draft-stanley-geopriv-int-ext
&
draft-polk-geopriv-int-relative-in-tlv

IETF 76 – Hiroshima

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Topics in this Presentation

- Overview and motivation for
  - http://www.ietf.org/id/draft-stanley-geopriv-int-ext-00.txt
  - Including example use cases
  - Including sample location definitions
- Use of
  - http://tools.ietf.org/id/draft-polk-geopriv-int-relative-in-tlv-00.txt , and a
- Comparison (chair request) with
  - http://tools.ietf.org/id/draft-thomson-geopriv-indoor-location-00.txt

Proposal Motivation

- Satisfy the liaison request from IEEE
  - https://datatracker.ietf.org/documents/LIAISON/file704.doc
  - … develop extensions to existing Civic binary encodings … to support WLAN location applications…
    - A binary representation that supports the Point, Polygon, Arc Band, Rectangle, Circle, Ellipse, Cube, Cuboid, Sphere, and Ellipsoid shapes is required.
    - The binary representation should extend or be combinable with civic information already defined in RFC 4776 so that a single payload message can convey the location of a WLAN entity that combines Building Address, Floor and a determined/known reference point and reference location as represented by a shape.

Requirements

- Add relative location capability, with support for binary encoded shapes
- Easy mapping between XML and Binary representation in use for Civic/Geospatial
- Allow a variety of RF shapes to be represented
- No requirement to relate location information to a visual representation (although allowed)
- Extend Civic Location specification to provide additional definition flexibility for interior/indoor spaces, RF environments

