

Mobile Cell Broadcasting for Commercial Use and Public Warning in the Maldives

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List of Acronyms

ATIS	Alliance for Telecommunications Industry Solutions
ATM	Automatic Teller Machine
BSC	Base Station Controller
BSS	Base Station System
BTS	Base Transceiver Station
CB	Cell Broadcast(ing)
CBE	Cell Broadcast Entity
CBS	Cell Broadcast Service
CDMA	Code Division Multiple Access
CGAP	Consultative Group to Assist the Poor
EIR	Equipment Identity Register
EFTPOS	Electronic Funds Transfer at Point of Sale
GoM	Government of the Maldives
GSM	Global System for Mobiles
ITU	International Telecommunications Union
M-Banking	Mobile Banking
MMA	Maldives Monetary Authority
MS	Mobile Station
NECC	National Emergency Communications Center
TAM	Telecommunications Authority of the Maldives
TETRAnet	Terrestrial Trunked Radio Network
TIA	Telecommunications Industry Association
TVM	Television Maldives
UMTS	Universal Mobile Telecommunications System
UNDP	United Nations Development Programme
VOM	Voice of the Maldives
SAARC	South Asian Association for Regional Cooperation
SIM	Subscriber Identity Module

SMS	Short Message Service
WAP	Wireless Application Protocol
WiFi	“Wireless Fidelity”

Introduction

The Maldives is prone to a number of hazards including tsunamis, earthquakes, flash floods, tidal waves, thunderstorms, tornadoes and waterspouts, strong winds, and drought. The December 2004 tsunami affected many of its islands and wrought considerable devastation to its infrastructure, particularly telecom. Not only did it destroy shelters, but it affected five major nodes, disrupted service to 13 atolls (163 islands), destroyed power systems and batteries, and damaged radio equipment.¹

Maldives, a country of 1,192 islands and 290,000 citizens, is highly dependent on its natural resources. Along with tourism, which provides more than 30 percent of the country's income, fisheries and agriculture are essential to livelihoods on the country's 199 inhabited islands.² Can early warning help save lives? The need for early warning has become greater since the tsunami and the growing threat of the atoll nation receding under a rapidly increasing sea level.³ These claims are further reinforced by a study conducted by RMSI for UNDP Maldives that "It is estimated that Male will be inundated by 15 per cent by 2025 and 50 per cent by 2100 due to climate change and consequent sea level rise".⁴

Therefore, early warning is essential in timely notification of alerts so that the general populace may be able to take the necessary precautions. In the case of the Maldives, if an early warning is introduced, it must be able to reach all of the outlying islands including tourists on resorts. With mobile phones quite ubiquitous, it may be an ideal time to introduce an emerging technology – cell broadcasting – for public early warning.

Cell Broadcasting

Purpose of study

The purpose of this study was to fulfill a request by the Telecommunications Authority of the Maldives (TAM)⁵ to investigate pre-conditions in the Maldives that would make it feasible to implement cell broadcasting within a national public warning system, and, concurrently, evaluate the use of cell broadcasting for commercial usage.

*What is cell broadcasting?*⁶

Cell broadcast is the term given for the technological ability to send a single text or binary message to be distributed to multiple mobile phones within a "cell". Cell broadcast was originally designed to let network operators offer location-

¹ "Developing a Disaster Risk Profile for Maldives". *RMSI: United Nations Development Programme Maldives*. Volume 1: Main Report, May 2006.

² "Maldives Post-Tsunami Environmental Assessment", United Nations Environment Programme (UNEP),

³ "Maldives: Paradise Soon to be Lost", BBC News Online, 28 July 2004. Online: http://news.bbc.co.uk/2/hi/south_asia/3930765.stm

⁴ "Developing a Disaster Risk Profile for Maldives". *RMSI: United Nations Development Programme Maldives*. Volume 1: Main Report, May 2006.

⁵ As of early 2009, TAM will be reorganized into the Communications Authority. See <http://lirneasia.net/2009/01/new-communications-act-in-maldives/>.

⁶ "Cell Broadcast". *Wikipedia*. Online: http://en.wikipedia.org/wiki/Cell_Broadcast

based services. It is a standard feature on GSM⁷ networks as well as on IS95 CDMA networks. Essentially, cell broadcasting is a timely and efficient means of “pushing” out a message to an entire cell area without the lag times associated with sending messages via SMS, which are queued. It is a one-to-many mode of communication, unlike SMS, which is in essence a one-to-one mode.

A cell broadcast is composed of 82 octets, which equates 93 characters using a default character set. Only mobile handsets that have cell broadcast channels activated will receive the messages.

How does cell broadcasting differ from the prevalent mode of messaging, SMS? The table below gives a brief breakdown of key differences as they relate to the main subject of this report – public warning.

Table 2: SMS vs. Cell Broadcasting for Public Warning

Characteristic	Short Message Service Message (SMS)	Cell Broadcast Message (CB)
Transmission Type	Messages sent point-to-point (Messages directed to terminals; one-to-one or one-to-preset group)	Messages sent point-to-area (Messages directed to radio cells)
Mobile Number Dependency	Dependent. Requires specific phone numbers to be input.	Independent. Does not require phone number input.
Location Dependency	Independent. Only pre-registered numbers will be notified; message can be received anywhere.	Dependent. All numbers within a geographical area (cell) will be notified. The Cell Broadcast Service allows messages to be broadcast to all Mobile Stations (MS) in a given country, all MSs in a selected group of geographical locations, or all MSs in a particular cell area. ⁸
Message Type	Static messages will be sent to all pre-registered numbers.	Tailored messages can be sent to different areas based on the alert level for each area.
Bi-directionality	Yes. Users can both receive and respond directly to the sender via SMS.	Yes. Two-way messaging is an option that may be provided by the CB authority through embedded numbers or URLs to which the user

⁷ “Global System for Mobile Communication (GSM)”. The International Engineering Consortium. Online: <http://www.burnsidetelecom.com/whitepapers/gsm.pdf>.

⁸ “Analysis of the Short Message Service (SMS) and Cell Broadcast Service (CBS) for Emergency Messaging applications; Emergency Messaging; SMS and CBS”. ETSI TR 102 444 V1.1.1 (2006-02). Online: <http://www.etsi.org>.

		may respond. If using 'native' software then the user must 'click' on the link. The phone will then either phone the number or open the WAP browser and go to the link. ⁹
Congestion and delay	Subject to congestion as messages are queued. Immense numbers will cause delays.	Broadcasts are sent to a cell area on dedicated channels, eliminating congestion . Delays may only occur in poor coverage areas.
Message Length	140-160 characters in length <i>Can 'concatenate' up to 5 times, advisably. But it may not be supported by all mobile services.</i> ¹⁰	93 characters <i>It is possible to 'concatenate' up to 15 'pages' together to produce a single message of up to 80 * 15 = 1200 'bytes' of data.</i>
Security	Poor authenticity. No indication that a message is generated by a legitimate authority that cannot be emulated by typing in a text message from another phone. ¹¹	Good security. There is no way for an outsider to generate a cell broadcast message; so false emergency alerts are unlikely using this method. ¹²
Service Barring	No barring.	Limited. Received only if the broadcast reception status is set to "ON".
Reception	Yes. Message received once the mobile is switched on.	Yes, but limited. No reception if broadcast is sent before mobile is switched on. However, if updates to the cell broadcast are sent, they will be received if mobile remains on.
Delivery Confirmation	Yes. Sender can request delivery confirmation.	No. No confirmation of delivery.
Repetition Rate	No repetition rate.	Yes. Can be repeated periodically within 2 second to 32-minute intervals. In a UMTS environment, the

⁹ Obviously, this is more suitable for commercial applications than for emergency alerts as the demand for further information through such message back features would overwhelm a system during a disaster.

¹⁰ "Analysis of the Short Message Service (SMS) and Cell Broadcast Service (CBS) for Emergency Messaging applications; Emergency Messaging; SMS and CBS". ETSI TR 102 444 V1.1.1 (2006-02). Online: <http://www.etsi.org>.

¹¹ Crowe, David. "Wireless Telecom – EAS – Q3 2006". Online: <http://www.cnp-wireless.com/ArticleArchive/Wireless%20Telecom/2006Q4-EAS.html>. Accessed: 15 June 2008.

¹² Ibid.

		highest repetition rate is 1 s.
Language	Identical to all receivers.	Multi-language broadcasts can be broadcast to multiple channels simultaneously. ¹³
Message Storage [Most important for first responders and government officials re: public warning]	Yes.	No. However, the user may choose to at his/her discretion should the appropriate firmware be housed on the handset. In some cases, the message is placed in a special area of the inbox and the alarm goes off. In other cases the message is flashed straight on the screen and also placed in the inbox. ¹⁴

Why cell broadcasting?

