Cisco Evolved Packet Core

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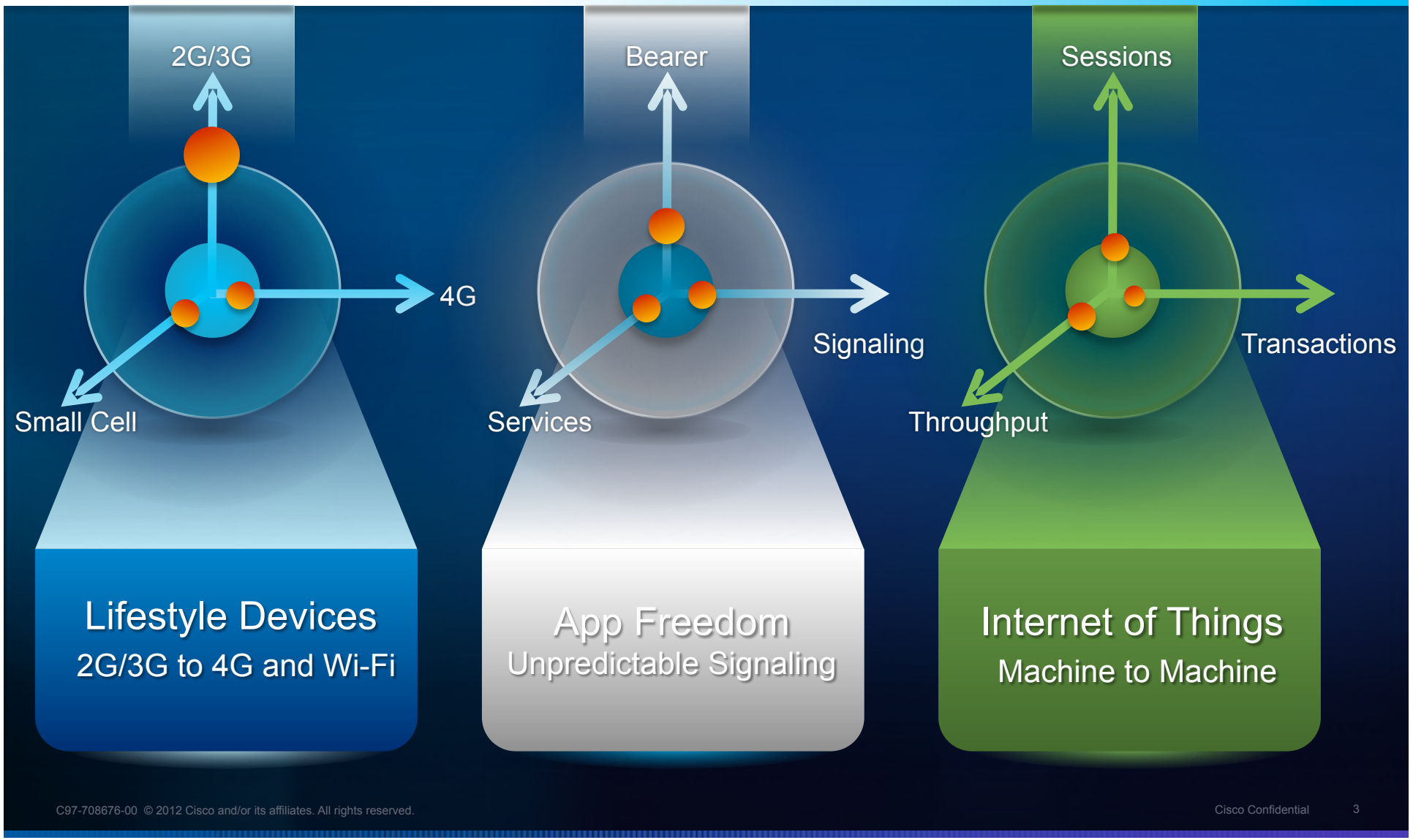
Agenda

- Cisco's Elastic Architecture
- Cisco LTE Core

The Need for Elastic Architecture
Multidimensional Elasticity



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Cisco's Mobile Internet Market Leadership

