

Enterprise Architecture in SESAR *An Overview*

presented by

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***NATS – Chief Architect European ATM
and on behalf of SESAR Joint Undertaking***

**FAA NAS Enterprise Architecture Conference
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SESAR Joint Undertaking

- Current Membership is now 17 organisations/companies :
 - Founding Members
 - European Commission
 - Eurocontrol
 - Air Navigation Service Providers
 - AENA (Spain), DFS (Germany), DSNA (France), ENAV (Italy), NATS (United Kingdom), NORACON (North European & Austrian Consortium)
 - Airport Operators
 - SEAC (SESAR European Airports Consortium)
 - Systems Supply Industry
 - Airbus, Alenia Aeronautica, Frequentis, Honeywell, Indra, NATMIG (North European Industries), Selex Consortium, Thales

Overview of Presentation

- SESAR Vision from Project Definition phase (2006-2008)
- Reasons for taking Enterprise Architecture (EA) & Service-based Approaches
- Outline of Results from Recent Studies
- Expectations concerning how they will be used in SESAR Development Programme (2009-2017)
- Challenge for Stakeholders
- Summary

Background from SESAR Project Definition (PD) Phase

SESAR (Single European Sky ATM Research)

- European air traffic control infrastructure modernisation programme
- Aim is to develop new generation ATM System for 2020 & beyond
- Give Europe a high-performance ATM infrastructure to enable **Safe** and **Environmentally sustainable** development of Air Transport

A System that, compared with 2005 baseline, will :

- **Enable** 3-fold increase in Capacity
- **Improve** safety performance by factor of 10
- **Enable** reduction in effects of flights on the environment by 10%
- **Provide** ATM services to airspace users 50% cheaper

SESAR is taking a Performance-driven Approach

Background from SESAR Project Definition (PD) Phase

- Recommended that Enterprise Architecture (EA) & Service-Oriented Approach (SOA) techniques be used to manage the development of the future European Air Traffic Management System (EATMS)
- Proposal based upon following principal shortcomings of current situation :
 - Today's EATMS has fragmented design which is difficult & expensive to change
 - Large diversity of technologies in use throughout Systems in operational service today
 - Today's "bottom-up" approach to making changes to individual systems to create "Single EATMS" for the future will not work
 - Need different approach to meet today's expectations of the stakeholders for taking performance-driven approach in future

Background from SESAR Project Definition (PD) Phase

- Future vision relies on stakeholders being able to :
 - create an ATM Performance Partnership (ATMPP) between them
 - share information (i.e., through the use of System-wide Information Management (SWIM) techniques)
 - achieve a high degree of connectivity to maximise the benefits of using Collaborative Decision Making (CDM) techniques
 - work to meet a common ATM Master Plan to realise a “Single European ATM System (EATMS)”

SESAR Vision – Concept of Operations

- Seven major features, the first two :
 - System Wide Information Management (SWIM)
 - Collaborative Decision Making (CDM)

provide foundation for :

- Trajectory managed environment – NOT airspace
- Human-centric decision-making with automation support to handle workload
- Use of new separation modes to take advantage of :
 - advanced aircraft navigation capabilities, to allow
 - (ultimately) some tasks to be delegated to pilots
- Performance of Aircraft & ATM systems to be matched to achieve “ATM Capability Levels”
- Airports to be fully integrated into the ATM network

