NGN OAM Capabilities

Dinesh Mohan

CTO Sr. Advisor, Nortel

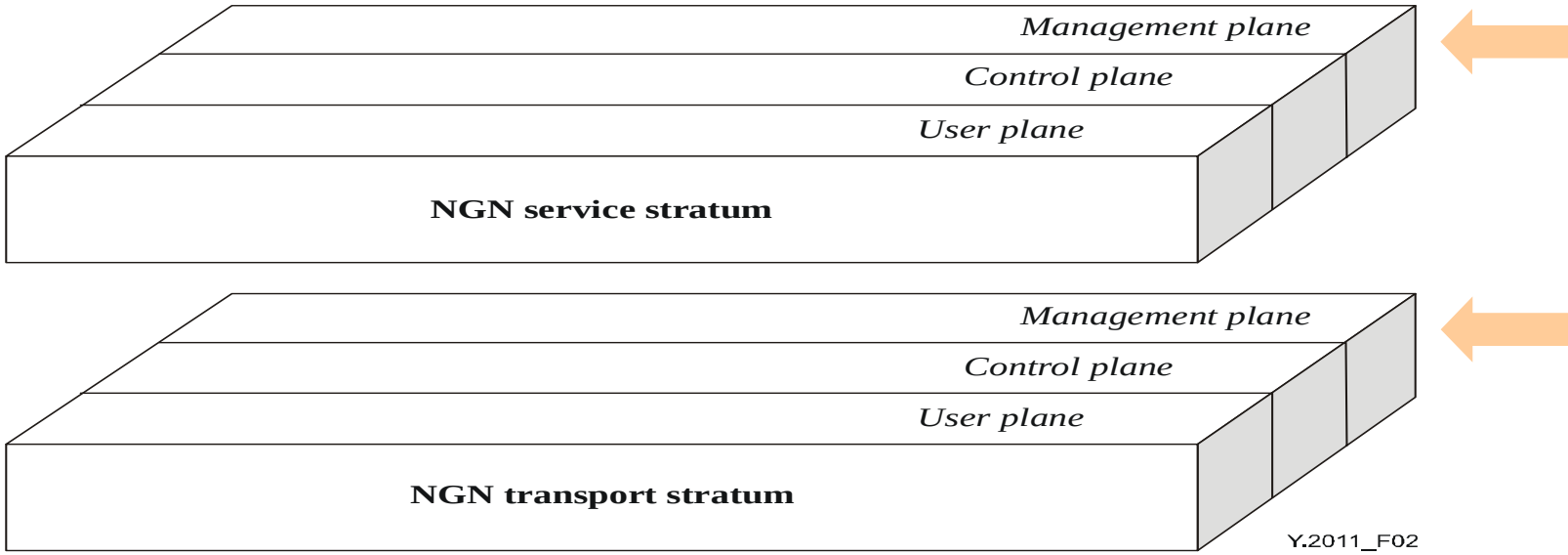
ITU-T Workshop "NGN and its Transport Networks"
Kobe, 20-21 April 2006

NGN OAM Activities Update

- NGN related activities are progressing
  - Y.2001 and Y.2011 specify the overview, principles and reference models for NGN
  - draft Y.NGN-FRA specifies NGN Functional Requirements and Architecture