275 Operators in More Than 75 Countries

1B Subscribers Across Mobile Packet Cores

Cisco mobile packet core powers ~50% of worldwide LTE connections

45 LTE Wins

Best LTE Core Network Product Award

Cisco EPC/MPC Market Momentum

MPC/EPC Market Share

QoQ/ YoY Market Share 1QCY12

Source:
ACG Research
May 2012

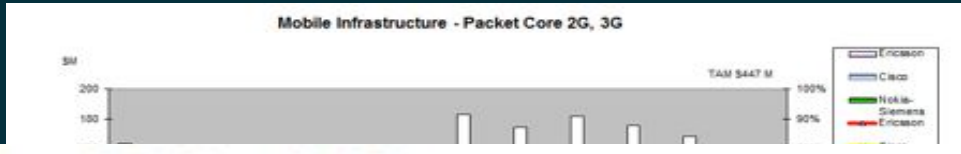
Mobile Packet Core

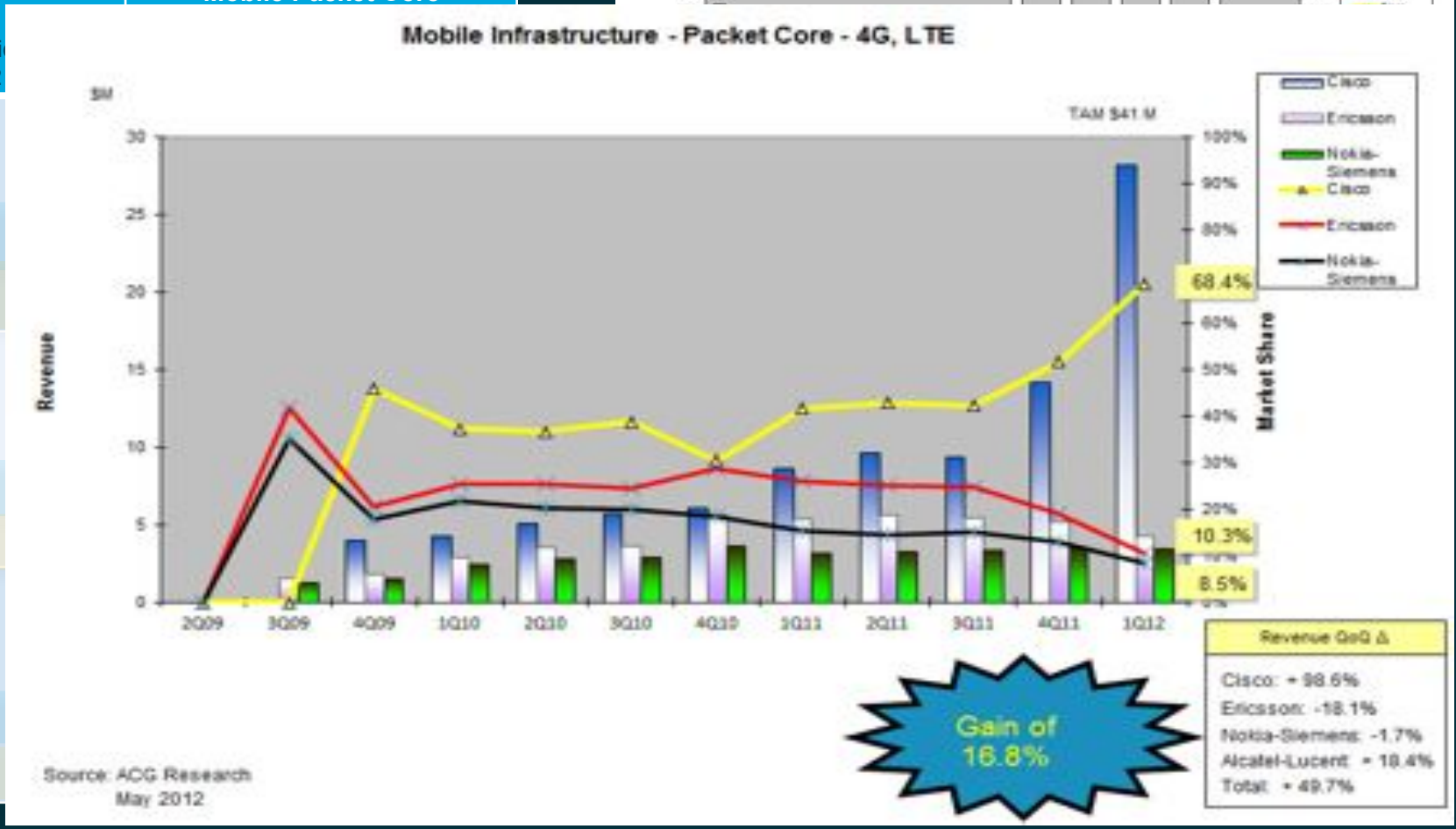
World-wi
1QCY12

#1
QoQ
YoYQ

#2
QoQ
YoYQ

#3
QoQ
YoYQ





Cisco Packet Core Swaps (Non exhaustive list)

Service Provider	Network Element	Previous Vendor	Comment
Tier 1 – UK	SGSN	Ericsson	18M subs. IOT with ALU & Ericsson RNC and Ericsson SGSN
Tier 1 – UK	GGSN	Ericsson & Nortel	18M subs. IOT with RedKnee, AmDocsMyCom, TeMIP
Tier 1 – Germany	GGSN /SGSN	Cisco-NSN	35M subs, IOT with NSN & Ericsson RNC
Tier 1 – South America	GGSN/ SGSN	NSN	3 Operating companies
Tier 1 – Spain	GGSN	Cisco-NSN	16.2M subs. IOT with HP, AmDocs, SORIA
Tier 1 – Portugal	GGSN/ SGSN	NSN	**7M subs, GGSN/PGW already in production, SGSN being swapped**
Tier 1 – Romania	SGSN	NSN	9.2M subs. IOT with Huawei & Siemens RNC
Tier 1 – France	GGSN	Ericsson	9.6M subs. IOT with Ericsson SGSN
Tier 1 – Denmark	GGSN/SGSN	Ericsson & Juniper	1.8M subs , IOT with Nokia RAN
Tier 1 – Norway	SGSN /GGSN	Ericsson	2.98M subs (deployment underway 2010), IOT with Huawei, NSN and Ericsson RAN
Tier 1 – Poland	GGSN	Huawei	5.8M subs IOT with Huawei SGSN, Comverse OCS
Tier 1 – Hungary	GGSN	Ericsson and Nokia	4.5M subs. IOT with Camient (PCRF) and Siemens SGSN
Tier 1 – Hungary	SGSN	NSN	4.5M subs. IOT with Huawei & Siemens RNC and Ericsson and Nokia GGSN
Tier 2 – Korea	GGSN	Samsung	12M subs, IOT with Samsung SGSN
Tier 1 – Ireland	GGSN/ SGSN	Nortel and NSN	2.3M subs. IOT with Ericsson Mediation Mgmt
Tier 1 – Australia	GGSN	Ericsson and Nortel	3.8M subs. IOT with Comptel (credit control) and Nokia SGSN
Tier 1 – Czech Republic	GGSN/SGSN	Huaweii	5.5M subs. In the process of Swap. IOT with Huaweii and Ericsson RAN, NSN OCS, Amdocs PCRF
Tier 1 – Qatar	GGSN	Greenfield	IOT with ALU RNC, BSC, HLR
Tier 1 – South Africa	GGSN/ SGSN	NSN	25.4M subs. IOT Nokia (Credit Control). Complete swap of Nokia SGSN and GGSN
Tier 1 – India	GGSN/SGSN	Huawei	49.7M subs. IOT with Comverse, Verint
Tier 1 – Russia	SGSN/GGSN	NSN/Ericsson/Huaweii	In the process of Swap
Tier 1 – India	GGSN/SGSN	Ericsson	19.7M subs. IOT with Huawei & Ericsson
Tier 1 – India	GGSN	Ericsson	Integration with NSN
Tier 1 – Canada	SGSN /GGSN	NSN	In the process of swap
Tier 1 – US	SGSN /GGSN	Ericsson	In the process of swap
Tier1 – France	SGSN /GGSN	NSN	20M subs
Tier 1 – Hungary	SGSN/GGSN	Huawei	5M subs,. IOT with Ericsson RAN, NSN OCS, Amdocs PCRF

Completed IOT's with RAN Vendors

3rd Party Vendor (product)	Cisco Product / (Interface)	Date Completed
e/// (eNB / MME)	SGW / PGW (S11/S1-U)	Q2 2010
e///(UE/eNB)	MME/SGW/PGW (S1-U/S1MME)	Q3 2010
NSN (UE/eNB)	MME/SGW/PGW /(S1-U/S1-MME)	Q2 2010
Huawei (UE/eNB)	MME/SGW/PGW (S1-MME/S1-U)	Q4 2009
Huawei (UE/eNB)	MME /SGW/PGW (S11/ S1-U)	Q1 2010
ALU (eNB / UE)	MME/SGW/PGW (S1-U/S1MME)	Q2 2010
Samsung	MME/SGW/PGW (S1-U/S1MME)	Q4 2010
ZTE (UE/eNB)	MME/SGW/PGW (S1-MME/S1-U)	Q4 2009
MOT (eNB/MME)	SGW / PGW (S11/S1-U)	Q32009
Fujitsu (eNB)	MME/SGW/PGW (S1-MME/S1-U)	Q2 2010
NEC(eNB)	MME/SGW/PGW (S1-MME/S1-U)	Q2 2010
NPC (eNB)	MME/SGW/PGW (S1-MME/S1-U)	Q4 2009

- Active participation in the LTE/SAE Trial Initiative (LSTI) Forum with 23 LTE vendors and 9 network operators.
- Our EPC solutions have repeatedly demonstrated interoperability with other vendor components
  - •Completed S1-MME and S1-u IOTs with majority of the leading LTE eNodeB equipment providers

