Journey from Advice Notes to Intelligent Agents

Wednesday 14 January 2026

Welcome

The event will start at 7:00pm

Introduction: Kevin Foster FIET, Chairman, Anglian Coastal Local Network

Presenter(s): Dave Milham, Chief Architect AI Programme, TM Forum

Questions: Live in the Atrium & via Q&A Messaging in Teams. In Teams, please type in your questions and these will be taken in a Q&A session at the end of the presentation.

Close: Approximately 8:15pm

Telecom Operations History in Nutshell

Digitalisation

Compute and Storage

Automation and Autonomy

Era:
- Manual People Centric

Era:
- Software Automation Centric

Era:
- AI-enabled Autonomous Operations Centric

1970's

1980's

2023

2026

2030's
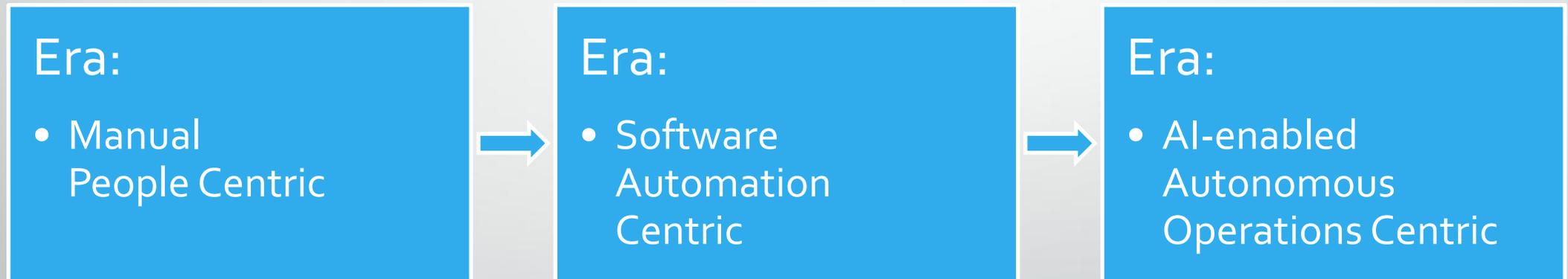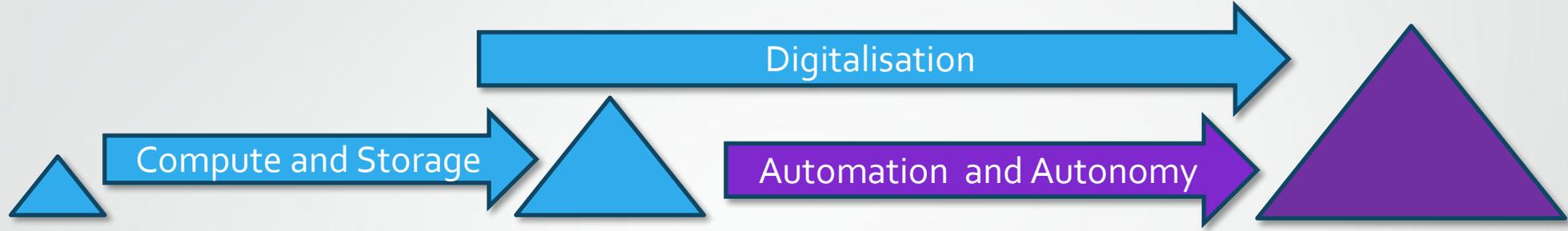
Hidden Drivers: Business Case, Funding and Risk

- High Capex industry

- Initially Software was unfamiliar technology, with uncertain returns

- Initially AI is unfamiliar technology, with uncertain returns

- Business Focus:

  - Improving Customer Experience

  - Automation to:

    - Reduce CAPEX

    - Reduce OPEX

- Risk aversion to large long duration Software projects
  ➲ Incremental improvements, Minimum Viable Product, Technical Deficit

Conway's law:
"organizations design systems that mirror their own communication structure"

Hidden enablers: Technology

- Networks
  - Electro-mechanical Analog Networks ➲ Digital Electronics and Semiconductors
- Administrative Automation
  - Paper records ➲ Digital records: Disk Tapes
  - Administrative processes ➲ Software Program Automation
- Autonomy
  - Decision making by people ➲ Decisions by AI Algorithms
  - Humans 'In the Loop' ➲ Humans 'On the Loop'
  - Re-active ➲ pro-active

What did Networks look like in the '60s?

Network Switching

Strowger/Rotary

Analog FDM Transmission

Analog Copper Access Network

Maintenance
Administration
Operations

Planning & Maintenance Technical Instructions (TI)


Mechanical 'Units' Meters

Era: Manual Administration Operations

- Networks focussed on Telecom functions and technologies

- Manual operations focus on Repair and Order/Provisioning 'Technical Instructions TIs' aka 'Engineering Instructions EI'

- Manual functions and processes with limited IT support
    - Largely record keeping
    - **Advice Notes**
    - ➲Mechanised Order Handling (MOH)
        - Manual Computer input
        - Printing and distributing paper copies
        - Provisioning process unchanged and manual
    - Electro-mechanical metering for Billing
        - Photographed
        - Manual data input
        - Automated Bill creation, printing and mailing
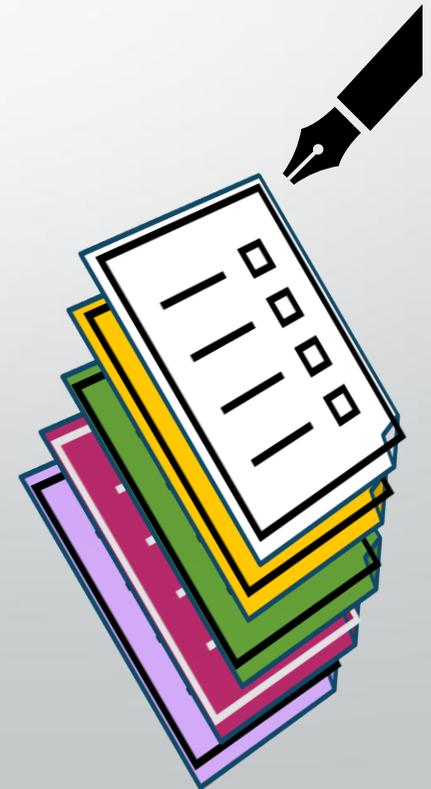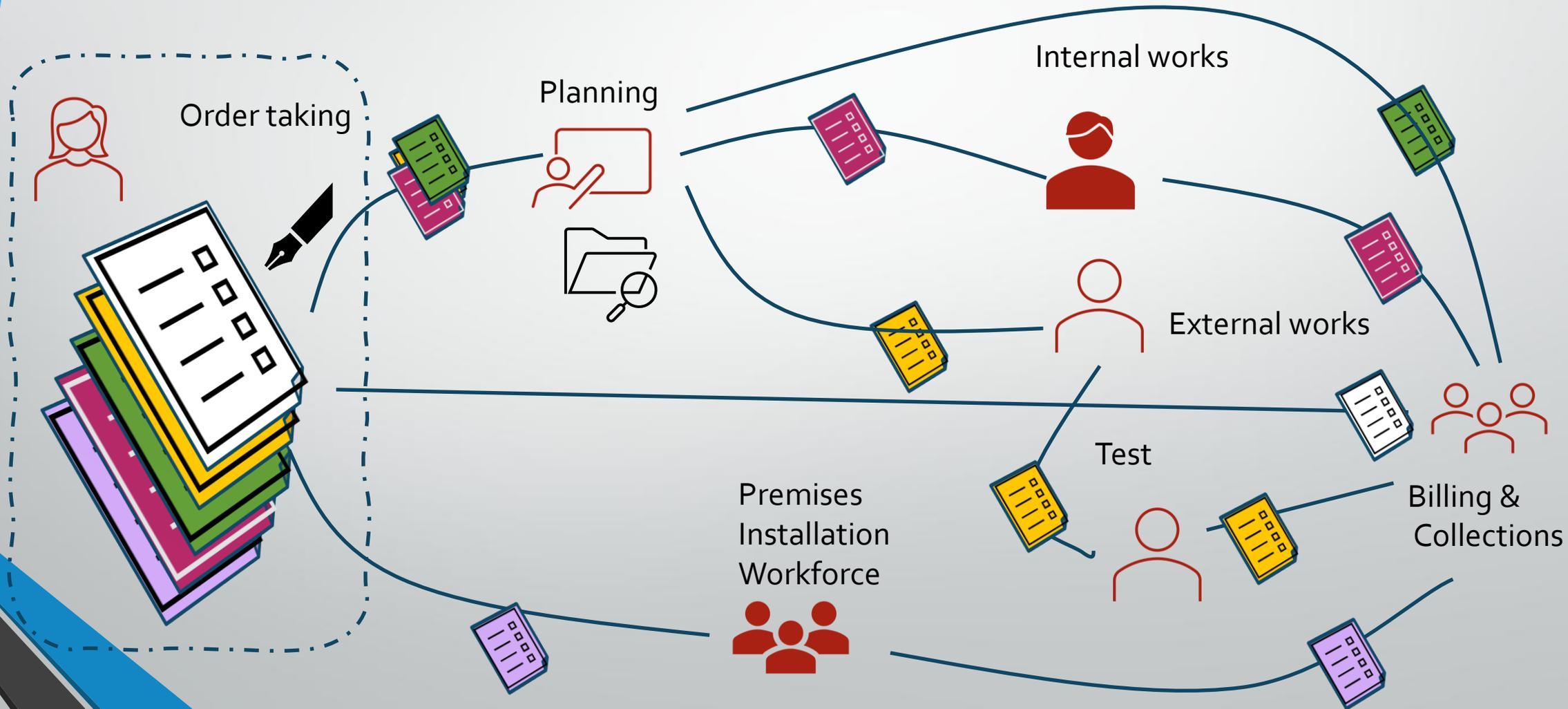
What happened in the '70s and '80's?

