Services In Telecommunications

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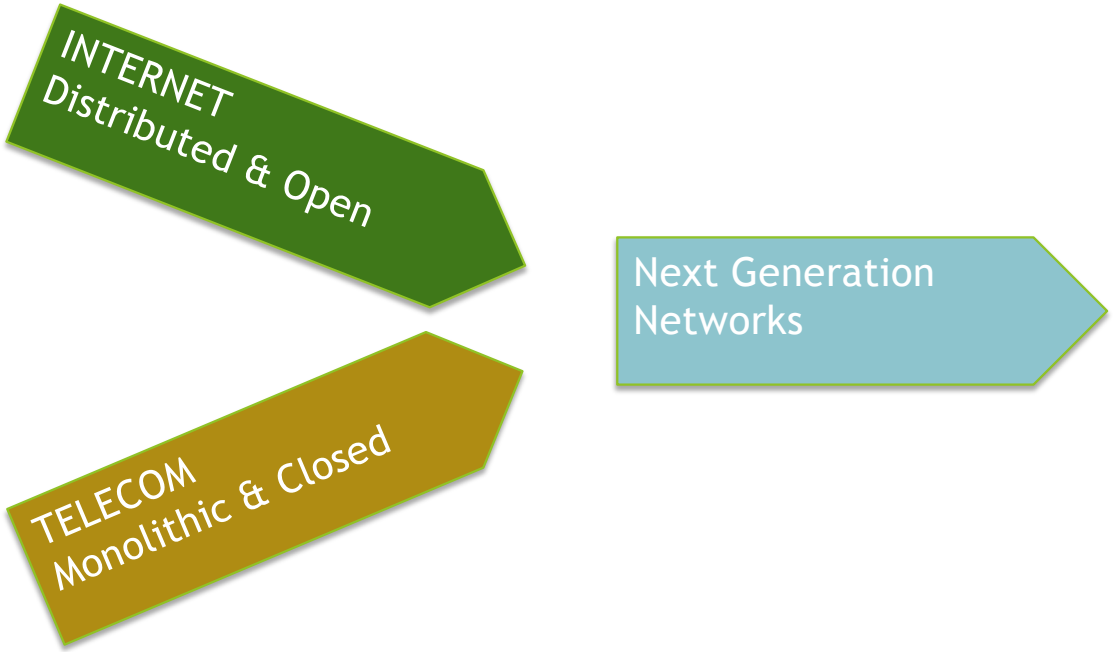
