

LTE Roaming Challenges and Opportunities

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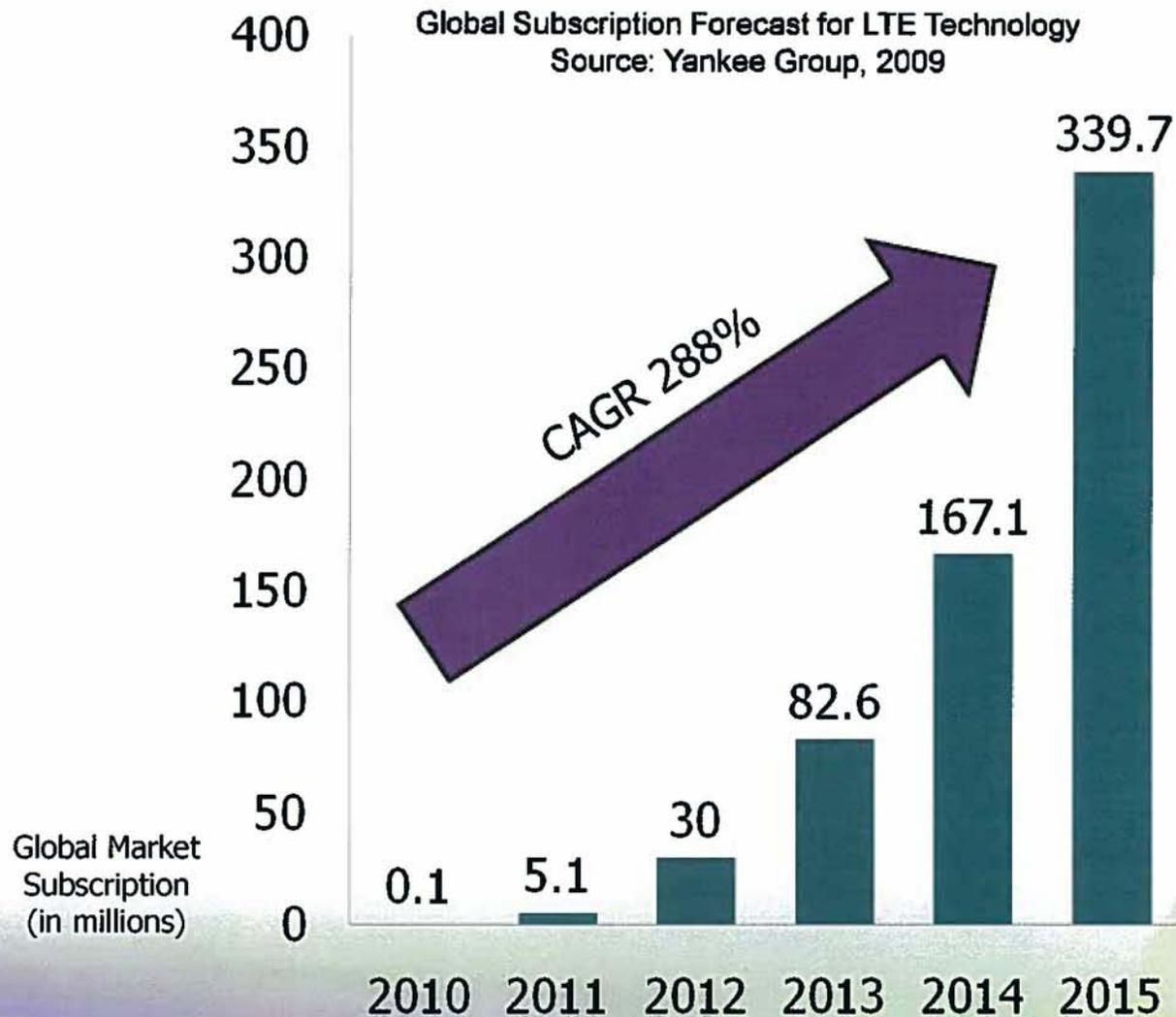


LTE Progress Today

- Network evolution to LTE is inevitable due to demands for mobile broadband solutions
- A dozen operators committed to deploying LTE in 2010, 125 operators are planning or in LTE deployment
- North America will be first to deploy LTE, closely followed by several countries in Asia Pacific and Europe
- Spectrum harmonization underway globally on spectrum allocation and strategies for LTE
- LTE roaming trials are starting

