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## **A Best Practice Approach to Priority Messaging**

An overview of Priority Messaging

This paper provides a framework for organisations to review the critical nature of priority messaging within their business.

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**Paper 1 in a series of 3**

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This paper is the first in a series of 3 white papers:

<b>Paper 1</b>	<b>A framework for understanding priority messaging.</b>
<b>Paper 2</b>	A model for building response scenarios.
<b>Paper 3</b>	A practical approach to implementing a priority messaging architecture.

The purpose of this series of White Papers is to:

- Assist organisations in clarifying the critical nature of priority messaging in their business
- Show how business needs can be matched with appropriate priority messaging solutions
- Provide guidance on implementation strategies.

This white paper (Paper 1) provides a high level context for understanding priority messaging.

## Introduction

We define priority messages as concise electronic messages delivered in the shortest possible time to generate an appropriate response to an event.

Every organisation uses priority messaging to varying degrees.

So how critical is priority messaging to an organisation?

America's most powerful hospital accrediting group, Joint Commission on Accreditation of Healthcare Organizations, has ranked poor communications as the number one cause of death and serious injury in hospitals<sup>1</sup>. Improving the speed and clarity of communication is a priority for many healthcare organisations and priority messaging is at the centre of this movement.

The following table demonstrates that effective communication is critical to not only the healthcare industry:

<b>Emergency Services</b>	Organisations such as hospitals, emergency rescue services and organisations that are driven by critical situations require fast and reliable delivery of messages.
<b>Disaster Planning</b>	All organisations must have the capability to respond to a fire alarm. Some organisations must consider their response to one off disasters such as extreme weather, terrorist threat and other scenarios.
<b>Operations</b>	The day to day operations of an organisation depends on many systems e.g.; building management, production line, IT, phone and safety systems. Repair & maintenance staff amongst others must respond effectively to priority messages that demand resolutions 24/7.
<b>Security</b>	Security systems are critical to a safe workplace as well as protecting the assets of an organisation, any breaches must be responded to quickly and effectively.

A priority messaging framework defines how an organisation manages their distribution and management of priority messages to achieve the best outcomes for the organisation.

The Priority Messaging Framework:

- Provides a common reference for both business staff and technologists to review an organisation's priority messaging requirements
- Defines a business led approach to the selection of priority messaging technology

This White Paper outlines the priority messaging framework and describes the core processes underpinning every event / response scenario.

## The Priority Messaging Framework

The priority messaging framework describes how an organisation manages a response to any event.

