P2P Multilanguage CAP Broker:
Last-Mile Hazard Warning System Sri Lanka

World Meteorological Organization

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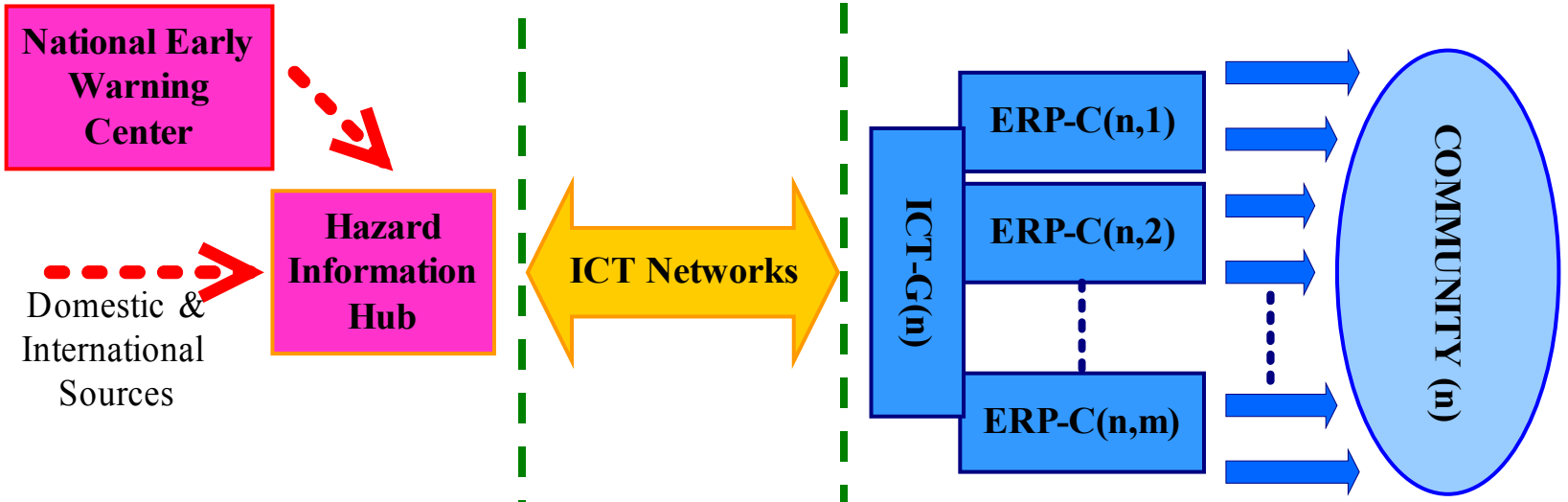
Last Mile Hazard Warning System (HazInfo Project)



Sarvodaya Community Disaster Management Center (SCDMC)

