South American Astronomy Coordination Committee (SAACC) Meeting Report

April 17, 2019

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1. Executive Summary

This report attempts to capture the main updates from the AmLight SAACC Meeting April 2019. The meeting gathered participants from several universities, organizations and research institutions from the USA, Latin America, and Europe. The SAACC Meeting was comprised of two sessions: Science Requirements & Activities Updates and Providers updates.

The Science Requirements & Activity Updates session started with welcome remarks and an introduction followed by presentations from AURA, GEMINI, LSST, NRAO, Data Observatory Chile, GTMO, and ended with Open Discussion & Coordination. The Providers Updates session started with presentations on the AmLight-ExP network and continued with presentations from Center for Excellence in Astrophysics and associated Technologies[1], REUNA, RNP, RedCLARA, Internet2 and ended with Open Discussion/Coordination.

2. Introduction

The South American Astronomy Coordination Committee (SAACC) is now in its 10th year and serves not only to provide input and advice to the AmLight PI and the Steering Committee on program and network needs, but also as a venue for coordinating the needs of astronomical projects and institutions to improve their resource planning and implementation of operational connections between distant facilities and users in the continental US and Latin-American Countries.

Now in its third year, the LSST Network Engineering Team (NET), works to describe and update the requirements to interconnect the networks and operations towards a manageable, cost-effective, secure and scalable end-to-end network infrastructure to support LSST. LSST NET includes network engineers from every institution involved with the LSST end-to-end network provisioning and governance. The goal of the April 18th meeting of the LSST NET team was to further clarify the requirements and interconnections to each of the networks that will be supporting LSST. The LSST NET meeting report is documented in a different file.

3. Goals and Objectives of the AmLight SAACC Meeting

AmLight-ExP builds upon the results of the WHREN-LILA project, Award# OCI-0441095, and the AmLight IRNC project, Award# ACI-0963053. Over the last 14 years, these projects successfully supported a cooperative and collaborative consortium among R&E network providers and users in the Western Hemisphere. The success of previous U.S. - Latin American networking activities has led to a groundswell of change for research instruments. Data-intensive instruments and data *dependent* instruments continue to be located in South America. The Large Synoptic Survey Telescope (LSST) is a significant example of a data-dependent instrument and has from the beginning been part of the planning for AmLight-ExP (NSF award # 1451018). The focus of AmLight-ExP is to be an open instrument for collaboration, interconnecting open exchange points, and providing a means to leverage collaborative purchasing and network operation to effectively maximize the benefits to all investors, and manage the NSF investment in the context of international partnerships. See Appendix A for the agenda.

4. Activities of the SAACC Meeting

The AmLight SAACC Spring meeting, hosted by The National Network of Chile for Science and Education (REUNA), took place on April 17, 2019 at **Cerro Calán, Observatorio Astronómico Nacional, Camino El Observatorio #1515, Las Condes, Santiago, Chile.** More details about logistics of the meetings can be found here: https://www.amlight.net/?p=3362

The meeting gathered 54 participants (28 in-person and 26 remotely) from 25 university, organizations and research institutions from the USA, Latin America, and Europe:

[1] The Center for Excellence in Astrophysics and associated Technologies is the largest Chilean effort dedicated to the research of the Astronomy: http://www.cata.cl/index_en.php

- Academic Network at São Paulo (ANSP), Brazil
- Brazilian e-science/astronomy virtual institute LINEA
- Brazilian National Research and Educational Network (Rede Nacional de Ensino e Pesquisa - RNP)
- Cerro Tololo Inter-American Observatory (CTIO)
- Cherenkov Telescope Array (CTA) Observatory
- CIARA at Florida International University (FIU)
- Data Observatory Chile
- Energy Sciences Network (ESnet)
- European Southern Observatory (ESO)
- Federico Santa María Technical University (UTFSM), Chile
- FermiLab (FNAL)
- Florida LambdaRail – Florida's Research and Education Network
- Gemini Observatory Chile
- GMTO (Giant Magellan Telescope Observatory)
- Information Science Institute (ISI) at University of Southern California (USC)
- Internet2
- Large Synoptic Survey Telescope (LSST)
- Latin American Advanced Networks Cooperation (Cooperation Latino Americana de Redes Avanzadas - RedCLARA)
- London School of Economics & Political Science (invited by REUNA)
- National Center for Supercomputing Applications (NSCA)
- National Optical Astronomy Observatory (NOAO)
- National Radio Astronomy Observatory (NRAO)
- National Science Foundation (NSF)
- National University Network Chile (Red Universitaria Nacional -REUNA)
- Universidad de Chile, Astronomy

A video conference connection via ZOOM was offered by REUNA for all invited participants.

