

Mobile Ethernet Backhaul Lessons Learned

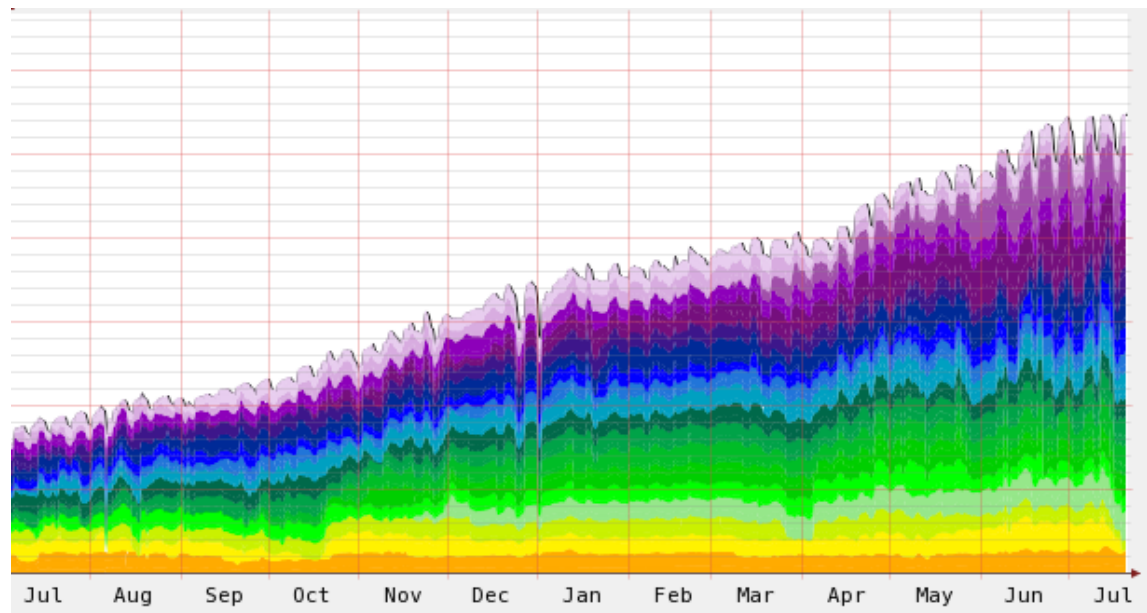
Jason Kleberg/T-Mobile USA

NANOG53

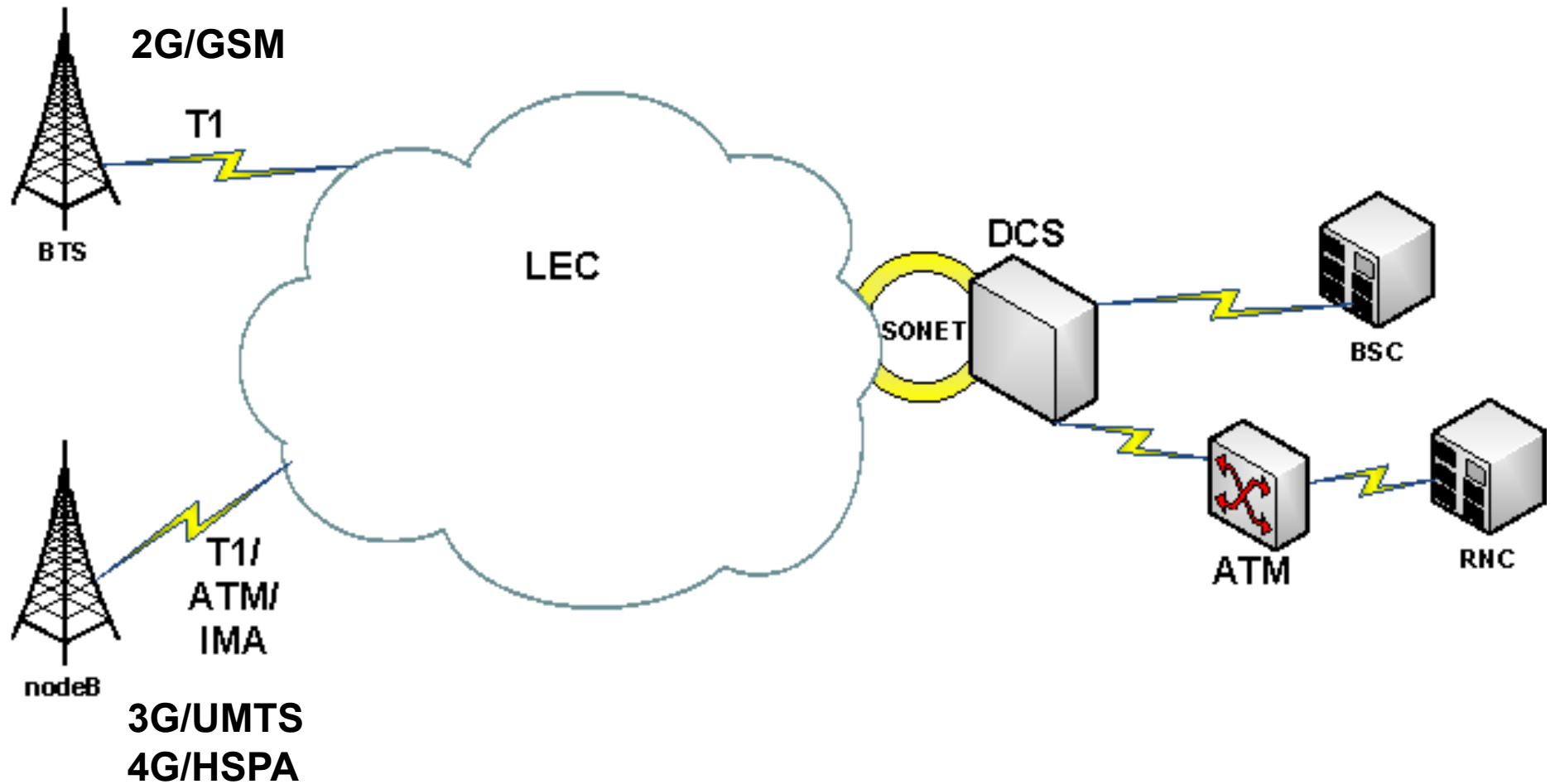
Date

