Role of Satellite Technologies in Disaster Mitigation

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Disaster: Communications Requirements

- Wireless mobility and easy terminal setup
- Voice, data and Internet capabilities
- Assistance at every stage of Disaster Life Cycle
- GPS Navigation & Location info. and Maps

- Coverage beyond currently available terrestrial black spots and uneconomic coverage areas
- Social calling, information centre, group alerts for relief workers and affected public (last mile)

Satellite technology

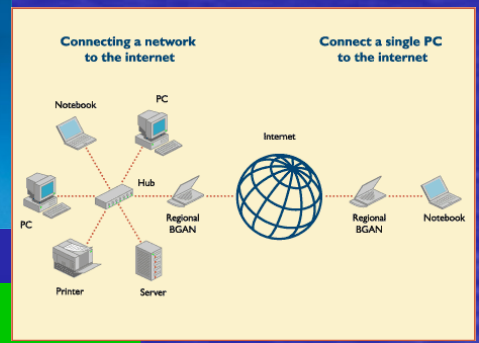
The Right Technology - satellite functionality

- Exempt by location from terrestrial-based disasters
  - Gateway only, is land-based
- Orbit:
  - geo-stationary orbit provides stable configuration for disaster communications
  - Elliptical orbit useful for remote polar area access
- 'wirelessly' uninterruptible communications:
  - Toll & broadcast quality voice
  - Low to broadband data rates
- Steer-able spot beams can selectively direct higher power on disaster-affected area
- It can support each stage of the disaster life cycle:
  - preparedness, mitigation, relief & reconstruction
- Interoperability with radio of public protection services:
  - Military, Police, Fire Dept. Ambulance & Civil Defense
- 99.99% System network availability

The Right Technology - satellite capability

- Remote Sensing
- Navigation
  - GPS co-ordinate info.
  - Distress, Search & Rescue
  - GLONASS, GMDSS, Cospas-Sarsat
- Broadcasting
- L-band frequency satellites unaffected by adverse weather / propagation conditions
- Instant communication
- Reliable high quality access to information less downtime risk
- Simple to use terminals

- Mobile terminal
  - Pedestrian and vehicular
- Dynamic capacity assignment and random access
  - Demand assignment
  - Leased services
- Low forward terminal power
  - Battery conservation



Example:
Inmarsat RBGAN

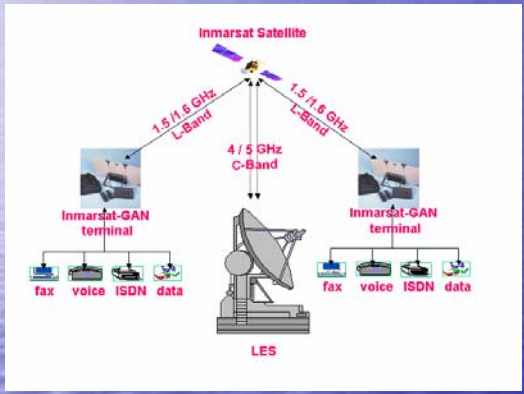
Satellite Technology Applications

- Remote Sensing Satellites
  - Earth Observations
  - Weather Monitoring
- Early warning systems
  - Satellite activated audio-visual warning alarm beacons & buoys
- GPS Navigation satellites
  - coordinate observations
  - location
- Satellite Broadcasting
- Cellular backhaul over satellite
- Satellite phones with voice and broadband data communication capability
- Telemedicine / health applications
- Asset tracking and tracing
- Distress & safety
  - Maritime safety (GMDSS)
  - Air safety (GLONASS)

- An example of an early warning beach system in Thailand

Courtesy of Kemilinks Int'l, Singapore

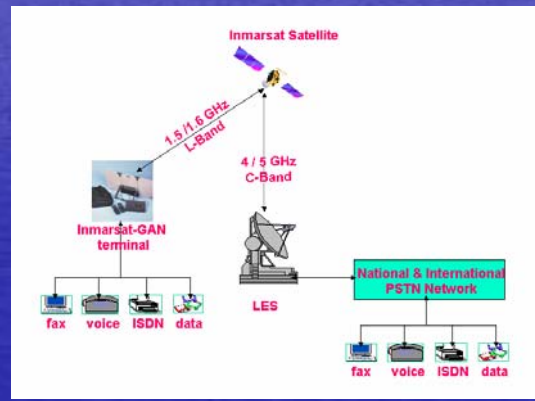
Typical Satellite Communications System Configurations