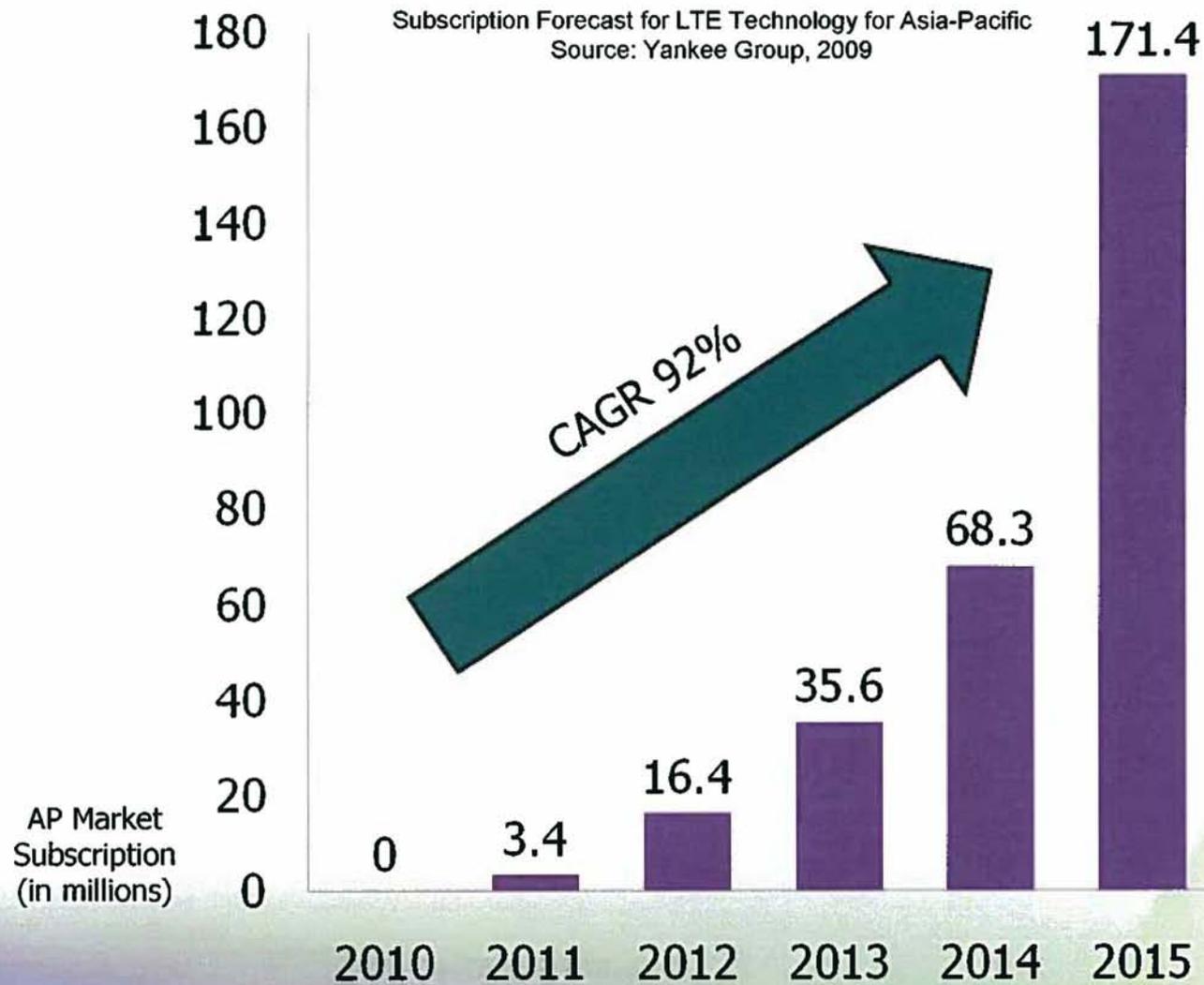
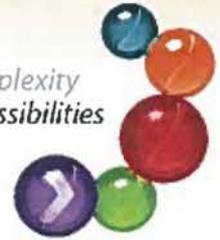
Global LTE Adoption Forecast

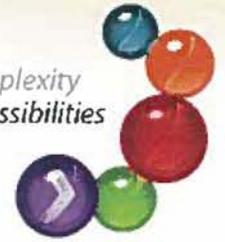
Simplifying complexity
Delivering possibilities



LTE Adoption Forecast for Asia Pacific

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LTE Impact on Roaming

- Core network evolution
 - EPC/IMS specs, standards bodies
 - Impact on charging models
 - Local breakout
- Support new protocols and interfaces
 - Diameter, SIP, PMIP, GTPv2
 - S6a, S8, S9, S13, etc.
- Network interworking evolution
 - IPX: Support for LTE and IMS, QoS
 - Backward compatible
- Interworking between LTE and legacy networks
 - Multiple roaming scenarios coexist
 - More complex testing



