ONE2MANY
AN EVERBRIDGE COMPANY

CELL BROADCAST SOLUTION OVERVIEW

A telco-grade solution that lets Mobile Network Operators leverage core network capabilities to comply with Governments' nationwide emergency alerting requirements.

> When it comes to mass message broadcast, no technology is more reliable and effective than cell broadcast. Residing in the mobile telecommunication network, Mobile Operators manage a truly location-specific service that can reach millions of people in seconds.

INTRODUCTION

As cell broadcast service is part of the mobile network's signaling, its capability is in every mobile telecommunication network. This global technology is standardized for all networks. Cell Broadcast messages are inherently location-based. Importantly, cell broadcast utilizes dedicated network signaling, different from voice and data capacity. It is not affected by network congestion, making it ideal for Government nationwide emergency alerts.

The international Telecommunication standardization bodies (3GPP, ETSI, ATIS) have acknowledged Cell Broadcast as the most viable mobile technology for implementing Mobile Emergency Alerts in 2G, 3G, 4G & 5G networks. As the only technology service standardized for emergency alerting, Cell Broadcast meets all the criteria of the various emergency warning requirements, be it EU-Alert, W-PAS, KPAS, ETWS, EMA, CMAS, WEA, to name a few.

one2many is the pioneer behind Cell Broadcast. As an active participant in the Standardization bodies, one2many play a leading role in defining the emergency alerting standardization requirements and end-user experience. This active involvement ensures that up-coming market requirements are incorporated into standards but also that the Cell Broadcast Solution product roadmap is standards-based and future proof.

Having built the world's first Cell Broadcast Center in 1996, one2many's Cell Broadcast Solution is the most mature on the market. It includes a rich collection of features, including PLMN import tools, multi-language support, and the unique diagnostic messaging. The telco-grade, standards-based, open distributed architecture solution includes specific built-in public warning functionality, such as priority messaging and device-based geo-fencing. There is full end-to-end technology chain auditing and monitoring, providing Operators with actionable insight into the state of the cells in their network. The extensive reporting simplifies the compliance to any Government emergency alerting requirements.

As an independent, RAN agnostic partner, with one2many, you have a partner who understands and has expertise in both the mobile network and Government domains. One2many is the market leader in cell broadcast.

KEY BENEFITS

■ For Mobile Operators

Standards-based solution for all networks

- Cell Broadcast is supported in all network technologies 2G, 3G, 4G and 5G

- one2many's Cell Broadcast Solution is compliant to all 3GPP standards

- A proven solution for all Global Public Warning Systems: CMAS, WEA, EU-Alert, KPAS, ETWS, WPAS

- one2many's Cell Broadcast Solution supports the latest features WEA 1.0, WEA 2.0, WEA 3.0

- one2many's Cell Broadcast Center (CBC) supports Cell Broadcast Entity (CBE) interfaces based on international standards, including CAP V1.2, C-Interface, XML standards

An independent agnostic, telco-grade solution

- one2many's CBC integrates with all RAN vendors and offers an unrivalled library of BSC/RNC/MME/AMF interfaces

- A telco-grade Cell Broadcast Solution that uses critical infrastructure paradigms at the core of its design including, interoperability, reliability, scalability and high availability with no single point of failure and provides SNMP V3 support

- one2many's Cell Broadcast Solution is fully site redundant and geo-redundant

- The Cell Broadcast Solution can be deployed as bare-metal, virtual, cloud based or as an on-site managed service

- one2many has support hubs in The Netherlands, China and Canada, there is global 24*7 support with follow-the-sun ticket handling

■ For Governments

- one2many's Cell Broadcast Solution supports a distributed CBC and centralized CBC for nationwide Cell Broadcast launch

- The CBC is tested and certified with all known CBE systems in the world, including Everbridge, UMS, one2many, Eviglio, IPAWS

- one2many's Cell Broadcast Solution is a high secure and GDPR compliant solution

CELL BROADCAST SOLUTION

Cell Broadcast messages (CB-messages) are disseminated from the mobile network's radio cells rather than to a specific mobile device. As such, cell broadcast works on a one-to-many basis, unlike SMS, which uses a point-to-point connection. With cell broadcast, one message can be sent to millions of devices, within a target area in seconds. The specified area can be just a single radio cell, up to the entire mobile network. Cell broadcast is intrinsically a location-based technology. Public warning is the leading and proven use case for cell broadcast.