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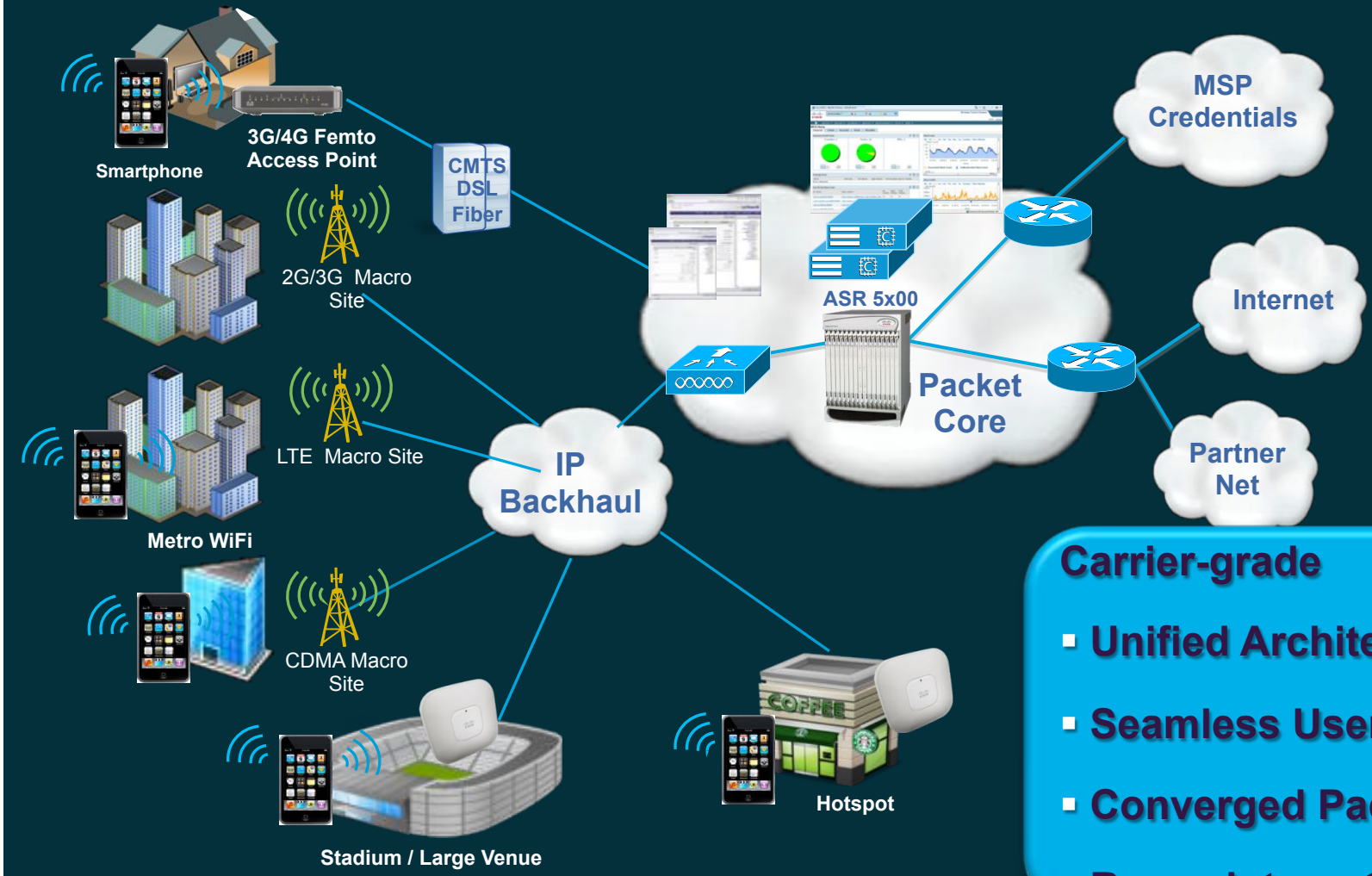
Agenda

Cisco Converged Core

Cisco Smallcells: Femto and SP Wi-Fi

Enhance Subscriber Experience, Intelligent Offload



Carrier-grade

- **Unified Architecture**
- **Seamless User Experience**
- **Converged Packet Core**
- **Reuse integrations**

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Multimedia Packet Core Leadership

Policy Control
- PCEF

IMS
- V²oLTE – IMS CSCF
- OneVoice
- Circuit Switched Fall Back

Mobile Packet Core

Evolved Packet Core
- S/GGSN, MME, P/SGW, HA, HNB GW, e-WAG (WiFi), PDSN, HA, …

In-Line Services
- Enhanced Charging (DPI)
- Video Optimization
- Content Filtering
- NAT/Firewall
- And more…

Cisco® ASR 5x00 Series

In-Line Services
Services, Policy and Actions

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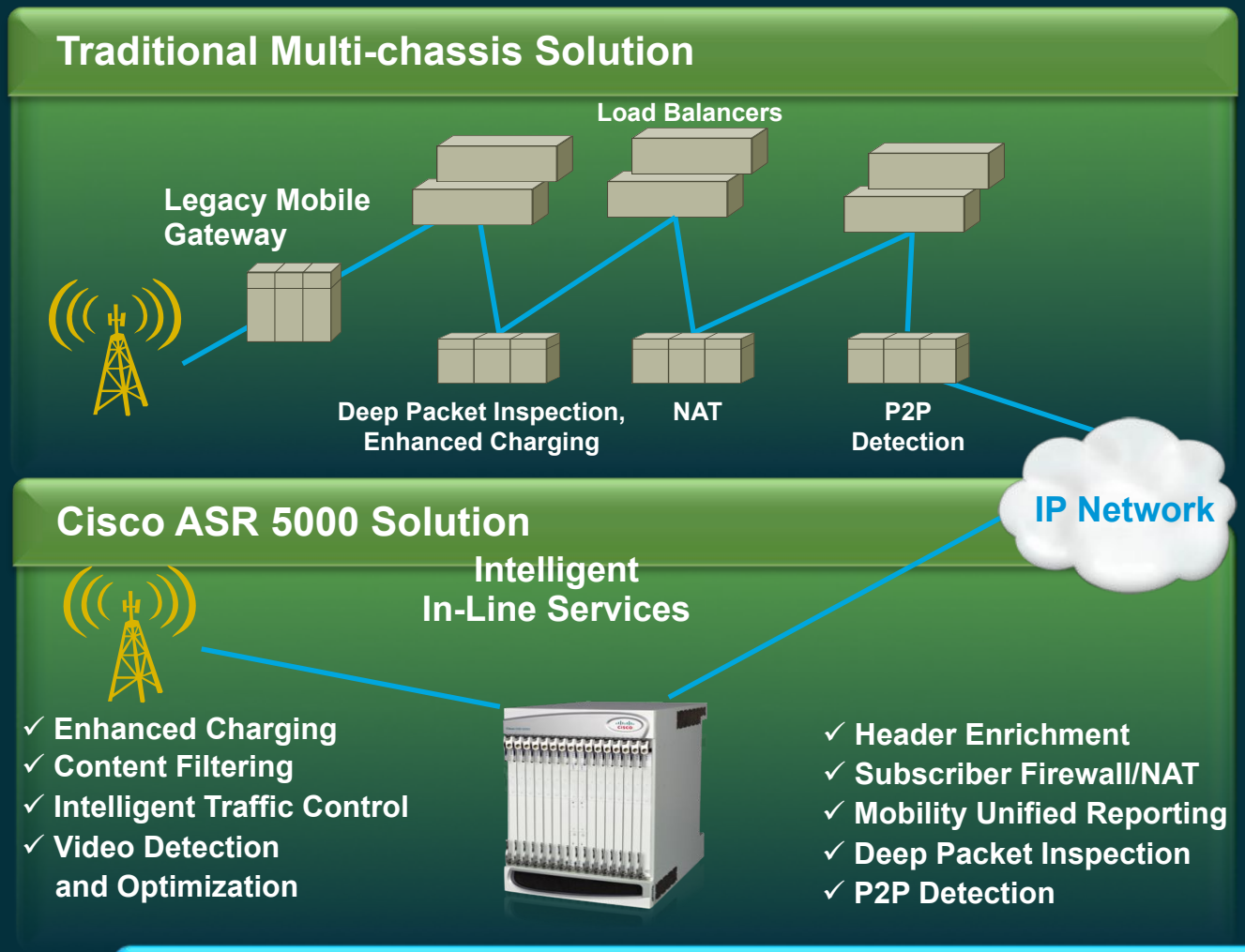
Cisco ASR 5x00 In-line Services
Integrated Intelligence



