



# Design of a Resilient Transport Network to support an NGN Rollout

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# Introduction

- Objective of this Presentation is to give the FITCE audience a picture of some of the issues involved in designing a transport network to support an NGN
- This is based on the author's experience over the last year
- Opinions expressed are those of the author



# Background

- Eircom is the incumbent fixed line network operator in Ireland
- Approx. 1.7 Million lines PSTN/ISDN
- ~ 300 Thousand DSL Lines
- Active NGN RFP project since Jun-06



# eircom NGN Drivers

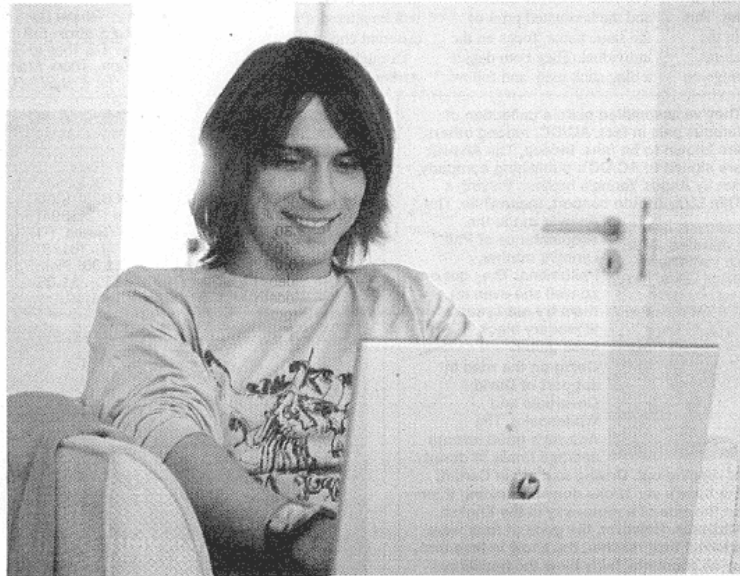
- Primary driver is to support the deployment of Ethernet DSLAMs for DSL rollout
- At a later stage we will then seek to upgrade the DSLAMs to handle PSTN to become full MSANs ( Multi Service Aggregation Nodes )
- Coverage of all sites in the network
- Network should have evolution path for triple play services



# Targeted

# ampaigns

"Czuję, że dzięki eircom broadband mam lepszy kontakt ze światem"



Damian Halaburda – Inishfallon Parade/Gorzów Wielkopolski

*„Korzystam z Internetu, aby być w kontakcie z rodziną i przyjaciółmi pozostawionymi w domu. Za pomocą sieci rezerwuję też bilety lotnicze. Internet jest świetnym narzędziem do pobierania muzyki – słucham teraz najnowszych kawałków Kazika. W dodatku mam zapewnioną dzienną dawkę Trójki, więc nigdy zbytnio nie tęsknię za domem!”*

Teraz możesz za darmo podłączyć się do sieci eircom. Zamów eircom **broadband** przez Internet, a uzyskasz darmowe podłączenie do sieci. Dodatkowo pakiet eircom **talktime** oferuje rozmowy z Polską w cenie 10c za minutę niezależnie od pory dnia. Wiodąca firma telekomunikacyjna w Irlandii oferuje połączenia telefoniczne w przystępnej cenie oraz niezawodny dostęp do Internetu – aby skorzystać z bogatej oferty, zadzwoń już dziś.

Ulubione strony internetowe Damiana:  
[www.wp.pl](http://www.wp.pl)  
[www.onet.pl](http://www.onet.pl)  
<http://www.radio.com.pl/trojka/>

