IOT IDEA BOOK

24

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IOT IDEA BOOK:

DISASTER SURVEILLANCE AND RESPONSE MANAGEMENT

DISASTER SURVEILLANCE AND RESPONSE MANAGEMENT

EFFICIENT AND EFFECTIVE DISASTER OPERATIONS AND COMMUNICATIONS

Expanding population, urbanisation and industrialisation, and development within high-risk zones, have all heightened the vulnerabilities of a nation to disaster risks. According to the Centre for Research on the Epidemiology of Disasters (CRED), 330 registered natural disasters in 2013 have victimised 96.5 million people worldwide, with deaths from floods having the largest share of natural disaster fatalities, representing 45.4 percent of global disaster mortality, while deaths from storms accounted for 39.7 percent[1].

1 Debarati Guha-Sapir, Philippe Hoyois, Regina Below (2013). 'Annual Disaster Statistical Review 2013 - The numbers and trends'. September 2014. Accessed from http://www.cred.be/sites/default/files/ADSR_2013.pdf on 16 June 2015.


24
30

By geographical hotspots, Asia is the continent most often hit by natural disasters in 2013 with 40.7 percent, followed by the Americas (22.2 percent), Europe (18.3 percent), Africa (15.7 percent) and Oceania (3.1 percent), with estimated economic losses amounting to US$118.6 billion globally[2]. The economic losses in the Asia and Pacific region have surged significantly from US$5 billion per year in the 1970s to around US$75 billion per year in recent years[3]. In 2013 alone, natural disasters in Asia and the Pacific affected more than 57 million people and cost US$128 billion in damages[4].

Consistent with global warming trends and climate changes, Malaysia has experienced more extreme weather events over the last decade compared to the previous few; such as drought, severe thunderstorms and heavy rainfall that caused devastating floods. Based on the probabilistic risk analysis result from the Global Assessment Report (GAR) on Disaster Risk Reduction 2015, Malaysia should seriously view the risk of earthquake damages as the country is surrounded by the 'ring of fire' and there are marked increases in earthquake activities occurring locally[5]. The most recent evidence is the 5.9-magnitude earthquake on June 5 2015 with a total record of 90 tremors as of June 23 in the heart of Kota Kinabalu, Sabah[6].

2 Lenon. (2014). '*The statistics of natural disasters: A 2013 review*'. The Watcher, 24 September 2014. Accessed from : http://thewatchers.adorraeli.com/2014/09/24/the-statistics-of-natural-disasters-2013-review/ on 16 June 2015.

3 The Malaysia Insider. (2015). '*Asia Pacific lost 2 million lives, US$1.15 trillion to disasters*'. 22 March 2015. Accessed from http://www.themalaysianinsider.com/world/article/asia-pacific-lost-2-million-lives-us1.15-trillion-to-disasters on 16 June 2015.

4 United Nations ESCAP. Accessed from http://www.unescap.org/our-work/ict-disaster-risk-reduction on 16 June 2015

5 Marufish World of Disaster Prevention. 'GAR 2015 Malaysia country report (Part 2)'. 2 April 2015. Accessed from http://marufish.com/2015/04/02/gar-2015-malaysia-country-report-part-2/ on 17 June 2015.

6 Vanar, M., Sario, R., & Lee, S. (2015). Sabahans living in fear. 24 June 2015. The Star.

In addition to earthquakes, floods are a primary calamity, particularly in the east coast of Malaysia, followed by landslides and drought which spread across various geographical regions. Based on Malaysia's profile in GAR 2015, on average there are two disaster occurrences happening annually with a mortality rate of 10 deaths and economic loss of US$127 million per annum[7]. In 2014, there were 21 casualties and over 230,000 people were displaced[8], with the total damage to property and infrastructure in all affected states amounting close to RM1 billion (US$284 million)[9]. This does not include the losses incurred among the main economic activities for the area's residents. The cost for rebuilding and repairing damaged amenities in flood-affected areas can reach up to RM1 billion[10].