Network
Switching

Analog Copper Access Network

System X
Digital Software Controlled
Switching

Internet

Digital Fibre Transmission

Maintenance
Administration
Operations

Operations & Maintenance System
(OMC) 1 and 2 Minicomputers
Network Operations Centre (NOC)

Mainframe
Front Office
Customer Support Systems

Automation concepts: e2e BSS OSS ERP processes

OSI/NMF TM Forum
Business Process Framework
GB921 aka eTOM

eTOM describes
Business Processes
that are performed
by organisational units
Gives an end to end
process viewpoint

Key:
- BSS Business Support Systems
- OSS Operational Support System
- ERP Enterprise Resource Planning
    - Network Management Systems (NMS)
   - Element Management Systems (EMS)
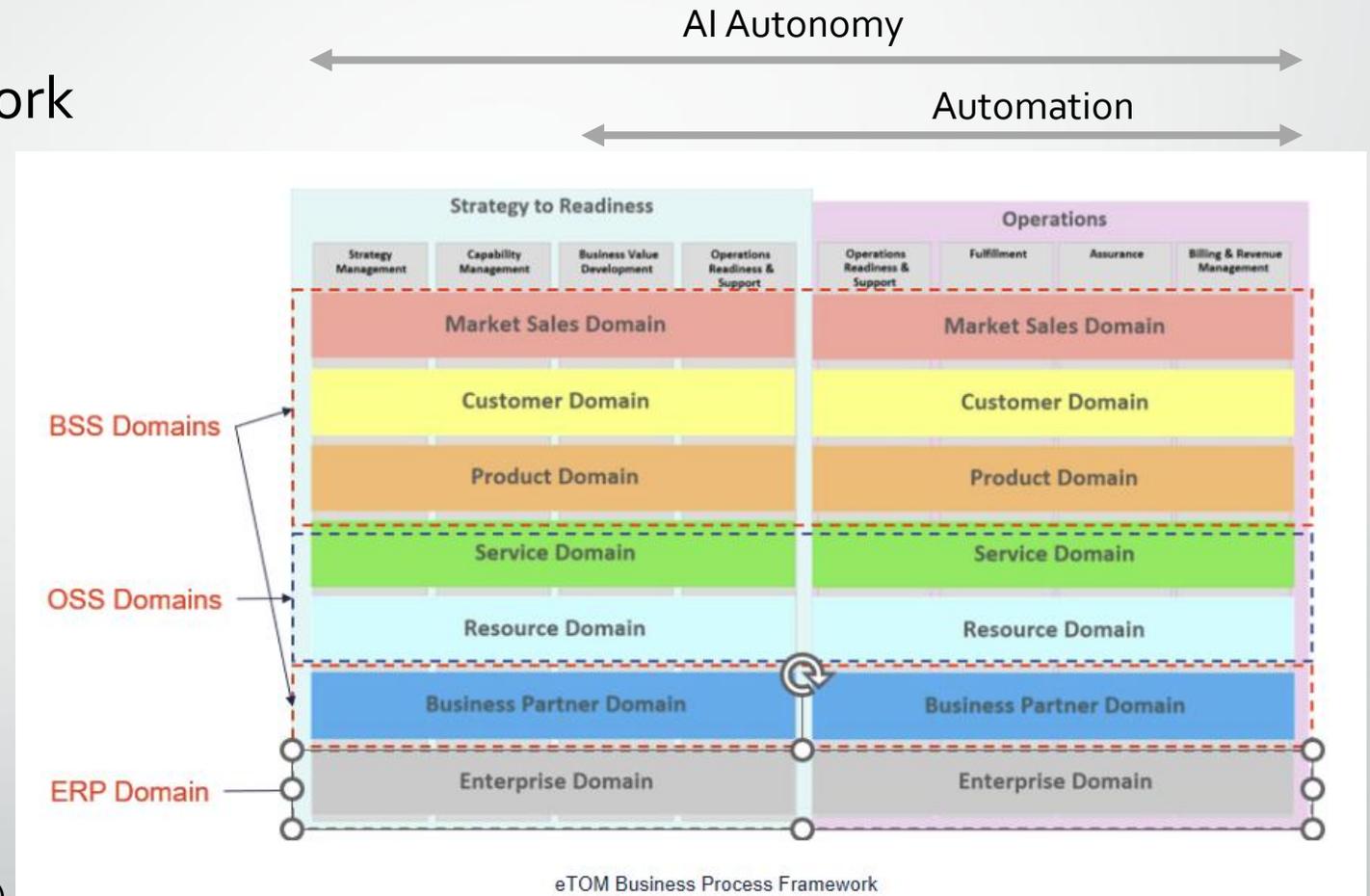
eTOM Business Process Framework

Era: Software Automation Centric

- From automation of Organisational Functions and individuals ➲ *Process re-engineering*
- *End to end processes*
  - Order to Cash, Trouble to Resolve, Billing, Planning and Design
- Operational focus on processes and realisation by people and systems
- Core Concepts captured ITU –T Telecom Management Network
- *Systems focussed on automating processes*
  - System interfaces ➲ *Task APIs*
- *Challenges*
  - *API technology evolved every 3-5 years*
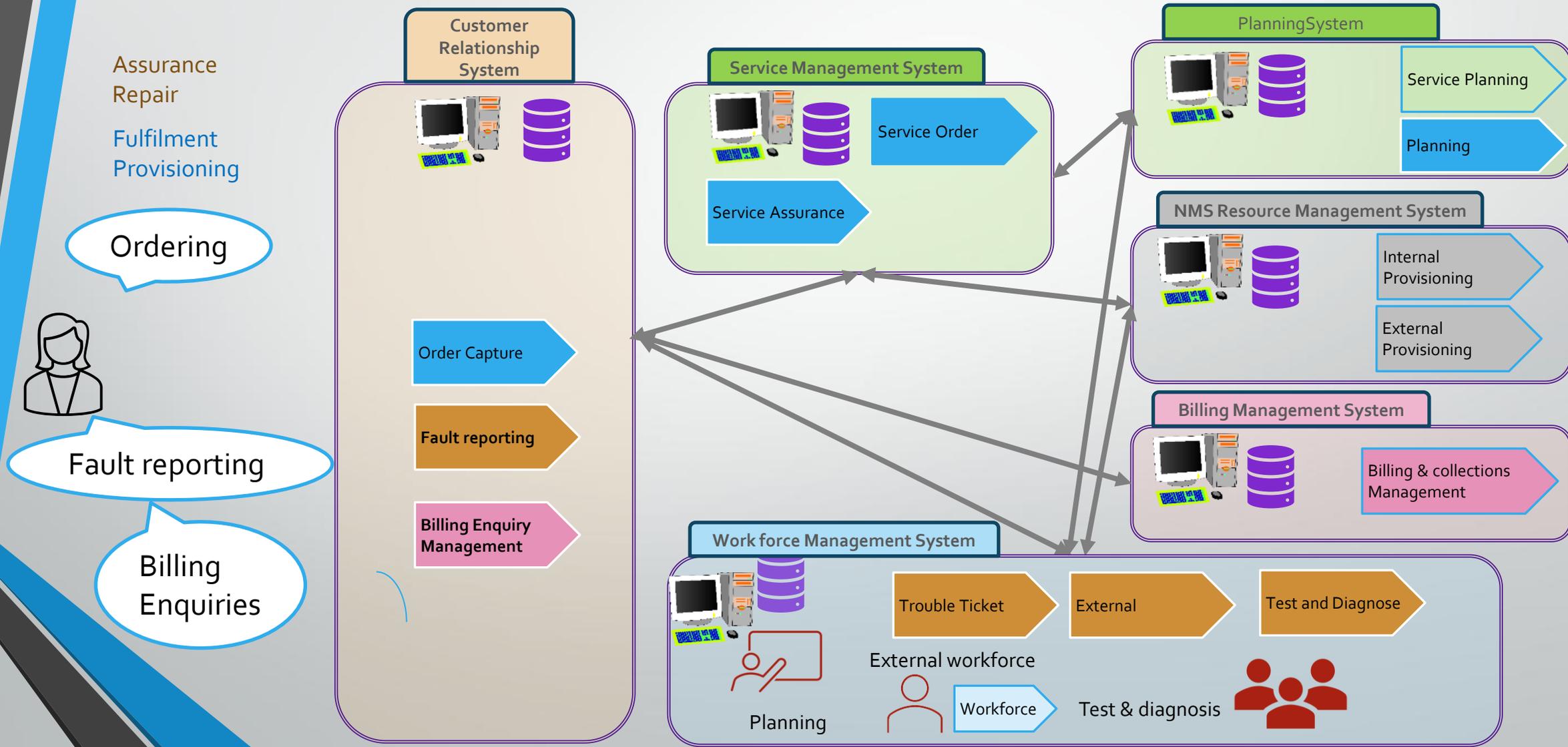 - Disconnect between IT and Network API and technologies

