

Bell Labs Analysis for BT

PSTN Service Mapping Analysis

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PSTN Service Mapping Analysis

Outline

- Methodology
- Feature Categorization and Assessment
- Feature Category Distribution
- Bell Labs Feature Analysis
- Bell Labs Observations

Methodology

The Bell Labs team's approach to the feature analysis is as follows:

- Assess technical feasibility of each feature implementation in target architecture
- Compare feature implementation in target NG architecture relative to PSTN
- Validate feature availability and implementation
- Categorize features to reflect BT regulatory requirements and key networking capabilities
- Use color codes to indicate availability/implementation complexity of features in NGN. For example:
 - Green : Typically available in vendors' offer (Low)
 - Amber : Available with bespoke development (Medium)
 - Red : Significant development needed or not available (High)
 - Purple : Irrelevant or better substitutes available in NGN (N/A)
- Provide industry perspectives on PSTN feature implementation and complexity in NGN
- Resulting in a 5-Step process:



Feature Categorization, Assessment, and Distribution

PSTN Feature Categorization Process

- The original PSTN feature list comprises of 234 features categorized as:
 - Universal Service Offer (USO)
 - General Conditions (GCE)

– Wholesale (WLR)

- In order to conduct a more detailed and technical analysis of the features, the joint Bell Labs and BT agreed on defining 11 primary mapping categories for the features
- The features are also mapped in a secondary category in order to recognize that some features might belong to more than one category
- The new categories allow for:
 - better mapping of individual features into key network domains and capabilities
 - full understanding of the feature impacts on key BT services
- Finally, the joint Bell Labs and BT team assessed the features according to their implementation complexity, availability, and outlook in NGN

PSTN Feature Categories

BT PSTN Features can be categorized as follows:

- ASP Services Including IN-based features, Inbound, Non-geographic Number Portability, Operator Call Steering, VM
- Line Control Based on CPE control protocol in NGN (e.g., SIP Vs. H.248). Example features include Overlap Sending, DC

Interworking

- Wholesale variants (e.g., Multiple origin based routing)
- DPNSS signaling based features (e.g., RBWF, MWI)
- E2E DTMF signal
- Non regulated VoIP interconnect product
- Voice Band Data 28K modem, different CPE types

Regulatory

- Non Functional (e.g., service availability)
- Functional (e.g., payphone lines, CPS, NP, IA, 999 emergency call routing)

Interconnect

- Delivered around TDM structure
- Associated with network changes (e.g., CPS, special routing required for VIEC)

PSTN Feature Categories (cont.)

- Call Server CW, 3WC, ACR
- Call Routing Inbound, Outbound
- CPE mainly related to CPE provisioning & management in NGN (e.g., public payphone, private kiosk)
- N/A or Service Wrap Only (e.g., irrelevant VBD, nodal resilience)
- ISDN ISDN2 and ISDN30

BT PSTN Feature Category Distribution

Feature Category Count:

Category

ASP

CPE

ISDN

N/A

VBD

Interconnect

Interworking

Line Control

Regulatory

Grand Total

Primary **T** Secondary T VBD 51 6 6% 67 23 Call Server Feature ASP Regulatory Call Server Routing 6 22% 20 7% 17 0 N/A Line Control 19 15 8% 3% 1 1 ISDN 4 3 2% -6 0 Interworking 18 0 0% Interconnect 7 17 Call Server Feature 8% 14 12 29% 73 234 CPE Call 7% Server Routing 8%

BT PSTN Feature Category Distribution

- > The BT PSTN feature list comprises of 234 features
- 60% of the PSTN features are related to BT's ASP and Call Server and Routing capabilities
- > 30% of the PSTN features belong to more than one category (e.g., 999/112 is an Emergency and Line Control feature)

BT PSTN Feature Category Distribution and Implementation Complexity in NGN -- Heat Map