Additionally, REUNA, together with the Universities of O'Higgins, Talca, Bío-Bío, Concepción and La Frontera, invited all participants to the launch event of the new High-Speed Optical Network between Santiago and Temuco. The event marks the second milestone in the construction of the digital super highway that REUNA will make available to the scientific and academic community of Chile. This new section has a capacity of 100 Gbps and unlimited growth potential.

This ceremony was held on Tuesday, April 16 from 10:00 am to 12:00 pm, at the offices of Inria Chile (Apoquindo 2827, 12th floor, Santiago) in Spanish. For copy of the invitation click here.

4.1 SAACC Participants Updates

The SAACC Meeting was comprised of two sessions: Science Requirements & Activities Updates and Providers updates. See Appendix A for agenda details.

Science Requirements & Activity Updates session started with welcome remarks from Guido Garay (REUNA & UChile Astronomy Department), followed by welcome by Julio Ibarra (AmLight PI) and Jeff Kantor (LSST). The meeting continued with presentations from Mauricio Rojas (AURA), Eduardo Toro (GEMINI), Jeff Kantor (LSST), Robert Blum (LSST), David Halstead and Adele Plunkett (NRAO), Aisen Echeverria (Data Observatory Chile), and Mauricio Pilleux and Sam Chan (GTMO).

Providers Updates session began with presentations on AmLight1: AmLight-ExP Links, Express route activation, In-band network telemetry (Jeronimo Bezerra) and continued with presentations from Monica Rubio (Astronomy in Chile), AmLight2: Performance monitoring and measurement by Rodrigo Pescador

(AmLight/RNP), Albert Astudillo (REUNA), Aluizio Hazin (RNP), Luis Cadenas (RedCLARA), John Hicks (Internet2) and ended with Open Discussion/Coordination.

Questions and comments were discussed from the remote participants.

4.1.1 Association of Universities for Research in Astronomy (AURA)

The Association of Universities for Research in Astronomy (AURA) is a consortium of 42 US institutions and five international affiliates that operates world-class astronomical observatories. AURA's role is to establish, nurture, and promote public observatories and facilities that advance innovative astronomical research.

AURA's presentation on the network update included installation of a private fiber optic cable from the Summit to the Base (200Gbs), shared Lambdas among the tenants and 4x10Gbs to Santiago, and plan on an upgrade of the current 4Gb backup link to 10Gb soon. 100% data delivery has been achieved due to the second path to Santiago. The current list of AURA tenants' facility in Tololo includes:

- GONG- Global network monitoring solar oscillation for the past 24 years
- Wisconsin H-alpha Mapper (WHAM) all sky H-alpha emission line survey
- South Western Association for Research in Astronomy SARA (0.6-m)
- Last Cumbres Observatory (LCOGTN)3x1-m +2x0.4-m telescope +ASAS-SN part of a dynamic scheduled global network
- PROMPT 5x0.41-m,1x0.5-m,1x0.6-m GRB and other transients, education Evryscope 24x6cm lens whole sky Gpixel camera-whole sky transient detection
- MEarth 8x0.4-m telescope -transiting rocky exo-planet search
- Korean Astronomy & Space Science Institute (KASI) KMTNet 1.6m global network, exo-planet search using microlensing
- T80 (USP) 0.8 -m part of Javalambre Photometric Local Universe Survey (J-PAS)
- USNO CCD Astrograph - Survey (URAT) just completed new 1.0-m installed in March 2019 to tie astrometric reference frame in optical to QSOs

Highlights of NOAO/CTIO Víctor M. Blanco Telescope DECam[2] scientific discoveries (300 science and 50 technical papers) were presented: twelve new Jupiter's moons, doubled number of Milky Way dwarf satellites, several new Trans-Neptunian and Kuiper Belt objects, and eleven new Milky Way stellar streams.