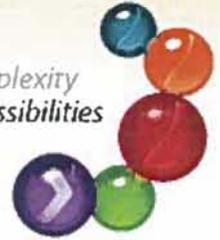
LTE Impact on Roaming - Core

- 3GPP evolved packet core (EPC) and IMS specs provide technical support for LTE roaming
 - Details for local breakout in visited network being outlined
- GSMA roaming in LTE (RiLTE) and next generation roaming and interworking (NGRAI) groups are addressing LTE roaming
 - Focus on issues such as handling voice calls in LTE roaming environment
 - 3GPP QoS class identifier (QCI) mechanism is one of the options for application awareness
 - Use of deep packet inspection (DPI) is explored by NGRAI



LTE Impact on Wholesale Charging

- The GSMA transferred account data interchange group (TADIG) is reviewing the impact on wholesale clearing and settlement processes, and TAP record specification
- Planning new recording entity-type codes for the serving and PDN gateway network elements to TAP record specification in May 2010
 - Addition of QCI codes to TAP records under investigation
- Full TAP support for LTE/IMS roaming currently being evaluated by GSMA working groups



LTE Local Breakout Impact on Retail Billing Processes

- Local breakout: Ability for the home operator to direct subscribers' data sessions to the visited network PDN-GW
- 2G/3G operators can choose to use TAP records from visited network or G-CDRs from home GGSNs to enable retail billing
- If local breakout is used in LTE, then CDRs will not be generated by PDN-GWs in the home network
 - May cause operators to move to retail billing based on visited network, TAP only, or a combination of visited network TAP and home PDN-GW CDRs

