



Technical Report Name

Technical Report Sub-Title

Research Group:	Telecommunications Software & Systems Group (TSSG)
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Synopsis: An executive summary of what is contained in this technical report

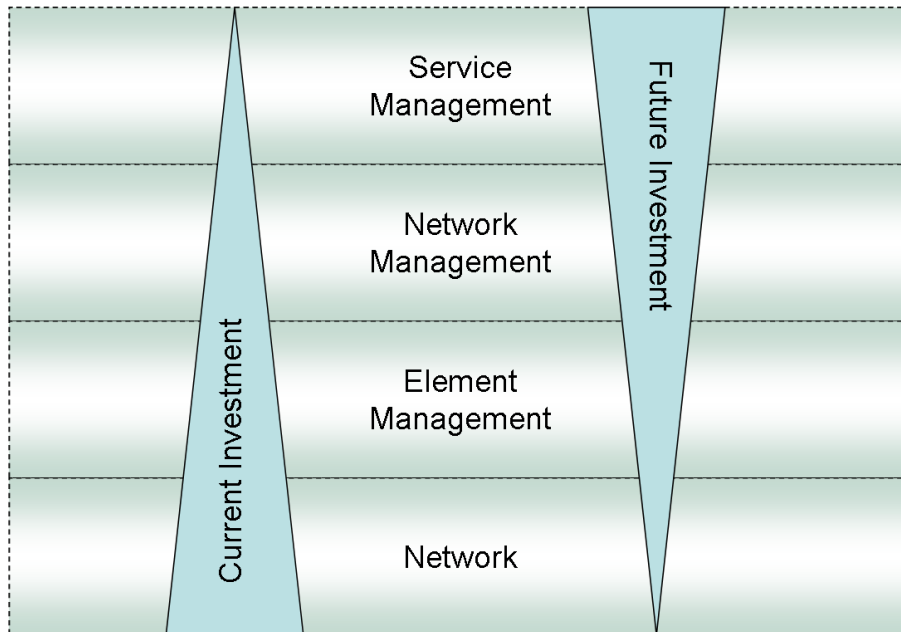


Figure 1: Why Premium Services?

## 1 Introduction

<Body of text for the introduction to the report.

This should be written in a format that gives the reader at least seven major points>.

## 2 Elaboration of one of the major points of the report

<What follows is example text.>

Investment from operators today is traditionally based on providing connectivity – providing bandwidth i.e. the “dumb-pipe” [?]. As the Return of Investment by adding bandwidth declines, operators are searching for new ways for reversing the trend. Their objective is to spend less on running the network while investing in the provisioning of revenue-generating premium services depicted in the Figure 1.

For network operators to increase their revenue streams their investment portfolio needs re-positioning. There is a need for greater investment in their services and in particular premium services. Some operators already have made strides in this direction, see Case Study on Portugal Telecom.

However, premium services require service assurance which is to a degree premium management.

To achieve this re-positioning of investment current OPEX levels must be reduced by operators. A number of mechanisms are available to operators in order to achieve this.

It is important to note here that in order to achieve the greatest reductions in OPEX a number of the above mechanisms must be combined. The degrees of saving will vary depending on the technique or techniques implemented.

