positions
- When vehicles move, they leave areas uncovered
- The system suggests the best placements to cover the territory

Thanks to the GPS integration, vehicles returning to their base stations are included in the forecasting, and unless requested by users, vehicles not on duty are relocated before any stationary vehicle is moved.

The modules can works without GPS integration but it is necessary know the position of the units.

- **Coverage Optimization:** to place available vehicles in order to cover the biggest portions of territory, according to their importance (population density, emergency calls density, etc. and in compliance with the Service Level Agreement (SLA).
- **Single coverage**: depends on the number of potential users served by the vehicle base and on the historical number of missions.
- **Multiple coverage:** sum of single coverage for each station point. Overlapping areas define "yellow zones", which are partially covered by SLA.

Resources needed for predictions

- Number of Vehicles available
- Historical Missions (Historical DB of Emergency Calls)
- Access to Real-Time Situation
- Ambulance bases details (Position, vehicle, capability, etc)
- PSAP Business rules (SLA with ambulance services, etc)

Platform parametrization

- The system is subject to an initial calibration, in order to properly set all parameters.
- The more complex is the process that is monitored, the higher the number of parameters and the more important is the tuning, to deliver the expected results.

3.10 iO™ HOSPITAL TRANSPORTATION

iO™ provides a complete electronic patient records system (available in the units through mobile CAD) and hospital information such as: location, wards, hospital beds availability, hospital expertise.

When the units are assigned, the system suggests the most appropriate hospital that is ready to receive the patient. The suggestion is based on the distance and configurable criteria such as location, wards hospital beds availability and hospital expertise.

All the information suggestions given by the CAD can be changed, in case of adjustable dispatch or severity.

With an API's integration with the hospital availability information system, it will be possible to have, in the real time and directly in the iO™ system, which are the most appropriate hospitals as destination for a dispatch. The dispatcher can control this information and depending on the integration he can update it in iO™ and/or the hospital system.

During the patient transportation or the event, the crew can fill up the electronic patient care record (ePCR) on the Tablet and all the current patient's health information can be transmitted directly to the center and/or to destination Hospital. Every update inserted in the CAD/mobile CAD has been instantaneously made accessible such as:

- Timestamps of each dispatch status: enroute, on the target, enroute to the hospital, arrived at the hospital, leaving the hospital, back to substation
- Health information
- Target Hospital name/locality (it might be chosen during the rescue on the basis of actual patient's conditions and thus, it might not be the nearest to the incident spot)
- The severity code as assessed by first responders
- ER alert timestamp
- Outcome of the rescue
- Total covered distance (miles)
- Presence of Basic Live Support (BLS) or Advanced Life Support (ALS) personnel on the scene

3.11 iO™ TACTICAL AREAS AND GEOFENCING

iO™ has the Large Events Module that allows the management of large planned and unplanned events in accordance with the response plan and with all the other dispatching functions. The module offers the following functions:

- Information Registration about the event: Type, Classification, Date, Localization
- Define the Event's geographical area by drawing a specific, color-highlighted, perimeter
- Define the Responsibility for agency and resources
- Response Plan Definition
- List of the all Events planned and show all details about the agency and units involved that were assigned

In addition, iO™ offers a Web Module for Command and Control Structures which allows constant on-scene information sharing between the PSAP and the remote command and control post.

3.11.1 PLANNED EVENT

Every event information is available on a batch mode. When the Centre receives a call, the system verifies its exact location and in case it is within the event area, the response plan is automatically activated and the dispatch can be managed from the Centre or from remote command and control room.

As references, iO™ had been used for emergency response management in the events below:

- UCI ROAD WORLD CHAMPIONSHIPS in Varese in the 2008
- Italian Soccer league 2015/2016
- Verona Italy - Pope Benedetto XVI visit in 2013
- Milan Italy - Pope Francis visit in 2015
- Sao Paulo Brazil – Action delousing urban area 2015
- EXPO - Universal Exposition hosted by Milan in Italy from May to October 2015

3.11.2 UNPLANNED EVENT

Unplanned Events can be managed starting from defining the Event area to establishing response protocols for specific cases.

GIS Module Interface allows the PSAP Manager to define the event zone, as well as to visualize and manage the units assigned to the event. In this process iO™ makes accessible a function to share available units from different types, agencies and territories in order to better respond and organize the event.

For example, iO™ was used to manage the emergency response in these events:

- Milan Italy - Industrial fire in the hangar of a transportation company - 10,000m² in June 2015
- Monza Italy - flooding in Novembers 2014
- Milan Italy - Black Bloc manifestation anti-globalization in May 2015

3.11.3 THE TAVOLO™

The Tavolo™, a part of the iO™ solution suite, is a state-of-the-art touch screen table that can be used for a wide variety of command and viewing functions required for PSAPs, Emergency Operations Centers, or any command and control facility, fixed or mobile.

The Tavolo™ can display live events, dispatches and any relevant real-time information through a simple Web Services integration and **it can be integrated with ANY CAD and MULTIPLE CADs.**

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THE TAVOLO™ SHORT VIDEO
https://youtu.be/3GKJnD6PJQc

THE TAVOLO™ DEMO VIDEO
https://youtu.be/lO3FLEec3fc

THE TAVOLO™ CAPABILITIES

The Tavolo™ combines touch screen capabilities on a table top mount with unique software functioning that enables:

- Handling larger scale emergency situations;
- Direct, two-way interaction with events, missions and points of interests;
- Managing law, fire and medical resources;
- Integrated telephone system to communicate with dispatchers, command staff and first responders;
- Coordinating and managing multiple jurisdictional incidents;
- Multi-layer GIS display and support;
- Creation and management of geographic custom shapes.

