

Distant Early Warning System for Tsunamis

A wide-area and multi-hazard approach

EGU General Assembly 2010 – Vienna, Austria

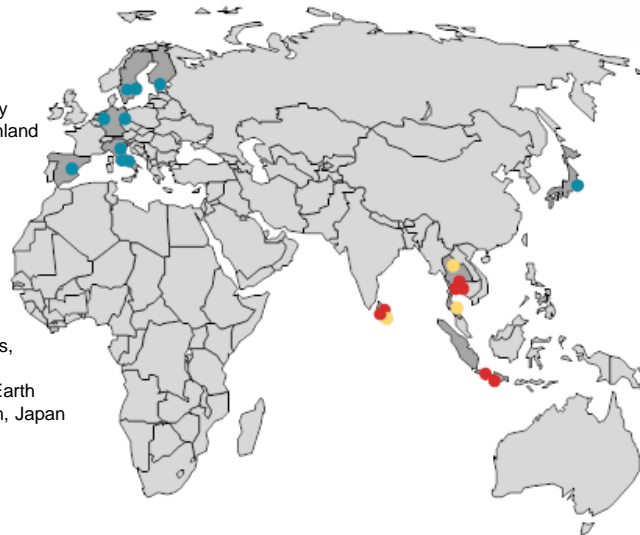
Martin Hammitzsch, Matthias Lendholt, Prof. Dr. Joachim Wächter
GFZ German Research Centre for Geosciences








www.dews-online.org

DEWS – What is it?

- European Union funded **research project**
 - EU partners (industry + research/HE institutions)
 - Partners in Indian Ocean, Pacific Region

	Atos Origin SA., Spain Coordinator
	GFZ Potsdam, Germany
	Citizen Alert Services BV, Netherlands
	Helsinki University of Technology Communications Laboratory, Finland
	Swedish Civil Contingencies Agency, Sweden
	Engineering Ingegneria Informatica S.p.A., Italy
	DATAMAT S.p.A., Italy
	University of Bologna, Italy
	Geological and Nuclear Sciences, New Zealand
	National Research Institute for Earth Science and Disaster Prevention, Japan
	Bandung Institute of Technology, Indonesia
	Moratuwa University, Dept. of Engineering, Sri Lanka
	Prince of Songkla University, Thailand
	Chiang Mai University, Thailand

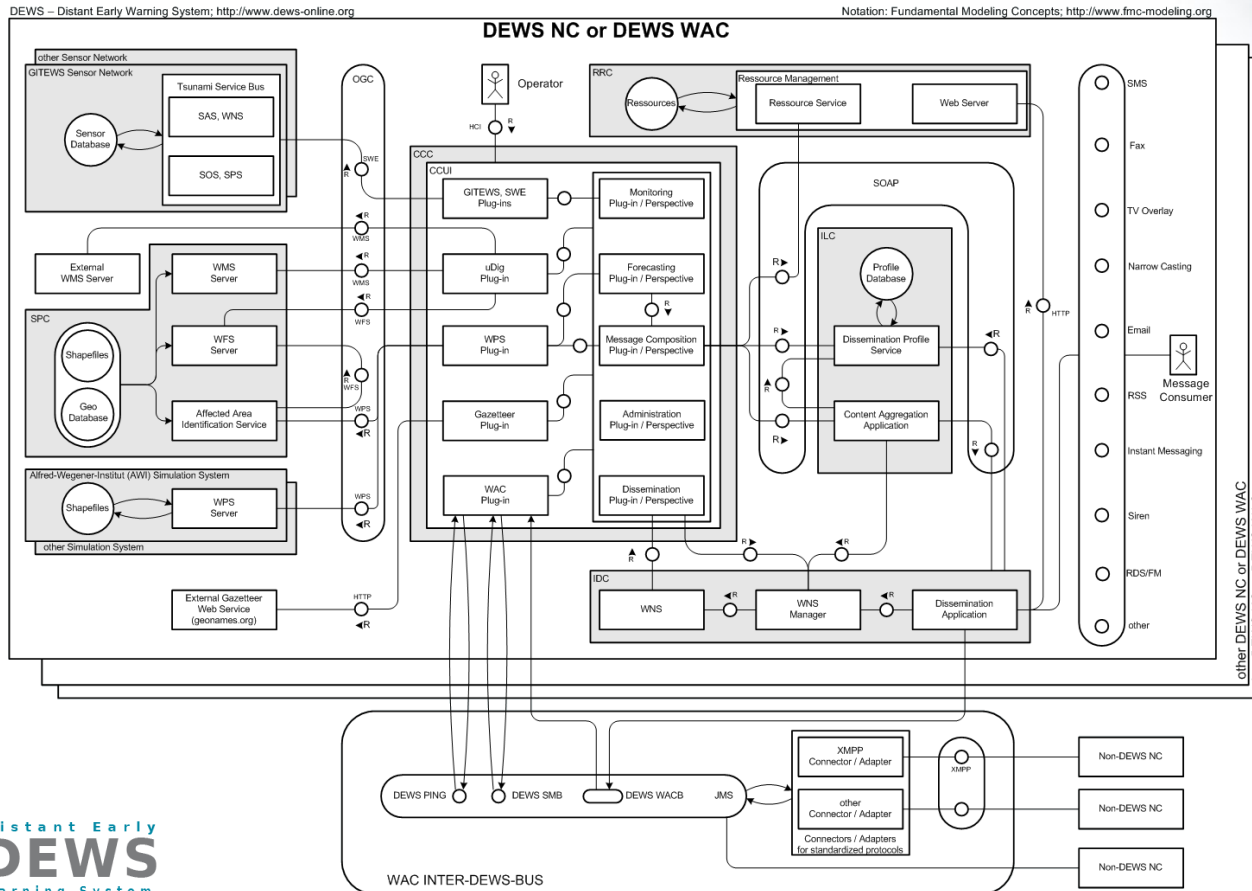


	Geological Survey & Mines Bureau, Sri Lanka
	Thai Meteorological Dept., Seismological Bureau, Thailand
	Badan Meteorologi, Klimatologi dan Geofisika, Indonesia
	Disaster Management Centre, Sri Lanka
	National Disaster Warning Center, International Affairs, Thailand
	Department of Disaster Prevention and Mitigation Thailand
	

● Project-Partner ● INCO-Partner (Authority) ● INCO-Partner (University)

DEWS – What is it? ... contd.

- Complex system, **software product**
 - Open Standards and Open Source



Challenges

- New generation of **open standard based** early warning systems
- Reliable hazard detection and **effective warning dissemination**
- **Multi-hazard approach**: Application potential for all types of hazards
- **Transferable** to different geographic areas
- **Modular** architecture with **standardised interfaces**
- Upstream: Open integration platform for sensor systems
- Downstream: Information logistics and warning dissemination components
- **Free and open source software** wherever possible
- Existing open standards wherever possible

Characteristics

- **DEWS focuses on downstream**
 - Improving information logistics and multi-channel warning dissemination
 - In a multilingual environment
- Sister project **GITEWS provides upstream**
 - Standard based distributed multi-sensor platform for tsunami detection
- Specifics
 - Rapid generation of warning messages
 - Rapid dissemination to responsible authorities and people at risk
 - Timely and in-depth information management understandable and reliable for people
 - International communication and warning exchange in the Indian Ocean region



DEWS – Today and tomorrow

- Principal focus on
 - **Tsunami**
 - **Early warning** (authorities, emergency management forces, rescue services and the public)
 - **Indian Ocean region** (Indonesia, Thailand and Sri Lanka)
 - **3 National Centres** and **1 Wide Area Centre**
- Aims to follow
 - Other geological paradigms / hazards
 - Landslides
 - Floods
 - Volcanic eruptions
 - Other areas / regions
 - Mediterranean and connected seas

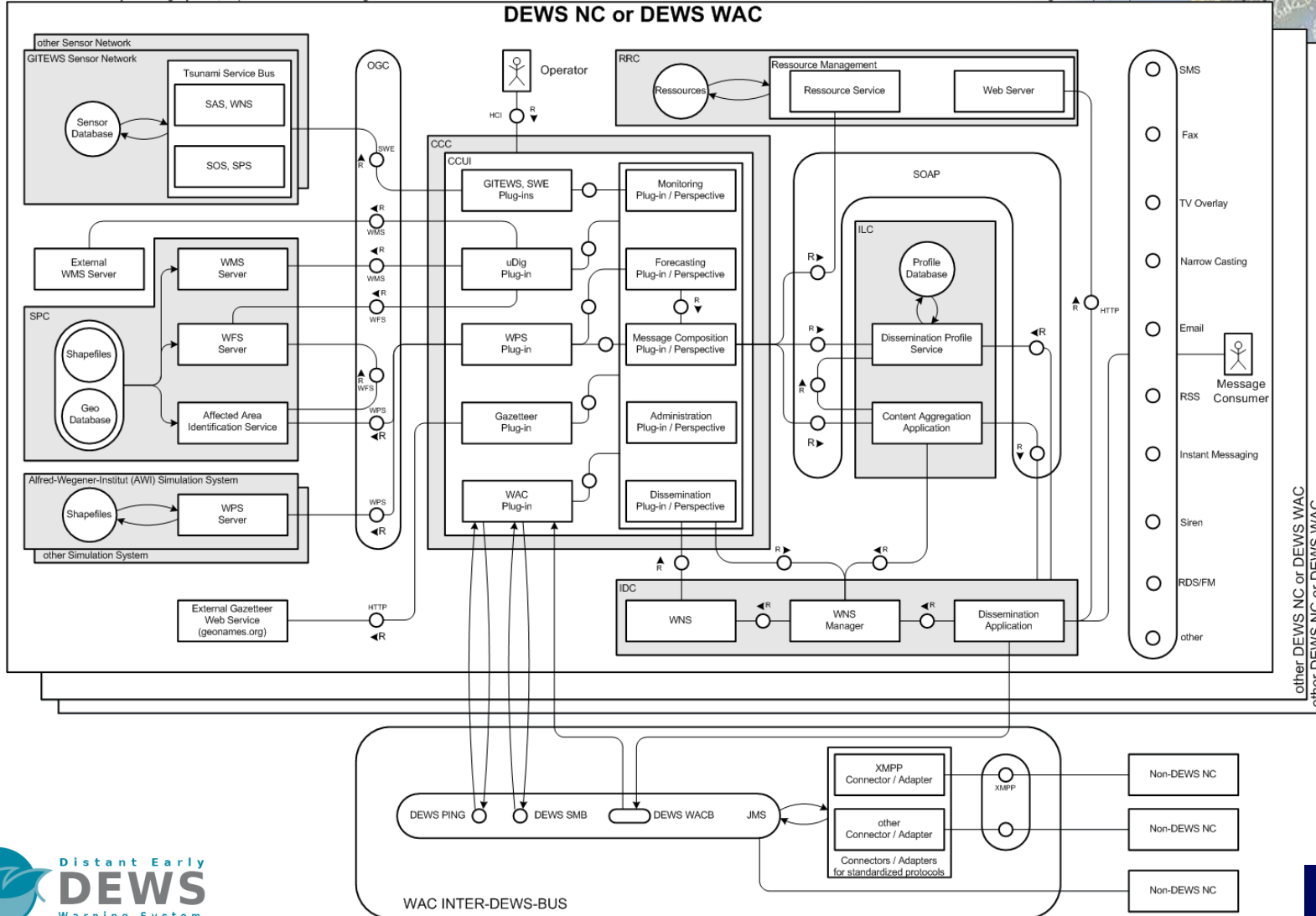


Architecture



DEWS – Distant Early Warning System; <http://www.dews-online.org>

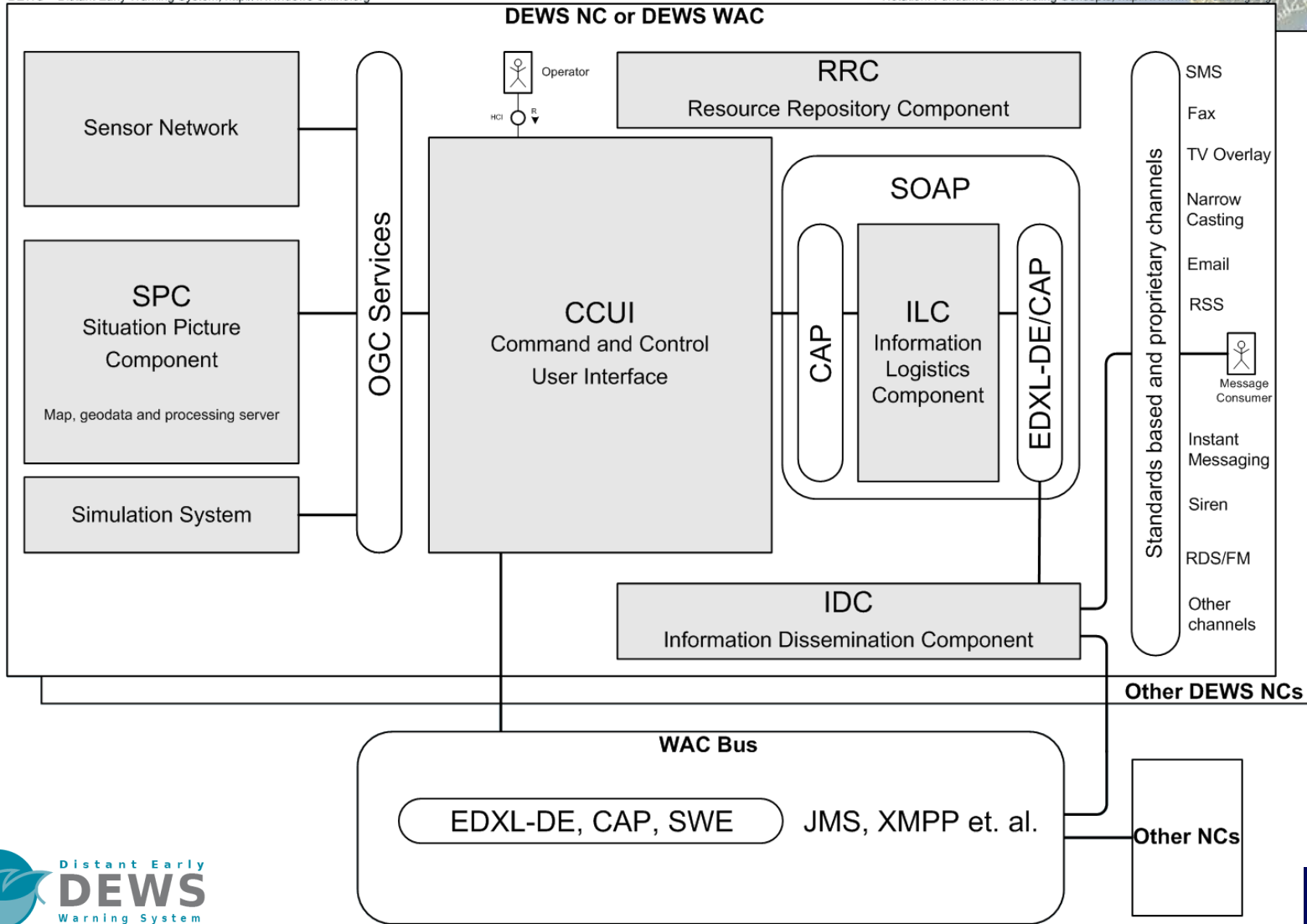
Notation: Fundamental Modeling Concepts; <http://www.fmc-modeling.org>