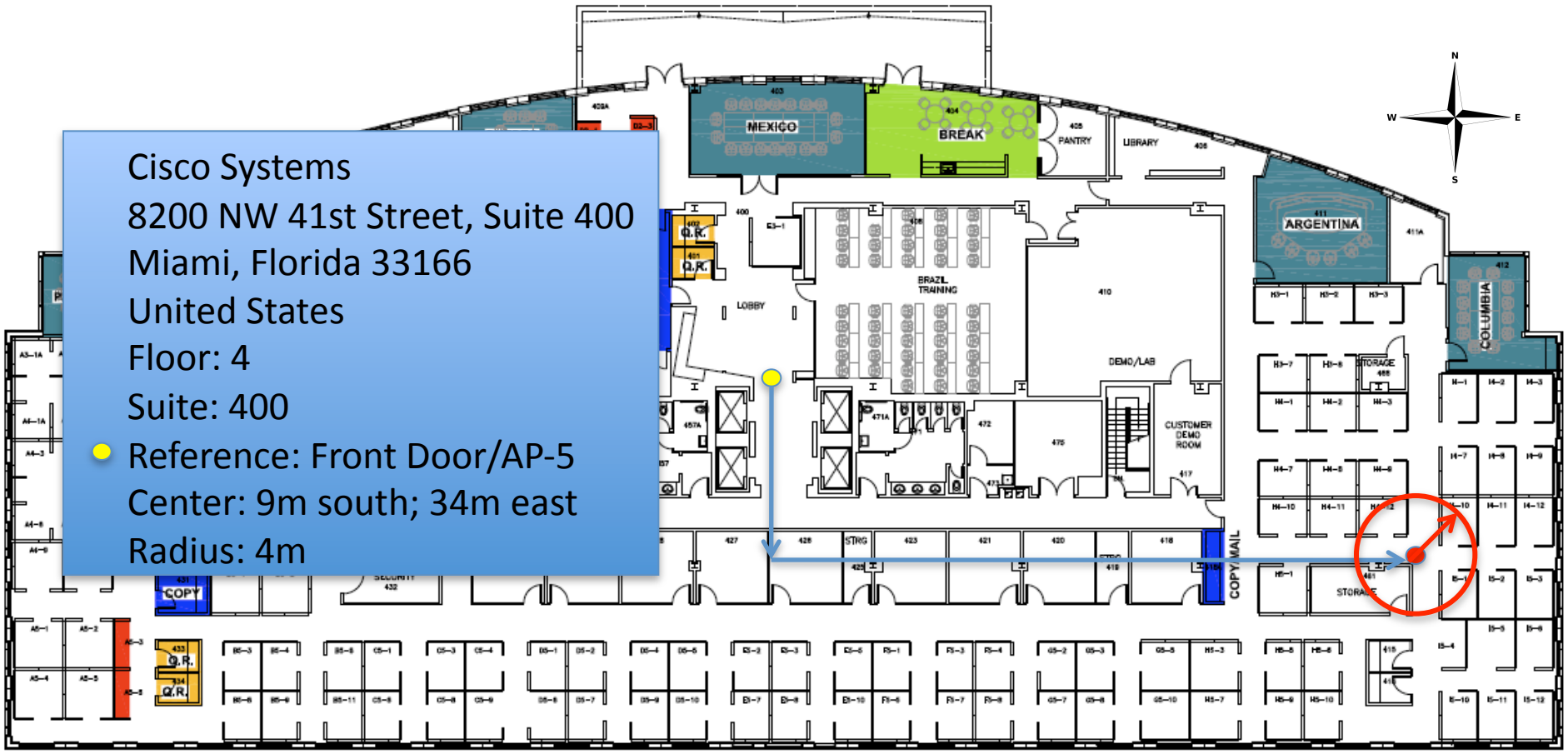
Proposal Summary

- Define and register new xml elements for use in PIDF-LO
  - http://www.ietf.org/id/draft-stanley-geopriv-int-ext-00.txt
- Register the corresponding TLV binary mappings
  - http://tools.ietf.org/id/draft-polk-geopriv-int-relative-in-tlv-00.txt
- Extend the 'INT' mechanism defined in draft-rosen-geopriv-pidf-interior
  - http://www.ietf.org/id/draft-rosen-geopriv-pidf-interior-00.txt
  - Support private 'INT' element provided in baseline INT
  - Add an extension to support a set of 'registered INT' elements
- Define 4 shapes – point, circle, arcband, polygon
- Maintain a registry of these elements and TLV fields to enable vendor interoperability
- Multi-vendor proposal

Use Cases

- Asset Tracking & Workflow Management
  - Locate devices within a boundary defined administratively or by building boundaries
  - Integrate with back-end business policies, e.g. ROI analysis
- Network Routing Based on Location
  - Track a device that provides voice service and the network location of that device within the confines of a corporate building; relating the location to network topology
- Indoor Emergency Responders
  - Track devices capable of sending an emergency signal (not just voice) and provide the location to emergency systems
- Presence
  - Provide location indication for e,g, Handheld devices that indicate an individual's location, backend servers that provide proximity services such as closest free meeting room, location of meeting participants, nearest projector
- IT Manager Policy/AAA
  - Apply network policy based on location
- Network Management
  - Locate devices assists ability to debug network problems, client device performance, etc.

Relative Location - Circle



LEGEND

- CONFERENCE / TRAINING ROOM
- QUIET ROOM/TOUCH DOWN STATION
- CAFE / BREAK / FITNESS
- COPY / MAIL
- GUEST (MOBILE) OFFICE / CUBE

0 10 20 30 40 50

CISCO SYSTEMS, INC.
MIAMI, FL 4TH FLOOR
8200 NW 41ST STREET
Modified 2008-NOV-17
Published 2008-NOV-17

Entire Civic Location - Circle

- <country>US</country>
- <A1>Florida</A1>
- <A3>Miami</A3>
- <HNO>8200</HNO>
- <PRD>NW</PRD>
- <RD>41st</RD>
- <STS>Street</STS>
- <PC>33166</PC>
- <FLR>4</FLR>

