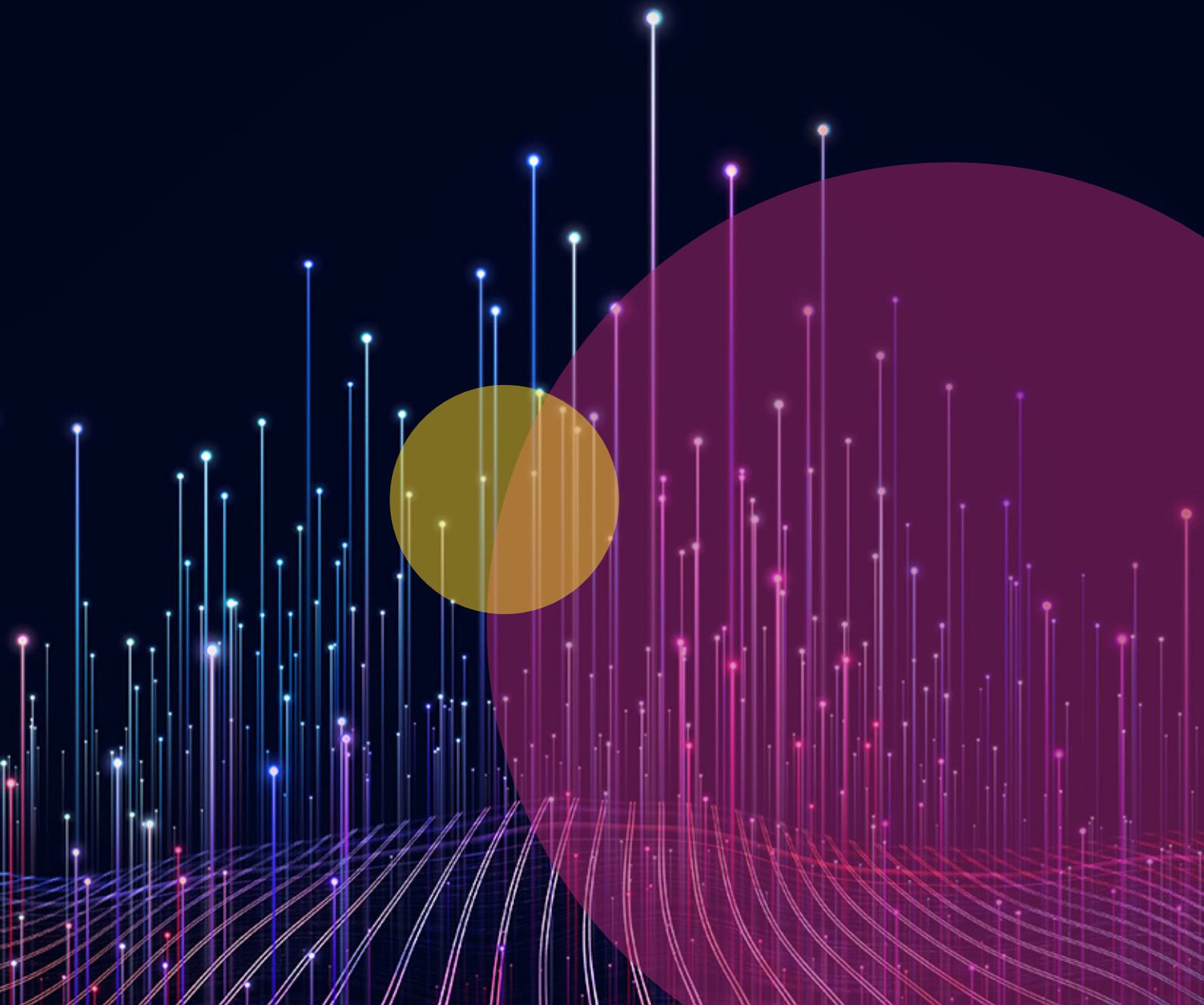




End-to-end Network Lifecycle Automation in Telecom Networks



Introduction

5G, IoT, and Edge Cloud offer huge potential for operators to increase their revenue multifold, by transforming the way they offer services to their customers. However, the cost around new spectrum, new radio, 5G core and control plane elements, increased capacity & low-latency transport network, virtualization/containerization, slicing & orchestration requirements all make the cost management and transformation a key compulsion for operators. Many top tier-1 operators have already taken up Network Optimization and End-to-end Network Lifecycle Automation as visionary projects to optimize costs.

