VoIP: Tandem Switch Migration For Service Providers

EXCELERATION 2002 ASIA-PACIFIC

Cisco.com

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1

Agenda

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- **The Challenges of Legacy PSTN Infrastructure**

- **Open Packet Telephony**

- **Who have done it?**

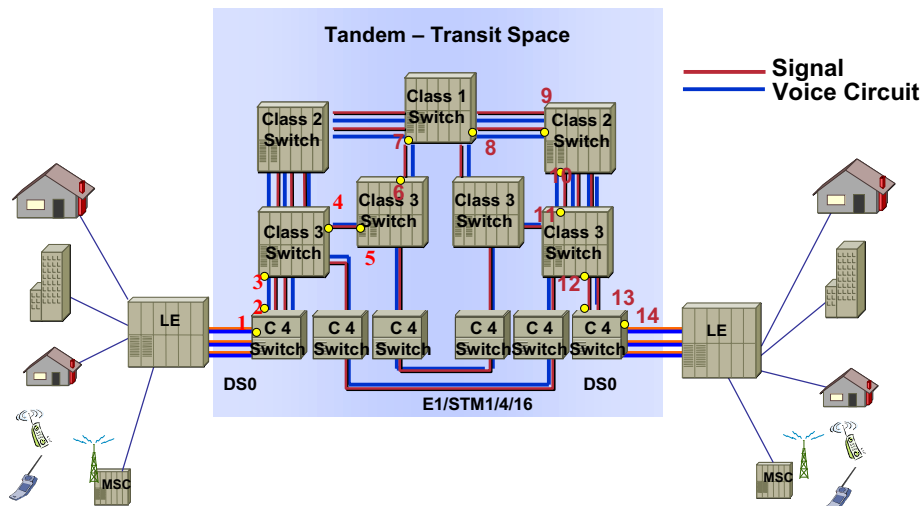- **Sample ROI- Tandem Switch Replacement Mobile SP**

- **Summary**

 2

Circuit Based tandem-Transit Network

Tandem – Transit Space

Signal
Voice Circuit

Class 2 Switch

Class 1 Switch

9

Class 2 Switch

7

8

10

4

6

Class 3 Switch

Class 3 Switch

11

Class 3 Switch

Class 3 Switch

5

12

3

2

13

1

14

LE

C 4 Switch | C 4 Switch | C 4 Switch

C 4 Switch | C 4 Switch | C 4 Switch

LE

DS0

DS0

E1/STM1/4/16

MSC

MSC

Cost Statistics

Profit margin per minute of usage goes down as traffic volume and network complexity increase.

PSTN Service over Intelligent Network

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SC

SMS

IP

SCP

SS 7

STP   STP

LE   SSP   PSTN   SSP   LE

PBX   LE   PBX
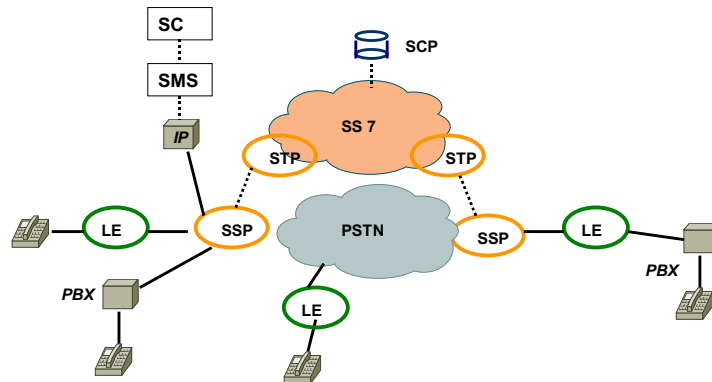
    5

Telephone Switches Today

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TDM Switch

Robust Carrier Grade Architecture

Switch-Based Features (Voice Only)