Existing PIDF-LO syntax

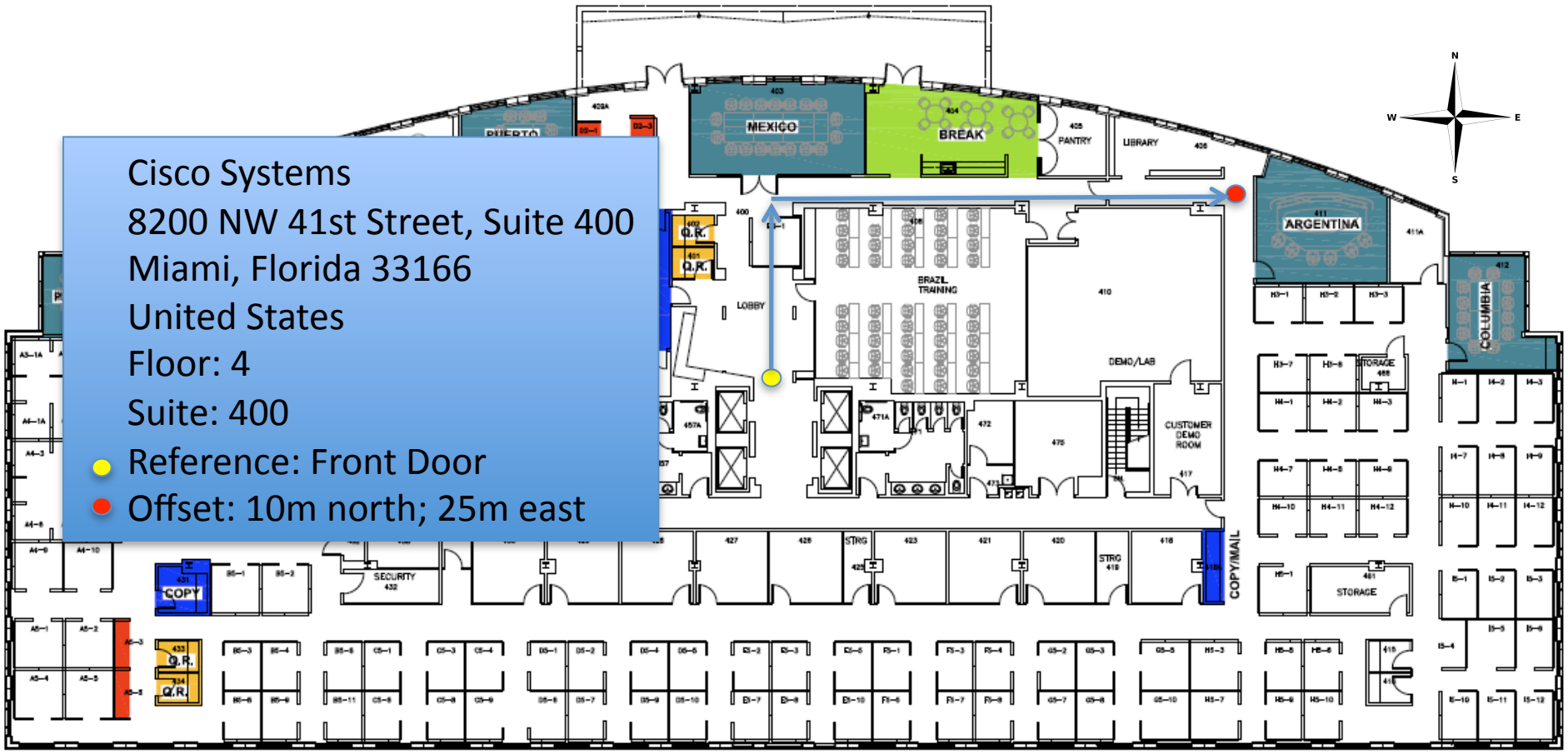
- <INT>'Suite'>400</INT>

New 'Private' INT syntax

- <INT N='Reference'>Front Door</INT>
- <INT N='Circle'/>
- <INT N='SHAPE-OFFSET-X'>+34</INT>
- <INT N='SHAPE-OFFSET-Y'>-9</INT>
- <INT N='SHAPE-OFFSET-Z'>+5</INT>
- <INT N='Radius'>4</INT>

New 'Registered' INT syntax

Relative Location - Point



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CISCO SYSTEMS, INC.
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Modified 2008-NOV-17
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Entire Civic Location - Point

- <country>US</country>
- <A1>Florida</A1>
- <A3>Miami</A3>
- <HNO>8200</HNO>
- <PRD>NW</PRD>
- <RD>41st</RD>
- <STS>Street</STS>
- <PC>33166</PC>
- <FLR>4</FLR>