4.1.2 GEMINI Observatory Chile

The Gemini Observatory consists of twin 8.1-meter diameter optical/infrared telescopes located on two of the best observing sites on the planet. From their locations on mountains in Hawaii (Gemini North) and Chile (Gemini South), Gemini Observatory's telescopes can collectively access the entire sky. Gemini is operated by a partnership of six countries including the United States, Canada, Chile, Brazil, Argentina, and Korea. Gemini Observatory has data centers at both locations: Hilo Base Facility (HBF) in Hilo City (Mauna Kea Operations (MKO) at 4200m) for Gemini North and La Serena Base Facility (SBF) in La Serena (Cerro Pachon Operation (CPO) at 2700m) for Gemini South. Five key use cases were presented: Base Facility Operations (High QoS), Summit Base Data Transfer (High Bandwidth), High Availability (multiple paths ,fiber optic and microwave link, and data center redundancy), Cross-site Coordination between Hilo and La Serena (low latency of ~220ms), and Cloud Data Archiving (high reliability for low cost archiving). Future updates for 2019 included firewall and hardware upgrades.

4.1.3 Large Synoptic Survey Telescope (LSST) Construction and Commissioning

Updates on the LSST network construction and commissioning included network and path diversity between sites and centers. The LSST Long Haul network diagram included primary and secondary paths for the 2021 fiscal year:

[2] DECam is a high-performance, wide-field CCD imager mounted at the prime focus of the Blanco 4-m telescope at CTIO http://www.ctio.noao.edu/noao/node/1033

1) Primary: Cerro Pachon >>La Serena>>Santiago>>Sao Paulo>>Boca Raton>>Chicago>>Champaign (and low-bandwidth connections to Tucson, SLAC & other DOEs, CC-IN2P3 in Lyon France)
2) Secondary: Cerro Pachon >>La Serena>>Santiago>>Sao Paulo or Panama>>Miami>>Boca Raton, Chicago>>Champaign

A summary of the end-to-end demonstration for 2017-18 and the parties involved were presented along with the bandwidth evolution. With regards to the Base to Summit part, new improved cement posts have been installed to provide better resiliency for the network. The Base Data Center facility with new LSST racks of hardware is nearly completed. A new fiber link for the Auxiliary telescope is also in place. Remaining future major activity to be completed include: Summit network cabling, access switches, Wi-Fi, VOIP, Summit server installations (Aux Tel, EFD, MW, ESAS/ECS, TMA, Camera rooms, etc.), installation of LSST DWDM Summit & Base, installation of the Base Data-Center racks, transferring existing equipment, installing new network switches and servers, DWDM purchase and activation of Spectrum link, Base Office building cabling (offices, rooms, access switches, Wi-Fi, VOIP), and implementation 2 x 20 Gbps ESnet.

4.1.4 Large Synoptic Survey Telescope (LSST) Operations

LSST is an Observatory system (telescope, camera, data facility) with peta-scale data management. The primary science drivers are Cosmology (Dark energy, Dark matter), Milky Way (Stellar populations, Stellar Streams, Dwarf Galaxies), Solar System (Near-Earth Objects, Trans-Neptunian Objects, Comets), Dynamic Universe (Explosive transients, and Multi-messenger counterparts, Variable stars, quasars, Lensing events). LSST's survey will be a 10-year log of half the sky, taking an image every 40 seconds for 10 years starting 2022. High level vision for collaboration environment for LSST science encompass the ability to analyze peta-scale LSST data, do exploratory analysis via browsing and visualization, enable science discovery by "bringing the analyst to the data", support user-generated product creation, integrate extant archives via IVOA protocols, create a collaborative working environment, and provision of backend computation and analysis resources. The LSST Data Management system handles about 20TB per night raw data and the current snapshot includes a portal, JupiterLab, and a web API. There are five LSST operational departments: Observatory Operations (Observatory), Data Facility Operations (Production), System Performance (Optimizations), Science Operations (Assurance), and Education and Public Outreach.

4.1.5 National Radio Astronomy Observatory (NRAO)

The NRAO team presented updates on ALMA data rate and bidirectional data flow. Cycle 5 (Oct 2017-Sept 2018) of ALMA Science data rate evolution included 43 main array antennas and 10 compact arrays with approximately 45% of array time to science. The total volume was 275TB including image products. In Cycle 6, Water Vapor Radiometer duplication will be eliminated, and the data won't be taken in 2 streams anymore. Approximately 55% of array time will be used for science with minimum 43 to 66 (25 dishes from North America, 25 Europe, 16 Japan) antennas. Total volume will be approximately 220TB, including image products (which will constitute about 30% of the total data volume). For future cycles, the "duty cycles" of observation will slowly increase as testing and maintenance procedures improve. Best estimate of future data size is 250TB (raw and product). Over 800 proposals have been submitted for the use of ALMA (cycle starting Oct 2019) which operates on a "space mission" style.