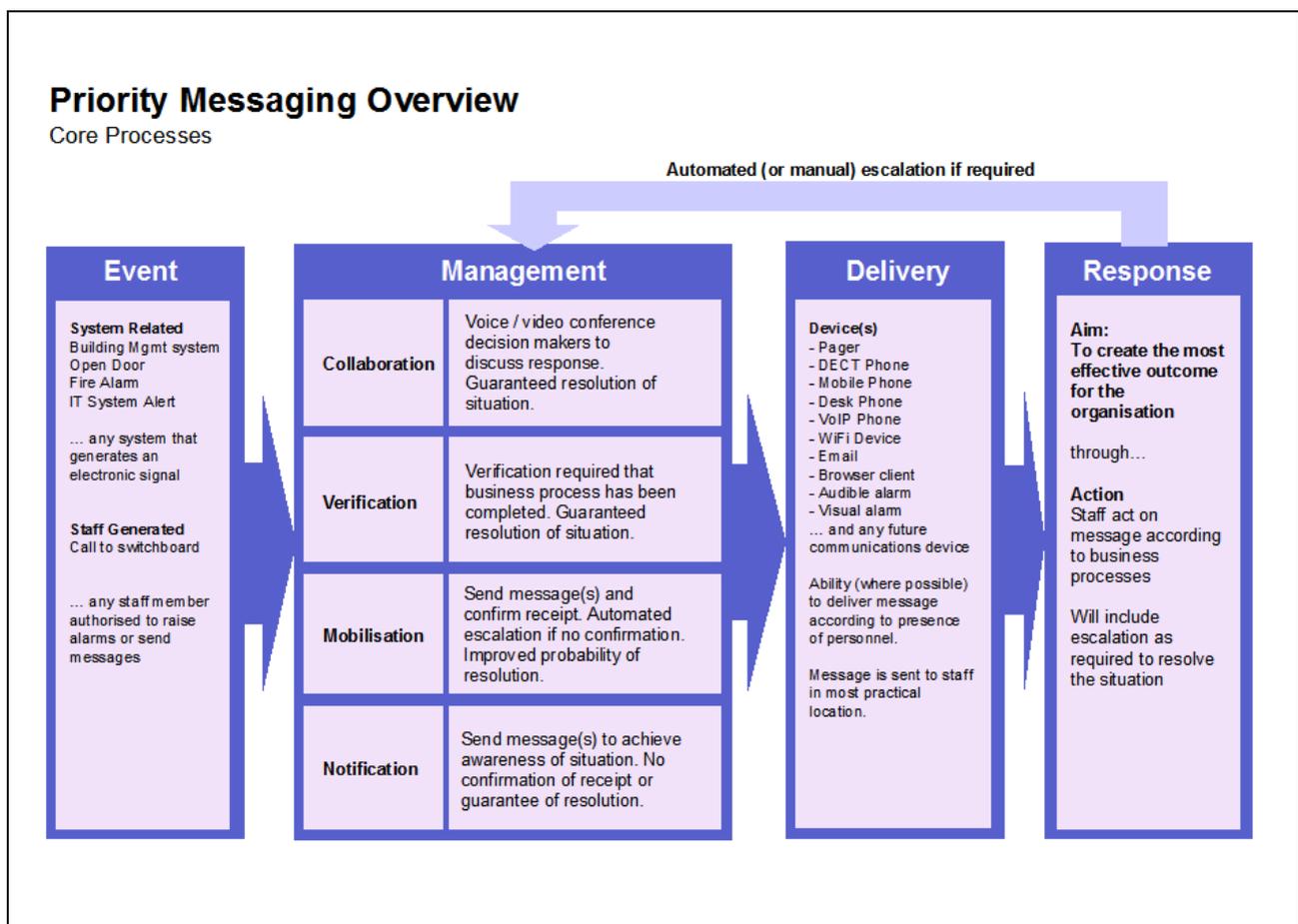
The framework is comprised of 4 core processes:

1	<b>Event</b>	The alert message generated by system(s) and/or staff.
2	<b>Management</b>	Application of business rules to the alarm message to determine who, how and when the message should be communicated.
3	<b>Delivery</b>	Message delivered in time via the most appropriate channels / devices.
4	<b>Response</b>	Staff respond promptly to delivered messages. Messaging system capable of automatically escalating messages until appropriate response is confirmed and verified.

The priority messaging framework is applicable to any Event / Response situation as a means of describing both the business processes and the technology required to meet the business needs.

This means the framework becomes a common reference for both for business staff who have to manage the responses to events within their organisation and technical staff installing and maintaining a priority messaging infrastructure.

The relationship between the core processes is shown below:



The following sections will explore each core process in detail, identify how they relate to each other and illustrate how the framework is applied in organisations today.

## Core Process 1: Event

An Event is where it all starts. If there were no events, then there would be no need for a response.

Organisations must have an understanding of why, how and where events occur, what is considered the best response by the organisation and the relative priorities of those responses. Without a fundamental understanding of events within an organisation, no priority messaging framework can be developed.

<b>Definition</b>	<ul style="list-style-type: none"> <li>• An event is a situation that generates an alarm requiring a specific response</li> <li>• An alarm is a concise message from a recognised, validated source</li> <li>• A response to the event must happen in a time frame defined by the organisation</li> <li>• An alarm message provides the 'input' for the management process</li> <li>• A defined set of business rules will be applied to an event to create a response</li> </ul>
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In response to an event, an alarm message can be generated via a range of sources, for example:

- A system generates a message based on rules within that system
- A person calls another staff member to alert them to a situation
- A button is pressed by a staff member, sending an alert signal out of a system

The alarm message must be capable of being transmitted as an electronic signal (voice and/or data) containing sufficient details to be processed accurately in the management process.

