SOA, Business Value and Legacy Migration

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Session Overview

Preface

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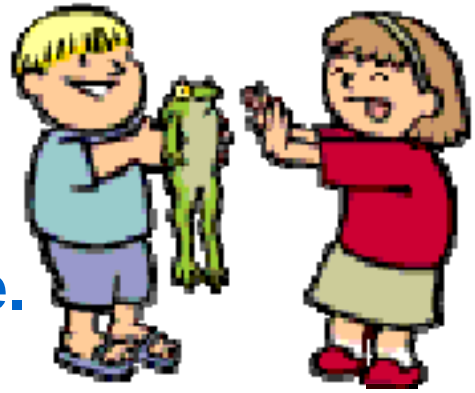
Legacy Migration Strategy Using SOA

AT&T SOA Journey

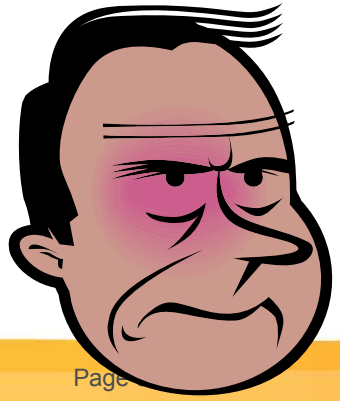
Summary

Preface: SOA Hype

SOA is passing through the hype cycle and has finally 'achieved' a measure of derision!



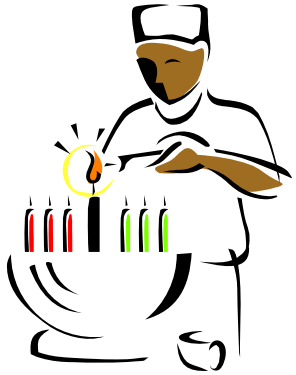
- **SOA started with lots of promise and hope.**
- **So consultants and vendors co-opted the word to sell their engagements and products.**
- **Now many people confuse SOA with web services, ESBs, governance systems and more.**
- **Organizations are also suing consultants over projects which have failed to deliver 'SOA benefits'.**
- **So it is starting to becoming fashionable to deride SOA.**



The question is: how many CIOs have truly embraced SOA (and what exactly is that)?

Preface: One Size Doesn't Fit All

Different organizations have different goals and challenges and need different SOA programs.



- **Needs may vary**
  - Process Flexibility
  - Information Agility
  - Legacy Consolidation
  - Time to Market
  - Cost Reduction
- **Organizational and 'political' challenges may vary**
  - Command and control effectiveness
  - Number of organizations involved
  - Outsourcing
  - Funding models

SOA Motivation and Business Value

Traditional Interface Development

Different project teams create similar interface functionality on the same systems in the same release cycles.

Project 1 - Software Development Process Steps

1. Determine conceptual solution including necessary system interfaces
2. Concept Gate approval without consideration of target interfaces or reuse
3. Prepare Business Reqs with high level description of interfaces
4. Reqs Gate approval with no consideration of interface target or reuse
5. Prepare Tier3 Requirements & IAs
6. Commit Gate approval without consideration of interface target or reuse
7. Prepare Software Design
8. Design Gate approval without consideration of interface target or reuse
9. Implement, Test and Deploy

Parallel teams

Project architects specify project-specific interfaces without trying to reuse/extend what exists nor create a desired target API

Project teams work independently with little collaboration cross-team and end up deploying similar interface functionality

Project 2 - Software Development Process Steps

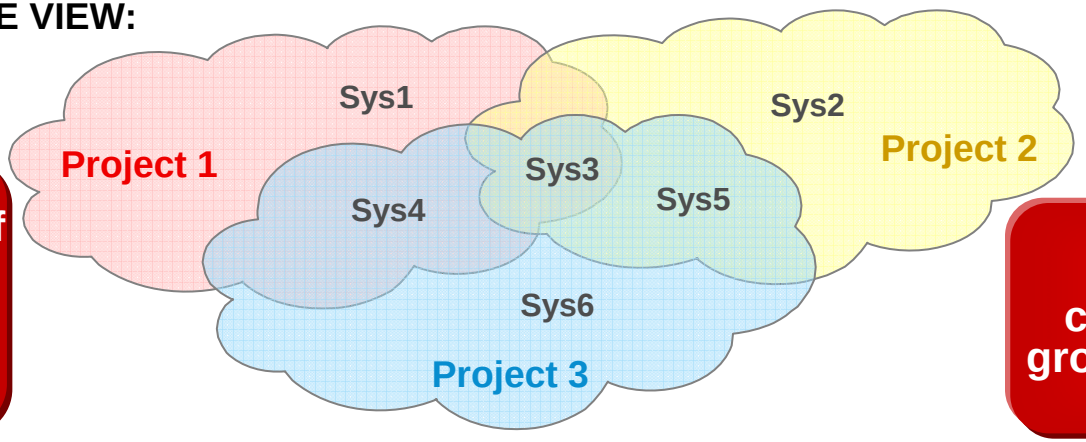
1. Determine conceptual solution including necessary system interfaces
2. Concept Gate approval without consideration of target interfaces or reuse
3. Prepare Business Reqs with high level description of interfaces
4. Reqs Gate approval with no consideration of interface target or reuse
5. Prepare Tier3 Requirements & IAs
6. Commit Gate approval without consideration of interface target or reuse
7. Prepare Software Design
8. Design Gate approval without consideration of interface target or reuse
9. Implement, Test and Deploy

Note: Interfaces designed in the fire of project urgency are usually not reusable in different contexts

Impact of a SOA Development Process

SOA cuts interface cost, complexity and time to market

OCTOBER RELEASE VIEW:



Stops development, test & maintenance of new versions of the same interface functionality across different projects

Reduces total complexity by constraining the growth of interfaces per system

Traditional Approach

	Project Interfaces			Release-Relevant Total*	Dev $
	New	Extended	Reused		
Sys1	4	1	0	7	675K
Sys2	2	1	0	4	375K
Sys3	4	0	0	6	600K
Sys4	2	0	0	2	300K
Sys5	1	0	0	1	150K
Sys6	1	0	0	1	150K
					2250K

* Includes relevant interfaces that could have been reused

With SOA Development Process

	Project Interfaces			Release-Relevant Total	Dev $
	New	Extended	Reused		
Sys1	2	1	2	5	475K
Sys2	1	1	1	3	275K
Sys3	2	0	2	4	400K
Sys4	2	0	0	2	300K
Sys5	1	0	0	1	150K
S6s6	1	0	0	1	150K
					1200K

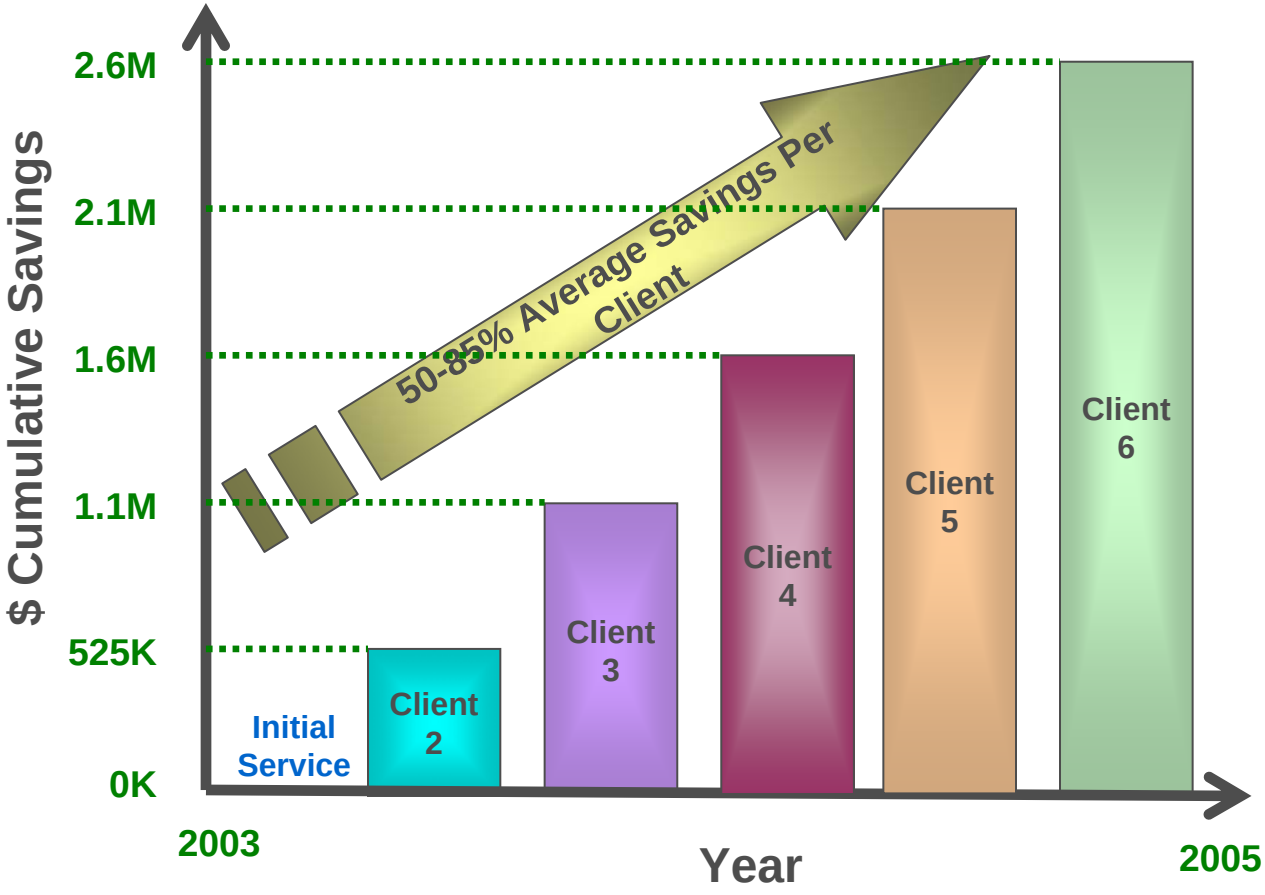
Cuts development cost through interface reuse

Benefits increase over time as the library of services grows

at&t

SOA Case Study

By 2005 AT&T had documented over $40 million in savings from SOA, as in this example of a system that accrued $2.6 million in 2 years by reusing one service across 5 clients.

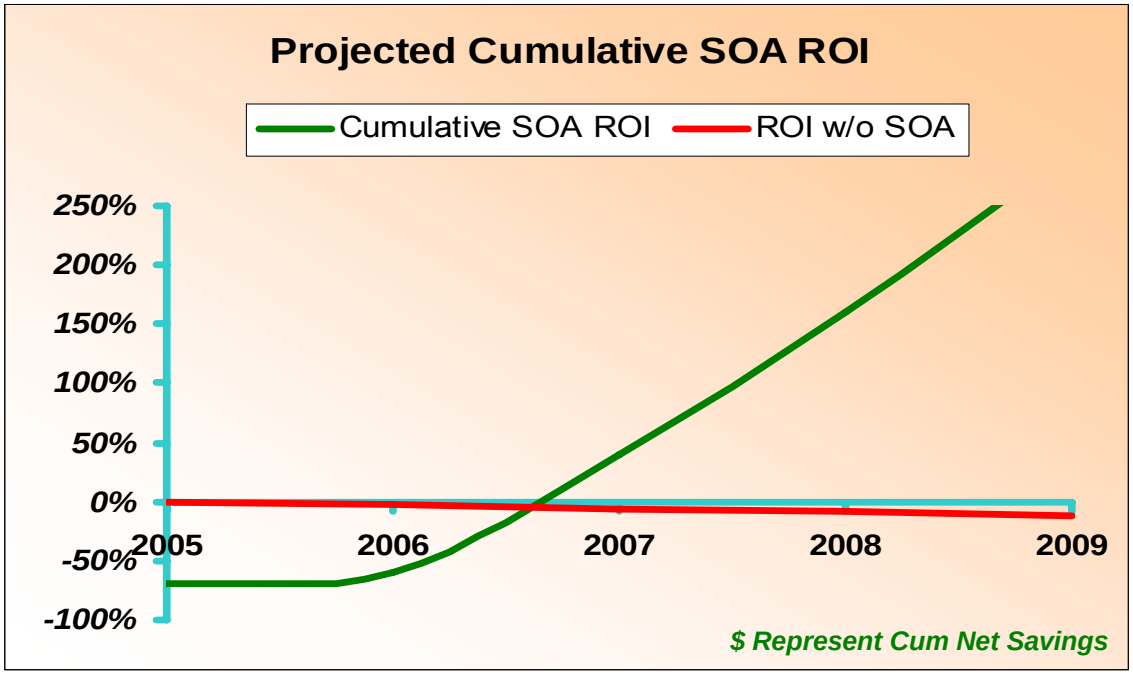


Highlights:

- Reuse of a single service **saved 50%-85%** of the cost of building custom interfaces.
- **Savings will continue to accumulate** as more clients are added.
- **Maintenance costs will be lower** (not shown) because fewer interfaces need to be versioned and maintained.
- **Operational efficiencies will be higher** (not shown) because of increased consistency across SOA customer/client interfaces.

SOA Value to AT&T

The SOA benefit model was recast and zeroed out in 2005. It projects additional savings in excess of $100M by 2009.



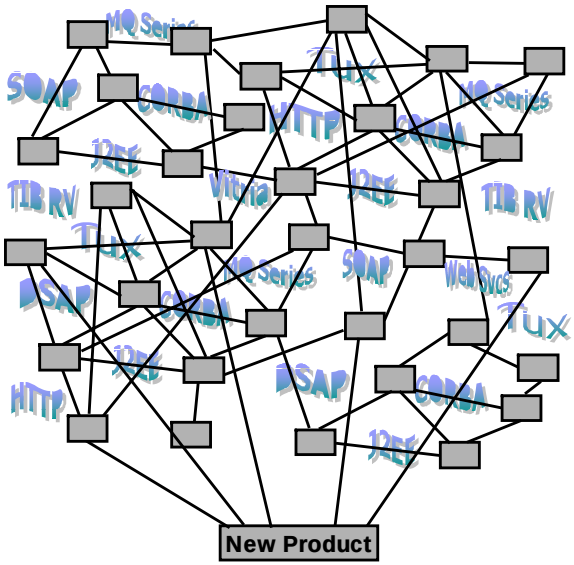
SOA Benefit Model:

- Service reuse contributes an average 50% reduction in integration cost.
- Includes engineering efficiencies from use of standards, models and repositories.
- Includes development efficiencies from use of standard integration toolkits
- Without SOA costs and complexity continue to increase.

