DCCP Implementation Status

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Outline

1. Applications & Ports
2. Socket API - Packet Priorities
3. DCCP Nat Traversal
4. CCID-3 changes
5. Current work
6. Further work

Applications and ports

- Work by Leandro Melo de Sales, Brasil
- CCID-4 subtree
  `git://eden-feed.erg.abdn.ac.uk/dccp_exp`
- DCCP port for Embedded Phone Project
  - Maemo kernel with DCCP support
  - for mobile devices such as the Nokia N810
  - `https://garage.maemo.org/projects/ephone`
- gstreamer DCCP plugin
  - GNU gstreamer is the toolbox for streaming apps
  - facilitates wide range of possible applications/uses

Socket API: Packet Priorities

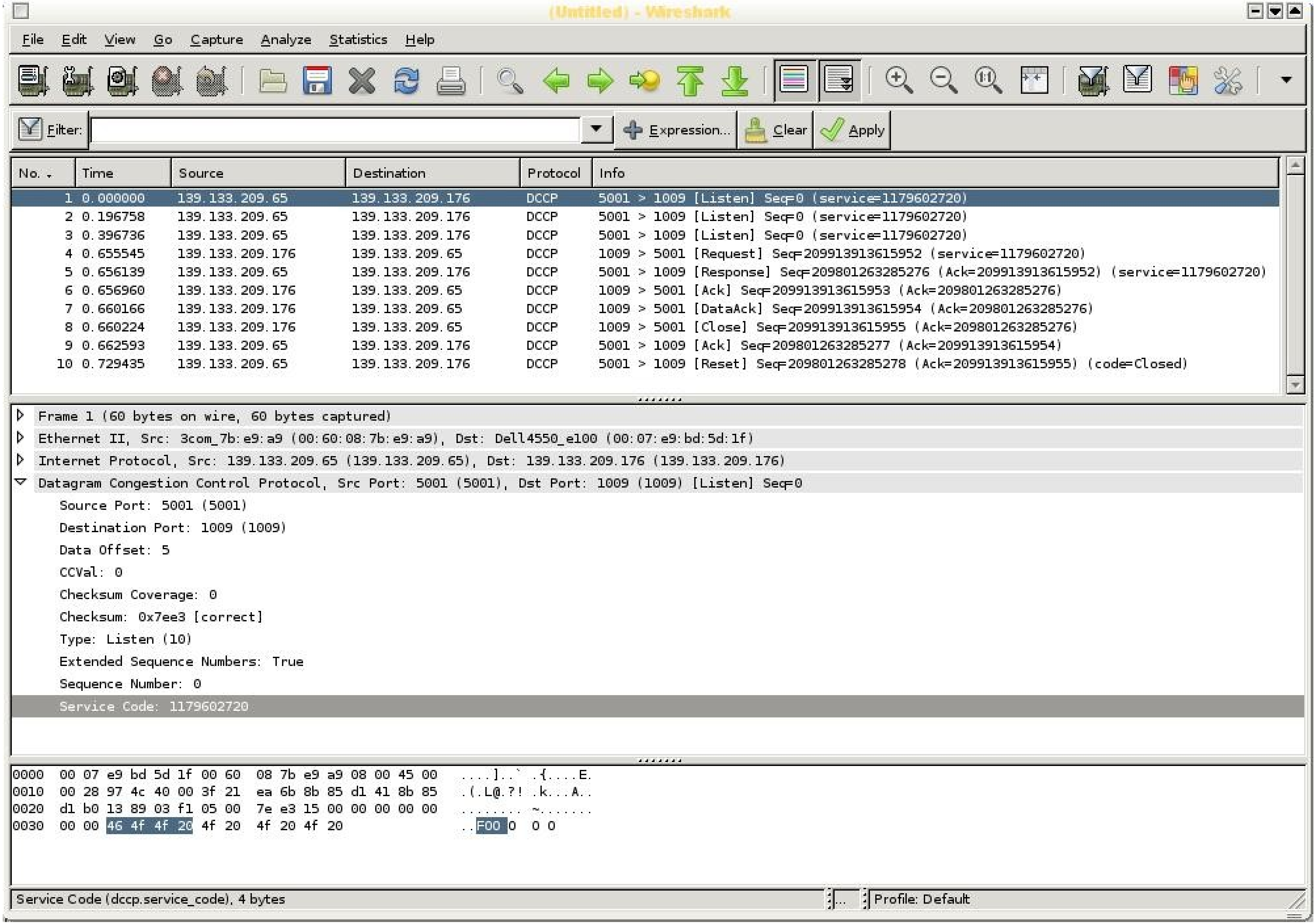
- Work by Tomasz Grobelny, Poland
- per-packet priorities
  - timeout, numeric priority, symbolic priority, ...
  - passed as cmsg(3) parameter to sendmsg()
  - can use different types of priority queue
- policies which act on and interpret the priorities
  - drop-lowest-priority first
  - look-at-best-before-date-of-packet
  - send-best-packet-next ?
  - ...