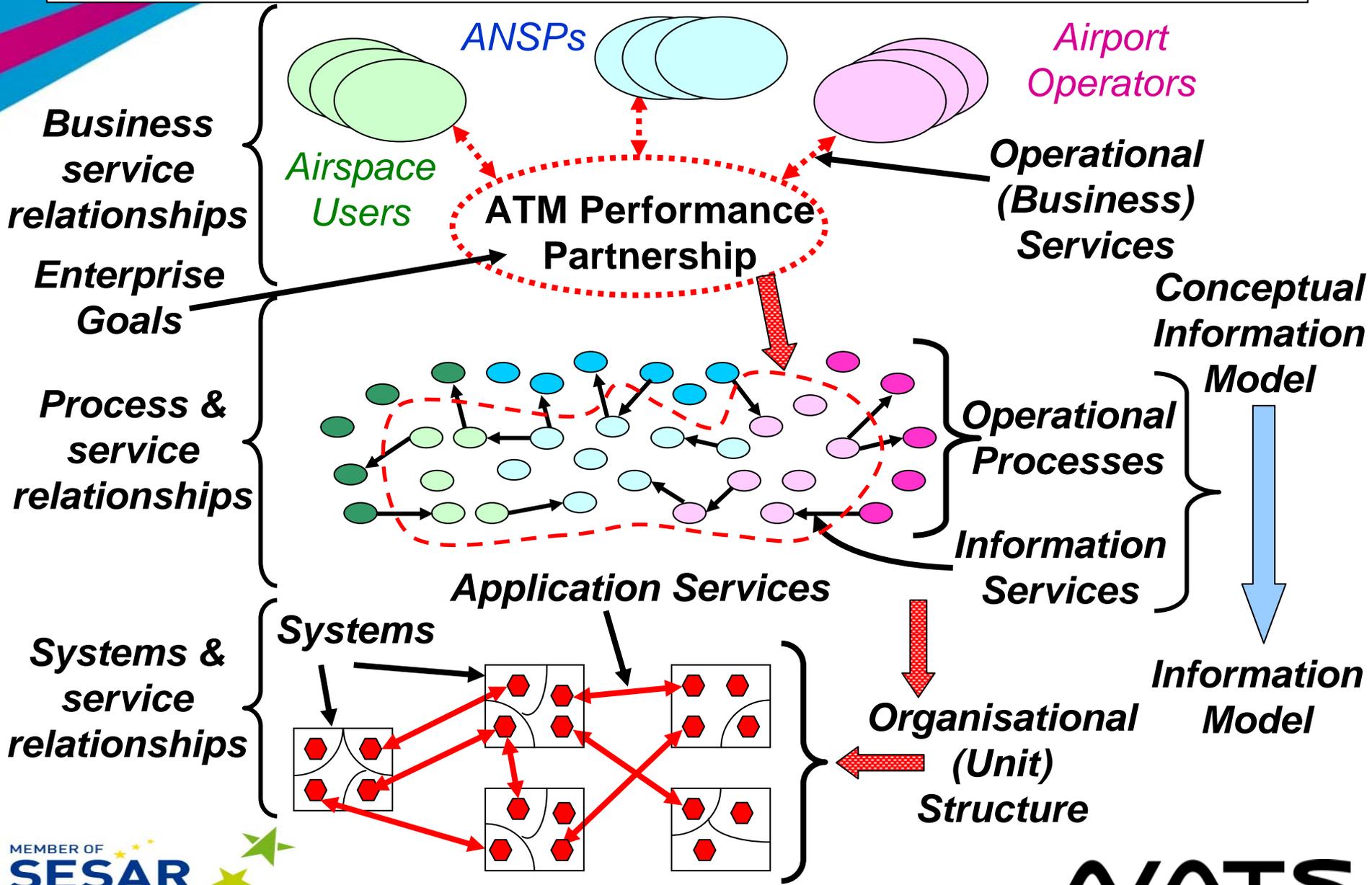
Reasons for taking an EA Approach

- Expectation is using Enterprise Architecture will improve ability to manage technological developments & keep them aligned with meeting operational & business goals
..... *because the*
- approach to systems development must be coherent to create vision of a “Single EATMS”
- value to the “ATM Enterprise” of the technical systems must be consistent & visible
- communication of technical solutions to the stakeholder community must be clear, to achieve their “buy-in”
- investment decisions to implement the solutions must be made from a strategic perspective, not tactical
- ability to perform scenario planning & modelling must be comprehensive to ensure the “best” solutions are chosen

Conclusions & Recommendations from Recent Studies

- To derive benefits of using modern Information Technology (IT) solutions to implement the Future ATM Target Concept, making changes to and/or replacing, systems must be done in a harmonised way and at a common level throughout the EATMS's architecture
- Taking a service-oriented approach & using an EA framework will enable this harmonisation to be achieved
- European ATM has to be seen as a “single enterprise”, manifest in the notion of a European ATM EA (EAEA)
- The EAEA provides a performance-driven framework that allows a meaningful way to partition & manage ATM complexity, reconciling different partners' business visions for ATM and creating a “bridge” between their business needs & their requirements for IT solutions