Communications Providers

Sarvodaya Communities

Five Wireless Technologies

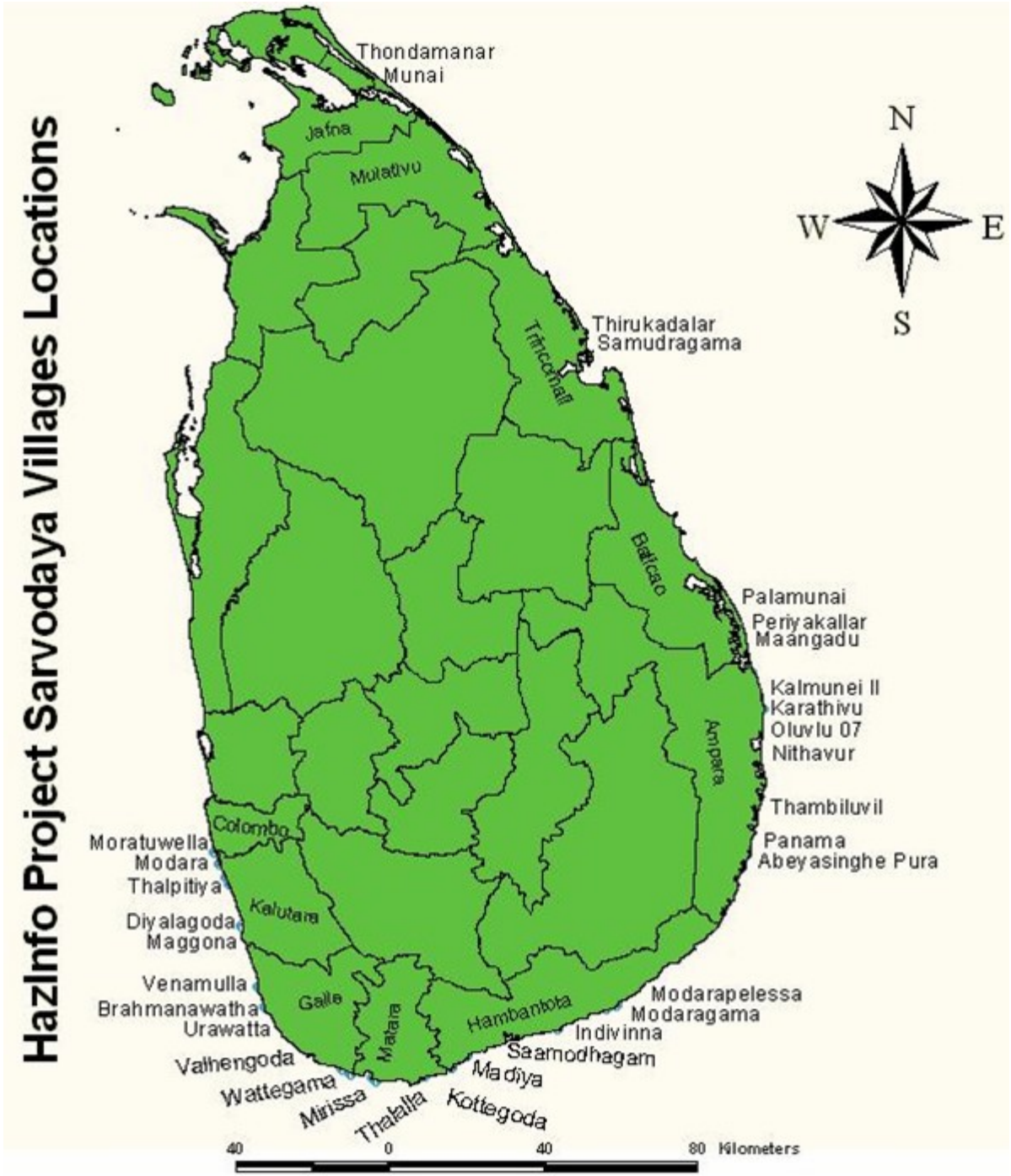
CDMA Fixed Phone

GSM Mobile Phone

Remote Alarm Device

Addressable Radios for Emergency Alerts

Very Small Aperture Terminals



Research Matrix

	With ERP Training				No ERP Training			
Sarvodaya Stage 1, 2, 3	**VSAT** Urawatha (Galle)	**MoP** Nidavur (Batticalo)	**FxP** Thirukadalar (Trincomalee)	**AREA** Moratuwella (Colombo)	**MoP** Meddhawatha (Matara)	**MoP** Thambiluvil (Kalmunai)	**FxP** Oluville (Kalmunai)	**AREA** Maggona (Kalutara)
	AREA + RAD Modarapallassa (Hambantota)	**AREA + FxP** Wathegama North (Matara)	**AREA + MoP** Palmunnai (Batticalo)	Control Village Abeyasinghepura (Ampara)	**AREA + RAD** Thondamanar (Jaffna)	**AREA + FxP** Karathivu (Kalmunai)	**AREA + MoP** Munnai (Jaffna)	Control Village Modara (Colombo)
Sarvodaya Stage 4	**VSAT** Modaragama (Hambantota)	**MoP** Diyalagoda (Kalutara)	**FxP** Periyakallar (Batticalo)	**AREA** Panama North (Ampara)	**MoP** Satur-kondagnya (Batticallo)	**MoP** Samodhagama (Hambantota)	**FxP** Indivinna (Galle)	**AREA** Brahamana-wattha (Galle)
	AREA + RAD Kalmunai II (Kalmunai)	**AREA + FxP** Samudragama (Trincomalee	**AREA + MoP** Valhengoda (Galle)	Control Village Mirissa South (Matara)	**AREA + RAD** Venamulla (Galle)	**AREA + FxP** Kottegoda (Matara)	**AREA + MoP** Thallala South (Matara)	Control Village Thalpitiya (Kalutara)

AREA: Addressable Radio for Emergency Alerts, Class B configuration of WorldSpace System

MoP: Java enabled Mobile Phone, Dialog-Microimage innovation MiDews application

RAD: Remote Alarm Device, Dialog-University-of-Moratuwa Innovation

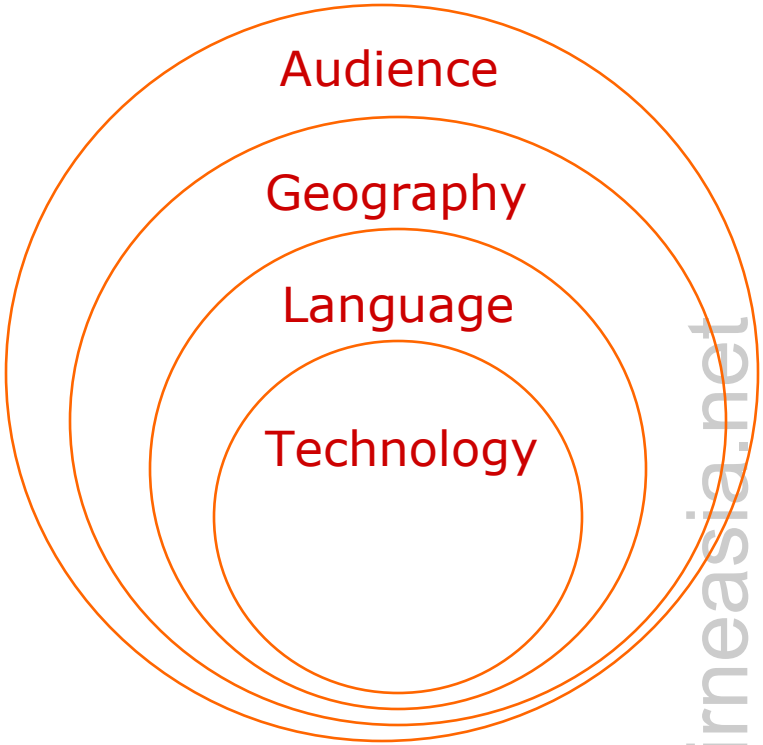
FxP: CDMA Wireless Fixed Phones with 1xRTT functions, Sri Lanka Telecom

VSAT: Very Small Aperture Terminals coupled with Internet Public Alerting System Innovative-Tech & Solana Networks