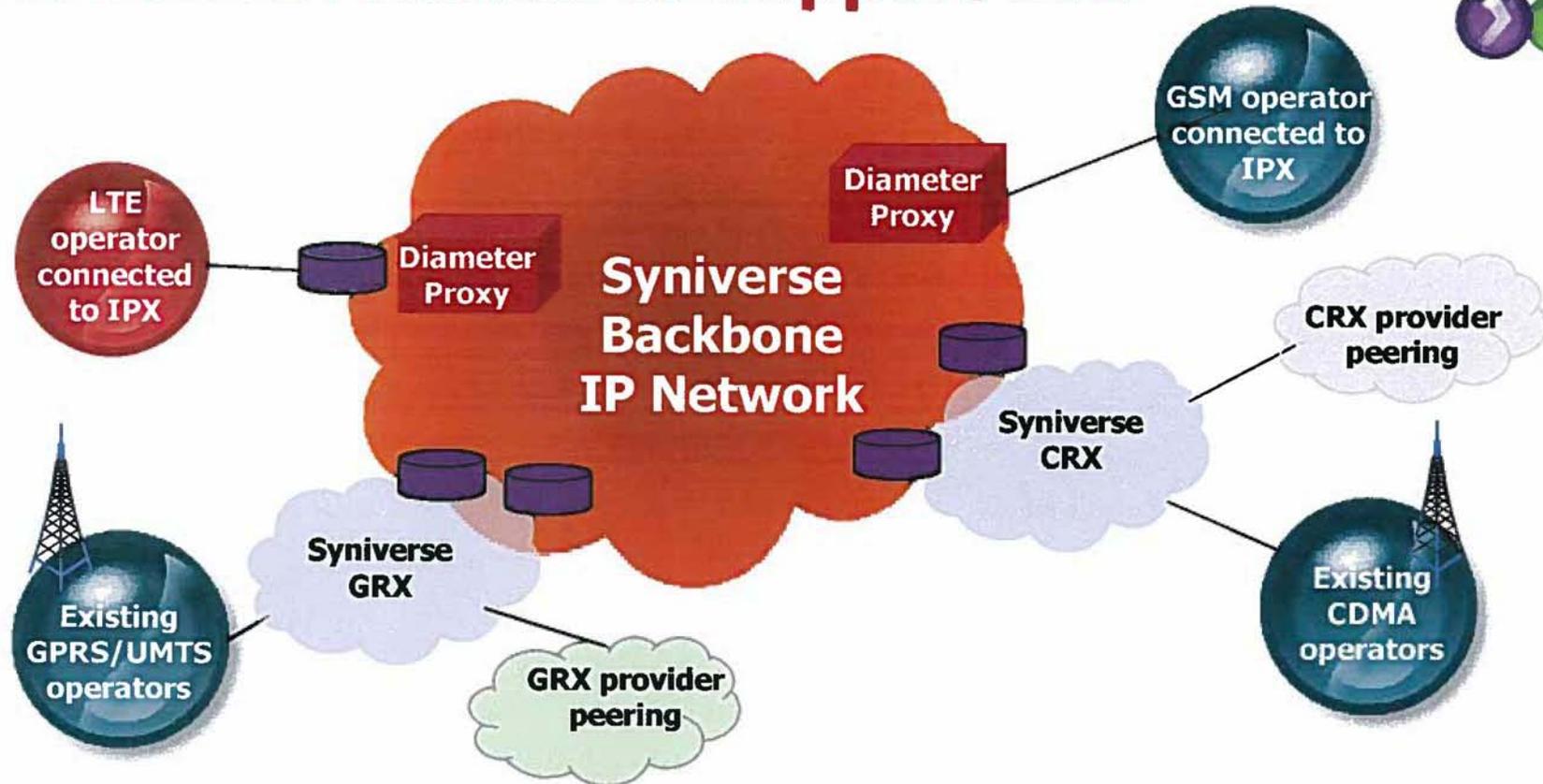


Network Interworking Evolution

- GRX supports GRPS, EDGE, 3G, HSPA data roaming and MMS interworking
 - No inherent support for LTE or IMS
 - Only specified for use by mobile network operators
 - No required support for QoS
- IPX is developed by the GSMA to foster open standardized IP connectivity for multiple types of service providers
 - Provides for end-to-end QoS in support of both roaming and interworking for LTE and IMS
 - Fully backward compatible with GRX networks
 - Used by MNOs, FNOs, ISPs and ASPs



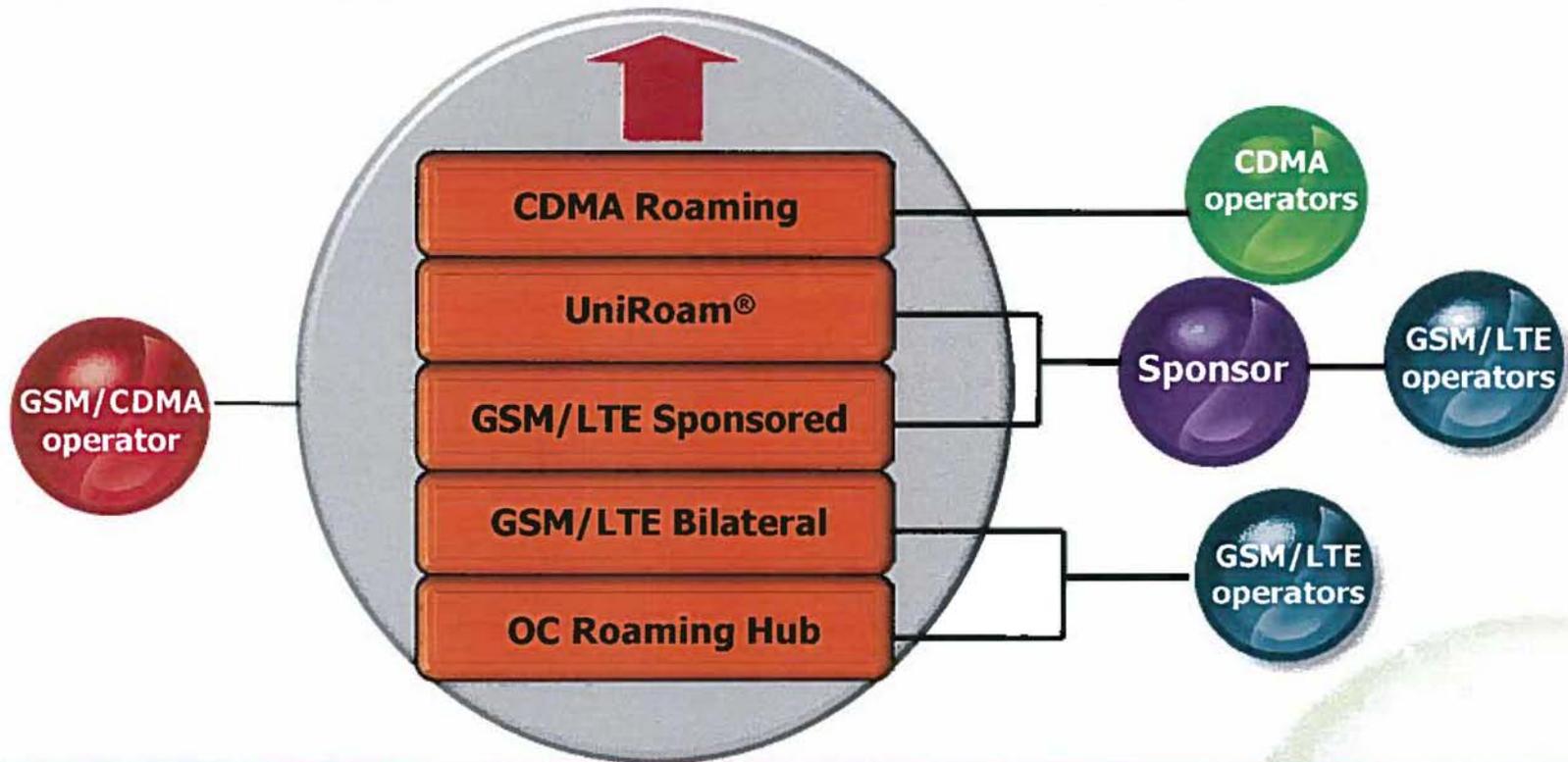
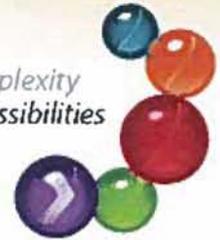
Network Evolution to Support LTE