Key Assumptions:

- Constant annual development budget spend at 2005 levels.
- Rate of re-use of existing services is approximately 3 times per service during a 10 year period.
  - *Note: The system on the previous slide provided 5 instances of reuse within 2 years*
- SOA adoption rate grows from 25% of projects in 2006 to 90% of projects by 2009.
- Average overhead to create SOA services for the first time is 10% over the current costs.
- Cost of a new interface is $(att proprietary) on average.

Complexity Reduction & Consolidation



BEFORE – The Accidental Architecture

Over the years, many enterprises have developed 'accidental architectures' made up of the gradual accretion of systems and applications interconnected with diverse middleware.

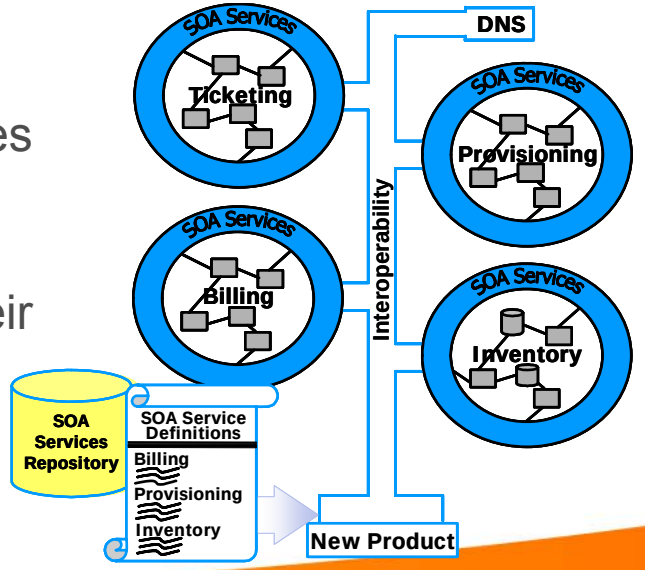
The 'accidental architecture' misses the primary aim of architecture, which is to break down a complicated problem into simple pieces and drive out complexity to make construction and maintenance easy.

AFTER – Service Oriented Architecture

SOA partitions and encapsulates existing capabilities behind a well thought out set of target services.

Solution teams reuse and extend this portfolio services, instead of redeveloping functionality to their specific preferences. Reuse of services cuts cost and speeds time to market.

Once encapsulated, internal infrastructure can be consolidated, enhanced and/or retired.



SOA Business Value Summary

With the correct execution strategy, SOA will deliver significant benefits across the enterprise.

Driver	Description	Benefits
Reduced development costs	**Reuse & less reinvention of functionality across projects**	**20% reduction in development cost; 50% savings per reuse**
Reduced maintenance costs	**Fewer interfaces, versions and middlewares to maintain**	**Ongoing cost savings beyond development**
Reduced complexity	**Encapsulates complexity behind simple service interfaces**	**Teams see SOA services; not legacy systems and technology**
Reduced effort in design & testing	**Complexity reduction leads to easier design and testing**	**Higher quality features; reduced fallout**
Accelerated time to market	**Reuse and complexity reduction cuts time required to deliver new features**	**Greater responsiveness to competitive pressures**
Increased solution assembly	**Solutions are delivered by orchestrating a library of existing services**	**Process centric solutions; more time for business logic**
Easier systems consolidation	**Breaks the direct link between users and legacy assets**	**Business can dictate when & where to rationalize assets**
More integrated & agile processes	**Process tasks leverage a growing library of SOA services**	**Reduced re-keying & input errors**

SOA Definition and Context

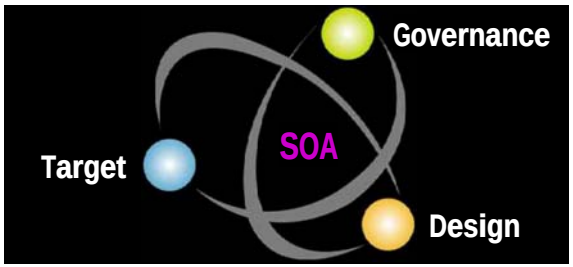
The Challenge of Realignment

SOA is a 'Realignment' challenge rather than a 'Turnaround' or 'Startup' challenge.

- **Realignments challenge established cultural norms that hamper high performance.**
  - Realignments are important to business success.
- **But in realignments, the situation is not dire, leading many to feel change is not necessary.**
  - So realignment advocacy is like farming: cultivating awareness of the need for change, influencing opinion leaders, keeping the pressure on.
- **Unlike startups or turnarounds, the impact of realignment is not always appreciated.**
  - If abandoned, most will not know what could have been.
- **Major realignments like SOA need strong executive support to overcome inertia and resistance.**

AT&T Definition of SOA

SOA is an overloaded term which requires definition and alignment.



"SOA" is an approach to architecture & solution design which:

- Decomposes a domain or application into a set of abstract, highly reusable target functional interfaces (called target 'services').
- Brings governance to the design and selection of services as projects flow thru the development cycle, encouraging both reuse and build-out of target.

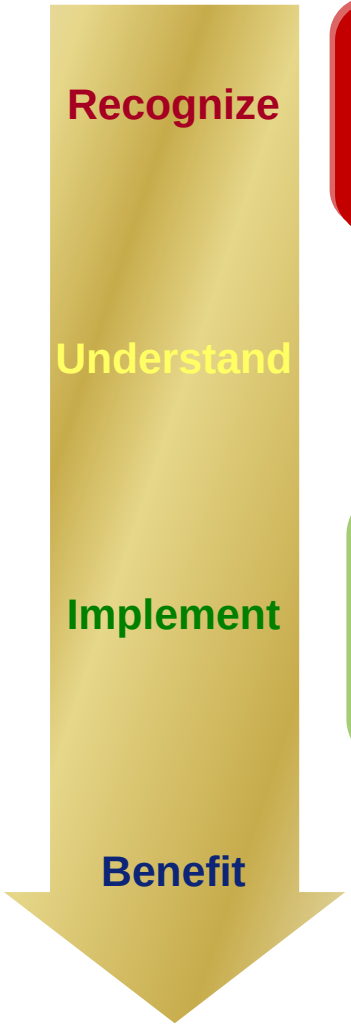
To support SOA:

- **A foundation of middleware, taxonomy and naming standards must be put in place, along with repository / management tools and governance.**
- **Target architects & lead engineers must functionally decompose their applications & enterprise domains into a set of highly reusable target services, which solution designers can reference in their designs and build out over time.**

A common misconception is to equate SOA with Web Services or integration technologies like ESBs.

The SOA Reuse Challenge

Reuse requires a repository of existing & target interfaces, plus governance or minimally buy-in from app owners.



Typically, 1/3 of development is spent on interfaces, many of which are project-specific and not easily reused. API functionality is reinvented by parallel teams sometimes in the same release.

Reusable interfaces are difficult to think up in the fire of project urgency. If they were, reuse would be widespread today.

Reuse of existing interfaces saves 40-80% over building new. Where new interfaces must be built, they should be built for reuse.

Reuse will require: 1) analyzing & specifying reusable interfaces outside the fire of project delivery; 2) applying that target to projects during development.

There are no simple guidelines for generating a reusable target--it's doing good design: layering, modularizing, data flows/models, use cases, strategy for dynamic elements... But an online handbook will help the community.

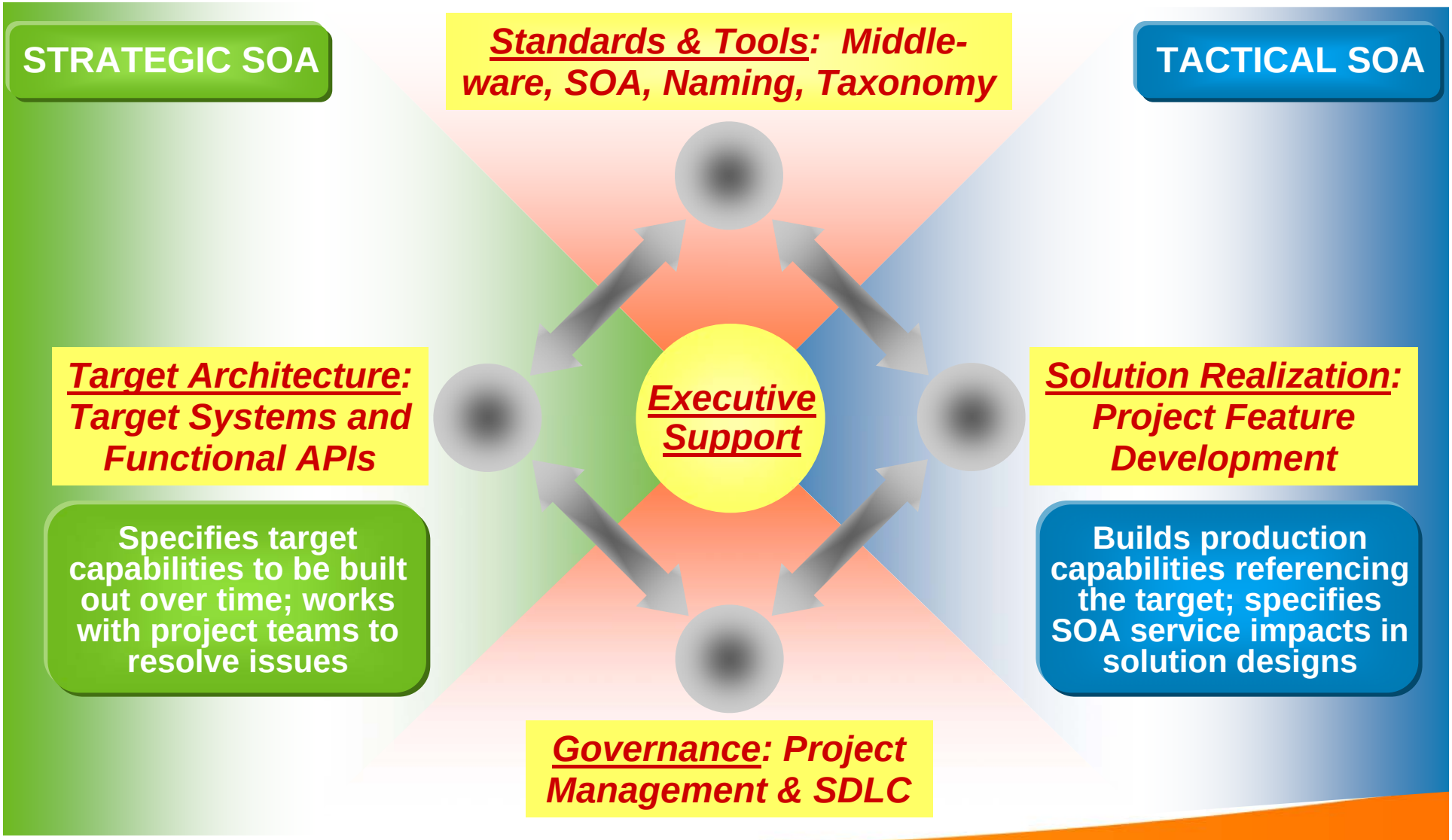
A good target is agreed by architects, engineers and developers: reps should be appointed for each app and/or functional area.

If they buy into their target, then even without governance oversight, app engineers will propose & advocate the target.

Savings: development (reuse), maintenance, ops & design (simplicity). Costs: target definition, tools & governance.

SOA Actors

A SOA program needs to successfully engage five teams.



Building the SOA Puzzle

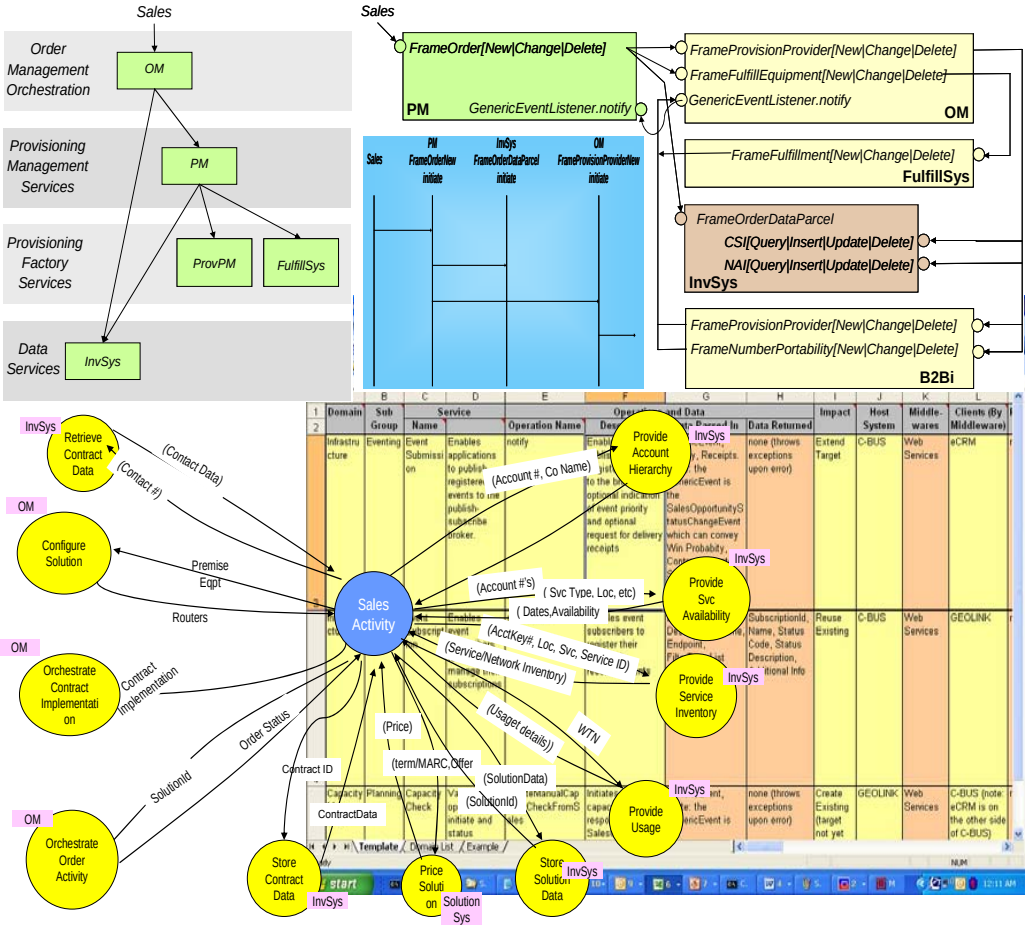
The challenge of SOA in a large enterprise can be related to the assembly of a complex puzzle.