Existing PIDF-LO syntax

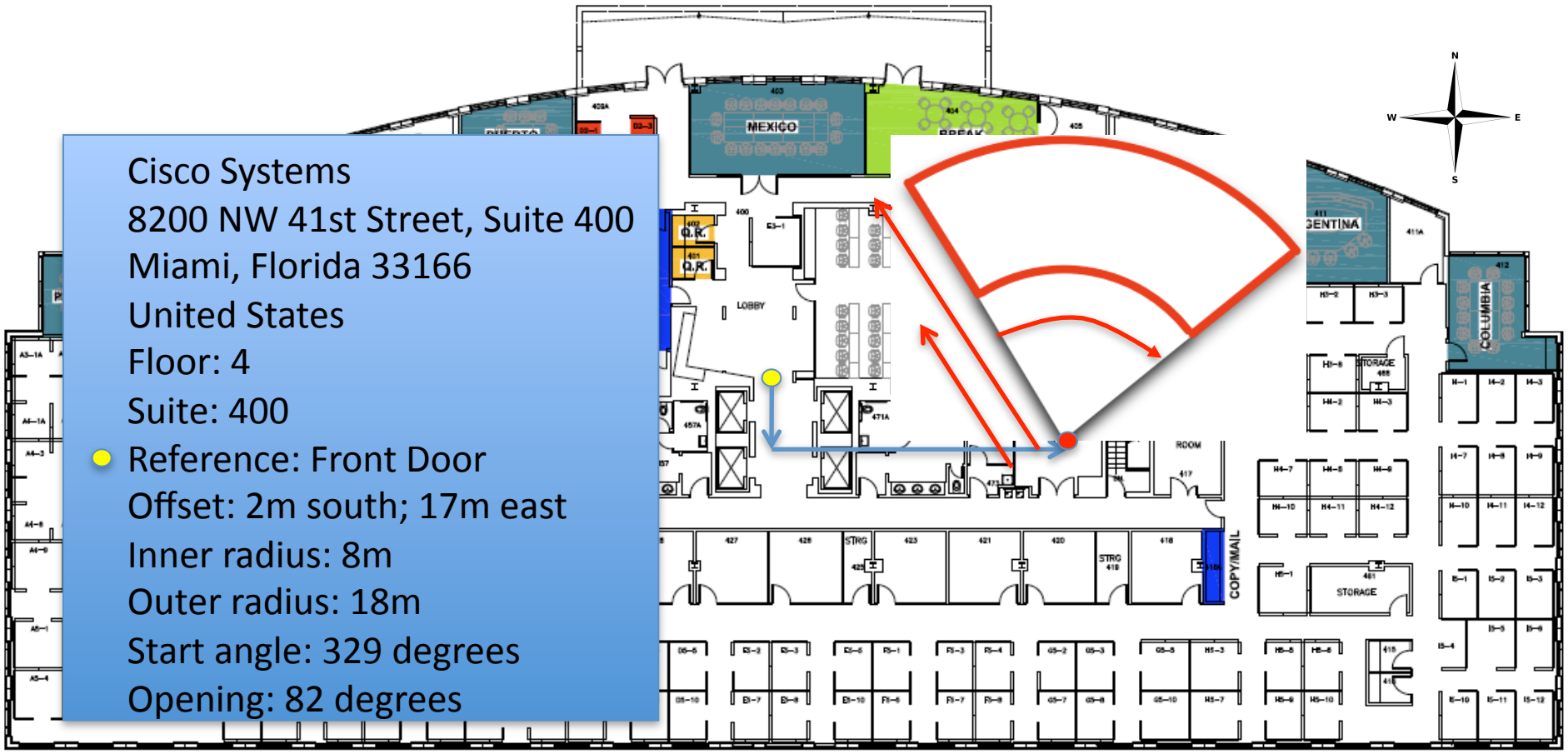
- <INT>'Suite'>400</INT>

New 'Private' INT syntax

- <INT N='Reference'>Front Door</INT>
- <INT N='Point'/>
- <INT N='SHAPE-OFFSET-X'>+25</INT>
- <INT N='SHAPE-OFFSET-Y'>+10</INT>
- <INT N='SHAPE-OFFSET-Z'>+10</INT>