Modern technological information dissemination tools such as SMS are quite prevalent as are warning technologies, such as sirens, radios and TVs. So how might cell broadcasting enhance general information dissemination and public warning? From the above table, there are many obvious contrasts to SMS for public warning, making it an ideal standalone or addition to any warning system since it is less vulnerable to congestion and can reach a broader audience with no privacy infringement. For general information dissemination, it can now be used for commercial purposes thanks to a growing number of income-generation models.

Furthermore, we live in an age of greater awareness of risks due to increased media presence. Governments play such strong roles in many societies that citizens have come to expect more services from them, akin to services provided by private entities. With rapid technological progress, it is necessary that they keep current and use the latest information technologies. Additionally, in our globalized world where people, products and ideas are moving across borders, it is important that communication methods are standardized. Cell broadcast is an easily standardized system since it is a simple technology, universally available regardless of mobile communication system, and international standardization will soon be available through the work of the ITU. Finally, alerts and warnings over current tools are insufficient because they have lesser reach and cannot

¹³ Aloudat, A, Michael, K and Yan, J. "Location- Based Services in Emergency Management- from Government to Citizens: Global Case Studies", in Mendis, P, Lai, J, Dawson, E and Abbass, H, Recent Advances in Security Technology, Australian Homeland Security Research Centre, Melbourne, 2007, 190-201. Online: <http://ro.uow.edu.au/infopapers/562>.

¹⁴ Wood, Mark (2008, September). *TAM Meeting Male 29 Sept 2008: Authority to Citizen Communications for the 21st Century*. PowerPoint presentation made to the Cell Broadcasting Workshop to Maldivian stakeholders, Male, Maldives

provide proper, timely information. The above table clearly shows how cell broadcast compares in scale to SMS within a public warning framework. However, this also extends to general information dissemination use as well.

The Maldives exhibits many key characteristics that demonstrate why current tools can no longer be as effective. Geographical coverage, type of coverage (use of undersea fiber optic cables, etc.), tourism and a modern communications network are some of those characteristics. For instance, sirens or loudspeakers must be placed on every island in every atoll of the Maldives for the general public to receive warning. Although TV and radio are fairly ubiquitous, the mobile phone is fast becoming the most common technology available to all

Commercial uses within the system

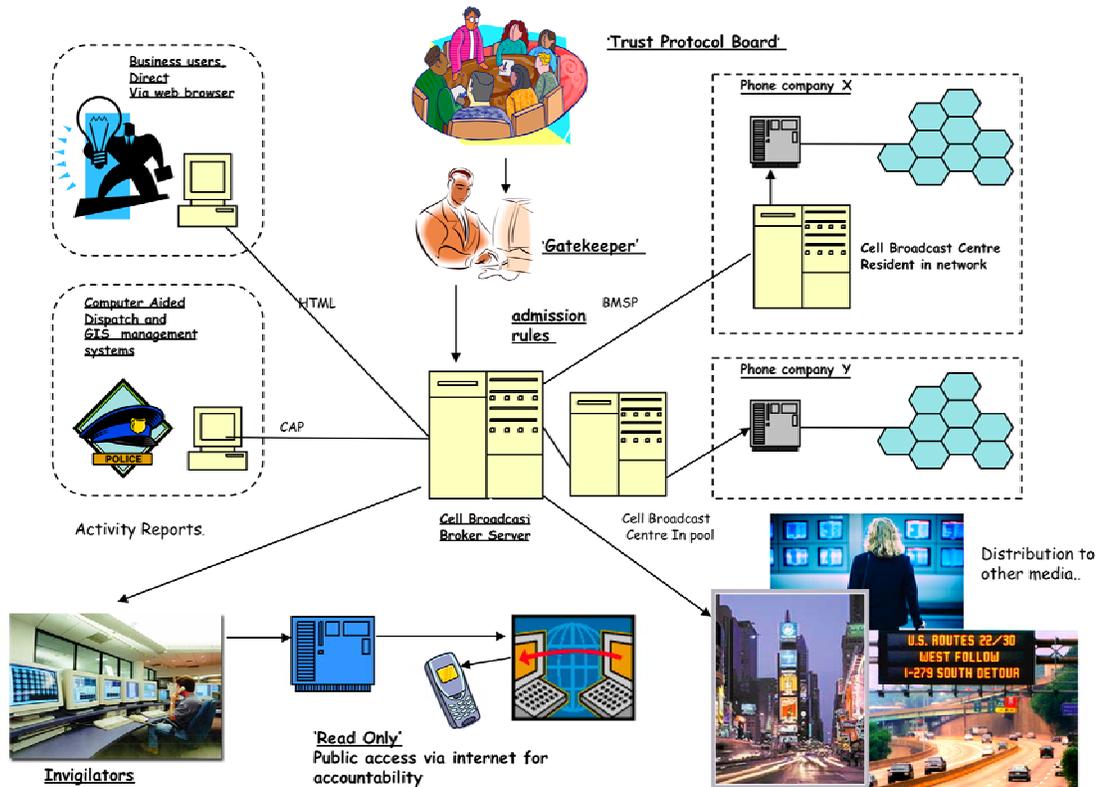


Figure 2: CellCast Technologies System for Commercial Use of Cell Broadcasting [Wood, Mark (2008, September). TAM Meeting Male 29 Sept 2008: Authority to Citizen Communications for the 21st Century. PowerPoint presentation made to the Cell Broadcasting Workshop to Maldivian stakeholders, Male, Maldives]

classes. Moreover, the mobile phone is a medium that is available and easily accessible by the majority of tourists who enter the country. Although resorts may have a public announcement system, cell broadcasts received over a mobile phone could be perceived as less intrusive (of course, intrusion is relative) and cause less panic. Thus, Maldivian officials must closely examine how cell broadcasting as explained herein can enhance and build upon existing warning and information dissemination infrastructure.

Public Warning in the Maldives

The use of cell broadcasting for public warning in the Maldives has gained more attention, since the unique characteristics of the country appear to complement this technology. An island nation composed of groups of 26 atolls of about 1,192 islets of which 250 islands are inhabited, it is crucial that a public warning system be able to reach all of the inhabited islands scattered within the Maldives. The country is prone to a number of hazards including tsunamis, earthquakes [overall hazard is low, except for Seenu, Gnaviyani and Gaafu atolls¹⁵], flash floods, tidal waves, thunderstorms, tornadoes and waterspouts, strong winds, drought and cyclones [northern atolls¹⁶].

Although the GoM has already made significant strides towards instituting a public warning system through its Emergency Telecommunications Committee and mandating TETRAnet as a first responder warning system nationwide, cell broadcasting has the potential to be an inexpensive, effective, and all-purpose means of disseminating crucial warning information to the *public* – including all roaming customers, regardless of nationality.

Necessity for Public Warning

The December 2004 tsunami affected many of its islands and wrought considerable devastation to Maldivian infrastructure, particularly telecom. Although it was not widely reported in the media, on a *per capita* basis, Maldives was one of the worst affected countries.^{17,18}

Not only did the tsunami destroy telecom shelters, but it affected five major nodes, disrupted service to 13 atolls (163 islands), destroyed power systems and batteries, and damaged radio equipment. Since the tsunami caused a loss of lives and wrought considerable destruction upon the infrastructure, the need for resilient telecommunications as well as a public warning system has become more palpable in the atoll nation. Distances between atoll islands and a population scattered thinly (except the densely populated capital city of Male) require a system to help manage the possible destruction that may be wrought by natural hazards to which the country is susceptible. The Telecom Authority of the Maldives (TAM) has taken a number of steps to implement a public warning system in collaboration with the nation's Emergency and Telecommunications Committee. One of the initiatives that will be in full operation by the end of 2009 is TETRAnet, a system consisting of a series of sirens placed strategically in the atolls adjacent to existing cell towers. Despite this considerable step forward, this solution still does not address how a fisherman would be alerted. How would a resort speedboat carrying tourists to and from resorts be notified of impending danger? Public warning is necessary to ensure that the general public is able to take timely steps in evacuating from dangerous areas, to save lives.

¹⁵ "Developing a Disaster Risk Profile for Maldives". *RMSI: United Nations Development Programme Maldives*. Volume 1: Main Report, May 2006. p. 15.

¹⁶ *Ibid.*, p.15.

¹⁷ "National Rapid Environmental Assessment – The Maldives". United Nations Environment Programme. 2004, p. 78. Online: http://www.unep.org/tsunami/reports/TSUNAMI_MALDIVES_LAYOUT.pdf.

¹⁸ "Maldives - Tsunami: Impact and Recovery Joint Needs Assessment by World Bank-ADB-UN System". Asian Development Bank (ADB), the United Nations Development Programme (UNDP), and the World Bank. Annex 15, 8 February 2005. <http://www.adb.org/Documents/Reports/Tsunami/joint-needs-annex15.pdf>

A public warning system with an embedded cell broadcast feature would provide the optimal answer to the above questions, since it is the most versatile and far-reaching public warning technology. Moreover, CB is an inexpensive technology that requires no further infrastructure. Instituting cell broadcast costs next to nothing given that an existing mobile telecommunications system is already in place, as it is in the Maldives.

