Transforming 5G Networks with Disaggregated Cell Site Gateways (DCSG)

December 8, 2021
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2. Network Disaggregation
3. 5G & DCSG
4. IP Infusion DCSG Solution
5. Why IP Infusion?
IP Infusion Corporate Overview

20 Years of Innovative Network Software Solutions
- Carrier-Grade Open Networking
- Unparalleled Control Plane
- 1,000s of customers
- 10,000s of deployments

Open Source Innovation
- GNU Zebra OS
- Quagga
- LF FRR
- DANOS

Product and Technology Leadership
- White Box Solutions
- Carrier Grade OcNOS
- Control Plane

IP Infusion Recognized as Leader by Industry Analysts

“With over 20 years’ experience providing NOS solutions, IP Infusion’s rich pedigree guarantees you won’t get fired for choosing this company.”

Chris Grundemann, Analyst, GigaOm

IP Infusion is the leading CSP NOS vendor, with strong hardware abstraction capabilities and open-source credentials

Gorkem Yigit, Analysys Mason
20 Years of Enabling Network Equipment Manufacturers
Enabling End-to-End Solutions for Service Providers
IP Infusion Enables Operators To Break Vendor Lock-in

Traditional networking forces a mix of HW + NOS for multiple use cases. Stove-pipe solutions and an Operational nightmare.

IP Infusion enables best-of-breed HW across multiple use cases with standardized NOS. Operational simplicity with HW flexibility.

IP Infusion OcNOS: Open & Standards based for interoperability.

- Application A
- Application B
- Application C
- Application D

Open Config

Open TAI

IP Infusion

Multiple Use Cases

3rd Party Transceiver & Optical Modules
Disaggregation Delivers Benefits Over Traditional Model

<table>
<thead>
<tr>
<th>Traditional Way</th>
<th>IP Infusion Way</th>
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<tbody>
<tr>
<td><strong>Slow innovation and longer TTR</strong></td>
<td><strong>Fast paced innovation and shorter TTR</strong></td>
</tr>
<tr>
<td>• New platforms/features take 18-24 months</td>
<td>• Open networking solutions accelerate innovation &amp; quicker TTR</td>
</tr>
<tr>
<td><strong>Lack of interoperability</strong></td>
<td><strong>Interoperable across vendors</strong></td>
</tr>
<tr>
<td>• Proprietary solutions lack of interop across vendors</td>
<td>• Open, standards-based solutions ensures interop across vendors</td>
</tr>
<tr>
<td><strong>Lack of choice</strong></td>
<td><strong>Enabling choice and supply chain agility</strong></td>
</tr>
<tr>
<td>• Operators do not have flexibility in selecting best-of-breed or latest technologies</td>
<td>• Operators can quickly adopt latest hardware from different white-box vendors</td>
</tr>
<tr>
<td><strong>Higher TCO and operational complexity</strong></td>
<td><strong>Lower TCO and operational complexity</strong></td>
</tr>
<tr>
<td>• Trapped to higher CapEx and growing OpEx</td>
<td>• Significant TCO saving annually over traditional model</td>
</tr>
<tr>
<td><strong>Shackled by vendor lock-in</strong></td>
<td><strong>Free from vendor lock-in</strong></td>
</tr>
<tr>
<td>• Control is in the hands of the vendor, not network operators</td>
<td>• Handing strategic control back to network operators</td>
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End-to-End Service Provider Network: Traditional Solutions

ACCESS
- Enterprise
- Residential
- Fixed Wireless Access
- Mobility
- IoT
- 5G NR
- Business Users
- eNodeb

AGGREGATION
- Optical Splitter
- GPS Antenna
- Optical Transponder
- Mux/Demux
- Amplifier

CORE
- Core Data Center

INTERNET
- Core Data Center

Fixed Wireless Access: 5G NR

Residential: IoT, Business Users

Mobility: 5G NR

Enterprise: eNodeb

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End-to-End Service Provider Network With IP Infusion
5G Drives New Challenges & Requirements

5G brings new challenges & xHaul requirements

- **MORE CELLS**
  - Increase number of CSRs, compelling greater need to reduce costs

- **HIGHER SPEEDS**
  - Transport disaggregation requires range of interfaces spanning orders of magnitude of bandwidth

- **LOWER LATENCIES**
  - Disaggregation necessitates low-cost timing and synchronization

- **ORAN**
  - Open RAN requires flexible and diverse xHaul transport, and legacy services for migration
Disaggregated Cell Site Gateway At A Glance

The Cell Site router is a critical component of any xHaul deployment

DCSG – A family of white-box aggregation routers based on an open and disaggregated architecture for existing 2G/3G/4G and 5G mobile infrastructures.

- Modularize the SW functions to enable different use cases and deployment scenarios
- Build HW SKUs for each deployment scenario with common APIs and SW capabilities
- Enabling disaggregated solutions for any deployment type and architecture
IP Infusion Software Platform: OcNOS

Carrier Grade Network OS
- Modular
- Scalable
- Flexible
- Extensible
- Future ready

OcNOS

SW Abstraction
Control Plane
HW Abstraction
Data Plane

Management Plane

Containers for 3rd Party Apps

Industry-Leading Control Plane

Highly Optimized Software Data Plane

APIs

Management

Automation
NSMO Functions

- Network Service Automation (OAM)
- Network Telemetry
- Event Correlation (FCAPS)
- Integration for 3rd party EMS/NMS
- Integration for 3rd Party Domain Controllers
- SDN Based, Cloud Enabled
<table>
<thead>
<tr>
<th>OcNOS Software Platform: Key Differentiators</th>
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</table>