- Single connection points (geo-redundant) for converged service
 - CRX, GRX, signaling (IP Sigtran), IPX (LTE), others
- End-to-end QoS supported for 2G/3G/LTE through an IPX network
- Option to reuse existing network assets (GRX/CRX)

Integrated Roaming Solutions for LTE & Legacy Networks

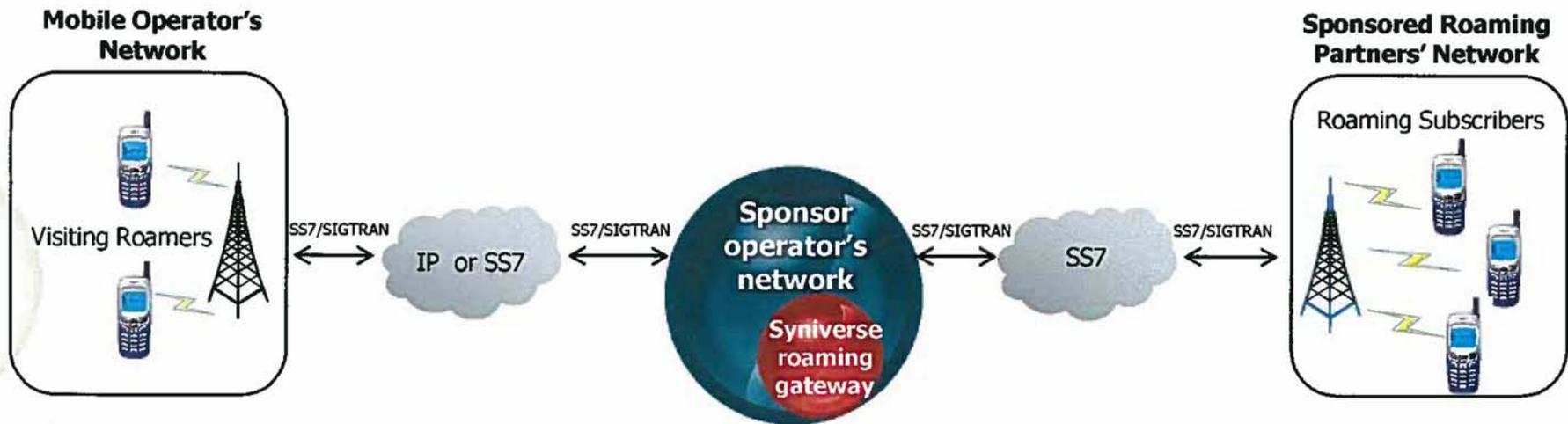
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Integrated solution across multiple technologies ensures end user QoE and simplifies operations and support