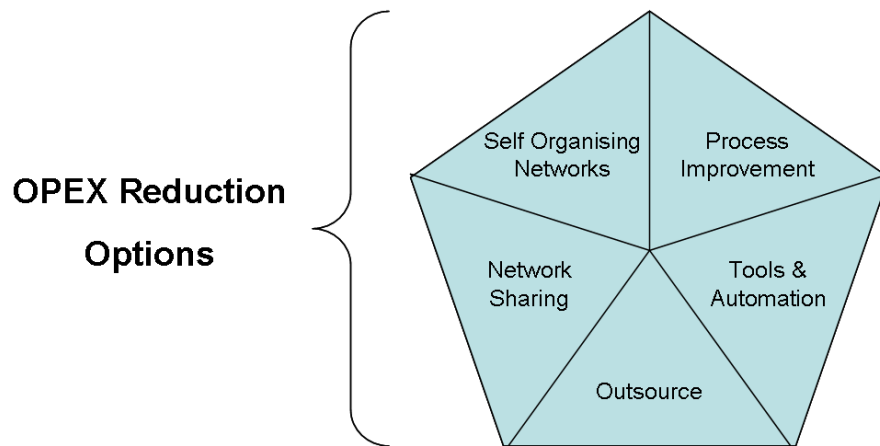


Figure 2: Methods for Reducing OPEX

## 2.1 Outsource

Outsourcing network operations to a 3rd party managed service provider has seen tremendous growth in recent years - so much so that all the major network equipment vendors have added a professional services arm to their portfolios. While the global economic crises hit bottom lines, it inevitably led to a slow down in CAPEX by network operators, it was the managed services business that often propped up the ailing network infrastructures sales for the vendors allowing them to report a somewhat healthy balance sheets in some cases.

Equipment Vendors developed proprietary management systems for their network elements and often different management systems for different network technologies resulting in a substantial integration effort for Network Operators. Network Operators also wanted to integrate the Element Management systems into their multi-vendor networks, and did so through the development of in-house bespoke Network Management Systems often performed by specialist System Integrators that included OSS applications such as Billing, CRM etc.

This environment presented a significant technical challenge for Network Operators and is slowing innovation and the introduction of self-managed networks. For the Network Operator, outsourcing the management of the network to a 3rd party was a much less risky proposition in the drive to reducing OPEX.

Reducing Costs Through Innovation: Case Study Verizon Communication Inc. announced at Management World 2009 that they have deployed a software from Nakina Systems Inc to create a multi-vendor Common Element Management System to manage Verizon's ultra-long haul optical, metro Ethernet and converged packet-based back-haul infrastructures in North America, Europe and Asia/Pacific which included equipment from 14 different vendors and as much as 12,000 by 2010 which Verizon claims saves them \$11 million per annum.

## 2.2 Self Organising Networks

The Next Generation Management Networks<sup>1</sup> (NGMN), an alliance of Network Operators, outline the requirements for Self-Organised Networks (SON) with the ultimate goal of increased automation and therefore reduced OPEX. The challenge is on the Network Equipment Vendors (e.g. Ericsson, Nokia-Siemens Networks, Alcatel-Lucent, Huawei etc.) to bring to market next generation networks that are capable of SON so

that Network Equipment can be plug and play, where following installation and power-up the Network Elements can determine their optimal configuration based on their location and that of their peer network elements.

Innovation is the key to producing real stable efficient self-management solutions.

The OPEX savings made through these initiatives will underpin the necessary re-positioning of investment into premium services.

### 3 Overview of TSSG Autonomic Management Group

The Telecommunications Software & Systems Group (TSSG) is one of the largest integrated information communication technology (ICT) research centres in Ireland. It is a place of high quality research that addresses the transformation of the telecommunications industry, with a core focus on telecommunications network management, security and mobile services.

TSSG believes that solutions are needed that allow management of the network to evolve so that it is increasingly more automated allowing Network Operators to focus their efforts on the delivery of premium services with assured delivery for the benefit of both Service Providers and Consumers. The ability to increase revenues is fundamental and essential to achieving Return on Investment (RoI). The Return on Investment (RoI) will ensure continued investment in Capital Expenditure (CAPEX) in the rollout and upgrade of new network technologies supporting higher bandwidths and greater capabilities – essential for continued innovation, commercialisation and adoption for vertical markets without which would result in stagnation.

Research has been ongoing in seeking to develop new network management solutions that are more efficient, cost effective and scalable. One of the most promising is the vision that networks can organise and manage themselves with reduced intervention from humans. This is commonly known as self-management or self-\*. Self-managed networks have the potential benefit of scalability, fast reaction time and self-adaptation to changing network conditions – a fundamental driver for the Future Internet.