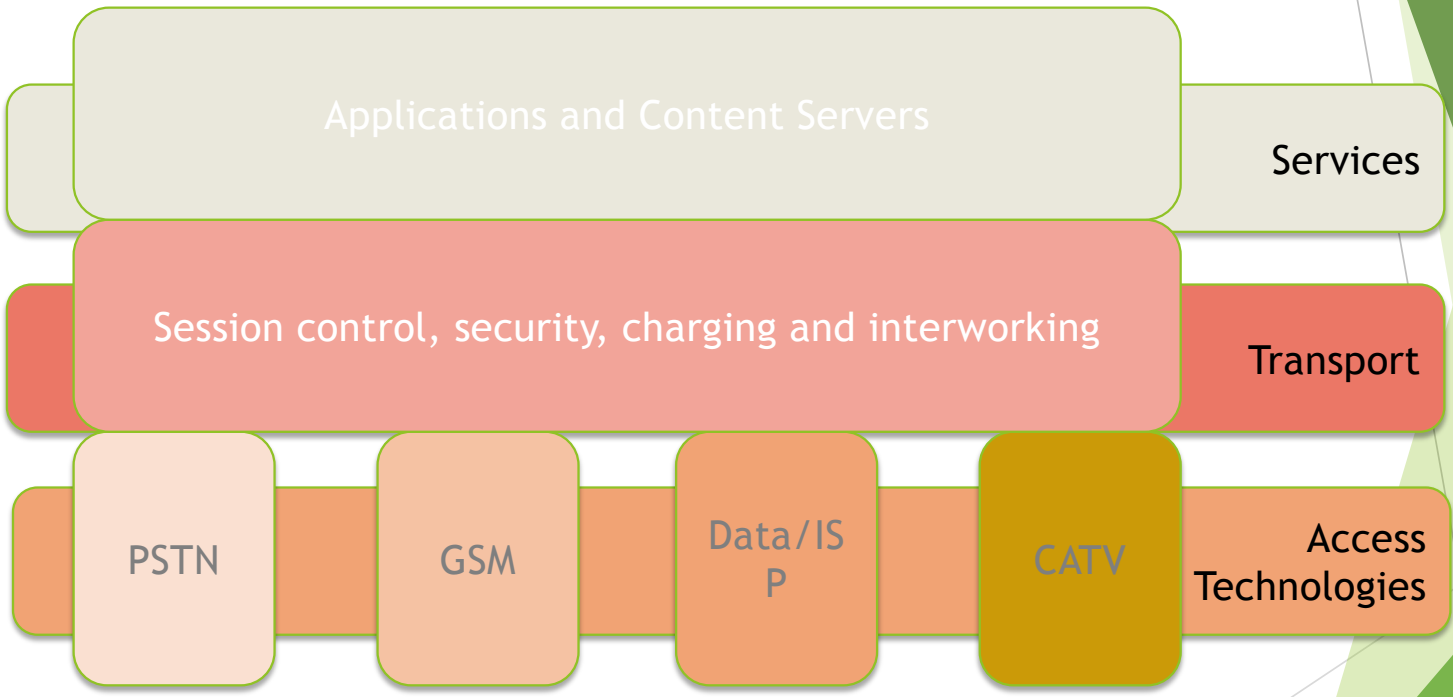
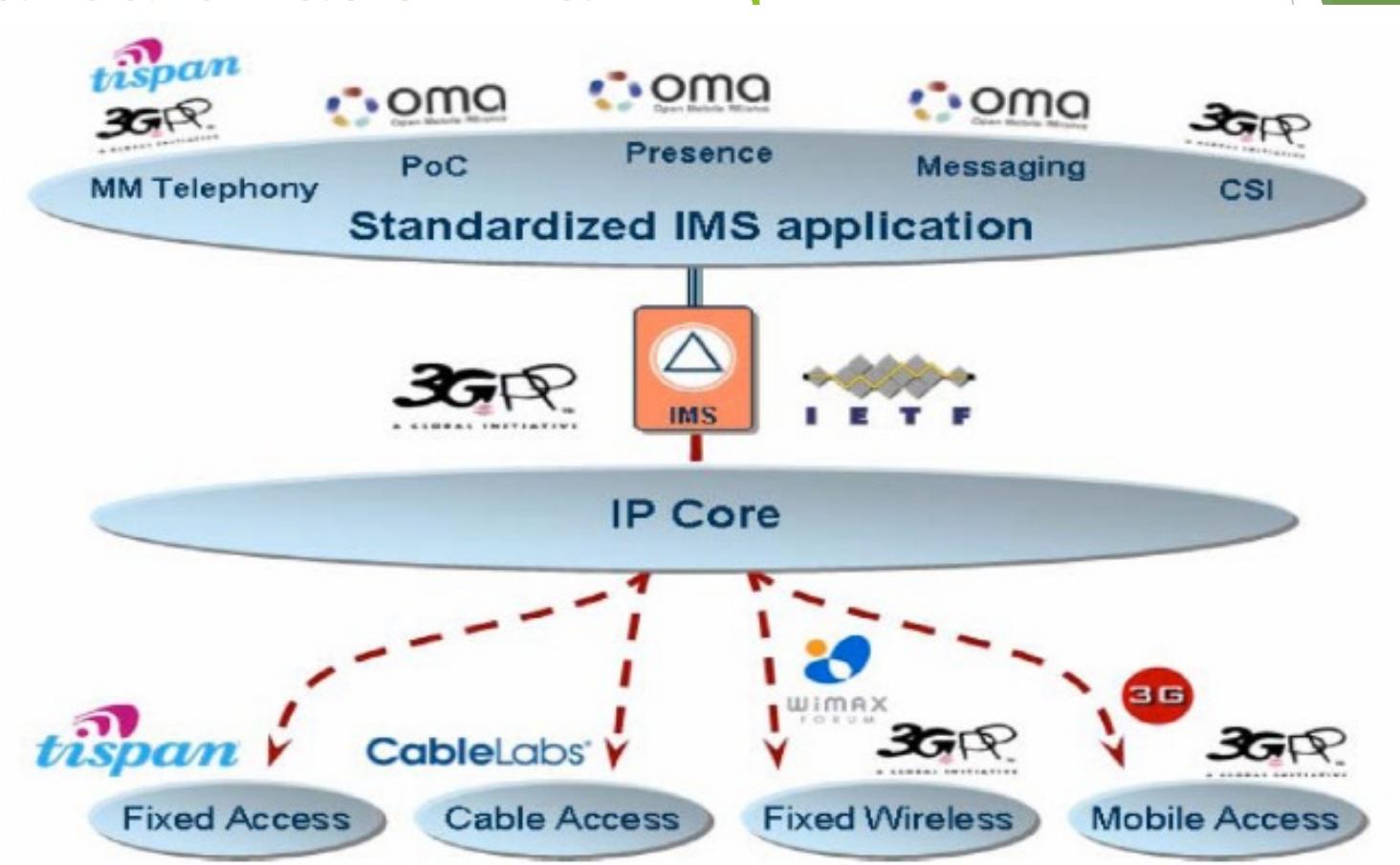
What is happening in Telecom ?