Line Concentration

Call Control Connection Control Features

Closed Inflexible Unmanageable

Narrowband Access Only

Digital Trunk Subsystem

Common Channel Signaling Complex

Interface to IN Service Logic

Administration Maintenance Billing

Limited to 64 Kb

Costly and Inflexible

Switching Network

Benefit   Drawbacks
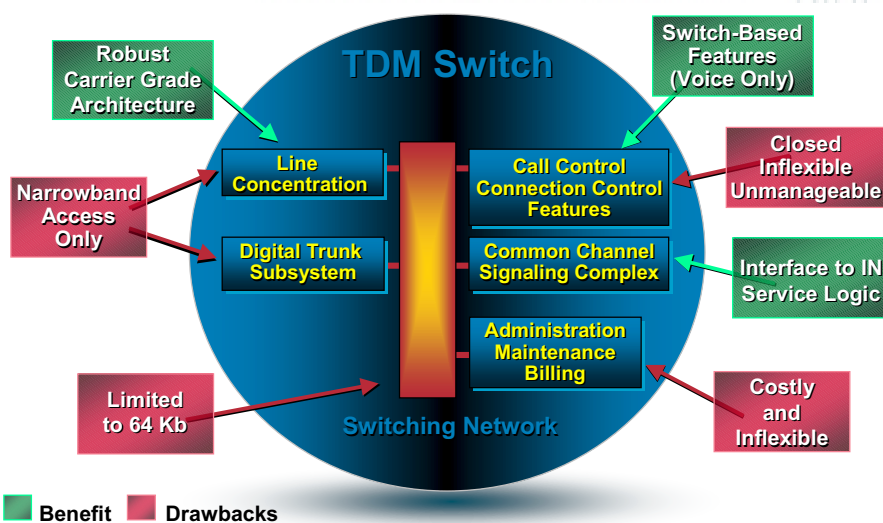
    6

Demand of New Services

- Debit Card
- Personal Assistant Follow-me/Find-me
- Fax Store and Forward
- Virtual Office
- Intelligent Network Dialing
- *Interactive Voice Response*
- Never Busy Fax
- Voice Controlled Services
- Inbound/Outbound Call
- Management

- Prepaid Cellular
- Personal Teleconferencing
- Intelligent Call Screening
- *Multimedia Call Notification*
- Voice Activated Dialing
- Fraud Control
- Virtual Telephone
- 1+ Resale
- Closed User Group
- *Virtual Private Networking*

- Calling Card
- Single Number Voice/Fax
- Enhanced Voicemail
- Return Call
- Travel Cards
- Enhanced 800 Service
- *Internet Enabled Applications*
- Operator Services
- Financial Telemanagement Services
- *International Least Cost Routing*

Summary Current Network Challenge

- **PSTN has issues even for Voice itself**
  Too slow to deployment, not scalable, not flexible.
  Provisioning/Operation are cost.
  DS0 Rules All.
- **Different network for New Service**
  Service are only different in application level. Network should be transmission (switching & routing) in digital/optical media
- **Data application growth demand bandwidth**
  Bandwidth rule all.
  VoIP can be packetized, Voice is only application
- **Market competition demand integration**
  Broadband & Core IP Infrastructure to all service.

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Business ROI Consideration

- **Lower network capital costs**
  Packet infrastructure is cheaper and more flexible than circuit switches. Distributed switch architecture
- **Lower network transport costs**
  Compression economies, non-consequential busy hours, single network (voice & data) volume economies
- **Lower Operational Cost**
  Broadband Infrastructure to avoid complex narrow band circuit provisioning

- **Enable New services quick & easy**
  Interactive call centers, enhanced fax services, video calls, expanded competition in new markets, voice messaging.

- **One Big Decision turn into many Small Decision**
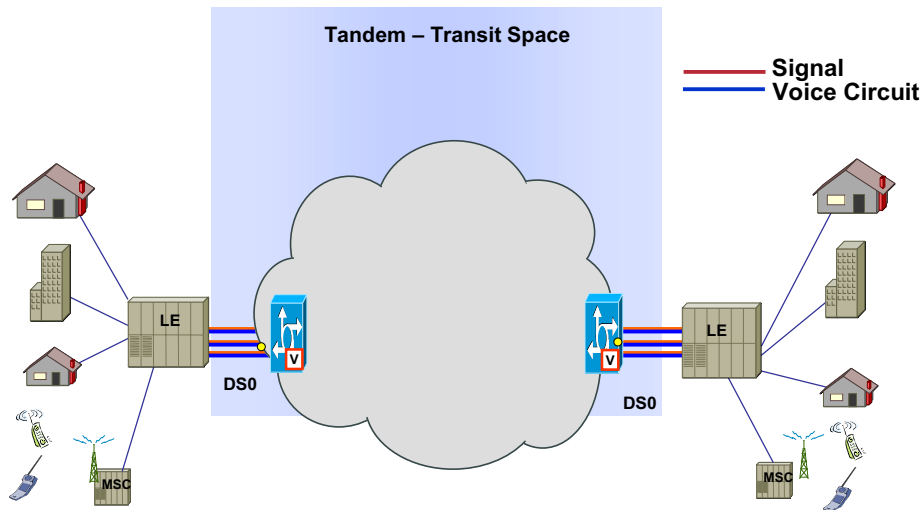 Gradually Invest and ROI. Service by Service