Industry expectations on end-to-end network automation

The industry expectations on network automation span the entire lifecycle of the network and many top operators have started their first steps in unified IT and network operations. In our view, the automation has to be seamless, modular, and end-to-end for the lifecycle of networks spanning planning, engineering, deployment/rollout/transformation, operations, and optimization.

End-to-end lifecycle and coverage areas for automation

The following are key areas to address in an end-to-end network lifecycle automation:

- AI-based automated network planning
- Flow-through network build
- Automated network configuration/build/turn-up and Automated End-to-end Network Testing/Validation
- AIOps:
 - Predictive & preventive operations
 - AI-based cross-domain correlation of events
 - Self-healing
 - Zero-touch provisioning
 - Self-optimizing networks
 - Cognitive smart field operations
- Unified network and IT operations driving all possible synergies
- Continuous monitoring and improvement of automation through agile delivery processes and tools

Figure-1 shows the lifecycle and coverage that the automation should address.



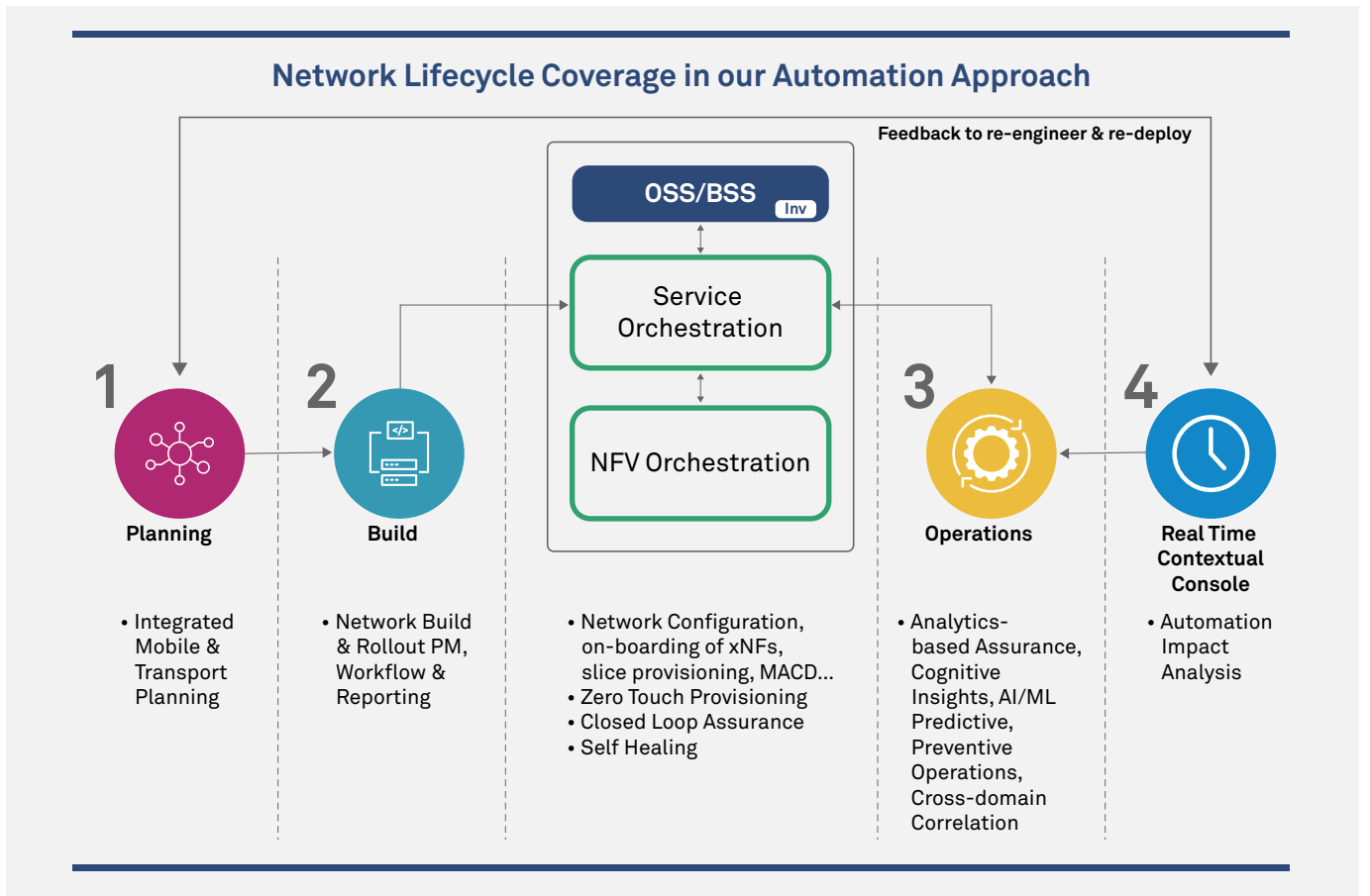
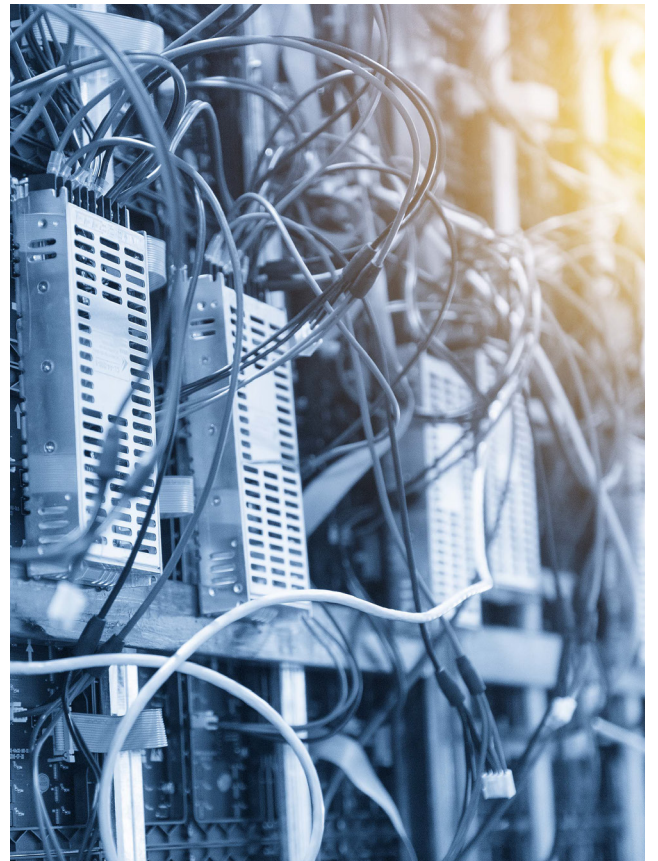