Examples of events and alarms include:

Event	Alarm
Medical emergency	Call to Emergency Number A call to a designated number will alert staff or an organisation to a problem. A response is then initiated depending on the circumstances of the alert.
Fire in building	Fire Alarm. A fire alarm is a high priority alert. An alert that generates a loud audible alarm to be heard by occupants of a building. Response can include evacuation of a building.
Telephone system problem	Call Out to Engineer. All manner of systems can experience problems that require an engineer. A system or staff member can raise an alert that an engineer is required.
Open Fridge Door	In a laboratory, fridge doors cannot be left open. An audible alarm is insufficient if a room is left unoccupied, so having the capability for the fridge to generate an alarm (that can be transmitted as a text message to nearby staff via mobile device / phone) is critical.

An organisation must be able to prioritise events and alarms as part of its own priority messaging framework because alarms from different sources are likely to have different priorities.

An organisation should also have a clear understanding of the architecture over which alert messages are created and sent. Not only must the network and systems be resilient, there must be clear support and maintenance agreements in place to ensure their continued operation.

To this end, a review of the events occurring within an organisation helps:

- Define the response scenarios required (see remaining 3 core processes)
- Identify potential efficiencies in processing events through common processes or technology.
- Confirm the relative priority of different alarms.

The alarm messages are the 'input' to the management process which is described in the next section.

## Core Process 2: Management

The management process is the engine room of the priority messaging framework.

An organisation, having identified the events and alarms that occur on a day to day basis, must define the business rules that guide and manage the most effective response to those events.

The management process defines a response to an event. A response is known as a 'Response Scenario'.

<b>Definition</b>	<ul style="list-style-type: none"> <li>• An alarm message is an 'input' to the management process</li> <li>• A set of business rules are pre-defined and applied to incoming alarms</li> <li>• Business rules can be applied manually, automatically or via a combination of both</li> <li>• The management process determines the 'outputs' or 'Response Scenarios'; the why, who and how a message(s) is sent and the rules for resolution of a situation.</li> <li>• The management process defines:             <ul style="list-style-type: none"> <li>○ recipient(s) of message(s)</li> <li>○ message format(s) and content</li> <li>○ timescales for message delivery</li> <li>○ system(s) and device(s) to transmit and receive messages</li> <li>○ business rules to create response scenarios</li> </ul> </li> </ul>
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The management process must have the capability to handle alarms 24 hours a day, 7 days a week.

The 4 layer priority messaging model underpins the entire management process and supports the creation of both simple and highly complex response scenarios.

The model is summarised below. The second white paper in this series focuses exclusively on the 4 layer model and is recommended reading to further understand the creation of response scenarios.

4 Layer Priority Messaging Model		
Layer	Activity	Response / Resolution
<b>Collaboration</b>	Voice / video conference decision makers to agree and action a response.	Guaranteed resolution of situation.
<b>Verification</b>	Verification required that business response is complete.	Guaranteed resolution of situation.
<b>Mobilisation</b>	Send message(s) and confirm receipt. Automated escalation if no confirmation.	Improved probability of resolution.
<b>Notification</b>	Send message(s) to generate a response.	No confirmation of receipt of message or guarantee response has taken place.

The 4 layers are used as building blocks to create response scenarios. The 4 layers do not have to be used in a specific order and can be used multiple times in the course of one response scenario.

See the White Paper 2, 'The 4 Layer Priority Messaging Model' for further information.

There are 3 main approaches to processing of business rules:

Processing	Description
Automatic	Messages generated by systems automatically – e.g.; overheating system sends a message to a designated device or phone number to alert personnel to the problem.
Manual	Staff call other staff, manually create and send messages.
Combination	Use of automatic systems to quickly call and escalate. Use human intervention to accommodate changes to response scenario.

Message servers can be used to store and process business rules and automate the processing to achieve quicker and more concise message delivery when compared to purely manual systems. Each organisation has to decide on processing methods that will help achieve the most effective response.

It should be understood that the main aim of the management process is to not generate large volumes of messages.