3GPP/TI-SPAN Telecom Model



IMS standardization framing



IMS

- IMS is the architectural foundation of Telecommunication Services
- IMS defines a common framework for delivering IP-based multimedia services while maintaining Quality-of-Service, Billing, and Service Integration
- IMS architecture adopted by major standards bodies – 3GPP, ITU, ETSI
- Architecture principles
  - Distributed intelligence
  - SIP signaling
  - Centralized subscriber data and routing
  - Border security
  - End-to-end QoS

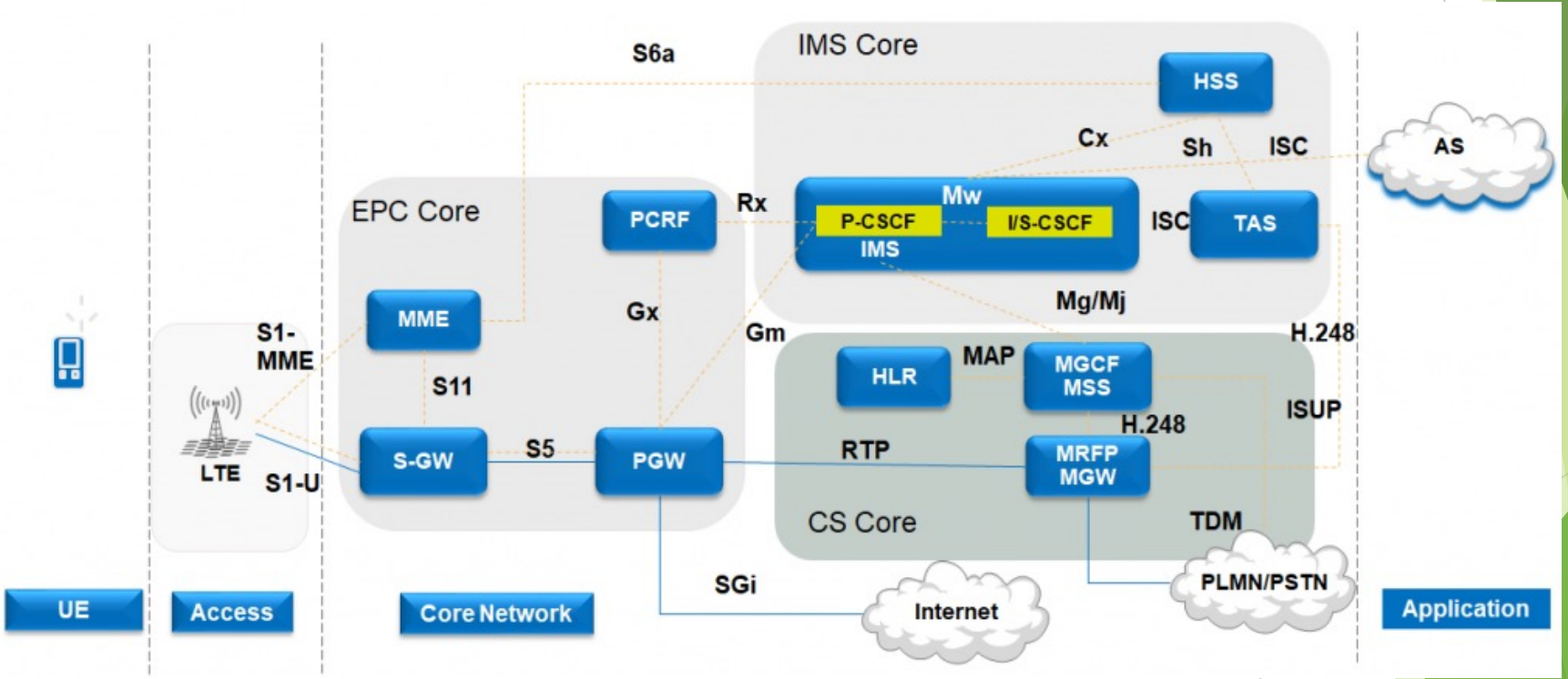
Implications

- Any Device
- Any Access Technology
- Any Where

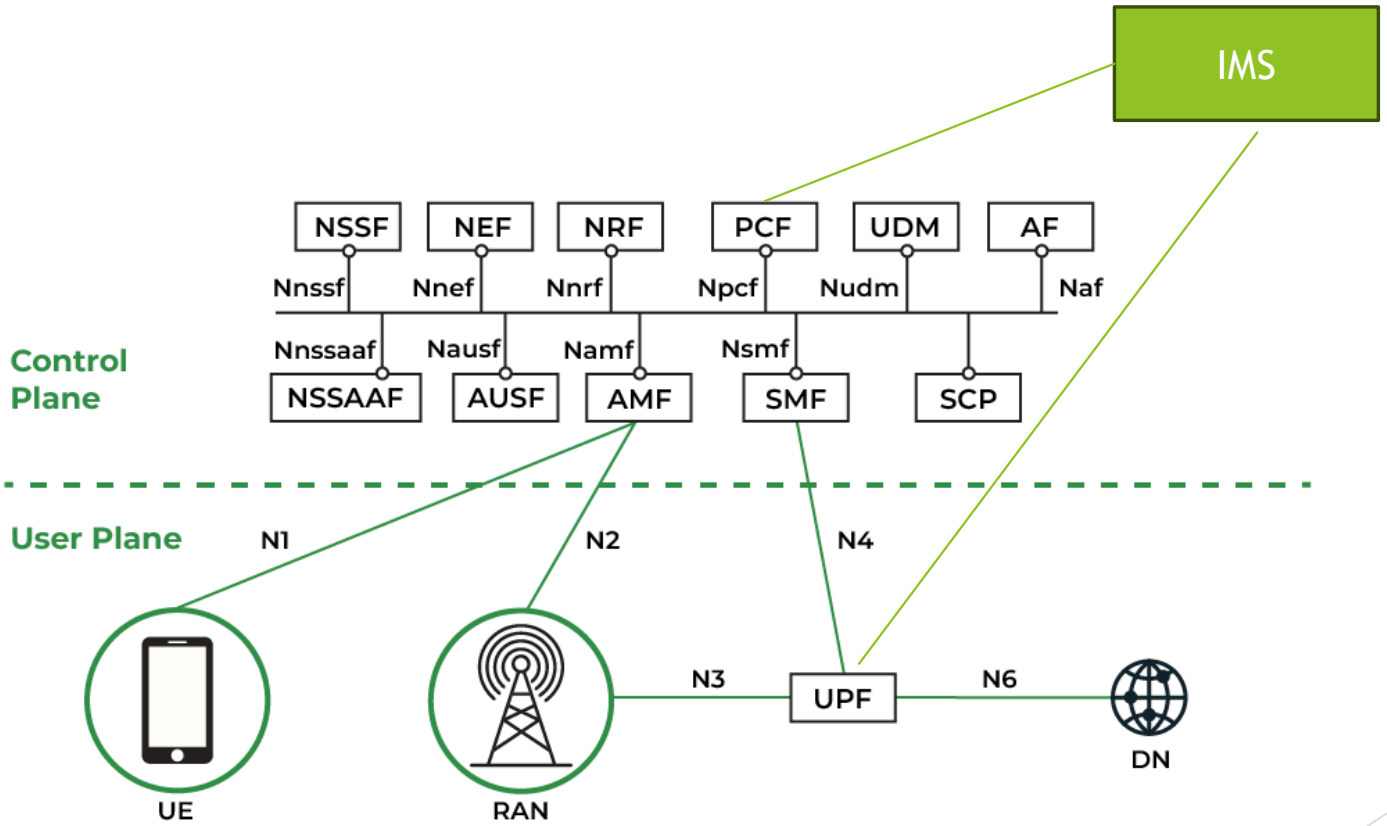
ALWAYS BEST CONNECTED

- One Network, multiple access technologies
- Common Session Control
- Generic Application Servers
- Single set of services that apply network wide
- Consistent user experience
- Operational efficiency
- New services/applications

VoLTE (Voice over LTE) Architecture



5G Standalone



IMS Layer

- The IMS core is access independent which means that same services can be delivered over different types of access technologies. In the IMS specification the “core” of IMS comprises two main nodes: the Call Session Control Function (CSCF) and the Home Subscriber Server (HSS).