The Government shall be responsible for taking necessary measures to respond effectively to any disaster situation. A comprehensive disaster management cycle includes prevention, mitigation, preparedness, relief, response, rehabilitation and reconstruction. With disaster early warning systems powered by Internet of Things (IoT) technologies, early evacuation can be aided by accurate and fast decision making. Enhanced emergency rescue operations can also minimise loss of lives and property, and enhanced crisis management can prevent further impact from progressing to other adjacent areas and its residents.

7 Ditto

8 Malay Mail Online. '*Flood damage estimate tops RM1b*'. 2 Jan 2015. Accessed from: http://www.themalaymailonline.com/malaysia/article/flood-damage-estimate-tops-rm1b on 17 June 2015.

9 Inquire.Net. '*Damage due to Malaysia flood close to $284M*'. 3 Jan 2015. Accessed from: http://newsinfo.inquirer.net/662008/damage-due-to-malaysia-flood-close-to-284m on 17 June 2015. Malay Mail Online. '*Flood damage estimate tops RM1b*'. 2 Jan 2015. Accessed from: http://www.themalaymailonline.com/malaysia/article/flood-damage-estimate-tops-rm1b on 17 June 2015.

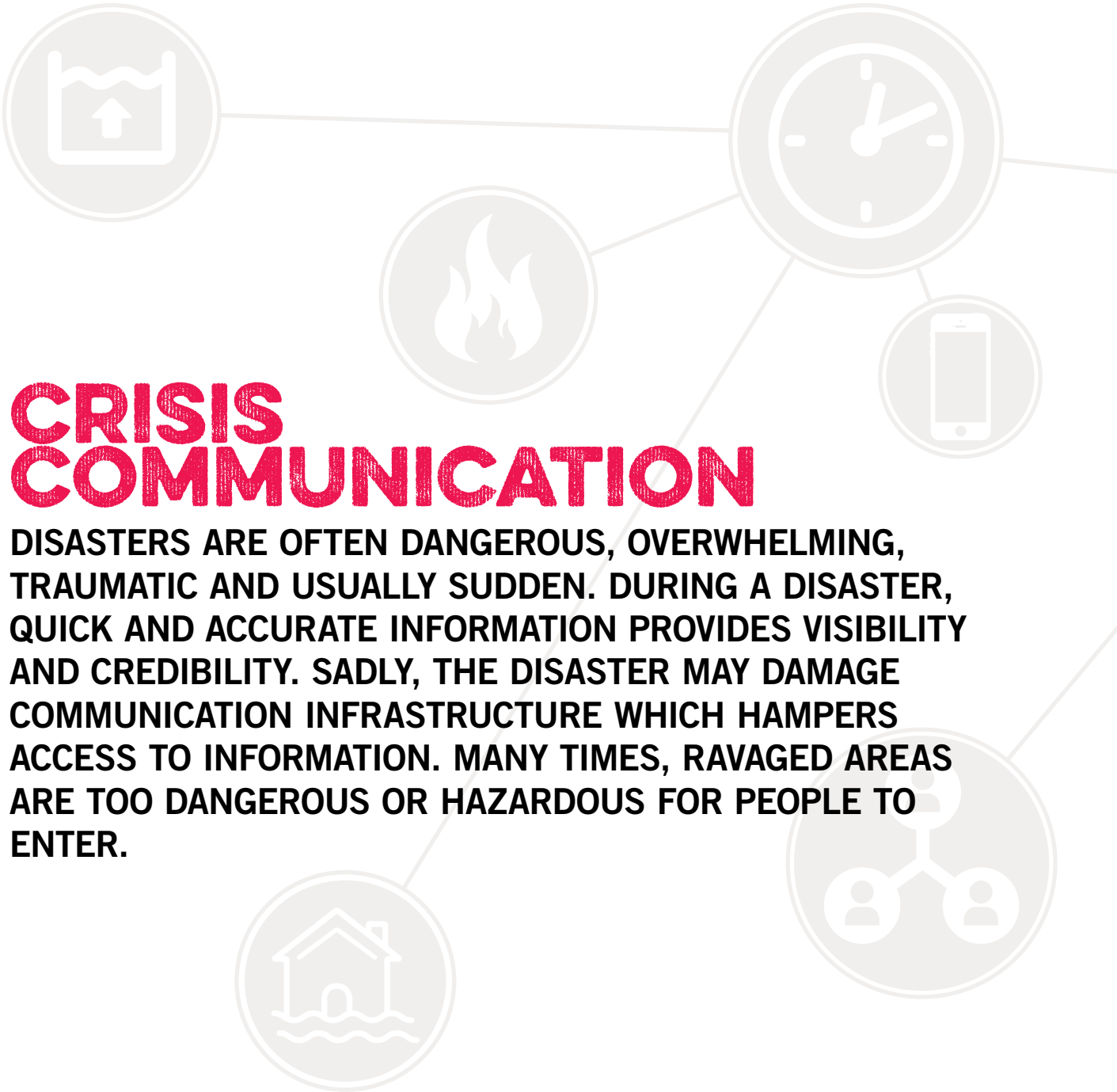
10 The Malaysia Insider. '*At least RM1 billion needed to rebuild flood-affected areas, says report*'. 2 Jan 2015. Accessed from http://www.themalaysianinsider.com/malaysia/article/floods-in-kelantan-cost-rm200-million-in-losses on 17 June 2015.