Cat_Complex	High	Medium	Low	N/A	Grand Total
ASP	30	7	14		51
VBD	14				14
Interconnect	13	1	5		19
Call Server Feature	12	6	49		67
Regulatory	6	3	7	1	17
Call Server Routing	5	2	13		20
ISDN	4				4
Line Control	1		5		6
CPE			16	1	17
N/A		1	1	16	18
Interworking		1			1
Grand Total	85	21	110	18	234



36% of PSTN features have no straightforward solution implementations in NGN

- Lack of Standards
- Costly Development
- > CP Impacting
- Performance requirements are hard to meet

BT PSTN Feature Outlook -- Classification

Bell Labs Classified the PSTN Feature Outlook into 4 Categories:

- Sunset This set of features represents outdated capabilities or technologies that are being replaced with alternate mechanisms that provide superior capability (e.g., Dialup, X.25 on D-Channel services)
- Transitional Due to market penetration, this set of features/services will require strategies for ongoing support until such time as it makes commercial sense to transition (e.g., ISDN2)
- Future Features supported in future NGN networks driven by regulatory, social policy and market forces
- N/A -- Irrelevant in NGN

BT PSTN Feature Outlook -- Distribution

Cat_Complex	High	Medium	Low	N/A	Cat_Outlook	Future	Transitional	Sunset	N/A
ASP	30	7	14		ASP	48	1	2	
VBD	14				Call Server Feature	63	5		
Interconnect	13	1	5		Call Server Routing	18	2		
Call Server Feature	12	6	49		CPE	6	10		1
Regulatory	6	3	7	1	Interconnect	9	6	4	
Call Server Routing	5	2	13		Interworking	1			
ISDN	4				ISDN	0	4		
Line Control	1		5		Line Control	6			
CPE			16	1	N/A	2			15
N/A		1	1	16	Regulatory	15		1	1
Interworking		1			VBD	1		13	
Grand Total	85	21	110	18	Grand Total	169	28	20	17

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Out_Complex	High	Medium	Low	N/A
Future	50	20	98	1
Transitional	16	1	11	
Sunset	19		1	
N/A				17
Grand Total	85	21	110	18

- 77% of PSTN features with high degree of implementation complexity in NGN are Future or Transitional features
- > Almost All Sunset features are amongst the hardest to replicate in NGN
 - 65% of Sunset features are VBD
- Replicating the PSTN Sunset features in NGN is costly:
 - Significant development effort required
 - Declining relevance to end users better substitutes are available in NGN

Bell Labs Feature Analysis

Bell Labs PSTN Feature Analysis Guidelines

- The Bell Labs team further analyzed the full feature list by taking into consideration
 - Industry perspectives regarding the complexity of implementing similar features in NGN
 - Standards support for related capabilities in NGN, wherever applied
- The following slides are excerpts from the master assessment document, as a summary of the Bell Labs analysis

BT PSTN Features with High Implementation Complexity in NGN – Feature Analysis (1)

Example Fully-Aligned Assessment (4 out of 85)