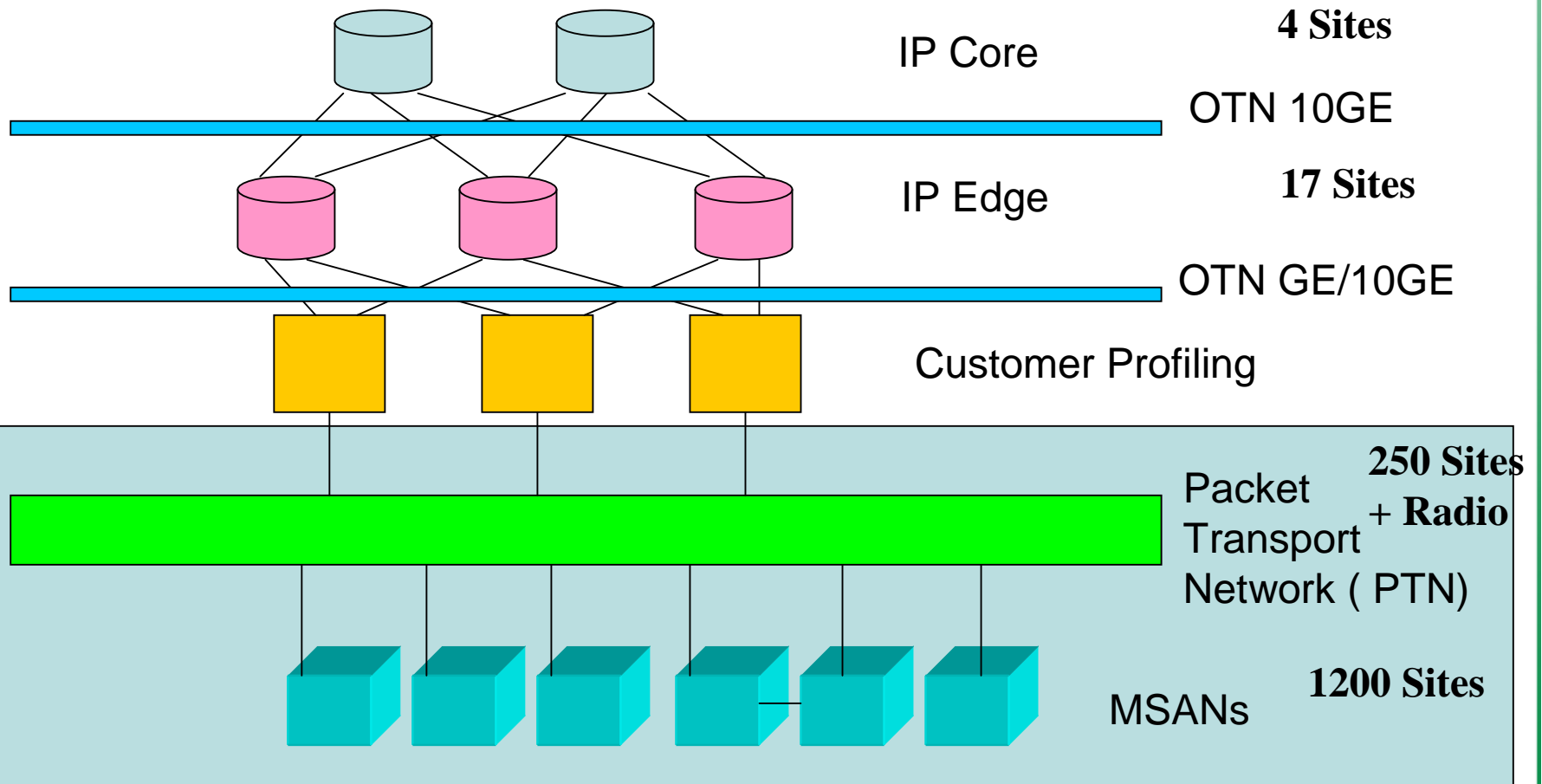
Freefone 1800 765 752 (Polska)  
[eircom.ie/polska](http://eircom.ie/polska)

Oferta dostępna, gdy linia telefoniczna jest zamontowana.  
 Oferta obowiązuje w przypadku zamówień złożonych przed 16/08/06.  
 Pełny tekst regulaminu jest dostępny na stronie [eircom.ie/polska](http://eircom.ie/polska)





