802.21, L2 Triggers
A Strawman Proposal

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Purpose (of these slides)

• Introduce 802.21
• Describe straw man L2 triggers model
• Solicit feedback
802.21

• Approved as a full IEEE WG Feb 27th
• Has been meeting as an ECSG for 1 year
• Initial charter to study handover between
  – 802.x ⇔ 802.x (where handover not supported)
  – 802.x ⇔ 802.y (where x may not equal y)
  – 802.x ⇔ Non 802 (e.g. cellular)
• Now has approved PAR for ‘Media Independent Handover Services’
Current Work

• DNA
  – Put in place useful L2 network detection mechanisms

• Handover Optimization
  – Handover information definition and transport
  – L2 Triggers

• Other
  – Cellular coupling methods
Trigger Sources

• Knowledge of L2 state changes may derive from the MAC, PHY or decisions made above the MAC and communicated to it through the MAC SAP
  – They may arise from either the local or far end of a link
  – The source of a trigger may dictate the appropriate response to a trigger

• Therefore a trigger should be annotated with its source PHY, MAC, Above MAC, local or remote

• In shared media, the source may need to be a MAC address to distinguish between multiple endpoints
Trigger Destinations

• The 802 model allows for multiple L3 entities above a single PHY through the 802.2 LLC
  – Each L3 entity may comprehend some, all or no L2 triggers
  – It would be inappropriate to push triggers up to L3 entities that do not comprehend those triggers
  – It will be necessary for a trigger comprehended by multiple L3 entities to be passed to all of them
  – We don’t want or need to send duplicates over a transport in the case of remote triggers
• So triggers with multiple destinations get forked at the L2/L3 interface and delivered to all L3 entities that have in interest in the type of trigger being delivered
• For the delivery mechanism to know which triggers each L3 entity is interested in, each L3 entity must solicit the trigger types it comprehends
Trigger Transport

• If a layer 2 trigger can be sourced from the other end of a link, then a layer 2 transport for it must be provided
Local Triggers

- IP
- LLC
- MAC
- PHY
- Other
Link Traversing Triggers

- Trigger sent down the stack to appear at remote end of link
- Requires a transport
- Could originate from upper layer
Trigger Types (2 of them)

- **Event Triggers**
  - Indicate a L2 event, such as a state change
  - E.G. Link_Up, Link_Down
- **Predictive Triggers**
  - Indicate a future event
  - E.G. Link_Going_Down
  - Must be bounded to minimize state requirements. So must include a finite duration
  - Predictions are generally unreliable, so indicate a confidence level (%)
  - Can be rolled back before expiry if it is found that the future trigger is not likely to happen
  - For a rollback to identify the predictive trigger that it is rolling back, each predictive trigger must be tagged with an ID
Trigger Semantics

• To be useful to L3, trigger semantics must be in terms relevant to L3
  – Link layer SQMs are pretty useless
  – The safe passage of class 1 frames is critical

• It is the responsibility of the lower media specification or of an implementation to map the L2 state to the trigger semantics
  – E.G. In 802.11, Link_Up means 802.11i authentication, key exchange and group key exchange has completed successfully. In 802.16 it means a dynamic transport connection has been provisioned, following network entry and PKM auth.
The Service

MAC_SAP Messages
Defined within base MAC Spec (802.3/11/16)

MAC_SAP Messages
Defined within HO Spec 802.x[y]

Messages are generic, E.G.:
- Link_up
- Link_down
- Link_event_pre_indication(what, when)
- Handoff_request(where, why)
- Fetch_base_descriptor(from where)

MAC and PHY implementations determine mapping to these based on their own special cases

Pass triggers and/or roaming decision data through management interface?
Trigger Base Set

- Link_Up
- Link_Down
- Link_Going_Up
- Link_Going_Down
- Trigger_Rollback
- Link_Quality_Crosses_Threshold
- Better_Signal_Quality_AP_Available
Example

- Link Going Down, leading to a handover
Feedback?

- We need to specify triggers that are useful to external groups such as the IETF
  - Straw man proposal is intended to stimulate a process that will lead to agreement and closure on a trigger model and base set of triggers that are acceptable to 802.21 and the IETF (and others, E.G. 3GPP*)
Where to Look

- http://www.ieee802.org/handoff
  - Details for the mailing list stds-802-handoff are there
    - Unlike some IEEE 802 lists, its open to all