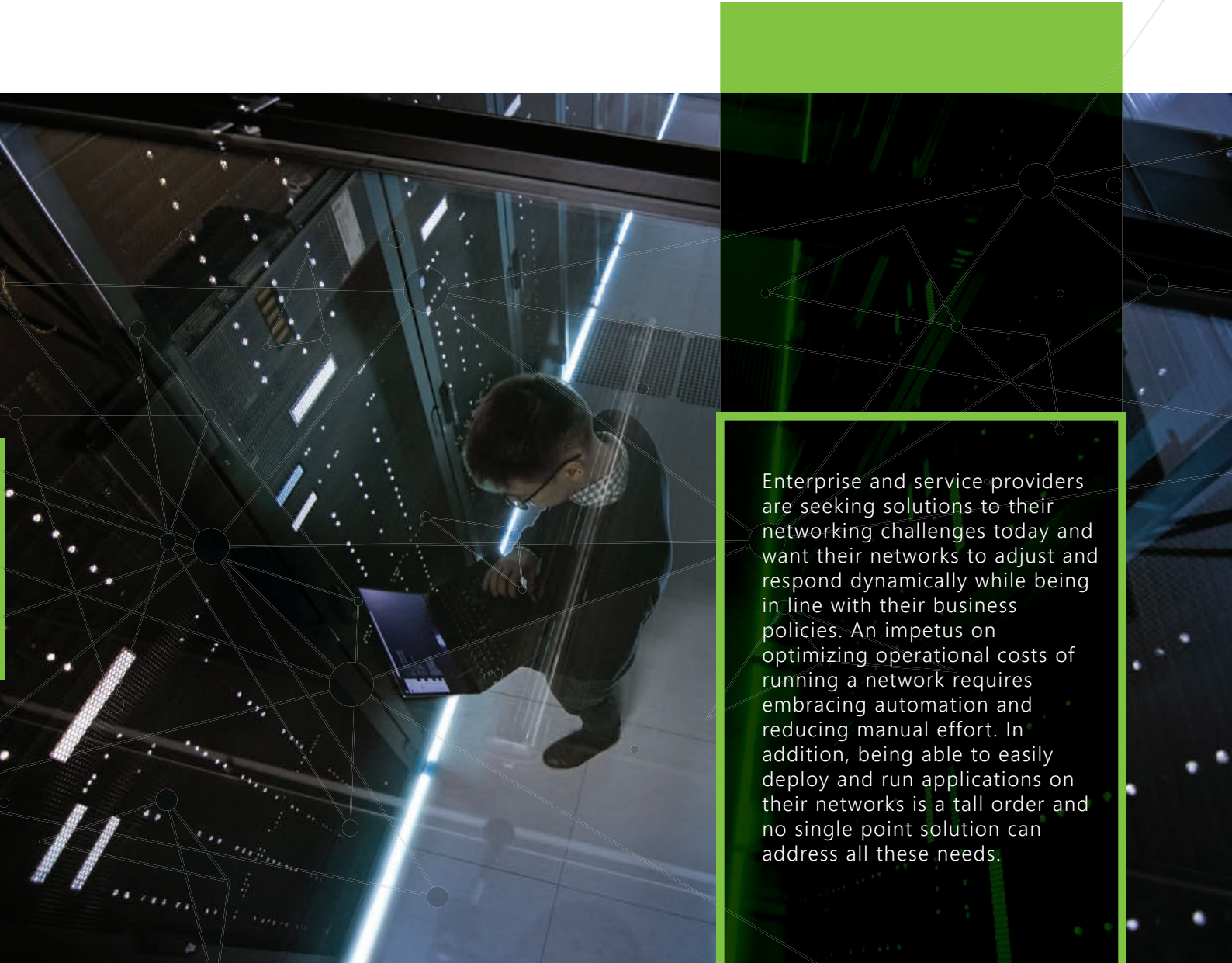# YOUR ENGINEERING PARTNER OF CHOICE FOR
SOFTWARE DEFINED INNOVATION

FROM CONCEPT TO REALITY!