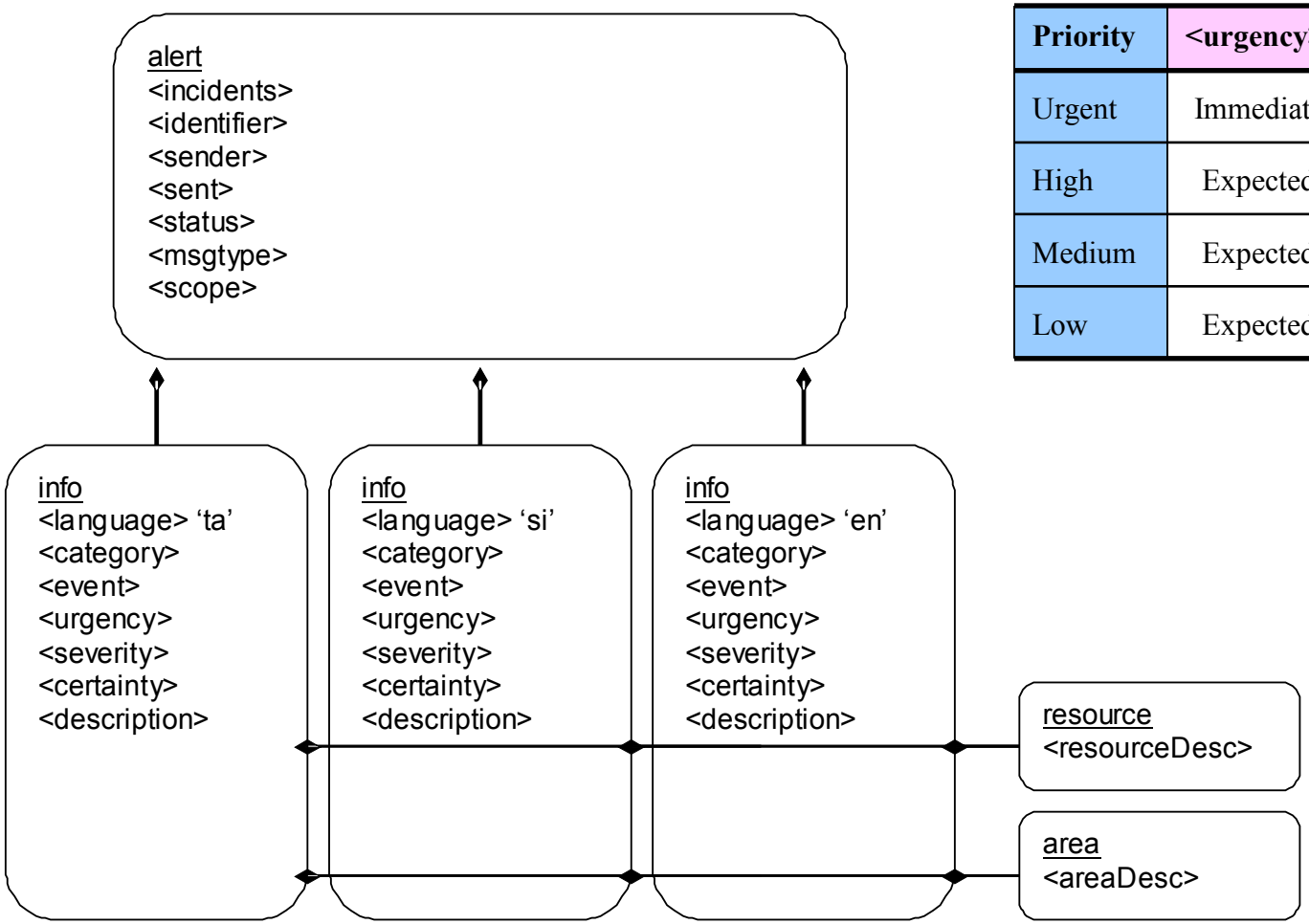
Approach for setting up the CAP Profile

- **Audience <*scope*>**
  - Restricted to Sarvodaya Community First Responders
- **Geographical Descriptions <*areaDesc*>**
  - Country
  - District
  - Towns and Villages
  - Sarvodaya member Communities
- **National <*language*>**
  - Sinhala, Tamil, English

4. **Communication Technology?**
   - Mobile phones (GSM)
   - Remote Alarm Device (GSM)
   - WorldSpace Satellite Radio (L/X-Band)
   - Very Small Aperture Terminals (C-Band)
   - Nomadic (fixed) phones (CDMA)



CAP Profile for Sri Lanka



Priority	<urgency>	<severity>	<certainty>
Urgent	Immediate	Extreme	Observed
High	Expected	Severe	Observed
Medium	Expected	Moderate	Observed
Low	Expected	Unknown	Likely

Acknowledgement: **Gordon Gow** (PhD), University of Alberta, ggow@ualberta.ca
For introducing the CAP Profile for Sri Lanka

Cyclone Bulletin used in HazInfo Exercises

Last-Mile HazInfo Simulation. No Repeat No Real Event is Effect

TROPICAL CYCLONE ADVICE NUMBER 001
Issued at 09:55 am on Monday, December 11, 2006
BY Sri Lanka Met Department

