UNIFY Harmonize your enterprise
Presentation Overview

• CSTA protocol and standards overview
• OpenScape Voice architectural overview for CSTA
CSTA Protocol Standards
What is CSTA?

- CSTA = Computer Supported Telecommunications Applications
- Basic call model standardized in 1992 – continually refined and enhanced based upon significant industry implementation experiences, new protocols, etc.
- CSTA specifies an Applications Interface for monitoring and controlling calls, and devices in a communications network
- CSTA creates an abstraction layer for telecomm applications:
  - CSTA is independent of any underlying signaling protocols
    - E.g. H.323, SIP, Analog, T1, ISDN, etc.
  - CSTA is independent of the devices chosen by users
    - E.g. intelligent endpoints, low-function/stimulus devices, SIP Signaling models - 3PCC vs. Peer/Peer
What is CSTA?

• Equally well suited for different modes of operation:
  • 3rd-party call control
  • 1st-party call control
• Design goal of CSTA is to enhance portability across various CSTA implementations:
  • Specifies normalized call model and behavior
  • Complete functional definition of Services, Events
  • Specific conformance criteria
CSTA Standards - Evolution

- Phase I (published June ’92)
  - 40 features, 66 pages (Services Specification)
  - focus on call control
- Phase II (published Dec. ’94)
  - 77 features, 145 pages (Services Specification)
  - I/O & Voice Unit Services, more call control services
- Phase III - CSTA Phase II Features & versit CTI Technology
  - Published Dec. ’98
  - 136 features, 650 pages (Services Specification)
  - Published as an ISO Standard July 2000
  - Published CSTA XML (ECMA-323) June 2004
  - Published “Using CSTA with Voice Browsers” (TR/85) Dec. 02
  - Published CSTA WSDL (ECMA-348) June 2004
CSTA Standards - Evolution

• June 2004: Published Object Model TR/88
• June 2004: Published “Using CSTA for SIP Phone User Agents (uaCSTA)” TR/87
• June 2004: Published “Application Session Services” (ECMA-354)
• June 2005: Published “WS-Session: WSDL for ECMA-354” (ECMA-366)
• December 2005: Published “Management Notification and Computing Function Services”
• December 2005: Session Management, Event Notification, Amendements for ECMA-348” (TR/90)
• December 2006: Published new editions of ECMA-269, ECMA-323, ECMA-348
# CSTA Standards Documents

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<th>Ecma Publication</th>
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<th>ETSI Publication</th>
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<td>ECMA-269</td>
<td>ISO/IEC 18051</td>
<td>ETSI TS 102.173</td>
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<tr>
<td>ASN.1 Protocol for CSTA Phase III</td>
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<tr>
<td>XML Protocol for CSTA Phase III</td>
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<td>ISO/IEC 18053</td>
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<td>Using Ecma-323 (CSTA XML) in a Voice Browser Environment</td>
<td>ECMA TR/85</td>
<td>ISO/IEC 18057</td>
<td>ETSI TR 102.171</td>
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<td>Using CSTA for SIP Phone User Agents (uaCSTA)</td>
<td>ECMA TR/87</td>
<td>ISO/IEC TR 22767</td>
<td>ETSI TR 102.348</td>
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<tr>
<td>Designing an Object Model for ECMA-269 (CSTA)</td>
<td>ECMA TR/88</td>
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## CSTA Standards Documents

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<td>Application Session Services (used in ECMA-269)</td>
<td><strong>ECMA-354</strong></td>
<td>ISO/IEC 22534</td>
<td>ETSI TS 102 344</td>
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<tr>
<td>Session Management, Event Notification and Computing Function Services –</td>
<td><strong>ECMA-TR/90</strong></td>
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</tr>
<tr>
<td>Amendments for ECMA-348</td>
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</tbody>
</table>
CSTA Standards: Extensibility

- Additional features can be added to the standard via new editions of the standard
- New Parameters, new values to existing parameters can be added via new editions of the standard
- Backward compatibility must be maintained in any future editions
- Implementations can add proprietary features using built-in CSTA extension mechanisms (e.g. ONS – One Number Service)
CSTA Operational Model

