



# LTE DEPLOYMENT SUCCESS

Will You Avoid the Most Common Pitfalls?

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## OPERATIONAL CHALLENGES

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### Conformance and operation within the LTE network

- New network elements, including combined 3G/LTE nodes
  - Flat, all IP architecture with mixed NEM environment
  - Rapid expansion of new user devices
  - Mobility with new spectrums and coverage footprints
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### Inter-operation with other networks

- Hand overs to existing 3G networks for coverage and fallback
  - Mobile voice services often initially provided by non-LTE networks
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### Troubleshooting tools and processes for Tier 2-3

- New protocols and signaling flows
  - Processes must be reengineered
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### Proactive performance monitoring

- Meeting accessibility, retainability and performance goals
  - Delivering throughput and latency to match defined QoS performance standards
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### Manage traffic growth and continuous network expansion

- Critical decisions on when and where to deploy nodes, expand pooling, offload traffic
  - No historical data to guide planning
  - Constant change control and network tuning
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## How to avoid the most common LTE pitfalls

Deploying an Long Term Evolution (LTE) network is a significant undertaking for any operator. Facing complex interoperability requirements, high profile commercial deadlines and an entirely new architecture, the pressure is on to make a splash on the competitive scene with a high-performing next-generation network that exceeds subscriber expectations.

With an opportunity to win significant market share with an aggressive rollout schedule and stellar first impression, operators are looking for solutions and expertise that will help them address the steep learning curve and stay ahead of the competition.

NETSCOUT knows first hand what it takes to manage a major technology turn across an organization. Working alongside the world's leading operators, we've helped identify a number of pitfalls that can be avoided with the right monitoring approach. The following is a summary of lessons learned from the front lines of some of the most successful LTE network deployments.

### Eliminate the blind spots

When customers experience problems with the network, they do not expect to bear the burden of proof by having to recreate the issue for support teams to capture and analyze. In many cases, they do not even know or care if the problem is related to 3G or LTE. Accurate correlation of network activity to a particular subscriber is needed to enable and accelerate the resolution of subscriber issues whenever they are reported. For mobile networks, this correlation is typically made possible through the use of temporary IDs that are associated with an International Mobile Subscriber Identity or IMSI. In 3G, this temporary ID changes frequently and is therefore easily captured by a variety of monitoring methods.

In LTE however, the network's inherent security properties allow for less frequent updates of this critical identifier known as the Globally Unique Temporary ID (GUTI).

In some cases, this GUTI may remain unchanged for more than 24 hours. In such instances, missing the exact moment of assignment means you lose visibility to the subscriber's associated activities for an entire day. Furthermore, even if the keys are captured, without the ability to accurately decrypt and correlate them to the subscriber, meaningful and timely analysis is impossible.

The ability to correlate the GUTI to the IMSI is fundamental to ensuring data integrity and success when troubleshooting complex LTE problems. It is also required when tracking subscribers across multiple technology domains.

Only a solution that can support continuous real-time capture across all network topologies and minimize post-processing requirements can accurately retrieve all the associated messages and deliver a more complete troubleshooting view.

### Clear Administrative Hurdles

The race is on to launch and expand LTE coverage. With operators turning up countless eNodeBs at a breakneck speed, critical back office administrative tasks are easily overlooked. In some cases a growing backlog of node assignments and configuration tasks will result in a delay in the operator's ability to accurately assess and track the performance of newly active nodes. In others, the manual process will introduce seemingly insignificant errors that ultimately produce a blind spot in the network.

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## COMMERCIAL CHALLENGES

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### Early, efficient integration with BSS and processes

- Must avoid creation of silo or duplication of operations
  - Delays add risk Empowering customer care
  - Minimize escalations
  - Facilitate capture of troubleshooting data when escalation is required
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### Manage new revenue and service strategies

- Direct pricing and third-party monetization opportunities
  - Location-based services
  - Track subscriber behavior and service usage
  - Intelligence is crucial to adapt to rapid, unpredictable changes in use
  - Monitor Quality of Experience at individual and subscriber group levels
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To certify the overall interoperability of deployed network entities and maintain acceptable performance levels across the entire network, operators have to stay in lock step with fielded infrastructure.