Evolution of mechanisation to Automation MOH ➲ Customer Support Systems (BSS)
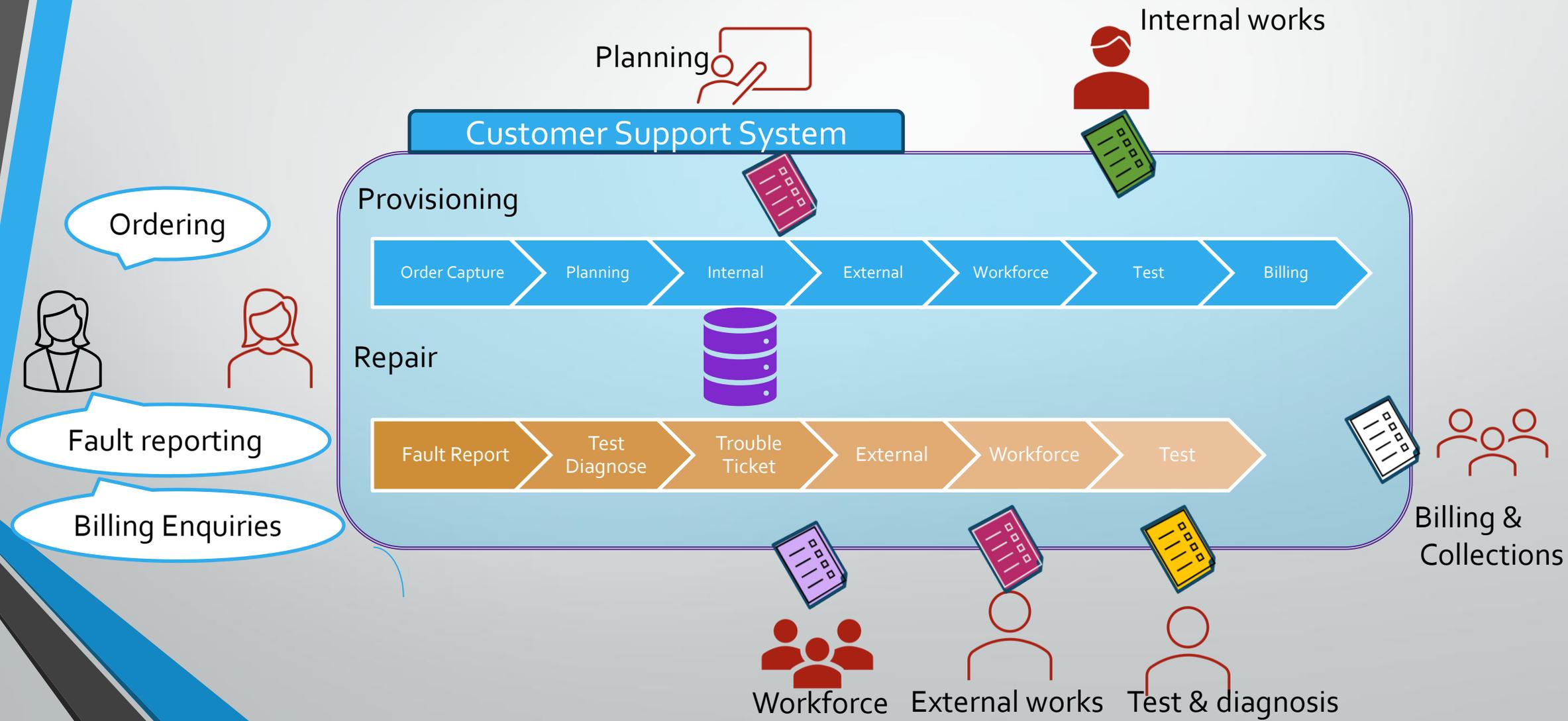
Emergence of end 2 end Process Engineering - use of Best of Breed products

WHAT HAPPENED?

TAKEOUTS

Monolithic System → Distributed system
Large number of intersystem APIs

Large s/w Development teams → Distributed parallel agile Development teams

Processes:
Internal system software logic → Processes: Distributed logic linked by inter system APIs

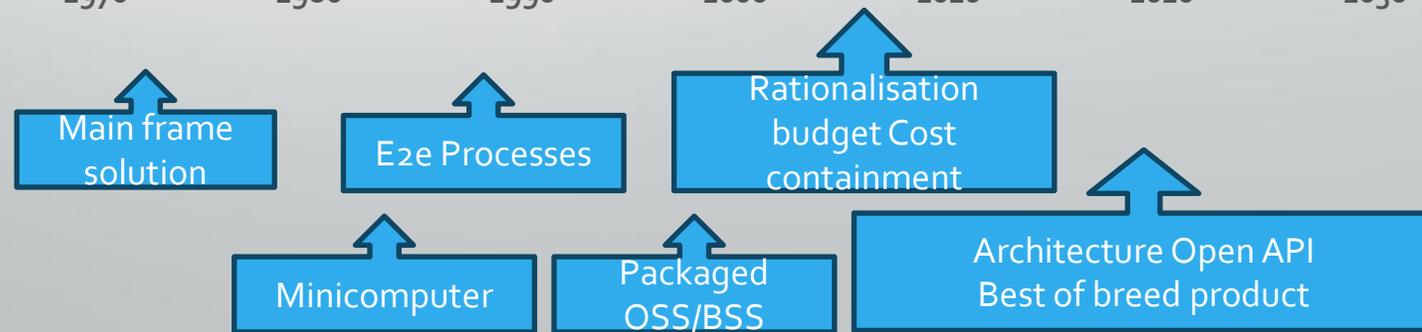**Centralised Database** → **Distributed Databases**

The rise of OSS BSS Architecture

What happened next?

Indicative trend

AI Copilot

Agentic AI

#Sytems

inteconnections

System CAPEX Costs

1970   1980   1990   2000   2010   2020   2030

Main frame solution

E2e Processes

Rationalisation budget Cost containment

Minicomputer

Packaged OSS/BSS

Architecture Open API Best of breed product
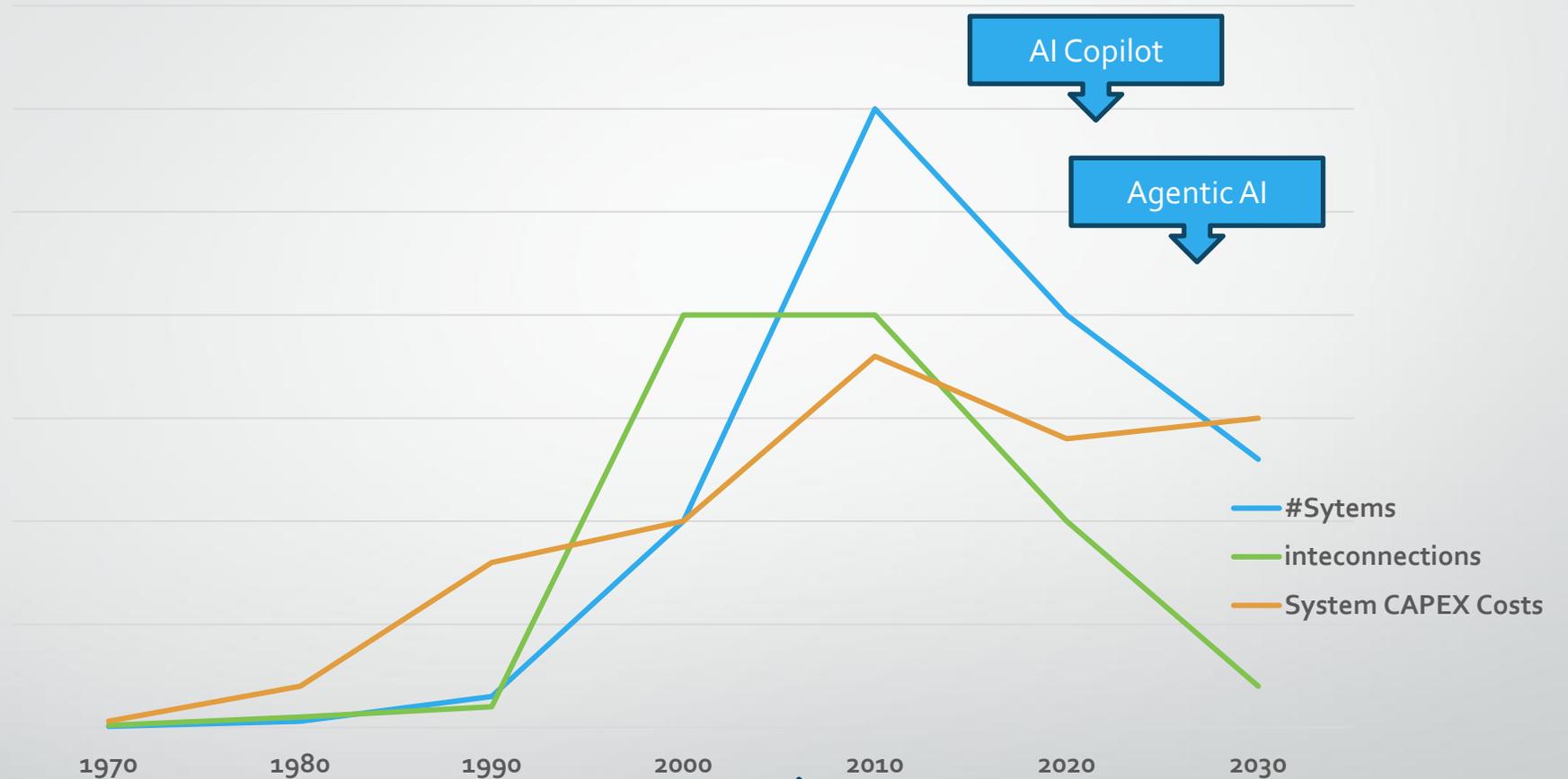
IT Optimisation Challenge

- >3000 systems
- Increasing yearly
- Vertically integrated
- Highly complex data
- Lengthy & costly development cycles
- Excessive maintenance & support costs
- Reliability and stability issues
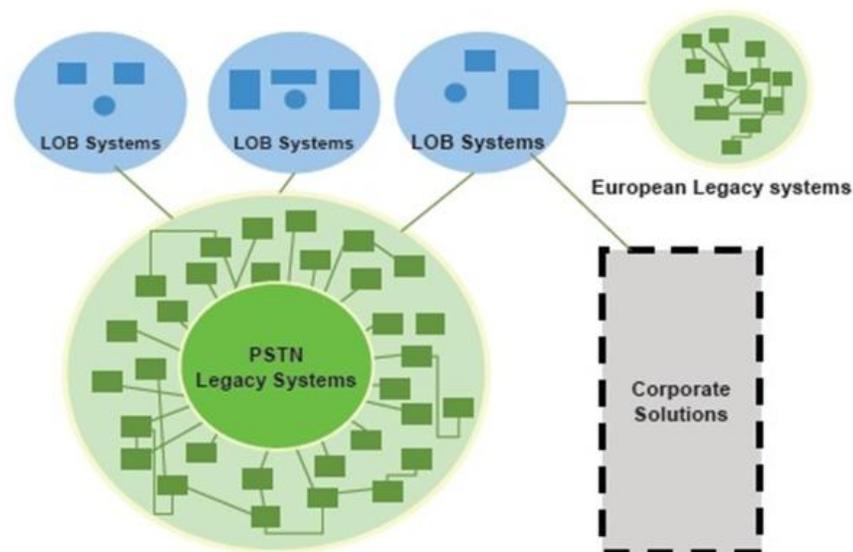
LOB Systems   LOB Systems   LOB Systems   European Legacy systems