Recent Study – Principal Relationships Evaluated



Conclusions & Recommendations from Recent Studies

- Notion of being performance-driven & using EA approach suggests a “top-down” approach must be followed. However, to allow parallel working for efficiency, “middle-out” approach can be taken provided a rigorous governance régime is applied
- Some Architecture Framework (AF) considerations were investigated
 - NATO AF (NAF) used to illustrate how different views can be used
- Expressing Performance Targets & Goals through the notion of Capabilities to link to Stakeholders using Operational (Business) Services seems to be a sound basis
- Creation & agreement between Stakeholders of an Information Model leading to the development of a data model considered to be vital to achieve coherence

Conclusions & Recommendations from Recent Studies

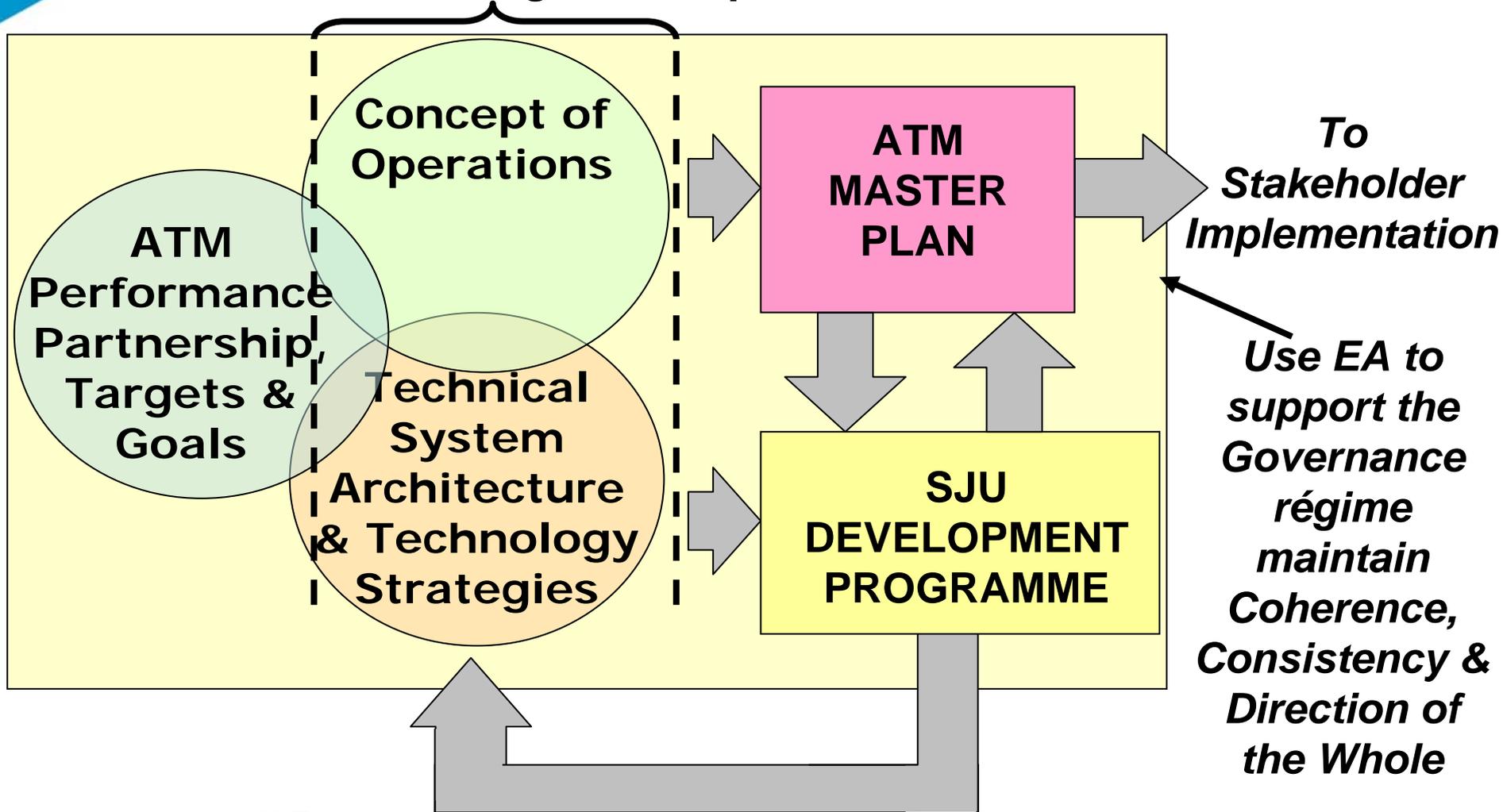
- Adopting a combination of using EAEA & taking a Service-based Approach :
 - will enable improvements in business agility & efficiency to be realised through a streamlining & aligning the supporting IT infrastructure to the business
 - is not a “silver bullet” that will immediately solve all the issues surrounding the evolution of ATM systems
 - has been done successfully in other industries
 - European ATM is not the first to attempt this, but it must embrace their experience to identify best practice & learn lessons
 - implies a “paradigm shift” in the way the business is viewed & managed, and in the way the supporting IT infrastructure is specified and developed – requiring a big cultural change

