Stakeholder/Value Approach to Integrating System Development Model and Dependability Analysis: CS-GPE Case Study

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Presentation Outline

- Research Project Problems
- System Environment
- Case Study
  - System Development Model
    - Model Elements
  - Dependability Analysis Model
    - Success Critical Stakeholders
    - Stakeholder/System Interactions
    - System Dependability Attributes
    - Stakeholders/Dependability Attributes Relationships
- Conclusions
Research Project Problems

- Study (analyze) communication systems for re-occurring, time-limited and geographically focused, large-scale events. What kind of demands these large-scale events put on communication systems?
- Understand the environment of Grand Public Events
- Understand the complex interactions of different stakeholders and their requirements connected to the communication system
- Develop new secure and reliable communication system for grand public events, satisfying stakeholders’ requirements.
- Enhance the experience of visitors attending large-scale events using modern telecommunications and information technology.
System Environment

- Public events such as outdoor concerts, summer city festivals and other celebrations provide a vital social, economic and cultural experience to the community.

- They are time-limited, geographically focused, attract thousands of visitors and generate a variety of opportunities for both local and global actors.

- The communication systems and value chains for traditional telecom services are based on a long-term view and address specific locations (populations). The communication system for repetitive short-term, large-scale events has different priorities as compared to location-specific systems.
Large Scale Public Events

- Sport Events
- Festivals & Concerts
- Gatherings
- Conferences
- Exhibitions
- Disasters
Case Study: Hultsfred Rock Festival 2004
System Development Model for Uncertain and Turbulent Environments

Development Stage  →  Evolution Stage

- Initial Investigation & Hypothesis
- Develop Strategy
- Data Collection and Testing
- Analysis & Requirements
- Prototyping/System

- Data Collection and Testing
- Analysis & Improvements
- Design & Build-to-Improvements
Figure 1: System Life-Cycle Model for Uncertain and Turbulent Environments
Model Elements

Development Stage

1 Initial Investigation

The process start by identify problem in existing system or a need of a new solution for a turbulent and uncertain environment with continuously changing needs. Initial investigation is made to the environment, its need and stakeholders, their complex interaction with the system.

2 Hypothesis

On the bases of this initial investigation hypothesis is made about the environment.

3 Developing Strategy

As the event is time limited, it is very important to make a clear strategy how to deal with the environment in order to learn more about it in short time duration.
4 Real Time Testing and Data Collection

At the event real time testing and data is collected from the stakeholders that are gathered for the event and may not appear until next year. The methodology like interviews, questionnaires and stakeholders’ workshops are used.

5 Stakeholder Dependability Analysis

Collected information is analyzed to learn about the stakeholder interests and their interactions with the system. Stakeholder/Value Dependency Analysis is used to make tradeoffs in case of stakeholders’ interests collision and contribute to the development of a Win-Win balanced system.

6 Screen Out Requirements

Through this analysis, requirements are screened out for the future system.
Model Elements (cont.)

7 Early Architectural Concepts
The next step is the early architectural concept development in which early concepts are formed about the system architecture that will fulfill the requirements.

8 Prototyping
These concepts are then refined and a prototype is built to be tested in the next upcoming large-scale public event.

9 Real time testing/collectiong feedback
With the help of the prototype, real time feedback is collected.

10 Stakeholder Dependability Analysis
The collected information about the experience of people using the prototype and the problems they face or their wishes from the system are analyzed.
11 Screen out improvements
   In this stage improvements to be done are screened out.

12 Design and build-to-improvements
   On the basis of above screened improvements the system is built.

13 System release
   The developed system is delivered for current use in GPE.

**Evolution Stage**
   After the development stage, the system enters into a cyclic evolution stage to cope with changes.

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**Figure 2: A Process Cycle**
Understanding Stakeholder/Value Dependencies

➢ Study Methodologies

 Printing Interviews
  ▪ Organizers
  ▪ Service Providers
  ▪ Visitors

 Printing Questionnaires
  ▪ Organizers
  ▪ Service Providers

 Printing Observer Eye

 Printing Photographs

 Printing Ethnographic analysis
Success Critical Stakeholders’ Classes

- Infrastructure Providers
  - Organizers
- System Controllers
  - Organizers
- Infrastructure Brokers
  - Service Providers (MNO and ISP)
- Infrastructure Consumers
  - Organizers
  - Service Providers (MNO and ISP)
- Administrators
  - Organizers
- Maintainers
  - Organizers
- System Dependents
  - Visitors
- Developers
  - Wireless Festival Project Partners
Stakeholder/System Interactions

Communication System (CS-GPE)

- Infrastructure Providers
- Infrastructure Brokers
- Infrastructure Consumers
- System Controllers
- Developers, Administrators, Maintainers
- Dependents
Stakeholders Needs vs Technologies

- Organizers

<table>
<thead>
<tr>
<th>Actor</th>
<th>Needs</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORGANIZERS</td>
<td>Communication (Voice + SMS)</td>
<td>Mobile system (GSM/GPRS/3G)</td>
</tr>
<tr>
<td></td>
<td>Reliability &amp; Redundancy</td>
<td>DECT system</td>
</tr>
<tr>
<td></td>
<td>Connectivity without wires + Services like messaging, schedules, etc</td>
<td>Wireless LAN</td>
</tr>
<tr>
<td></td>
<td>Flexible and easy solution</td>
<td>Walkie-talkie</td>
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<td></td>
<td>Web updates &amp; Video streaming</td>
<td>ADSL</td>
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</tbody>
</table>
Stakeholders Needs vs Technologies (cont.)