• CSTA operation model consists of computing and switching domains / sub-domains. The CSTA standard defines the interface between the 2 domain types.
• CSTA Standard specifies the messages (Services and Event Reports), and their associated behavior.
• Computing Domain – is the environment/host for CSTA applications that interact with and controls the switching domains.
• Switching Domain – The CSTA Model provides an abstract view of a part of a switching sub-domain that an application can control and/or observe. The Switching Domain includes objects such as CSTA calls, devices and connections.
CSTA Operational Model
CSTA Domain
CSTA Operational Model: Calls, Devices and Connections
Call Control Model: Connection States

- **Alerting** – Indicates an incoming call at an endpoint. Typically the connection may be ringing or it may be in a pre-alerting (e.g. offered) condition.

- **Connected** – Indicates that a connection is actively participating in a call. This connection state can be the result of an incoming or outgoing call.

- **Failed** – Indicates that call progression has stalled. Typically this could represent that an outgoing call attempt that encountered a busy endpoint.

- **Held** – Indicates that an endpoint is no longer actively participating in a call. For implementations that support multiple calls per endpoint (i.e. line), a connection could be Held while the line is used to place another call (consultation transfer on an analog line, for example).

- **Initiated** – A transient state, usually indicating that the endpoint is initiating a service (e.g. dial tone) or the device is being prompted to go off hook.

- **Null** – There is no relationship between the call and the endpoint.
Standardized CSTA Features
ECMA-269, ECMA-323, ECMA-348

- 26 Call Control features (making call, answering call, etc.)
- 6 Call Associated features (sending user data, etc.)
- 19 Logical Device features (do not disturb, forwarding, etc.)
- 23 Physical Device features (writing to device display, etc.)
- 5 Capability Exchange features (feature discovery, etc.)
- 4 Snapshot features (query existing calls at a device, etc.)
- 3 Monitor features (subscribing to event reports, etc.)
- 17 Voice Services (for Listener, DTMF, Prompt and message resources)
- Other: Routing services, Media Attachment services, Maintenance services, Data Collection services, Accounting services, etc.

- *Any given CSTA implementation does not need to support all of these features to be CSTA compliant! (Profiles)*
Features: Call Control Overview

- Exhaustive set of standardized call control features:
- **Services:** Accept, Alternate, Answer, Call Back, Call Back Message, Camp On, Clear Call, Clear Connection, Conference, Consultation, Deflect, Dial Digits, Directed Pick up, Group Pick Up, Hold, Intrude, Join, Make Call, Park, Retrieve, Send Message, Single Step Conference, Single Step Transfer, Transfer.
- **Events:** Bridged, Call Cleared, Conferenced, Connection Cleared, Delivered, Digits Dialed, Diverted, Established, Failed, Held, Network Capabilities Changed, Network Reached, Offered, Originated, Queued, Retrieved, Service Initiated, Transferred.
- Each feature includes a complete operational model on how the feature works, from the applications perspective.
  - Initial and final conditions
  - State transitions
  - Event flows
  - Textual behavior description

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Features: Event Sequences

• Typical call events for an incoming call

Offered \(\rightarrow\) Delivered \(\rightarrow\) Established \(\rightarrow\) Connection Cleared

- Call is Accepted
- Call is Answered
- Call is Cleared

• Typical call events for an outgoing call (Make Call)

Originated \(\rightarrow\) Offered \(\rightarrow\) Delivered \(\rightarrow\) Established \(\rightarrow\) Connection Cleared

- Call Offered To Called device
- Called Device alerted
- Called Party answers
- Called Party clears
CSTA Application Examples

• Personal telephone support, dialers, phone control, soft-phone, etc.
• Multi-media messaging (IM, SMS, MMS, Email, voice mail)
• Inbound & outbound telemarketing, call centers
• Conferencing & collaboration
• User/agent statistics/reporting
• Personal assistant, rules based routing
• Auto-attendant
• Voice browsers, advanced speech, DTMF
• Presence, availability, device context
• Call logging, accounting, billing
• Phone as UI for apps (button press, displays) for hospitality
• Routing/distributing calls (ACD)
• And more…
Topics