The management process should aim to generate a sufficient but not excessive number of messages for an organisation to understand and respond appropriately to an event. The objective is clarity rather than confusion.

#### Case Study – Texaco, Milford Haven, 1994<sup>ii</sup>

The 1994 explosion and fires at the Texaco Milford Haven refinery injured twenty-six people and caused damage of around £48 million and significant production loss. Key factors that emerged from the **Health and Safety Executive's (HSE's)** investigation were (These are quotes from a HSE information sheet "Better Alarm Handling\*):

- There were too many alarms and they were poorly prioritized.
- The control room displays did not help the operators to understand what was happening.
- There had been inadequate training for dealing with a stressful and sustained plant upset.
- In the last 11 minutes before the explosion the two operators had to recognize, acknowledge and act on 275 alarms.

In summary, the HSE concluded:

“Better alarm handling can have a significant effect on the safety of your business (the cost of not improving alarm handling can literally be your business in some cases). An improved alarm system can bring tighter quality control, improved fault diagnosis and more effective plant management by operators. A number of quick and relatively easy technical solutions are available which can bring immediate benefits. Medium and longer-term programmes can bring greater benefits still.”

Delivery of the priority messages defined in the management process must take into account the technical infrastructure over which the messages will be delivered.

The next section describes the delivery process and the critical nature of the messaging infrastructure.

## Core Process 3: Delivery

The delivery process is at the sharp end of the priority messaging framework. The right message must arrive with right person(s) in the most appropriate format in the required timeframe.

The technical architecture and infrastructure supporting the delivery process is a critical element of a priority messaging strategy. If the infrastructure is not in place then message delivery cannot be guaranteed and an organisation's ability to respond to situations becomes severely compromised.

<b>Definition</b>	<ul style="list-style-type: none"> <li>• Delivery of message(s) according to 'output' from management process</li> <li>• Deliver the message(s) in the specified format(s) to the designated device(s) in the required timeframe</li> <li>• Deliver in sequence or in parallel</li> <li>• Support the response process in the communication and resolution of a situation</li> <li>• Typically message delivery happens automatically but can be completed manually</li> </ul>
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The following table outlines some infrastructure capabilities an organisation must have in place in order to deliver priority messages.

Infrastructure	Description
<b>Reliability</b>	The infrastructure must have a high degree of reliability and trust by the business. Reliability is not only determined by the equipment deployed but by the support and maintenance agreements in place.
<b>Resiliency</b>	Building upon the day to day reliability, the priority messaging infrastructure must have a necessary degree of resilience to ensure the continued delivery of the highest priority messages in the event of any outage or major issue.
<b>Asset Management</b>	An organisation must have an asset register of systems and end user devices to define its response capability. The functionality of the systems and devices must also be clearly understood to ensure devices are used appropriately and response outcomes can be achieved.

In reviewing the infrastructure of an organisation, a variety factors can affect the success of a priority messaging architecture.

1. **Ownership of infrastructure.** In large, complex organisations it is entirely possible there is no one owner of all devices and systems of communication. It is imperative that ownership issues are clearly understood and managed as part of the implementation as well as ongoing support.
2. **Standards Integration.** With a wide range of systems and devices, a variety of standards are likely to be in use. These standards must be recognised and accommodated accordingly by a priority messaging solution.
3. **Vendor Integration.** An organisation must review and balance the integration of technology with the possibility that this may lock the organisation in to a particular vendor for a period of time.
4. **Capacity Planning.** Planning must take place to ensure there is end to end capacity in the infrastructure to support priority messaging. Installing the technology is one thing but the technology has to meet the demands of the business.
5. **Security standards.** The priority messaging infrastructure must meet the internal security standards of an organisation at all times. This involves an end to end review of security as each response scenario is developed.

There are 4 main data formats for message delivery:

Delivery Format	Description
<b>Text</b>	<ul style="list-style-type: none"> <li>Alpha numeric text message, variable length</li> </ul>
<b>Voice</b>	<ul style="list-style-type: none"> <li>A person can call one or many people directly</li> <li>A recorded voice message can be played to the call recipient</li> <li>A person can be conferenced in to a phone call automatically</li> </ul>
<b>Image</b>	<ul style="list-style-type: none"> <li>An image file e.g.; a jpeg picture file can be sent to a device</li> </ul>
<b>Video</b>	<ul style="list-style-type: none"> <li>A video file can be sent to a device for playback</li> <li>A video streaming session between devices can be initiated</li> </ul>

The following table lists a selection of end user devices typically used in priority messaging scenarios.