New 'Registered' INT syntax

Relative Location - Arcband



LEGEND

- CONFERENCE / TRAINING ROOM
- QUIET ROOM/TOUCH DOWN STATION
- CAFE / BREAK / FITNESS
- COPY / MAIL
- GUEST (MOBILE) OFFICE / CUBE

0 10 20 30 40 50

CISCO SYSTEMS, INC.
MIAMI, FL 4TH FLOOR
8200 NW 41ST STREET
Modified 2008-NOV-17
Published 2008-NOV-17

Entire Civic Location - Arcband

- <country>US</country>
- <A1>Florida</A1>
- <A3>Miami</A3>
- <HNO>8200</HNO>
- <PRD>NW</PRD>
- <RD>41st</RD>
- <STS>Street</STS>
- <PC>33166</PC>
- <FLR>4</FLR>

Existing PIDF-LO syntax

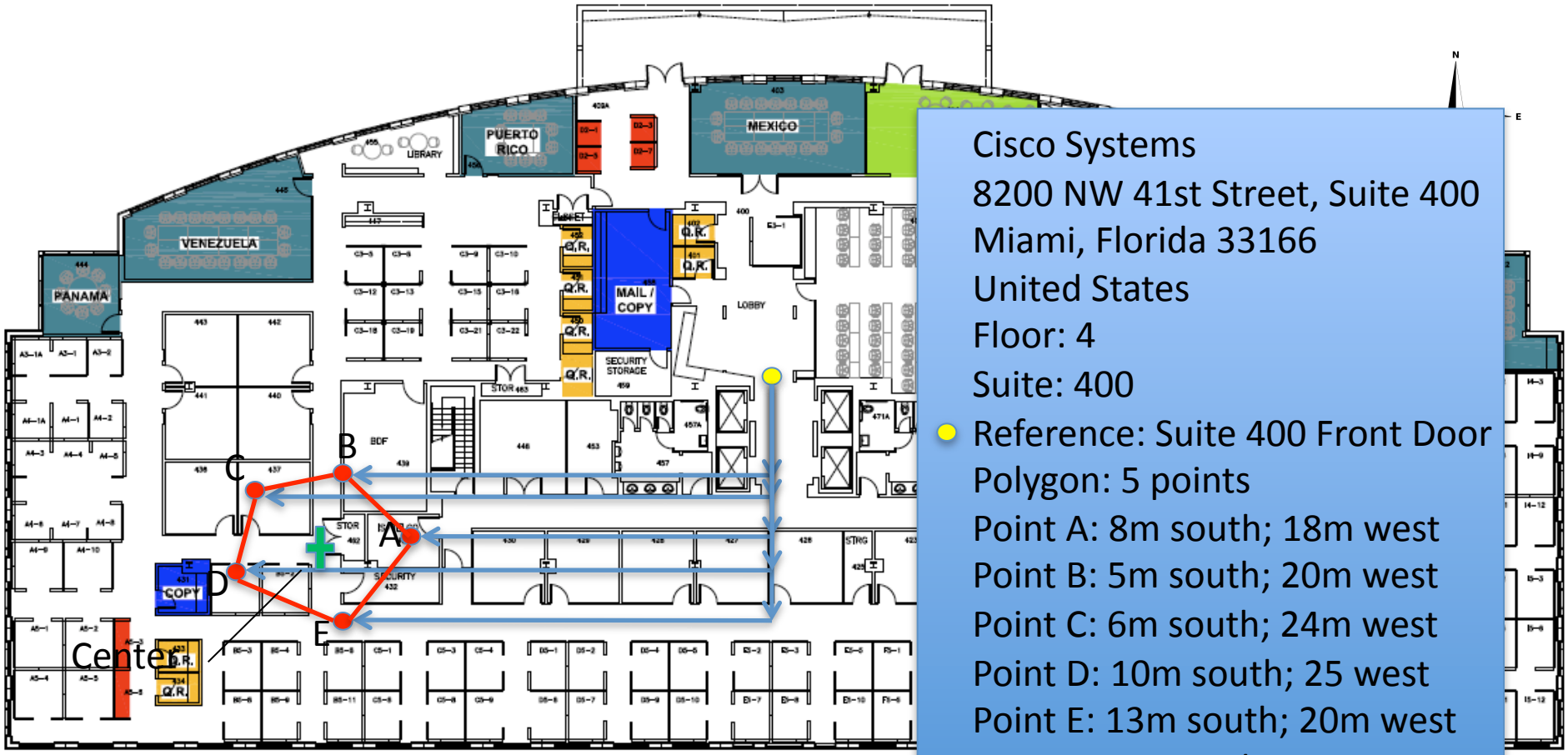
- <INT>'Suite'>400</INT>

New 'Private' INT syntax

- <INT N='Reference'>Front Door</INT>
- <INT N='Arcband'/>
- <INT N='SHAPE-OFFSET-X'>+17</INT>
- <INT N='SHAPE-OFFSET-Y'>-2</INT>
  <INT N='SHAPE-OFFSET-Z'>+2</INT>
  <INT N='InnerRadius'>8</INT>
- <INT N='OuterRadius'>18</INT>
- <INT N='StartAngle'>329</INT>
- <INT N='Opening'>82</INT>

New 'Registered' INT syntax

Relative Location – Polygon



- Cisco Systems
- 8200 NW 41st Street, Suite 400
- Miami, Florida 33166
- United States
- Floor: 4
- Suite: 400
- Reference: Suite 400 Front Door
- Polygon: 5 points
- Point A: 8m south; 18m west
- Point B: 5m south; 20m west
- Point C: 6m south; 24m west