The Next Generation Management Networks (NGNM) industry consortium have been defining the requirements for next generation networks for Self-Organised Networks (SON) which are being adopted by the 3GPP as a key driver for 4th Generation mobile networks - Long Term Evolution (LTE).

TSSG believes that the introduction of self-\* capabilities is a key enabling technology that offers significant potential both in terms of OPEX savings and optimisation of usage-based service operations essential for successful large-scale provisioning and smooth running of premium services.

TSSG performs research to identify the innovative ways of integrating self-managed systems into the network provisioning lifecycle. Core to this research is developing autonomic management solutions incorporating semantic analysis, that can be applied to build federated network and service management systems that understand changes in the environment and coordinate their actions to effectively deliver services on an end-to-end basis.

TSSG recognises the importance of reliable self-management necessary to enhance the dependability of the network management systems that are used by network operators. Research and development in key methods and techniques that increase the ability of management systems (specifically self-managed systems) to operate in a way that is aware of the operation of other management systems (legacy or self-managed) and can recover from failure situations exhibited from these systems efficiently and limit disturbances to its network services. Therefore the TSSG aims to go beyond the state of the art in this area through research of new architecture capabilities and coordination schemes for fault detection, fault recovery and fault mitigation for self-managed networks.

The TSSG has many years experience in advanced Network Management Systems with recent projects including 4WARD and EFIPSANS (FP7 IPs), Autol (FP7 STREP), MORE (FP6 STREP),

MADEIRA and MAGNETO (Celtic Project), AMCNS and FAME (Science Foundation Ireland) and ASYST and ASTRAL (Enterprise Ireland).

TSSG is one of the founding members of two of the ETSI Industry Specification Groups (ISGs): (i) Autonomic network engineering for the self-managing Future Internets (AFIs) and (ii) Measurement Ontology for IP traffic (MOI). The TSSG also currently holds the positions of Academic Co-chair and Academic Co-chair of the Architecture Expert's Group within the Autonomic Communications Forum (ACF), which is the first international standards body for autonomic communications and holds the secretary position for the IEEE Communications Society Technical Committee on Network Operations and Management (CNOM).

FP7 4WARD	<a href="http://www.4ward-project.eu/">http://www.4ward-project.eu/</a>
FP7 EFIPSANS	<a href="http://www.efipsans.org/">http://www.efipsans.org/</a>
FP7 AutoI	<a href="http://ist-autoi.eu/autoi/">http://ist-autoi.eu/autoi/</a>
FP6 MORE	<a href="http://www.ist-more.org/">http://www.ist-more.org/</a>
Celtic Eureka Magneto	<a href="http://www.celtic-initiative.org/Projects/MAGNETO/default.asp/">http://www.celtic-initiative.org/Projects/MAGNETO/default.asp/</a>
Celtic Eureka Madeira	<a href="http://www.celtic-madeira.org/">http://www.celtic-madeira.org/</a>
SFI FAME	<a href="http://www.fame.ie">http://www.fame.ie</a>
ASYST	<a href="http://www.asystnm.com/">http://www.asystnm.com/</a>
ASTRAL	<a href="http://www.asystnm.com/astral">http://www.asystnm.com/astral</a>

Table 1: Related Projects in the TSSG

Contact Details:

<generic mailing list email account relevant  
to the technical report subject area>

## A Acronyms

<b>TSSG</b>	Telecommunications Software & Systems Group
<b>ICT</b>	information communication technology
<b>RoI</b>	Return on Investment
<b>CAPEX</b>	Capital Expenditure
<b>NGNM</b>	Next Generation Management Networks
<b>SON</b>	Self-Organised Networks
<b>LTE</b>	Long Term Evolution
<b>OPEX</b>	Operational Expenditure
<b>ISG</b>	Industry Specification Group
<b>AFI</b>	Autonomic network engineering for the self-managing Future Internet
<b>MOI</b>	Measurement Ontology for IP traffic
<b>ACF</b>	Autonomic Communications Forum
<b>CNOM</b>	Technical Committee on Network Operations and Management

## B Disclaimer

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