Architecture simplified

DEWS – Distant Early Warning System; <http://www.dews-online.org>

Notation: Fundamental Modeling Concepts; <http://www.fmc-modeling.org>



Open Standards

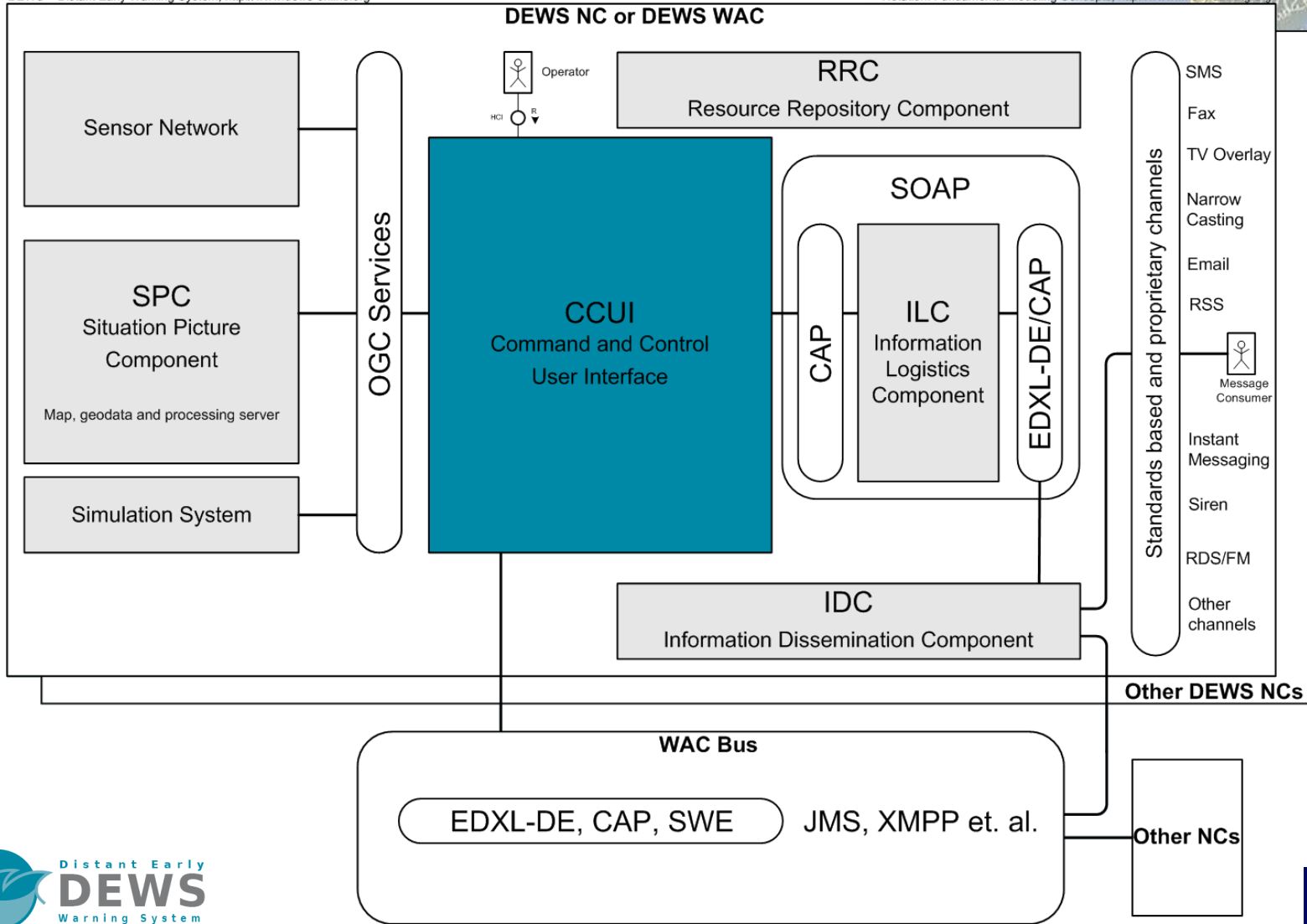
- OGC – Open Geospatial Consortium
 - SWE (Sensor Web Enablement) Standards
 - SAS (Sensor Alert Service)
 - SOS (Sensor Observation Service)
 - WNS (Web Notification Service)
 - OWS (OpenGIS Web Service) Standards
 - WMS (Web Mapping Service)
 - WPS (Web Processing Service)
 - WFS (Web Feature Service)
- OASIS – Org. for the Advancement of Structured Info. Standards
 - EM (Emergency Management) TC
 - CAP (Common Alerting Protocol)
 - EDXL-DE (Emergency Data Exchange Language - Distribution Element)



Command and Control User Interface

DEWS – Distant Early Warning System; <http://www.dews-online.org>

Notation: Fundamental Modeling Concepts; <http://www.fmc-modeling.org>



CCUI contd.

- Key component of DEWS
- Application for OOD (operator on duty)
- Task oriented workflow
 - Monitoring
 - Forecasting
 - Message composition
 - Dissemination
 - Information logistics administration
(user profiles, providers, preferences etc.)
- One perspective for each task



Workflow – Perspectives of CCUI

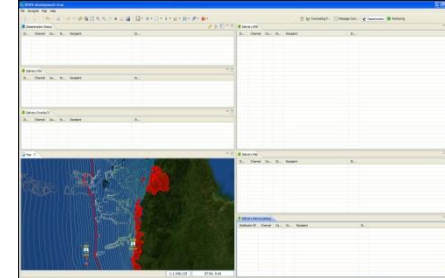
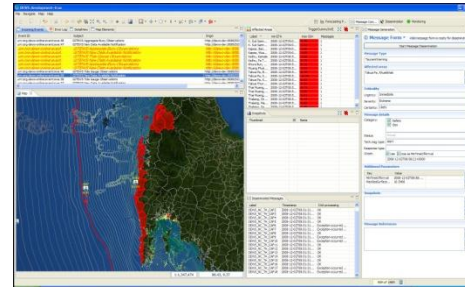
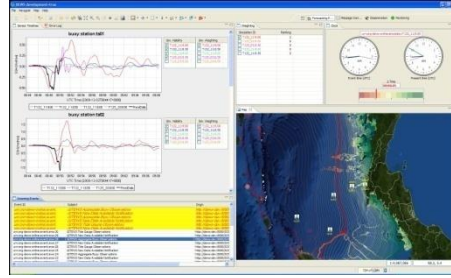
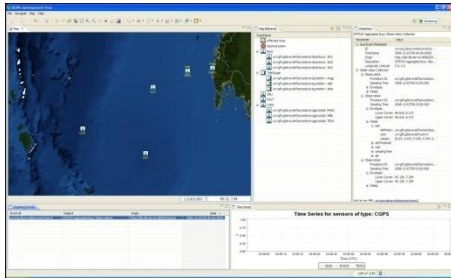


Monitoring
Perspective

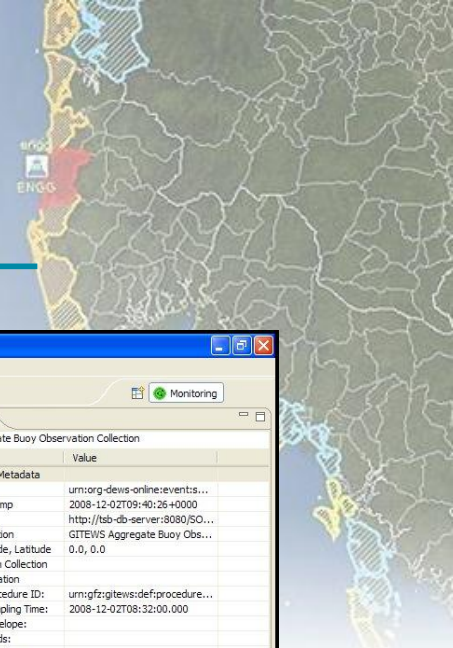
Forecasting
Perspective

Message
Composition P.

Dissemination
Perspective



CCUI – Monitoring Perspective



DEWS development-true

File Navigate Map Help

Map Elements

Type/Name

- Affected Area
- SeismicSystem
- Buoy
 - urn:gfz:gitews:def:procedure:doos:buoy ts01
 - urn:gfz:gitews:def:procedure:doos:buoy ts02
 - urn:gfz:gitews:def:procedure:doos:buoy ts03
- TideGauge
 - urn:gfz:gitews:def:procedure:tg:station: engg
 - urn:gfz:gitews:def:procedure:tg:station: sebl
 - urn:gfz:gitews:def:procedure:tg:station: teda
- OBU
- PACT
- CGPS
 - urn:gfz:gitews:def:procedure:cgps:static ENGG
 - urn:gfz:gitews:def:procedure:cgps:static SEBL
 - urn:gfz:gitews:def:procedure:cgps:static TEDA

Detailview

GITEWS Aggregate Buoy Observation Collection

Parameter	Value
Swe Event Metadata	
ID	urn:org-dews-online:events:...
TimeStamp	2008-12-02T09:40:26+0000
Origin	http://tsb-db-server:8080/SOS/...
Description	GITEWS Aggregate Buoy Obs...
Longitude, Latitude	0.0, 0.0
Observation Collection	
Observation	Procedure ID: urn:gfz:gitews:def:procedure:...
Sampling Time	2008-12-02T08:32:00.000
Envelope:	
Fields:	
Observation	Procedure ID: urn:gfz:gitews:def:procedure:...
Sampling Time	2008-12-02T08:32:00.000
Envelope:	
Lower Corner	96.819, 8.272
Upper Corner	96.819, 8.272
Fields:	
issh	
definition:	urn:gfz:gitews:def:instantSea...
uom:	urn:gfz:gitews:def:uom:m
values:	[0.05, 0.042, 0.038, 0.044, 0...
slsThreshold	
rssh	
samplingTime	
sls	
Observation	Procedure ID: urn:gfz:gitews:def:procedure:...
Sampling Time	2008-12-02T08:32:00.000
Envelope:	
Lower Corner	95.159, 7.299
Upper Corner	95.159, 7.299
Fields:	

Link to raw XML: urn:org-dews-online:events:swe:0

Incoming Events

Event ID	Subject	Origin	Date
urn:org-dews-online:events:swe:0	GITEWS Aggregate Buoy Observations	http://tsb-db-server:8080/SOS/sos	2008-12-02T09:40:26+0000