Planned Infrastructure

TETRAnet [end 2009]

Terrestrial Trunked Radio (TETRA) is a digital trunked mobile radio standard developed to meet the needs of traditional Professional Mobile Radio (PMR) user organizations. The core technologies of the TETRA standard include digital trunking, and Time Division Multiple Access (TDMA).

In 2006, the Maldivian police received its first TETRA for island-to-island communications.¹⁹ Digital TETRA networks will be established for the Maldives Police. Digital Motorola Enhanced Trunk Radio (DiMETRa) will, by the end of the first phase, cover 42 locations. The National Security Services (NSS) TETRA systems will be developed by Thales of France and Motorola. By the end of the first phase, it will cover 500 users.²⁰ The proposed system is said to cost upwards of 8 million Euros.

TETRAnet Benefits:

- Cannot be used by the general public, and is therefore not subject to congestion
- Highly secure (high level voice encryption to meet the security needs of public safety organizations)
- Wide area fast call set-up "all informed net" group calls
- Direct Mode Operation (DMO) allowing "back to back" communications between radio terminals independent of the network
- An Emergency Call facility that gets through even if the system is busy
- It can be used for more than just public safety (e.g., Transportation, Utilities, Government, Military, Commercial & Industry, and Oil & Gas)

TETRAnet Limitations:

- Not a public warning system
- Can be used by system participants while on *police business only*
- Single industry usage at any given time (i.e. system cannot be used for both public safety and transportation; networks must be separate to ensure integrity)

¹⁹ "Motorola and TETRA", www.publicsafetyevents.techknowmoto.com/wp-content/uploads/TWC_mot_tetraFS_210508_d4.pdf

²⁰ Shiham Adam, Abdullah. "Emergency Telecommunications Initiatives for Disaster Management in Maldives". *ITU/ESCAP Disaster Communications Workshop*, 12-15 December 2006; Bangkok, Thailand. <http://www.itu.int/ITU-D/emergencytelecoms/events/ThailandWorkshop/final1/Session%202/SESSION%20%20%5BMaldives%5D%20Country%20Presentation.pdf>.

- Communication within the system is to other authorized talk groups *only*^{21,22, 23}

TETRAnet is not a public warning system. Rather, it is a closed-user group solution for notifying first responders when they are in the vicinity of TETRA radios. TETRAnet would not be effective should a police officer be off-duty and not have his TETRA radio on and/or nearby. It would be best served by a redundant form of communication that would be secure, be available for first responders both on and off duty, and could inform the general public of impending hazards and related alerts. Cell broadcasting is the technology that can do all of the above, making it a favorable option as a stand-alone or complementary emergency communications option.

²¹ Mark Wood (personal communication, May 31, 2008)

²² "TETRA". Online: <http://www.etsi.org/WebSite/Technologies/TETRA.aspx>.

²³ "TETRA Technology Advantages and Benefits". *TETRA MoU Association*. January 2006. Online: http://www.tetra-association.com/uploadedFiles/Why_TETRA/Technology%20Benefits.pdf.

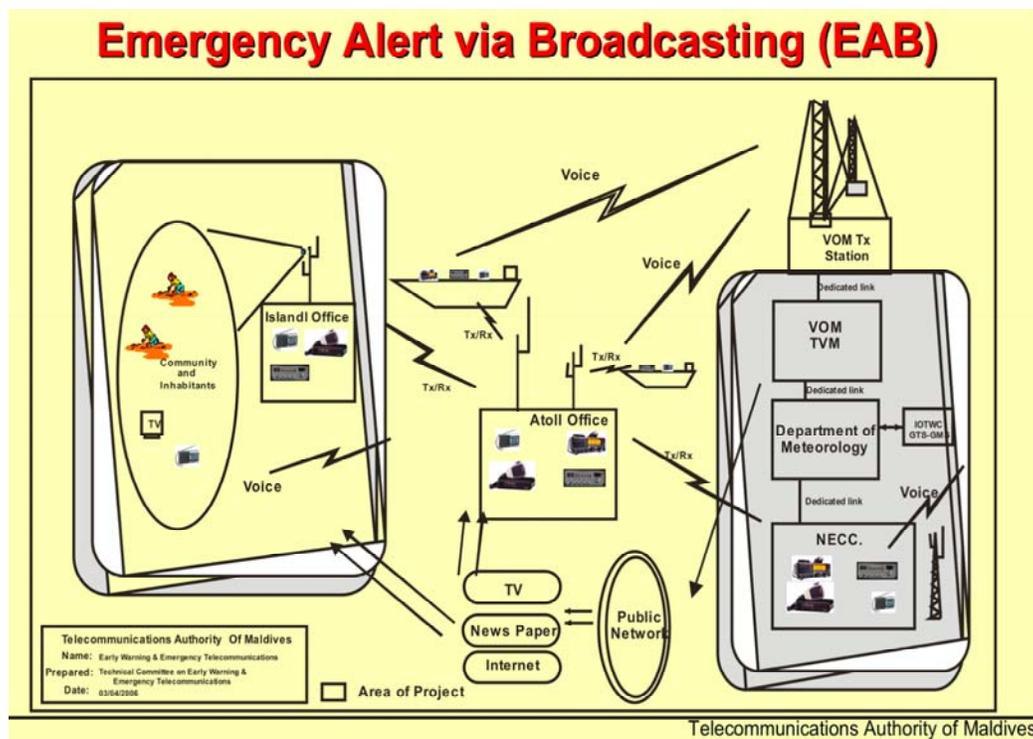


Figure 2: Emergency Alert System in the Maldives

Figure 2 depicts the current emergency alert system in the Maldives. Currently, the system is dependent upon VOM and TVM (local TV stations), the Department of Meteorology and the NECC coordinating in order to send information via TV broadcast or radio. Information would be relayed through atoll offices, to island offices and only then to the general public. This complex relay of information leaves significant room for mistakes. TETRAnet would eliminate some of this complexity; but cell broadcasting would eliminate this complexity and allow the general public to have quicker access to the information they need in a timely manner.

Telecom Providers: Dhiraagu and Wataniya

Currently there are two main GSM service providers in the Maldives. The larger and older, Dhivehi Raajjeyge Gulhun Private Limited (Dhiraagu), a joint venture company 55% owned by the Government of the Maldives and 45% by Cable and Wireless, is the most widespread and has excellent coverage in the resort islands. Dhiraagu has a near-monopoly in the most lucrative market – tourism – in international roaming.²⁴ In 2004, a license was granted to Kuwait-based Wataniya to introduce competition into the telecommunications sector. Both operators claim close to universal geographic coverage, even in the most remote atolls. On-the-ground reports rated Dhiraagu's coverage as superior to Wataniya's, particularly on the water and at tourist resorts. In the Maldives, there is yet no substantive user interface available for SMS messaging in Dhivehi script, so the Latin script is used for transliterated texting.

²⁴ From Galpaya, Helani "TRE Study" LIRNEasia. 9/19/2008. Online: <http://lirneasia.net/2008/09/colloquium-maldive-tre-study-2008/>.

Some of the emergency alert initiatives the island nation has made include emergency alert via broadcasting (EAB), the use of bulk SMS on a mobile network, priority calling and national roaming, and the establishment of a national Emergency Operating Center. Moreover, regular communications drills, awareness programs and inclusion of emergency telecommunications in curricula continue to inculcate preparedness.

Advantages/Limitations of CB for *the Maldives*

<i>Advantages</i>
<p>Location-Based Push Service</p> <p>CB offers the ability to differentiate the push messages depending on the location. It can be broadcast to areas:</p> <ul style="list-style-type: none"> ○ as small as a single radio cell; ○ as big as an entire network; ○ a cluster of areas in between.
<p>More efficient distribution than SMS</p> <p>SMS is one-to-one technology whereas CB is one-to-many. This significantly impacts the cost structure of such services allowing for easier network dimensioning. In an average network it would take 100 SMS with the same content approximately 30 seconds to reach its destination, whereas in a CB-enabled network, a similar message transmission takes 30 seconds to reach <i>all</i> end users tuned into a CB channel, up to several million at a time.</p>
<p>CB messages provoke other mobile phone traffic (SMS, WAP, voice)</p> <p>Since a customer can opt to participate in a CB channel, he acknowledges that he will receive occasional messages. SMS can seem more intrusive as it is not generally by choice that a customer will receive such messages. Opting into a CB channel exposes the customer to various “teasers”; in the case of CB commercials, they may have the form of triggers for SMS, WAP or voice services.</p>
<p>Real-time communication</p> <p>Unlike SMS, the time to broadcast a message over a CB channel is insensitive to the number of subscribers scheduled to receive the message. In a typical CB, a message can be sent within 30 seconds to all handsets. Efficiency of communicating the message does not decline in peak hours and CB does not use the signaling network (IN7) to carry messages as with SMS. One CB message (with a maximum of 15 pages with 93 characters, in total 1395 characters) to a BSC carries as much data as 8 basic SMS messages. The network infrastructure to carry these CB messages is dedicated to SMS-CB and the peak traffic on SMS-CB does not collide with any other service.</p>

One can 'concatenate' up to 15 'pages' together to produce a single message of up to $80 * 15 = 1200$ 'bytes' of data. It is possible to 'concatenate' 15 'Pages' together, however the limitation is the size of the screen on the phone. Many researchers conclude that about 180 characters (2 pages) is the optimum size for a public warning message, though the true maximum figure is closer to 1350 characters of Latin using 7-bit coding.²⁵

Multi-Language Push Services

On a single CB channel, messages may be broadcast in various languages. However, since mobiles are sensitive to the selected language, only messages in that language will be displayed. This kind of feature is most attractive for multi-lingual countries, or for services dedicated to roamers to encourage loyalty to a particular network.