4.1.6 Data Observatory Chile

Data Observatory (DO) is a public-private, non-profit collaboration, with the mission of acquiring, processing, storing and making available datasets whose potential is not being fully exploited for the development of science, technology, innovation, knowledge, and economic development[3]. The presentation began with a representation of the evolution of the astronomical instruments through the years (1847-2020+). Chile is currently the location where 55% of the world astronomical observation capacity and will contain 96% of the earth hemisphere for the next decade. As astronomy is expanding the data science frontiers, it is among the fields that are producing more exploitable data (e.g., SKA1 will

[3] http://dataobservatory.net/

produce 6.5 EB - Exabyte). Chile is generating global value data because it has a high level of solar radiation, clear sky most of the year suitable for astronomy, freshwater reserves, peculiar geography with over 12,784 lakes and lagoons, 3,094 islands and islets, 1,509 peaks above 4000 mamsl[4], over 270 hot springs, and 90 active volcanoes. As a next step, Data Observatory Chile is planning to explore the knowledge base economy for technology transfer.

4.1.7 Giant Magellan Telescope Observatory (GMTO)

The Giant Magellan Telescope will be one member of the next class of giant ground-based telescopes that promises to revolutionize our view and understanding of the universe. It will be constructed in the Las Campanas Observatory in Chile. Commissioning of the telescope is scheduled to begin in 2025. There are three new telescope currently being built in Chile: the Giant Magellan Telescope (GMT) in Cerro Las Campanas (operational in 2023) by GMTO Corporation, the European Extremely Large Telescope (EELT) in Cerro Armazones (operational in 2026) by ESO, and the Large Synoptic Survey Telescope (LSST) in Cerro Pachón (operational in 2022) by NSF/AURA-DOE/SLAC. GMT is funded by 12 research institutions and the research area includes exoplanets and their atmosphere, dark matter, distant object, and unknown. Currently, the top of the mountain has been cleared, 5 of the 6 mirrors are made already, residency facilities (max capacity 300 people) are built, water and telescope/enclosure cooling system utilities are under construction. The anticipated data, once the telescope is fully operational, is 10-40TB/night. Data archive location has not yet been defined and the data center currently is located in Pasadena/California with future data replication option at the summit.

4.1.8 Americas Lightpaths Express and Protect (AmLight-ExP[6])

Current status of the AmLight-ExP Links includes leased capacity on two submarine cable systems. Express (spectrum) capacity will provide up to six optical channels which will be lit with 100G transponders and protect (leased) capacity ring will back up the Express capacity. Current total upstream capacity of 230Gbps includes: 100G ring Miami-Fortaleza, Fortaleza-Sao Paulo, Sao Paulo- Santiago, Santiago-Panama, and Panama-Miami; 10G ring from Miami-Sao Paulo- Miami for protection; 10G Miami-Santiago for protection, and 100G and 10G rings are diverse, operating on multiple submarine cables. Monitoring and measurements tools used to troubleshoot the network are four perfSonar nodes, three 100G network taps installed to support the IRNC AMIS projects, and two 100G DTNs for high bandwidth experiments and measurements. Evaluation of the network was performed at the Supercomputing Conference (SC18) demonstration where 100Gbps were successfully exhibited. Next steps include Spectrum activation of two 100G channels via Fortaleza (RNP and ANSP) and two 100G channels from Miami to Sao Paulo (ANSP). Total upstream capacity by May 2019 will be 630Gbps and total network capacity by May 2019 will be 1,230 Gbps / 1.23 Tbps. Future upgrades on the terrestrial path to Chicago will take place from 2019 to 2021. To have a complete view of the network, AmLight-ExP will implement In-band Network Telemetry framework designed to allow for the collection and reporting of network state, by the data plane, without requiring intervention or work by the control plane.