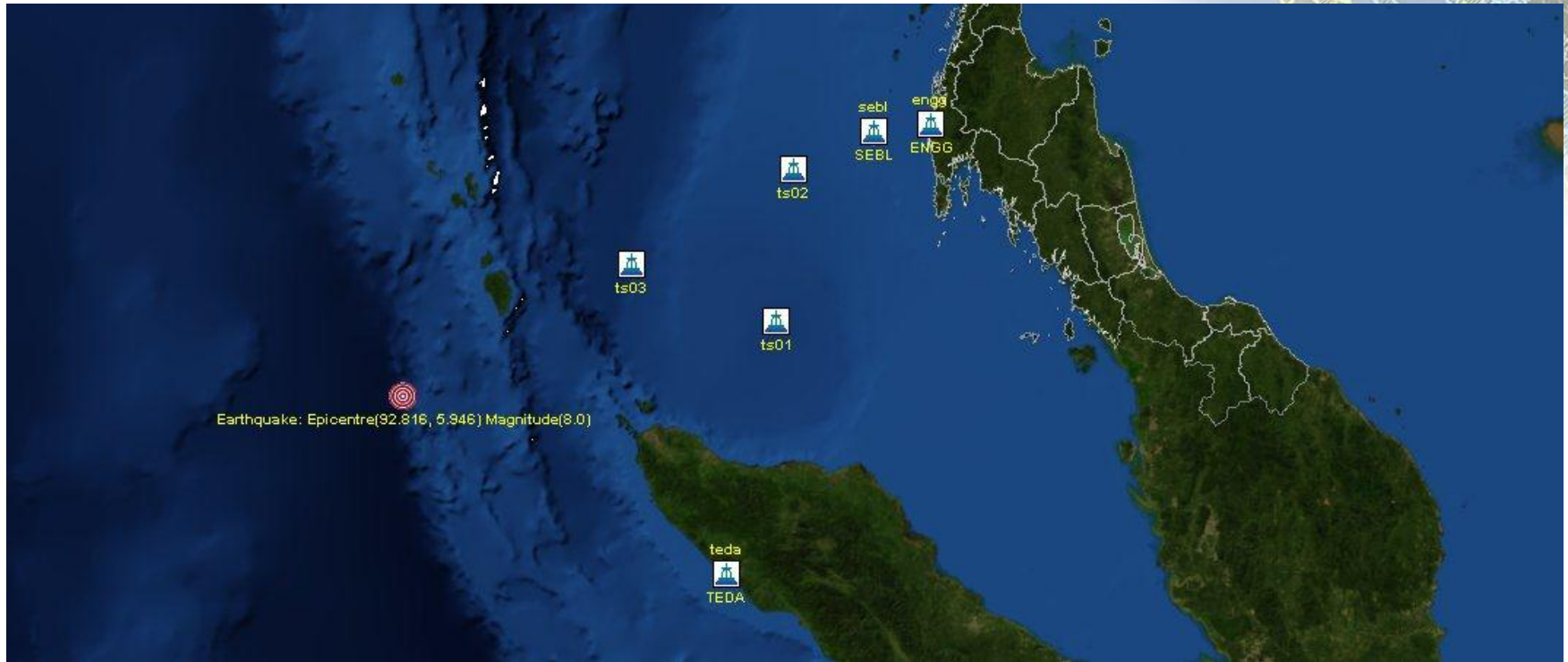
Time Series

Time Series for sensors of type: CGPS

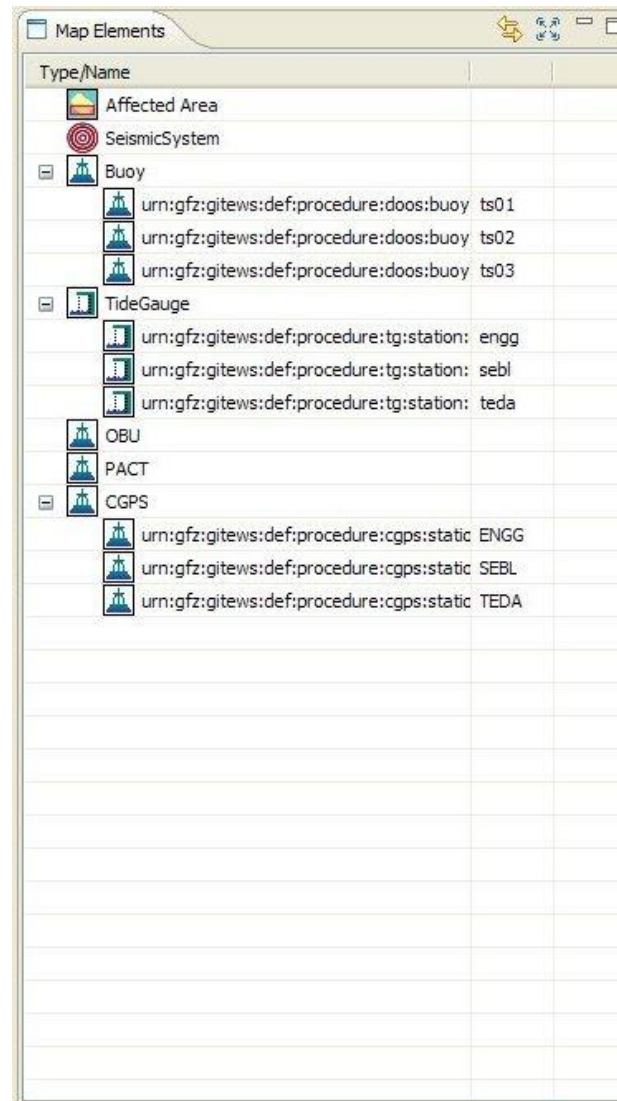
SEBL — ENGG — TEDA

















119M of 132M

CCUI – Monitoring Perspective cont'd

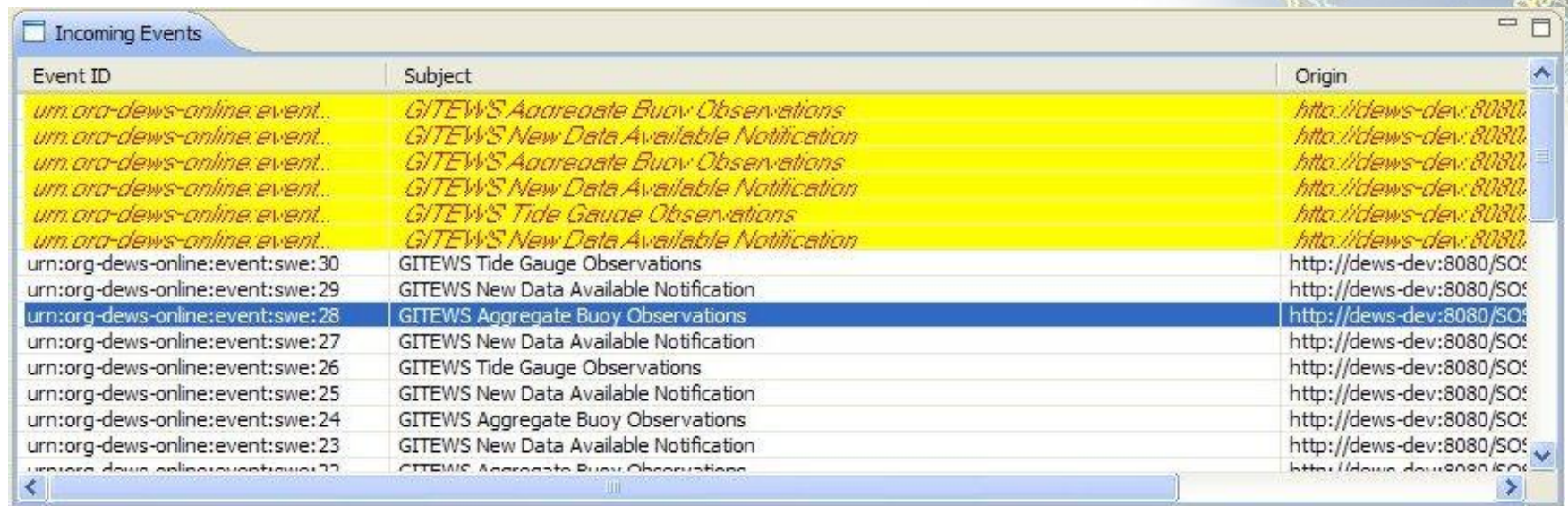


CCUI – Monitoring Perspective cont'd



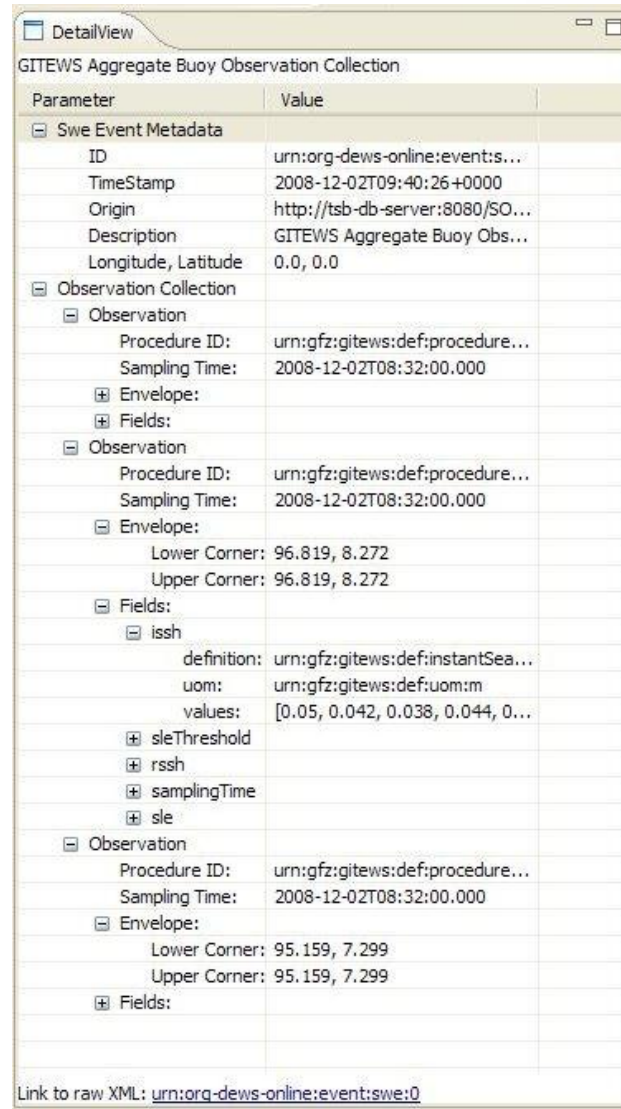
Type/Name		
 Affected Area		
 SeismicSystem		
 Buoy		
 urn:gfw:gitews:def:procedure:doos:buoy	ts01	
 urn:gfw:gitews:def:procedure:doos:buoy	ts02	
 urn:gfw:gitews:def:procedure:doos:buoy	ts03	
 TideGauge		
 urn:gfw:gitews:def:procedure:tg:station:	engg	
 urn:gfw:gitews:def:procedure:tg:station:	sebl	
 urn:gfw:gitews:def:procedure:tg:station:	teda	
 OBU		
 PACT		
 CGPS		
 urn:gfw:gitews:def:procedure:cgps:static	ENGG	
 urn:gfw:gitews:def:procedure:cgps:static	SEBL	
 urn:gfw:gitews:def:procedure:cgps:static	TEDA	

CCUI – Monitoring Perspective cont'd



Event ID	Subject	Origin
<i>urn:ora-dews-online:event:...</i>	<i>GITEWS Aggregate Buoy Observations</i>	<i>http://dews-dev:8080/</i>
<i>urn:ora-dews-online:event:...</i>	<i>GITEWS New Data Available Notification</i>	<i>http://dews-dev:8080/</i>
<i>urn:ora-dews-online:event:...</i>	<i>GITEWS Aggregate Buoy Observations</i>	<i>http://dews-dev:8080/</i>
<i>urn:ora-dews-online:event:...</i>	<i>GITEWS New Data Available Notification</i>	<i>http://dews-dev:8080/</i>
<i>urn:ora-dews-online:event:...</i>	<i>GITEWS Tide Gauge Observations</i>	<i>http://dews-dev:8080/</i>
<i>urn:ora-dews-online:event:...</i>	<i>GITEWS New Data Available Notification</i>	<i>http://dews-dev:8080/</i>
urn:org-dews-online:event:swe:30	GITEWS Tide Gauge Observations	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:29	GITEWS New Data Available Notification	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:28	GITEWS Aggregate Buoy Observations	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:27	GITEWS New Data Available Notification	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:26	GITEWS Tide Gauge Observations	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:25	GITEWS New Data Available Notification	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:24	GITEWS Aggregate Buoy Observations	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:23	GITEWS New Data Available Notification	http://dews-dev:8080/SO:
urn:org-dews-online:event:swe:22	GITEWS Aggregate Buoy Observations	http://dews-dev:8080/SO:

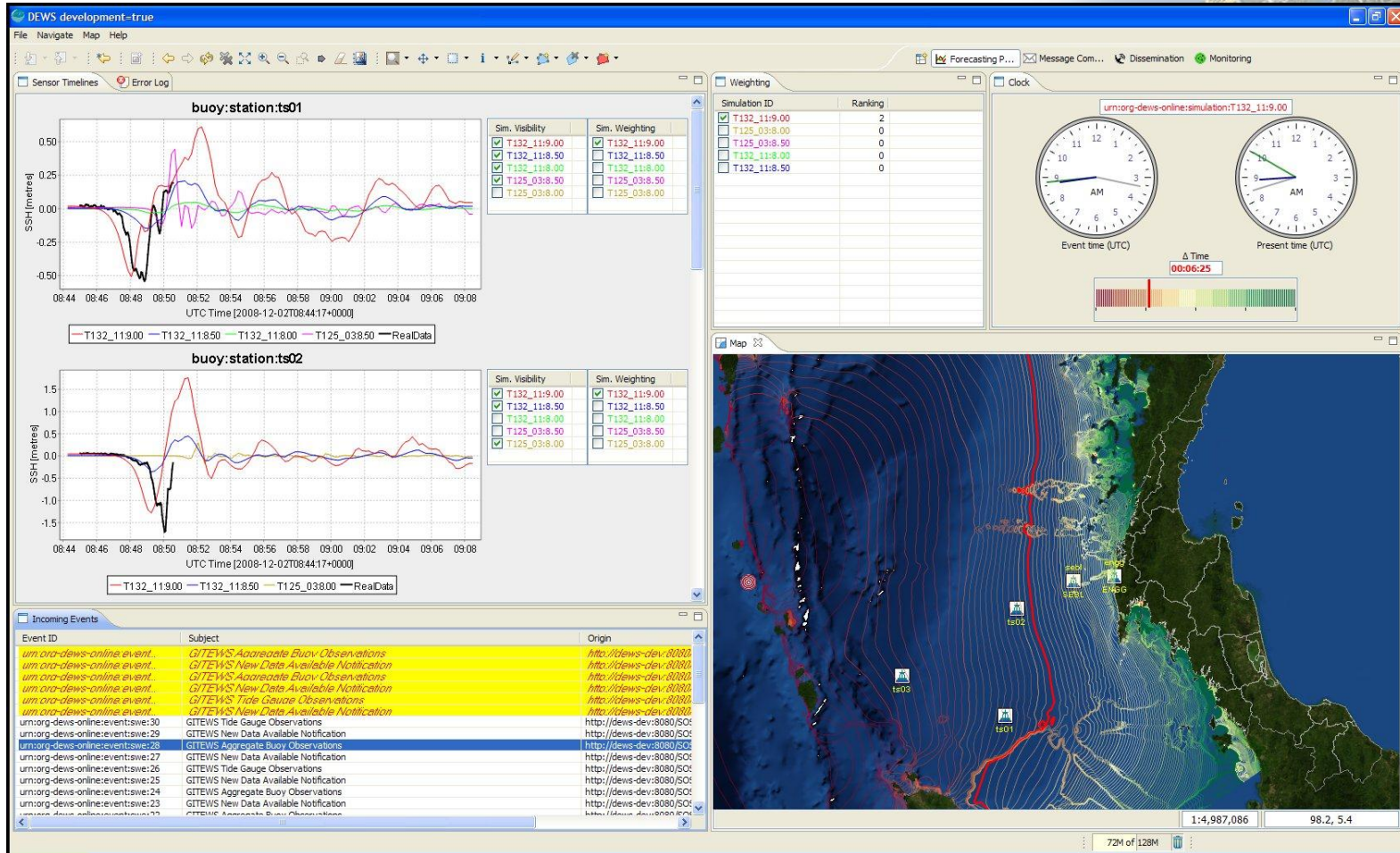
CCUI – Monitoring Perspective cont'd



Parameter	Value
Swe Event Metadata	
ID	urn:org-dews-online:event:s...
TimeStamp	2008-12-02T09:40:26+0000
Origin	http://tsb-db-server:8080/SO...
Description	GITEWS Aggregate Buoy Obs...
Longitude, Latitude	0.0, 0.0
Observation Collection	
Observation	
Procedure ID:	urn:gfz:gitews:def:procedure...
Sampling Time:	2008-12-02T08:32:00.000
Envelope:	
Fields:	
Observation	
Procedure ID:	urn:gfz:gitews:def:procedure...
Sampling Time:	2008-12-02T08:32:00.000
Envelope:	
Lower Corner:	96.819, 8.272
Upper Corner:	96.819, 8.272
Fields:	
issh	
definition:	urn:gfz:gitews:def:instantSea...
uom:	urn:gfz:gitews:def:uom:m
values:	[0.05, 0.042, 0.038, 0.044, 0...
sleThreshold	
rssh	
samplingTime	
sle	
Observation	
Procedure ID:	urn:gfz:gitews:def:procedure...
Sampling Time:	2008-12-02T08:32:00.000
Envelope:	
Lower Corner:	95.159, 7.299
Upper Corner:	95.159, 7.299
Fields:	