- Point D: 10m south; 25 west
- Point E: 13m south; 20m west
- Point A: 8m south; 18m west
- GeoCenter:10m south;20m west

LEGEND

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0 10 20 30 40 50

8200 NW 41ST STREET
Modified 2008–NOV–17
Published 2008–NOV–17

Entire Civic Location – Polygon w/Center

- <country>US</country>
- <A1>Florida</A1>
- <A3>Miami</A3>
- <HNO>8200</HNO>
- <PRD>NW</PRD>
- <RD>41st</RD>
- <STS>Street</STS>
- <PC>33166</PC>
- <FLR>4</FLR>
- <INT>'Suite'>400</INT>
- <INT N='Reference'>Front Door</INT>
- <INT N='Polygon'/>
- <INT N='PolygonPoints'>5</INT>
- <INT N='SHAPE-OFFSET -X'>-18</INT> <!—A-X-->
- <INT N='SHAPE-OFFSET -Y'>-8</INT> <!—A-Y-->
- <INT N='SHAPE-OFFSET -X'>-20</INT> <!—B-X-->
- <INT N='SHAPE-OFFSET -Y'>-5</INT> <!—B-Y-->
- <INT N='SHAPE-OFFSET -X'>-25</INT> <!—C-X-->
- <INT N='SHAPE-OFFSET -Y'>-6</INT> <!—C-Y-->
- <INT N='SHAPE-OFFSET -X'>-25</INT> <!—D-X-->
- <INT N='SHAPE-OFFSET -Y'>-10</INT> <!—D-Y-->
- <INT N='SHAPE-OFFSET -X'>-20</INT> <!—E-X-->
- <INT N='SHAPE-OFFSET -Y'>-13</INT> <!—E-Y-->
- <INT N='SHAPE-OFFSET -X'>-18</INT> <!—A-X-->
- <INT N='SHAPE-OFFSET -Y'>-8</INT> <!—A-Y-->
- <INT N='SHAPE-GEOCENTER-X'>-10</INT> <!—Center-X-->
- <INT N='SHAPE-GEOCENTER-Y'>-20</INT> <!—Center-Y-->