Why Ethernet in Backhaul

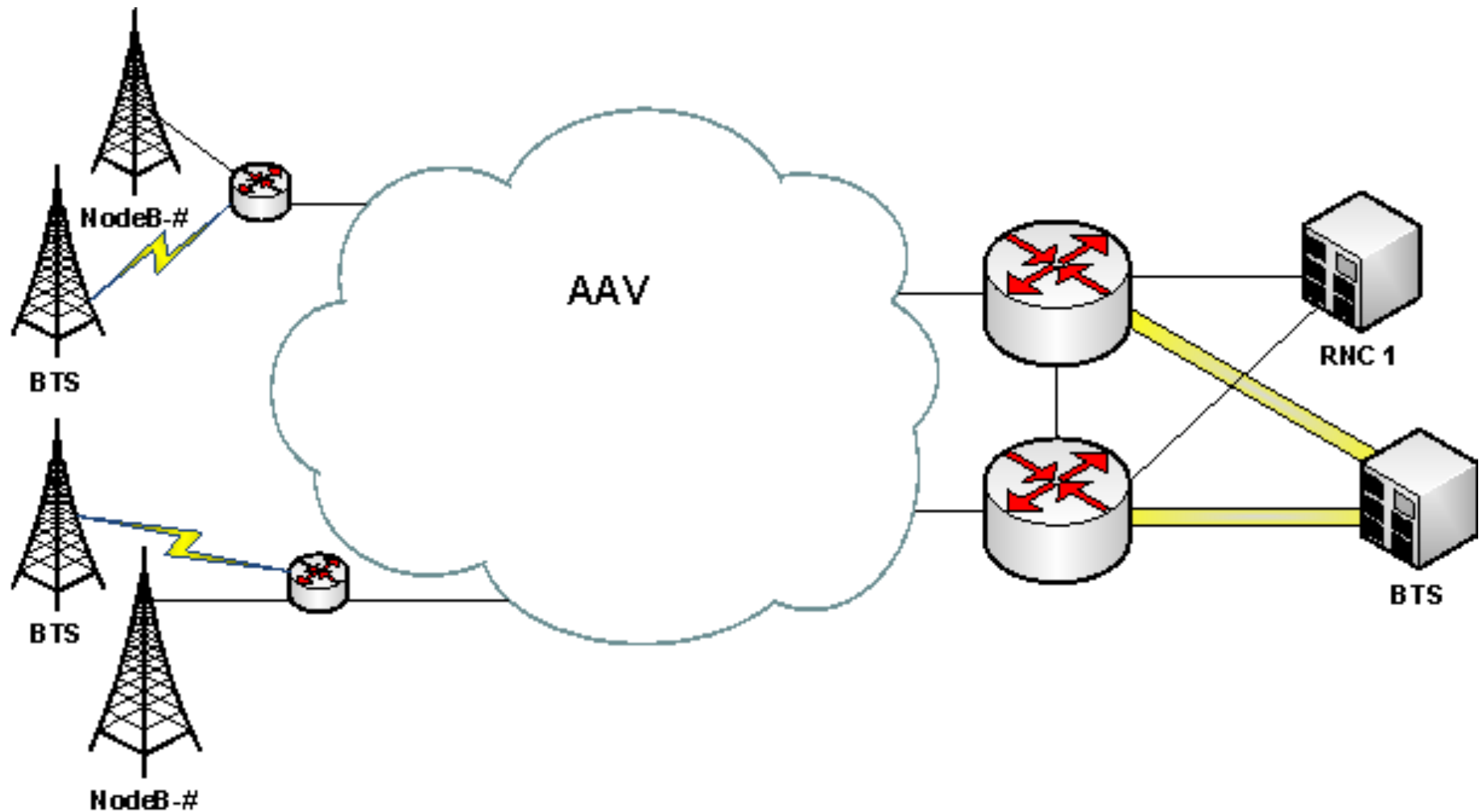
- Customers use lots of data (see below)
- Ran architecture moving to all IP (kind of)
- Ethernet is everywhere (quality?)