A Cell Broadcast System consists of (redundant) Cell Broadcast Centers and one or more Cell Broadcast Entities. Authorized parties compose messages on a CBE. The CBC manages the broadcasting of those messages to the RAN.
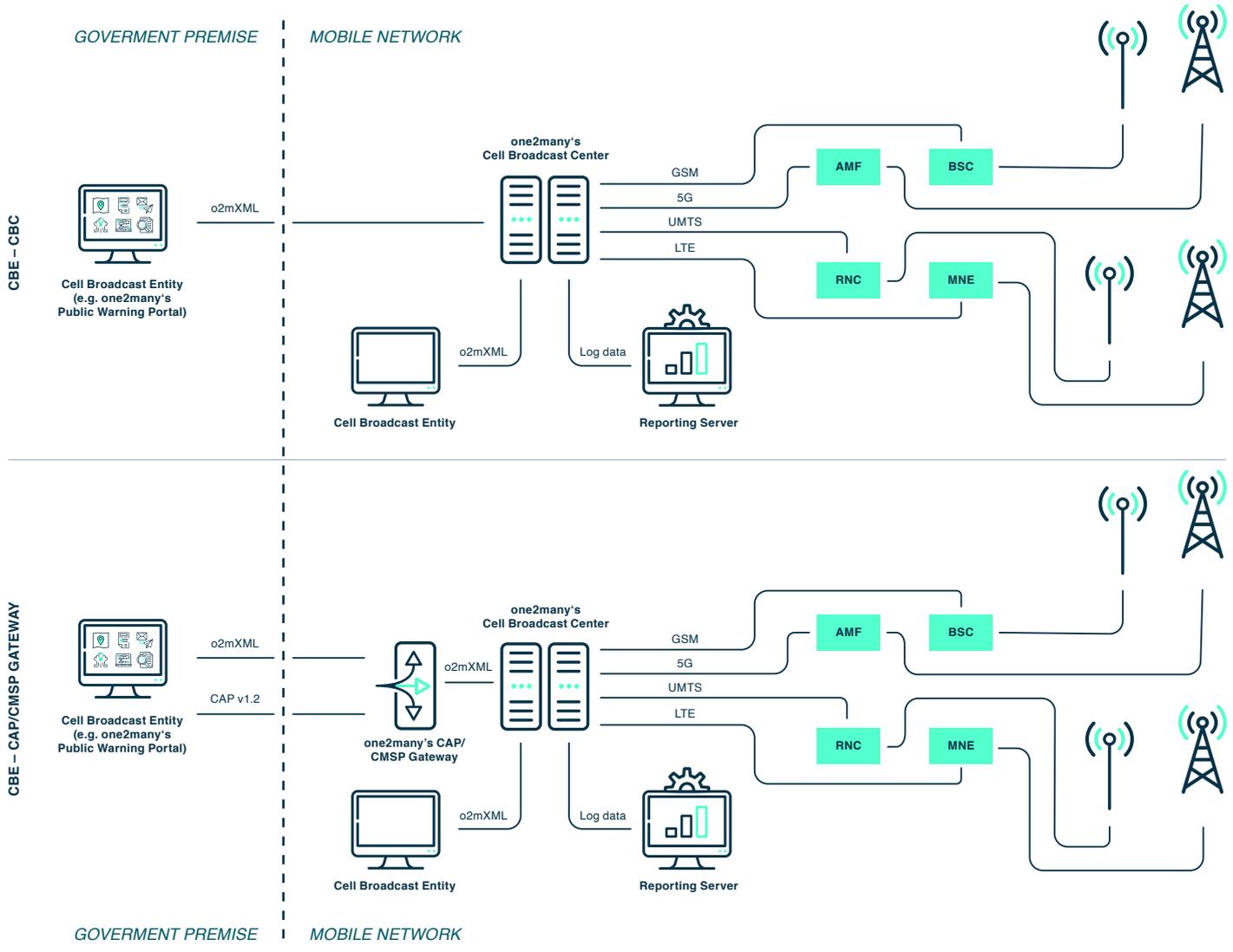
one2many's Cell Broadcast Solution comprises of

- **Cell Broadcast Entity (CBE).** A CBE is any application connecting to a Cell Broadcast Center. For public warning, this network unaware application resides in the Government environment and integrates to the mobile operator network. There are two CBEs available. A simple CBE (CB only) or a multi-hazard, multi-channel CBE called the Public Warning Platform.