4.1.9 Development of the Chilean Astronomical Community and Projections

Observing the sky in Chile began in 1966 at Cerro Tololo Interamerican Observatory, 1969 European Southern Observatory, La Silla, and 1971 Las Campanas Observatory. By 2005 the situation has changed dramatically, and Chile has become a leading astronomical facilitator. Currently, main telescopes in operations include Very Large Telescope (VLT), Magellan Las Campanas, APEX (ESO) Chanjnantor, ASTE (NAOJ) Pampa La Bola, and Atacama Large Millimeter Array (ALMA). The Chilean government has been very supportive in the process for the building all the telescopes in Chile by providing tax incentives and stimulus. Since 1984, there is an exponential growth in the number of faculty, astronomers, astrophysicists, and the number of institutions involved with astronomy educational program in Chile. Chile is also attracting a significant number of undergraduate and graduate astronomy students

[4] Metres above sea level (mamsl)
[5] https://www.gmto.org/overview/
[6] NSF Award #ACI-1451018 - IRNC: Backbone: AmLight-ExPress and Protect (ExP), https://www.nsf.gov/awardsearch/showAward?AWD_ID=1451018&HistoricalAwards=false

willing to conduct their study in Chile due to the high number of science instrument available in the area. The number of academic publications has grown as well (e.g., 898 articles are referencing ALMA). The two funding agencies in Chile, CONICYT and ECONOMY, invest about $10M every year in astronomy projects. Since 1970, approximately every 10-20 years, astronomy is embarking on new generation telescopes (2010-2030) with a new window (wavelength & time) and larger collecting area. According to CONICYT, the foreign investments in International Observatories in Chiles are about $5,750M:
In operation:

- Magellan Telescope -$100M
- GEMINI – $300M
- VLT – $700M
- ACT- $40M
- Mini-TAO – $20M
- ALMA- $1,300M
- Polarbear - $20M

In construction:

- CLASS -$20M
- Simmons -$100M
- LSST -$650M
- GMT- $800M
- ELT -$1,500M
-

Projected:

- TAO -$100M
- CCAT-p -$40M
- CTA-South

In conclusion, by mid-2020, Chile will host ~70% of the astronomical collecting area with 10% access for researchers in Chile. In the case of LSST, the astronomy community is faced with the new petascale data management, data science, mining, storage & retrieval, and visualization. However, the astronomy projects in Chile are an excellent opportunity to develop collaborations with international research groups.

4.1.10 AmLight-ExP Performance monitoring and measurement

PerfSonar nodes are installed in Miami, São Paulo, Santiago, La Serena, and in Panamá (in partnership with CLARA). The performance monitoring and measurement components consist of PerfSonar central management (archive, visualization), PWA (web tool to manage all the tests), and PerfSonar-testpoint. The approach used is to run tests point-to-point to get information regarding every single link with test specifications OWAMP, latency (RTT) and bandwidth. A perfSonar dashboard (https://dashboard.ampath.net) is created to visually represent the metrics. Another visualization dashboard, NetSage, retrieves data from the AmLight perfSonar servers and is displayed at https://portal.netsage.global/grafana/d/000000005/. The plots are designed to allow NetSage users to easily spot patterns over long periods of time across IRNC links.

4.1.11 National Network for Research and Education in Chile, REUNA

REUNA's new 850 km optical network includes 11 optical nodes and 100G capacity was inaugurated on April 16, 2019. Currently, REUNA's network includes over 8,470km (north to south). Future 100Gbps tender extension from La Serena to Antofagasta is planned to have completed infrastructure in operation at 2020. Synergistic relationships are explored with partners from ESO and ALMA. Several segments from REUNA's backbone are planned to be upgraded from 1-2Gbps to 10Gbps and some 10Gbps to 100Gbps. Additional protection to be added in La Serena: 100G LSST primary link, 40G LSST backup link, and 40G AURA primary link. As additional backup connectivity, microwave radio links are considered too under the new LYRA project.

4.1.12 Brazil's academic network - Rede Nacional de Ensino e Pesquisa (RNP)

RNP included updates on newly signed agreements with the Electric Power Utility Companies for the northeast, southeast, and the southern regions. RNP current partners are CHESF, Furnas, Eletrosul, GXP, Telebras (agreement in progress), and others. A solution for a current gap between the PoP of Sao Paulo and Porto Alegre in the state of Sao Paulo is currently discussed to address the needs of LSST and Bella-T project. Spectrum activation on the Monet submarine cable system is expected to be operational by the end of April 2019. Updates on the infrastructure for LSST outside RNP network included: Porto Alegre/RS to Buenos Aires/AR (Bella-T Project) tender process is in the final phase, and the optical channels will be available by September 2019; Buenos Aires/AR to Santiago/CL (Bella-T Project) also in final phase and will be ready by November 2019; and Porto Alegre/BR to Buenos Aires/AR to Santiago/CL (Bella-T Project) has an optical equipment ready, and RedCLARA is preparing the RFP to launch the process in May 2019. To optimize the scientific data transfer for LIneA and the preliminary path for the LSST, RNP is in touch with the teams involved to coordinate a performance test.