			В	T Assessment			Bell Labs Analysis			
Ind 🗐	Product Name + Sub Product Name	Description/Comments	Implementation Assessmer	Difficulty of Implementing in an N	Categor	Complex for NC → 7	•	Bell Labs Assessment & Industry Perspectives	Bell Lat 구	Outloo
1	3G Video transit calls	Enables Video telephony calls from/to mobile phones to transit BT's network using ISDN transit capability (64kbit/s clear path). Since OLO interconnect will be at NGSs for Pathfinder 3G Video transit calls will not route over the 21CN. Wholesale service for conveyance of CP's traffic.	Delay sensitive. BER: 1 in 10 to 8; ISDN User part; coder: H.264 M	High ISDN data service	ISDN	High	S	Same.	High	Transitional
2	Cardway	The BT Cardw ay service provides a means of data communication between terminals connected via PSTN or ISDN lines and a central host computer connected via the Cardw ay Delivery Connection. The principal application is the authorisation of credit card transactions in retail stores along with Visa II A TMs.	X.25 data on B-Channel; Short CHT - > GW Call processing capacity	High Edge of netw ork DASS2 data service	ISDN	High	S S h e tr d c p	Same. TISPAN defined ISDN2 over IP standards with X.25 on IUA over SCTP/IP. Solution requires a next generation protocol andler (NGPH) between the NSN and the existing X.25 network. Given that ISDN is a ransitional service, vendors' comitments for developing ISDN card on MSAN is limited. Short sall holding time increases requirement of call processing capacities.	High	Transitional
e	Text Direct	This is the Deaf and Dumb users' Text system using 18000, 18001 and 18002 and modem based transport over the voice netw ork.	Support for VBD in a NGN (IP) environment. Non standard modems not using calling/answ er tones (V.25 or Bell 103 startup sequences). Applies to older pre- standards textphones. New er models comforming to V.18 should w ork OK as they use calling/answ er tones. Calling/answ er tones change the gatew ays form speech to data mode. i.e. remove EC and NLP and fix the DJBs.	Support for non standards data modulations that don't use calling/answ er tones. Requires DSP workarounds in the iP gatew ays or modem changeouts that have a standards based implementation.	VBD	High	S	Same.	High	Future
17	Business Port	BT BusinessPort is a product aimed at corporate institutions seeking to take advantage of low er call charges provided by IP call routing enabling employees to connect remotely to their corporate netw orks via the PSTN. From a 21C perspective it utilises a call into the legacy to reach a NAS associated with the Dial IP core netw ork.		assumed VBD, high, is this still a relevant service (w hy not just use dsl + VPN)	VBD	High	S	Same. Better VoBB/VPN service offer substitute available in NGN.	High	Sunset

Bell Labs and BT are fully aligned on 91% (77 out of 85) of High features

BT PSTN Features with High Implementation Complexity in NGN – Feature Analysis (2)

Example Partially-Aligned Assessment (5 out of 85)

			BT Assessment					Bell Labs Analysis				
Ind 🖵	ProductName+ SubProductName	Description/Comments	Implementation Assessmer 👻	Difficulty of Implementing in an N	Catego	Complex for NC → 7	•	Bell Labs Assessment & Industry Perspectives	Bell Lat 🖓	Outloo		
31	Choose To Refuse	Also called Last Incoming Call Barred (LICB). A Core IN service enabling users to bar incoming calls from particular numbers. The terminating Call Server performs triggering to the IN.	Call routing capability. No special requirement,	IN service in BT	ASP	High		Feature is generally available in NGN using enhanced Selective Call Rejection (SCR). Allow the SCR subscriber to enter a dialed code which causes the number of the last incoming call, if available, to be placed on the Selective Call Rejection Screening List.	Medium	Future		
42	Inbound Calls	"Inbound" is an umbrella title for a number of different services including non-geographic numbers. Wholesale service for conveyance of CP's traffic	Call routing capability. No special requirement,	Line pow er. G.711 codecs, high availability, disaster recovery. Also charging based upon the IP address pairs used by the media. Cost of terminating traffic to TDM endpoints. High Cost.	Call Server Routing	High		BT interconnect and billing implementation specifics. Capabilities, otherwise, are generally supported in NGN	Medium	Future		
45	Indirect Access	Customer manually prefixes Indirect access codes to their called numbers.	Done using the N . Overlap sending required as no analysis undertaken of the called number. Need also to route on DLE origin.	Overlap sending support required in SIP. No clear agreed mechanism in internatioani standards but UK specific solutions exist for SIP-I. Also need to include DLE origin in the routing. High.	Regulatory	High		The overlap sending feature is designed to reduce end-of-dialing delay when the caller's UE digit map is not able to identify a completely dialed destination number. In such cases, the UE typically waits for an inter-digit timer to expire before sending an INV ITE request with the collected digits. Since the inter-digit timeout value is typically several seconds long, the caller may perceive that call setup is taking a long time. Solutions leveraging the "in-dialog" method as described in TS 183 056 and TS 183 043 are available in marketplace.	Medium	Future		
61	Network Controlled Calling	Restricted Outgoing Access for Aged & Disabled customers w ho make involuntary nuisance calls.	Number blocks allocated to DLEs and Concs.	High to replicate but very low volumes.	Call Server Feature	High		Variants of Outgoing Call Barring (OCB) are available in NGN to support this feature. Example implementation includes the following: restricting calling to destinations within certain blocking categories (for example: all calls, all local calls, all long distance calls, and so on). Determination of the category of a dialed destination address comes from provisioning of call type in digit analysis. Call barring operates by checking to see if the call category determined by digit analysis is one of the categories blocked for the calling subscriber.	Medium	Future		
75	1471 Extra	BT implementation is IN service		IN service in BT	ASP	High		Customer dials 1471 to find out the telephone number of the last person w ho called you (unless the number is withheld, unavailable or came from a switchboard extension number). BT specific, but generally available in NGN.	Medium	Future		