- Architectural Overview and CSTA Features on OpenScape Voice
- CSTA Signaling Manager
- CSTA Service
- uaCSTA
OSV architectural overview for CSTA: Client (CSTA Application)

- Different Application Servers may connect and monitor/control OpenScape Voice devices via a CSTA connection. XML is used for message encoding, and TCP is used as transport.
  - Up to 16 TCP connections supported (default 4)
- The Application Server is required/responsible to establish and maintain the connection with OSV.
  - If the connection is lost the Application Server must reestablish it
  - If the connection is lost all Monitors on OpenScape Voice devices will be lost unless the application supports Application Session Layer (ECMA-354).
CSTA Service
Supported CallP Features (V3.1)

- Make Call Service
- Accept Call Service
- Answer Call Service
- Clear Connection Service
- Consultation Call Service
- Hold/Retrieve Call Service
- Alternate Calls Service
- Reconnect Service
- Deflect incoming call
- Transfer Call (Blind, Consultation, SingleStep, Transfer to VoiceMail)

- Change Connection Information
- Generate Digits
- Conference, Add to Conference, Remove From Conference
- Clear Connection After Call Back
- Group Pickup Call,
- Directed Pickup Call
- One Number Service Inbound
- One Number Service Outbound
Features: Call Control Events

OpenScape Voice currently supports the following events (V3.1):

- **Events**: Bridged, Call Cleared, Conference, Connection Cleared, Delivered, Digits Dialed, Diverted, Established, Failed, Held, Network Reached, Offered, Originated, Queued, Retrieved, Service Initiated, Transferred.
## CSTA Events/Attributes Matrix

<table>
<thead>
<tr>
<th>Event</th>
<th>active device</th>
<th>Event code</th>
<th>cause</th>
<th>called DN</th>
<th>Calling DN</th>
<th>Last Redir</th>
<th>Conn State</th>
<th>Partner Context</th>
<th>Partner DN</th>
</tr>
</thead>
<tbody>
<tr>
<td>conferenced</td>
<td>conference originator</td>
<td>yes</td>
<td>yes</td>
<td>conf ID</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>added party</td>
</tr>
<tr>
<td>connection cleared</td>
<td>clearing device</td>
<td>yes</td>
<td>yes</td>
<td>yes*</td>
<td>yes*</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>delivered</td>
<td>alerting device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes*</td>
<td>yes</td>
<td>yes*</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>diverted</td>
<td>diverting device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes*</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>new dest</td>
</tr>
<tr>
<td>established</td>
<td>answering device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>failed</td>
<td>failing device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>held</td>
<td>holding device</td>
<td>yes*</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>network reached</td>
<td>nw device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
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<tr>
<td>offered</td>
<td>routing device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>originated</td>
<td>same as reporting</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>same as reporting</td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>queued (not V1)</td>
<td>queue device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>retrieved</td>
<td>retrieving device</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>service initiated</td>
<td>same as reporting</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>transferred</td>
<td>Transferring device</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>transfer dest</td>
</tr>
</tbody>
</table>
OpenScape Voice currently supports the following services (V3.1):

- **Get CSTA Features**: The Get CSTA Features service obtains the list of CSTA services and events supported by the switching function (OSV).

- **Get Logical Device Information**: The Get Logical Device Information service is used to obtain the current set of characteristics/capabilities associated with the logical element of a given device.

- **Get Switching Function Capabilities**: The Get Switching Function Capabilities service is used by the computing function to obtain the current set of capabilities for the entire switching function.

- **Get Switching Function Devices**: The Get Switching Function Devices service is used by the computing function to obtain the current set of devices in the application working domain along with their associated device categories and associated device names.

- **Switching Function Devices**: The Switching Function Devices service is used by the switching function to provide a list of devices in the application working domain. This service is generated as a result of the Get Switching Function Devices service.
Features
Physical Device Services

OpenScape Voice currently supports the following services (V3.1):

- **Get Message Waiting Indicator**: The Get Message Waiting Indicator service provides the message waiting feature status at a specified device. The message waiting feature is typically used to notify a user (typically via a dedicated lamp on a phone device) when messages are available.