Mobile to Rural

useful when

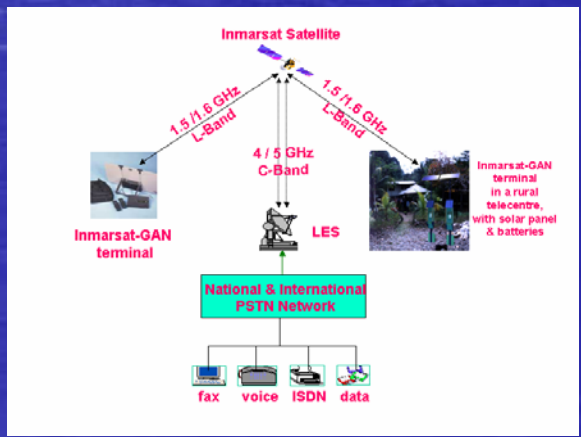
- PSTN is un-served
- Service delivery is to Thin-route, Wide-area



Mobile to Mobile

useful when

- PSTN is congested
- PSTN is destroyed
- PSTN is unavailable



Mobile to Fixed

useful when

- No PSTN services is available in disaster-affected area
- Communicating with other areas

Applicability to Disaster Life Cycle

- Preparedness
  - GIS, Remote Sensing, Broadcasting, telemetry
- Mitigation
  - Early alarm warning systems for Floods, Cyclones, Tsunamis, Sea Level Monitoring, Earthquakes, Surface Current & Wave detection, Tidal wave
- Reconstruction:
  - voice and data communications to specified hubs
  - Last mile phone services
  - National & regional inventories

- Relief
  - Voice & Data Communications
  - Can replace air-interface between cellular's BTS & BSC or TRAU & MSC
  - Amateur satellite service,
  - Mobile land-, aero- & sea satellite communications
  - Satellite geo-maps
  - Multi-purpose information tele-centres
  - Broadcasting

Satellite Operator's services

Satellite Communications Operators' Product and Services

	Iridium	Inmarsat	Thuraya	AceS (now Inmarsat)	VSAT
Global Coverage	Yes	Yes	Regional	Regional	Typically Regional
Accessible Countries	n/a	180+	EMEA	7+	Regional
Voice kbps	4.8	4.8 - 64	4.8	4.8	4.8 - 16
Data kbps	2.4	2.4 – 432	Up to 64	2.4	0.3 – 8k
Messaging	Yes	Yes	Yes	No	No
Battery Talk time	2 hrs	4 hrs	2.4 hrs	2.4 hrs	Mains
Battery Standby	20 hrs	70 hrs	34 hrs	42 hrs	Mains

Satellite Technology Tool: - the satellite phone

- Technical Specification
  - Internet IP modem
  - High-speed data communications
    - up to 64 kbps
  - Secure communications
  - Plug and play capability
  - Standard interfaces and protocol (USB, ethernet, bluetooth)
  - Lightweight <> 2kg
  - **Battery life** similar to notebook PC
  - Robust to environment

- Technical Applications
  - **Voice communications** for social and administrative use
  - Internet access & browsing
  - E-mail messaging
  - File transfer
  - **Digital image transfer**
  - Database queries
  - Store and Forward video
  - Remote IT support
  - **Telemedicine**

Case Study example

Case Study...(Pakistan Earthquake)

- 55 ITU-loaned satellite terminals; 15 Inmarsat GAN terminals for voice and 40 RBGAN data terminals
- Equipment training given to 45 designated government officials, including Doctors

- Terminals sent by government helicopters to needy inaccessible areas for:
  - coordination, social calling, resource inventory update, logistical survey
- Health relief by Doctors using telemedicine
  - Digital image transfer
  - Remote patient diagnosis
  - Essential data transfer
- Solid effort by Ministry

Constraints

- Interoperability issues
- Non-uniform peripheral standards
  - Non-availability of DECT sets in certain regions
- Airtime costs
- Independent power supply
  - Battery recharge from solar panels, small generators or vehicular batteries
- Lack of national resource inventory & disaster plan
- Satellite Operator's Single Network Access Code:
  - In PTT International switch
- Regulatory and political barriers
  - For example, warring-divide areas
  - Delayed clearance of relief satellite equipment

Few Thoughts...

- Renewed emphasis on portable independent battery/power supply development
- A dedicated disaster management satellite
  - PPP-based DiMaSat
  - operated by new/old private satellite operators and used by ITU
  - The new dedicated DiMaSat would have built-in intelligent switching networks (small scale gateway)
- Disaster - global problem; centralized management
- Mandatory national disaster communications equipment training
- Express ‘tag’ passage for ITU relief equipment
- Develop robust PDA- or computer-integrated satellite phones
  - Instant messaging
  - Rapid data transfer

Summary

- Remember to keep it simple
- Take advantage of satellite communications to manage early window of opportunity during disaster wisely in order to save lives
- Simple satellite phones can save lives
- Equipment training and regular retraining is key!

Thank You!