Link to raw XML: <urn:org-dews-online:event:swe:0>

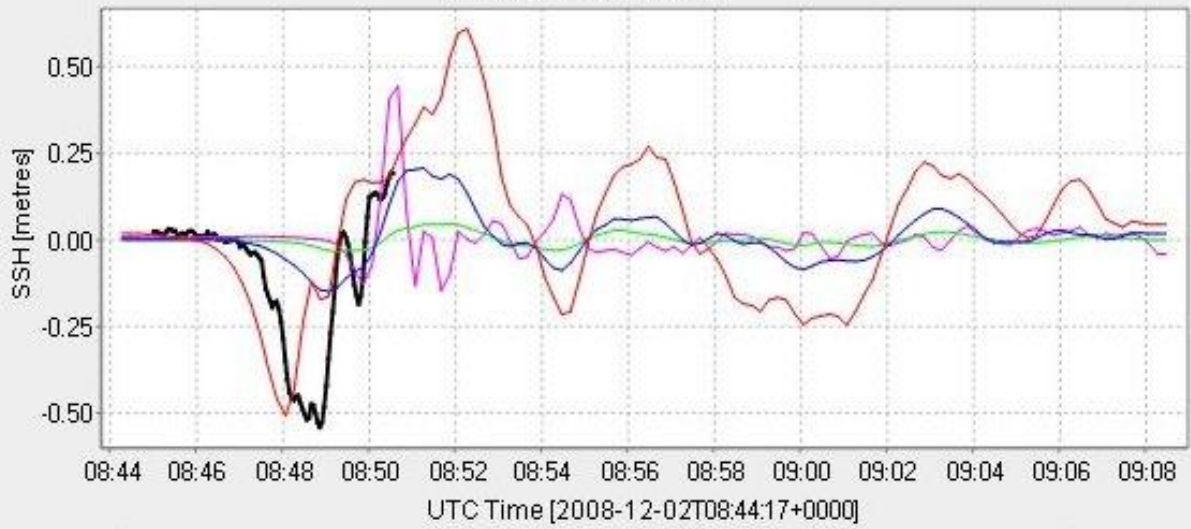
CCUI – Forecasting Perspective



CCUI – Forecasting Perspective cont'd



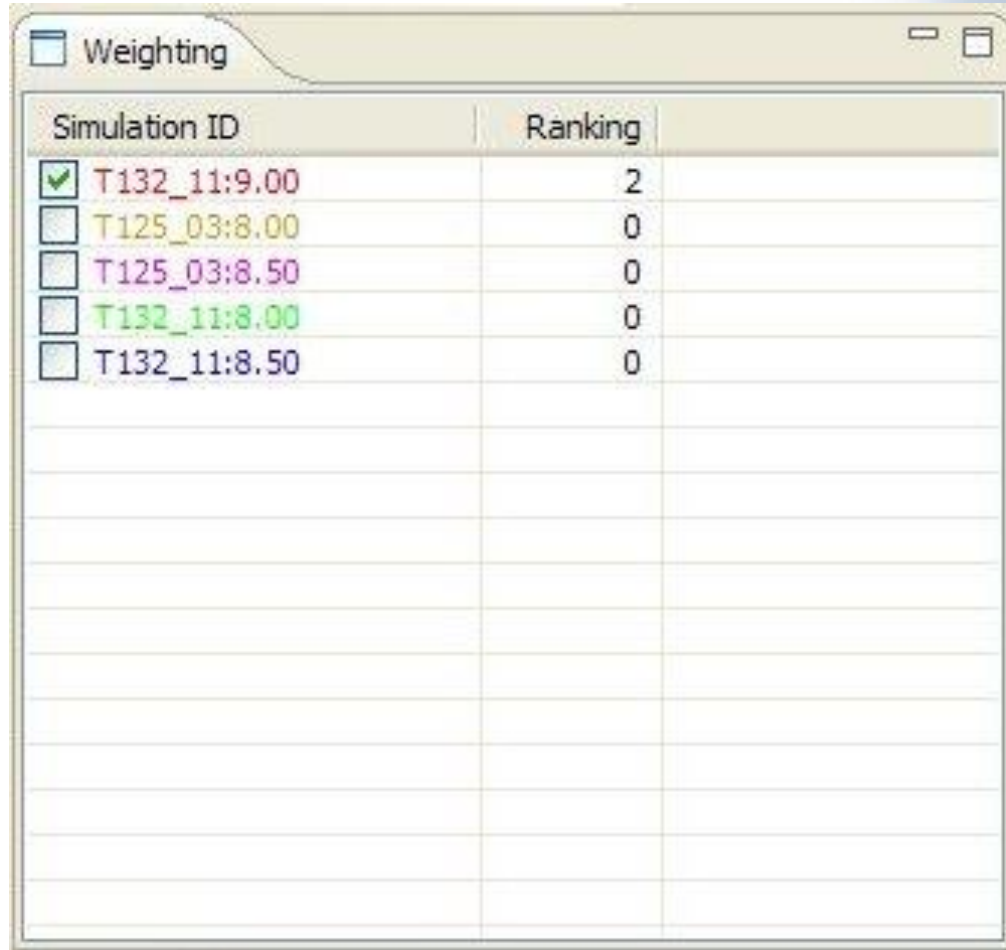
buoy:station:ts01



— T132_11:9.00 — T132_11:8.50 — T132_11:8.00 — T125_03:8.50 — RealData

Sim. Visibility		Sim. Weighting	
<input checked="" type="checkbox"/>	T132_11:9.00	<input checked="" type="checkbox"/>	T132_11:9.00
<input checked="" type="checkbox"/>	T132_11:8.50	<input type="checkbox"/>	T132_11:8.50
<input checked="" type="checkbox"/>	T132_11:8.00	<input type="checkbox"/>	T132_11:8.00
<input checked="" type="checkbox"/>	T125_03:8.50	<input type="checkbox"/>	T125_03:8.50
<input type="checkbox"/>	T125_03:8.00	<input type="checkbox"/>	T125_03:8.00

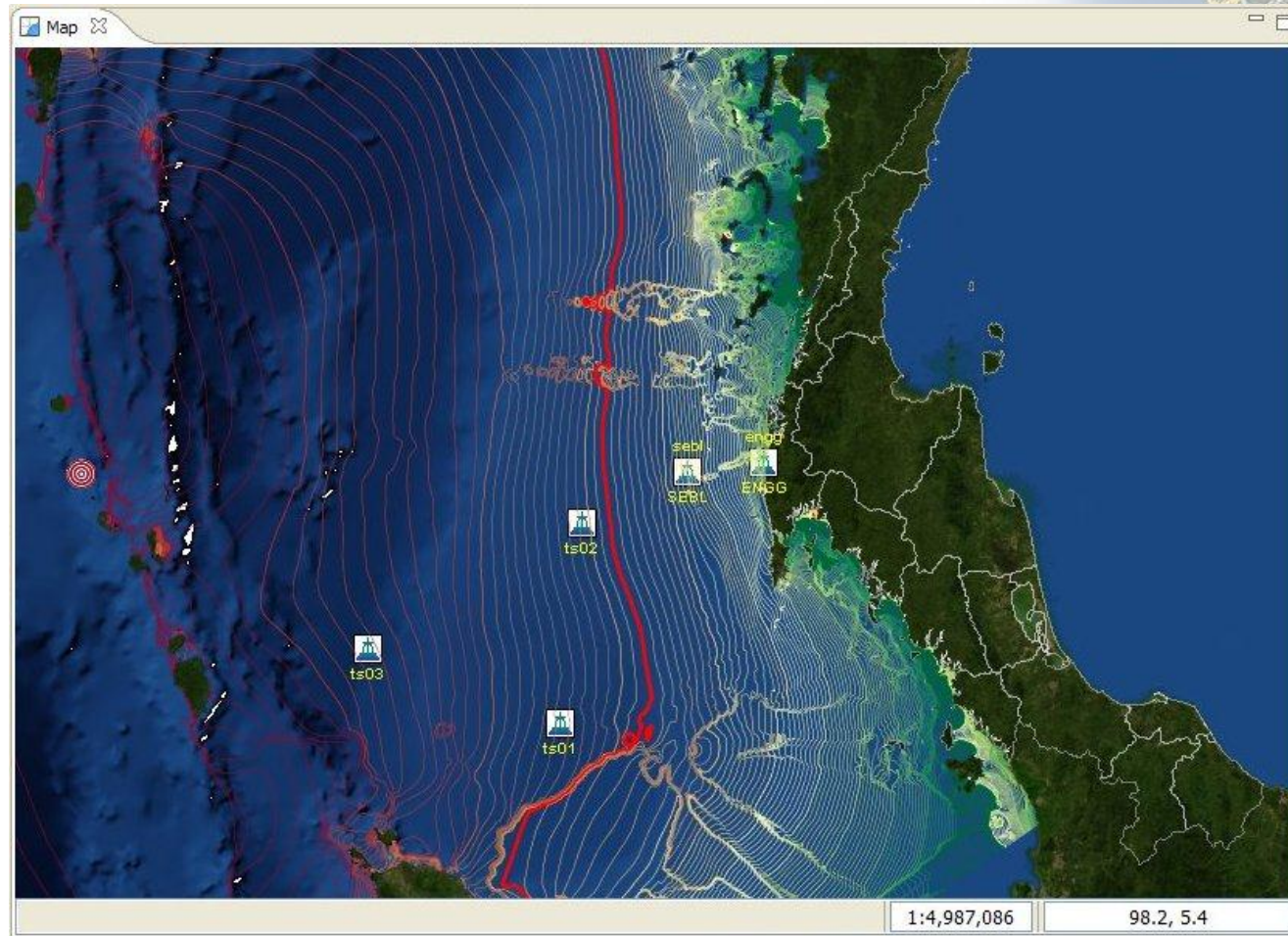
CCUI – Forecasting Perspective cont'd



The screenshot shows a window titled 'Weighting' with a table containing simulation data. The table has two columns: 'Simulation ID' and 'Ranking'. The first row is checked and has a ranking of 2, while the other four rows are unchecked and have a ranking of 0.

Simulation ID	Ranking
<input checked="" type="checkbox"/> T132_11:9.00	2
<input type="checkbox"/> T125_03:8.00	0
<input type="checkbox"/> T125_03:8.50	0
<input type="checkbox"/> T132_11:8.00	0
<input type="checkbox"/> T132_11:8.50	0

CCUI – Forecasting Perspective cont'd



Tsunami Warning Dissemination Wizard

Tsunami Warning Dissemination Wizard

Generation of affected areas

Select simulation and sea surface threshold for generation of affected areas

Simulation: urn:org-dews-online:simulation:T144_11:8.50

min SSH in [cm]: 50

Determined areas: 11

Maximum sea surface height in determined areas:

lowest [cm]: 56

highest [cm]: 121

Tsunami Warning Dissemination Wizard

Criticality Parameters

Specification of message criticality parameters

Message Type: TsunamiWarning

Certainty: Likely

Urgency is based on Minimum Time of Arrival (ETA):

Immediate: Till 20 minutes in future.

Expected: From 21 to 60 minutes in future.

Future: Over 61 minutes in future.

Severity is based on Maximum Sea Surface Height (SSH):

Minor: Till 50 cm.

Moderate: From 51 to 100 cm.

Severe: From 101 to 300 cm.

Extreme: Over 301 cm.

Areas: 11
Areas: 0
Areas: 0
Areas: 0
Areas: 10
Areas: 1
Areas: 0

Tsunami Warning Dissemination Wizard

Additional parameter and information

Please check the additional parameters and general information

Category: Safety Geo

Status: Actual

Tech.msg.type: Alert

Response type: Shelter

Add screenshot of current map

Content for each affected area. Each message will contain arrival (ETA) as absolute UTC time
face height in [m]
tain no additional snapshot nor references to other messages.

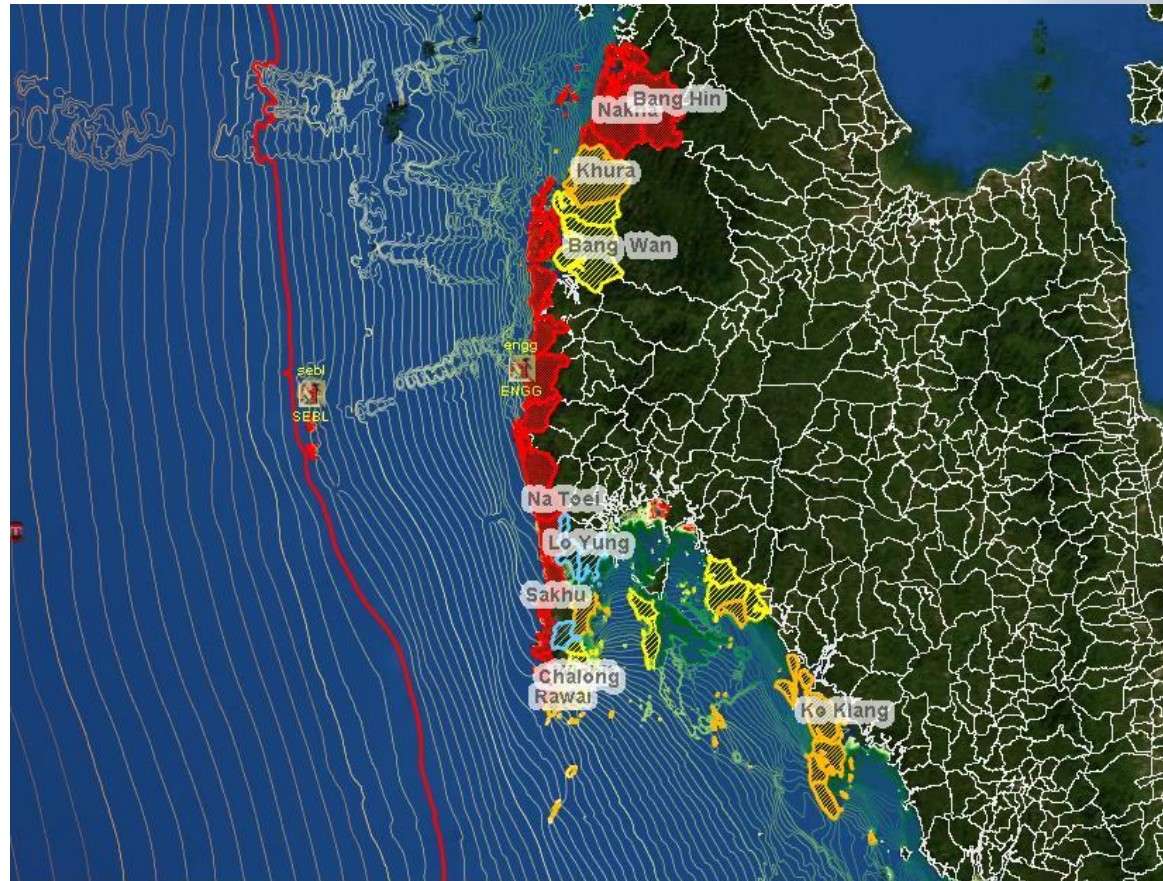
CCUI – Message Composition Perspective

The screenshot displays the DEWS development-true software interface, which is used for message composition and dissemination. The interface is divided into several panels:

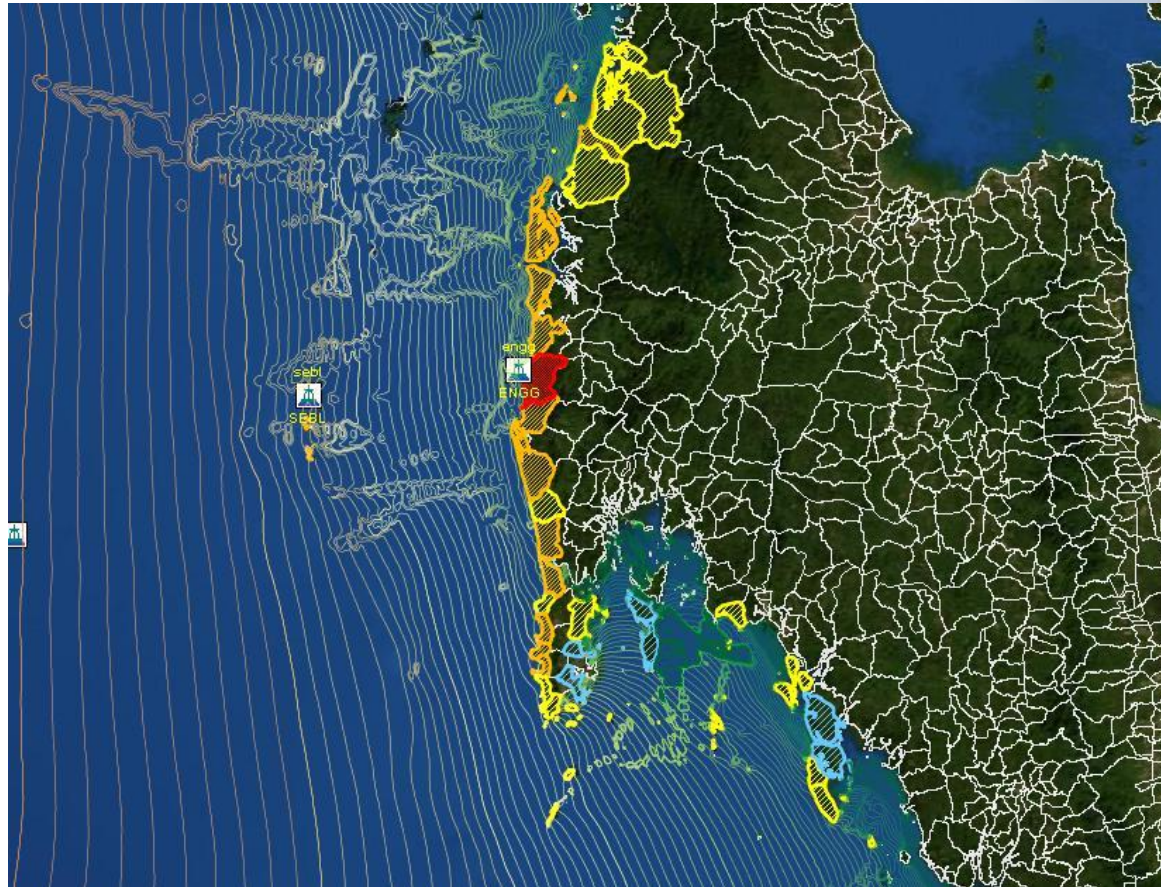
- Incoming Events:** A table listing various events such as "GITEWS Aggregate Buoy Observations" and "GITEWS New Data Available Notification".
- Map:** A satellite-style map showing the geographical area of interest, with red and blue overlays indicating specific regions or data points.
- Affected Areas:** A table listing affected areas with columns for Label, min ETA, max SSH, and Messages. The data is as follows:

Label	min ETA	max SSH	Messages
K. Suk Samr...	2008-12-02T09:0...	2.61	1
K. Suk Samr...	2008-12-02T09:0...	2.63	1
Kapee, Ban...	2008-12-02T09:0...	2.59	1
Kapee, Mu...	2008-12-02T09:0...	2.58	1
Kathu, Kan...	2008-12-02T08:5...	2.51	1
Kathu, Pa T...	2008-12-02T08:5...	2.59	1
Khura Buri...	2008-12-02T08:5...	2.13	1
Muang Phuk...	2008-12-02T08:5...	2.27	1
Takua Pa, B...	2008-12-02T08:5...	2.39	1
Takua Pa, K...	2008-12-02T08:5...	2.38	1
Takua Pa, K...	2008-12-02T08:5...	2.41	1
Takua Thun...	2008-12-02T08:5...	2.43	1
Thai Muang...	2008-12-02T08:5...	2.71	1
Thai Muang...	2008-12-02T08:5...	2.29	1
Thalang, Ch...	2008-12-02T08:5...	2.14	1
Thalang, Ma...	2008-12-02T08:5...	2.81	1
Thalang, Sa...	2008-12-02T08:5...	2.89	1
- Message Generation:** A panel for composing and disseminating messages, including a "Message Form" and "Message details" section.
- Disseminated Messages:** A table showing the status of disseminated messages, including columns for Label, Timestamp, and CAA processing.

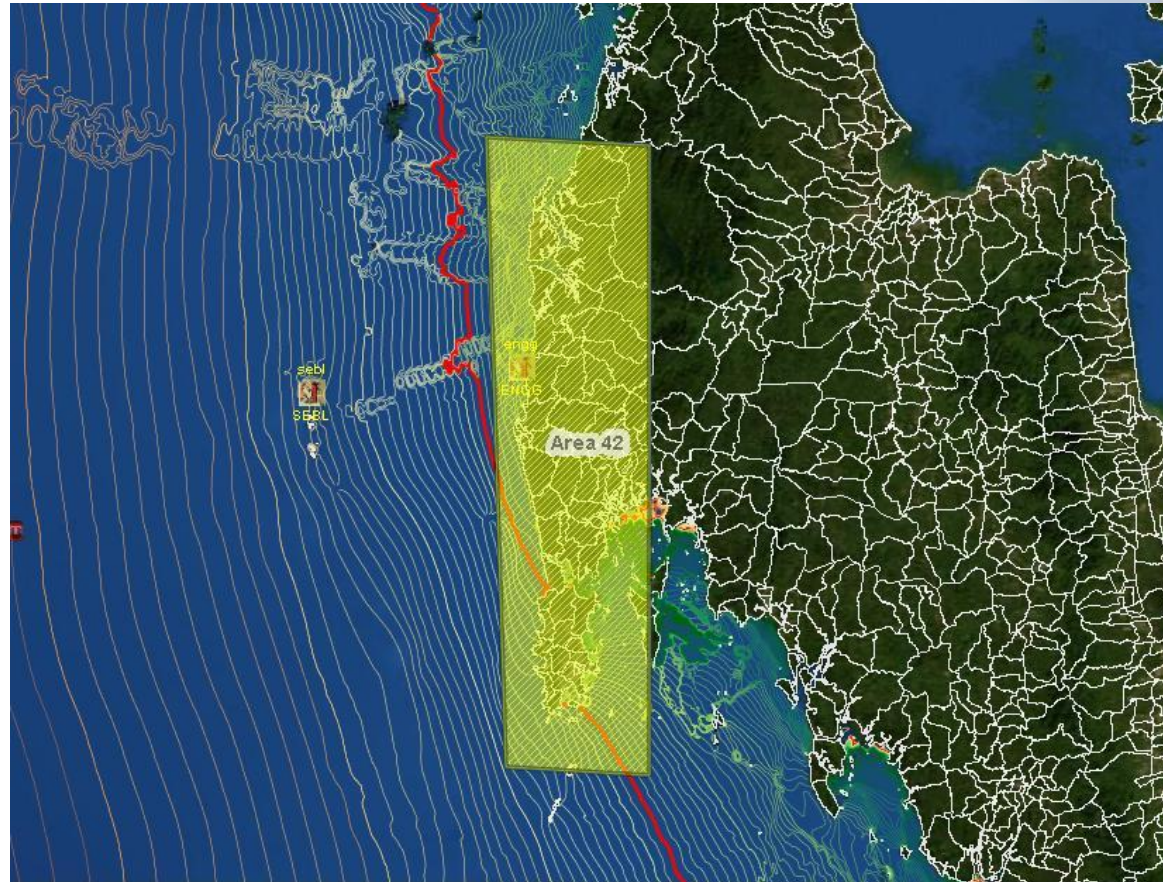
CCUI – Message Composition Persp. cont'd



CCUI – Message Composition Persp. cont'd



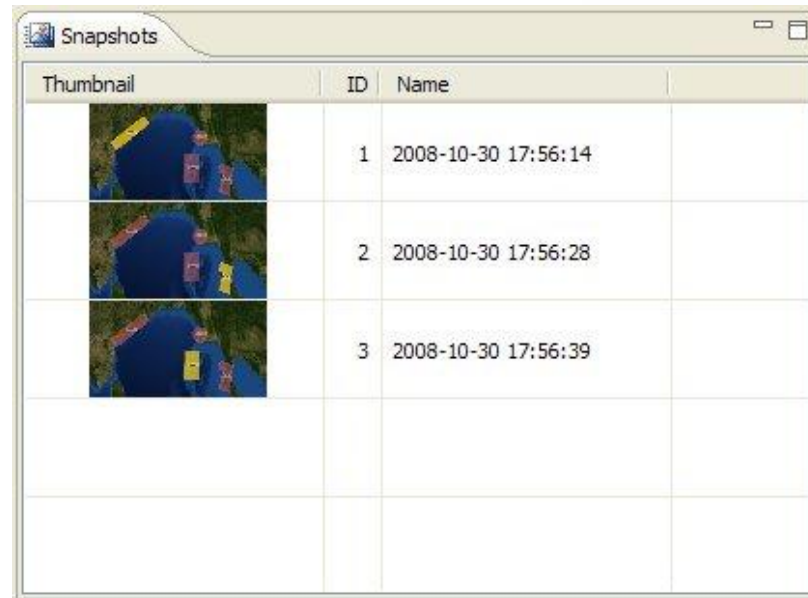
CCUI – Message Composition Persp. cont'd






CCUI – Message Composition Persp. cont'd

Label	min ETA	max SSH	Mess
Kapoe, Muang Klang	2008-11-26T12:02:55+...	1.12	0
Takua Pa, Bang M...	2008-11-26T11:22:16+...	1.62	0
Thalang, Sakhu	2008-11-26T10:48:43+...	0.48	0
Muang Krabi, Ao ...	2008-11-26T11:23:29+...	0.56	0
Muang Phuket, Ka...	2008-11-26T10:46:08+...	0.27	0
Kapoe, Bang Hin	2008-11-26T12:00:00+...	1.13	0
Muang Satun, Ko ...	2008-11-26T11:22:47+...	0.34	0
Thai Muang, Lam ...	2008-11-26T11:02:18+...	1.62	0
Muang Krabi, Kha...	2008-11-26T12:12:47+...	0.42	0
Takua Thung, Kho...	2008-11-26T11:01:10+...	1.03	0
Khura Buri, Khura	2008-11-26T11:46:05+...	0.78	0
Muang Phuket, R...	2008-11-26T10:44:09+...	0.23	0
Takua Pa, Ko Kho ...	2008-11-26T11:20:47+...	1.29	0

CCUI – Message Composition Persp. cont'd



The screenshot shows a window titled 'Snapshots' with a table containing three rows of data. Each row includes a thumbnail image, an ID, and a name. The thumbnails show a person in a blue uniform holding a yellow object. The names are timestamps from 2008-10-30.

Thumbnail	ID	Name
	1	2008-10-30 17:56:14
	2	2008-10-30 17:56:28
	3	2008-10-30 17:56:39

CCUI – Message Composition Persp. cont'd

Message Generation

Message Generation Valid message for...or dissemination.

Start Message Dissemination

Message Type
TsunamiWarning

Affected areas
Area 2
Area 3
Area 4
Area 5

Criticality
Urgency: Immediate
Severity: Extreme
Certainty: Observed

Message details
Category: Safety Geo
Status: Actual
Tech. msg. type: Alert
Response type: Shelter
Onset: 2008-10-30 17:47:27
 Use Use as MinTimeOfArrival

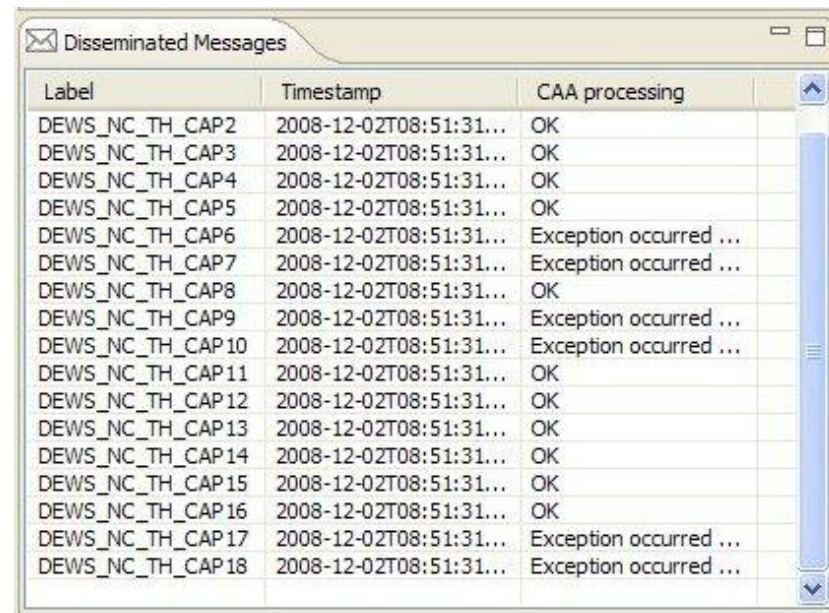
Additional Parameters

Key	Value
MinTimeOfArrival	2008-10-30 17:...

Snapshots
2008-10-30 17:56:28
2008-10-30 17:56:39

Message References

CCUI – Message Composition Persp. cont'd



Disseminated Messages

Label	Timestamp	CAA processing
DEWS_NC_TH_CAP2	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP3	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP4	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP5	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP6	2008-12-02T08:51:31...	Exception occurred ...
DEWS_NC_TH_CAP7	2008-12-02T08:51:31...	Exception occurred ...
DEWS_NC_TH_CAP8	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP9	2008-12-02T08:51:31...	Exception occurred ...
DEWS_NC_TH_CAP10	2008-12-02T08:51:31...	Exception occurred ...
DEWS_NC_TH_CAP11	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP12	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP13	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP14	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP15	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP16	2008-12-02T08:51:31...	OK
DEWS_NC_TH_CAP17	2008-12-02T08:51:31...	Exception occurred ...
DEWS_NC_TH_CAP18	2008-12-02T08:51:31...	Exception occurred ...

CCUI – Dissemination Perspective

DEWS development=true

File SWE Services Map Help

Dissemination Monitoring

Dissemination Status

Distribution ID	Channel	Category	GlobalStatus	Recipient	Distribution Time
DEWS_NC...	IDC_FAX	A	GSTOK		20081120140127
DEWS_NC...	IDC_FAX	B	GSTOK	+39-06-50275920,+39-06-50274330	20081120140132
ieam_e3_2_2...	IDC_FAX	A	GSTOK		20081120140320
ieam_e3_2_2...	IDC_FAX	B	GSTOK	+39-06-50274330	20081120140323
DEWS_NC...	IDC_SMS	A	GSTOK		20081120141158
DEWS_NC...	IDC_SMS	B	GSTOK	+393476057807	20081120141159
DEWS_NC...	IDC_EMAIL	A	GSTOK		20081120141845
DEWS_NC...	IDC_EMAIL	B	GSTOK	saint@eng.it.andrea.angeletti@3stea...	20081120141847
DEWS_NC...	IDC_EMAIL	A	GSTOK		20081120142145
DEWS_NC...	IDC_EMAIL	B	GSTOK	andrea.angeletti@3steam.it	20081120142146
ieam_e3_2_2...	IDC_EMAIL	A	GSTOK		20081120142607
ieam_e3_2_2...	IDC_EMAIL	B	GSTOK	andrea.angeletti@3steam.it.andrea.a...	20081120142613
ieam_e3_2_2...	IDC_TV	A	GSTOK		20081120142816
ieam_e3_2_2...	IDC_TV	B	GSTKO	default_destination	20081120143117

Delivery SMS

Distribution ID	Channel	Category	Status	Recipient	Distribution Time
DEWS_NC_TH_MSG1234	IDC_SMS	A	GSTOK		20081120141158
DEWS_NC_TH_MSG1234	IDC_SMS	B	GSTOK	+393476057807	20081120141159

Delivery FAX

Distribution ID	Channel	Category	Status	Recipient	Distribution
DEWS_NC_TH_MSG1234	IDC_FAX	A	GSTOK		2008112014
DEWS_NC_TH_MSG1234	IDC_FAX	B	GSTOK	+39-06-50275920,+39-06-50274330	2008112014
ieam_e3_2_2008-10-30	IDC_FAX	A	GSTOK		2008112014
ieam_e3_2_2008-10-30	IDC_FAX	B	GSTOK	+39-06-50274330	2008112014
ieam_e3_2_2008-10-30	IDC_FAX	C	UTOK	+39-06-50274330	2008112014
DEWS_NC_TH_MSG1234	IDC_FAX	C	UTNOK	+39-06-50275920	2008112014
DEWS_NC_TH_MSG1234	IDC_FAX	C	UTNOK	+39-06-50274330	2008112014

Delivery Mail

Distribution ID	Channel	Category	Status	Recipient
DEWS_NC_TH_MSG1234	IDC_EMAIL	A	GSTOK	
DEWS_NC_TH_MSG1234	IDC_EMAIL	B	GSTOK	saint@eng.it.andrea.angeletti@3steam.it
DEWS_NC_TH_MSG1234	IDC_EMAIL	A	GSTOK	
DEWS_NC_TH_MSG1234	IDC_EMAIL	B	GSTOK	andrea.angeletti@3steam.it
ieam_e3_2_2008-10-30	IDC_EMAIL	A	GSTOK	
ieam_e3_2_2008-10-30	IDC_EMAIL	B	GSTOK	andrea.angeletti@3steam.it.andrea.angeletti@el...