Figure-1: Network Lifecycle Coverage

Integrated End-to-End Network Automation Architecture

Figure-2 gives us the integrated automation architecture leveraging the analytical data lake that is already ingested with the live/real-time data, historical/snapshot data, fixed/static data, planned information data, predicted/projected data etc. coming from the various network and IT data sources, analyzed using cognitive analytics and AI/ML techniques etc., performing the following end-to-end network life cycle automation functions:



Integrated Automation Architecture

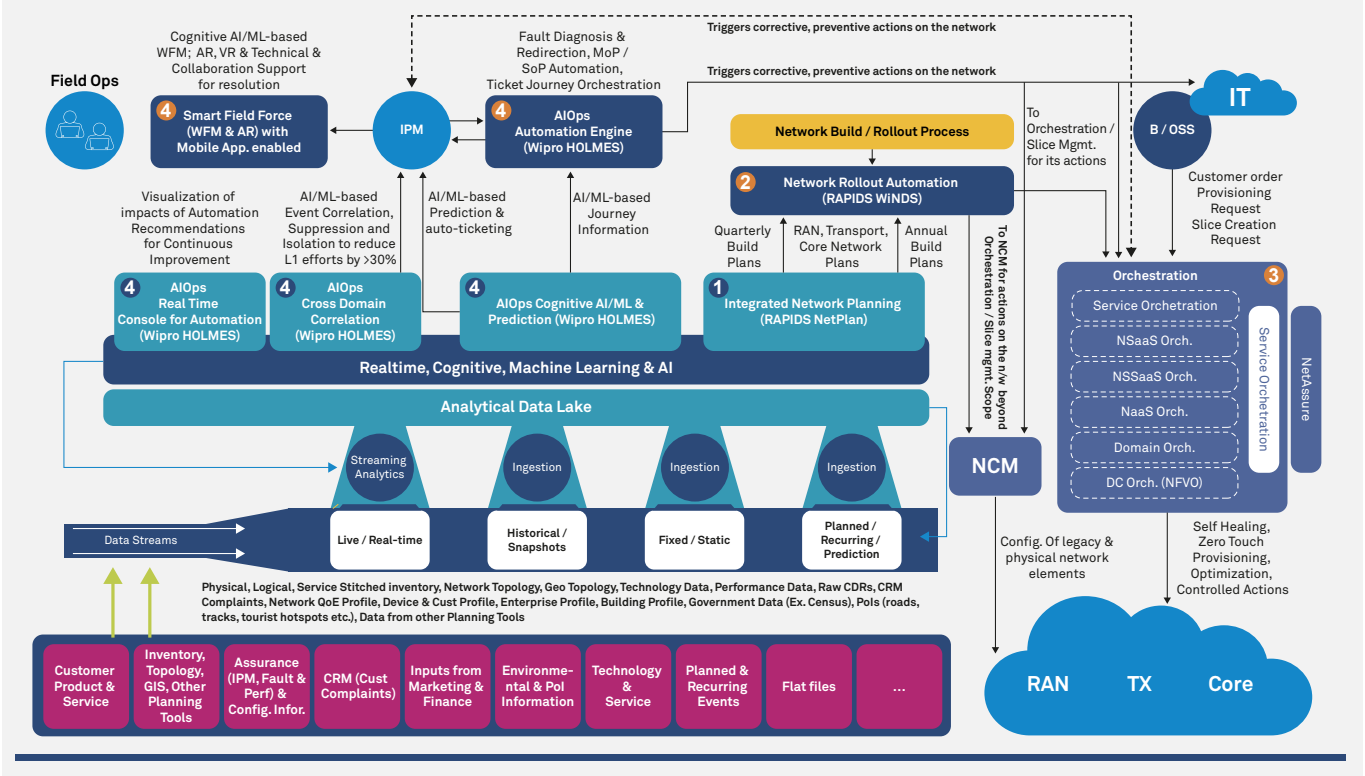


Figure-2: Integrated Automation Architecture



AI-based automated network planning

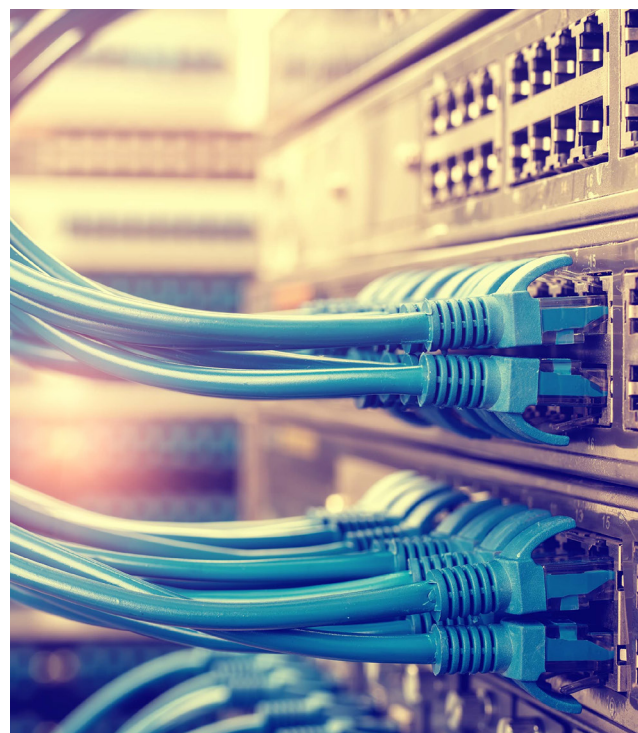
- AI-based network planning addresses the automation of the planning process involving integrated RAN, front-haul, mid-haul, backhaul transport, and core network planning covering the physical, virtual, and containerized network functions as well as multiple layers of the network utilizing AI/ML techniques
- The planning should utilize the current processes of the operator, all relevant inputs for such integrated planning, employ cognitive analytics and AI/ML techniques to produce quarterly/annual network plans to roll out

