



Transforming and Improving Business Process with Alerts and Exceptions

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Agenda

- Introduction and Background
- Case-study: Medical House-call System
 - Some Design Details
 - Applicability and Advantage
- Ongoing Related Research
- Future Work and Summary

Alert-based Process Improvement

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Introduction and Background



New Requirements of e-Business Process Management

- Process execution often requires human decision
 - competition of resources
 - highly dynamic environment
 - effective communications and coordination of personnel
 - improve the response time of some “more important” executing instances
 - **Handle exceptions**
- Objectives
 - Process improvement
 - Service excellence
- Solution: Alert Management System (AMS)
 - Alerts - urgent / critical messages
 - Routing, monitoring, and logging the alerts
 - Find suitable human attention / services dynamically

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Project Background

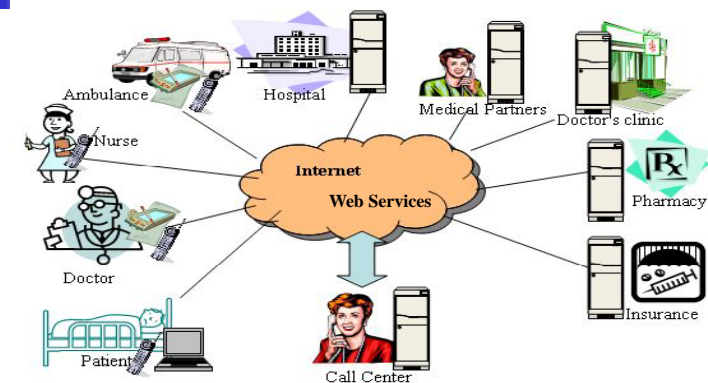
- Motivated by exception handling requirements in workflow management systems (WFMS)
 - D.K.W. Chiu, Q. Li and K. Karlapalem. A Meta Modeling Approach for Workflow Management System Supporting Exception Handling. *Information Systems*, 24(2):159-184, 1999.
 - D.K.W. Chiu, Q. Li and K. Karlapalem. Web Interface-Driven Cooperative Exception Handling in ADOME Workflow Management System. *Information Systems*, 26(2):93-120, 2001.
 - D.K.W. Chiu, K. Karlapalem, Q. Li and E. Kafeza. Workflow Views Based E-Contracts in a Cross-Organization E-Service Environment. *Distributed and Parallel Databases*, 12(2-3):193-216, 2002.
 - S.C. Cheung and D.K.W. Chiu. Cross-Organizational Process Exceptions. RGC Grant (HKUST 6170/03E)
- Capture the essences of workflow *development and management methodology*
- *Light-weight* system integration platform

Initial Research on This Topic

- Focus on B2B e-Services
 - D.K.W. Chiu, Benny Kwok+, Ray Wong+, E. Kafeza and S.C. Cheung. Alert Driven E-Services Management, **37th Hawaii International Conference on System Sciences (HICSS37)**, 1/2004, (**BEST PAPER AWARD, Decision Technologies Track**). (+PTMSc student)
- Focus on medical applications
 - D.K.W. Chiu, Benny Kwok+, Ray Wong+, E. Kafeza, S.C. Cheung, and M. Kafeza. Alert Driven Healthcare Process and Data Integration, **IEEE HICSS37**, 1/2004. (+PTMSc student)
- Journal version: conceptual model and initial study
 - E. Kafeza, D.K.W. Chiu, S.C. Cheung, and M. Kafeza. Alerts in Mobile Healthcare Applications: Requirements and Pilot Study, *IEEE Transactions on Information Technology in Biomedicine*, 8(2):173-181, 6/ 2004.
- Journal version: medical application summary
 - D.K.W. Chiu, M. Kafeza, S.C. Cheung, E. Kafeza, and P.C.K. Hung. Alerts in Healthcare Applications: Process and Data Integration. *International Journal of Healthcare Information Systems and Informatics (IJHISI)*, 4(2):36-56, 2009.