Device	Text	Voice	Image	Video
Short Range pager				
Long range pager				
Mobile Phone	SMS		*	*
DECT extension	SMS			
Fixed PABX extension	SMS*			
Land line				
PC	Email & IM	*	*	*
VoIP phone / device (WiFi)			*	*
System e.g.; Help Desk system – any system capable of receiving a message from message server		*	*	*
Audio Alarm	**			
Visual Alarm	**			
... and others yet to be defined				

\* Dependent on device specifications

\*\* Text message sent to systems controlling audio and visual alarms

The following case study illustrates the importance of matching the technology infrastructure to meet the needs of the organisation so that the required messages could be delivered in an emergency situation.

#### Case Study - Santa Fe Community College, Gainesville, Florida, USA, February 2008

A gunman has been spotted on campus. While police and security personnel seek the gunman, it is vital the college communicates to all staff and students in the quickest possible timeframe.

The campus had a plan in place.

The management process was to have their message server (which was integrated into their PABX), make every one of 772 phone extensions on campus into a hands free speaker phone. Through this mechanism, the security personnel were able to communicate to the entire campus and keep them up to date with developments. The gunman fled after 2.5 hours and no one was hurt.

In terms of the delivery process, the campus had chosen to use voice as the best means of communication and had a technology infrastructure capable of supporting quick and immediate mass communication across the campus. Their pre-defined business rules allowed them to manage the response very effectively.

## Core Process 4: Response

The response process is the actual activity an organisation undertakes to respond and resolve an event.

It is at this point the previous 3 phases come together to generate the required response.

<b>Definition</b>	<ul style="list-style-type: none"> <li>• Actions taken by organisation to resolve an event.</li> <li>• Defined by the business rules in Management Process</li> <li>• Deliver the outcome required by the organisation</li> </ul>
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A response can range from a simple scenario whereby a security guard closes a door that has been left open to a multi-stage emergency response involving personnel from different organisations using different communication technologies over an extended period of time.

At the heart of the response are the business rules defined in the management process.

The business rules are typically defined in workflow diagrams. The second white paper in this series describes how these workflow diagrams can be augmented with response scenarios based on the 4 layer model.

A response scenario will describe the exact steps and use of communications technology in a response. It brings clarity to an organisation by creating 'response scenarios' which encapsulate the business rules as well as providing structure for use of appropriate delivery technologies.

It is critical that an organisation tests the logic of the business rules, the capability of the delivery infrastructure and the personnel / systems required to respond. An assumption cannot be made that everything will work when required; only through testing can hidden problems and unforeseen issues be discovered and addressed.

A critical element of the response process is Full Event Traceability (FET).

Full Event Traceability gives authorised staff the means to review an audit trail of events from the generation of an alarm to the resolution of a response. This means the organisation can:

- Identify areas for process improvement
- Confirm system records reflect the perceived resolution of the alert
- Compare response statistics against organisational Key Performance Indicators (KPIs)

The higher the degree of automation of a response process, the more accurate the data an organisation has to review as systems automatically record when alerts were raised, messages were sent and confirmations received.

