

Building an Enterprise Communications Cloud With Sequenced Applications



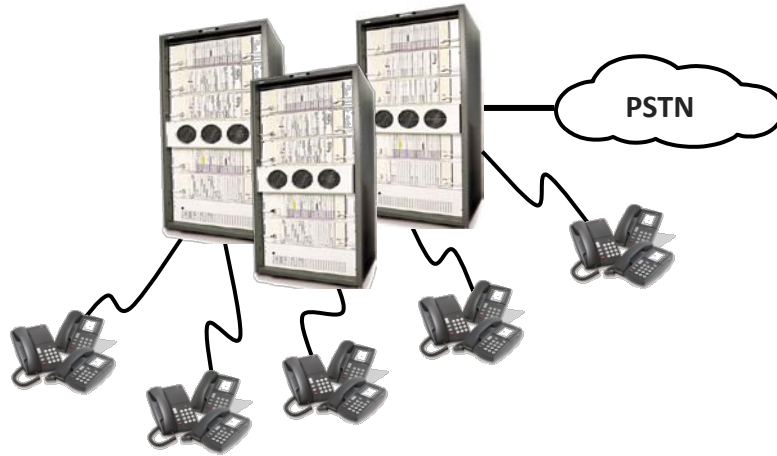
ARROW S3

Andrew Prokop
SIP Architect

- Quick primer on Avaya Aura
- Sequenced Applications
- Evolution Server vs. Feature Server
- Adaptation Modules
- ACE Foundation Toolkit

- Gartner defines Cloud Computing as...
 - A style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service to external customers using Internet technologies
- Gartner further identifies **five attributes**
 - Service-based
 - Scalable and elastic
 - Shared
 - Metered by use
 - Uses Internet technologies

The Legacy TDM PBX



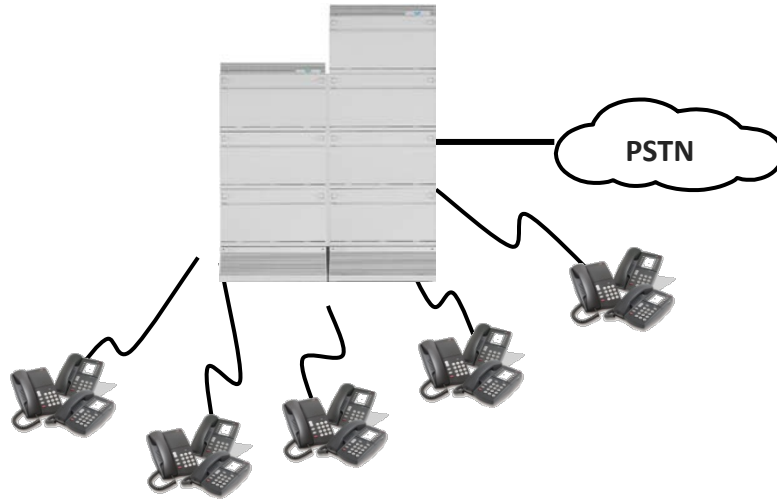
Application

Connection Mgmt

Access

1. Limited Scope
2. Multi-Location → Multiple Systems
3. Lack of Geo-Redundancy
4. Resources bound to PBX
5. Scalability
6. Very Limited Mobility
7. Large Footprint
8. Primarily Designed for Voice
9. PBX owns entire user experience
10. Devices are tightly bound to PBX
11. Devices are unsophisticated
12. New Services → Upgrade
13. Single Vendor
14. Application Integration Limitations

The Legacy TDM PBX



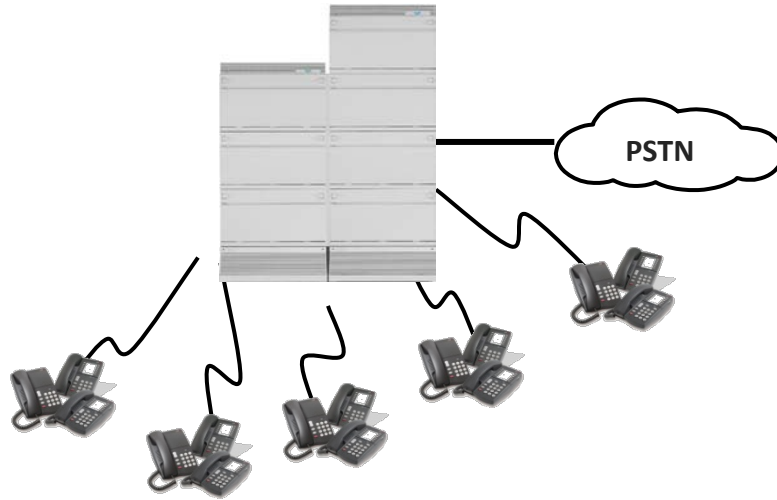
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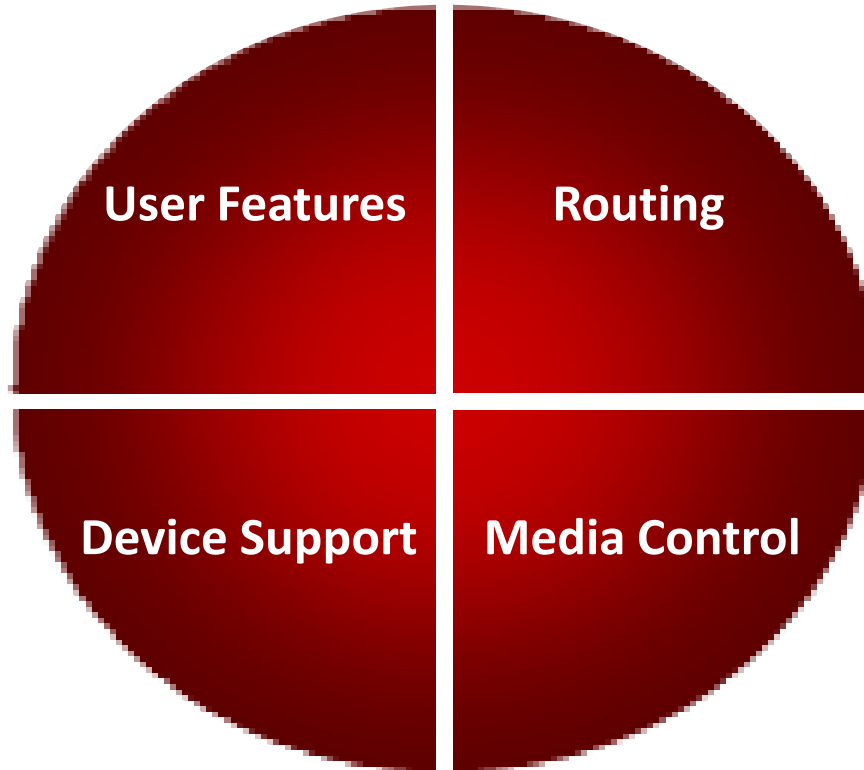
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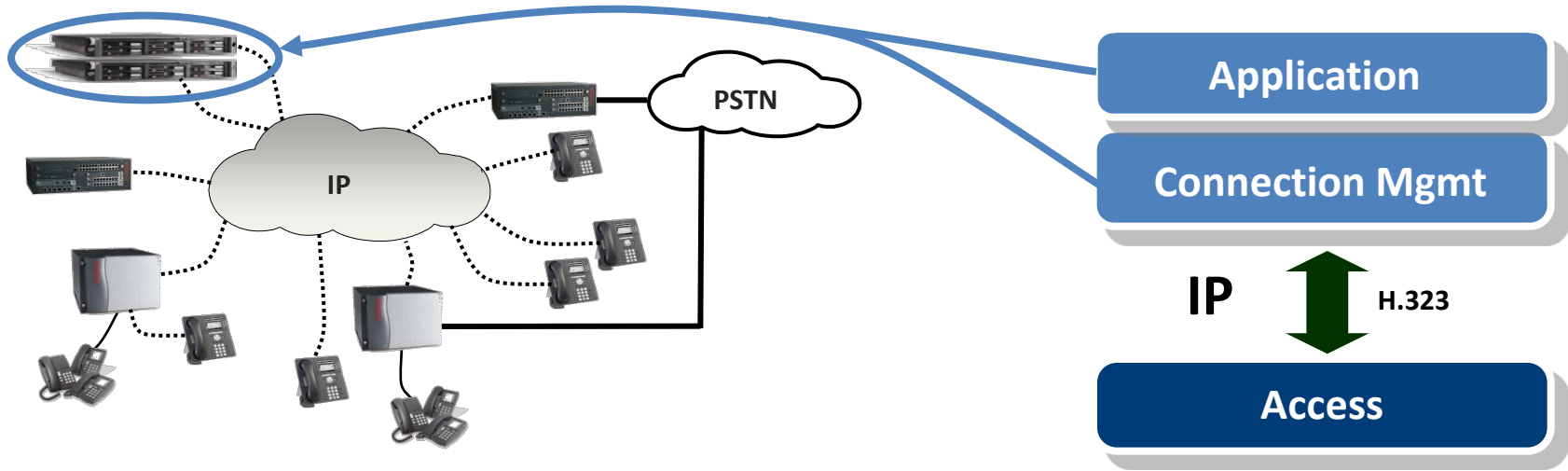
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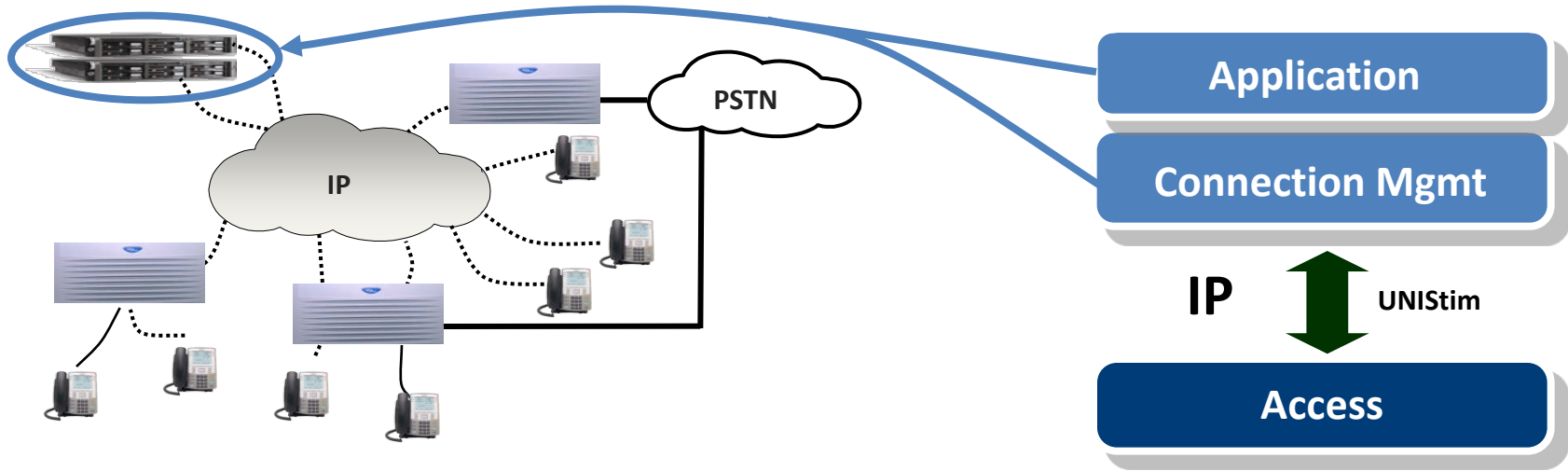
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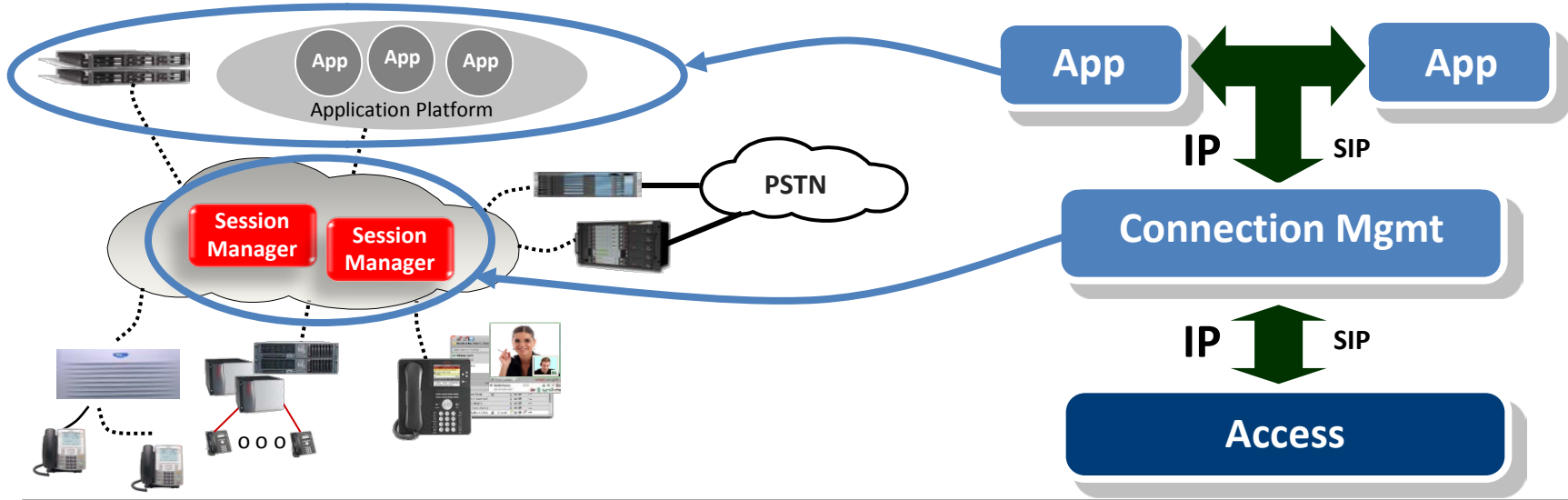