Monetize

Optimize

Secure

Increase Network Intelligence and Service Velocity, Reduce CAPEX and OPEX

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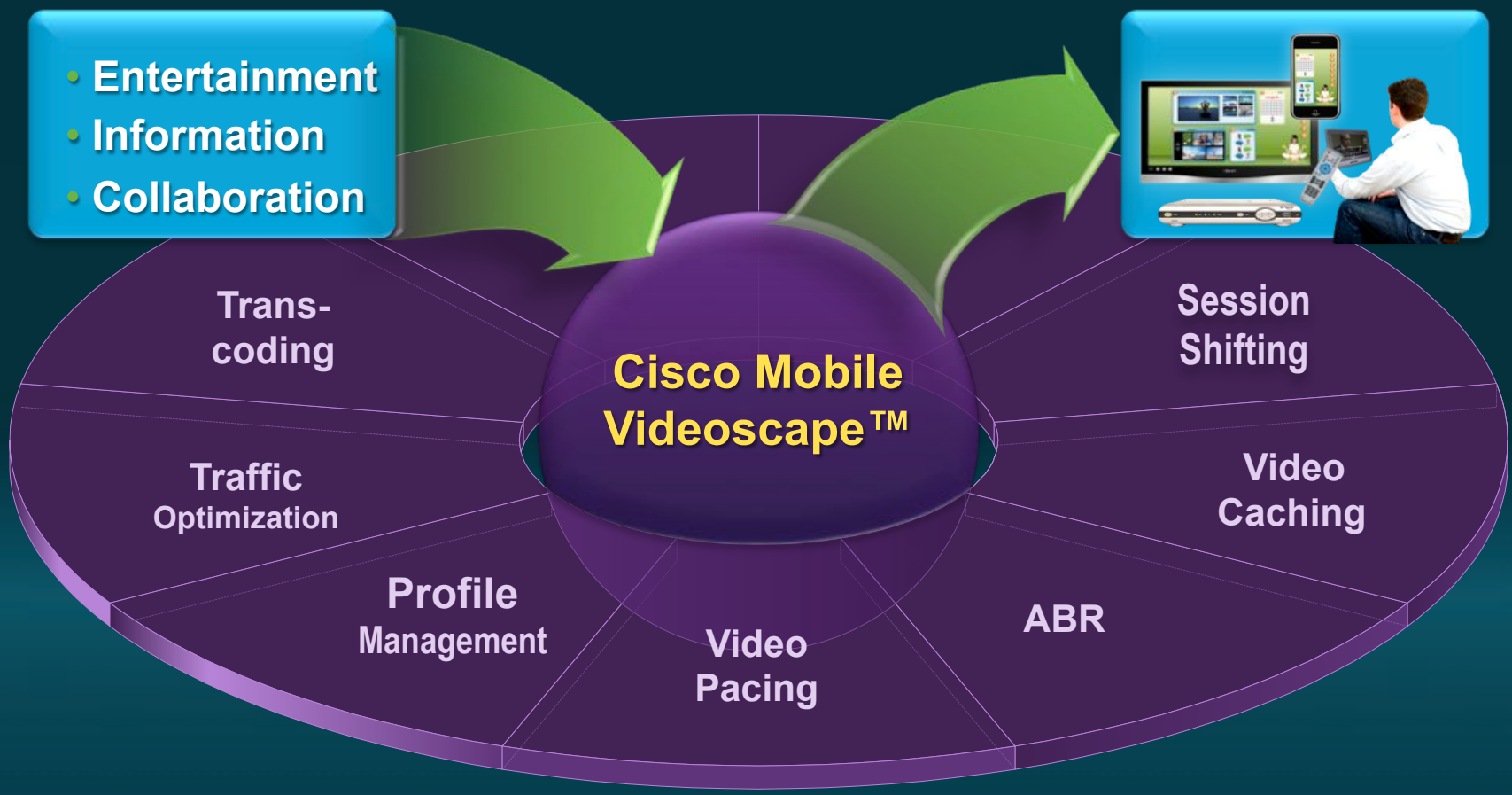
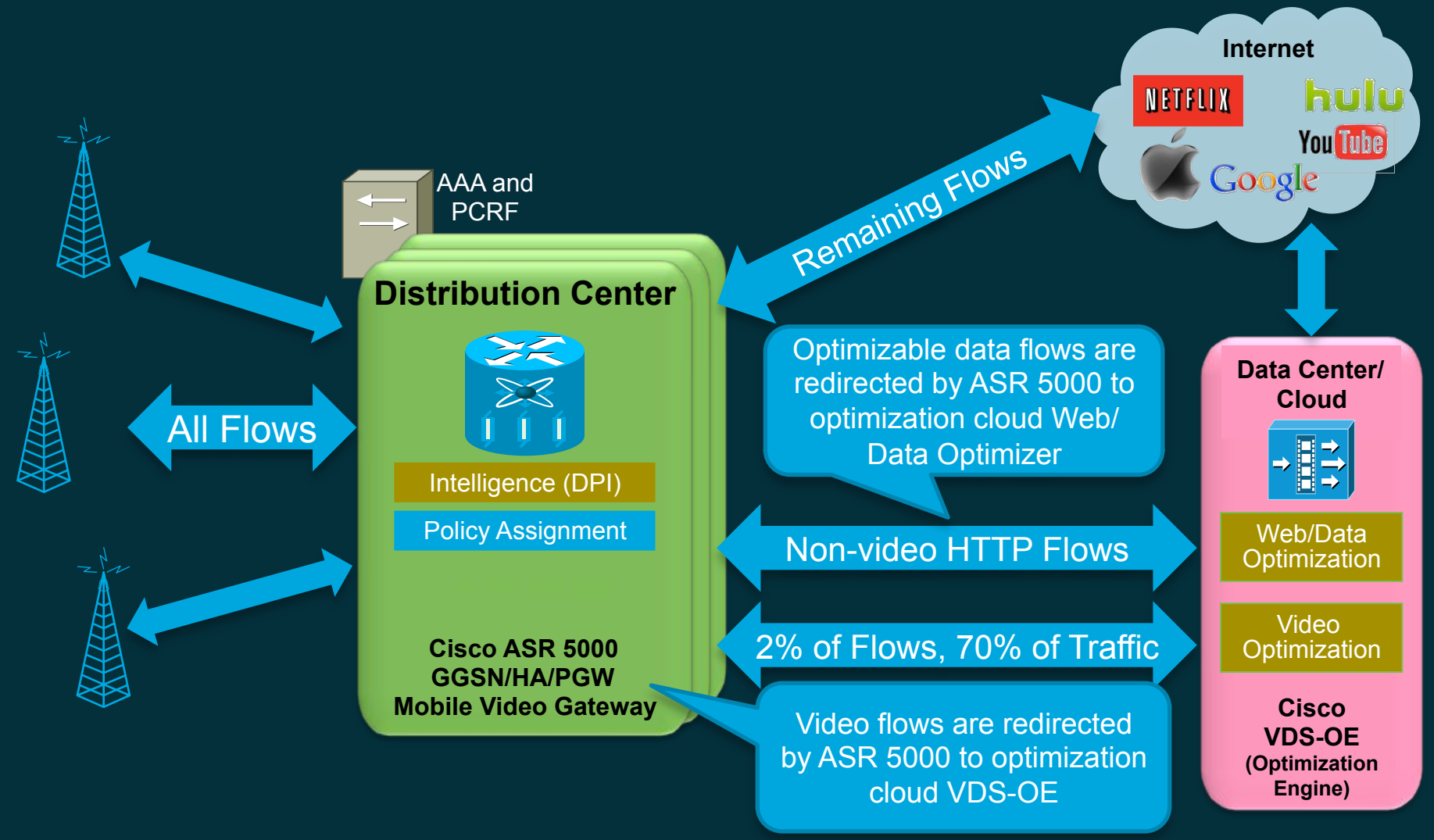
Optimizing The Video Experience