**INNOVATION**

- One Software Platform for diverse use cases:
  - Access, Aggregation, Transport, DCN
- Open programmability & automation approach
- Extensive OAM functionality
- Best-of-breed Grandmaster clock solution on COTS silicon
- Microwave radio awareness for Softhaul
- Customization for meeting unique one-off requirements

**NETWORK SIMPLIFICATION**

- Simplified network operations via CLI/NETCONF/OPENCONFIG/SNMP
- Broad ecosystem of technology and integration partners
- Packaged solutions for faster deployment and TTR
- ITU/IEEE/IETF/TIP/MEF Standards Compliance

**DE-RISKING DISAGGREGATION**

- Investment protection through Service Interworking
- Seamless migration from legacy to next gen networks
- Fully validated, hardened and carrier grade solutions
- Single point of contact support model for Hardware and Software
IP Infusion Turnkey Solutions

Simple Procurement Process with OEM Quality Support for Disaggregated Solutions

**Problem**

- The technology maturity level and available features (61%)
- Internal processes and lack of operational models to deal with this type of solutions (e.g., procuring components from different suppliers) (50%)
- Security concerns (46%)
- Problem resolution and root cause analysis when several providers are involved (no single "throat to choke") (40%)
- Quality and reliability concerns (37%)
- Total cost is too high/not compelling (including capex and opex) (29%)

**Solution**

- One supplier
- One point of contact for support & RMA

Operational Complexity And Full Support For Open Solutions Are Key Challenges For Network Operators

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Cell Site Router Deployments

- Asia Pacific Telecom (APT) launched 5G services based on IP Infusion’s Disaggregated Cell Site Gateway (DCSG) solution
- Delivered increased bandwidth with a compact, feature rich, and cost efficient solution
- Helped APT achieved a fast, reliable 5G network for consumers and business users
- Located in Taipei, Taiwan

- IP Infusion’s DCSG tested and validated at KDDI
- Lab Trial by KDDI as per TIP specifications for DCSG Solution
- End-to-End Integration testing carried out
- Located in Tokyo, Japan

- IP Infusion’s DCSG & Cassini Solutions (Optical) validated in CPqD Lab
- Achieved optical coherent 100/200 Gbps transmission over 2000 km without regeneration
- Located in Sao Paulo, Brazil
IP Infusion Commercial Deployments

Enabled high capacity optical packet transport network in Chile
- Delivered triple-play services, agility in service creation & scalability
- Expanding countrywide backbone capacity across 80km to 120km over 200 Gbps optical links
- All cities deployed with leaf dual-homed to the spines for redundancy

Innovating Data Center with Disaggregated Solutions
- Modernizing and expanding datacenter capacity with open disaggregated spine-leaf architecture
- Reducing TCO with best-of-breed white box solution
- Automation using NETCONF and ZTP with controller

The World’s First Disaggregated IXP
- Connecting more than 820 networks in over 75 countries
- Best-of-breed platform, EVPN over VxLAN, leaf-spine topology
- Reduces total cost of ownership
- Exceeding 800Gb peak traffic & SLA of 99.9999%

First Commercial Deployment of DCSG & Cassini in Africa
- 200 km network connectivity between Ouagadougou & Dakola
- First 200 Gbps link extending ISP capacity in Burkina Faso
- Land-locked country, with limited access to transit network connections
## Supported DCSG Platforms

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Vendor</th>
<th>Platform</th>
<th>Broadcom Chipset</th>
<th>Port Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Edgecore</td>
<td>AS5915-18X</td>
<td>Qumran-UX</td>
<td>6 x 10GE, 8 x 1GE, 4 x 1GE RJ45</td>
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<td>5</td>
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<td>Qumran-UX</td>
<td>6 x 10GE, 8 x 1GE, 4 x 1GE RJ45</td>
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<td>6</td>
<td>UfiSpace</td>
<td>S9501-28SMT</td>
<td>Qumran-UX</td>
<td>8 x 10GE, 16 x 1GE, 4 x 1GE RJ45</td>
</tr>
</tbody>
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Delivering Lower TCO Compared to Traditional Networking

- Up to 68% TCO saving annually over traditional networking model
- Lower TCO ~ $61M over 5 years

- Up to 64% CapEx saving over traditional networking model
- Lower CapEx ~ $37M over 5 years

- Up to 76% OpEx saving over traditional networking model
- Lower OpEx ~ $24M over 5 years
IP Infusion Delivers End-to-End Disaggregated Network Solutions

Access
- X-Haul solution for OpenRAN
- RF Intelligence & Microwave integration
- Support for Private 5G
- WAN Overlay, Traffic engineering
- Carrier Ethernet, XGSPON/NGPON2
- Programmability and advanced telemetry for automation and insights

Aggregation
- Capacity: 60 Gbps - 2.4 Tbps
- Interworking with existing networks
- Tunable optics for long range

Optical Transport
- Cassini: Long range, minimal delay
- Phoenix, Galileo
- 100/400/800 Gbps +
- DCO/ACO and ZR pluggable optics

Core & DC
- Edge-computing: Massive data exchanged at datacenter
- DCI, Next Gen DC/HPC
- 25/51/102Tbps Scale Carrier Packet Switching

Services and Capacity, at lower cost per bit without complexity, seamless interworking with legacy network without any service disruption
IP Infusion Solution Recap

Open Compute Network Operating System (OcNOS)

- Open Standards-based Software Platform (IETF/ITU/IEEE/OIF/MEF/TIP Compliant)
- End-to-end use cases (Access/PE/CSR/OTN/DC)
- Proven Industry-leading Control Plane
- Lower TCO (choice of ODM hardware)
- Advanced Network Services
- Future Ready (ODM/COTS Silicon/Optics/3rd Party Application integration)
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For more product info:
https://www.ipinfusion.com/products/ocnos/?1#osp

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