PSTN Legacy Systems

Corporate Solutions

IT Optimisation Challenge

Presentation George Glass BT at TM Forum Managemment World Dallas 2006

Systems rationalisation –emergence of platforms

Departmental systems

Budget rationalisation from systems - platforms

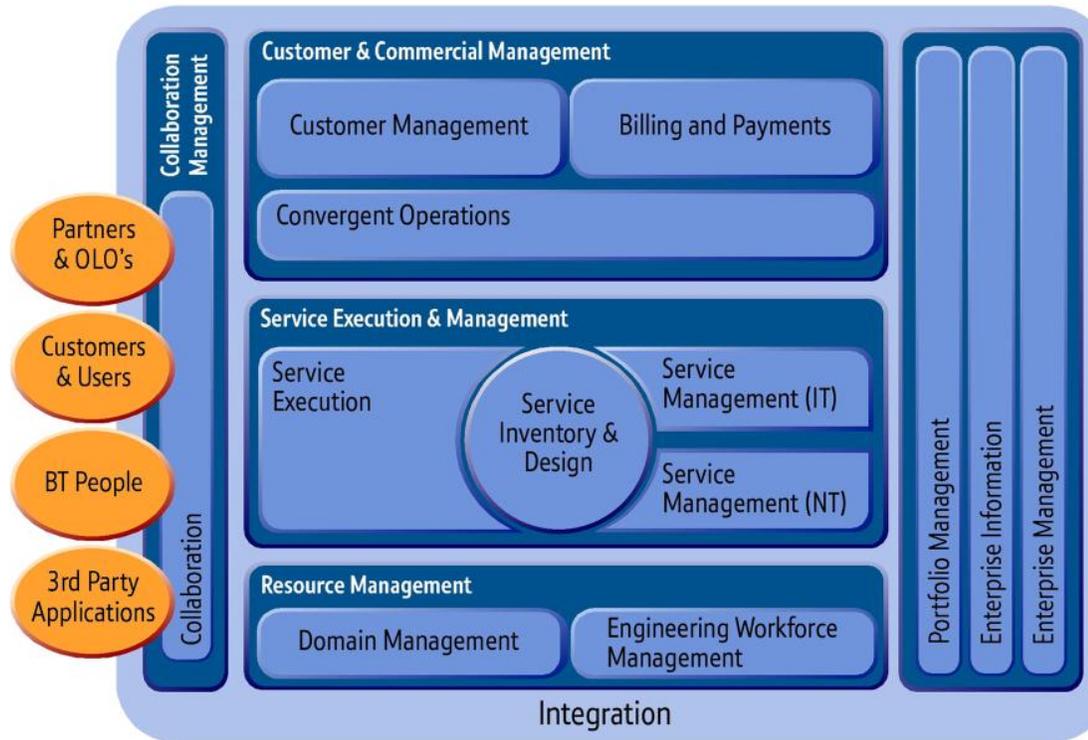Organise functionality by platform

Align functionality with capabilities

- Technical rationalisation
- best of breed package
- OpenAPIs per Platform

Technical integration open APIs per Platform
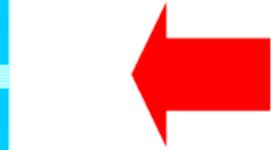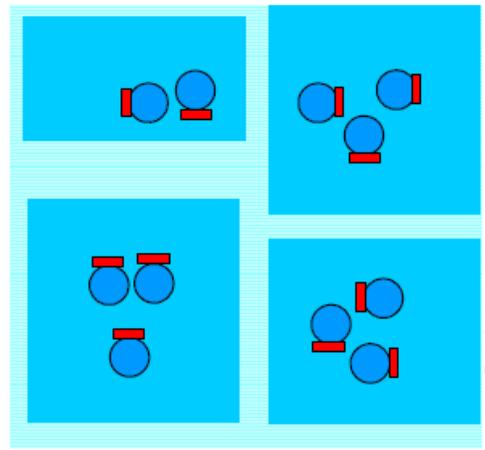
Switch off legacy systems using self-funding cases

Key — ● **Existing functionality** — 🔵 **Functionality aligned and encapsulated as capabilities**

2025 – 2030 and beyond: The adoption of AI and Autonomous Networks

High risk, High reward?

Era: Autonomous Operations Centric Operations
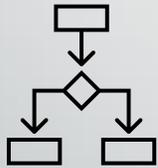
- Business Drivers
  - Processes 95-99% automated
  - Humans still in the Loop for complex planning and assurance
  - example Diagnostics Repair outside line plant
    Cost 50% of OPEX
    Typically £ Billions pa for Tier 1 operators.
- Change of Integration Model
  - Move from purely predetermined Design Time Processes
  - To Delegation and Coordination to and between Agents:
    run time non- deterministic behaviour Intent based.
- Move to autonomous systems &networks
- Self-managing, Self-healing, Self-remediating

What happening in 2026?

Network Switching

Fibre Access Network

Internet

Digital OpticalFibre Transmission

AI /ML

Cloud Computing

Sovereign Data Computer Center
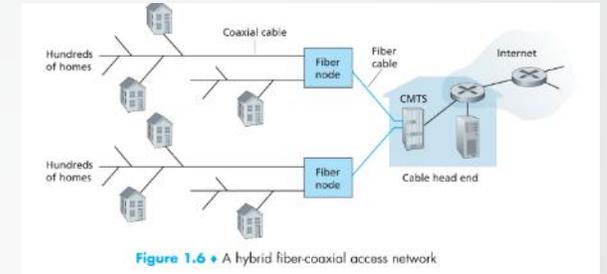
Operations
Customer Service and Network

Converged IT

NOC operations
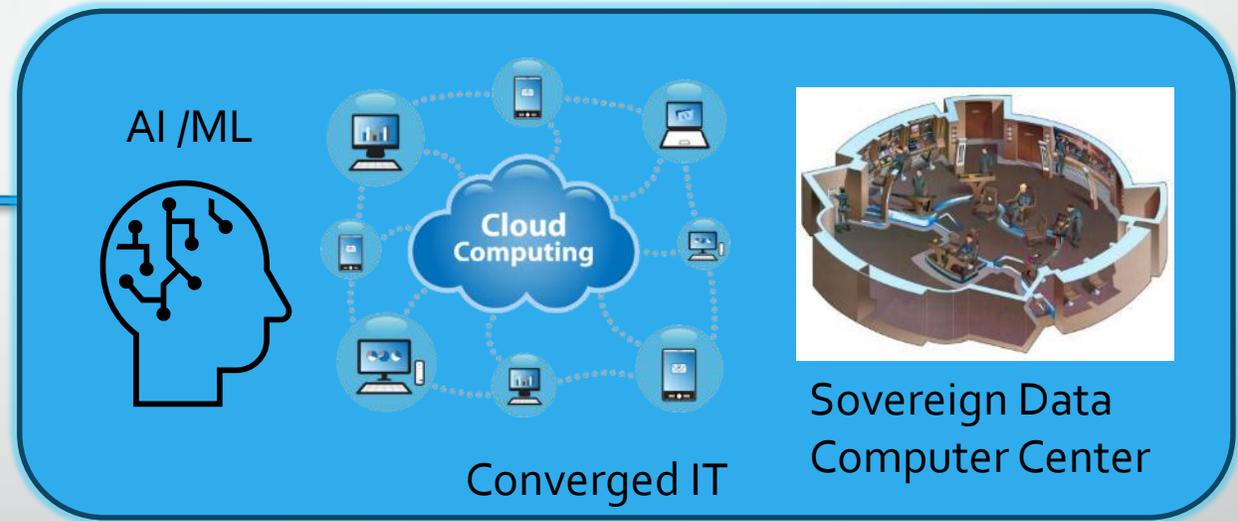
AI Interaction Mechanisms