Sponsored Roaming

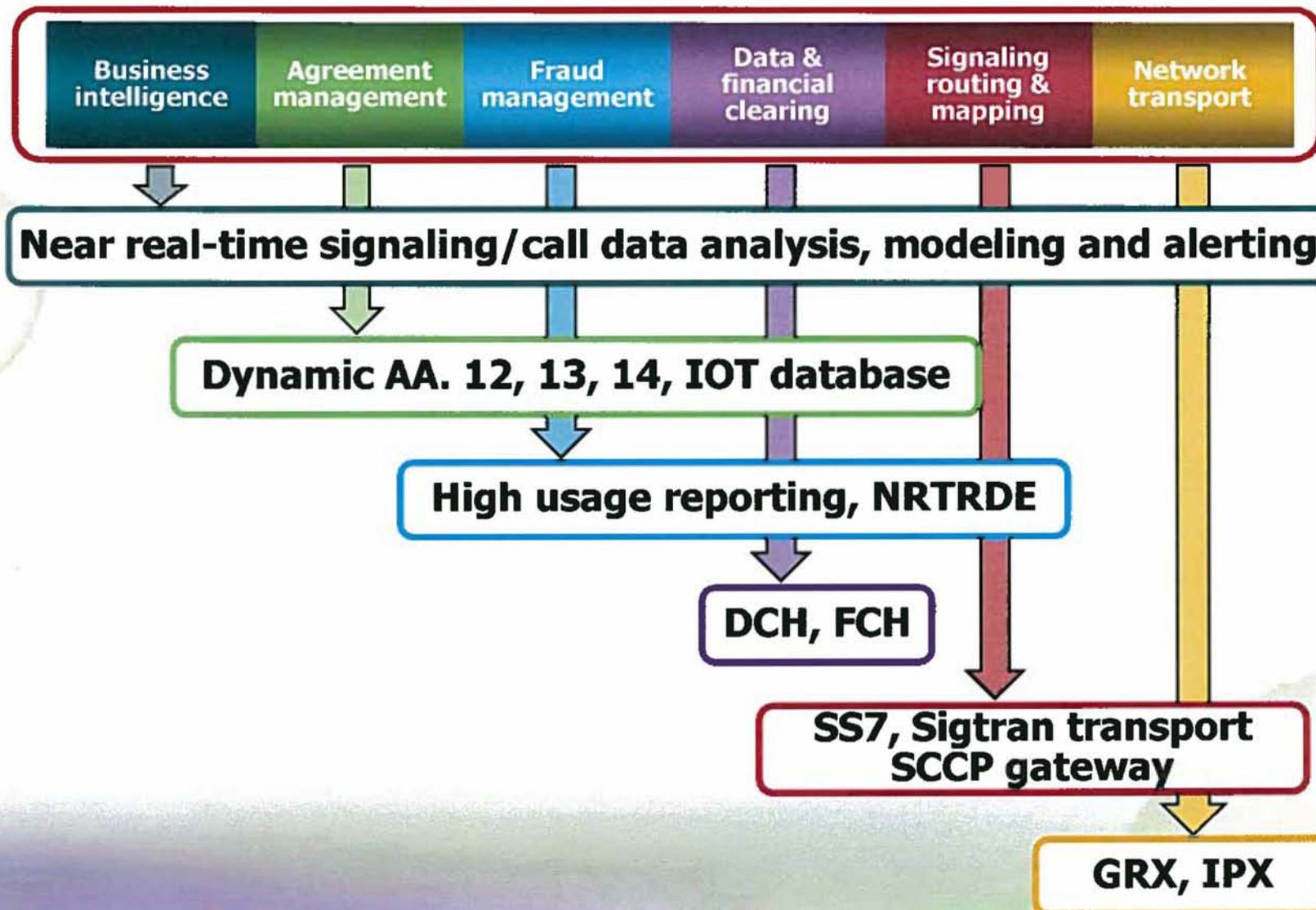
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- Complete end-to-end sponsored roaming solution, supporting inbound and outbound roaming
 - Uses sponsor network and Syniverse's Sponsored Roaming platform
 - Syniverse utilizes an implicit IMSI range from the sponsor network
 - Operation is invisible to subscriber
 - Subscriber retains home MSISDN
 - Operator retains control in home HLR
 - Support for inbound roaming is subject to GSMA BA.21 requirements



GSM/LTE Bilateral Roaming



Roaming Hub

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Agreement Management

Simplifies establishment of roaming agreements and launch of new services with roaming partners