4.1.13 RedCLARA

Since 2004 RedCLARA provides regional and global connectivity through its links to the global network architecture (GÉANT, Internet2, Ubuntunet, Wacren, Aspen, Apan, Tein, Aarnet). RedCLARA consists of 13 National Research Educational Networks and provides services to 2049 universities and research centers. Currently, RedCLARA services include teaching & learning, digital transformation, research support, cloud services, videoconferencing, HPC and computing, CDN, data services, security, roaming, federation, 100Gbps network backbone.

4.1.14 Internet2 (I2)

I2 Next Generation Infrastructure is addressing the support for emerging science infrastructures requirements, software-driven infrastructure, additional end-to-end and infrastructure sharing, cloud connect services, and a response to a request to increase the offered capacity. During 2018, overall backbone capacity was augmented by nearly 20% with 15 new 100G links coming online to augment the 80 existing 100G backbone links. For 2019 and beyond, the plans include automated internal process and automatic configuration for consistency and rapid delivery, the addition of self-service & API features, updated measurement tools, leading network security, and testbeds. A programmable packet platform is underway and will introduce more deeply programmable and virtualizable (shareable) network elements, along with a bandwidth increase. I2 will support 400G on its national backbone with the first segment rolling out in 2020, user-specific telemetry, self-service portals, cloud integration, and dedicated wavelengths. The current science achievement of the image of a black hole was presented as a use-case for future use of the I2 network instead of shipping disks from the research site to the computational data center.

4.1.15 Observatorio Astronomico Nacional - Cerro Calan

Current challenges the network connectivity projects are facing are processing capabilities (CPU+GPU), lower datasets/observations transfer time, distributed science project interaction, and maximizing science productivity. The universities in Chile connect via 10Gbps dedicated fiber PtP to STI, then to REUNAs backbone, and from there to Internet2 network. Next step is to optimize the internal connectivity and use the less used links, engage on future science collaborative, projects, and provide better and more stable services.

Appendix A. Program for the SAACC Meeting

Wednesday, April 17, 2019

9:00 – Welcome remarks from REUNA and UChile Astronomy Department (Guido Garay)
9:10 – Welcome remarks and introduction (Jeff Kantor, Julio Ibarra) | Download presentation

Session I: Science Requirements & Activities Updates
9:20 – AURA (Mauricio Rojas) | Download presentation
9:40 – Gemini and NCOA (Eduardo Toro) | Download presentation
10:00 – LSST Construction and Commissioning (Jeff Kantor) Download presentation
10:20 – LSST Operations (Robert Blum) Download Presentation
10:40 – NRAO (David Halstead, Adele Plunkett) Download presentation
11:00 – *Refreshment Break*
11:30 – Data Observatory Chile (Aisen Echeverria) Download presentation
11:50 – GMTO (Mauricio Pilleux, Sam Chan) Download presentation
12:10 – Open Discussion/Coordination

12:30 – *Lunch Break (1 hour 30 min)*

Session II: Providers updates
14:00 – AmLight1: AmLight-ExP Links, Express route activation, In-band network telemetry (Jeronimo Bezerra) | Download presentation
14:30 – Astronomy in Chile (Monica Rubio)
15:00 – AmLight2: Performance monitoring and measurement (Rodrigo Pescador) | Download Presentation
15:20 – REUNA (Albert Astudillo)| Download Presentation
15:40 – RNP (Aluizio Hazin)| Download Presentation
16:00 – *Refreshment Break*
16:30 – RedCLARA (Luis Cadenas)| Download Presentation
16:50 – Internet2 (John Hicks)| Download Presentation
17:10 – Open Discussion/Coordination
17:30 – Adjourn

18:30 (TBD) – SAACC Social Dinner Event at Restaurant El Mestizo (Bicentenario 4050, Vitacura, Región Metropolitana, Chile). Please RSVP here.

Appendix C. List of Participants

In Person:

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