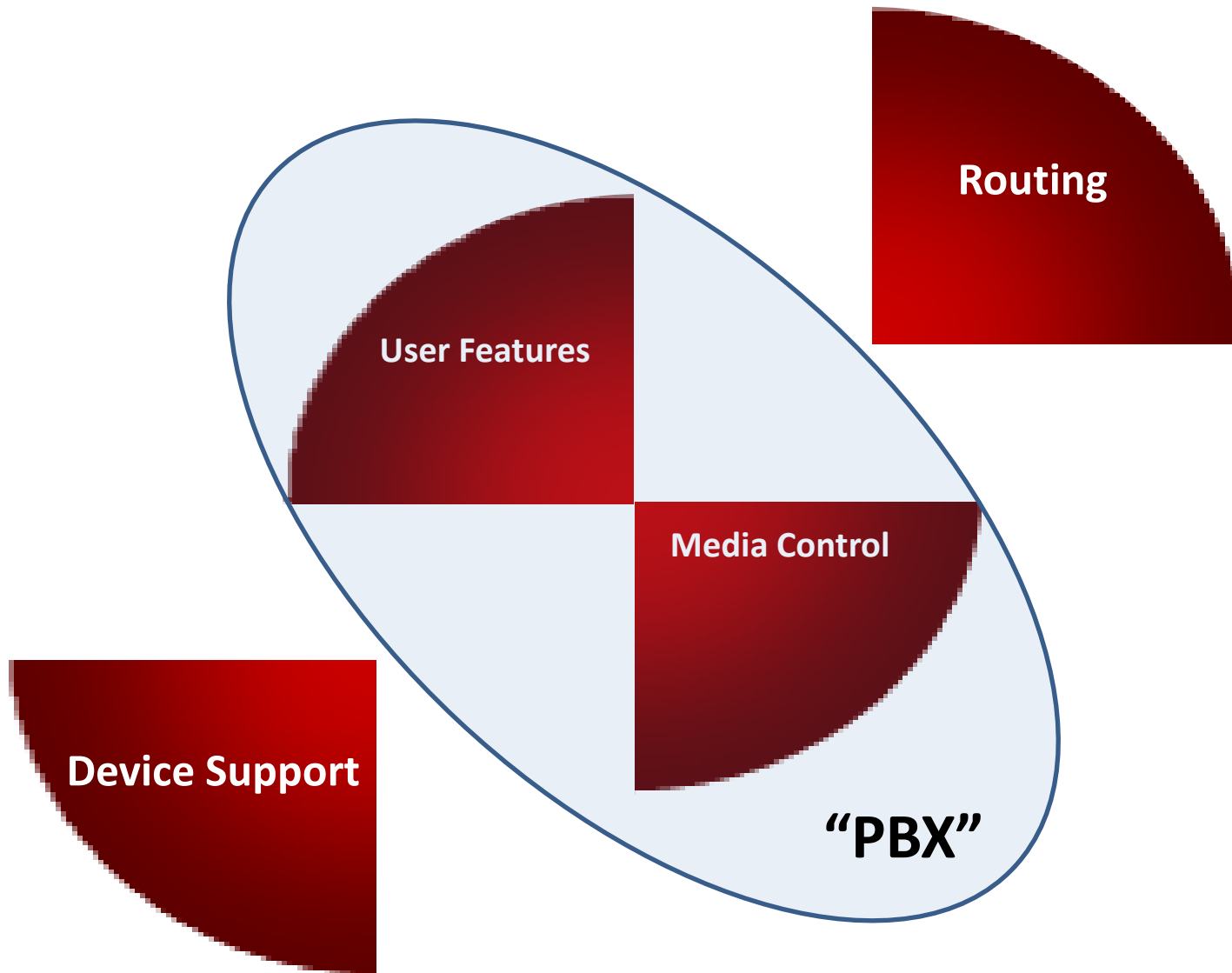
- | | |
|---|---|
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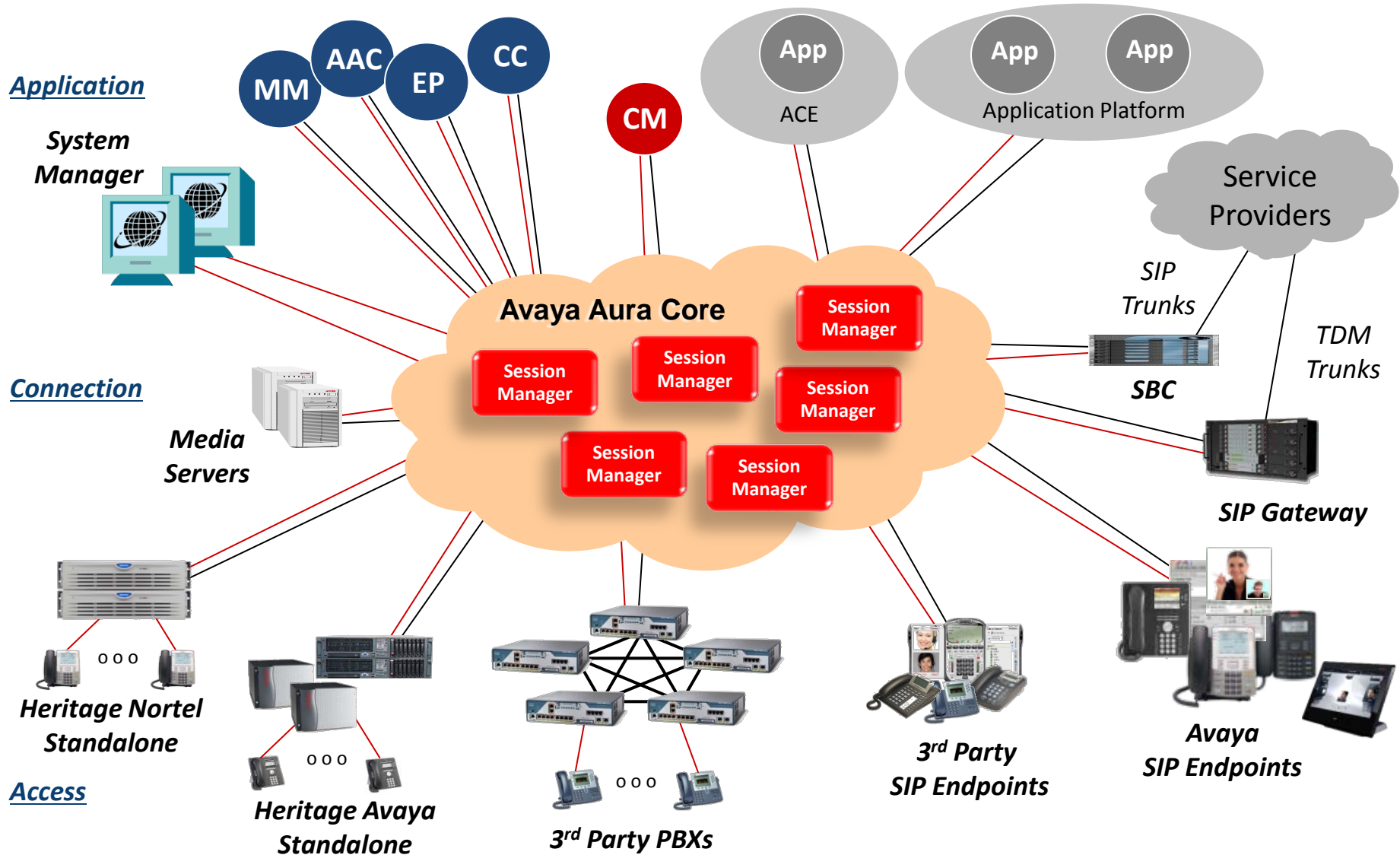
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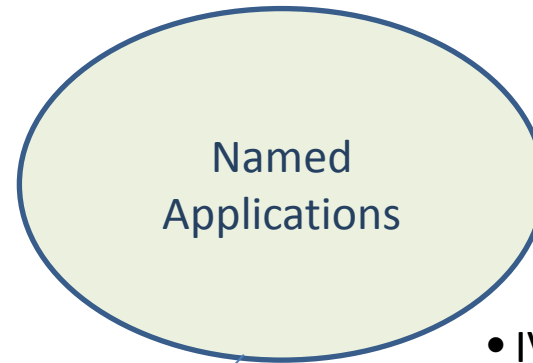
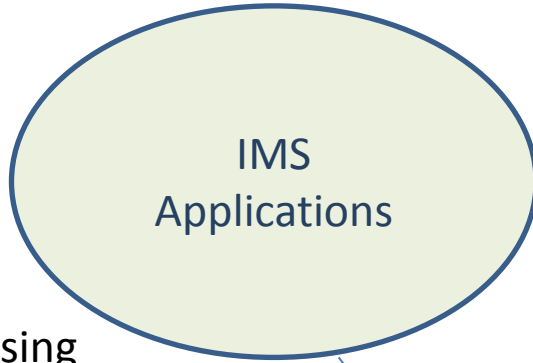


