

# Dialogic®



**Build on Dialogic**

## FoIP and SIP Trunking: Technical Considerations

---

Allan Ashmore  
Systems Engineer and  
Project Manager  
[allan.ashmore@dialogic.com](mailto:allan.ashmore@dialogic.com)

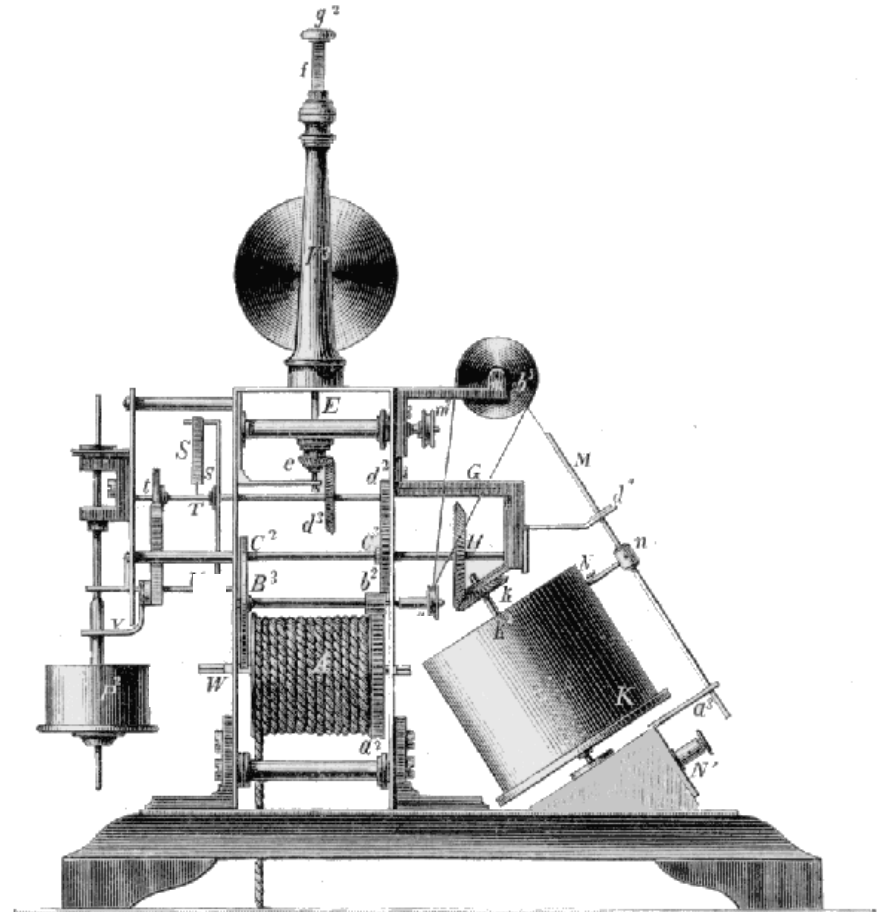
# Dialogic® Brooktrout® Fax

- Worldwide market segment leader for fax server technology
  - Trusted supplier of fax technology for many years
  - Supported by over 60 application partners
  - Dialogic® Brooktrout® Fax Products: ~ 90.5% worldwide market share for FoIP hardware\*
- Fax server technology market segment leader & trusted advisor
  - Broad range of fax products
    - Boards, software only, TDM, FoIP
    - One API for all fax products
  - A leading contributor to the T.38 standard
  - Industry-first T.38 V.34 fax termination support