Conclusions & Recommendations from Recent Studies

- In an EAEA, Service- & SWIM-based environment, partners give access to their systems and information to other partners within the Enterprise
 - Note : This means that security issues, such as authentication & access control, have to be managed at the enterprise level
- Adoption of an EAEA & taking a service-based approach represents a long-term strategy for change
 - It will challenge partners to re-engineer their organisation, processes & IT to optimise their ATM related activities as federations of relatively independent services

SESAR Approach to using EA

Future ATM Target Concept



Breadth of EA in SESAR

- The Complete ATM Scope (both on the ground & in the air)
 - Operations
 - Systems
 - Technology
 - Finance
- Development Programme is “outcome oriented” with tangible benefits being delivered in evolutionary steps
- European ATM Master Plan is the single community reference document describing what SESAR is doing to meet Stakeholders’ future needs
- Master Plan & Development Programme Scope includes need to work internationally on interoperability & standardisation activities
 - these to be co-ordinated by SJU Programme’s Core Team

The Challenge for Stakeholders



Develop a coherent strategy to address :



- *Increasing traffic demands*



- *Improving safety & environmental performance*



- *Minimising operating costs*



- *Meet contractual commitments*

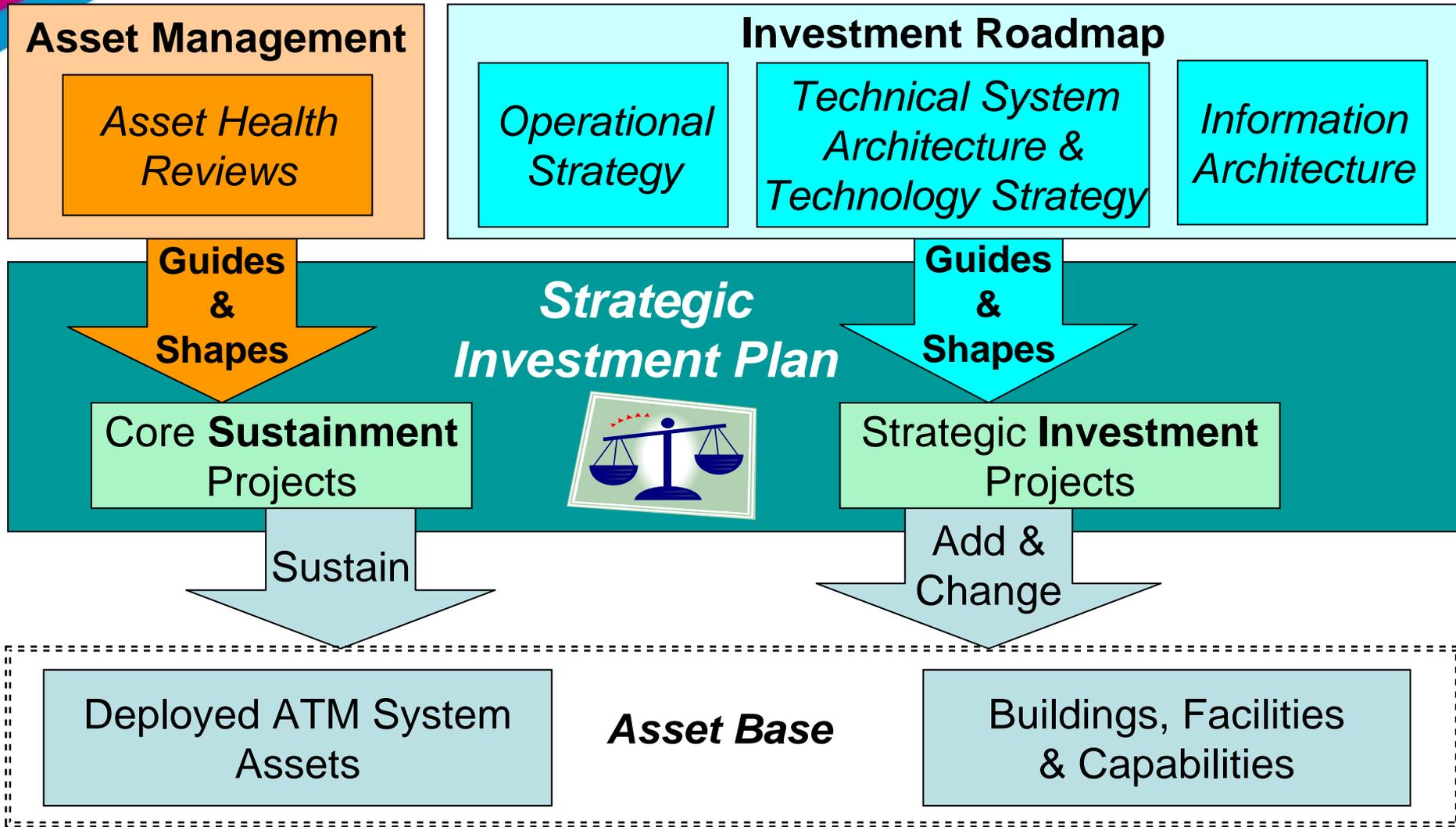


- *Formulate a credible implementation strategy*

- *Position their ATM Systems for SESAR*



Relationship used by NATS to manage Investment Roadmap & Plan



Some NATS Experience of using EA to Date (1/2)

- Learn through actions
 - Identify Key Issues