Emergency Location Based Info Services

Governmental institutions may want to broadcast emergency messages to handsets in a particular area in the event of local emergencies. This feature is particularly useful for people on the move, listening to radio/TV, or working with the Internet. CB is the only currently existing technology for emergency services available on 2G and 3G networks.

CB can broadcast binary messages

Binary data can also be transmitted over a CB channel. In other words, encryption-decryption for subscribed services is possible as well as machine-to-machine communication using CB as a bearer.

Other features are equally possible:

- Dynamic traffic updates
- Enhanced CB, like EMS enabling ring tones or logo transmission
- Assisted GPS

Opt-in and Opt-out features

With the development of the Internet, trends in privacy protection regulation are on the upswing in the EU and in some domestic laws. Increasingly, concepts with push services targeted at mobile handset users that require permission of the end-user must be well defined. Thus, opt-in (customer wants access) and opt-out (customer does not want access) are conceptual features of CB technology. When a customer "opts in", content providers will reach him; otherwise, the content provider does not reach that customer. This allows for m-marketing campaigns to be targeted at the right mobile community.

Message streams are not stored

²⁵ Mark Wood (personal communication, June 23, 2008)

CB messages are display only meaning that no information is stored on the handset or the SIM, unless the user desires to archive the message. Thus, CB messages can be seen as a form of streaming content and will not overload mobile phone inboxes. It is important to note that the option of storing is solely dependent upon the type of firmware available on the handset. Thus, if a user desires to store a CB message, the following options may be available:

- A cell broadcast appears on the main screen and is stored by the user when given an on-screen option;
- A cell broadcast is stored immediately in the inbox without ringing an alarm or appearing on the main screen;
- A cell broadcast is stored immediately in the inbox and an alarm is sounded.

Broadcasts do not infringe on privacy

The content provider is broadcasting data to any mobile in a given area. It does not know which numbers it is reaching.²⁶ However, cell broadcasts have the potential to be disruptive to mobile phone users if they do not have the option to participate in a cell broadcast service or not (excluding emergency cell broadcasts). Therefore, the aforementioned opt-in and opt-out feature must be included.

Little to no additional physical infrastructure required

Since all that is required for cell broadcasting is a CBC, broker and a mobile user, its use will require little additional physical infrastructure in between the aforementioned components as it uses mobile communications over terrestrial cables and wires so often found in other systems (i.e. TETRAnet).

Limitations

CB Compatible Handsets

The user must have a CB enabled handset switched on and set to receive the appropriate CBs.

Lack of Standardization and use across networks

All the mobile networks must carry the message to ensure maximum people coverage.

Complex Geographical Areas

²⁶ Shillingford, Joia. "Shot on Target". *The Guardian*. May 2, 2002. Online: www.guardian.co.uk/technology/2002/may/02/internetnews.onlinesupplement1.

Determination of the geographical area for a CB message is complex and varies between networks due to the use of separate transmitter sites. The superb coverage of the two telecommunications providers in the Maldives would overcome this limitation to a large extent.

Not a stand-alone public warning system

The extent to which such a service is complementary to, or can replace, other warning mechanisms²⁷

Not infallible to hazardous events

In the event of extreme weather, such as cyclones, if cell towers come down cellular communications of any sort will not function. Any hazardous event that disrupts the cellular system would impede optimal functioning of the cell broadcast system.

Considerations for a Public Warning System

When planning a public warning system, certain characteristics must be considered according to the ITU's study group on cell broadcasting. These characteristics include:

- **Inter-jurisdictional, national, and regional cooperation.** A public warning network in the Maldives must reach *at least* all inhabited islands within the nation. It may also be prudent if the Maldives network were linked in some way to the Sri Lankan national warning system. This would not result in a loss of autonomous decision-making on the part of the Maldives. The levels of cooperation should be decided by the relevant authorities on both sides.
- **Involvement of the user community in identifying requirements and ascertaining value; need for support of multiple languages in message delivery.** The Emergency Telecommunications Committee, or the appropriate body, would involve all stakeholders within the public warning community so as to determine the public warning needs of the Maldives. Concurrently, it would decide in which language(s) CB messages would be sent.
- **Involvement of vendors.** Inclusion of commercial vendors will help strengthen the general public's interest and buy-in to the system. For instance, if Villa Resorts decided use cell broadcasting to notify tourists at its resorts of not only changing climate conditions, but also entertainment options, promotion of these choices to the Maldivian general public would enhance the likelihood that the technology would become more accepted as more than just a public warning mechanism.

²⁷ From www.ukresilience.gov.uk/nscwip/publications/interimreport/technology.aspx

- **Aiming for low-tech solutions to ensure relevance for people without access to sophisticated receiving devices (so-called “last-mile” community solution).** The mobile phone has become quite ubiquitous in the last few years, giving those in the “last-mile” access. A public warning system that uses cell broadcast has the capability of reaching everyone – from first responders, to tourists, to communities in the “last-mile”.
- **Systems to be designed up-front with security in mind to retain public trust in alerts and warning.** The use of cell broadcast for public warning ensures top-notch security since only authorized personnel, or agencies, may produce and disseminate warnings.
- **Interoperability to be enhanced by common elements and open, international standards.**²⁸ Since cell broadcasting can be sent via more than one technology (i.e., message boards, radios, etc.), it has the potential of being highly interoperable and easily standardized nationally, regionally and internationally. Nevertheless, absent standardization, no guarantees can be given that tourists roaming in the Maldives, or in any country for that matter, will receive the necessary notifications. Thus, it is important that all stakeholders interested in cell broadcasting stress standardization.

Beyond Public Warning: General and Commercial Applications of Cell Broadcasting

Although the primary focus here is upon cell broadcasting for public warning, this report will explore the uses of cell broadcasting for other general information dissemination purposes of which there are several.

Its general characteristics make it ideal for use in public warning. However, it can be used for a variety of information dissemination messages. Such messages may include: news alerts, traffic notifications, service announcements, advertising, event information, and much more. To date, no optimal business model available to sanction appropriate billing for commercial use. However, several burgeoning cell broadcast companies have created models that address income generation schemes for cell broadcast. Below are some commercial applications of cell broadcast:

Cell Information

Possibly the most widespread application of cell broadcast is the provision of cell information. This includes location information, i.e. the name of the cell area will be “broadcast” on the screen of the mobile phone. Currently, neither Dhiraagu nor



Figure 3: Example of cell information display

International Telecommunications Union (ITU): Study Group 2. TD
 0 January - 8 February 2007. Online:
<http://markmail.org/download.xqy%3Fid%3D534e4c4bbkkjitebf%2&usg=AFQjCNF9qK-daPx-MQiqnPbnHXmmWks3aQ>.

Wataniya have this service activated. This may be due to the fact that the service was not originally provided in their respective agreements or the operators are not fully aware of the benefits that the service may provide. By contrast, most operators in neighboring Sri Lanka have this feature activated within their networks for both commercial and, as of early 2009, public warning use [see Figure 3].

Advertising

Cell broadcast is suitable for advertising and is probably the best way to generate revenue for the service provider. For advertising usage, subscription options must be made available to the user. Individual companies might have the option of having their own dedicated channel explicitly for their company advertising. However, it is advisable that there be a balance between advertising and “useful” information, otherwise it is possible that the handset user may unsubscribe from the channel. “Useful” information might be weather information, stock-exchange rates, product discounts, local news, etc. The user may opt into advertising that is most relevant and opt out of advertising that is not.

Mobile Banking

The Maldives Monetary Authority (MMA) is in the process of improving the financial infrastructure of the country. The first step towards an interoperable payment system in the country is to connect the banks’ ATM population and reconcile all Points of Sale acquired through a shared EFTPOS Switching System.²⁹ M-banking is the optimal solution for an accessible banking system for an atoll nation, as banks are not easily reachable like in other nations. Since both operators in the Maldives are participating in this initiative, it may be useful to collectively explore the possibility of covering the minimal costs of activating cell broadcast channels. Other cost-sharing activities may be brokered with the banks themselves.