- In the IMS architecture overview the General Switched Telephony Network (GSTN) interworking is handled by a Media Gateway Control Function (MGCF) and Media Gateway (MGW) have been depicted beside the IMS Core.
- The horizontalization provides common; supervision and control of services in the IMS network, management and routing of sessions, as well as supporting the authorization and manipulation of media in the network.

IMS – Key Architectural Principals

- Border Functions
  - Access and Network Border Security
  - QoS and Admission Control
  - Media and Signaling Adaptation
- Core Functions
  - Subscriber Management – Registration
  - Session Switching – Set-up and tear-down of session legs, Session state maintenance, Application Server invocation
  - Session Routing – Breakout to external networks
  - Centralized Provisioning – Subscriber and Routing data
- Application Functions
  - Access to legacy applications
  - Native SIP Applications
  - Service Brokering

Advantages

- Network Providers
  - Migrating everything to a universal network reduces Operational Expenditures
  - They do not resign to become mere bit pipes and lose central position in the business value chain.
  - Will enable them to tap into Service Providers market
- Service Providers
  - Reaches a new and broader market
  - Enables outsourcing of functions to Network Providers (Authentication, Charging, Billing)

HSS

- The Home Subscriber Server (HSS) is the master database that contains user and subscriber information to support the network entities handling calls and sessions. It provides the following functions:
  - identification handling
  - access authorization
  - authentication,
  - mobility management (keeping track of which session control entity is serving the user)
  - session establishment support
  - service provisioning support
  - service authorization support
- When a user registers in the IMS domain, the user profile (relevant information related to the services to be provided to the user) is downloaded from the HSS to the CSCF. For session establishment, HSS provides information on which CSCF currently serves the user.