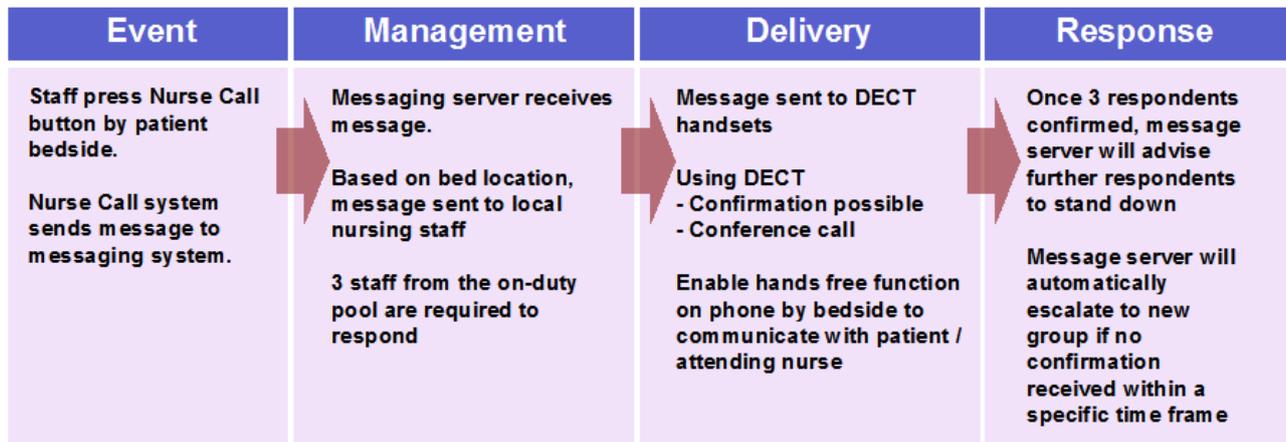
An example response scenario is detailed in the following section to illustrate how the priority messaging framework helps give context to an organisation's response to an alert.

## An Example Response Scenario

We will use a health care response scenario to explain the use of the priority messaging framework.

In hospitals, a Nurse Call button is located at a patient's bedside to be pressed in the event of an emergency such as cardiac arrest. This scenario describes what happens if that button is pressed.

This scenario is based upon a message server handling the automated management of the response.



Notes and commentary:	
<b>Alert</b>	<ul style="list-style-type: none"> <li>A signal is sent from the button at the bedside to the Nurse Call system which registers at which bed a button has been pressed.</li> <li>A message is sent immediately from the Nurse Call system to a message server.</li> </ul>
<b>Management</b>	<ul style="list-style-type: none"> <li>The message is received by the message server and is checked against a database of business rules held by the server. These business rules have been defined by the hospital on who to contact in the case of an emergency at this bed at this time of day.</li> <li>Based on these rules, the message server begins the management process. The message server sends a pre-recorded message to the DECT phones of specific personnel on duty. The business rules state 3 staff members must respond to the message.</li> </ul>
<b>Delivery</b>	<ul style="list-style-type: none"> <li>The personnel who respond on their DECT phones will listen to the recorded voice message, they will be required to press a button on the phone to confirm receipt.</li> <li>On confirmation of receipt, the message server will send a signal to the phone system to put the DECT handsets of the responding personnel into a conference call. The staff will immediately be able to communicate in conference as they move quickly to the patient's bed from different parts of the hospital.</li> <li>Once 3 staff members have confirmed they have heard the voice message, any further staff responding will listen to the message and automatically be informed by the message server that sufficient personnel have already responded. This ensures the best use of staff resources.</li> <li>The message server will also send another signal to the phone system to make the phone handset by the bedside 'hands free'. This allows the clinical staff at the bedside to talk to the team responding to the emergency call without having to leave the patient or hold the phone.</li> </ul>
<b>Response</b>	<ul style="list-style-type: none"> <li>The respondents are now on their way to the bedside and in communication with the attending staff member. On arriving at the bedside the button will be pressed again to confirm staff have arrived. This confirms to the message server the situation is under control. The staff will now follow business rules to treat and care for the patient. The messaging process has done its job.</li> <li>Should insufficient numbers or no staff respond within a certain timeframe, the message server will escalate the call to further groups of employees until a response was confirmed.</li> </ul>

## Priority Messaging Infrastructure

As highlighted in the delivery process (page 7), any priority messaging strategy is dependent upon a reliable and resilient infrastructure.