Case-study: Medical House-call System

Case Study – Medical House-call System



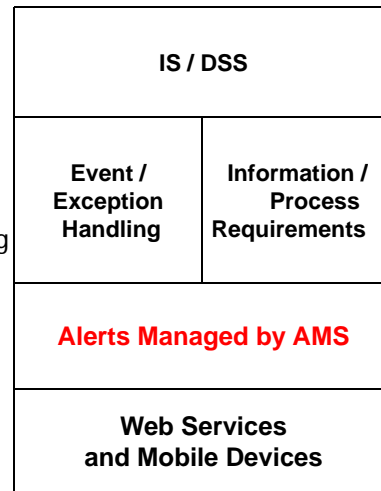
- Both human and computerized systems are involved
- Business partners have different degree of computerization
- Web Services supports both type of interactions in a unified framework

Role of Alerts in IS / DSS

What are Alerts?

- Different from general events, alerts have more specific attributes, e.g., urgency and process requirements.
- Different from exceptions, they need not relate to abnormal behaviors.
- *asynchronously* received through business events / exceptions / incoming requests
- *synchronously* generated by internal business application
- *handled* by the AMS by requesting services from:
 - internal information systems
 - management / human attention
 - external e-Service providers
- 3R – Retry, Reroute, Reassign

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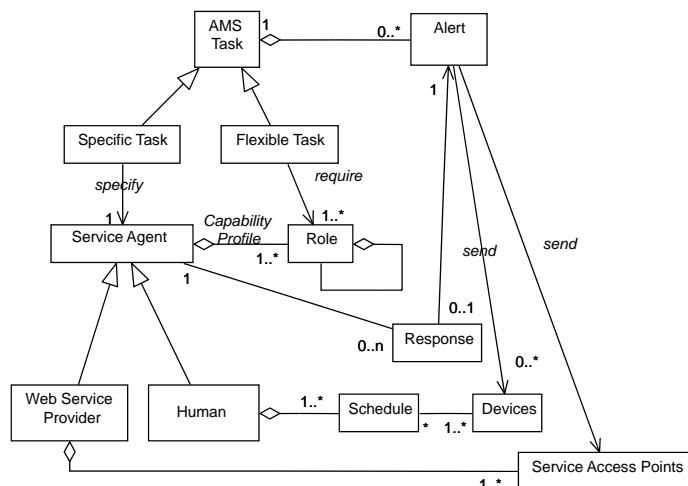


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Some Design Details

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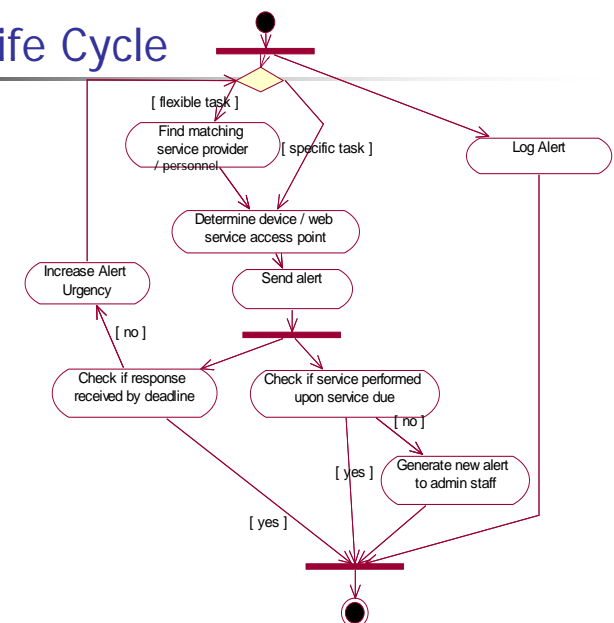
Alert Conceptual Model (UML Class Diagram)