Existing PIDF-LO syntax

New 'Private' INT syntax

New 'Registered' INT syntax

int-relative-in-tlv

- Binary encodings of the registered ‘INT’ location extensions to PIDF-LO
  - Extension of mechanisms already in use, defined in RFC4776/5139
- For use in binary protocols
- Vendor interoperability assured via registration of these values

Registered TLV fields

Field	LocType	Description	Example
REF	201	Reference point or Starting point	‘Front Door’
POINT	202	Point	<no data>
CIRCLE	203	Circle	<no data>
ARCBAND	204	Arcband	<no data>
POLYGON	205	Polygon	<no data>
SHAPE-OFFSET-X	206	Shape Offset X	‘+10’
SHAPE-OFFSET-Y	207	Shape Offset Y	‘-20’
SHAPE-OFFSET-Z	208	Shape Offset Z	‘+2’
RAD	209	Radius of circle	‘+4’
INRAD	210	Inner radius of arcband	‘+8’
OUTRAD	211	Outer radius of arcband	‘+18’
STANGLE	212	Starting angle of arcband	329
OPEN	213	Opening angle of arcband	82
NUMPGONPTS	214	Number of points in the Polygon	‘5’
SHAPE-CENTER-X	215	Geographic center of polygon X	+10
SHAPE-CENTER-Y	216	Geographic center of polygon Y	-12.2
SHAPE-CENTER-Z	217	Geographic center of polygon Z	+0.4

Summary

- This proposal provides the ability to map to a binary format supporting the IEEE liaison
- Extends Civic Location specification to provide additional definition flexibility for interior/ indoor spaces, RF environments
- Adds a relative location capability, with support for binary encoded shapes

Analysis - Comparison

Characteristic	**draft-stanley & in-tlv**	**draft-thomson**
Recognize/support need for additional location specification flexibility to indoor spaces	Yes	Yes
Encoding Supported	XML, Binary	XML
Relative Location	Yes, enables both structural (.e.g door) and administrative entities. Uses local conventions	Yes, uses local datum. Uses Loc field for human-readable info.
Need for Local CRS	No; use local conventions and landmarks; offset (meters in NSEW) is needed	Local (unique) CRS needed
Location Base	Civic Location; conversion to WGS-84 unnecessary. RFC4119, 5139, 4776; minimizes development effort for extensions	WGS-84 Local CRS conversion to WGS-84 Requires new development
Scaling Factor, Pixel Offset	Not needed	Yes
Interior coordinate system	Building considered a self contained system; Axis of Cartesian Coordinate System point NESW	Local CRS constructed
Readily deployable	Yes, local Indoor datum (indoor conventions) of the building are established	Local CRS needs to be defined
Navigation support	Yes, if link to a tagged map is added	Construct graph using Local CRS

Recommendation

- Solutions have different characteristics
  - see previous slide
- Application needs (products, requirements) vary
  - Civic, WGS-84, XML, Binary
  - Deployment complexity of building unique CRSs
- Progress both proposals

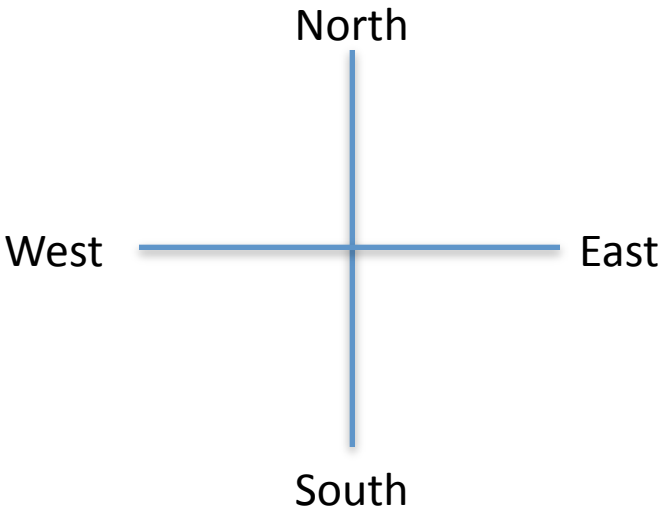
Backup Slides

Assumptions

- Each shape XML/Binary object must be accompanied by a civic address object
- Confidence is always 95%