GOLDEN HOURS OPERATION

WHEN A CATASTROPHIC NATURAL DISASTER OCCURS, AN EMERGENCY RESCUE OPERATION IS CRITICAL. PEOPLE TRAPPED UNDER COLLAPSED BUILDINGS OR LANDSLIDES MAY HAVE A GOOD CHANCE TO SURVIVE IF THEY ARE RESCUED WITHIN THE 'GOLDEN 72 HOURS'. DURING THE 'GOLDEN HOURS', INFORMATION IS SPREAD OUT FROM DIFFERENT SOURCES, AND CAN TAKE A LONG TIME BEFORE IT REACHES THE INTENDED RECIPIENT.

A major challenge for first line responders is the absence of access to formalised information needed to identify rectification opportunities during incidents which lead to critical errors and delays.

In this scenario, augmented information through IoT integration of reliable sources of information will save the first line responders' time in accessing information as well as in vulnerability assessment, which currently is done manually. Information clipping, gathering and analysis done through the use of web robots that feed this to a centralised information data exchange will be able to serve time-critical information specific to those who need it for immediate action. The central exchange will also draw information from social networks which often times prove faster than traditional media.



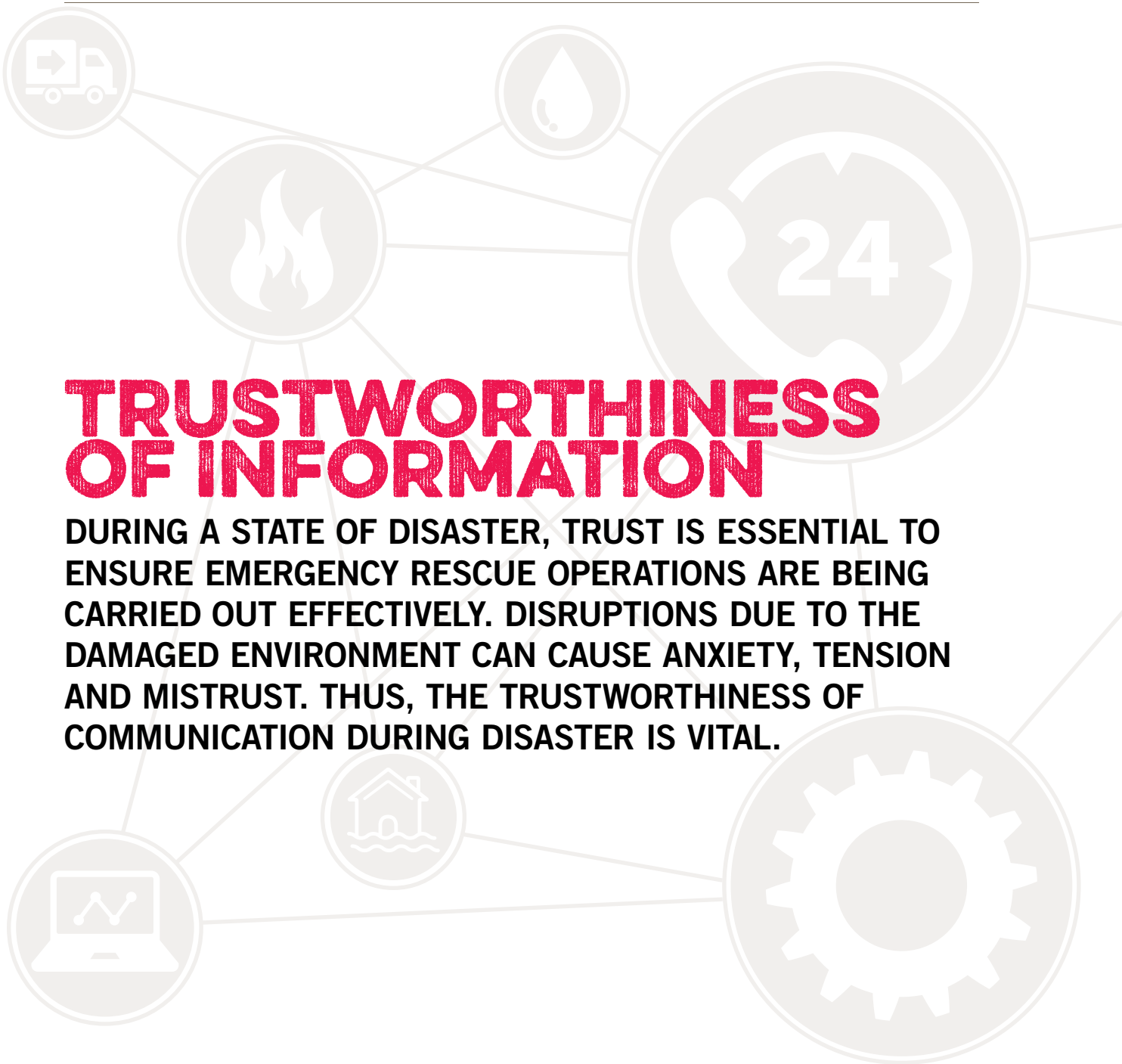
CRISIS COMMUNICATION

DISASTERS ARE OFTEN DANGEROUS, OVERWHELMING, TRAUMATIC AND USUALLY SUDDEN. DURING A DISASTER, QUICK AND ACCURATE INFORMATION PROVIDES VISIBILITY AND CREDIBILITY. SADLY, THE DISASTER MAY DAMAGE COMMUNICATION INFRASTRUCTURE WHICH HAMPERS ACCESS TO INFORMATION. MANY TIMES, RAVAGED AREAS ARE TOO DANGEROUS OR HAZARDOUS FOR PEOPLE TO ENTER.

Various stakeholders such as government authorities, international agencies, humanitarian assistance organisations and affected populations will demand information in the form of data, figures, reports and situational analysis, or recommendations. These stakeholders depend on this information to guide their work and to translate their interests and concerns into action. In a flood situation, detailed maps showing the extent of disaster footprints over affected areas as well as the extent of damage is critical for first line responders to plan their resources and aid distribution efforts.