Decision making support

Direct, two-way interaction with events

Dispatch and Tracking Resources

Creation of geographic custom shapes

Coordinating multiple incidents

Integrated Telephone System

Crisis Management and Planning

Multi-layer GIS display and support

TECH SPECS

- Multitouch table 42'' with Full HD LED screen
- Up to 20 simultaneous touches DISPLAX film
- Intel I5 processor
- 8Gb RAM
- 64+ GB HD SSD
- Wi-Fi and Ethernet
- Operating System: Windows 8.1

The Tavolo™ puts your CAD on the table. It is a truly innovative solution for Public Safety and you can already see our The Tavolo™ at Avaya's Executive Briefing Center in New York as well as in Sacramento Regional Fire/EMS Communications Center.

3.11.4 iO™ SOCIAL MEDIA MONITORING

In collaboration with Pick1, Beta 80 will integrate a Pick1's social media monitoring software to provide the PSAP with:

- Real-time data collection, showing real time caller's profile
- Pre-alarm 911 based on public social media data
- Social events profiles monitoring
- Threats identification based on brand mentions, hashtags & keywords
- Profiles, messages and filters organized in a structural and intuitive form
- Information Support in emergency response and crisis intervention
- Geofence with information from social platform

The tool is based on IBM Watson to allow key information extraction from all data in order to reveal insights, patterns and relationships across data.

The tool can combine information about the Caller (from Telephony system), information from social media and from external systems (NCSJ, DMV, NCIC, N-DEx, Nlets).it uses a natural language to have more accurate information regarding the subjects involved in an emergency situation and what is happening around the scene.

iO™ Social Media Monitoring
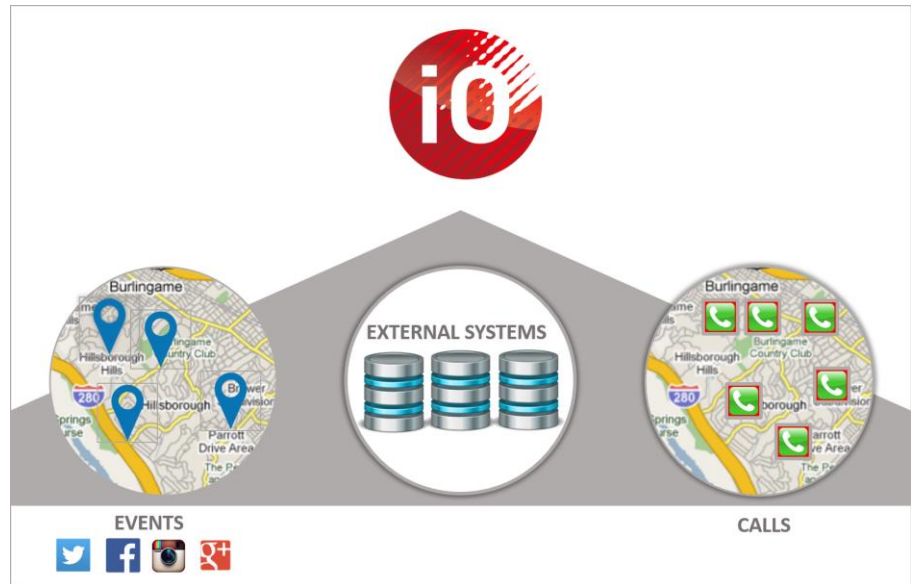
This function allows collection and analysis of structured and unstructured data from several sources. This could be used by a PSAP in order to plan special activities.

Social Media provides important real-time information which helps in anticipating the potential challenges with public gatherings and protests as well as preparing in advance to maintain the peace and control the scene (e.g. strengthen traffic control, pre-alert patrol unit, etc.). Events on Facebook, Twitter, Instagram and Google+ with related information such as location, historic data and attendees can be constantly monitored. This is an important planning tool which will minimize risks and better manage time, effort and resources.

3.12 iO™ INTEROPERABILITY

iO™ has the ability to share information in real time between multiple, and separate entities or agencies. As focus, the interoperability is critical to initial response, and emergency services of all types.

iO™ has an architectural component dedicated to integrations called MIB (Manager Integration BUS). This component is used to guarantee the integration not only with mobile Device, Radio System, telephone systems, home care, camera, additional interface but also to enable the highest priority information exchanges CAD-to- CAD following the technical and procedural standards related to the 9-1-1.

The iO™'s architecture for the 9-1-1 Centre, combine the communication with external sources and enables the exchange of information within departments or agencies within the same community, for this case:

- E9-1-1 Information to CAD
- Incident notification
- New incident from another CAD system (CAD-to-CAD)
- External alarm information – Dedicate integration
- NG9-1-1 Information to CAD
- Transfer of Incident
- Updates to CFS events from mobiles
- New incident from a field unit
- GIS /AVL providing closest unit recommendation
- Broadcast media warnings and alerts

Our Experience with this function comes from 1-1-2 Centre based on integrations with the following CADs:

- CC112 – Siemens
- A115 –Fire Fighters Center – ATOS
- Police – ATOS Origin

iO™ Manage the most large 1-1-2 Center in Italy Milan, Rome and Trento. In both case the information shared with this vendor CAD are:

- 1-1-2 Caller Location –ANI/ALI
- Incident Qualification
- Patient Health Information Tracking

- Units tracking location
- Critical Geographic information
- Incident Hazard information
- Support Units

3.13 iO™ MOBILE MODULE

iO™ offers different applications that provide field officers access to critical information, support in managing several situations and improve performance with lifesaving technologies.

- iO™ Patrol Application
- Tablet Commmand
- iO™ Patient Care Record Application (ePCR)

3.13.1 iO™ PATROL APPLICATION

iO™ Patrol App is the most technological and reliable solution for the management of rescue vehicles' interventions actually on the market.