Cell broadcast may enhance the use of m-banking in the following ways:

- It is an existing feature of UMTS, the proposed system for the MMA’s m-banking system.
- Cell broadcast would allow banks to send service notifications to subscribers through designated channels for individual banks. [e.g., HSBC could notify its customers through the HSBC CB channel that banking services will be unavailable on Eid al-Fitr.]
- Security and privacy of each customer is ensured since broadcasts would reach only those who subscribe to a banking channel. [Numbers of messages may be reduced by allowing options to the subscriber for types of notifications, enhancing privacy in its other sense.]

²⁹ Maldives Monetary Authority (MMA). eftpos.pdf.

- Cell broadcast is default “ON” on most handsets. Otherwise, operators may educate users on how to switch on CB.
- An operator can verify whether a user received a CB by having a number embedded within a message. [This depends on the firmware available on the handsets available through each operator.]
- When a phone is switched off and then switched on again, the most up-to-date information will always be relayed since CB is not a “store and forward” service.
- MMA could have the option of addressing all subscribers; whereas banks would be able to address their respective customers.
- The Trust Protocol Board³⁰, or its equivalent, can set standards of use.

Events

During events such as the last SAARC Championships co-hosted by the Maldives and Sri Lanka, CB may be used to inform visitors of the start of matches, special offers, etc. Along routes to event locations, event information could be broadcast with directions and other relevant information to keep people aware of changes, promotions, etc. Income may be generated using commercial income generating schemes such as CellCast Technologies’ commercial uses of the system (as described earlier in Figure 1). The ITU is currently in the process of developing designated channels for commercial broadcasts that will better enable event management broadcasting (i.e., broadcasts may be charged to specific clients).

Service Information

The Maldives has a large tourist industry. Generally, the country may want to provide tourists with basic information when arriving. Information about the nearest hospitals, banks, travel agencies, supermarkets, pharmacists, weather (see Figure 4), WiFi hot spots could be broadcast via CB to enhance the tourist experience in the Maldives. Nuisance broadcasts may be curtailed by awareness campaigns in airports and other public areas giving instructions on how to opt-in and opt-out of available cell broadcast services. Service information itself may also be used to notify potential cell broadcast recipients on how to opt-in and opt-out.

Airport Information

Cell broadcast may be used to inform travelers about arrivals, departures, cancellations, delays and other related information. In the Maldives, it could also provide ferry schedules to and from Male, where to find



Opties ▲ Terug
 Figure 4: Example of a Weather Cell Broadcast on the Turkcell network, Turkey.

³⁰ Group of stakeholders assembled to provide guidelines for the use of CB in a country.

resort information and speedboat ferries, and the location of currency exchange facilities.

Tourist Information

Tourists to the Maldives may be interested in accessing resort information, such as beach information (e.g., water temperature, sea conditions, beach events). Resorts themselves may be interested in using it as a means of getting pertinent resort-related information to its customers, like entertainment options, promotions, activities, etc.

Possible Business Scheme: MMA Interoperable Mobile Banking³¹

The Maldives Monetary Authority, the country's central bank, has embarked on an ambitious project in partnership with CGAP and the World Bank. The objectives of this project are to significantly reduce the levels of cash in the economy and to provide universal access to formal financial services through the introduction of a mobile phone-based banking system. It will involve shaping an appropriate regulatory framework for branchless banking, developing an interoperable retail payments system with sufficient volume to be viable, and introducing retail banking competition and greater access to banking through mobile phones and a network of banking agents on the islands.³²

Taking Action: Cell Broadcasting for M-Banking

The MMA, mobile operators and other relevant stakeholders, with the information available herein, can use the cell broadcasting solution for the Maldivian m-banking scheme. By integrating cell broadcasting into m-banking, a stronger argument for cell broadcasting use for both commercial and public warning will exist. The commercial application of CB for this interoperable m-banking scheme will provide a sound sustainable option.

To ensure sustainability, it will be important to consider the following steps towards successful integration of an m-banking commercial application of cell broadcasting for the Maldivian market:

1. ***Making the case.*** Convince operators of CB's commercial application, particularly within the context of banking.
2. ***Becoming involved in standard setting groups.*** [If using the CellCast commercial model] Engage MMA within the "Trust Protocol Board".
3. ***Developing a revenue generation scheme.*** MMA must request operators to provide a certain percentage for funding of channels OR ask each bank to pay for their own channels. [Revenue on channels may be earned through mobile bankers themselves. For example, charging a fee by embedding a number within a CB so that a user may make a bank transaction.]
4. ***Choosing/Designing an interface.*** Choose an m-banking applet to interface via cell broadcasting. [Numerous options are available through CB vendors.]
5. ***Designating channels.*** Under the auspices of the "Trust Protocol Board", allocate specific commercial closed user group channels for each bank involved in the m-banking scheme. MMA should also have a designated commercial channel OR have space to broadcast on the Dhivehi and/or English civic message channel.

Other Uses of Cell Broadcasting

Since its advent in 1988, cell broadcasting has increasingly been used for both public warning and general information dissemination purposes by several nations. In China it is used for advertising. South Korea has been using cell broadcasting for public warning since 2003. In May 2005, South Korea became the first to switch on nationwide cellular-based emergency system, paying wireless operators to equip network for broadcasts.³³

The Mobile Democracy Platform in Turkey allows local governments to broadcast information on a variety of issues concerning their administrative zones such as time-critical issues, plans or activities of the municipality concerning the area or residents, as well as information about roads, buildings, water supply interruption, traffic, health, cultural and social activities. All a resident needs to do to receive cell broadcast messages from their local administration is to activate the '888' cell broadcast channel on their mobile phones. The service also allows municipalities to conduct public surveys where questions are transmitted through cell broadcast and residents respond through an SMS shortcode.

The municipalities can broadcast their desired information to the targeted area via cell broadcast (CBC) technology over Turkcell GSM BTSs (Base Transceiver Stations). These CBC messages reach mobile phone screens of Turkcell subscribers who have activated the 888 cell broadcast channel code in their mobile phones. This service is completely free of charge to all subscribers, and customers are able to respond to the broadcast messages using an SMS shortcode.

In October 2005, the Netherlands became the first country in Europe to *require* all operators to transmit government text warnings via cell broadcasts. The government of Netherlands paid approximately 2.5m euro/US\$3m to three operators – Vodafone, KPN and Telfort – to equip their networks for cell broadcast.³⁴

³³ From shellbinator.com/2007/4/17/emergency-cellular-broadcasting/

³⁴ Ibid.

Since November 2007, NTT Docomo in Japan offers Alert Mail. It is a CB service that provides warnings for earthquake and tsunamis. Additionally, NTT Docomo supplies mobile handsets to their customers that have a specific configuration menu where the user can choose to receive earthquake warnings and/or tsunami warnings. Furthermore, the volume and duration of the dedicated alert tone can be set in this menu. The Earthquake and Tsunami Warning System (ETWS) is currently being standardized in 3GPP (a global telecommunications standardization institute). Once that has completed other tsunami and earthquake prone countries, mostly in Asia, may deploy the same service.

The USA is developing a Commercial Mobile Alert Service (CMAS) in ATIS (GSM and UMTS standardization) and TIA (CDMA standardization). Operators may elect to participate in the service and when they do, they must follow the specifications that are currently being developed by ATIS and TIA. Both ATIS and TIA are developing a CMAS via CB specification, since CB is considered the only viable technology for CMAS. At the end of 2009, testing of CMAS will start so as to be operational in 2010.³⁵

As of January 30, 2009, Sri Lanka's Dialog Telekom in collaboration with its partners Dialog-University of Moratuwa Mobile Communications Research Laboratory and MicroImage Technologies together with the Disaster Management Centre (DMC) of Sri Lanka launched Sri Lanka's first ever mass alert warning system; the 'Disaster and Emergency Warning Network' (DEWN). DEWN is a system being tested by the DMC for issuing alerts via cell broadcasting. Users need only to configure area information reception settings on their Dialog mobiles to receive the alerts issued. Although emergency cell broadcasts to the general public will initially be done over the default Channel 50, eventually a dedicated emergency cell broadcast channel will be in place so that trilingual messages (Sinhala, Tamil and English) can be sent.³⁶

Recommended Uses for the Maldives

With consideration to the results of the informal surveys and the uses of cell broadcasting, it would be ideal for the Maldives to adopt cell broadcasting for public warning. Adoption of cell broadcasting for public warning is fundamental, yet it will be necessary to ensure that it complements planned warning infrastructure such as TETRAnet as well as basic warning tools like sirens and loudspeakers.