Cisco OTT Video/Data Optimization Architecture
ASR 5000 Intelligence, Efficiency and Integration



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Cisco OTT Video/Data Optimization Architecture
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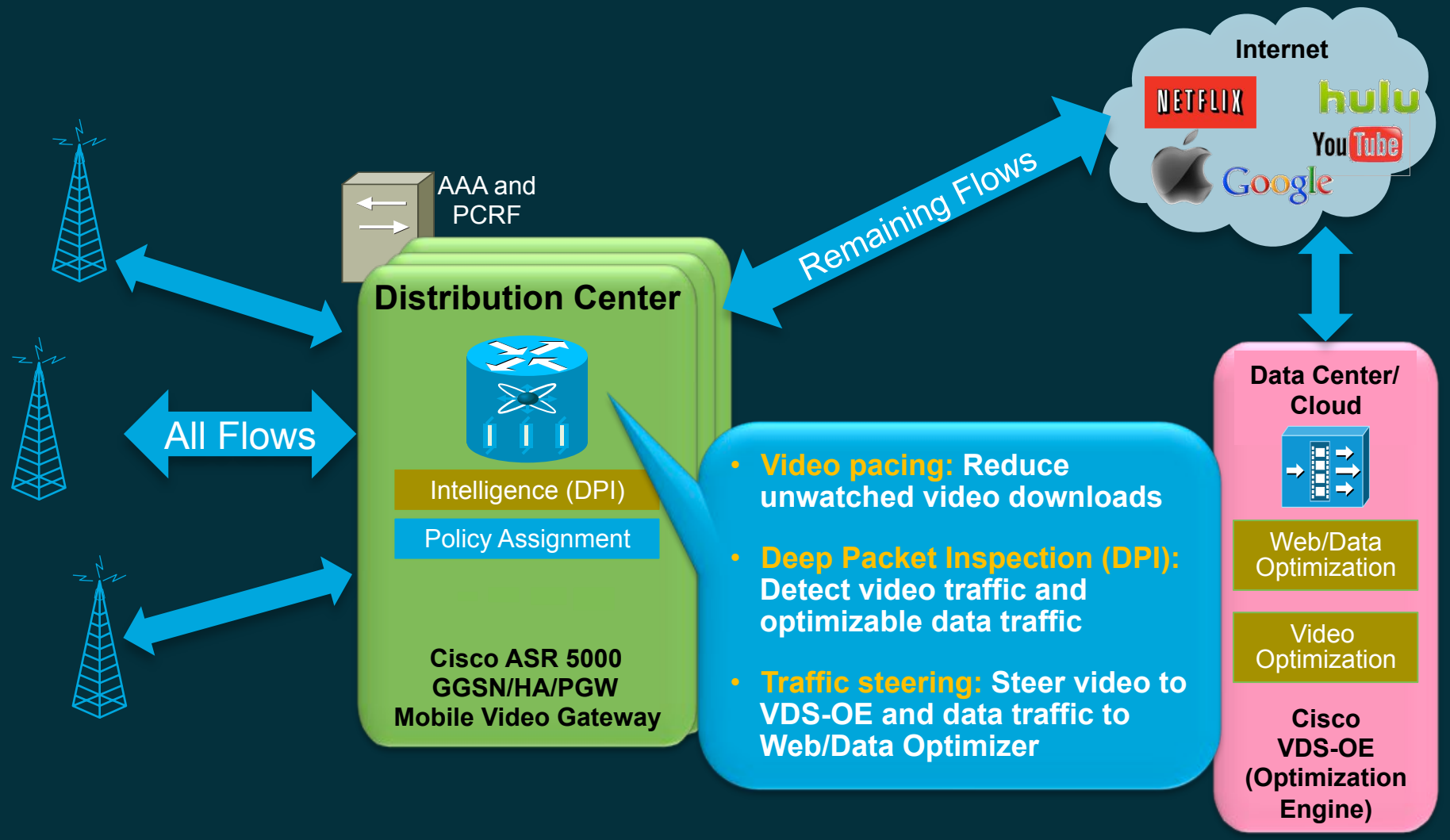

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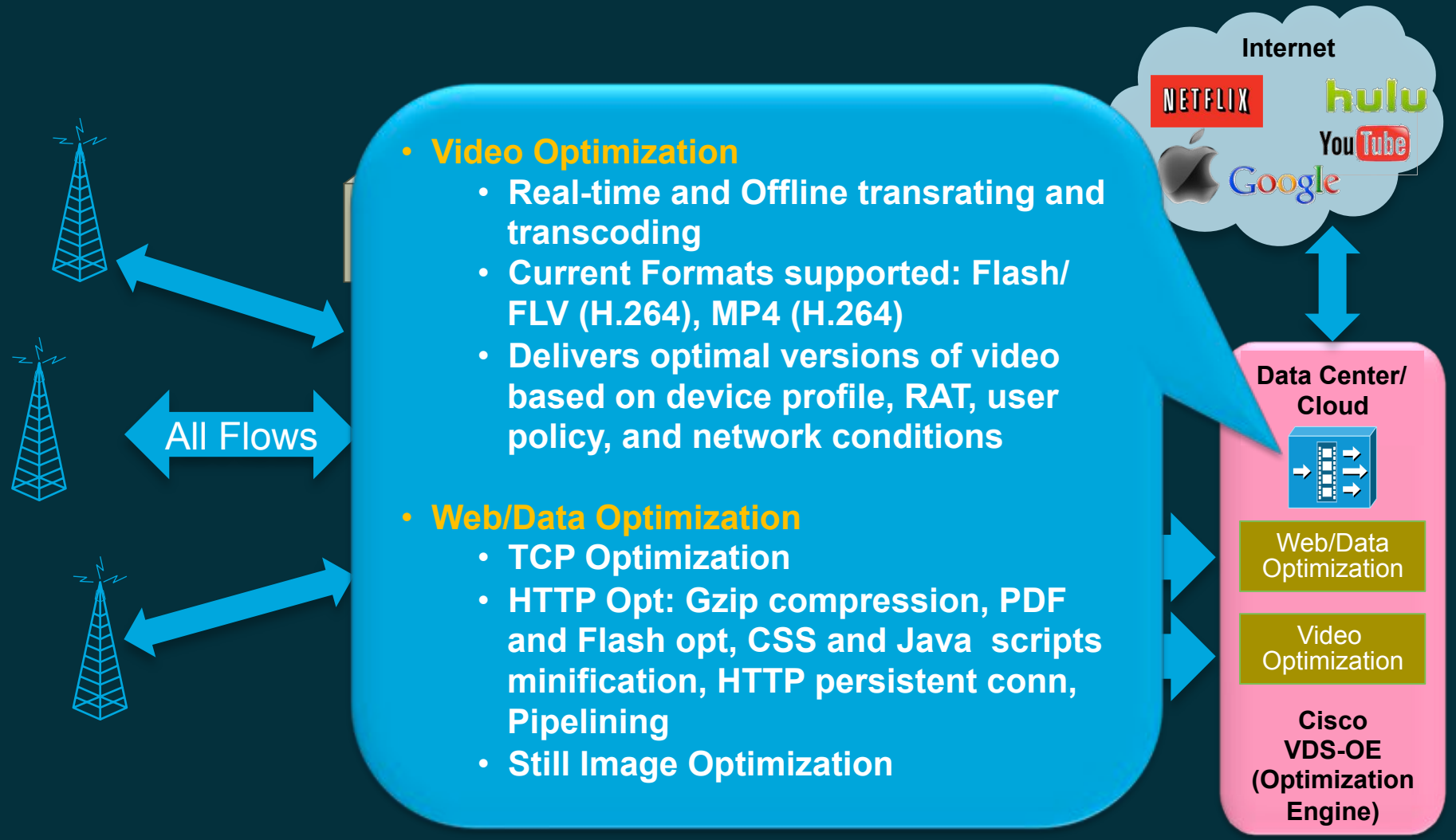