- **Cell Broadcast Center (CBC).** A CBC a network element in the mobile core network that sends the cell broadcast messages. Located within the MNO domain, this network aware application maintains all relevant information on the radio cell location (Public Land Mobile Network [PLMN] data set)

- **CAP/CMSP Gateway.** Depending on which standard is prevalent, a CAP/CMSP gateway may be required. For instance, the North American CMAS standard uses the C-interface. As a CBE, this application translates C-interface or Common Application Protocol (CAP) to connect to the CBC. In this case using one2many's XML interface.

All the components can be enabled and integrated when required. They utilize one2many common infrastructure and OSS elements.

HIGH LEVEL OVERVIEW OF TWO SCENARIOS WITH ONE2MANY'S CELL BROADCAST CENTER

GOVERMENT PREMISE *MOBILE NETWORK*

CBE – CBC

Cell Broadcast Entity
(e.g. one2many's
Public Warning Portal)

o2mXML

one2many's
Cell Broadcast Center

GSM
5G
UMTS
LTE

AMF
BSC
RNC
MNE

o2mXML

Cell Broadcast Entity

Log data

Reporting Server

CBE – CAP/CMSP GATEWAY

Cell Broadcast Entity
(e.g. one2many's
Public Warning Portal)

o2mXML

CAP v1.2

one2many's CAP/
CMSP Gateway

o2mXML

one2many's
Cell Broadcast Center

GSM
5G
UMTS
LTE

AMF
BSC
RNC
MNE

o2mXML

Cell Broadcast Entity

Log data

Reporting Server

GOVERMENT PREMISE *MOBILE NETWORK*

ONE2MANY'S CELL BROADCAST ENTITY – A COMPREHENSIVE, INTUITIVE ALERT WARNING SOLUTION

In an emergency situation, it's critical that the public trust the alerts they receive. Using a CBE, such as one2many's Public Warning Platform (PWP), authorized and authenticated Government users create and issue emergency alerts via a secure web browser session. There is an option with the PWP to configure two-factor authentication if additional levels of security are deemed necessary.

The Cell Broadcast System architecture enables a Government Agency to operate without being aware of the complexity and the changes in the radio access network. This structure has a dual benefit. Often CBEs are located at the Government Agency's premise, remote from the CBC. This architecture enables complete control by the Government Agency over messages sent, while the mobile network, itself, is shielded.

The PWP is a portal, supporting multi-channel communication which lets Government Crisis Management Centers inform the public about imminent threats and guide them to safety. It's not just Governments who benefit from the PWP. From an MNO perspective, the PWP enables them to create their own alerts for testing purposes. In a worst-case fallback scenario if the link to the Crisis Management Team is down, at the direction of the Government authorized personnel, the MNO can issue the emergency alerts on their behalf.

■ **Creating alerts with multi-input for a holistic view of the situation**

For a comprehensive view of all threats and hazards, the PWP aggregates alert information from multiple sources using the C-interface and CAP compliant input adapters. Information, from for example weather stations, earthquake or flooding sensor networks, but also from websites such as Google SOS Public Alerts or the WHO Alert Hub are combined to provide users with a complete picture of the situation.

The permission-based user interface has multi-language support, it includes pre-defined template warning messages and pre-defined areas. Its intuitive layout with a dynamic map functionality prompts the user to enter all pertinent information, making it easier to use in an emergency situation. The PWP dashboard provides a clear, date-stamped overview of all alert messages: active, completed and draft.

■ Audit, tracking and security available at your fingertips

The extensive audit logging and reporting functionality ensures that all activities are captured with a wide range of reports available out of the box. Statistics and reports are stored on the system for up to 12 months accelerating response to any compliance or incident post-mortem requests.

■ Disseminate alerts over multiple channels

The PWP is designed to send approved warning messages in a specific geographic area over one or multi-channels. In addition to cell broadcast, users can select location-based SMS, voice, email, WhatsApp or social media. As cell broadcast can be sent in binary format for processing by machine-to-machine application, using CAP protocol, alerts can also be sent to screens for the broadest reach. For example: roadside information, billboards, public transport displays.

Using cryptographic techniques, the PWP's CAP digital signature provides an extra level of assurance that only authorized personnel are sending messages.