Data Clearing House*

Financial Clearing House

One contract/ one invoice for billing, settlement and clearing

NRTRDE*

Facilitates transmission of call detail records in near real time

Visibility® Services*

Customer tools and services to manage hub-related information and processes

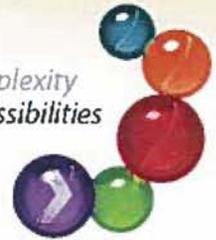
IREG TADIG Testing

Hub-coordinated testing services using automated testing equipment

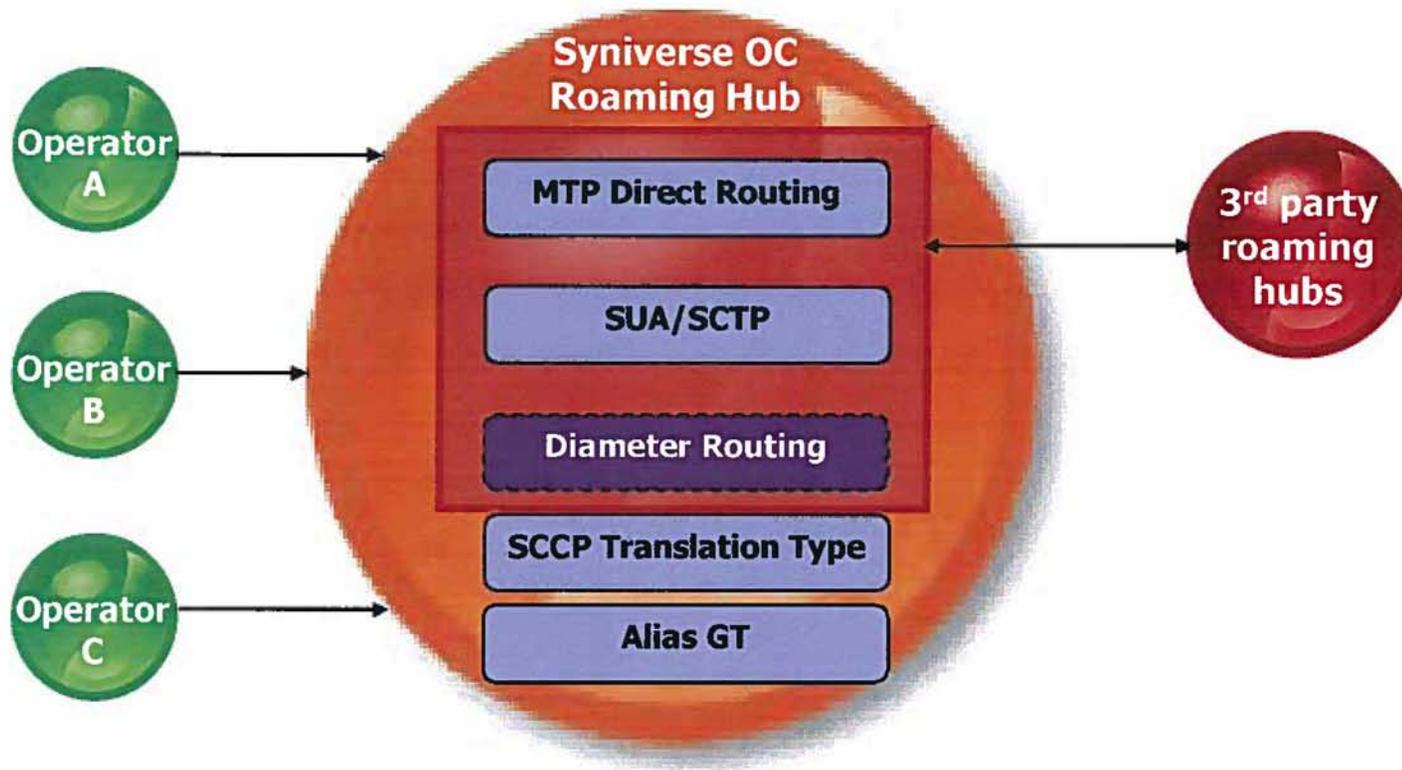
Centralized Signaling/ Network

One signaling configuration for routing to hub that enables symmetrical routing

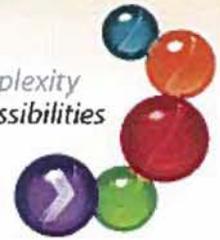
*Optional



Roaming Hub Signaling Architecture



- Syniverse has defined a new roaming hub architecture method "diameter routing"
 - On both MNO-hub and hub-hub interfaces
 - Change request to GSMA PRD IR.80 (Syniverse is the author)



Integrated Approach to Hubbing

- Importance of value-added services such as business intelligence, CAMEL Hub and virtual roaming environment
- Integrating messaging/interworking
- Future proof: Support for IPX, roadmap to 4G
- Other critical criteria to successful and sustainable hubs:
 - GSMA certification
 - Neutrality and independence
 - Complete and proven capability
 - Financial stability
 - Global presence
 - Holistic approach to simplify operations
 - Leadership role in GSMA and hubbing project



Business Intelligence: Improving End-User Experience While Optimizing Revenue

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Operators

Advanced Analytics

Revenue Optimization

Subscribers

Actionable Alerts

Personalized Interaction

Business Rules Engine (BRE)

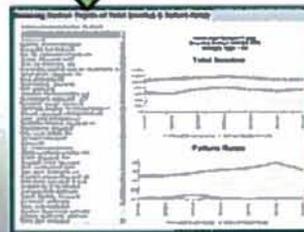
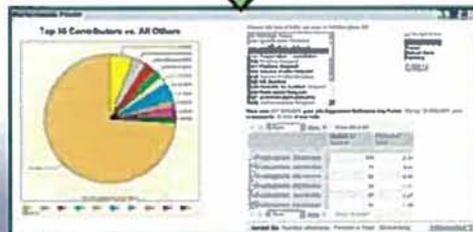
Visibility®
Services -
RoamProActive