DCCP NAT Traversal

- Work by Patrick McHardy
  - DCCP NAT available already at a Linux near you
  - *Linux the only (stateful) NAT to support DCCP*

- Implementation of draft-ietf-dccp-simul-open:
  - fairly straightforward & already works
  - **need IANA type for DCCP-Listen packet**
  - at the moment supports DCCPv4 and 1 peer
  - easily extended to other scenarios

draft-dccp-simul-open …



No.	Time	Source	Destination	Protocol	Info
1	0.000000	139.133.209.65	139.133.209.176	DCCP	5001 > 1009 [Listen] Seq=0 (service=1179602720)
2	0.196758	139.133.209.65	139.133.209.176	DCCP	5001 > 1009 [Listen] Seq=0 (service=1179602720)
3	0.396736	139.133.209.65	139.133.209.176	DCCP	5001 > 1009 [Listen] Seq=0 (service=1179602720)
4	0.655545	139.133.209.176	139.133.209.65	DCCP	1009 > 5001 [Request] Seq=209913913615952 (service=1179602720)
5	0.656139	139.133.209.65	139.133.209.176	DCCP	5001 > 1009 [Response] Seq=209801263285276 (Ack=209913913615952) (service=1179602720)
6	0.656960	139.133.209.176	139.133.209.65	DCCP	1009 > 5001 [Ack] Seq=209913913615953 (Ack=209801263285276)
7	0.660166	139.133.209.176	139.133.209.65	DCCP	1009 > 5001 [DataAck] Seq=209913913615954 (Ack=209801263285276)
8	0.660224	139.133.209.176	139.133.209.65	DCCP	1009 > 5001 [Close] Seq=209913913615955 (Ack=209801263285276)
9	0.662593	139.133.209.65	139.133.209.176	DCCP	5001 > 1009 [Ack] Seq=209801263285277 (Ack=209913913615954)
10	0.729435	139.133.209.65	139.133.209.176	DCCP	5001 > 1009 [Reset] Seq=209801263285278 (Ack=209913913615955) (code=Closed)

```
▷ Frame 1 (60 bytes on wire, 60 bytes captured)
▷ Ethernet II, Src: 3com_7b:e9:a9 (00:60:08:7b:e9:a9), Dst: Dell4550_e100 (00:07:e9:bd:5d:1f)
▷ Internet Protocol, Src: 139.133.209.65 (139.133.209.65), Dst: 139.133.209.176 (139.133.209.176)
▽ Datagram Congestion Control Protocol, Src Port: 5001 (5001), Dst Port: 1009 (1009) [Listen] Seq=0
    Source Port: 5001 (5001)
    Destination Port: 1009 (1009)
    Data Offset: 5
    CCVal: 0
    Checksum Coverage: 0
    Checksum: 0x7ee3 [correct]
    Type: Listen (10)
    Extended Sequence Numbers: True
    Sequence Number: 0
    Service Code: 1179602720
```

```
0000  00 07 e9 bd 5d 1f 00 60  08 7b e9 a9 08 00 45 00   ....]..` .{....E.
0010  00 28 97 4c 40 00 3f 21  ea 6b 8b 85 d1 41 8b 85   .(.L@.?! .k...A..
0020  d1 b0 13 89 03 f1 05 00  7e e3 15 00 00 00 00 00   ........ ~.......
0030  00 00 46 4f 4f 20 4f 20  4f 20 4f 20              ..FOO O  O O
```