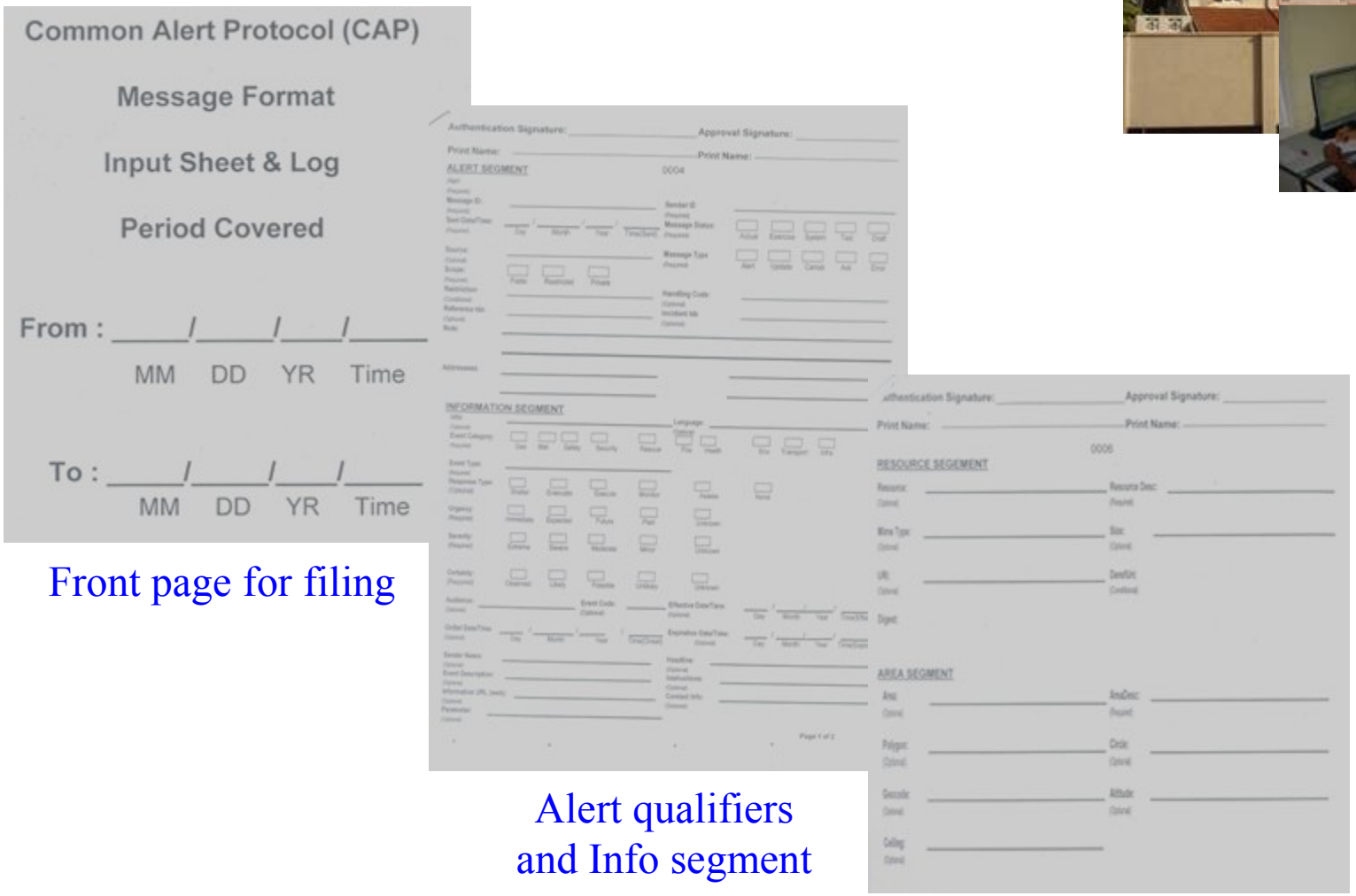
A **SEVERE CATEGORY 4 CYCLONE** is now current for AMPARA and MATARA District coastal areas. At **06:00 am** local time SEVERE TROPICAL CYCLONE MONTY was estimated to be **80 kilometres northeast of Ampara District** and moving southwest at **10 kilometres per hour**. Severe Tropical Cyclone Monty is expected to cross the coast in the vicinity of Ampara and Matara Districts during Monday. Gales with gusts to 180 kilometres per hour are likely in coastal communities in Ampara and Matara District during the day.

This is to **alert** the residents of Ampara and Matara District about the potential of a very **dangerous storm** tide as the cyclone centre approaches the coast. **Tides are likely** to rise significantly above the normal high tide mark with very dangerous flooding, damaging waves and strong currents.

Widespread heavy rain and further flooding are likely in southern parts of the Ampara and Matara Districts over the next few days.

Last-Mile HazInfo Simulation. No Repeat No Real Event is Effect.