The effect of a natural disaster is far subtler than fear-mongering and anxiety due to the mismanagement or unavailability of information or the inability to contact families and friends affected by the disaster. Timely and transparent production and dissemination of information generates trust and credibility and forms the backbone for crisis management.

With an effective information dissemination using IoT, nuggets of information from heterogeneous data can be extracted for actionable decision making. Expanding from this, heat maps showing affected areas enable rescue operations to deploy resources to critical areas and prevent further losses in adjacent areas. Structured reporting as a result of intelligence gathering may also help higher authorities in getting a macro view of the extent of a disaster to quickly arrive at the next course of action. Mobile communications infrastructure that can be quickly set up will also assist in re-establishing severed lines of communication.



TRUSTWORTHINESS OF INFORMATION

DURING A STATE OF DISASTER, TRUST IS ESSENTIAL TO ENSURE EMERGENCY RESCUE OPERATIONS ARE BEING CARRIED OUT EFFECTIVELY. DISRUPTIONS DUE TO THE DAMAGED ENVIRONMENT CAN CAUSE ANXIETY, TENSION AND MISTRUST. THUS, THE TRUSTWORTHINESS OF COMMUNICATION DURING DISASTER IS VITAL.

The five-point communication guideline during a disaster comprises the following:

a. Identify key information that needs to be communicated to the public
b. Craft messages conveying key information that are clear and easily understood by all, including those with special needs
c. Prioritise messages to ensure timely delivery of information without overwhelming the audience
d. Verify accuracy of information through appropriate channels
e. Disseminate messages using the most effective means available

Using IoT, a centralised information authentication and verification system which gathers information from various sources including sensors, social communication devices, and traditional media will help in this aspect. Key information can then be prioritised using structured data analysis and sentiment analysis then repurposed and disseminated to the respective audiences according to their need-to-know levels.

REAL-TIME SOCIAL COMMUNICATION

SOCIAL NETWORKS ARE FAST SEALING THEIR POSITION AN INTEGRAL PART OF DISASTER COMMUNICATION PLANS FOR EMERGENCY MANAGEMENT AGENCIES, AND MANY OTHER PUBLIC AND PRIVATE SECTOR ENTERPRISES. THEY ARE ONE OF THE KEY AVENUES FOR CITIZEN-REPORTED NEWS FROM LOCALS AFFECTED BY DISASTERS – TO SEEK AID, SWAP INFORMATION AND PROVIDE SUPPORT FOR THE VICTIMS OF THE DISASTER.

Integrating geo-spatial information with social-based information will establish more accurate, reliable and real-time baseline data through multi-hazard maps with live statistical updates of each area that highlight areas at greater risk and most vulnerable when disasters hit. Citizens also are able to report incidents on-the-fly through device apps and view the authorities' actions to close the issues and at the same time authorities can also use the same platform to reach citizens quicker.

TECHNOLOGIES FOR CRITICAL DISASTER COMMUNICATION

ENABLING CRITICAL COMMUNICATION OF INFORMATION TO THE RIGHT AUTHORITIES AND ENSURING CITIZENS ARE WELL-INFORMED ARE KEY IN DISASTER-PRONE AREAS. A FINE LINE LIES BETWEEN LIFE AND DEATH SHOULD THE SLIP UP OCCUR WHILE INFORMATION IS BEING GATHERED OR RELAYED. MIMOS TECHNOLOGIES RENDER RELIABILITY AND ASSURANCE TO RAPIDLY REDUCE FURTHER EVENT ESCALATION AND ASSIST RECOVERY AND REINSTATEMENT OF DISASTER-HIT AREAS.

Information Harvesting and Dissemination

Through the use of web robots deployed with Mi-Clip, information can be harvested throughout networks. The information is organised in a central cloud services repository through Mi-Cloud powered by Mi-Semantic which organises unstructured information from various sources. Critical information is then disseminated through Mi-IDS to first line responders to take immediate action. This structured manner reduces instances of slow information pooling often done manually and hastens the rescue operation process.

