Appledore Research Group

Nokia Network Services Platform (NSP)
November, 2016

SOLUTION PROFILES FROM APPLEDORE RESEARCH GROUP

By Grant Lena

Executive Summary
Nokia is an innovator in the technologies that connect people and things. The company taps into the power of connectivity by combining network infrastructure, software and services with technologies for smart devices. Nokia is a publicly traded company with headquarters in Espoo, Finland.

Nokia Network Services Platform (NSP) is a carrier SDN platform that unifies service automation, network optimization and dynamic assurance for delivery of profitable, on-demand network services. NSP provides operators with an efficient way to define, provision, activate and assure network services across multiple layers, physical/virtual infrastructure, as well as equipment from multiple vendors.

This solution profile focuses on the NSP specifically, and its ability to deliver closed loop automation, consistent with our 2016 framework report “The Role of Closed Loop Automation in Virtualized Networks”, ARG 2016.

Appledore Research Group guides readers to the extensive “analysis” section further into this profile. In summary however, we find the NSP to be consistent with the best practices identified in the research above, and further note the following key strengths or differentiators of the NOKIA NSP:

- Network aware routing/placement and optimization, utilizing assurance data
- Multi-layer routing and optimization – L0 → L3
- Concurrent and rules-based optimization algorithms
- Proven code base and backward compatibility with deployed technologies

Source: Nokia, Analysis and commentary: Appledore Research Group
Competitors
Competitors to NSP include Ericsson Dynamic Service Manager and Aria Networks solutions. Indirect competitors include multi-product, multi-supplier solutions that incorporate SDN-C, order management, cross-domain transport management, performance monitoring, optimization, and automated healing/scaling.

We also refer readers to our framework report: “The Role of Closed Loop Automation in Virtualized Networks”, ARG 2016

Source: Appledore Research Group

Figure 1: Nokia NSP distribution of revenue by business segment

![Figure 1: Nokia NSP distribution of revenue by business segment](source)

Source: Appledore Research Group

Figure 2: Breakdown of Nokia NSP revenue by application segment
Not relevant

Table 1: Company Basics

<table>
<thead>
<tr>
<th>Name</th>
<th>Nokia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year founded</td>
<td>1865</td>
</tr>
<tr>
<td>Headquarters</td>
<td>Espoo, Finland</td>
</tr>
<tr>
<td>CEO</td>
<td>Rajeev Suri</td>
</tr>
<tr>
<td>Employees</td>
<td>106,000</td>
</tr>
<tr>
<td>Product segment</td>
<td>Software-Defined Networking</td>
</tr>
<tr>
<td>Geographic focus</td>
<td>Global</td>
</tr>
<tr>
<td>Primary products</td>
<td>Network Services Platform</td>
</tr>
<tr>
<td>Key partners</td>
<td>ARIA-Networks, IBM NetCool, ONOS, ODL</td>
</tr>
<tr>
<td>Key customers</td>
<td>Telecom Italia (public stated intention to use); China Mobile (using to manage flows to/from datacenters), Globe Telecom (using for IP/optical bandwidth on demand and closed-loop bandwidth re-sizing)</td>
</tr>
<tr>
<td>NOKIA Revenues</td>
<td>USD $26.6B</td>
</tr>
<tr>
<td>NSP Revenues</td>
<td>$10M 2016 (ARG estimate)</td>
</tr>
</tbody>
</table>

Source: Nokia

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**Products and Services**

Network Service Platform (NSP) is NOKIA’s entry into the carrier-SDN or WAN-SDN market. Nokia NSP addresses the dynamic connectivity needs of enterprises and cloud applications through on-demand creation, maintenance, turn-down and optimal use of IP/optical network services and resources. It uses a powerful policy engine and abstracted service models to quickly and efficiently create IP/optical network services and an intelligent, network-aware service connection manager to optimize the mapping of service connections to network tunnels and resources.

NSP operates in two related, but slightly different ways. First, it can be used to create *individual* network (flow) services that best meet product and order parameters (supporting individual orders as they occur). Second, when a new service instance cannot be accommodated, NSP can re-position a number of existing services – still meeting the demands placed on those services – in order to create capacity for a new service. In this second scenario, NSP is automatically re-claiming capacity and increasing capacity utilization. NOKIA emphasizes that this is accomplished utilizing the Bell Labs STAR algorithm (details available from NOKIA).