Event of Interest Forms filled by Monitors



Front page for filing

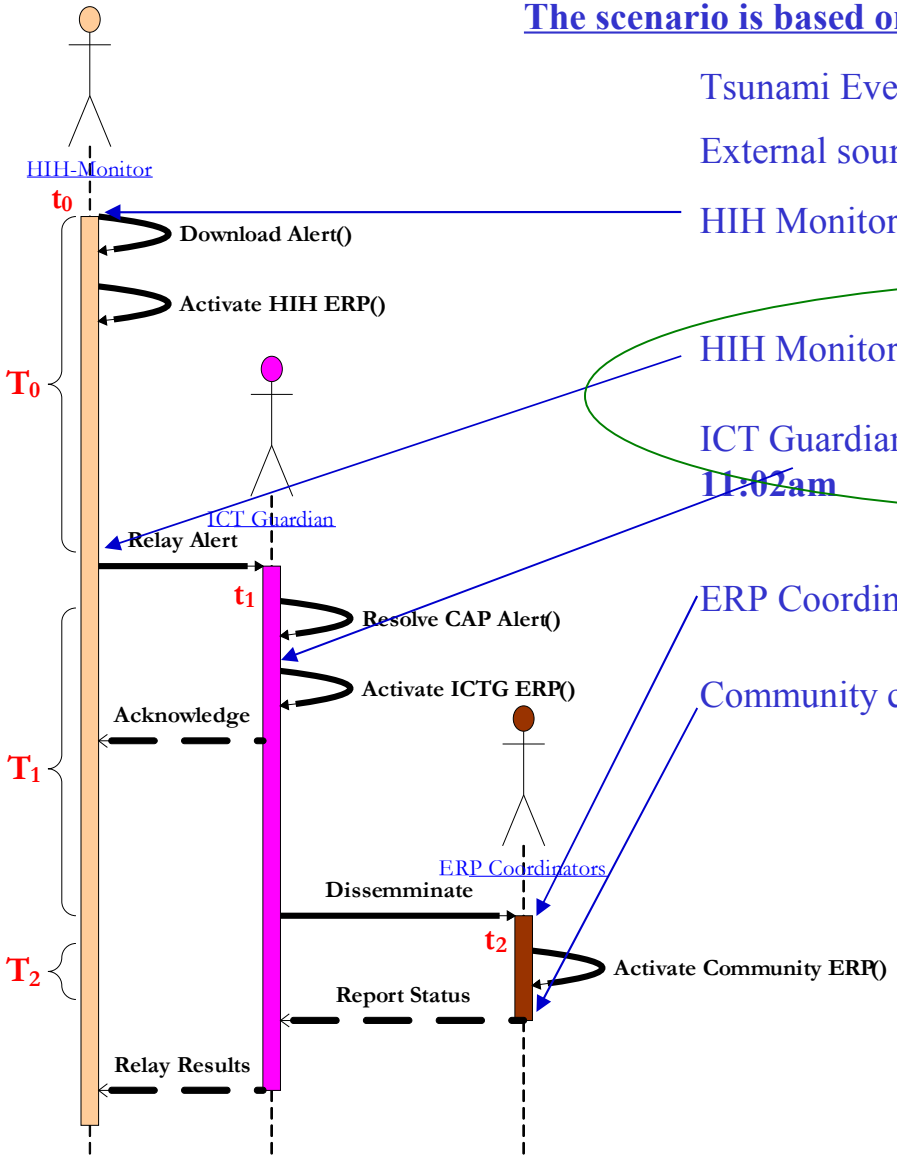
Alert qualifiers and Info segment

Area and Resource segments

Cyclone CAP Message used in HazInfo Exercises

```
<alert>
    <identifier>HIH-2006-12-11T095500</identifier>
    <sender>hih@sarvodaya.lk</sender>
    <sent>2006-12-11T09:55:00.0000000+06:00</sent>
    <status>Excersise</status>
    <msgType>Alert</msgType>
    <source>Last Mile Hazard Warning System</source>
    <scope>Restricted</scope>
    <restriction>Sarvodaya ICT Gaurdians</restriction>
    <info>
        <language>en-US</language>
        <category>Met</category>
        <event>Category 4 Cyclone</event>
        <responseType>Shelter</responseType>
        <urgency>Expected</urgency>
        <severity>Sever</severity>
        <certainty>Observed</certainty>
        <description> At 06:00 am local time SEVERE TROPICAL CYCLONE MONTY was estimated to be 80 kilometers
        northeast of Ampara District and moving southwest at 10 kilometers per hour. Severe Tropical Cyclone Monty is
        expected to cross the coast in the vicinity of Ampara and Matara Districts during Monday. Gales with gusts to 180
        kilometers per hour are likely in coastal communities in Ampara and Matara District during the day. This is to alert the
        residents of Ampara and Matara District about the potential of a very dangerous storm tide as the cyclone centre
        approaches the coast. Tides are likely to rise significantly above the normal high tide mark with very dangerous
        flooding, damaging waves and strong currents. Widespread heavy rain and further flooding are likely in southern parts
        of the Ampara and Matara Districts over the next few days. </description>
        <area>
            <areaDesc>Ampara and Matara Districts of Sri Lanka</areaDesc>
        </area>
    </info>
</alert>
```

Method for calculating reliability (efficiency)



The scenario is based on the Panama (Ampara District) simulation data

Tsunami Event occurred at 10:15am and will impact at 11:45

External source issued email bulletin at 10:25am

HIH Monitor receives email at 10:35am

HIH Monitor issues CAP alert at **10:46am**

ICT Guardian receives CAP alert over AREA-B at **11:02am**

ERP Coordinator receives alert information at 11:08am

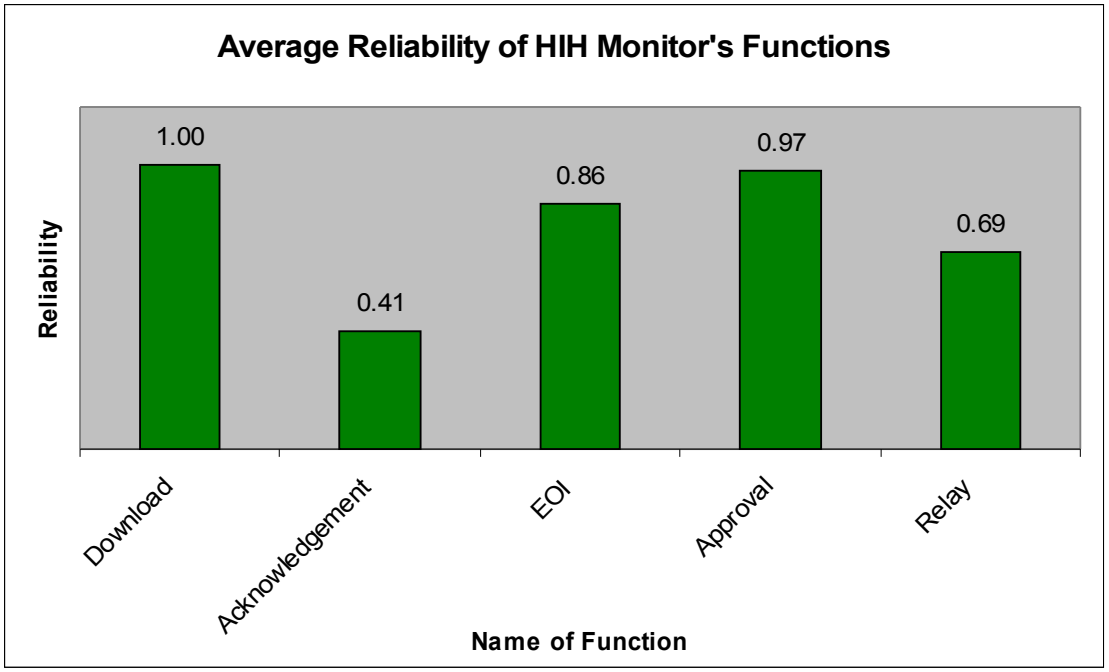
Community completes evacuation at 11:08am

Efficiency of ICT Network and ICT Guardian activities

Assumption: since this is the first set of trials and the LM-HWS has no data to calculate an 'expected time we set $E(\bar{T}) = 0$ (i.e. best case scenario)

$$R_e = 1 - \left(\frac{16}{90}\right) = 0.8222$$

HIH Monitor Performance and Conclusions



Effectiveness

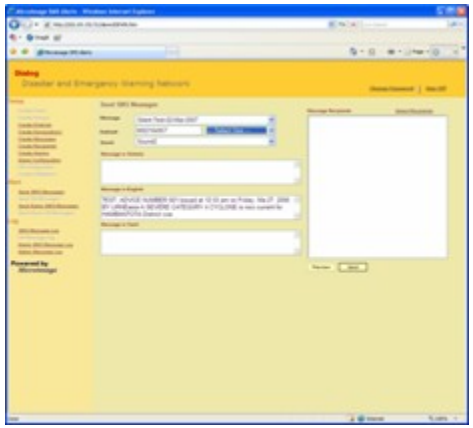
- Monitors had difficulty transforming the bulletin to a CAP message
- Not all elements of the EOI were populated
- Difficulty in coding the urgency, severity, and certainty elements
- Difficulties in translating alert in to local languages