Bell Labs and BT are partially aligned on 7% (6 out of 85) of High features

BT PSTN Features with High Implementation Complexity in NGN – Feature Analysis (3)

Example Non-Aligned Assessment (2 out of 85)

			BT Assessment					Bell Labs Analysis			
Ind 📑	Product Name + Sub Product Name	Description/Comments	Implementation Assessmer	Difficulty of Implementing in an N	Categor	Complex for NG	¥	Bell Labs Assessment & Industry Perspectives	Bell Lat	Outloo	
118	Wholesale Access :- Analogue Select Services- Wholesale Access Feature :- Choose To Refuse	A Core IN service enabling users to bar incoming calls from particular numbers. The service announcements are played from the MAS-T.		Wholesale duplicate of service covered elsew here	ASP	High		Feature is generally available in NGN using enhanced Selective Call Rejection (SCR). Allow the SCR subscriber to enter a dialed code w hich causes the number of the last incoming call, if available, to be placed on the Selective Call Rejection Screening List.	Low	Future	
119	Wholesale Access :- Analogue Select Services- Wholesale Access Feature :- Choose to Refuse PIN Number Chan	A Choose to Refuse service feature. The service interaction announcements are handled by the MAS-T.		Wholesale duplicate of service covered elsew here	ASP	High		Feature is generally available in NGN using enhanced Selective Call Rejection (SCR). Allow the SCR subscriber to enter a dialed code which causes the number of the last incoming call, if available, to be placed on the Selective Call Rejection Screening List.	Low	Future	

Bell Labs and BT are not aligned on 2 out of 85 High features

BT PSTN Features with Medium Implementation Complexity in NGN – Feature Analysis (1)

Example Fully-Aligned Assessment (4 out of 21)