As a CBE, the Government's Public Warning solution must be integrated with the CBC. However, the CBE-CBC interface is not standardized by 3GPP, proprietary interface protocols are required. The PWP is connected to the MNO CBCs via the one2many XML interface which provides richer integration, faster network deployment while lowering risk and cost. With one2many's PWP, there is an open interface that supports all 3GPP and ATIS protocols, including alerting protocols, like CAP. The physical connection between the CBC and CBE systems is a redundant connection (TCP/IP over HTTP), secured with IPSec or VPN using HTTPS security certificates. When no transmission occurs on a link within a specified timespan, the idle time detection capability in one2many's CBC terminates the connection.

ONE2MANY'S CELL BROADCAST CENTER DESIGNED WITH THE MOBILE OPERATOR IN MIND

The CBC is the central point from where cell broadcast messages are distributed. Ensuring that the emergency alert is sent to all those in the target geo-location requires up to date, accurate cell information. Mobile networks are continually expanding with new radio cells, including home devices, which makes maintaining accurate information on the location of the cells and their coverage a never-ending process for the Network Planning Department.

one2many's CBC provides you with an extensive cell site interface, which makes it easier to keep this information up to date with any cell location changes in the actual network. Combined with that, the one2many PLMN data import tool streamlines this process. The

import tool takes the existing network data and converts it into the format required for the PWP; making it more straightforward to map the dynamic topology to the target area or polygons for the emergency alerts.

■ Schedule alert types with precision accuracy

To aid the optimization of the Cell Broadcast service, one2many's CBC supports device-based geo-fencing. With the enhanced WEA 3.0 specification of device-based geo-fencing, it's possible to deliver potentially life-saving alerts even more precisely by using the mobile device's actual location. This translates into the accuracy of meters and is equal to that of GPS

navigation. If there is no direct line-of-sight with any satellite, the device-based geo-fencing can use Wi-Fi which results in the accuracy being in the 10s of meters.

- **There are 5 types of emergency and Government alerts that can be received on a mobile device:**

  - Presidential Alert (EU-Alert Level 1)
  - Extreme Threats
  - Severe Threats
  - AMBER Alerts
  - Public Safety Messages
  - Test Messages

The message parameters contain the broadcasting schedule. This schedule defines the start time and repetition rate of each message. Each Cell Broadcast message has a unique serial number that ensures mobile devices in the targeted area only receive each message once. An important task of the CBC is the automatic generation of those serial numbers for messages. It doesn't matter whether the cell controllers are ETSI compliant or not, one2many's CBC algorithm harmonizes the serial number generation across the different technologies.

- **Works with all RAN vendors and on all Networks**

When it comes to broadcasting of those alerts to the RAN, one2many's CBC addresses the necessary cell controllers to execute the broadcasting of the message using its comprehensive library of BSCs, RNCs, MMEs, AMFs interfaces. The Network Operations team is assured of a system that is integrated with every RAN vendor. With one2many, you have an independent partner who is trusted by the RAN vendors. one2many worked together with Nokia and Ericsson to co-develop the associated standards, using one2many's solution for testing. One2many has helped debug BTS (2G/3G), eNodeB (4G) and eNodeB (5G).

What's more, as one2many's Cell Broadcast Center is standards based, it simultaneously supports PLMN types for GSM, UMTS, LTE and 5G as described by 3GPP.

Network Type	Cell Controller	Protocol	Cell
GSM	BSC	CBSP over TCP/IP	BTS, consisting of one or more cell sectors
UMTS	RNC	IuBC over TCP/IP	Service Area, consisting of one node-B
LTE	MME	sBC over SCTP	eNodeB consisting of up to 256 cell sectors
5G	AMF	Namf (HTTP service based)	gNodeB consisting of up to 16.384 cell sectors and Ng-eNodeB consisting of up to 256 cell sectors

Generic PLMN Component Names
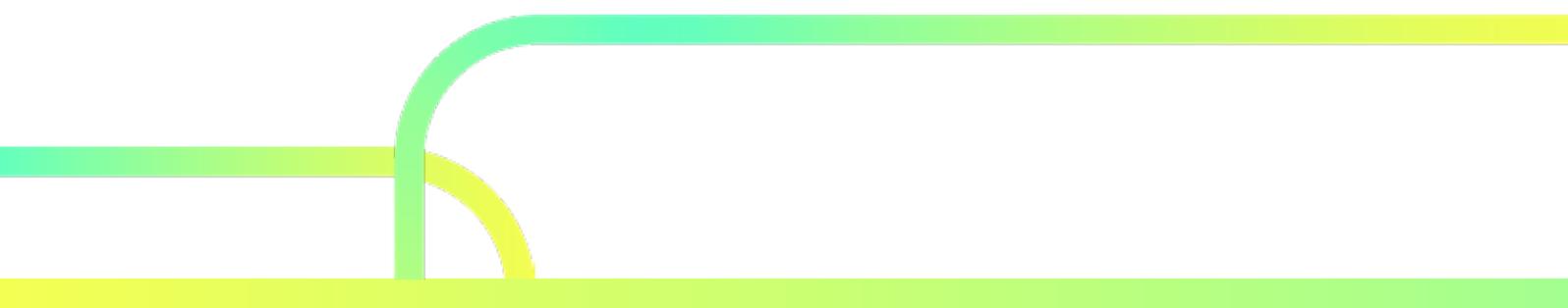
CAP GATEWAY AND CMSP GATEWAY PROVIDING GREATER FLEXIBILITY