Port requirements in a VoIP Network

Tandem – Transit Space

Signal
Voice Circuit

LE

DS0

V

V

DS0

LE

MSC

MSC

Tandem-Transit with Open Packet telephony

Services Plane
IN Service Logic
Address Resolution
AAA

Service Logic

Call Control Plane
Signaling and Call Control
Service Access Function
Switch-Based Service Logic
End to End Voice Services

Call Logic

Tool Set
Definition
Conversion
Simulation

Connection Plane
Connection Negotiation
Transcoding
Bearer Switching
Media Control: SIP, H.323, PNNI

Switching Logic

LE

LE

MSC

MSC
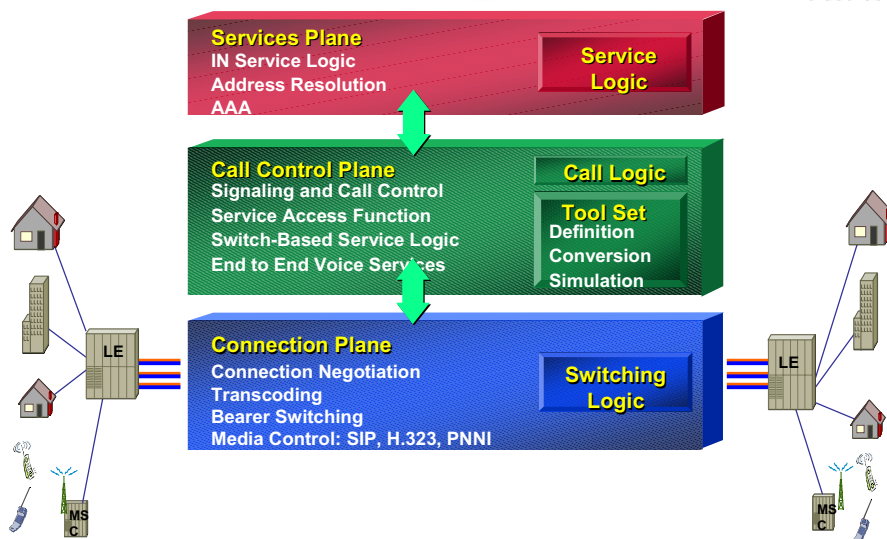
Open Packet Telephony Architecture

Services Plane
IN Service Logic
AAA,
Address Resolution

Service Logic

OSS

Service Innovation

IN/AIN/CTI

Billing
Net. Mgt.
Fault Mgt
Service
Provisioning
Cust.
Provisioning

Call Control Plane
Signaling and Call Control
Service Access Function
Switch-Based Service Logic
End to End Voice
    Services

Call Logic

MGC/Gatekeeper/Softswitch

MGCP

Connection (Bearer) Control Plane
Connection Negotiation
Transcoding
Bearer Switching
Media Control

Switching Logic

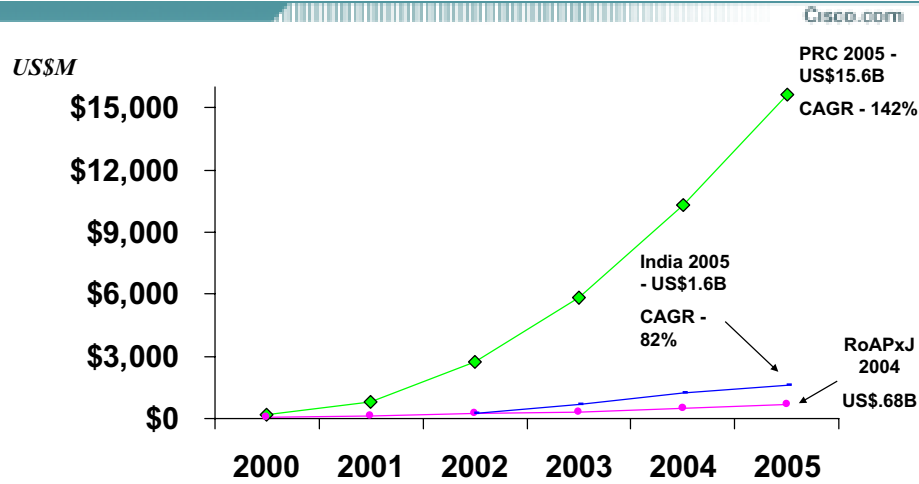
Application & Services in VoIP Long Distance