# NGN Hierarchy





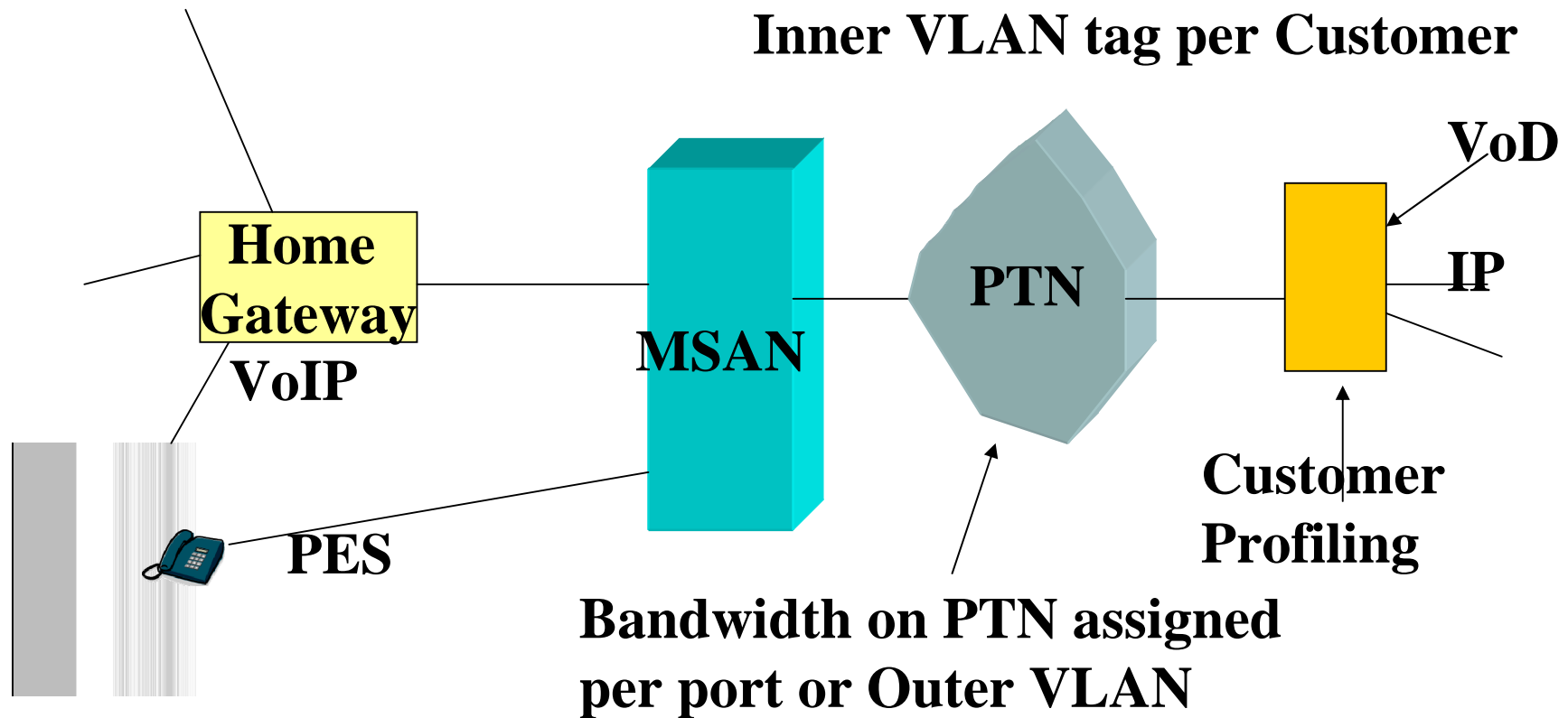
# Eircom NGN Structure

- IP Core            4 Sites
- IP Edge            ~17 Sites
- Aggregation    ~240 Sites
  - of which 60 - 80 Super-Aggregation on OTN
- MSANs            ~ 1200 Sites



# Service Structure

**IEEE 802.1Q VLAN Tagging**  
**Outer VLAN tag Per MSAN**  
**Inner VLAN tag per Customer**







# Customer Profiling

- An MSAN is associated with a single Customer Profiling Device ( BRAS etc. )
  - This matches the Various services the customer has subscribed to into the available bandwidth
  - Also maps all the customers on an MSAN into the available bandwidth to the MSAN
  - Shapes customer VLANs
  - Need resilient Transport network from MSAN to Customer Profiling Node
    - Too complex to rehome customers to an alternative node on a regular basis



