Planning and Engineering for Extreme Events in Mobile Communications

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Introduction

- – Extreme Events
- – Power
- – Path-Diversity/Geo-Redundant engineering factors
- – Geo-redundancy Example
- – Equipment Overload
- – Engineering/Planning and Operation feedback

Extreme…not…Unexpected

Extreme Events

- Hurricanes
- Earthquakes
- Floods
- Power Outages
- Tornados

- Infrastructure hardware or software failure
- Generic
    - any mass text messaging or voice traffic surge

Question is *not*…Will it happen?

Question should be…

How can we minimize or eliminate our risk of service impact for our **customers** *when* it happens again?

West Atlantic 2005 Hurricane Season

- Average of…
  - 16 hurricanes/year in last 6 years
  - 4 major/year (cat 3+)
- No way to avoid them….they will hit and hit hard!
- Power and connectivity to Cell Sites biggest impact

Strategy
- Cell sites need a power generator connected to them if power is lost
- Contract and Stage Fuel Resources near probable impact areas
- Use microwave links for connectivity if available
- COWs (Cell on Wheels) – mobile coverage hooked up via microwave
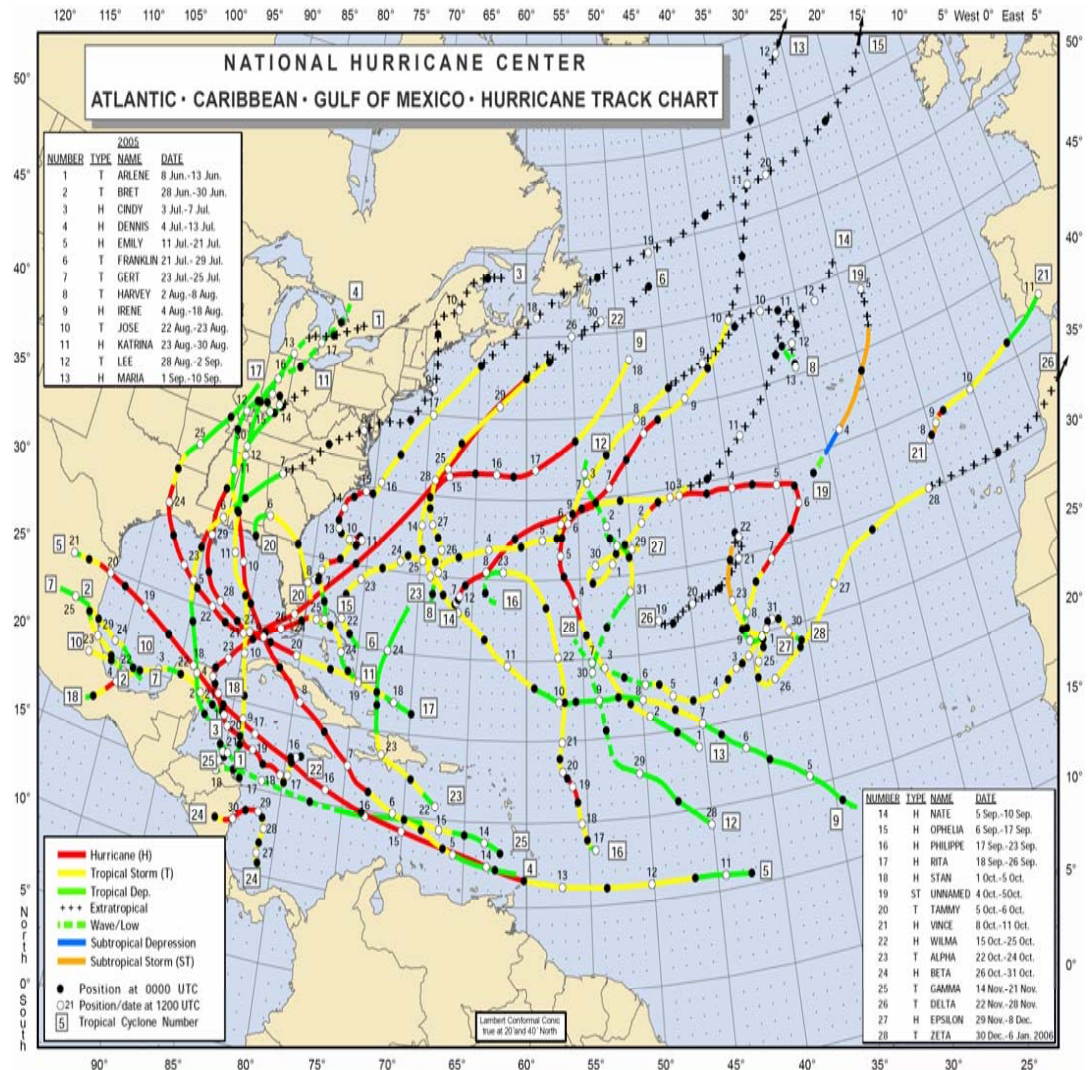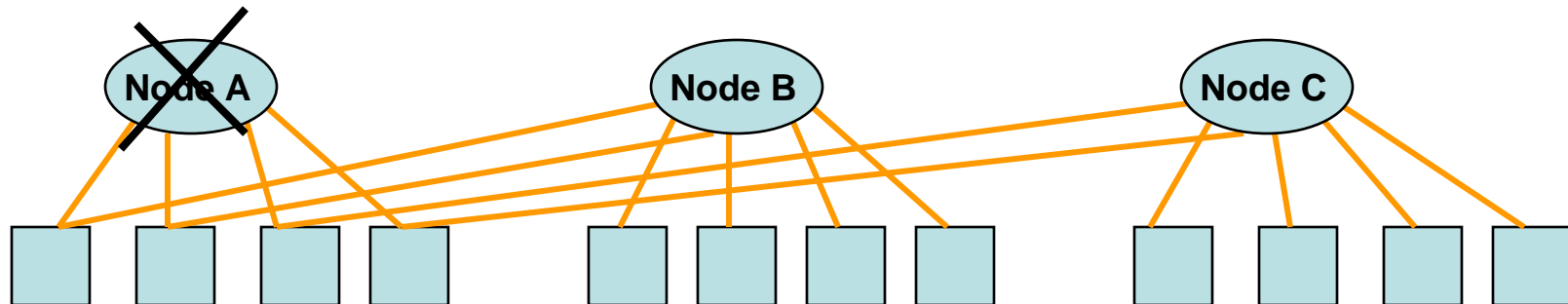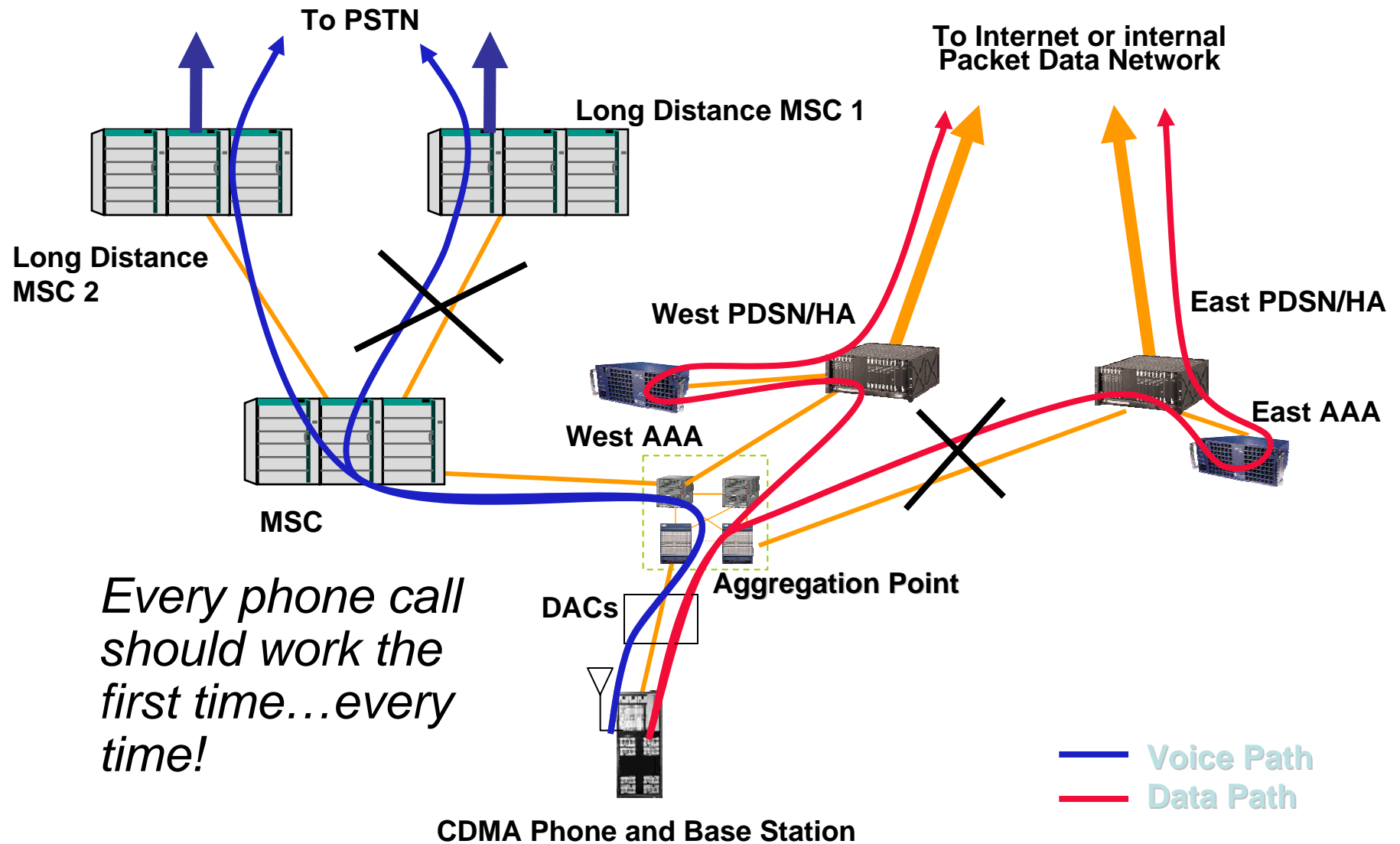