\* *Fax over IP Server Markets 2010-2015*, Davidson Consulting, April 2011

# Agenda

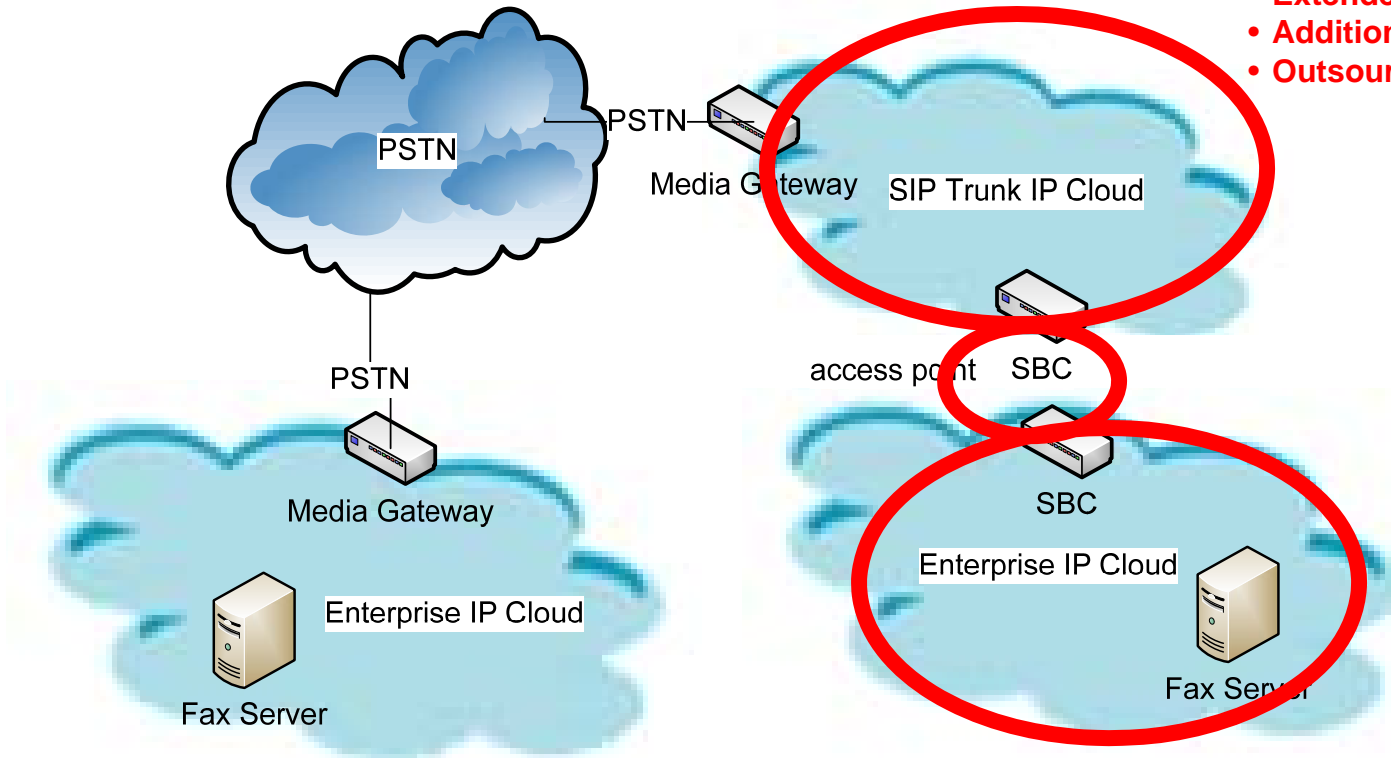
- SIP trunk challenges
- Primary FoIP techniques
- Factors influencing success
- Impaired network research
- Conclusions



Alexander Bain, from the Mech. Mag., p. 104, 1850; Dinglers Journal 117, p. 40, 1850; Zetsche, p. 411-413.

# SIP Trunk – IP QoS Network Challenges

- Extended IP network
- Additional management zones
- Outsourced QoS



On premise Media Gateway

SIP Trunk Media Gateway

*Managing impairment is a challenge using SIP trunks*

# G.711 Fax

- Fax used to be treated as a regular voice call (G.711)
- Some impairments can impact fax much more than voice
- Fax can be degraded with as little as 0.2% **packet loss**, while voice can tolerate relatively high packet loss, 5% without significant degradation
- **Jitter** turns into packet loss if it exceeds the jitter buffer depth
- **Delay** is not as much an issue for fax as it is for voice
- Techniques used by gateways to improve voice quality can adversely affect fax
  - Dynamic jitter buffers
  - Packet loss concealment
  - Silence suppression
  - Echo cancellation

*There are solutions.....*

# G.711 Fax Cont.

## How is this addressed?

- Most gateways offer a G.711 Fax Pass-Through mode that can be enabled by a SIP trunk provider to improve fax quality/success
  - Disables the previously listed voice enhancing techniques on fax calls
  - Static large jitter buffer
  
- T.38 was introduced as a standardized procedure for transporting fax over IP networks

## T.38 Fax

- ITU standard procedure for real-time fax over IP networks
- Designed to address the issues including impairments
  - Can tolerate Internet-level packet loss, very high delays, and jitter
- Much lower bandwidth requirements than G.711
- Optional redundancy mode
  - Usually implemented and enabled

### Not a silver bullet

- Not all SIP trunk providers offer T.38
- Few if any offer T.38 that can operate at V.34 fax speeds
- Not all T.38 implementations are alike
- Large transcoding delays with typical gateways
  - Can be a challenge with multiple call segments



***Support for T.38 is a major factor influencing FoIP success***

# Factors Influencing End-to-End Success

- SIP trunk provider
  - T.38 support
    - In the access points and core
    - Redundancy
    - Peering
  - Number and type of call segments
  
- Endpoints
  - ECM
  - Fax speed (V.17, V.34)
  - T.30 interoperability
  - Fax document specifics: length, image
  
- Network
  - Managed (access point, enterprise)
  - Impairment levels (QoS)





# Factors Influencing Success – Impairment Levels

- Impaired network

- Network conditions based on ITU G.1050 definitions, used for impairment testing