- Initial NGN OAM requirements have been identified in draft Y.NGN-R1-Reqts

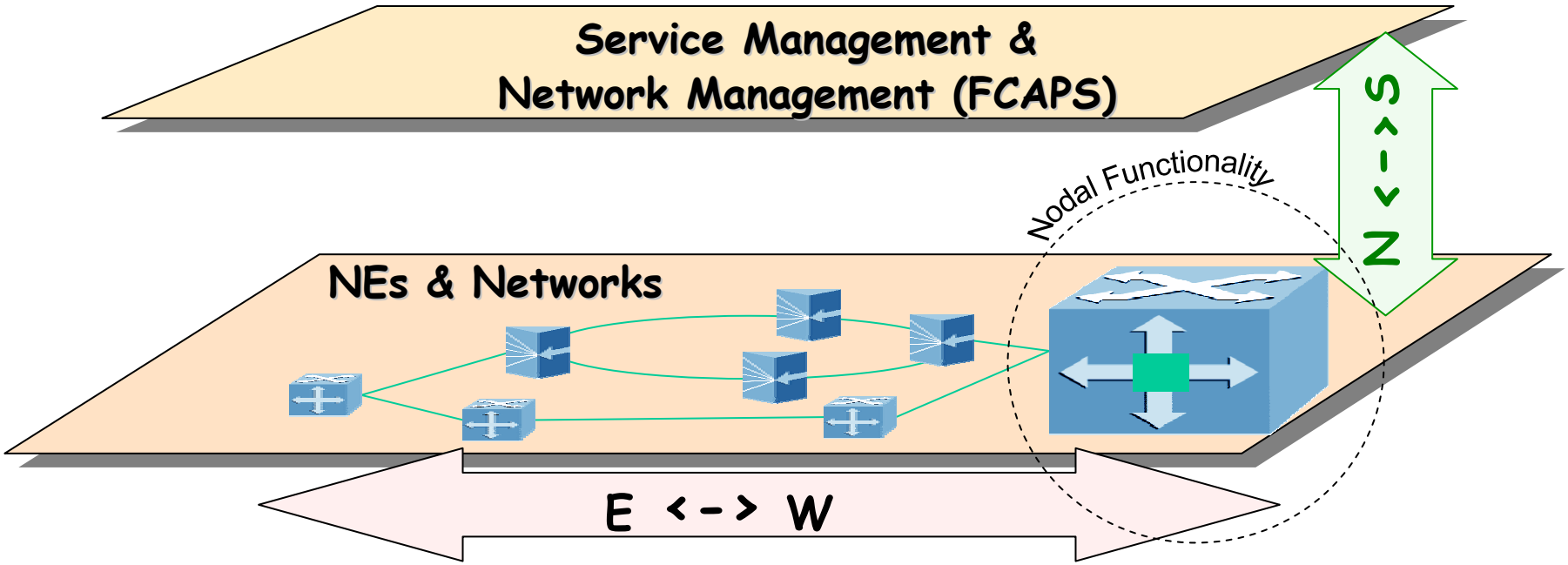
NGN Basic Reference Model



Y.2011/Figure 2: NGN Basic Reference Model

- Transport and Service stratum independence is a key feature of NGN
- NGN OAM capabilities need to address both transport and service management

What is OAM?

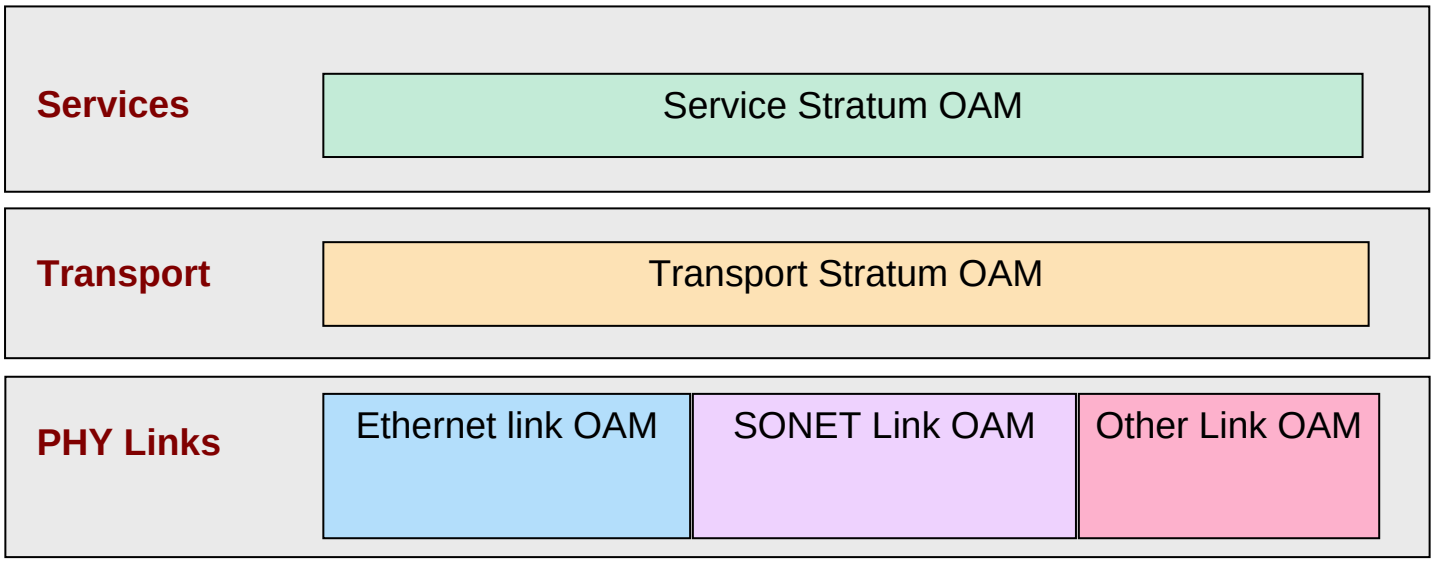


- OAM = Operations, Administration & Maintenance
- FCAPS = Fault, Configuration, Accounting, Performance & Security
- E <->W OAM functionality is guided by N <-> S OAM requirements to support Network/Service Management

Why is OAM critical?