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Power

- Battery backup for all tier one systems
  - Planning and engineering for defined number of hours of backup

- Routine exercise of generators

- Training
  - staff know when power alarms are seen
  - staff know the procedure when batteries go into discharge
  - Emergency power shut-offs
    - clearly marked
    - procedures when needed to be used well documented and understood

Path Diversity/Geo-Redundant Factors

- ## 2-way redundancy
  - 40% planning/eng utilization/load limit
    - $$$
  - all nodes that point to geo-redundant node have automatic switchover of failure of 1 node

- ## 3-way redundancy
  - 53% planning/eng utilization/load limit
  - all nodes need to have a secondary node listed, but not all should have the same node listed as a backup

Geo-Redundant Example

To PSTN

Long Distance MSC 1

Long Distance MSC 2

To Internet or internal Packet Data Network

West PDSN/HA

East PDSN/HA

West AAA

East AAA

MSC

Every phone call should work the first time…every time!

DACs

Aggregation Point

Voice Path
Data Path

CDMA Phone and Base Station

Equipment Overloading

- ## Carriers and vendors need to insist…

  - – push infrastructure equipment up to and past the capacity limit (3x to 5x more than rated load)

    - • In doing this call mixes (hold times, messages per second, size of messages) need to be agreed on to best simulate the field call/data/SMS mixes to the field

  - – Behavior then needs to be understood and corrective behavior designed in if needed

- # Feedback of past performance of planning and engineered systems is critical

  - Feedback given to internal designers

  - External vendors needs proper direction and

    - Were requirements no given to vendors?

    - Were requirements skipped or poorly executed?

Extreme events don't have to be something to fear if properly planned and engineered for!

Oh and one more thing…

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Just In case Nobody Has Smiled At You Today ...

END