Further, the adoption of cell broadcast for public warning is suitably complemented by its capability for commercial information dissemination. Maldivian authorities should consider the adoption of cell broadcasting for advertising, Islamic information, event information, and tourist information. Given that the Maldives Monetary Authority is in the process of instituting an m-banking system in the country, it is recommended that authorities explore the compatibilities of m-banking with the cell broadcast technology. If common

³⁵ One2Many. "Cell Broadcast System: FAQ for CB in Public Warning". January 2009. Online: <http://www.on2many.eu>.

³⁶ Antonio, Jithendra. "Dialog Aids Disaster Management". *Daily Mirror*. January 31, 2009. Online: http://www.dailymirror.lk/DM_BLOG/Sections/frmNewsDetailView.aspx?ARTID=39321.

ground is found, it may be useful to bring the MMA into the stakeholders committee to decide upon the implementation of cell broadcasting. This would allow for a certain degree of standardization to occur enabling a more marketable use of cell broadcasting for commercial and general information dissemination purposes.

Conclusions

Essentially, cell broadcast is an integrated open system that has the potential to allow emergency officials one-touch notification to cell phones with guarantee of covering all carriers. This technology enables a government entity to securely transmit an emergency alert of natural or human-caused disasters to mobile phones in an affected area anywhere between 5 seconds to 2 minutes, regardless of the size of the area and the subscriber's carrier.

Although cell broadcasting requires minimal to no expenditure, all stakeholders still maintain that a profit scheme would greatly enhance the desirability of cell broadcasting. Cell broadcasting is on the precipice of becoming one of the most versatile and most effective means of transmitting information. Therefore, several income-generating schemes are now available from cell broadcasting vendors. Maldivian authorities should select appropriate vendors and discuss suitable income generation schemes accordingly. Further, thought should be given to inclusion of cell broadcasting into certain aspects of m-banking as described earlier. Annex B gives a proposed schedule of activities discussed with Maldivian stakeholders during the research phase and recommended for full implementation of cell broadcasting.

Once the GoM and other stakeholders have acknowledged that there is a use of CB within the Maldives, they must obtain more information from CB vendors on actual costs (albeit minimal), security features, and income-generating scheme they will adopt. Since TETRAnet is a warning standard that the Maldives has adopted, further investigation should go into ways in which TETRAnet may complement cell broadcasting, and vice versa. It may also be useful to learn more about the various uses of cell broadcasting around the world – the Netherlands, South Korea, and Turkey may be able to help Maldivians determine whether cell broadcast is a good fit. The Maldives should pay special attention to the use of cell broadcasting in transmitting information in multiple languages and ensure that Dhivehi is an option. Once these steps are taken, cell broadcast may prove to be an affordable all-purpose information disseminating technology with crucial life-saving characteristics.

Annexes:

Appendix A: Meeting and Presentation Documentation

Meeting with Telecom Authority of Maldives (TAM)

29 May 2008

Attendees: Mohamed Nasih, Ilyas Ahmed (Deputy Director Generals); Shiham; Natasha Udu-gama

Agenda

1. Review project methodology and plan
2. Review questions, address any gaps.
3. Ask about others to meet
4. Discuss a timeline for implementation of cell broadcast
5. Discuss any new developments on the Maldives side regarding cell broadcast for public warning and other use.

Summary

TAM is not completely well-versed on cell broadcast and the possibilities it may hold for the Maldives. Natasha Udu-gama first asked about what capabilities have recently been implemented through the telecom providers. TAM informed that national roaming and priority calling are in the testing phase with both providers. Other than public warning, TAM is interested in sending out information, advertising and text banking (the MMA is in the process of instituting mobile banking through the telecom providers). One of their main interests is what the additional cost might be for mobile providers to implement cell broadcast on their networks. TAM has also mandated that Equipment Identity Registry (EIR) be installed on all phones to help deter and/or detect theft of mobile phones.

Regarding the need for a Dhivehi template for cell broadcasting, TAM officials believe it is unnecessary. Already, Wataniya has developed a template for Dhivehi SMS but it is not as widely used as Dhivehi texts using the Latin alphabet. Further, TAM officials say that the majority of Maldivians are literate enough to be able to read English, and if not, can read Latin alphabet-composed Dhivehi texts/CB.

In terms of early warning initiatives, the TETRAnet system is currently in the process of being deployed with the assistance of a grant from the French government. The Trans-European Trunked Radio System (TETRA) is the first truly open digital private mobile radio standard. TETRA Standard is a telecommunications standard for Private Mobile Radio (PMR) systems developed by ETSI as an answer, at European level, to the evolving needs of PMR Operators, which have to cope with traffic congestion and a growing demand for speech and data services. The TETRA standard contains high functionality for emergency services and is also very well suited for commercial trunked radio

users.³⁷ TETRA should be functional by the end of 2009 as an early warning system for the Maldives, as outlined in the National Telecommunications Plan (2006). According to TAM, the interest in cell broadcasting for public warning stems from the need to have a redundant system as a backstop to TETRAnet. If cell broadcast were shown to be affordable, implementation would help reach 100% of the population in the event of a crisis.

Also, it should be noted that mobile penetration in the Maldives is now more than the last figure of 97% to over 100%.

Meeting with Dhiraagu **3 June 2008**

Attendees: John Murray, Natasha Udu-gama

Agenda

1. Review of project and purpose
2. Discussion of questionnaire

Summary

This meeting with Dhiraagu representatives began with a brief overview of the project and its purpose. Then discussion turned to what knowledge the representatives had of cell broadcasting. John Murray, head of marketing, said that he had been involved with an Israeli company that did cell broadcasting used to send out news headlines.

Unlike Wataniya, Dhiraagu representatives were very much aware of cell broadcasting and its potential uses. They are aware that CB is available on the network though not activated. As expected, their interest in cell broadcasting would be primarily in marketing and information delivery. They have done preliminary explorations of CB (tested it 2 years ago; mainly its capability) but still believe that bulk SMS serves their interests for information and advertising better. Even with the use of bulk SMS there has been many complaints from subscribers on the volume received. The 88-90 character limit of CB is one of the major limitations that the representatives cite.

One of the technical experts noted that cell broadcast would have to be purchased which would mean a base station controller (BSC) and a cell broadcast machine for the server. They brought up the fact that mass CB early warning alerts could be detrimental to the network in that it could cause panic and result in increased calls leading to network congestion. Another issue that was cited is that GSM signals cannot go beyond the 25-35km distance from the tower.

Dhiraagu was most interested in learning more about the CB for public warning initiative currently being implemented by the Sri Lankan telecom providers with the National Disaster Management Center. They were most interested in

³⁷ "Introduction to TETRA Technology". ET Industries. Online: <http://www.etiworld.com/wireless/tetra.pdf>.

knowing what the costs and specific plans and procedures would necessarily have to be implemented for CB from the operator end.

Chief Executive Ismail Rasheed stated that CB has not been thoroughly examined as a viable option for information dissemination in the Maldives to date because there has been no regulatory approval to do so.

Informal Meeting with Dhiraagu: Marketing Department

29 September 2008

Attendees: John Murray, Head of Marketing; Harsha Purasinghe (MicroImage) [HP], Mark Wood (CellCast Technologies) [MW], Natasha Udu-gama (LIRNEasia)

Mark Wood gave his CellCast presentation on cell broadcasting to the two Dhiraagu representatives that were unable to make it to the special session on cell broadcasting organized by LIRNEasia and TAM.

Following the presentation, the representatives asked the following questions from Mark (answers are indicated immediately below):

1. Why isn't CB used more for commercial uses?
[MW] SMS is easier to track.
2. Where is the money going to come from?
[MW] Government, UNDP, World Bank...
Dhiraagu does not do bulk SMS.
3. How do you prevent abuse?
[MW] Civic Emergency Alert Channels differ from commercial ones.
4. What would it cost to put in the Cell Broadcast Center (CBC)?
[MW] Different vendors do CBC – so don't know. A CBC could cost anywhere from US\$.5 – 1 million.
5. What is Dialog doing?
[HP] Dialog has a Celltick CBC which uses the '077' interface.
6. [MW] Does Celltick resolve down to one cell?
[HP] Yes.

CellCast uses the CBC made by CMGM Logica. Celltick has not engaged much with CellCast.

7. When will channel assignments be ratified?
[MW] March 2009 by ITU. Dutch operators implemented cell broadcasting upon the request of the Dutch government. In contrast, the British government said that they would do it if the operators wanted it.

M-Banking Meeting with the Maldives Monetary Authority

30 September 2008

Attendees: Carl Rosenquist + 3 others (MMA); Shiham (TAM); Mark Wood (CellCast), Natasha Udu-gama (LIRNEasia)

This impromptu meeting was organized by TAM so that Mark Wood could discuss cell broadcasting and how they may apply to mobile banking. Mark says that 80% of phones have a working cell broadcasting function, often found under "info services" among other titles (not standardized).