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Alert Life Cycle



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Alert Urgency Elevation

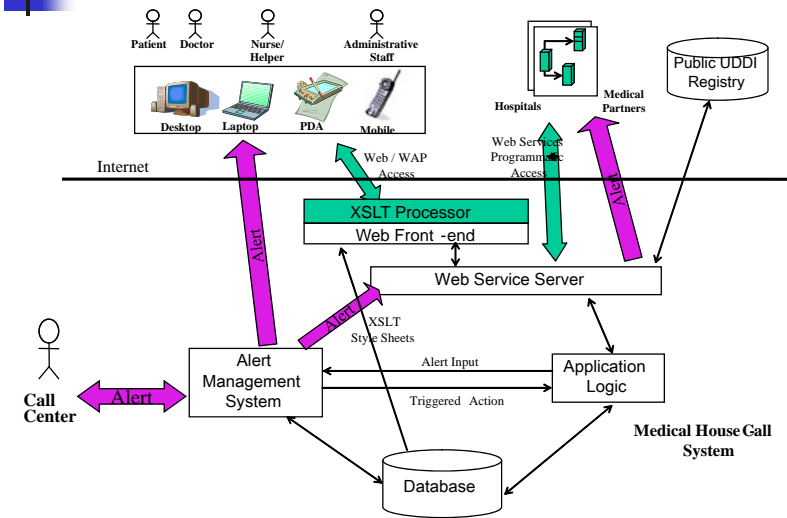
- Defining the policies according to which the urgency of the alert will be "elevated"

- Example

$$U_{002}(t) = \begin{cases} \text{Urgent} & t \leq T \text{ (default)} \\ \text{Very Urgent} & T < t \leq T + dt_1 \\ \text{Critical} & T + dt_1 < t \leq T + dt_1 + dt_2 \\ \text{Very Critical} & T + dt_1 + dt_2 < t \leq T + dt_1 + dt_2 + dt_3 \end{cases}$$

Urgency Level	Action
Urgent	default – notify the selected agent
Very Urgent	Submit a second alert to the same agent, notifying about the approaching deadline
Critical	Redirect the alert to another agent that has the best response time
Very Critical	Send the alert to several agents and accept the results of the one that response first, notify an administrator

Brief System Architecture



Sample Screen – Doctor Selection

The screenshot shows a web browser window titled "AMS - Medical House-Call - Microsoft Internet Explorer". The main content area is titled "Doctor Search for House-Call". It contains a form with the following fields:

- Patient No.: PN0023487
- Consultation Date: Date: 2003 - 5 - 10, Time: 18 : 30
- Consultation Location: Tsim Sha Tsui
- Sex of Doctor: N/A
- Specialism of Doctor: A list of medical specialisms including Cancer, Pneumatic, Dietetic Consultation, Endoscopy, Fetal Medicine, Eye Diseases, Heart Diseases (selected), Magnetic Resonance Imaging, Maternity, Osteoporosis, Pathology, Physiotherapy, Prosthetic Diseases, Sleep Apnoea, X-Ray & Medical Imaging.
- Type: Off-duty
- Urgency: Normal

Sample Alert Acknowledgement User Interface

The screenshot shows a Palm OS Simulator window titled "Palm OS Simulator - [NTFull_enUS.rom]". It displays a message titled "Message 1 of 1" from "To: 92348374". The message content is:

~ AMS House Call ~

Patient: Heart diseases
Location: Tsim Sha Tsui
Time: 5May2003 13:30
Deadline: 20min

Can you take the house call (y/n)?

At the bottom, there are buttons for "Done", "Edit", and "Delete".



Alert Status Monitoring



The screenshot shows a web browser window titled 'AMS - Medical House-Call - Microsoft Internet Explorer'. The main content area displays a header with the word 'MONITOR' and 'House Call Status'. Below the header is a table with the following data:

Call ID	Patient ID	Doctor	Admin Staff	Start Time	Status
HC0384	PN002993	N/A	N/A	11 May 2003 12:30	Finding Doctor, waiting for doctors' reply
HC3748	PN000392	Dr. Philip Ng	Terence Yeung	11 May 2003 10:05	On the way to local patient
HC1283	PN048737	Dr. Joanne Wong	Cindy Wong	11 May 2003 09:25	Consultation in progress
HC6483	PN009938	Dr. Steven Ip	Cindy Wong	11 May 2003 05:45	Replacement for absence of doctor
HC4588	PN006744	Dr. Amy Chan	May Cheung	11 May 2003 03:15	On the way to oversea patient
HC5448	PN005544	Dr. Gary Lee	Cindy Wong	11 May 2003 01:10	Consultation in progress, need extra help
HC2334	PN006222	Dr. Paul Yip	Gillian Chan	10 May 2003 23:55	Wait for Payment