Recommendations

- Make CAP literature available in local language for capacity building
- Integrate EOI form into alerting software with ability to print; avoid double entry
- Periodic refresher courses with certification program for the Monitors
- Single input multiple output application for generating and issuing alerts
- Technology for rapid translation of messages to local language

Evaluation of technologies for issuing and receiving alerts

DEWNS



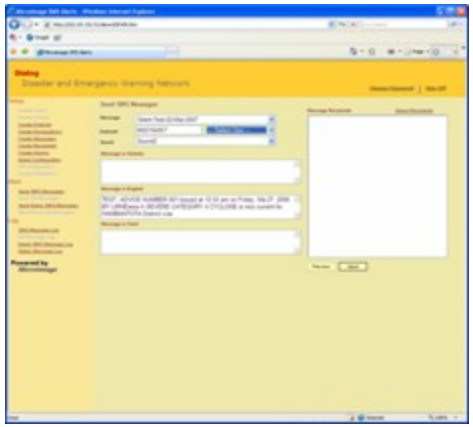
ANNY

IPAS

CALL

Dialog DEWN Terminal Devices (CAP 1.1)

Interface	HIH Monitor issued CAP Message	Receiver Device and {Medium}	ICT Guardian received Message elements
DEWN Internet Browse	<identifier> <sent> <sender> <info> sub element with <Language>en <Description> … {no size restriction} <Language>si <Description> … {no size restriction} <Language>tm <Description> … {no size restriction}	Mobile Phone {Text} Remote Alarm Device {Text}	"Warning" <info> <Language>en <Description>A SEVERE CATEGORY 4 CYCLONE… <Language>si <Description> …{sinhala lang} <Language>tm <Description> … {tamil lang} {total msg restricted by 130 characters}



WorldSpace Satellite Radio (CAP 1.1)

Interface	HIH Monitor issued CAP Message	Receiver Device and {Medium}	ICT Guardian received Message elements
ANNY Internet Browser application (AREA)	All sub elements in <Alert>, <Info>, <Resource>, <Area> segments, and message in <Language>en only.	Sat-Radio AREA – B {Text}	<msgType>Alert <Scope>restricted <Sender>hih <Status>exercise <Category>met <Urgency>expected <Severity> sever <Certainty>observed <Event>A SEVERE CATEGORY 4 CYCLONE … {total restricted 250 characters}
	<Description> with <Language>all… {no size restriction}	Sat-Radio AREA – B {Audio}	<Description> A SEVERE CATEGORY 4 CYCLONE …{no size restriction}

Public Internet Alert System

Interface	HIH Monitor issued CAP Message	Receiver Device and {Medium}	ICT Guardian received Message elements
IPAS Internet Browser	<Description> with <Language>en only … {no size restriction}	Personal Computer {Text}	<Description> A SEVERE CATEGORY 4 CYCLONE … {no size restriction}

CDMA Voice Alerts

Interface	HIH Monitor issued CAP Message	Receiver Device and {Medium}	ICT Guardian received Message elements
CDMA 2000 1x_RTT	<Description> … {no size and language restriction}	CDMA2000 1x_RTT Telephones {Audio}	<Description> A SEVERE CATEGORY 4 CYCLONE … {no size restriction}

Evaluating Terminal Devices for CAP Completeness

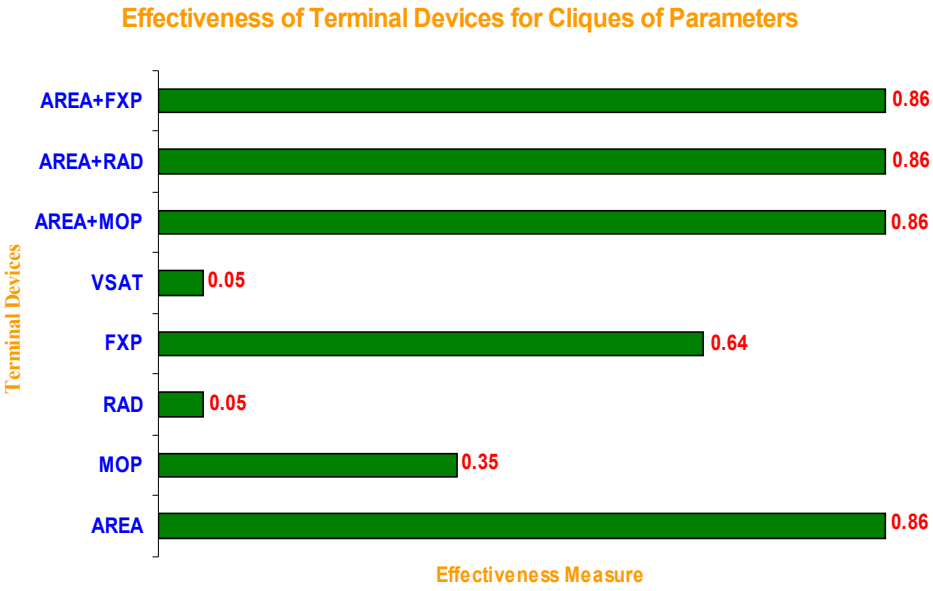
Value	*Fuzzy rules for completing Profile requirements (Table 1)*
1.00	All sub elements that are contained in the <*Alert*> segment, which includes all the qualifier elements and <*info*> element as well as the <*resource*> and <*area*> sub elements
0.95	Mandatory elements described in the Profile for Sri Lanka, which are qualifier elements in the <*alert*> segment with at least the <*urgency*>, <*severity*>, <*certainty*>, and <*description*>
0.85	Qualifier elements of the <alert> segment and the <*description*> only
0.70	<*description*> only
0.50	Elements <*category*> and <*event*> only
0.25	Mandatory sub elements of the <*alert*> segment only
0	Otherwise