Aura™ Architecture



Application Framework

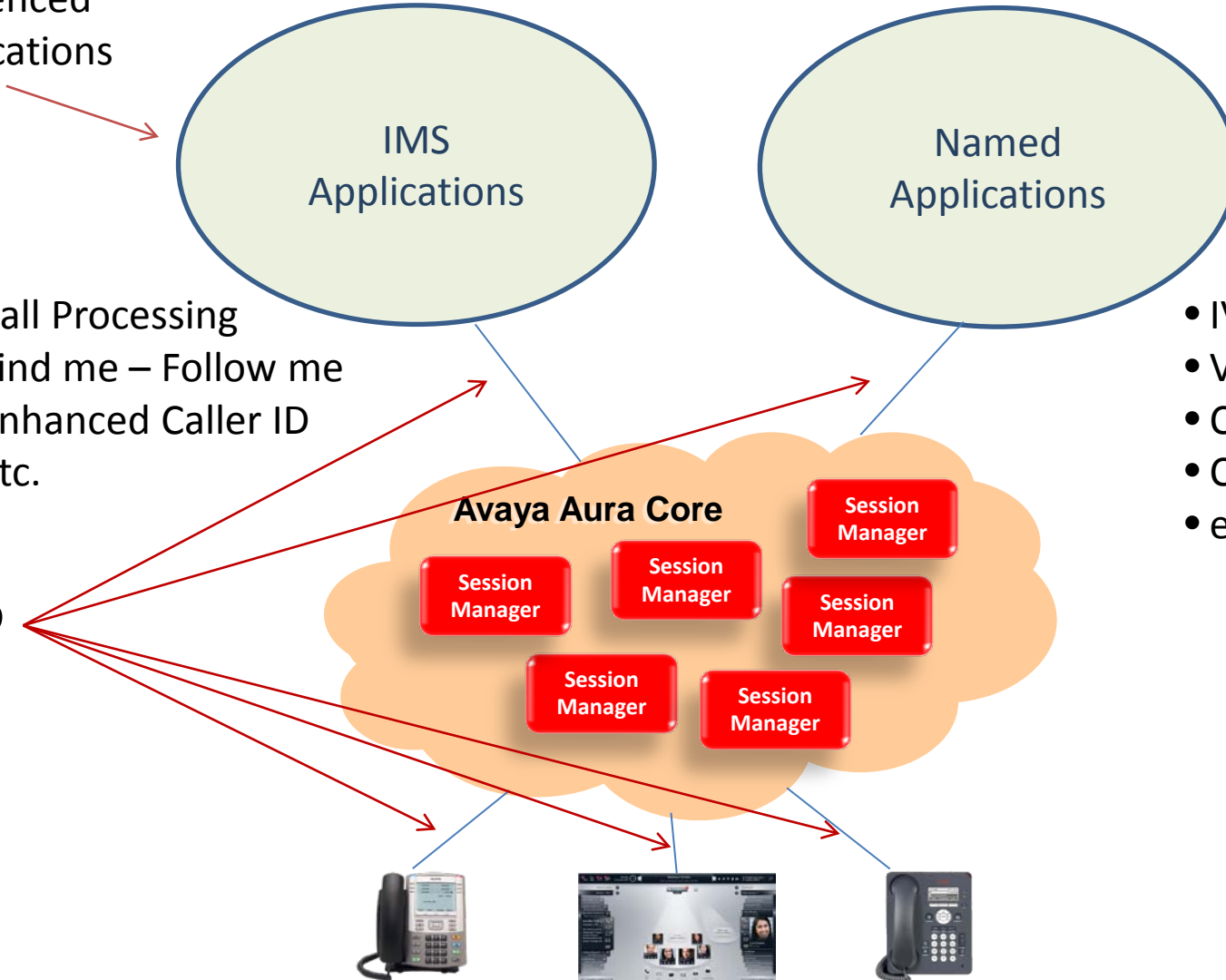
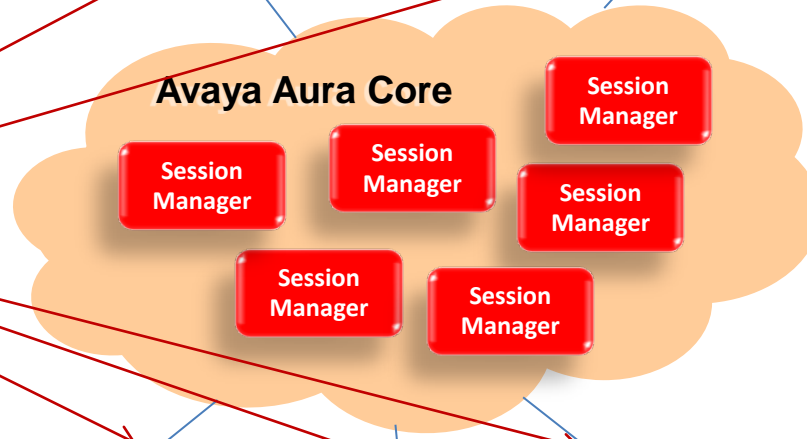
Sequenced Applications



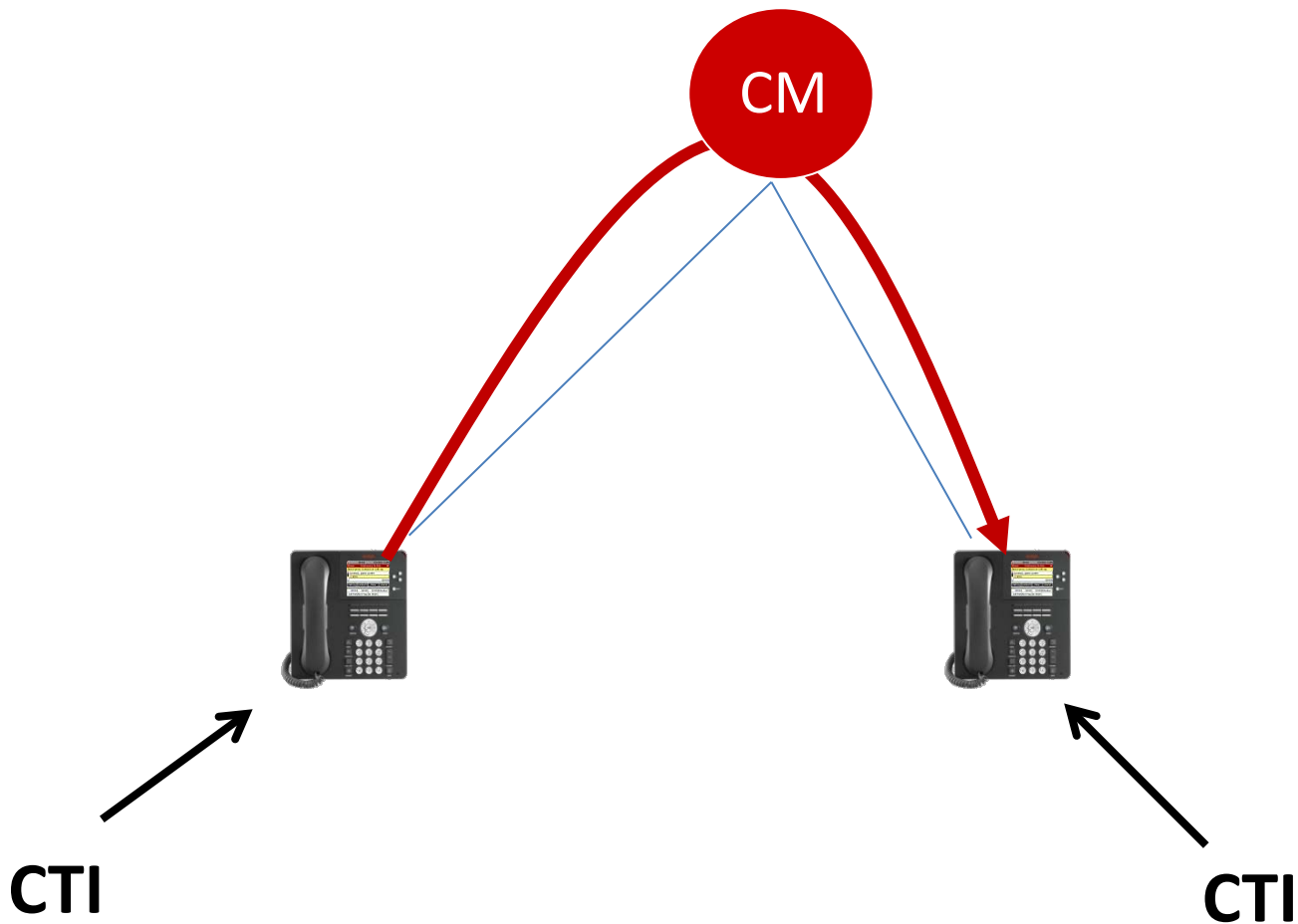
- Call Processing
- Find me – Follow me
- Enhanced Caller ID
- etc.