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MVG Field Readout (Pacing only)

- MVG Video Pacing
  - MVG sold and deployed in a Tier 1 US customer
  - Video data transmission savings of 26% (average)
  - Overall data transmission savings of 6% (average)
  - No issues reported by subscribers
  - No capacity/functionality impacts reported
  - Reduces overall throughput load on system – has positive impacts to capacity planning exercise
- MVG + VDS OE
  - MVG + Video optimization in a European Operator
  - 23% reduction in overall traffic (of which less than 30% is video)

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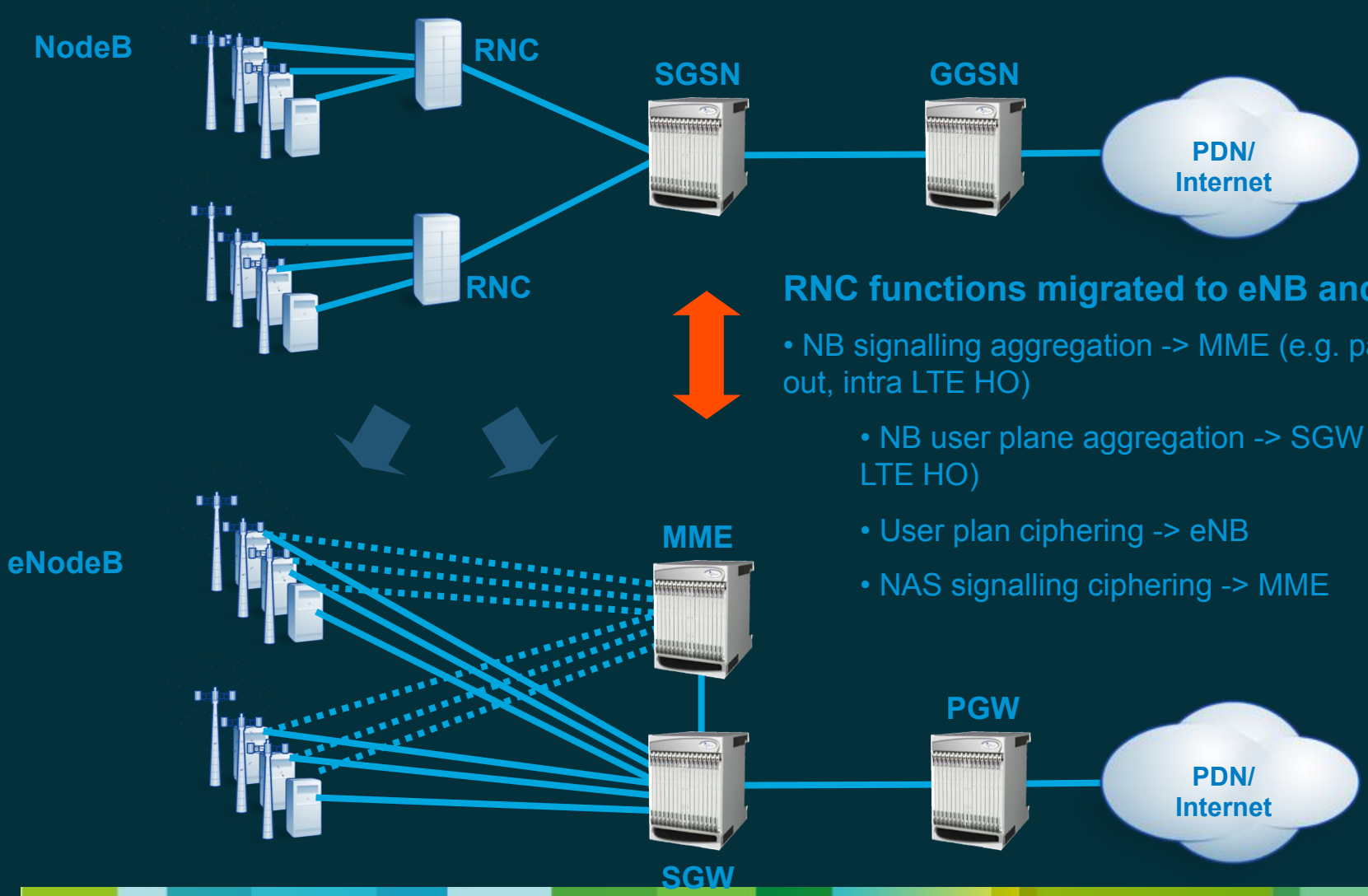
Architecture Evolution
Massive signaling increase



RNC functions migrated to eNB and EPC

- NB signalling aggregation -> MME (e.g. paging fan out, intra LTE HO)
- NB user plane aggregation -> SGW (e.g. intra LTE HO)
- User plan ciphering -> eNB
- NAS signalling ciphering -> MME

The EPC Challenge
Enabling All-IP flat architecture

- Massive increase of Throughput, Signaling and Density
- Need for an architecture that optimizes the investments, taking into account
  - Cost of transmission / routing
  - Location of the Peering points
  - Scalability of the EPC platforms themselves
- Flat IP architecture opens new possibility for network deployment.
  - - Centralized versus Distributed
- True LTE subscriber profile is unknown today, Service mix is also to be confirmed
- Holistic view must include all technologies (E.g. including WiFi, Femto, etc.)
- Re-architecting the network today to prepare LTE is a “leap of faith”