Through a Web-Interface it is possible to display on a map the vehicles on duty, sending them tasks to accomplish, simply by clicking on the screen.

A system that enables the double redundant communication guarantees the sending and the receiving of messages between the operation center and the emergency vehicles on the territory.

With iO™ Patrol App it is now possible to reduce the response times of the vehicles helping them with traffic information, to facilitate the communication between the operation center and the officers on the territory and to have a device that can be integrated with your ow infrastructure (CRM, ERP,...)

Operation Center: Web

The iO™ Patrol App web application allows users to have the complete management of the vehicles in the geographic area and to assign missions and tasks simply by accessing the web, without having to install any additional software.

- Tasks assignment in real-time
- Searching on the map of the closest vehicle for the mission
- Display of the moving vehicles on the map
- Route check and road traffic conditions
- Control of the past missions
- Easy control of the steps of the mission thanks to the displayed colors
- View and print report
- Fast and intuitive display of the officer's status

User: iPhone

The officer receives in real-time a message from the operation center to assign the task. The message includes all the necessary information about the mission. Thanks to the notification the user can receive and accept the missions even when he is away from his vehicle or iPad, by using his iPhone.

- Maximum traceability of the officer
- Secure receipt of the notification and secure task assignment
- It can be integrated with other business instruments
- Bidirectional communication between the user and the operation center

User: iPad

The officer receives all the missions/tasks assignments on his iPad. By accepting the mission, the device shows the path to follow, all the necessary information, the traffic news and the satellite navigation starts automatically.

- Receipt of the notification for a new mission assignment on the iPad and two-way communication
- Reporting to the operation center of the officer's state
- Display of the list of the assigned missions, with time details
- Automatic start of the integrated satellite navigation system

How Does iO™ Patrol App Work?

* The Customer can choose the Brand of the satellite navigation system

1 - Sending of the mission / task request by the operation center to the officer

2 - Receiving of the notification of the mission on the officer's iPhone and iPad devices; acceptance or refuse of the mission, automatic calculation of the path on the iPad and start of the satellite navigation

3 - Taking charge of the mission, report of the state to the operation center, display of the path, traffic situation and display of the destination building thank to Street View

4 - Reporting to the operation center about the closure of the mission and check of the related data and information

Maximum Customization and Integration

iO™ Patrol App allows the development of custom-made and dedicated applications, and the reading and management of QRCodes and Barcodes.

This feature allows the reading of the code with the camera on the iPad or iPhone, enabling the real-time transmission of information to the head office, the direct printing of the bill / form or the sending via email of these documents.

All of these additional solutions are conceived and developed with the goal of making as automatic as possible the Dispatchers' process of all associated data and activity linked to the event.

3.13.2 TABLET COMMAND

Tablet Command will constitute the proposed solution for the mobile client. Tablet Command is a tablet-based incident management and tactical command software built on the iPad platform. With Tablet Command, an incident commander can tap and drag responding apparatus onto an emergency scene, track progress against critical checklists, and time-stamp every maneuver and benchmark throughout an incident.

Tablet Command allows emergency responders to:

- Assess overall incident status at a glance;
- Increase crew safety by tracking individual crew work timers;
- Improve a working IC's mobility and dual-purpose on the fireground;
- Export time-stamped incident reports directly from the tactical worksheet;
- Confidently track elapsed time on the fireground;
- Configure and customize an unlimited number of units;
- Create customized checklists for any type of emergency;
- Deploy customized incident templates to stay ahead of expanding incidents;
- Place resources on a satellite incident scene view;
- Share incident status in real time with all iPads in the department;
- Recreate incidents step-by-step, even months after they happened;
- Enable aspiring fireground managers to build their skills for handling emergencies.

Tablet Command displays real time unit location on incident maps. GPS data can be provided by AVL modems or taken from the iPad itself.

Tablet Command and Beta 80 are partnering to provide a truly best in class CAD and mobile solution. Beta 80 will support integration with third parties and encourages the department to bring the best solutions to the table. Beta 80 believes that Tablet Command is the best in its class and has developed a robust and seamless integration.

Tablet Command runs exclusively on iPad. We recommend the iPad Air 2, 64GB, Wi-Fi + cellular. Tablet Command can run on any iPad running iOS 7 or later.

3.13.3 iO™ PATIENT CARE RECORD APPLICATION (ePCR)

Our Patient Care Records App allows EMS agencies and First Responders to easily capture a full patient report on the field or at the hospital. It has several patient management features for Paramedics and it allows sending and receiving time-sensitive and vital patient information during the entire emergency process. IO™ Patient Record is an intuitive and EMS-friendly platform that runs on any computer or mobile device and field officers can enter data even without internet connection.

iO™ Patient Care Record Features:

- Tough rugged case which helps the iPad withstand heavy use;
- Well-organized and intuitive interface for EMS field officers;
- In the rescue phase, core patient data such as the patient's name and address, can be sent to the CAD directly from the ePCR and vice versa;
- Entering patient information quickly. The App can capture picture of patient ID documents, and all the contact information can be quickly & accurately read and saved on the Patient Details. It minimizes errors and paramedics can spend less time collecting information from patients and more time helping them;
- Patient Details has important data such as age, weight, height, gender, medications used and clinical information that supports a safer and more effective diagnosis;
- Real-Time Position. Our iO™ ePCR transmits constantly the geographic location of the vehicle through AVL integration;
- Apple/Google Maps gives Field Officers turn-by turn spoken directions, interactive 3D views and real-time traffic information. When the officer makes a turn, the viewing angle changes dynamically to show where to go. In case he misses a turn, maps automatically reroutes you and updates your estimated time of arrival;
- Easy Operation Status Update. Field officers can send its Operation Status to its Agency by a simple tap of a button;
- Loud Emergency Alerts. When a field officer has just been assigned to a new Incident, all event details will be sent automatically to the ePCR which will start a loud emergency sound. This feature improve communication efficiency with agencies since it decreases the number of calls and time spent on transmitting important information. It helps Field Officers to be alerted in noise locations or in cases he's far away from the iPad;