Overview of Legacy RAN



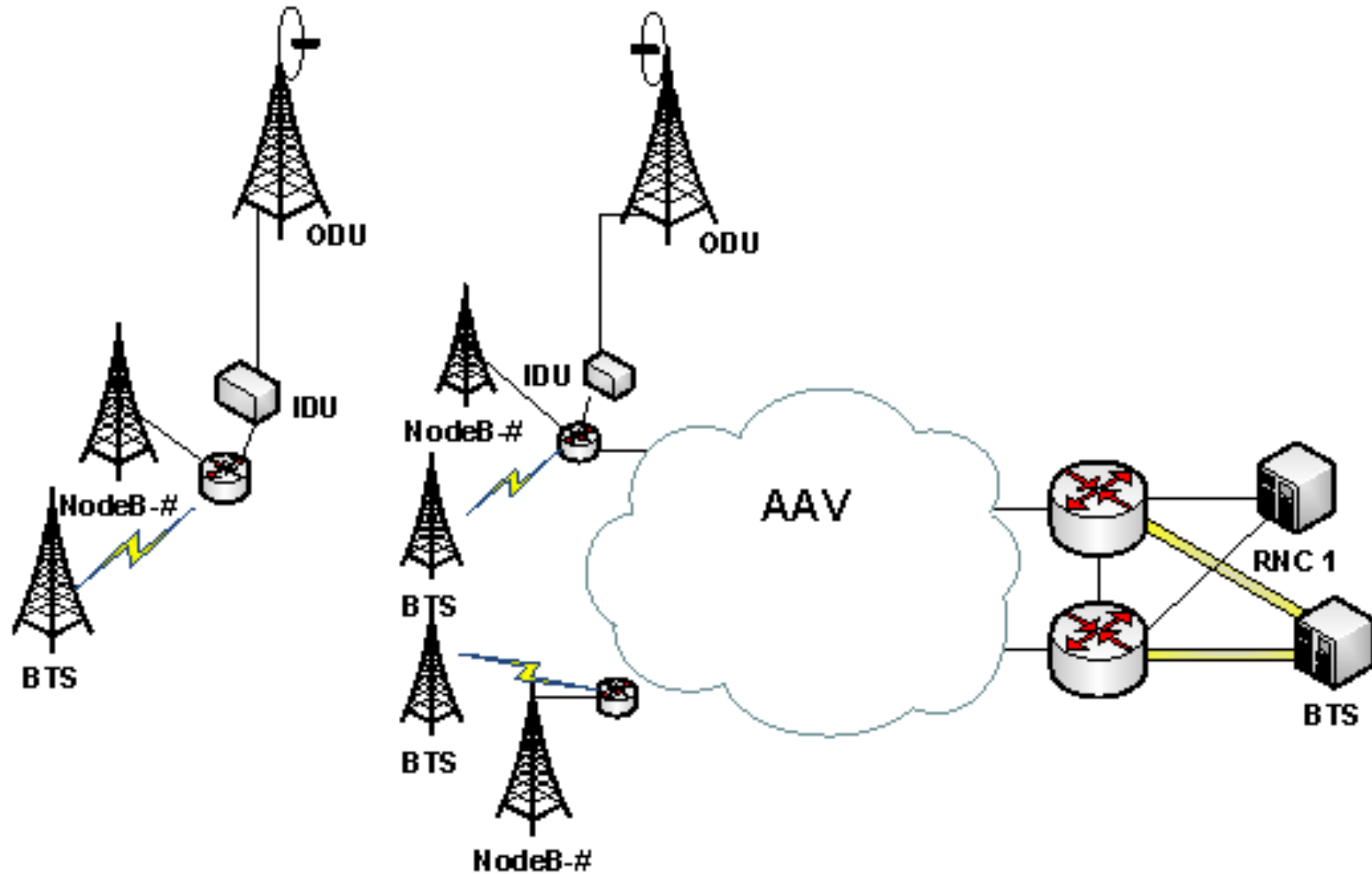
Overview of Ethernet RAN



Challenges in Moving to Ethernet

- Build or Buy?
 - Mixture (++microwave)
 - 30+ ethernet providers
 - Licensed and unlicensed microwave for boundary and underserved sites
 - What's this MEF thing?
 - Standardization and certification effort
 - MetroE means many different things to different people
 - Sonet/vt1.5 based
 - Packet based
 - Mix
 - Common terms do not mean same thing between providers
 - E-line
 - E-lan

Overview of Microwave in RAN



Challenges in Moving to Ethernet

- Building Transport Requirements
 - No matter what standardize (best we can)
 - Provide stringent list of characteristics
 - Frame loss
 - Frame delay variation max and avg
 - 1 way maximum delay
 - Interface handoff specification (1g edge/N*10g MSO)
 - Forwarding characteristics (ptp, fdb, flooding)
 - Customer and provider monitoring (who, how, granularity)
 - Vet design with carrier (and document)
 - Ask for details because you may be surprised...
 - Underlying design (details of product and technologies used)
 - Failure, convergence, and diversity design
 - Scaling (>36months)
 - QOS (queuing/policing)
 - Consider future architecture (x2?)

Challenges in Moving to Ethernet

- Mobile/RAN Architecture
 - Consider your domain sizing