	Contributor	Output	Puzzle Analogy
Tactical Aspect of SOA	Project Solution Designers	Specification of SOA service impacts in solution designs	Each solution team assembles a few pieces; over time they assemble the whole puzzle.
Strategic Aspect of SOA	Target Architects	The 'To Be' view of functional capabilities by domain*	Definition of the puzzle to be built out over time, including the shape of each piece.
Foundation of SOA	Technical Architects and SOA Support	Interoperability standards, SOA tools and governance	Puzzle piece requirements and governance of the assembly process.

SOA Service Delivery

Strategic SOA: Target Services

Strategic SOA is tasked with functionally decomposing the architecture into a set of abstract target services.*



* Note: while target interfaces are optimal for the enterprise as a whole, they may not be optimal for all projects or clients.

- **Decomposition starts by dividing the architecture into domains.**
- **Working top-down, domain teams define the target services they will provide to other domains.**
  - Domains expectations must be vetted cross-team.
  - Service functionality is described abstractly without regard to protocol or implementation details.
- **The hard work is the mental analysis that must be performed.**
  - Modeling tools can help document decisions but are not essential to the actual analysis.
- **Service definitions must extend to the data flowing in/out of operations or the target won't be stable or usable.**

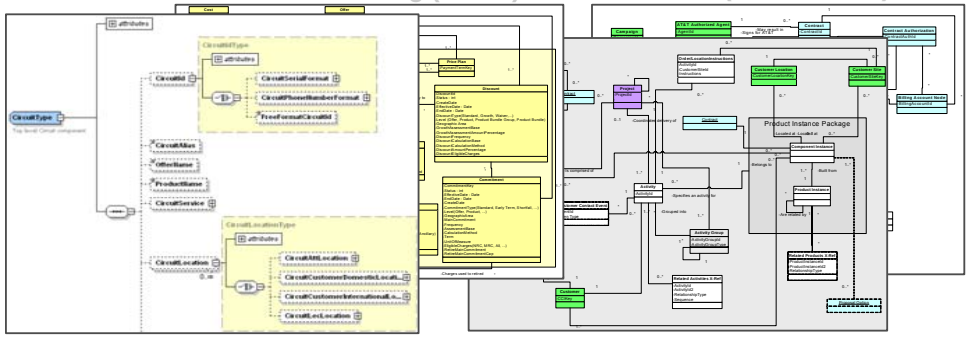
Data Standardization

SOA APIs express an implicit data model, which ideally should be identified to increase the comprehensibility & consistency of service definitions.

Enterprise Data Models

Product Catalog (PSOC)

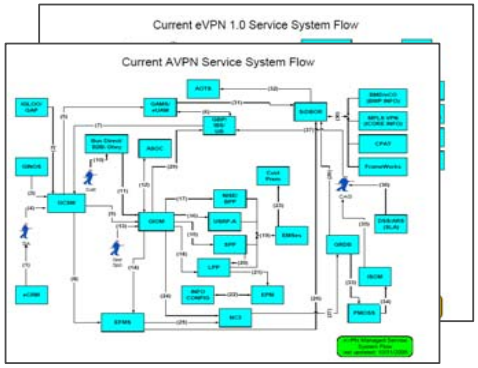
Customer (CCI & eCRM)

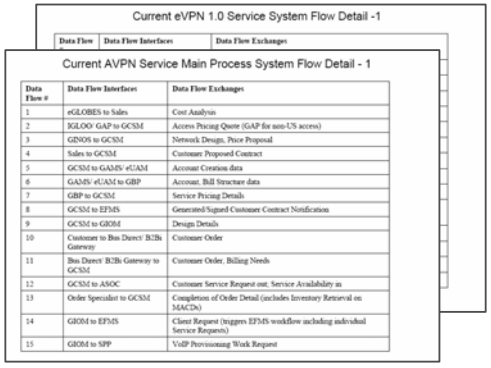


Circuit Schema

Solution, Order (CSI)

High Level Data Flow Diagrams





Target Object Requirements:

- Technology for modeling and describing objects
- Standards for reuse and aggregation of base components
- How to identify, propose and approve objects

SOA Service Best Practices:

- Strategy for using complex objects in SOA APIs
- Strategy for object-agnostic services

Data Dictionary:

- Store and discover target objects
- Link to SOA Repository operation parameters
- Document data translations for key applications and flows

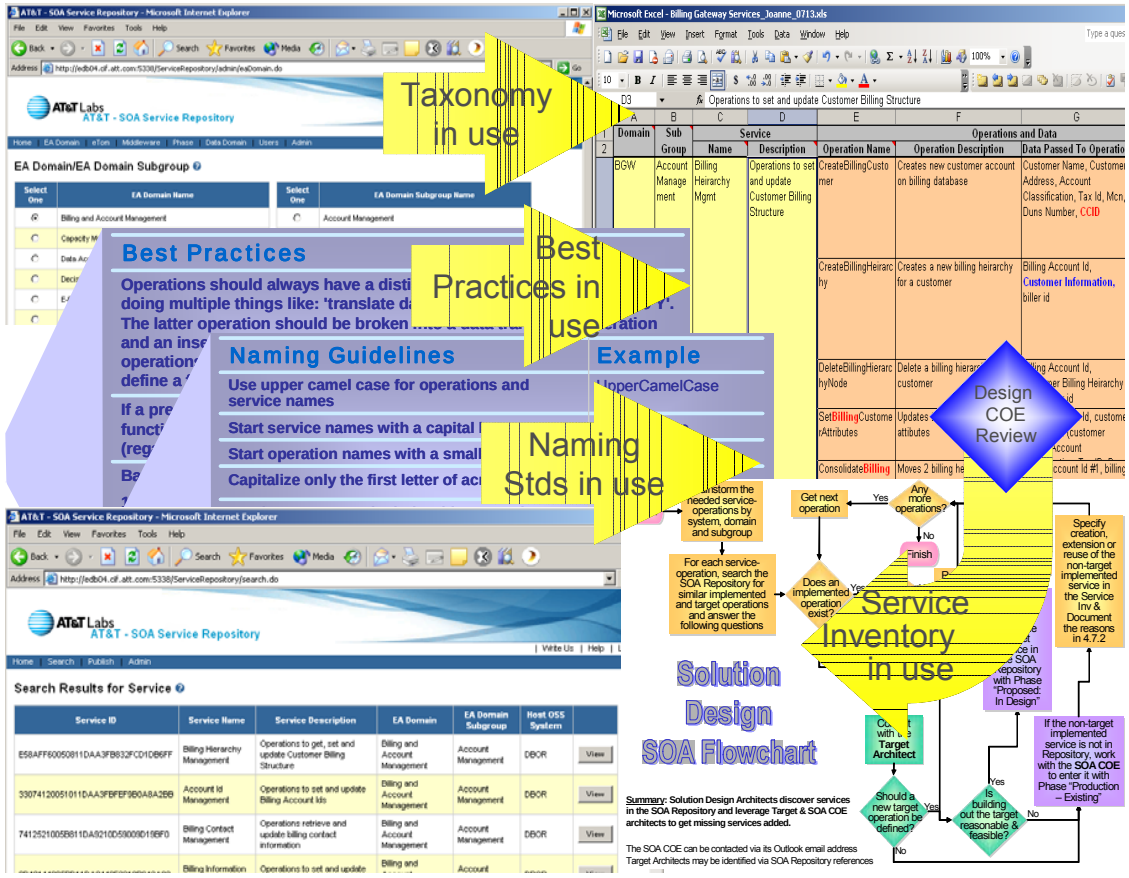
Benefits of Target Data Objects

Establishing target objects provides a number of benefits

- **Knowledge Capture**
  - Synthesizes knowledge drawn from diverse participants
  - Models knowledge precisely
- **Reduces Fallout**
  - Reduces confusion about the meaning and usage of data leading to reduced order fallout
- **Enhances SOA Service Reuse**
  - Systems speak a common language with all of their clients
  - Curtails the practice of legacy systems asking servers to provide interfaces in their proprietary data abstractions
  - Systems must translate their legacy abstractions to the canonical standard but are freed from having to do pair wise translations with every interfacing system
- **Improves Data Quality**
  - Supports the initiative to consolidate legacy data into standard data services
- **Enhances Use of Legacy**
  - Legacy can be more easily accessed when wrapped with SOA interfaces leveraging standard middlewares and standard data abstractions
- **Cost Reduction & Time To Market Improvements**
  - From reduced fallout, reuse of data translations, enhanced understanding, reduced complexity, increased service reuse.

SOA Framework

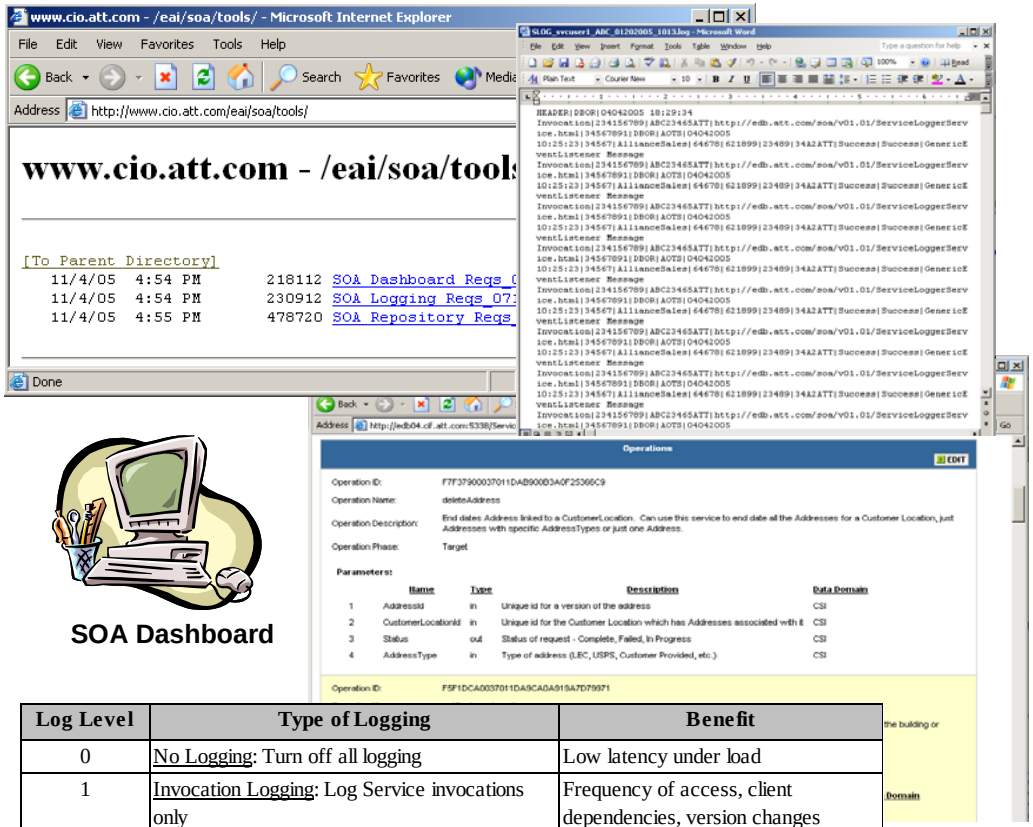
A SOA framework is used for consistent delivery of SOA services across parallel teams.



- A SOA Taxonomy divides the enterprise into domains
- SOA Naming Standards improve service discovery
- Best Practices provide guidance on service scope
- Architects specify the 'To Be' Target View for each domain
- An Inventory of existing services is performed
- A SOA Repository captures service definitions online
- A Solution Design Flowchart specifies how Designers interact with Target Architects
- A Service Inventory template captures service impacts in SOA Design Templates

SOA Tools

SOA tools are used to manage adoption, performance & reuse of SOA services, plus compliance with standards



SOA Dashboard

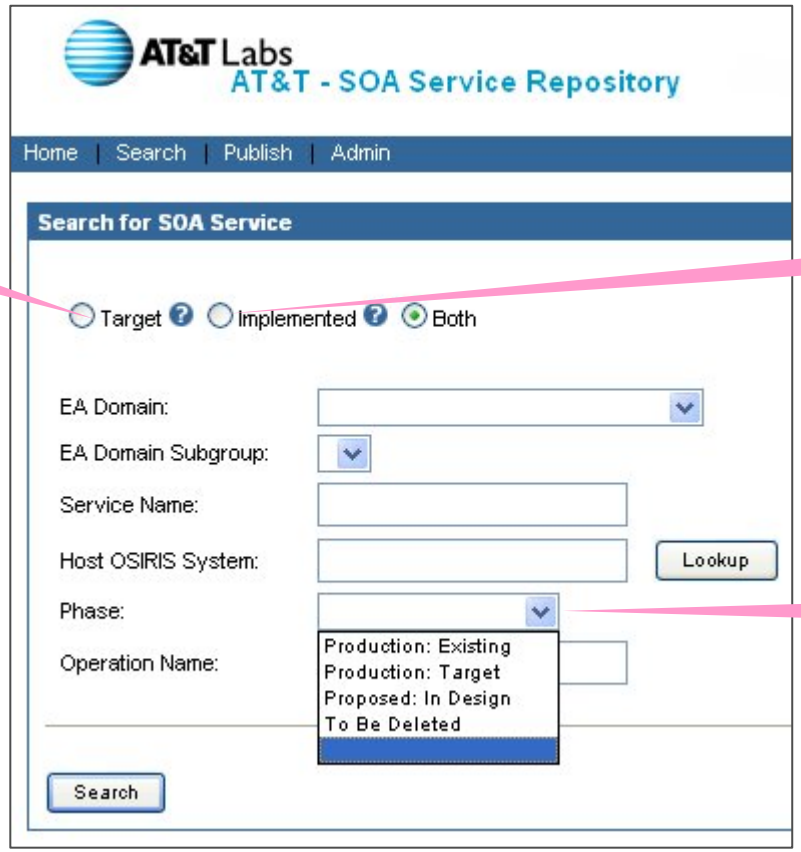
Log Level	Type of Logging	Benefit
0	No Logging: Turn off all logging	Low latency under load
1	Invocation Logging: Log Service invocations only	Frequency of access, client dependencies, version changes
2	Authorization Logging: success or failure	Probing and attacks can be detected
3	Exit Logging: Log all exits from the Service	Service Performance can be derived
4	Call Trace Logging: Log all calls made from the Service to other Services.	Service dependencies and call traces can be graphed

- **A SOA Repository captures service definitions online:**
  - Promotes reuse of services and communicates the target
- **A simple SOA Logger may be used to log SOA activities at various levels of detail:**
  - Captures clients, versions, access frequency, latency, dependencies and more
- **A SOA Dashboard tracks reuse and adoption of the 'To Be' target by application & domain**
- **A Data Dictionary is the database of record for target data objects and abstractions**

'Target' and Implemented Services

The SOA Repository supports both target & implemented services.