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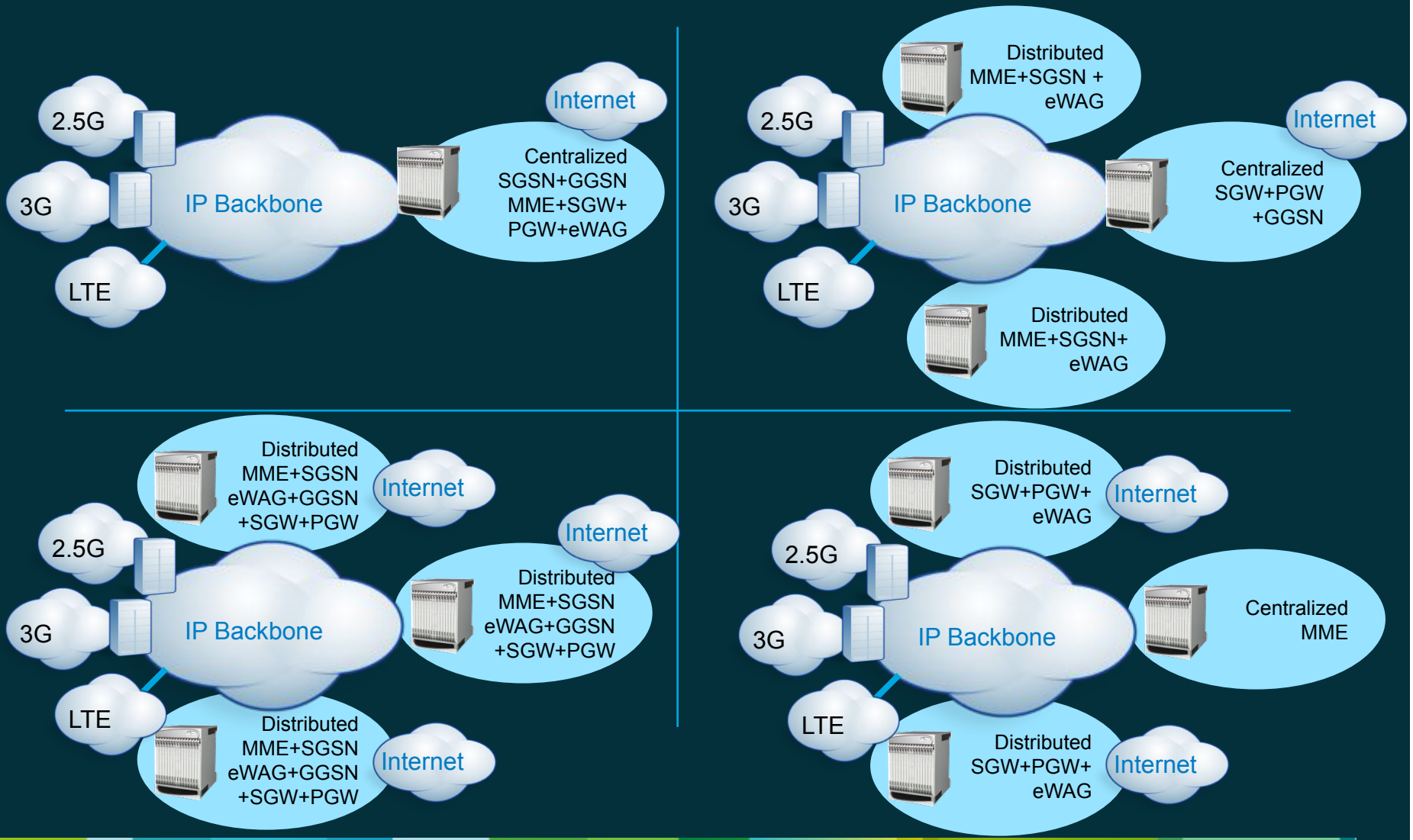
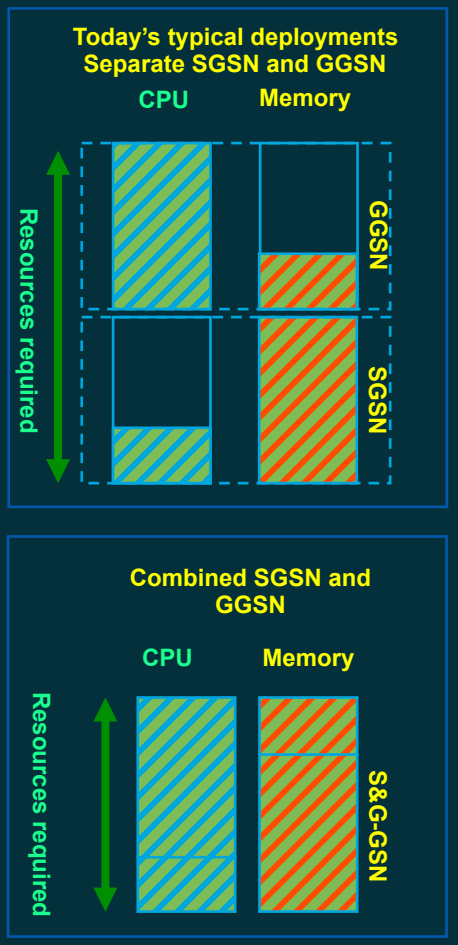
Core Deployment Flexibility

One Size Does Not Fit All



Combo: One plus One = Three !

- SGSN and GGSN on the same High Capacity Network Element
- Better usage of resources
- Reduce CAPEX, OPEX, Training, Spares, OA&M, Charging complexity, Footprint
- HW usage optimization
  - More than 30% HW savings for a large Northern European carrier



ASR 5x00 Distributed Architecture

PSC/DPC
The only card needed for services and for expansion

- Purpose designed not an adapted product
  - Call Servers: Designed for handling “high” processing
  - Routers: Designed for handling high bandwidth
  - Bladed architectures: Limited set of functions, scalability
- Harvests & applies all system resources to optimize performance & maximize capital efficiency
  - Processes distributed across the entire system
  - CPU resources are automatically adapted to meet needs
  - Single software image
- Simple, Elastic, scalability
  - Just one type of cards, no specific functional cards
    - Linear scalability – all network functions & services scale with addition of single type of card
  - Within the card, processing power elastically allocated between Signalling, Throughput, services
  - Multiple collocated functions, single platform to manage, capacity elastically allocated among the different functions
    - Single platform to manage, easy to maintain

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Non Bladed Elastic Architecture

- Single pool of CPU resources
  - Drastically simplifies the planning effort. Throughput Vs Signaling flexibility:
    - During the day (ToD)
    - As users behaviour evolves
    - As new applications are launched
    - As terminals behaviour evolves
    - During unusual conditions

- Cisco EPC as a Control Point to manage signaling storms
  - CPU gets automatically fully allocated to signaling during signaling storms
    - ASR5k typically never goes to overload during signalling storms
    - Surrounding boxes may be impacted
  - Cisco EPC supports Throttling, thus becoming the control point to manage a signaling storm