Network type	Network Round Trip Latency*	Single Packet Loss	Burst Packet Loss
Well Managed IP Network	40 to 200 ms (regional) 180 to 600 ms (intercontinental)	< 0.05%	Random loss only
Partially Managed IP Network	100 to 200 ms (regional) 180 to 800 ms (intercontinental)	< 2%	40-200 ms
Unmanaged IP Network (open Internet)	100 to 1000 ms	< 20%	40-10,000 ms

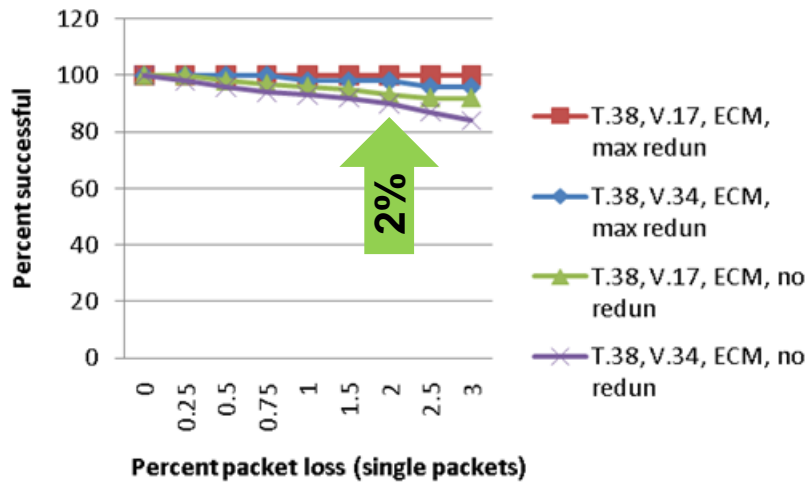
\*not including transcoding, jitter buffers, or response generation (supports real-time applications with strict constraints)

**Typical SIP Trunk**

# Sample Lab Testing Results

## Packet Loss: T.38 vs. G.711 Pass-Through

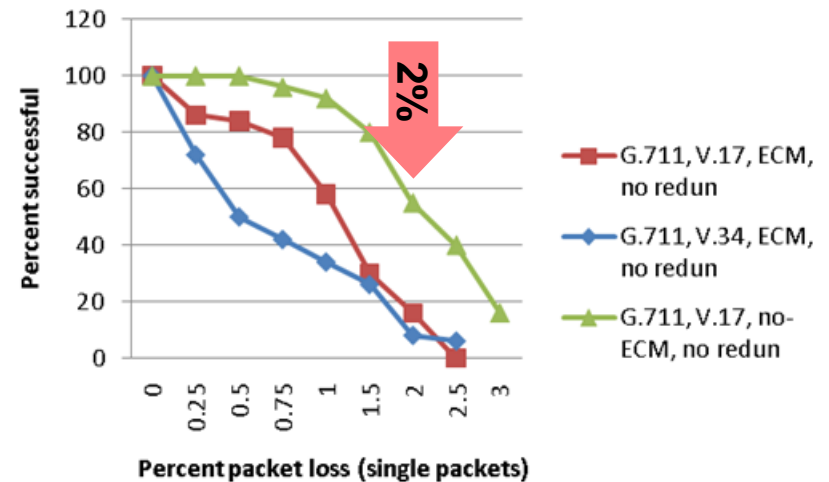
### T.38 Fax Completion Rate



T.38 completion rates remained above 90% at 2% packet loss

G.711 Pass-Through completion rates dropped below 60% at 2% packet loss

### G.711 Fax Completion Rate



# FoIP Research White Paper

**Dialogic**

## Considerations for Using T.38 versus G.711 for Fax over IP

White Paper

### Abstract:

As businesses move to Voice over IP (VoIP), they often want to move their fax traffic onto the IP network as well.

However, VoIP networks are, as the name implies, optimized for voice traffic.

This white paper will compare the performance of the two principal options for implementing fax over an IP network: Fax-Relay (T.38) and Fax Pass-Through (G.711).

# Conclusions

- Carefully select SIP trunk provider
  - Specifically offer support for fax, preferably T.38
  - SLA, access options, and historical data to support QoS
  - Geographical coverage matches your needs
- Most cases choose T.38
  - G.711 can be successful with a Well Managed Network, even V.34 speeds
- Enable redundancy
  - Even lowest levels of redundancy can protect against the impairments found in a Partially Managed Network
- Select access option
- Test and pre-qualify using a quality metrics tool (e.g., FDTool in Dialogic® Brooktrout® SR140 Fax Software)

# Dialogic®

Dialogic, Veraz, Brooktrout among others as well as related logos, are either registered trademarks or trademarks of Dialogic Inc. and all companies controlling, controlled by, or under common control with Dialogic Inc. ("Dialogic"). The names of actual companies and products mentioned herein are the trademarks of their respective owners.

09/11

---

[www.dialogic.com](http://www.dialogic.com)