'Target services' describe 'To Be' functional capa-ilities to be built out over time, as defined by architecture.



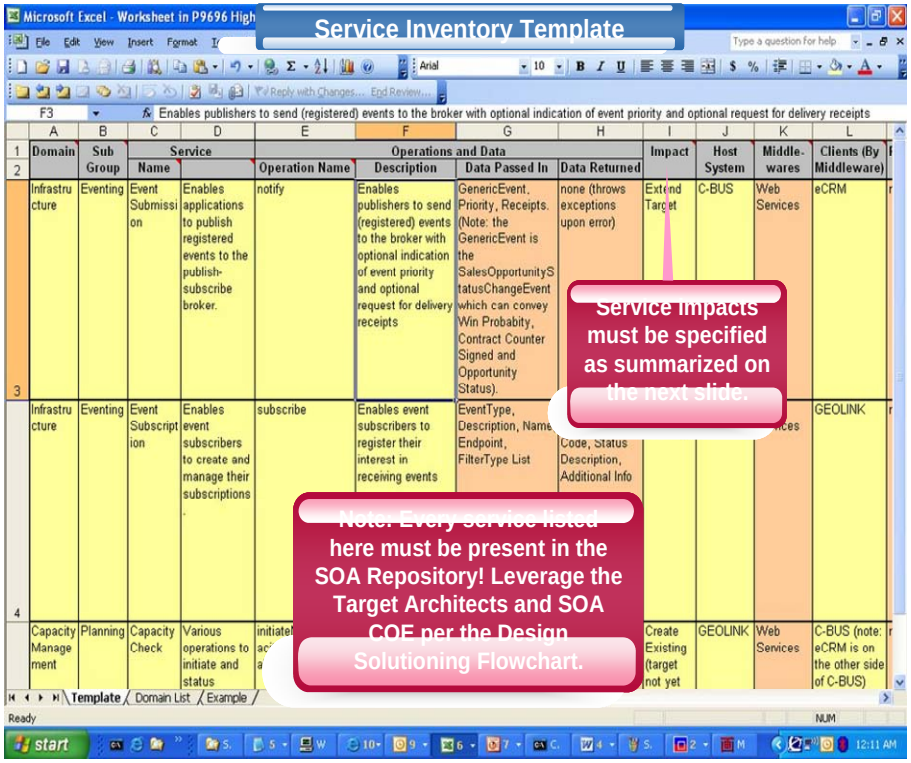
"Implemented services" are actually placed in production, and are further qualified by a "Phase" attribute.

The SOA Repository is a design time discovery tool leveraged heavily by Solution Designers working on time to market projects. The UI is optimized for fast assimilation of enterprise service functionality down to the data passed to/from operations.

Tactical SOA: Delivering Solutions

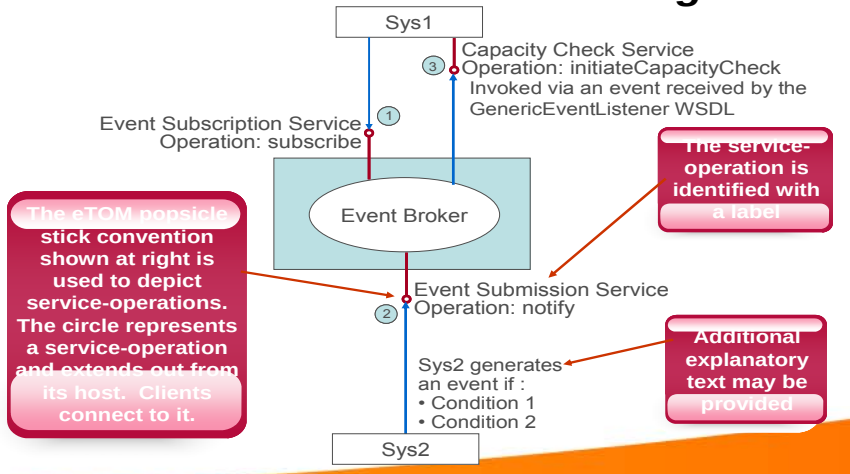
Tactical SOA is tasked with specifying and reviewing abstract SOA services in project solution designs.

- **Design Templates and Governance Processes must be modified to capture and review service choices & impacts.**
  - Specific target/production services must be identified, but the focus is on abstract service functionality (down to the data level); not on middleware.



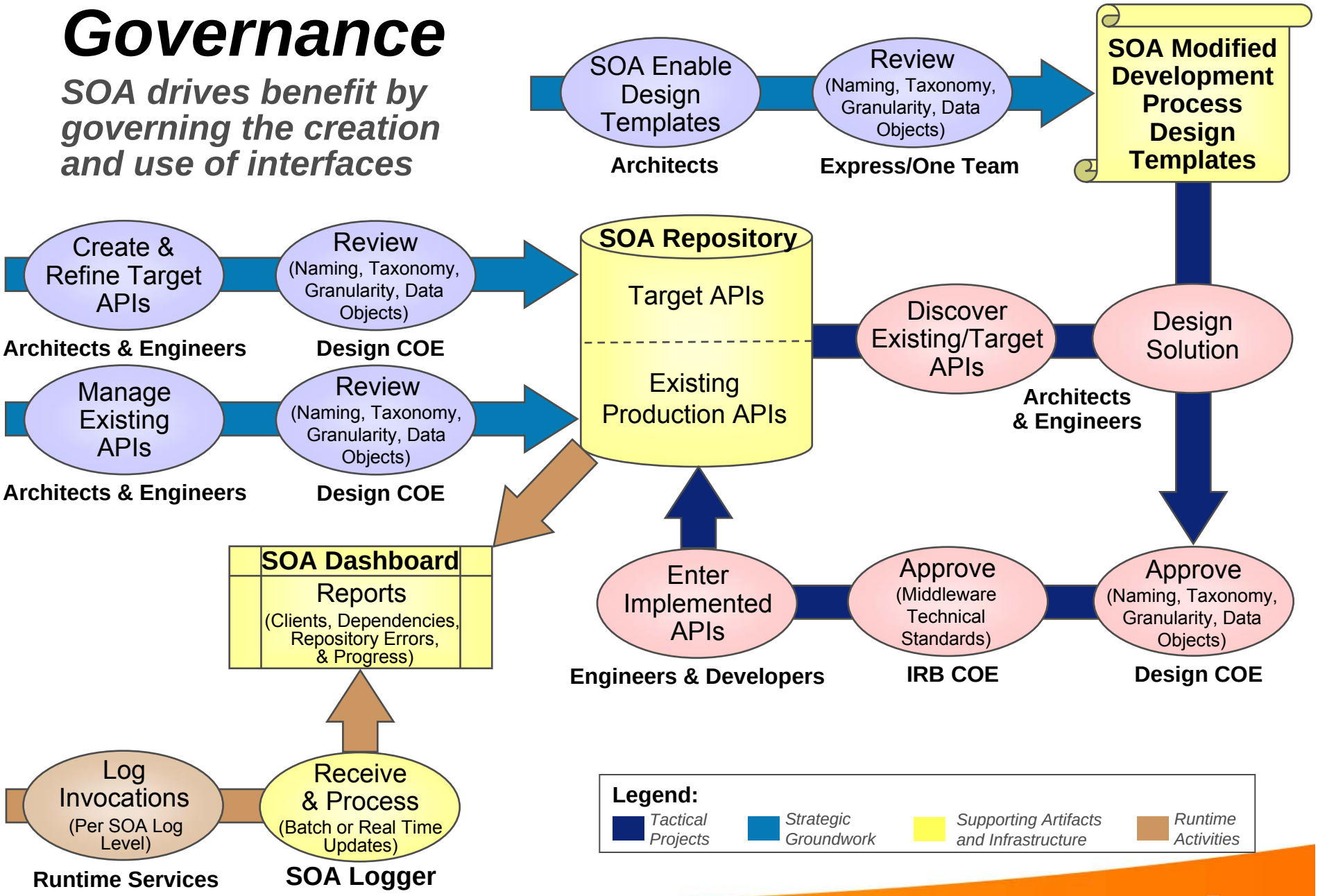
Impact / Phase	Production – Target	Production – Existing	To Be Deleted
Create	Create a target operation **Expected**	Create a non-target operation **Forum Approval**	Create an operation which is expected to be deleted *Approved Exception*
Extend	Extend an existing operation mapped to target **Expected**	Extend an existing operation not mapped to target **Forum Approval**	Extend an existing operation which is marked for deletion *Approved Exception*
Reuse	Reuse an existing operation mapped to target **Expected**	Reuse an existing operation not mapped to target **Forum Approval**	Reuse an existing operation which is marked for deletion *Approved Exception*

SOA Services Architecture Diagram



Governance

SOA drives benefit by governing the creation and use of interfaces



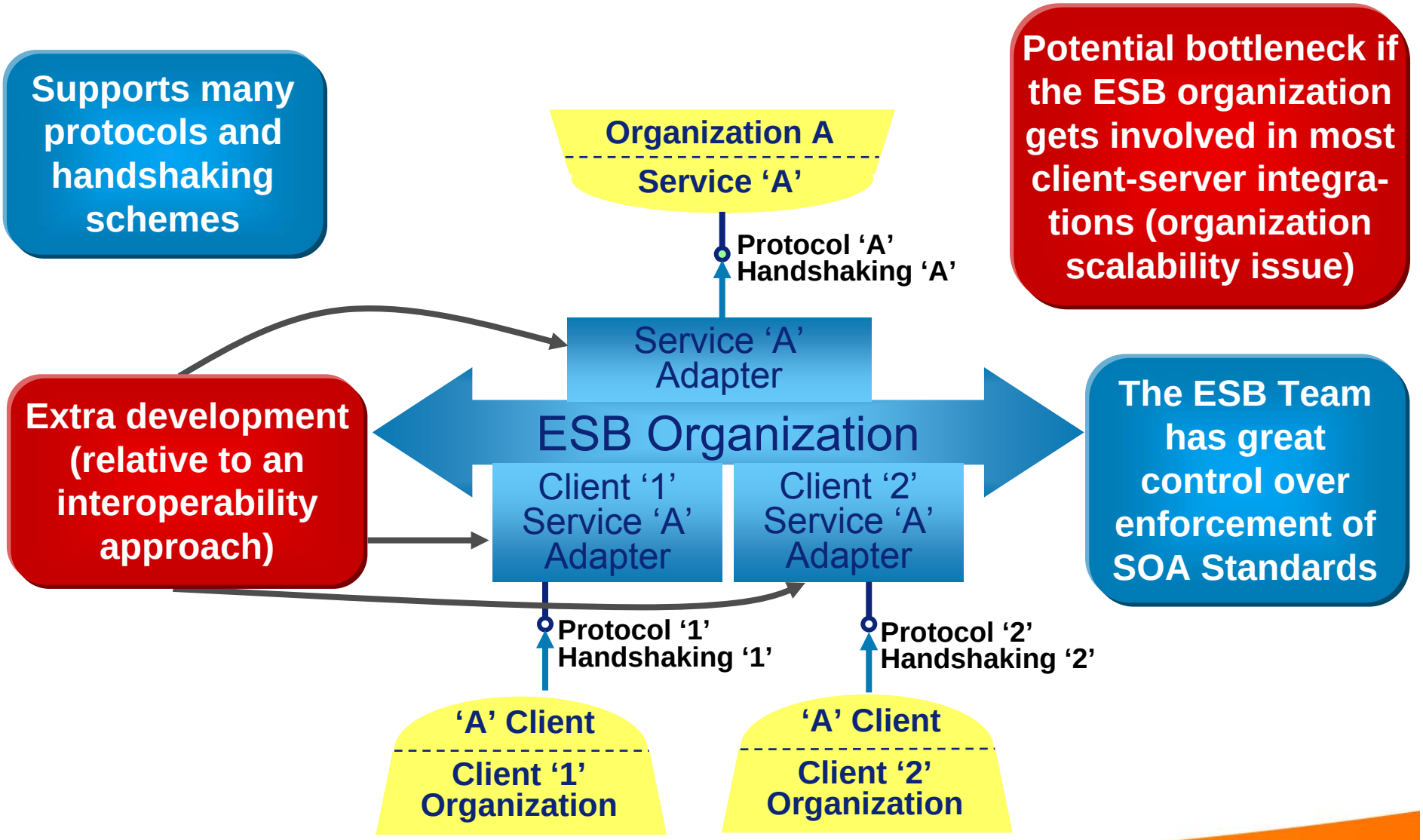
Foundation Integration Strategy

A real world Enterprise will blend two fundamentally different ways of approaching integration.

- **The Integration Broker or ESB approach:**
  - The challenge of ESBs lies not their technology but in the centralized organization required to support and develop integrations with it.
    - Many protocols and handshaking schemes can be supported but,
    - To the extent that it gets involved in pair-wise integrations, the ESB organization must be able to provide resources when they are requested or risk being branded as a bottleneck.
- **The Interoperability Standard approach:**
  - The interoperability standard approach specifies enterprise-standard protocols and handshaking schemes, and requires all network endpoints to develop support for those standards.
    - Once exposed to the network, a service is consumable by all endpoints.