BETA 80 **INTERNATIONAL**

- iO™ePCR Works Offline. Data can be entered even without a connection and sync when one is available;
- Great Report Customization. Our ePCR allows officers to easily create personalized Reports to use agency's terms for field labels;
- Billing and administrative processes are simplified. All administrative information are instantly submitted when the paramedic closes a case in ePCR;
- Diagrams allow Paramedics to easily indicate pain and injuries points on the body. For example, in the case of a car accident, points of impact, injuries or patient position within a vehicle can be easily marked;
- Report Photos, the app allows officers to include as many photos as you need per report;
- E-mail and Print Reports. Field Officers can send reports where it needs to go by simply tapping the appropriate icons on the bottom;
- Report includes digital signature of the responsible Personnel.

3.14 iO™ MAPPING (GIS)

iO™ GIS module is devoted to the call taking/dispatching functionalities and specifically to the geographical and localization part.

The module is divided into three parts. The first is devoted to the general description of the geoviewer such as: structuring of the functions and menus, showing different cartographic layers, display vector and static resources, activation functions related to the icons cartographic registries (institutions, hospitals, etc.). The second part is devoted to the human interaction with the application software, the integration between the geoviewer and the rest of the application and the localization features.
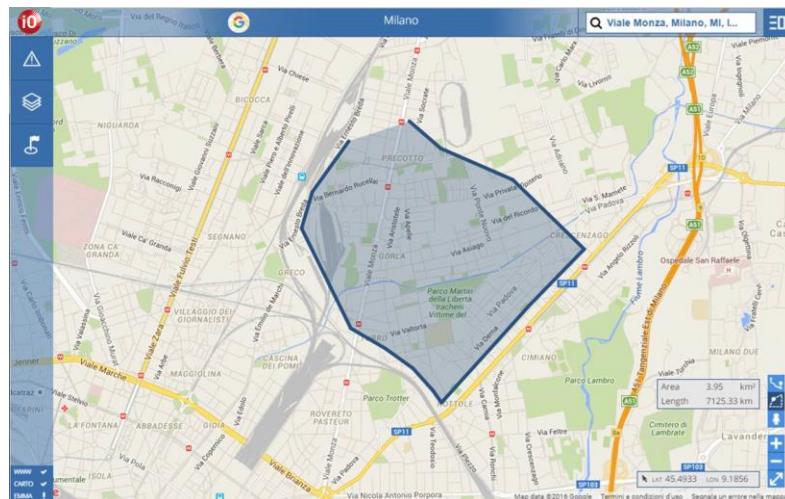
The main features are the following:

1. **Multi-Layered Visualization**: the GIS system can provide all kind of geo-referenced maps with a high performance visualization (including the display of Open Street Maps, Google Maps and Google Street View, where applicable). The GIS system allows also to superimpose different customized layers of information (typically consisting of Point of Interests [POI] maps or orthophotos of the covered territory); layers can be added or tuned off by PSAP dispatchers according to what they have to display during the emergency management (e.g. turn on the gas pipes layer). This feature helps dispatchers the pinpoint caller's location on maps and to speed up the identification of the most appropriate resources on the ground. iO™ GIS allows also to customize colours for each element represented: trees, rivers, parks, industrial areas, wetlands, etc.
2. **Ease of use**: the user's interface is developed according to the general method of User Centred Design;

3. **Completeness:** the (TomTom) digital maps for all of the County of San Mateo and adjacent counties will be provided. The mapping system is able to simultaneously perform real-time route calculations for tens of vehicles. It also allows the calculation of paths of aircrafts or helicopters. The route calculation is performed with simple clicks on the map and the display of the route is drawn on the map with a colour line.

The mapping system has all the typical features of a GIS: it is geo-referenced and can manage all types of cartographic layers (raster layers, vector layers and orthophotos). The mapping system integrates the services of Google Maps loading of up to 25,000 single maps per day. The architecture of the new mapping system reflects two specific requirements related to the world of emergency services:

1. Reliability
2. Performance

The mapping system has been designed according to the international standards defined by the Open Geospatial Consortium (OGC), including Web Map Services (WMS) Web Feature Service (WFS). The adherence to these standards gives full interoperability with other mapping systems. The visualization component enables to quickly and simply focus the map onto the portion of interest. The navigation features of the map are presented through simple and intuitive interfaces. The dispatcher will be able to move on the map, perform zoom operations, measurement, etc. with a simple click of the mouse. The software architecture is based on client-server structure

The GIS module is fully integrated with iO™ and automatically imports entities and objects created within the system (i.e. incidents, emergency vehicles, substations, factories/plants, etc.), each of them is easily recognizable thanks to customized icons (please, refer to the previous figure).

It is also possible to import a specific point's coordinates from the GIS into iO™; this is particularly helpful whenever the caller cannot tell where they are but can only describe what they are seeing around them (i.e. points of interest).

In conjunction with an AVL system, when present, iO™ GIS provides a powerful tool for tracking the positions that represent real-time location and route taken by resources localized by on board GPS devices. Please, refer to AVL integration description.