Solutions that can identify new entities based on the messages exchanged can reduce the reliance on lagging communication channels and minimize administrative tasks—keeping operations teams current with network changes. Once identified, automatic configuration tasks can further ensure accurate and immediate monitoring system visibility for comprehensive protection of deployed assets from day one.

### Find the Needle in the Haystack

In LTE's all-IP network, DNS is used to facilitate highly secure routing to serving gateways. These important infrastructure DNS messages however are easily lost in the flood of superfluous internet or user DNS traffic. Problems can arise when critical routing message failures are masked by the sheer volume of user DNS. Unless network personnel can easily filter out the non-essential DNS and proactively monitor secure routing functions, they may be blind to a widespread network outage until it occurs.

Solutions that can simplify troubleshooting efforts through the tagging and visual discrimination of user verses infrastructure DNS messages can deliver a clear advantage. By enabling proactive alarming on the messages that matter most outages are preempted.

### Prevent an Outage Avalanche

Software updates and rapidly expanding coverage areas drive a continuous cycle of LTE network tuning. Whether upgrades involve IMS, core, or access technologies, changes are often geographically disparate and require implementation by multiple parties.

While such changes are often necessary to keep the network functional, the frequency of on-the-fly implementations can readily introduce and breed configuration errors. Without the inherent expertise and experience to predict how changes may impact LTE's mixed NEM environment, operators are flying blind.

And, while many operators adopt a simple element-based change procedure methodology, network elements are limited to hourly KPI reporting. To truly stay on top of behavior changes during an upgrade, operators need more granularity.

To circumvent these challenges, operators need a way to monitor individual node behavior before, during, and after a change is committed. By deploying a solution that can support minute-by-minute analysis of specific procedure failures, operators gain the granularity and unbiased analysis they need to identify risk indicators the very moment they occur. Armed with this visibility, operators can detect emerging problems and prevent massive network outages with immediate corrective actions or change control rollback.

## Bridge the Knowledge Gap

While proactive alarming is paramount to preventing a major LTE outage, the ability to identify the next best steps in resolution is of equal importance. As LTE is a relatively new technology, even the most experienced personnel will face a significant learning curve in the first months of operation.

Guided workflows can begin to fill this critical knowledge gap with easy-to-follow drill through analysis paths that take users from top level node and service violations to explore suspect and related nodes with access to deep dive troubleshooting at the packet level.

Paired with timely alarm capabilities that may be adjusted to trigger based on by-the-minute KPI threshold violations, network troubleshooting teams will begin to learn how new network elements interact as they find and fix problems faster than ever before.

## Count on Every Hop

LTE's flat, all-IP architecture creates new challenges for network troubleshooting teams trying to pinpoint the precise moment of QoS degradation and isolate any number of contributors. As interworking between LTE and existing 3G networks will remain a necessary practice for service delivery, operators must be able to follow the packet no matter where it goes. The criticality of this capability is best illustrated in the following example.

Outside of VoLTE, traditional voice calls are typically handed down to the 3G network. Once the call completes however, the network requires a trigger to indicate a hand back for LTE-enabled data speeds and throughput.

For many operators this trigger relies upon the device being idle for a period of time. In practice, this idle threshold may never occur as devices and smartphone users are "always on."

To rectify this issue and ultimately prevent customer complaints regarding slow data connections, it may be necessary to identify the hand back trouble spots and fine tune network parameters and triggers. For this level of inspection, operators need a complete and chronological view of all associated activity for a given session.

With a solution that automatically and efficiently captures and stores critical session information for offline analysis, network operations teams always have the information they need to identify specific faults, document root cause and make recommendations.

## Strike the Right Balance

With ever-increasing and largely unpredictable bandwidth demands, efficient use of deployed network resources is a top priority. To delay CAPEX spending, pooling architectures of MMEs and SGWs are employed to effectively balance network loads and ensure network and service accessibility and availability.