Delivery Overlay TV

Di...	Channel	Ca...	Status	Recipient	Di...	Ca...
ieam...	IDC_TV	A	GSTOK		200...	
ieam...	IDC_TV	B	GSTKO	default_destination	200...	

Delivery Narrowcasting

Distribution ID	Channel	Categ...	Status	Recipient	Di...
ieam_e3_2_2008-1...	IDC_TV	A	GSTOK		200...
ieam_e3_2_2008-1...	IDC_TV	B	GSTKO	default_destination	200...

7M of 14M

CCUI – Administration Perspective

Message Consumer Profiles

Message Types

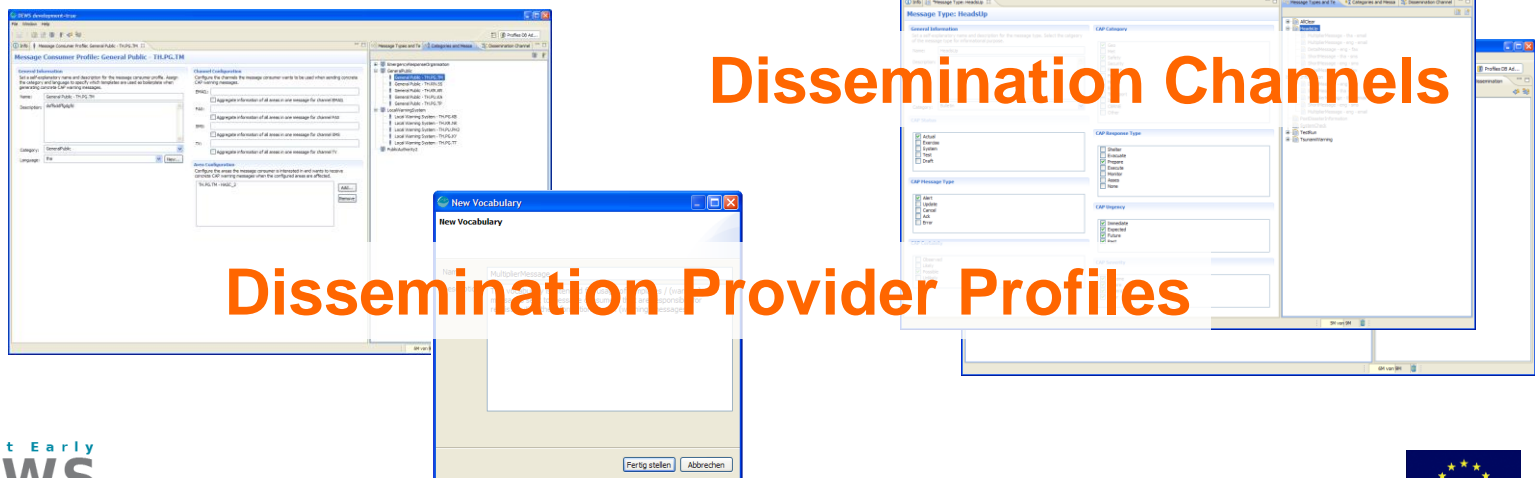
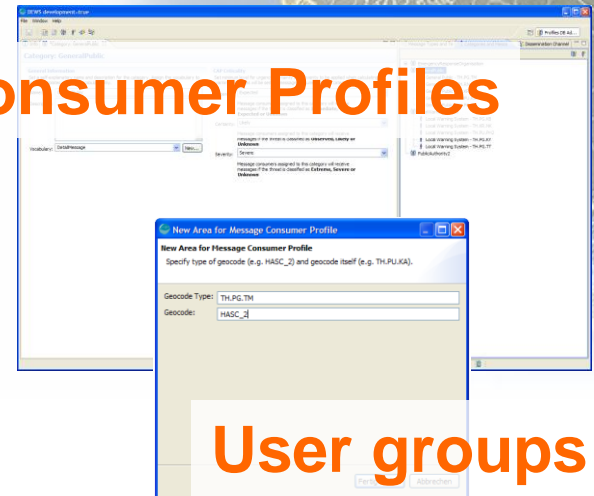
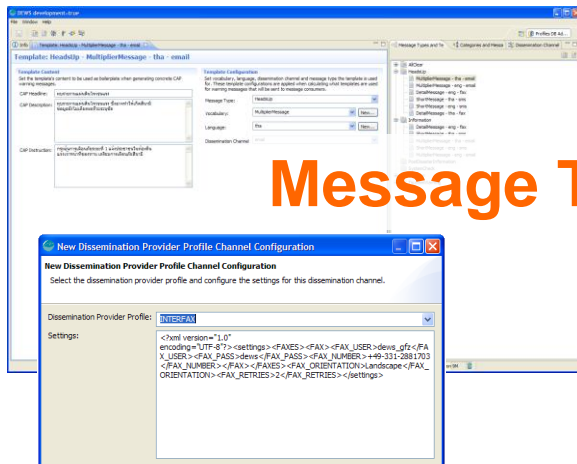
Administration Perspective

User groups

Message Templates

Dissemination Channels

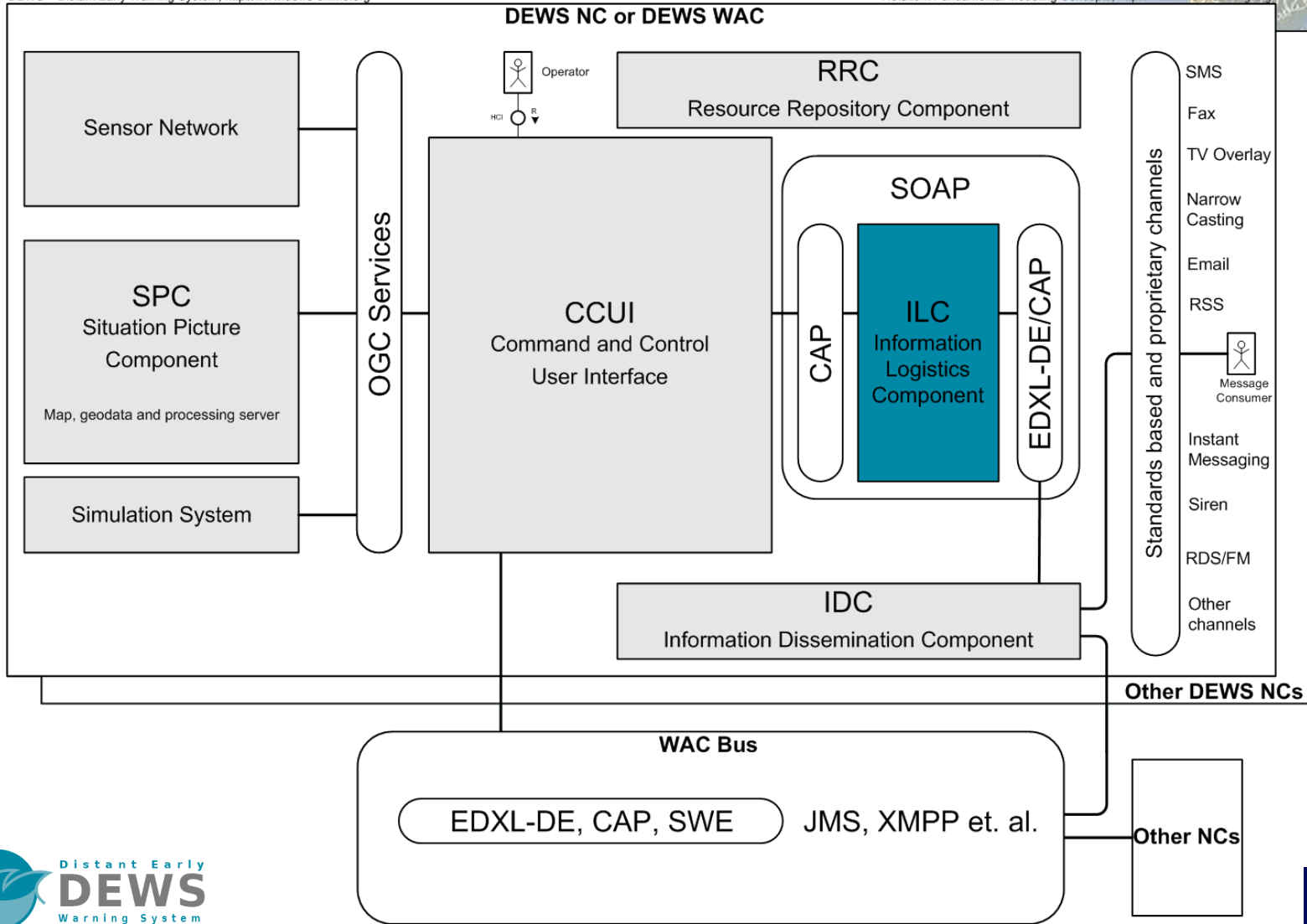
Dissemination Provider Profiles



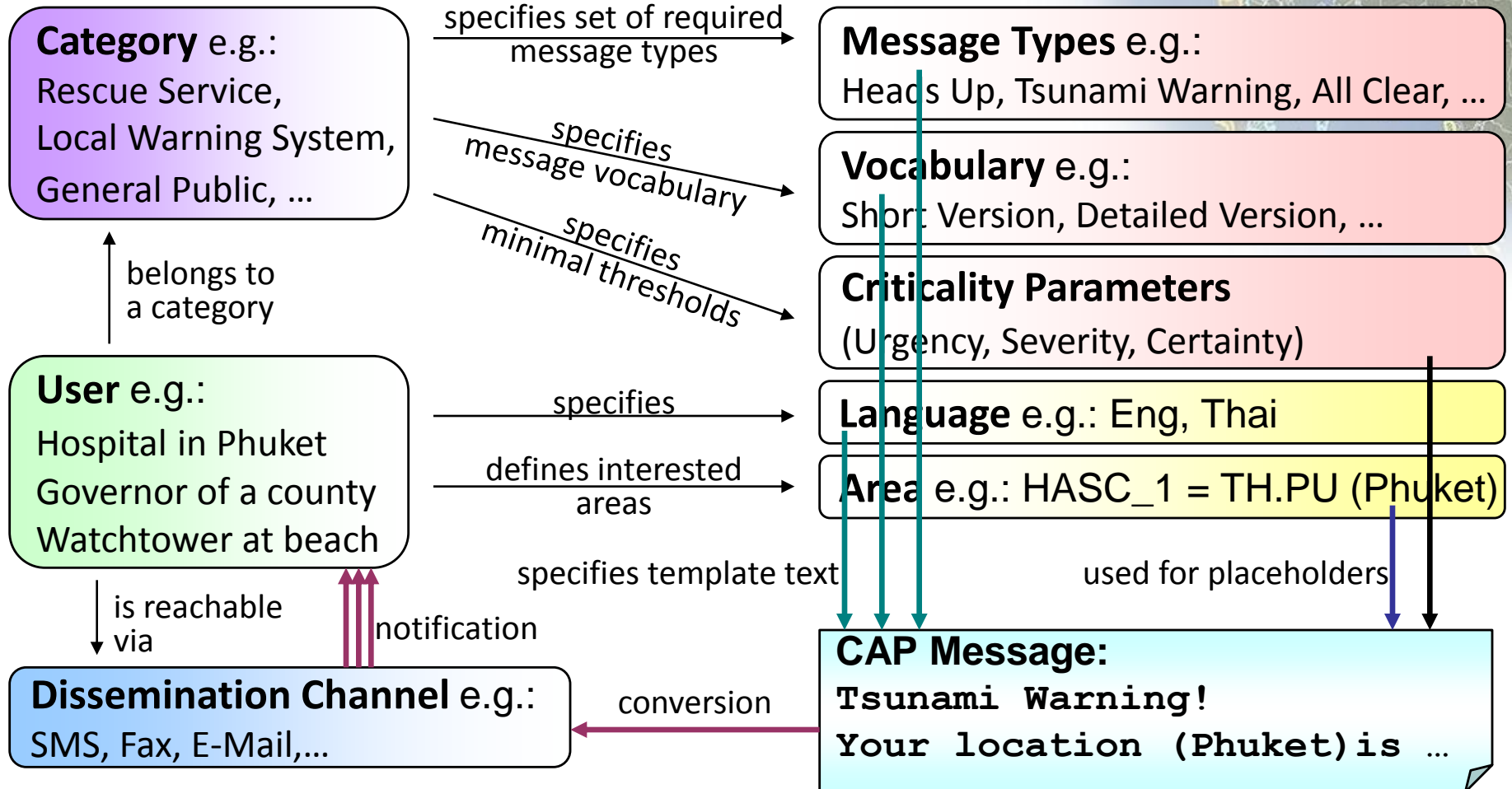
Information Logistics

DEWS – Distant Early Warning System; <http://www.dews-online.org>

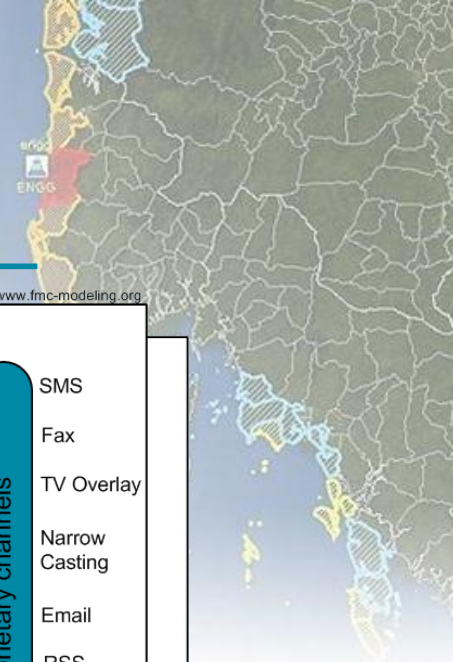
Notation: Fundamental Modeling Concepts; <http://www.fmc-modeling.org>



Information Logistics contd.