- **Calling Card**
  Prepaid, PostPaid, Bank/Credit Card, AAA, IVR, PIN Change, Merge Card, etc…

- **FAX Service**

- **Equal Access, One Stage Dial (call base or pre-select)**

- **Free Phone   -   800 call**

- **Voice VPN**

- **International Interconnection**

- **Tandem Replacement**

- **Internet Telephony Termination (IP Conference, PC/Web to Phone interconnection)**

- **Wholesale**
  Traffic Aggregation; Interconnection with ITSP/ASP, Clear house & settlement

Comparative A/P View Illustrative of VoIPs Immediate Application - PSTN Replacement

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US$M

PRC 2005 - US$15.6B

CAGR - 142%

$15,000

$12,000

$9,000

India 2005 - US$1.6B

$6,000

CAGR - 82%

$3,000

RoAPxJ 2004

$0

US$.68B

2000 2001 2002 2003 2004 2005

Source: IDC Preliminary Data, Oct 2001
CAGR 2000-2005 (except India 2002-2005)

17

Developed Market Revenue Outlook

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US$M

Korea '00-'05 CAGR - 53%

Korea $US176M

$180

Aust '00-'05 CAGR - 97%

$150

$120

Taiwan '00-'05 CAGR - 89%

$90

S'pore '00-'05 CAGR - 31%

$60

$30

HK '00-'05 CAGR - 10.5%

$0

2000 2001 2002 2003 2004 2005

- ■ **Australia**   ✕ **Hong Kong**   ✳ **Korea**
- ○ **Singapore**   ● **Taiwan**
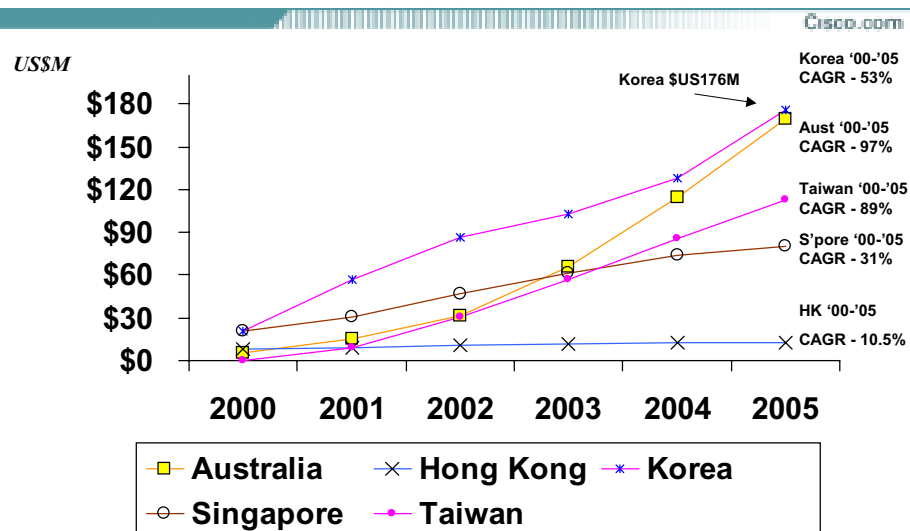
Source: IDC Preliminary Data, Oct 2001

18

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- **Summary**

China Unicom

中国联通
CHINA UNICOM

- **China Unicom- founded 1994 Beijing**

  provide long distance phone services to general public an local phone services to remote areas with limited public phone networks

- **Challenges: Greenfield operator. Need to scale to over 400 cities, across 39 provinces, in the People's Republic of China.**

China Unicom

中国联通
CHINA UNICOM

The Network:

World Largest Production VoIP Network

China's Second Largest Telecommunications Company

Cisco 12000 Series, Cisco Catalyst Switches, VoIP Gateways, H.323

Over 30 Provinces in PRC

Key to Success:

Cisco's IP and VoIP Expertise

Open standards allows Third Party Development

Flexibility to add new value added services

China UniCom VoIP : How To Manage THE Growth?