RoamWise

RoamMonitor

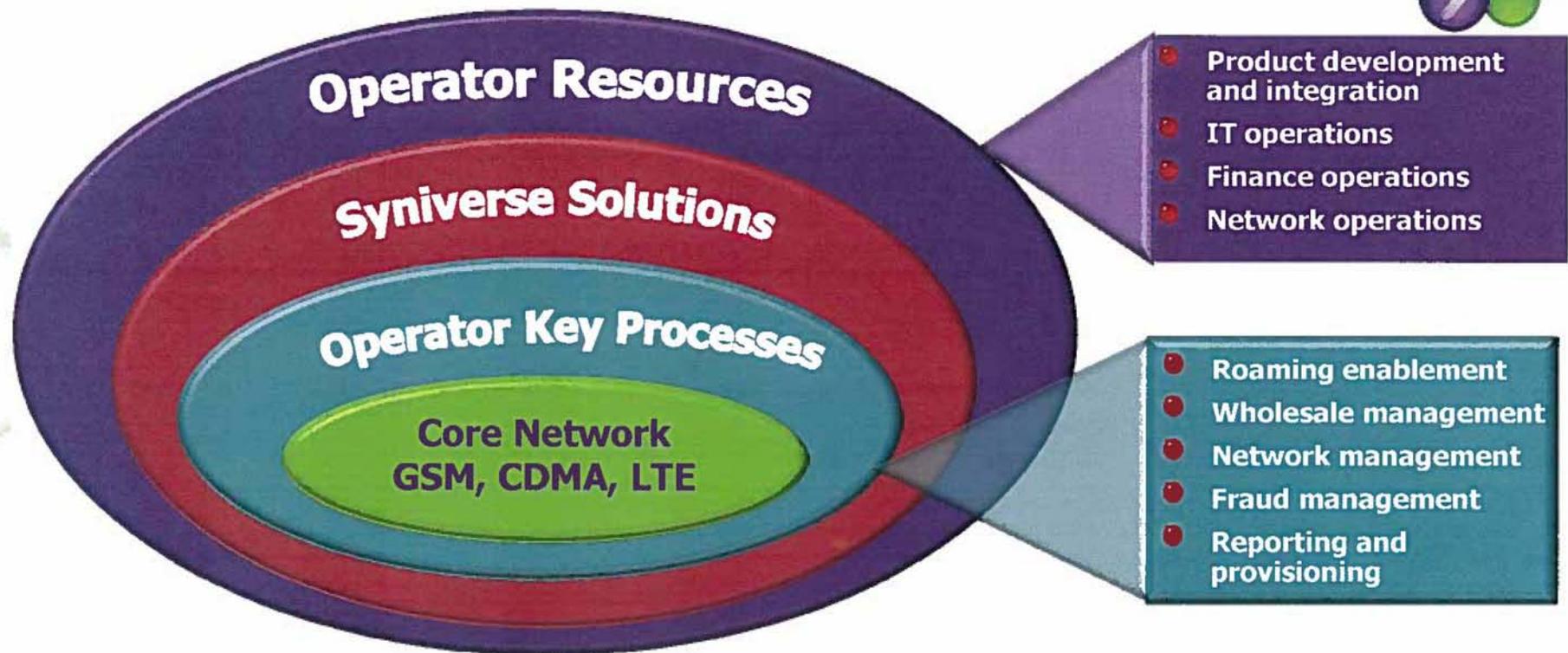
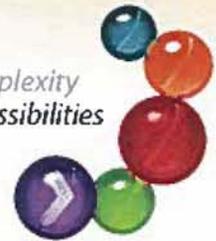
Value Proposition

- Proactive alerting and resolution
- Personalized interaction with end user
- Near real-time actions based on analysis



Operators' Partner for Now and Future

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Uniquely qualified partner on CDMA/GSM/LTE evolution path

- Business continuity
 - Consistent process and tool sets
- Maximum efficiency and profitability
 - Focus on being the best operator
- Evolved integrated solutions
 - Vs. piecemeal, compartmentalized approach
- Full support for all networks and processes
 - Multi-network seamless evolution and integration



Conclusion

- LTE roaming brings many roaming and interworking challenges and opportunities across network and billing processes for operators
- Roaming solutions need to support LTE protocol and network evolutions
- Integrated solution across core/transport network, billing and operations support needed to ensure optimal QoE
- Syniverse is a uniquely qualified partner to support evolution to LTE and provide integrated solutions that align with operator network systems and billing processes