Emergency Crisis Communication System

Mobile communication towers using Mi-MESA can be erected for secure high-speed communications where base level communication systems have been nullified or disabled as a result of disaster. Mi-Sensor environment sensors strategically placed at various sites offer climate and geographical change information to accurately collate reported information. An information dissemination system, Mi-IDS, can then ride on this communication backbone to deliver targeted information to rescue operations for immediate action. At the central operations centre, a single coordination platform leveraging on intelligence reporting through Mi-BIS generates associated heat maps for optimal resource allocation and monitoring throughout the rescue operation duration.

High Performance Big Data Analytics

Information coming from various sources, whether unidentified or verified, needs to be filtered, structured and repurposed for target audiences. Structured big data analysis and sentiment analysis is performed by Mi-Semantic and processed in a high-speed manner using Mi-AccLib. This can be done at stations near the disaster site and then relayed to the central operations centre for decision making. Ultimately, this reduces the chances of unwanted information reaching non-audiences and unnecessarily causing a frantic state of panic.

Secured Social Communication for Citizens

Citizens in affected areas are also empowered to contribute to 'live' reporting of the turn of events at hand at the disaster site to assist authorities. This secured two-way communication is enabled through Mi-Mobile with surveillance environment reporting and human movement analysis maps of Mi-SP. These are linked to secured cloud services and high-speed wireless infrastructure powered by Mi-Cloud and Mi-MESA.

CRITICAL INFORMATION DELIVERED FAST

acclib

An accelerator library that capitalises on different processor capabilities while maintaining application usage needs by parallelising data analysis and processing.

- Text/String analytics
- Financial computation algorithms
- Generic parallelised library
- Enhancements for common and customised operations

bis

A business intelligence platform for customised report creation and business analytics.

- Dashboard management
- Ad hoc reporting
- KPI management
- Location intelligence
- Parallel in-memory database
- Big data processing engine

clip

A web scraping/harvesting application to create customised web bots.

- Wizard robot
- Generic robot
- Web-based and multi-user
- Scheduler

cloud

A cloud infrastructure platform that allows virtualisation of physical hardware.

- Open and neutral architecture
- Comprehensive management modules
- Total service orchestration suite
- Hardware agnostics

ids

A component that provides multiple-channel information dissemination services.

- E-mail, SMS and fax channel distribution
- Static and dynamic merging
- Supplementary web services

mesa

A wireless multi-radio mesh broadband infrastructure appliance integrated with multi-protocol broadband connectivity and sensory system.

- IP65 robustness
- Modular design
- Long haul at high throughput
- Integrated sensor appliance
- Wireless infrastructure for surveillance systems

A mobile application management (MAM), mobile device management (MDM) and mobile content management (MCM) platform.

- Mobile application and enterprise content management
- Real-time enterprise mobile device management, policy, compliance and risk management
- Mobile analytics and reporting, and location services
- Mobile security management with anti-theft and data loss prevention
- Enterprise mobile location services

An SOA-based semantic technology platform that supports the development of various kinds of intelligent applications that interface via the W3C web service standard.

- Structured development platform
- Reliable and scalable components
- Adopts open web standards

A solution that comprises a sensor platform and sensor elements to provide real-time feedback of physical parameters.

- Robust and reliable for outdoor usage
- Real-time data measurement
- Wireless communications

A versatile video surveillance system with advanced video analytics that automatically detects and alerts occurrences of suspicious activity.

- Event detection video analytics
- Smart client video analytics
- Flexible architecture

MIMOS is supporting the growth and proliferation of IoT in Malaysia through Big Data IoT Technology Accelerator (BITX) which comprises core technologies that drive the development efforts in IoT in areas of Applications, Smart Devices and Network & Services.

To know more about MIMOS technologies go to: http://www.mimos.my/tech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