Other iO™ GIS module features:

- **Mouse Wheel:** it is possible to increase or decrease the zoom level by scrolling the mouse wheel
- **Navigation Controls:** through the zoom bar to increase ("+" key) or decrease ("-" key) the level of zoom (e.g. Google Maps). Through a button, it is possible to go back to the initial scale
- **Scale of Visualization:** it is possible to select the value of the scale of the maps and the type (vectorial, raster or other types) at which the dispatcher wants to view the map thanks to the menu Tools "Choose Scale"
- **Surfing the Maps:** with the buttons it will be possible to surf the maps
- **Print the Maps:** it will be possible to print the selected maps
- **Search Functions:** the activation of the research tool (lens) allows the dispatcher to query the database of commonplace names, address, intersection and house number. The search is made for progressive fine-tuning: the inclusion of the town activates the centre of the map in order to optimize the zoom level for the urban area identified. The next compilation address further defines the map area concerned to centre the view and include the full path. The research takes advantage of "approximate string matching algorithms" to provide an opportunity to correct manually an address that contains typographical errors or does not correspond exactly to the syntax in the base data or the prefix. The results are shown directly proportional to the priority rankings, calculated by these algorithms.

3.14.1 LOCATION VALIDATION

Location validation information and other geographic data are contained in the iO's geofile. Geofiles contain street centerline information, along with appropriate latitude, longitude and information for each street center line segment, as well as attributes describing the addresses contained on each side of a street centerline segment. iO's geofile could contain information about streets.

Each piece of geographical information can be tuned with specific narratives to describe a particular status or just to make suggestions.

In addition, iO™ supports the structure file based geofiles that contain street centerline data, plus all of the unique structures within a portion of (e.g. the urban portion) or the entire iO™'s service area.

The call pick-up performed via iO™ client triggers the creation of the call taking incident form and the collection of ANI and ALI information. iO™ manages the calling number (CLI) as correct

data which doesn't require to be double-checked by the Call Taker. ALI and caller identification are produced in a separate box in order for the Call Taker to check them before adding them into the incident form. This represents a two-fold aspect; the caller identification might not correspond to the phone line billing name, and second, the caller location might not be as precise as it ought to be and may not correspond to the incident location. Location issues are even more complex when the emergency incoming call is generated from a mobile device (the typical example is a caller who is driving on a highway and reports an accident he witnessed few minutes earlier). Only after having checked the ALI and caller identification data, the Call Taker imports those into the incident record by simply choosing "OK" on the ALI/ANI box. This operation takes less than 20 seconds.

In case the incident location does not correspond to the caller, and the system doesn't recognize the location through the GIS, different layers (e.g. google street view aerial images) can import the coordinates of the correct point into the CAD and fill in the location data for the dispatch.

3.15 iO™ BUSINESS INTELLIGENCE

iO™ BI module makes it possible for the concerned stakeholders to create reports and dashboards aimed at the constant monitoring and statistical analysis of historical data and obtain constant performance measurements of the emergency service and of the Centre. The BI module is composed by the following three iO™ BI module building blocks internal business processes:

- The data warehouse is the Sybase ASE database, properly structured to store filtered and transformed iO™ historical data to be used by the BI application. The data warehouse is structured in datamart, with each of them representing specific, self-consistent emergency management aspects.
- ETL (Extract, Transformation, Load) procedures are used to extract relevant data from iO™ DataBase, and transform them in order to be suitable for the structure of the data warehouse. ETL runs typically with a daily frequency and overnight in order to lower the impact on the production DB; ETL tasks can however be configured according to the Customer needs. Once data is imported into the data warehouse, the subsequent processing will not affect iO-CAD DB, preventing it from being possibly overwhelmed by heavy computational queries that might affect Centre efficiency.
- Business Intelligence application, based on MicroStrategy Intelligence Server runs the query engine and exposes the web interfaces towards the end users.
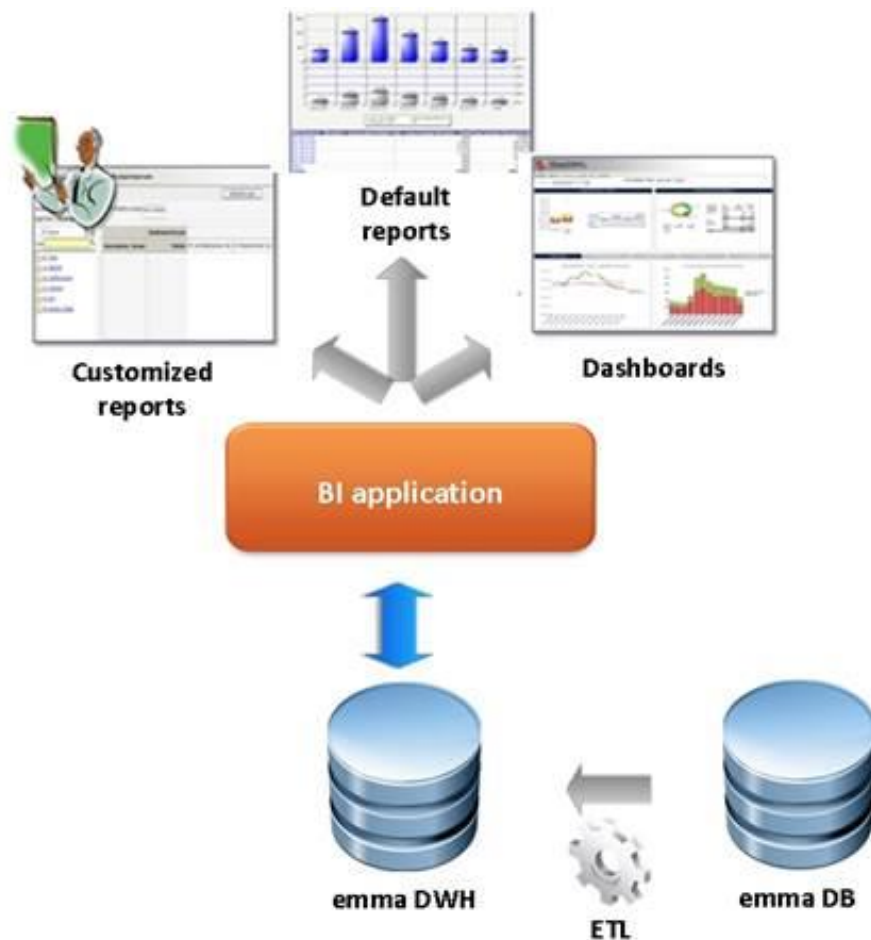
An example of this implementation is AREU - Regional Emergency Agency. On the website below is possible to see some information about real-time events in Milan 112 PSAP.