The benefits delivered by NSP include profitable on-demand network services, faster and simpler network service innovation and delivery, optimal use of network assets during service activation, rapid adaptation to changing demand and traffic patterns, and increased revenue from existing assets.

Table 2 provides descriptions of Nokia NSP modules, which are sold individually as needed.
Table 2: Nokia NSP market products (functional capabilities)

<table>
<thead>
<tr>
<th>NSP Product Modules</th>
<th>ARG Segment</th>
<th>Capabilities Relevant to Closed-Loop Automation</th>
</tr>
</thead>
</table>
| Network Services Director | 1 - Management and Orchestration 2 - Service Creation/definition | • Network Services Director (NSD) is the network service fulfillment module of the NSP. It automates IP/optical service provisioning by mapping abstract service definitions to detailed service templates using operator-defined policies.  
• Maps network service definition to internal YANG model  
• Performs network service definition (creation), including definition of policies.  
• Performs the orchestration to instantiate new services  
• NSD is the Policy construct used for service abstraction, network-aware service placement, and service optimization objectives  
• Automates provisioning and orchestration of layer 0-3 services. There are two ways to provision services with the NSP, through a customer-developed or 3rd party OSS that interfaces with the NSP through REST / RESTCONF APIs, or directly through integrated web-based front-ends that ship with the NSP (i.e., “GUIs”). The latter is popular with tier-2 and tier-3s without OSS investments of their own. |
| Assurance Functionality | Management and Orchestration | • These are not modules per se, but rather capabilities that have been built into NSP – and upgraded as of Q3 2016.  
• Traditional transport NM functionality including collection fault and performance data. Support for current NOKIA product, plus compatibility layer to facilitate multi-vendor normalization and support. Allows for both visualization, and threshold/script-based automation when data is fed back into the NSP process for “self healing” or “self-scaling.  
• Support for Transport, Packet and Flows |
| Network Resource Controller – X (NRC-X) | Resource Control | • Centralized view across layers  
• NSR-X provides the policy construct for multi-layer optimization objectives  
• Manages the provisioning of a connection path across multiple routing domains, multiple transport domains (layers), or a combination of routing and transport domains.  
• NRT-X serves as a parent to the NRC-P (packet) and NRC-T (Transport/Optical) when required to dynamically calculate optimal paths through hybrid IP/optical networks. |
| Network Resource Controllers – Transport, Packet and Flow (NRC-P, NRC-P, NRC-F) | Resource Control | • Collectively, the NRC modules provide a Centralized view and control of network, including programmable path computation for layer 0,1,2 & 3 (DWDM, optical, Ethernet, switching, routing)  
• Provide policy based constructs for Optical, Packet, or Flow optimization objectives.  
Layers 0 → 3 are DWDM, Optical, Switching and Routing  
• NRC-F (Flow): Manages (effects) policies used to redirect flows in BGP FlowSpec and OpenFlow-capable (or other command capable) routers  
• NRC-P (Packet): Manages (effects) the creation Label Switched Paths (LSP) across IP network elements and supports both Resource Reservation Protocol (RSVP) and Segment Routing (SR) LSP technologies. The NRC-P maintains an enhanced Interior Gateway Protocol- Traffic Engineering (IGP-TE) topology and a current path database that is synchronized with the network elements.  
(continued next page)  
• NRC-T (Transport): Manages (effects) the creation of transport path connections for layer 1 Optical and Layer 0 DWDM |
The NRC-T maintains an optical topology and current path database that is synchronized with the network elements and takes physical layer knowledge such as impairments into consideration to ensure that optimal paths are computed.

- Tightly integrated with IP and Optical network management provided by NSP’s NFM modules (formerly known as 5620 SAM and 1350 OMS). Integration framework provides for integration with other vendors’ transport managers and elements (interoperability demonstrated at SDN & OpenFlow WC).
- Rules based resource control algorithms – specifically NOKIA Bell Labs’ STAR algorithm and the NSP’s GCO (Global Concurrent Optimization) algorithms. Both contribute to managing both local and global optima, which greatly complicate routing (and are the downfall of many sequential OSPF actions, for example).