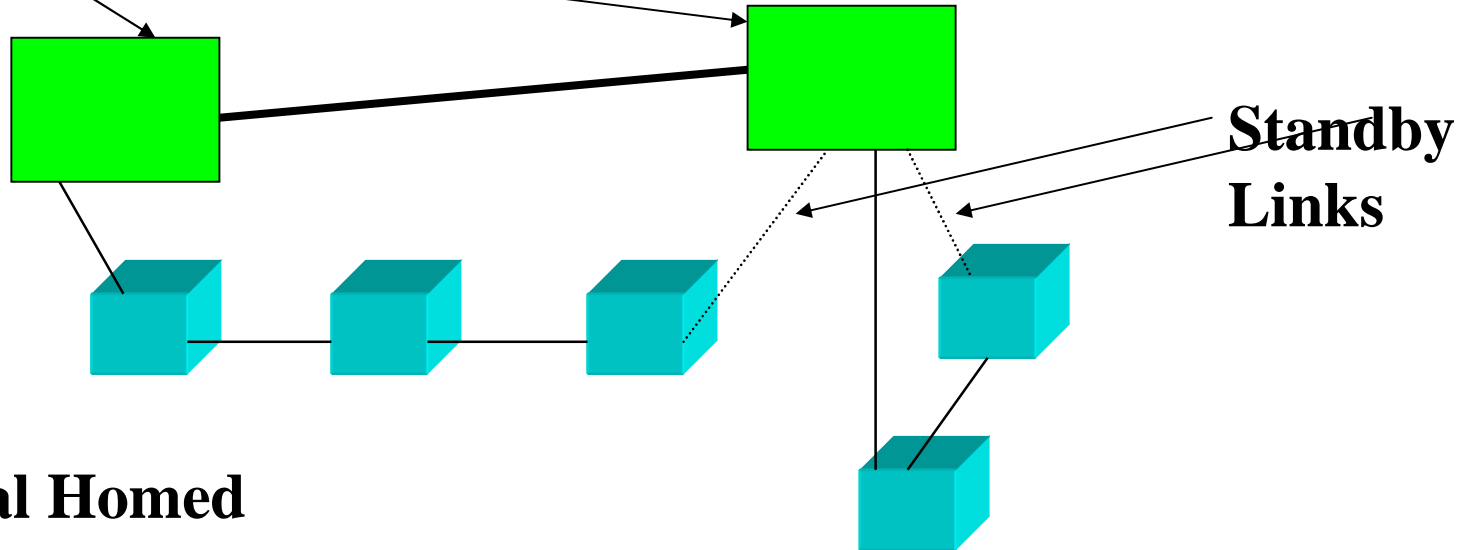
# MSAN Network Resilience

- MSANs are equipped with Gig.E interfaces and a limited internal Ethernet Switching functionality
- Support Rapid Spanning Tree Protocol
- PSTN ports for PSTN Emulation Service (PES)
- DSL Ports for High Speed Internet, Video, VoIP



# MSAN Topologies

**Packet Transport  
Nodes**



**Dual Homed  
MSAN Chain**

**Single Homed  
MSAN Chain**



# Ethernet Resilience RSTP

- Rapid Spanning Tree Protocol (802.1w)
  - One link kept shut down to prevent loops
  - Immediate switching takes place if loss of power seen
  - Otherwise failure detected after loss of 3 BPDUs
  - Default Hello Timer is 2 seconds so could be 8 seconds before reconvergence starts
  - We need to shorten the default Hello timer interval in a carrier environment



# Packet Transport Network(PTN)

- Packet Transport Network transparently carries VLANs from MSAN Groups up to Service Aggregation point
- VLANs have defined bandwidth
- PTN provides resilience
- Links can be STM-16/STM-64/ 10 Gig.E
- Configured in rings on Core Network
- Protection Mechanisms SDH ( SNCP/MS-SPRING), Ethernet Ring Protection, T-MPLS



# Packet Transport Issues

- Network Demands are uncertain
- Need to be able to evolve the network over time