The choice of integration strategy has significant time and cost implications

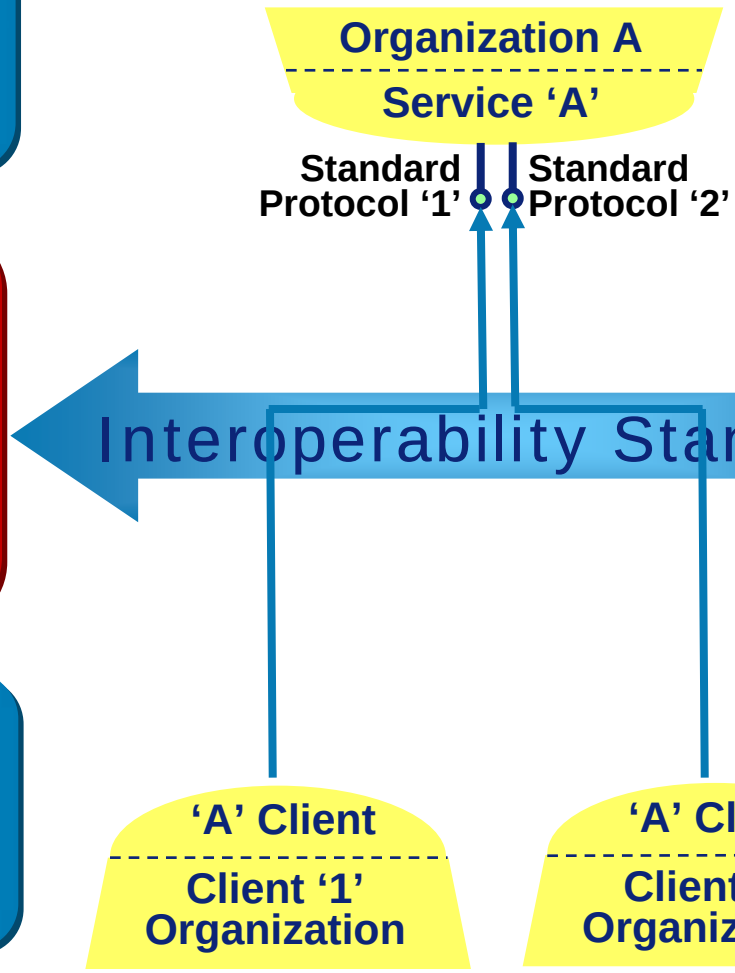
The ESB / Integration Broker Approach



The Interoperability Standard Approach

All endpoints support standard handshaking & protocols

Service providers may have to express their services in more than one protocol (as dictated by the standard)



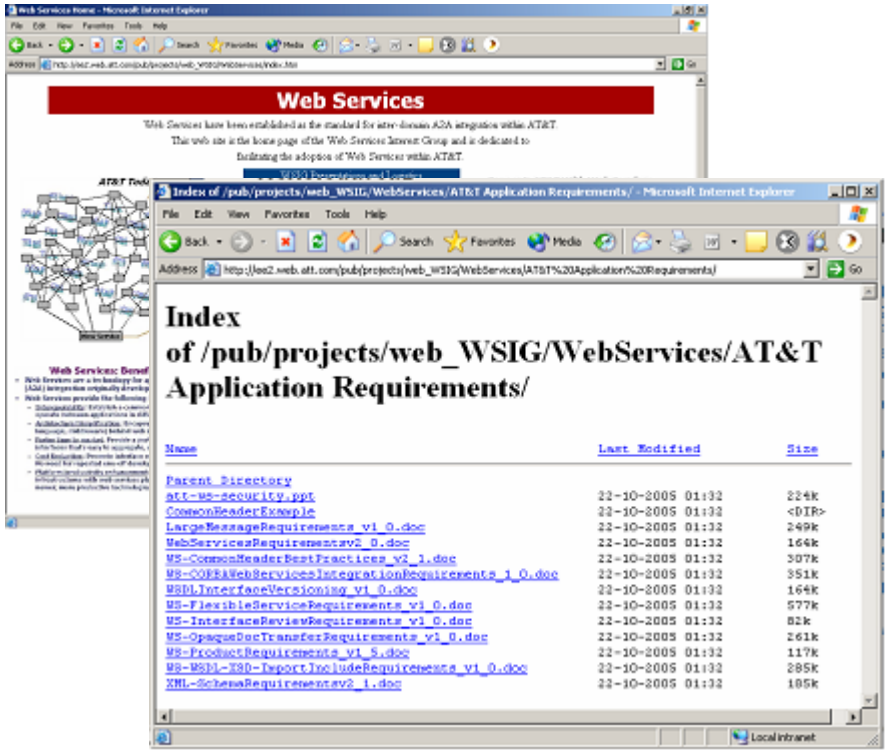
Control over SOA standards is more difficult since integration are implemented by many teams

There is no need to interlock with a centralized ESB organization

Leveraging new protocols is as easy as with the ESB approach

Interoperability Standard

An Interoperability standard must minimally cover:



- **Protocol Standards**
  - **Strategy for requirements that exceed protocol capabilities**
    - Web Services has issues with large messages and extreme performance
- **Handshaking**
  - **Credentials, callbacks, message ID, guaranteed delivery and other message semantics**
- **Vendor Product Standards**
- **Definition of the interoperable subset of protocol capabilities**
  - **WSDL & XML Schema Best Practices for Web Services**
- **Versioning strategy**

There is a danger in relying on emerging industry standards since vendors often implement them inconsistently

Application Centric SOA

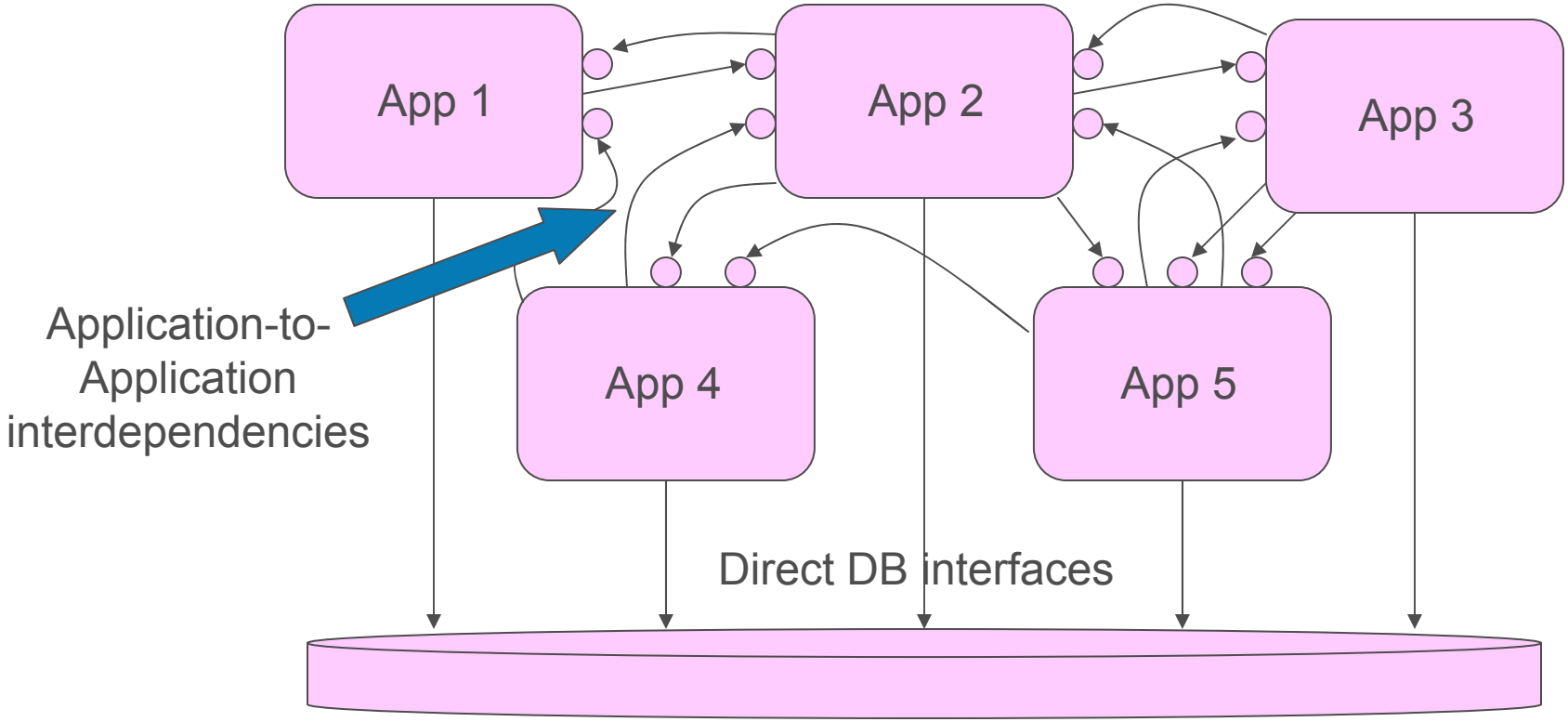
If enterprise wide modification of the SDLC is not possible, an application centric SOA approach may be used instead.

AT&T has had success with different approaches. Think out of the box!

Legacy Migration Strategy Using SOA

Legacy Transformation Starting Point

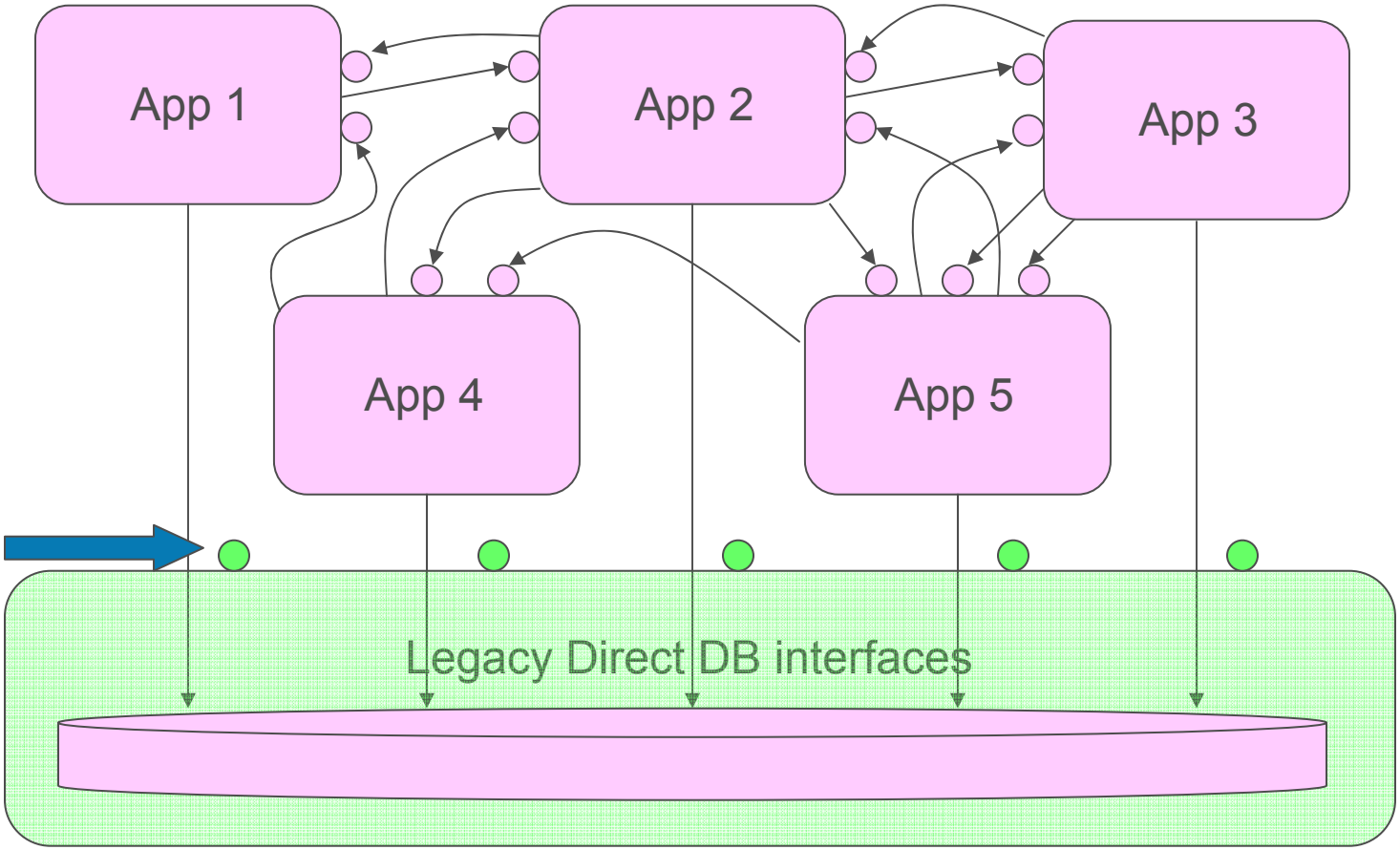
The system consists of a number of different applications with app-to-database, app-to-app & app-to-user interfaces.



Thread 1: DB Transformation Step 1A

Build a target services layer around the legacy databases while retaining existing direct application access to those legacy databases.

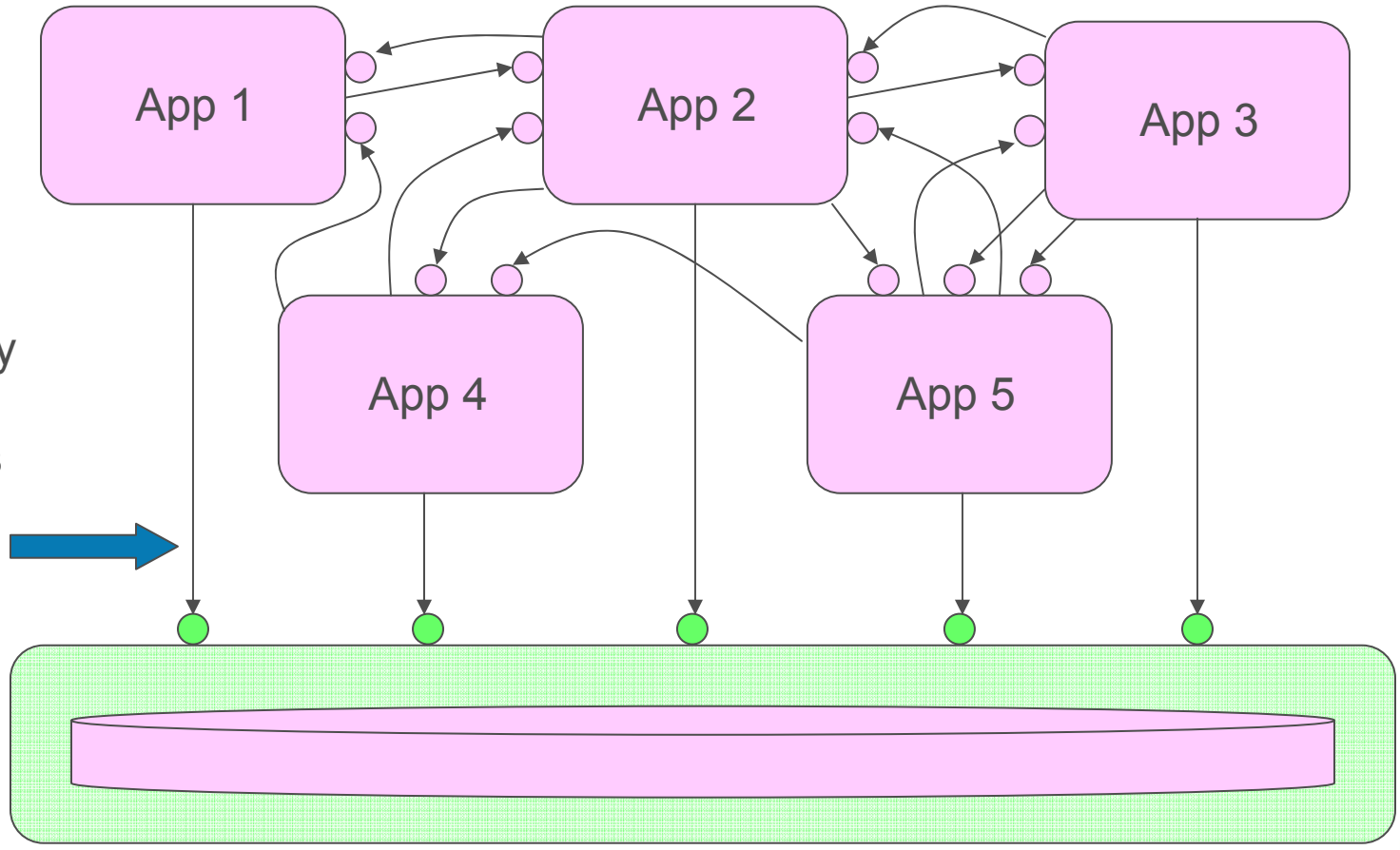
Introduce a target services layer around the DB while maintaining legacy I/Fs