- **Get Microphone Mute**: The Get Microphone Mute service provides the microphone mute feature status of a microphone associated with an auditory apparatus at a specified device.

- **Get Speaker Volume**: The Get Speaker Volume service provides the speaker volume setting for the speakers associated with one or more auditory apparatuses at a specified device.

- **Set Message Waiting Indicator**: The Set Message Waiting Indicator service allows a computing function to control the status of the message waiting feature at a specified device. The message waiting feature is typically used to notify a user (typically via a dedicated lamp on a phone device) when messages are available.

- **Set Microphone Mute**: The Set Microphone Mute service allows the computing function to control the microphone mute status of the microphone associated with one auditory apparatus at a specified device.

- **Set Speaker Volume**: The Set Speaker Volume service allows the computing function to control the speaker volume of the speaker associated with one auditory apparatus at a specified device.

- *This service requires a Siemens UACSTA-capable physical device such as the OpenStage phone.*
OpenScape Voice currently supports the following services (V3.1):

- **Get Forwarding**: The Get Forwarding service provides the forwarding feature status at a specified device. The status returned may consist of one or more forwarding types that are active at the specified device based on user defined conditions.

- **Get Agent State**: The Get Agent State service provides the agent state at a specified device.

- **Get Do Not Disturb**: The Get Do Not Disturb service provides the do not disturb feature status at a specified device.

- **Set Forwarding**: The Set Forwarding service allows the computing function to control the forwarding feature at a specified device based on user defined conditions. The forwarding feature is used to redirect calls that arrive at a specified device to an alternate destination.

- **Set Agent State**: The Set Agent State service requests a new agent state at a specified device. In the case where an ACD agent is involved with an ACD call, the transition to the requested state may or may not occur until the current connection transitions to the null state.

- **Set Do Not Disturb**: The Set Do Not Disturb service allows the computing function to control the do not disturb feature at a specified device. The do not disturb feature is typically used to prevent a specified device from being alerted.
OpenScape Voice currently supports the following services:

- **Get Forwarding**: The Get Forwarding service provides the forwarding feature status at a specified device. The status returned may consist of one or more forwarding types that are active at the specified device based on user defined conditions.

- **Snapshot Call**: The Snapshot Call service provides information about the devices participating in a specified call. The information provided includes device identifiers, their connections in the call, and local connection states of the devices in the call as well as call related information.

- **Snapshot Device**: The Snapshot Device service provides information about calls associated with a given device. The information provided identifies each call the device is participating in and the local connection state of the device in that call.

- **Snapshot DeviceData**: This service is generated as a result of the Snapshot Device service. It is used when the switching function is providing snapshot device response information in multiple messages (otherwise the switching function provides the snapshot device response in the Snapshot Device positive acknowledgement).
  - This includes information about calls associated with a given device. The information provided identifies each call the device is participating in and the local connection state of the device in that call.
  - The switching function may generate a sequence of Snapshot DeviceData services, individually referred to as segments, in response to a single Snapshot Device service request.
Switching Function Representation
International Num Format, GNF and Displays

• Switching Function Representation (SFR Format)
  • **Generic Format:** N<DN!SA&CA/EXT%AID>NM (*in this order*) *e.g.*
    `<deviceIdentifier>N<+15615051005>Boca-1005;displayNumber=1005</deviceIdentifier>`

• International Number Format and GNF
  • The CSTA International Number Format is defined in ECMA 269 and applies to both the generic Dialable Digits (DD)
    (e.g. `<deviceIdentifier>+15615051009</deviceIdentifier>`)  
    and Switching Function Representation (SFR) format
  • **CSTA International Number Format** is also referred as **Global Number Format (GNF)**.
  • The plus sign indicates that this number is an international number format.
    • GNF is defined as: an international number prefixed with “+”
      *e.g.* +15619231388 ; +498972231668
CSTA Signaling Manager (SM) Services