AREU real-time: https://www.areu.lombardia.it/web/home/missioni-aat-real-time

All the information in iO™ provides statistics information through interface tools that allows generation of Report and Analysis in different levels. It's possible to show information for the citizens or to share information for the personnel in the emergency center to generate analysis in order to optimize the service.

Every information can be generated following different drivers, the list of default iO™ reports follows:

"Emergency mgmt" datamart	The "emergency mgmt" datamart is intended as a monitoring tool throughout rescue processes, from the incoming emergency call management to the end of the rescue dispatch. The "emergency mgmt" datamart contains the following reports: 1. **Number of rescues/incidents incidents** 2. **Number of affected people** 3. **Number of transported/treated patients (EMS)** 4. **Waiting time of the incoming calls in the PBX queue** 5. **Phone call duration** 6. **Triage filter interview duration** 7. **Time to perform the first dispatch** 8. **Time for the first emergency vehicle to depart** 9. **Time for the first emergency vehicle to be on the spot** 10. **Time for the first emergency vehicle to reach the selected hospital (EMS)** 11. **Overall incident duration**
"Rescue and Dispatches" datamart	The "Rescues and Dispatches" datamart contains the following reports: 12. **Number of dispatches** 13. **Time to open dispatch records** 14. **Time between the dispatch record creation and the engaged emergency vehicle departure** 15. **Rescue duration** 16. **Evaluated rescue duration** 17. **Time for the engaged vehicles to get to the spot** 18. **Waiting time of the engaged vehicles once on the spot** 19. **Time for the engaged vehicles to get to the selected hospital (EMS)** 20. **Total amount of miles** 21. **Evaluated miles**
"Routes" datamart	The "Route" datamart contains the following reports: 22. **Number of routes** 23. **Time to cover the routes** 24. **Emergency vehicles waiting time while enroute**
"Phone Calls" datamart	The "Phone Calls" datamart contains the following reports: 25. **Number of phone calls classified as "incoming", "outgoing", "not responded" and "interrupted"** 26. **Queue waiting time** 27. **Phone call duration**
"Patients" datamart	The "Patients" datamart contains the following reports: Number of patients, Patients' main clinical data (e.g. breath frequency, blood pressure, …) classified on the basis of the specific medical incident (e.g. trauma, stroke, …) and engaged vehicle typology
"Population statistics" datamart	Statistics concerning population distribution, age, gender, …

Reports can be provided in different ways: tabled, graphical, geo-referenced as depicted in the following pictures. Reports access can be ruled on the basis of the user profile accessing iO™ Business Intelligence.

Thanks to its native integration with Standard Maps service, iO™ BI Module provides Geo-referred reports.

The upper right-end report displays primary rescues; the left-end report displays rescues spots and the related starting post of the vehicle; the central low report represents the rescues statistics compared with per-Municipality population densities.

iO™ BI Module provides the concerned stakeholders with customizable dashboards, which are automatically updated and focused on particular Key Performance Indicator.

3.16 iO™ MANAGEMENT AND ADMINISTRATION

In order to give centre administrators the possibility to autonomously configure and fine tune the most commonly used system parameters, iO™ CAD platform comes with a specific management and administration tool. iO™ configuration tool allows the centre administrator to set up customized new fields, graphical user interfaces, processes and new functions.

iO™ is composed by several tools to improve the user experience and the productivity. iO™ Management and Administration Module allows the user to manage all the information in to the CAD without vendor support.

SECTION 4: TECHNICAL OVERVIEW

4.1 TECHNICAL ARCHITECTURE INFORMATION

From the beginning to the end of any critical project, especially for installing a CAD for a PSAP, continuous communication and solution driven, hands-on ownership are the main keys to project success. The software architecture of the solution provided throughout the entire project life-cycle must be based on a well-known and robust set of products and services. In particular, the following objectives will be pursued:

- Global solution design of the whole system software architecture (data, application, security)
- Definition of the migration strategies and processes to ensure the best solution deployment
- Exhaustive factory and site Test Acceptance Procedures (ATP)
- In the following sections, these guidelines will be described in more detail

4.1.1 TECHNOLOGY OVERVIEW

On the client side, iO™ runs on Microsoft Windows 7 Pro 64 bit or newer.

On the server side, iO™ is composed by different software modules: application modules which are based on Windows Server 2008/2012 operating system and the database module, SAP ASE technology, which is Linux based. The DB is licensed to provide security by column-level encryption and SSL access.

Apart from the operating system requirements, iO™ is platform independent; nonetheless Beta 80 endorses an ICT infrastructure specific for mission critical environments which comprises the following:

- Virtualization platform: vmware vsphere v5.1 (or later) including at least vMotion and High Availability services

- Fault tolerant computing layer composed by Stratus Technologies ftservers which assure "five nines" degree availability; ftservers fault tolerance mechanisms do not affect the actual CPU resources which can be completely devoted to CAD applications
- 8Gbps Fibre Channel, non-blocking SAN (Storage Area Network)
- Storage platform EMC2 VNX equipped with both SAS and Solid State disks
- Both the SAN and the storage array are characterized by proper redundancy mechanisms to ensure a "five nines" degree availability
- Data consistent and virtual machine-level backups possibly stored in a remote repository via an IP wideband connection
- Fully redounded, Gigabit Ethernet LAN between application servers and clients

Such architecture is disaster recovery ready and can be easily evolved into a geographical business continuity solution.