Enterprise and service providers are seeking solutions to their networking challenges today and want their networks to adjust and respond dynamically while being in line with their business policies. An impetus on optimizing operational costs of running a network requires embracing automation and reducing manual effort. In addition, being able to easily deploy and run applications on their networks is a tall order and no single point solution can address all these needs.

HOW
HAPPIEST MINDS
CAN HELP

Happiest Minds Technologies is a company with investments from Intel Capital and JP Morgan, with a rich engineering pedigree. We have a digital mindset with a strong focus on 3rd Platform technologies like Cloud, Mobility, IOT, Big Data Analytics & Blockchain. We are committed to supporting OEMs, ISVs, Service Providers, Web Scale & Enterprises in the design, development and deployment of Software Defined Networking, Network Function Virtualization, Software Defined Storage & Cloud Storage while bringing all the 3rd Platform Technologies together to create a unique value proposition and address the 200B$+ B2B2X Market.

NFV
Services

The need for Business Agility, Scale, everything as a service (XaaS) has led to several disruptions in the way Network Services are delivered. We have seen the transition from physical machines to virtual machines and then to Containers while witnessing the rise of Intent Based Networks and acceleration technologies like DPDK, NIC offloads and the emergence of high performing yet flexible and programmable ASICS and programming models like P4.

SDN
Services

Evolving from the separation of the control and data plane and openness, SDN has now come into its own, performing critical functions like Orchestration, Provisioning and Intent based networking. An SDN solution is an integral component in Telco Cloud NFV solutions, SDWAN solutions and Enterprise data centers. We are now dealing with an ecosystem where we have open as well as proprietary solutions co-existing along with pureplay SDN and hybrid SDN solutions.

Happiest Minds brings together all this expertise to offer comprehensive end to end NFV Services which include:

VNF DEVELOPMENT & PORTING

• Design and Development of VNFs

• Enhancement of VNFs

• Performance tuning and optimization using DPDK and other technologies

• Virtualization, Containerization

VNF MANO

• Development of VNF Management Applications and Systems

• Integration with Open Source and 3rd party software VNFM, VNFO like Tacker, Cloudify etc.

• Integration with NMS/OSS systems.

VNF TESTING & PRE-CERTIFICATION

• Automated NFVI testing

• E2E VNF Pre-Certification Testing

• System Validation – Multi-platform, Multi-vendor VNF

• Performance testing using Industry Standard tools Yardstick, Tempest, Rally, Ostinato, IXIA, SPIRENT, Intel NEP

NETWORK ELEMENT ENGINEERING

• System design based on OCP standards.

• Data path and Control Plane software development.

• OpenFlow Agent development, integration

• Switching OS engineering

SDN CONTROLLER ENGINEERING

• Enhancements, Hardening of Open Source SDN controllers

• Development of new services and APIs

• Northbound and providers South Bound for multi – application and multi-vendor deployment

• Integration with EMS/NMS/OSS systems, Network Automation Platforms

SDN APPLICATION ENGINEERING

• Development of SDN Applications and features.

• Integration with commercial and open source SDN controllers

• Integration with Portals , EMS / NMS systems.

SDN TESTING AND TEST AUTOMATION

• Test Automation framework for functional and conformance testing

• Multi protocol testing - OpenFlow, NetConf, OVSDB, P4 Runtime etc.

• E2E system testing including Network Intents, Orchestration, Application, Controllers and network elements.

TELECOM
Services

The Telecom Industry is currently undergoing a complete transformation to maintain its competitive advantage, as expectations of a seamless digital experience increase from enterprises as well as consumers. Telecoms players are now focused on leveraging disruptive technologies such as Open Programmable Networks, SDN, NFV and Analytics to create low latency, high performance networks. The end goal is for these networks to come through on the demands of scale and quality of experience on one hand, while bringing in 3rd Platform technologies like Cloud, Mobility, IOT, Big Data & Analytics on the other to create a strong application eco-system and maximize the full potential of B2B2X. Happiest Minds can assist Telecom Service Providers in this journey through our expertise in SDN, NFV, IOT, Analytics and DevOps.