- Multiple roles are involved
  - Service Provider contracts with Operators for facilities
  - Customer contracts with Service Provider for services
- OAM is probably not needed when no faults occur and everyone is happy ☺
- However, each role is required to fulfill contract
  - Accountable for compliance
  - Must reduce Opex when things go wrong

OAM Layering



- Principle
  - Each layer must support OAM capabilities independently
- OAM Layers are iterative
- Interworking is possible to utilize OAM functionality across different layers (e.g. fault notification)

NGN OAM Principles

- Modularity
  - User ought to be able to decide OAM functionality deployed
- Security
  - OAM frames from one domain should not leak into other domain
  - Each domain should be able to control access to other domains
- Congruency
  - OAM frames should traverse the same path as data frames
- Accountability
  - Each OAM domain is independently responsible for its monitoring
- Independence
  - OAM in each stratum should be independent of OAM other stratum
  - OAM should be independent of Control plane
- Backward Compatibility
  - NEs not supporting OAM should not adversely effect OAM

ITU-T

NGN OAM Functions

- OAM Functions for Fault Management
  - Fault Detection
  - Fault Verification
  - Fault Isolation
  - Fault Notification
  - Protection Switching
- OAM Functions for Performance Monitoring
  - Frame Loss Measurement
  - Frame Delay Measurement
  - Frame Delay Variation Measurement
- Other OAM Functions
  - Discovery
  - Diagnostics
  - Maintenance Channel

Ethernet OAM (NGN OAM enabler)

- Ethernet is a key technology in NGN
  - Ethernet has moved in provider/carrier space
  - Ethernet Services (E-Line, E-LAN, etc) are being offered today
  - Lots of standardization activities in IEEE 802, ITU-T, MEF, etc.
- Different Ethernet technologies are being discussed
  - Layer 2 Networking
    - Provider Bridges (PB)
    - Provider Backbone Bridges (PBB)
    - Provider Backbone Transport (PBT)
  - Link Layer: 802.3, RPR, GFP
  - Physical: 802.3
- Ethernet OAM, being defined in Y.1731 and IEEE 802.1ag, is a good example of how NGN OAM capabilities are being realized

ITU-T

Fault Management

- Fault Management is about detecting defects and verifying, localizing, notifying the failures
  - Fault restoration is a follow-up action
- Defects detected via OAM
  - Loss of Continuity
  - Misconnections
  - Server failures
- Ethernet OAM Functions for Fault Management
  - Fault Detection — CCM
  - Fault Verification — LBM/LBR
  - Fault Isolation — LTM/LTR
  - Fault Notification — AIS, CCM (with RDI), LCK
  - Protection Switching — APS

ITU-T

Performance Monitoring

- Performance Monitoring is about measuring performance parameters to determine QoS, conformance to SLAs, etc.
  - Frame Loss Ratio
  - Frame Delay
  - Frame Delay Variation
  - Availability
- Current focus of OAM functions has been PM for p2p
  - mp and p2mp/mp2p work is getting started
- Ethernet OAM Functions for Performance Monitoring
  - Frame Loss — LMM/LMR, CCM (with LM)
  - Frame Delay — 1DM, DMM/DMR

ITU-T

Other OAM Functions

- Discovery
  - Discover peer MEPs — Multicast LBM/LBR
  - Adjacency Retrieval — ETH-LT
- Diagnostics: Out-of-service and in-service to test line rate, PRBS patters, etc.
  - Bidirectional — LBM/LBR
  - Unidirectional — TST
- Maintenance Channel
  - Remote Management — MCC

Ethernet OAM Standardization

- ITU-T Y.1731
  - Being done in Q.5 SG13
  - Scope is Fault Management and Performance Monitoring
  - Document consented in Jan'06
  - Last Call comments resolution is being carried out

- IEEE 802.1ag
  - Amendment to IEEE 802.1Q
  - Scope is limited to Fault Management (CCM, LBM/LBR, LTM/LTR)
  - Expected timeline: 1Q07 for Sponsor Ballot

ITU-T

Conclusion

- NGN related activities are progressing well with current standardization focus
- NGN OAM capabilities are identified based on service and transport stratum management expectations
- Key NGN enablers are already being standardized e.g. Carrier Ethernet
- Ethernet OAM meets the NGN OAM capability requirements

ITU-T