The design of these pooling architectures is exceedingly difficult in that LTE's inherent self-healing characteristics can fool the individual nodes and create a signaling storm between them. While the network is performing the necessary functions and will not register a fault, individual nodes and pools are compromised with excessive and unnecessary signaling that can register a false capacity limitation or result in node overload conditions.

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## LTE ADVANTAGE

Ensure LTE deployment success with a solution that excels at addressing LTE's unique challenges. NETSCOUT provides technology turn leadership with real world experience and a history of NEM developer intimacy. Discover how our LTE essentials package can ensure your operational and commercial success and keep you away from the most common pitfalls.

### Eliminate the blind spots with full subscriber-based correlation

- Patent-pending mapping algorithms efficiently decrypt and correlate subscriber identities including GUTI, IMSI and MSISDN.
- Real-time capture eliminates post-processing and ensures critical messages are captured.
- Cross-domain expertise enables tracking across mixed network topologies and architectures.

### Clear administrative hurdles with automatic network discovery

- Auto-discovery eliminates manual and error-prone intervention otherwise required to begin monitoring.
- Immediate configuration accelerates visibility to new node activity.

### Prevent an outage avalanche with real-time visibility

- Critical performance metrics are presented and updated every 60 seconds in a single dashboard.
- Degrading service is detected immediately allowing rollback or other corrective actions to be taken to minimize the impact.

### Bridge the knowledge gap with guided workflows

- Intuitive GUIs assist less experienced personnel in identifying critical LTE node relationships.
- Real-time alarms identify key impact areas for clear prioritization.

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A system that can accurately measure changes in volume/rate and effectively monitor transaction-based performance indicators for pooled entities can improve an operator's ability to identify problem areas. With the ability to alarm on high volumes of modified bearer KPIs for example, operators are empowered to improve network efficiency and delay CAPEX spend through targeted network optimization techniques.

### Spring Forward

Beyond assuring the basic functional operation and maintenance of the LTE network, operators cannot ignore the commercial aspects. Service uptake predictions are already heralding unprecedented data usage and bandwidth growth. Coupled with the availability of new LTE-enabled devices, operators have to begin tracking and benchmarking actual user traffic in order to stay in line with subscriber demands and expectations.

With the help of correlated service and network performance data derived from the same system employed to keep it up and running, operators can begin to understand how LTE subscribers, devices and new applications actually use and consume valuable network resources. Armed with meaningful, unbiased and consistent information, operations and engineering personnel can make more informed capacity investment decisions that meet increasing bandwidth demands without sacrificing network reliability. In addition, these same insights can foster alignment with marketing teams to proactively prepare for surges in use expected from a promotional campaign.

## ESSENTIALS REQUIRED FOR YOUR LTE SUCCESS

An LTE essentials package can help you ensure your operational and commercial success.

### Analyze Sessions

Uncover and analyze the specific calls and sessions that fail to deliver required performance.

### Analyze Traffic

Identify and resolve network, service and infrastructure performance issues – often before your end users are impacted.

### Analyze Protocols

Invaluable granularity and deep dive packet-level analysis aids seasoned engineering teams looking to reduce MTTR.

## LTE ADVANTAGE CONTINUED

### Find the needle in the haystack with DNS traffic discrimination

- Tagging and separation of User DNS from Infrastructure DNS allows for a better view of what matters most.
- DNS Timeout support includes visibility to provisioning and IMS core changes.

### Count on every hop by following the packet through the network

- Automated session capture and PCAP storage enables offline analysis.
- Time-stitching capabilities ensure the presentation of a complete chronological view of activity.
- Bandwidth thresholds help to isolate when packets are lost at technology or element boundaries.

### Strike the right balance with effective pooling validation

- Display traffic volume/rate within the pool.
- Configure alarms for each MME or SGW in the pool based on the maximum load threshold values.
- Prevent false alarms from consuming valuable resources.
- Spring forward with a solution that gracefully extends value beyond operational goals
- Tracking of actual usage from day one enables better alignment with growing capacity and tuning needs.
- Common platform easily extends visibility for use with other departments.



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