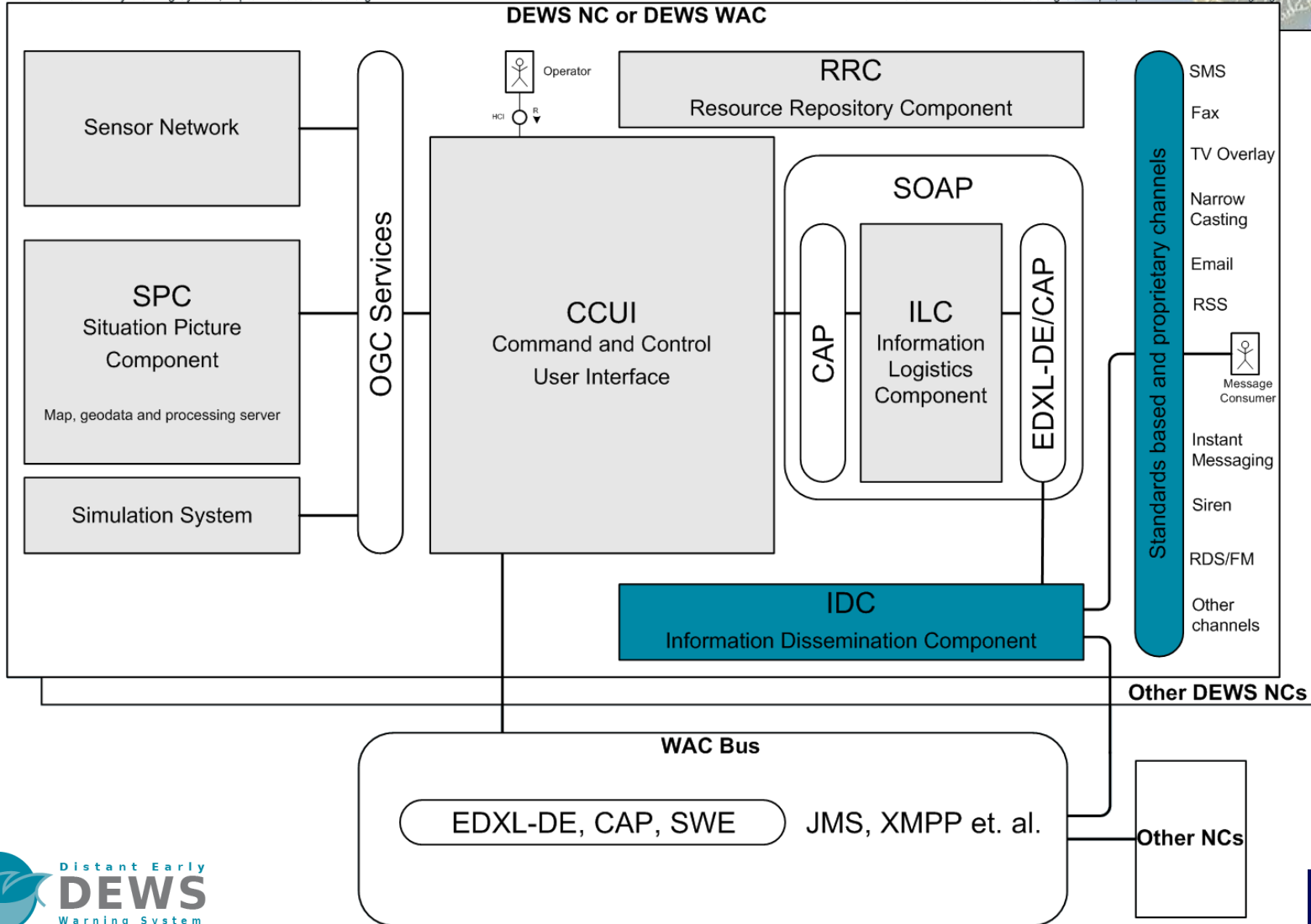


Dissemination Channels

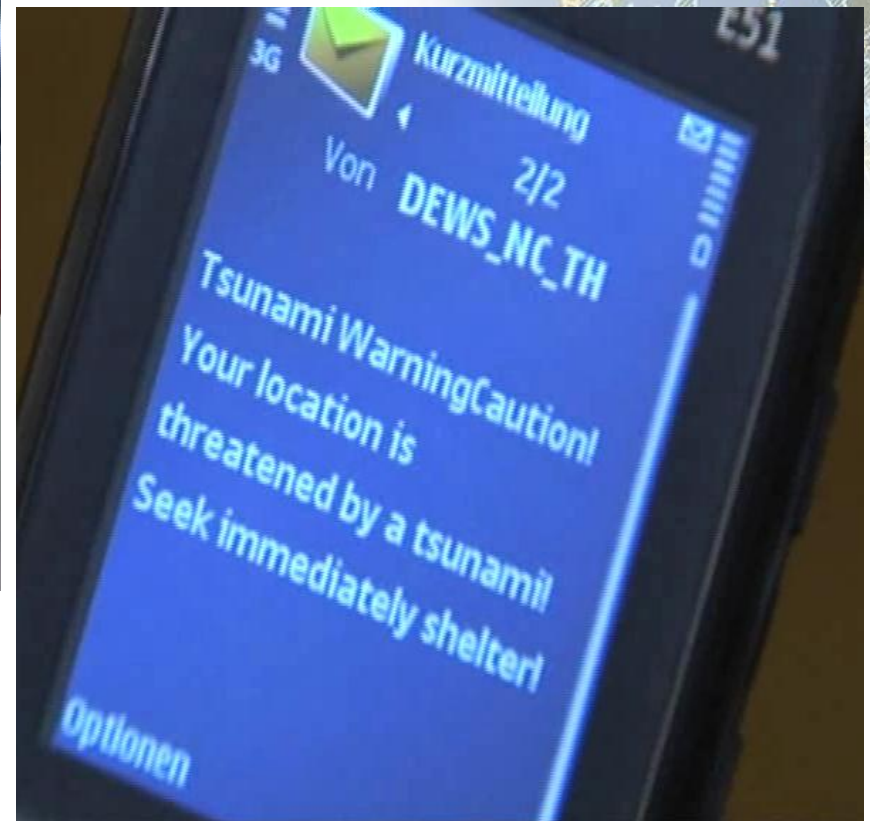
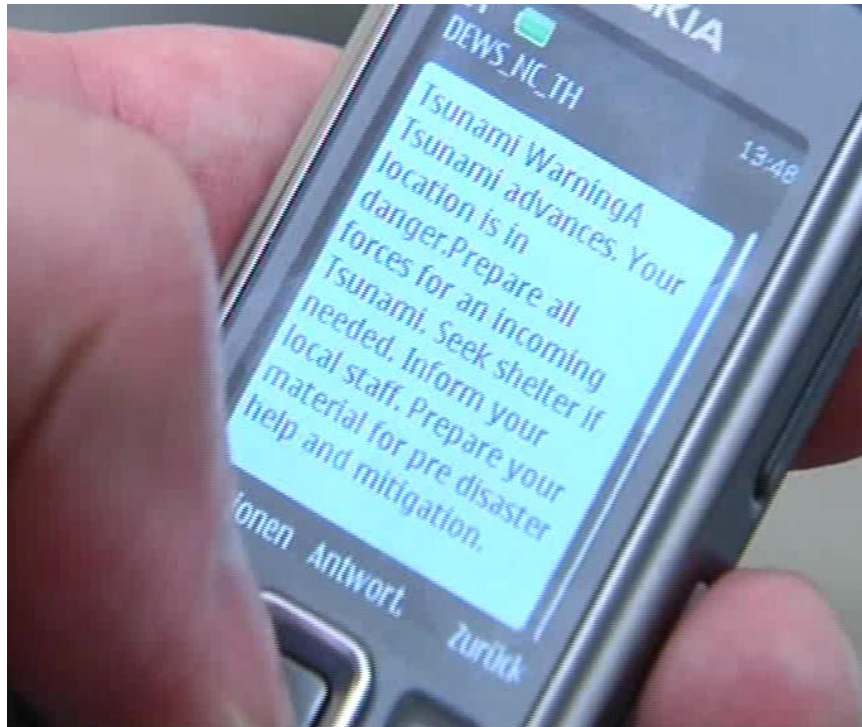


DEWS – Distant Early Warning System; <http://www.dews-online.org>

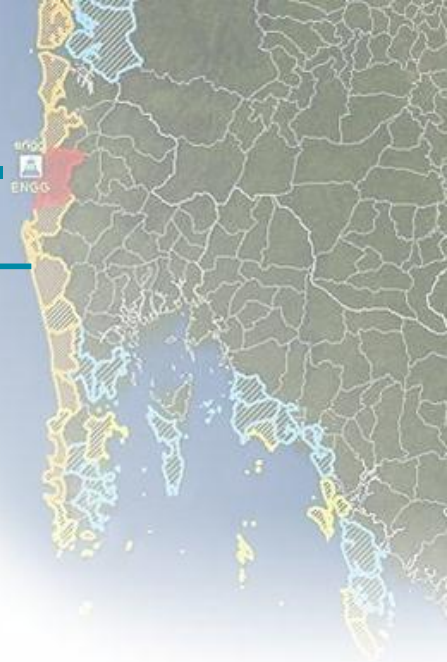
Notation: Fundamental Modeling Concepts; <http://www.fmc-modeling.org>



Dissemination – SMS

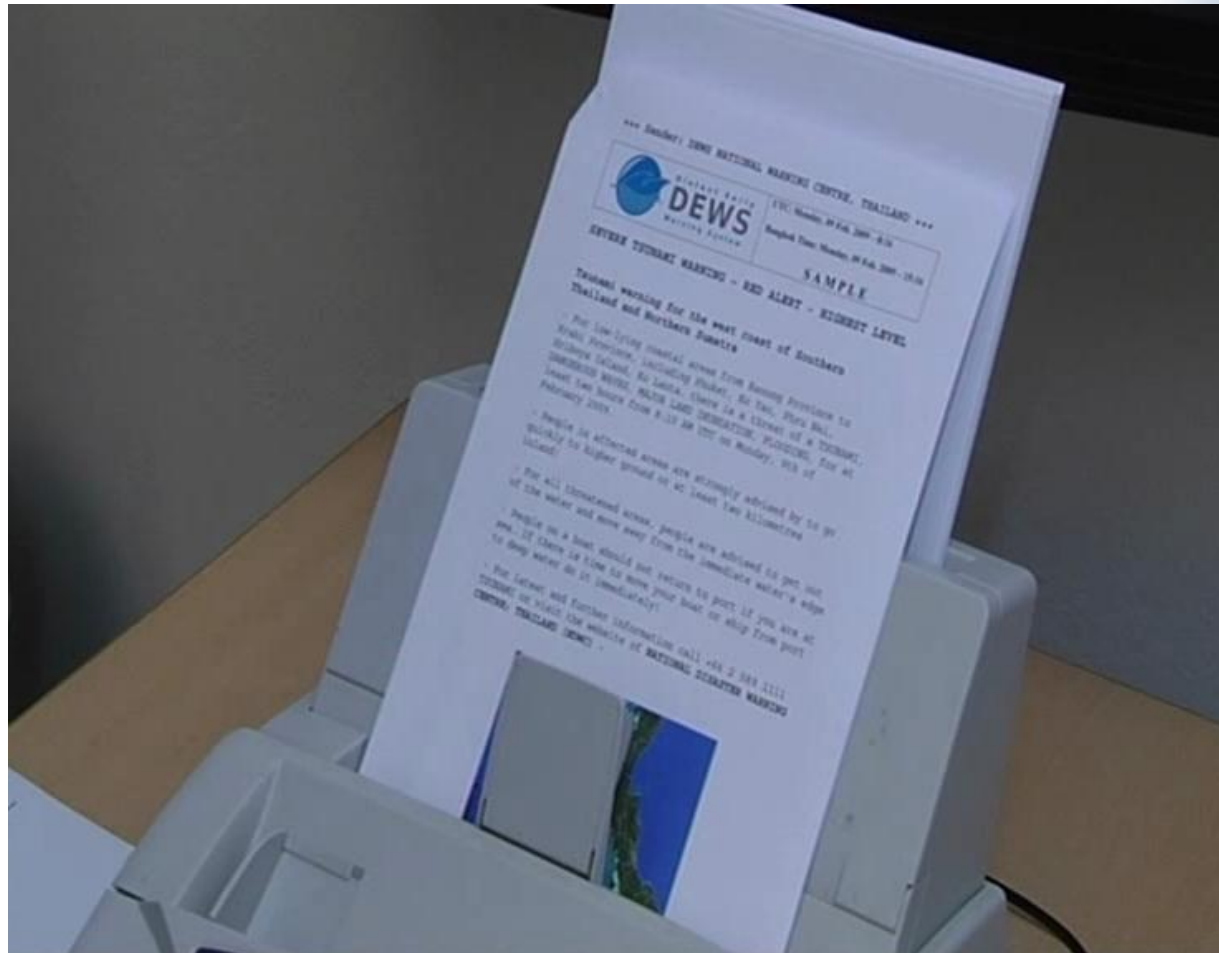


Dissemination – TV Overlay et. al.



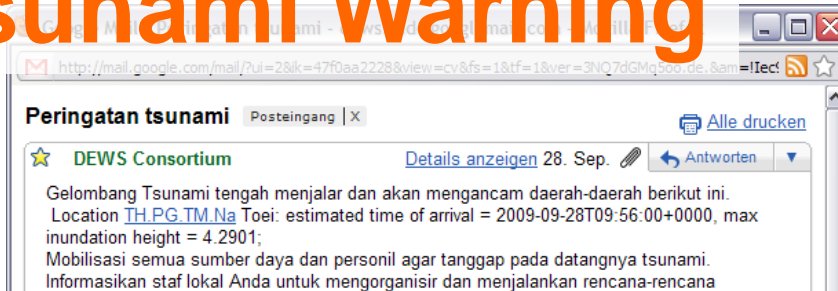
**Narrow
Casting**

Dissemination – Facsimile



Dissemination – Email

Tsunami Warning



Peringatan tsunami Posteingang | X

DEWS Consortium Details anzeigen 28. Sep. Antworten

Gelombang Tsunami tengah menjalar dan akan mengancam daerah-daerah berikut ini.
Location [TH.PG.TM.Na](#) Toei: estimated time of arrival = 2009-09-28T09:56:00+0000 max inundation height = 4.2901;
Mobilisasi semua sumber daya dan personil agar tanggap pada datangnya tsunami.
Informasikan staf lokal Anda untuk mengorganisir dan menjalankan rencana-rencana evakuasi.