			BT Assessment					Bell Labs Analysis			
Ind	Product Name +	Description/Comments	Implementation Assessment	Difficulty of	Categor	Complex		Bell Labs Assessment & Industry	Bell I ak	Outlool	
	Sub Product Name 💌			Implementing in an N 🚬	Categol -	for NG 🗹	•	Perspectives			
24	Call Diversion-Smart	A service enabling customers to change the		Medium -need an IVR	Call Server	Medium		Same.	Medium	Future	
	Divert	diversion type and destination of a line from			Feature						
		a remote location. The user dials a									
		telephone number that gives access to the									
		Remote Control of Supplementary Services									
		facility on the diverting line's DLE/Call Server.									
		The user is then able to set up or cancel									
		diversion by use of the appropriate control									
		codes. Operation of the service is protected									
		by the use of a PIN as part of the control									
		code sequence.						•		-	
27	Caller Display	A service whereby a called customer	Requires V.23 FSK signalling from	Medium	Call Server	Medium		Same.	Medium	Future	
		receives the telephone number of the caller	the line cct. Requires provisiong in		Feature						
		on dedicated caller display enabled CPE.	the AIA. Need functionality to								
		The information is sent over the called	convert the CLI from International								
		customer's line using V.23 FSK signalling. If	format to national format.								
		the calling customers telephone number is									
		withheid of unavailable an appropriate text									
	Online Destine of	string is sent in its place.		Madiana and an N/D	1.05	D. da all'anna		0	Mar all sure	Estar	
28	Caller Redirect	where a customer has had a change of		Medium - need an IV R	ASP	wedium		Same.	Medium	Future	
		number this facility may be provided against									
		the vacated number to provide callers with									
		an announcement advising them of the									
		customers new number. The									
20		announcement is played from the MAS-1.	Poquiros routing to on IDD actourou	hauga with V/PD og mora		Madium		Sama	Madium	Futuro	
38	טטו	International Direct Dial. Being able to Call	head upon country and Ales	IDD connections move to ID	Call Server	Medium		Salle.	Medium	ruiure	
		priories abroad without going through an	variable number lengths incurring	Modium	Routing						
		operator.		medium							
			auditional FDD.								

Bell Labs and BT are fully aligned on 80% (17 out of 21) of Medium features

BT PSTN Features with Medium Implementation Complexity in NGN – Feature Analysis (2)

Example Partially-Aligned Assessment (4 out of 21)

			B	BT Assessment Bell Labs Anal						
Ind _{↓↑}	Product Name + Sub Product Name	Description/Comments	Implementation Assessmer	Difficulty of Implementing in an N	Catego	Complex for NG	•	Bell Labs Assessment & Industry Perspectives	Bell Lat	Outloo
93	Indirect Access - Route to Credit Control	This service is provided for SP customers who have not paid their bills. When activated on a WA line, a caller can make calls to a very limited set of numbers, eg 999/112. How ever, calls to all other numbers are automatically routed to the Credit Control department of the SP.	Requires routing to the WLR provider for the line if the customer dials a chargebale number. Done via the IN. Requires an IN? Per customer profiles.	Requires origin based routing on a per line basis. Medium.	ASP	Medium		Features such as Hotline, Outgoing Call Barring are generally available in NGN	Low	Future
103	Wholesale Access :- Analogue Select Services- Customer Originated Trace	COT enables a customer to produce a printed record, available to the administration, of a call in progress, or a call recently completed. The record contains details of the parties involved in the call and may be used, for example, in the investigation of malicious calls. The service is invoked during a call by using the recall facility and dialling a service code or by dialling the service code shortly after the call has completed.	bespoke development for COT on last answ ered call	medium not off the shelf	Regulatory	Medium		BT implementation specific. Service is generally available in NGN leveraging Customer Originated Trace (COT) or Malicious Call Identification (MCI) features. A customer w ho w ants to trace the number of a harassing phone call uses this feature in a one-shot fashion. COT can either be executed mid-call, by flashing and dialing the COT activation code, or executed after a call by originating and dialing the activation code. The Malicious Call Identification feature enhances the COT capability.	Low	Future
117	Wholesale Access :- Analogue Select Services- Wholesale Access Feature :- Caller Redirect / CNI	Where a customer has had a change of number this facility may be provided against the vacated number to provide callers with an announcement advising them of the customer's new number. The service announcement is played from the MAS-T.		Wholesale duplicate of service covered elsew here	Call Server Feature	Medium		Generally available in NGN. AKA Intercept Referral. The intercept referral feature plays an announcement that can supply a new or changed number w hen a call is received for a subscriber w ho has moved or changed numbers.	Low	Future
228	Connection Admission Control (CAC)	Ability to limit calls according to available bandwidth for the media		Depends on architecture - SIP is low as its an SBC feature, H.248 is medium.	Call Server Feature	Medium		Function generally available on access SBC and MSAN.	Low	Future