UniCom currently generates more than 300M MPM!

April, 2001, 330 cities +7295E1   11,513E1

Full Set of Applications & Service over H323 Long Distance Network

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Routing Policy :
% allocation for outgoing traffic
QoS Based routing
Least Cost Routing
Time Based Routing
Credit Control

Incoming/outgoing Traffic Control
  CPA/CIC/TG based
  Source based Routing

Global Title Translation:
800 Translation, Source Sensitive
Mobile HRL translation
SS7 Interconnection

VoIP IN based Service
Calling Card Service, Post/Prepaid Paid
  Bank/Credit Card,
  AAA, IVR, PIN Change, Merge Card, etc…
Equal Access, One Stage Dial
(ANI authenticated or pre-select)
 Premium Rate
 Family & Friends

Voice VPN
 All kinds of Access
Overlapping dial plan
WholeSale
 Clearinghouse; ASP InterConnection,
Interconnect Security
 Inter-domain/ Intra-domain

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23

China Unicom Ecosystem Partners

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Shanghai Bell   : Route Server

NETSPEAK   :VoIP VPN

digiquant   : billing one-stage, enterprise and
                      termination services

MIND   : billing VoIP calling-card service

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24

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Unicom ROI - Business Profitability

US$ '000

EBITDA & Net Profit

- EBITDA
- Net Profit

250,000
200,000
150,000
100,000
50,000
0

Q1 Year 1 · Q3 Year 1 · Q1 Year 2 · Q3 Year 2 · Q1 Year 3 · Q3 Year 3 · Q1 Year 4 · Q3 Year 4 · Q1 Year 5 · Q3 Year 5
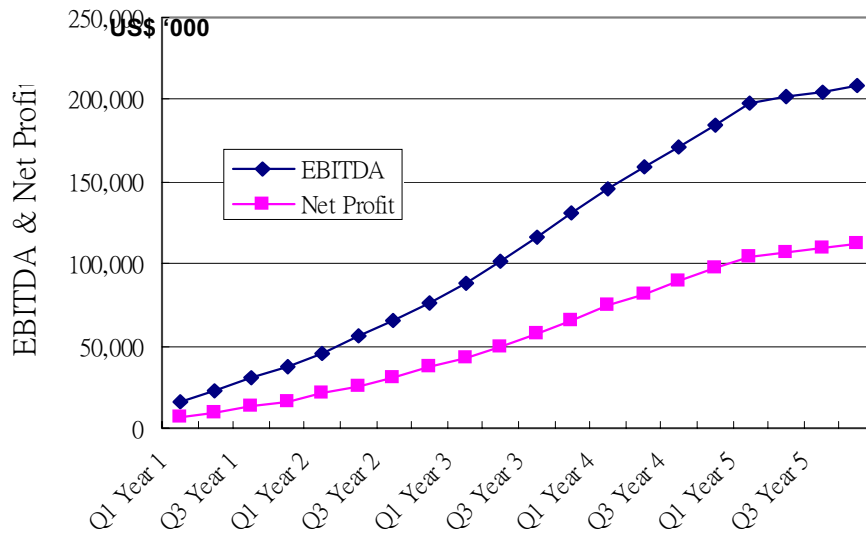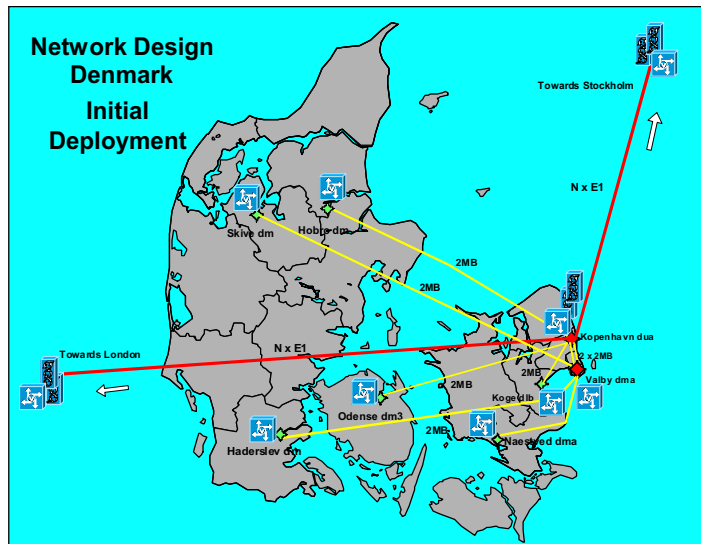