Self Service
Customer Experience Operations

Technology shift

Move from design time deterministic Processes

Move to autonomous systems & networks

ITU-T Smart Operations Maintenance and Management (SOMM) M.3041/M.3080

Intent based interfaces

Open Data Semantic Web

Supporting AI agents

Integration model: Delegation and Coordination model ,not solely Process

Stability reliability

Guardrails

Governance, Regulation and Compliance
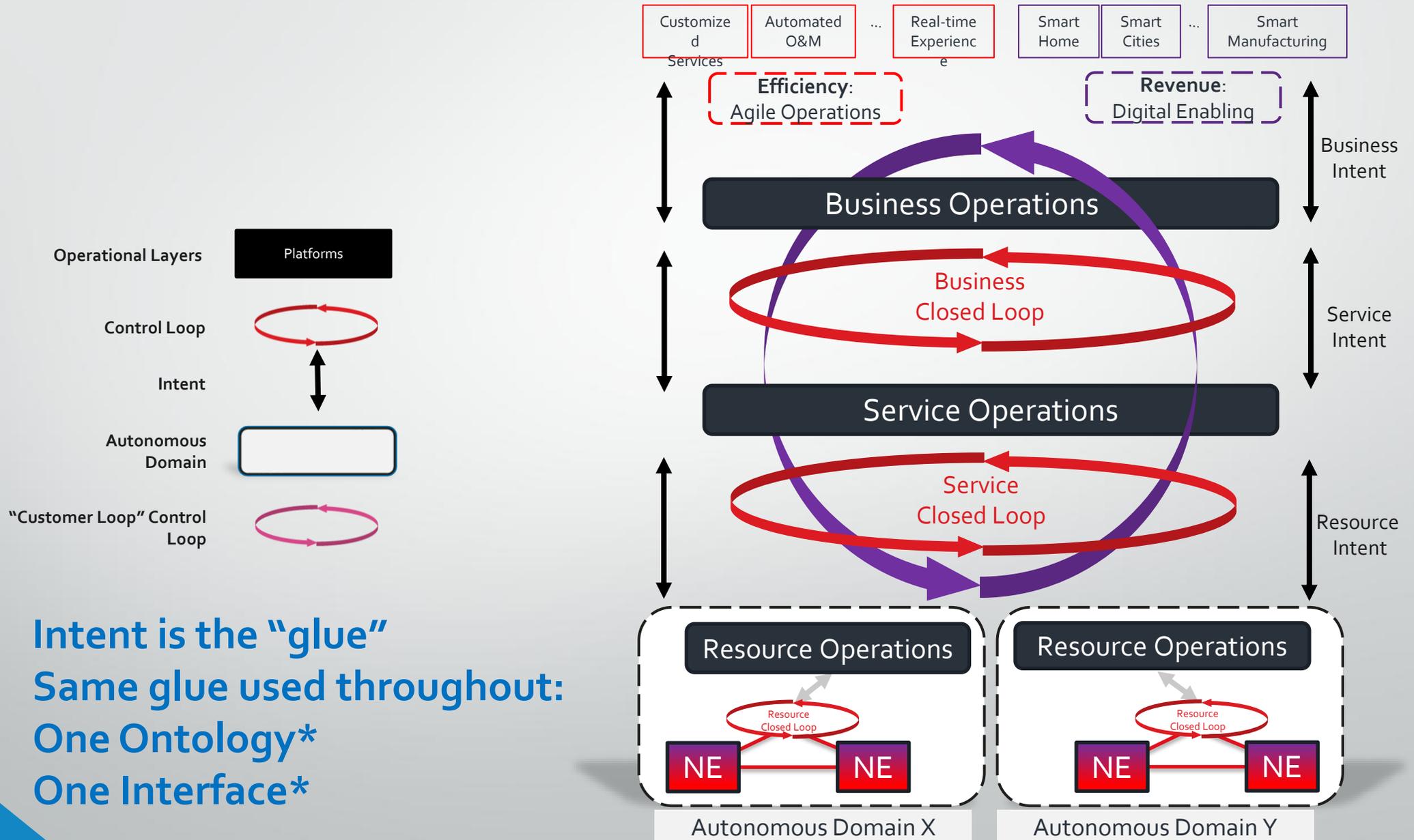
What is intent?

"I want the network/system/domain to achieve X with the properties Y ..."

- Intent defines (all) **expectations**
- Intent is the terminal **goal** given to a system
- Intent is **abstract** enough for **humans** to understand
- Intent is formally specified for **machines** to use
- Intent is **domain-specific**
- Intent spans from **abstract concepts** to technically **detailed requirements**

TM Forum Specified *F*

Formal Language based on Semantic Web Ontologies

Intent Management API TMF 921

Business Intent

- Be legally compliant
- Avoid losses
- Be secure

Service Intent

- Save resources
- Deliver Service S1
- Max latency 100ms
- System Level 1
- Prioritize high value customers

Resource Intent

- Change antenna tilt
- System Level 2
- System Level 2
- Provision TOSCA model T1
- Assure service
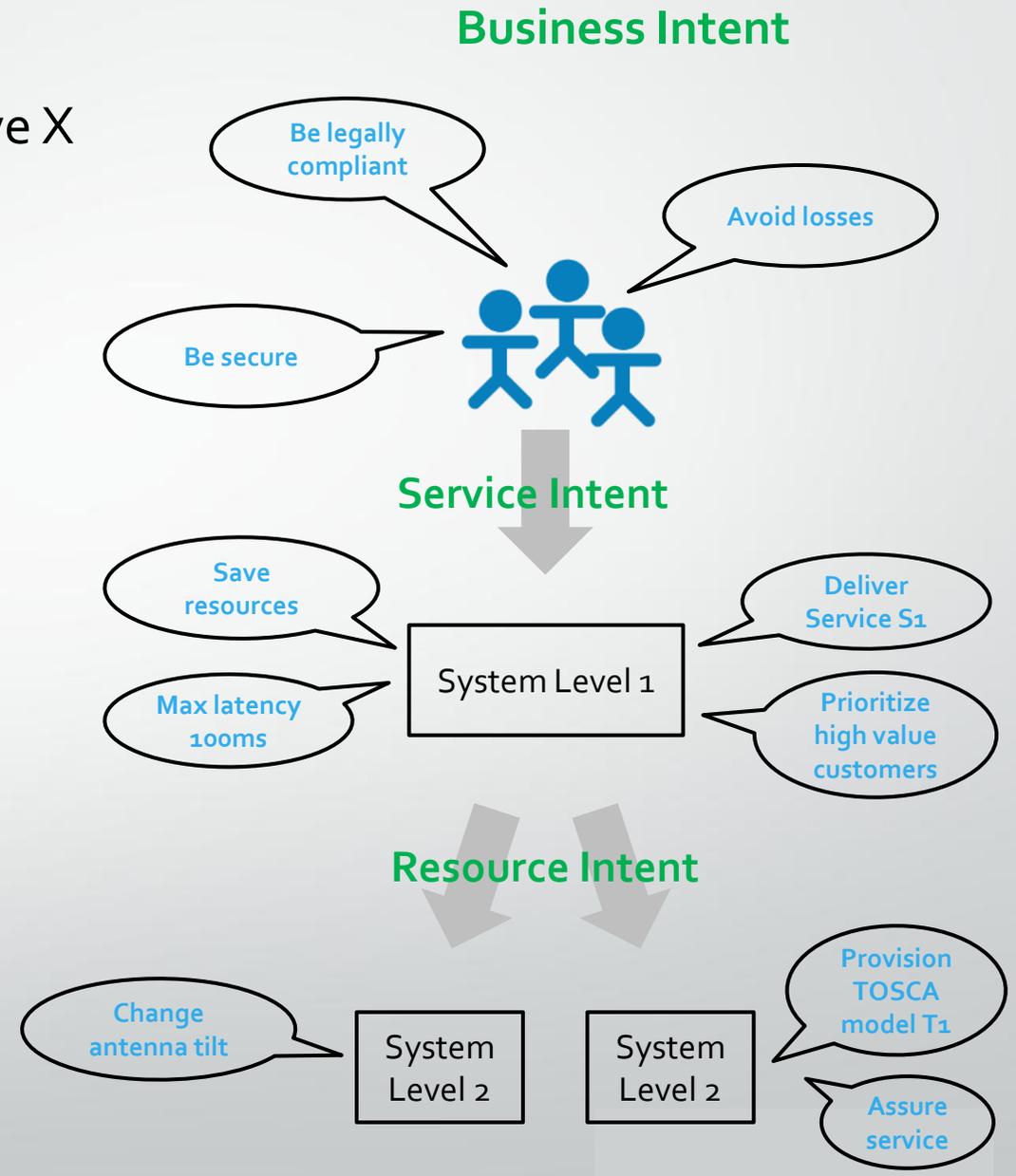
Autonomy versus Automation

Diagram based on similar diagrams from: Stuart J. Russell, Peter Norvig 2003: "Artificial Intelligence, A Modern Approach" (2013)
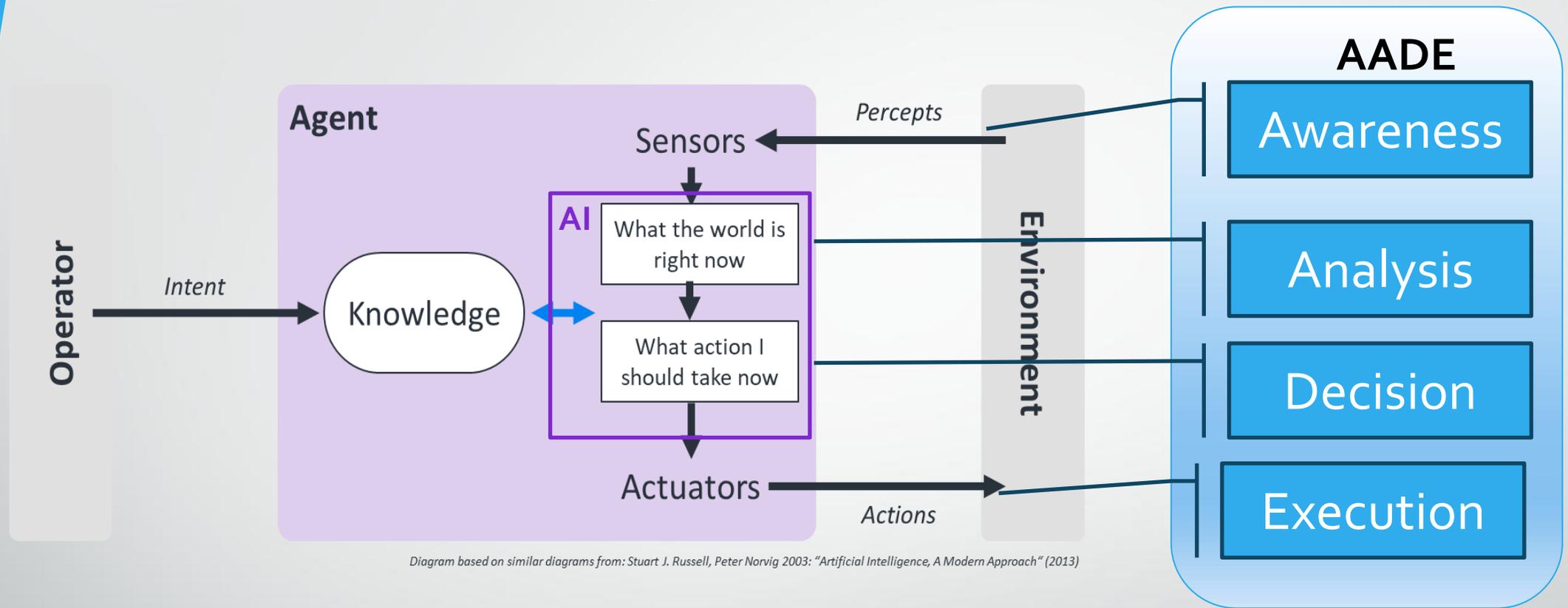
Autonomy means decisions made within...