Bell Labs and BT are partially aligned on 20% (4 out of 21) of Medium features

BT PSTN Features with Low Implementation Complexity in NGN – Feature Analysis

Example Fully-Aligned Assessment (8 out of 110)

			В	T Assessment	Bell Labs Analysis				
Ind∵t	Product Name + Sub Product Name	Description/Comments	Implementation Assessmer	Difficulty of Implementing in an N	Categor	for NC	Bell Labs Assessment & Industry Perspectives	Bell Lat	Outloo
3	Conference Call - Express, Plus and Premium	Conferencing product. Edge of netw ork platform. Uses basic call and sometimes number translation service for call set-up.		Edge of network - Voice service - Low	ASP	Low	Same. TISPAN-compliant conference invocation and control procedures are in NGN available for both advanced endpoints (e.g., SIP based) and traditional analog phones. Additional capabilities such as Click to Conference could enhance service offer.	Low	Future
5	ReservationLess	Voice conferencing service that doesn't require a time slot or number of lines to be booked, i.e. like MeetMe		As row 3	ASP	Low	Same as in row 3.	Low	Future
7	Voice DQ	Directory Access / Directory Enquiries (195 Blind)	Call routing capability. No special requirement,	Line pow er. G.711 codecs, high availability, disaster recovery Low.	ASP	Low	Same.	Low	Future
8	Outbound Services	Global outbound calls from outsourced contact centres. NGS interconnect.	Call routing capability. No special requirement,	Voice, may be performance issues - dialers, short hold calls low	Call Server Routing	Low	Same.	Low	Future
9	(Admin Controlled)- Admin controlled ICB all calls	Customer's line configured, by the administration, to bar all incoming calls.		Call Server Feature - Low	Call Server Feature	Low	Same.	Low	Future
10	(Admin Controlled)- Admin controlled OCB all calls	Customer's line configured, by the administration to bar either all outgoing calls or calls to certain destinations.		Call Server Feature - Low	Call Server Feature	Low	Same.	Low	Future
11	(Admin Controlled)- Admin controlled OCB all calls except 999 etc.	Remains as Call barring option 1 after FRN002 updates.		Call Server Feature - Low	Call Server Feature	Low	Same.	Low	Future
12	(Admin Controlled)- Admin controlled PRS & International Call Barring	Call barring option 3 under FRN002 updates.		Call Server Feature - Low	Call Server Feature	Low	Same.	Low	Future

Bell Labs and BT are fully aligned on 100% (110 out of 110) of Low features

BT PSTN Features with N/A Category – Feature Analysis

Example *Fully-Aligned* Assessment (8 out of 18)

			B	T Assessment		Bell Labs Analysis				
Ind∵i	ProductName+ SubProductName I▼	Description/Comments	Implementation Assessmer	Difficulty of Implementing in an N	Categor	Complex for NC	-	Bell Labs Assessment & Industry Perspectives	Bell Lat	Outloo
4	Enterprise Solutions (UK/ROW)	This is a managed conferencing service. The Conferencing platforms will remain located outside the 21C network during		N/A - removed from portfolio	N/A	N∕A		N/A	N/A	N⁄A
		now no longer found in the RoP								
89	Custodial Tagging Line	Requires a separate PSTN business line to be ordered by the Home Office. For Custodial Tagging, this line is provided with the follow ing facilities:		Service w rap feature	N∕A	N∕A		NA	N⁄A	N∕A
97	Number Portability	A regulatory requirement w hereby customers may transfer their business betw een communications providers w ithout requiring a change of directory number (DN) as long as certain geographic criteria are met. This covers the concept of both BT DNs ported-out to other SPs, and SP DNs ported-in to BT.	Duplicate	Duplicate	N⁄A	N∕A		As above (96). Duplicate	N∕A	Future
137	BT MeetMe	Conferencing products. Edge of netw ork platform. Use basic call and sometimes number translation service for call set-up.		Duplicate	N/A	N/A		N/A	N/A	N/A
138	BT MeetMe (UK/ROW)	Conferencing products. Edge of netw ork platform. Use basic call and sometimes number translation service for call set-up.		Duplicate	N/A	N/A		N/A	N/A	N⁄A
140	Enterprise Solutions	This is a managed conferencing service. The Conferencing platforms will remain located outside the 21C network during Pathfinder timescales.		Duplicate	N⁄A	N∕A		NA	N/A	N⁄A
158	BT Genesys	IN based call delivery system for Inbound Services. Similar to the ICM [Intelligent Contact Manager].		N/A Withdraw n	N/A	N/A		WA	N⁄A	N/A
161	Complex routed Calls (NP, NTS, Transit and CPS)	Complex routed calls for Number Portability, Number Translation Services, Transit and Carrier Pre Selection. See also details in individual service-specific rows.		duplicate	NA	NA		NA	N/A	NVA