Common Notes for XML

- X Axis
  - East = + (Positive) X number
  - West = - (Negative) X number
- Y Axis
  - North = + (Positive) Y number
  - South = - (Negative) Y number



Asset Tracking

- Where are all devices belonging to a group, category or organization, other pertinent information, licensing, software version…etc
- What: Any network infrastructure or endpoint device
- Consumers: IT, End-users of endpoint device, 3rd party user of information (such as a parent tracking a child), other application servers
- Requirements: The ability to locate devices within a defined boundary defined by the building boundaries or admin defined areas within that.
- Ability to automatically act on location information to provide alarms, notifications… etc is important. This is done without mapping to a visual representation
- Alarms/notifications are often tied to “defined areas” within the building such as a secured area that covers multiple rooms or an area within a manufacturing floor
- Assets are defined by their relative location to the area where area is a well defined thing within the indoor space
- Representation: Typically both Point and Polygon are used

Network Routing Based on Location

- At the time of a phone call, the location of the caller determines how the call must be routed within a private telephone network
- Consumers: Backend systems, routers..etc that provide route decisions based on location information and forward
- Requirements: Ability to track any network device that provides voice service and the associated network location of that device within the confines of a corporate building while relating it to the network topology
- No requirement to provide location based on a map per se.
- Representation: Typically a Point would be used

Indoor Emergency Responders

- At the time of an emergency call, the location of the caller is determined and the backend system dispatches a notification to the corporate emergency responders where the emergency is
- Consumers: In addition to emergency personnel, the notification can be dispatched to the security/video system to target video capture in the area and feed that information to a backend system
- Requirements: Ability to track any device capable of sending an emergency signal (not just voice) and provide that location to systems that localize the emergency
- Could be visualization on a map for personnel but also coordinate based for video/security systems
- Representation: Both Point/Polygon are typically used depending on the consumer applications

Presence

- Unified client applications running on laptops, pdas…etc
- Buddy lists, meeting services…etc benefit if the person and their associated devices are known accurately
- Consumers: Handheld devices that visualize people, backend servers that can provide proximity services such as closest free meeting room, where are all the meeting participants, find nearest projector for my meeting
- Requires backend system integration that can automate some of the more “fancy” features related to proximity of resources…etc.
- Not just visualization on a map for handheld devices
- Representation: Some presence applications don’t even show a map they show a textual representation of the user’s location but if they do show location they usually show a Point even if a Polygon provides the underlying estimate of location
- This is one of the reasons why providing a centerpoint of the polygon is useful for certain applications

Policy

- The ability to determine location for devices to apply network policy when the device accesses the network or moves physically within the network
- Highly mobile networks, IP address is no longer enough to apply location aware policies
- Consumers: Backend policy enforcement and administration points that can define location policies as well as enforce policy based on where a device is physically located
- Requires a definition of location, not usually related a visual map
- Representation: Polygon/Point depending on whether the policy system wants to include location inaccuracies in the decisions made

Network Management

- Many network management tasks in a mobile environment are highly dependent on knowing where the user/device is
- Such as :
  - –Troubleshooting client connection, coverage area problems
  - –Performance analysis of clients based on location
  - –….etc
- By locating devices to an accurate level indoors the ability to isolate problems when debugging network problems will become easier or performance data will become more relevant …etc
- Although visualization is often required, relating location to the other objects defined within the network management system are important such as nearest set of APs…etc
- Representation: Both a Point (for summary screens showing multiple devices located) and Polygon (for individual devices and summary screens where mgmt wants to show location accuracy depiction) are typically used that shows the possible position of devices based on the inaccuracies of location determination

Use cases where arcband/circle representations are used

- Arcbands are typically used in RF environments where directional antennas are used or determination techniques are used that can isolate to a “band” around a center point
- Examples include warehouses, hangers where a directional antenna points down a long narrow area within the area
- Circles are used where non-directional antennas are deployed and RF triangulation using RSSI or TDOA…etc is not possible to determine location
  - –i.e. where a single AP (e.g. hotspot) is aware of your location relative to the hotspot AP