P-CSCF

- IMS contact point for the user's SIP signaling
- Several in a domain
- Located in the visited domain
- Terminals must know this proxy (e.g. DHCP used)
- Compresses and decompresses SIP messages
- Secures SIP messages
- Assures correctness of SIP messages

S-CSCF

- Serving - CSCF
  - Controls the user's SIP Session
  - very few per domain
  - Located in the home domain
  - Is a SIP registrar (and proxy)

I-CSCF

- domain’s contact point for inter-domain SIP signaling
- one or more per domain
- In case there are more than one S-CSCFs in the domain, locates which S-CSCF is serving a user

IMS Identity and User Profiles

- IMS uses SIP identity: SIP URIs
  - e.g. sip:dgomes@meo.pt
  - Opposed to phone numbers
  - A user is uniquely identified in the HSS by his IMPI (Private User Identity).
  - IMPI is a **unique global identity defined by the Home operator**
  - used only in the process of registration
- to establish communication with a user IMPU (Public User Identity) is necessary.
  - Every user has one or more IMPUs.
  - Each IMPI can have several IMPUs
  - Users can classify their public identities: business, family, friends, …
    - E.g. sip:dgomes.casa@meo.pt, dgomes.prof@meo.pt

Services in IMS

- IMS is an advanced infrastructure enabling services. But the services are in the end points or peers (calls, etc.), not in the IMS
- Application Servers (AS) are the key part to endow IMS with services
- AS are not owned by the network operator
  - (therefore not part of IMS)
- AS offered services enjoy all IMS advantages
- AS interact – using SIP - with the S-CSCF (which controls user's SIP session)
- AS can behave as another SIP proxy or as a SIP UA (terminal)
  - in this case they also receive and send media!

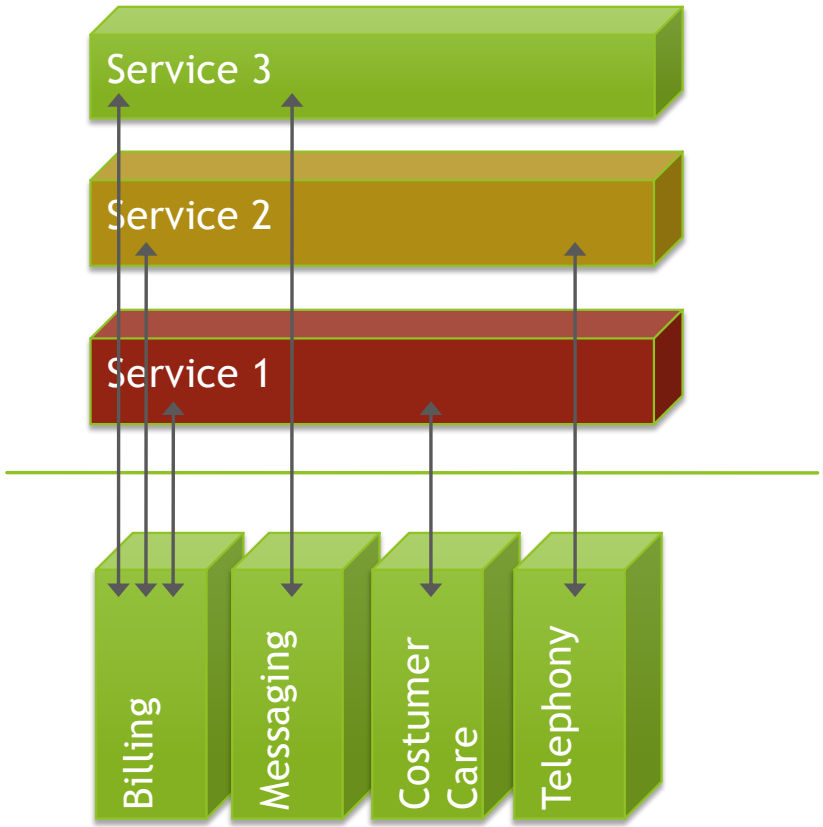
Services in IMS (filter criterias)