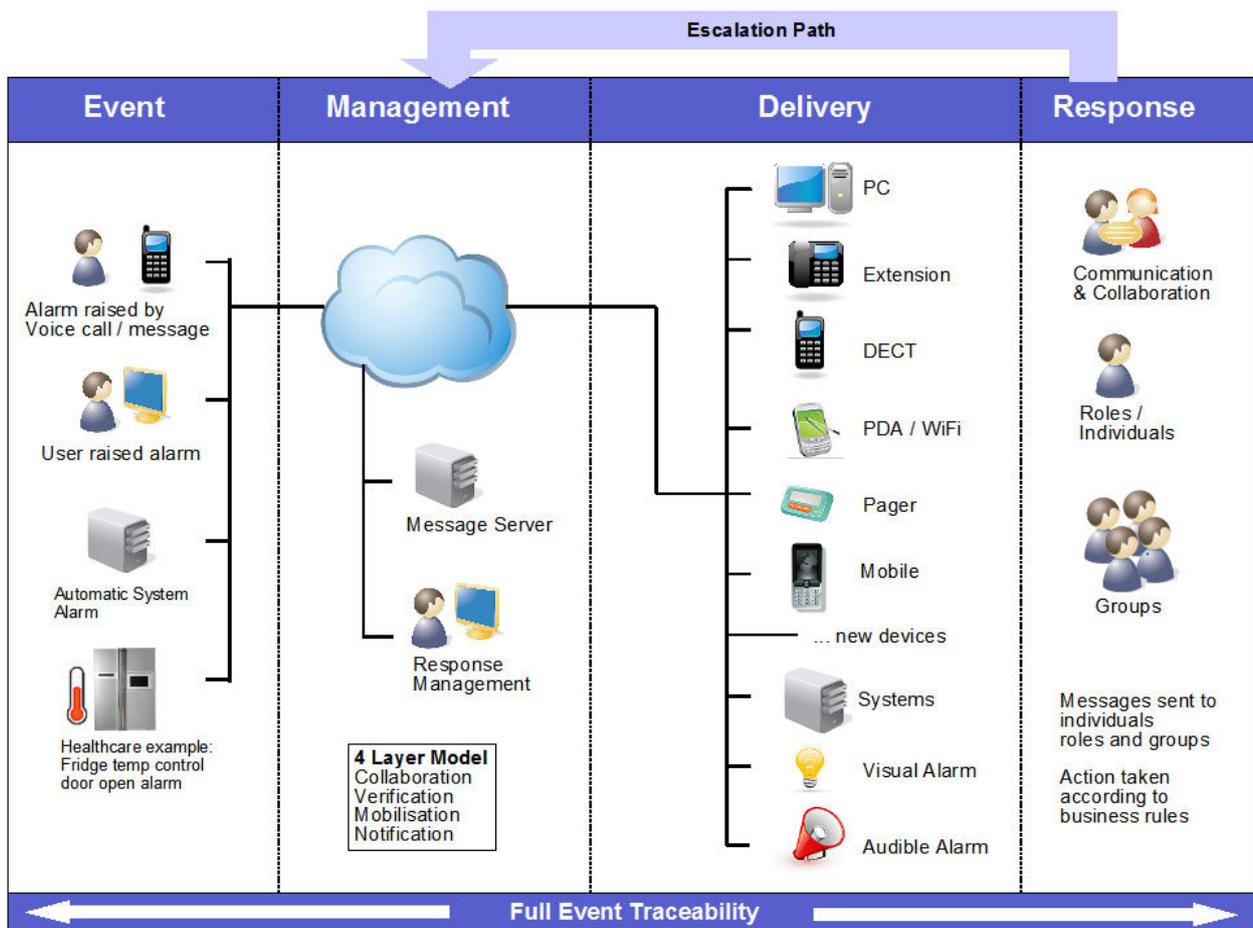
An organisation must review its technology capability in light of the business requirements. The infrastructure has an equal ability to be an inhibitor of success as it is to be an enabler.

The following elements must be clearly defined:

<b>Infrastructure Ownership</b>	Who owns which parts of the infrastructure? What is their role in priority messaging?
<b>Standards Integration</b>	How will different standards be integrated across a variety of technologies?
<b>Vendor Integration</b>	What is the functionality offered by close integration of systems?
<b>Capacity Planning</b>	What will be typical and extreme loadings on the priority messaging infrastructure?
<b>Security Standards</b>	How will security and data standards be maintained from alert to response?