...and NOT externally!

1. Automation – operate without human control

2. Autonomic – respond to stimuli, within.

3. Autonomous – make decisions without human intervention

The 6 Levels of Autonomous Networks

0   1   2   3   4   5

Level Definition	L0: Manual Operation & Maintenance	L1: Assisted Operation & Maintenance	L2: Partial Autonomous Network	L3: Conditional Autonomous Network	L4: High Autonomous Network	L5: Full Autonomous Network
Execution	P	P/S	S	S	S	S
Awareness	P	P	P/S	S	S	S
Analysis	P	P	P	P/S	S	S
Decision	P	P	P	P/S	S	S
Intent/Experience	P	P	P	P	P/S	S
Applicability	N/A	Select scenarios				All scenarios

P: Personnel, **S:** Systems

AUTONOMOUS NETWORKS: Intent Management

Architecture
Concepts and definitions

- › Definition of intent
- › Operation principles
- › Intent management function
- › Interactions with other domain functions

Intent Interface
Open API TMF921

- › Life cycle management of intent objects
- › Negotiation and feasibility
- › Role definitions of owner and handler
- › Domain agnostic and highly reusable

Capability Management
for Intent Managers

- › Publishes capabilities of individual intent managers
- › States scope of responsibility
- › Supported models, API methods serialization formats
- › Discovery of suitable intent manager

Intent Expression
TMForum Intent Ontology (TIO)

- › Ontology of intent and intent reports
- › Vocabulary for intent expression
- › Model federation
- › Domain specific extensions

Cognitive Loop
of intent managers

- › The internal control loop of intent management
- › Knowledge centric interactions
- › Insights through reasoning with the ontology

Closed Loop Interaction
and intent life-cycle

- › The intent control loop between intent managers
- › Life-cycle phases of Intent
- › Interaction with cognitive loop and real-time control

Ericsson Digital Events archive - OSS/BSS Summit 2025

Semantic Web Standards

www.CKAN.org

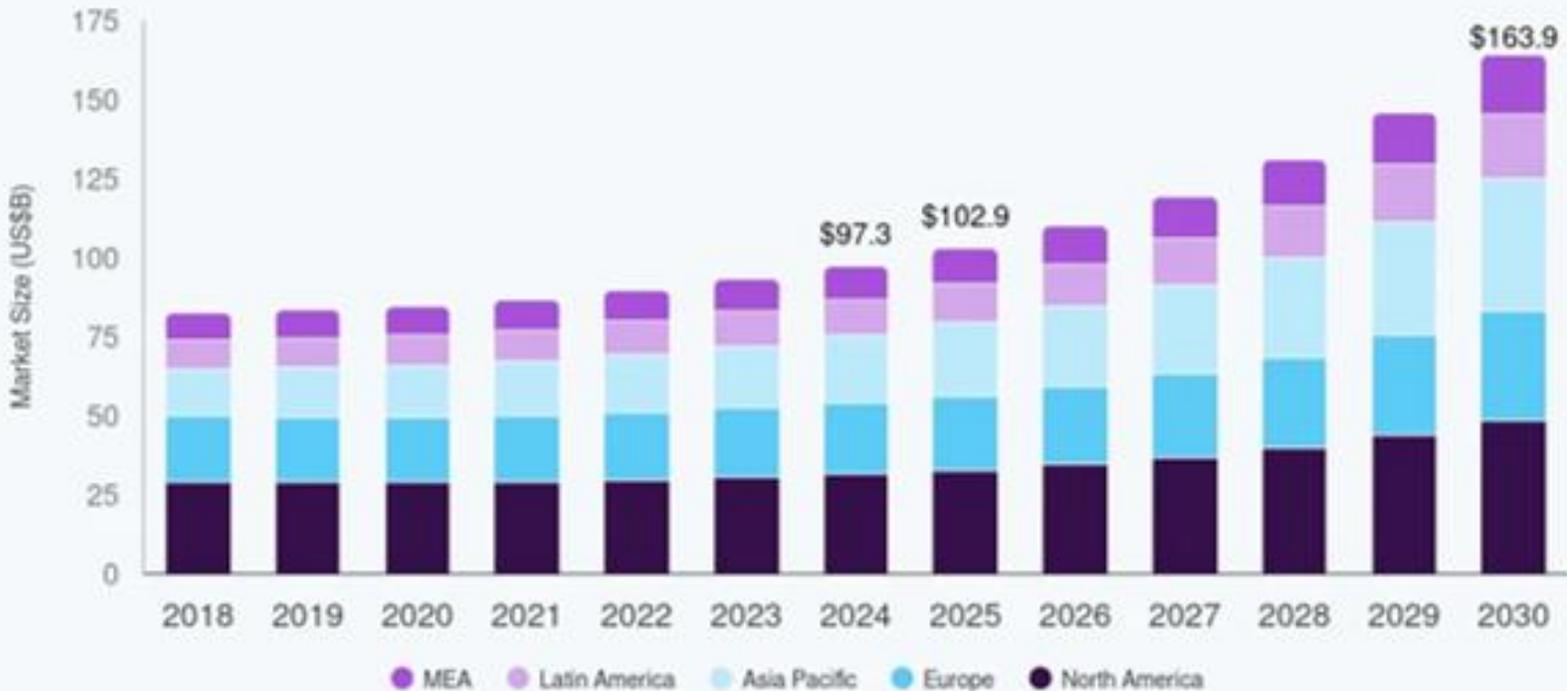# Use Case AI Contact Centre- Source: China Mobile

Challenge

- Call Contact Centre Demand Rising

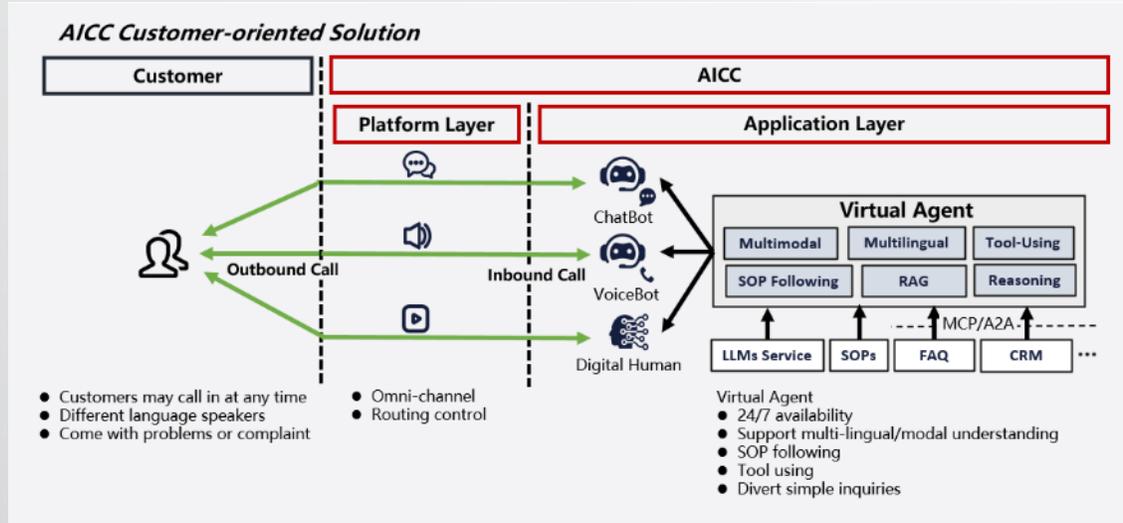- High churn job – Finding, Training and Maintaining Human agents

Call and contact center outsourcing market during 2018-2030 by Grand View Research

Call And Contact Center Outsourcing Market

Size, by Region, 2018 - 2030

Market Size (US$B)