Thread 1: DB Transformation Step 1B

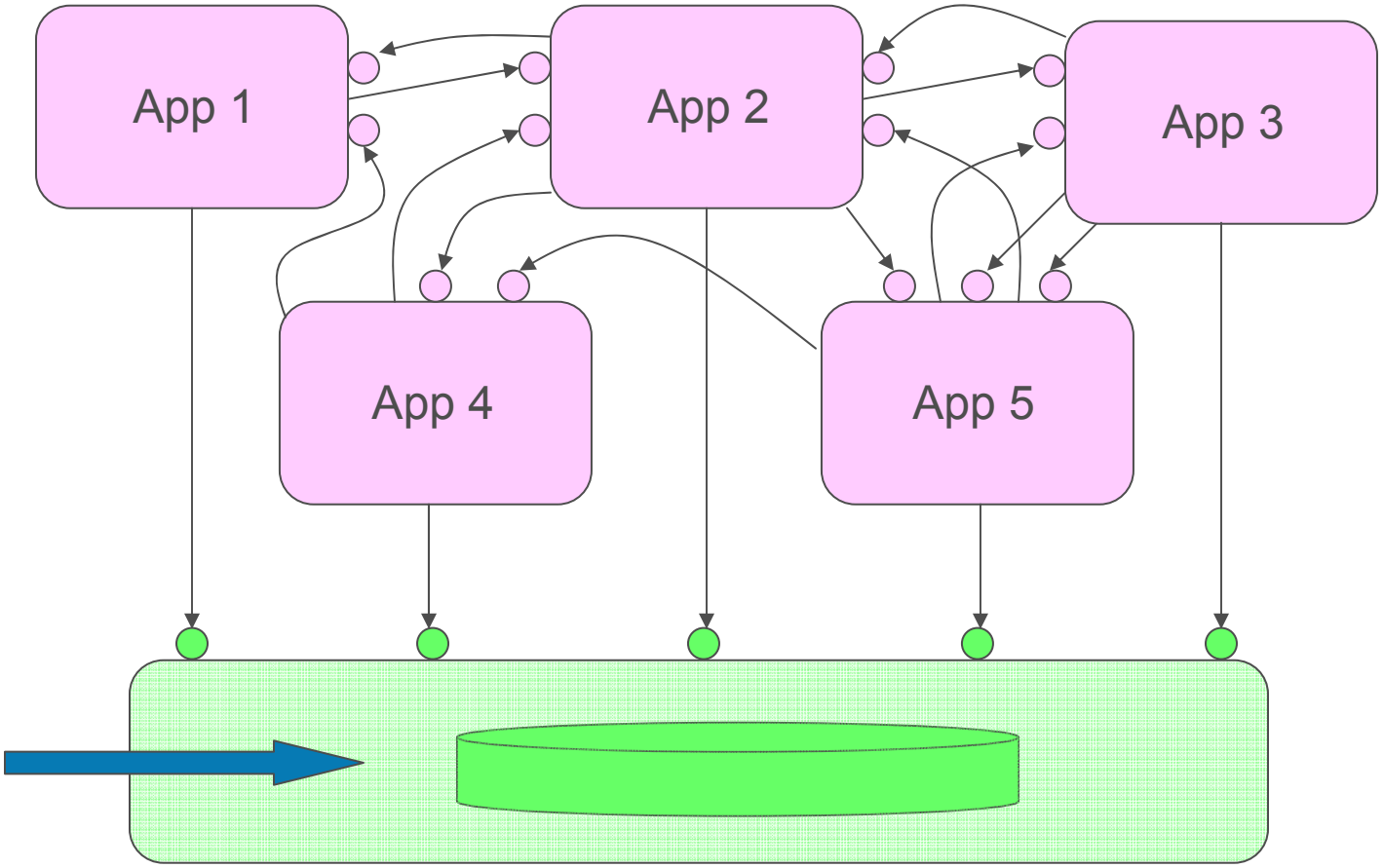
Incrementally wed the legacy apps to the new target services and retire the direct DB accesses.

Incrementally wed the legacy apps to the new target services (& retire the direct DB accesses)



Thread 1: DB Transformation Step 1C

Optimize and replace the legacy DBs without affecting the existing apps (which are shielded from changes by the target services layer).

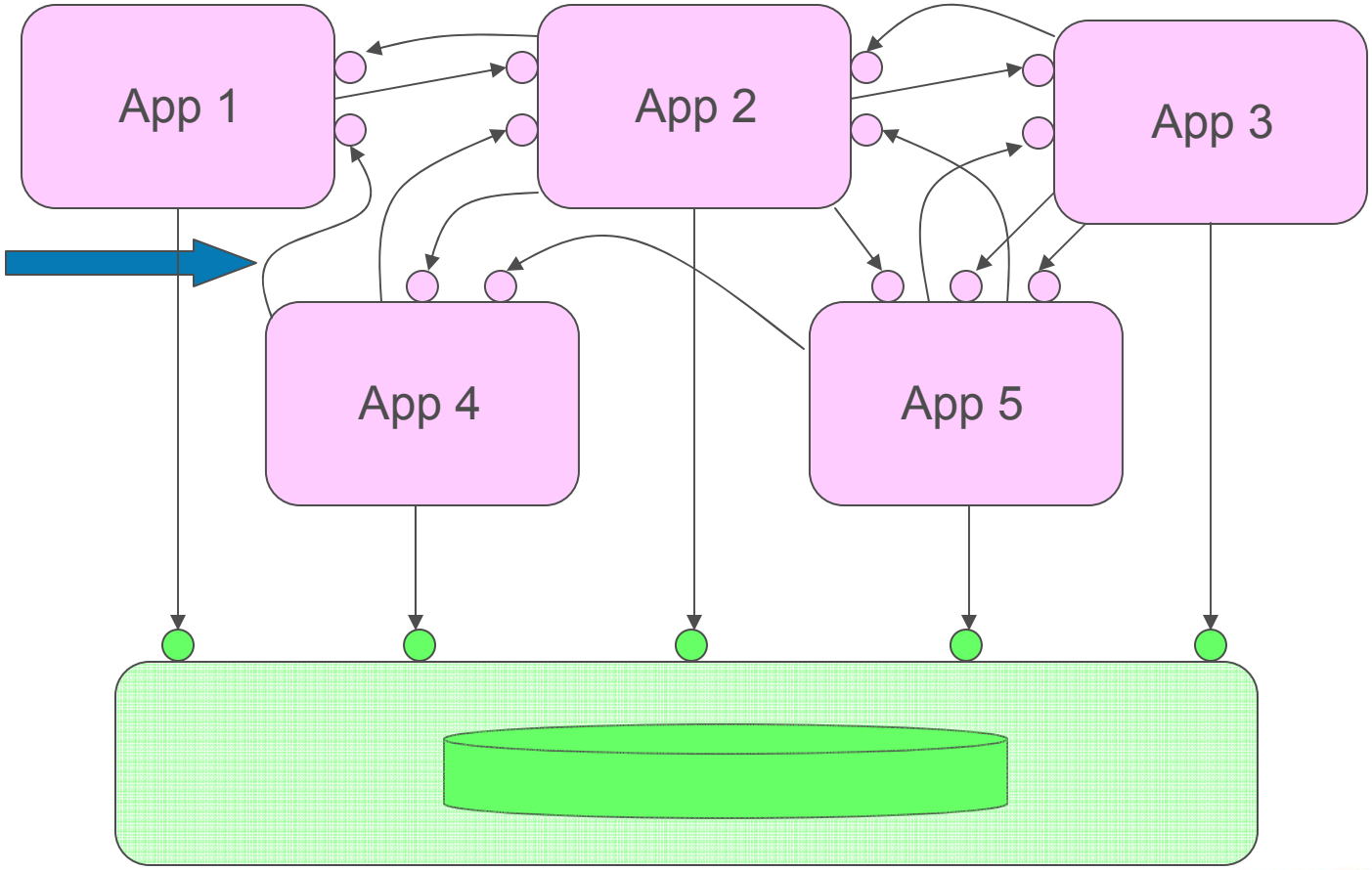


Optimize / replace the legacy DB without affecting the existing apps

Thread 2: App Transformation Step 2A

Analyze & document the existing functional interfaces between apps (and exposed to users via their presentation layers).

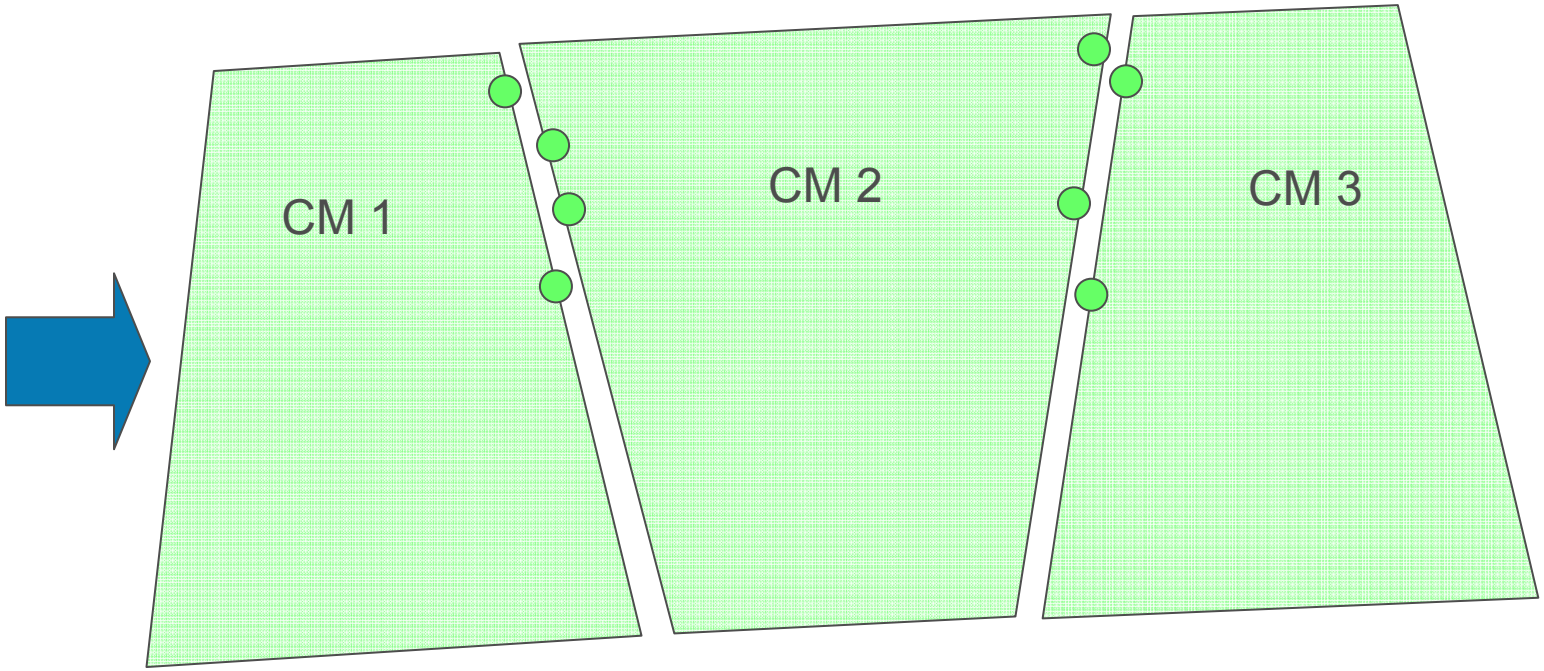
Analyze and document the functional interfaces (i.e., services) being exposed between existing apps



Thread 2: App Transformation Step 2B

Based on the analysis of what exists, specify a set of idealized capability modules interconnected with target services interfaces.