4.1.2 HIGH-AVAILABILITY AND REDUNDANCY

iO™ is built upon self-consistent software modules: the database as the core of the solution and a number of ancillary application functions (e.g. radio integration, external systems integration/IF, web access front ends, etc). This modularity allows for a higher system resilience since an issue arising on a module does not affect the others; it also leads to a better exploitation of hardware resources which goes hands-in-hands with virtualization's specific hardware optimization.

Column level encryption of the database allows the cyphering of exclusive columns of sensitive data, creating a relevant optimization of CPU resources and streamlining user access.

At the database level a continuous near real-time data consistent replica is performed to keep a warm synchronized database ready to be used in case of the master DB unavailability.

Ordinary, scheduled maintenance activities on the hardware platform and on the CAD typically lead to no service disruption.

As far as the ICT platform fault tolerance levels are concerned, please refer to the description provided in the previous section.

Service Level Agreements (SLA) concerning critical issues are defined as follows:

- Incident creation and assignment: within 1h from the notification in 99% of cases
- Incident resolution: within 8h in 98% of cases

An estimated downtime for the CAD is less than four hours per year.

iO™ can be simultaneously accessed from both local and remote positions; remote access can be performed via iO™ client (a secure VPN connection is strongly suggested in this case) or can be web based (via a secure VPN connection or Internet). There is no limit on the number of satellite sites that can connect to the iO™ installation.

The iO™ dispatch system is based on configurable functions to support Adjustable Dispatch Levels to alternative sets of dispatch policy plans in special circumstances, such as inclement weather, major incidents, disasters, and low resource levels.

iO™ monitors the percentages of all available resources and notify to the Dispatcher that the current response plan to generate the run cards move to other level.

The definition of the policy to define the degraded mode in a run cards can be pre-configured or manipulate during the event in according with the SOP of the Center.

The Trento and Milan Fire Departments have created the following Degraded Mode pre-plan:

- Create a response plan for degraded mode to reduce response levels.
- Definition of several percentage levels to activate degraded response plans. For instance, a department has determined it needs to reduce response levels when activities consume a certain percentages of all available resources within a jurisdiction.
- Search for new resources available to cover the gap.

4.1.3 SYSTEM ADMINISTRATION AND MAINTENANCE

iO™ is a highly customizable platform; a ToI (Transfer of Information) precedes its configuration in order to shape it as close as possible to the Agency's specific operating procedures.

Deployment activities are performed on site by highly skilled personnel who if needed can rely on remote support from HQ resident specialists.

iO™ deployment is always followed by proper class training performed by certified Beta 80 personnel; the same applies upon any subsequent scheduled CAD release update.

Support services are granted 365 days per year, 24x7, and can be accessed by phone and email. Support services con be broken down as follows: incident management, service management (including information requests) and change management.

As the Prime Contractor, Beta 80 acts as the first line of support and provides help desk assistance with respect to Third Parties' components provided by Beta 80.

Depending on the Customer choice, Beta 80 can provide up to four minor release updates per year; minor release updates are performed on site by Beta 80's professionals during "low traffic" time slots and do not cause service interruption.

Both support and delivery teams are composed by highly skilled professionals with years or decades of experience in emergency management and public safety.

Software support is typically performed via remote secure access by Beta 80's specialists with the SLA outlined in the previous section; hardware support is performed on site with a Next Business Day intervention SLA.

Upon contract signature, a Beta 80 Group Account Executive is assigned to the Customer and acts as their single point of contact throughout the lifecycle of the contract. The Account Executive is in charge of coordinating the CAD delivery stages and represents the first contact for technical and non-technical issues as well as for incident escalations.

4.2 SYSTEM INTERFACE INFORMATION

iO™ is equipped with a multi-purpose XML based integration framework (a.k.a. IF– Integration Framework) specifically designed to easily develop application level interfaces towards external systems that go beyond:

- E9-1-1
- External Databases
- CAD To CAD (e.g. in case of mutual aids agreements with other Agencies)
- Telephone system and TDS
- Mobile CAD (please see chapter 3.15)

Other possible external systems whose integration could be of interest in the future might be Federal, State and Local Databases, sensor networks and hospitals (e.g. for the PSAP to be aware of bed counts).

Using the iO™ E9-1-1Interface, Personnel are able to easily add caller data (ALI/ANI) into the system and display on the Map using GIS data (latitude/longitude) provided by the Telephony system or obtained directly from the iO™ Map. iO™ interface is interconnected with Social media networks which supports identifying the caller by receiving extra information (e.g. pictures, age, status, kinship).

4.2.1. E9-1-1 TELEPHONY

iO™ integration with a call taking system requires, as a minimum, the capability to acquire the caller's location information (ALI). In order to achieve this goal, Call Taking platform should expose relevant interfaces for the CAD system to handshake with (e.g. XML based APIs, in case of ESInet based call taking services).

According to the Telephone System interfaces, other integrations with the CAD platform might be the following: CAD registration, event transfer, ALI discrepancy report submission, etc.

4.2.2 FIRE STATION ALERTING

An FSA is strongly suggested whenever the PSAP has to dispatch stations in which no real-time monitoring of PSAP incoming alerts takes place.

No standard exists specifying CAD-to-FSA interfaces, hence iO™ system has to leverage on FSA Vendor provided APIs; IP, possibly XML based interfaces are to be preferred since they provide more flexibility and simplify CAD-side development activities.