$97.3 $102.9 $163.9

2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030

● MEA   ● Latin America   ● Asia Pacific   ● Europe   ● North America
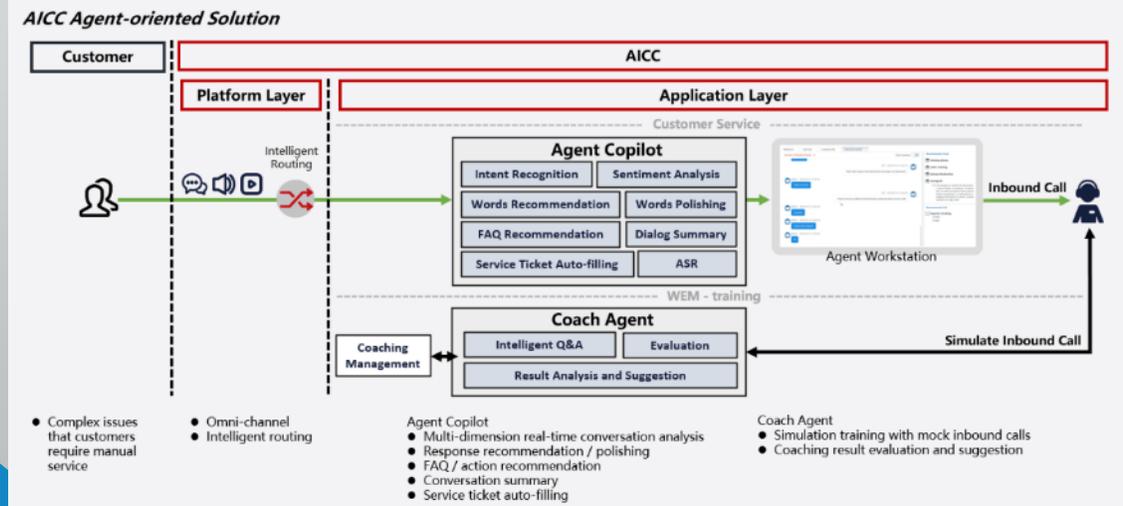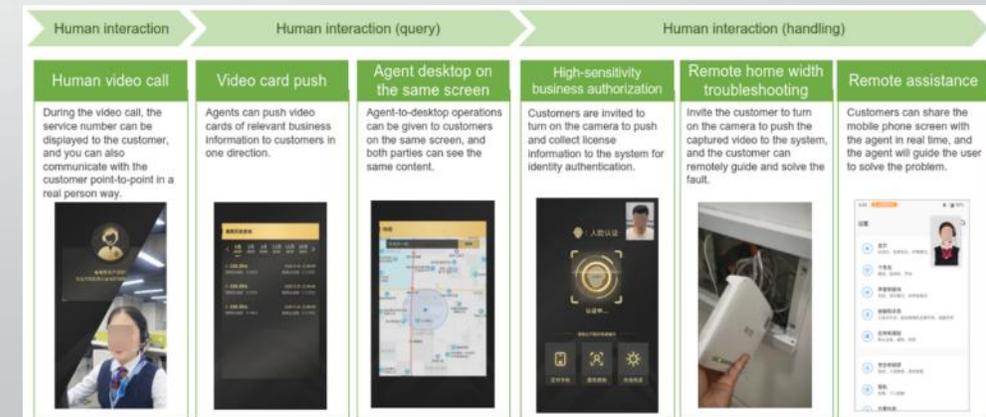
Virtual agent Copilot

Self-service of China Mobile 10086 Hotline

Manual service of China Mobile 10086 Hotline

2026 challenges: Telecom AI Operations

- Use case and credible business cases
  - Customer Experience
  - Network assurance and planning (OPEX CAPEX)
  - Supported by DEMONSTRATORS/ Proof of Concept
- Data Architecture
  - 'Data as a Product' 'Knowledge as an Asset'
  - Frictionless Data Knowledge and Wisdom
  - Scale challenges for Network Observability   30 Billion triples
- Security and Privacy
  - Compliance with regional regulation
  - Governance: Trust, Regulations for AI and Critical infrastructure, & Compliance
  - Data Sovereignty
- AI Ops
  - Multiple Lifecycles:Training,Models, Software, Operational data including Digital Twins, Supply Chains
  - Integration with Industry APIs: MCP, A2A, intent, etc

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Summary

Evolution from manual administration

Focus:
Customer Experience and Telecom Operational Efficiency

Three Decades of IT-enabled Automation

Evolution to AI-enabled Autonomous Systems & Networks

Open-Source Reference Innovation based on Standards

Conway's law still applies:
Benefits require organisational change and mindset changes

Thank You!

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Thank you for your attendance

Future IET Anglian Coastal Local Network events:

- 24 February 2026 (hybrid), **CityFibre 5 years on**, Clayton Nash, Strategy Director, CityFibre

- 18 March 2026 TBC (hybrid), **The history of SMS**, Kevin Holley, Distinguished Engineer, BT

- 23 April 2026 (online only), **The Cavity Magnetron**, Prof. Peter Grant, Emeritus Professor, The University of Edinburgh

For more details and how to register please visit:

https://engx.theiet.org/local-networks/ea1

Event CPD Certificate and Slides/Video (subject to permission) will be available on this site.

Anglian Coastal

The volunteers of the IET Anglian Coastal Network organise events and other activities covering engineering and technology topics for engineers and also members of the public who have an interest in engineering and technology. Even if you're not a member of the IET, you're still welcome to join us at any of our events.

We cover the areas of Norfolk, Suffolk and north Essex. Over the past few years we have organised a large number of highly successful Webinars when face-to-face meetings have not been possible. We are now able to resume face-to-face events. We aim to retain many of the benefits of the Webinar format where practical. Most of the lecture events will be hybrid offering both face to face attendance or online options. We also organise occasional visits to places of engineering interest (e.g. Bentwaters Cold War and Bawdsey Radar museums).

Breaking News (New feature!)

Before our next event **Dave Milham** reflects on his 55+ years in telecoms, spanning roles at GPO, BT, and the TM Forum, as well as contributions to IEEE and European R&D projects. His **upcoming talk on 14th January 2026 will cover the evolution of telecom operations and the impact of AI**. Please read the interview that Dave did with our own George Williamson (see PDF below).

We have launched our own **YouTube Channel** which we will use to publish videos of our events (subject to speaker permission). Do check it out if you have missed a previous event.
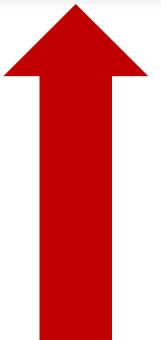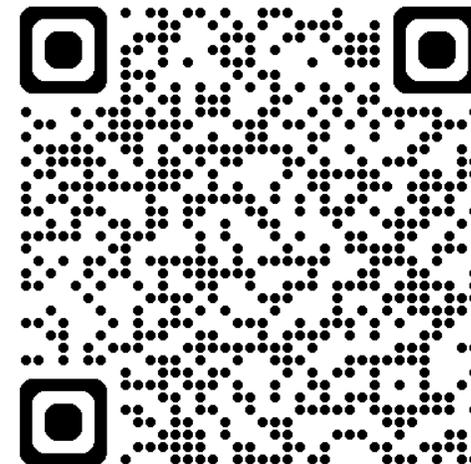
Was this helpful?

👍 Yes (28)   👎 No

In this Article

Breaking News (New feature!)
Blogs and Articles (New!)
Contact us
Car parking in Ipswich (face to face event)
Foothold (needs your help)
Watch one of our event videos
CPD Certificates for our events
Previous event information (slides and videos)
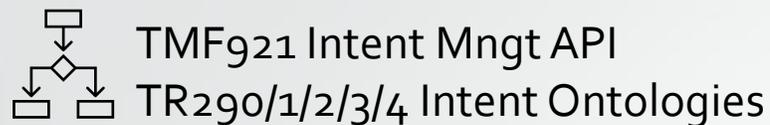Our committee

Created over 4 years ago

Updated 12 days ago

Upcoming Events

From Advice Notes to Intelligent Automation
14 Jan 2026 7:00 PM to 8:30 PM

City Fibre is rolling out gigabit-speed connectivity to 8 million premises
24 Feb 2026 7:00 PM to 8:15 PM

TM Forum Autonomous Networks Reference Architecture

TMF921 Intent Mngt API
TR290/1/2/3/4 Intent Ontologies

I3

F3

K3

Intent Management

Domain Intelligence

Knowledge Governance

Knowledge Optimization

Knowledge Base

Intent-driven…

Domain Control Loop Management
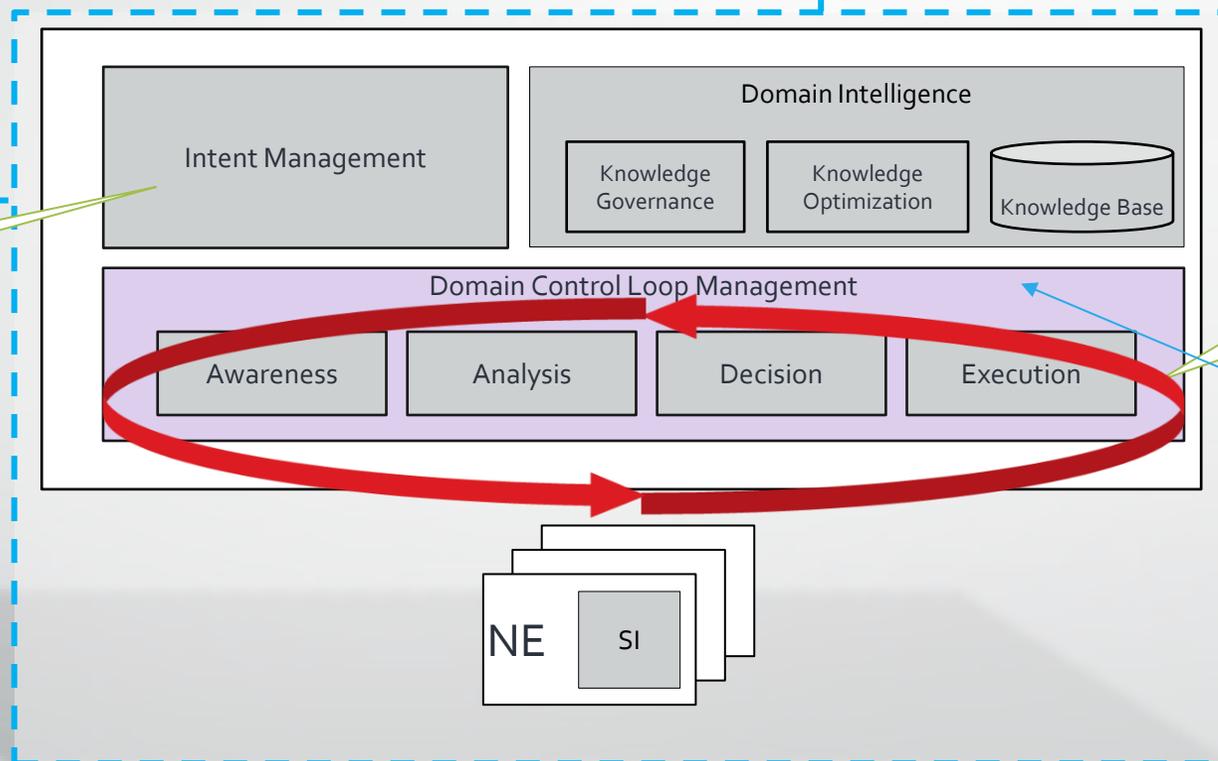
Awareness | Analysis | Decision | Execution

"AADE" Control Loop
MAPE-K inspired

IG1219
AI Closed Loop Automat
 - Anomaly Detection
   and Resolution

NE   SI

Autonomous Domain

Why AI changes everything?