- Service Providers

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<thead>
<tr>
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</thead>
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<tr>
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<td>Communication (Voice + SMS)</td>
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<tr>
<td></td>
<td>Connectivity without wires</td>
<td>Wireless LAN</td>
</tr>
<tr>
<td></td>
<td>Intranet &amp; Internet</td>
<td>ADSL</td>
</tr>
<tr>
<td></td>
<td>Video Broadcasting</td>
<td>Satellite</td>
</tr>
</tbody>
</table>
Stakeholders Needs vs Technologies (cont.)

- Visitors

![Diagram showing the relationship between visitors, communication (voice + SMS), and mobile system (GSM/GPRS/3G).]
System Dependability Attributes

- **Dependability Attribute Class: Quality of Service**
  - Provides good quality voice, data and video (Performance)
  - With high capacity and speed (Capacity, Speed)
  - Provide services with accuracy and consistency (Accuracy, Consistency)

- **Dependability Attribute Class: Security**
  - Can be connected to intranet and Internet without compromising confidentiality and integrity (Confidentiality, Integrity)

- **Dependability Attribute Class: Robustness**
  - With high reliability and availability (Reliability, Availability)
  - Can withstand disasters (Survivability)

- **Dependability Attribute: Evolvability**
  - With a possibility to be upgraded

- **Dependability Attribute: Usability**
  - Easy to install and use

- **Dependability Attribute: Cost**
  - Economical

- **Dependability Attribute: Safety**
# Table 1: Stakeholders/Dependability Attributes Relationships

<table>
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<tr>
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<th>Service Provider</th>
<th>Visitors</th>
<th>Developers</th>
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<tbody>
<tr>
<td><strong>Security</strong></td>
<td></td>
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<tr>
<td>Confidentiality</td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Integrity</td>
<td>*</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td><strong>Robustness</strong></td>
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<tr>
<td>Reliability</td>
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<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Survivability</td>
<td></td>
<td>**</td>
<td>**</td>
<td></td>
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<tr>
<td>Availability</td>
<td>**</td>
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### Table 1: Stakeholders/Dependability Attributes Relationships (cont.)

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</thead>
<tbody>
<tr>
<td><strong>Dependability Attributes</strong></td>
<td><strong>Infrastructure Providers</strong></td>
<td><strong>System Controllers</strong></td>
<td><strong>Administrators</strong></td>
<td><strong>Maintainers</strong></td>
</tr>
<tr>
<td>Quality of Service</td>
<td>Performance</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Accuracy, Consistency</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Speed, Capacity</td>
<td>**</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Evolvability</td>
<td>**</td>
<td>*</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Usability</td>
<td>*</td>
<td>**</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Cost</td>
<td></td>
<td>*</td>
<td>**</td>
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<tr>
<td>Safety</td>
<td></td>
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</table>
Internal Organizer's Network - W-LAN

- Festival office
- Check in office
- Hultsfred.TV's caravan
- BTH's caravan
- 802.11b wireless link
- Ethernet
- Stora dans stage
- Pampas stage
- Atlantis stage
- Orinoco and Compex solutions with external antennas to connect buildings
- Standard access points for WHAT project roaming and to connect PCs

Legend:
* = Single PC client with external flat panel antenna
s = slave

It is possible to connect most clients to either the extranet or the intranet. The details are left out of this figure.
Extramers' Network

- Festival office
- Rock City
- Industry area
- Water tower
- Lake Hulingen
- Town of Hultsfred
- Fiber network
- Internet
- 100 Mbps fiber
- 2 Mbps DSL line
- 1 Mbps link
- Wireless 802.11
- Network for external people
- Network for Rockparty people
- Office
- Web sites etc.
- Local exchange
- Extranet
- Rockparty's intranet
- Ethernet with VLAN tagging for extranet and intranet.
- Other (economy etc.) office
- Extranet
- Town of Hultsfred
- Water tower
- Festival office
- Festival area
- Ethernet
- VLAN tagging
- Extranet
- Intranet
- Web sites
- Other (economy etc.) office
Proposed Early Architecture Concepts: W-LAN (Scalable High-Capacity Hotspot)

- **Public IP Address**: e.g. 200.200.200.20
- **SSID**: Public
- **SSID**: Admin
- **Channel 1**: 802.11b = 11 Mb/s – 1 Mb/s, 802.11g = 54 Mb/s – 1 Mb/s, 30m - 90m
- **Channel 6**: 
- **Use Wi-Fi CERTIFIED Products Only.**
- **RADIUS Authentication, Authorization, Accounting.**
- **DHCP, DNS, NAT, Firewall, IDS, WEP, EAP, EAPOL Authentication Server**
- **RADIUS support PAP, CHAP.**
Proposed Early Architecture Concepts: **W-LAN**

(Organizers Network)
Proposed Mobile Operator supported W-LAN
Proposed W-LAN inter-working with Mobile NW (2.5G/3G)
Proposed Early Architecture Concepts: **Location Services**

![Diagram of Location Services]

**3GPP & OMA**
Early Architecture Concepts: Location Services

Proposal for LCS - FriendFinder
Conclusions

- The paper presented a value-based approach to integrating development model and dependability analysis for a case study: Communication System for Grand Public Events (CS-GPE).
- The approach gives a very clear picture about the system role in relation to its environment and the complex interactions with different stakeholders and their value requirements.
- The stakeholder/value dependency framework is useful for reasoning about the CS-GPE dependability attributes and project scoping.
- The development model and stakeholder dependability analysis are key models to identify the tradeoffs which are necessary in order to provide a dependable system that will evolve to meet future requirement changes and will satisfy the stakeholder/value dependencies.