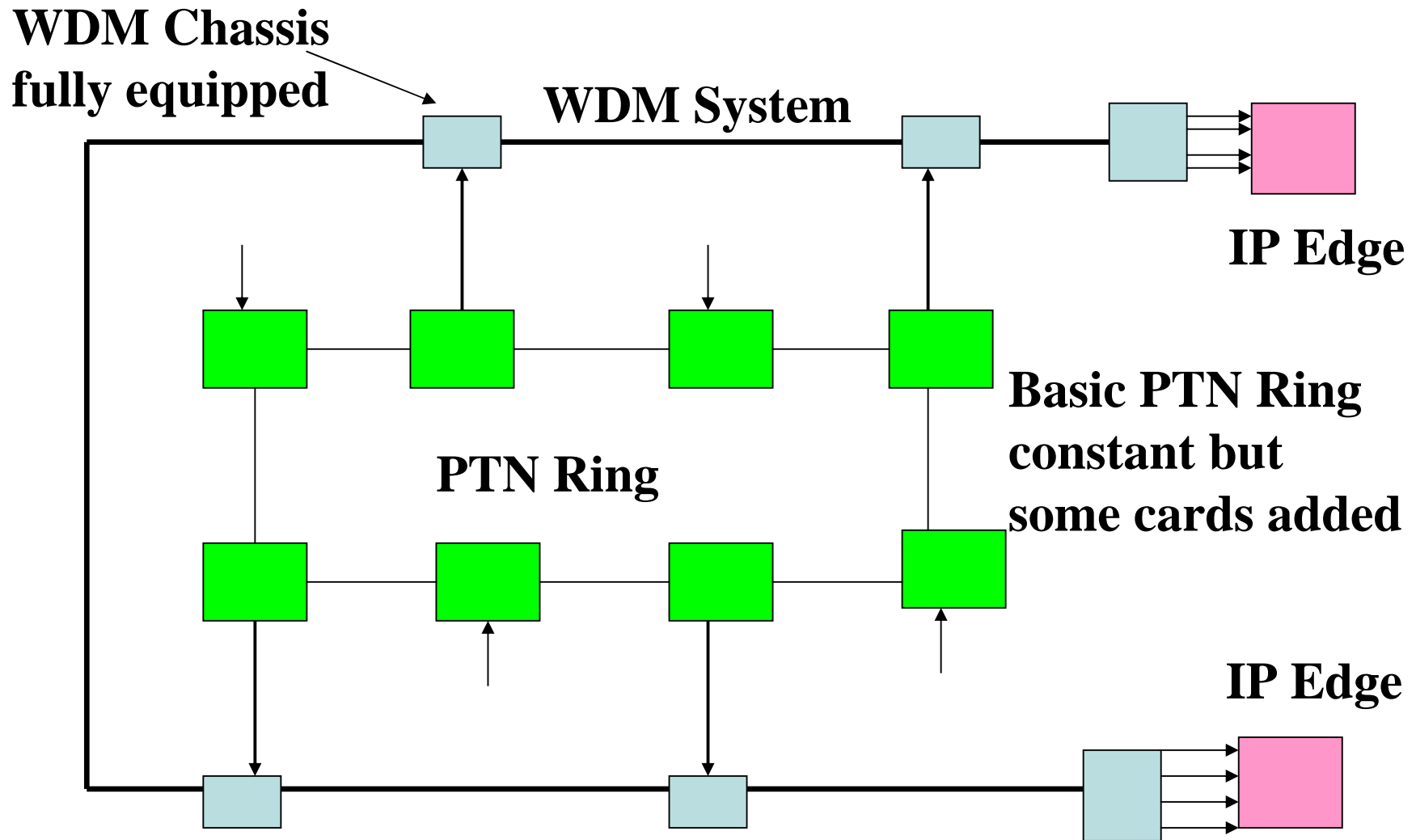


# PTN Ring Evolution

- Deploy basic PTN Ring on physical fibre initially
- Deploy a DWDM system to serve the larger sites on the PTN Ring
- We start by taking traffic off the ring at two nodes and backhauling it to the IP Edge site on the DWDM network
- As traffic grows we equip more lambdas on the DWDM and take traffic off at more large sites to relieve the physical fibre ring.