Integration model changes from Processes ⇨ delegation of responsibility / cooperating agents
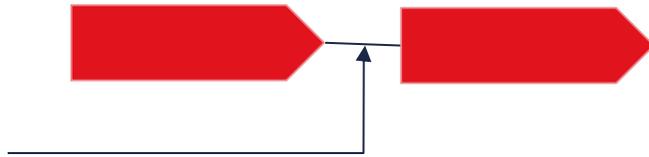
Task Centric Integration -Automation
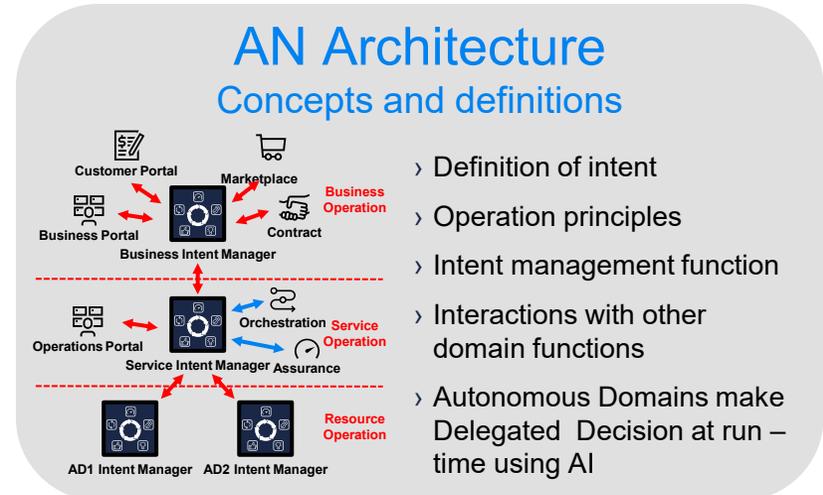
Business Process Framework

Business Process Flows

Imperative APIs between Process tasks

Control and data flow identical

Autonomous Centric Integration -Autonomy Level 4

Intent Negotiation

Delegation

AN Architecture
Concepts and definitions

Customer Portal   Marketplace
Business Portal   Contract   **Business Operation**
Business Intent Manager

Operations Portal   Orchestration   **Service Operation**
Service Intent Manager   Assurance

AD1 Intent Manager   AD2 Intent Manager   **Resource Operation**

› Definition of intent
› Operation principles
› Intent management function
› Interactions with other domain functions
› Autonomous Domains make Delegated Decision at run – time using AI
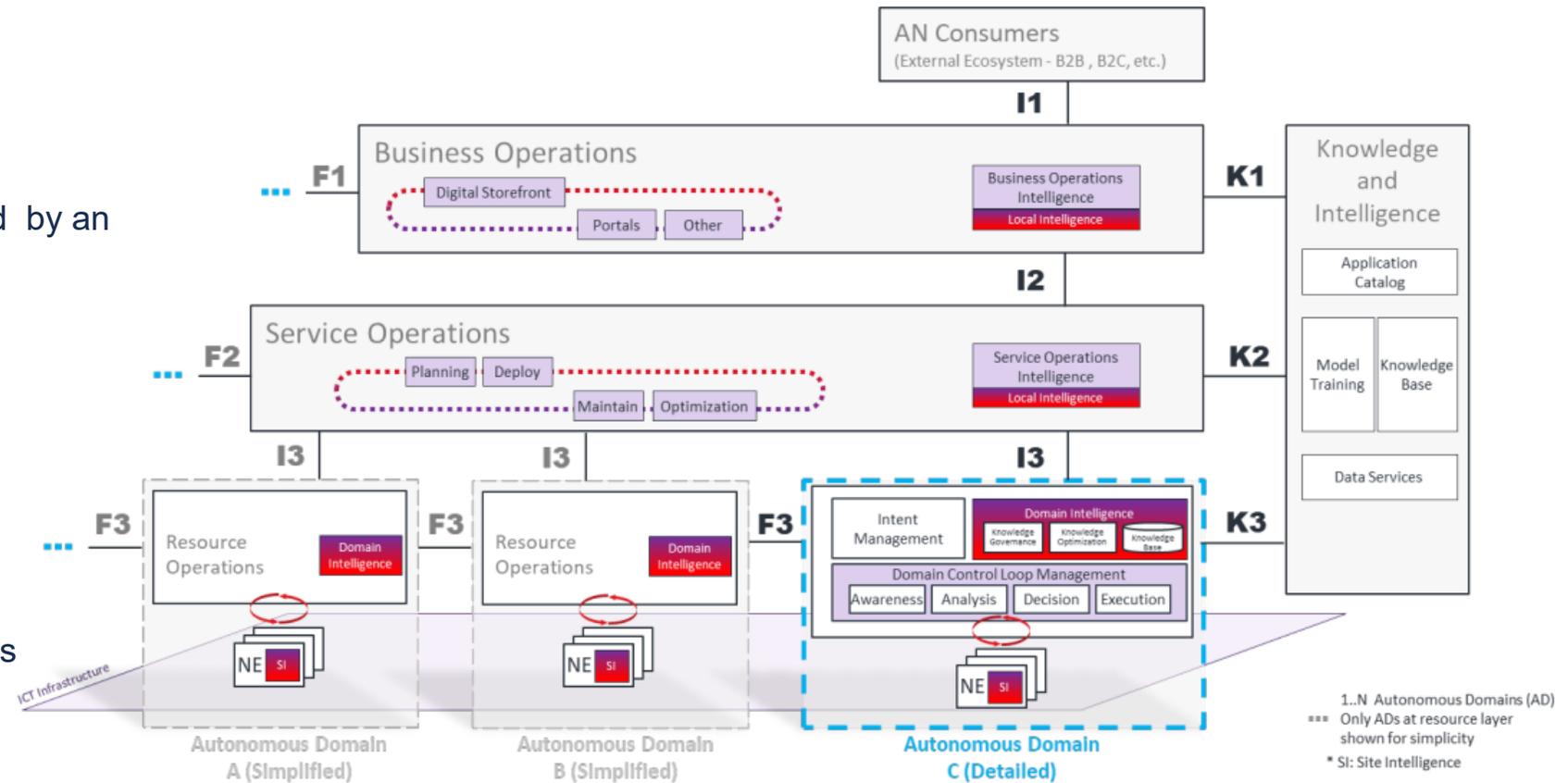
Co-operation

Intent Negotiation

Data exchange (sensor)

Control and data flow separate
⇨ Intent and Data become First class concepts
⇨ Intent API and Data Mesh API flows

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Autonomous Networks Reference Architecture: Functional (IG1251)
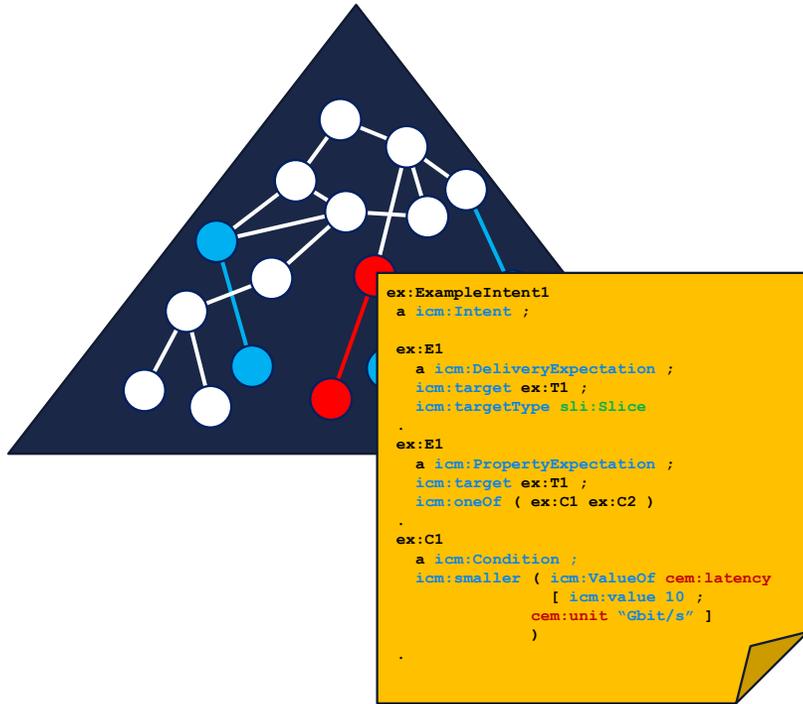
Autonomous Domain

- Scopes a set of assets managed/ governed by an Intent Handler Function
- Enables
  - Closed-loop automation
  - Intent based interactions
  - Simplifies infrastructure
  - Self-X operating capabilities
  - Use of AI within Autonomous Domains

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THE INTENT ONTOLOGY

The internal control loop of intent management functions


```
ex:ExampleIntent1
 a icm:Intent ;

ex:E1
  a icm:DeliveryExpectation ;
  icm:target ex:T1 ;
  icm:targetType sli:Slice
 .
ex:E1
  a icm:PropertyExpectation ;
  icm:target ex:T1 ;
  icm:oneOf ( ex:C1 ex:C2 )
 .
ex:C1
  a icm:Condition ;
  icm:smaller ( icm:ValueOf cem:latency
               [ icm:value 10 ;
                 cem:unit "Gbit/s" ]
               )
 .
```

- Intent modeled based on Resource Description Framework (RDF / RDFS)

- Ontology model: TM Forum Intent Ontology (TIO)
  - Vocabulary for intent expression
  - It models semantics and not only information
  - Based on logical reasoning axioms of RDF

- Enables knowledge-centric implementations
  - Logic programming and machine reasoning
  - Self adapting generic implementation

- Intent based federation of constituent models from multiple sources
  - Model federation without central governance