- When are AS engaged?
  - “Filter criteria” in S- CSCF: they analyze the SIP signaling and decide when to divert it to AS (i.e. involve them)
- In user’s profile, each of its personalized services has (among others) a set of filter criteria
  - To allow disambiguation, each has a priority
  - The AS where to direct the SIP messages when the filter rules are met is specified
- Filter criterias are stored in the HSS and are provisioned to the S-CSCF on user registration
- Filter criterias mean flexibility
  - Per domain, time, user, location criterias
  - Can direct a user to diferent AS

Challenges faced by Telecom Operators

- Most of the infrastructure an operator uses has been created at different times, with different ways and means to access the systems.
  - standalone “stove-pipe” applications in the organization.
  - E.g. developers may access the billing system in a different way for different applications.
- The internal systems typically have a mixed pedigree: skilled internal teams developed some systems in-house, some were bought “off the shelf” and customized, and some were created as bespoke projects using an outsourced supplier.
  - there is no standard toolset, architecture or hardware platform for the different systems.
  - places a heavy burden on both maintenance of existing services and the development of new services.
- Generally, there is a very tight coupling between the services on the network and the network infrastructure itself. This makes it difficult to change one without the other.

Example



Each new service must access each system in it's own way

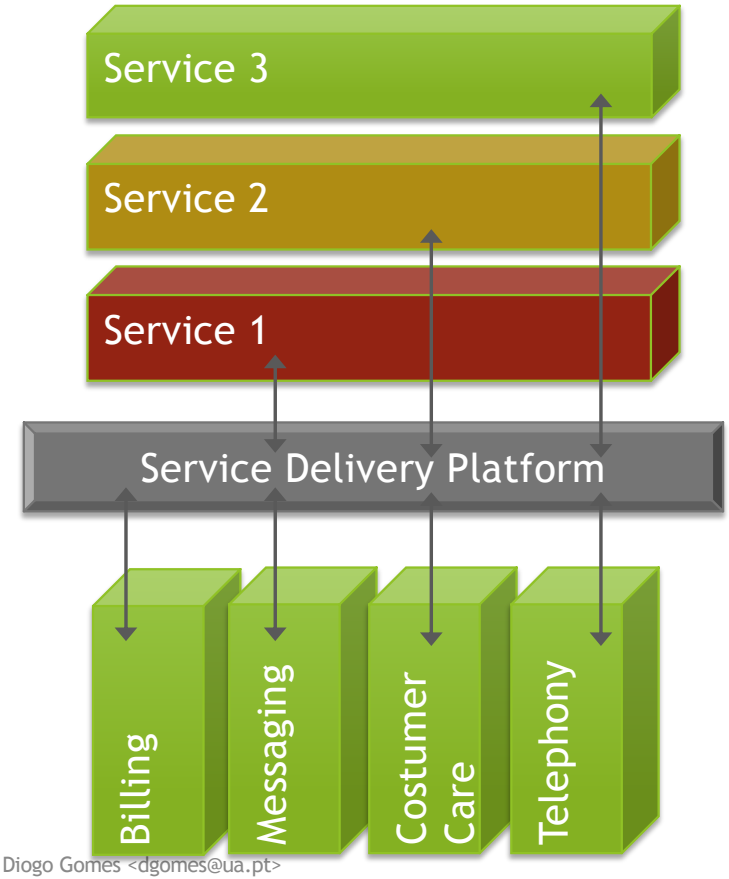
This leads to complex code, maintenance issues, and tight dependencies

Changes to a system (e.g. Billing) perturb all services that use the system

Service Delivery Platform (SDP)

- An SDP is designed to enable rapid service creation and deployment. Service Delivery Platforms introduce one standardized way of creating and deploying new services so that standard toolsets, processes and access methods may be used when developing any new service. If this can be achieved, significant efficiencies are gained by the organization as a whole.
- New services can be created in a greatly reduced timeframe because a standard agreed mechanism for accessing the underlying network can be used. This means common skill sets, toolsets and processes can be brought to bear on new developments. As projects are completed and deployed, new projects become lower risk and more predictable.

Example (2) – Using SDP



Each new service accesses systems in a standard way

Systems are connected into a standard SDP

System can be changed without affecting services that use the system