Questions asked of Mark Wood included the following:

What is the timeframe for deployment?

How do you get users to switch it on?

An application is not yet chosen for m-banking, there may be an applet for phones.

[CR] How would we interface?

How does the user see the message?

[MW] The Base Station Controller (BSC) uses the cell name (logical) not the site name.

What is the commercial cost of CB?

[MW] CB has no call data record and thus difficult to charge. However, it is much cheaper than SMS (up to thousand times cheaper).

Are there any actual experiences of commercial use?

[MW] Not yet. CellCast is only looking for business use of CellCast.

How can an operator know if a user got the message?

[MW] Have an embedded number in a message [CB]. Cell broadcast gives the option for doing either.

[IDEA: Use Mark's business model for the MMA mobile banking scheme.]

How would a user get a CB if the phone is off?

[MW] Not store and forward so you will only get the current message once the phone is switched back on. ***[MMA comments that this would be valuable]***

If my phone is on all the time, would there be repeated messages every one minute for twenty minutes (as recommended by TAM)?

[MW] No, you would not get the same message (spam) all the time. The server knows you have already received the message.

Is the system open to all businesses?

[MW] That decision would be up to the Trust Protocol Board.

Have there been any prototypes of this?

[MW] The DEWN system in Sri Lanka.

The Maldives Monetary Authority (MMA) definitely sees a use for CB within their m-banking system. Overall, the questions and response was highly enthusiastic. The MMA representatives asked questions that incorrectly assumed that cell broadcasting had already been implemented.

On 29 September 2008, TAM, in cooperation with LIRNEasia, organized a seminar on "Mobile Cell Broadcasting for a Public Warning System in the Maldives" for key stakeholders in the Maldives. Mr. Mark Wood, Honorable Secretary of CEASa International and CTO of CellCast Technologies, along with Mr. Harsha Purasinghe, CEO/MicroImage (Sri Lanka) were special guests invited by LIRNEasia to describe the concept of cell broadcasting and its capabilities in detail, and to describe the DEWN radio box developed by MicroImage Sri Lanka and Dialog Telekom, respectively. Prof. Rohan Samarajiva, Executive Director, LIRNEasia, and Ms. Natasha Udu-gama, Researcher at LIRNEasia also attended, with the latter giving a brief introduction to the study of cell broadcasting for the Maldives. Representatives from Maldivian stakeholders included Dhiraagu, Wataniya, the National Emergency Management Agency, and a couple of private enterprises.

Below are presentations made by Mark Wood and Harsha Purasinghe:

Appendix B: Recommended Action Plan for Cell Broadcasting Implementation in the Maldives

Timeframe	Action	Participants
June - August 2009	<i>CB Demo for the Maldivians</i>	TAM Other Maldivian stakeholders CellCast Technologies Sri Lankan service providers (optional)
	<i>Maldivians enter into cost negotiations the selected CB vendor</i>	TAM Dhiraagu Wataniya
September 2009	<i>GoM mandates CB implementation for both telecom operators</i>	GoM
September - October 2009	<i>Operators obtain information on commercial applications of CB</i>	Dhiraagu Wataniya
	<i>TAM makes the existing Emergency Telecommunication Committee into the "Trust Protocol Board"</i>	TAM
November 2009	<i>Implementation of Cell Broadcasting</i>	All
January 2010	<i>International conference on lessons learned & findings</i>	TAM LIRNEasia

Appendix C: Cellcast Technologies

CellCast Technologies offers the most advanced cell phone notification solution available that instantly delivers text messages securely to large numbers of people specific to a geographical area. This revolutionary technology uses a feature called cell broadcast, which is available in most cell phones. Cell broadcast is particularly suited to delivery of large-scale mass public notifications and emergency alerts and warnings to cell phones.

EAGLE Alerts

As a front end solution, EAGLE Alerts(tm) (Emergency Alerts for Government and Law Enforcement) is a secure, web-based alert system allowing registered citizens to be directly contacted during emergency situations through SMS text messaging, email, landline and cellular telephone. EAGLE Alert messages may include alerts and information about emergencies, such as floods, fires, acts of terrorism, weather related emergencies, and community notifications, such as criminal information, school closings and traffic.

Community Benefits with the implementation of EAGLE Alerts(tm):

Provide life-saving emergency alerts when natural disasters or terrorist threats occur: In compliance with the FCC's Commercial Mobile Alert System (CMAS) recent rulings, EAGLE Alerts allows you to deliver lifesaving messages to citizens and first responders about imminent emergencies, protective strategies and recommended recovery actions.

Proactively engage the community in Crime Prevention through real-time notifications/alerts

Create a valuable one-stop community resource that supports partnerships with schools and other government agencies: Interagency collaboration maximizes public safety goals and improves coordinated responses at the time of any emergency. This system can provide the public with information about threats and emergencies at schools, hospitals, medical centers, the prison and an unlimited number of other potential partners.

Build community confidence and trust in a police/public relationship:

Increased traffic to your customized website during enrollment will promote greater name recognition for your agency. Important notification and alerts will further strengthen public relations.

Provide public registration for alerts thru a secure website with your agency branding and messages: The EAGLE Alerts solution will provide a customized agency website that can act as a stand-alone or linked information exchange to the public. The EAGLE Alerts solution will create a web presence for your agency that can provide important resource information, online enrollment for EAGLE Alerts and links to important public safety information, such as hotlines and local service providers, including SAFENOWPROJECT(r) resources on child safety and

protection.

Important Features of the EAGLE Alerts(tm) solution:

- Customized web interface for the public that supports local agency branding and messages
- Scalable, efficient and secure
- Affordable turn-key solution with no hidden costs
- Quick and easy to implement and maintain
- CMAS ready...this system supports enhanced geo-targeted large scale secure alerting via CELL BROADCAST essential during periods of network load
- Training provided with excellent customer service and technical support
- Community members can select and enroll in a variety of targeted notification and emergency alerts:
 - Police & Fire emergencies
 - Missing children/Amber alerts
 - Health & medical alerts
 - Post storm recovery action plans
 - Neighborhood Watch/Volunteer mobilization
 - Sex offender notification
 - Emergency alerts
 - First responder notification
 - Evacuation procedures
 - Jail and prison security alerts
 - Service outage notification
 - School closing information
 - Weather alerts

EAGLE Alerts(tm) is CMAS ready!

Commercial Mobile Alerting System (CMAS) is the FCC's [USA] designation for a system that will utilize newly implemented cell broadcast technology to deliver geo-targeted, emergency messages to cell phones. In addition to conventional message delivery options, such as SMS, landline phone and email, the EAGLE Alerts(tm) solution is equipped for CMAS compliance--reliably delivering emergency messages to all CMAS compliant wireless carriers / cell phones within a specified area within a few minutes at no additional cost.

Only EAGLE Alerts delivers an affordable CAP (Common Alert Protocol) compliant solution that surpasses your highest performance expectations today - and positions you for virtually unlimited opportunities for communicating life saving emergency alerts or broad community notifications.

CellCast Aggregator Gateway Broker

The CellCast Aggregator Gateway(tm) is a middle-ware broker that accepts messages from EAGLE Alerts(tm), or an existing message originating system such as NOAA alerts. It authenticates the message, identifies the geo-targeted area to which the

message is to be sent, applies CAP Protocols, and finally delivers messages based on priority to mobile phones operating within a desired geographic area. The CellCast Aggregator Gateway(tm) provides point-to-multipoint communications technology, referred to as "cell broadcast", which can be used effectively for emergency alerts, notifications and commercial applications.

- **Technology**
Point to Multi-point (broadcast)
Delivers short text message to unlimited number of cellular phones
Geo-targeted to any desired area
- **Delivery**
Phone rings to announce message
Message is displayed immediately -or-
Message is placed in phone's Inbox
- **Database-Free**
Phone number is not used for message delivery- Protection!!
No subscriber database required- Privacy!!
Area visitors also receive alerts- Penetration!!

Special features of the CellCast Aggregator Gateway(tm) broker:

- **Reliable**
Works despite voice and text messaging system congestion
Will not crash cellular network
Point to Multi Point cell broadcast technology
Has not failed in any operational scenarios
- **Trustworthy**
Protected against spamming, hacking and spoofing
Access limited to authorized officials
Citizens are assured of message authenticity - not possible in point-to-point systems
Available
Exists today
Enabled with setting change or minor hardware/software upgrade
Most phones already have feature
No need to design or build new systems
- **Scalable**
Is a massively scalable messaging solution
Can reach hundreds or millions in minutes
- **Geo-Specific**
Evacuate neighborhood by neighborhood
Notify only affected regions - avoid "warning burnout"
Attention Shoppers - in a mall or stadium

Appendix D: Celltick Technology

Celltick Technologies Ltd., the pioneer of Active Mobile Marketing, has introduced a new medium into the mobile space. Its flagship product, LiveScreen(TM) Media, allows content providers and advertisers to broadcast targeted content and marketing messages to millions of mobile idle screens, turning them into a network of interactive billboards, creating a strong revenue stream for operators.