Each organisation develops their own architecture framework based on their own internal standards, IT security requirements, equipment vendors and capacity requirements. This is discussed further in the third white paper in this series.

The following diagram has been kept deliberately simplistic to illustrate how and where commonly used technology sits within the priority messaging framework.



## Summary

Priority messaging is critical to all organisations. Every alarm must be met with an appropriate response.

From simple alarms to complex emergencies, the priority messaging framework provides a method for organisations to understand the challenges and opportunities in both business and technical context.

The strength of the priority messaging framework is in its simplicity. Every event can be described in the same language of event, management, delivery and response.

Process	Outcome
Event	Alarm raised
Management	Rules defined and messages sent
Delivery	Messages delivered via the most appropriate devices
Response	Situation resolved

The complexity of priority messaging is derived, to begin with, from the sheer variety of business rules, timing, devices and personnel involved in just one event / response process.

The complexity is magnified many fold when an organisation recognises the need to define and manage every alert, 24 hours a day, every day of the year.

It is this complexity that is at the heart of the priority messaging challenge for all organisations.

**The second white paper in this series shows how an organisation's priority messaging business needs can be matched with appropriate technical solutions through the creation of response scenarios.**

Nexon Asia Pacific is a leading telecommunications integration consultancy with offices in Sydney, Brisbane and Melbourne.

Nexon have developed both the Priority Messaging Framework and the Priority Messaging 4 Layer Model as a means of assisting organisations to more effectively review their priority messaging strategy. Nexon offer priority messaging integration consultancy and services to medium sized enterprises, the corporate community and government agencies.

If you require assistance with your priority messaging strategy and implementation, call Mike Sultan, Priority Messaging Programme Manager at Nexon Asia Pacific.

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## Glossary

<b>Priority Messaging</b>	Priority messages are concise electronic messages delivered in the shortest possible time to generate an appropriate response to an event.
<b>Priority Messaging Framework</b>	A framework of processes describing how an organisation responds to an event.
<b>Core Process</b>	There are 4 core processes within the priority messaging framework. The processes are: event, management, delivery and response.
<b>Event</b>	A concise message from a validated source that requires an organisation to respond.
<b>Management</b>	A set of pre-defined business rules are applied to an incoming alarm. The rules define the process of how an event will be resolved through the sending of specific priority messages to people / systems via the most appropriate technology.
<b>Delivery</b>	Delivery of message(s) via the most appropriate device(s) / system(s).
<b>Response</b>	Action to be taken by an organisation to resolve an event. The business rules in the management process underpin the actions in the response process.
<b>Full Event Traceability (FET)</b>	The ability of an organisation to track and report on actions starting with the generation of an alert to the resolution of a response.
<b>Priority Messaging 4 Layer Model</b>	A model for interpreting business rules to create priority messages and define how the messages are transmitted and who they are received by in order to respond and resolve an alert. The 4 layer model sits within the management process of the priority messaging framework.
<b>Response Scenario</b>	A specific event and response situation within an organisation.
<b>Notification</b>	Send message(s) to generate a response. No confirmation of receipt of message or guarantee response has taken place.
<b>Mobilisation</b>	Send message(s) and confirm receipt. Automated escalation if no confirmation. Improved probability of resolution.
<b>Verification</b>	Verification required that business response is complete. Guaranteed resolution of situation.
<b>Collaboration</b>	Voice / video conference decision makers to agree and action a response. Guaranteed resolution of situation.
<b>Message Server</b>	A message server will decode the signal from an alarm, apply business rules and send a message(s) via the chosen delivery mechanism(s). A message server sits within the management process in the priority messaging framework and provides the means to automate many priority messaging tasks.

## References

<sup>i</sup> **Source:** [http://www.jointcommission.org/NR/rdonlyres/FA465646-5F5F-4543-AC8F-E8AF6571E372/0/root\\_cause\\_se.jpg](http://www.jointcommission.org/NR/rdonlyres/FA465646-5F5F-4543-AC8F-E8AF6571E372/0/root_cause_se.jpg)

<sup>ii</sup> **Source:** <http://www.hse.gov.uk/pubns/chis6.pdf>