 - Large ecosystem
 - Each nodeb <500 UE
 - Each MSO <1500 nodeb
 - ++ 2G services
 - Identify single POF for fiber and node (fault/maintenance domain)
 - AAV aggregation/edge
 - AAV handoff at MSO
 - Customer Router/RNC
 - Things will break
 - Understand failure scenarios and impact
 - Break it down to service impact and restoral
 - Identify expected behavior and vet

Challenges in Moving to Ethernet

- Mobile/RAN Architecture
 - Use Ratified technologies
 - Layer2 or Layer3 from provider?
 - All offer L2 services
 - L2 EVPL (2 ptp) are ideal in our network
 - Some open to L3 VPN
 - Who do you want to converge (customer or carrier)
 - Pseudowire for T1 (2G not going anywhere)
 - SATOP
 - Widely deployed
 - CESOPSN lower overhead but missing AIS (our implementation so YMMV)
 - Major cost savings
 - Service most impacted during network events

Challenges in Moving to Ethernet

- Mobile/RAN Architecture
 - Use Ratified technologies (cont.)
 - Synchronization
 - 1588v2 works well for us
 - Understand PDV implications here
 - syncE not readily available
 - GPS great but wise to have secondary
 - End to end intelligence
 - BFD scales and can be managed in hardware
 - BFD fast (easily <1s convergence)
 - Routing protocol only if needed
 - » If subnetting done does additional protocol hello make sense?