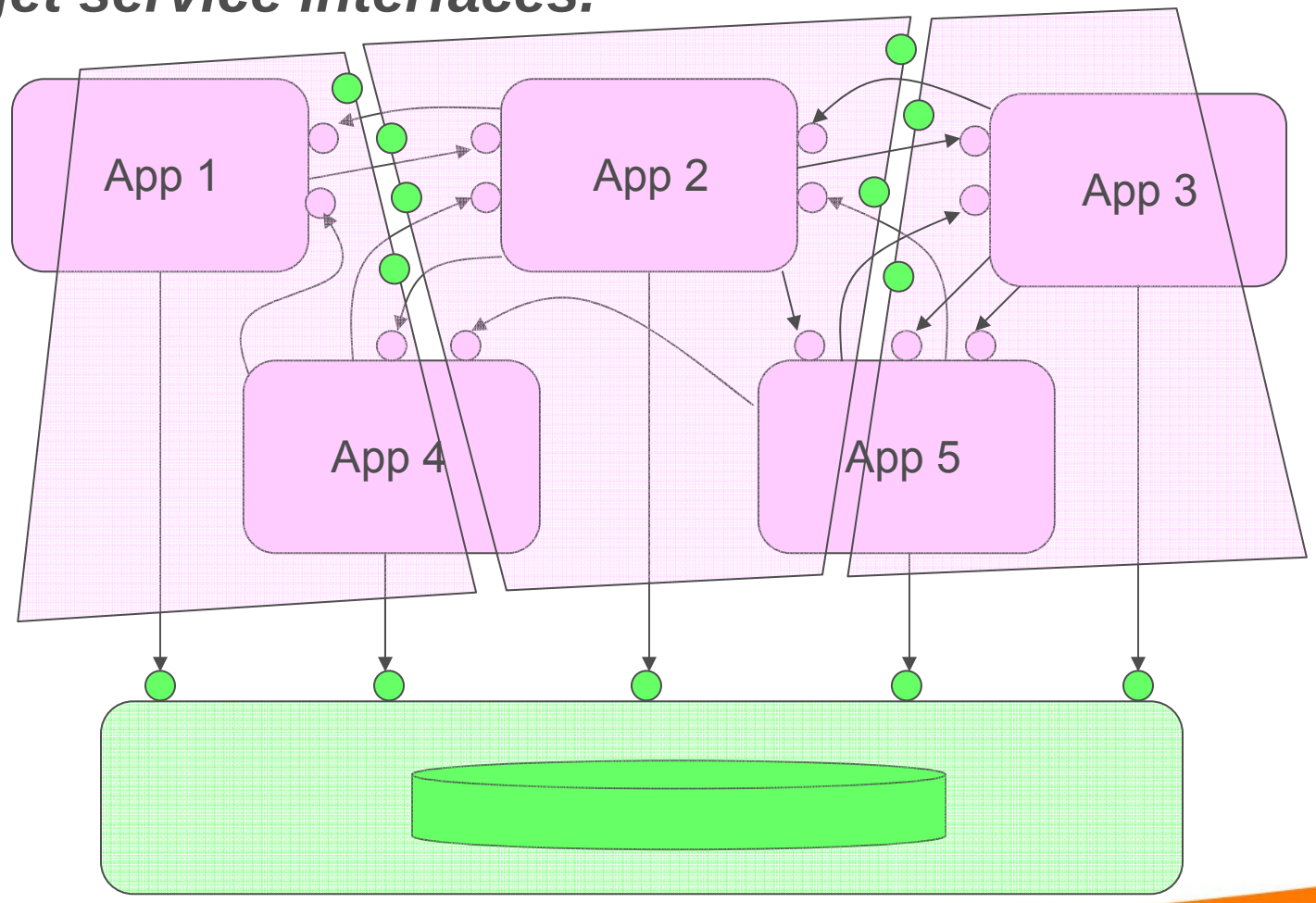
Based on the analysis of what exists specify a set of idealized capability modules with target services interfaces



Thread 3: App Transformation Step 3A

While leaving existing app interfaces in place, build out a wrapper layer over the existing apps which implements the target service interfaces.

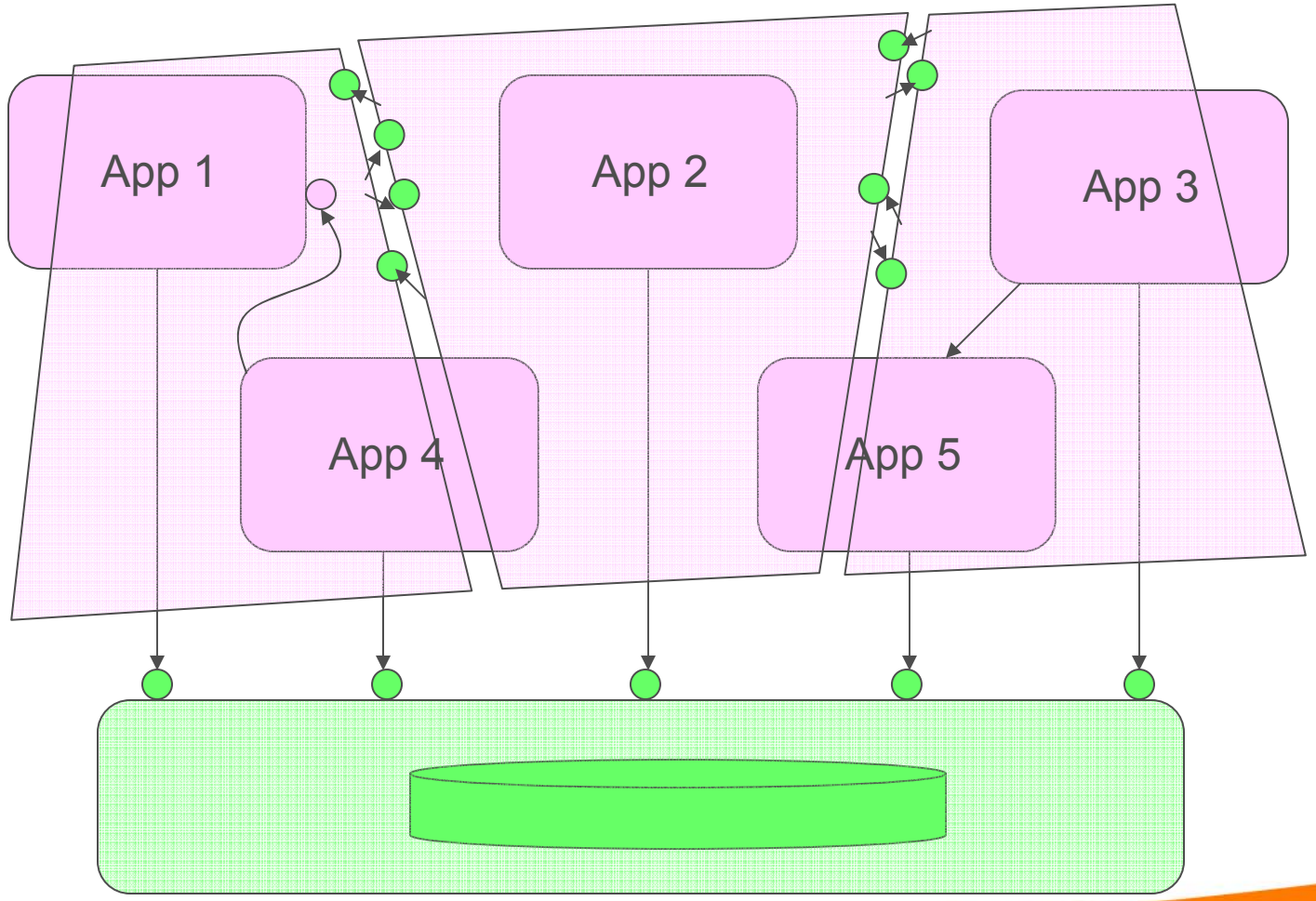
Build out a wrapper / orchestration layer around the existing apps which implements the target services over the existing apps



Thread 3: App Transformation Step 3B

Incrementally wed the existing apps to the target APIs and retire the legacy app-to-app interfaces.

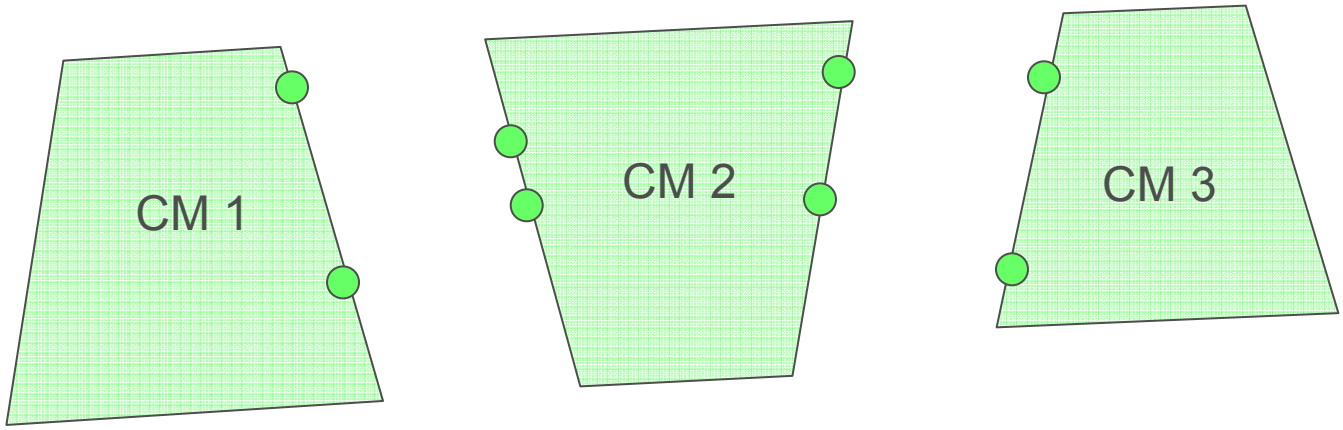
Incrementally wed apps to the target APIs and retire the legacy inter-app interfaces



Thread 4: App Transformation Step 4A

Build out the target capability modules from Step 2B.

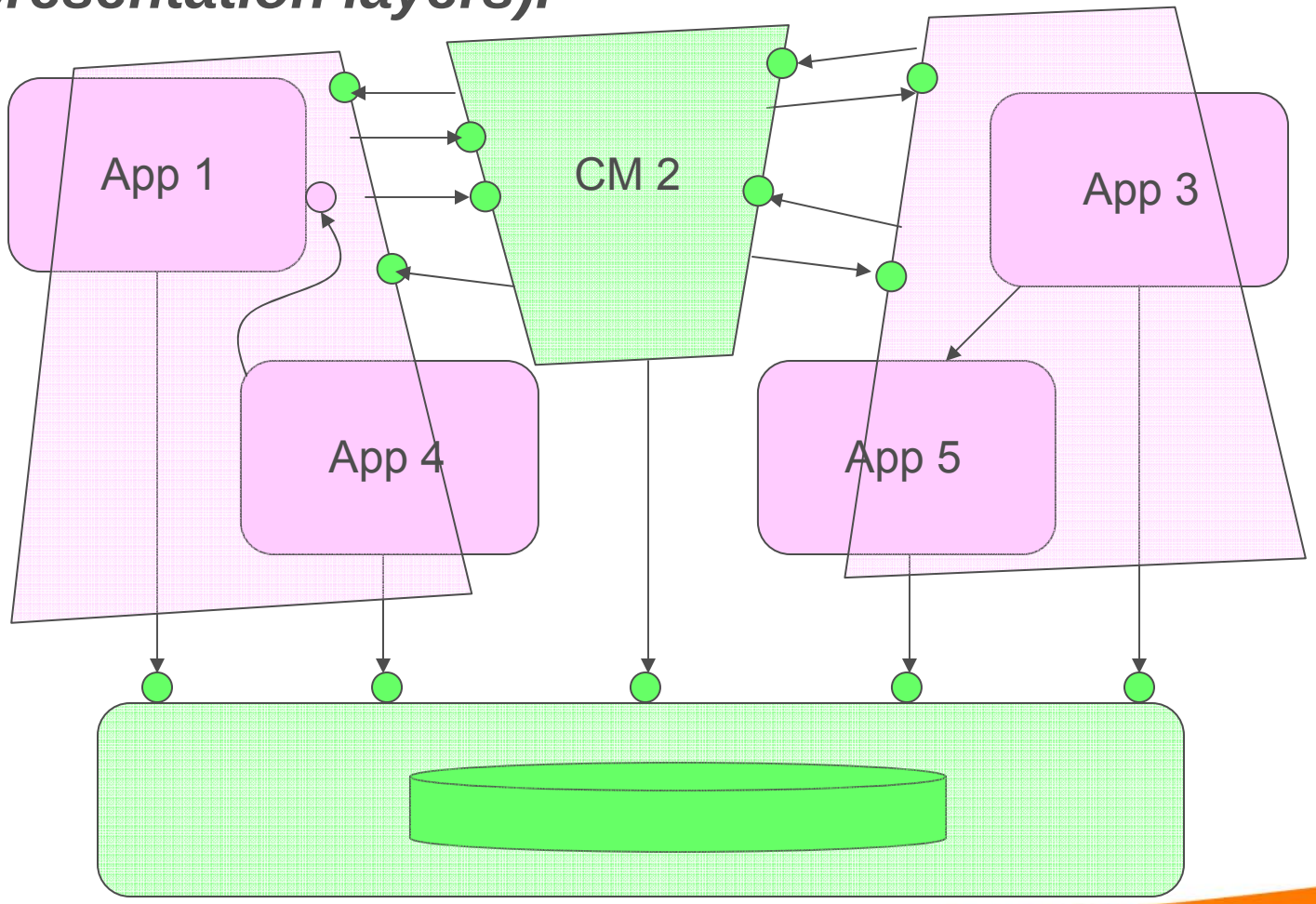
Build out the target capability modules



Thread 4: App Transformation Step 4B

Incrementally replace the existing apps with the target capability modules (this includes wedding users to the target presentation layers).

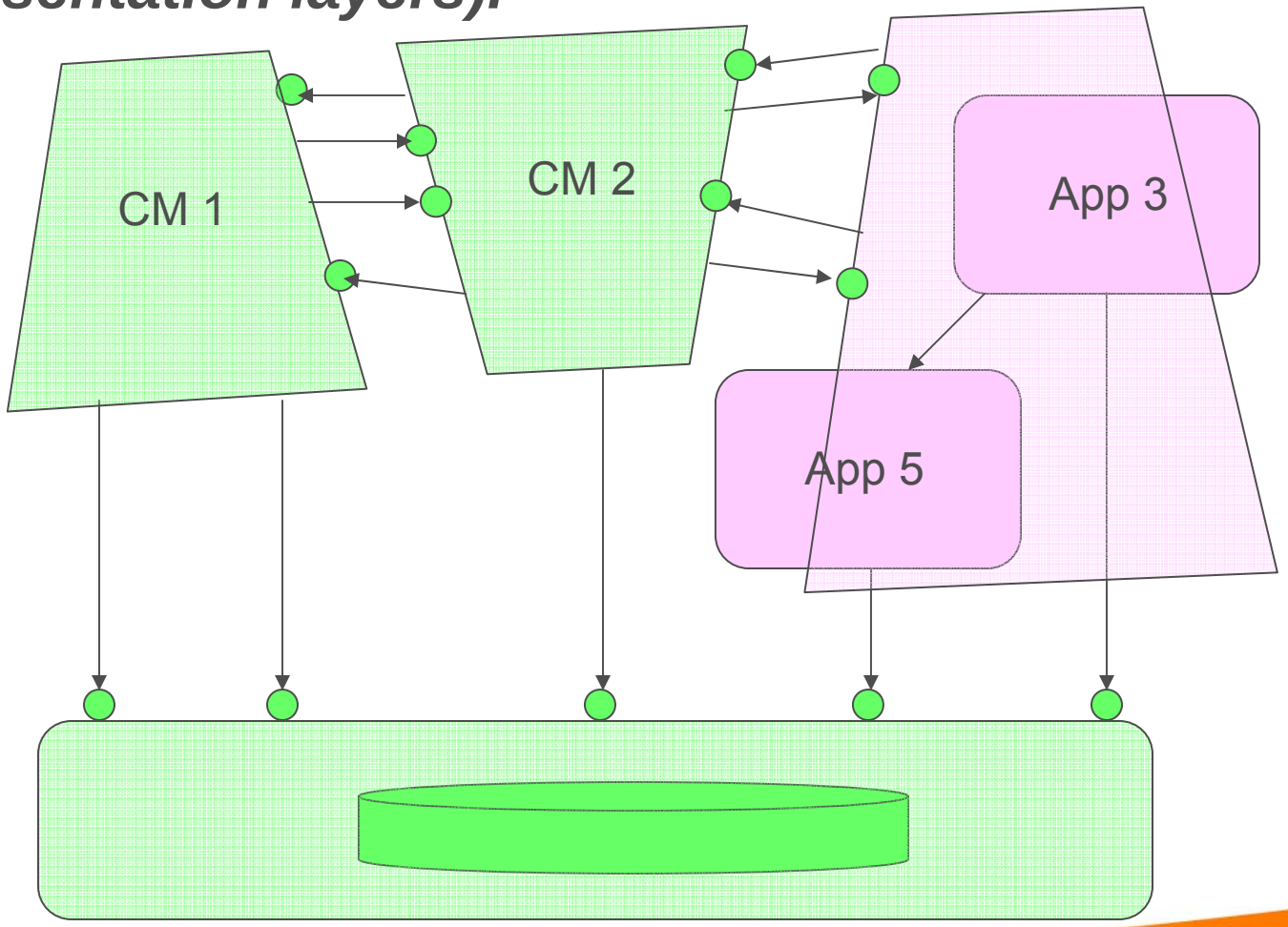
Incrementally replace the existing apps with 'plug and play' capability modules



Thread 4: App Transformation Step 4C

Incrementally replace the existing apps with the target capability modules (this includes wedding users to the target presentation layers).