- IVR
- Voicemail
- Conferencing
- Contact Center
- etc.

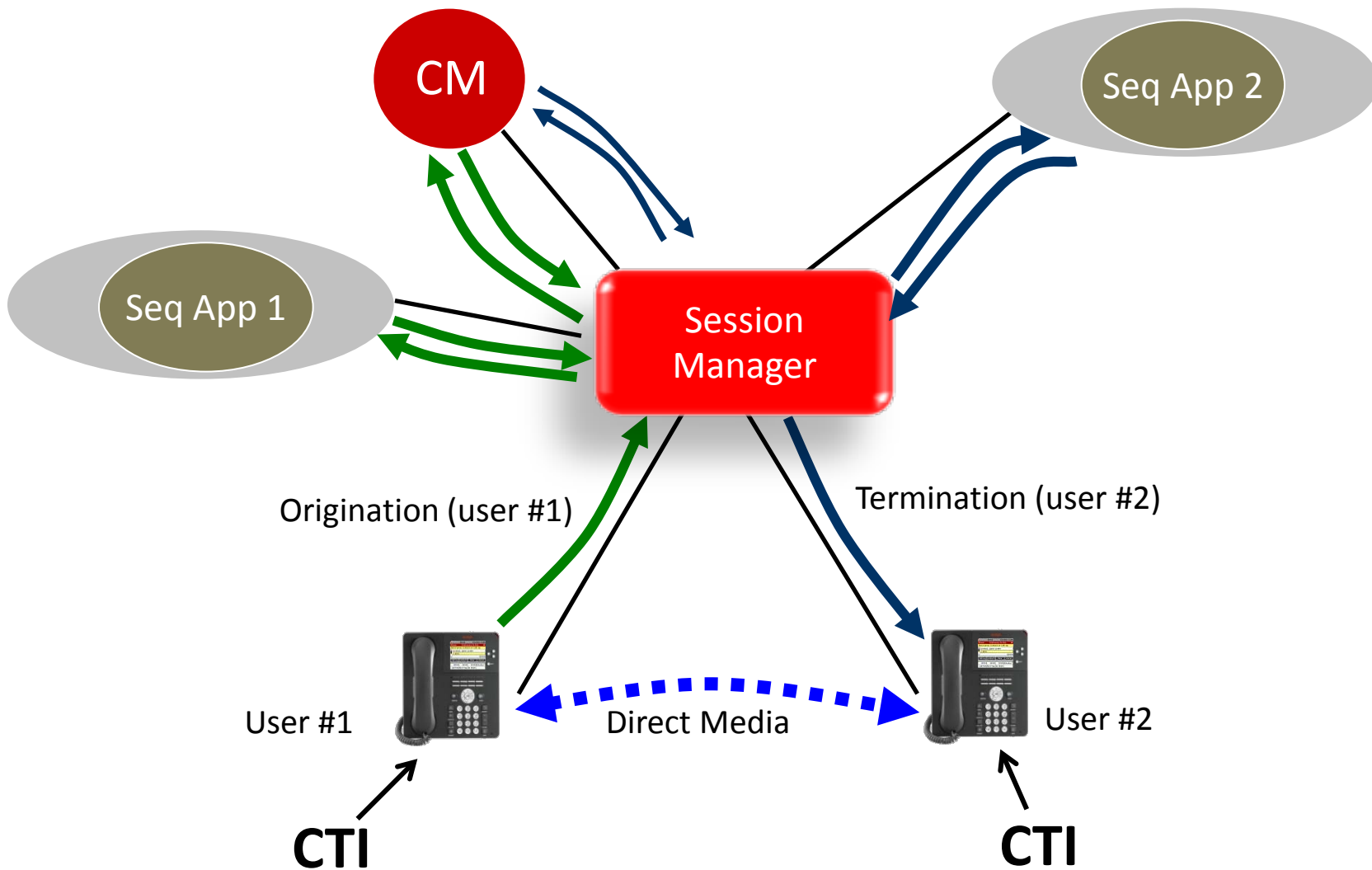
SIP

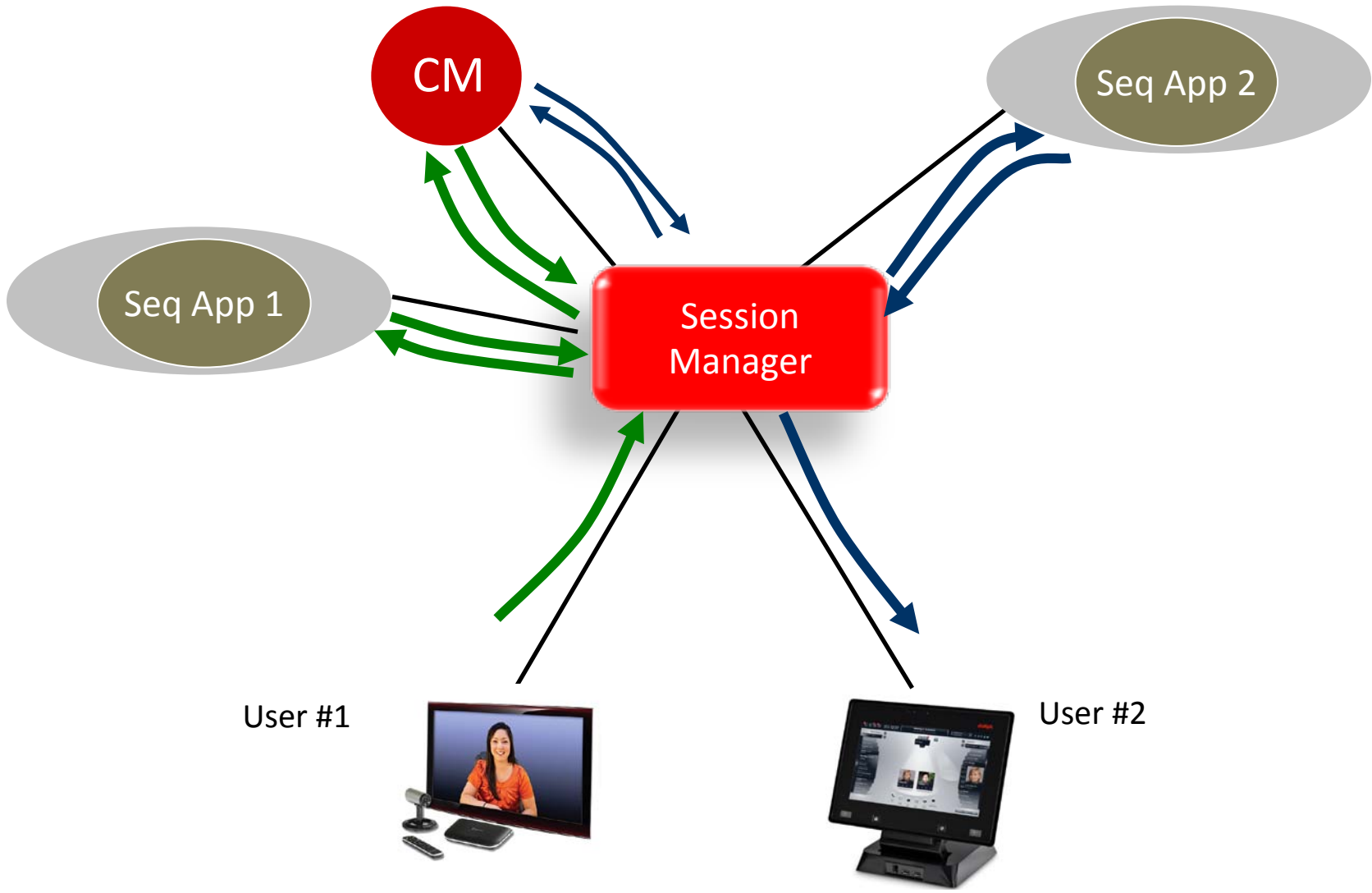


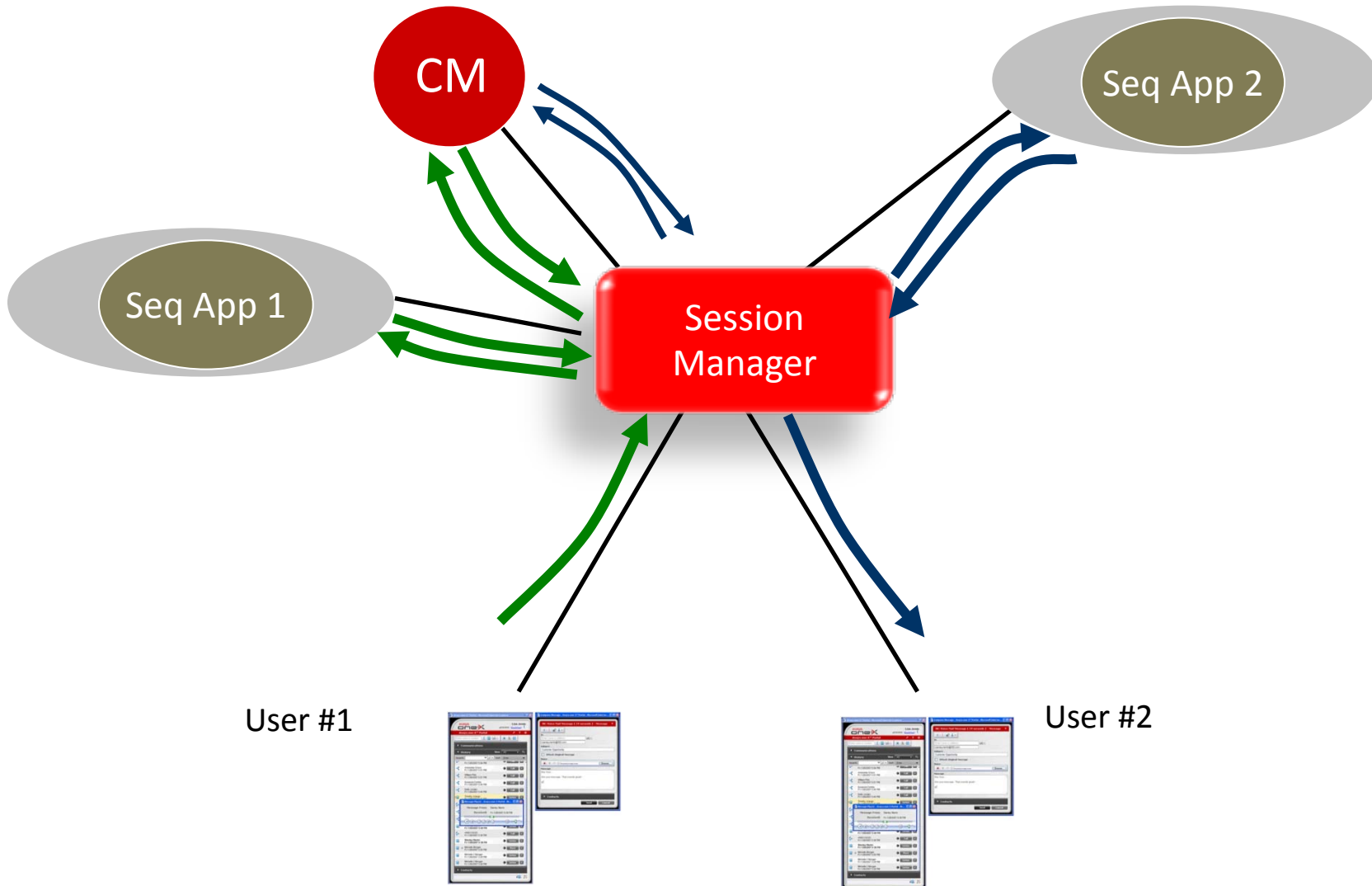
Before Sequenced Applications

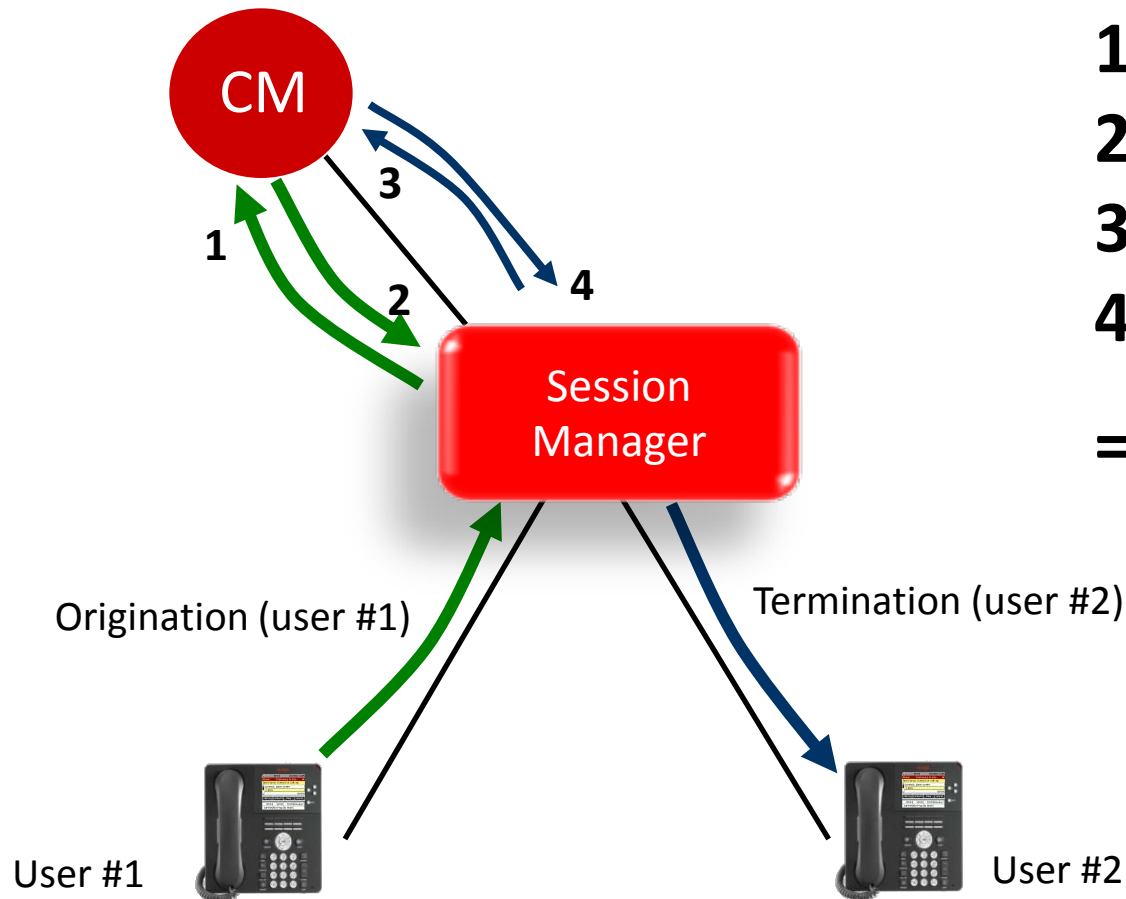


Applications and the Half-Call Model





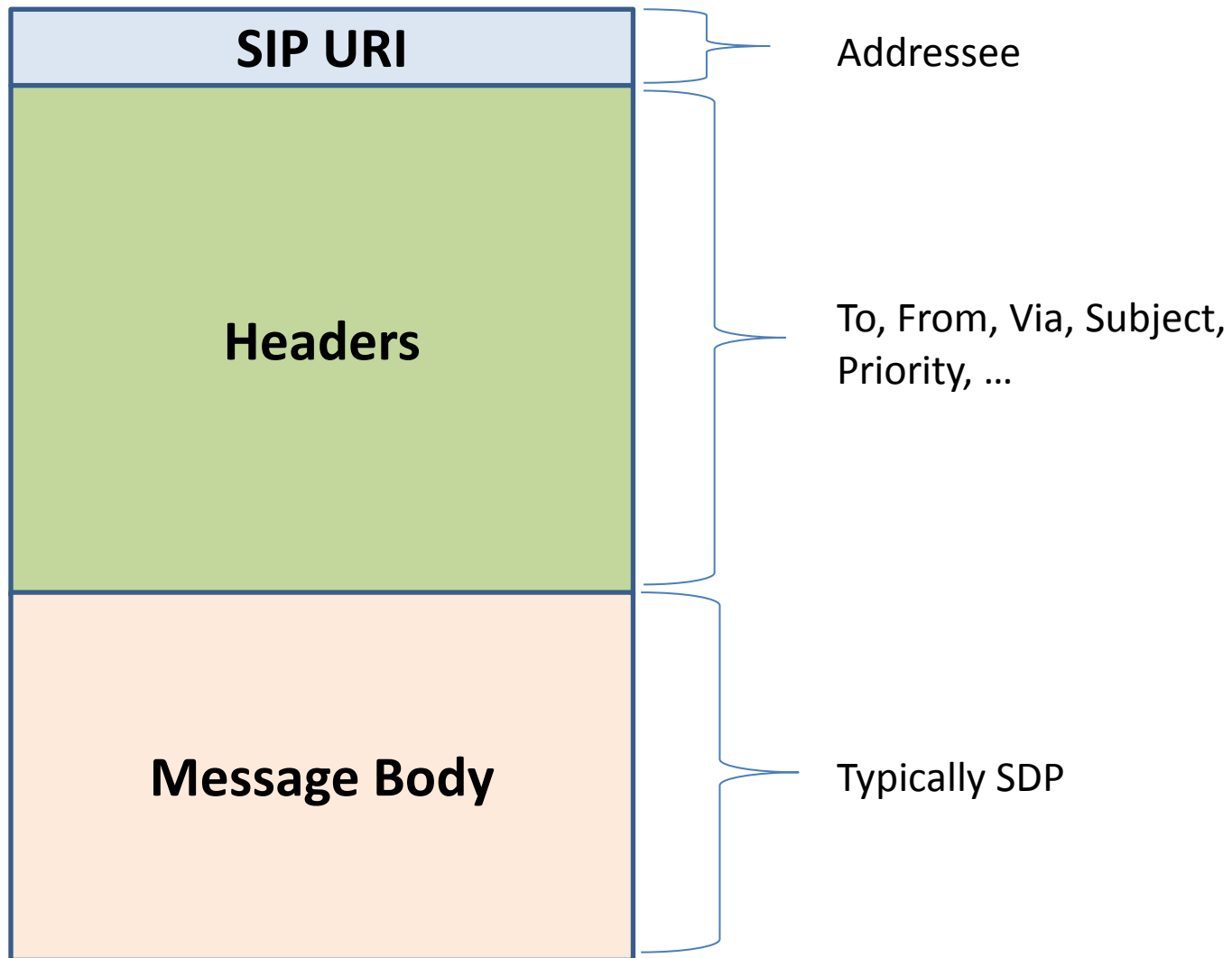




- 1. IMSORIG**
 - 2. ORIGDONE**
 - 3. IMSTERM**
 - 4. TERMDONE**
- = 4 SIP trunks**

- An application that runs as part of a call (session) flow
- Supports SIP-ISC (IMS Service Control) interface
 - imsortig, origdone, imsterm, termdone
- Hosted on an application server
- Invoked by Session Manager
- Can run as part of origination call flow (caller), termination call flow (called party), or both
- Can run as either a Proxy (fast) or B2BUA (more powerful)

- Approved number list
- Calendar call screener
- Hotel guest privacy protection
- Legal billing program
- Presence-based call routing
- Enhanced caller-ID
- Conference bridge finder



What Can a Sequenced Application Do?