Flow-through network build

- The plans created above seamlessly flow into an automated network build management system; create a project, start, run, and track until its closure
- The system is an umbrella tool covering all internal including various planning, engineering, testing, operations, procurement, sales, and finance teams of the operator and all external stakeholders like Tower Companies, OEMs, Systems Integrators, Field Partners, Data Center Partners, MS Partners, Cloud Partners, Transportation and Logistics Partners etc.
- The system also produces contextual intuitive reports and incorporates role-based access; it also integrates the mobile application
- The automation also provides an option to chat with/speak to the stakeholder responsible for the task delay/failures

Automated network configuration/build/turn-up and Automated Network Testing/Validation

- The end-to-end build automation covers device onboarding as part of the network build process including xNF onboarding, xNF configurations, slice provisioning, MACD, required onboarding into OSS and inventory updates etc.
- The system includes automated testing / validation of the thus-built / transformed network using Wipro's Network Testing Automation Framework (NTAF) including the Wipro IPs and accelerators viz. NetAssure & VeVaTo (Verification and Validation Tool)
- With decades of experience in the network testing and device accreditation areas of telecom networks, Wipro has built 4,000+ test cases across the device, RAN, fixed access, IP/optical transport networks, mobile/fixed core networks, hybrid cloud, data center use-cases etc. and a significant portion of those are ready for regression test automation using Wipro's NTAF



AI Ops: Predictive & preventive operations

Once a network build phase is over, the operations part of the solution incorporates a lot of automation use cases viz.

AI-based cross-domain correlation of events

Automated alarm/event inputs to the correlation engine from the analytical data lake or fault management system(s) getting correlated using AI algorithms; raising tickets automatically for the actual event only

Self-healing

Orchestrating and executing the method of procedures automatically through the automation engine for each of the ticket journeys or scenarios and updating the ticketing system with relevant inputs; raising and invoking the right-priority tickets in the field ticketing tool for tickets that will require field intervention

Zero-touch provisioning

Enabled through OSS and/or Service/Domain Orchestration systems across the Network Abstraction Layer boundaries

Self-optimizing networks

RAN, Transport, and Core optimizing systems and related automation logic

Cognitive field operations

Smart Field Operations may apply to Service Delivery and/or Service/Network Assurance. The automation and intelligence lies in:

- Dispatching the right engineer to the site based on AI-computed parameters like proximity of the current location of the engineer to the fault location, the earlier experience of doing a similar task, the spares availability etc.
- Helping the field engineer with a mobile app, AR/VR technologies etc. with the required technical support via relevant and contextual documentation help getting pushed to the engineer, allowing collaboration with the NOC engineers for advanced technical support etc.

Unified network and IT operations driving all possible synergies

- The solution also leverages all possible synergies including processes, tools, automation etc. across IT and network lifecycle activities

Continuous monitoring and improvement of automation through agile delivery processes and tools

- Using real-time contextual console, the solution monitors and provides the impacts of the implemented automation release as well as the feedback for further automation that is feasible for further optimization/improvement sprints in the completely agile delivery process



Conclusion

Automation is a critical part of the new ways of working. Not only does it improve efficiency in the way end-to-end processes work in the new 5G networks but also saves significant costs. Our automation solution addresses the end-to-end network lifecycle instead of just targeting the operations part. It also introduces several synergies the way operators operate their IT and networks, which is one of the key areas to address in the new era where the boundaries between IT and networks are shrinking and blurring.

About the author

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Sankar Srinivasan has more than 25 years of experience in telecom networks. He is a DMTS – Senior Member and essays the role of Practice Head – Network Solutions in the Communications BU. His responsibilities primarily include creating network solutions for Telcos around cutting-edge network technologies such as 5G, Orchestration, Virtualization, IP & Optical Transport Networks, Cognitive Analytics based Hyper Automation, and Network Optimization in Telco Networks.

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strong commitment to sustainability and good corporate citizenship, we have over 180,000 dedicated employees serving clients across six continents. Together, we discover ideas and connect the dots to build a better and a bold new future.

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