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Alert Web Services Summary

- **Service Name: requestAlert**
 - *Input: AlertID, RequestorID, AlertMessage, Roles, Urgency, ResponseRequired (TRUE | FALSE), Deadline*
 - *Response: AlertID, ServicePartnerID, Ack (Confirmed | Denied | Deferred), ResponseMessage, AlertReceiptTime*
- **Service Name: cancelAlert**
 - *Input: AlertID, RequestorID*
 - *Response: Ack (Confirmed | Denied | Deferred)*
- **Service Name: checkAlertStatus**
 - *Input: AlertID, RequestorID*
 - *Response: Alert Status*
- **Service Name: listActiveAlerts**
 - *Input: (TaskID | ServicePartnerID), RequestorID*
 - *Response: List of pending alerts associated*
- **Service Name: receiveDeferredResponse**
 - *Input: Item AlertID, ServicePartnerID, ResponseMessage, AlertReceiptTime*
 - *Response: Ack (Confirmed, NotConfirmed)*

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Advantage: Process Improvement

- AMS is a **unified platform** supporting operational, tactical, and strategic decision making
 - seek different level of attention depending on alert's nature
 - alert "elevation"
- Improves communications and coordination of management / personnel
 - Anytime anywhere multi-platform alerts for management decisions
 - Right person at right time with right information
 - Automatic retry of calls and routing
 - Accountability - logging and monitoring
 - Mobile workforce management
- Captures management knowledge and experience
 - Alert management policies
 - Addressing urgency requirements
 - Avoiding errors and help handle exceptions

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Advantage: Service Improvement

- Improves e-Services provision
 - Automation of call center which is a bottleneck in the whole e-Service process
 - Productivity improvement and cost reduction
 - Clients / partners can request service via Web, mobile devices, and even an emergency button
 - Timely services
- Business partners & service personnel form a *service grid*
 - B2B system integration - convergence of disparate business functionalities
 - Increase in business opportunities
- Relationships improvement
 - more "transparent" business process operations
 - quality services

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Ongoing Related Research

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Other Key Applications of Alert / Exception Management

Application on e-Learning

- D.K.W. Chiu, Samuel P.M. Choi, Minhong Wang, and Eleanna Kafeza. Towards Ubiquitous Communication Support for Distance Education with Alert Management. *Educational Technology & Society*, 11(2): 92-106, 2008.

Application on emergency preparedness

- D.K.W. Chiu, Drake T. T. Lin, Eleanna Kafeza, Minhong Wang, Haiyang Hu, Hua Hu, Yi Zhuang. Alert based disaster notification and resource allocation. *Information Systems Frontier*, 2009.

Application on assets management

- Shengguang Meng, D.K.W. Chiu, Eleanna Kafeza, Wenying Liu, Qing Li. Automated management of assets based on RFID triggered alarm messages. *Information Systems Frontier*, 2009.

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Summary

- A conceptual model for specifying alerts based on the requirements of business processes and a set of routing parameters
- A mechanism for (re-)routing alerts and increasing their urgency when alerts are not acknowledged or processed within deadline
- A practical architecture for the AMS based on contemporary Web Services and mobile technologies – supports human and programmatic interfaces
- Improved information and process management for decision support
- Improved service provision through speed-up
- Flexible, reusable, light-weight AMS plugged into other systems
- Looking for research collaborations (esp. domain knowledge, say, logistics, tourism) for *cross-disciplinary research* and empirical studies in more depth and wider scope

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Future Work



- What (and when) are urgent / exceptions?
- How important / urgent are they?
- Advanced match-making
- Location dependent applications
 - Workforce management
 - Mobile CRM
- Analysis and simulation of alert-based speed-up
- Inter-relations among alerts
- Failure of commitments and their relation to contract enforcement
- Impact of cancellations, other possible exceptions

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