Alternative National Transit Voice SP-Denmark

- **Alternative Voice Service Provider in Denmark**

- **Certified Interconnect with local PTT, and other carriers**

- **Have over 60 POPs**

- **Want to be alternative international transit voice SP, grow into managed VoIP for enterprises**

National Reseller Network - Denmark

## Features and Benefits

Feature	Advantage	Benefit
Certified to Interconnect to PTT (Telephonica)	Achieve minimum call costs	- maximize profit
Remote Media Gateways	- local switching with minimal capital and space	- High efficiency - reduce LL costs
Remote SS7 Termination	- combined sig/voice traffic to remote sites	- easier operations - reduce LL costs
PRI backhaul	- Integrate V&D - Connect internal PBXs	- reduce LL costs - reduce call charges
VoIP Compression	- use a lot less the TDM b/w [64kbps] per call	- reduce LL costs - utilise IP svcs for b/bone
Interfaces to support new svcs	- launch new svcs - build custom svcs	- expand revenue opport.
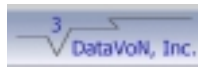
DataVon

- **DataVon (US)- established 1998**

    wholesale telecom services (carriers' carrier)

    40 POPs w/ appx. 156 mmpm voice

- **Challenges: limited ability to offer new services, small amount of people, increase profit margins, differentiate from their competitors**

DataVon Requirements

- **Next gen packet network (open, standard, scaleable, carrier class)**

- **Support: whole sales voice origination and termination**

    scale: increase 6 folds in 6 months to 1 billion minutes per month (bmpm) voice

    LNP, voice VPN, ISDN-PRI direct access for PBX from enterprises

    ISPs, enterprise customers, tier 1, 2 telcos, CLECs, emerging global carriers

DataVon Solutions

- **Five pairs of ipVerse ControlSwitch replace class 4 tandem switches. Each supporting at least 270K concurrent calls**

- **Growth to 60 MGX8XX0 GWs, at 80 POPs. Each supporting about 40 million minutes voice calls**

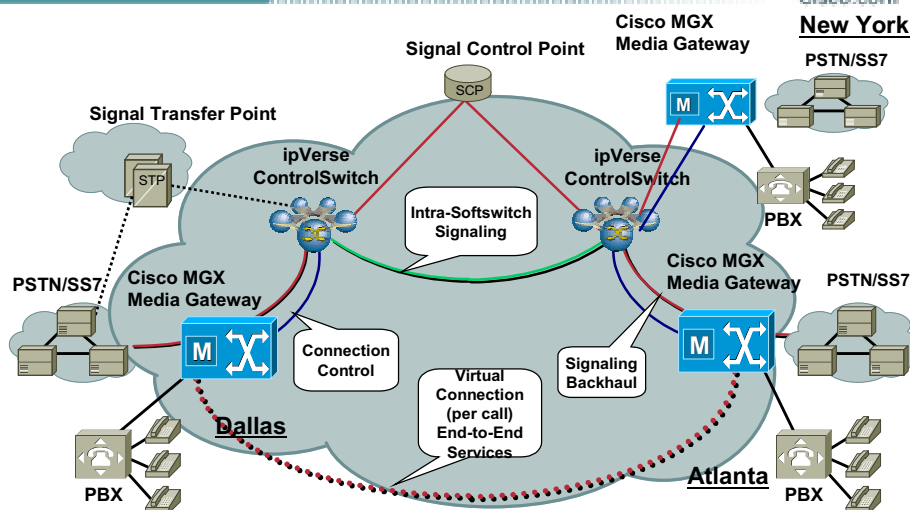- **open interfaces to 3rd party application services enable rapid creation and deployment of revenue generating services**