Source: Nokia and ARG; ARG commentary

Table 3: NOKIA Acquisitions (2014-Present)

<table>
<thead>
<tr>
<th>Company</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nakina Systems</td>
<td>This acquisition complements Nokia’s existing security portfolio and helps its customers meet the growing requirements of network security.</td>
</tr>
<tr>
<td>Alcatel-Lucent</td>
<td>Nokia and Alcatel-Lucent offer a combined end-to-end portfolio of the scope and scale to meet the needs of their global customers.</td>
</tr>
<tr>
<td>SAC Wireless</td>
<td>This acquisition builds upon Nokia Networks’ existing network implementation service capabilities and is expected to increase its market share in this space.</td>
</tr>
<tr>
<td>3D Geolocation capabilities</td>
<td>Nokia Networks bought a broad solution for advanced geolocation capabilities from NICE Systems to enhance the planning and optimization of mobile networks. Nokia Networks gains access to tools, technical expertise, and the right to further develop these capabilities.</td>
</tr>
<tr>
<td>of NICE Systems</td>
<td></td>
</tr>
<tr>
<td>Mesaplexx Pty Ltd</td>
<td>Nokia has acquired the Australian company Mesaplexx Pty Ltd in order to boost its radio capabilities in the Networks business.</td>
</tr>
</tbody>
</table>

Of the above acquisitions, Alcatel-Lucent is highly relevant since NSP was originated within Alcatel-Lucent. ARG has no indication that expertise from the other listed acquisitions has been incorporated into NSP.

Source: Nokia. Commentary: ARG.


**Figure 3: Nokia NSP Platform**

Figure #3 (courtesy: NOKIA) illustrates NSP’s place in the larger network and market environment. It conceptually illustrates the touch-points and capabilities of NSP. NSP is NOKIA’s WAN-SDN solution, and automates path selection, creation, monitoring, restoral and optimization within the Layers 0 (DWDM) → 3 (IP routing) transport domains. It integrates to OSS/BSS, exposes capabilities, and integrates with NOKIA’s own element/network manager (5620 SAM) and provides for similar integration with element/network managers from other vendors.

NSP can interact with the underlying network either through “network management” systems such as NOKIA’s own NSP Network Functions Manager (NFM) modules (formerly known as 5620 SAM or 1350 OMS), or through NSP’s multi-vendor device drivers (SNMP and CLI), or directly via standard protocols (NetConf, OpenFlow, PCEP) and object models (YANG). Either way, it must and can discover underlying device topology and configuration, inventory service flows and routes, find optimal routes, collect performance data, correlate services to devices, and enforce customer-level and service-level requirements (policies). In summary, NSP can use NMSs but is not dependent upon them.

*Analysis: ARG; Diagrams: Nokia*
Figure 4: Nokia NSP product architecture

Figure #4 illustrates the functional component of NSP and its integration points in more detail. Appledore Research Group notes the following key attributes of NSP:

- Policy driven service (flow) definition
- Policy driven optimization / search definition
- Performs automated re-arrangement, when possible, to free capacity and support additional incremental services (optimization)
- Multi-layer, including optical switching and routing
- Multi-vendor, using EMS/NMS or emerging standardized protocols and object models (i.e. YANG) (NOKIA 5620 SAM and 1350 OMS fully integrated; can integrate others via domain resource controllers)
- Supports multi-vendor assurance and analytics (beyond NOKIA and 5620 SAM support), with a set of new, advanced Assurance and Analytics functional modules on-platform. These are derived from NOKIA’s mainstream OSS functionality.
- Mapped to a normalized, central view of both capacity and net service demand (active inventory and live topology for the SDN domain)
- Full automation of “assign and design”; optimal re-arrangements; auto-restoral
- Ability to use rules (policies) to define priorities, exclusions, etc.
- Offline analysis for global-rearrangement to improve capacity utilization (optimization). Expected future integration into online process.
Customers and Markets
Nokia markets NSP to CSPs, Consumer WEB firms, and enterprises. In each case the target will wish to either create new flows on an existing underlay, or optimize traffic on that underlay to improve capital and operational efficiency. NSP went GA in June of 2015, and is seeing its first deployments this year, 2016. At the moment ARG estimates that NSP has approximately 10 customers committed, with the following characteristics:

• Number of committed customers: 10
• Number deployed and “live”: 3
• Predominantly in Asia-Pacific region
• Roughly split between CSPs and non-CSP firms (e.g.: Consumer web, enterprise)

Discussions with NOKIA and CSPs indicate that there is a pattern behind interest in NSP and similar solutions: Tier-1 CSPs are mostly interested in specific, constrained use cases, such as automating optimization (“grooming” for capacity), but are not necessarily using NSP to re-plumb their service order handling and service provisioning. On the other hand, smaller operators with fewer resources are more interested in the “end to end” capabilities that NSP offers to automate order handling and provisioning, including subsequent monitoring and healing. This makes sense given the complex and ambitious OSS/BSS architectures of some of the largest Tier-1s; that said, ARG believes that the automation and transformation of service operations cannot happen too soon and encourages all CSPs to think seriously about step-wise migrations that achieve a high level of closed-loop automation early in the process.

Source: Nokia

Table 4: Significant Nokia NSP customers

<table>
<thead>
<tr>
<th>Customers</th>
<th>Deployment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSP + Web/Enterprise</td>
<td>Approximately 10 global customers, with 3 in commercial service</td>
</tr>
</tbody>
</table>

Source: NOKIA, Public Announcements

Table 5: Position in geographic markets

<table>
<thead>
<tr>
<th>Market</th>
<th>Deployments and relative strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>See below</td>
</tr>
<tr>
<td>EMEA</td>
<td>See below</td>
</tr>
<tr>
<td>CALA</td>
<td>See below</td>
</tr>
<tr>
<td>APAC</td>
<td>Approximately 10 global customers, with 3 in commercial service, and a heavy concentration in Asia-Pacific</td>
</tr>
</tbody>
</table>

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Figure 5: Nokia NSP revenue geographic segments
NSP went “GA” in June 2015, so all revenue and deployments are for 2016. ARG estimates that NSP is undergoing ~10 deployments from now through the next twelve months, valued at $10M for deployments, and trials.

Source: Appledore Research Group
**Appledore Research Group Analysis**

**Context:**

This *solution profile* summarizes NOKIA’s Network Services Platform, which is NOKIA’s entry into the carrier-SDN or WAN-SDN market. NSP complements NOKIA’s Nuage family of datacenter SDN and SD-WAN products, and NOKIA’s CloudBand MANO/NFV portfolio. This profile should be considered in the context of several ARG framework reports, specifically:

- Managing the Telco Cloud, 2015
- The Role of Policy in Virtualized Networks, 2015
- The Economics of Virtualized Networks, July 2016
- The Role of Automation in Virtualized Networks, September 2016

We encourage readers to first consult those documents, which identify the characteristics that Appledore Research Group believes are critical for leading products that will successfully transform CSPs’ businesses.

**Key Take-Aways:**

- NOKIA’s network service platform is one of very few offerings in this space that effects true automation, optimization and closed-loop context aware operation. NOKIA notes that few alternative solutions are truly network aware (e.g.: congestion).
- NSP clearly reflects NOKIA’s belief that significant benefits derive if Assurance and Analytics are integrated into orchestration logic – both within individual domains, and across domains. This is reflected in NSP’s ability to monitor flows created, rearrange flows to “mine” capacity, and in NOKIA’s decision to add significant multi-vendor Assurance & Analytics functionality to the platform, drawing on NOKIA’s larger pool of OSS expertise and code.
- NSP is a type of carrier-SDN (or WAN-SDN) *solution*, although it does not utilize OpenFlow as its exclusive/primary router control protocol. It is also significantly more than an SDN controller, incorporating automated optimization, multi-layer support, and support for existing network controllers – and an abstraction layer that allows these resources to be pooled and managed centrally.
- NSP automates the selection of network paths for service flows, enabling:

  - Service (flow) provisioning and necessary grooming on a large scale, in a short time
  - Fast, optimal path selection (assign and design; execute service order)