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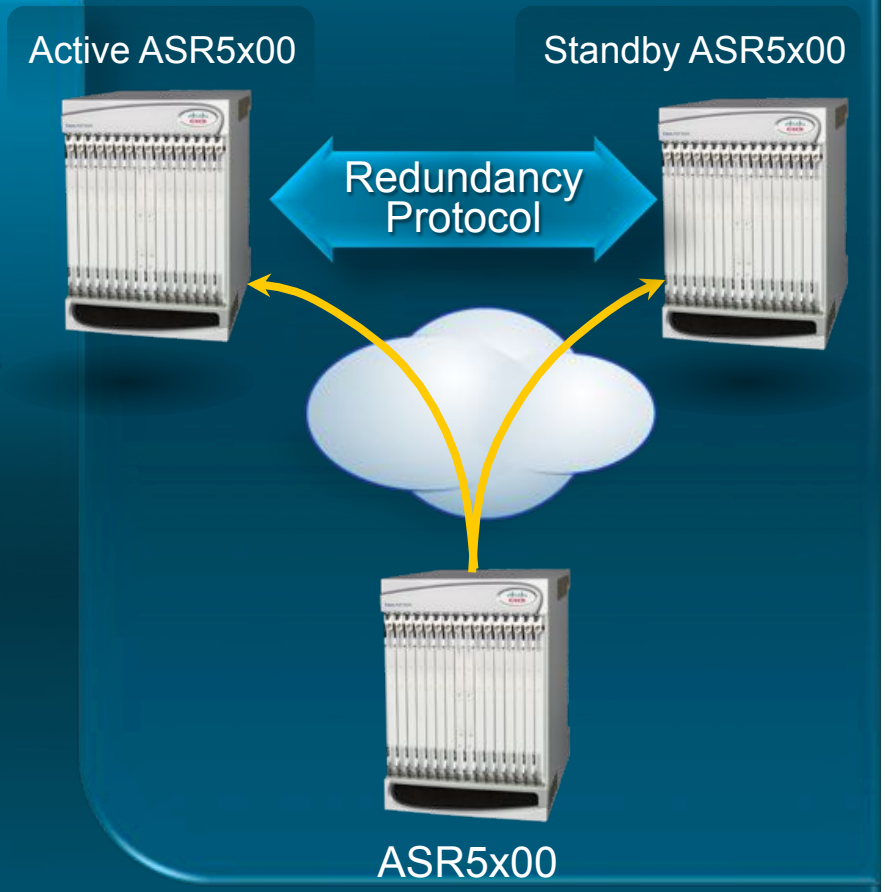
ASR 5x00 Architecture
Designed for Scalability and High Availability

- Session recovery for common services
  - Software task recovery time is 2 seconds or less
- Carrier grade architecture
  - Any terminated task will be restarted
  - State will be recovered/verified via consistency audits
- NEBS Level 3 certification
- 99.9999% reliability (6 nines)
- Stateful inter-chassis redundancy
  - Nodal redundancy due to catastrophic failures
  - Power outages, fiber cuts, loss of routing table
  - SW upgrades across major software versions



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ASR Family of Platforms

Common Operating System = StarOS

Platform Selection based on Scale & Deployment

ASR 5000
PSC2 Series

ASR 5000
PSC3 Series

ASR 5500

PSC2 Card
Session Capacity: 4M
2 Bearers/Session=8M bearers
* Throughput: 30G
Signaling: (MPS): 180K

PSC3 Card
Session Capacity: 7M
2 Bearers/Session = 14M Bearers
*Throughput: 50G
Signaling (MPS): 280K

ASR 5500 w/ DPC
Session Capacity: 10M+
3 Bearers/Session = 30M Bearers
*Throughput: 200G – 1TB
Signaling (MPS):400K

- Actual performance is call model dependent and varies based on number/type of rules
- Supports any access technology (GSM/GPRS, UMTS, HSPA, fixed, femtocell, Wi-Fi, WIMAX, LTE)

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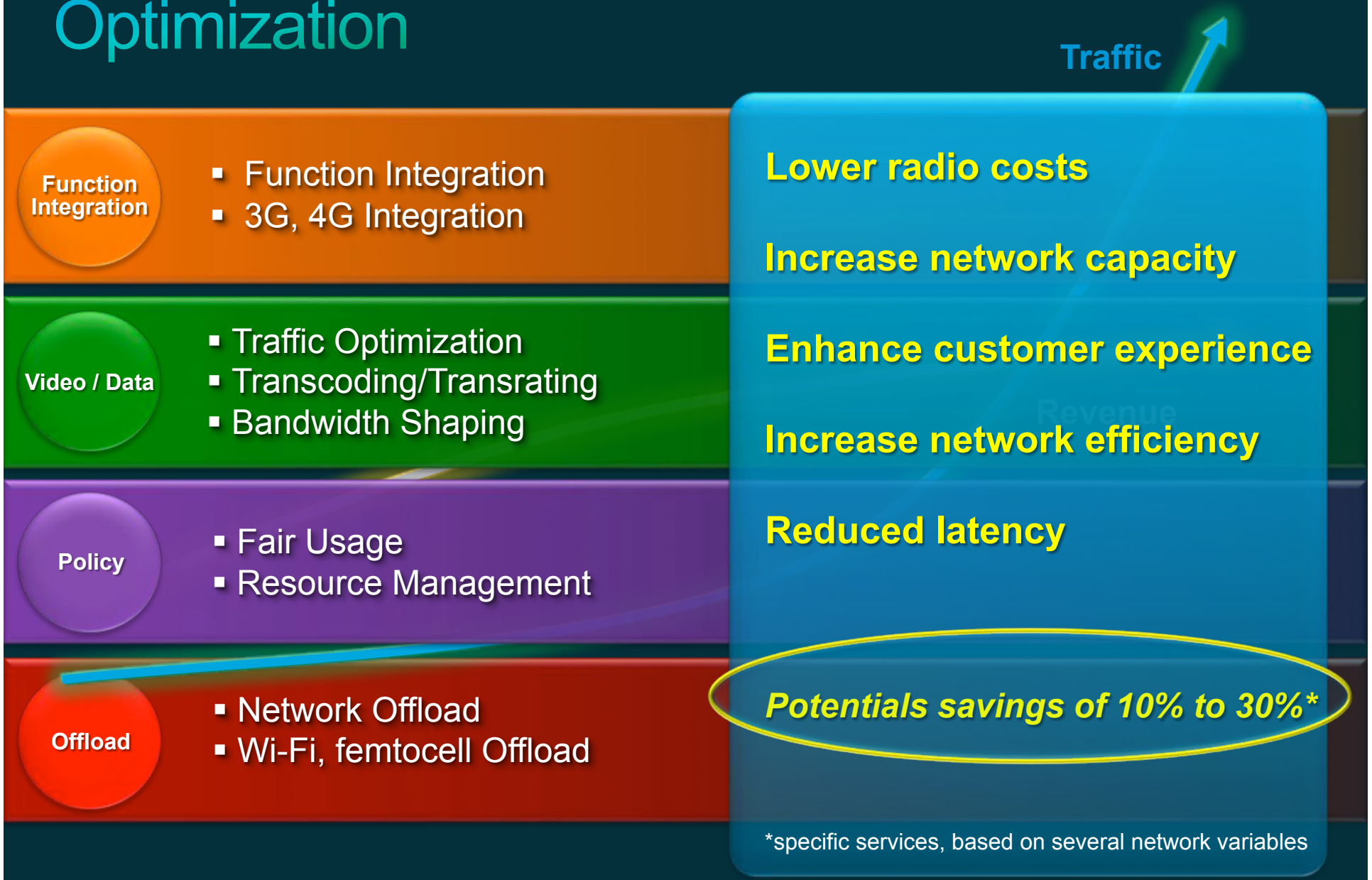
Optimization



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Thank you.