Affected Area Code

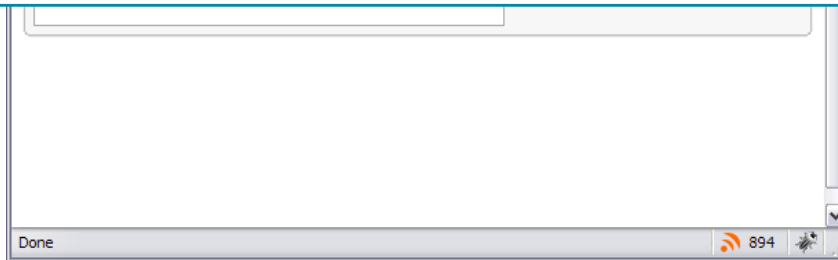
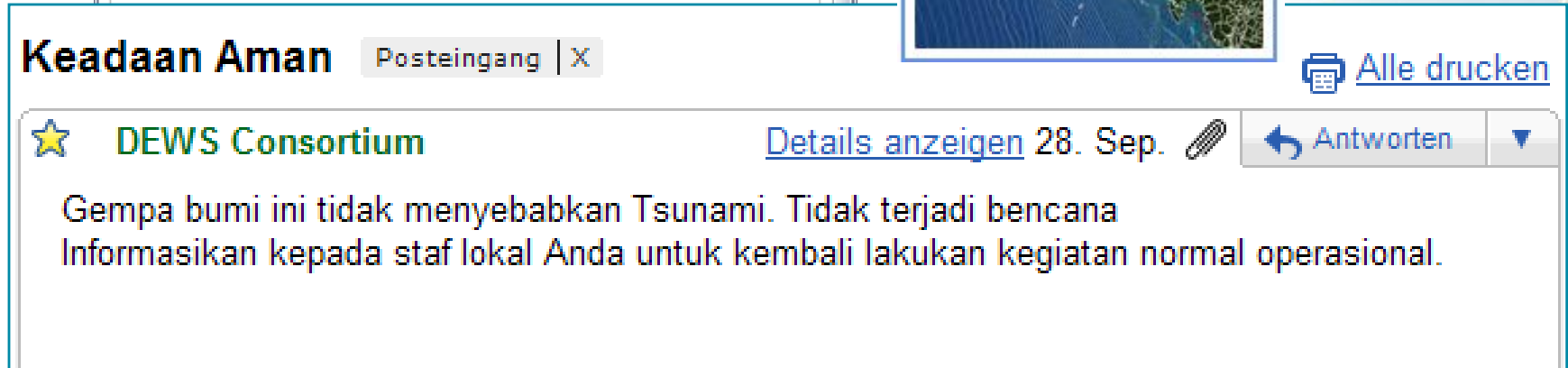
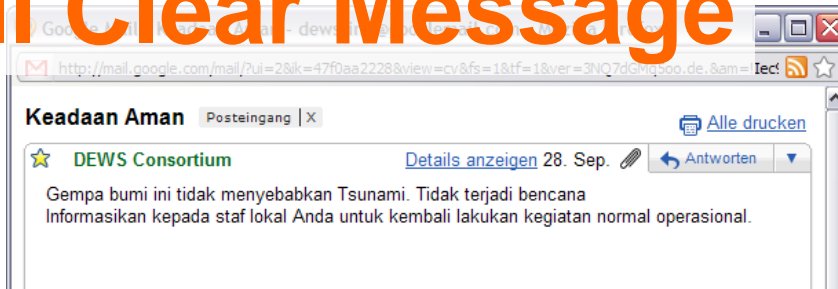
Estimated Time of Arrival

Estimated Wave Height

Bahasa Indonesia

Dissemination – Email contd.

All Clear Message



Bahasa Indonesia

Dissemination – Email contd.

Different languages different character sets

เตือนภัยสึนามิ!

Posteingang | X

Alle drucken

★ DEWS Consortium

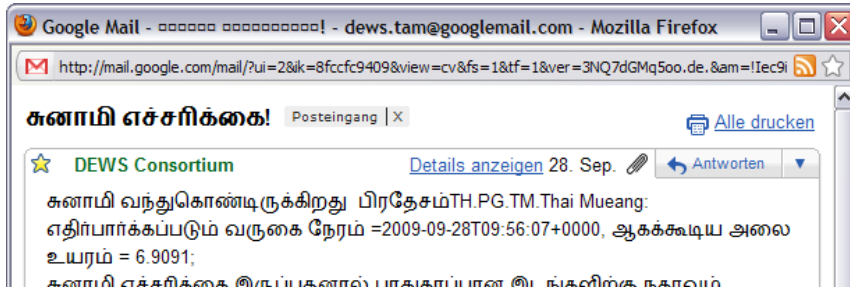
[Details anzeigen](#) 28. Sep.

[Antworten](#) ▼

เกิดสึนามิ ซึ่งจะมาถึง ณ บริเวณ TH.PG.TT.Khok Kloi: ณ เวลาประมาณ =
2009-09-28T09:55:42+0000, ความสูงของคลื่นสูงสุด = 5.43;
ระดมทรัพยากรและกำลังคนเพื่อรองรับภัยสึนามิที่จะเกิดขึ้น แจ้งเจ้าหน้าที่ท้องถิ่นให้จัดระบบและดำเนินการตามมาตรการการอพยพหนีภัย

Phasa Thai

Dissemination – Email contd.



சுனாமி எச்சரிக்கை! Posteingang | X Alle drucken

★ **DEWS Consortium** [Details anzeigen](#) 28. Sep. Antworten

சுனாமி வந்துகொண்டிருக்கிறது பிரதேசம்TH.PG.TM.Thai Mueang:
எதிர்பார்க்கப்படும் வருகை நேரம் =2009-09-28T09:56:07+0000, ஆகக்கூடிய அலை
உயரம் = 6.9091;
சுனாமி எச்சரிக்கை இருப்பதனால் பாதுகாப்பான இடங்களிற்கு நகரவும்.
உள்ளூர் அலுவலர்க்கு அறிவிக்கவும். வெளியேற்று நடவடிக்கைகளை
பின்பற்றவும்.

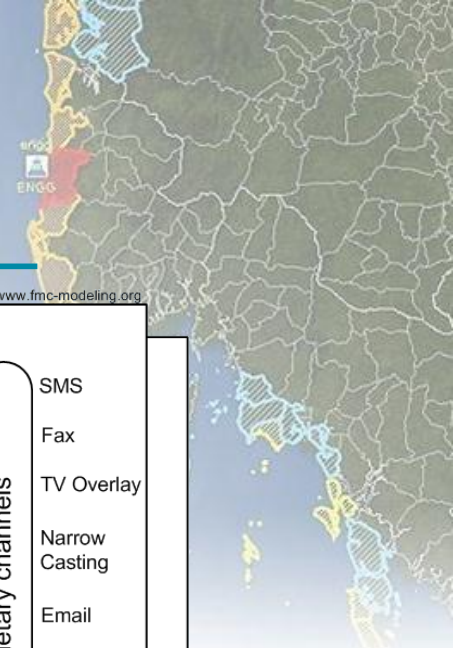
Tamil

Dissemination Channels contd.

- Channels of many different kinds
 - SMS
 - TV Overlay and Narrow Casting
 - Facsimile
 - Email
 - RSS feeds
 - Instant Messaging
 - Sirens / siren networks
 - Voice via FM broadcast
 - Other channels

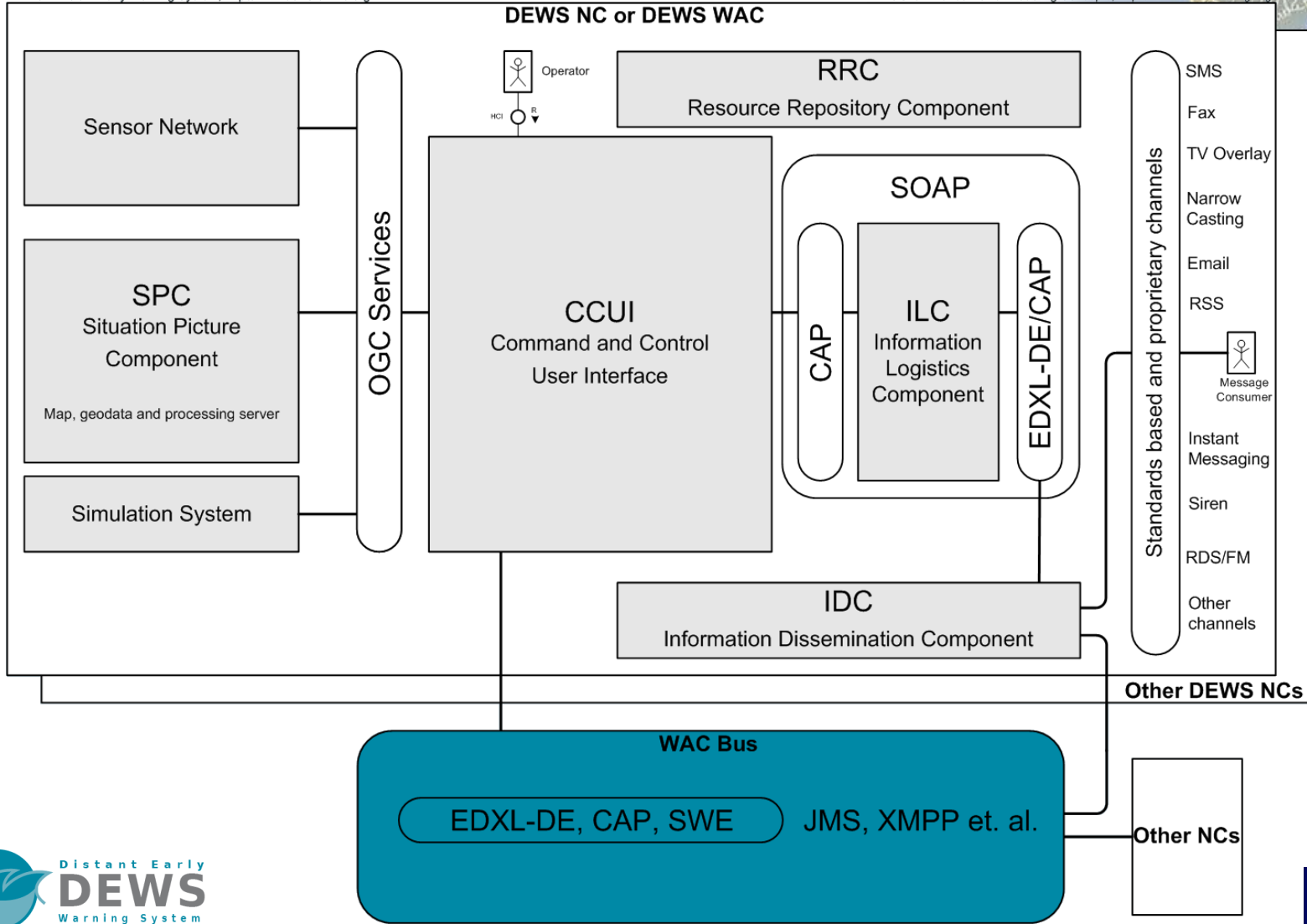


Wide Area Centre and WAC Bus



DEWS – Distant Early Warning System; <http://www.dews-online.org>

Notation: Fundamental Modeling Concepts; <http://www.fmc-modeling.org>



DEWS National Centres

National Centre Sri Lanka



National Centre Thailand



National Centre Indonesia



Wide Area Centre Infrastructure

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Earthquake Event / SSH Anomaly

National Centre
Sri Lanka



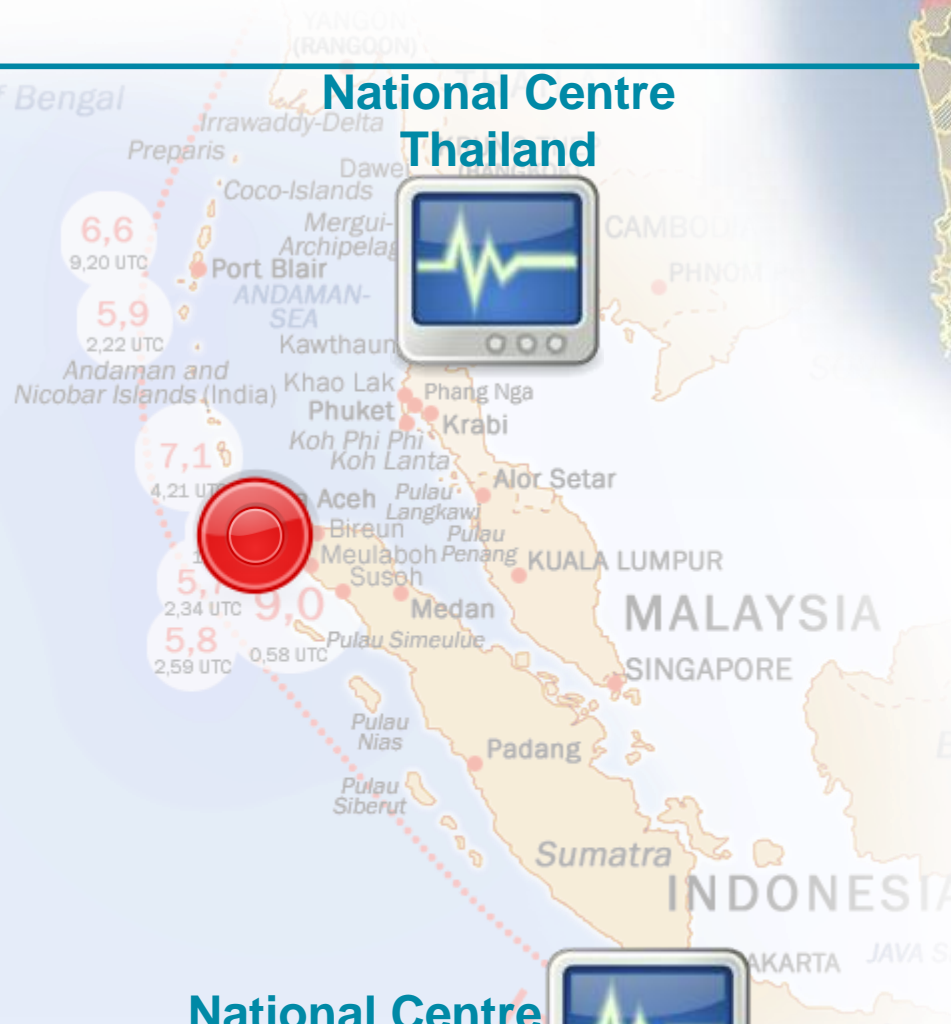
National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Measurement of Event by NC

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Dissemination on National Level

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Generation of SMB by NC

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Delivery of SMB to WAC

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Forwarding of SMB to NCs

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Generation of WACB by WAC

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Delivery of WACB to NCs

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Dissemination on National Level

National Centre
Sri Lanka



National Centre
Thailand



National Centre
Indonesia



Wide Area Centre



Distant Early Warning System for Tsunamis

A wide-area and multi-hazard approach

EGU General Assembly 2010 – Vienna, Austria

Martin Hammitzsch, Matthias Lendholt, Prof. Dr. Joachim Wächter
GFZ German Research Centre for Geosciences

www.dews-online.org