- Inspect, modify, and add SIP headers
- Inspect, modify, and add SIP message body
- Redirect sessions
- Create new sessions
- Inspect or send mid call messages
- Media manipulation

- Independent of device or media type
- Can be invoked before network resources are claimed
- Complete access to entire SIP message
- A Sequenced Application can choose to stay in path until call completion or drop out after call has been established
- Sequenced Applications can complement and build upon features provided by Communication Manager

Proxy Sequenced Applications



Proxy Sequenced Applications

- Can base its behavior on database or web services look-up
- Can reject a session
- Can Reroute a session
- Can parallel or sequentially proxy a session
- SIP header inspection/manipulation
- High performance
- Scales well
- Cannot send BYE or mid-call messages (e.g. INFO)
- Cannot change SIP message body (e.g. SDP)

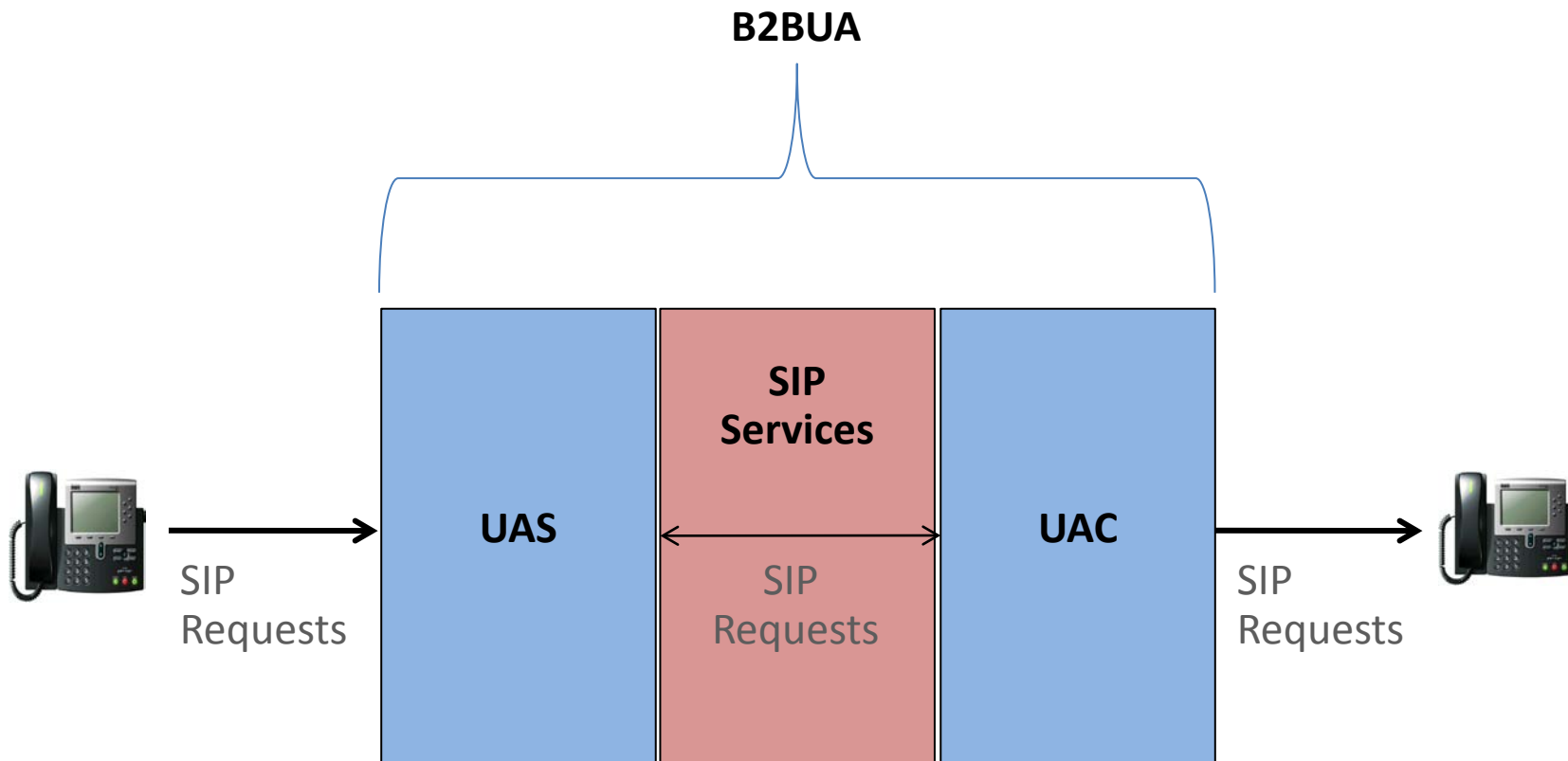
➤ Stateless

- No Record-Route header
- Drops out of call flow after session has been established
- Does not see session termination
- Easy to create HA configuration

➤ Stateful

- Record-Route header
- Stays in call flow after session has been established
- Sees session termination
- HA configuration possible, but more complicated

Back-to-Back User Agent (B2BUA)



Back-to-Back User Agent Sequenced Applications

➤ B2BUA

- Can do all the header manipulation that a proxy Sequenced Application can do
- Can control mid-call messages (i.e. send INFO, BYE, re-INVITE, etc.)
- Can modify SIP message body
- Controls two or more dialogs (sessions)
- Ideal if media manipulation is required
 - Requires media server such as AMS
- More complex to code than a proxy application
- Does not perform as well as a proxy application

1. Sequenced Applications are created and installed on a “SIP application server. “
2. Using System Manager, the system administrator defines which applications are applied to which users – both on the originating and terminating sides of that user’s calls. Note: Communication Manager 6.x is a sequenced application.
3. Sequenced Applications are invoked by Session Manager as part of its SIP message processing to manage a communications session.

Configuring a User in System Manager

Session Manager Profile ▼

* **Primary Session Manager**

MN-SM ▼

Primary	Secondary	Maximum
6	0	6

Secondary Session Manager

(None) ▼

Primary	Secondary	Maximum

Origination Application Sequence

Bloomington CM6 ▼

Termination Application Sequence

Bloomington CM6 ▼

Survivability Server

(None) ▼

* **Home Location**

MN-CM6 ▼

- Explicit Users: SIP users registered against Session Manager
- Implicit Users: Address ranges (i.e. telephone numbers) of users that are routed through Session Manager

Sequenced or Named Application?

- A Sequenced Application runs as part of an originating or terminating call flow on behalf of a user (explicit or implicit). It is never invoked directly by name, but rather is part of the configuration for that user.
- A Named Application has a SIP address and is invoked directly.
- Some *solutions* may be a combination of Sequenced and Named Applications.



ARROW S3

Evolution Server or Feature Server?

Evolution Server Versus Feature Server?

➤ Evolution Server

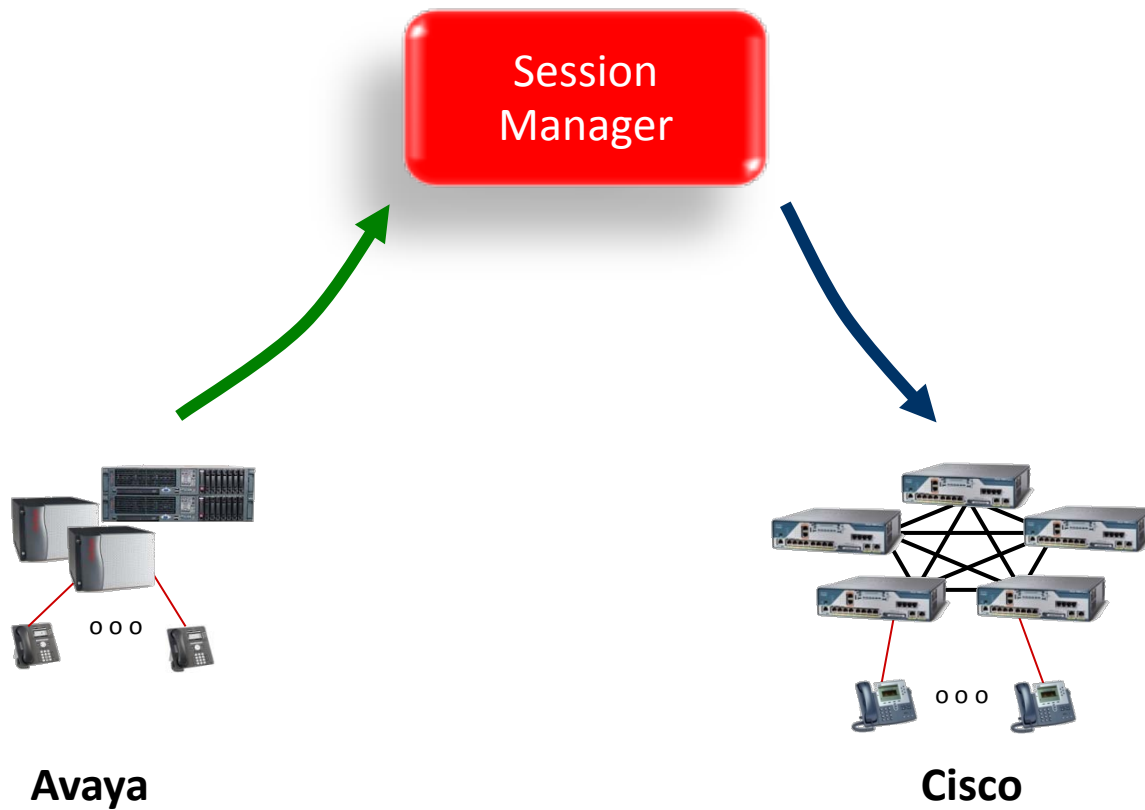
- Communication Manager 6.x code base
- H.323, digital, SIP, and analog phones
- Full-call Model
- Limited support for sequenced applications