Challenges in Moving to Ethernet

- Support
 - Providers are new at this..
 - Best to understand architecture of provider rather than during outage call
 - Build common procedure for data collection and triage steps
 - RAN vendors are new at this..
 - Kick tires/vendors in lab
 - Understand RAN technologies
 - 3G natively encapsulated in IP
 - 2G no change
 - Identify impact to RAN during failure scenarios
 - Understand RAN element behavior and troubleshooting
 - » Nodeb arps for each data connection
 - » RNC sends directed arp as keepalive to gateway
 - » Neither have CLI accessible fdp (what's a mac address?)

Challenges in Moving to Ethernet

- Support (cont.)
 - Legacy NOC's are new at this..
 - Correlate events
 - You don't need 15 alarms from a single event
 - Combine IP/TDM/EOAM/RAN events
 - » Ex. UNI port failure on customer edge router
 - Embrace procedures
 - The NOC that troubleshoot T1 now fix IP/ethernet
 - Expect few types of events to happen majority of time
 - Create tools/training to ensure effectiveness
 - Device at edge (CSR) must do many things well
 - Meet service needs (today/tomorrow)
 - Capable to troubleshoot events from far away
 - Integrate OAM?

Challenges in Moving to Ethernet

- Monitor
 - What important? (rank ordered)
 - RAN KPI
 - Collected today, should not change when transport changed
 - Tells customer story most accurately
 - Attach/call drops/data throughput
 - Network devices
 - Can identify service up/down or event start/stop
 - Capture IP statistics here for planning
 - Syslog/snmp
 - Transport behavior
 - Can report OAM frame story
 - Good indicator of ethernet service interruption, not customer impact
 - EOAM/y.1731

Challenges in Moving to Ethernet

- Monitor
 - Y.1731/802.1ag
 - Good tool to extrapolate/sample network behavior
 - Even better when done in hardware
 - Discuss interoperability challenges with your carrier (MEP/CFM processing)
 - This is NOT TDM replacement for with per frame check (UAS)
 - And we miss all that good stuff it gives us (except cost)
 - RFC2544
 - You would think 50mbps is 50mbps right?
 - Trust buy verify
 - Often times incorrect provisioning
 - Qos assumes CIR is achievable

Challenges in Moving to Ethernet

- Scaling
 - Things grow fast
 - Radio has real limitation but often times software upgradeable
 - UMTS Rel99 to HSPA
 - HSPA evolution (+multiple carrier)
 - » 42mbps today
 - » More to come
 - Consider upgrade timeline
 - Set expectations for 36 month growth
 - Interim steps done via soft provisioning and completed within minutes not weeks
 - IP infrastructure should meet 3-5 year plan
 - IP design should only change by adding $N \cdot 10g$ at MSO (100g?)
 - IP edge should support 1gbps day 1
 - RAN technologies will evolve around stable IP network

Challenges in Moving to Ethernet

- Scaling

- Automation is a must

- Accessible for data, provisioning and troubleshooting
- Provisioning in the tens of thousands
- Authoritative database

The screenshot displays the SLIPED web interface, a T-Mobile tool for site management. The top navigation bar includes Home, Reports, Exports, Administration, and Bulk Operations. The main content area is divided into two sections: Cell Site Details and Configuration Details.

Cell Site Details:

Site Code	NJ05216D	Site Name	Clifton_L_2	Latitude	40.83529606	Longitude	-74.14689530	Site Technology	GSM, UMTS
Market	NJ	Address	777 Passaic Avenue	City	Clifton	State	NJ	Zip	7012

Buttons: Save, Delete, Ping All Addresses, Activate, De-Activate, Export To Granite, Back To Search

Configuration Details:

Configuration	Bundle Details	Cabinet Management	CORENET	NMNET	
Status	Current	Last Modified By	SQLSERVERSLIPEDUSER on 5/19/2011		
Transaction Type	Bundle Reallocation	Cabinet(s)	1		
Backhaul Type	PureP lub for E/W NodeBs				
3G UTRAN ID	UNJ05216D	3G UTRAN Vendor	Ericsson		
RHC Parenting MSO	WAYNNJAW	RHC ID	NYRNC005	Site Market	NJ
MetroEthernet	WAYNNJAW				

Q & A