(continued next page)
• “What if” analysis & capacity planning
  (currently offline, ARG will update as NSP evolves)
• NSP incorporates a set of functions, including capacity discovery, traffic and
  performance data collection, routing policy definition, search algorithms, and
  optimization algorithms. It also interfaces to existing NOK (or 3rd party) domain
  controllers for the optical, MANO/cloud, L2 and IP domains.
• NSP delivers a significant portion of the promise of SDN today, namely:
  • Abstraction of the transport and routing network
  • Improved capacity utilization
  • Services turn-up on demand
• NSP’s support for existing equipment and non-OpenFlow routers delivers significant
  benefits since it can bring many benefits of SDN utilizing today’s deployed products
  – speeding time to market and making dynamic flow creation more ubiquitous.
• NSP primarily works in conjunction with NOKIA’s well-regarded 5620 SAM to
  control NOKIA equipment, but also has defined southbound interfaces to support
  integration to other vendors’ equipment.
• Beyond 5620 SAM, NOKIA has provided a full suite of Assurance & Analytics
  functional modules, which are inherently multi-vendor, and for flow-control fully
  supports OpenFlow and BGP FlowSpec.
• The modeling capability and routing algorithms are explicitly vendor agnostic and
  extensible.
• NSP allows for on-demand flow creation, guaranteed QoS, and mass-
  rearrangements to increase capacity utilization and reduce stranded capacity.
  Hence it effects agility, opex reduction and capex reduction (via capacity utilization).
NSP Contrasted with ARG’s Recommendations for Successful Automation:

In “The Role of Automation in Virtualized Networks” Appledore Research Group outlines a set of functional recommendations for successful automation. We urge you to familiarize yourself with the “why’s” and “how’s” from that report. Below we summarize how NOKIA’s NSP stacks up against those recommendations.

<table>
<thead>
<tr>
<th>Business Need</th>
<th>Technical Implication</th>
<th>NSP Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 -- Minimize complexity, latency and risk in control loops. Allow loose coupling.</td>
<td>Multiple layers of nested loops corresponding to layers of infrastructure -NFV-I, VNF, Service and Product</td>
<td>Consistent. NSP acts in a distributed fashion at multiple layers. However, its cross-layer capabilities distinguish it.</td>
</tr>
<tr>
<td>#2 -- Allow flexibility in service / flow / NFV instantiation.</td>
<td>• Rules (policy) driven instantiation of NFVs, flows, etc.</td>
<td>Consistent. (not necessarily part of MANO)</td>
</tr>
<tr>
<td></td>
<td>• Rules implement context</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rules apply at both order flow and MANO</td>
<td></td>
</tr>
<tr>
<td>#3 -- Avoid complex duplication between fulfillment and assurance</td>
<td>Healing and scaling are performed by the original orchestration (instantiation) method, governed by rules that constrain the output to meet new reqts.</td>
<td>Consistent.</td>
</tr>
<tr>
<td>#4 -- Minimize systems integration.</td>
<td>• No functional or technology silos</td>
<td>Consistent. Underlying technologies abstracted to common model.</td>
</tr>
<tr>
<td></td>
<td>• All technologies and functions follow the same structure, share common data, topology, etc.</td>
<td></td>
</tr>
<tr>
<td>#5 -- Enable a high degree of agility in innovation (service creation)</td>
<td>• Micro-Service Architecture</td>
<td>Consistent, but mostly outside NSP’s scope.</td>
</tr>
<tr>
<td></td>
<td>• MSA linked to pre-defined DevOps</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• All micro-services must be available to the single service orchestration method (yes, there are layers)</td>
<td></td>
</tr>
<tr>
<td>#6 -- Support for pro-active scaling and healing, and large volumes of actions.</td>
<td>• Needs to operate in real-time or NRT</td>
<td>Consistent.</td>
</tr>
<tr>
<td></td>
<td>• Support for volumes 10-100x higher than today</td>
<td></td>
</tr>
<tr>
<td>#7 -- Data integrity to support automated operations.</td>
<td>No duplication; data from original sources; “live” (not obsolete) data</td>
<td>Consistent.</td>
</tr>
<tr>
<td>#8 -- Equipment models and scripts to achieve automation</td>
<td>Comprehensive modeling and on-boarding of VNFs, including pre-built FCAPS DevOps, sufficient to support automation without additional costs.</td>
<td>Outside of NSP’s scope. (Consistent)</td>
</tr>
</tbody>
</table>
**NSP Overlay with commentary on**
**ARG “Closed Loop Automation Reference Architecture”:**

The following overlays NOKIA's NSP on the ‘Closed Loop Automation Reference Architecture’ that we developed in our framework report on automation. The call-out boxes indicate where NSP contributes to that architecture, and what some of the germane points are. For details please reference “*The Role of Automation in Virtualized Networks*,” ARG 2016, available with subscriptions.