Service Code (dccp.service_code), 4 bytes

Backwards compatibility in 3 lines

```
--- a/net/dccp/ipv4.c
+++ b/net/dccp/ipv4.c
@@ -809,6 +809,10 @@ static int dccp_v4_rcv(

     dh = dccp_hdr(skb);

+  /* Ignore DCCP-Listen packets (NAT Traversal) */
+    if (dh->dccph_type == DCCP_PKT_INVITE)
+          goto discard_it;

     dccpd_seq  = dccp_hdr_seq(dh);
     dccpd_type = dh->dccph_type;
```

Current work

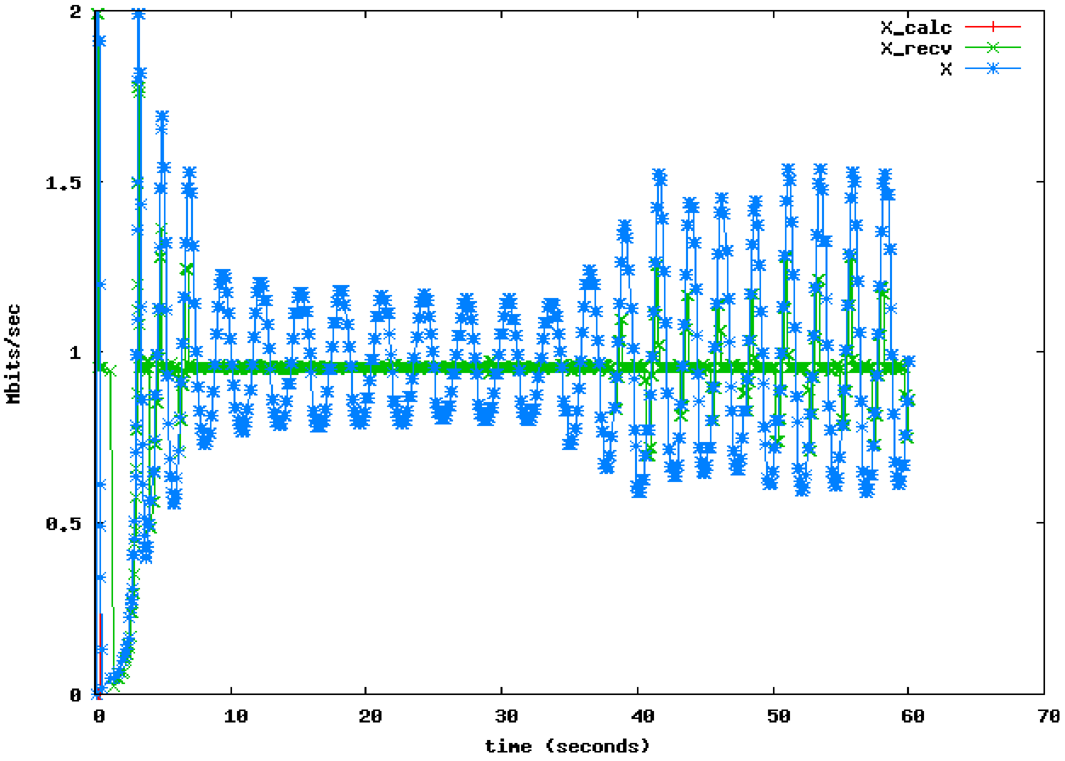
- Contributions from Wei Yonjung:
  - TAHI tests for DCCP
    - helped uncover several bugs
    - proved very useful input
- (slowly) adding *changes from rfc3448bis-06*
- rewriting CCID-3 code to *support ECN*
  - ECN subtree available already
- *Oscillation Prevention* for CCID-3/4
- modularisation of TFRC code