Bell Labs and BT are fully aligned on 100% (18 out of 18) of N/A features

Bell Labs Analysis of BT PSTN Feature Assessment – Summary

Assessment	High	Medium	Low	N/A
Fully Aligned	77	17	110	18
Partially Aligned	6	4	0	0
Not Aligned	2	0	0	0
Grand Total	85	21	110	18



Bell Labs' analysis of BT PSTN Feature Assessment Results in the Following:

- 95% Full Alignment
- > 4% Partial Alignment
- > 1% Non Alignment

Bell Labs Observations

Bell Labs Observations

Key Challenges in Preserving BT PSTN Functionality in NGN (1 of 4)

There are a number of technical challenges of preserving or replicating BT's PSTN functionality in NGN

- Voice Services that Rely upon Existing PSTN assets
 - Operator Assistance / Directory Assistance
 - IN-Based services (e.g., Freephone, ICM)
 - Other service platforms (e.g., RIDE, Call Minder)
 - OSS/BSS
- Non-Voice Technologies that Rely upon the PSTN (e.g., ISDN clear 64Kbps, Fax, Alarm)
 - Analog data transmission requires high clock accuracy in NGN network
 - Mechanism to distribute the clock in packet network is a challenge
 - Disabling of echo canceller in presence of modem tone (1800 Hz in UK ?)

Emergency Services (e.g., 999, 112)

- NGN is required to interwork with assets in the PSTN that support emergency services and that are not replicated in NGN (e.g., PSAP)
- Subs mapping to PSAP location function is handled in NGN; then emergency calls are routed to PSAP in PSTN using screening index
- VoIP calls in UK use a default civic location (registered address) which is confirmed verbally where possible

Bell Labs Observations

Key Challenges in Preserving BT PSTN Functionality in NGN (2 of 4)

There are a number of technical challenges of preserving or replicating BT's PSTN functionality in NGN

PSTN Databases

- Traditional PSTN databases previously deployed may lose their relevance in NGN
- Database information may no longer be solely based on geographical constructs or numbers
- Ensuring "any-to-any" reach-ability regardless of network, location, or CPE used requires deployment of new resources (e.g., ENUM) and industry-wide collaboration

Interconnections

- The interconnection models in NGN have various requirements (e.g., QoS, security) and compensation models that are different than the established PSTN interconnection model
- Emerging technologies and services (e.g., Cloud, OTT, WebRTC) will also influence the evolution of the NGN interconnection models
- Direct interconnections in NGN require access to address translation and routing resolution (e.g., through federated ENUM)
- IP Interconnect for voice will be transformational as it will eliminate need for legacy structures such as Rate Centers, Routing rules, etc
- Thus, replicating the PSTN interconnection model in NGN might be wasteful

Bell Labs Observations Key Challenges in Preserving BT PSTN Functionality in NGN (3 of 4)

There are a number of technical challenges of preserving or replicating BT's PSTN functionality in NGN