# Final PTN Network





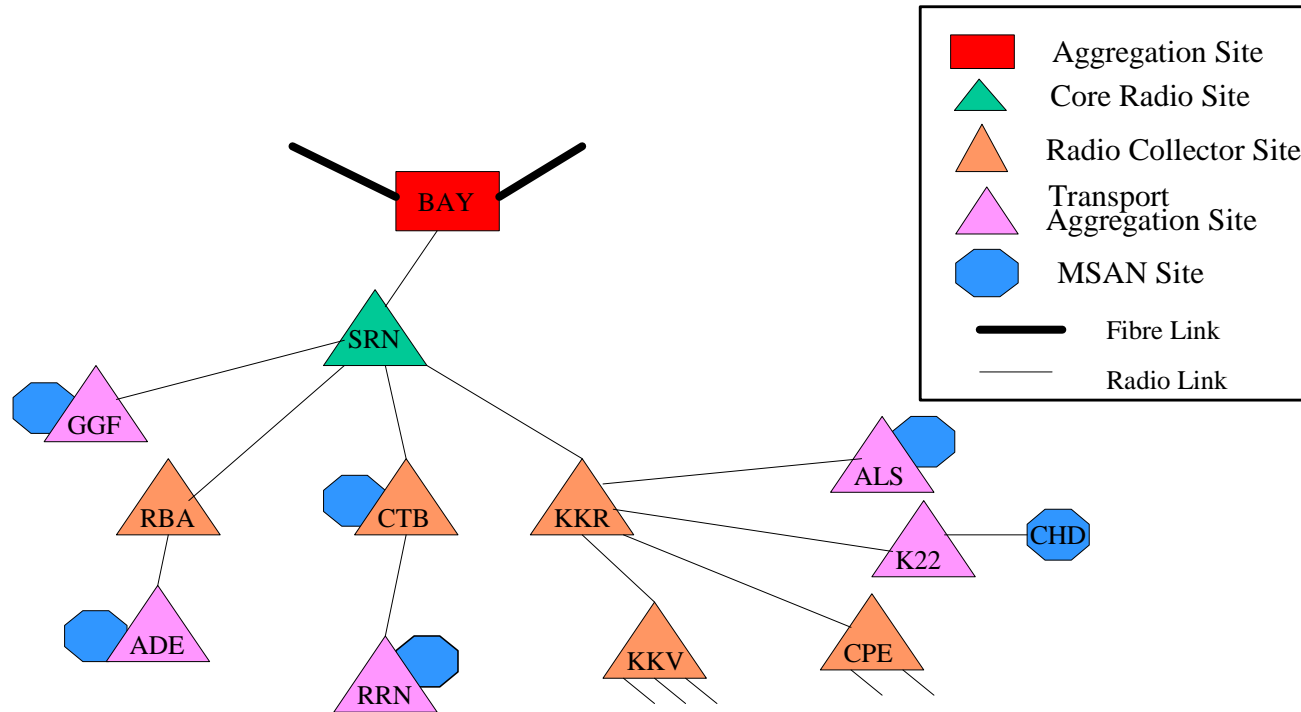


# Eircom Radio Network

- eircom Network has 250 exchanges dependent on Radio
- These represent 20% of sites but 6.5 % of lines
- Typically we use PDH radio to smaller exchanges
- PDH radios used today are 16x2M with 2M interfaces
- SDH radios used from large aggregation sites back to core network.



# Radio Aggregation Area





# Radio Issues

- Radio network optimised for PSTN
- ATM DSLAMS start with 4x2Ms for backhaul but next upgrade is a complete 34M
- Need another 34M Radio channel but often less than 25% of capacity on first channel used for PSTN
- PSTN traffic has to be backhauled to a defined core switch
- With DSL and NGN traffic we do not have the same requirements to backhaul to a legacy location



# Radio NGN Objective

- Carry circuit traffic and ethernet traffic on same link
  - ( Ethernet DSLAM rollout before PSTN migration)
  - about a third of links still only require 34M bandwidth
- Flatten network and get NGN traffic to fibre network as fast as possible
- Maximise re-use of existing infrastructure
  - Only upgrade existing links because we need more bandwidth than the link can handle
- Radio Network is also a Packet Transport Network
  - Should have solution compatible with core fibre network



# NGN Radio Issues

- Most Radio Systems are used by Mobile Operators for Base Station backhaul
- Mobile networks focussed on 2Ms for GSM
- 3G is ATM based
- Ethernet migration is some way off in Mobile world
- Where Ethernet Radios are available all or virtually all of bandwidth may be for Ethernet
- Ethernet over SDH standards are mature but Ethernet over PDH is only recently standardised



- Thank you for listening
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