one2many's CAP Gateway provides authorized and authenticated users with the opportunity to issue emergency alert messages over a variety of channels. The benefit of the CAP Gateway is that it applies flexible rule-based decision logic to translate different elements of CAP to the CMAS and EU-Alert items.

CBC Channel number	CMAS message type	EU-Alert Level	Opt-out capability for Mobile subscribers
4370	Presidential Alert	EU-Alert Level 1	Opt-Out is not possible
4371	Extreme Alert	EU-Alert Level 2	Opt-Out is possible
4372	Severe Alert	EU-Alert Level 3	Opt-Out is possible
4373	Public Safety Alert	EU-Alert Level 4	Opt-Out is possible
4379	Child Abduction Alert	EU-Amber	Opt-Out is possible
4380	Monthly test	EU-Monthly Test	Opt-Out is possible

Cell Broadcasts Message Identifiers for Public Warning

For countries that are strictly bound to the CMAS standard, only one2many provides a Cell Broadcast Solution that consists of a Cell Broadcast Center and a separate Commercial Mobile Service Provider (CMSP) Gateway.

MANAGING SERVICE LEVEL AGREEMENTS AND MAINTENANCE WITH EASE

One, often unknown, aspect of a Public Warning Service is that the Government requires regular updates from the MNO. A Public Warning Service Level Agreement (SLA). With one2many's CBC all activities are logged. When the logs are collated and analyzed, the MNOs have all the operational intelligence needed for the Service Manager to demonstrate their performance against the SLA. This information provides the RAN Operations Manager with greater insight into the health of the network.

one2many's CBC provides you with extensive reporting functionality. The Reporting Server performs post-processing of all log and result files, which generates the operational intelligence. The wide range of pre-defined reports streamlines the reporting process to the Government Agency or for use internally within the MNO domain.

Like all technology, there are times when operation and maintenance are required. This is particularly important for a Public Warning solution which is likely to be idle for the majority of time. A MNO needs to be assured that when needed, the Cell Broadcast Solution works faultlessly.

- **With one2many's CBC, you have a choice of three management interfaces to use.**
- SNMP compliant remote management interface
- A web interface for general CBC operation and maintenance
- Locally, via a Command Line Tool

- **These interfaces let you perform essential functions such as**
- Starting and stopping the CBC or parts of it.
- Checking basic system data (e.g. which Cell Controller controls a specific cell).
- Monitoring CBC activity, including events and alarms.

In addition to the general maintenance capabilities, with one2many, you have unique functionality that provides you with the ability to perform end-to-end testing to validate continuously that all your cells are operational. The diagnostic messaging lets you test each step of the process from CB-message creation to individual cell delivery, without broadcasting a message to mobile phones. With one2many, you have the confidence that all the cells in your network are ready whenever needed.

CRITICAL INFRASTRUCTURE READY

one2many's Cell Broadcast Solution is a scalable, standards-based telco-grade solution that is highly available, geo-redundant with automatic failover.

From an architecture perspective, with one2many's solution, there is no single point of failure due to the layered redundancy.

This approach means:
- Redundant hardware architecture.
- Software monitoring.
- Clustering software.
- Geographic redundancy
- Active – Passive sites

The Cell Broadcast Solution's hardware architecture offers both site level redundancy, with a dual node cluster configuration and geo-redundancy with geo-site cluster automatic failover. With one2many, you have a CBC Remote Site Monitoring Service that checks all network interfaces on all sites.

Back-up and Restore procedures are provided as standard, with four back up types supported:
- Full
- Partial
- Incremental Full
- Incremental Partial

For security, standard security hardening forms part of any one2many project. Software security policies follow the latest version of Red Hat Enterprise Linux security guidelines.

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