Some CSTA Services are handled entirely within CSTASM:

| Monitoring Services                           | Monitor Start (ECMA 269,15.1.2)  |
|                                              | Monitor Stop (ECMA 269,15.1.2)    |
| System Services                              | System Register (ECMA 269,14.1.2) |
|                                              | System Register Cancel (ECMA 269,14.1.4) |
|                                              | Request System Status (C<-S, ECMA 269,14.2.1) |
|                                              | System Status (ECMA 269,14.2.2)    |
| Snapshot Services                            | Snapshot Device (ECMA 269,16.1.2)  |
| Capability Exchange Services                 | Get Switching Function Capabilities (ECMA 269,13.1.4) |
| Physical Device Features                     | Get Message Waiting Indicator (ECMA 269, 21.1.8) |
|                                              | Set Message Waiting Indicator (ECMA 269, 21.1.18) |
|                                              | Message Waiting (ECMA 269, 21.2.6)  |
| Logical Device Features                      | Get Forwarding (ECMA 269 22.1.10)  |
|                                              | Set Forwarding (ECMA 269 22.1.18)  |
|                                              | Forwarding (ECMA 269 22.2.13)      |
CSTA Signaling Manager (CSTA-SM) Services

Monitor Start /Monitor Stop

With a “Monitor Start” the CSTA applications requests that a device be monitored. If it has CSTA service subscribed, CSTASM sets a flag in SDAL, creates a monitor record in shared memory using a Monitor Cross Reference ID (XRefID), and sends a Monitor Start Response with the XrefID. The CSTA application must save the XRefID and send it inside a Monitor Stop request if it wants to stop receiving events for the device: CSTASM will search the XRefID for a “Monitor Stop” request in shared memory, delete the appropriate record, clear the SDAL flag, and send a response to the application.

System Register /System Register Cancel

A CSTA application registers with CSTASM in order to receive or request System Status (register services).
CSTA-SM Services

Request System Status / System Status

The System Status services and events are used to query or report the system status of the peer function (the computing function or switching function)

Snapshot Device

The Snapshot Device service is used to provide information about calls (connection identifier, local state) for a given device included in the request.

Get Switching Function Capabilities

The application queries the current set of capabilities for the entire switching function.

Get / Set Message Waiting Indicator / Message Waiting

The application can query, and set the message waiting feature (typically used via dedicated lamp when messages are waiting for the user)

Get Forwarding / Set Forwarding / Forwarding

The application can query and set switch-based “immediate-always” forwarding for a device.
CSTA Service Basics

• UCE framework starts the CSTA service, if provisioned, for the subscriber once the UCE detects a call to that subscriber.

• An instance of the service is started for each leg of the call. The master service – CSTA, terminates after it spawns the child services; CSTA-A and CSTA-B (together called the CSTA Service)

• CSTA Service has two functions: monitor calls and invoke features/services on behalf of applications

• CSTA Service communicates the call status to CSTA-SM for every call (incoming or outgoing) for the subscriber provisioned with CSTA

• CSTA Service terminates at the end of each half call OR when explicitly told to terminate.
CSTA Connection Model
CSTA Feature Example - MakeCall
Call Origination Scenario
MakeCall (Part 1 of 3)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Monitored Device D1</th>
<th>Monitored Device D2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Make Call service to a valid device is invoked on behalf of device D1.</td>
<td>MakeCallRequest • callingDevice • calledDirectoryNumber • autoOriginate</td>
<td>D1 D2 Prompt</td>
<td>The Make Call service specifies that device D1 should be prompted to go off-hook.</td>
</tr>
<tr>
<td>Acknowledgement.</td>
<td>MakeCallResult • initiatedCall</td>
<td>D1C1</td>
<td></td>
</tr>
</tbody>
</table>
## Call Origination Scenario

### MakeCall (Part 2 of 3)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Monitored Device D1</th>
<th>Monitored Device D2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication that the service has been initiated from this device.</td>
<td>Service Initiated Event</td>
<td>D1C1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• initiatedConnection</td>
<td>D1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• initiatedDevice</td>
<td>Initiated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• localConnectionState</td>
<td>makeCall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• cause</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device D1 goes off-hook and is connected in the call.</td>
<td>Originated Event</td>
<td>D1C1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• originatedConnection</td>
<td>D1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• callingDevice</td>
<td>D2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• calledDevice</td>
<td>Connected</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• localConnectionState</td>
<td>newCall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• cause</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The generation of this event is switch specific. The MakeCall cause indicates that the device D1 is being prompted (via ringing, for example) to go off-hook.
### Call Origination Scenario