➤ Feature Server

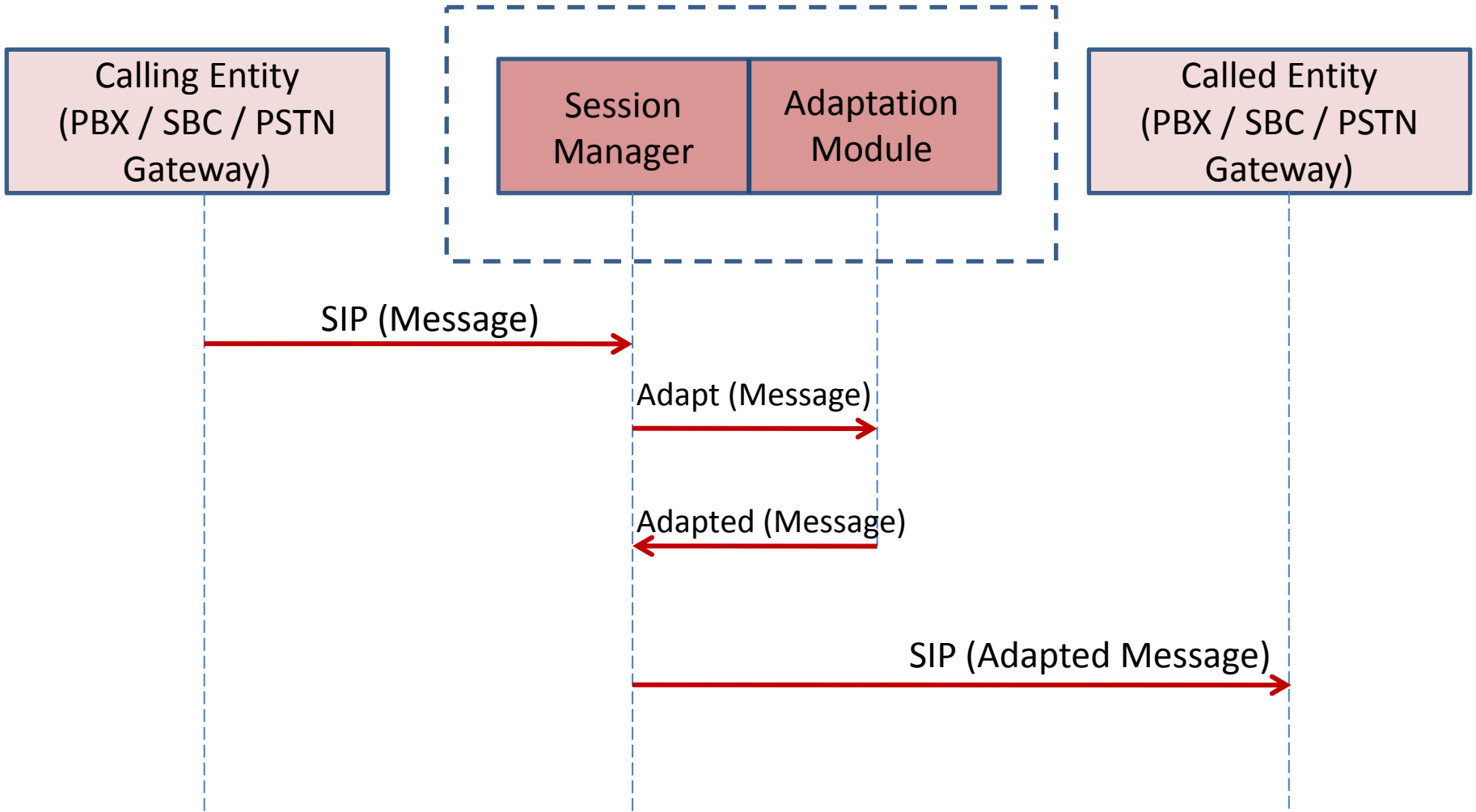
- Communication Manager 6.x code base
- SIP phones only
- Half-call Model
- Full support for sequenced applications

Evolution Server and Sequenced Applications

- Communication Manager MUST be the LAST Sequenced Application on the originator side and the FIRST Sequenced Application on the terminator side.
 - No origination Sequenced Application can be invoked after Communication Manager has been invoked.
 - No termination Sequenced Application can be invoked before Communication Manager has been invoked.
 - In SIP-ISC speak, origdone and imsterm are back-to-back.
- The call will be ringing at the destination before the first termination Sequenced Application is invoked.
 - Phone is alerting, lamps have been lit, display has been written to...



Adaptation Modules



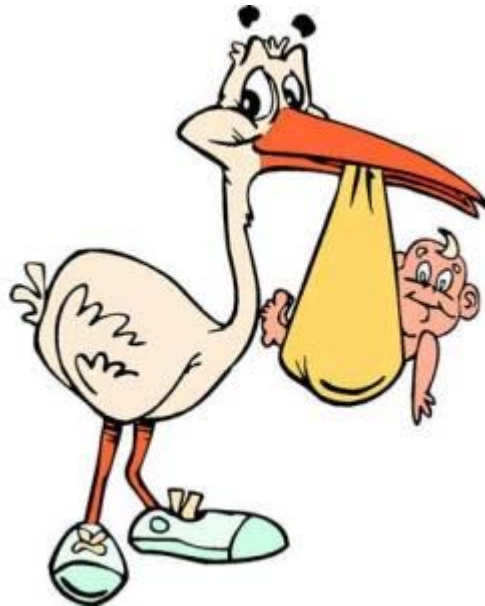
Can

- SIP header manipulation
- Strip non-SDP multi-part MIME from SIP message body
- Fast -- runs on Session Manager

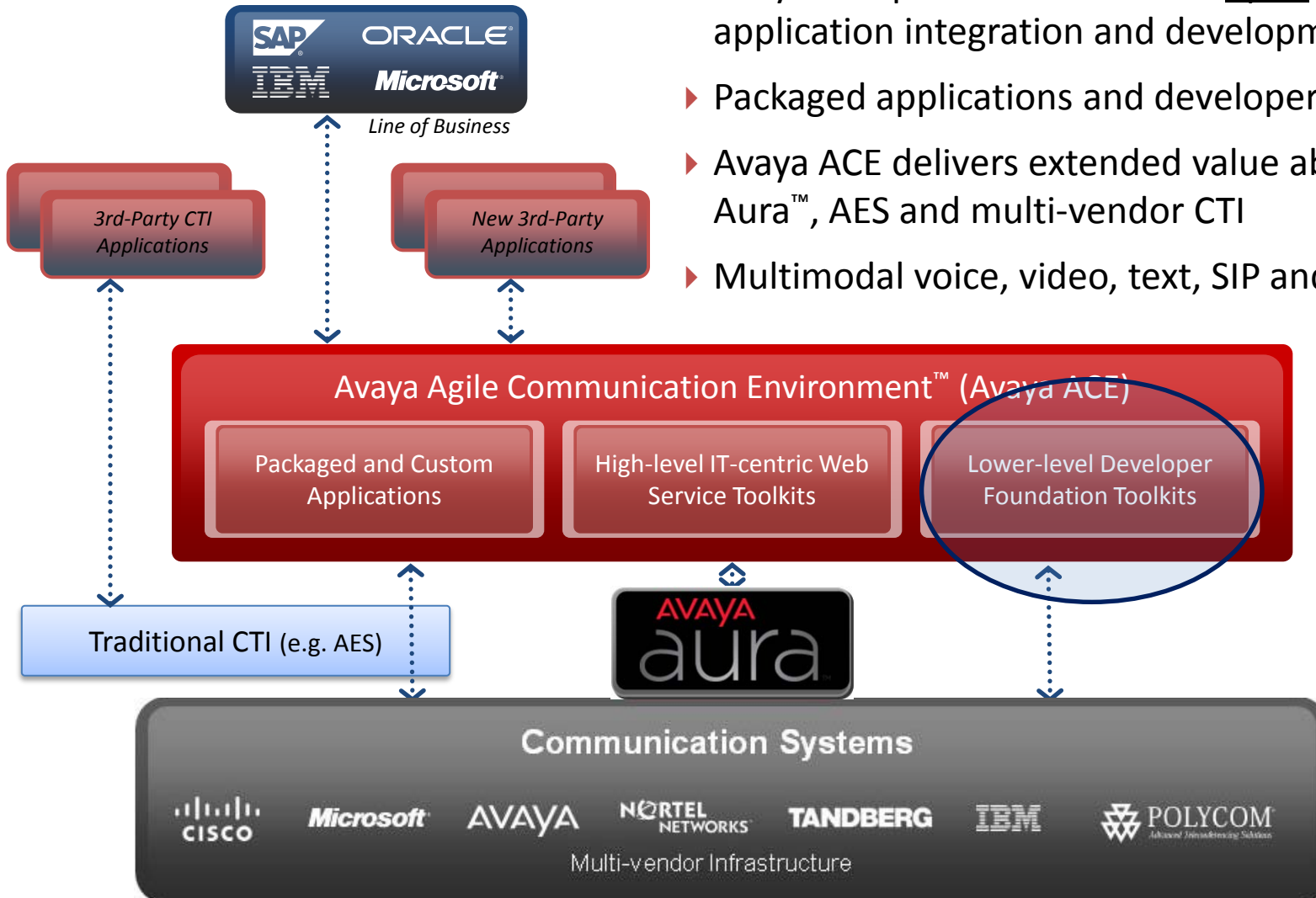
Cannot

- Static rules-- no database access or web services
- Cannot reject a call
- Cannot fork a call
- Cannot send BYE or mid-call messages
- Cannot change SDP
- Cannot invoke media services
- There is currently no SDK to write custom adaptation modules

Where do Sequenced Applications come from?



- ▶ Avaya ACE provides a common open platform for application integration and development
- ▶ Packaged applications and developer toolkits
- ▶ Avaya ACE delivers extended value above Avaya Aura™, AES and multi-vendor CTI
- ▶ Multimodal voice, video, text, SIP and presence