DataVon Initial Deployment

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- **Summary**

 33

Scenario

- **Mobile Operator in Malaysia**
- **1.25M subscribers**
- **Considering replacement of 6 tandem MSC switches**
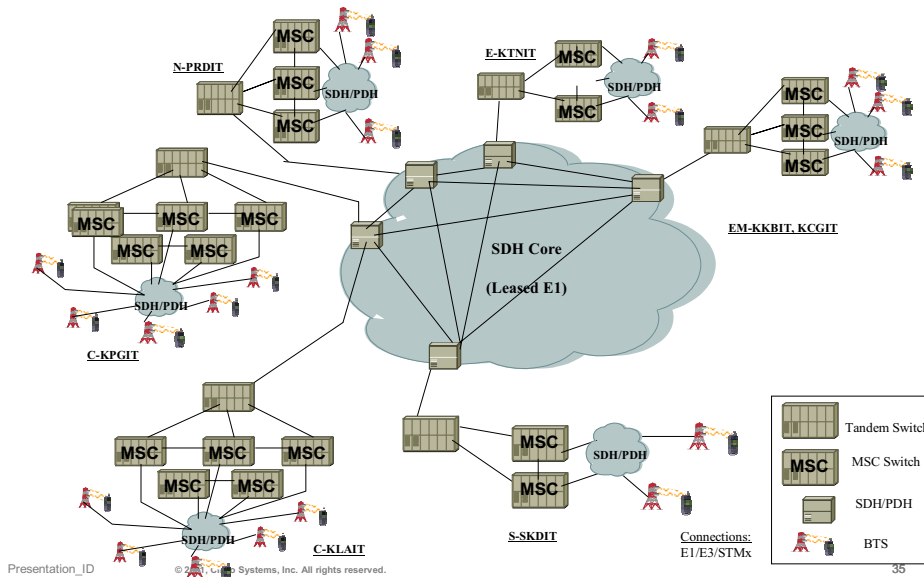- **Currently, leasing E1 links from incumbent**

(inter-tandem, MSC-MSC)

 34

Assumptions

Tandem Switch Network Capacity							
	C- KPGIT	C-KLAIT	N-PRDIT	S-SKDIT	E-KTNIT	EM-KKBIT	EM-KCGIT
SubTotal E1	563	563	515	563	274	206	223
Equivalent DS0	16890	16890	15450	16890	8220	6180	6690
Total Equivalent DS0	87210						

- $83/DS0 circuit tandem switch
- 1 to 1 mesh ratio inter-tandem connections (60% capacity)
- Leased E1 (annual)

                inter-tandem $64,211

                tandem –MSC $11,711

       Leased dark fiber (annual)

                Long Haul $789/Km/core

                Metro $1,316/Km/core

36

Assumptions (Continued)

Efficiency of Packet Networking

IP Core BW: reduced 5 times from circuit requirements
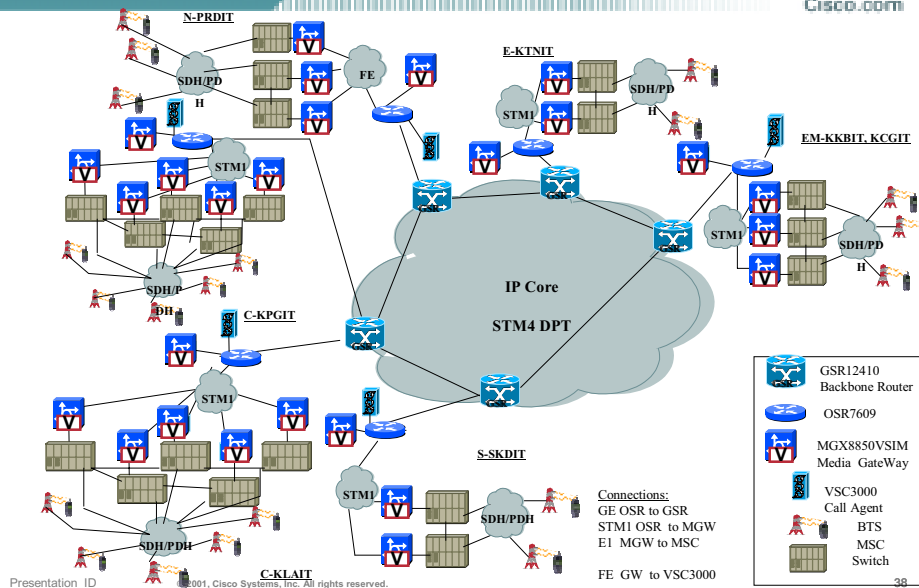
Port Count: reduced 30% to 70% of circuit requirements