Synchronization

- Synchronization is directly associated with the transport domain in TDM networks and indirectly with services – transmitting and receiving ends must be synchronized
- In NGN, timing and frequency are evolving to more comprehensive set of requirements for transport infrastructure, management (e.g., measurement of delay, dynamic management of bandwidth) and services (e.g., QoS, billing)

Resiliency/Reliability

- Meeting 5x9s reliability requirements while maintaining emergency calls under failure scenarios
- Nodal resilience e.g., moving from a fully distributed to a centralized call/session control architecture; fully meshed network connectivity (metro/outer-/inner-core)
- Route diversity MSAN dual homing; multi-layer restoration scheme

Services with Better Substitute in NGN

- Consumers have access to new applications/services, which will continue to evolve as broadband penetration increases
- These market adoption forces will render some existing PSTN applications irrelevant in NGN (e.g., X.25 over D-Channel)
- Question is: how much backward compatibility is needed?

Bell Labs Observations Key Challenges in Preserving BT PSTN Functionality in NGN (4 of 4)

There are a number of technical challenges of preserving or replicating BT's PSTN functionality in NGN

Access Considerations

- Stranding of CPE (e.g., dialup modem)
- Central office loop powering (e.g., VoBB using ATA) can be offered as a feature
- Network attachment and nomadicity (e.g., security, emergency services)

Contributors

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- **Ian Jenkins** for supporting the ISDN feature assessment on the last day of the workshop

Glossary

Glossary

3WC	Three-Way Call		MCD	Mid Call Diversion	
ACR	Automatic Call Rejection		MCI	Malicious Call Identification	
ASP	Advanced Service Platform		MSAN	Multi-Service Access Node	
ATA	Analog Telephone Adapter		MWI	Message Waiting Indicator	
BER	Bit Error Rate		MWI	Message Waiting Indicator	
BSS	Business Support System		NGN	Next Generation Network	
CISL	Common Intelligence Services Laver		NGS	Next Generation Switch	
COT	Call Originated Trace		NP	Number Portability	
СР	Competitive Provider (?)		OCP	Other Communications Provider	
CPE	Customer Premise Equipment		OLO	Other Licensed Operator	
CPS	Carrier Pre-Selection		OSS	Operations Support System	
CPS	Carrier Pre-Selection		OTT	Over The Top	
CW	Call Waiting		PoC	Point of Connection	
DASS	Digital Access Signaling System		PSAP	Public Safety Answering Point	
DC	Direct Connect		PSTN	Public Switched Telephone Network	
DLE	Digital Local Exchange		QoS	Quality of Service	
DLE	Digital Local Exchange		RBWF	Ring Back When Free	
DPNSS	Digital Private Network Signaling System	n	RIDE	Televoting, IVR Service/platform (?)	
DTMF	Dual-Tone Multi-Frequency		SAD	Same and Adjacent DLE	
E2E	End to End		SCR	Selective Call Rejection	
EC	Echo Canceller		SCTP	Stream Control Transmission Protocol	
ENUM	E.164 NUmber Mapping		SIP	Session Initiation Protocol	
GCE	General Conditions		SP	Service Provider	
IA	Indirect Access		TDM	Time Division Multiplexing	
				Telecoms & Internet converged	
IAD	Integrated Access Devices		TISPAN	Services & Protocols for Advanced	
				Networks	
ICM	Intelligent Contact Manager		USO	Universal Service Offer	
IDD	Int'l Direct Dial		VBD	Voice Band Data	
IEC	Interconnection Extension Circuit		VIEC	Virtual Interconnect Extensions Circuit	S
IN	Intelligent Network		VM	Voice Mail	
IPCC	IP Contact Center		VoBB	Voice over Broadband	
ISDN	Integrated Services Digital Network		VoIP	Voice over IP	
ISI	In-Span Interconnect		VPN	Virtual Private Network	
IUA	ISDN User Adaptation		WebRTC	Web with Real Time Communication	
LD	Loop Disconnect		WLR	Wholesale	
LNP	Local Number Portability				
LRN	Location Routing Number				