- **IoT PLATFORM ENGINEERING**

- **IoT DEVICE INTEGRATION AND LIFECYCLE MANAGEMENT**

- **SERVICE ASSURANCE SOLUTION**

- **ELEMENT ENGINEERING**

- **PORTALS AND APPLICATION ENGINEERING**

- **B2B2X SERVICES**

- **SYSTEM VALIDATION**

FRAMEWORKS & REFERENCE IMPLEMENTATION

Happiest Minds has always taken a proactive approach in providing the best in class engineering services to OEMs, ISVs, Service Providers and the entire Networking and Telecom eco-system. We have invested in creating frameworks and reference implementations which can help reduce the cycle times of our customers by using the right frameworks and implementations. It also consequently drives down steep learning curves due to experienced engineers with a wide variety of experience. The current frameworks available include:

- **CLOUD BASED WAN ORCHESTRATOR -** Cloud based single pane of glass solution to manage the edge devices as well as the virtualized operator core, built on top of Open Day Light and Open Stack.

- **uCPE -** Adding more power to SDWAN solutions by uCPE based on Open Networking systems and White Box Switch, with each network function on the device containerized and service chained.

- **MEC EDGE SYSTEM** - End to End MEC Infrastructure including the Edge Device and Orchestrator providing programmability and service chaining of individual components to provide agile network services.

- **P4 BASED LOAD BALANCER DEMOED ON BMV2 MODEL** – An approach to have Stateful load balancer in the switch itself

- **TEST FRAMEWORKS**

  SDN-NFV TEST FRAMEWORK – A keyword driven, model based test framework with auto test case generation capabilities and rich library of test cases.

  E2E VNF TEST FRAMEWORK - Model based test framework for pre-certification level testing including VNF functionality, VNF lifecycle management and NFV MANO testing.

TOOLS AND TECHNOLOGIES

Dataplane Software	P4 | DPDK | OVS
SDN Controllers	Open Day Light | ONOS | Tungsten Fabric
Cloud,Orchestration & Automation Platforms	Open Stack | VMWare | Kubernetes | Tacker | ONAP
Programming Language Expertise	C | C++ | Python | Java & Java Frameworks Java Script frameworks – Node, React, Angular
Test Frameworks	Robot | Yardstick | Rally | Intel NSB | Tempest | PyTest | Selenium Spirent | IXIA

SUCCESS STORIES

1 Engineered, Integrated and Deployed SDN Orchestrated Smart Home IoT services to a 3 million broadband subscriber base for one of the largest Cable Service Providers of Netherlands.

2 Engineered an SDN and NFV enabled scale out of a Network Monitoring and Service Assurance solution for one of the Top 3 Telecom Service providers in Europe and India.

3 Developed an Intelligent SD-WAN solution, integrating a leading SDWAN platform and developing an enhanced Analytics platform for one of the largest low latency financial network providers in the US.

4 Cloud in a Box NFVi for a leading Communications modules systems provider compliant to ETSI MANO.

5 Developed, Tested and provided Automated Deployment of Red Hat and Mirantis Open Stack based NFV Cloud for one of the largest TEMs in Europe that services some of the largest telcos of the world.

About Happiest Minds Technologies:

Happiest Minds, the Mindful IT Company, applies agile methodologies to enable digital transformation for enterprises and technology providers by delivering seamless customer experience, business efficiency and actionable insights. We leverage a spectrum of disruptive technologies such as: Big Data Analytics, AI & Cognitive Computing, Internet of Things, Cloud, Security, SDN-NFV, RPA, Blockchain, etc. Positioned as "Born Digital . Born Agile", our capabilities spans across product engineering, digital business solutions, infrastructure management and security services. We deliver these services across industry sectors such as retail, consumer packaged goods, edutech, e-commerce, banking, insurance, hi-tech, engineering R&D, manufacturing, automotive and travel/transportation/hospitality.

Headquartered in Bangalore, India; Happiest Minds has operations in USA, UK, The Netherlands, Australia and Middle East.

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