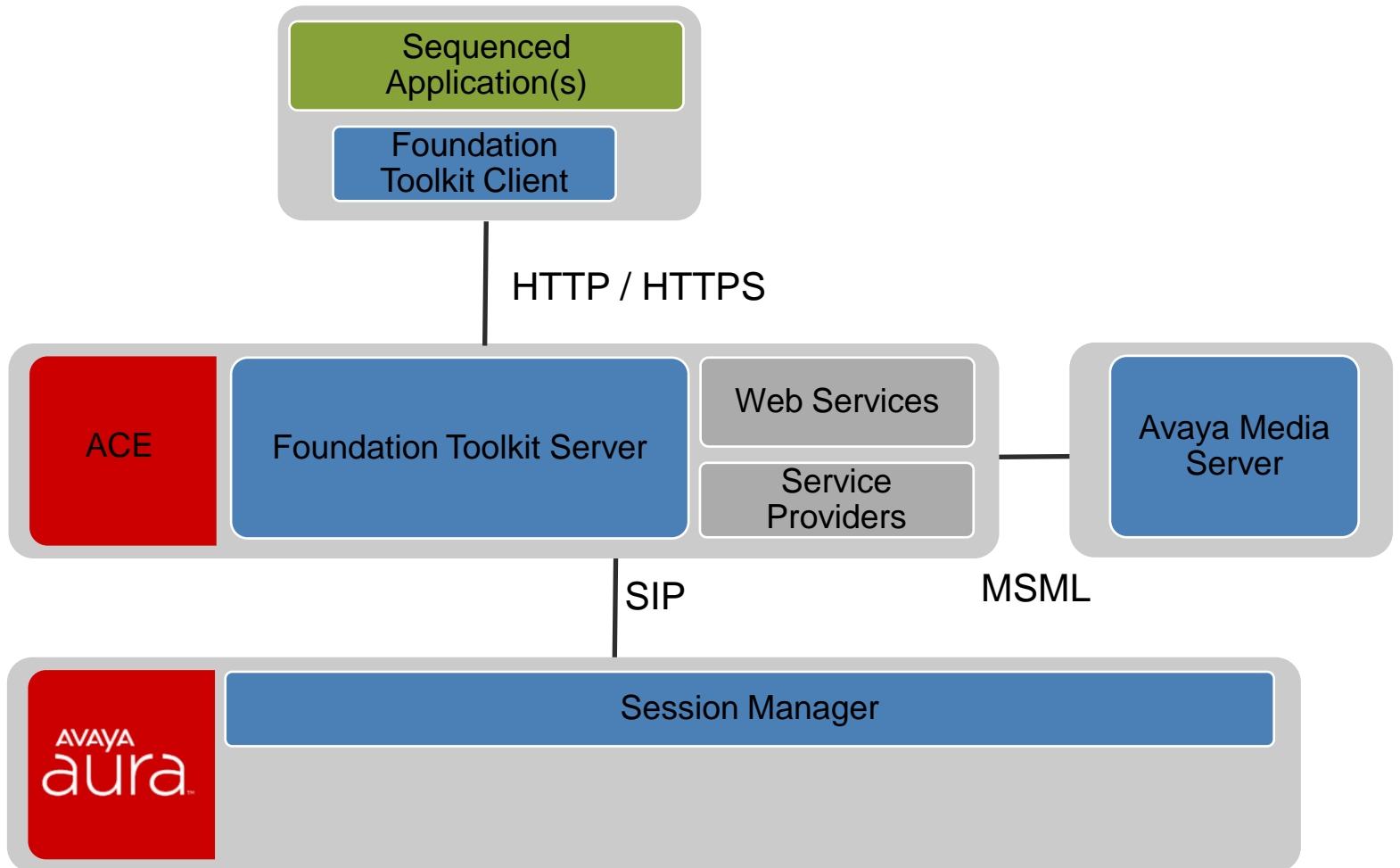


- ▶ The Aura Foundation Toolkit provides an abstraction layer that enables the development of Sequenced Applications without having an in-depth knowledge of telecommunications or SIP.
- ▶ The Foundation Toolkit server is responsible for managing the SIP container and that ensuring SIP messages are well constructed. Application designers need only a high-level understanding of SIP for background context.
- ▶ Foundation Toolkit services are based around common user outcomes to simplify API structure.

Avaya ACE Foundation Toolkit

- ▶ The Foundation Toolkit Client supports a Java-based API library.
- ▶ The Foundation Toolkit Client communicates with the ACE Foundation Toolkit Server via HTTP / HTTPS.
- ▶ Multiple 3rd party sequenced applications can be supported by ACE.

Avaya ACE Foundation Toolkit Architecture



Foundation Toolkit API Example

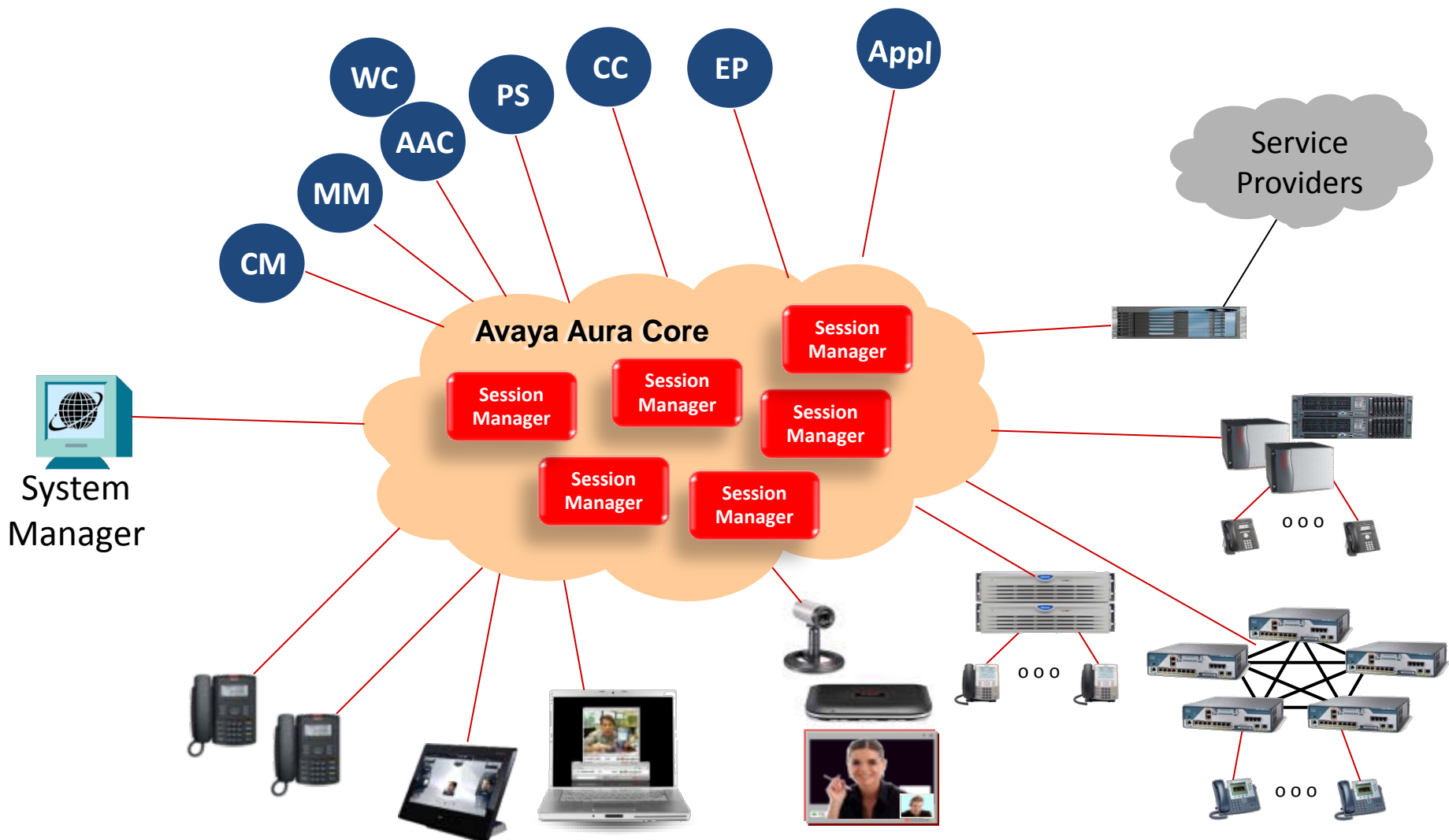
- ▶ As an example, redirecting a call to a different destination than the original can be accomplished in the following steps:
 - Bind the application to the Foundation Toolkit

```
URL url = new URL("http://localhost:8080/foundation/cometd/");
AppBindingService appBindingService =
    ServiceFactory.getAppBindingService(); // create a binding BindId
binding = appBindingService.createBinding(url ,properties);
```
 - Register an inbound dialog listener

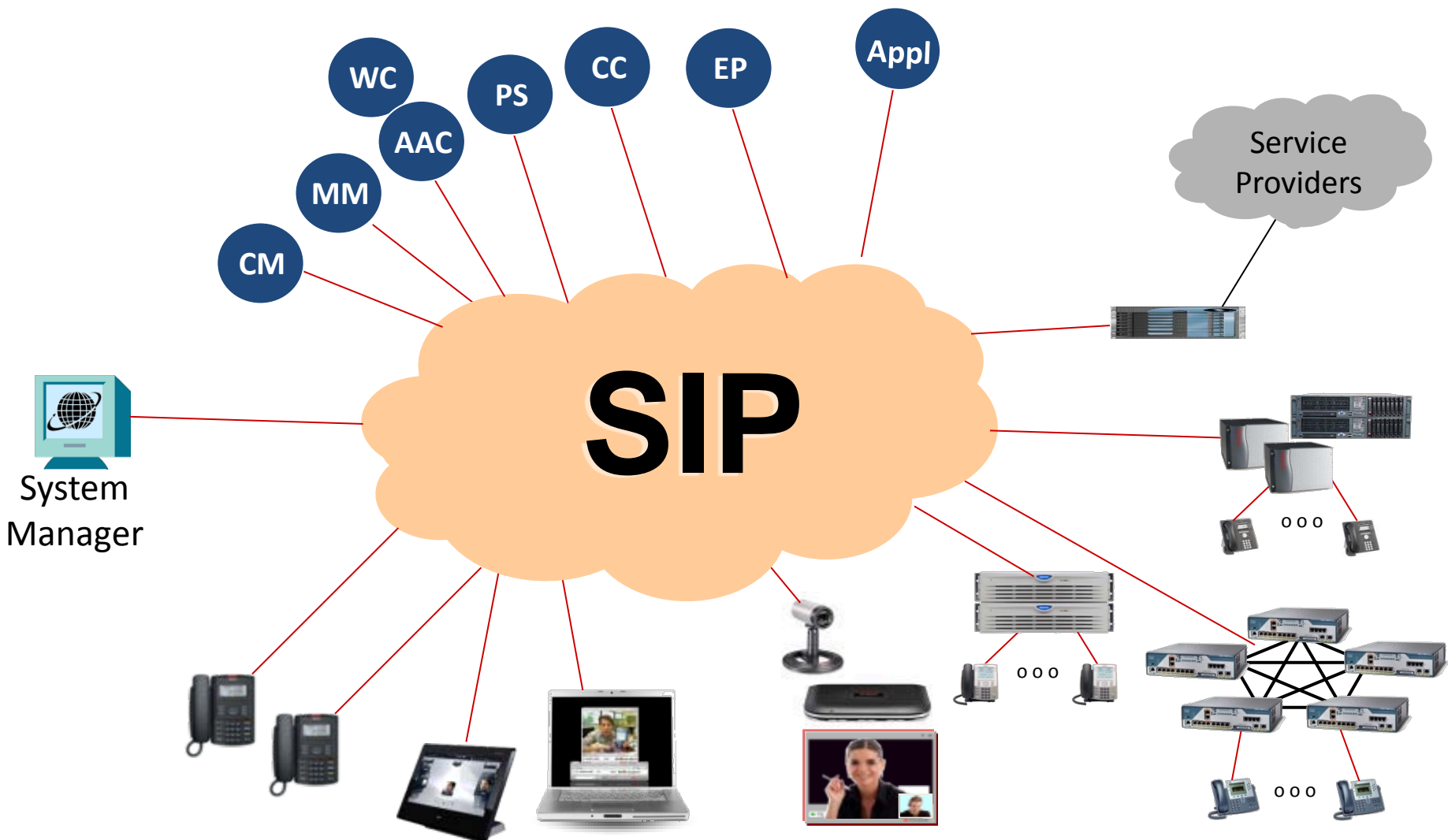
```
InboundDialogService . setSequencedDialogListener(listener,
    applicationName);
```
 - Use the Proxy Routing Service proxy method when the listener is invoked

```
ProxyRoutingService.proxy(dialog, newTarget, ...);
```

Enterprise Communications Cloud



Enterprise Communications Cloud



Thank you



ARROW S3

For for an even deeper dive, take the Avaya Aura and SIP courses at Cross University.