Value	*Fuzzy rule for Language Diversity (Table 2)*
1.00	Sinhala + Tamil + English
0.99	Sinhala + Tamil
0.95	Sinhala + English
0.80	Sinhala Only
0.38	Tamil + English
0.28	Tamil Only
0.15	English Only
0	Otherwise

Value	*Fuzzy Rule for Communication Medium (Table 3)*
1.00	Graphic + Audio + Text
0.95	Graphic+ Audio
0.90	Audio + Text
0.80	Audio
0.70	Graphic + Text
0.60	Graphic
0.50	Text only
0	Otherwise

For a full description of the evaluation method refer to the "**HazInfo Technical Report**" - http://www.lirneasia.net/wp-content/uploads/2008/05

Terminal Devices Performance and Conclusions



Effectiveness

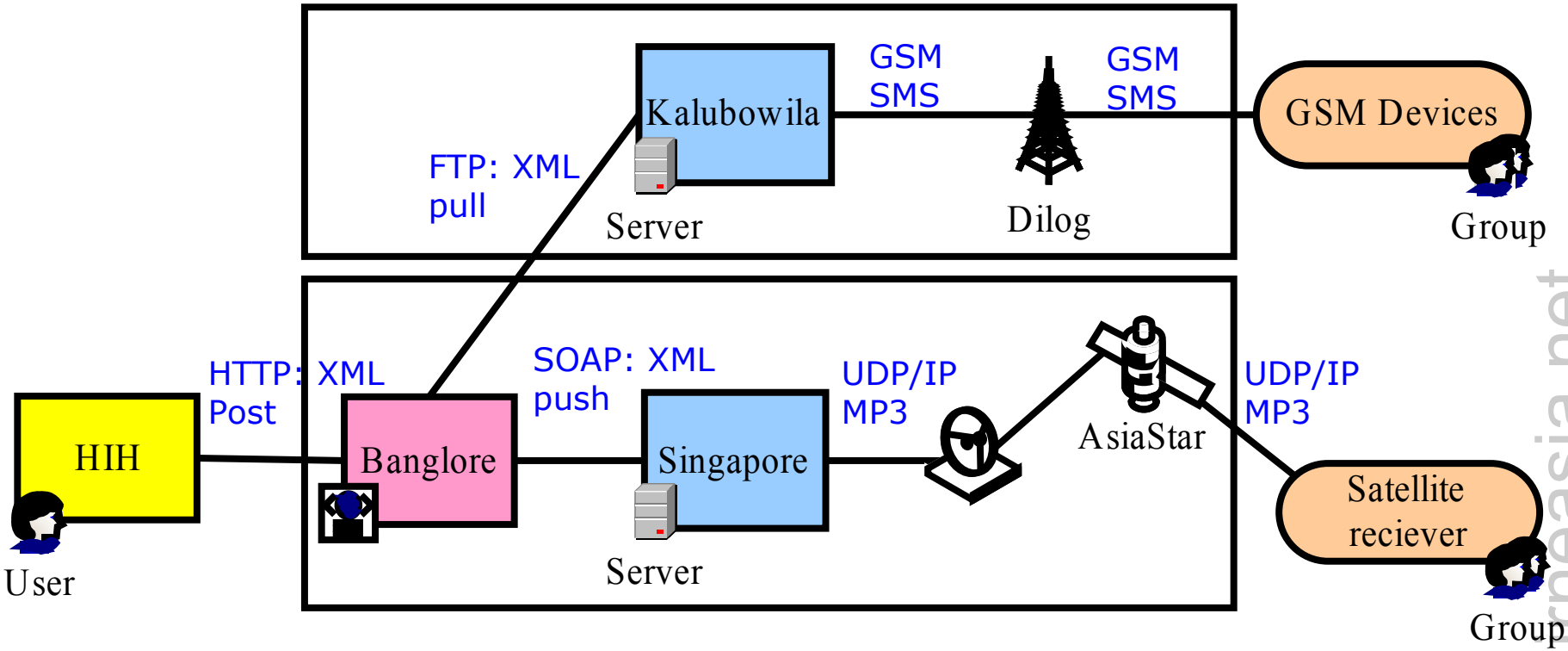
- Alert recipients were unable to interpret the priority from urgency, severity, and certainty
- Partial messages resulted in execution of wrong emergency response plans
- Messages received in English only were hard to comprehend

Recommendations

- Terminal devices must have local language capabilities over text and audio media
- Emergency communications equipment manufacturers adopting CAP should specify the limitations of the inputs and outputs with respect to CAP
- Interface issuing alerts should know the limits of the receiving terminal devices
- CAP Broker should poses knowledge of technology transport and terminal device limitations