4.2.3 MOBILE DATA COMPUTERS AND DATA RADIO NETWORK

iO™ seamlessly integrates with Law, Fire and EMS mobile clients, respectively iO™ Patrol App, Tablet Command software and Beta 80's own EMS mobile CAD.

Nonetheless iO™ can integrate other systems including mobile CAD solutions. Depending on the range of open interfaces made available by the PSAP planned mobile software platform, iO™ can relay CFS record details to MDCs, receive dispatch statuses and notes, exchange messages.

A full integration between the CAD and mobile devices software is crucial to streamline and make more effective the incident response, since it:

- Reduces units engaging time
- Reduces radio voice communications leaving this valuable channel only for emergency communications between officers and dispatchers
- Makes it possible to optimally track dispatched resources
- provides first responders in the field with the proper degree of situational awareness and with tools such as the Commander dashboard, Patient Record, pre-plans
- Provides a higher degree of situational awareness also to dispatchers and other response concerned professionals (e.g. medics at the target E.R.)

4.2.4 TIERED DISPATCH SYSTEM (TDS)

Other than having its own, Beta 80 developed, TDS, iO™ is integrated with Priority Dispatch EMS ProQA and it's about to be certified for EMS ProQA Paramount.

Basing on our experience, the CAD interface to an external call taking/protocol system should perform the following tasks:

- Launch the Tiered Dispatch tool directly from the CAD screen
- Populate the Tiered Dispatch tool screen with a minimum set of data specific to the incident: starting time, incident ID, ANI/ALI
- Make the severity and determinant code available to CAD as soon as they have been generated in order for the CAD system to generate the proper run card for dispatchers
- Real time import the Q&A session related information within the CFS record and make it available to dispatchers (and to field personnel depending on the mobile CAD software capabilities). This set of information will then be logged within the CFS record and be part of incident's historical data
- Manage changes in case status (e.g. determinant change) in order for concerned dispatchers and responders to be properly alerted in a timely manner

In case the call taker and dispatcher are the same person, the integration between the TDS and CAD will provide an easy way for them to toggle between the two systems.

BETA 80 INTERNATIONAL

SECTION 5: SUPPORT, MAINTENANCE AND WARRANTY

5.1 TRANSITION AND CHANGE MANAGEMENT

The change management consist of two main activities: services continuity and SLAs (Service Level Agreement) compliance. Both activities should be carefully planned and organized by providing the corresponding risk management. The change management will be based on ITIL best practices that offer the highest guarantees of efficiency and effectiveness. The two previous activities involve the following main areas:

- **APPLICATION INFRASTRUCTURE:** this area includes the definition of the new software architecture and the test plan which is the fundamental tool to release the application components
- **TECHNOLOGY INFRASTRUCTURE**: this area investigates the characteristics of the new technological system and the different components that make it up
- **TRAINING:** this area provides staff training services including logistics and training tools for proper delivery courses
- **SERVICES APPLICATION:** this area identifies the best communication channel between users and Help Desk service to troubleshooting problems

5.2 SYSTEM ADMINISTRATION AND SUPPORT

Beta 80 Group carries out maintenance activities using the Service Management Framework, based primarily on the ITILv3 Service Management Lifecycle deploying a team composed of the following senior professional skills: Project Manager, Software Developer, Software Analyst and System Analyst.

ITIL (Information Technology Infrastructure Library) is the most widely accepted best practices-based approach to deliver IT services.

Beta 80's support services leverage on the activation of two VPN connections: a secure client-to-site VPN which is necessary for Beta 80 professionals to access the remote iO™ instance and a secure site-to-site VPN which is the base of the underlying real time proactive monitoring of the system.

During the design phase, the Project Manager together with the Customer, follows the Service Design ITIL recommendations which revolves around IT services, processes and other aspects of the service management effort

Support Services are delivered according to the following processes:

- Event management, - Events may be Customer originated or detected by Beta 80's proactive monitoring tool. After an event has been generated it may lead to an Incident, Problem or Change
- Incident management, to restore normal operations as quickly as possible with the lowest possible impact on either the business or the user
- Request fulfilment, minor service requests
- Problem management, that aims to resolve the root causes of incidents and hence to prevent their recurrence
- Identity management, focused on granting different user classes the rights to access the correct set of services they are authorized for

Beta 80 acts as its Single Point of Contact (SPOC) for the Customer with regard to all components that are part of the iO™ proposal; Beta 80 Help Desk service is active 24 hours per day, 365 days a year and can be reached via phone and email.

Beta 80 is committed to provide up to four CAD release updates per year, each update being aimed at solving detected issues, delivering new functionalities able to maintain iO™ at the

Market's leading edge. CAD updates and upgrades are to be intended as part of the annual software support fee.

A number of these enhancements is typically the result of specific customization requests which have been submitted by Customers. Before its acceptance, each customization request has to be analyzed by Beta 80's analysts in order to ensure it has no severe impact on the CAD platform as a whole.

The actual number of updates delivered each year is determined by the contractual agreement with the customer.

iO™ presents a specific system management interface that can be accessed by authorized Customer's administrators in order to carry out basic CAD configurations regarding units and resources, personnel shifts, stations, address book entries, Point of Interests, run cards, dispositions, medical response attributes (e.g. diagnosis, therapies / drugs), pre-plans.

More complex CAD configurations and changes have to be submitted to Beta 80 Help Desk and are included in the annual support fee.

The software will be covered by warranty throughout the lifetime of the contract from the installation date. The warranty will cover the solution of possible malfunctioning of the software correctly used. The Customer will report in detail, during working hours, by telephone, fax or email, the malfunctioning found.