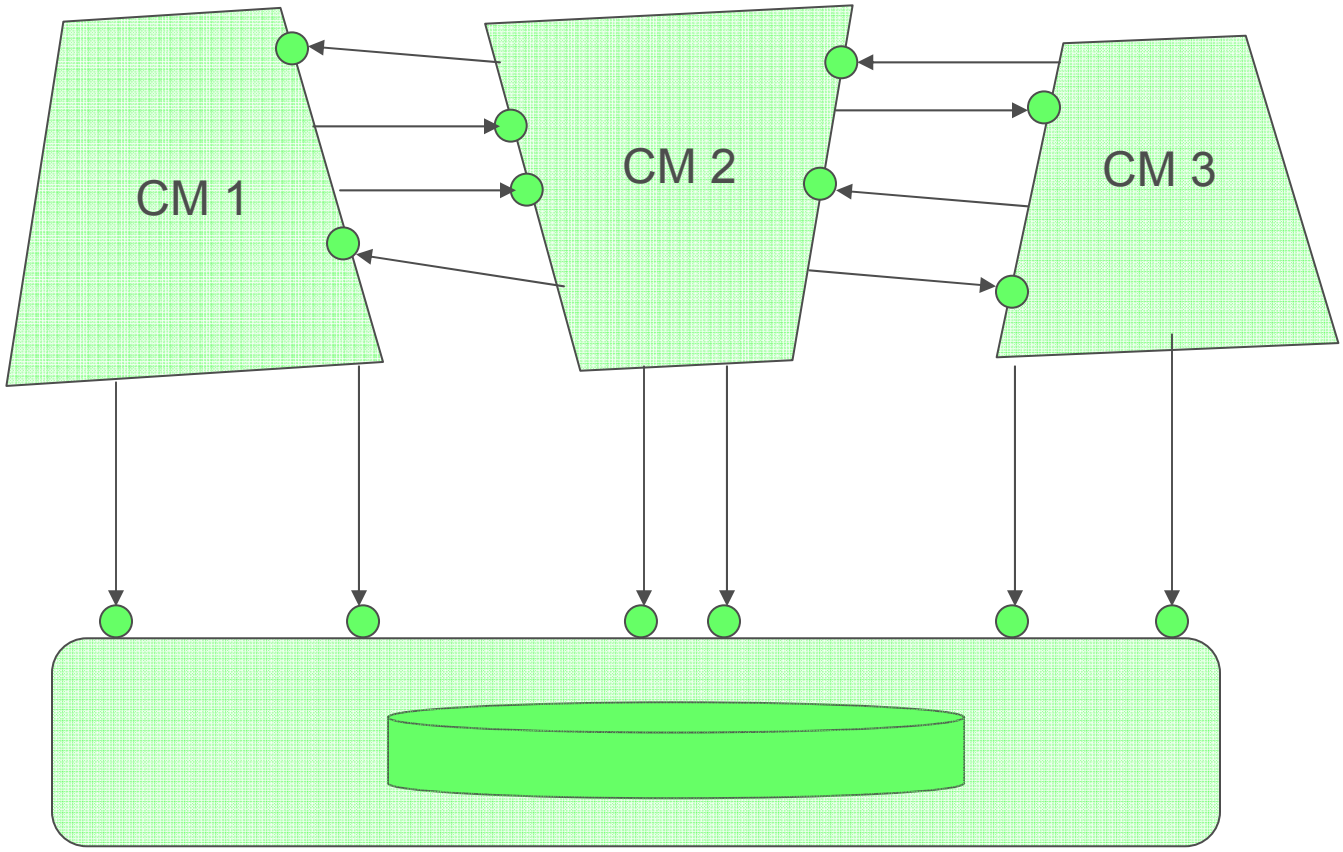
Incrementally replace the existing apps with 'plug and play' capability modules



Thread 4: App Transformation Step 4D

Incrementally replace the existing apps with the target capability modules (this includes wedding users to the target presentation layers).

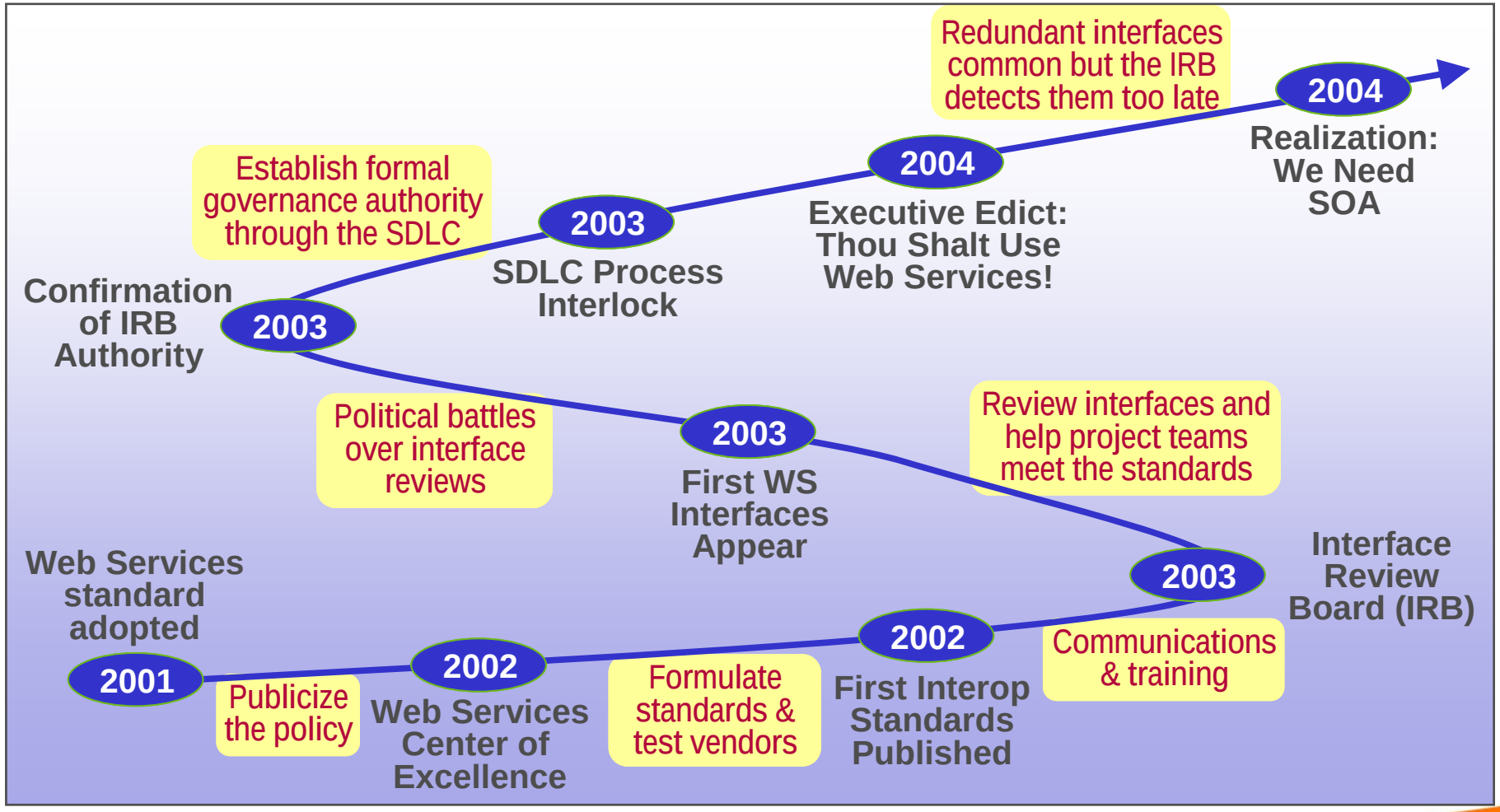
Incrementally replace the existing apps with 'plug and play' capability modules



AT&T SOA Journey

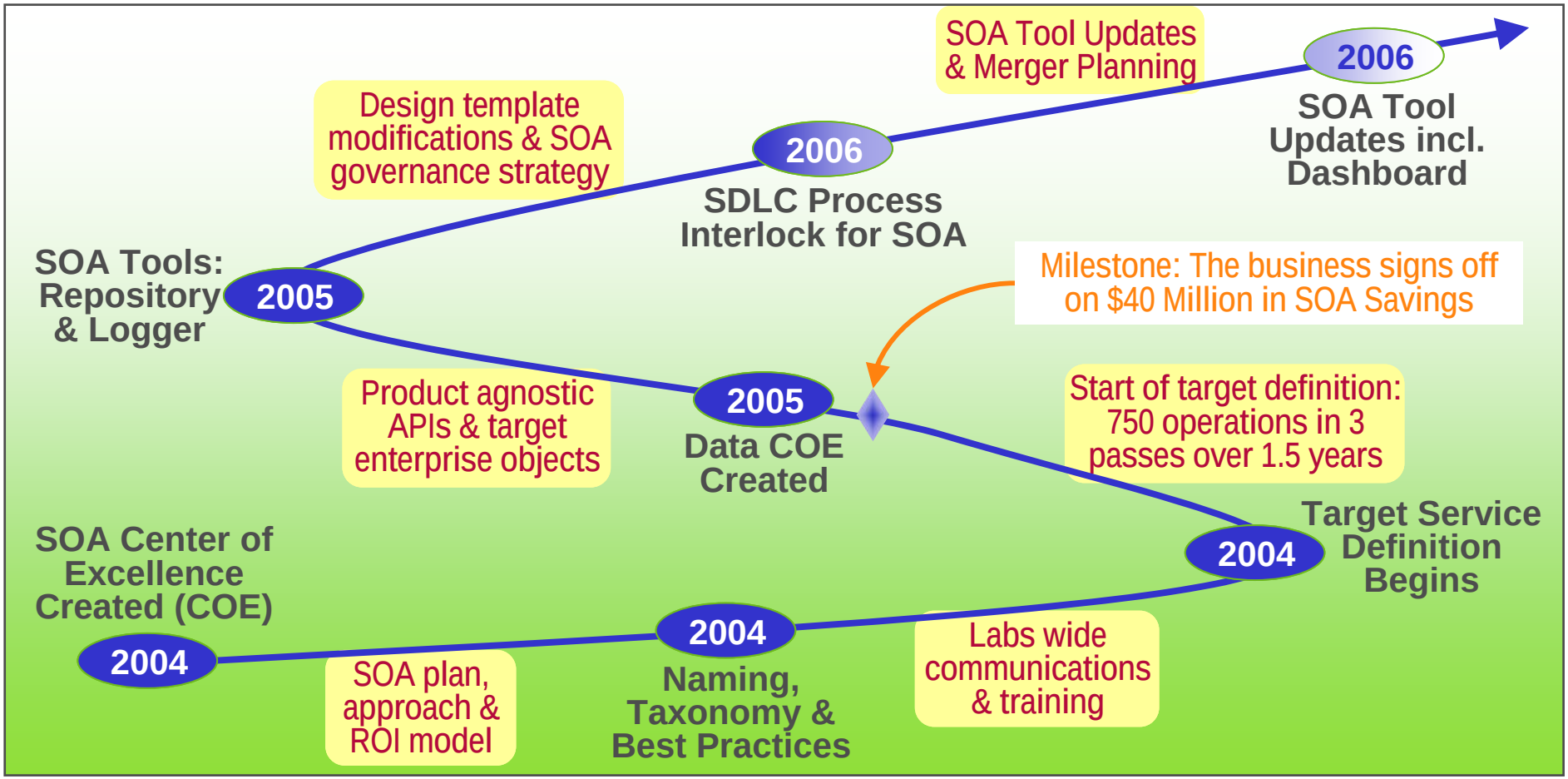
2001-2003: Web Services Strategy

A Web Services interoperability strategy was adopted in 2001 with the hope of ending redundant interface creation.



2004-2006: SOA Strategy

In 2004, the Web Services Interoperability strategy matured into a true SOA strategy with strong Executive support.



Summary

Summary

A SOA program offers great potential to cut cost, complexity and time to market.

- **The SOA program comes into focus when the business goals are clearly articulated and quantified.**
- **Defining terms is very important since the words ‘SOA’ and ‘service’ are heavily overloaded and have been successfully appropriated by vendors.**
- **Executive support is essential to overcoming inertia & resistance. Many will question the need for SOA and the rationale for changing familiar practices.**
- **An ESB is not the only integration option for implementing SOA. In 2001, AT&T adopted a highly scalable interoperability strategy in which ESBs were the exception and not the rule.**
- **Other keys to success are: changing the development process, inventorying existing services, defining target services, deploying an online repository, and adopting a runtime management strategy & dashboard.**

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