 37

ROI Exercise
Proposed VoIP Solution

 38

ROI Exercise Results

Comparison TDM vs. VoIP investment						
(All units in USD)		Year 1	Year 2	Year 3	Year 4	Year 5
Total CAPEX VoIP	33,427,701	4,815,789	4,815,789	4,815,789	4,815,789	4,815,789
Total CAPEX TDM	40,161,760	31,804,135	31,804,135	31,804,135	31,804,135	31,804,135
Savings CAPEX VoIP over TDM Deployment	$ 6,734,059	$ 26,988,345	$ 26,988,345	$ 26,988,345	$ 26,988,345	$ 26,988,345
NPV		$31,723,267	$54,861,424	$76,285,642	$96,122,882	$114,490,696

CAPEX In First Year:					
VoIP equipment:		Per port	**TDM Equipment:**		Per port
CAPEX equipment Total	$24,879,923	$285	Tandem Switches	$7,267,500	$83
			Total Switch ports	87,210	
VoIP Recurring Network Lease:			**TDM Recurring Network Lease:**		
	$4,815,789	$55		$31,804,135	$365
Total Per Port	$337		**Total Per Port**	$448	

First Cost Savings of VoIP over TDM Network		**24.81%**

Logical Depiction of ROI CAPEX Results

Class 5 Switch — SDH/PDH Mesh — Class 4 Switch — SDH/PDH Mesh — Class 4 Switch

$8,337,895 $7,267,500 $23,466,240

Meshed E1   Tandem Switches   Meshed E1

Class 5 Switch

IP Core
STM4 DPT

$2,842,105
$3,947,368

Leased dark fi ber (STM1)

Leased dark fi ber (STM4)

$20,524,822
$4,038,125

VoIP Equipment
(VSC3000, MGX8850VISM)

IP Core Equipment
(GSR12410, OSR7609)
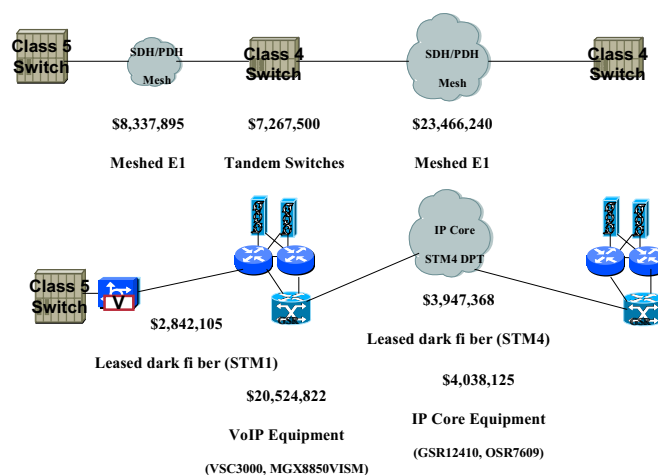
**OPEX Savings
TDM vs. VoIP**

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Circuit Tandem Switch

**12 racks for 20K DS0 ports
Power**

GSR

VSC

MG

MG

MG

**Media
GW**

**4 racks
Power**
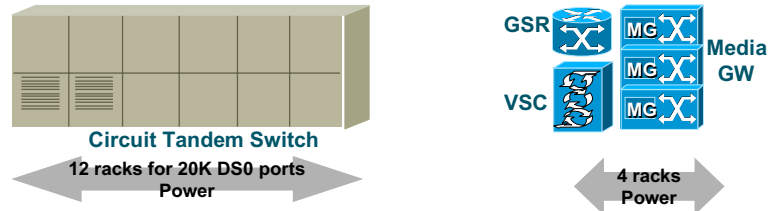
Space/Power Savings Appx.

85%

† **Add $50-75/DS0 for external or integrated echo cancellers**

 41

ROI Summary

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- **Initial CAPEX/OPEX savings realized right away (space, power, people hour)**
- **Positive Return of Investment realized immediately**
- **Open Packet Telephony provides investment protection, as well as provides ability to provide converged data/voice services keeping customer loyalty**

 42

Summary

- **Long Distance Carrier Class VOIP is Realities.**
- **Open VoIP Architecture Bring Full Set Solutions**
  - **H.323 is dominating IP Telephony Protocol**
  - **MGCP Convergence with H.323**
- **VoIP in NGN:**
  - **Not Only For Profit Margin but Survival Strategy**
- **Challenge: How to Manage The growth**
  - **Cisco Vision for internet and IP telephony**
  - **Unique Experience for VoIP Deployment in large Scale.**
  - **Leading Role with Partner for full set of application.**

SPs in APAC deployed or considering deployment of VoIP Networks

45