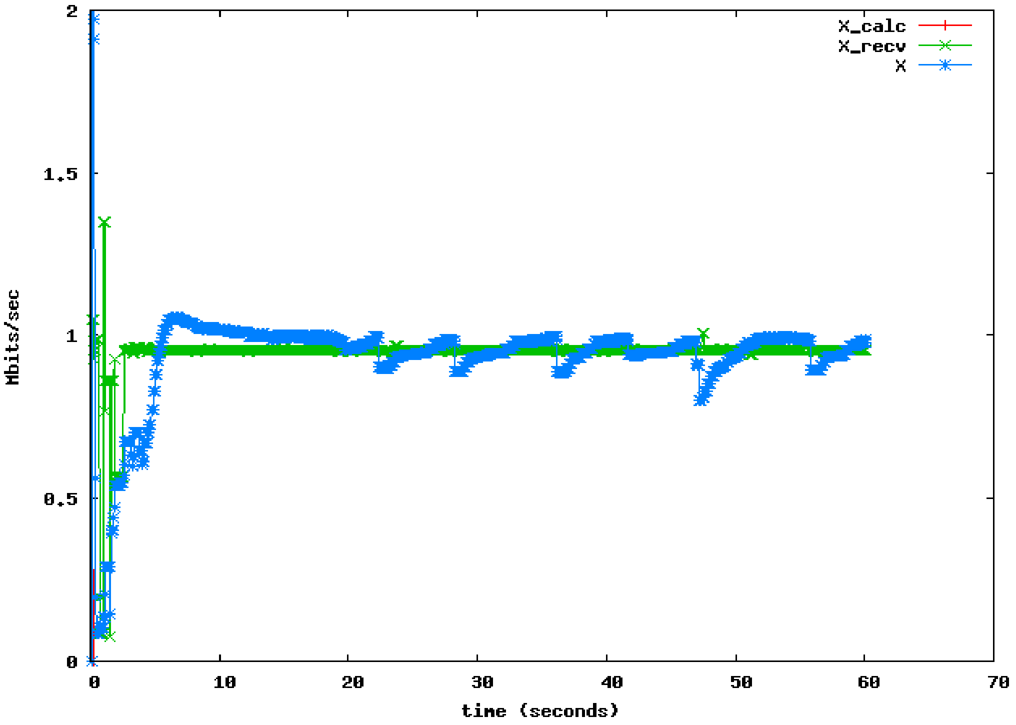
TFRC librarification

The entire CCID-3 Receiver in one slide:

```
void ccid3_hc_rx_packet_recv(sk, skb)

{
  struct ccid3_hc_rx_sock *hcrx = ccid3_hc_rx_sk(sk);
  const u64 ndp = dccp_sk(sk)->dccpor_ndp;
  const bool is_data_packet = dccp_data_packet(skb);


  if (tfrc_rx_congestion_event(&hcrx->hist, &hcrx->li_hist,
                               skb, ndp, ccid3_first_li, sk))
      send_feedback(sk, skb, CCID3_FBACK_PARAM_CHANGE);

  else if (hcrx->feedback == CCID3_FBACK_NONE && is_data_packet)
      send_feedback(sk, skb, CCID3_FBACK_INITIAL);

  else if (!loss_pending(&hcrx->hist) && is_data_packet &&
           SUB16(dccp_hdr(skb)->ccval, hcrx->last_counter) > 3)
      send_feedback(sk, skb, CCID3_FBACK_PERIODIC);

}
```

Oscillation Reduction before/after





Further work

- ECN work to be finished
  - needs testing & verification
- CCID-3 needs better RTT estimation
  - see other slides
- CCID-2 needs an overhaul
  - reverse-path congestion not supported
  - very good initial results in using CWND Validation
- Ack Vectors need new algorithms
  - on 802.11g links they grow up to 0.5 kilobyte!

Conclusions

- need more testers/contributors
  - TAHI tests proved very useful
  - code only gets good through frequent review
- still a lot to be done
- Linux DCCP framework is reasonably stable