**MakeCall (Part 3 of 3)**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Monitored Device D1</th>
<th>Monitored Device D2</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device D2 begins to ring and D1 receives ringing tone.</td>
<td>DeliveredEvent • connection • alertingDevice • callingDevice • calledDevice • lastRedirectionDevice • localConnectionState • cause</td>
<td>D2C1</td>
<td>D2C1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D1</td>
<td>D1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D2</td>
<td>D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connected</td>
<td>Alerting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>newCall</td>
<td>newCall</td>
</tr>
<tr>
<td>Device D2 answers the call by manually going off-hook.</td>
<td>EstablishedEvent • establishedConnection • answerDevice • callingDevice • calledDevice • lastRedirectionDevice • localConnectionState • cause</td>
<td>D2C1</td>
<td>D2C1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D2</td>
<td>D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D1</td>
<td>D1</td>
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<tr>
<td></td>
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<td>D2</td>
<td>D2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NR</td>
<td>NR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connected</td>
<td>Connected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>newCall</td>
<td>newCall</td>
</tr>
</tbody>
</table>

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CSTA Services and Events
MakeCall Flow (Part 1 of 2)

- UCE starts CSTA-SVC
  - CSTASResponse(Ack)
  - CSTASInfo(INITIATED, A)
  - CSTASInfo(ORIGINATED, A)

- AS executes validation, translation and routing
  - EvUCESetupAck
  - EvUCESetupRequest
  - EvUCESetupCommon

- INVITE (no_sdp)
  - 100 - Trying
  - 180 - Ringing

- EvUCEAddrCompl
  - EvUCEAnswer
  - EvUCEAnswer

Here, ITS changes from 3PCC FSM to SIP FSM, before OTS sends the setup message
CSTA Services and Events
MakeCall Flow (Part 2 of 2)
User Agent CSTA (uaCSTA)
• To provide better feature activation
  • 1st party feature activation instead of 3rd party feature activation by directly sending
    the request to the phone and phone initiating the request. Eg: MakeCall, ClearConnection, etc.

• Performance enhancement
  • By reducing the message interaction. 1st party feature activation results in fewer
    messages than 3rd party.

• Not a standard conformant (ECMA TR/87)
  • Standard requires phone session specifically established through INVITE and requests
    send as INFO messages. Currently we use unsolicited NOTIFY messages to send
    requests to SIP user agents.
  • Fewer SIP SM impacts and easy Phone implementation.
uaCSTA Flows – Device Registration

1. REGISTER + uaCSTA package
2. 200 OK.
3. NOTIFY + uaCSTA XML body
4. 200 OK or 4** error response.

Repeated 3 and 4.

SIP server (SIP SM)

SIP user agent

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uaCSTA supported CSTA Services

Only Request to SIP-UA

• Call Control services
  • MakeCall
  • ClearConnection
  • HoldCall
  • RetrieveCall
  • GenerateDigits

• Physical Device services
  • GetMicrophoneMute
  • SetMicroPhoneMute
  • GetSpeakerVolume
  • SetSpeakerVolume

SIP user endpoint can not have multiple contacts (multiple registration bindings)
uaCSTA supported CSTA Services

Supported requests from SIP-UA (and responses back to SIP-UA)
  • GetForwarding
  • SetForwarding
  • GetDoNotDisturb
  • SetDoNotDisturb

Supported events to SIP-UA
  • DIVERTED EVENT (call forwarding display)

SIP user profile must be provisioning with option CSTA_TYPE_CSTA_OVER_SIP
uaCSTA call control flows
ClearConnection

* request would be one of AnswerCall, ClearConnection, HoldCall, RetrieveCall and GenerateDigits request

** events generated by CSTA-SVC would depend on the request invoked
CSTA – References

CSTA Standards: ECMA

http://www.ecma-international.org/activities/Communications/TG11/cstalll.htm

Other CSTA related documentation at ESY-Wiki

http://usbrws01.bocb.siemens.com/mwiki/index.php/DevCallProcessingCSTA

CSTA Browser (ESY-Wiki)