*Figure 5: NOKIA NSP Overlaid on Appledore Research Group Closed-Loop Reference Architecture*

**SWOT**

<table>
<thead>
<tr>
<th>Strengths:</th>
<th>Weaknesses:</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Early to market with a comprehensive, multi-layer, fully automated, service optimization solution for the WAN.</td>
<td>☐ New and relatively unproven</td>
</tr>
<tr>
<td>☐ Real-time assurance &amp; monitoring, yielding integrated performance management and network-aware routing and optimization.</td>
<td>☐ Some operators will view it as a “closed” solution; unclear how modular it will prove to be when needed.</td>
</tr>
<tr>
<td>☐ Multi-layer (L0→3) with correlation across layers</td>
<td></td>
</tr>
<tr>
<td>☐ SDN functionality and value, ahead of widespread OpenFlow deployment</td>
<td></td>
</tr>
<tr>
<td>☐ Integrates to widely deployed 5620 SAM, but does not require it nor similar (3rd party) NMSes</td>
<td></td>
</tr>
<tr>
<td>☐ Compatible with OpenFlow as it emerges, and allows for a transparent introduction of OpenFlow with existing technology.</td>
<td></td>
</tr>
<tr>
<td>☐ Extensible (“STAR”) algorithms</td>
<td></td>
</tr>
<tr>
<td>☐ Optional suite of full-featured, multi-vendor Assurance &amp; Analytics modules</td>
<td></td>
</tr>
</tbody>
</table>

**Opportunities:**

- NSP can allow NOKIA to capture market share and become an SDN leader.
- Image transformation, emphasizing NOKIA’s role in automation and the transformation of operations.
- Establish a foothold for the automation of the network, beyond SDN.

**Threats:**

- Some operators may look for components rather than solutions, to effect a clean break with the past.
- Timing of window before most routers are OpenFlow enabled and competition heats up?
- Disruptive entrants

**Summary:**

Appledore Research Group believes that the transformation to fully automated, on-demand services is a critical one. Similarly, we believe that the most significant potential capital savings in NFV and SDN come from the flexibility to increase capacity – and therefore capital – utilization. NSP addresses both and does so in a fully integrated solution.

NOKIA’s Network Services Platform is one of the first commercial entrants to bring mass-scale automation to flow-based services. While the capabilities exist in many SDN-Cs combined with rules based orchestrators, NOKIA has integrated together many of the critical components such that:

1. SDN-like capabilities maybe applied to true SDN infrastructure and much existing infrastructure alike. This accelerates time to mass deployment.
2. Assurance is integrated, allowing the operation of closed loop healing
3. Assurance and network state (e.g.: congestion, delay) are taken into account at the time of route/flow/path selection or concurrent optimization.
4. Flow-through of internal and external orders can occur at high volumes
5. Ability to groom existing services in order to reclaim capacity and increase capacity utilization and CAPEX efficiency.
Many firms have some, and maybe most, of the components needed. What sets NSP apart from most, if not all competitors, is that the components have been integrated, the rules/triggers defined, and the solution tested and deployed such that automation is a proven reality, not a laudable goal, and science projects.

NSP has several capabilities worth noting: a) true cross-layer operation from L0 \(\rightarrow\) L3; b) support for both OpenFlow and existing equipment and interfaces; c) north-bound and south-bound interfaces and integration capabilities; d) grooming / capacity reclaim ability e) network-aware routing and optimization (as noted), and f) algorithms that effect concurrent optimization (not only flow-by-flow).

Some may point to existing software systems and technology and conclude that NSP is not truly new. We at Appledore Research Group believe that a new framework that supports both new protocols/methods and existing-deployed software and equipment is an asset; it supports the hybrid environment that we have projected will exist for > another decade, and speeds the adoption of modern, automated methods to the largest possible set of infrastructure, customers and routes. In fact, we see one of NSP’s strengths to be its proven code base (> 700 CSP deployments) for core service-aware routing.

We look forward to seeing NSP in service and hearing first hand reports that qualify and quantify the degree of automation, and the efficiency gains that it delivers. When we get that data, we will report on it.