- There is no ideal organisational solution
 - Collaboration is essential !
- Different Stakeholders have different roles at different points of the lifecycle
- Clear responsibilities and accountabilities needed
- Strong Leadership needed
 - Gain Executive Sponsorship !
- “Dig into” the conflicts between stakeholders
 - Don’t avoid them !
- Communication is difficult and has to be worked hard
 - Without good stakeholder communication, you will fail !

Some NATS Experience of using EA to Date (2/2)

- Use of an Architecture Framework (AF) is essential
 - It gives a structure to architecture analysis
 - It provides a standard form for communication
- The Real Value of an Architecture Framework is in its Meta-model, not the Views
 - The meta-model allows capture of entities & their relationships
 - The meta-model ensures consistency between views
- Choose an AF that has good tools support is important
- Architecture is only a means
 - Need to focus on the value the architecture modelling provides
- Adapt/Tailor a standard framework to meet your needs
 - There is no “one size fits all”

Summary

- Future EATMS will have a single SESAR EA integrating widely distributed businesses, services & systems in an ATM Network-centric “system of systems”
- SESAR EA will integrate Programme Activities & Projects to support the development of the EATMS & application of SOA principles
- Taking an EA approach will :
 - Manage complexity, reducing it into manageable & integrated elements
 - Structure the EATMS in terms of service relationships
 - Align initiatives with a common SESAR Vision
 - Communicate with Stakeholders, especially to prepare them for the ensuing Implementation Actions

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