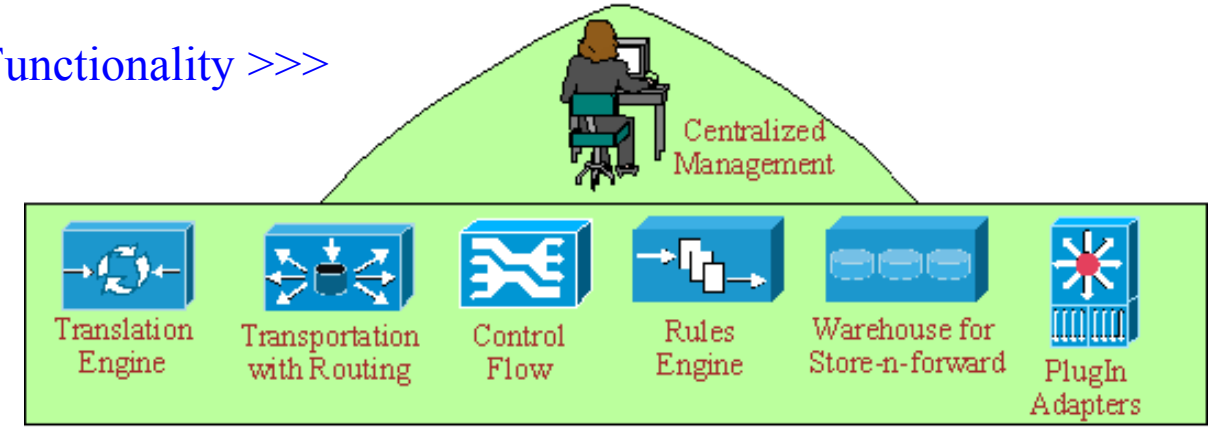
Interoperability Testing

June 2007 between **WorldSpace-Sankya** and **Dialog-Microimage**

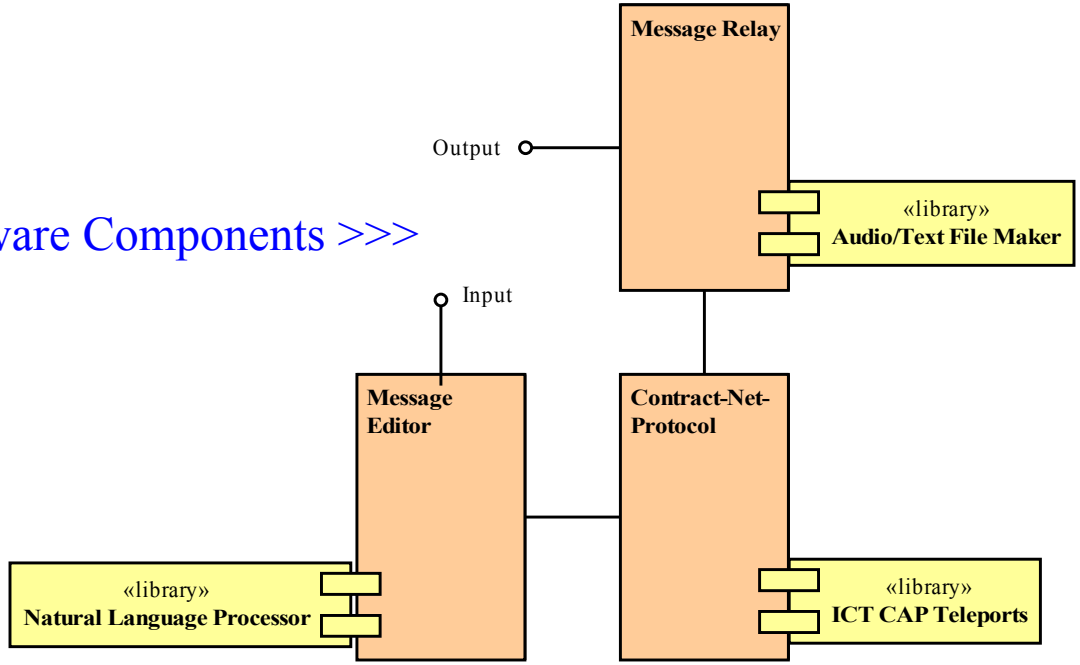


Elements of the PROPOSED Sahana CAP Broker

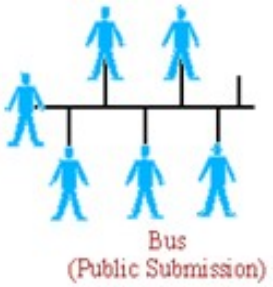
Functionality >>>

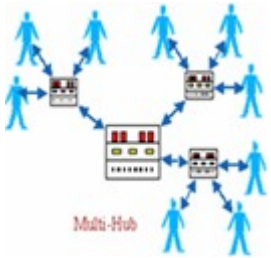


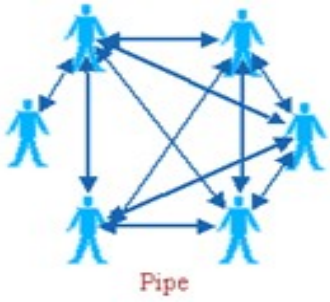
Software Components >>>



Communication Topologies





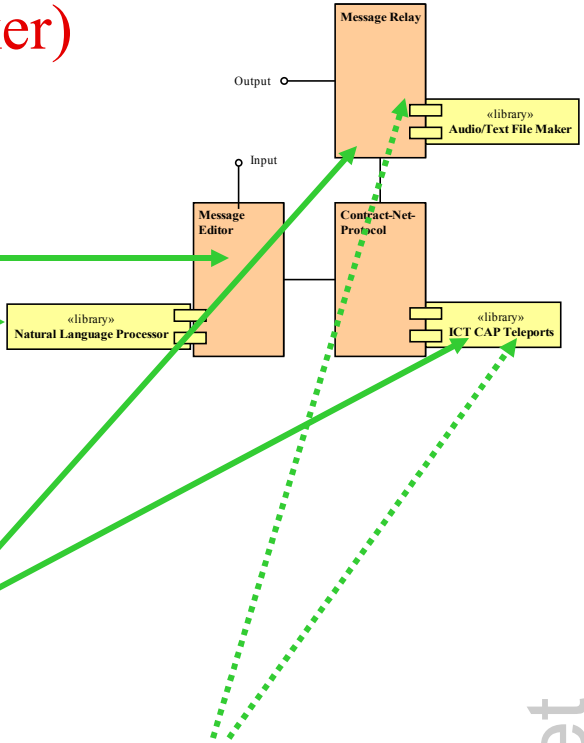


Acknowledgement: **Mark Wood** (PhD), CEASA, U.K, mark.wood@engineer.com
For first introducing the notion of a "Cell Broadcast Broker"

FOSS – "Sahana" Messaging Module (CAP Broker)

CAP Template and Message with Mapping UI
(*Lanka Software Foundation*)

SMS/Email Messaging UI/Engine
(*Respere*)



HF Radio voice/text UI/Engine
(*Universiti Teknologi Malaysia*)

- Available
- Partially available
- Work in progress

http://www.sahana.lk/

<*End*> Do you have any questions? </*End*>

Since I am not physically present I would appreciate if you could email your suggestions to waidyanatha@lirne.net

Reference: "**HazInfo Technical Report**" -
http://www.lirneasia.net/wp-content/uploads/2008/05/hazinfo-technical-repo