Celltick cooperates with mobile operators to turn the mobile screen into a powerful revenue driver. The company has close relations with all network infrastructure companies, major SIM vendors, leading handset manufacturers and industry standard organizations, as well as global content providers and media agents.

Celltick's Cell Broadcast Centre Key to Implement New FCC Regulations for Nationwide Public Warning Service (PWS) Rollout LONDON, October 7

LONDON, October 7 /PRNewswire/ -- Celltick today confirmed that its proven Cell Broadcast Centre (CBC) solution is ideally positioned to support operators looking to implement the new commercial mobile alerting services recommended by the Federal Communications Commission (FCC).

The Commercial Mobile Alerting System (CMAS) is a new nationwide warning system that utilizes cell phone messaging to alert the public of emergencies. The system is recommended by the FCC due to the increased reliance on mobile communications in times of emergency. The FCC has been working with the carriers as part of the Commercial Service Alert Advisory Committee (CMSAAC) for coming up with the technical requirements for CMAS. By use of open standards-based cell broadcast technology, operators can relay emergency alerts to their subscribers.

Celltick's robust Cell Broadcast Center (CBC) solution supports the CMAS by ensuring mass distribution of messages with minimal network load, scalable to limitless amounts of subscribers, with an overload-proof system to ensure reliability. It also enables location specific messaging, allowing different messages to be sent to different areas according to the situation's requirements. Celltick's CBC has already been successfully utilized during emergencies in the Asian Tsunamis and in Terrorist events in South Asia.

Uniquely, Celltick provides a return-on-investment advantage for operators implementing emergency systems, through its revenue-generating LiveScreen(TM) Media service. Celltick's LiveScreen(TM) Media easily integrates with the cell broadcast solution, allowing operators to generate revenue from mobile phone idle screen advertising and marketing, whilst still being able to broadcast public warnings when required. LiveScreen Media is a managed service that broadcasts targeted mobile content and advertising to millions of mobile phones in more than 25 countries. Using patented technology, LiveScreen transforms the idle screen into an interactive, personalized, location-sensitive media channel.

Stephen Dunford, CEO of Celltick, comments: "During emergencies, people are increasingly relying on wireless telecommunications services and devices to receive critical, time-sensitive information. We have an industry leading mechanism to distribute large-scale information, quickly and securely, when people need it most. We are proud that our cell broadcast technology which is already in use worldwide to provide commercial and emergency services can support the FCC's goal of distributing emergency information as quickly as possible to the people who need to receive it."

Founded in 2000 and privately owned, Celltick is headquartered in the UK with offices in Israel, Russia, Singapore and Brazil.

Appendix E: Uses of Cell Broadcasting in other nations

Cell broadcast new tool to alert, inform and instruct in crisis situations

Press release 21 August 2008

Cell broadcast – the technology that allows text messages to be sent to cell phones in a specific area via radio waves – is going to be used in the Netherlands for the crisis information system and to alert the population. Minister Ter Horst (of the Interior and Kingdom Relations) announced this in a letter to the Lower House today. Cell broadcast allows the authorities to quickly alert, inform and instruct people about a disaster, crisis or dangerous situation in a specific selected area. The Minister aims to start introducing cell broadcast gradually in 2009.

The existing siren-based system no longer lives up to the expectations that Dutch citizens have from the government in relation to alerting and communication. Sirens merely alert the population; the text messages transmitted via cell broadcast can also inform people about what is happening and what they have to do. The technical applications and acceptance of cell broadcast by citizens, authorities and operational departments have been tested comprehensively, and the results of this research convinced Minister Ter Horst about the suitability of cell broadcast as a means to complement the existing siren-based system. As a result, the Minister plans to initiate a European tendering procedure for the system in the near future. She also announced her intention to reach an agreement with the three mobile operators in the Netherlands (KPN, T-Mobile and Vodafone), since the messages will be transmitted via their networks. If both processes proceed satisfactorily, the cell broadcast technology will be introduced gradually from 2009. The siren-based system will not be eliminated in the near future.

Cell broadcast is not a new technology, but the use of it to alert citizens alerting and send crisis information is. Its technological possibilities make it an important addition to and improvement of the existing warning system. The technology also allows the authorities to add an alarm tone to messages. Specialized devices can convert text messages to voice messages, improving the options for the blind and partially sighted.

Cell broadcast and SMS use different technologies. The coverage of cell broadcast messages can be limited to a specific area in a district, town or region, or extended to all devices in the Netherlands. Unlike SMS, it does not need telephone numbers: cell broadcast messages are transmitted simultaneously to every single cell phone. As a result, the system is extremely fast. Another difference from SMS is that cell broadcast can also be used when the mobile network is overloaded.

During the introduction of the cell broadcast technology, the authorities will provide comprehensive information on what people should expect and what they need to do to be able to receive cell broadcast messages. The Netherlands is a global pioneer in the implementation of cell broadcast technology as a means to alert and inform citizens in crisis situations. Other countries are following the developments in the Netherlands.

The University of Delft has done cell broadcast trials, yielding the following results according to 4 set parameters: reach, acceptance, technology and content. The results of each are as follows:

Reach –

1. Reach of cell broadcast messages in the tests with ‘best effort’ implementation is low. This is due both to the transmission infrastructure and the receiving handsets.
2. Even when messages are received on a handset, this does not guarantee that citizens will read the message immediately (and in full). In the tests, cell broadcast messages were not always read straight away or responded to immediately. This may be because people know that the messages are not urgent, because they are taking part in a test. There are also citizens who are unable to read messages, because of the poor user interface on their handsets.
3. Correct use of the mobile phone is a necessary condition to be able to receive cell broadcast messages. Citizens will only be able to receive messages if they have their phones switched on. Citizens must also be able to check whether they have set their handset correctly.
4. The effectiveness of cell broadcast as a citizen-alert system depends largely on the willingness of citizens to have handsets with them and have them switched on.

Acceptance by Citizens –

1. Citizens see cell broadcast as a useful addition to the current siren system. However, replacement of the siren system by cell broadcast is regarded as undesirable.
2. Cell broadcast only works when citizens participate in the system, by setting the phone and having it with them. As such, acceptance of cell broadcast is a precondition for an effective system. However, when the system does not meet expectations, poor experience with cell broadcast,

such as the non-receipt of messages, or the receipt of incomplete messages, leads to reduced acceptance. If cell broadcast were to be introduced, careful management of citizens' expectations will be an important condition for its success.

Acceptance by Administrators –

1. Use of cell broadcast to alert citizens makes different demands on the system than its use to inform citizens. Administrators vary in their perception of the choice to use cell broadcast.
2. Cell broadcast technology is still being developed. Thus, administrators do not want to make a decision on replacing the current siren system as yet.
3. According to a number of interviewees, scrapping the existing warning and alert systems would not be advisable even where cell broadcast was to be used primarily for the alert disaster control process.
4. The use of cell broadcast as a citizen alarm system means that availability must be monitored precisely when use of the technology is required: in a crisis or disaster situation.
5. Standard messages must be made available, particularly with a view to alerting people quickly. In addition, there is always the possibility of formulating customized citizen alert messages. Each message form must contain an action aspect.
6. Cell broadcasts must be recognizable as citizen alert messages and contain the requisite authorization.
7. Where cell broadcast is to be introduced as a citizen alert system, commercial application of this technology will be inadvisable.

Technology –

1. During the tests, there were a large number of disruptions when sending messages. However, it is definitely possible to organize the infrastructure for sending cell broadcast messages in a way that provides complete coverage. Agreements must be made with providers on the reliability and availability of the transmission infrastructure.
2. Various problems exist in relation to the use of cell broadcast with some of the mobile phones on the market. These problems include setting up the cell broadcast channel, receiving messages of more than one page and recognition of the tone when messages are received.

Content –

1. Use of cell broadcast makes it possible to provide concrete information about necessary/advisable actions in the event of disaster. Information provision during the alert process is more direct than when using the siren.

2. Besides indication of a disaster or location of the incident, the message must include a description of the action to be taken by citizens.
3. Citizens attach the least importance to the question of where more information can be found. This part of the message can be omitted.
4. Citizens have a strong preference for short texts in cell broadcast messages as part of a citizen alert system. As far as participants are concerned, content may be presented in a telegram style.
5. Participants say that they would like to receive a date and time indication in or with cell broadcast messages.
6. Based on various experiments, it is not possible to establish whether citizens will act after reading a cell broadcast alert message in the event of an actual disaster.
7. A cell broadcast as part of a citizen alert system must be clearly recognizable when received. Use of a specific tone is a possibility and participants indicate as an advisable option. Although the use of a distinctive tone is experienced as advisable, this did not lead to a large number of faster reactions during the practical test than when using a standard tone.³⁸

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